

# INDEX

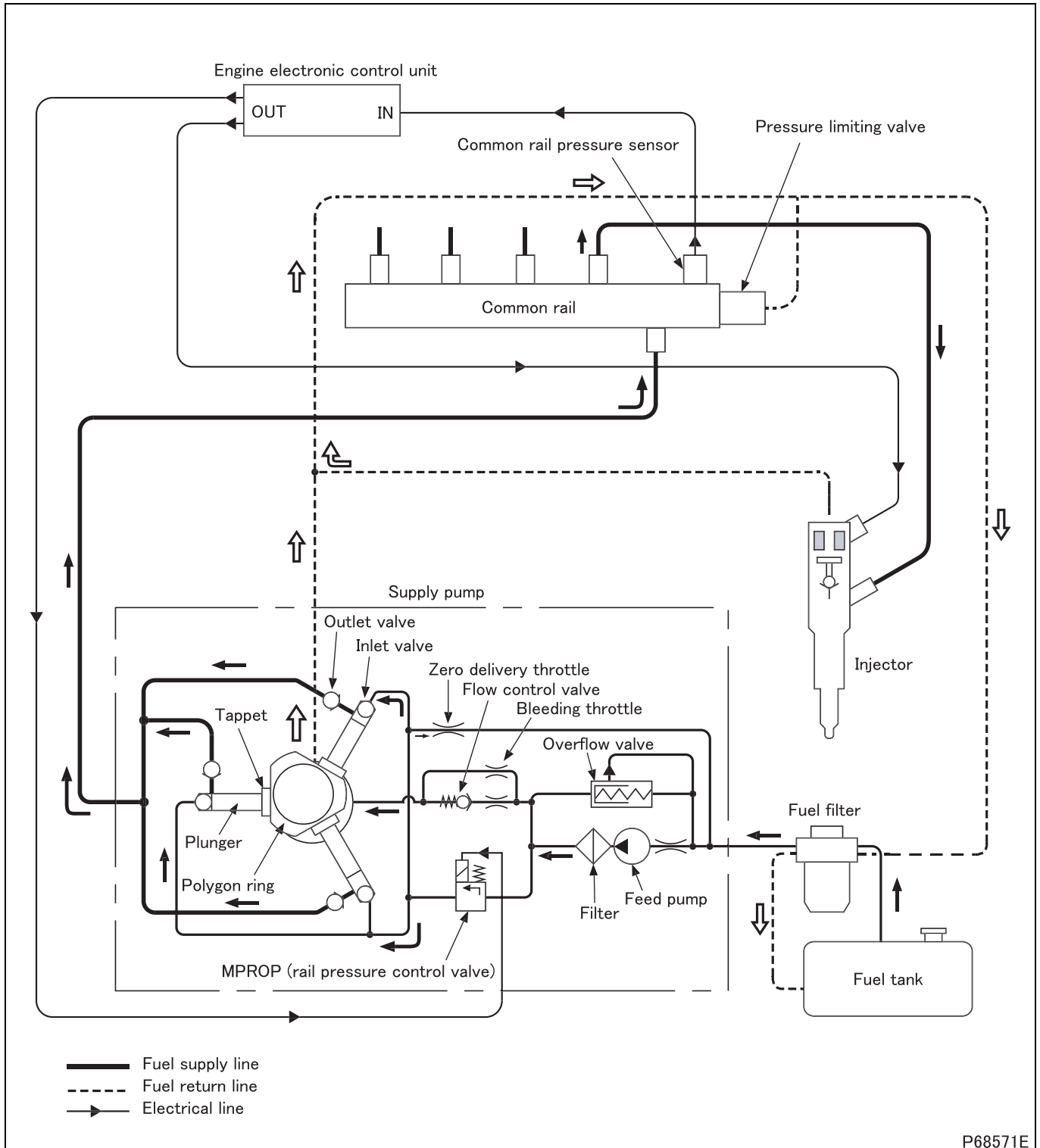
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# SPECIFICATIONS

| Item                                |  | Specifications   |
|-------------------------------------|--|--|
| Supply pump                         | Manufacturer   | Bosch  |
|                                     | Model  | CP3.3 NH   |
|                                     | Control method   | Electronic   |
|                                     | Type   | Radial, 3-cylinder   |
|                                     | Type   | External gear type   |
|                                     | Rail pressure control valve                                  | Model<br>MPROP   |
|                                     |  | Rated voltage V<br>12  |
|                                     | Max. common rail pressure<br>MPa {psi, kgf/cm <sup>2</sup> } | 180 {26100, 1840}  |
| Common rail                         | Manufacturer   | Bosch  |
|                                     | Common rail volume   | cm <sup>3</sup> {cu. in., ml}<br>18.7 {1.14, 18.7}                           |
|                                     | Pressure limiting valve opening pressure                     | MPa {psi, kgf/cm <sup>2</sup> }<br>210 to 220 {30450 to 31900, 2141 to 2243} |
|                                     | Common rail pressure sensor supply voltage                   | V<br>5   |
| Injectors                           | Manufacturer   | Bosch  |
|                                     | Control method   | Electrical   |
|                                     | Max. operating pressure                                      | MPa {psi, kgf/cm <sup>2</sup> }<br>180 {26100, 1840}                         |
|                                     | Min. operating pressure                                      | MPa {psi, kgf/cm <sup>2</sup> }<br>25 {3630, 255}                            |
| Common rail electronic control unit | Manufacturer   | Bosch  |
|                                     | Rated voltage  | V<br>12  |

## 1. Overview

- In the common rail system, an electronic control unit monitors various aspects of the engine (engine speed, throttle opening, coolant temperature, etc.) using information from sensors. In accordance with these data, the electronic control unit effects control over the fuel injection quantity, fuel injection timing, and fuel injection pressure in order to optimize the engine's operation.
- The electronic control unit has a diagnosis function that enables it to recognize abnormalities in the common rail system's major components and alert the driver to them.
- The common rail system consists mainly of an electronically controlled supply pump; injectors; a common rail; and the electronic control unit and sensors that are used to control the other components.



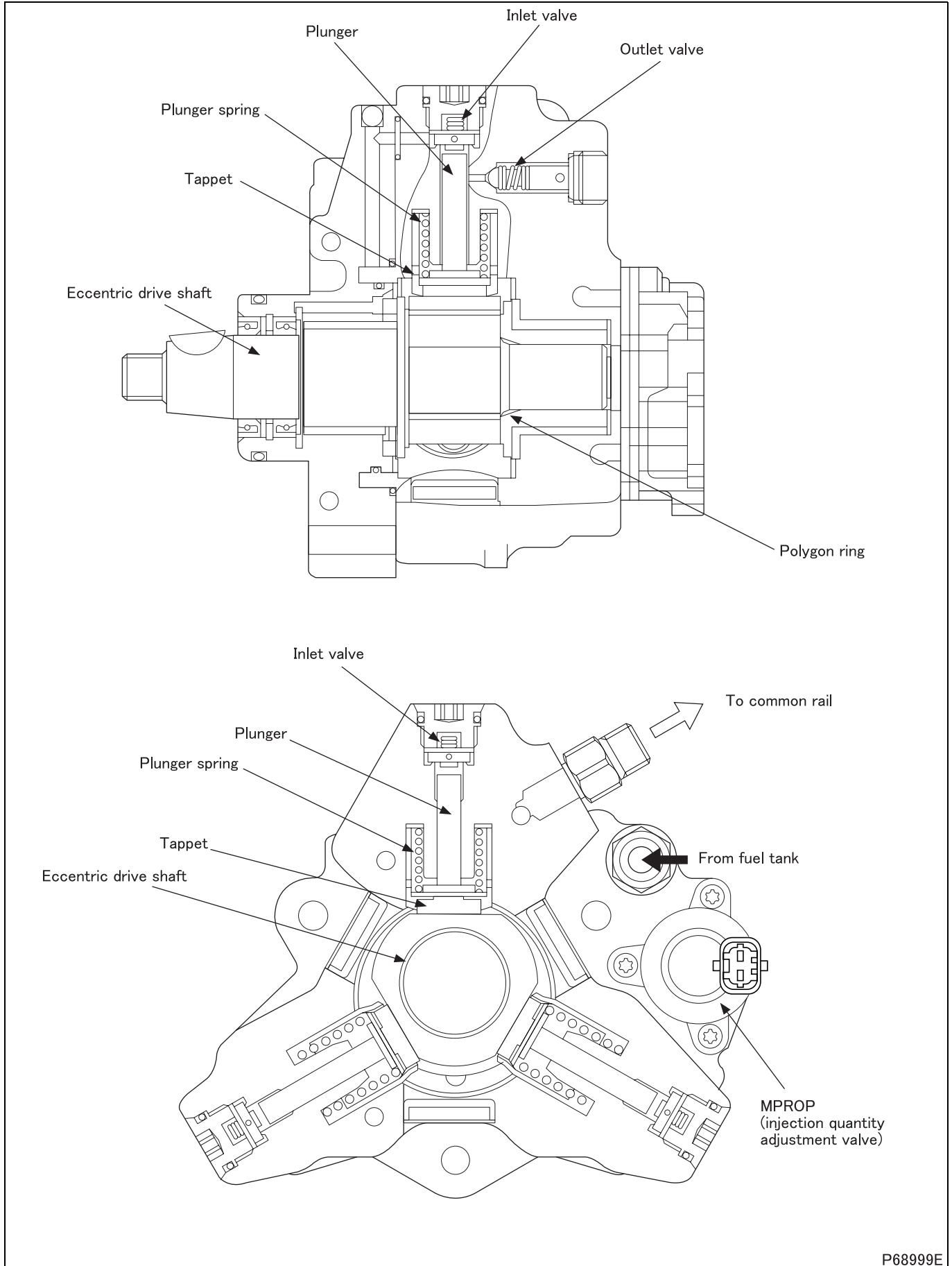
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# STRUCTURE AND OPERATION

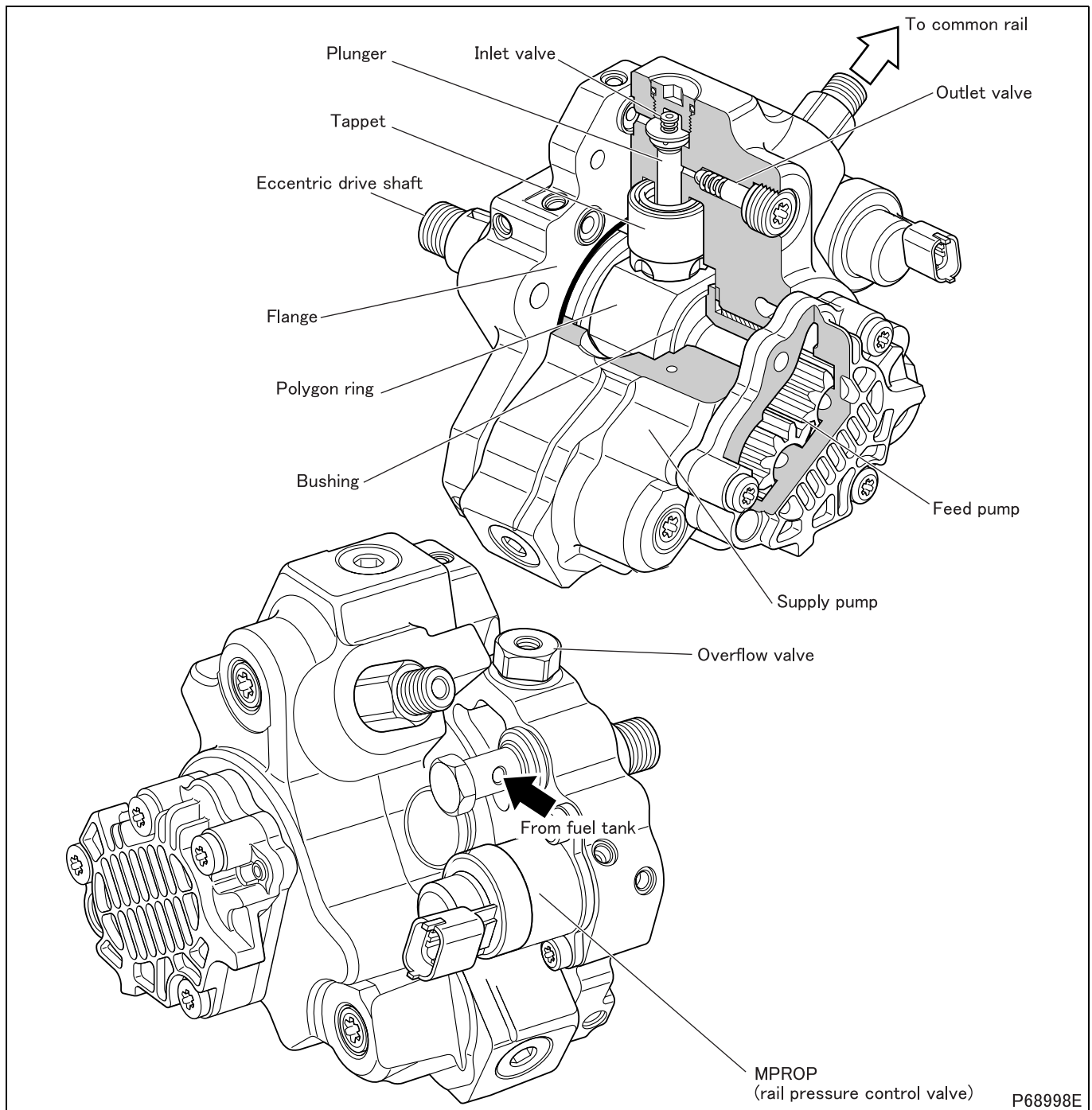
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- When the engine is cranked by means of the starter switch, the feed pump (this is located inside the supply pump) simultaneously draws fuel from the fuel tank and feeds it via the fuel filter to the MPROP (rail pressure control valve). A quantity of fuel metered by the MPROP is supplied via the inlet valves to the plunger chambers.
- The fuel in the plunger chambers is pressurized. The outlet valves are then opened, and the fuel is fed under pressure to the common rail.
- The pressurized fuel is held in the common rail and then uniformly fed to the injectors.
- In response to signals from the engine electronic control unit, a magnetic valve in each injector causes the injector to inject fuel into the relevant combustion chamber at the optimal timing and in the optimal quantity.

1.1 Supply pump



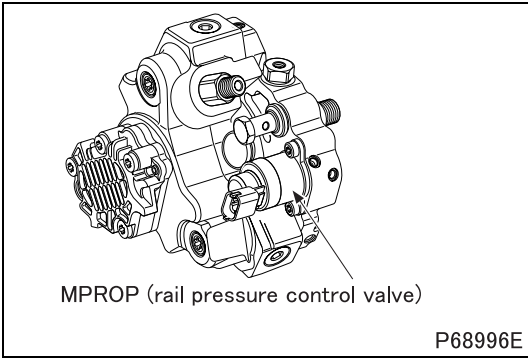
# STRUCTURE AND OPERATION



## CAUTION

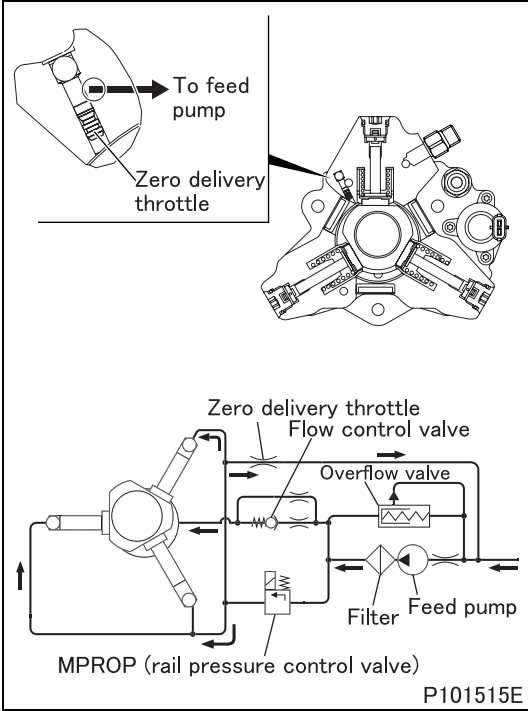
- **Be sure to connect the MPROP (rail pressure control valve) connector to the engine harness before starting the engine. If the engine were started with the MPROP connector not connected, control of the supply pump by the engine electronic control unit would not be possible and a fault would ensue.**

- The supply pump pressurizes fuel and supplies it in a highly pressurized state.
- Fuel drawn from the fuel tank by the feed pump is not supplied directly to the plungers. It is supplied first to the MPROP (rail pressure control valve), which controls the amount of fuel reaching the plungers.
- If the fuel pressure exceeds a certain level, the overflow valve returns fuel to the inlet side of the feed pump. This operation keeps the fuel pressure constant.
- Rotation of the eccentric drive shaft causes (via the tappets) up-down movement of the plungers. Fuel in the plunger chambers is thus highly pressurized.



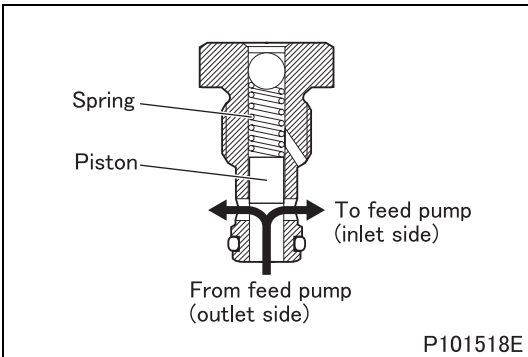
**(1) MPROP (rail pressure control valve)**

- The MPROP receives fuel from the feed pump and feeds fuel toward the plungers of the supply pump in such a quantity that the fuel pressure corresponds to that required by the engine electronic control unit.
- When the MPROP is not operating, i.e., when current is not flowing, fuel flows at its maximum rate. When current flows, the piston in the MPROP is pressed down such that fuel is not fed toward the plungers.



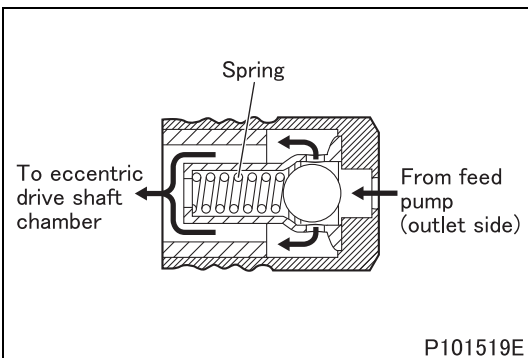
**(2) Zero delivery throttle**

- A small amount of fuel can flow through the MPROP (rail pressure control valve) even when no fuel is to be supplied. The zero delivery throttle prevents this fuel flow by returning the fuel to the inlet port side of the feed pump to zero the fuel delivery to the plunger.



**(3) Overflow valve**

- The overflow valve limits the pressure of the fuel sent from the feed pump to the predetermined level.
- When fuel pressure exceeds the predetermined level, it overcomes the spring force of the overflow valve to move the piston, returning the fuel to the inlet side of the feed pump. The fuel which has overflowed enters into the eccentric drive shaft chamber to lubricate the parts in the chamber.

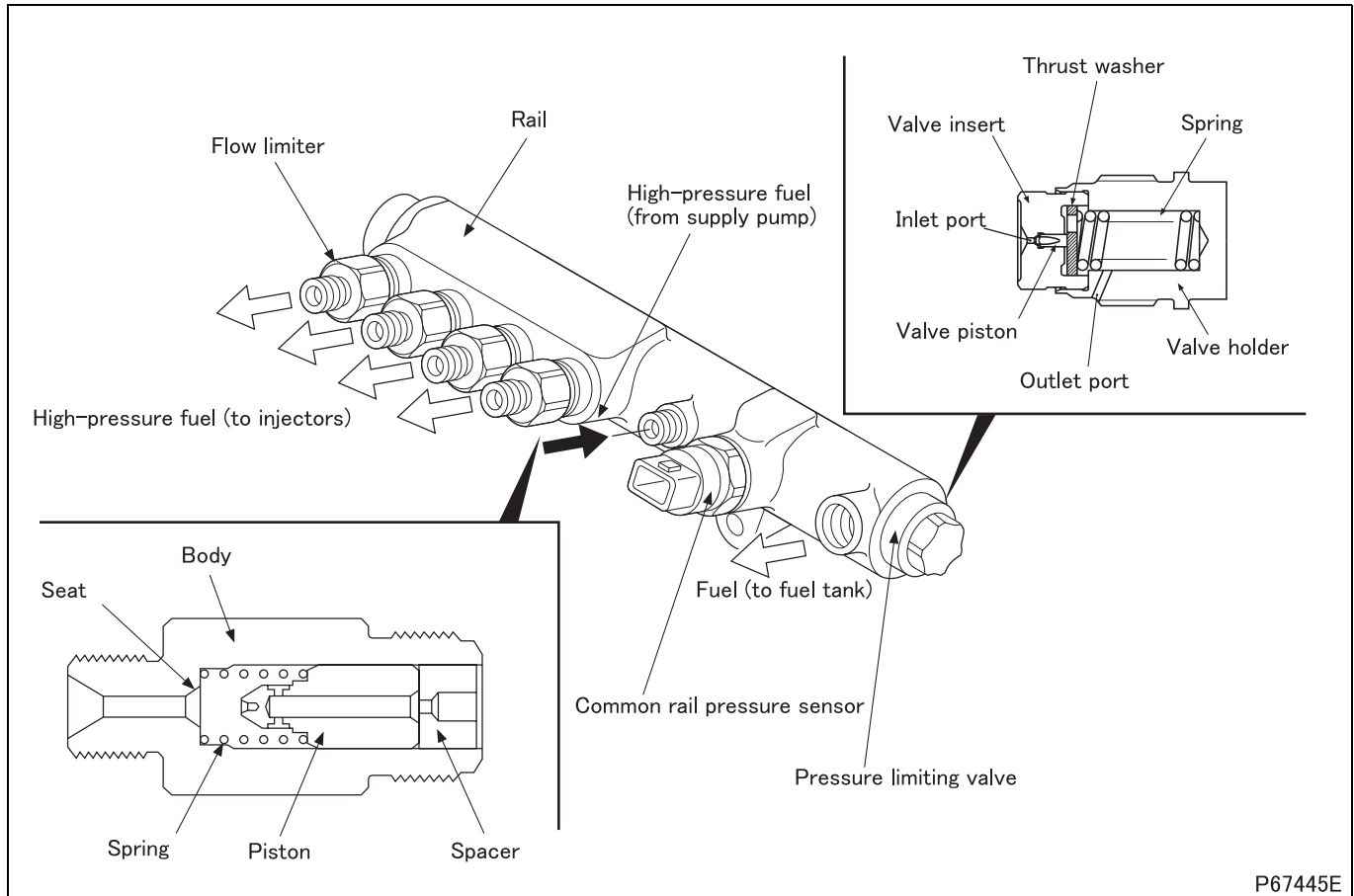


**(4) Flow control valve**

- The flow control valve sends the fuel from the feed pump into the eccentric drive shaft chamber for lubrication of parts in the chamber.
- When the revolution of the feed pump increases, fuel pressure also increases. It overcomes the spring force of the flow control valve to move the ball, sending the fuel to the eccentric drive shaft chamber for lubrication of parts in the chamber.

# STRUCTURE AND OPERATION

## 1.2 Common rail



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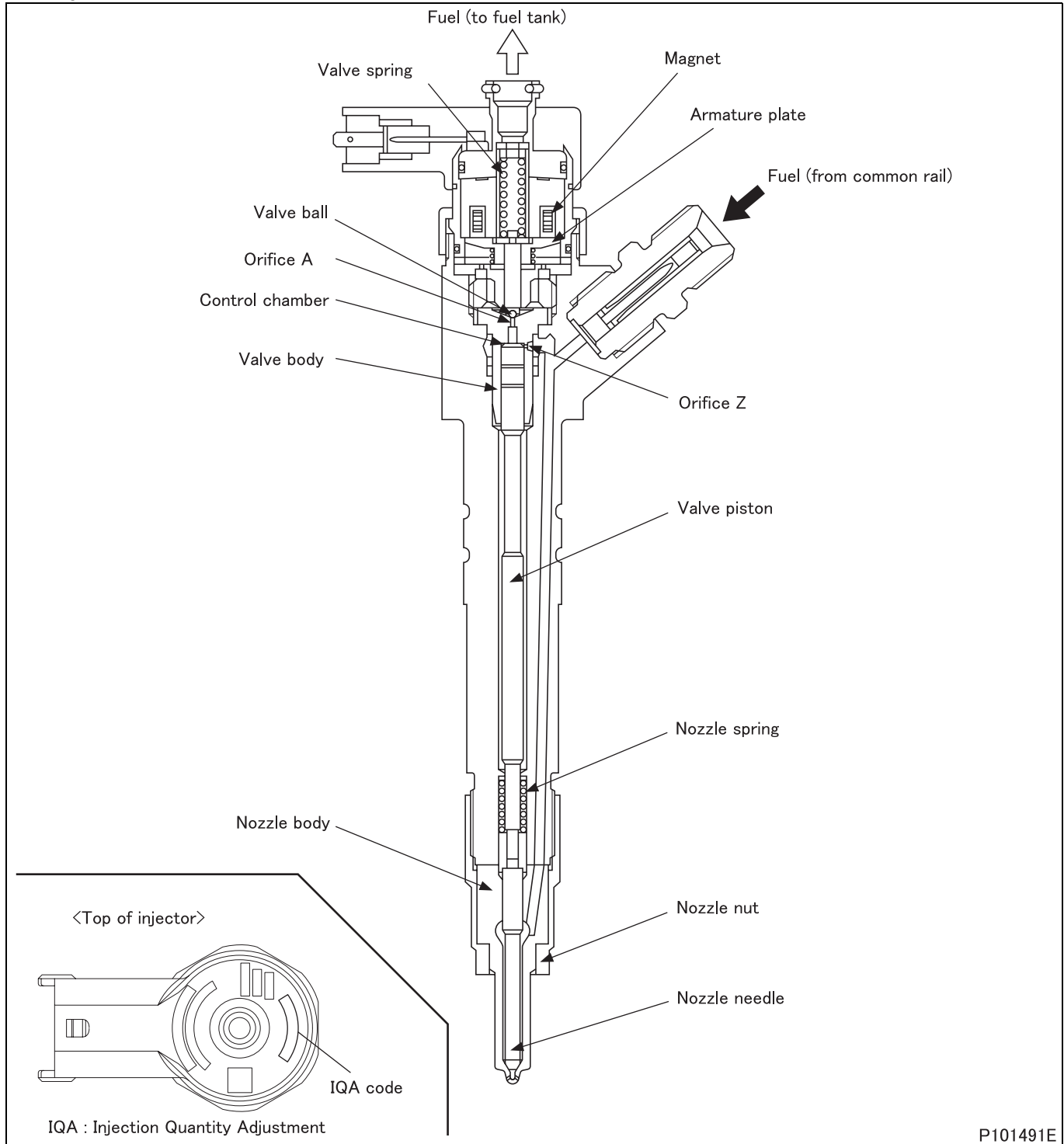
- The common rail distributes to the injectors high-pressure fuel that has been fed from the supply pump.
- Each flow limiter prevents an abnormal outflow of fuel. It does so by blocking the fuel passage in the event of fuel leakage from the injection pipe or excessive injection of fuel from the injector.
- The common rail pressure sensor is used in feedback control. It senses the fuel pressure inside the common rail and feeds a corresponding signal to the electronic control unit.
- If the fuel pressure in the common rail exceeds a certain, set level, the piston in the pressure limiting valve pushes and compresses the spring such that fuel is able to escape. The pressure limiting valve thus prevents the fuel pressure from becoming higher than the set pressure.

### Flow limiter

- During normal operation, the piston moves (thus pushing and compressing the spring) to the extent necessary for one injection quantity to pass through. The piston does not make contact with the seat at this time. When injection is complete, the piston is returned to its initial position by the spring.
- If the amount of fuel passing through the flow limiter becomes excessively great, the piston presses against the seat, thereby closing the fuel passage and preventing an abnormal outflow of fuel. When the piston has pressed against the seat, it does not return to its original position until the engine has been stopped and the pressure in the common rail has come down.

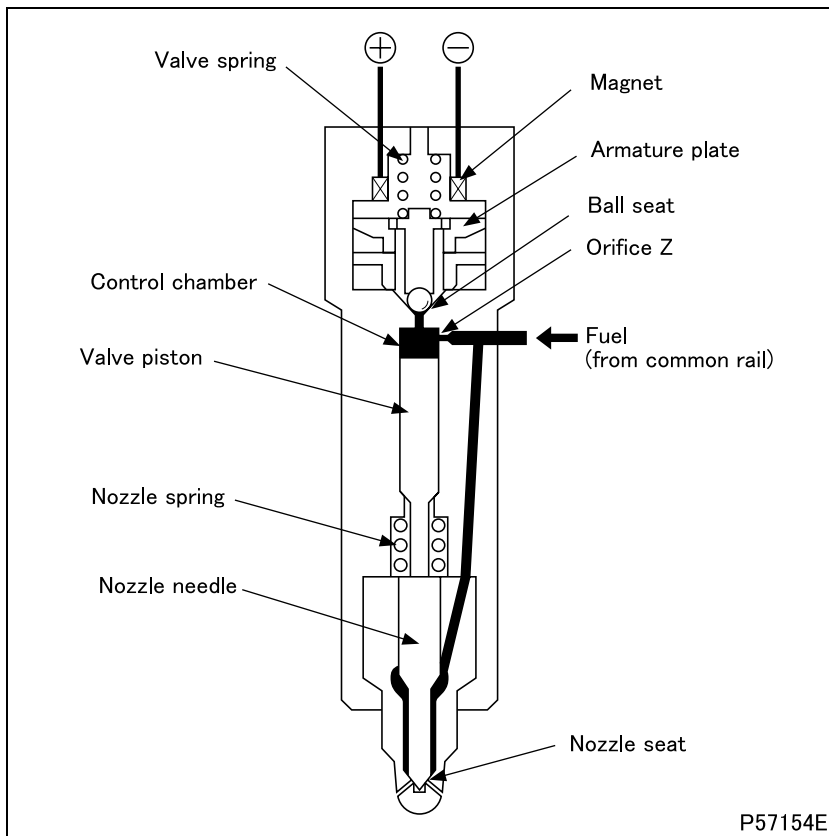


### 1.3 Injector



- In accordance with electrical signals from the engine electronic control unit, the injector supplies high-pressure fuel from the common rail to the relevant combustion chamber of the engine at the optimal timing and in the optimal quantity.
- The injector is divided into the control section and injector section.
  - The control section consists of the control chamber, magnet, spring, armature plate, valve ball, valve body, valve piston, orifice A, and orifice Z. The valve piston is located between the control section and the injector section.
  - The injector section consists of the nozzle body, nozzle needle, nozzle spring, and nozzle nut.
- On the top of the injector is marked the IQA (Injection Quantity Adjustment) code for entry of injector correction data into the engine electronic control unit.
- The fluctuation of each injector in injection quantity is thereby restrained.

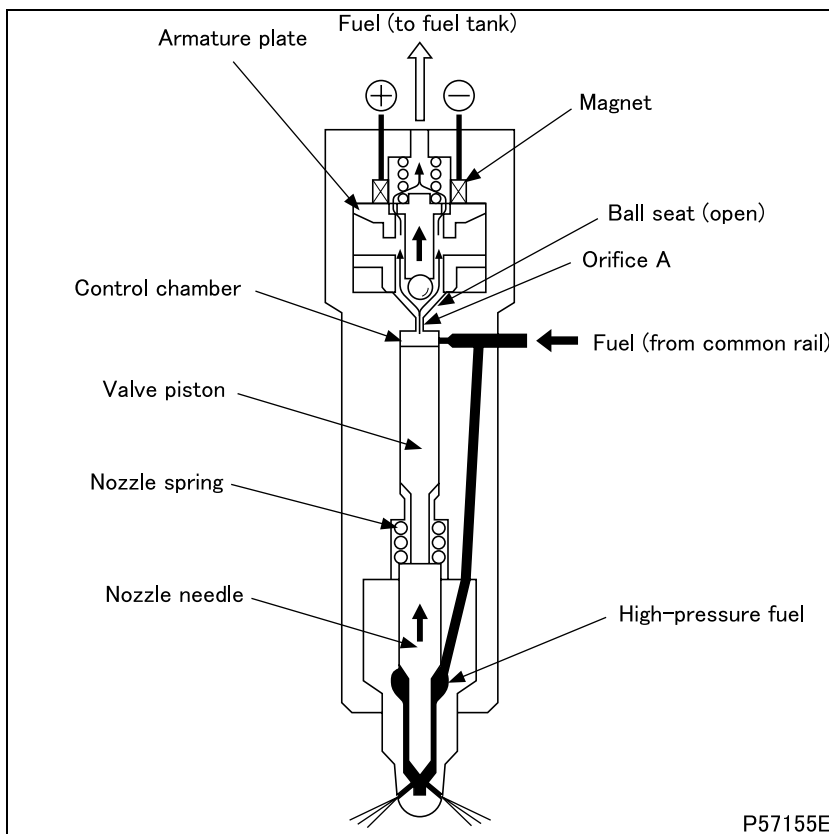
# STRUCTURE AND OPERATION



## (1) Operation

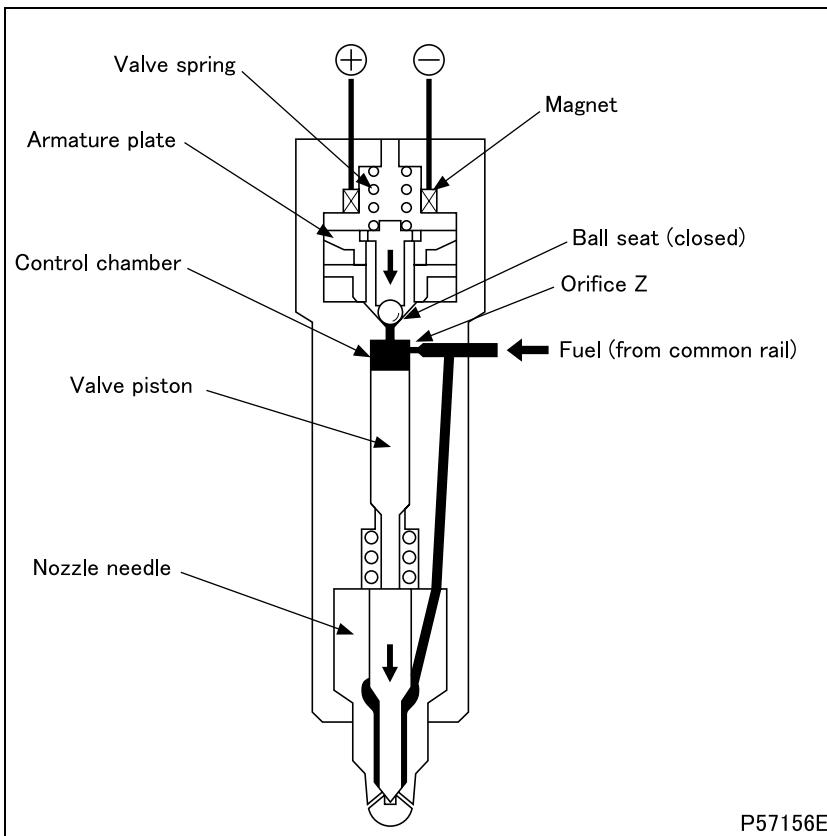
### (1.1) Injection not taking place

- With the magnet not energized, the armature plate is pushed up by the valve spring such that the ball seat is closed.
- The high-pressure fuel acts upon the control chamber via orifice Z. The same pressure acts upon the nozzle needle.
- The fuel pressure acting on the nozzle needle cannot overcome the valve piston and nozzle spring, so the nozzle needle stays in its downward-pushed position and injection does not take place.



### (1.2) Start of injection

- When the magnet is energized, the resulting electromagnetic force draws the armature plate upward, causing the ball seat to open.
- Fuel in the control chamber passes through the ball seat and orifice A and flows to the fuel tank.
- With the pressure in the control chamber reduced, the fuel acting on the nozzle needle overcomes the valve piston and nozzle spring, pushing up the nozzle needle such that injection starts.
- If the magnet remains energized, the injection rate reaches its maximum level.



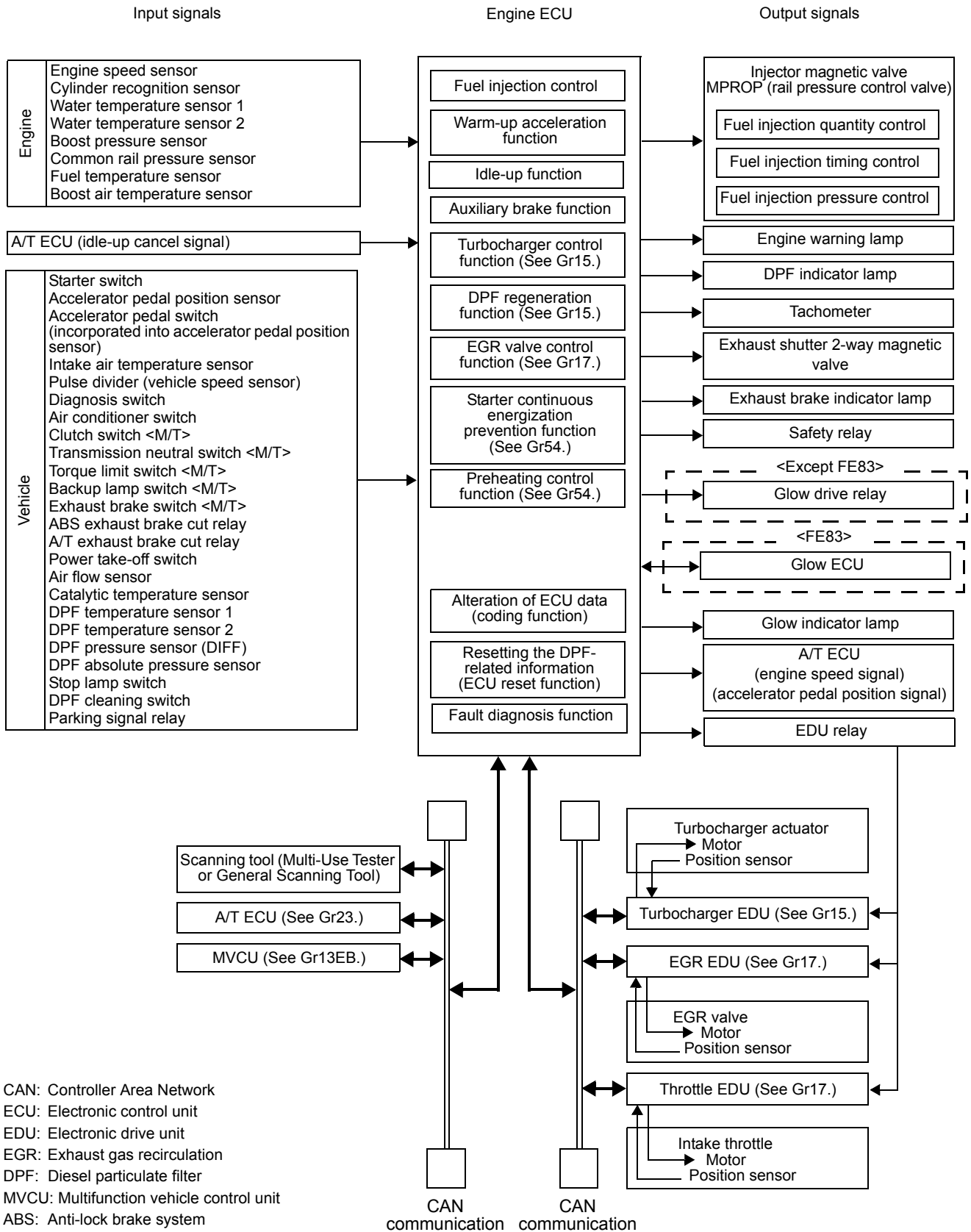
### (1.3) End of injection

- When energization of the magnet is stopped, the armature plate is pushed downward by the valve spring such that the ball seat closes. At this time, fuel flows into the control chamber via orifice Z, pushing down the valve piston and nozzle needle such that injection finishes.

# STRUCTURE AND OPERATION

## 2. Electronic Control System

### 2.1 System block diagram



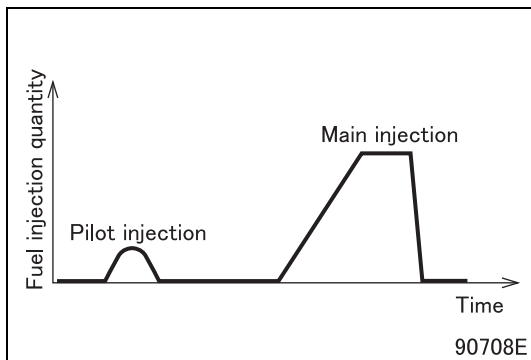
| Part name  | Main function/operation   |
|--|---|
| Engine speed sensor  | Sensing of engine speed   |
| Cylinder recognition sensor  | Cylinder recognition  |
| Water temperature sensor 1   | Sensing of coolant temperature  |
| Water temperature sensor 2   | <ul style="list-style-type: none"> <li>• Backup of coolant temperature</li> <li>• Sensing of coolant temperature for temperature gauge</li> </ul> |
| Boost pressure sensor  | Sensing of boost pressure   |
| Common rail pressure sensor  | Sensing of common rail pressure   |
| Fuel temperature sensor  | Sensing of fuel temperature   |
| Boost air temperature sensor   | Detection of intake air temperature after joining the exhaust gas recirculation   |
| Starter switch   | Senses that the engine is in starting condition with the starter switch in START position.  |
| Accelerator pedal position sensor  | Sensing of extent of accelerator pedal depression   |
| Accelerator pedal switch (incorporated into accelerator pedal position sensor) | Sensing of released/pressed condition of accelerator pedal (ON with pedal released)   |
| Intake air temperature sensor  | Sensing of intake air temperature   |
| Pulse divider (vehicle speed sensor)   | Sensing of vehicle speed  |
| Diagnosis switch   | Output of diagnosis codes   |
| Air conditioner switch   | ON when air conditioner is operating  |
| Clutch switch <M/T>  | Sensing of released/pressed condition of clutch pedal (OFF with pedal released)   |
| Transmission neutral switch <M/T>  | Detection of transmission neutral condition (OFF with transmission in neutral)  |
| Torque limit switch <M/T>  | Detection of transmission 1st and Rev positions   |
| Backup lamp switch <M/T>   |   |
| Exhaust brake switch   | Operation of auxiliary brake  |
| ABS exhaust brake cut relay  | Exhaust brake cut signal for ABS operation  |
| Automatic transmission exhaust brake cut relay                                 | Exhaust brake cut signal with selector in P or N range position and vehicle at low speed  |
| Power take-off switch  | Operation of power take-off   |
| Air flow sensor  | Sensing of intake air flow rate   |
| Catalytic temperature sensor   | Detection of front oxidation catalytic inlet temperature  |
| DPF temperature sensor 1   | Detection of ceramic filter inlet temperature   |
| DPF temperature sensor 2   | Detection of ceramic filter outlet temperature  |
| DPF absolute pressure sensor   | Sensing of DPF absolute pressure value  |
| DPF pressure sensor (DIFF)   | Sensing of DPF filter differential pressure   |
| Stop lamp switch   | Sensing of released/pressed condition of brake pedal (OFF with pedal released)  |
| DPF cleaning switch  | ON/OFF changeover of DPF manual regeneration  |
| Parking signal relay (parking brake switch)                                    | Detection of parking condition (turns ON when the parking brake is applied)   |
| Injector magnetic valve  | Control of fuel injection pressure, fuel injection quantity, and fuel injection timing  |
| MPROP (rail pressure control valve)  | Control of fuel injection pressure  |
| Engine warning lamp  | Indication of system abnormalities<br>Illuminates when the particulate matter accumulation in the DPF ceramic filter is excessive                 |
| DPF indicator lamp   | Illuminates when the particulate matter accumulates in the DPF ceramic filter   |
| Tachometer   | Indicates engine speed (revolutions per minute)   |

# STRUCTURE AND OPERATION

| Part name   |                                   | Main function/operation   |
|---|-----------------------------------|---|
| Exhaust shutter 2-way magnetic valve                        |                                   | ON/OFF changeover of exhaust shutter valve  |
| Exhaust brake indicator lamp                                |                                   | Illuminates when exhaust brake system is operating  |
| Safety relay  |                                   | Changeover of starter continuous energization prevention function   |
| Glow drive relay <Except FE83>                              |                                   | ON/OFF changeover of glow plugs   |
| Glow ECU <FE83>   |                                   | ON/OFF changeover of glow plugs and troubleshooting   |
| Glow indicator lamp   |                                   | ON when preheating system is started  |
| Automatic transmission ECU                                  | Idle-up cancel signal             | Releasing the idle-up except N range  |
|   | Engine speed signal               | Output of engine speed for A/T control  |
|   | Accelerator pedal position signal | Output of extent of accelerator pedal for A/T control   |
| EDU relay   |                                   | ON/OFF changeover of power supply to turbocharger, EGR and throttle EDU   |
| CAN communication (Turbocharger EDU, EGR EDU, throttle EDU) |                                   | Engine data recognized by the engine ECU are outputted to the CAN bus to enable systems to obtain data that they need for control. Each system's EDU issues signals to the engine ECU to enable it to effect engine control appropriate to control of the system. (See Gr15 for Turbocharger EDU control.) (See Gr17 for EGR EDU and throttle EDU control.) |
| CAN communication (A/T ECU, MVCU)                           |                                   | Engine data recognized by the engine ECU are outputted to the CAN bus to enable systems to obtain data that they need for control. The A/T ECU and MVCU issue signals to the engine ECU to enable it to effect engine control appropriate to control of the system. (See Gr23 for A/T ECU.) (See Gr13EB for MVCU.)  |
| CAN communication (scanning tool)                           |                                   | Indicating and erasing fault codes and obtaining the vehicle data of the ECU  |

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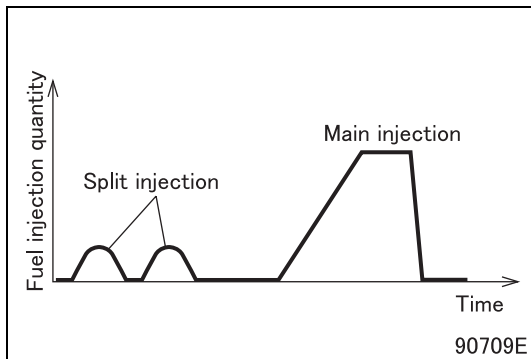
# STRUCTURE AND OPERATION



## 2.2 Fuel injection rate control

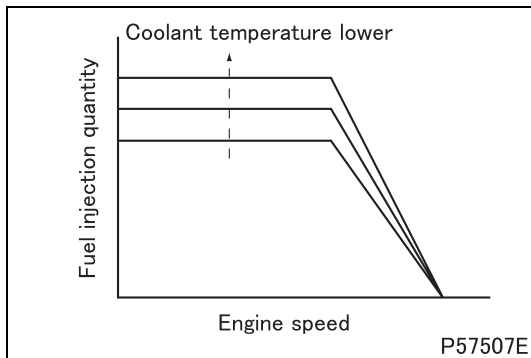
### (1) Pilot injection

- Pilot injection entails the injection of an extremely small amount of fuel ahead of the main injection.
- Pilot injection suppresses heat generation early in the injection cycle and thus suppresses NOx generation and noise at the start of combustion.



### (2) Split injection control

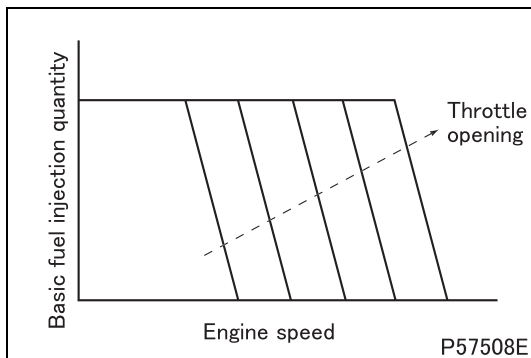
- Split injection entails the injection of an extremely small amount of fuel two or more times ahead of the main injection.
- Split injection increases the fuel's combustibility and thus enhances the engine's cold startability.



## 2.3 Fuel injection quantity control

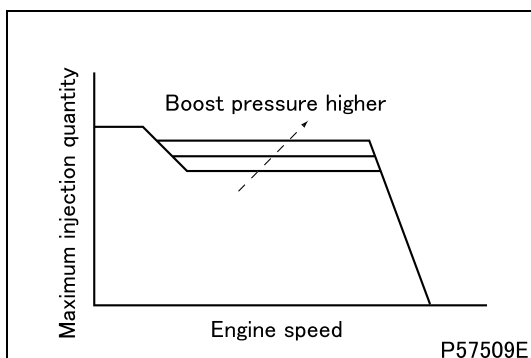
### (1) Fuel injection quantity during engine startup

- During engine startup, the fuel injection quantity is determined in accordance with the engine speed and coolant temperature.



### (2) Basic fuel injection quantity

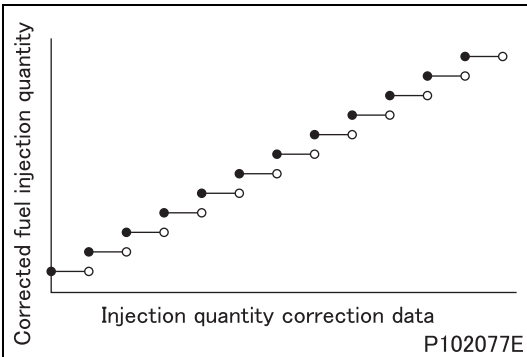
- The basic fuel injection quantity is determined in accordance with the engine speed and throttle opening.



### (3) Maximum injection quantity

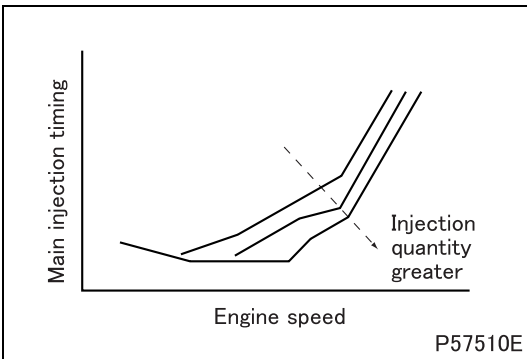
- The maximum injection quantity is calculated from the engine speed and boost pressure.





**(4) Injection quantity correction**

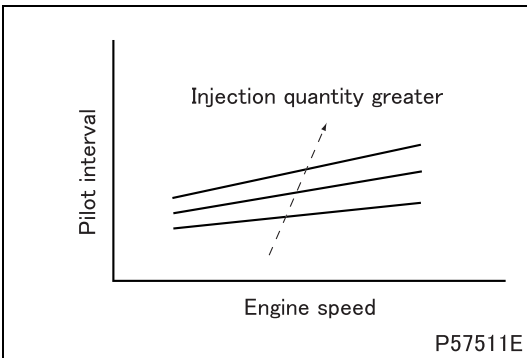
- Injection quantity correction is performed to restrain fluctuations in fuel injection quantity.
- Injection quantity correction data are stored in the engine electronic control unit.
- The storage of injection quantity correction data is effected by the coding function of the Multi-Use Tester.



**2.4 Fuel injection timing control**

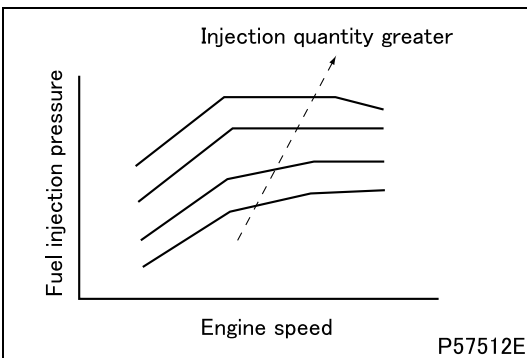
**(1) Main injection timing**

- The main injection timing is calculated from the fuel injection quantity and engine speed.



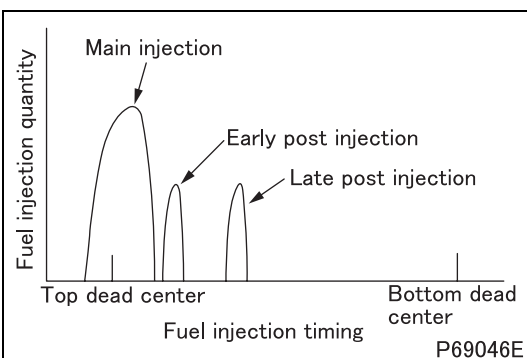
**(2) Pilot injection timing (pilot interval)**

- The pilot interval is calculated from the fuel injection quantity and engine speed.



**2.5 Fuel injection pressure control**

- The fuel injection pressure is calculated from the fuel injection quantity and engine speed.



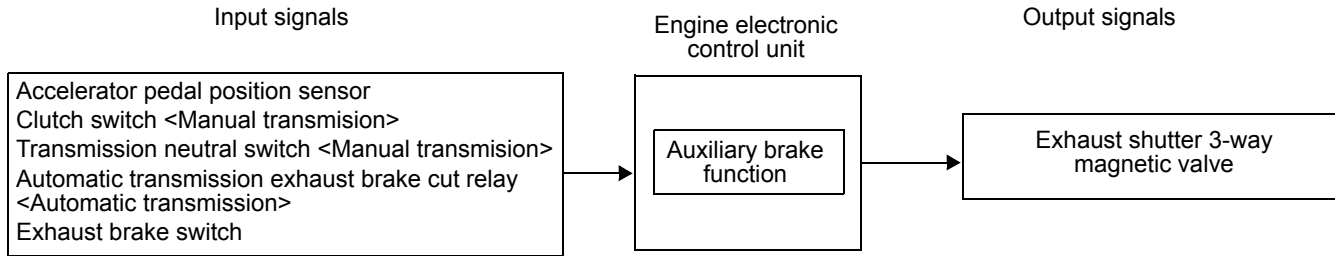
**2.6 Fuel injection control for DPF regeneration**

- Fuel injection control for diesel particulate filter regeneration is performed in such a way, with early post injection and late post injection added after conventional fuel injection (main injection), exhaust gas temperature is increased to burn out particulate matter (PM) collected in the DPF.

# STRUCTURE AND OPERATION

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## 2.7 Auxiliary brake function



- The auxiliary brake function activates or deactivates the exhaust shutter 3-way magnetic valve according to the vehicle condition to control the exhaust brake.

## 2.8 Idle-up function

- The idle-up function increases the engine idling speed when a load is applied to the engine by other system (such as air conditioner, PTO) or when the warm-up acceleration function and DPF regeneration are activated.

## 2.9 Alteration of electronic control unit data (coding function)

- Vehicle information and equipment specifications are registered in each engine electronic control unit as coded data (coding data).
- When an engine electronic control unit or some equipment is replaced, it is necessary to alter registered related data or register new related data using a Multi-Use Tester (for details, see REGISTRATION AND ALTERATION OF DATA IN ENGINE ELECTRONIC CONTROL UNIT).
- For data alteration/registration and data write operation, see Gr13ECU "ECU Rewrite and Programming".

## 2.10 Resetting the diesel particulate filter related information (resetting electronic control unit )

- In the diesel particulate filter regeneration control system, the engine electronic control unit accumulates various information to control the diesel particulate filter regeneration as diesel particulate filter history.
- These accumulated data are automatically initialized by the engine electronic control unit at diesel particulate filter cleaning for regeneration. In the case where the diesel particulate filter regeneration involved the replacement of ceramic filter, etc., however, the initialization of accumulated data is impossible and therefore it is necessary to reset diesel particulate filter related information (the electronic control unit) using a Multi-Use Tester. (for reset procedure, see Gr15.)
- It is necessary to reset diesel particulate filter related information (the electronic control unit) after the following operations are performed.
  - Replacement of diesel particulate filter ceramic filter
  - Cleaning of diesel particulate filter ceramic filter

## **2.11 Diagnostic function**

### **(1) Overview**

- The system continuously monitors the sensors and other system components. If any fault is detected, the system warns the driver of this by displaying the relevant fault information on the meter cluster. At the same time, the system also stores a relevant fault code in the memory and starts operation in the fault mode.
- When control is performed during a failure, the system function is limited to ensure the safety of the vehicle and driver.

### **(2) Reading fault code**

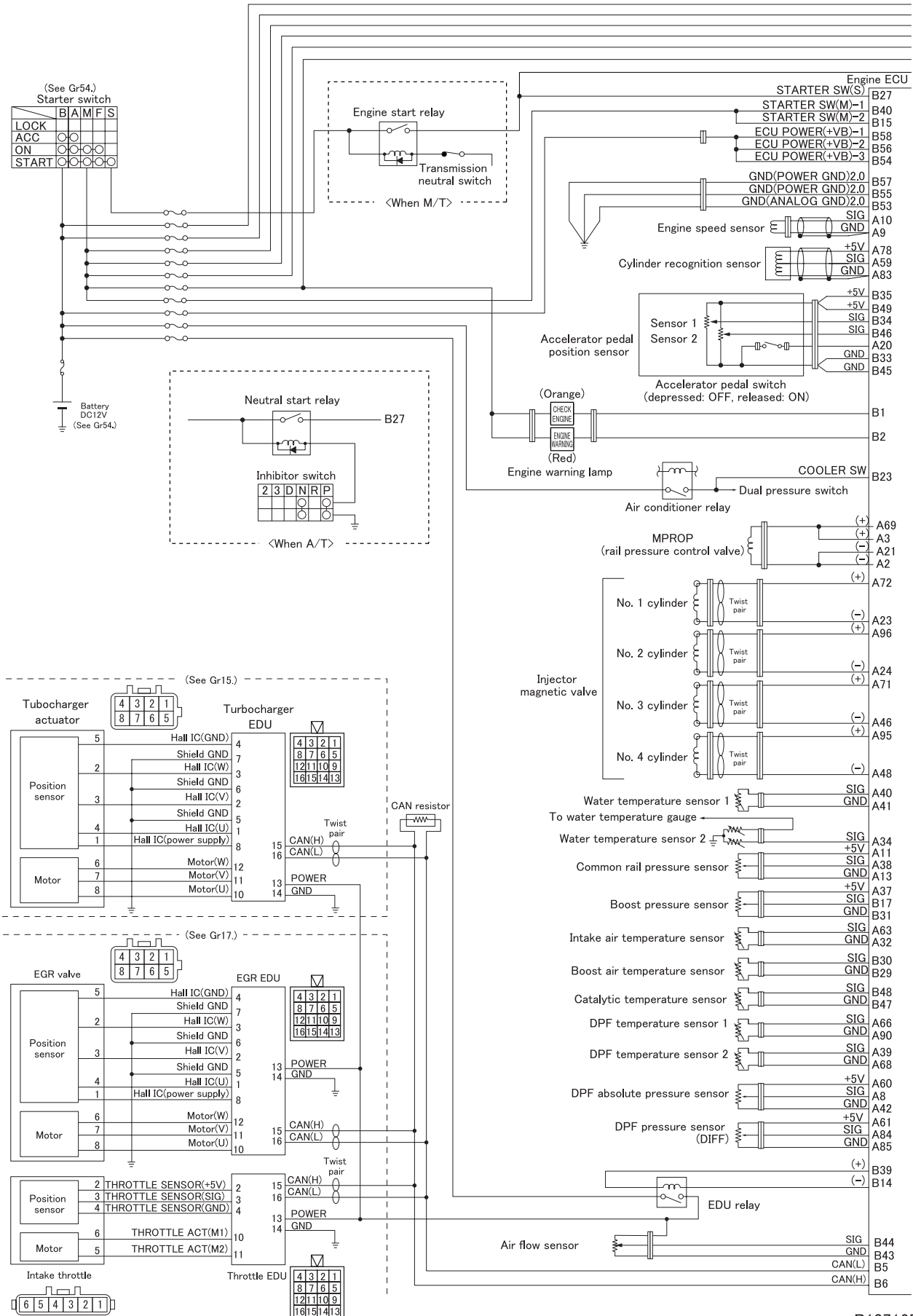
- It is possible to read memorized fault codes using a scanning tool (Multi-Use Tester or General Scanning Tool) or from the number of flashes of the warning lamp in the meter cluster.
- Diagnosis codes shown by the scanning tool (Multi-Use Tester or General Scanning Tool) and those indicated by the flashing of the warning lamp (flash codes) are different.
- Diagnosis codes shown by the scanning tool are more specific than flash codes.

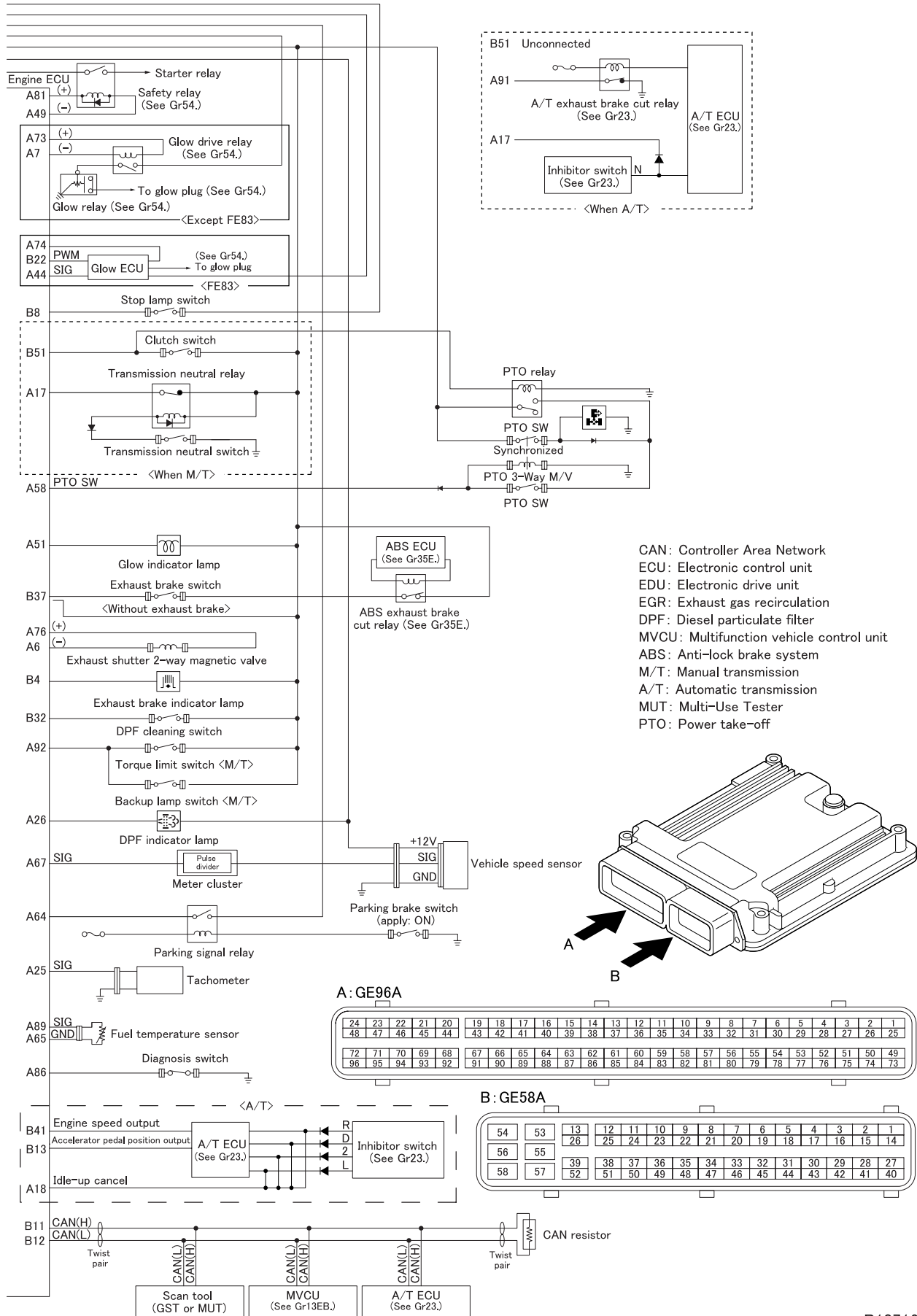
### **(3) Erasing of fault code**

- Control status during fault is back to normal with the fault location serviced. Although it depends on fault code, the warning lamp is not extinguished until the driving cycle has been repeated several times.
- The driving cycle means a period of a series of engine operations from engine start with starter switch ON to completion of after-run sequence with the starter switch OFF.

# STRUCTURE AND OPERATION

## 3. Electronic Control Unit Connection Diagram

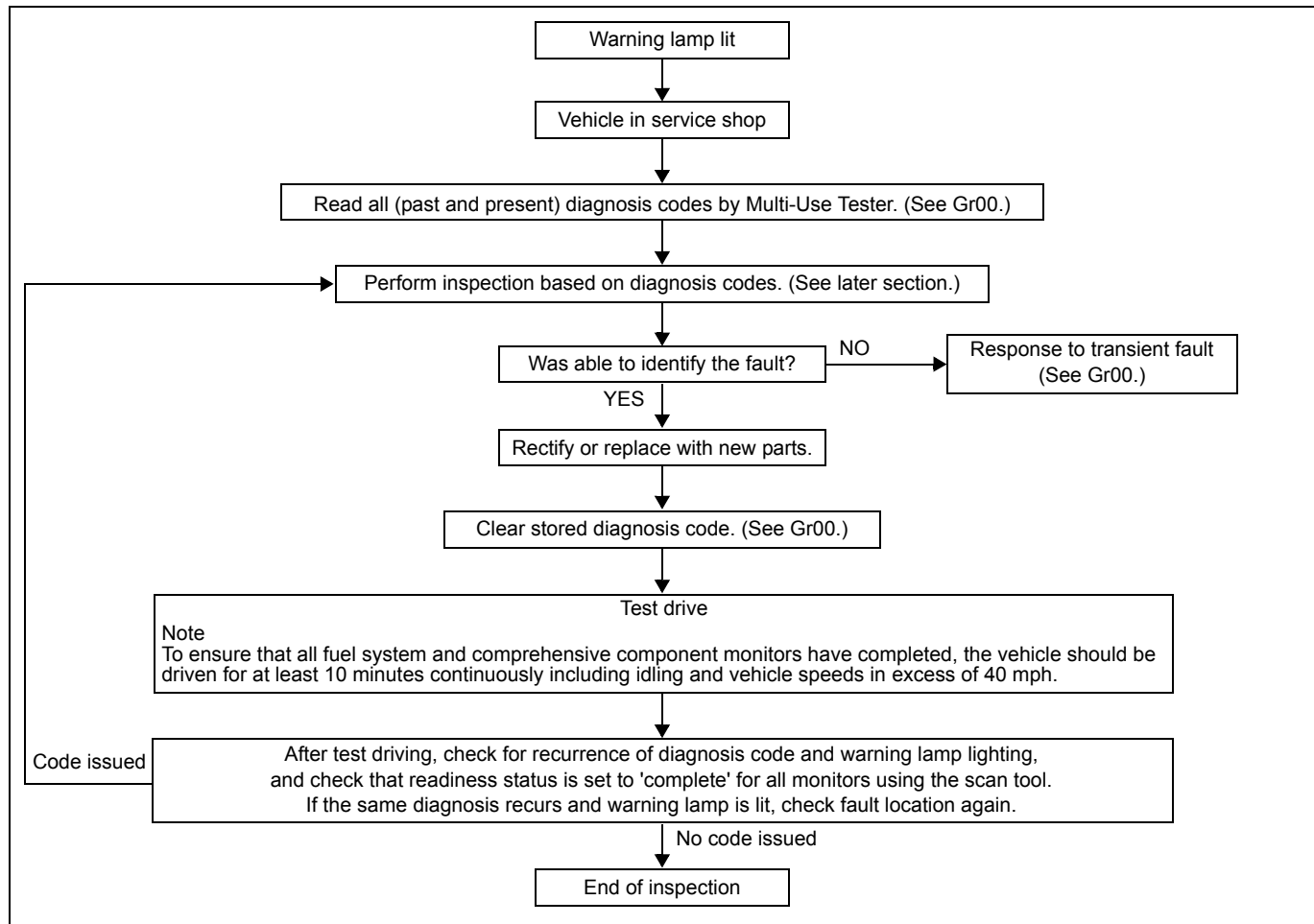




# TROUBLESHOOTING

## 1. Diagnosis Procedure

- Carry out system inspection in accordance with the flow chart given below.



## 2. Diagnostic Precautions

- Before measuring voltage, check the battery for charged condition and specific gravity. If system inspection is performed with the battery uncharged or reduced in specific gravity, accurate measurements cannot be achieved.
- Before disconnecting battery cables, harnesses and connectors, set the starter switch to LOCK or OFF, then allow at least 20 seconds.
- To avoid having electrical parts damaged, set the starter switch and lighting switch to LOCK or OFF before reconnecting battery cables, harnesses and connectors.
- When performing measurement with the tester, handle the test bar carefully so that it does not damage internal circuit and other electrical parts of the electronic control unit to result in a short-circuit failure between terminals in connector or between connector and car body.
- Resistance is affected by temperature. Determine the necessity of resistance measurement following given temperature specification as a guide. Otherwise, use normal temperature (10 to 35°C {50 to 95°F}) as the measuring condition.
- To start the engine, be sure to connect the connector of the MPROP (rail pressure control valve) to the engine harness. If the engine is started without connecting the MPROP connector, the engine electronic control unit cannot control the supply pump and the fault of the engine may result.
- If the electronic control unit is replaced with a new one, some data must be registered in the new electronic control unit for proper engine control. This also applied to the case when replacing the electronic control unit with the one that has been used in other vehicle. (See "REGISTRATION AND ALTERATION OF DATA IN ENGINE ELECTRONIC CONTROL UNIT".)

### 3. Inspections Based on Fault Codes

#### 3.1 Fault code list

- Fault codes can be monitored through the scanning tool (General Scanning Tool or Multi-Use Tester) or the flashing of the warning lamp in the meter cluster.
- There are two kinds of fault codes, i.e., fault code displayed by the General Scanning Tool or Multi-Use Tester and flash code given by the flashing of the warning lamp.
- Scanning tool (General Scanning Tool or Multi-Use Tester) can display diagnosis codes that are more specific than flash codes.
- Diagnosis codes asterisked in the list differ in fault diagnosis period according to the fault diagnosis condition. (For details on fault diagnosis condition, see “Inspection against Each Diagnosis Code”)
- Occurrence of diagnosis codes marked with ■ or ▲ in the list depends on vehicle specification.  
 ■ : Automatic transmission  
 ▲ : FE83

| Fault code     |            | Monitor   | Fault (outline)  | Warning |     | Multi-Use Tester indication    | Fault diagnosis period |
|----------------|------------|---|--|---------|-----|--------------------------------|------------------------|
| Diagnosis code | Flash code |   |  | Orange  | Red |                                |                        |
| P0002          | 63         | Failure of MPROP (rail pressure control valve)  | MPROP (rail pressure control valve) control saturated  | ○       |     | Fuel system                    | IMD                    |
| P0003          | 63         | Failure of MPROP (rail pressure control valve)  | Low signal range check   | ○       |     | Fuel system (Low)              | IMD                    |
| P0004          | 63         | Failure of MPROP (rail pressure control valve)  | High signal range check  | ○       |     | Fuel system (High)             | IMD                    |
| *P0016         | 12, 14, 15 | Both speed sensor (Engine speed sensor, Cylinder recognition sensor)                                  | <ul style="list-style-type: none"> <li>• Cam/crank signals present</li> <li>• Gap phase shift</li> </ul> | ○       |     | Ne SNSR Offset/Backup Mode     | IMD                    |
| P0045          | 51         | Failure of turbocharger actuator  | Circuit  | ○       |     | VGT Acuator (Open)             | 2DC                    |
| P0046          | 51         | Failure of turbocharger actuator  | Circuit  | ○       |     | VGT Acuator (Performance)      | 2DC                    |
| P0047          | 51         | Failure of turbocharger actuator  | Circuit  | ○       |     | VGT Acuator (Low)              | 2DC                    |
| P0069          | 19         | Characteristic abnormality of atmospheric pressure sensor (built into engine electronic control unit) | Gain and offset drift  | ○       |     | Boost Press SNSR (Correlation) | 2DC                    |
| P0087          | 36         | Abnormality of common rail pressure (comparison)  | Rail pressure regulator adjustment   | ○       |     | CRS (Too Low)                  | IMD                    |
| *P0088         | 23         | Abnormality of common rail pressure (pressure: high)  | Plausibility   | ○       | ○   | CRS (Too High)                 | IMD                    |
| P0089          | 63         | Failure of MPROP (rail pressure control valve)  | Overload   | ○       |     | MPROP (Over Load)              | IMD                    |
| P0090          | 63         | Failure of MPROP (rail pressure control valve)  | MPROP (rail pressure control valve) open – circuit   | ○       |     | MPROP (Open Circuit)           | IMD                    |
| P0091          | 63         | Failure of MPROP (rail pressure control valve)  | MPROP (rail pressure control valve) short circuit  | ○       |     | MPROP (Low)                    | IMD                    |
| P0092          | 63         | Failure of MPROP (rail pressure control valve)  | MPROP (rail pressure control valve) short circuit  | ○       |     | MPROP (High)                   | IMD                    |
| P0093          | 22         | Abnormality of common rail pressure (fuel leakage)  | Fuel leakage   |         | ○   | CRS (Fuel Leak)                | IMD                    |
| P0097          | 9          | Failure of boost air temperature sensor   | Low signal range check   | ○       |     | INT Air Temp SNSR2 (Low)       | 2DC                    |

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# TROUBLESHOOTING

| Fault code     |            | Monitor   | Fault (outline)                        | Warning |     | Multi-Use Tester indication      | Fault diagnosis period |
|----------------|------------|---|--|---------|-----|----------------------------------|------------------------|
| Diagnosis code | Flash code |   |  | Orange  | Red |                                  |                        |
| P0098          | 9          | Failure of boost air temperature sensor                   | High signal range check                | O       |     | INT Air Temp SNSR2 (High)        | 2DC                    |
| P0101          | 17         | Characteristic abnormality in air flow sensor             | Gain and offset drift                  | O       |     | Airflow Sensor (Plausibility)    | 2DC                    |
| P0102          | 17         | Failure of air flow sensor                                | Low signal range check                 | O       |     | Airflow Sensor (Low)             | 2DC                    |
| P0103          | 17         | Failure of air flow sensor                                | High signal range check                | O       |     | Airflow Sensor (High)            | 2DC                    |
| P0112          | 44         | Failure of intake air temperature sensor                  | Low signal range check                 | O       |     | INT Air Temp SNSR (Low)          | 2DC                    |
| P0113          | 44         | Failure of intake air temperature sensor                  | High signal range check                | O       |     | INT Air Temp SNSR (High)         | 2DC                    |
| P0117          | 21         | Failure of water temperature sensor                       | Low signal range check                 | O       |     | Water Temp SNSR (Low)            | 2DC                    |
| P0118          | 21         | Failure of water temperature sensor                       | High signal range check                | O       |     | Water Temp SNSR (High)           | 2DC                    |
| P011A          | 21         | Characteristic abnormality of water temperature sensor    | Gain drift                             | O       |     | Water Temp SNSR                  | 2DC                    |
| P0122          | 24         | Failure of accelerator pedal position sensor 1            | Low signal range check                 | O       |     | Accel Pedal Sensor 1             | IMD                    |
| P0123          | 24         | Failure of accelerator pedal position sensor 1            | High signal range check                | O       |     | Accel Pedal Sensor 1             | IMD                    |
| ▲P0127         | 27         | Abnormality of intercooler                                | Intercooler failure                    | O       |     | Intake Air Temperature Too High  | 2DC                    |
| ▲P0128         | 5          | Failure of thermostat                                     | Below regulating temperature           | O       |     | Coolant Thermostat               | 2DC                    |
| P0148          | 22         | Abnormality of common rail pressure (pressure: low)       | Plausibility                           |         | O   | CRS (Fuel Delivery)              | IMD                    |
| P0182          | 41         | Failure of fuel temperature sensor                        | Low signal range check                 |         |     | Fuel Temp Sensor (inlet) Low     | IMD                    |
| P0183          | 41         | Failure of fuel temperature sensor                        | High signal range check                |         |     | Fuel Temp Sensor (inlet) High    | IMD                    |
| P0191          | 11         | Characteristic abnormality of common rail pressure sensor | Offset<br>▲Gain drift                  | O       |     | CRS Pressure SNSR (Plausibility) | IMD                    |
| P0192          | 11         | Failure of common rail pressure sensor                    | Low signal range check                 | O       |     | CRS Pressure SNSR (Low)          | IMD                    |
| P0193          | 11         | Failure of common rail pressure sensor                    | High signal range check                | O       |     | CRS Pressure SNSR (High)         | IMD                    |
| P0201          | 37         | Failure of injector magnetic valve (No. 1 cylinder)       | Injector open circuit (No. 1 cylinder) | O       |     | Injector M/V-Cylinder 1 (Load)   | IMD                    |
| P0202          | 8          | Failure of injector magnetic valve (No. 2 cylinder)       | Injector open circuit (No. 2 cylinder) | O       |     | Injector M/V-Cylinder 2 (Load)   | IMD                    |
| P0203          | 38         | Failure of injector magnetic valve (No. 3 cylinder)       | Injector open circuit (No. 3 cylinder) | O       |     | Injector M/V-Cylinder 3 (Load)   | IMD                    |
| P0204          | 39         | Failure of injector magnetic valve (No. 4 cylinder)       | Injector open circuit (No. 4 cylinder) | O       |     | Injector M/V-Cylinder 4 (Load)   | IMD                    |
| P0219          | 7          | Abnormality of engine speed                               | High signal range check                |         | O   | Engine Overrunning               | IMD                    |
| P0222          | 16         | Failure of accelerator pedal position sensor 2            | Low signal range check                 | O       |     | Accel Pedal Sensor 2             | IMD                    |

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| Fault code     |            | Monitor   | Fault (outline)   | Warning |     | Multi-Use Tester indication  | Fault diagnosis period |
|----------------|------------|---|---|---------|-----|------------------------------|------------------------|
| Diagnosis code | Flash code |   |   | Orange  | Red |                              |                        |
| P0223          | 16         | Failure of accelerator pedal position sensor 2                            | High signal range check   | ○       |     | Accel Pedal Sensor 2         | IMD                    |
| P0226          | 28         | Failure of intake throttle  | <ul style="list-style-type: none"> <li>Signal range check</li> <li>Ref voltage</li> </ul>   | ○       |     | Throttle Valve Position      | 2DC                    |
| *P0234         | 32, 54     | Overboost   | Overboost   | ○       | ○   | Over Boost                   | 2DC<br>IMD             |
| P0236          | 32         | Characteristic abnormality of boost pressure sensor                       | <ul style="list-style-type: none"> <li>Offset and gain drift (High)</li> <li>Offset and gain drift (Low)</li> </ul>                       | ○       |     | Boost Press SNSR (Plausi)    | 2DC                    |
| P0237          | 32         | Failure of boost pressure sensor  | Low signal range check  | ○       |     | Boost Press SNSR (Low)       | 2DC                    |
| P0238          | 32         | Failure of boost pressure sensor  | High signal range check   | ○       |     | Boost Press SNSR (High)      | 2DC                    |
| P0251          | 36         | Valve opening of common rail safety valve (DBV)                           | Common rail pressure (maximum)  |         | ○   | Common Rail Pressure Defect  | IMD                    |
| P0253          | 22         | Rail pressure is abnormal (to low) during opening of safety valve (DBV).  | Common rail pressure (minimum)  |         | ○   | Common Rail Pressure Defect  | IMD                    |
| *P0254         | 23         | Rail pressure is abnormal (to high) during opening of safety valve (DBV). | <ul style="list-style-type: none"> <li>Pressure shock</li> <li>Not open</li> <li>Common rail pressure (maximum)</li> </ul>                |         | ○   | Common Rail Pressure Defect  | IMD                    |
| P0261          | 37         | Failure of injector magnetic valve (No. 1 cylinder)                       | Injector short circuit (No. 1 cylinder)   | ○       |     | Injector #1-A (Low)          | IMD                    |
| P0262          | 37         | Failure of injector magnetic valve (No. 1 cylinder)                       | Injector short circuit (No. 1 cylinder)   | ○       |     | Injector #1-A (High)         | IMD                    |
| ▲P0263         | 53         | Abnormality in cylinder balance correction                                | Cylinder balancing out of range   | ○       |     | Injector #1-A (Plausibility) | 2DC                    |
| P0264          | 8          | Failure of injector magnetic valve (No. 2 cylinder)                       | Injector short circuit (No. 2 cylinder)   | ○       |     | Injector #2-A (Low)          | IMD                    |
| P0265          | 8          | Failure of injector magnetic valve (No. 2 cylinder)                       | Injector short circuit (No. 2 cylinder)   | ○       |     | Injector #2-A (High)         | IMD                    |
| ▲P0266         | 53         | Abnormality in cylinder balance correction                                | <ul style="list-style-type: none"> <li>Cylinder balancing out of range</li> <li>Sensor signal range check</li> <li>Ref voltage</li> </ul> | ○       |     | Injector #2-A (Plausibility) | 2DC                    |
| P0267          | 38         | Failure of injector magnetic valve (No. 3 cylinder)                       | Injector short circuit (No. 3 cylinder)   | ○       |     | Injector #3-A (Low)          | IMD                    |
| P0268          | 38         | Failure of injector magnetic valve (No. 3 cylinder)                       | Injector short circuit (No. 3 cylinder)   | ○       |     | Injector #3-A (High)         | IMD                    |
| ▲P0269         | 53         | Abnormality in cylinder balance correction                                | Cylinder balancing out of range   | ○       |     | Injector #3-A (Plausibility) | 2DC                    |
| P0270          | 39         | Failure of injector magnetic valve (No. 4 cylinder)                       | Injector short circuit (No. 4 cylinder)   | ○       |     | Injector #4-A (Low)          | IMD                    |
| P0271          | 39         | Failure of injector magnetic valve (No. 4 cylinder)                       | Injector short circuit (No. 4 cylinder)   | ○       |     | Injector #4-A (High)         | IMD                    |
| ▲P0272         | 53         | Abnormality in cylinder balance correction                                | Cylinder balancing out of range   | ○       |     | Injector #4-A (Plausibility) | 2DC                    |
| ▲P0299         | 32         | Underboost  | Underboost  | ○       |     | Turbocharger (Underboost)    | 2DC                    |
| ▲P0300         | 45         | Cylinder misfire (multiple cylinders)                                     | Misfire multiple cylinders  | ○       |     | Multiple Cylinder Misfire    | 2DC                    |

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# TROUBLESHOOTING

| Fault code     |            | Monitor   | Fault (outline)   | Warning |     | Multi-Use Tester indication       | Fault diagnosis period |
|----------------|------------|---|---|---------|-----|-----------------------------------|------------------------|
| Diagnosis code | Flash code |   |   | Orange  | Red |                                   |                        |
| ▲P0301         | 45         | Cylinder misfire (individual cylinders)   | Misfire individual cylinder 1   | ○       |     | Cylinder 1 Misfire                | 2DC                    |
| ▲P0302         | 45         | Cylinder misfire (individual cylinders)   | Misfire individual cylinder 2   | ○       |     | Cylinder 2 Misfire                | 2DC                    |
| ▲P0303         | 45         | Cylinder misfire (individual cylinders)   | Misfire individual cylinder 3   | ○       |     | Cylinder 3 Misfire                | 2DC                    |
| ▲P0304         | 45         | Cylinder misfire (individual cylinders)   | Misfire individual cylinder 4   | ○       |     | Cylinder 4 Misfire                | 2DC                    |
| P0335          | 15         | Failure of engine speed sensor  | No pulse check  | ○       |     | Engine Revolution SNSR            | IMD                    |
| *P0339         | 15         | Failure of engine speed sensor  | Abnormality of pulse count  | ○       | ○   | Engine Revolution SNSR (Plausi)   | IMD                    |
| P0340          | 12         | Failure of cylinder recognition sensor  | No pulse check  | ○       |     | Camshaft Position SNSR            | IMD                    |
| P0344          | 12         | Failure of cylinder recognition sensor  | Abnormality of pulse count  | ○       |     | Camshaft Position SNSR (Plausi)   | IMD                    |
| ▲P0381         | 26         | Failure of preheating indicator lamp  | <ul style="list-style-type: none"> <li>• Short circuit battery</li> <li>• Short circuit ground</li> <li>• Open circuit</li> <li>• Overload</li> </ul>         | ○       |     | Glow Lamp                         | 2DC                    |
| P0383          | 26         | Failure of preheating control   | Short circuit ground  | ○       |     | Relay for Glow Relay              | 2DC                    |
| P0384          | 26         | Failure of preheating control   | Short circuit battery   | ○       |     | Relay for Glow Relay              | 2DC                    |
| P0401          | 2          | Insufficient air flow rate in exhaust gas recirculation system                            | <ul style="list-style-type: none"> <li>• Exhaust gas recirculation system insufficient flow</li> <li>• Exhaust gas recirculation mass flow too low</li> </ul> | ○       |     | EGR Flow (Insufficient)           | 2DC                    |
| P0402          | 2          | Excessive air flow rate in exhaust gas recirculation system                               | <ul style="list-style-type: none"> <li>• Exhaust gas recirculation system excessive flow</li> <li>• Exhaust gas recirculation mass flow too high</li> </ul>   | ○       |     | EGR Flow (Excessive)              | 2DC                    |
| P0403          | 2, 67      | Failure of exhaust gas recirculation system   | <ul style="list-style-type: none"> <li>• Circuit</li> <li>• Plausibility</li> </ul>   | ○       |     | EGR1 (Actuator Circuit)           | 2DC                    |
| P0404          | 67         | Failure of exhaust gas recirculation valve  | <ul style="list-style-type: none"> <li>• Circuit</li> <li>• Open valve</li> </ul>   | ○       |     | EGR System                        | 2DC                    |
| P0409          | 67         | Failure of exhaust gas recirculation valve  | <ul style="list-style-type: none"> <li>• Low signal range check</li> <li>• High signal range check</li> </ul>   | ○       |     | EGR1 (Position Sensor)            | 2DC                    |
| P0426          | 42         | Characteristic abnormality of catalytic temperature sensor                                | Gain and offset drift   | ○       |     | EXH Gas Temp SNSR1 (Plausibility) | 2DC                    |
| P0427          | 42         | Failure of catalytic temperature sensor   | Low signal range check  | ○       |     | EXH Gas Temp SNSR1 (Low)          | 2DC                    |
| P0428          | 42         | Failure of catalytic temperature sensor   | High signal range check   | ○       |     | EXH Gas Temp SNSR1 (High)         | 2DC                    |
| P0470          | 92         | Characteristic abnormality of DPF absolute pressure sensor and DPF pressure sensor (DIFF) | <ul style="list-style-type: none"> <li>• Gain drift</li> <li>• Offset and gain drift</li> </ul>   | ○       |     | DPF Press SNSR (Plausi)           | 2DC                    |
| P0471          | 98         | Failure of DPF absolute pressure sensor   | Offset drift  | ○       |     | DPF Press SNSR (Plausi)           | 2DC                    |

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| Fault code     |            | Monitor  | Fault (outline)  | Warning |     | Multi-Use Tester indication      | Fault diagnosis period |
|----------------|------------|--|--|---------|-----|----------------------------------|------------------------|
| Diagnosis code | Flash code |  |  | Orange  | Red |                                  |                        |
| P0472          | 98         | Failure of DPF absolute pressure sensor                  | Low signal range check   | O       |     | DPF Press SNSR (Low)             | 2DC                    |
| P0473          | 98         | Failure of DPF absolute pressure sensor                  | High signal range check  | O       |     | DPF Press SNSR (High)            | 2DC                    |
| ▲P0476         | 93         | Failure of exhaust brake                                 | Valve stuck open/shut  | O       |     | Exhaust Brake PWR (Performance)  | 2DC                    |
| P0489          | 67         | Failure of exhaust gas recirculation system              | Power out of range   | O       |     | EGR Power Supply                 | 2DC                    |
| P0490          | 67         | Failure of exhaust gas recirculation system              | Power out of range   | O       |     | EGR Power Supply                 | 2DC                    |
| *P0500         | 25         | Failure of vehicle speed sensor                          | Signal   | O       | O   | Vehicle Speed Sensor             | 2DC<br>IMD             |
| P0502          | 25         | Failure of vehicle speed sensor                          | Too low  | O       |     | Vehicle Speed Sensor (Low)       | 2DC                    |
| P0503          | 25         | Failure of vehicle speed sensor                          | Too high   | O       |     | Vehicle Speed Sensor (High)      | 2DC                    |
| ▲P0506         | 52         | Abnormality in idling control (idling speed is too low)  | Idle speed too low   | O       |     | Idle Volume                      | 2DC                    |
| ▲P0507         | 52         | Abnormality in idling control (idling speed is too high) | Idle speed too high  | O       |     | Idle Volume                      | 2DC                    |
| P0544          | 87         | Characteristic abnormality of DPF temperature sensor 1   | Gain and offset drift  | O       |     | DPF Temp SNSR (upstream)         | 2DC                    |
| P0545          | 87         | Failure of DPF temperature sensor 1                      | Low signal range check   | O       |     | DPF Temp SNSR (upstream) Low     | 2DC                    |
| P0546          | 87         | Failure of DPF temperature sensor 1                      | High signal range check  | O       |     | DPF Temp SNSR (upstream) High    | 2DC                    |
| *P0562         | 33         | Failure inside engine electronic control unit            | Low signal range check   | O       | O   | Power Supply Voltage (Low)       | 2DC<br>IMD             |
| *P0563         | 33         | Failure inside engine electronic control unit            | High signal range check  | O       | O   | Power Supply Voltage (High)      | 2DC<br>IMD             |
| P0600          | 64, 76     | Abnormality of speed limitation device system            | <ul style="list-style-type: none"> <li>Controller area network</li> <li>Message timeout</li> </ul> |         | O   | CAN Communication                | IMD                    |
| P0605          | 33         | Failure inside engine electronic control unit            | Electronic control unit  |         | O   | ECU System (Hardware)            | IMD                    |
| *P0607         | 33         | Failure inside engine electronic control unit            | Injector driver circuit  | O       | O   | ECU System                       | IMD                    |
| P060B          | 33         | Failure inside engine electronic control unit            | A/D Converter fault  | O       |     | A/D Converter                    | IMD                    |
| P0611          | 47         | Injector adjustment data                                 | Electronic control unit  |         | O   | No adjustment data of injector   | IMD                    |
| P0615          | 48         | Failure of safety relay                                  | Overload   |         | O   | Starter Safety Relay (Over Load) | IMD                    |
| P0616          | 48         | Failure of safety relay                                  | <ul style="list-style-type: none"> <li>Short circuit ground</li> <li>Open circuit</li> </ul>       |         | O   | Starter Safety Relay (Low)       | IMD                    |
| P0617          | 48         | Failure of safety relay                                  | Short circuit battery  |         | O   | Starter Safety Relay (High)      | IMD                    |

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# TROUBLESHOOTING

| Fault code     |            | Monitor   | Fault (outline)   | Warning |     | Multi-Use Tester indication    | Fault diagnosis period |
|----------------|------------|---|---|---------|-----|--------------------------------|------------------------|
| Diagnosis code | Flash code |   |   | Orange  | Red |                                |                        |
| P061B          | 33         | Failure inside engine electronic control unit                     | Plausibility  |         | O   | ECU Performance (Calc)         | IMD                    |
| P061C          | 33         | Failure inside engine electronic control unit                     | Plausibility  |         | O   | ECU Performance (Ne)           | IMD                    |
| P062D          | 82         | Failure of injector circuit inside engine electronic control unit | Injector driver circuit (No. 1 and 3 cylinders)   | O       |     | Injector Bank 1                | IMD                    |
| P062E          | 82         | Failure of injector circuit inside engine electronic control unit | Injector driver circuit (No. 2 and 4 cylinders)   | O       |     | Injector Bank 2                | IMD                    |
| P0642          | 81         | Sensor power supply abnormal                                      | Low signal range check  | O       |     | Sensor Supply Voltage 1 (Low)  | IMD                    |
| P0643          | 81         | Sensor power supply abnormal                                      | High signal range check   | O       |     | Sensor Supply Voltage 1 (High) | IMD                    |
| ▲P0650         | 3          | Failure of engine warning lamp (orange)                           | <ul style="list-style-type: none"> <li>• Short circuit battery</li> <li>• Short circuit ground</li> <li>• Open circuit</li> <li>• Overload</li> </ul> | O       |     | MIL                            | 2DC                    |
| P0652          | 81         | Sensor power supply abnormal                                      | Low signal range check  | O       |     | Sensor Supply Voltage 2 (Low)  | IMD                    |
| P0653          | 81         | Sensor power supply abnormal                                      | High signal range check   | O       |     | Sensor Supply Voltage 2 (High) | IMD                    |
| P0657          | 79         | Abnormality of magnetic valve power supply                        | Short circuit ground  |         | O   | M/V Voltage (Low)              | IMD                    |
| P0670          | 26         | Failure of preheating control system                              | <ul style="list-style-type: none"> <li>• Open circuit</li> <li>• Overload</li> <li>• GCU communication error</li> </ul>                               | O       |     | Glow ECU                       | 2DC                    |
| ▲P0671         | 26         | Failure of preheating control system                              | No. 1 cylinder fault  | O       |     | Glow Plug 1                    | 2DC                    |
| ▲P0672         | 26         | Failure of preheating control system                              | No. 2 cylinder fault  | O       |     | Glow Plug 2                    | 2DC                    |
| ▲P0673         | 26         | Failure of preheating control system                              | No. 3 cylinder fault  | O       |     | Glow Plug 3                    | 2DC                    |
| ▲P0674         | 26         | Failure of preheating control system                              | No. 4 cylinder fault  | O       |     | Glow Plug 4                    | 2DC                    |
| ▲P0684         | 26         | Failure of preheating control                                     | Overload  | O       |     | Glow ECU communication         | 2DC                    |
| P0685          | 84         | Failure of electronic drive unit relay                            | Open circuit  | O       |     | EDU Relay (Open)               | 2DC                    |
| P0686          | 84         | Failure of electronic drive unit relay                            | Short circuit ground  | O       |     | EDU Relay (Low)                | 2DC                    |
| P0687          | 84         | Failure of electronic drive unit relay                            | Short circuit battery   | O       |     | EDU Relay (High)               | 2DC                    |
| P0688          | 84         | Failure of electronic drive unit relay                            | Overload  | O       |     | EDU Relay (Over Load)          | 2DC                    |
| P0698          | 81         | Sensor power supply abnormal                                      | Low signal range check  | O       |     | Sensor Supply Voltage 3 (Low)  | IMD                    |
| P0699          | 81         | Sensor power supply abnormal                                      | High signal range check   | O       |     | Sensor Supply Voltage 3 (High) | IMD                    |

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| Fault code     |            | Monitor   | Fault (outline)   | Warning |     | Multi-Use Tester indication       | Fault diagnosis period |
|----------------|------------|---|---|---------|-----|-----------------------------------|------------------------|
| Diagnosis code | Flash code |   |   | Orange  | Red |                                   |                        |
| ▲■P0700        | 71         | Failure of automatic transmission control   | Fault present in TCM (TCM: Transmission Control Module)   | O       |     | Transmission ECU MIL Request      | IMD                    |
| P1169          | 56         | Characteristic value of air flow sensor   | Electronic control unit   |         | O   | Abnormal adjustment data of AFS   | IMD                    |
| P1170          | 34         | Injection quantity adjustment data  | Electronic control unit   |         | O   | Abnormal adjustment data of Q     | IMD                    |
| P1410          | 92         | Excessive exhaust pressure  | <ul style="list-style-type: none"> <li>Low signal range check</li> <li>High signal range check</li> </ul>                       |         | O   | Exhaust Absolute Pressure (High)  | IMD                    |
| P1411          | 88         | Diesel particulate filter is overheated.  | <ul style="list-style-type: none"> <li>Low signal range check</li> <li>High signal range check</li> <li>Plausibility</li> </ul> |         | O   | Excessive exhaust Temperature     | IMD                    |
| P1412          | 92         | Temperature increase is insufficient for automatic diesel particulate filter regeneration control | Plausibility  |         |     | DPF Temp Abnormal1 (Auto)(Low)    | IMD                    |
| P1413          | 92         | Temperature increase is insufficient for automatic diesel particulate filter regeneration control | Plausibility  |         |     | DPF Temp Abnormal2 (Auto)(Low)    | IMD                    |
| P1414          | 92         | Temperature increase is insufficient for automatic diesel particulate filter regeneration control | Plausibility  |         |     | DPF Temp Abnormal3 (Auto)(High)   | IMD                    |
| P1415          | 92         | Failure of automatic diesel particulate filter regeneration control                               | Plausibility  |         |     | DPF Interval Abnormal (Auto)      | IMD                    |
| P1416          | 92         | Temperature increase is insufficient for manual diesel particulate filter regeneration control    | Plausibility  |         | O   | DPF Temp Abnormal1 (Manual)(Low)  | IMD                    |
| P1417          | 92         | Temperature increase is insufficient for manual diesel particulate filter regeneration control    | Plausibility  |         | O   | DPF Temp Abnormal2 (Manual)(Low)  | IMD                    |
| P1418          | 92         | Temperature increase is insufficient for manual diesel particulate filter regeneration control    | Plausibility  |         | O   | DPF Temp Abnormal3 (Manual)(High) | IMD                    |
| P1419          | 92         | Failure of manual diesel particulate filter regeneration control                                  | Plausibility  |         | O   | DPF Interval Abnormal (Manual)    | IMD                    |
| P1421          | 92         | Diesel particulate filter clogged   | Plausibility  |         | O   | PM accumulation amount level 1    | IMD                    |
| P1422          | 92         | Diesel particulate filter clogged   | Plausibility  |         | O   | PM accumulation amount level 2    | IMD                    |
| P1430          | 78         | Failure of diesel particulate filter cleaning switch  | Plausibility  |         |     | DPF Regeneration Switch           | IMD                    |
| P1435          | 92         | Diesel particulate filter broken  | Efficiency below threshold (blocked diesel particulate filter)  | O       |     | Exhaust Relative Pressure (Low)   | 2DC                    |
| P1440          | 92         | For counter recording of diagnosis code P1412, P1413, P1414                                       | Plausibility  |         |     | DPF Temp Abnormal4 (Auto)         | IMD                    |

IMD: Immediate

DC[Drive cycle]: "Start switch ON to start engine till starter switch OFF" constitutes 1 DC.

# TROUBLESHOOTING

| Fault code     |            | Monitor  | Fault (outline)   | Warning |     | Multi-Use Tester indication    | Fault diagnosis period |
|----------------|------------|--|---|---------|-----|--------------------------------|------------------------|
| Diagnosis code | Flash code |  |   | Orange  | Red |                                |                        |
| P1441          | 92         | For counter recording of diagnosis code P1416, P1417, P1418                      | High signal range check   |         |     | DPF Temp Abnormal4 (Manual)    | IMD                    |
| P1632          | 73         | Abnormality in controller area network 2 communication                           | Message timeout   | O       |     | CAN (EGR1 Time out)            | 2DC                    |
| P1635          | 74         | Abnormality in controller area network 2 communication                           | Message timeout   | O       |     | CAN (Intake Throttle)          | 2DC                    |
| P1640          | 75         | Abnormality in controller area network 2 communication                           | Time out  | O       |     | CAN Communication (W/G)        | 2DC                    |
| ▲P1660         | 29         | Failure of diesel particulate filter indicator lamp                              | <ul style="list-style-type: none"> <li>• Short circuit battery</li> <li>• Short circuit ground</li> <li>• Open circuit</li> <li>• Overload</li> </ul> | O       |     | DPF Lamp Control Circuit (Low) | IMD                    |
| P2002          | 92         | Diesel particulate filter clogged  | Efficiency below threshold (leaking diesel particulate filter)  | O       |     | DPF MFF                        | 2DC<br>IMD             |
| P2031          | 88         | Characteristic abnormality of DPF temperature sensor 2                           | Gain and offset drift   | O       |     | Exhaust Gas Temp               | 2DC                    |
| P2032          | 88         | Failure of DPF temperature sensor 2  | Low signal range check  | O       |     | Exhaust Gas Temp (Low)         | 2DC                    |
| P2033          | 88         | Failure of DPF temperature sensor 2  | High signal range check   | O       |     | Exhaust Gas Temp (High)        | 2DC                    |
| P2080          | 42         | Relative check between catalytic temperature sensor and DPF temperature sensor 1 | Gain and offset drift   | O       |     | DOC Temp SNSR                  | 2DC                    |
| P2084          | 92         | Relative check between DPF temperature sensors (1 and 2)                         | Gain and offset drift   | O       |     | DOC Temp SNSR (Plausibility)   | 2DC                    |
| P2100          | 28         | Failure of intake throttle system  | Circuit check   | O       |     | TVA (Open)                     | 2DC                    |
| P2101          | 28         | Failure of intake throttle system  | <ul style="list-style-type: none"> <li>• Intake throttle valve slow response/steady state position deviation</li> <li>• Circuit check</li> </ul>      | O       |     | TVA (System)                   | 2DC                    |
| P2102          | 28         | Failure of intake throttle system  | Circuit check   | O       |     | TVA (Short)                    | 2DC                    |
| P2108          | 28         | Failure of intake throttle system  | Plausibility  | O       |     | TVA (Controller)               | 2DC                    |
| P2120          | 65         | Failure of accelerator pedal switch  | Plausibility  |         |     | Acc Switch                     | IMD                    |
| P2135          | 16, 24, 58 | Failure of accelerator pedal position sensors (1 and 2)                          | Gain and offset drift   | O       |     | TVA SNSR (Voltage)             | IMD                    |
| P2138          | 58         | Failure of accelerator pedal position sensors (1 and 2)                          | <ul style="list-style-type: none"> <li>• Low signal range check</li> <li>• High signal range check</li> <li>• Plausibility</li> </ul>                 |         | O   | Acc Sensor Correlation         | IMD                    |

IMD: Immediate

DC[Drive cycle]: "Start switch ON to start engine till starter switch OFF" constitutes 1 DC.

| Fault code     |            | Monitor  | Fault (outline)   | Warning |     | Multi-Use Tester indication   | Fault diagnosis period |
|----------------|------------|--|---|---------|-----|-------------------------------|------------------------|
| Diagnosis code | Flash code |  |   | Orange  | Red |                               |                        |
| P2147          | 82         | Injector magnetic valve  | Injector short circuit (No. 1 and 3 cylinders)  | O       |     | Injector Bank 1 (Low)         | IMD                    |
| P2148          | 82         | Injector magnetic valve  | Injector short circuit (No. 1 and 3 cylinders)  | O       |     | Injector Bank 1 (High)        | IMD                    |
| P2150          | 82         | Injector magnetic valve  | Injector short circuit (No. 2 and 4 cylinders)  | O       |     | Injector Bank 2 (Low)         | IMD                    |
| P2151          | 82         | Injector magnetic valve  | Injector short circuit (No. 2 and 4 cylinders)  | O       |     | Injector Bank 2 (High)        | IMD                    |
| P2169          | 93         | Failure of exhaust shutter 3-way magnetic valve                                | Open circuit  | O       |     | Exhaust Valve Act (Open)      | 2DC                    |
| P2170          | 93         | Failure of exhaust shutter 3-way magnetic valve                                | Short circuit ground  | O       |     | Exhaust Valve Act (Gnd)       | 2DC                    |
| P2171          | 93         | Failure of exhaust shutter 3-way magnetic valve                                | Short circuit battery   | O       |     | Exhaust Valve Act (Batt)      | 2DC                    |
| P2184          | 21         | Failure of water temperature sensor 2  | Low signal range check  | O       |     | Water Temp SNSR2 (Low)        | 2DC                    |
| P2185          | 21         | Failure of water temperature sensor 2  | High signal range check   | O       |     | Water Temp SNSR2 (High)       | 2DC                    |
| ▲P2187         | 52         | Abnormality in idling control  | Idle fuelling too low   | O       |     | Low Idle Speed (Low)          | 2DC                    |
| ▲P2188         | 52         | Abnormality in idling control  | Idle fuelling too high  | O       |     | Low Idle Speed (High)         | 2DC                    |
| P2199          | 44         | Characteristic abnormality of intake air temperature sensor                    | Gain and offset drift   | O       |     | EGR Temp Sensor (Correlation) | 2DC                    |
| P2228          | 19         | Failure of atmospheric pressure sensor (inside engine electronic control unit) | Low signal range check  | O       |     | Atm Press SNSR (Low)          | 2DC                    |
| P2229          | 19         | Failure of atmospheric pressure sensor (inside engine electronic control unit) | High signal range check   | O       |     | Atm Press SNSR (High)         | 2DC                    |
| P2263          | 51         | Turbocharger actuator system   | <ul style="list-style-type: none"> <li>• Turbocharger actuator slow response/steady state position deviation</li> <li>• Plausibility</li> <li>• Motor lock</li> </ul> | O       |     | VGT System                    | 2DC                    |
| P2413          | 67, 95     | Abnormality in exhaust gas recirculation valve position                        | <ul style="list-style-type: none"> <li>• Exhaust gas recirculation valve slow response/ steady state position deviation</li> <li>• Plausibility</li> </ul>            | O       |     | EGR System                    | 2DC                    |
| ▲P2423         | 46         | Failure of front oxidation catalyst  | Inactive (unable to generate exotherm for diesel particulate filter regeneration)   | O       |     | Catalyst Efficiency           | 2DC                    |
| *P2453         | 97         | Failure of DPF pressure sensor (DIFF)  | <ul style="list-style-type: none"> <li>• Dynamic check</li> <li>• Offset check</li> </ul>   | O       | O   | DPF Diff SNSR (Plausi) & MFF  | 2DC<br>IMD             |
| P2454          | 97         | Failure of DPF pressure sensor (DIFF)  | Low signal range check  | O       |     | DPF Diff SNSR (Low) & MFF     | 2DC                    |

IMD: Immediate

DC[Drive cycle]: "Start switch ON to start engine till starter switch OFF" constitutes 1 DC.

# TROUBLESHOOTING

| Fault code     |            | Monitor   | Fault (outline)   | Warning |     | Multi-Use Tester indication   | Fault diagnosis period |
|----------------|------------|---|---|---------|-----|-------------------------------|------------------------|
| Diagnosis code | Flash code |   |   | Orange  | Red |                               |                        |
| P2455          | 97         | Failure of DPF pressure sensor (DIFF)   | High signal range check   | O       |     | DPF Diff SNSR (High) & MFF    | 2DC                    |
| ▲P2457         | 2          | Failure of exhaust gas recirculation cooler                                   | Exhaust gas recirculation cooler failure  | O       |     | EGR Cooler Performance        | 2DC                    |
| ▲P2459         | 92         | Frequent diesel particulate filter regeneration                               | Excessive diesel particulate filter regeneration frequency (diesel particulate filter clogged up)             | O       |     | DPF Regeneration Frequency    | 2 Regen                |
| P2533          | 66         | Failure of starter switch   | Open circuit at electronic control unit in-out  | O       |     | Starter SW                    | 2DC                    |
| P253C          | 61         | Failure of auxiliary equipment sensor   | Low signal range check  |         |     | PTO Acc (Low)                 | IMD                    |
| P253D          | 61         | Failure of auxiliary equipment sensor   | High signal range check   |         |     | PTO Acc (High)                | IMD                    |
| P2563          | 51         | Turbocharger actuator system  | <ul style="list-style-type: none"> <li>• Low signal range check</li> <li>• High signal range check</li> </ul> | O       |     | Boost Pressure Actuator       | 2DC                    |
| P2670          | 36         | Abnormality of common rail pressure (comparison)                              | Short circuit ground  |         | O   | MPROP Voltage (Low)           | IMD                    |
| U0001          | 73         | Abnormality in controller area network 2 communication                        | Message timeout   | O       |     | High Speed CAN Communication  | 2DC                    |
| U0002          | 73         | Abnormality in controller area network 2 communication                        | Controller area network B bus off   | O       |     | High Speed CAN Communication  | 2DC                    |
| U0028          | 72         | Abnormality in controller area network 1 communication                        | Message timeout   | O       |     | Vehicle Communication Bus A   | 2DC                    |
| U0029          | 76         | Abnormality in controller area network 1 communication                        | Controller area network A bus off   | O       |     | Vehicle Communication Bus Off | 2DC                    |
| ▲*U0101        | 76         | Abnormality in controller area network (automatic transmission) communication | Engine warning lamp (orange) request message timeout  | O       |     | CAN (A/T ECU)                 | 2DC<br>IMD             |

IMD: Immediate

Regen: Regeneration

DC[Drive cycle]: "Start switch ON to start engine till starter switch OFF" constitutes 1 DC.



**[Fault code]**

Diagnosis code: P0002/Flash code: 63

**[Monitor]**

Failure of MPROP (rail pressure control valve)

**[Fault (outline)]**

MPROP (rail pressure control valve) control saturated

**[Diagnosis check]**

- MPROP (rail pressure control valve) signal conversion (analog/digital) function in the engine electronic control unit is monitored for fault.

**[Code generation condition]**

- Signal remains unconverted for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- MPROP (rail pressure control valve) control is stopped.
- Misfire detection is stopped.
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

- Malfunction of electronic control unit (replacement of engine electronic control unit)

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0003/Flash code: 63

## **[Monitor]**

Failure of MPROP (rail pressure control valve)

## **[Fault (outline)]**

Low signal range check

## **[Diagnosis check]**

- MPROP (rail pressure control valve) is monitored for fault.

## **[Code generation condition]**

- MPROP (rail pressure control valve) voltage exceeds 4 V.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- MPROP (rail pressure control valve) control is stopped.
- Misfire detection is stopped.
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

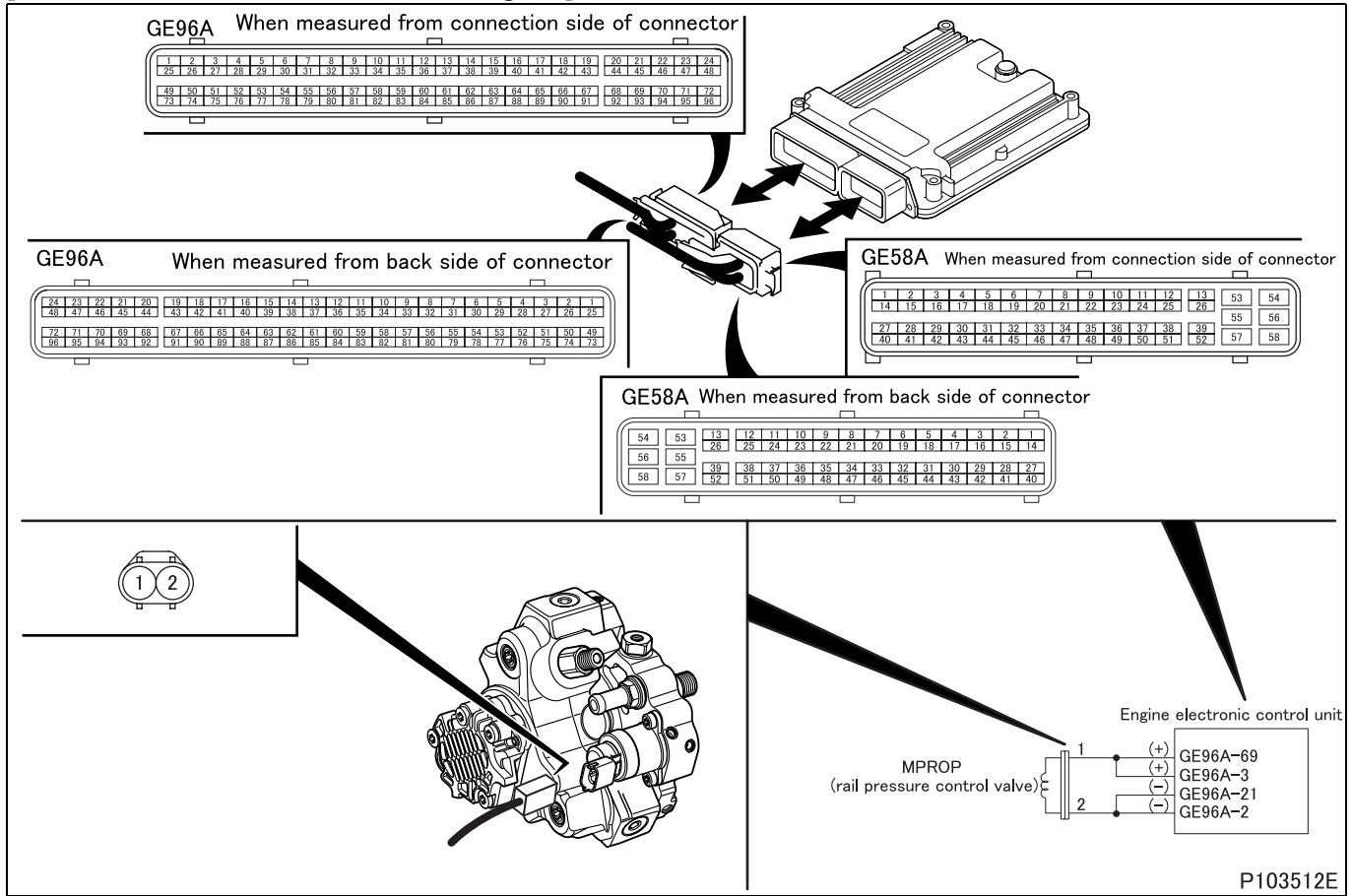
## **[Probable cause of trouble]**

- Open-circuit of harness between electronic control unit and MPROP (rail pressure control valve)
- Malfunction of each connector
- Malfunction of MPROP (rail pressure control valve)
- Malfunction of electronic control unit

## **[Recoverability]**

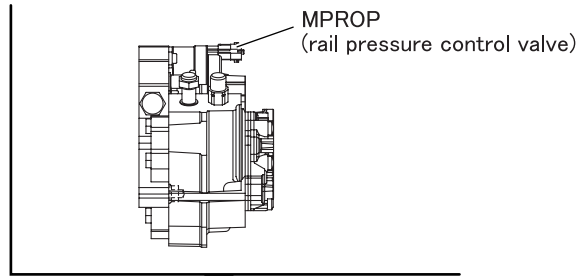
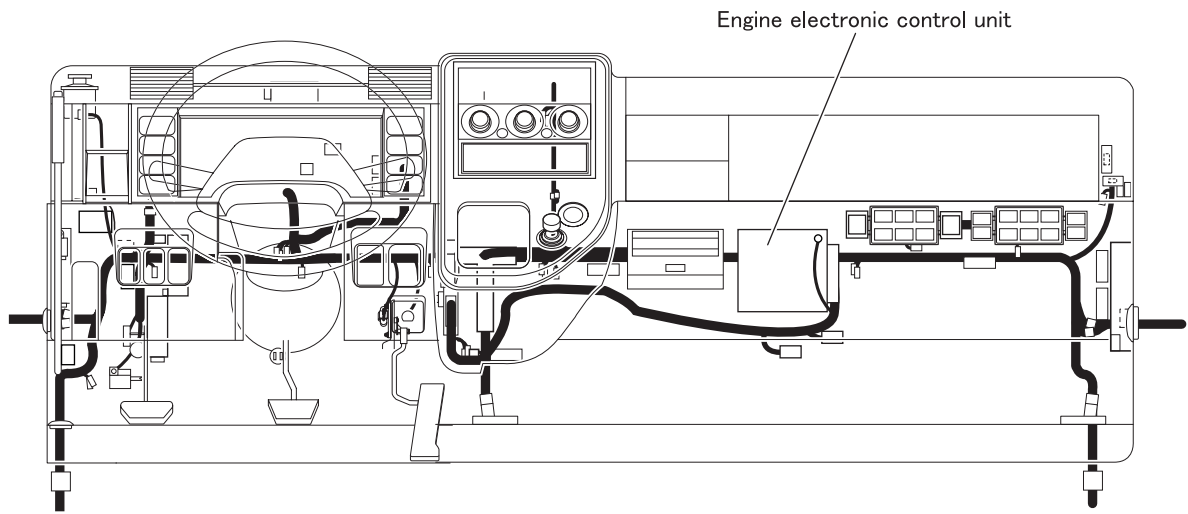
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]

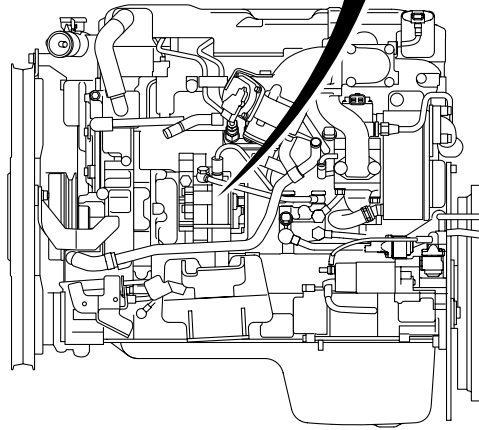


# TROUBLESHOOTING

## [Parts Identification and Location]



Left side view of engine



P103638E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 3 or No. 69 and No. 2 or No. 21.    |
|        | Inspection condition                                   |               | Disconnect electronic control unit and harness, and measure from connection side of harness connector. |
|        | Requirements   |               | 2.6 to 3.15 Ω  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of MPROP (rail pressure control valve) connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of supply pump  |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0004/Flash code: 63

## **[Monitor]**

Failure of MPROP (rail pressure control valve)

## **[Fault (outline)]**

High signal range check

## **[Diagnosis check]**

- MPROP (rail pressure control valve) is monitored for fault.

## **[Code generation condition]**

- MPROP (rail pressure control valve) voltage remains below 0 V for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- MPROP (rail pressure control valve) control is stopped.
- Misfire detection is stopped.
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

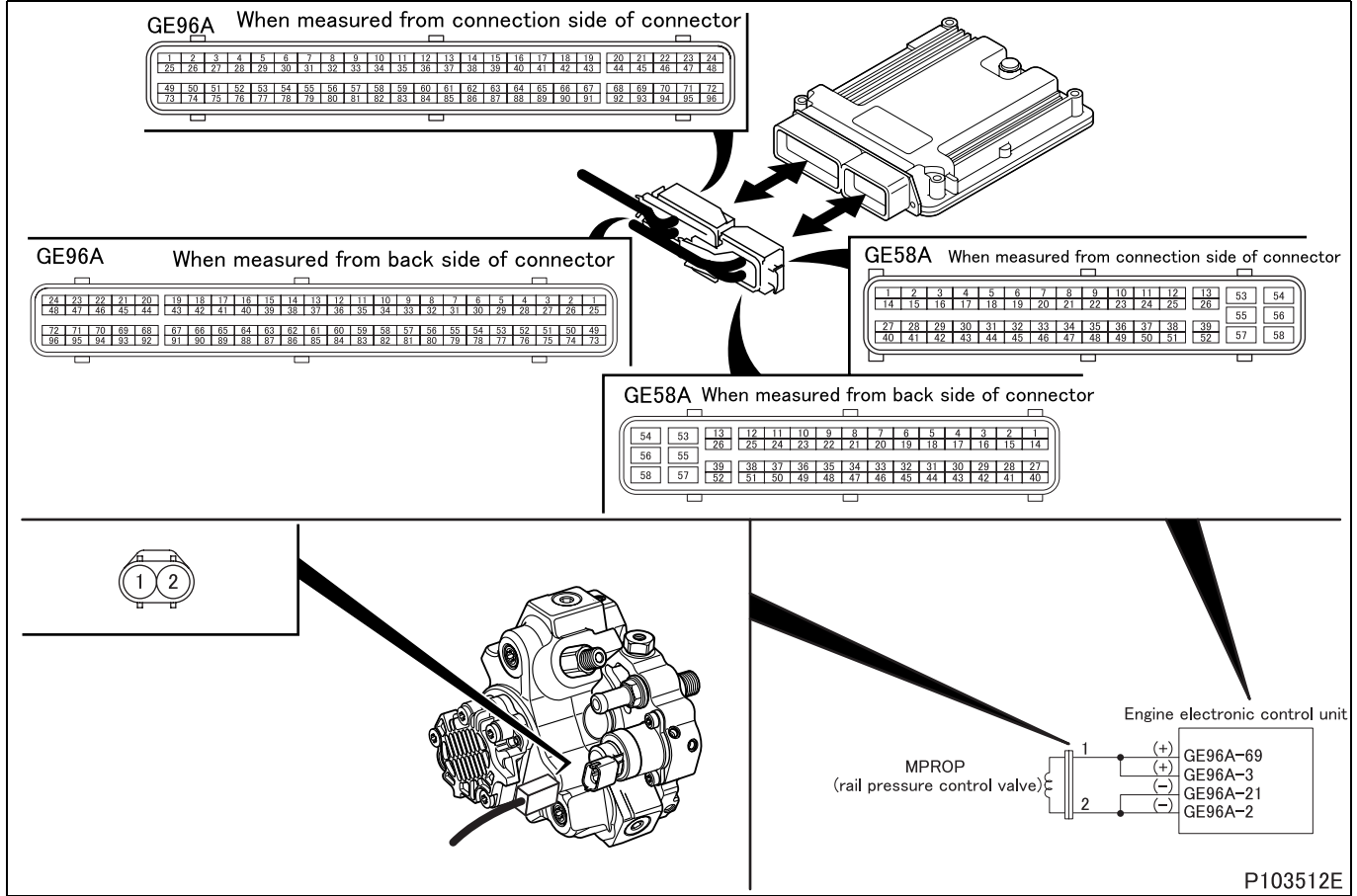
## **[Probable cause of trouble]**

- Short-circuit harness between electronic control unit and MPROP (rail pressure control valve)
- Malfunction of each connector
- Malfunction of MPROP (rail pressure control valve)
- Malfunction of electronic control unit

## **[Recoverability]**

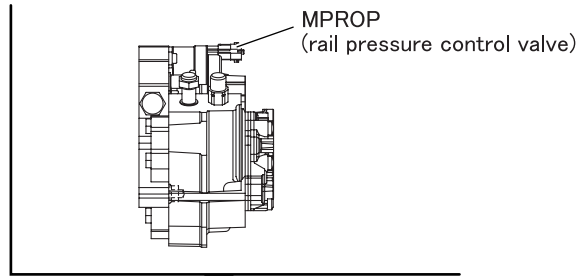
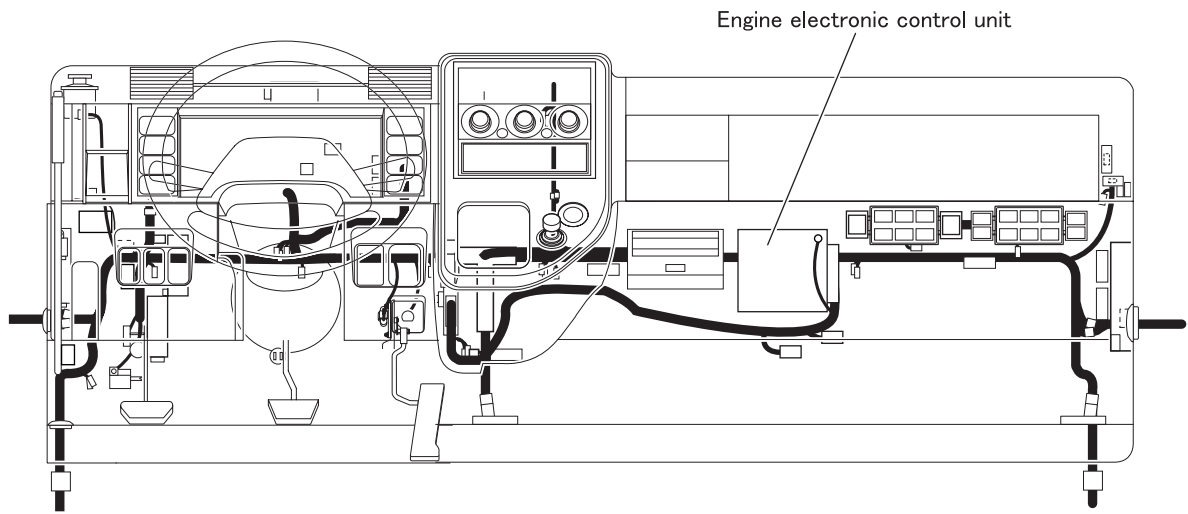
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]

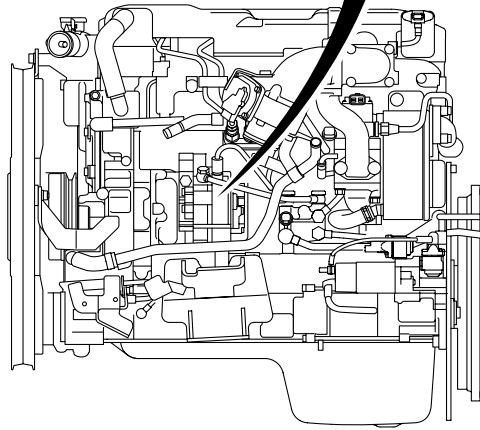


# TROUBLESHOOTING

## [Parts Identification and Location]



Left side view of engine



P103638E



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |  |                                    |
|--------|--|--|------------------------------------|
| Step 1 | Inspection items                                       | Inspection by electronic control unit connector  |                                    |
|        | Maintenance item                                       | Measure value of resistance between connector (GE96A) terminal No. 3 or No. 69 and No. 2 or No. 21.    |                                    |
|        | Inspection condition                                   | Disconnect electronic control unit and harness, and measure from connection side of harness connector. |                                    |
|        | Requirements   | 2.6 to 3.15 $\Omega$   |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to transient fault (See Gr00.). |
| NO     |  | Go to step 2.  |                                    |

|        |  |   |               |
|--------|--|---|---------------|
| Step 2 | Inspection items                                       | Inspection of electronic control unit connector   |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 3. |
| NO     |  | Modify connector.   |               |

|        |  |   |                            |
|--------|--|---|----------------------------|
| Step 3 | Inspection items                                       | Inspection of MPROP (rail pressure control valve) connector   |                            |
|        | Maintenance item                                       | Inspection of connector   |                            |
|        | Inspection condition                                   | -   |                            |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                            |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Replacement of supply pump |
| NO     |  | Modify connector.   |                            |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0016/Flash code: 12, 14, 15

## **[Monitor]**

Both speed sensor (Engine speed sensor, Cylinder recognition sensor)

## **[Fault (outline)]**

- Cam/crank signals present
- Gap phase shift

## **[Diagnosis check]**

- Output signals of engine speed sensor and cylinder recognition sensor at engine start are compared for abnormality.

## **[Code generation condition]**

Diagnosis code is generated under either of the following conditions.

<Condition (1)>

- Input signals from engine speed sensor and cylinder recognition sensor remain unreceived for more than 6 consecutive seconds.

(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

<Condition (2)>

- Signals from engine speed sensor and cylinder recognition sensor differ by more than 12 pulses.

(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation.)

<Condition (3)>

- Backup control of cylinder recognition sensor is started due to failure of engine speed sensor.

(Diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

<Condition (1)>

- Engine operating mode: starting
- Safety relay: OFF

<Condition (2)>

- Starter switch: ON
- Engine speed: more than 20 rpm

<Condition (3)>

- Engine speed sensor: faulty

## **[Control effected by electronic control unit during fault]**

- Electronic control unit differs in the way of control by the diagnosis check item.

<Condition (1)>

- Engine stopped

<Condition (2)>

- Misfire detection is stopped.
- Related fault check is stopped.

<Condition (3)>

- Engine torque is limited.
- Auto cruise control stopped
- Related fault check is stopped.

## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of engine speed sensor
- Malfunction of cylinder recognition sensor
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Timing of warning lamp/diagnosis code OFF depends on condition.)

<Condition (1)>

- Lamp is extinguished and code is cleared at fourth diagnosis code display after recovery.

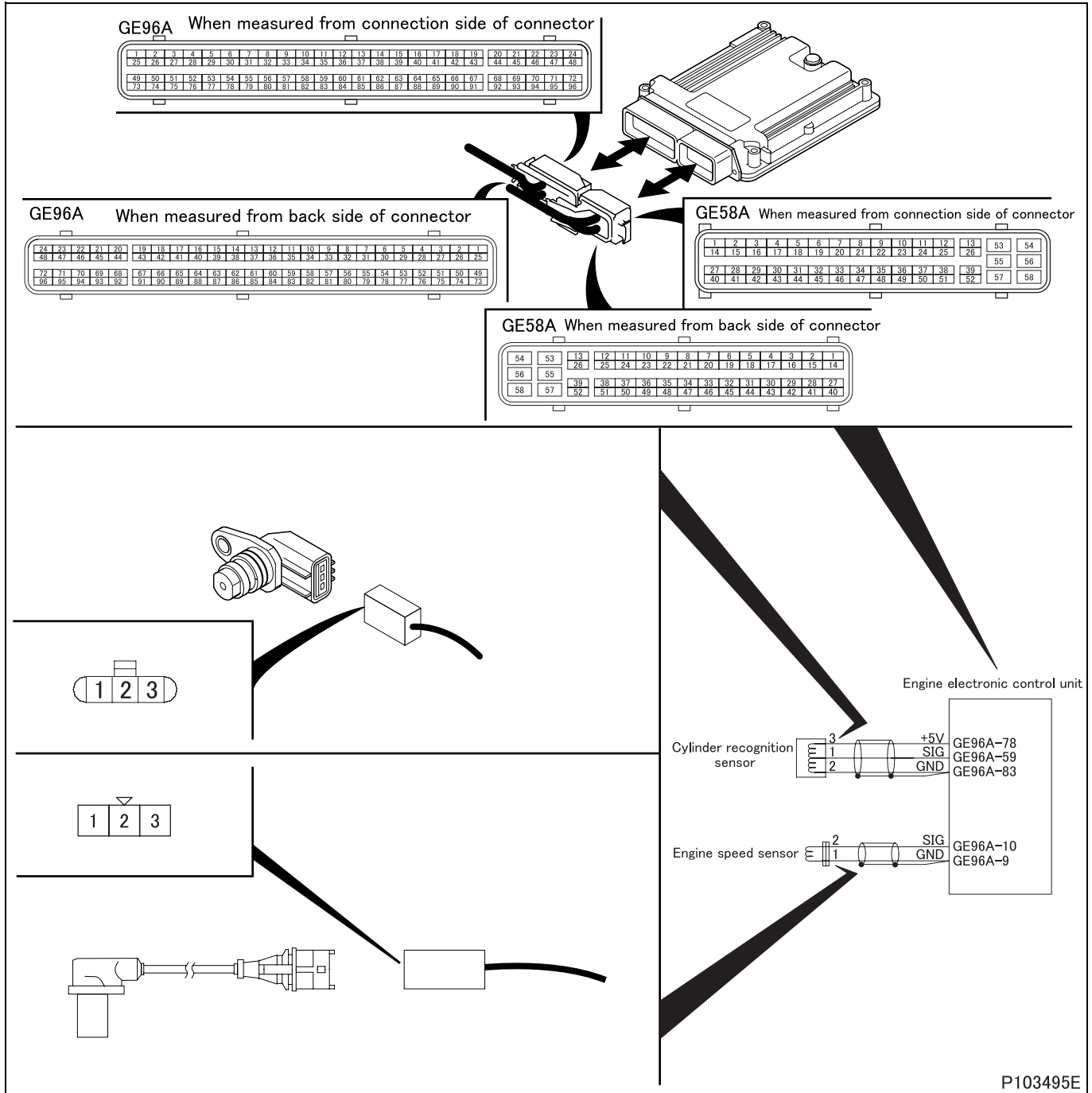
<Condition (2)>

- Lamp is extinguished and code is cleared at fourth diagnosis code display after recovery.

<Condition (3)>

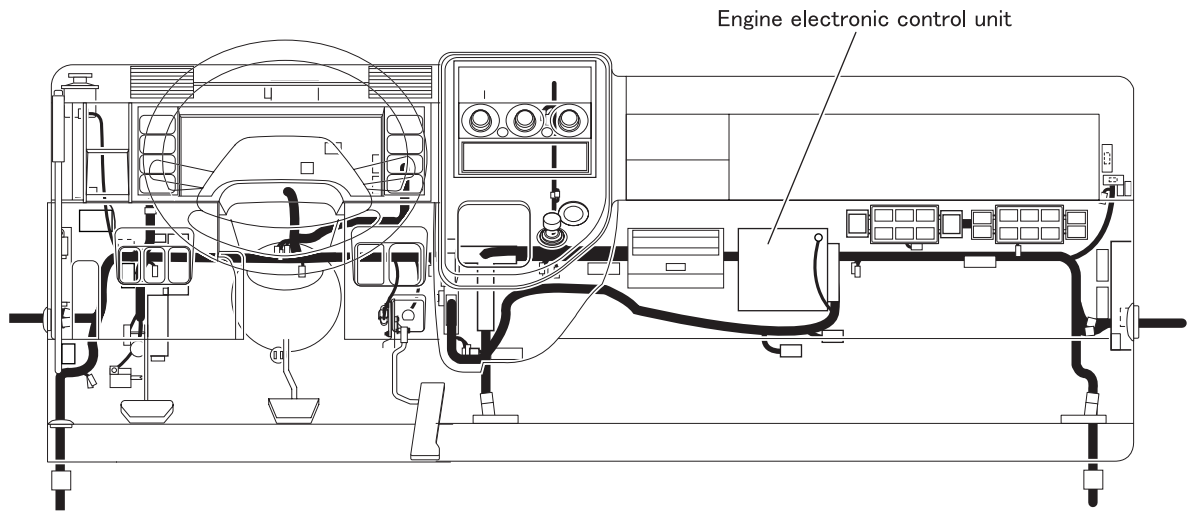
- Diagnosis code is cleared simultaneously with recovery.

**[Electronic Control Unit Connection Diagram]**

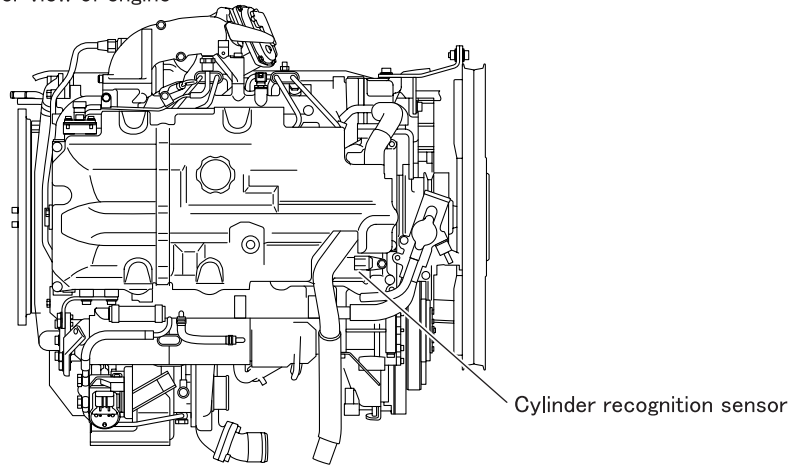


# TROUBLESHOOTING

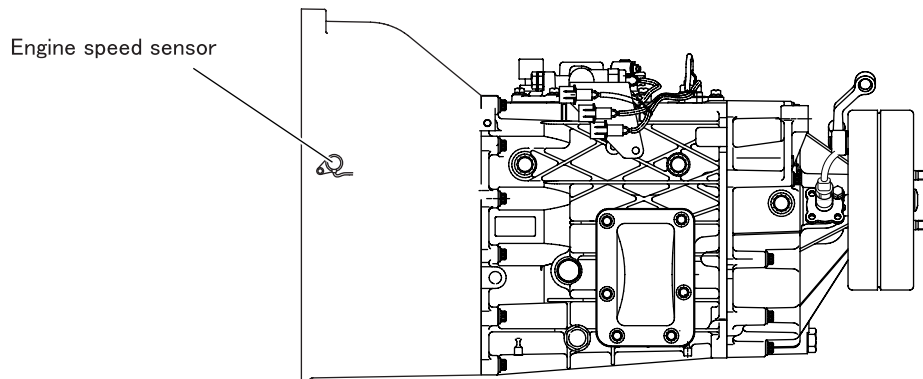
## [Parts Identification and Location]



Upper view of engine



Left side view of transmission



P103623E

[Fault diagnosis]

- Perform checks in the sequence of the following steps.

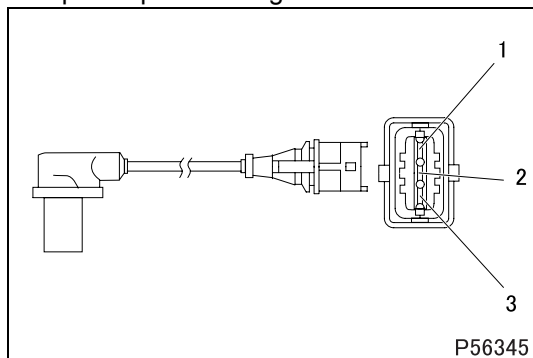
|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br>• Measure item "Ne".<br><b>&lt;Multi-Use Tester used&gt;</b><br>• Measure item No. 01 "Engine Revolution" of Service Data. |
|        | Inspection condition                                   |               | –   |
|        | Requirements   |               | Same indication as tachometer is given.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (engine speed sensor)                                  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 9 and 10.                           |
|        | Inspection condition                                   |               | Disconnect electronic control unit and harness, and measure from connection side of harness connector. |
|        | Requirements   |               | 860 ± 86 Ω   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 7.  |
| NO     |  | Go to step 3. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of engine speed sensor connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

|        |  |                       |   |
|--------|--|-----------------------|---|
| Step 4 | Inspection items                                       |                       | Inspection of engine speed sensor unit                              |
|        | Maintenance item                                       |                       | Measure value of resistance between connector terminal No. 1 and 2. |
|        | Inspection condition                                   |                       | –   |
|        | Requirements   |                       | 860 ± 86 Ω  |
|        | Inspection result (Is the judging standard satisfied?) | YES                   | Go to step 5.   |
| NO     |  | Replacement of sensor |   |

<Step 4 inspection diagram>



# TROUBLESHOOTING

|        |  |   |               |
|--------|--|---|---------------|
| Step 5 | Inspection items                                       | Inspection of harness between electronic control unit and engine speed sensor (power supply)                        |               |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 10 |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                          |               |
|        | Requirements   | There is continuity.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6. |
| NO     |  | Modify harness.   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 6 | Inspection items                                       | Inspection of harness between electronic control unit and engine speed sensor (ground)                             |               |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 9 |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                         |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7. |
| NO     |  | Modify harness.  |               |

|        |  |  |                |
|--------|--|--|----------------|
| Step 7 | Inspection items                                       | Inspection by electronic control unit connector (signal) (cylinder recognition sensor)   |                |
|        | Maintenance item                                       | Measure value of voltage between connector (GE96A) terminal No. 59 (+) and 83 (-).   |                |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |                |
|        | Requirements   | 1 V or more  |                |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 10. |
| NO     |  | Go to step 8.  |                |

|        |  |  |               |
|--------|--|--|---------------|
| Step 8 | Inspection items                                       | Inspection by electronic control unit connector (power supply) (cylinder recognition sensor)   |               |
|        | Maintenance item                                       | Measure value of voltage between connector (GE96A) terminal No. 78 (+) and 83 (-).   |               |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |               |
|        | Requirements   | 5 V  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 9. |
| NO     |  | Go to step 10.   |               |

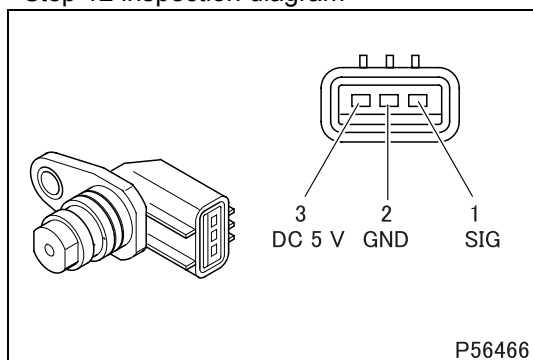
|        |  |  |                |
|--------|--|--|----------------|
| Step 9 | Inspection items                                       | Inspection by electronic control unit connector (ground) (cylinder recognition sensor)   |                |
|        | Maintenance item                                       | Measure value of voltage between connector (GE96A) terminal No. 83 (+) and (GE58A) 53 (-).   |                |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |                |
|        | Requirements   | 0 V  |                |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 11. |
| NO     |  | Go to step 10.   |                |

|         |  |   |                |
|---------|--|---|----------------|
| Step 10 | Inspection items                                       | Inspection of electronic control unit connector   |                |
|         | Maintenance item                                       | Inspection of connector   |                |
|         | Inspection condition                                   | -   |                |
|         | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|         | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 17. |
| NO      |  | Modify connector.   |                |

|         |  |   |                |
|---------|--|---|----------------|
| Step 11 | Inspection items                                       | Inspection of cylinder recognition sensor connector   |                |
|         | Maintenance item                                       | Inspection of connector   |                |
|         | Inspection condition                                   | -   |                |
|         | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|         | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 12. |
| NO      |  | Modify connector.   |                |

|         |  |   |                |
|---------|--|---|----------------|
| Step 12 | Inspection items                                       | Inspection of cylinder recognition sensor unit                      |                |
|         | Maintenance item                                       | Measure value of resistance between connector terminal No. 2 and 3. |                |
|         | Inspection condition                                   | -   |                |
|         | Requirements   | 200 to 1800 Ω   |                |
|         | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 13. |
| NO      |  | Replacement of sensor   |                |

<Step 12 inspection diagram>



|         |  |   |                |
|---------|--|---|----------------|
| Step 13 | Inspection items                                       | Inspection of harness between electronic control unit and cylinder recognition sensor (power supply)                              |                |
|         | Maintenance item                                       | Measure value of voltage between sensor connector terminal No. 3 (+) and 2 (-).   |                |
|         | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Remove connector and measure from harness side.</li> <li>• Starter switch: ON</li> </ul> |                |
|         | Requirements   | 5 V   |                |
|         | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 15. |
| NO      |  | Go to step 14.  |                |

# TROUBLESHOOTING

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 14 | Inspection items                                       |                 | Inspection of harness between electronic control unit and cylinder recognition sensor (power supply)                |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 78 |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                          |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 17.  |
| NO      |  | Modify harness. |   |

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 15 | Inspection items                                       |                 | Inspection of harness between electronic control unit and cylinder recognition sensor (ground)                      |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 83 |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                          |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 16.  |
| NO      |  | Modify harness. |   |

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 16 | Inspection items                                       |                 | Inspection of harness between electronic control unit and cylinder recognition sensor (signal)                      |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 59 |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                          |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 17.  |
| NO      |  | Modify harness. |   |

|         |  |  |   |
|---------|--|--|---|
| Step 17 | Inspection items                                       |  | Inspection by control data  |
|         | Maintenance item                                       |  | <b>&lt;General Scanning Tool used&gt;</b><br>• Measure item "Ne".<br><b>&lt;Multi-Use Tester used&gt;</b><br>• Measure item No. 01 "Engine Revolution" of Service Data. |
|         | Inspection condition                                   |  | –   |
|         | Requirements   |  | Same indication as tachometer is given.   |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO      |  | Replacement of electronic control unit |   |



**[Fault code]**

Diagnosis code: P0045/Flash code: 51

**[Monitor]**

Failure of turbocharger actuator

**[Fault (outline)]**

Circuit

**[Diagnosis check]**

- Turbocharger electronic drive unit monitors built-in motor of turbocharger actuator for circuit fault and sends fault information to engine electronic control unit through controller area network communication.
- Monitoring by turbocharger electronic drive unit is performed from initial operational status of motor at starter switch ON.

**[Code generation condition]**

- Actuator motor circuit remains open as detected by electronic drive unit for 2 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

- Controller area network communication in order

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

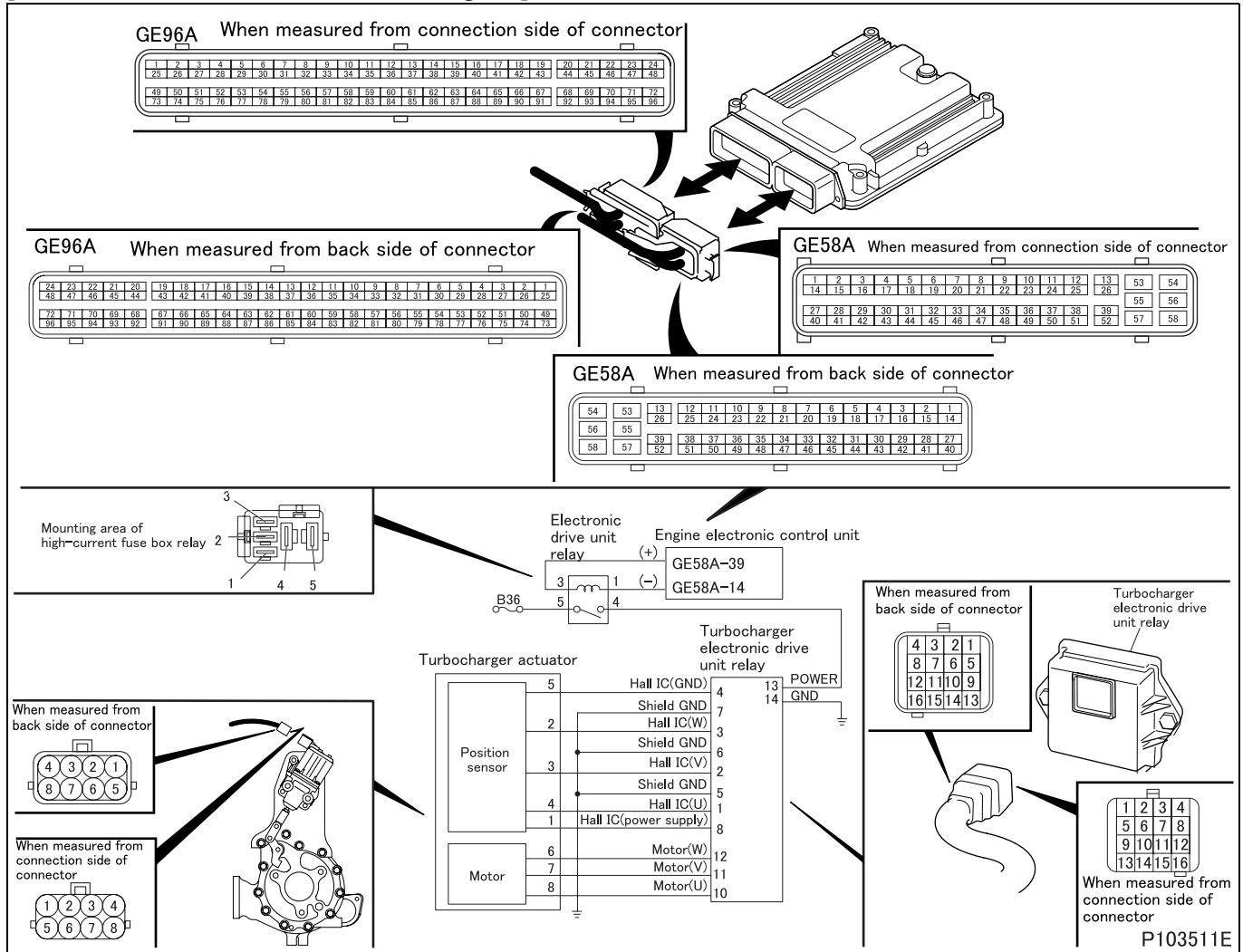
- Open-circuit or short-circuit of harness between electronic drive unit and turbocharger actuator
- Malfunction of each connector
- Malfunction of turbocharger motor (built in turbocharger actuator)
- Malfunction of turbocharger position sensor (built in turbocharger actuator)
- Malfunction of electronic drive unit
- Malfunction of electronic drive unit relay

**[Recoverability]**

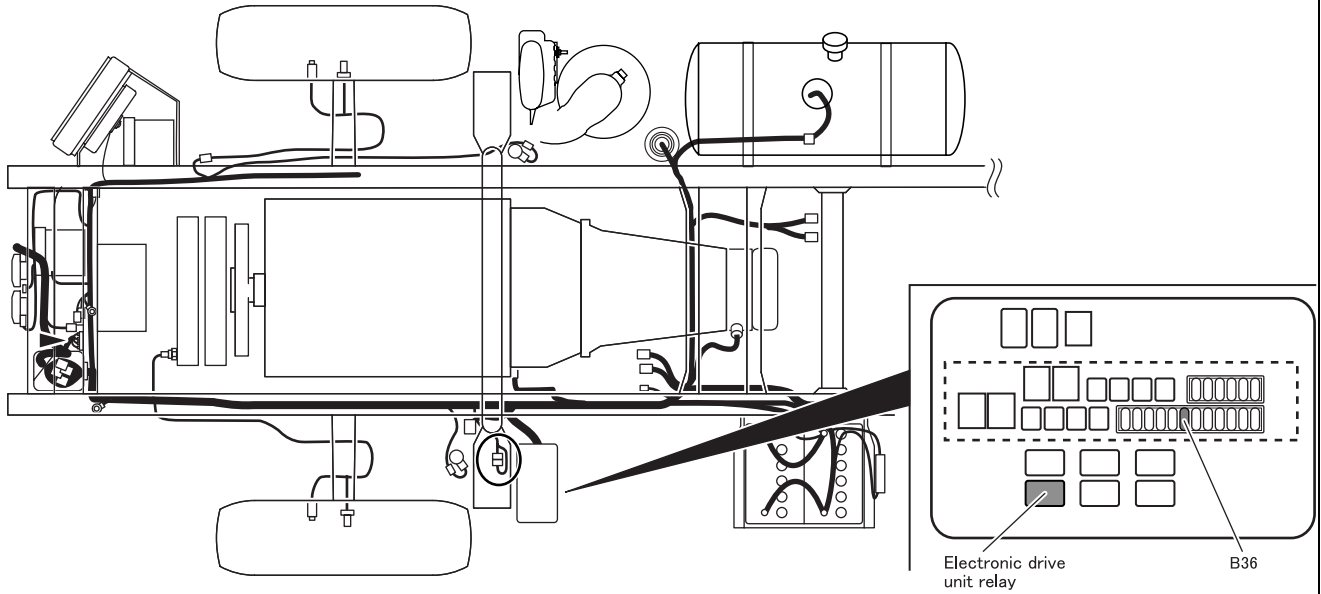
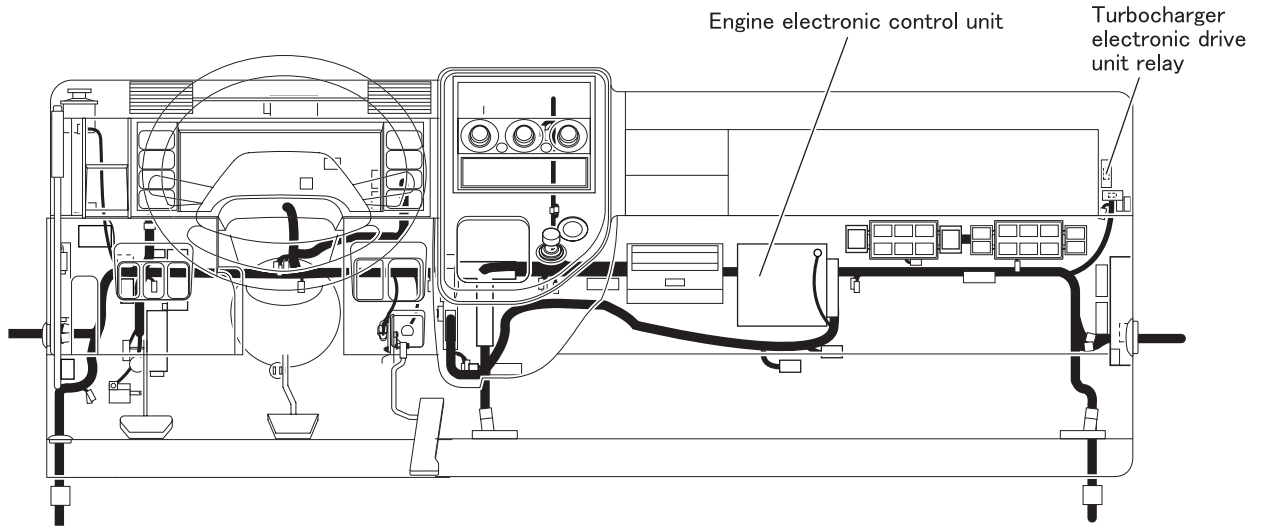
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

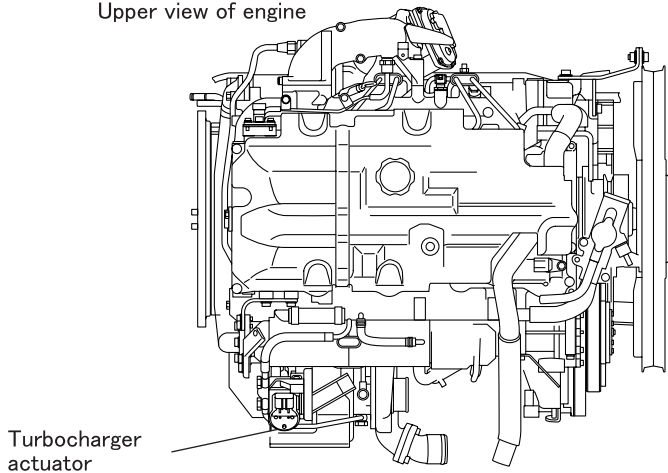
## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



Upper view of engine



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |   |                                    |
|--------|--|---|------------------------------------|
| Step 1 | Inspection items                                       | Inspection by control data  |                                    |
|        | Maintenance item                                       | Perform actuator test item No. A4 "VGT 1"   |                                    |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Transmission: neutral (parking satisfactory for automatic transmission)</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul>  |                                    |
|        | Requirements   | Actual position matches with target value set by Multi-Use Tester. (check with service data "54: Target VGT Position, 55: Actual VGT Position")<br><b>NOTE</b> <ul style="list-style-type: none"> <li>• Set turbocharger opening to the range of 20 to 80%.</li> <li>• As initial operational check of turbocharger actuator is automatically effected immediately after starter switch is ON, perform actuator test by Multi-Use Tester after that check (approximately 5 seconds later).</li> </ul> |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.). |
| NO     |  | Go to step 2.   |                                    |

|        |  |   |               |
|--------|--|---|---------------|
| Step 2 | Inspection items                                       | Inspection of electronic drive unit connector   |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 3. |
| NO     |  | Modify connector.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 3 | Inspection items                                       | Inspection of turbocharger actuator connector   |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 4. |
| NO     |  | Modify connector.   |               |

|        |  |  |   |  |
|--------|--|--|---|--|
| Step 4 | Inspection items                                       | Inspection by control data   |   |  |
|        | Maintenance item                                       | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0685 "EDU Relay (Open)"</li> <li>• P0686 "EDU Relay (Low)"</li> <li>• P0687 "EDU Relay (High)"</li> </ul> |   |  |
|        | Inspection condition                                   | Starter switch: ON   |   |  |
|        | Requirements   | No codes occur.  |   |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 5.                             |  |
|        |  | NO   | Inspect diagnosis code that is occurring. |  |

|        |  |               |  |
|--------|--|---------------|--|
| Step 5 | Inspection items                                       |               | Inspection of electronic drive unit connector (power supply)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector terminal No. 13 (+) and 14 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Remove connector and measure from harness side.</li> <li>Starter switch: ON</li> <li>Perform actuator test item No. AF "EDU Relay"</li> </ul> |
|        | Requirements   |               | Same as battery voltage.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 10.   |
| NO     |  | Go to step 6. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between fuse and relay   |
|        | Maintenance item                                       |                 | Check circuit between fuse No. B35 and relay connector terminal No. 5                      |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 8 | Inspection items                                       |                 | Inspection of harness between relay and electronic drive unit  |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 4 and electronic drive unit connector terminal No. 13 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.               |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of electronic drive unit relay, go to step 9   |
| NO     |  | Modify harness. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and ground  |
|        | Maintenance item                                       |                 | Check circuit between following electronic drive unit connector terminals <ul style="list-style-type: none"> <li>Electronic drive unit ground: terminal No. 14 - chassis ground</li> <li>Sensor shield ground (U): terminal No. 5 - 14</li> <li>Sensor shield ground (V): terminal No. 6 - 14</li> <li>Sensor shield ground (W): terminal No. 7 - 14</li> <li>Sensor ground: terminal No. 4 - 14</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 10.  |
| NO     |  | Modify harness. |   |

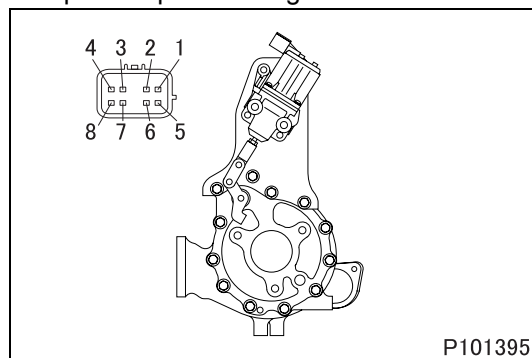
# TROUBLESHOOTING

|         |  |                      |  |
|---------|--|----------------------|--|
| Step 10 | Inspection items                                       |                      | Inspection of electronic drive unit connector (motor)  |
|         | Maintenance item                                       |                      | Measure value of resistance between following connector terminals.<br><ul style="list-style-type: none"> <li>Between U - V: 10 - 11</li> <li>Between U - W: 10 - 12</li> <li>Between V - W: 11 - 12</li> </ul> |
|         | Inspection condition                                   |                      | —  |
|         | Requirements   |                      | $2.1 \pm 0.3 \Omega$   |
|         | Inspection result (Is the judging standard satisfied?) |                      | YES<br>Go to step 13.  |
|         |  | NO<br>Go to step 11. |  |

|         |  |                       |   |
|---------|--|-----------------------|---|
| Step 11 | Inspection items                                       |                       | Inspection of harness between electronic drive unit and turbocharger actuator (motor)   |
|         | Maintenance item                                       |                       | Check circuit between following connector terminals.<br><ul style="list-style-type: none"> <li>Motor (U): electronic drive unit connector terminal No. 10 - turbocharger actuator connector terminal No. 8</li> <li>Motor (V): electronic drive unit connector terminal No. 11 - turbocharger actuator connector terminal No. 7</li> <li>Motor (W): electronic drive unit connector terminal No. 12 - turbocharger actuator connector terminal No. 6</li> </ul> |
|         | Inspection condition                                   |                       | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                       | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) |                       | YES<br>Go to step 12.   |
|         |  | NO<br>Modify harness. |   |

|         |  |   |   |
|---------|--|---|---|
| Step 12 | Inspection items                                       |   | Inspection of turbocharger actuator unit (motor)  |
|         | Maintenance item                                       |   | Measure value of resistance between following turbocharger actuator connector terminals<br><ul style="list-style-type: none"> <li>Between U - V: 8 - 7</li> <li>Between U - W: 8 - 6</li> <li>Between V - W: 7 - 6</li> </ul> |
|         | Inspection condition                                   |   | Keep turbocharger actuator installed on vehicle. Remove harness connector, and measure turbocharger actuator side.  |
|         | Requirements   |   | $2.1 \pm 0.3 \Omega$  |
|         | Inspection result (Is the judging standard satisfied?) |   | YES<br>Go to step 13.   |
|         |  | NO<br>Replacement of turbocharger actuator. |   |

<Step 12 inspection diagram>



|         |  |                |   |
|---------|--|----------------|---|
| Step 13 | Inspection items                                       |                | Inspection of turbocharger actuator connector (position sensor: power supply)   |
|         | Maintenance item                                       |                | Measure value of voltage between connector terminal No. 1 (+) and 5 (-).  |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|         | Requirements   |                | 10 V  |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 14.  |
| NO      |  | Go to step 15. |   |

|         |  |                |  |
|---------|--|----------------|--|
| Step 14 | Inspection items                                       |                | Inspection of electronic drive unit connector (position sensor: signal)  |
|         | Maintenance item                                       |                | Measure value of voltage between following electronic drive unit connector terminals <ul style="list-style-type: none"> <li>• U signal output: terminal 1 (+) - 4 (-)</li> <li>• V signal output: terminal 2 (+) - 4 (-)</li> <li>• W signal output: terminal 3 (+) - 4 (-)</li> </ul> |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> <li>• Perform actuator test item No. A4 "VGT 1"</li> </ul>   |
|         | Requirements   |                | 8 to 11 V  |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 16.   |
| NO      |  | Go to step 15. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 15 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and turbocharger actuator (position sensor)  |
|         | Maintenance item                                       |                 | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Sensor (power supply): electronic drive unit connector terminal No. 8 - turbocharger actuator connector terminal No. 1</li> <li>• Sensor (U): electronic drive unit connector terminal No. 1 - turbocharger actuator connector terminal No. 4</li> <li>• Sensor (V): electronic drive unit connector terminal No. 2 - turbocharger actuator connector terminal No. 3</li> <li>• Sensor (W): electronic drive unit connector terminal No. 3 - turbocharger actuator connector terminal No. 2</li> <li>• Sensor (ground): electronic drive unit connector terminal No. 4 - turbocharger actuator connector terminal No. 5</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of turbocharger, go to step 16   |
| NO      |  | Modify harness. |  |

# TROUBLESHOOTING

|         |  |  |  |     |                                    |    |
|---------|--|--|--|-----|------------------------------------|----|
| Step 16 | Inspection items                                       |  | Inspection by control data   |     |                                    |    |
|         | Maintenance item                                       |  | Perform actuator test item No. A4 "VGT 1"  |     |                                    |    |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Transmission: neutral (parking satisfactory for automatic transmission)</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul>   |     |                                    |    |
|         | Requirements   |  | <p>Actual position matches with target value set by Multi-Use Tester. (check with service data "54: Target VGT Position, 55: Actual VGT Position")</p> <p><b>NOTE</b></p> <ul style="list-style-type: none"> <li>• <b>Set turbocharger opening to the range of 20 to 80%.</b></li> <li>• <b>As initial operational check of turbocharger actuator is automatically effected immediately after starter switch is ON, perform actuator test by Multi-Use Tester after that check (approximately 5 seconds later).</b></li> </ul> |     |                                    |    |
|         | Inspection result (Is the judging standard satisfied?) |  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">YES</td> <td>Go to transient fault (See Gr00.).</td> </tr> <tr> <td style="width: 50%; text-align: center;">NO</td> <td>Replacement of electronic drive unit</td> </tr> </table>   | YES | Go to transient fault (See Gr00.). | NO |
| YES     | Go to transient fault (See Gr00.).                     |  |  |     |                                    |    |
| NO      | Replacement of electronic drive unit                   |  |  |     |                                    |    |



**[Fault code]**

Diagnosis code: P0046/Flash code: 51

**[Monitor]**

Failure of turbocharger actuator

**[Fault (outline)]**

Circuit

**[Diagnosis check]**

- Turbocharger electronic control drive monitors built-in motor of turbocharger actuator for sticking of parts and sends fault information to engine electronic control unit through controller area network communication.
- Turbocharger electronic drive unit determines actual shaft position from position sensor output data and calculates target shaft position from actual position data.

**[Code generation condition]**

- Actuator motor remains stuck as detected by electronic drive unit for 2 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

- Controller area network communication in order

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

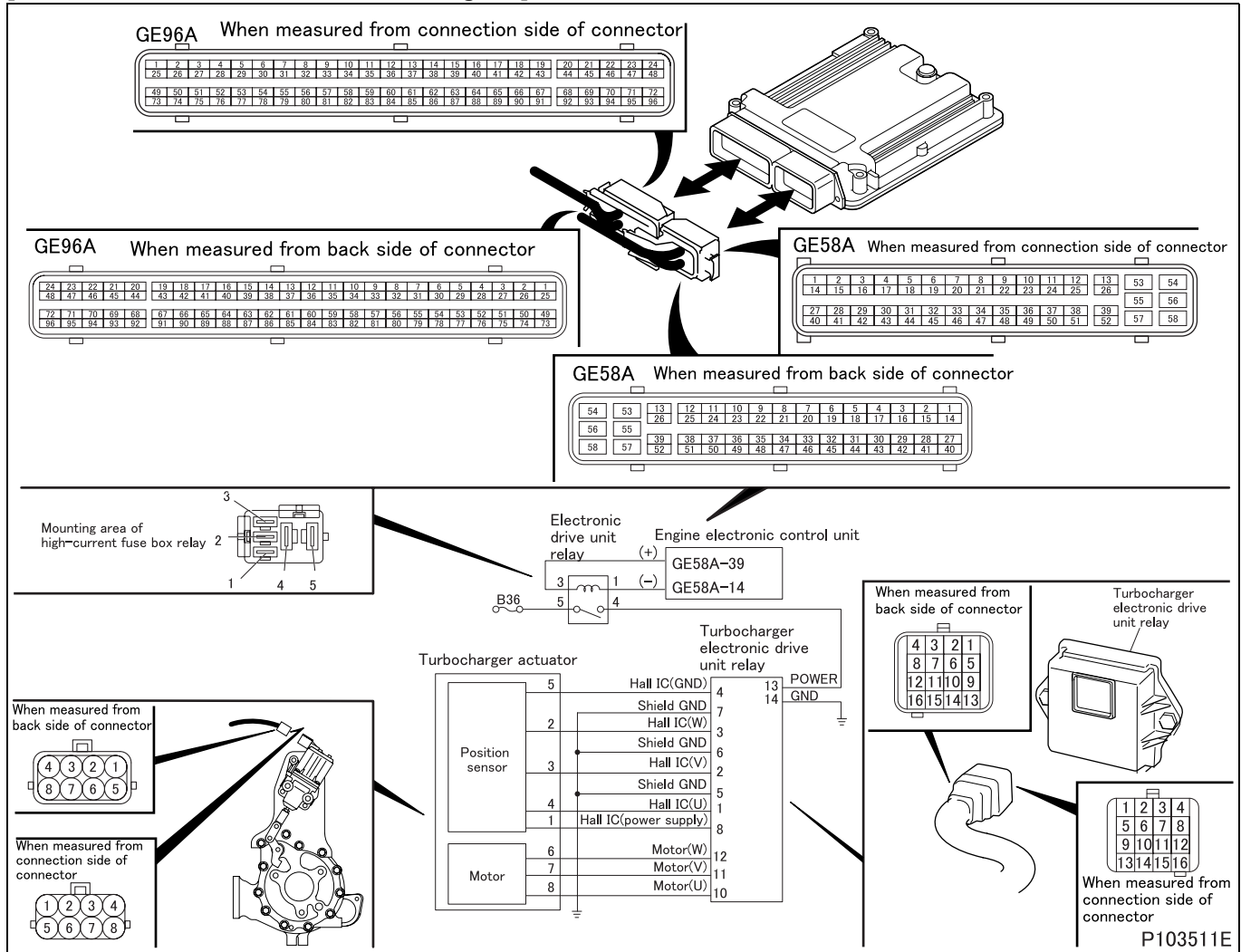
- Turbocharger actuator unit stuck
- Malfunction of electronic drive unit

**[Recoverability]**

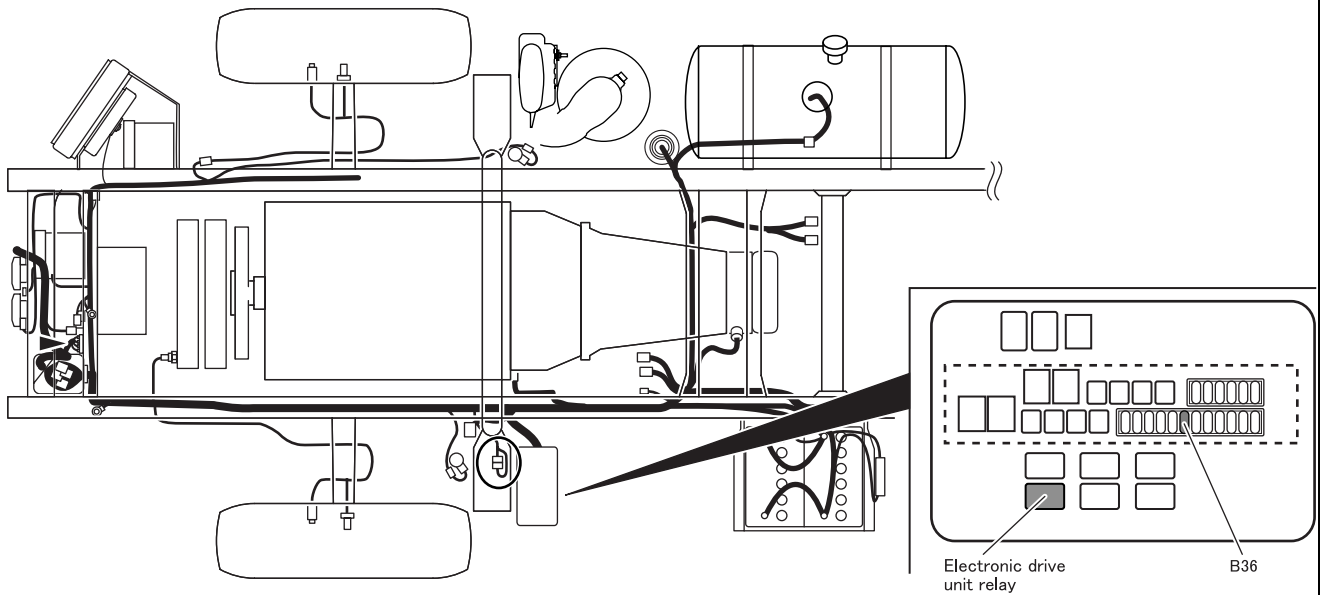
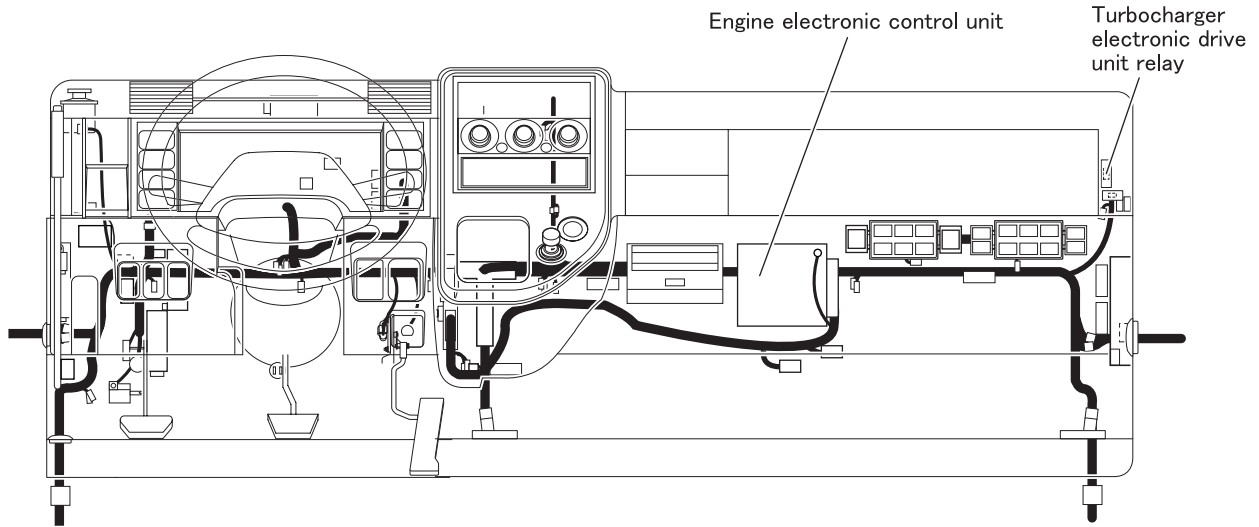
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

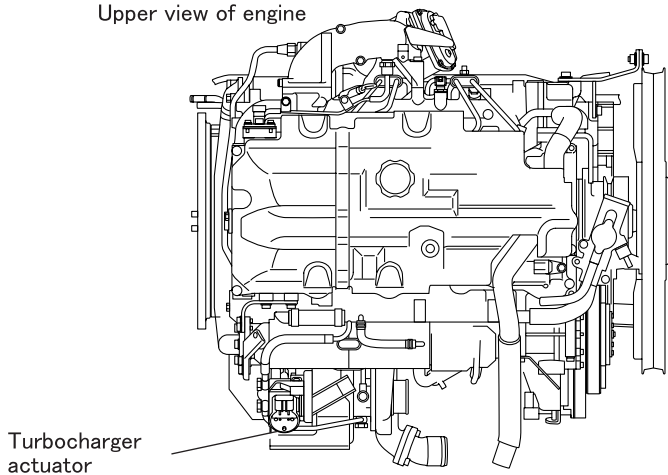
## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



Upper view of engine



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. A4 "VGT 1"   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Transmission: neutral (parking satisfactory for automatic transmission)</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul>  |
|        | Requirements   |               | Actual position matches with target value set by Multi-Use Tester. (check with service data "54: Target VGT Position, 55: Actual VGT Position")<br><br><b>NOTE</b> <ul style="list-style-type: none"> <li>• Set turbocharger opening to the range of 20 to 80%.</li> <li>• As initial operational check of turbocharger actuator is automatically effected immediately after starter switch is ON, perform actuator test by Multi-Use Tester after that check (approximately 5 seconds later).</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic drive unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of turbocharger actuator connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

|        |  |     |  |
|--------|--|-----|--|
| Step 4 | Inspection items                                       |     | Inspection by control data   |
|        | Maintenance item                                       |     | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0685 "EDU Relay (Open)"</li> <li>• P0686 "EDU Relay (Low)"</li> <li>• P0687 "EDU Relay (High)"</li> </ul> |
|        | Inspection condition                                   |     | Starter switch: ON   |
|        | Requirements   |     | No codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) | YES | Go to step 5.  |
|        |  | NO  | Inspect diagnosis code that is occurring.  |

|        |  |               |  |
|--------|--|---------------|--|
| Step 5 | Inspection items                                       |               | Inspection of electronic drive unit connector (power supply)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector terminal No. 13 (+) and 14 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Remove connector and measure from harness side.</li> <li>Starter switch: ON</li> <li>Perform actuator test item No. AF "EDU Relay"</li> </ul> |
|        | Requirements   |               | Same as battery voltage.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 10.   |
| NO     |  | Go to step 6. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between fuse and relay   |
|        | Maintenance item                                       |                 | Check circuit between fuse No. B35 and relay connector terminal No. 5                      |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 8 | Inspection items                                       |                 | Inspection of harness between relay and electronic drive unit  |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 4 and electronic drive unit connector terminal No. 13 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.               |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of electronic drive unit relay, go to step 9   |
| NO     |  | Modify harness. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and ground  |
|        | Maintenance item                                       |                 | Check circuit between following electronic drive unit connector terminals <ul style="list-style-type: none"> <li>Electronic drive unit ground: terminal No. 14 - chassis ground</li> <li>Sensor shield ground (U): terminal No. 5 - 14</li> <li>Sensor shield ground (V): terminal No. 6 - 14</li> <li>Sensor shield ground (W): terminal No. 7 - 14</li> <li>Sensor ground: terminal No. 4 - 14</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 10.  |
| NO     |  | Modify harness. |   |

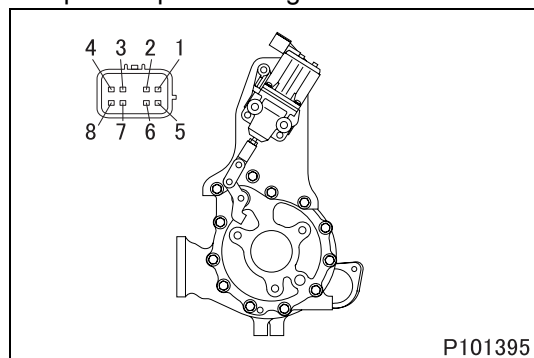
# TROUBLESHOOTING

|         |  |                      |  |
|---------|--|----------------------|--|
| Step 10 | Inspection items                                       |                      | Inspection of electronic drive unit connector (motor)  |
|         | Maintenance item                                       |                      | Measure value of resistance between following connector terminals.<br><ul style="list-style-type: none"> <li>Between U - V: 10 - 11</li> <li>Between U - W: 10 - 12</li> <li>Between V - W: 11 - 12</li> </ul> |
|         | Inspection condition                                   |                      | —  |
|         | Requirements   |                      | $2.1 \pm 0.3 \Omega$   |
|         | Inspection result (Is the judging standard satisfied?) |                      | YES<br>Go to step 13.  |
|         |  | NO<br>Go to step 11. |  |

|         |  |                       |   |
|---------|--|-----------------------|---|
| Step 11 | Inspection items                                       |                       | Inspection of harness between electronic drive unit and turbocharger actuator (motor)   |
|         | Maintenance item                                       |                       | Check circuit between following connector terminals.<br><ul style="list-style-type: none"> <li>Motor (U): electronic drive unit connector terminal No. 10 - turbocharger actuator connector terminal No. 8</li> <li>Motor (V): electronic drive unit connector terminal No. 11 - turbocharger actuator connector terminal No. 7</li> <li>Motor (W): electronic drive unit connector terminal No. 12 - turbocharger actuator connector terminal No. 6</li> </ul> |
|         | Inspection condition                                   |                       | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                       | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) |                       | YES<br>Go to step 12.   |
|         |  | NO<br>Modify harness. |   |

|         |  |   |   |
|---------|--|---|---|
| Step 12 | Inspection items                                       |   | Inspection of turbocharger actuator unit (motor)  |
|         | Maintenance item                                       |   | Measure value of resistance between following turbocharger actuator connector terminals<br><ul style="list-style-type: none"> <li>Between U - V: 8 - 7</li> <li>Between U - W: 8 - 6</li> <li>Between V - W: 7 - 6</li> </ul> |
|         | Inspection condition                                   |   | Keep turbocharger actuator installed on vehicle. Remove harness connector, and measure turbocharger actuator side.  |
|         | Requirements   |   | $2.1 \pm 0.3 \Omega$  |
|         | Inspection result (Is the judging standard satisfied?) |   | YES<br>Go to step 13.   |
|         |  | NO<br>Replacement of turbocharger actuator. |   |

<Step 12 inspection diagram>



|         |  |                |   |
|---------|--|----------------|---|
| Step 13 | Inspection items                                       |                | Inspection of turbocharger actuator connector (position sensor: power supply)   |
|         | Maintenance item                                       |                | Measure value of voltage between connector terminal No. 1 (+) and 5 (-).  |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|         | Requirements   |                | 10 V  |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 14.  |
| NO      |  | Go to step 15. |   |

|         |  |                |  |
|---------|--|----------------|--|
| Step 14 | Inspection items                                       |                | Inspection of electronic drive unit connector (position sensor: signal)  |
|         | Maintenance item                                       |                | Measure value of voltage between following electronic drive unit connector terminals <ul style="list-style-type: none"> <li>• U signal output: terminal 1 (+) - 4 (-)</li> <li>• V signal output: terminal 2 (+) - 4 (-)</li> <li>• W signal output: terminal 3 (+) - 4 (-)</li> </ul> |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> <li>• Perform Multi-Use Tester actuator test item No. A4 "VGT 1"</li> </ul>  |
|         | Requirements   |                | 8 to 11 V  |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 16.   |
| NO      |  | Go to step 15. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 15 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and turbocharger actuator (position sensor)  |
|         | Maintenance item                                       |                 | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Sensor (power supply): electronic drive unit connector terminal No. 8 - turbocharger actuator connector terminal No. 1</li> <li>• Sensor (U): electronic drive unit connector terminal No. 1 - turbocharger actuator connector terminal No. 4</li> <li>• Sensor (V): electronic drive unit connector terminal No. 2 - turbocharger actuator connector terminal No. 3</li> <li>• Sensor (W): electronic drive unit connector terminal No. 3 - turbocharger actuator connector terminal No. 2</li> <li>• Sensor (ground): electronic drive unit connector terminal No. 4 - turbocharger actuator connector terminal No. 5</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of turbocharger, go to step 16   |
| NO      |  | Modify harness. |  |

# TROUBLESHOOTING

|         |  |  |  |     |                                    |    |
|---------|--|--|--|-----|------------------------------------|----|
| Step 16 | Inspection items                                       |  | Inspection by control data   |     |                                    |    |
|         | Maintenance item                                       |  | Perform actuator test item No. A4 "VGT 1"  |     |                                    |    |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Transmission: neutral (parking satisfactory for automatic transmission)</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul>   |     |                                    |    |
|         | Requirements   |  | <p>Actual position matches with target value set by Multi-Use Tester. (check with service data "54: Target VGT Position, 55: Actual VGT Position")</p> <p><b>NOTE</b></p> <ul style="list-style-type: none"> <li>• <b>Set turbocharger opening to the range of 20 to 80%.</b></li> <li>• <b>As initial operational check of turbocharger actuator is automatically effected immediately after starter switch is ON, perform actuator test by Multi-Use Tester after that check (approximately 5 seconds later).</b></li> </ul> |     |                                    |    |
|         | Inspection result (Is the judging standard satisfied?) |  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">YES</td> <td>Go to transient fault (See Gr00.).</td> </tr> <tr> <td style="width: 50px; text-align: center;">NO</td> <td>Replacement of electronic drive unit</td> </tr> </table>   | YES | Go to transient fault (See Gr00.). | NO |
| YES     | Go to transient fault (See Gr00.).                     |  |  |     |                                    |    |
| NO      | Replacement of electronic drive unit                   |  |  |     |                                    |    |



**[Fault code]**

Diagnosis code: P0047/Flash code: 51

**[Monitor]**

Failure of turbocharger actuator

**[Fault (outline)]**

Circuit

**[Diagnosis check]**

- Turbocharger electronic drive unit monitors built-in motor of turbocharger actuator for circuit fault and sends fault information to engine electronic control unit through controller area network communication.
- Monitoring by turbocharger electronic drive unit is performed from internal current detection circuit.

**[Code generation condition]**

- Actuator motor circuit remains shorted as detected by electronic drive unit for 2 seconds. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

- Controller area network communication in order

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

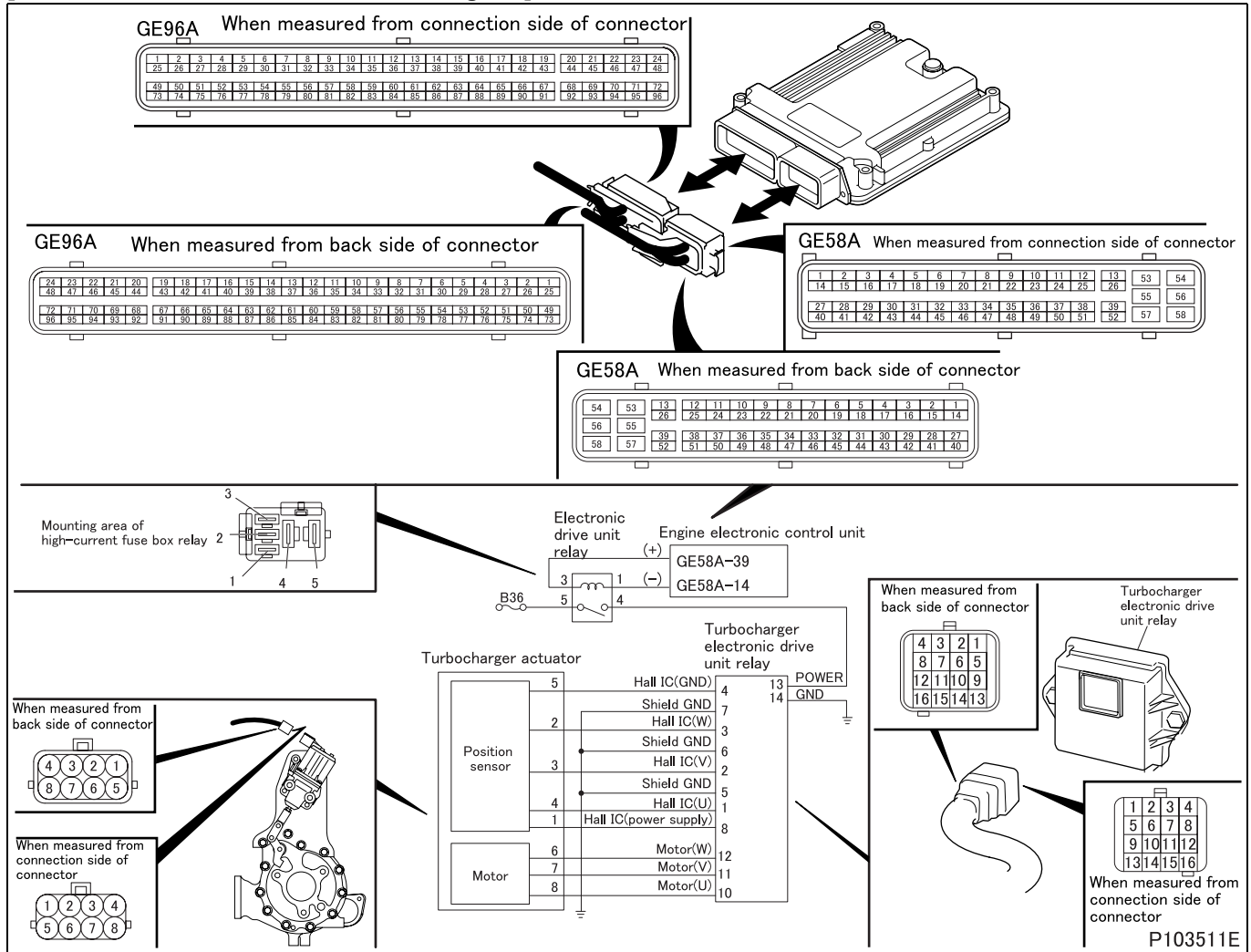
- Open-circuit or short-circuit harness between electronic drive unit and turbocharger actuator
- Malfunction of each connector
- Malfunction of turbocharger motor (built in turbocharger actuator)
- Malfunction of turbocharger position sensor (built in turbocharger actuator)
- Malfunction of electronic drive unit
- Malfunction of electronic drive unit relay

**[Recoverability]**

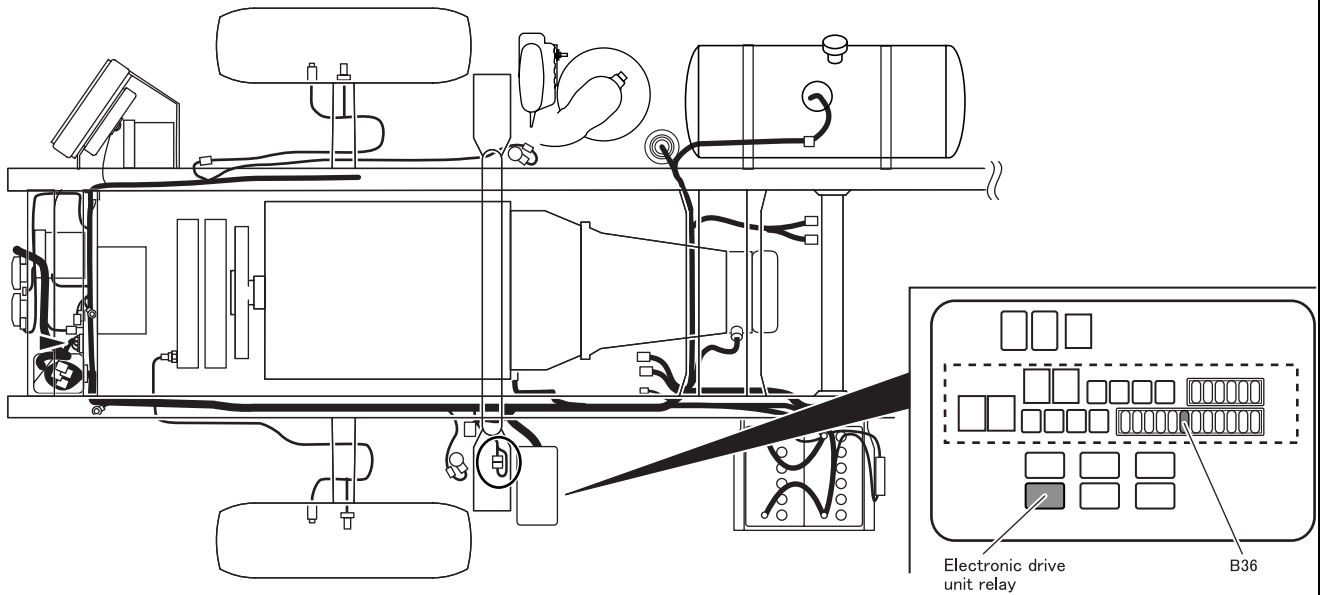
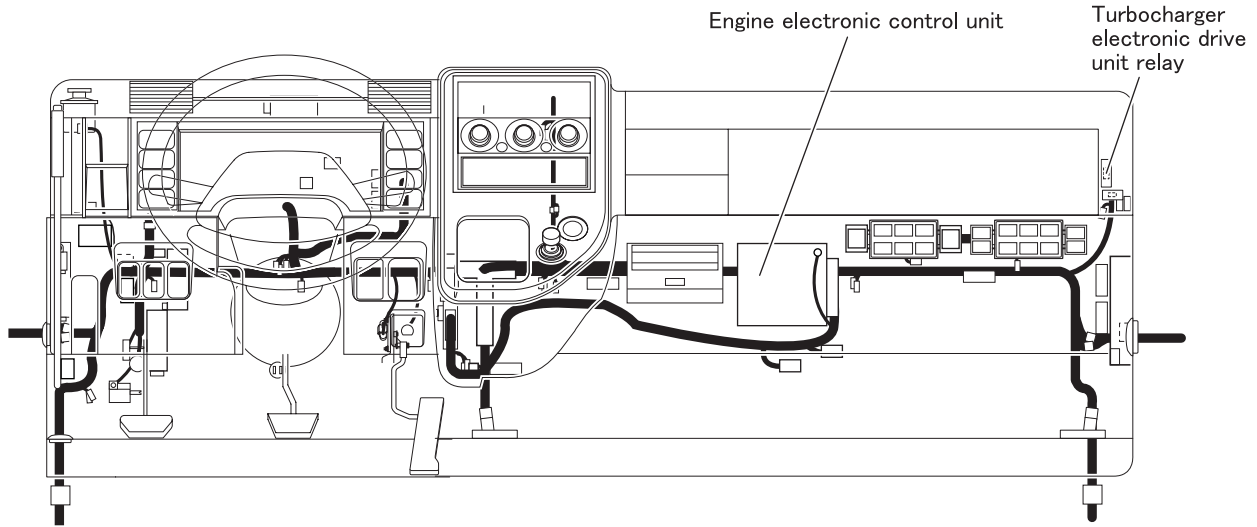
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

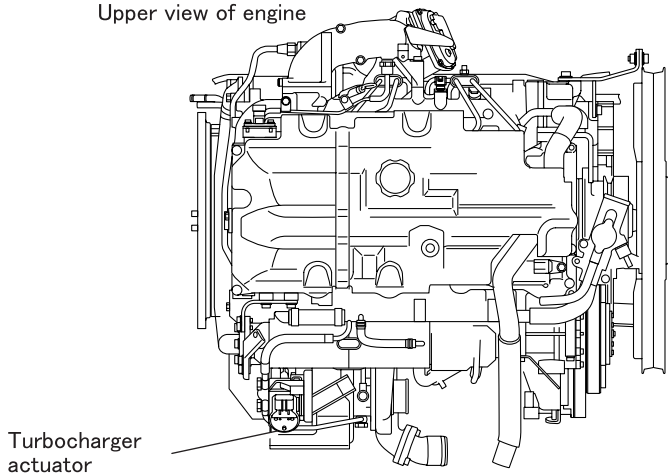
## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



Upper view of engine



P103637E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |   |                                    |
|--------|--|---|------------------------------------|
| Step 1 | Inspection items                                       | Inspection by control data  |                                    |
|        | Maintenance item                                       | Perform actuator test item No. A4 "VGT 1"   |                                    |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Transmission: neutral (parking satisfactory for automatic transmission)</li> <li>Diagnosis switch: OFF (fuse removed)</li> </ul>  |                                    |
|        | Requirements   | Actual position matches with target value set by Multi-Use Tester. (check with service data "54: Target VGT Position, 55: Actual VGT Position")<br><b>NOTE</b> <ul style="list-style-type: none"> <li>Set turbocharger opening to the range of 20 to 80%.</li> <li>As initial operational check of turbocharger actuator is automatically effected immediately after starter switch is ON, perform actuator test by Multi-Use Tester after that check (approximately 5 seconds later).</li> </ul> |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.). |
| NO     |  | Go to step 2.   |                                    |

|        |  |   |               |
|--------|--|---|---------------|
| Step 2 | Inspection items                                       | Inspection of electronic drive unit relay   |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 3. |
| NO     |  | Modify connector.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 3 | Inspection items                                       | Inspection of turbocharger actuator connector   |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 4. |
| NO     |  | Modify connector.   |               |

|        |  |  |   |  |
|--------|--|--|---|--|
| Step 4 | Inspection items                                       | Inspection by control data   |   |  |
|        | Maintenance item                                       | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>P0685 "EDU Relay (Open)"</li> <li>P0686 "EDU Relay (Low)"</li> <li>P0687 "EDU Relay (High)"</li> </ul> |   |  |
|        | Inspection condition                                   | Starter switch: ON   |   |  |
|        | Requirements   | No codes occur.  |   |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 5.                             |  |
|        |  | NO   | Inspect diagnosis code that is occurring. |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 5 | Inspection items                                       |               | Inspection of electronic drive unit connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector terminal No. 13 (+) and 14 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Remove connector and measure from harness side.</li> <li>Starter switch: ON</li> <li>Perform Multi-Use Tester actuator test item No. AF "EDU Relay"</li> </ul> |
|        | Requirements   |               | Same as battery voltage.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 10.  |
| NO     |  | Go to step 6. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between fuse and relay   |
|        | Maintenance item                                       |                 | Check circuit between fuse No. B35 and relay connector terminal No. 5                      |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 8 | Inspection items                                       |                 | Inspection of harness between relay and electronic drive unit  |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 4 and electronic drive unit connector terminal No. 13 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.               |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of electronic drive unit relay, go to step 9   |
| NO     |  | Modify harness. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and ground  |
|        | Maintenance item                                       |                 | Check circuit between following electronic drive unit connector terminals <ul style="list-style-type: none"> <li>Electronic drive unit ground: terminal No. 14 - chassis ground</li> <li>Sensor shield ground (U): terminal No. 5 - 14</li> <li>Sensor shield ground (V): terminal No. 6 - 14</li> <li>Sensor shield ground (W): terminal No. 7 - 14</li> <li>Sensor ground: terminal No. 4 - 14</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 10.  |
| NO     |  | Modify harness. |   |

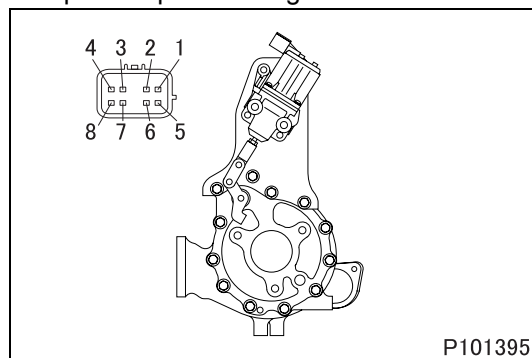
# TROUBLESHOOTING

|         |  |                      |   |
|---------|--|----------------------|---|
| Step 10 | Inspection items                                       |                      | Inspection of electronic drive unit connector (motor)   |
|         | Maintenance item                                       |                      | Measure value of resistance between following connector terminals. <ul style="list-style-type: none"> <li>Between U - V: 10 - 11</li> <li>Between U - W: 10 - 12</li> <li>Between V - W: 11 - 12</li> </ul> |
|         | Inspection condition                                   |                      | —   |
|         | Requirements   |                      | $2.1 \pm 0.3 \Omega$  |
|         | Inspection result (Is the judging standard satisfied?) |                      | YES<br>Go to step 13.   |
|         |  | NO<br>Go to step 11. |   |

|         |  |                       |  |
|---------|--|-----------------------|--|
| Step 11 | Inspection items                                       |                       | Inspection of harness between electronic drive unit and turbocharger actuator (motor)  |
|         | Maintenance item                                       |                       | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>Motor (U): electronic drive unit connector terminal No. 10 - turbocharger actuator connector terminal No. 8</li> <li>Motor (V): electronic drive unit connector terminal No. 11 - turbocharger actuator connector terminal No. 7</li> <li>Motor (W): electronic drive unit connector terminal No. 12 - turbocharger actuator connector terminal No. 6</li> </ul> |
|         | Inspection condition                                   |                       | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |                       | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) |                       | YES<br>Go to step 12.  |
|         |  | NO<br>Modify harness. |  |

|         |  |  |  |
|---------|--|--|--|
| Step 12 | Inspection items                                       |  | Inspection of turbocharger actuator unit (motor)   |
|         | Maintenance item                                       |  | Measure value of resistance between following turbocharger actuator connector terminals <ul style="list-style-type: none"> <li>Between U - V: 8 - 7</li> <li>Between U - W: 8 - 6</li> <li>Between V - W: 7 - 6</li> </ul> |
|         | Inspection condition                                   |  | Keep turbocharger actuator installed on vehicle. Remove harness connector, and measure turbocharger actuator side.   |
|         | Requirements   |  | $2.1 \pm 0.3 \Omega$   |
|         | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 13.  |
|         |  | NO<br>Replacement of turbocharger actuator |  |

<Step 12 inspection diagram>



|         |  |                |   |
|---------|--|----------------|---|
| Step 13 | Inspection items                                       |                | Inspection of turbocharger actuator connector (position sensor: power supply)   |
|         | Maintenance item                                       |                | Measure value of voltage between connector terminal No. 1 (+) and 5 (-).  |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|         | Requirements   |                | 10 V  |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 14.  |
| NO      |  | Go to step 15. |   |

|         |  |                |  |
|---------|--|----------------|--|
| Step 14 | Inspection items                                       |                | Inspection of electronic drive unit connector (position sensor: signal)  |
|         | Maintenance item                                       |                | Measure value of voltage between following electronic drive unit connector terminals <ul style="list-style-type: none"> <li>• U signal output: terminal 1 (+) - 4 (-)</li> <li>• V signal output: terminal 2 (+) - 4 (-)</li> <li>• W signal output: terminal 3 (+) - 4 (-)</li> </ul> |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> <li>• Perform actuator test item No. A4 "VGT 1"</li> </ul>   |
|         | Requirements   |                | 8 to 11 V  |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 16.   |
| NO      |  | Go to step 15. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 15 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and turbocharger actuator (position sensor)  |
|         | Maintenance item                                       |                 | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Sensor (power supply): electronic drive unit connector terminal No. 8 - variable geometry turbocharger actuator connector terminal No. 1</li> <li>• Sensor (U): electronic drive unit connector terminal No. 1 - turbocharger actuator connector terminal No. 4</li> <li>• Sensor (V): electronic drive unit connector terminal No. 2 - turbocharger actuator connector terminal No. 3</li> <li>• Sensor (W): electronic drive unit connector terminal No. 3 - turbocharger actuator connector terminal No. 2</li> <li>• Sensor (ground): electronic drive unit connector terminal No. 4 - turbocharger actuator connector terminal No. 5</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of turbocharger, go to step 16   |
| NO      |  | Modify harness. |  |

# TROUBLESHOOTING

|         |  |                                      |  |
|---------|--|--------------------------------------|--|
| Step 16 | Inspection items                                       |                                      | Inspection by control data   |
|         | Maintenance item                                       |                                      | Perform actuator test item No. A4 "VGT 1"  |
|         | Inspection condition                                   |                                      | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Transmission: neutral (parking satisfactory for automatic transmission)</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul>   |
|         | Requirements   |                                      | <p>Actual position matches with target value set by Multi-Use Tester. (check with service data "54: Target VGT Position, 55: Actual VGT Position")</p> <p><b>NOTE</b></p> <ul style="list-style-type: none"> <li>• <b>Set turbocharger opening to the range of 20 to 80%.</b></li> <li>• <b>As initial operational check of turbocharger actuator is automatically effected immediately after starter switch is ON, perform actuator test by Multi-Use Tester after that check (approximately 5 seconds later).</b></li> </ul> |
|         | Inspection result (Is the judging standard satisfied?) | YES                                  | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic drive unit |  |



**[Fault code]**

Diagnosis code: P0069/Flash code: 19

**[Monitor]**

Characteristic abnormality of atmospheric pressure sensor (built into engine electronic control unit)

**[Fault (outline)]**

Gain and offset drift

**[Diagnosis check]**

- Values of atmospheric pressure sensor and boost pressure sensor are compared when engine is in considerably low speed operation (value of boost pressure sensor is corrected value by exhaust gas recirculation valve position and throttle position)

**[Code generation condition]**

- Atmospheric pressure value remains higher than boost pressure value by 14 kPa {2.0 psi, 0.1 kgf/cm<sup>2</sup>} for 10 consecutive seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine operating mode: normal (engine in operation)
- Engine speed: less than 850 rpm
- Fuel injection quantity: less than 10 mg/cyc
- Exhaust gas recirculation valve: in order
- Intake throttle: in order
- Turbocharger actuator: in order
- Controller area network communication of each electronic drive unit (exhaust gas recirculation, intake throttle and turbocharger): in order
- Atmospheric pressure sensor: in order
- Boost pressure sensor: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- Injector: in order
- MPROP (rail pressure control valve): in order
- Fuel feed when engine is idling: in order

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- In-use performance counter is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 1 | Inspection items                                       |  | Inspection by control data   |     |               |    |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0234 "Overboost"</li> <li>• P0236 "Boost Press SNSR (Plausi)"</li> <li>• P0237 "Boost Press SNSR (Low)"</li> <li>• P0238 "Boost Press SNSR (High)"</li> <li>• P0299 "Turbocharger (Underboost)"</li> <li>• P2228 "Atm Press SNSR (Low)"</li> <li>• P2229 "Atm Press SNSR (High)"</li> </ul> |     |               |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: Idling</li> </ul>   |     |               |    |
|        | Requirements   |  | Codes occur.   |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 2.</td> </tr> <tr> <td>NO</td> <td>Inspect diagnosis code that is occurring.</td> </tr> </table>   | YES | Go to step 2. | NO |
| YES    | Go to step 2.  |  |  |     |               |    |
| NO     | Inspect diagnosis code that is occurring.              |  |  |     |               |    |

|        |  |  |   |     |                                    |    |
|--------|--|--|---|-----|------------------------------------|----|
| Step 2 | Inspection items                                       |  | Inspection by control data  |     |                                    |    |
|        | Maintenance item                                       |  | <b>&lt;General Scanning Tool used&gt;</b> <ul style="list-style-type: none"> <li>• Measure item "Intake MAP".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b> <ul style="list-style-type: none"> <li>• Measure item No. 20 "Atmospheric Pressure" of Service Data.</li> </ul> |     |                                    |    |
|        | Inspection condition                                   |  | Starter switch ON (engine stationary) → After engine has started, press accelerator pedal.  |     |                                    |    |
|        | Requirements   |  | Coincides with atmospheric pressure → Gradually increases   |     |                                    |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to transient fault (See Gr00.).</td> </tr> <tr> <td>NO</td> <td>Replacement of electronic control unit</td> </tr> </table>  | YES | Go to transient fault (See Gr00.). | NO |
| YES    | Go to transient fault (See Gr00.).                     |  |   |     |                                    |    |
| NO     | Replacement of electronic control unit                 |  |   |     |                                    |    |

**[Fault code]**

Diagnosis code: P0087/Flash code: 36

**[Monitor]**

Abnormality of common rail pressure (comparison)

**[Fault (outline)]**

Rail pressure regulator adjustment

**[Diagnosis check]**

- Pressure in common rail is detected as actual common rail pressure by common rail pressure sensor and compared with target common rail pressure for control by engine electronic control unit.

**[Code generation condition]**

- Actual common rail pressure remains higher than target common rail pressure by 300 bar or more for 10 seconds (not reaching the target pressure). (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Common rail pressure control: closed loop control

**[Control effected by electronic control unit during fault]**

- Engine torque is limited.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Traction control is stopped <Automatic transmission>
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

- Malfunction of supply pump (overflow valve)
- Malfunction of pressure limiting valve
- Airtight malfunction of injector
- Plugged fuel system
- Fuel leakage
- Malfunction of common rail pressure sensor

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |   |  |
|--------|--|---|--|
| Step 1 | Inspection items                                       |   | Inspection by control data   |
|        | Maintenance item                                       |   | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>P0093 "CRS (Fuel Leak)"</li> <li>P0148 "CRS (Fuel Delivery)"</li> <li>P0191 "CRS Pressure SNSR (Plausibility)"</li> <li>P0192 "CRS Pressure SNSR (Low)"</li> <li>P0193 "CRS Pressure SNSR (High)"</li> <li>P0201 "Injector M/V-Cylinder 1 (Load)"</li> <li>P0202 "Injector M/V-Cylinder 2 (Load)"</li> <li>P0203 "Injector M/V-Cylinder 3 (Load)"</li> <li>P0204 "Injector M/V-Cylinder 4 (Load)"</li> <li>P0261 "Injector #1-A (Low)"</li> <li>P0262 "Injector #1-A (High)"</li> <li>P0263 "Injector #1-A (Plausibility)"</li> <li>P0264 "Injector #2-A (Low)"</li> <li>P0265 "Injector #2-A (High)"</li> <li>P0266 "Injector #2-A (Plausibility)"</li> <li>P0267 "Injector #3-A (Low)"</li> <li>P0268 "Injector #3-A (High)"</li> <li>P0269 "Injector #3-A (Plausibility)"</li> <li>P0270 "Injector #4-A (Low)"</li> <li>P0271 "Injector #4-A (High)"</li> <li>P0272 "Injector #4-A (Plausibility)"</li> <li>P0562 "Power Supply Voltage (Low)"</li> <li>P0563 "Power Supply Voltage (High)"</li> <li>P0607 "ECU System"</li> <li>P060B "A/D Converter"</li> <li>P061B "ECU Performance (Calc)"</li> <li>P061C "ECU Performance (Ne)"</li> </ul> |
|        | Inspection condition                                   |   | <ul style="list-style-type: none"> <li>Starter switch: ON</li> <li>Do not start engine.</li> </ul>   |
|        | Requirements   |   | No codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 2.  |
|        | NO   | Inspect diagnosis code that is occurring. |  |

|        |  |               |                                  |
|--------|--|---------------|----------------------------------|
| Step 2 | Inspection items                                       |               | Checking of engine appearance    |
|        | Maintenance item                                       |               | Check fuel system for fuel leak. |
|        | Inspection condition                                   |               | Starter switch: OFF              |
|        | Requirements   |               | There is no fuel leak.           |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.                    |
|        | NO   | Go to step 6. |                                  |

|        |  |   |   |
|--------|--|---|---|
| Step 3 | Inspection items                                       |   | Inspection of low pressure piping (fuel tank – supply pump) |
|        | Maintenance item                                       |   | Check suction pipe or hose for bend.                        |
|        | Inspection condition                                   |   | Starter switch: OFF   |
|        | Requirements   |   | There is no bend on pipe or hose.                           |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 4.   |
|        | NO   | Correct and replace suction pipe or hose. |   |

|        |  |               |                                    |
|--------|--|---------------|------------------------------------|
| Step 4 | Inspection items                                       |               | Checking of air bleeding           |
|        | Maintenance item                                       |               | Bleed air from fuel filter.        |
|        | Inspection condition                                   |               | Starter switch: OFF                |
|        | Requirements   |               | Problem is solved by bleeding air. |
|        | Inspection result (Is the judging standard satisfied?) | YES           | –                                  |
|        | NO   | Go to step 5. |                                    |

|        |  |               |   |
|--------|--|---------------|---|
| Step 5 | Inspection items                                       |               | Inspection of low pressure piping           |
|        | Maintenance item                                       |               | Fuel filter                                 |
|        | Inspection condition                                   |               | Starter switch: OFF                         |
|        | Requirements   |               | Problem is solved by replacing fuel filter. |
|        | Inspection result (Is the judging standard satisfied?) | YES           | -   |
| NO     |  | Go to step 6. |   |

|        |  |                            |   |
|--------|--|----------------------------|---|
| Step 6 | Inspection items                                       |                            | Inspection by control data                          |
|        | Maintenance item                                       |                            | Perform actuator test item No. B2 "Fuel Leak Check" |
|        | Inspection condition                                   |                            | Engine start: At idle                               |
|        | Requirements   |                            | There is no leak from supply pump.                  |
|        | Inspection result (Is the judging standard satisfied?) | YES                        | Go to step 7.                                       |
| NO     |  | Replacement of supply pump |   |

|        |  |                          |   |
|--------|--|--------------------------|---|
| Step 7 | Inspection items                                       |                          | Inspection by control data                                    |
|        | Maintenance item                                       |                          | Perform actuator test item No. B2 "Fuel Leak Check"           |
|        | Inspection condition                                   |                          | Engine start: At idle   |
|        | Requirements   |                          | There is no leak from fuel pipe between supply pump and rail. |
|        | Inspection result (Is the judging standard satisfied?) | YES                      | Go to step 8.   |
| NO     |  | Replacement of fuel pipe |   |

|        |  |                     |   |
|--------|--|---------------------|---|
| Step 8 | Inspection items                                       |                     | Inspection by control data                          |
|        | Maintenance item                                       |                     | Perform actuator test item No. B2 "Fuel Leak Check" |
|        | Inspection condition                                   |                     | Engine start: At idle                               |
|        | Requirements   |                     | There is no leak from rail.                         |
|        | Inspection result (Is the judging standard satisfied?) | YES                 | Go to step 9.                                       |
| NO     |  | Replacement of rail |   |

|        |  |                               |  |
|--------|--|-------------------------------|--|
| Step 9 | Inspection items                                       |                               | Inspection by control data   |
|        | Maintenance item                                       |                               | Perform actuator test item No. B2 "Fuel Leak Check"                          |
|        | Inspection condition                                   |                               | Engine start: At idle  |
|        | Requirements   |                               | There is no leak from fuel injection pipes (four) between injector and rail. |
|        | Inspection result (Is the judging standard satisfied?) | YES                           | Go to step 10.   |
| NO     |  | Replacement of injection pipe |  |

|         |  |                         |   |
|---------|--|-------------------------|---|
| Step 10 | Inspection items                                       |                         | Inspection by control data                          |
|         | Maintenance item                                       |                         | Perform actuator test item No. B2 "Fuel Leak Check" |
|         | Inspection condition                                   |                         | Engine start: At idle                               |
|         | Requirements   |                         | There is no leak from injectors (four).             |
|         | Inspection result (Is the judging standard satisfied?) | YES                     | Go to step 11.                                      |
| NO      |  | Replacement of injector |   |

# TROUBLESHOOTING

|         |  |  |  |
|---------|--|--|--|
| Step 11 | Inspection items                                       |  | Check inside of combustion chamber.  |
|         | Maintenance item                                       |  | Check for fuel leak.   |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>After performing actuator test item No. B2 "Fuel Leak Check", stop engine.</li> <li>Remove glow plug, and check from glow plug mounting hole using bore scope.</li> </ul> |
|         | Requirements   |  | Inside of combustion chamber is not wet.   |
|         | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 12.   |
| NO      |  | Replacement of injector of object cylinder |  |

|         |  |                |  |
|---------|--|----------------|--|
| Step 12 | Inspection items                                       |                | Replacement of rail (common rail pressure sensor, flow damper and pressure limiter abnormal) |
|         | Maintenance item                                       |                | –  |
|         | Inspection condition                                   |                | –  |
|         | Requirements   |                | Problem is solved by replacing rail.   |
|         | Inspection result (Is the judging standard satisfied?) | YES            | –  |
| NO      |  | Go to step 13. |  |

|         |  |                                 |   |
|---------|--|---------------------------------|---|
| Step 13 | Inspection items                                       |                                 | Replacement of supply pump                  |
|         | Maintenance item                                       |                                 | –   |
|         | Inspection condition                                   |                                 | –   |
|         | Requirements   |                                 | Problem is solved by replacing supply pump. |
|         | Inspection result (Is the judging standard satisfied?) | YES                             | –   |
| NO      |  | Replacement of injectors (four) |   |

**[Fault code]**

Diagnosis code: P0088/Flash code: 23

**[Monitor]**

Abnormality of common rail pressure (pressure: high)

**[Fault (outline)]**

Plausibility

**[Diagnosis check]**

- Pressure in common rail is detected as actual common rail pressure by common rail pressure sensor and compared with target common rail pressure for control by engine electronic control unit.

**[Code generation condition]**

Diagnosis code is generated under either of the following conditions.

<Condition (1)>

- Actual common rail pressure remains 300 bar apart from target common rail pressure for 10 seconds (considerably exceeding the target value).  
(Warning lamp (orange) is lit and diagnosis code is displayed on first establishment of code generation condition.)

<Condition (2)>

- Common rail pressure remains at 190 MPa {27560 psi, 1937 kgf/cm<sup>2</sup>} or higher for 5 consecutive seconds.  
(Warning lamp (red) is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Common rail pressure control: closed loop control

**[Control effected by electronic control unit during fault]**

Electronic control unit varies in the way of control by the color of warning lamp.

<Warning lamp: Orange>

- Engine torque is limited.
- MPROP (rail pressure control valve) control is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Traction control is stopped <Automatic transmission>
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

<Warning lamp: Red>

- Engine torque is limited.
- MPROP (rail pressure control valve) control is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Auto cruise control stopped
- Traction control is stopped <Automatic transmission>
- Diesel particulate filter regeneration is stopped.

**[Probable cause of trouble]**

- Malfunction of supply pump (overflow valve)
- Malfunction of pressure limiting valve
- Airtight malfunction of injector
- Plugged fuel system
- Fuel leakage
- Malfunction of common rail pressure sensor

# TROUBLESHOOTING

## [Recoverability]

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Timing of warning lamp/diagnosis code OFF depends on condition.)

<Condition (1)>

- Lamp is extinguished and code is cleared at fourth diagnosis code display after recovery.

<Condition (2)>

- Lamp is extinguished and code is cleared simultaneously with recovery.

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|  |                      |     |  |
|--|----------------------|-----|--|
| Step 1   | Inspection items     |     | Inspection by control data   |
|  | Maintenance item     |     | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>P0093 "CRS (Fuel Leak)"</li> <li>P0148 "CRS (Fuel Delivery)"</li> <li>P0191 "CRS Pressure SNSR (Plausibility)"</li> <li>P0192 "CRS Pressure SNSR (Low)"</li> <li>P0193 "CRS Pressure SNSR (High)"</li> <li>P0201 "Injector M/V-Cylinder 1 (Load)"</li> <li>P0202 "Injector M/V-Cylinder 2 (Load)"</li> <li>P0203 "Injector M/V-Cylinder 3 (Load)"</li> <li>P0204 "Injector M/V-Cylinder 4 (Load)"</li> <li>P0261 "Injector #1-A (Low)"</li> <li>P0262 "Injector #1-A (High)"</li> <li>P0263 "Injector #1-A (Plausibility)"</li> <li>P0264 "Injector #2-A (Low)"</li> <li>P0265 "Injector #2-A (High)"</li> <li>P0266 "Injector #2-A (Plausibility)"</li> <li>P0267 "Injector #3-A (Low)"</li> <li>P0268 "Injector #3-A (High)"</li> <li>P0269 "Injector #3-A (Plausibility)"</li> <li>P0270 "Injector #4-A (Low)"</li> <li>P0271 "Injector #4-A (High)"</li> <li>P0272 "Injector #4-A (Plausibility)"</li> <li>P0562 "Power Supply Voltage (Low)"</li> <li>P0563 "Power Supply Voltage (High)"</li> <li>P0607 "ECU System"</li> <li>P060B "A/D Converter"</li> <li>P061B "ECU Performance (Calc)"</li> <li>P061C "ECU Performance (Ne)"</li> </ul> |
|  | Inspection condition |     | <ul style="list-style-type: none"> <li>Starter switch: ON</li> <li>Do not start engine.</li> </ul>   |
|  | Requirements         |     | No codes occur.  |
| Inspection result (Is the judging standard satisfied?) |                      | YES | Replacement of supply pump   |
|  |                      | NO  | Inspect diagnosis code that is occurring.  |



**[Fault code]**

Diagnosis code: P0089/Flash code: 63

**[Monitor]**

Failure of MPROP (rail pressure control valve)

**[Fault (outline)]**

Overload

**[Diagnosis check]**

- Engine electronic control unit internal function monitors MPROP (rail pressure control valve) circuit for overcurrent.

**[Code generation condition]**

- Overcurrent remains as detected by engine electronic control unit internal function for 3 seconds.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Engine torque is limited.
- MPROP (rail pressure control valve) control is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Traction control is stopped <Automatic transmission>
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

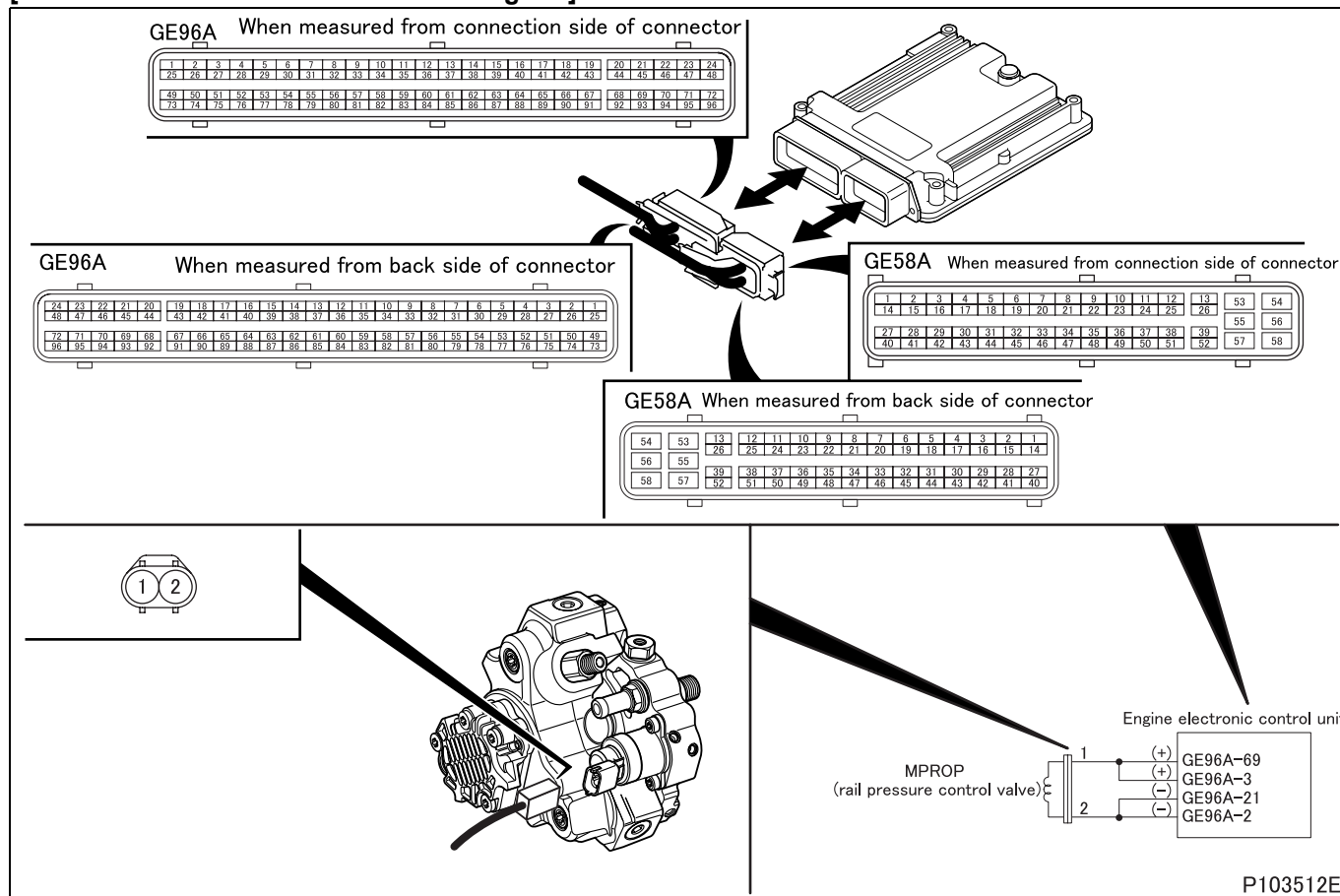
- Open-circuit or short-circuit of harness between electronic control unit and MPROP (rail pressure control valve)
- Malfunction of each connector
- Malfunction of MPROP (rail pressure control valve)
- Malfunction of electronic control unit

**[Recoverability]**

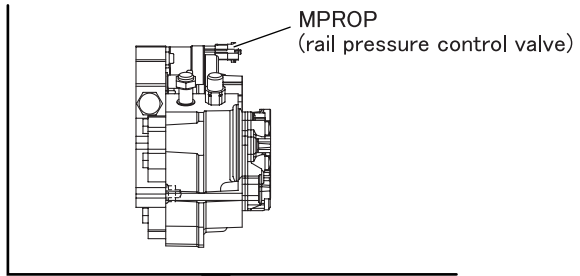
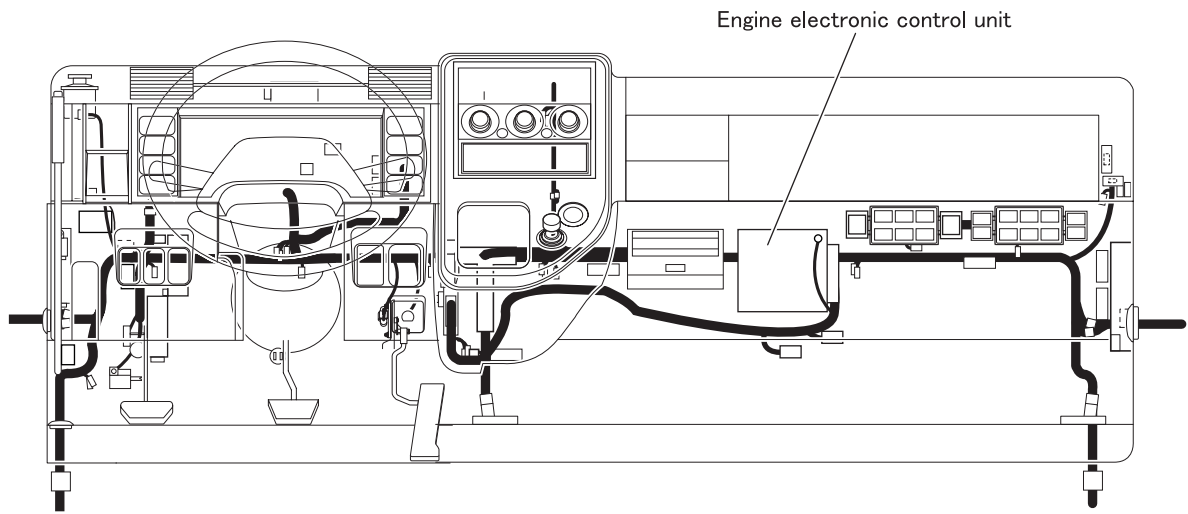
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

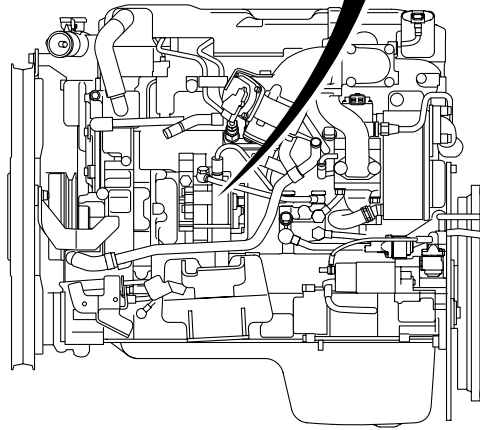
## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



Left side view of engine



P103638E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

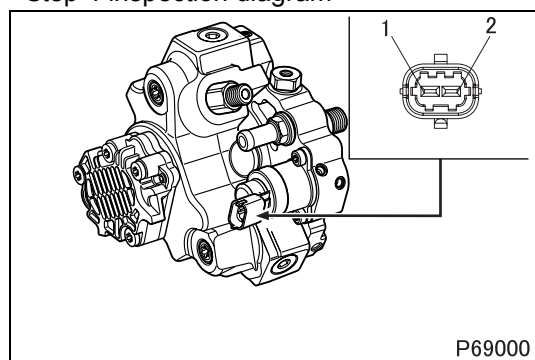
|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |  | Measure value of resistance between connector (GE96A) terminal No. 3 or No. 69 and No. 2 or No. 21.    |
|        | Inspection condition                                   |  | Disconnect electronic control unit and harness, and measure from connection side of harness connector. |
|        | Requirements   |  | 2.6 to 3.15 $\Omega$   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of MPROP (rail pressure control valve) connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of MPROP (rail pressure control valve) unit                                      |
|        | Maintenance item                                       |  | Check continuity across MPROP (rail pressure control valve) connector terminal No. 1 and 2. |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

<Step 4 inspection diagram>



|        |  |                 |  |
|--------|--|-----------------|--|
| Step 5 | Inspection items                                       |                 | Inspection of harness between electronic control unit and MPROP (rail pressure control valve) (power supply)   |
|        | Maintenance item                                       |                 | Check circuit between MPROP (rail pressure control valve) connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 3 or No. 69. |
|        | Inspection condition                                   |                 | –  |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness between electronic control unit and MPROP (rail pressure control valve) (ground)   |
|        | Maintenance item                                       |                 | Check circuit between MPROP (rail pressure control valve) connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 2 or No. 21. |
|        | Inspection condition                                   |                 | –  |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |  |   |
|--------|--|--|---|
| Step 7 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform actuator test item No. B2 “Fuel Leak Check” under the following conditions.   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Transmission: neutral</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul> |
|        | Requirements   |  | This diagnosis code is not displayed again.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0090/Flash code: 63

## **[Monitor]**

Failure of MPROP (rail pressure control valve)

## **[Fault (outline)]**

MPROP (rail pressure control valve) open – circuit

## **[Diagnosis check]**

- Engine electronic control unit internal function monitors MPROP (rail pressure control valve) for open-circuit.

## **[Code generation condition]**

- Open-circuit remains as detected by engine electronic control unit internal function for 0.3 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

–

## **[Control effected by electronic control unit during fault]**

- Engine torque is limited.
- MPROP (rail pressure control valve) control is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Traction control is stopped <Automatic transmission>
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

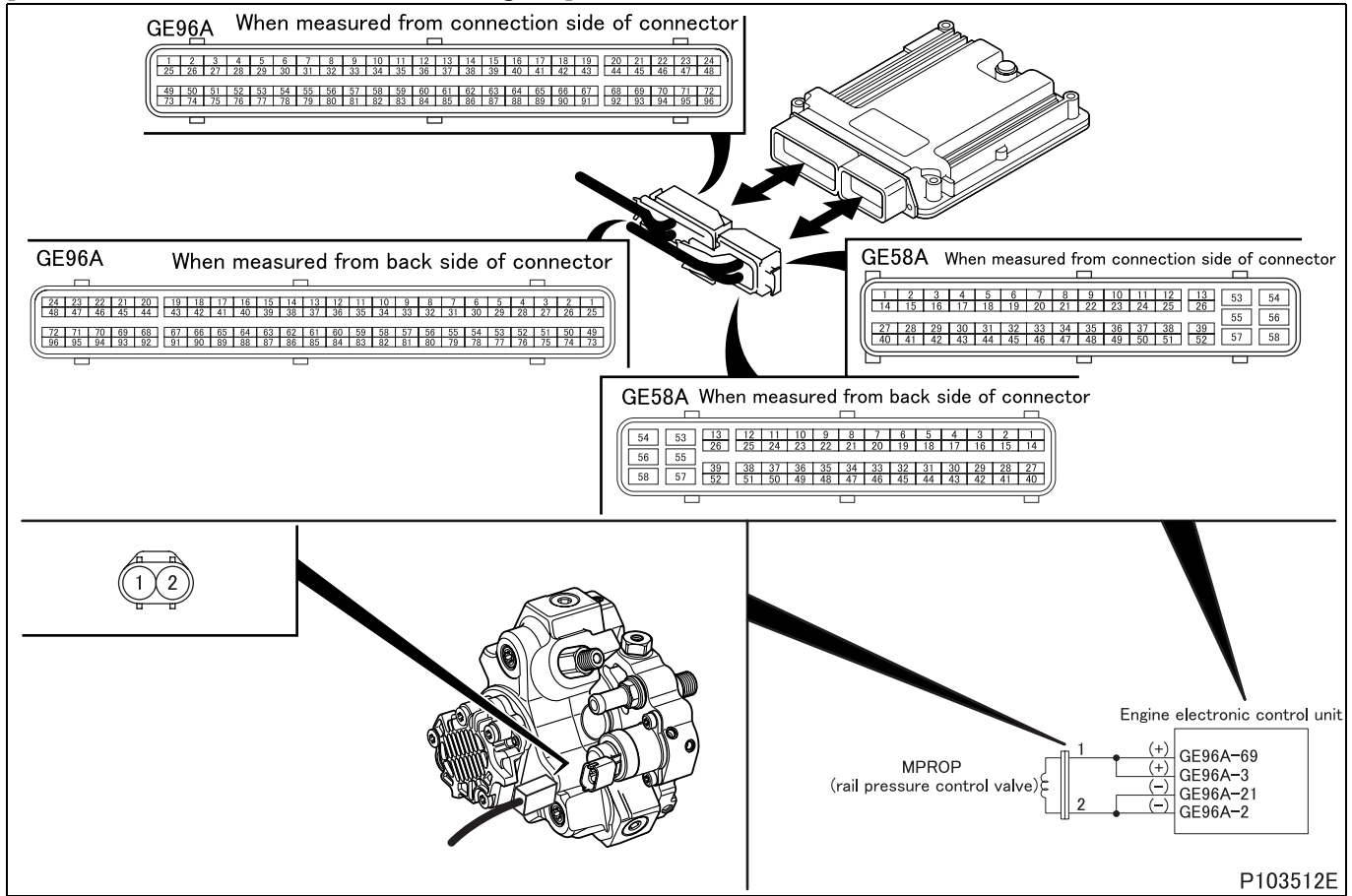
## **[Probable cause of trouble]**

- Open-circuit of harness between electronic control unit and MPROP (rail pressure control valve)
- Malfunction of each connector
- Malfunction of MPROP (rail pressure control valve)
- Malfunction of electronic control unit

## **[Recoverability]**

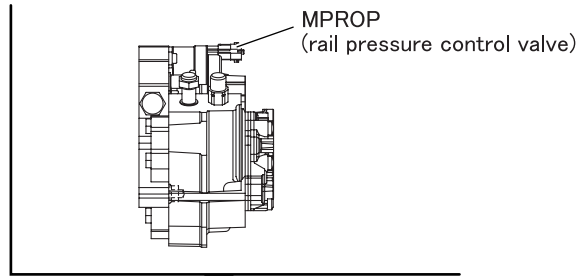
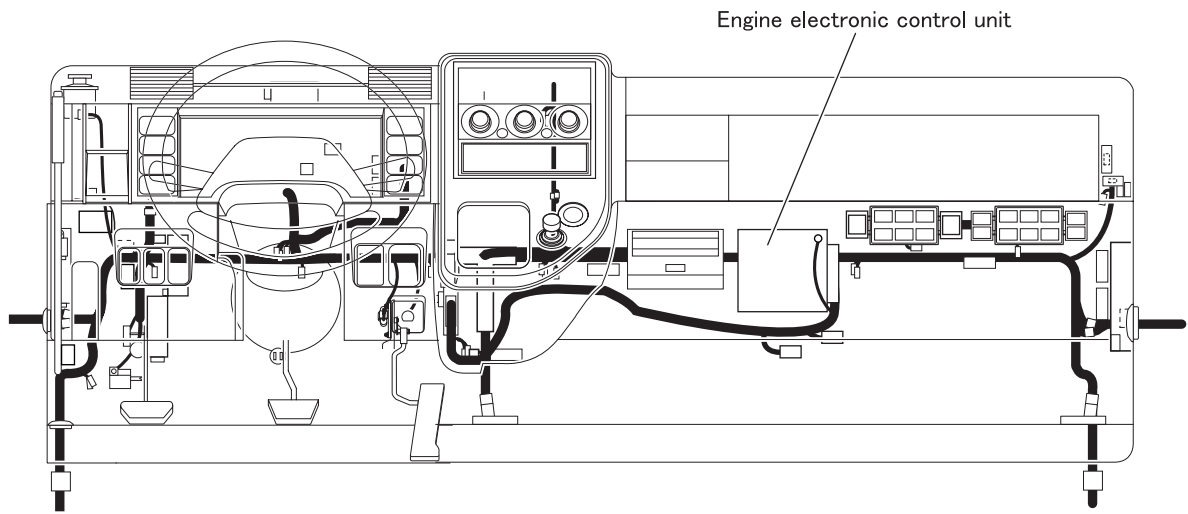
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]

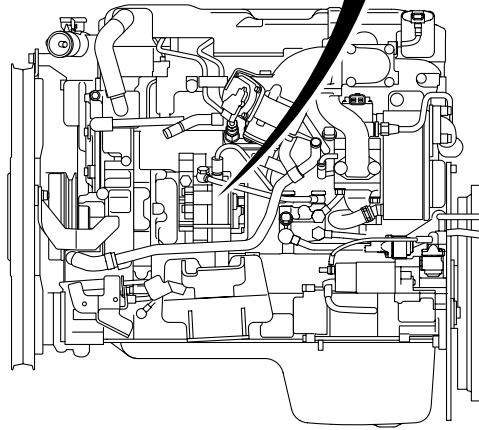


# TROUBLESHOOTING

## [Parts Identification and Location]



Left side view of engine



P103638E



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 3 or No. 69 and No. 2 or No. 21.    |
|        | Inspection condition                                   |               | Disconnect electronic control unit and harness, and measure from connection side of harness connector. |
|        | Requirements   |               | 2.6 to 3.15 Ω  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of MPROP (rail pressure control valve) connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of supply pump  |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0091/Flash code: 63

## **[Monitor]**

Failure of MPROP (rail pressure control valve)

## **[Fault (outline)]**

MPROP (rail pressure control valve) short circuit

## **[Diagnosis check]**

- Engine electronic control unit internal function monitors MPROP (rail pressure control valve) for short-circuit to ground.

## **[Code generation condition]**

- MPROP circuit remains shorted to ground as detected by engine electronic control unit internal function for 0.3 second. (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Engine torque is limited.
- MPROP (rail pressure control valve) control is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Traction control is stopped <Automatic transmission>
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

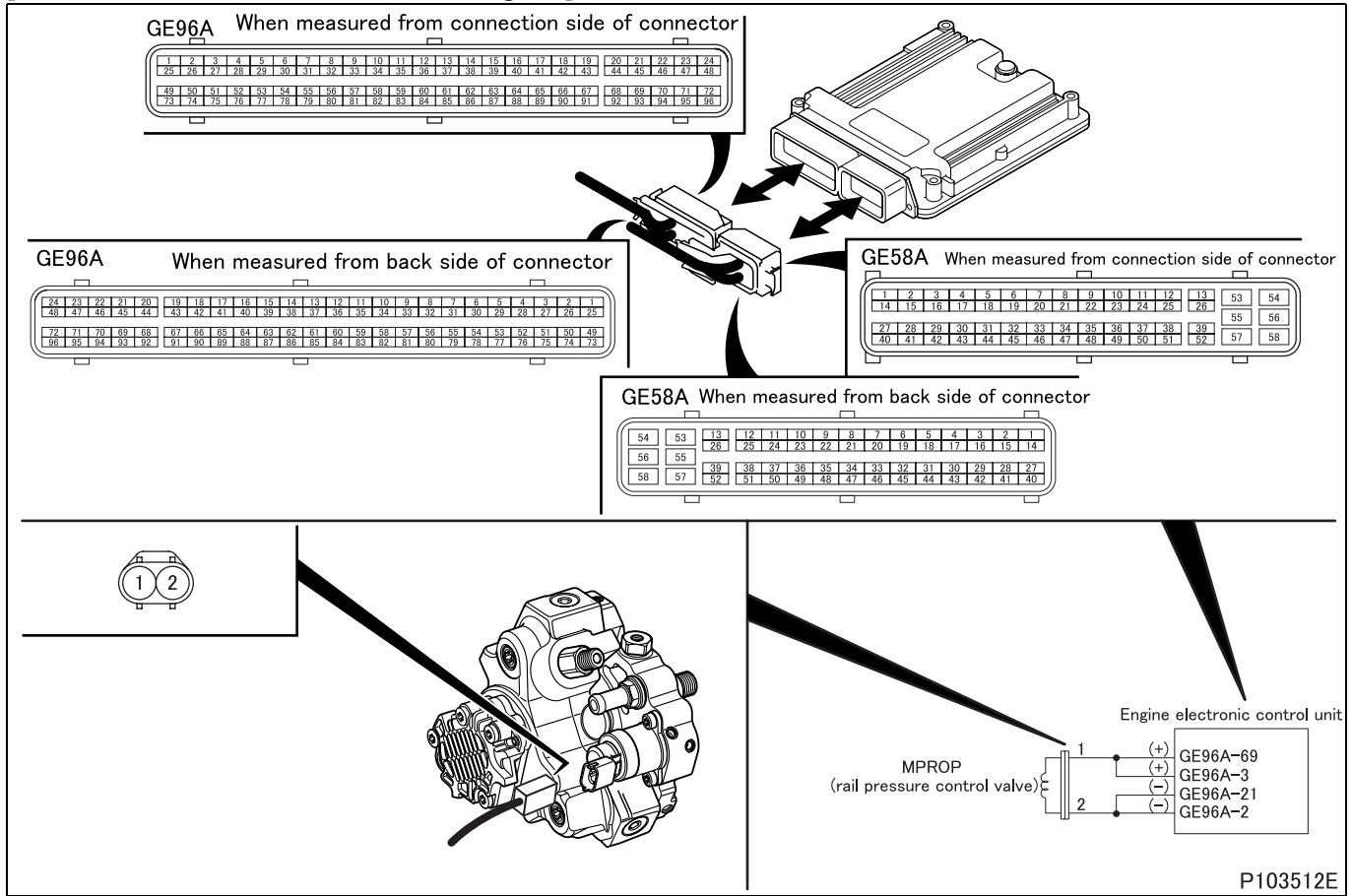
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and MPROP (rail pressure control valve)
- Malfunction of each connector
- Malfunction of MPROP (rail pressure control valve)
- Malfunction of electronic control unit

## **[Recoverability]**

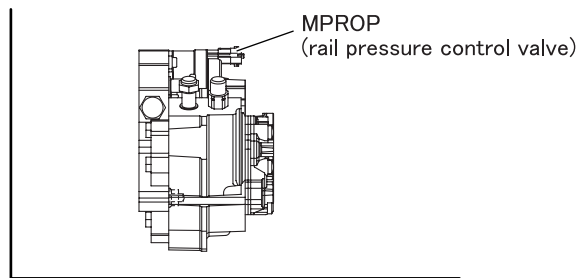
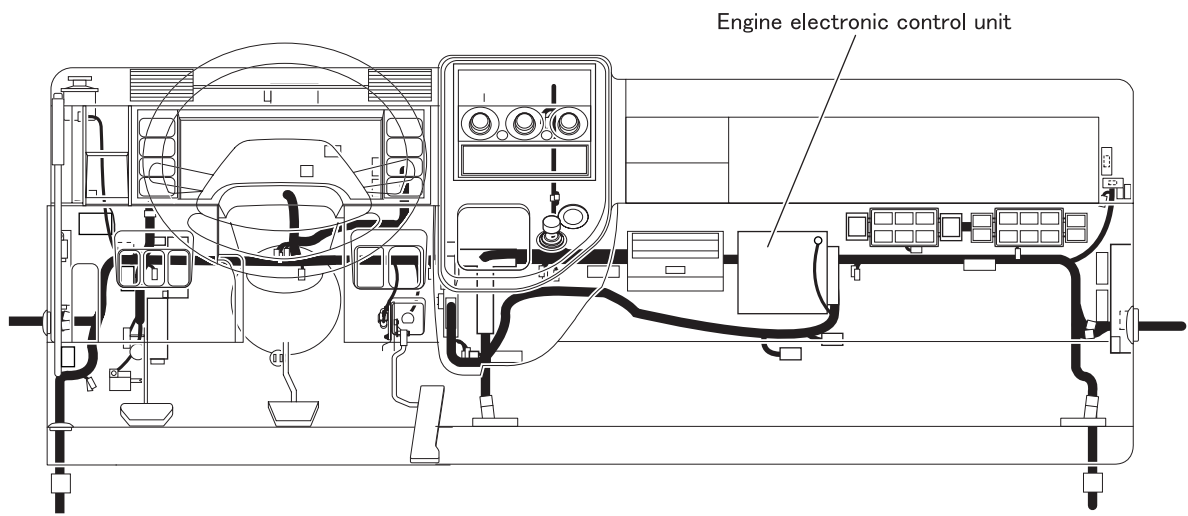
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]

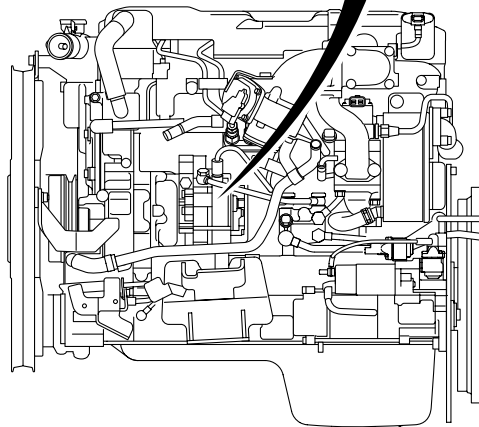


# TROUBLESHOOTING

## [Parts Identification and Location]



Left side view of engine



P103638E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |  |                                    |
|--------|--|--|------------------------------------|
| Step 1 | Inspection items                                       | Inspection by electronic control unit connector  |                                    |
|        | Maintenance item                                       | Measure value of resistance between connector (GE96A) terminal No. 3 or No. 69 and No. 2 or No. 21.    |                                    |
|        | Inspection condition                                   | Disconnect electronic control unit and harness, and measure from connection side of harness connector. |                                    |
|        | Requirements   | 2.6 to 3.15 Ω  |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to transient fault (See Gr00.). |
| NO     |  | Go to step 2.  |                                    |

|        |  |   |               |
|--------|--|---|---------------|
| Step 2 | Inspection items                                       | Inspection of electronic control unit connector   |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 3. |
| NO     |  | Modify connector.   |               |

|        |  |   |                            |
|--------|--|---|----------------------------|
| Step 3 | Inspection items                                       | Inspection of MPROP (rail pressure control valve) connector   |                            |
|        | Maintenance item                                       | Inspection of connector   |                            |
|        | Inspection condition                                   | -   |                            |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                            |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Replacement of supply pump |
| NO     |  | Modify connector.   |                            |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0092/Flash code: 63

## **[Monitor]**

Failure of MPROP (rail pressure control valve)

## **[Fault (outline)]**

MPROP (rail pressure control valve) short circuit

## **[Diagnosis check]**

- Engine electronic control unit internal function monitors MPROP (rail pressure control valve) for short-circuit to power supply.

## **[Code generation condition]**

- MPROP circuit remains shorted to power supply as detected by engine electronic control unit internal function for 0.3 second.

(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Engine torque is limited.
- MPROP (rail pressure control valve) control is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Traction control is stopped <Automatic transmission>
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

## **[Probable cause of trouble]**

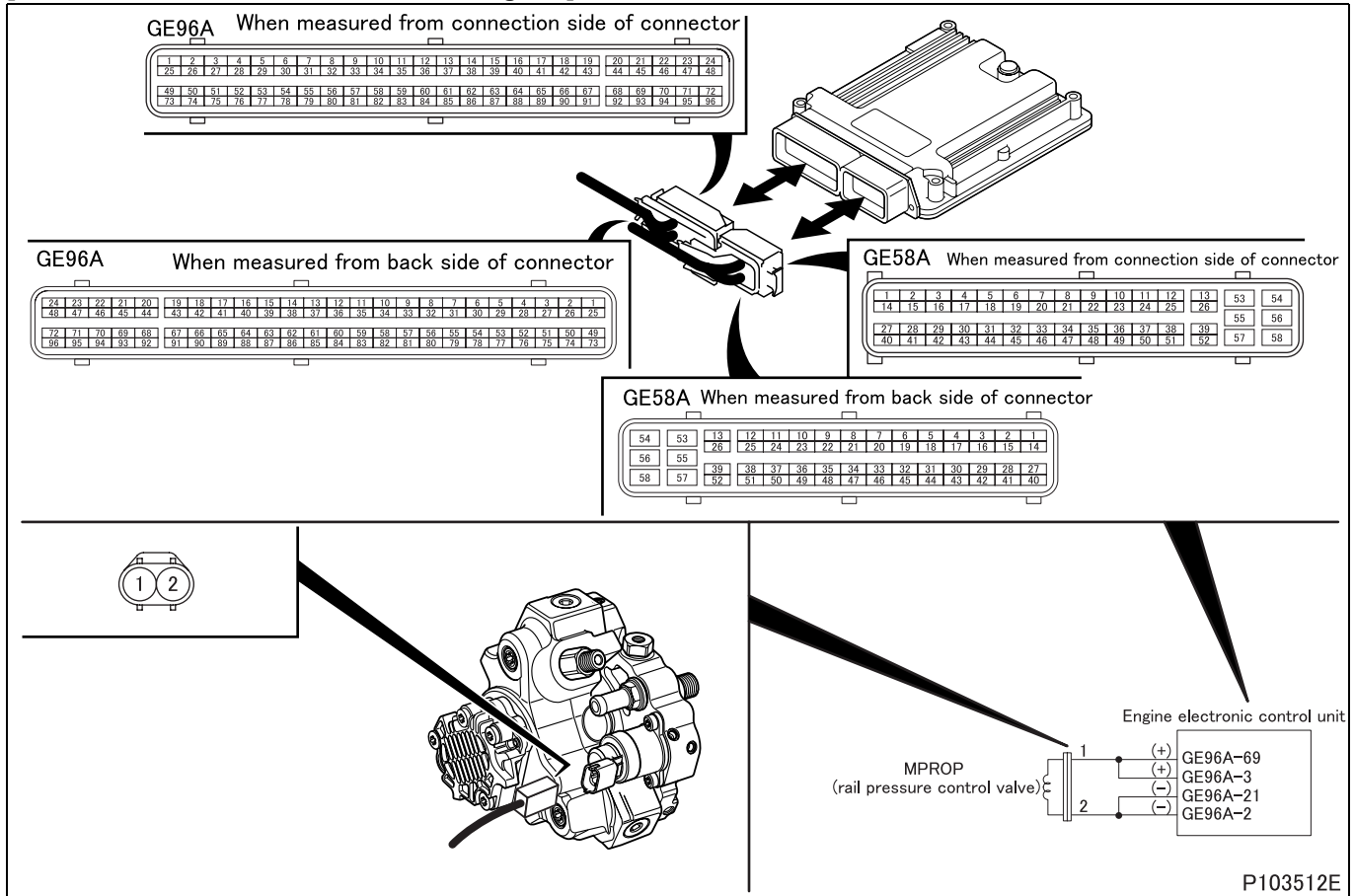
- Open-circuit or short-circuit of harness between electronic control unit and MPROP (rail pressure control valve)
- Malfunction of each connector
- Malfunction of MPROP (rail pressure control valve)
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

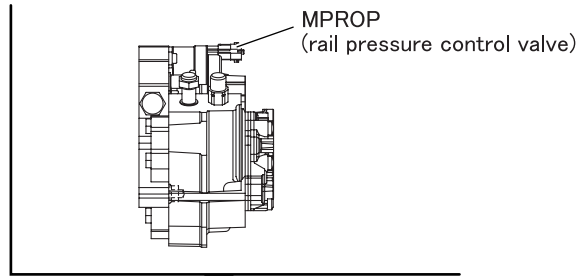
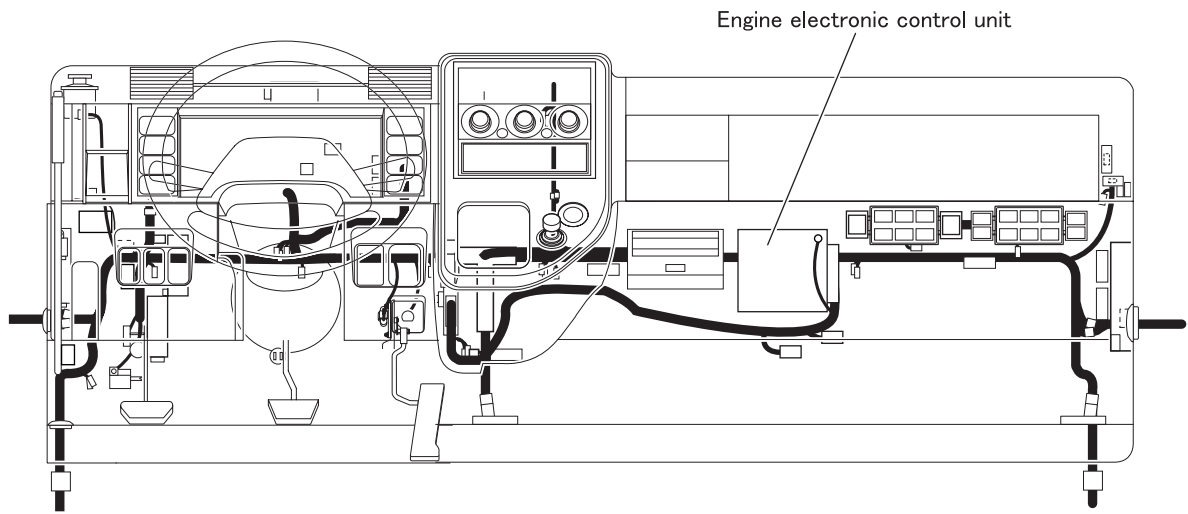
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]

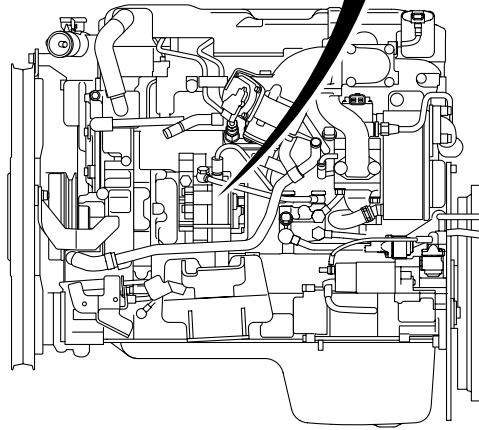


# TROUBLESHOOTING

## [Parts Identification and Location]



Left side view of engine



P103638E



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 3 or No. 69 and No. 2 or No. 21.    |
|        | Inspection condition                                   |               | Disconnect electronic control unit and harness, and measure from connection side of harness connector. |
|        | Requirements   |               | 2.6 to 3.15 Ω  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of MPROP (rail pressure control valve) connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of supply pump  |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0093/Flash code: 22

## **[Monitor]**

Abnormality of common rail pressure (fuel leakage)

## **[Fault (outline)]**

Fuel leakage

## **[Diagnosis check]**

- Common rail pressure is monitored during at-fault control (diagnosis code P0087).

## **[Code generation condition]**

- Actual common rail pressure remains 300 bar apart from target common rail pressure for 60 seconds in spite of full supply pump output.

(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Engine stopped

## **[Probable cause of trouble]**

- Malfunction of supply pump
- Malfunction of pressure limiter
- Airtight malfunction of injector
- Plugged fuel system
- Fuel leakage
- Malfunction of common rail pressure sensor

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(At the same time as recovery, warning lamp is extinguished and diagnosis code is cleared.)

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |   |   |
|--------|--|---|---|
| Step 1 | Inspection items                                       |   | Inspection by control data  |
|        | Maintenance item                                       |   | <p>Check if following diagnosis codes occur simultaneously.</p> <ul style="list-style-type: none"> <li>• P0093 "CRS (Fuel Leak)"</li> <li>• P0148 "CRS (Fuel Delivery)"</li> <li>• P0191 "CRS Pressure SNSR (Plausibility)"</li> <li>• P0192 "CRS Pressure SNSR (Low)"</li> <li>• P0193 "CRS Pressure SNSR (High)"</li> <li>• P0201 "Injector M/V-Cylinder 1 (Load)"</li> <li>• P0202 "Injector M/V-Cylinder 2 (Load)"</li> <li>• P0203 "Injector M/V-Cylinder 3 (Load)"</li> <li>• P0204 "Injector M/V-Cylinder 4 (Load)"</li> <li>• P0261 "Injector #1-A (Low)"</li> <li>• P0262 "Injector #1-A (High)"</li> <li>• P0263 "Injector #1-A (Plausibility)"</li> <li>• P0264 "Injector #2-A (Low)"</li> <li>• P0265 "Injector #2-A (High)"</li> <li>• P0266 "Injector #2-A (Plausibility)"</li> <li>• P0267 "Injector #3-A (Low)"</li> <li>• P0268 "Injector #3-A (High)"</li> <li>• P0269 "Injector #3-A (Plausibility)"</li> <li>• P0270 "Injector #4-A (Low)"</li> <li>• P0271 "Injector #4-A (High)"</li> <li>• P0272 "Injector #4-A (Plausibility)"</li> <li>• P0562 "Power Supply Voltage (Low)"</li> <li>• P0563 "Power Supply Voltage (High)"</li> <li>• P0607 "ECU System"</li> <li>• P060B "A/D Converter"</li> <li>• P061B "ECU Performance (Calc)"</li> <li>• P061C "ECU Performance (Ne)"</li> </ul> |
|        | Inspection condition                                   |   | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Do not start engine.</li> </ul>  |
|        | Requirements   |   | No codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 2.   |
|        | NO   | Inspect diagnosis code that is occurring. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Checking of engine appearance              |
|        | Maintenance item                                       |               | Check fuel system for fuel leak.           |
|        | Inspection condition                                   |               | Starter switch: OFF                        |
|        | Requirements   |               | There is fuel leak.                        |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Correct and replace wet or abnormal parts. |
|        | NO   | Go to step 3. |  |

|        |  |   |   |
|--------|--|---|---|
| Step 3 | Inspection items                                       |   | Inspection of low pressure piping (fuel tank – supply pump) |
|        | Maintenance item                                       |   | Check suction pipe or hose for bend.                        |
|        | Inspection condition                                   |   | Starter switch: OFF   |
|        | Requirements   |   | There is no bend on pipe or hose.                           |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 4.   |
|        | NO   | Correct and replace suction pipe or hose. |   |

|        |  |               |                                    |
|--------|--|---------------|------------------------------------|
| Step 4 | Inspection items                                       |               | Checking of air bleeding           |
|        | Maintenance item                                       |               | Bleed air from fuel filter.        |
|        | Inspection condition                                   |               | Starter switch: OFF                |
|        | Requirements   |               | Problem is solved by bleeding air. |
|        | Inspection result (Is the judging standard satisfied?) | YES           | –                                  |
|        | NO   | Go to step 5. |                                    |

# TROUBLESHOOTING

|        |  |               |   |
|--------|--|---------------|---|
| Step 5 | Inspection items                                       |               | Inspection of low pressure piping           |
|        | Maintenance item                                       |               | Fuel filter                                 |
|        | Inspection condition                                   |               | Starter switch: OFF                         |
|        | Requirements   |               | Problem is solved by replacing fuel filter. |
|        | Inspection result (Is the judging standard satisfied?) | YES           | –   |
| NO     |  | Go to step 6. |   |

|        |  |  |  |
|--------|--|--|--|
| Step 6 | Inspection items                                       |  | Check inside of combustion chamber.  |
|        | Maintenance item                                       |  | Check for fuel leak.   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• After performing actuator test item No. B2 “Fuel Leak Check”, stop engine.</li> <li>• Remove glow plug, and check from glow plug mounting hole using bore scope.</li> </ul> |
|        | Requirements   |  | Inside of combustion chamber is not wet.   |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Replacement of supply pump   |
| NO     |  | Replacement of injector of object cylinder |  |

**[Fault code]**

Diagnosis code: P0097/Flash code: 9

**[Monitor]**

Failure of boost air temperature sensor

**[Fault (outline)]**

Low signal range check

**[Diagnosis check]**

- Boost air temperature sensor output voltage is monitored.

**[Code generation condition]**

- Output voltage of boost air temperature sensor remains below 0.2 V for 1 second. (sensor temperature: 146°C {295°F} or higher)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation gas temperature is fixed at backup value.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Related fault check is stopped.

**[Probable cause of trouble]**

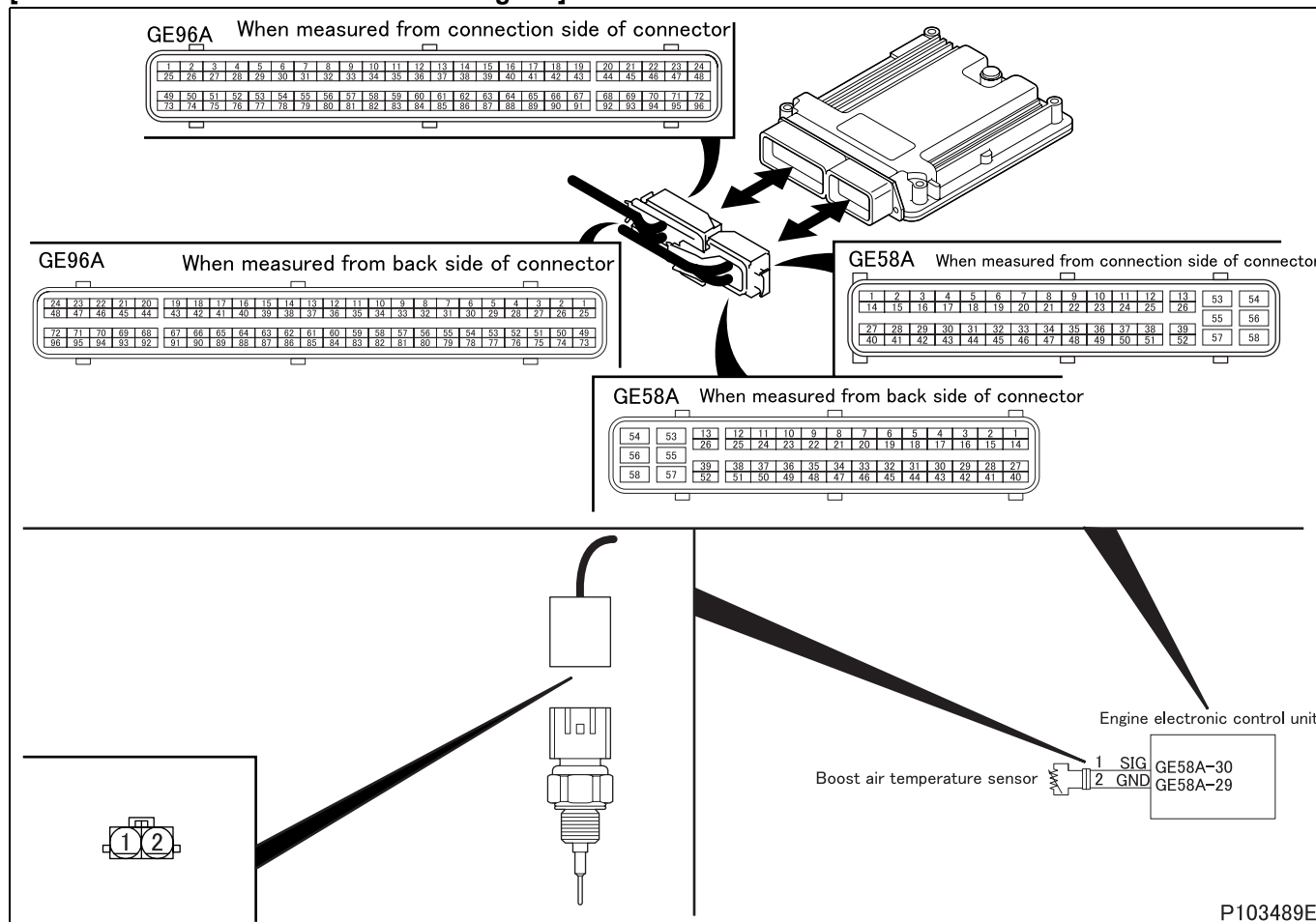
- Open-circuit or short-circuit of harness between electronic control unit and boost air temperature sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

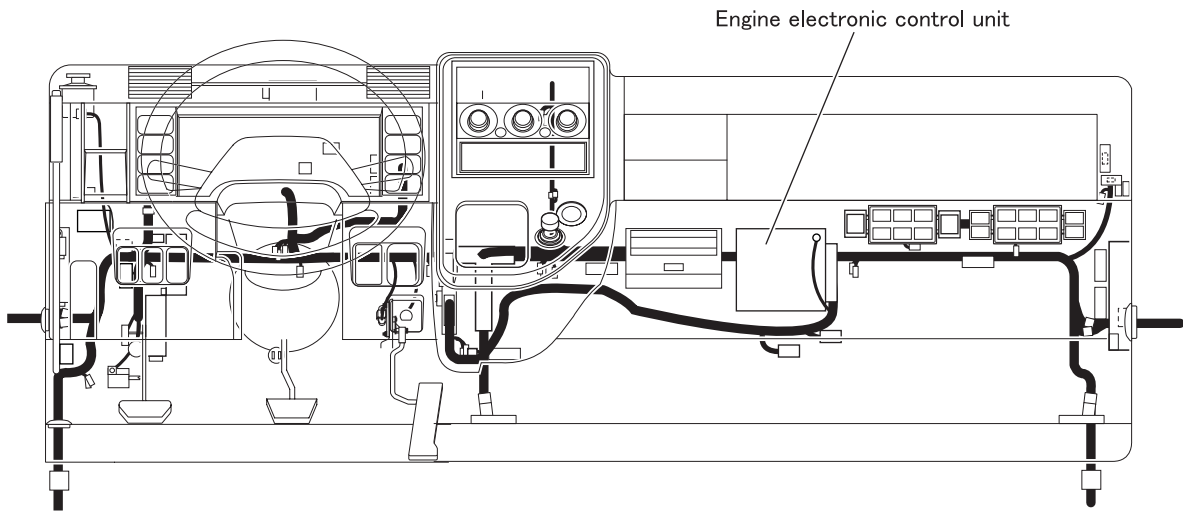
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

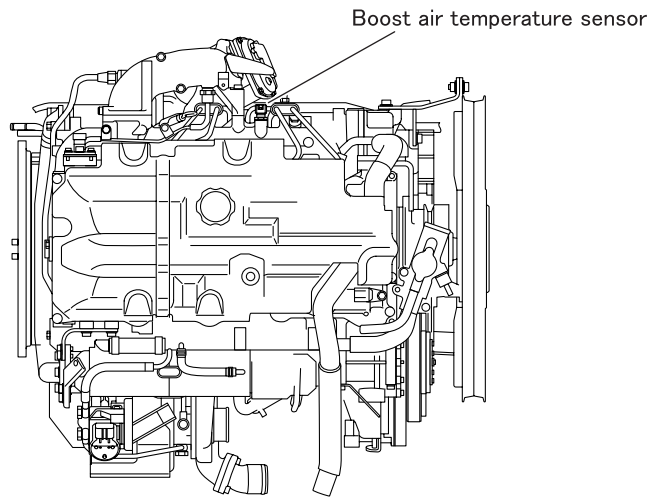
## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



Upper view of engine



P103617E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item "Intake Air Temperature".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item No. 10 "Intake Air Temperature (EGR)" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | –   |
|        | Requirements   |               | When engine is cold: Temperature is equivalent to outside temperature.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE58A) terminal No. 29 and 30.   |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>0°C {32°F}: 162.3 <math>\begin{matrix} +48.8 \\ -36.5 \end{matrix}</math> kΩ</li> <li>20°C {68°F}: 61.47 <math>\begin{matrix} +15.99 \\ -12.35 \end{matrix}</math> kΩ</li> <li>80°C {176°F}: 6.120 <math>\begin{matrix} +1.095 \\ -0.907 \end{matrix}</math> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

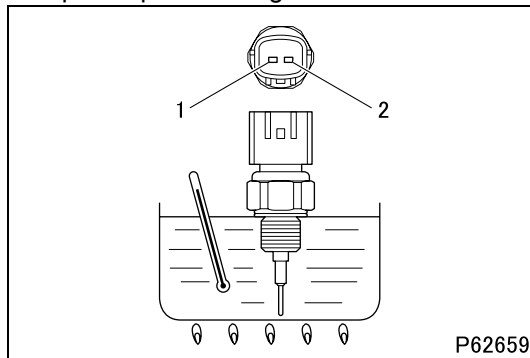
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of boost air temperature sensor connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |



|        |  |                       |   |
|--------|--|-----------------------|---|
| Step 5 | Inspection items                                       |                       | Inspection of boost air temperature sensor unit   |
|        | Maintenance item                                       |                       | Measure value of resistance between connector terminal No. 1 and 2.   |
|        | Inspection condition                                   |                       | <ul style="list-style-type: none"> <li>Put boost air temperature sensor in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |
|        | Requirements   |                       | <ul style="list-style-type: none"> <li>0°C {32°F}: 162.3 <math>\begin{smallmatrix} +48.8 \\ -36.5 \end{smallmatrix}</math> kΩ</li> <li>20°C {68°F}: 61.47 <math>\begin{smallmatrix} +15.99 \\ -12.35 \end{smallmatrix}</math> kΩ</li> <li>80°C {176°F}: 6.120 <math>\begin{smallmatrix} +1.095 \\ -0.907 \end{smallmatrix}</math> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                   | Go to step 6.   |
| NO     |  | Replacement of sensor |   |

<Step 5 inspection diagram>



|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE58A) terminal No. 30. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE58A) terminal No. 29. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | <p>&lt;General Scanning Tool used&gt;</p> <ul style="list-style-type: none"> <li>Measure item "Intake Air Temperature".</li> </ul> <p>&lt;Multi-Use Tester used&gt;</p> <ul style="list-style-type: none"> <li>Measure item No. 10 "Intake Air Temperature (EGR)" of Service Data.</li> </ul> |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | When engine is cold: Temperature is equivalent to outside temperature.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0098/Flash code: 9

## **[Monitor]**

Failure of boost air temperature sensor

## **[Fault (outline)]**

High signal range check

## **[Diagnosis check]**

- Boost air temperature sensor output voltage is monitored.

## **[Code generation condition]**

- Output voltage of boost air temperature sensor remains over 4.9 V for 1 second. (sensor temperature:  $-37^{\circ}\text{C}$  { $-34.6^{\circ}\text{F}$ } or lower)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation gas temperature is fixed at backup value.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

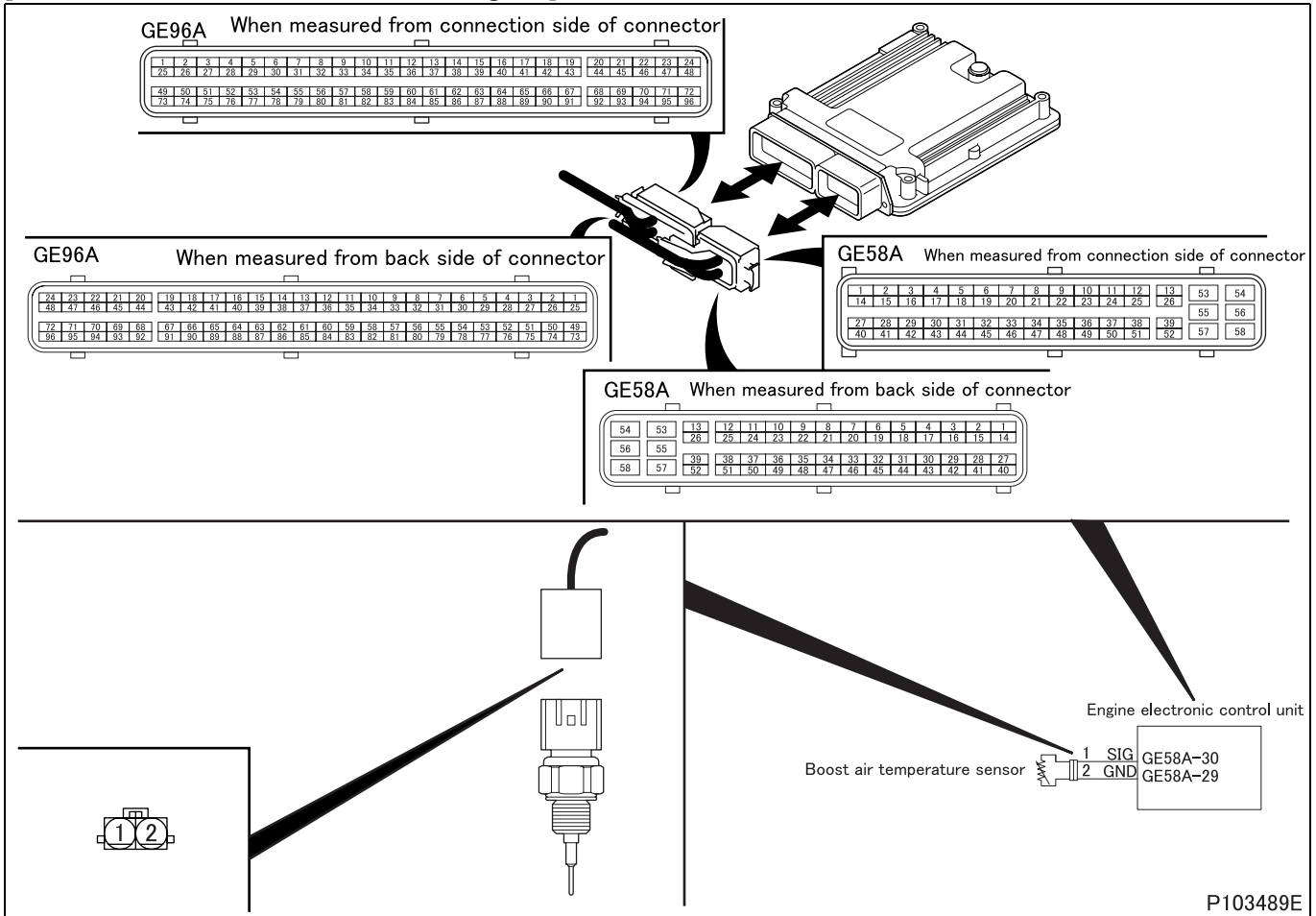
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and boost air temperature sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

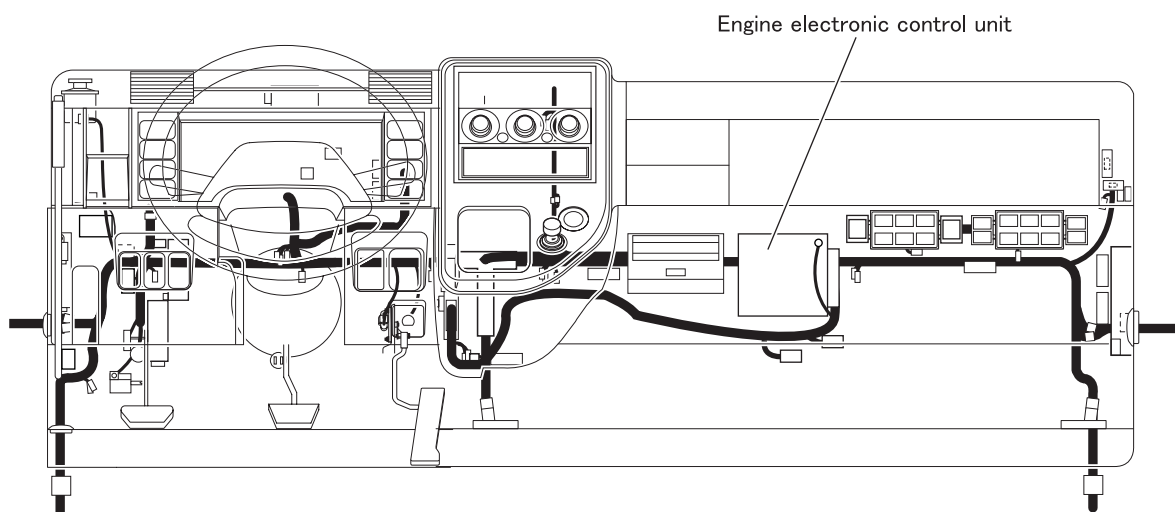
[Electronic Control Unit Connection Diagram]



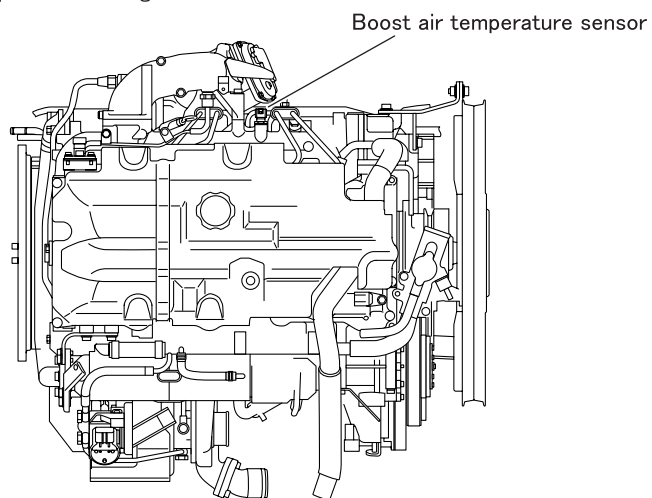
P103489E

# TROUBLESHOOTING

## [Parts Identification and Location]



Upper view of engine



P103617E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Intake Air Temperature".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 10 "Intake Air Temperature (EGR)" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | –   |
|        | Requirements   |               | When engine is cold: Temperature is equivalent to outside temperature.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE58A) terminal No. 29 and 30.   |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• 0°C {32°F}: 162.3 <sup>+48.8</sup>/<sub>-36.5</sub> kΩ</li> <li>• 20°C {68°F}: 61.47 <sup>+15.99</sup>/<sub>-12.35</sub> kΩ</li> <li>• 80°C {176°F}: 6.120 <sup>+1.095</sup>/<sub>-0.907</sub> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

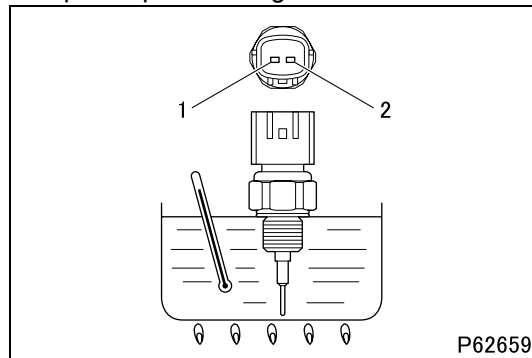
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of boost air temperature sensor connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

|        |  |                       |   |
|--------|--|-----------------------|---|
| Step 5 | Inspection items                                       |                       | Inspection of boost air temperature sensor unit   |
|        | Maintenance item                                       |                       | Measure value of resistance between connector terminal No. 1 and 2.   |
|        | Inspection condition                                   |                       | <ul style="list-style-type: none"> <li>Put boost air temperature sensor in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |
|        | Requirements   |                       | <ul style="list-style-type: none"> <li>0°C {32°F}: 162.3 <math>\begin{smallmatrix} +48.8 \\ -36.5 \end{smallmatrix}</math> kΩ</li> <li>20°C {68°F}: 61.47 <math>\begin{smallmatrix} +15.99 \\ -12.35 \end{smallmatrix}</math> kΩ</li> <li>80°C {176°F}: 6.120 <math>\begin{smallmatrix} +1.095 \\ -0.907 \end{smallmatrix}</math> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                   | Go to step 6.   |
| NO     |  | Replacement of sensor |   |

<Step 5 inspection diagram>



|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE58A) terminal No. 30. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE58A) terminal No. 29. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | <p>&lt;General Scanning Tool used&gt;</p> <ul style="list-style-type: none"> <li>Measure item "Intake Air Temperature".</li> </ul> <p>&lt;Multi-Use Tester used&gt;</p> <ul style="list-style-type: none"> <li>Measure item No. 10 "Intake Air Temperature (EGR)" of Service Data.</li> </ul> |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | When engine is cold: Temperature is equivalent to outside temperature.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

**[Fault code]**

Diagnosis code: P0101/Flash code: 17

**[Monitor]**

Characteristic abnormality in air flow sensor

**[Fault (outline)]**

Gain and offset drift

**[Diagnosis check]**

- Intake air flow rate is detected as actual intake air flow rate by air flow sensor and monitored for ratio to target air flow rate for control by engine electronic control unit.

**[Code generation condition]**

- Difference shows intake air flow rate remains considerably high (1.5 or more) or low (0.6 or less) for 5 seconds. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

<When difference in intake air flow rate is abnormally high>

- Engine operating mode: normal (engine in operation)
- Engine speed: 1000 to 3000 rpm
- Fuel injection quantity: less than 100 mg/cyc
- Atmospheric pressure: above 828 mbar {12 psi}
- Boost pressure: less than 2500 mbar {36.25 psi}
- Intake throttle valve opening: 15° to 95°
- Water temperature: 64 to 110°C {147 to 230°F}
- Diesel particulate filter regeneration control: not effected
- Time till above conditions were met: more than 2 seconds
- Air flow sensor: normal in output signal
- Exhaust gas recirculation valve: in order
- Intake throttle: in order
- Turbocharger actuator: in order
- Controller area network communication of each electronic drive unit (exhaust gas recirculation, intake throttle and turbocharger): in order
- Exhaust gas recirculation flow rate and exhaust gas recirculation valve operation: in order
- Atmospheric pressure sensor: in order
- Boost pressure sensor: in order
- Water temperature sensor: in order
- Intake air temperature sensor: in order
- Boost air temperature sensor: in order
- Exhaust gas recirculation cooler: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- Injector: in order
- MPROP (rail pressure control valve): in order
- Fuel feed when engine is idling: in order
- Exhaust shutter 3-way magnetic valve: in order

# TROUBLESHOOTING

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<When difference in intake air flow rate is abnormally low>

- Engine operating mode: normal (engine in operation)
- Engine speed: 1000 to 3000 rpm
- Fuel injection quantity: more than 12 mg/cyc
- Atmospheric pressure: above 828 mbar {12 psi}
- Boost pressure: less than 2500 mbar {36.25 psi}
- Intake throttle valve opening: more than 15°
- Exhaust gas recirculation  $\lambda$  value: 1.2 to 14
- Water temperature: 64 to 110°C {147 to 230°F}
- Diesel particulate filter regeneration control: not effected
- Time till above conditions were met: more than 2 seconds
- Air flow sensor: normal in output signal
- Exhaust gas recirculation valve: in order
- Intake throttle: in order
- Turbocharger actuator: in order
- Controller area network communication of each electronic drive unit (exhaust gas recirculation, intake throttle and turbocharger): in order
- Exhaust gas recirculation flow rate and exhaust gas recirculation valve operation: in order
- Atmospheric pressure sensor: in order
- Boost pressure sensor: in order
- Water temperature sensor: in order
- Intake air temperature sensor: in order
- Boost air temperature sensor: in order
- Exhaust gas recirculation cooler: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- Injector: in order
- MPROP (rail pressure control valve): in order
- Fuel feed when engine is idling: in order
- Exhaust shutter 3-way magnetic valve: in order

## **[Control effected by electronic control unit during fault]**

- Intake air flow rate is fixed at backup value.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

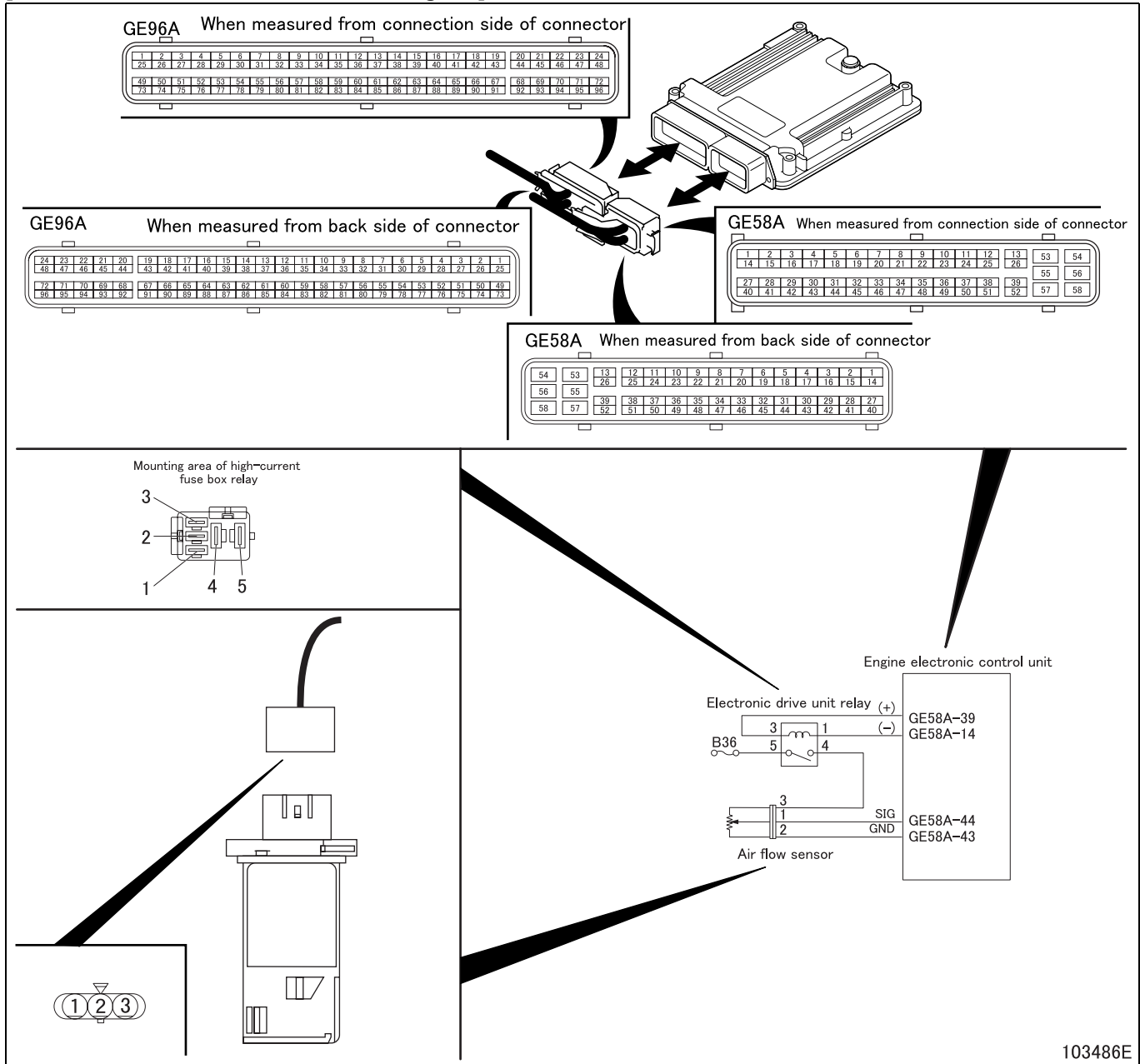
## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



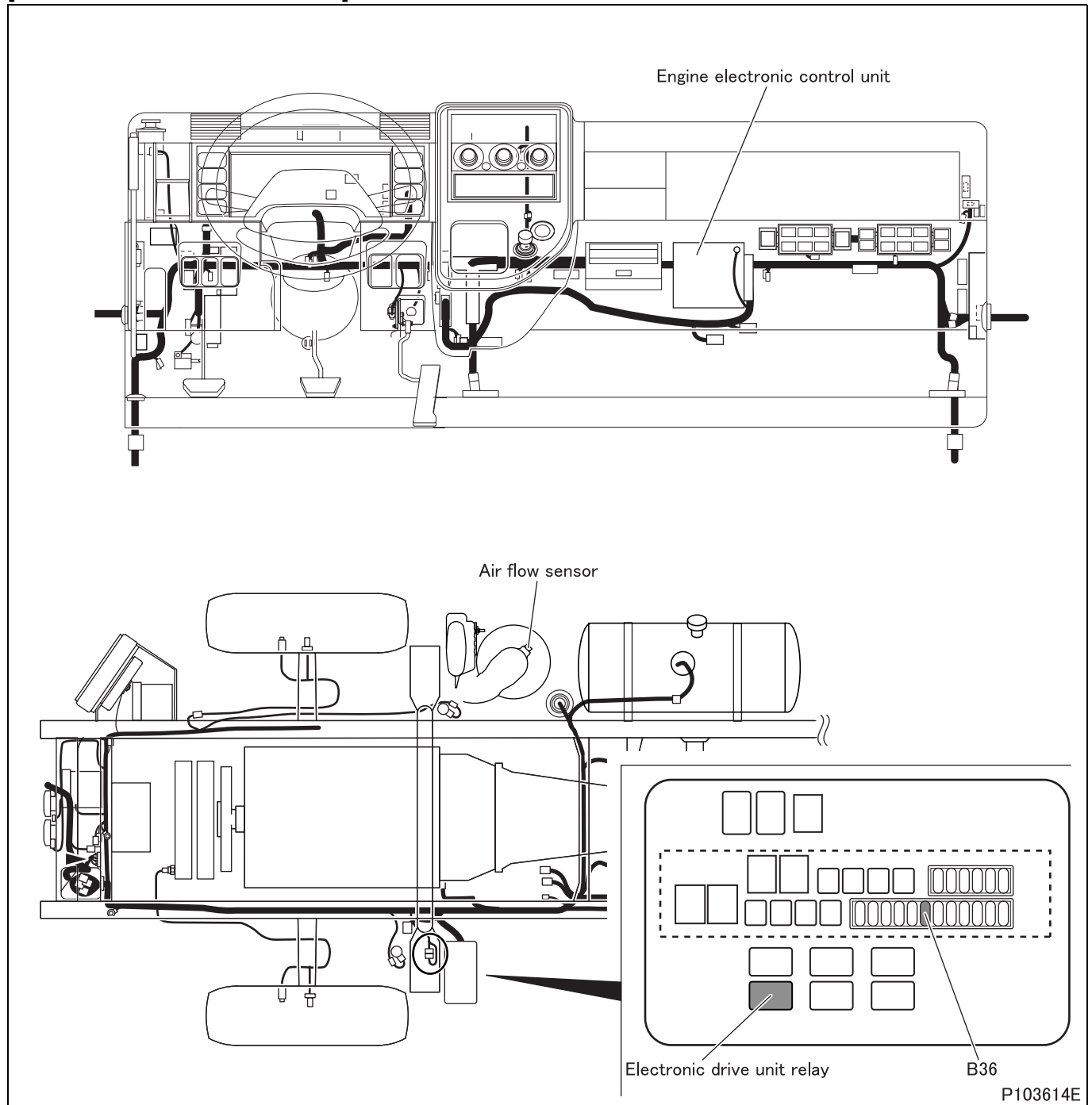
[Electronic Control Unit Connection Diagram]



103486E

# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Measure item No. 60 "Air mass flow" of Service Data.  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Perform actuator test item No. AF "EDU Relay"</li> <li>• Gradually press accelerator pedal.</li> </ul> |
|        | Requirements   |               | The numeric value should gradually increase.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of sensor connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 3 | Inspection items                                       |               | Inspection by sensor connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector terminal No. 3 (+) and 2 (–).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Perform actuator test item No. AF "EDU Relay"</li> </ul> |
|        | Requirements   |               | 12 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 6.  |
| NO     |  | Go to step 4. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 4 | Inspection items                                       |                 | Inspection of harness between electronic drive unit relay and sensor (power supply)                             |
|        | Maintenance item                                       |                 | Check circuit between electronic drive unit relay connector terminal No. 4 and sensor connector terminal No. 3. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                      |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 5.   |
| NO     |  | Modify harness. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 5 | Inspection items                                       |                 | Inspection of harness between sensor and electronic control unit (ground)  |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE58A) terminal No. 43. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.  |
| NO     |  | Modify harness. |  |

# TROUBLESHOOTING

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness between sensor and electronic control unit (signal)  |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE58A) terminal No. 44. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |                       |   |
|--------|--|-----------------------|---|
| Step 7 | Inspection items                                       |                       | Inspection of sensor unit   |
|        | Maintenance item                                       |                       | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among "Service data".</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: "Ne" (rpm)</li> <li>• Intake air flow rate: "Air Flow Rate from MAFS" (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 "Engine Revolution" (rpm)</li> <li>• Intake air flow rate: 60 "Air mass flow" (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of "Service data".</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |
|        | Inspection condition                                   |                       | –   |
|        | Requirements   |                       | 10% or less   |
|        | Inspection result (Is the judging standard satisfied?) | YES                   | Go to step 8.   |
| NO     |  | Replacement of sensor |   |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Measure item No. 60 "Air mass flow" of Service Data.  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Perform actuator test item No. AF "EDU Relay"</li> <li>• Gradually press accelerator pedal.</li> </ul> |
|        | Requirements   |  | The numeric value should gradually increase.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

**[Fault code]**

Diagnosis code: P0102/Flash code: 17

**[Monitor]**

Failure of air flow sensor

**[Fault (outline)]**

Low signal range check

**[Diagnosis check]**

- Air flow sensor output voltage is monitored.

**[Code generation condition]**

- Air flow output from air flow sensor remains below 1 kg/hr for 3 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Intake air flow rate is fixed at backup value.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

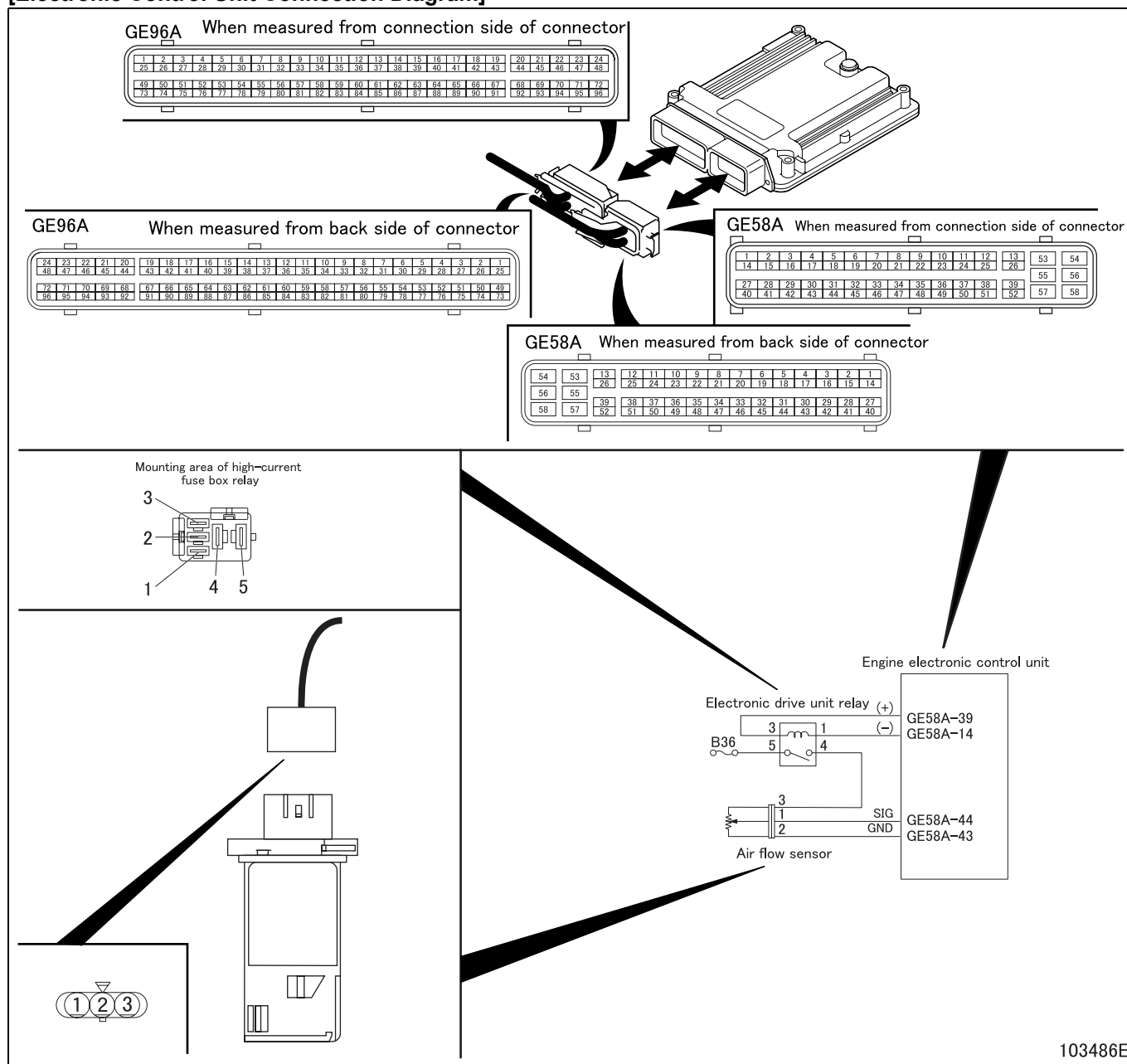
- Open-circuit or short-circuit of harness between electronic control unit and relay
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Open-circuit or short-circuit of harness between electronic drive unit and sensor
- Open-circuit or short-circuit of harness between fuse and relay
- Open-circuit or short-circuit of harness between relay and electronic drive unit
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of relay
- Malfunction of electronic drive unit
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

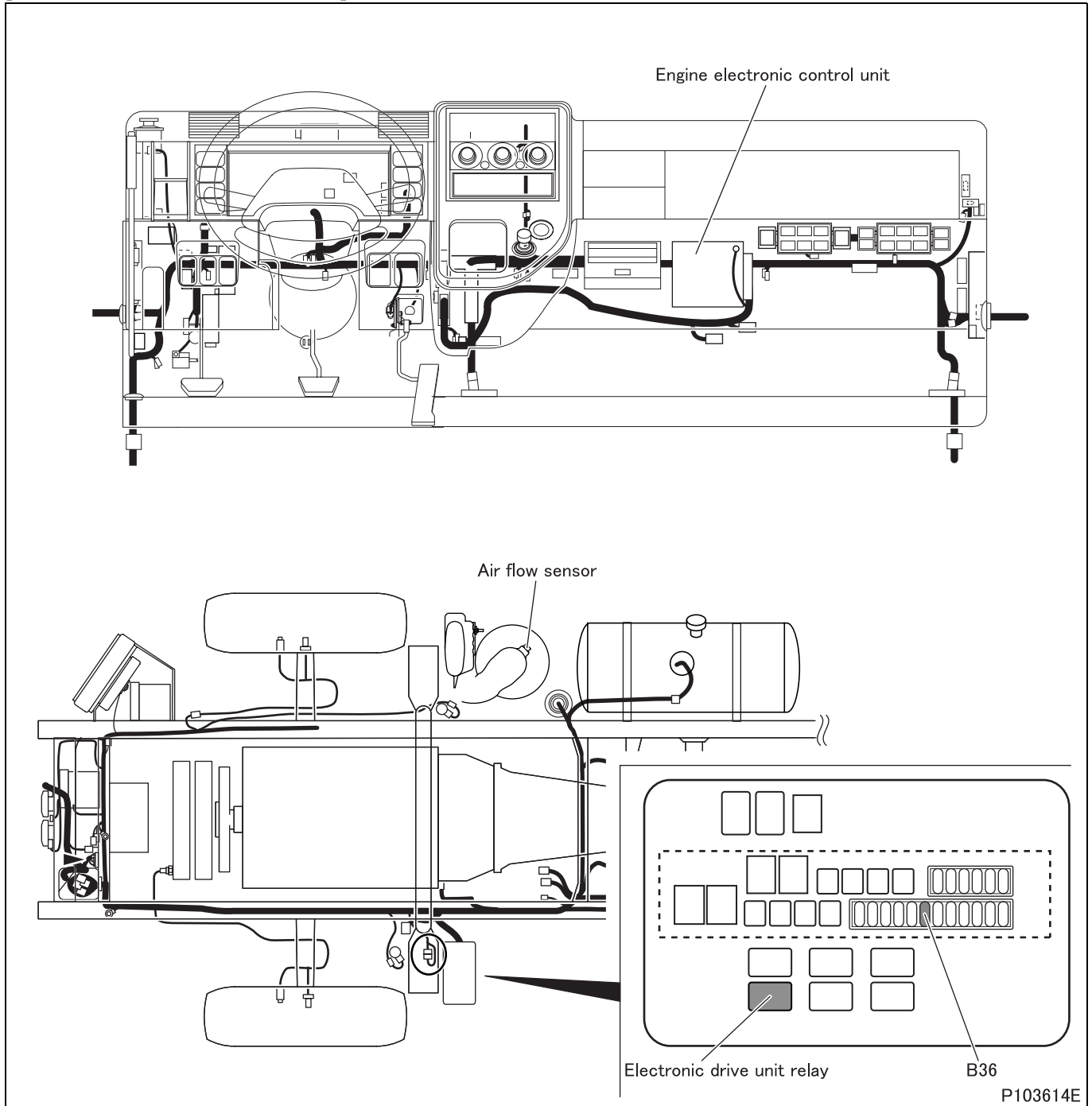
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



103486E

[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Measure item No. 60 "Air mass flow" of Service Data.  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Perform actuator test item No. AF "EDU Relay"</li> <li>• Gradually press accelerator pedal.</li> </ul> |
|        | Requirements   |               | The numeric value should gradually increase.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of sensor connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 3 | Inspection items                                       |               | Inspection of sensor connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector terminal No. 3 (+) and 2 (–).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Perform actuator test item No. AF "EDU Relay"</li> </ul> |
|        | Requirements   |               | 12 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 6.  |
| NO     |  | Go to step 4. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 4 | Inspection items                                       |                 | Inspection of harness between electronic drive unit relay and sensor (power supply)                             |
|        | Maintenance item                                       |                 | Check circuit between electronic drive unit relay connector terminal No. 4 and sensor connector terminal No. 3. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                      |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 5.   |
| NO     |  | Modify harness. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 5 | Inspection items                                       |                 | Inspection of harness between sensor and electronic control unit (ground)  |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE58A) terminal No. 43. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.  |
| NO     |  | Modify harness. |  |



|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness between sensor and electronic control unit (signal)  |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE58A) terminal No. 44. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |                       |   |
|--------|--|-----------------------|---|
| Step 7 | Inspection items                                       |                       | Inspection of sensor unit   |
|        | Maintenance item                                       |                       | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among "Service data".</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: "Ne" (rpm)</li> <li>• Intake air flow rate: "Air Flow Rate from MAFS" (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 "Engine Revolution" (rpm)</li> <li>• Intake air flow rate: 60 "Air mass flow" (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of "Service data".</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |
|        | Inspection condition                                   |                       | –   |
|        | Requirements   |                       | 10% or less   |
|        | Inspection result (Is the judging standard satisfied?) | YES                   | Go to step 8.   |
| NO     |  | Replacement of sensor |   |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Measure item No. 60 "Air mass flow" of Service Data.  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Perform actuator test item No. AF "EDU Relay"</li> <li>• Gradually press accelerator pedal.</li> </ul> |
|        | Requirements   |  | The numeric value should gradually increase.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0103/Flash code: 17

## **[Monitor]**

Failure of air flow sensor

## **[Fault (outline)]**

High signal range check

## **[Diagnosis check]**

- Air flow sensor output voltage is monitored.

## **[Code generation condition]**

- Air flow output from air flow sensor remains over 970 kg/hr for 3 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Intake air flow rate is fixed at backup value.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

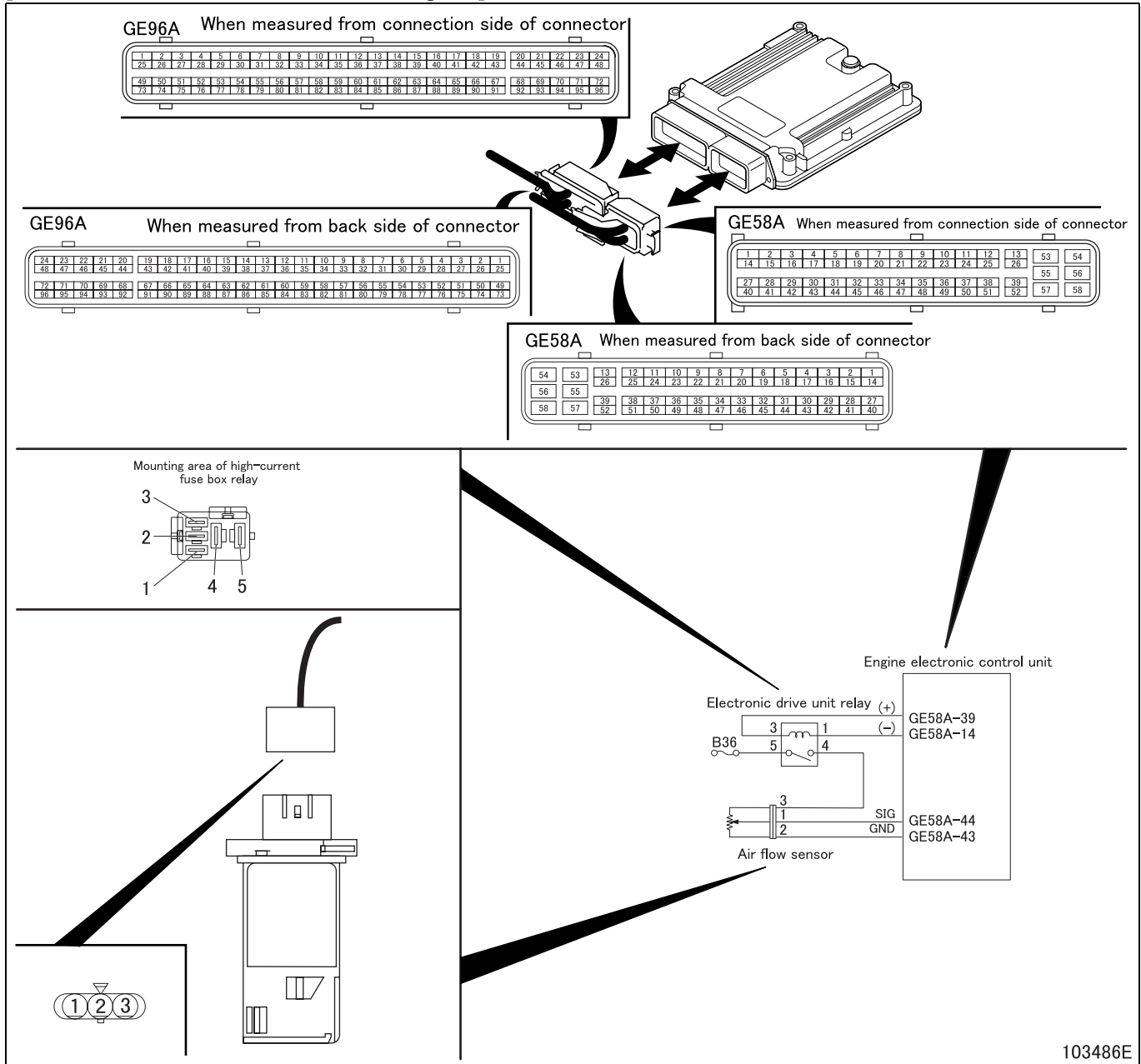
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and relay
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Open-circuit or short-circuit of harness between electronic drive unit and sensor
- Open-circuit or short-circuit of harness between fuse and relay
- Open-circuit or short-circuit of harness between relay and electronic drive unit
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of relay
- Malfunction of electronic drive unit
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

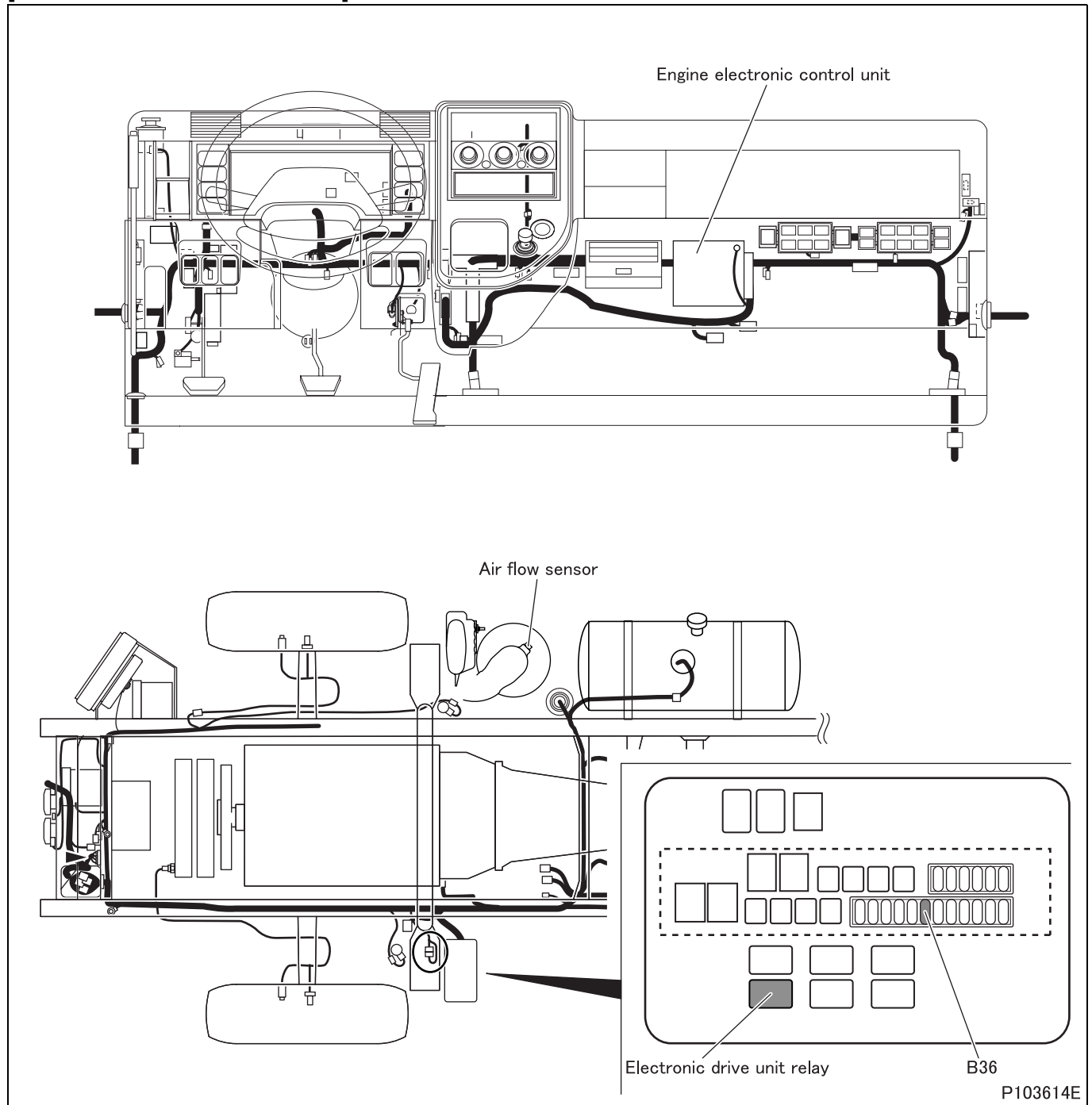
[Electronic Control Unit Connection Diagram]



103486E

# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Measure item No. 60 "Air mass flow" of Service Data.  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Perform actuator test item No. AF "EDU Relay"</li> <li>• Gradually press accelerator pedal.</li> </ul> |
|        | Requirements   |               | The numeric value should gradually increase.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of sensor connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 3 | Inspection items                                       |               | Inspection by sensor connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector terminal No. 3 (+) and 2 (–).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Perform actuator test item No. AF "EDU Relay"</li> </ul> |
|        | Requirements   |               | 12 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 6.  |
| NO     |  | Go to step 4. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 4 | Inspection items                                       |                 | Inspection of harness between electronic drive unit relay and sensor (power supply)                             |
|        | Maintenance item                                       |                 | Check circuit between electronic drive unit relay connector terminal No. 4 and sensor connector terminal No. 3. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                      |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 5.   |
| NO     |  | Modify harness. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 5 | Inspection items                                       |                 | Inspection of harness between sensor and electronic control unit (ground)  |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE58A) terminal No. 43. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.  |
| NO     |  | Modify harness. |  |

# TROUBLESHOOTING

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness between sensor and electronic control unit (signal)  |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE58A) terminal No. 44. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |                       |   |
|--------|--|-----------------------|---|
| Step 7 | Inspection items                                       |                       | Inspection of sensor unit   |
|        | Maintenance item                                       |                       | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among "Service data".</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: "Ne" (rpm)</li> <li>• Intake air flow rate: "Air Flow Rate from MAFS" (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 "Engine Revolution" (rpm)</li> <li>• Intake air flow rate: 60 "Air mass flow" (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of "Service data".</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |
|        | Inspection condition                                   |                       | –   |
|        | Requirements   |                       | 10% or less   |
|        | Inspection result (Is the judging standard satisfied?) | YES                   | Go to step 8.   |
| NO     |  | Replacement of sensor |   |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Measure item No. 60 "Air mass flow" of Service Data.  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Perform actuator test item No. AF "EDU Relay"</li> <li>• Gradually press accelerator pedal.</li> </ul> |
|        | Requirements   |  | The numeric value should gradually increase.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

**[Fault code]**

Diagnosis code: P0112/Flash code: 44

**[Monitor]**

Failure of intake air temperature sensor

**[Fault (outline)]**

Low signal range check

**[Diagnosis check]**

- Intake air temperature sensor output voltage is monitored.

**[Code generation condition]**

- Output voltage of intake air temperature sensor remains below 0.2 V for 1 second. (sensor temperature: 198°C {388°F} or higher)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Intake air flow rate is fixed at backup value.
- Related fault check is stopped.

**[Probable cause of trouble]**

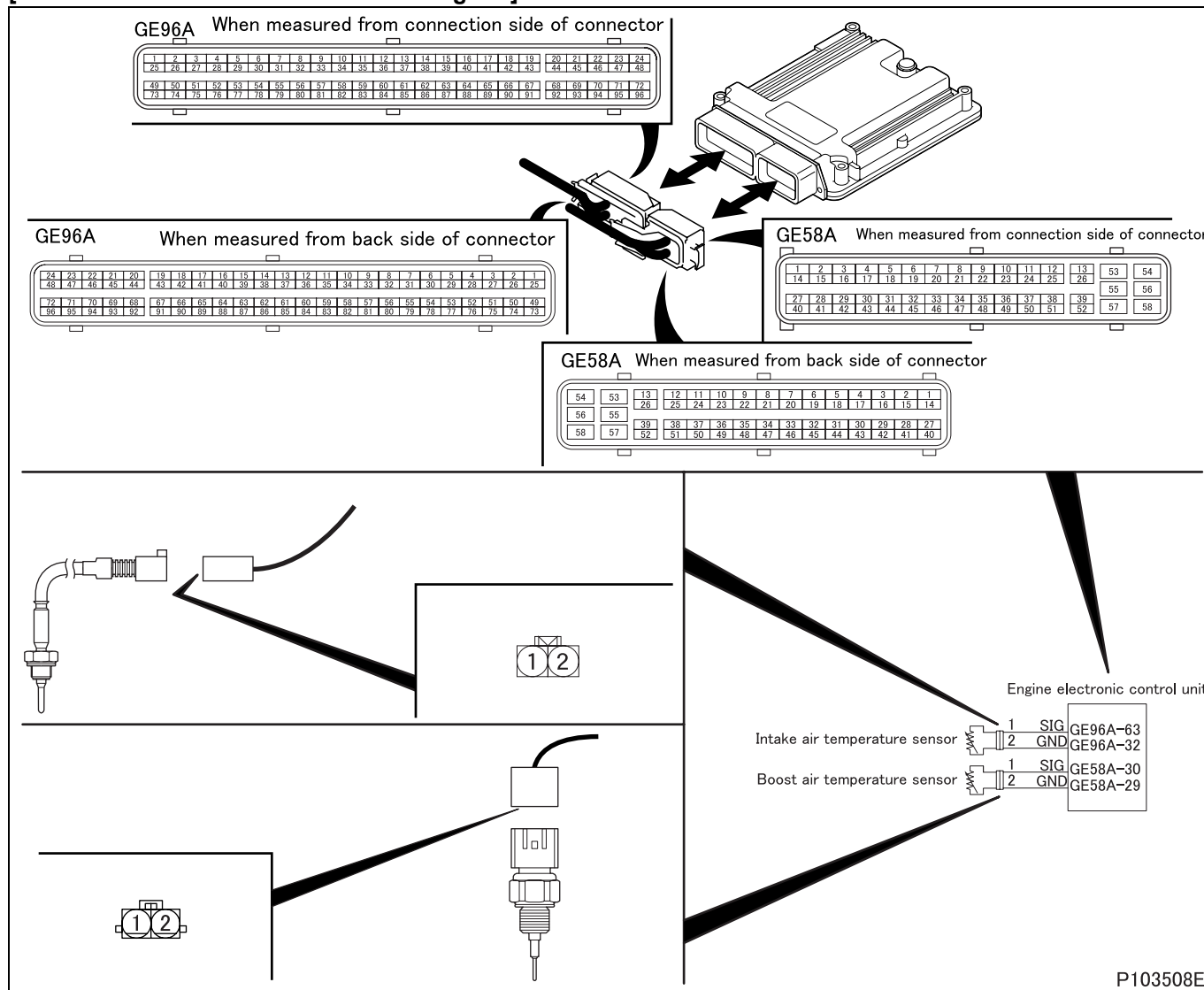
- Open-circuit or short-circuit of harness between electronic control unit and intake air temperature sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

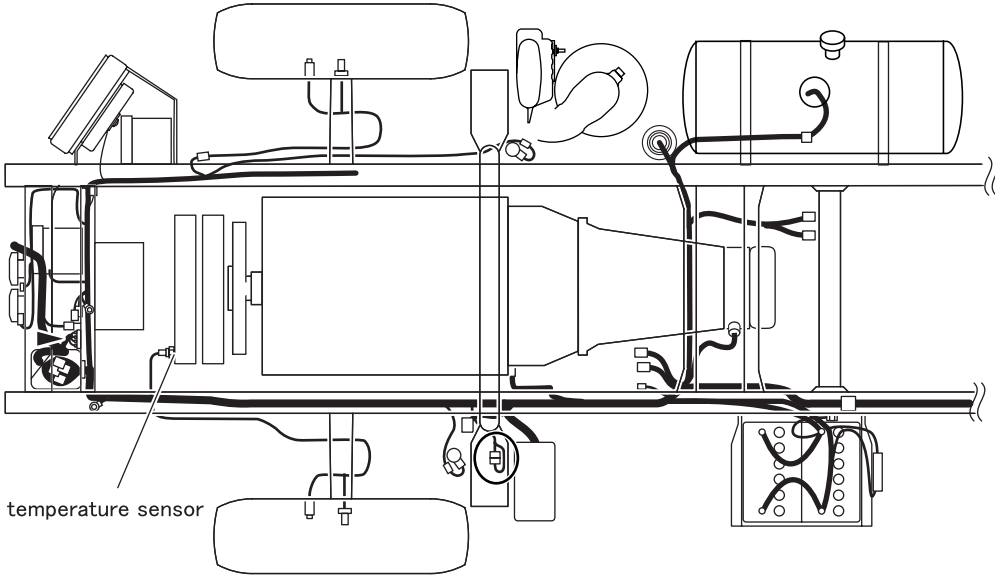
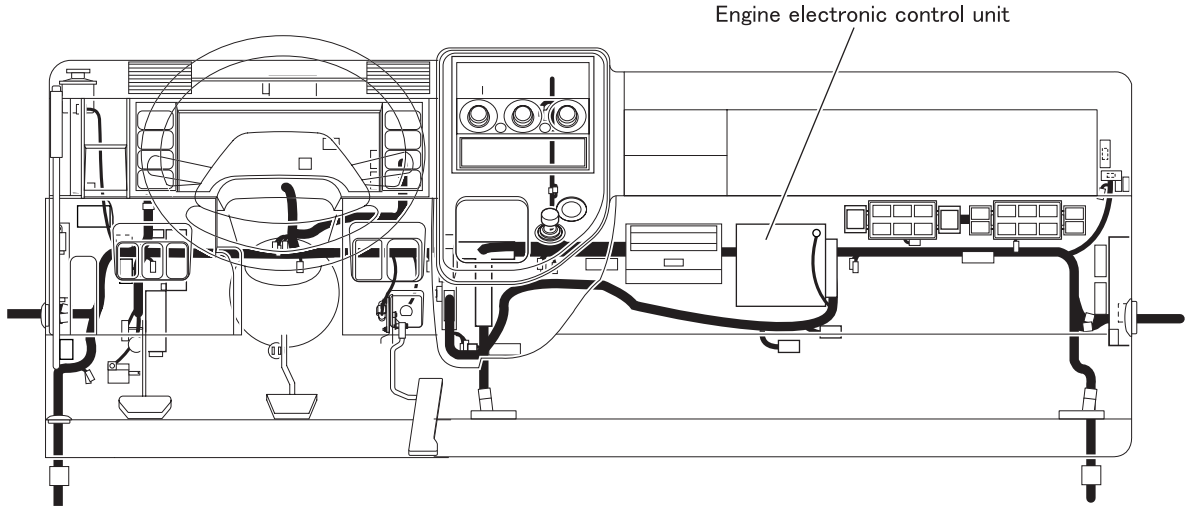
## [Electronic Control Unit Connection Diagram]



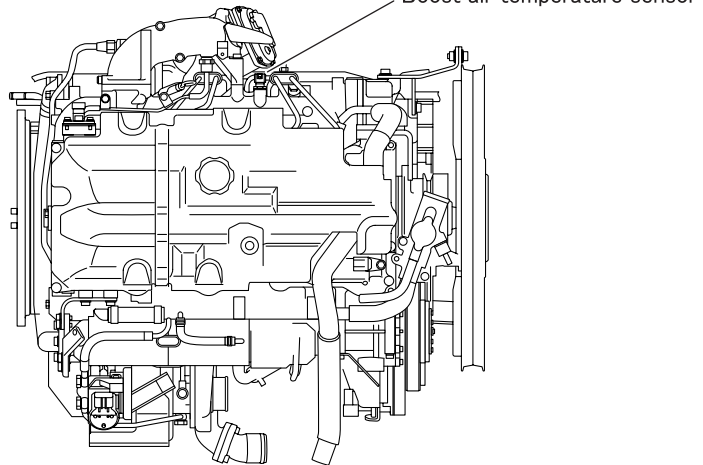
P103508E



[Parts Identification and Location]



Upper view of engine



P103634E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item "Intake Air Temperature" .</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item No. 30 "Intake Air Temp. (upstream)" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | –   |
|        | Requirements   |               | When engine is cold: Temperature is equivalent to outside temperature.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

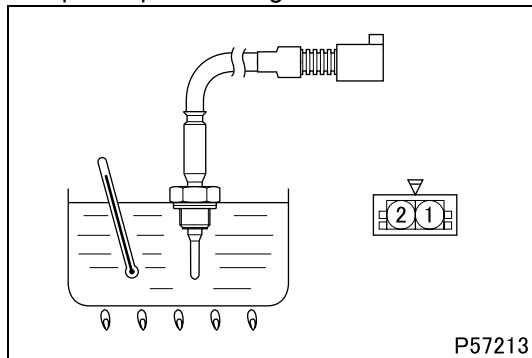
|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 32 and 63.   |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>50°C {122°F}: 2.202 <math>\begin{smallmatrix} +0.233 \\ -0.208 \end{smallmatrix}</math> kΩ</li> <li>100°C {212°F}: 508.1 <math>\begin{smallmatrix} +41.3 \\ -37.7 \end{smallmatrix}</math> Ω</li> <li>150°C {302°F}: 160.4 <math>\begin{smallmatrix} +10.3 \\ -9.6 \end{smallmatrix}</math> Ω</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of intake air temperature sensor connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

|        |  |                       |   |
|--------|--|-----------------------|---|
| Step 5 | Inspection items                                       |                       | Inspection of intake air temperature sensor unit  |
|        | Maintenance item                                       |                       | Measure value of resistance between connector terminal No. 1 and 2.   |
|        | Inspection condition                                   |                       | <ul style="list-style-type: none"> <li>Put intake air temperature sensor in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>   |
|        | Requirements   |                       | <ul style="list-style-type: none"> <li>50°C {122°F}: 2.202 <math>\begin{smallmatrix} +0.233 \\ -0.208 \end{smallmatrix}</math> kΩ</li> <li>100°C {212°F}: 508.1 <math>\begin{smallmatrix} +41.3 \\ -37.7 \end{smallmatrix}</math> Ω</li> <li>150°C {302°F}: 160.4 <math>\begin{smallmatrix} +10.3 \\ -9.6 \end{smallmatrix}</math> Ω</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                   | Go to step 6.   |
| NO     |  | Replacement of sensor |   |

<Step 5 inspection diagram>



|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 63. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 32. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |  |  |
|--------|--|--|--|
| Step 8 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | <p>&lt;General Scanning Tool used&gt;</p> <ul style="list-style-type: none"> <li>Measure item "Intake Air Temperature".</li> </ul> <p>&lt;Multi-Use Tester used&gt;</p> <ul style="list-style-type: none"> <li>Measure item No. 30 "Intake Air Temp. (upstream)" of Service Data.</li> </ul> |
|        | Inspection condition                                   |  | —  |
|        | Requirements   |  | When engine is cold: Temperature is equivalent to outside temperature.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO     |  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0113/Flash code: 44

## **[Monitor]**

Failure of intake air temperature sensor

## **[Fault (outline)]**

High signal range check

## **[Diagnosis check]**

- intake air temperature sensor output voltage is monitored.

## **[Code generation condition]**

- Output voltage of intake air temperature sensor remains above 4.87 V for 1 second. (sensor temperature:  $-37^{\circ}\text{C}$   $\{-34.6^{\circ}\text{F}\}$  or lower)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Intake air flow rate is fixed at backup value.
- Related fault check is stopped.

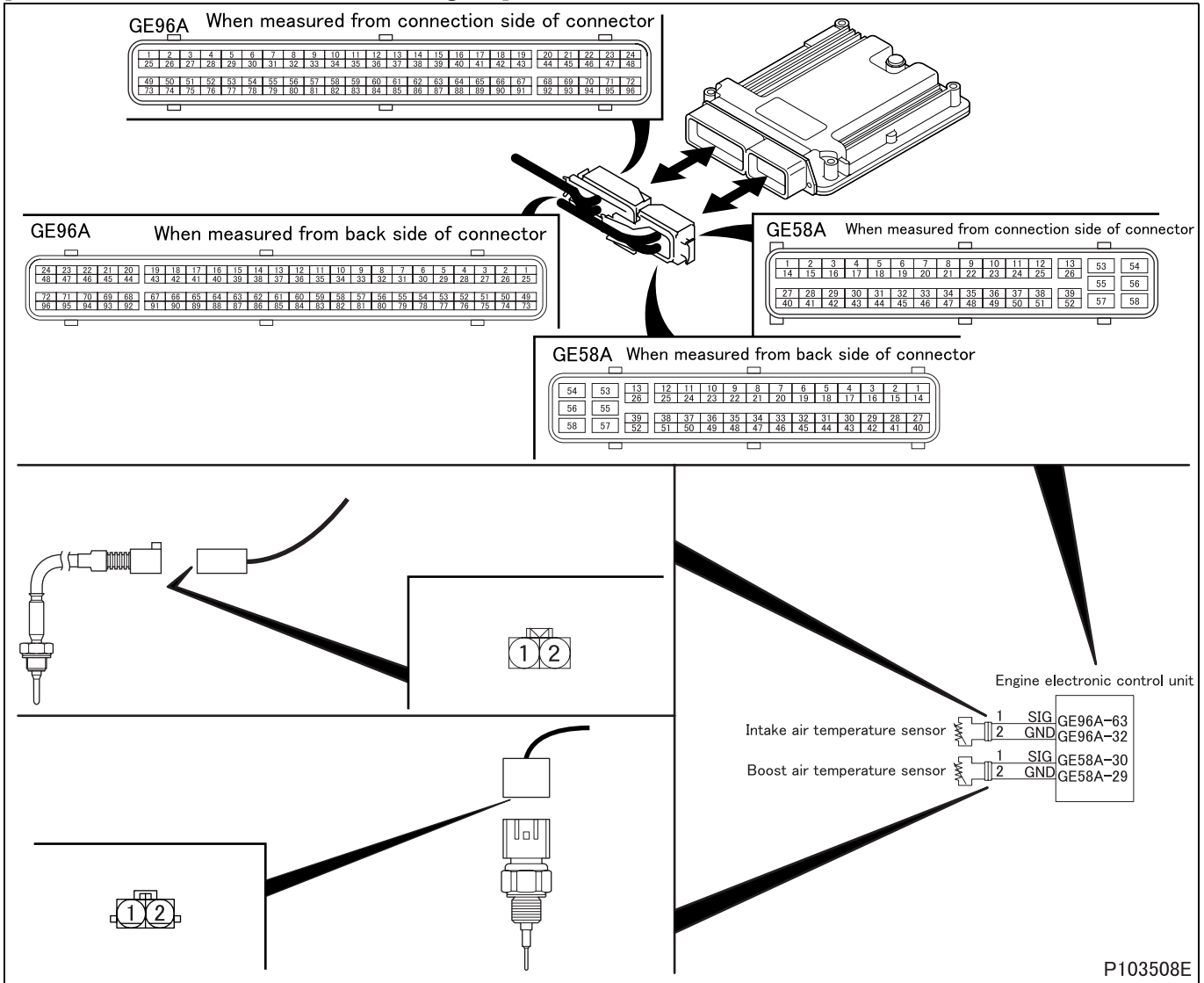
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and intake air temperature sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

## **[Recoverability]**

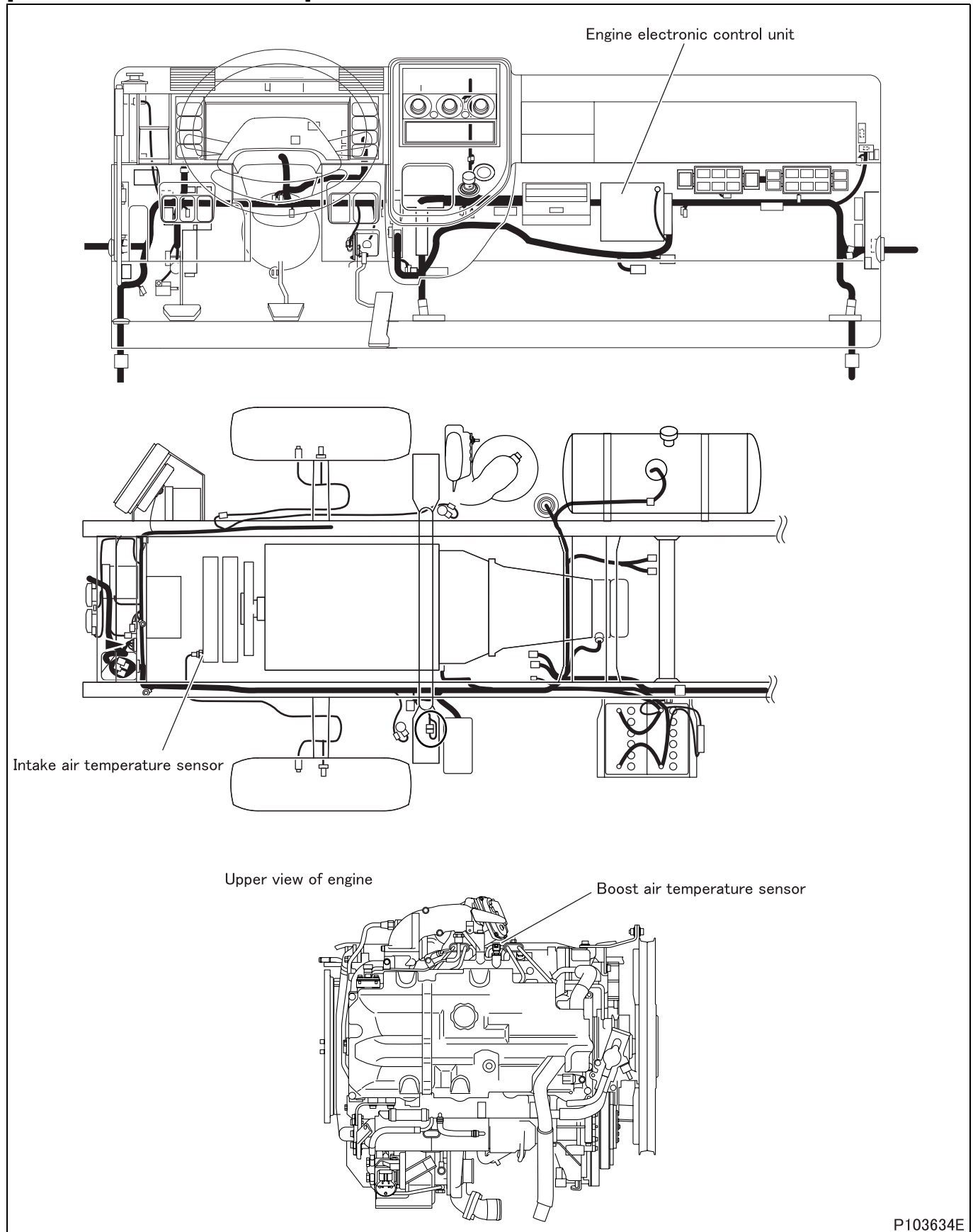
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]



P103634E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Intake Air Temperature".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 30 "Intake Air Temp. (upstream)" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | –  |
|        | Requirements   |               | When engine is cold: Temperature is equivalent to outside temperature.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 32 and 63.   |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• 50°C {122°F}: 2.202 <math>\begin{smallmatrix} +0.233 \\ -0.208 \end{smallmatrix}</math> kΩ</li> <li>• 100°C {212°F}: 508.1 <math>\begin{smallmatrix} +41.3 \\ -37.7 \end{smallmatrix}</math> Ω</li> <li>• 150°C {302°F}: 160.4 <math>\begin{smallmatrix} +10.3 \\ -9.6 \end{smallmatrix}</math> Ω</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

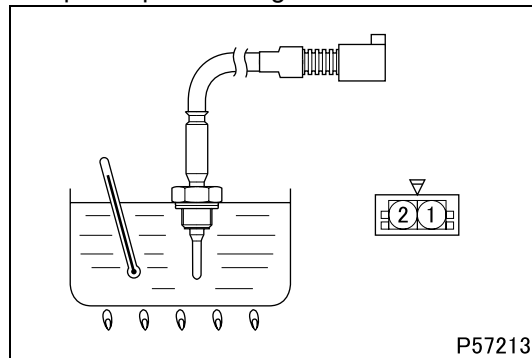
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of intake air temperature sensor connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

|        |  |                       |   |
|--------|--|-----------------------|---|
| Step 5 | Inspection items                                       |                       | Inspection of intake air temperature sensor unit  |
|        | Maintenance item                                       |                       | Measure value of resistance between connector terminal No. 1 and 2.   |
|        | Inspection condition                                   |                       | <ul style="list-style-type: none"> <li>Put intake air temperature sensor in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>   |
|        | Requirements   |                       | <ul style="list-style-type: none"> <li>50°C {122°F}: 2.202 <math>\begin{matrix} +0.233 \\ -0.208 \end{matrix}</math> k<math>\Omega</math></li> <li>100°C {212°F}: 508.1 <math>\begin{matrix} +41.3 \\ -37.7 \end{matrix}</math> <math>\Omega</math></li> <li>150°C {302°F}: 160.4 <math>\begin{matrix} +10.3 \\ -9.6 \end{matrix}</math> <math>\Omega</math></li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                   | Go to step 6.   |
| NO     |  | Replacement of sensor |   |

<Step 5 inspection diagram>



|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 63. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 32. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |  |  |
|--------|--|--|--|
| Step 8 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | <p>&lt;General Scanning Tool used&gt;</p> <ul style="list-style-type: none"> <li>Measure item "Intake Air Temperature".</li> </ul> <p>&lt;Multi-Use Tester used&gt;</p> <ul style="list-style-type: none"> <li>Measure item No. 30 "Intake Air Temp. (upstream)" of Service Data.</li> </ul> |
|        | Inspection condition                                   |  | —  |
|        | Requirements   |  | When engine is cold: Temperature is equivalent to outside temperature.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO     |  | Replacement of electronic control unit |  |



**[Fault code]**

Diagnosis code: P0117/Flash code: 21

**[Monitor]**

Failure of water temperature sensor

**[Fault (outline)]**

Low signal range check

**[Diagnosis check]**

- Water temperature sensor 1 output voltage is monitored.

**[Code generation condition]**

- Output voltage of temperature sensor 1 remains below 0.1 V for 1 second. (sensor temperature: 150°C {302°F} or higher)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Engine coolant temperature is fixed at backup value.
- Fuel system temperature is fixed at backup value.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Warm-up cycle counter is stopped.
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

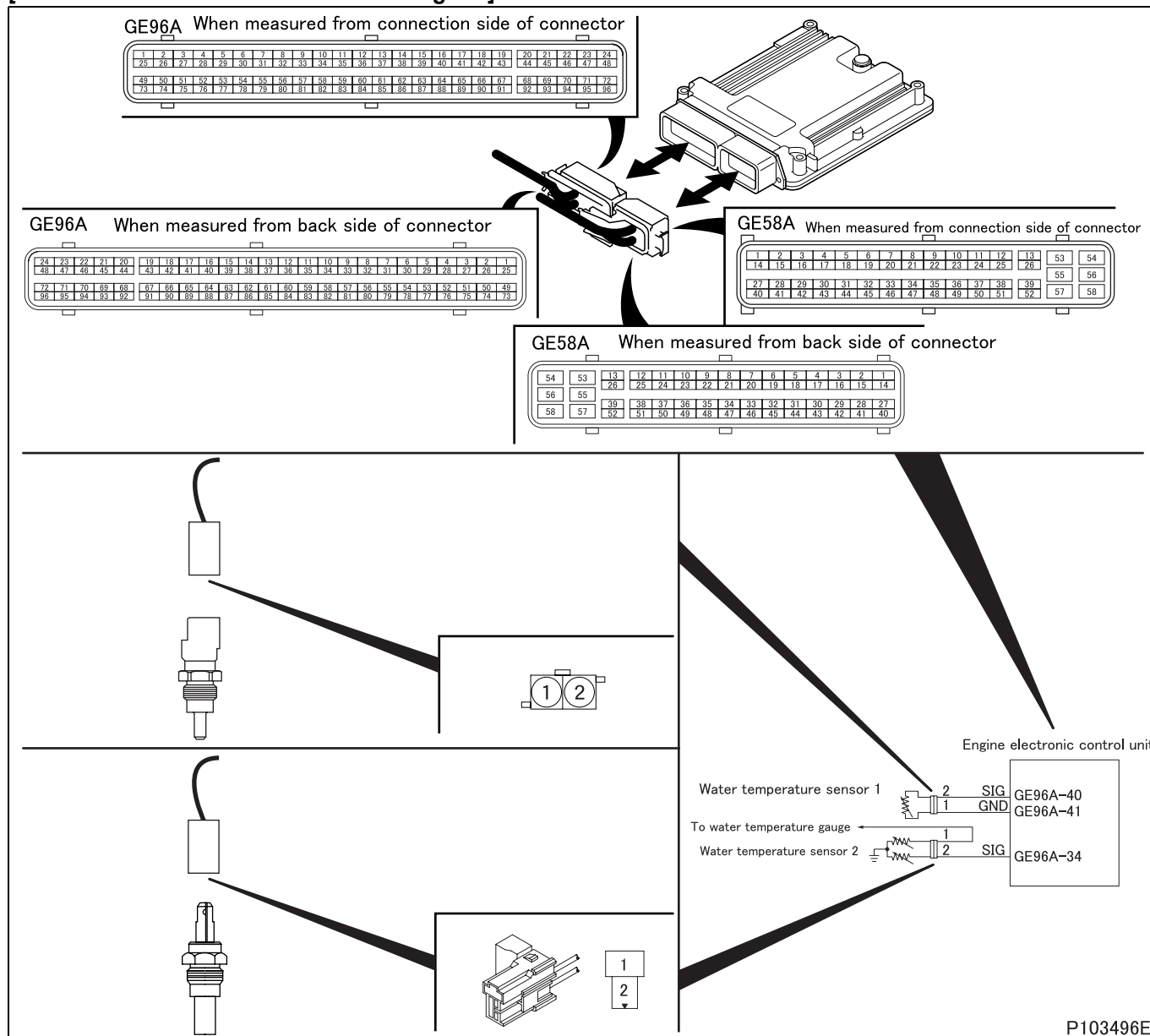
- Open-circuit or short-circuit of harness between electronic control unit and water temperature sensor 1
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

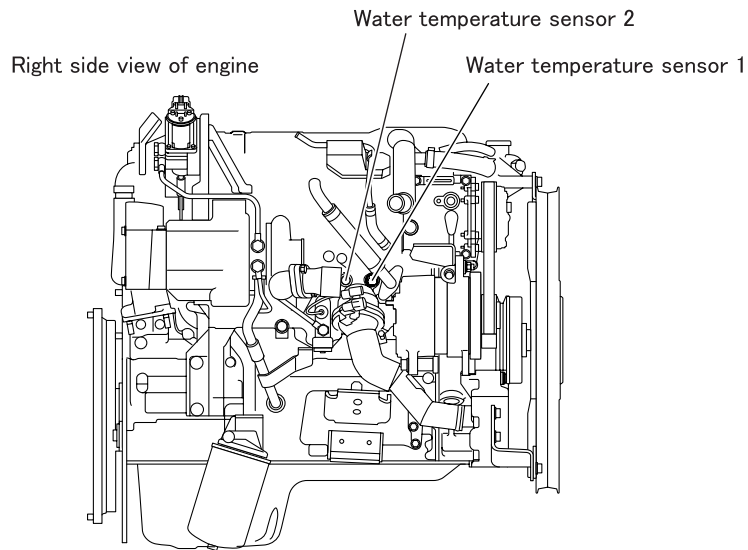
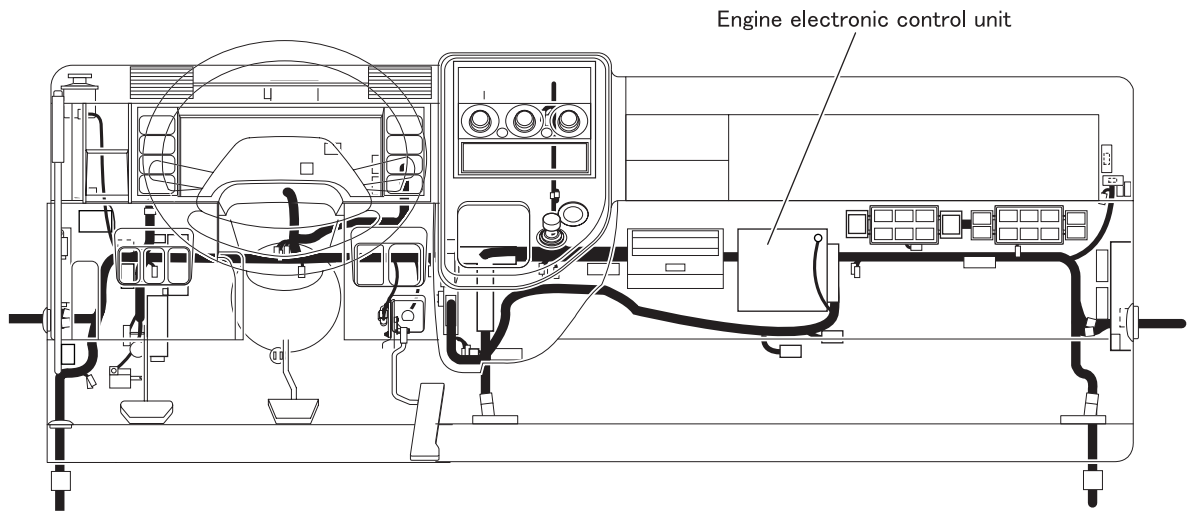
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



P103624E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item "Engine Coolant Temperature".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item No. 31 "Water Temperature" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | —  |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>When engine is cold: Temperature is equivalent to outside temperature.</li> <li>While engine is warmed up: Temperature gradually increases.</li> <li>When engine is stopped after warm-up: Temperature gradually declines.</li> </ul>                 |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

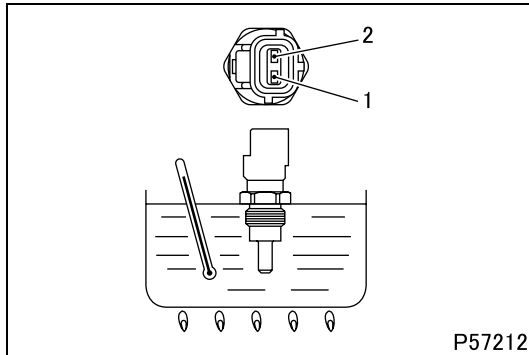
|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminals No. 40 and No. 41.  |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>20°C {68°F}: 2.45 ± 0.14 kΩ</li> <li>80°C {176°F}: 0.32 kΩ (reference value)</li> <li>110°C {230°F}: 141.7 ± 2 kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 3 | Inspection items                                       |                 | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                 | Inspection of connector   |
|        | Inspection condition                                   |                 | —   |
|        | Requirements   |                 | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.   |
| NO     |  | Modify harness. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of water temperature sensor 1 connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | —   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 5 | Inspection items                                       |  | Inspection of water temperature sensor 1 unit  |     |               |    |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2.  |     |               |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Put water temperature sensor 1 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul> |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>20°C {68°F}: 2.45 ± 0.14 kΩ</li> <li>80°C {176°F}: 0.32 kΩ (reference value)</li> <li>110°C {230°F}: 141.7 ± 2 kΩ</li> </ul>  |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 6.</td> </tr> <tr> <td>NO</td> <td>Replacement of sensor</td> </tr> </table>   | YES | Go to step 6. | NO |
| YES    | Go to step 6.  |  |  |     |               |    |
| NO     | Replacement of sensor                                  |  |  |     |               |    |

<Step 5 inspection diagram>



|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 6 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (power supply)  |     |               |    |
|        | Maintenance item                                       |  | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 40.       |     |               |    |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                                 |     |               |    |
|        | Requirements   |  | There is continuity.   |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 7.</td> </tr> <tr> <td>NO</td> <td>Modify harness.</td> </tr> </table> | YES | Go to step 7. | NO |
| YES    | Go to step 7.  |  |  |     |               |    |
| NO     | Modify harness.  |  |  |     |               |    |

|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 7 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (ground)  |     |               |    |
|        | Maintenance item                                       |  | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 41.       |     |               |    |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                                 |     |               |    |
|        | Requirements   |  | There is continuity.   |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 8.</td> </tr> <tr> <td>NO</td> <td>Modify harness.</td> </tr> </table> | YES | Go to step 8. | NO |
| YES    | Go to step 8.  |  |  |     |               |    |
| NO     | Modify harness.  |  |  |     |               |    |

|        |  |  |  |     |                                    |    |
|--------|--|--|--|-----|------------------------------------|----|
| Step 8 | Inspection items                                       |  | Inspection by control data   |     |                                    |    |
|        | Maintenance item                                       |  | <p>&lt;General Scanning Tool used&gt;</p> <ul style="list-style-type: none"> <li>Measure item "Engine Coolant Temperature".</li> </ul> <p>&lt;Multi-Use Tester used&gt;</p> <ul style="list-style-type: none"> <li>Measure item No. 31 "Water Temperature" of Service Data.</li> </ul> |     |                                    |    |
|        | Inspection condition                                   |  | –  |     |                                    |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>When engine is cold: Temperature is equivalent to outside temperature.</li> <li>While engine is warmed up: Temperature gradually increases.</li> <li>When engine is stopped after warm-up: Temperature gradually declines.</li> </ul>           |     |                                    |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to transient fault (See Gr00.).</td> </tr> <tr> <td>NO</td> <td>Replacement of electronic control unit</td> </tr> </table>   | YES | Go to transient fault (See Gr00.). | NO |
| YES    | Go to transient fault (See Gr00.).                     |  |  |     |                                    |    |
| NO     | Replacement of electronic control unit                 |  |  |     |                                    |    |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0118/Flash code: 21

## **[Monitor]**

Failure of water temperature sensor

## **[Fault (outline)]**

High signal range check

## **[Diagnosis check]**

- Water temperature sensor 1 output voltage is monitored.

## **[Code generation condition]**

- Output voltage of temperature sensor 1 remains above 4.8 V for 1 second. (sensor temperature:  $-45^{\circ}\text{C}$   $\{-49^{\circ}\text{F}\}$  or lower)

(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Engine coolant temperature is fixed at backup value.
- Fuel system temperature is fixed at backup value.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Warm-up cycle counter is stopped.
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

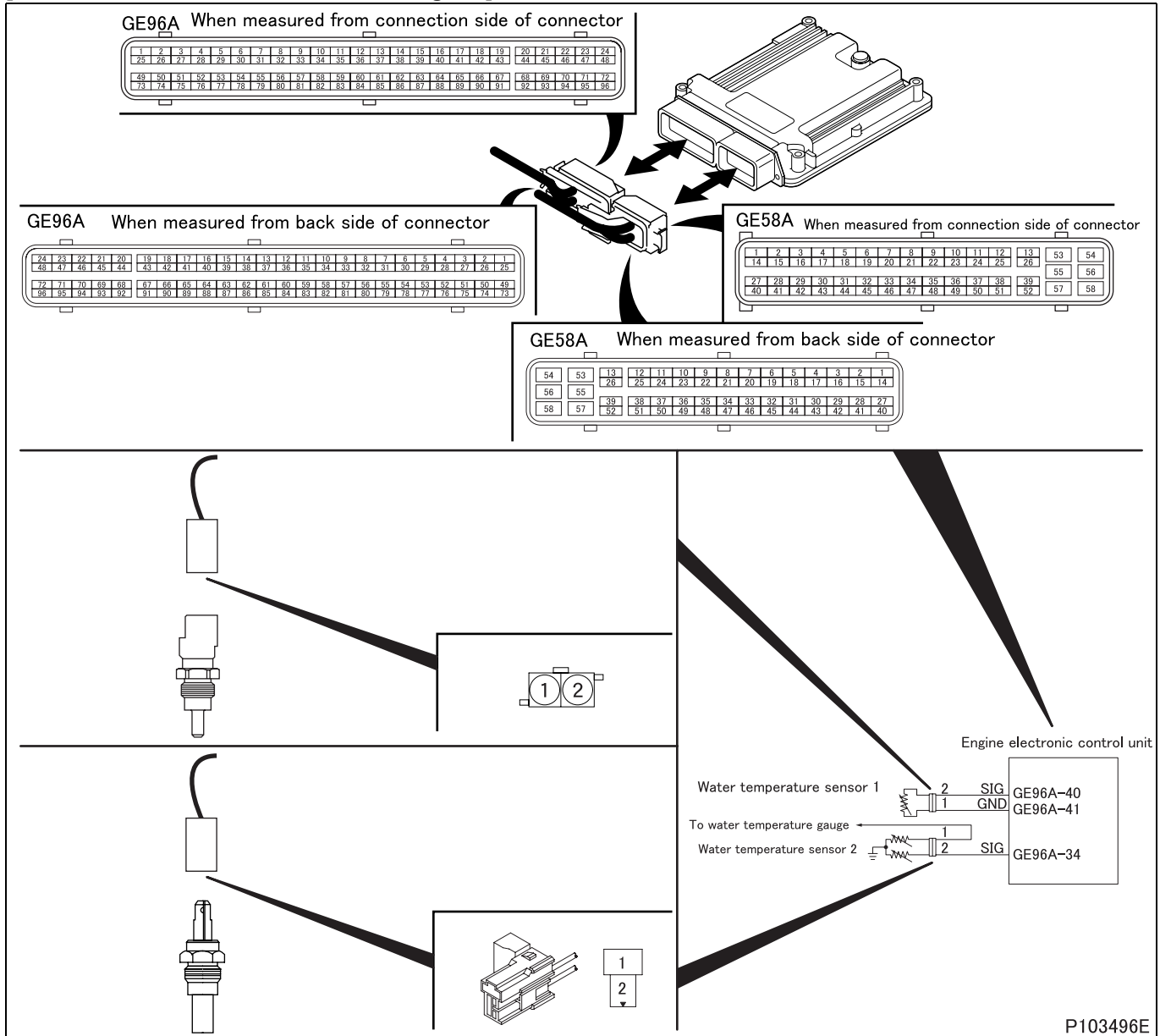
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and water temperature sensor 1
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

## **[Recoverability]**

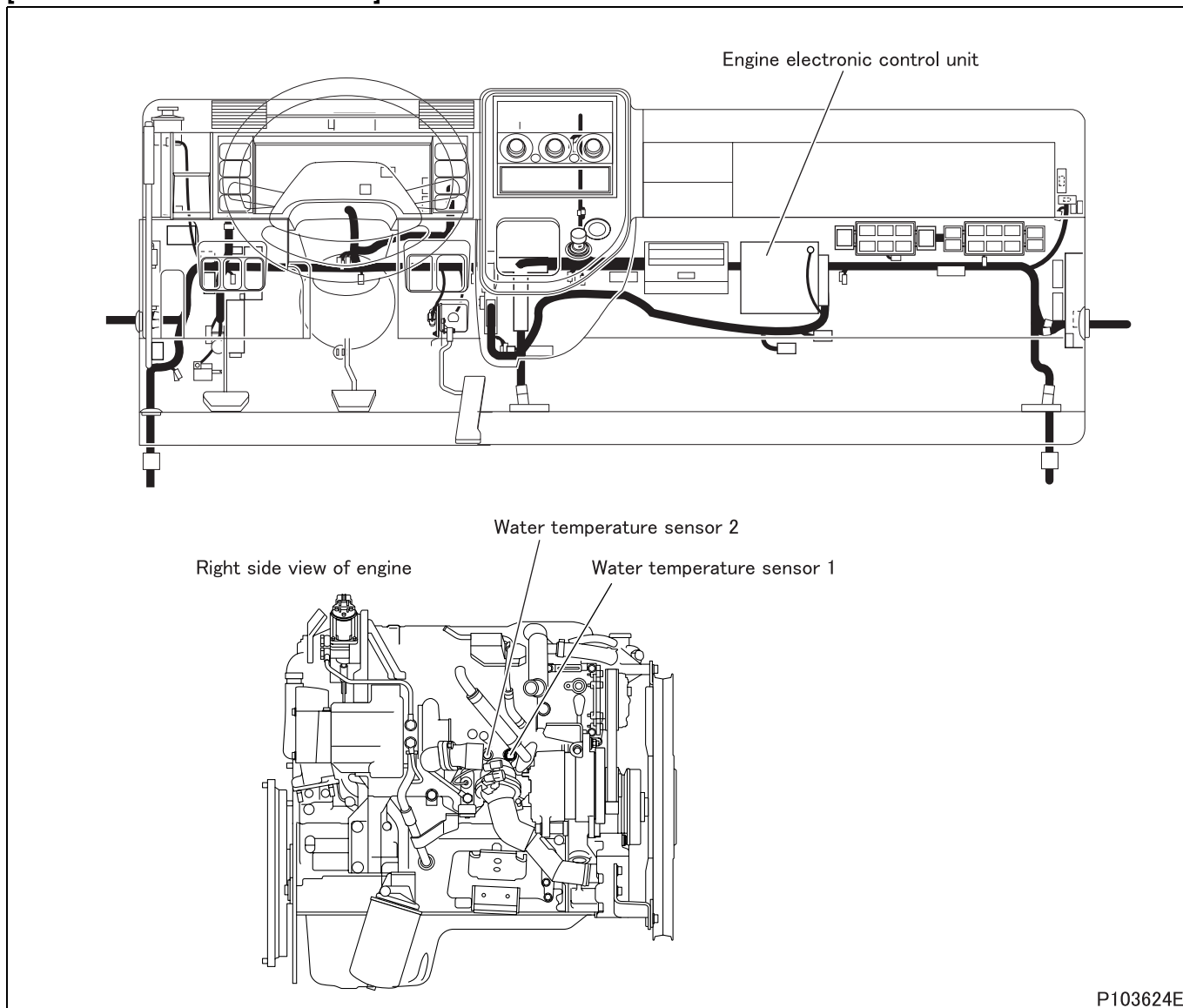
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]





**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item “Engine Coolant Temperature”.</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 31 “Water Temperature” of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | –  |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• When engine is cold: Temperature is equivalent to outside temperature.</li> <li>• While engine is warmed up: Temperature gradually increases.</li> <li>• When engine is stopped after warm-up: Temperature gradually declines.</li> </ul>               |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminals No. 40 and No. 41.  |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• 20°C {68°F}: 2.45 ± 0.14 kΩ</li> <li>• 80°C {176°F}: 0.32 kΩ (reference value)</li> <li>• 110°C {230°F}: 141.7 ± 2 kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

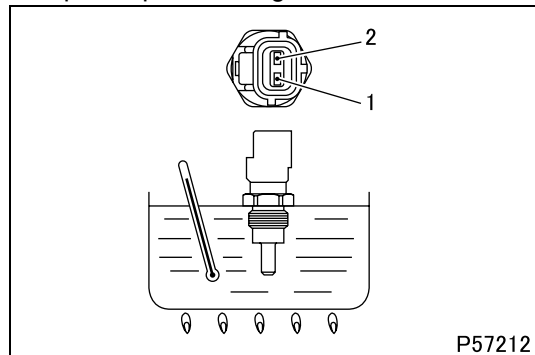
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of water temperature sensor 1 connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 5 | Inspection items                                       |  | Inspection of water temperature sensor 1 unit  |     |               |    |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2.  |     |               |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Put water temperature sensor 1 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul> |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>20°C {68°F}: 2.45 ± 0.14 kΩ</li> <li>80°C {176°F}: 0.32 kΩ (reference value)</li> <li>110°C {230°F}: 141.7 ± 2 kΩ</li> </ul>  |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 6.</td> </tr> <tr> <td>NO</td> <td>Replacement of sensor</td> </tr> </table>   | YES | Go to step 6. | NO |
| YES    | Go to step 6.  |  |  |     |               |    |
| NO     | Replacement of sensor                                  |  |  |     |               |    |

<Step 5 inspection diagram>



|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 6 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (power supply)  |     |               |    |
|        | Maintenance item                                       |  | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 40.       |     |               |    |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                                 |     |               |    |
|        | Requirements   |  | There is continuity.   |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 7.</td> </tr> <tr> <td>NO</td> <td>Modify harness.</td> </tr> </table> | YES | Go to step 7. | NO |
| YES    | Go to step 7.  |  |  |     |               |    |
| NO     | Modify harness.  |  |  |     |               |    |

|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 7 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (ground)  |     |               |    |
|        | Maintenance item                                       |  | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 41.       |     |               |    |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                                 |     |               |    |
|        | Requirements   |  | There is continuity.   |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 8.</td> </tr> <tr> <td>NO</td> <td>Modify harness.</td> </tr> </table> | YES | Go to step 8. | NO |
| YES    | Go to step 8.  |  |  |     |               |    |
| NO     | Modify harness.  |  |  |     |               |    |

|        |  |  |  |     |                                    |    |
|--------|--|--|--|-----|------------------------------------|----|
| Step 8 | Inspection items                                       |  | Inspection by control data   |     |                                    |    |
|        | Maintenance item                                       |  | <p>&lt;General Scanning Tool used&gt;</p> <ul style="list-style-type: none"> <li>Measure item "Engine Coolant Temperature".</li> </ul> <p>&lt;Multi-Use Tester used&gt;</p> <ul style="list-style-type: none"> <li>Measure item No. 31 "Water Temperature" of Service Data.</li> </ul> |     |                                    |    |
|        | Inspection condition                                   |  | –  |     |                                    |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>When engine is cold: Temperature is equivalent to outside temperature.</li> <li>While engine is warmed up: Temperature gradually increases.</li> <li>When engine is stopped after warm-up: Temperature gradually declines.</li> </ul>           |     |                                    |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to transient fault (See Gr00.).</td> </tr> <tr> <td>NO</td> <td>Replacement of electronic control unit</td> </tr> </table>   | YES | Go to transient fault (See Gr00.). | NO |
| YES    | Go to transient fault (See Gr00.).                     |  |  |     |                                    |    |
| NO     | Replacement of electronic control unit                 |  |  |     |                                    |    |

**[Fault code]**

Diagnosis code: P011A/Flash code: 21

**[Monitor]**

Characteristic abnormality of water temperature sensor

**[Fault (outline)]**

Gain drift

**[Diagnosis check]**

- Output temperature data from water temperature sensor 1 and sensor 2 are monitored for difference within specification.

**[Code generation condition]**

- 30 seconds after starting engine, difference in temperature data between sensor 1 and sensor 2 remains above 14°C {57°F} for 10 seconds.

(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine running time: 30 seconds

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Warm-up cycle counter is stopped.
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

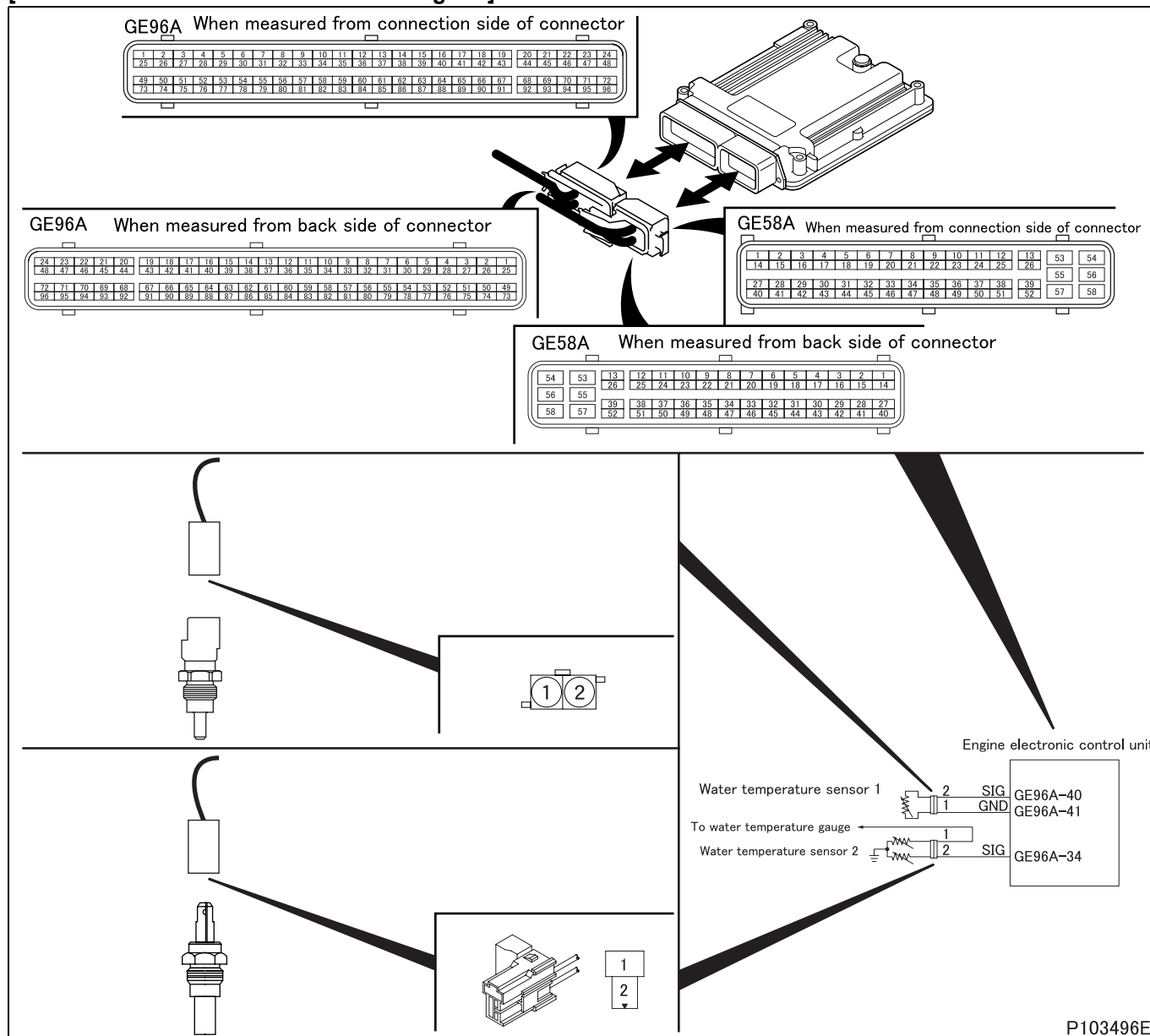
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

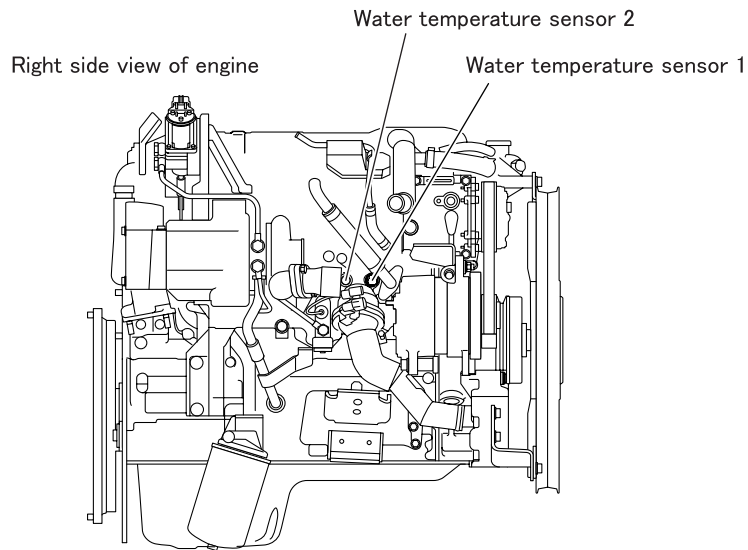
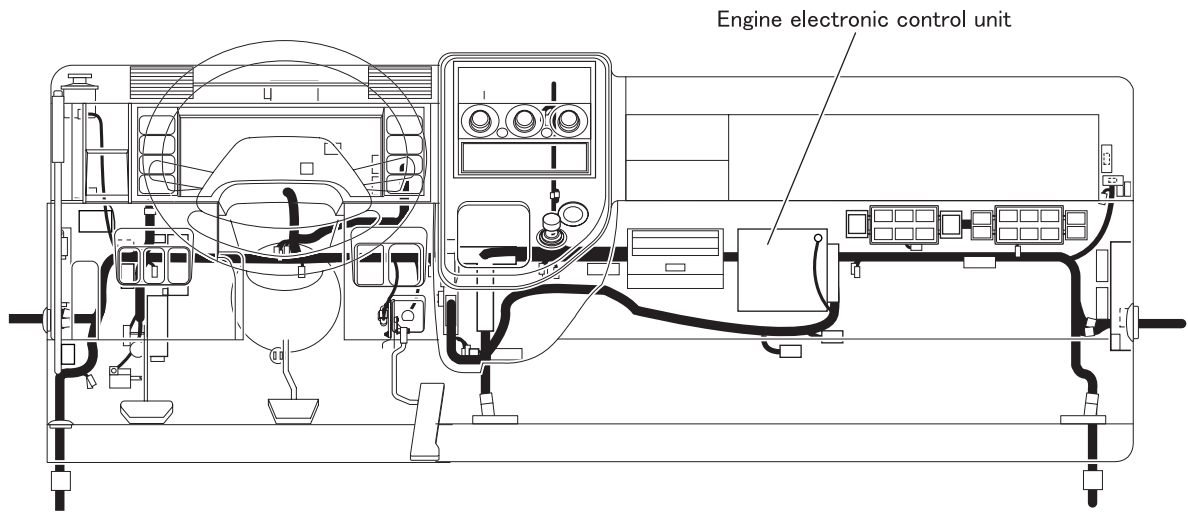
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



P103624E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | Measurement of following service data <ul style="list-style-type: none"> <li>Water temperature sensor 1: Item No. 31 "Water Temperature"</li> <li>Water temperature sensor 2: Item No. 32 "Water Temperature 2"</li> </ul> |
|        | Inspection condition                                   |               | Engine coolant temperature: 80°C {176°F}   |
|        | Requirements   |               | Each service data indicates same temperature   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

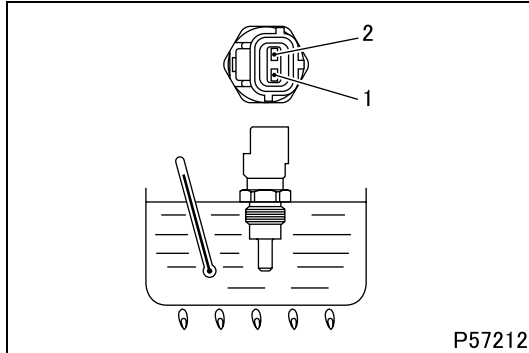
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of water temperature sensor connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 4 | Inspection items                                       |               | Inspection by electronic control unit connector (water temperature sensor 1)  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminals No. 40 and No. 41.  |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>20°C {68°F}: 2.45 ± 0.14 kΩ</li> <li>80°C {176°F}: 0.32 kΩ (reference value)</li> <li>110°C {230°F}: 141.7 ± 2 kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 6.   |
| NO     |  | Go to step 5. |   |

|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 5 | Inspection items                                       |  | Inspection of water temperature sensor 1 unit  |     |               |    |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2.  |     |               |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Put water temperature sensor 1 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul> |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>20°C {68°F}: 2.45 ± 0.14 kΩ</li> <li>80°C {176°F}: 0.32 kΩ (reference value)</li> <li>110°C {230°F}: 141.7 ± 2 kΩ</li> </ul>  |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 6.</td> </tr> <tr> <td>NO</td> <td>Replacement of sensor</td> </tr> </table>   | YES | Go to step 6. | NO |
| YES    | Go to step 6.  |  |  |     |               |    |
| NO     | Replacement of sensor                                  |  |  |     |               |    |

<Step 5 inspection diagram>

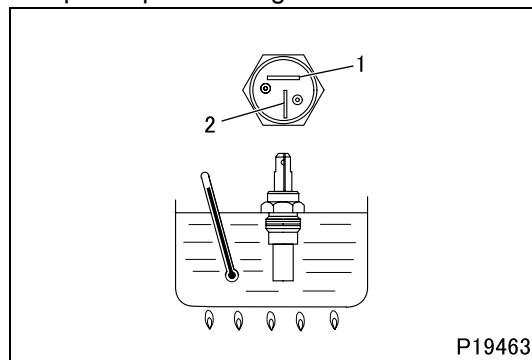


|        |  |  |   |     |  |    |
|--------|--|--|---|-----|--|----|
| Step 6 | Inspection items                                       |  | Inspection by electronic control unit connector (water temperature sensor 2)  |     |  |    |
|        | Maintenance item                                       |  | Measure value of resistance between connector (GE96A) terminals No. 34 and ground.  |     |  |    |
|        | Inspection condition                                   |  | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |     |  |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>-20°C {-4°F}: 24.8 ± 2.5 kΩ</li> <li>0°C {32°F}: 8.62 kΩ (reference value)</li> <li>20°C {68°F}: 3.25 ± 0.33 kΩ</li> <li>60°C {140°F}: 620 kΩ (reference value)</li> <li>80°C {176°F}: 300 kΩ (reference value)</li> </ul> |     |  |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Replacement of electronic control unit</td> </tr> <tr> <td>NO</td> <td>Go to step 7.</td> </tr> </table>   | YES | Replacement of electronic control unit | NO |
| YES    | Replacement of electronic control unit                 |  |   |     |  |    |
| NO     | Go to step 7.  |  |   |     |  |    |

# TROUBLESHOOTING

|        |  |   |  |  |
|--------|--|---|--|--|
| Step 7 | Inspection items                                       | Inspection of water temperature sensor 2 unit   |  |  |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 2 and body.  |  |  |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Put water temperature sensor 2 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |  |  |
|        | Requirements   | <ul style="list-style-type: none"> <li>-20°C {-4°F}: 24.8 ± 2.5 kΩ</li> <li>0°C {32°F}: 8.62 kΩ (reference value)</li> <li>20°C {68°F}: 3.25 ± 0.33 kΩ</li> <li>60°C {140°F}: 620 kΩ (reference value)</li> <li>80°C {176°F}: 300 kΩ (reference value)</li> </ul> |  |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Replacement of electronic control unit |  |
|        |  | NO  | Replacement of sensor                  |  |

<Step 7 inspection diagram>





**[Fault code]**

Diagnosis code: P0122/Flash code: 24

**[Monitor]**

Failure of accelerator pedal position sensor 1

**[Fault (outline)]**

Low signal range check

**[Diagnosis check]**

- Accelerator pedal position sensor is monitored for output within specification.

**[Code generation condition]**

- Voltage from accelerator pedal position sensor 1 remains below 0.5 V for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Accelerator pedal position sensor 2 is computed with accelerator pedal position sensor 1 only.
- In-use performance counter is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

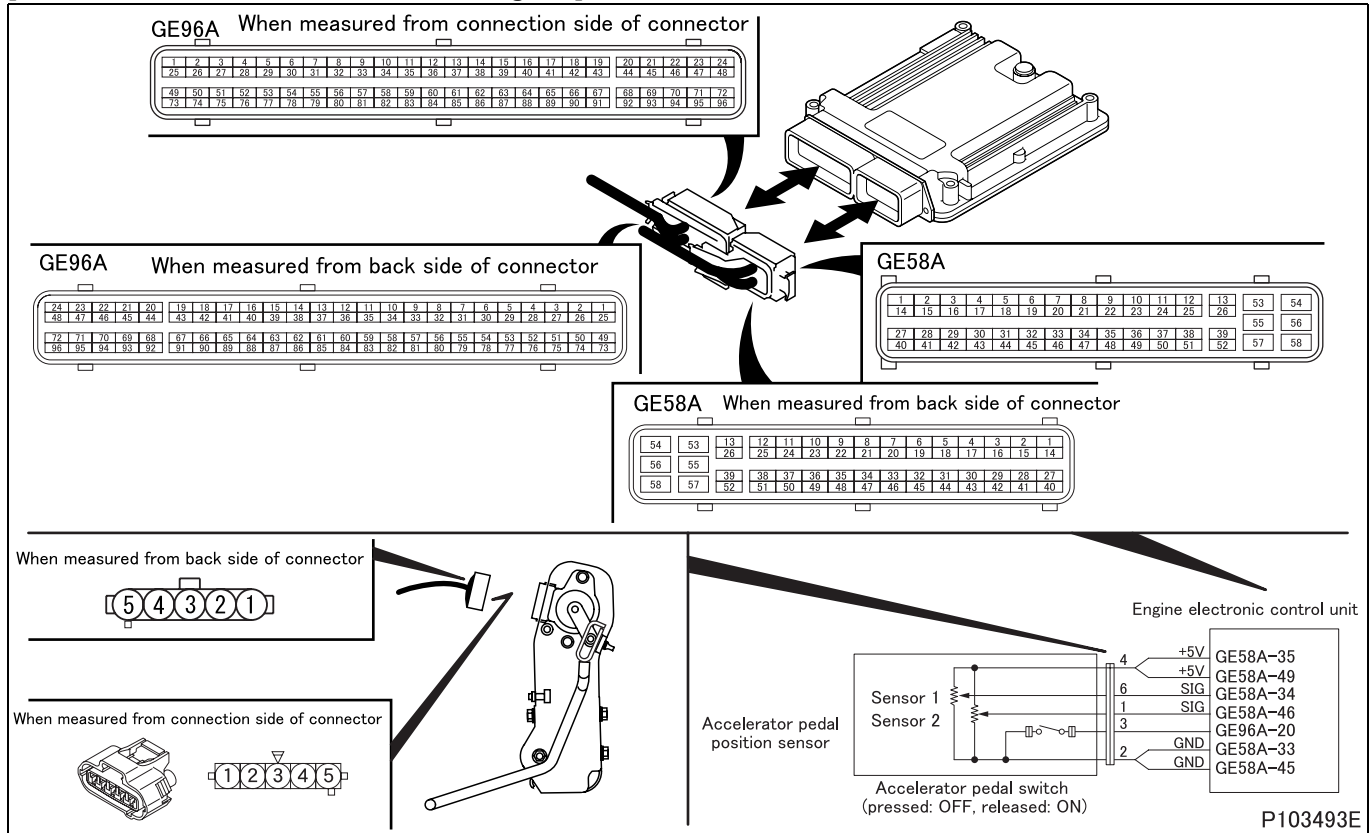
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

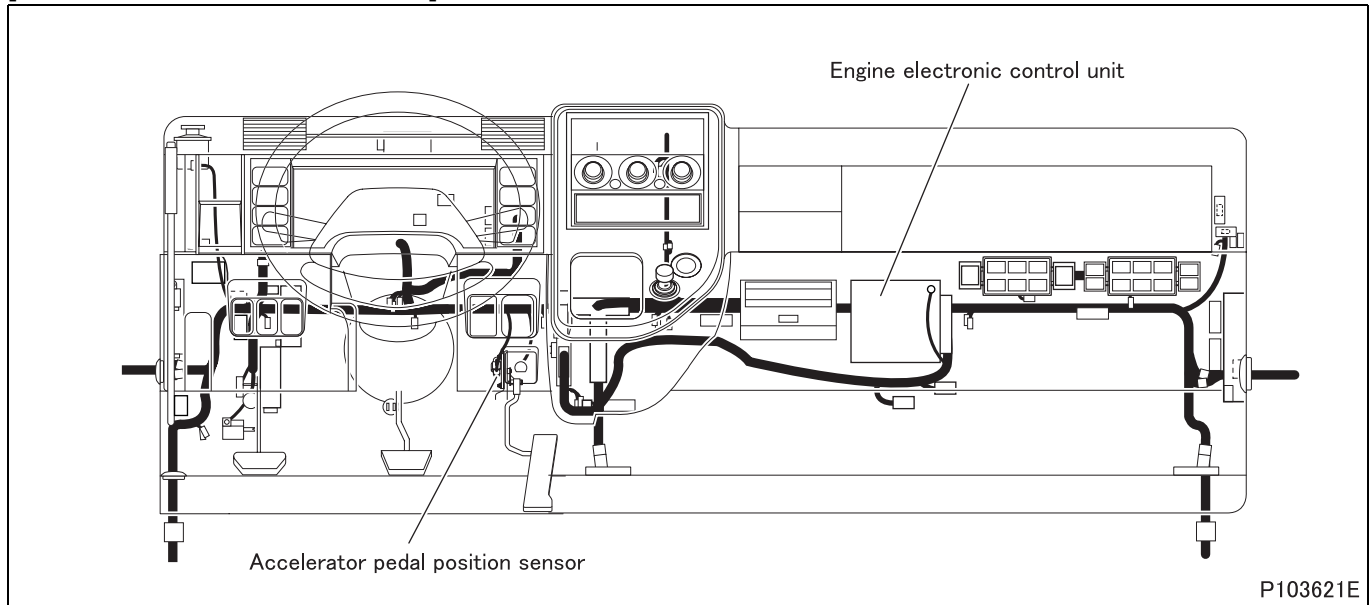
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure "Accelerator Pedal Position 1".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 40 "Accelerator sensor voltage 1" of Service Data.</li> </ul>   |
|        | Inspection condition                                   |               | –  |
|        | Requirements   |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Accelerator pedal not pressed: 0%</li> <li>• Accelerator pedal pressed: 100%</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Accelerator pedal not pressed: <math>0.85 \pm 0.1</math> V</li> <li>• Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
|        | NO   | Go to step 2. |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (signal)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE58A) terminal No. 34 (+) and No. 33 and No. 45 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine is stopped.</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• Accelerator pedal not pressed: <math>0.85 \pm 0.1</math> V</li> <li>• Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul>                      |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 5.   |
|        | NO   | Go to step 3. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 3 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE58A) terminal No. 35 (+) and No. 33 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine is stopped.</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.   |
|        | NO   | Go to step 5. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 4 | Inspection items                                       |               | Inspection by electronic control unit connector (ground)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE58A) terminal No. 33 (+) and No. 53 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine is stopped.</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |               | 0 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 6.   |
|        | NO   | Go to step 5. |   |

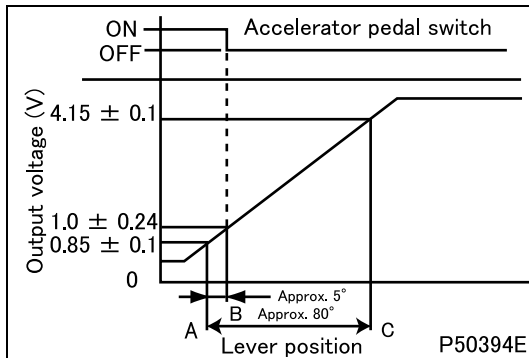
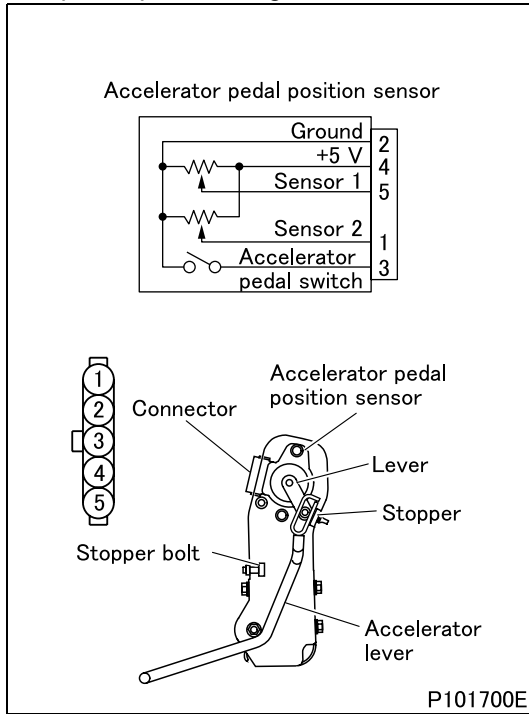
# TROUBLESHOOTING

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 5 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 12.  |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of sensor connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |  |  |
|--------|--|--|--|
| Step 7 | Inspection items                                       |  | Inspection of accelerator pedal position sensor 1 unit   |
|        | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 5 (+) and 2 (-).   |
|        | Inspection condition                                   |  | Apply voltage DC 5 V across connector terminals No. 4 (+) and 2 (-).   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Idle position A: <math>0.85 \pm 0.1</math> V</li> <li>• Accelerator switch operating position B: <math>1.0 \pm 0.24</math> V</li> <li>• Full load position C: <math>4.15 \pm 0.1</math> V <ul style="list-style-type: none"> <li>• A: When accelerator lever is in contact with stopper</li> <li>• B: When accelerator pedal is pressed until there is no continuity between terminals 2 and 3.</li> <li>• C: When lever is in contact with full load stopper bolt</li> </ul> </li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8.  |
| NO     |  | Adjustment of sensor (If the measurement deviates from the standard value after adjustment, replace the sensor.) (See "INSPECTION OF ELECTRICAL PARTS" – "INSPECTION OF ACCELERATOR PEDAL POSITION SENSOR".) |  |

<Step 7 inspection diagram>



|        |  |   |                |  |
|--------|--|---|----------------|--|
| Step 8 | Inspection items                                       | Inspection by sensor connector  |                |  |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 4 (+) and 2 (-).  |                |  |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Starter switch: ON</li> <li>Engine is stopped.</li> <li>Measure from back side of connector of harness with each device connected to harness.</li> </ul> |                |  |
|        | Requirements   | 5 V   |                |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 10. |  |
|        |  | NO  | Go to step 9.  |  |

|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 9 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)  |                 |  |
|        | Maintenance item                                       | Check circuit between electronic control unit connector (GE58A) terminal No. 35 and sensor connector terminal No. 4.   |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector. (As connector terminal is too small, use extra fine test lead/probe.) |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 12.  |  |
|        |  | NO   | Modify harness. |  |

# TROUBLESHOOTING

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE58A) terminal No. 33 and sensor connector terminal No. 2.   |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. (As connector terminal is too small, use extra fine test lead/probe.) |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO      |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE58A) terminal No. 34 and sensor connector terminal No. 5.   |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. (As connector terminal is too small, use extra fine test lead/probe.) |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |  |  |
|---------|--|--|--|
| Step 12 | Inspection items                                       |  | Inspection by control data   |
|         | Maintenance item                                       |  | <b>&lt;General Scanning Tool used&gt;</b> <ul style="list-style-type: none"> <li>• Measure item "Accelerator Pedal Position 1".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b> <ul style="list-style-type: none"> <li>• Measure item No. 40 "Accelerator sensor voltage 1" of Service Data.</li> </ul>  |
|         | Inspection condition                                   |  | —  |
|         | Requirements   |  | <b>&lt;General Scanning Tool used&gt;</b> <ul style="list-style-type: none"> <li>• Accelerator pedal not pressed: 0%</li> <li>• Accelerator pedal pressed: 100%</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b> <ul style="list-style-type: none"> <li>• Accelerator pedal not pressed: <math>0.85 \pm 0.1</math> V</li> <li>• Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul> |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic control unit |  |

**[Fault code]**

Diagnosis code: P0123/Flash code: 24

**[Monitor]**

Failure of accelerator pedal position sensor 1

**[Fault (outline)]**

High signal range check

**[Diagnosis check]**

- Accelerator pedal position sensor is monitored for output within specification.

**[Code generation condition]**

- Voltage from accelerator pedal position sensor 1 remains over 4.7 V for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Accelerator pedal position sensor 2 is computed with accelerator pedal position sensor 1 only.
- In-use performance counter is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

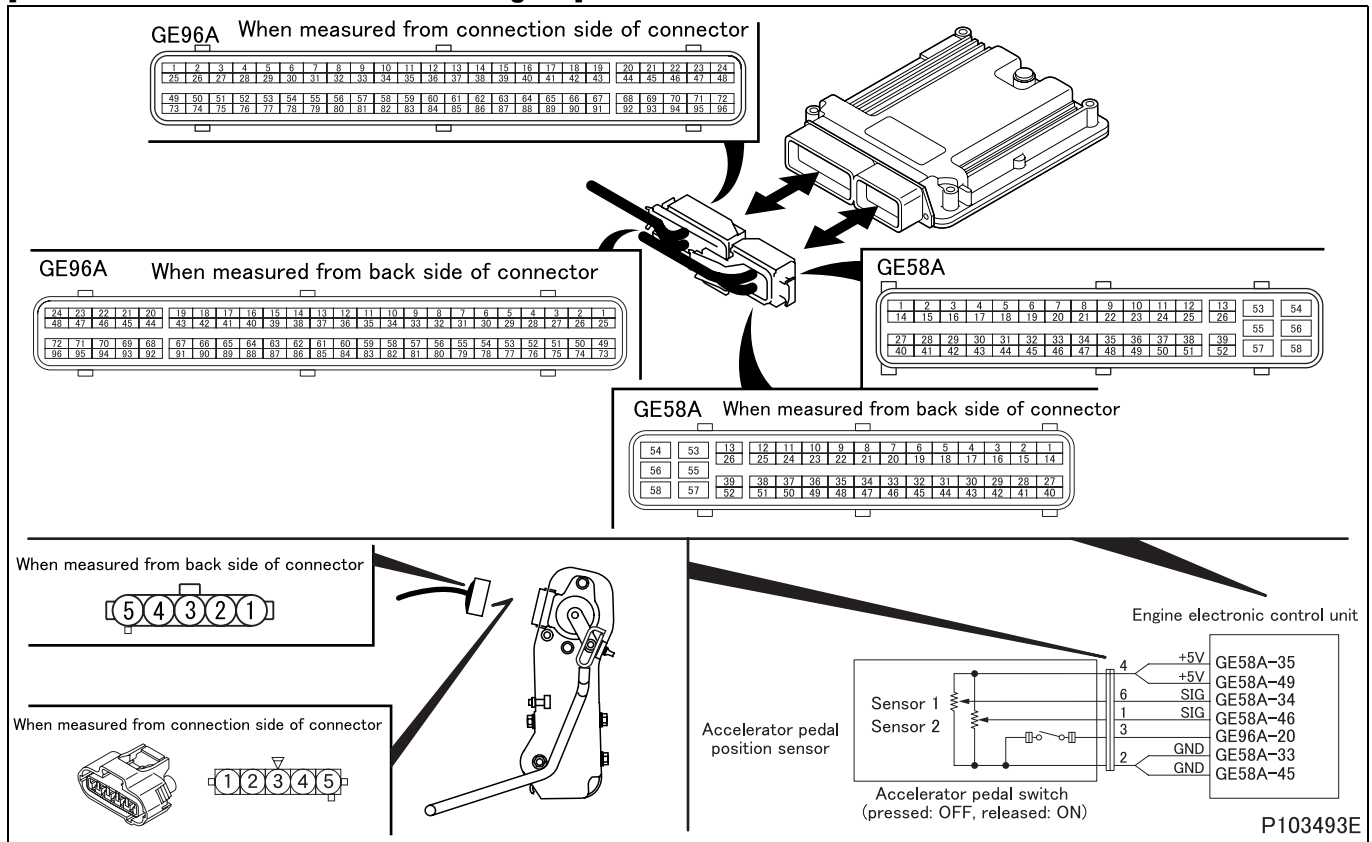
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

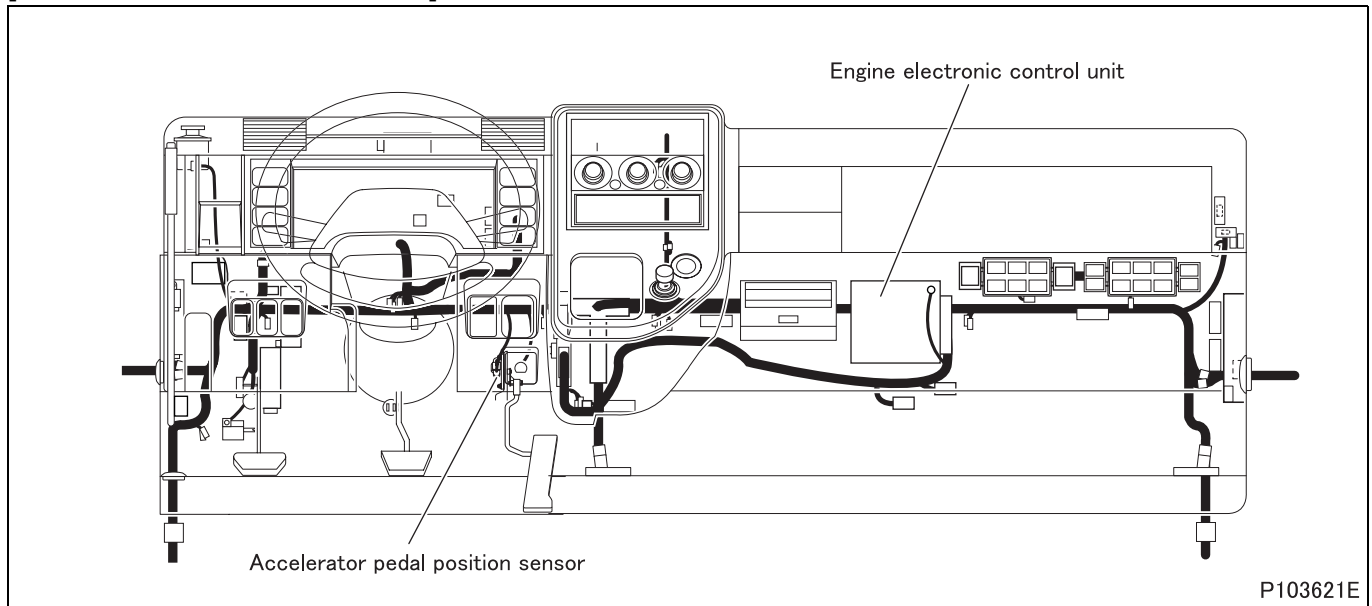
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



## [Parts Identification and Location]





**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |    |  |
|--------|--|----|--|
| Step 1 | Inspection items                                       |    | Inspection by control data   |
|        | Maintenance item                                       |    | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Accelerator Pedal Position 1".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 40 "Accelerator sensor voltage 1" of Service Data.</li> </ul>  |
|        | Inspection condition                                   |    | –  |
|        | Requirements   |    | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Accelerator pedal not pressed: 0%</li> <li>• Accelerator pedal pressed: 100%</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Accelerator pedal not pressed: <math>0.85 \pm 0.1</math> V</li> <li>• Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |    | YES  |
|        |  | NO | Go to step 2.  |

|        |  |    |   |
|--------|--|----|---|
| Step 2 | Inspection items                                       |    | Inspection by electronic control unit connector (signal)  |
|        | Maintenance item                                       |    | Measure value of voltage between connector (GE58A) terminal No. 34 (+) and No. 33 and No. 45 (-).   |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine is stopped.</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |    | <ul style="list-style-type: none"> <li>• Accelerator pedal not pressed: <math>0.85 \pm 0.1</math> V</li> <li>• Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul>                      |
|        | Inspection result (Is the judging standard satisfied?) |    | YES   |
|        |  | NO | Go to step 3.   |

|        |  |    |   |
|--------|--|----|---|
| Step 3 | Inspection items                                       |    | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |    | Measure value of voltage between connector (GE58A) terminal No. 35 (+) and No. 33 (-).  |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine is stopped.</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |    | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) |    | YES   |
|        |  | NO | Go to step 5.   |

|        |  |    |   |
|--------|--|----|---|
| Step 4 | Inspection items                                       |    | Inspection by electronic control unit connector (ground)  |
|        | Maintenance item                                       |    | Measure value of voltage between connector (GE58A) terminal No. 33 (+) and No. 53 (-).  |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine is stopped.</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |    | 0 V   |
|        | Inspection result (Is the judging standard satisfied?) |    | YES   |
|        |  | NO | Go to step 5.   |

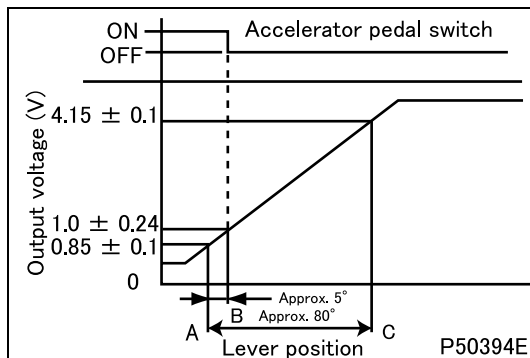
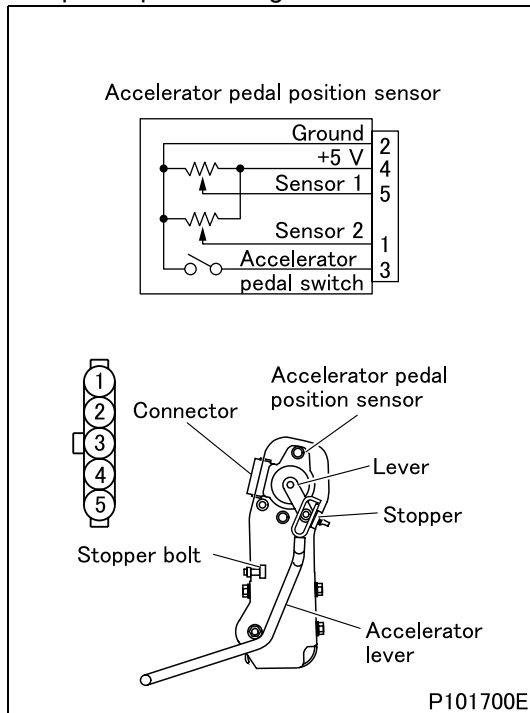
# TROUBLESHOOTING

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 5 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 12.  |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of sensor connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |  |  |
|--------|--|--|--|
| Step 7 | Inspection items                                       |  | Inspection of accelerator pedal position sensor 1 unit   |
|        | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 5 (+) and 2 (–).   |
|        | Inspection condition                                   |  | Apply voltage DC 5 V across connector terminals No. 4 (+) and 2 (–).   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Idle position A: <math>0.85 \pm 0.1</math> V</li> <li>• Accelerator switch operating position B: <math>1.0 \pm 0.24</math> V</li> <li>• Full load position C: <math>4.15 \pm 0.1</math> V <ul style="list-style-type: none"> <li>• A: When accelerator lever is in contact with stopper</li> <li>• B: When accelerator pedal is pressed until there is no continuity between terminals 2 and 3.</li> <li>• C: When lever is in contact with full load stopper bolt</li> </ul> </li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8.  |
| NO     |  | Adjustment of sensor (If the measurement deviates from the standard value after adjustment, replace the sensor.) (See “INSPECTION OF ELECTRICAL PARTS” – “INSPECTION OF ACCELERATOR PEDAL POSITION SENSOR”.) |  |

<Step 7 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by sensor connector  |
|        | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 4 (+) and 2 (-).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine is stopped.</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |  | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 10.<br>NO Go to step 9.  |

|        |  |  |  |
|--------|--|--|--|
| Step 9 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (power supply)  |
|        | Maintenance item                                       |  | Check circuit between electronic control unit connector (GE58A) terminal No. 35 and sensor connector terminal No. 4.   |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector. (As connector terminal is too small, use extra fine test lead/probe.) |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 12.<br>NO Modify harness.   |

# TROUBLESHOOTING

|         |  |  |                |
|---------|--|--|----------------|
| Step 10 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (ground)  |                |
|         | Maintenance item                                       | Check circuit between electronic control unit connector (GE58A) terminal No. 33 and sensor connector terminal No. 2.   |                |
|         | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector. (As connector terminal is too small, use extra fine test lead/probe.) |                |
|         | Requirements   | There is continuity.   |                |
|         | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 11. |
| NO      |  | Modify harness.  |                |

|         |  |  |                |
|---------|--|--|----------------|
| Step 11 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (signal)  |                |
|         | Maintenance item                                       | Check circuit between electronic control unit connector (GE58A) terminal No. 34 and sensor connector terminal No. 5.   |                |
|         | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector. (As connector terminal is too small, use extra fine test lead/probe.) |                |
|         | Requirements   | There is continuity.   |                |
|         | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 12. |
| NO      |  | Modify harness.  |                |

|         |  |  |                                    |
|---------|--|--|------------------------------------|
| Step 12 | Inspection items                                       | Inspection by control data   |                                    |
|         | Maintenance item                                       | <b>&lt;General Scanning Tool used&gt;</b> <ul style="list-style-type: none"> <li>• Measure item "Accelerator Pedal Position 1".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b> <ul style="list-style-type: none"> <li>• Measure item No. 40 "Accelerator sensor voltage 1" of Service Data.</li> </ul>  |                                    |
|         | Inspection condition                                   | -  |                                    |
|         | Requirements   | <b>&lt;General Scanning Tool used&gt;</b> <ul style="list-style-type: none"> <li>• Accelerator pedal not pressed: 0%</li> <li>• Accelerator pedal pressed: 100%</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b> <ul style="list-style-type: none"> <li>• Accelerator pedal not pressed: <math>0.85 \pm 0.1</math> V</li> <li>• Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul> |                                    |
|         | Inspection result (Is the judging standard satisfied?) | YES  | Go to transient fault (See Gr00.). |
| NO      |  | Replacement of electronic control unit   |                                    |

**[Fault code]**

Diagnosis code: P0127/Flash code: 27

**[Monitor]**

Abnormality of intercooler

**[Fault (outline)]**

Intercooler failure

**[Diagnosis check]**

- Intercooler outlet temperature is monitored to determine if it is within specified value.

**[Code generation condition]**

- Intercooler outlet temperature exceeds predetermined value.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Variation in engine speed: less than 300 rpm/s
- Exhaust shutter: open
- Engine speed: 1400 to 3000 rpm
- Vehicle speed: more than 20 km/h {12.4 MPH}
- Water temperature: 64 to 100°C {147 to 212°F}
- Approximate environment atmospheric temperature: -7 to 60°C {19 to 140°F}
- Engine running time: more than 60 seconds
- Turbocharger actuator: in order
- Controller area network communication of turbocharger electronic drive unit: in order
- Atmospheric pressure sensor: in order
- Boost pressure sensor: in order
- Water temperature sensor: in order
- Intake air temperature sensor: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order

**[Control effected by electronic control unit during fault]**

- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

- Abnormality of intercooler (clogging, leak)
- Malfunction of cooling fan and automatic cooling fan coupling unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |   |  |
|--------|--|---|--|
| Step 1 | Inspection items                                       |   | Inspection by control data   |
|        | Maintenance item                                       |   | Check if following diagnosis codes occur simultaneously.<br><ul style="list-style-type: none"> <li>• P0112 "INT Air Temp SNSR (Low)"</li> <li>• P0113 "INT Air Temp SNSR (High)"</li> <li>• P2199 "EGR Temp Sensor (Correlation)"</li> </ul> |
|        | Inspection condition                                   |   | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Do not start engine.</li> </ul>   |
|        | Requirements   |   | No codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 2.  |
| NO     |  | Inspect diagnosis code that is occurring. |  |

|        |  |                     |   |
|--------|--|---------------------|---|
| Step 2 | Inspection items                                       |                     | Inspection of intake air piping and hose for air leak |
|        | Maintenance item                                       |                     | Check for leak.                                       |
|        | Inspection condition                                   |                     | Engine at high idle speed or vehicle running          |
|        | Requirements   |                     | Free of air leakage or noise                          |
|        | Inspection result (Is the judging standard satisfied?) | YES                 | Go to step 3.   |
| NO     |  | Clamp is tightened. |   |

|        |  |                            |   |
|--------|--|----------------------------|---|
| Step 3 | Inspection items                                       |                            | Inspection of intercooler for leak and clogging |
|        | Maintenance item                                       |                            | Check intercooler for leak.                     |
|        | Inspection condition                                   |                            | –   |
|        | Requirements   |                            | Free of air leakage or not clogged.             |
|        | Inspection result (Is the judging standard satisfied?) | YES                        | Go to step 4.                                   |
| NO     |  | Replacement of intercooler |   |

|        |  |                             |   |
|--------|--|-----------------------------|---|
| Step 4 | Inspection items                                       |                             | Inspection of turbocharger boost pressure                                 |
|        | Maintenance item                                       |                             | Check of boost pressure   |
|        | Inspection condition                                   |                             | For boost pressure measurement and correction data calculation, see Gr15. |
|        | Requirements   |                             | Boost pressure is normal.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                         | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of turbocharger |   |

**[Fault code]**

Diagnosis code: P0128/Flash code: 5

**[Monitor]**

Failure of thermostat

**[Fault (outline)]**

Below regulating temperature

**[Diagnosis check]**

- Engine coolant temperature is monitored for rise up to standard level.

**[Code generation condition]**

- Actual engine coolant temperature is low at the point of predetermined time necessary for engine warm-up having passed.

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Water temperature at engine start:  $-7$  to  $45^{\circ}\text{C}$  { $19$  to  $113^{\circ}\text{F}$ }
- Intake air temperature at engine start: above  $-7^{\circ}\text{C}$  { $19^{\circ}\text{F}$ }
- Proportion of engine running time at idle: less than 50%
- When monitoring completed: This diagnosis code has already been cleared.
- Water temperature sensor: in order
- Boost pressure sensor: in order
- Intake air temperature sensor: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order

**[Control effected by electronic control unit during fault]**

- Effects no special control.

**[Probable cause of trouble]**

- Malfunction of thermostat unit (abnormality of valve opening temperature)
- Malfunction of radiator unit
- Malfunction of cooling fan and automatic cooling fan coupling unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |   |   |
|--------|--|---|---|
| Step 1 | Inspection items                                       |   | Inspection by control data  |
|        | Maintenance item                                       |   | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0117 "Water Temp SNSR (Low)"</li> <li>• P0118 "Water Temp SNSR (High)"</li> <li>• P011A "Water Temp SNSR"</li> </ul> |
|        | Inspection condition                                   |   | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: started</li> </ul>   |
|        | Requirements   |   | No codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 2.   |
| NO     |  | Inspect diagnosis code that is occurring. |   |

|        |  |                           |  |
|--------|--|---------------------------|--|
| Step 2 | Inspection items                                       |                           | Inspection of thermostat   |
|        | Maintenance item                                       |                           | Check thermostat for valve opening temperature and valve lift                            |
|        | Inspection condition                                   |                           | For measurement of thermostat valve opening temperature and valve lift, see shop manual. |
|        | Requirements   |                           | Thermostat is in normal condition.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                       | Go to transient fault (See Gr00.).   |
| NO     |  | Replacement of thermostat |  |



**[Fault code]**

Diagnosis code: P0148/Flash code: 22

**[Monitor]**

Abnormality of common rail pressure (pressure: low)

**[Fault (outline)]**

Plausibility

**[Diagnosis check]**

- Common rail pressure is monitored.

**[Code generation condition]**

- Common rail pressure remains below 100 bar for 30 seconds.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Engine stopped

**[Probable cause of trouble]**

- Malfunction of supply pump
- Malfunction of pressure limiter
- Airtight malfunction of injector
- Plugged fuel system
- Fuel leakage
- Malfunction of common rail pressure sensor

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(At the same time as recovery, warning lamp is extinguished and diagnosis code is cleared.)

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |   |  |
|--------|--|---|--|
| Step 1 | Inspection items                                       |   | Inspection by control data   |
|        | Maintenance item                                       |   | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0093 "CRS (Fuel Leak)"</li> <li>• P0148 "CRS (Fuel Delivery)"</li> <li>• P0191 "CRS Pressure SNSR (Plausibility)"</li> <li>• P0192 "CRS Pressure SNSR (Low)"</li> <li>• P0193 "CRS Pressure SNSR (High)"</li> <li>• P0201 "Injector M/V-Cylinder 1 (Load)"</li> <li>• P0202 "Injector M/V-Cylinder 2 (Load)"</li> <li>• P0203 "Injector M/V-Cylinder 3 (Load)"</li> <li>• P0204 "Injector M/V-Cylinder 4 (Load)"</li> <li>• P0261 "Injector #1-A (Low)"</li> <li>• P0262 "Injector #1-A (High)"</li> <li>• P0263 "Injector #1-A (Plausibility)"</li> <li>• P0264 "Injector #2-A (Low)"</li> <li>• P0265 "Injector #2-A (High)"</li> <li>• P0266 "Injector #2-A (Plausibility)"</li> <li>• P0267 "Injector #3-A (Low)"</li> <li>• P0268 "Injector #3-A (High)"</li> <li>• P0269 "Injector #3-A (Plausibility)"</li> <li>• P0270 "Injector #4-A (Low)"</li> <li>• P0271 "Injector #4-A (High)"</li> <li>• P0272 "Injector #4-A (Plausibility)"</li> <li>• P0562 "Power Supply Voltage (Low)"</li> <li>• P0563 "Power Supply Voltage (High)"</li> <li>• P0607 "ECU System"</li> <li>• P060B "A/D Converter"</li> <li>• P061B "ECU Performance (Calc)"</li> <li>• P061C "ECU Performance (Ne)"</li> </ul> |
|        | Inspection condition                                   |   | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Do not start engine</li> </ul>  |
|        | Requirements   |   | No codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 2.  |
|        | NO   | Inspect diagnosis code that is occurring. |  |

|        |  |               |                                  |
|--------|--|---------------|----------------------------------|
| Step 2 | Inspection items                                       |               | Checking of engine appearance    |
|        | Maintenance item                                       |               | Check fuel system for fuel leak. |
|        | Inspection condition                                   |               | Starter switch: OFF              |
|        | Requirements   |               | There is no fuel leak.           |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.                    |
|        | NO   | Go to step 6. |                                  |

|        |  |   |   |
|--------|--|---|---|
| Step 3 | Inspection items                                       |   | Inspection of low pressure piping (fuel tank – supply pump) |
|        | Maintenance item                                       |   | Check suction pipe or hose for bend.                        |
|        | Inspection condition                                   |   | Starter switch: OFF   |
|        | Requirements   |   | There is no bend on pipe or hose.                           |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 4.   |
|        | NO   | Correct and replace suction pipe or hose. |   |

|        |  |               |                                    |
|--------|--|---------------|------------------------------------|
| Step 4 | Inspection items                                       |               | Checking of air bleeding           |
|        | Maintenance item                                       |               | Bleed air from fuel filter.        |
|        | Inspection condition                                   |               | Starter switch: OFF                |
|        | Requirements   |               | Problem is solved by bleeding air. |
|        | Inspection result (Is the judging standard satisfied?) | YES           | –                                  |
|        | NO   | Go to step 5. |                                    |

|        |  |               |   |
|--------|--|---------------|---|
| Step 5 | Inspection items                                       |               | Inspection of low pressure piping           |
|        | Maintenance item                                       |               | Fuel filter                                 |
|        | Inspection condition                                   |               | Starter switch: OFF                         |
|        | Requirements   |               | Problem is solved by replacing fuel filter. |
|        | Inspection result (Is the judging standard satisfied?) | YES           | –   |
| NO     |  | Go to step 6. |   |

|        |  |                            |  |
|--------|--|----------------------------|--|
| Step 6 | Inspection items                                       |                            | Inspection by control data                           |
|        | Maintenance item                                       |                            | Perform actuator test item No. B2 “Fuel Leak Check”. |
|        | Inspection condition                                   |                            | Engine start: At idle                                |
|        | Requirements   |                            | There is no leak from supply pump.                   |
|        | Inspection result (Is the judging standard satisfied?) | YES                        | Go to step 7.  |
| NO     |  | Replacement of supply pump |  |

|        |  |                          |   |
|--------|--|--------------------------|---|
| Step 7 | Inspection items                                       |                          | Inspection by control data                                    |
|        | Maintenance item                                       |                          | Perform actuator test item No. B2 “Fuel Leak Check”.          |
|        | Inspection condition                                   |                          | Engine start: At idle   |
|        | Requirements   |                          | There is no leak from fuel pipe between supply pump and rail. |
|        | Inspection result (Is the judging standard satisfied?) | YES                      | Go to step 8.   |
| NO     |  | Replacement of fuel pipe |   |

|        |  |                     |  |
|--------|--|---------------------|--|
| Step 8 | Inspection items                                       |                     | Inspection by control data                           |
|        | Maintenance item                                       |                     | Perform actuator test item No. B2 “Fuel Leak Check”. |
|        | Inspection condition                                   |                     | Engine start: At idle                                |
|        | Requirements   |                     | There is no leak from rail.                          |
|        | Inspection result (Is the judging standard satisfied?) | YES                 | Go to step 9.  |
| NO     |  | Replacement of rail |  |

|        |  |                               |  |
|--------|--|-------------------------------|--|
| Step 9 | Inspection items                                       |                               | Inspection by control data   |
|        | Maintenance item                                       |                               | Perform actuator test item No. B2 “Fuel Leak Check”.                         |
|        | Inspection condition                                   |                               | Engine start: At idle  |
|        | Requirements   |                               | There is no leak from fuel injection pipes (four) between injector and rail. |
|        | Inspection result (Is the judging standard satisfied?) | YES                           | Go to step 10.   |
| NO     |  | Replacement of injection pipe |  |

|         |  |                         |  |
|---------|--|-------------------------|--|
| Step 10 | Inspection items                                       |                         | Inspection by control data                           |
|         | Maintenance item                                       |                         | Perform actuator test item No. B2 “Fuel Leak Check”. |
|         | Inspection condition                                   |                         | Engine start: At idle                                |
|         | Requirements   |                         | There is no leak from injectors (four).              |
|         | Inspection result (Is the judging standard satisfied?) | YES                     | Go to step 11.                                       |
| NO      |  | Replacement of injector |  |

# TROUBLESHOOTING

|         |  |  |  |
|---------|--|--|--|
| Step 11 | Inspection items                                       |  | Check inside of combustion chamber.  |
|         | Maintenance item                                       |  | Check for fuel leak.   |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>After performing actuator test item No. B2 "Fuel Leak Check", stop engine.</li> <li>Remove glow plug, and check from glow plug mounting hole using bore scope.</li> </ul> |
|         | Requirements   |  | Inside of combustion chamber is not wet.   |
|         | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 12.   |
| NO      |  | Replacement of injector of object cylinder |  |

|         |  |                |   |
|---------|--|----------------|---|
| Step 12 | Inspection items                                       |                | Replacement of rail (flow damper and pressure limiter abnormal) |
|         | Maintenance item                                       |                | –   |
|         | Inspection condition                                   |                | –   |
|         | Requirements   |                | Problem is solved by replacing rail.                            |
|         | Inspection result (Is the judging standard satisfied?) | YES            | –   |
| NO      |  | Go to step 13. |   |

|         |  |                                 |   |
|---------|--|---------------------------------|---|
| Step 13 | Inspection items                                       |                                 | Replacement of supply pump                  |
|         | Maintenance item                                       |                                 | –   |
|         | Inspection condition                                   |                                 | –   |
|         | Requirements   |                                 | Problem is solved by replacing supply pump. |
|         | Inspection result (Is the judging standard satisfied?) | YES                             | –   |
| NO      |  | Replacement of injectors (four) |   |

**[Fault code]**

Diagnosis code: P0182/Flash code: 41

**[Monitor]**

Failure of fuel temperature sensor

**[Fault (outline)]**

Low signal range check

**[Diagnosis check]**

- Fuel temperature sensor output voltage is monitored.

**[Code generation condition]**

- Fuel temperature sensor output voltage remains below 0.15 V for 3 seconds. (Diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Fuel temperature is fixed at backup value.
- Fuel system temperature is fixed at backup value.
- Related fault check is stopped.

**[Probable cause of trouble]**

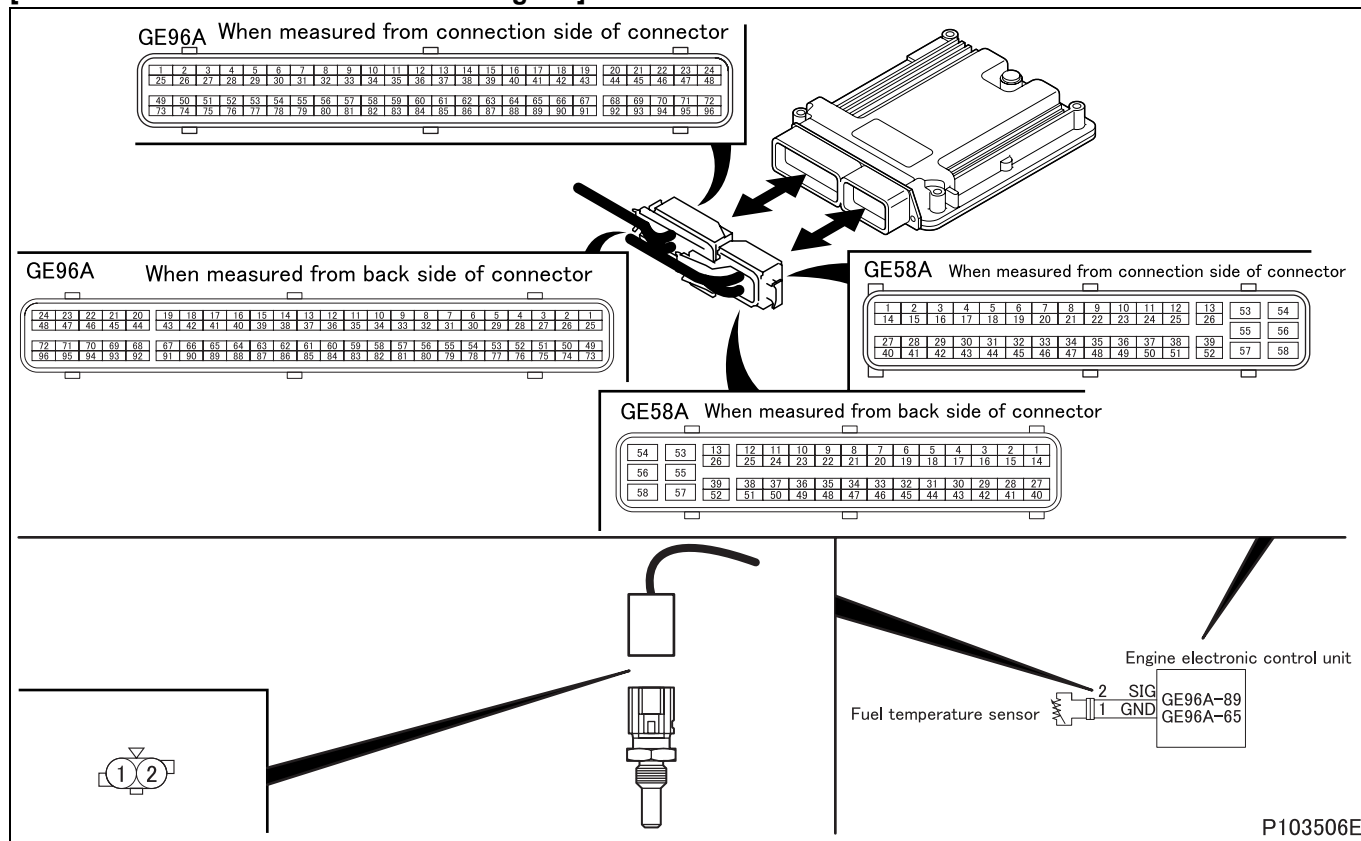
- Open-circuit or short-circuit of harness between electronic control unit and fuel temperature sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

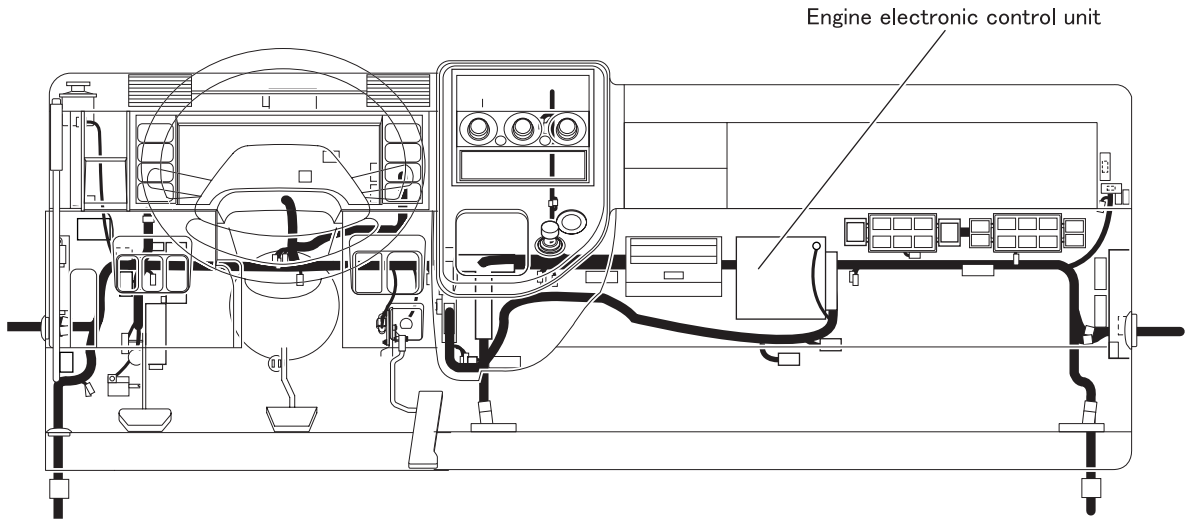
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

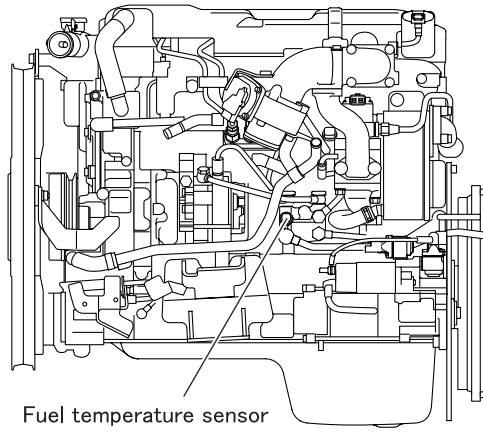
## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



Left side view of engine



P103632E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Measure item No. 33 "Fuel Temperature (inlet)" of Service Data.   |
|        | Inspection condition                                   |               | —   |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• When engine is cold: Temperature is equivalent to outside temperature.</li> <li>• While engine is warmed up: Temperature gradually increases.</li> <li>• When engine is stopped after warm-up: Temperature rise up just after engine stopped, then gradually decline.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 65 and 89.   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul>  |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• 20°C {68°F}: <math>2.45^{+0.14}_{-0.13}</math> kΩ</li> <li>• 80°C {176°F}: <math>0.318 \pm 0.008</math> kΩ</li> <li>• 110°C {230°F}: <math>0.1417 \pm 0.0018</math> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

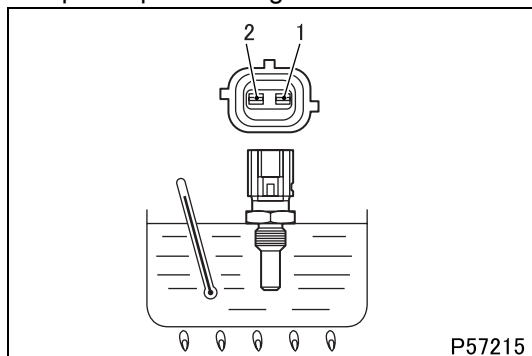
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | —   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of sensor connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | —   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |



|        |  |  |               |
|--------|--|--|---------------|
| Step 5 | Inspection items                                       | Inspection of fuel temperature sensor unit   |               |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 1 and 2.   |               |
|        | Inspection condition                                   | Put sensor in container filled with engine oil.  |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• 20°C {68°F}: 2.45 <sup>+0.14</sup><sub>-0.13</sub> kΩ</li> <li>• 80°C {176°F}: 0.318 ± 0.008 kΩ</li> <li>• 110°C {230°F}: 0.1417 ± 0.0018 kΩ</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 6. |
| NO     |  | Replacement of sensor  |               |

<Step 5 inspection diagram>



|        |  |  |               |
|--------|--|--|---------------|
| Step 6 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)                                      |               |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 89. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                           |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7. |
| NO     |  | Modify harness.  |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (ground)  |               |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 65. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                           |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Modify harness.  |               |

|        |  |   |                                    |
|--------|--|---|------------------------------------|
| Step 8 | Inspection items                                       | Inspection by control data  |                                    |
|        | Maintenance item                                       | Measure item No. 33 "Fuel Temperature (inlet)" of Service Data.   |                                    |
|        | Inspection condition                                   | -   |                                    |
|        | Requirements   | <ul style="list-style-type: none"> <li>• When engine is cold: Temperature is equivalent to outside temperature.</li> <li>• While engine is warmed up: Temperature gradually increases.</li> <li>• When engine is stopped after warm-up: Temperature rise up just after engine stopped, then gradually decline.</li> </ul> |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.). |
| NO     |  | Replacement of electronic control unit  |                                    |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0183/Flash code: 41

## **[Monitor]**

Failure of fuel temperature sensor

## **[Fault (outline)]**

High signal range check

## **[Diagnosis check]**

- Fuel temperature sensor output voltage is monitored.

## **[Code generation condition]**

- Fuel temperature sensor output voltage remains above 4.8 V for 3 seconds. (Diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Fuel temperature is fixed at backup value.
- Fuel system temperature is fixed at backup value.
- Related fault check is stopped.

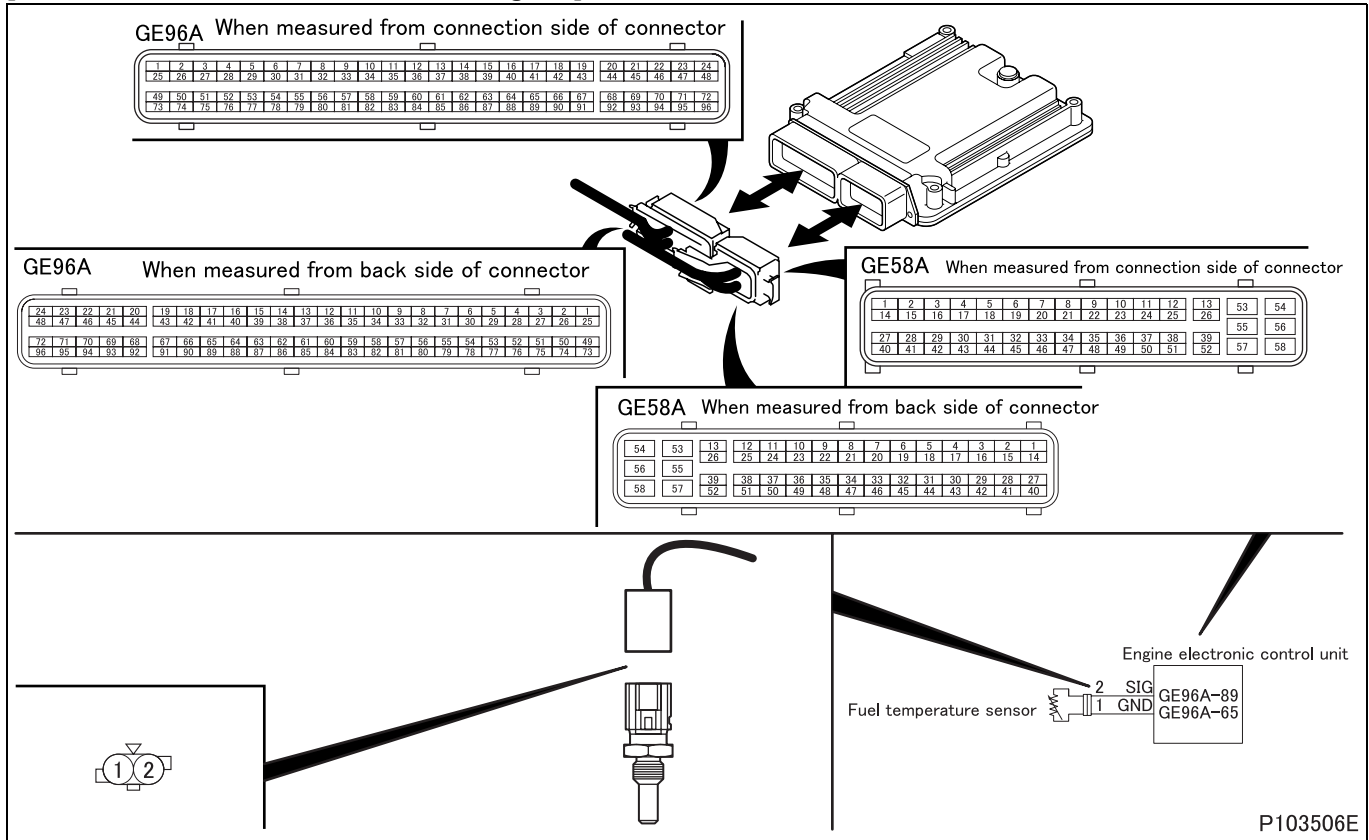
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and fuel temperature sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

## **[Recoverability]**

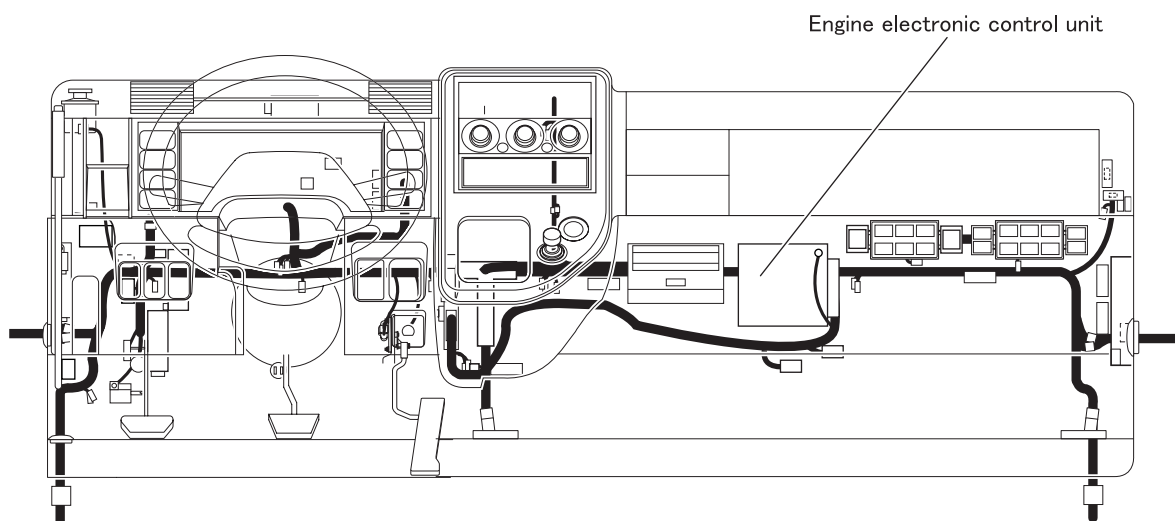
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

[Electronic Control Unit Connection Diagram]

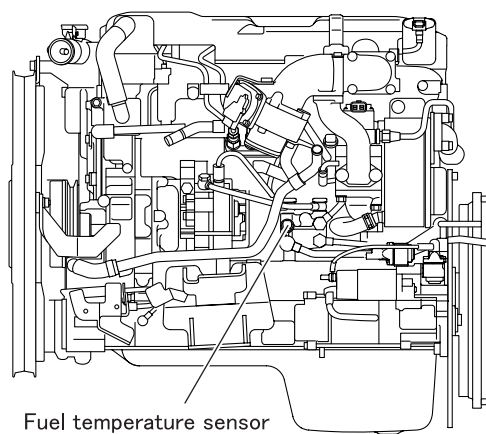


# TROUBLESHOOTING

## [Parts Identification and Location]



Left side view of engine



P103632E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |   |                                    |
|--------|--|---|------------------------------------|
| Step 1 | Inspection items                                       | Inspection by control data  |                                    |
|        | Maintenance item                                       | Measure item No. 33 "Fuel Temperature (inlet)" of Service Data.   |                                    |
|        | Inspection condition                                   | -   |                                    |
|        | Requirements   | <ul style="list-style-type: none"> <li>• When engine is cold: Temperature is equivalent to outside temperature.</li> <li>• While engine is warmed up: Temperature gradually increases.</li> <li>• When engine is stopped after warm-up: Temperature rise up just after engine stopped, then gradually decline.</li> </ul> |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.). |
| NO     |  | Go to step 2.   |                                    |

|        |  |  |               |
|--------|--|--|---------------|
| Step 2 | Inspection items                                       | Inspection by electronic control unit connector  |               |
|        | Maintenance item                                       | Measure value of voltage between connector (GE96A) terminal No. 65 and 89.   |               |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul>                          |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• 20°C {68°F}: 2.45 <sup>+0.14</sup><sub>-0.13</sub> kΩ</li> <li>• 80°C {176°F}: 0.318 ± 0.008 kΩ</li> <li>• 110°C {230°F}: 0.1417 ± 0.0018 kΩ</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 3. |
| NO     |  | Go to step 4.  |               |

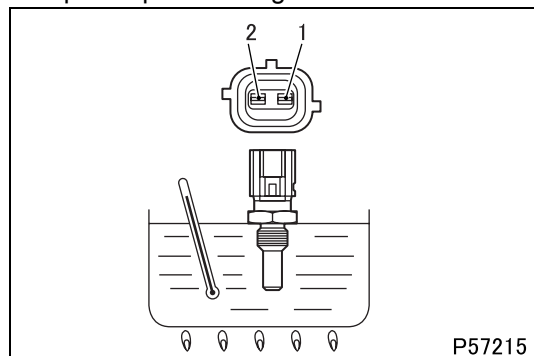
|        |  |   |               |
|--------|--|---|---------------|
| Step 3 | Inspection items                                       | Inspection of electronic control unit connector   |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8. |
| NO     |  | Modify connector.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 4 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5. |
| NO     |  | Modify connector.   |               |

# TROUBLESHOOTING

|        |  |                       |  |
|--------|--|-----------------------|--|
| Step 5 | Inspection items                                       |                       | Inspection of fuel temperature sensor unit   |
|        | Maintenance item                                       |                       | Measure value of voltage between connector terminal No. 1 and 2.   |
|        | Inspection condition                                   |                       | Put sensor in container filled with engine oil.  |
|        | Requirements   |                       | <ul style="list-style-type: none"> <li>• 20°C {68°F}: 2.45 <sup>+0.14</sup><sub>-0.13</sub> kΩ</li> <li>• 80°C {176°F}: 0.318 ± 0.008 kΩ</li> <li>• 110°C {230°F}: 0.1417 ± 0.0018 kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                   | Go to step 6.  |
| NO     |  | Replacement of sensor |  |

<Step 5 inspection diagram>



|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 89. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 65. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Measure item No. 33 "Fuel Temperature (inlet)" of Service Data.   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• When engine is cold: Temperature is equivalent to outside temperature.</li> <li>• While engine is warmed up: Temperature gradually increases.</li> <li>• When engine is stopped after warm-up: Temperature rise up just after engine stopped, then gradually decline.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

**[Fault code]**

Diagnosis code: P0191/Flash code: 11

**[Monitor]**

Characteristic abnormality of common rail pressure sensor

**[Fault (outline)]**

Offset

**[Diagnosis check]**

- Common rail pressure is monitored at starter switch ON.
- Common rail pressure is always monitored while driving.

**[Code generation condition]**

- Signal voltage from common rail pressure sensor remains excessively high (above 0.7 V) or low (below 0.3 V) for 3.2 seconds. (common rail pressure: above 100 bar or below –100 bar)  
(Diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the starter switch is turned from “stop” to “start” position.

**[Diagnostic requirement]**

- Status of engine: stop to start
- Water temperature: above 0°C {32°F}
- Delay time after starter switch ON: more than 3.2 seconds

**[Control effected by electronic control unit during fault]**

- Engine torque is limited.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Traction control is stopped <Automatic transmission>
- Diesel particulate filter regeneration is stopped.
- Injector actuator test is inhibited.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

**[Probable cause of trouble]**

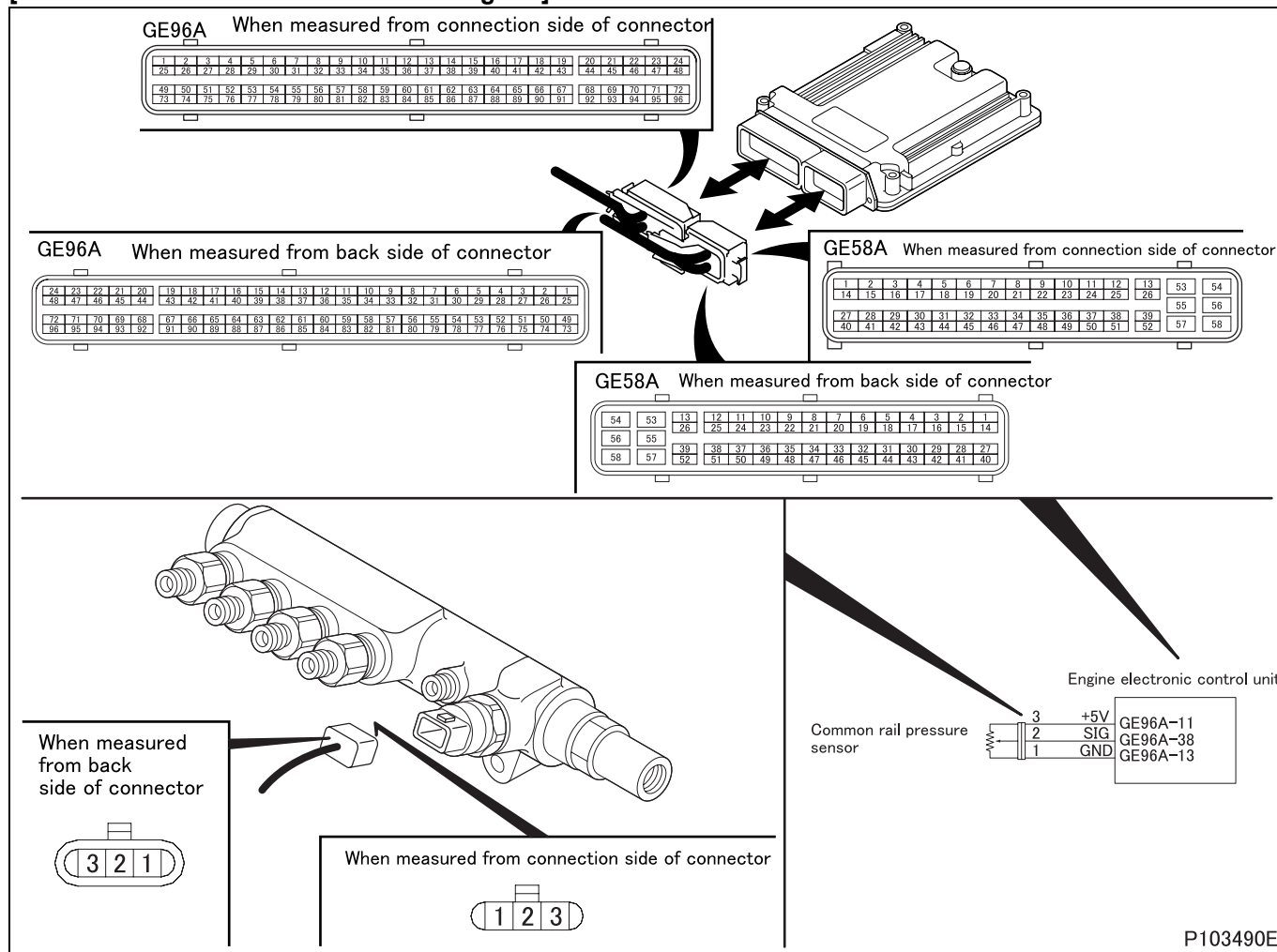
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit
- Malfunction of supply pump (overflow valve)
- Malfunction of pressure limiting valve
- Airtight malfunction of injector
- Plugged fuel system
- Fuel leakage
- Malfunction of common rail pressure sensor

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

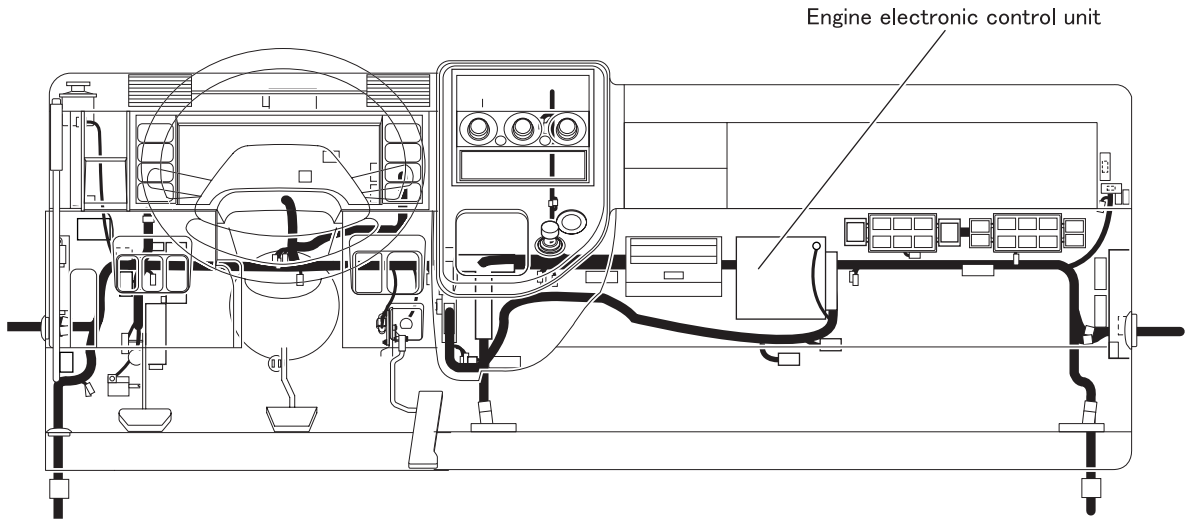
## [Electronic Control Unit Connection Diagram]



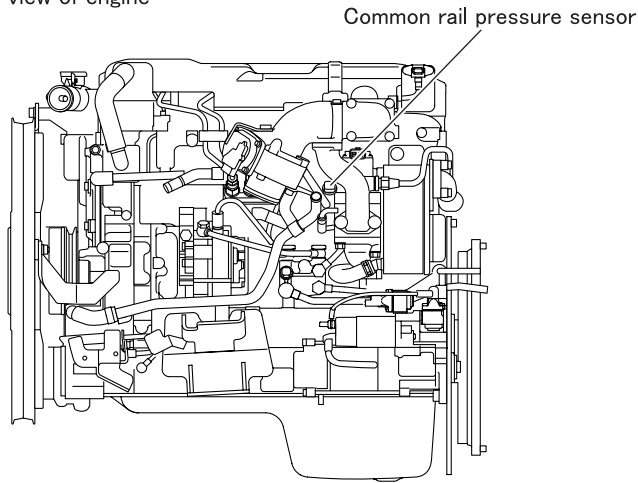
P103490E



[Parts Identification and Location]



Left side view of engine



P103618E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |   |  |
|--------|--|---|--|
| Step 1 | Inspection items                                       |   | Inspection by control data   |
|        | Maintenance item                                       |   | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0093 "CRS (Fuel Leak)"</li> <li>• P0148 "CRS (Fuel Delivery)"</li> <li>• P0191 "CRS Pressure SNSR (Plausibility)"</li> <li>• P0192 "CRS Pressure SNSR (Low)"</li> <li>• P0193 "CRS Pressure SNSR (High)"</li> <li>• P0201 "Injector M/V-Cylinder 1 (Load)"</li> <li>• P0202 "Injector M/V-Cylinder 2 (Load)"</li> <li>• P0203 "Injector M/V-Cylinder 3 (Load)"</li> <li>• P0204 "Injector M/V-Cylinder 4 (Load)"</li> <li>• P0261 "Injector #1-A (Low)"</li> <li>• P0262 "Injector #1-A (High)"</li> <li>• P0263 "Injector #1-A (Plausibility)"</li> <li>• P0264 "Injector #2-A (Low)"</li> <li>• P0265 "Injector #2-A (High)"</li> <li>• P0266 "Injector #2-A (Plausibility)"</li> <li>• P0267 "Injector #3-A (Low)"</li> <li>• P0268 "Injector #3-A (High)"</li> <li>• P0269 "Injector #3-A (Plausibility)"</li> <li>• P0270 "Injector #4-A (Low)"</li> <li>• P0271 "Injector #4-A (High)"</li> <li>• P0272 "Injector #4-A (Plausibility)"</li> <li>• P0562 "Power Supply Voltage (Low)"</li> <li>• P0563 "Power Supply Voltage (High)"</li> <li>• P0607 "ECU System"</li> <li>• P060B "A/D Converter"</li> <li>• P061B "ECU Performance (Calc)"</li> <li>• P061C "ECU Performance (Ne)"</li> </ul> |
|        | Inspection condition                                   |   | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Do not start engine.</li> </ul>   |
|        | Requirements   |   | No codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 2.  |
|        | NO   | Inspect diagnosis code that is occurring. |  |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | Measure item No. 1B "Actual Common Rail Pressure 2" of Service Data. |
|        | Inspection condition                                   |               | Starter switch: ON   |
|        | Requirements   |               | 0%   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).                                   |
|        | NO   | Go to step 3. |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 3 | Inspection items                                       |               | Inspection by electronic control unit connector (signal)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 38 (+) and 13 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 0.5 to 4.5 V  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 6.   |
|        | NO   | Go to step 4. |   |

|        |  |                     |   |
|--------|--|---------------------|---|
| Step 4 | Inspection items                                       |                     | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |                     | Measure value of voltage between connector (GE96A) terminal No. 11 (+) and 13 (-).  |
|        | Inspection condition                                   |                     | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |                     | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) |                     | YES<br>Go to step 5.  |
|        |  | NO<br>Go to step 6. |   |

|        |  |                     |   |
|--------|--|---------------------|---|
| Step 5 | Inspection items                                       |                     | Inspection by electronic control unit connector (ground)  |
|        | Maintenance item                                       |                     | Measure value of voltage between connector (GE96A) terminal No. 13 (+) and (GE58A) terminal No. 53 (-).   |
|        | Inspection condition                                   |                     | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |                     | 0 V   |
|        | Inspection result (Is the judging standard satisfied?) |                     | YES<br>Go to step 7.  |
|        |  | NO<br>Go to step 6. |   |

|        |  |                         |   |
|--------|--|-------------------------|---|
| Step 6 | Inspection items                                       |                         | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                         | Inspection of connector   |
|        | Inspection condition                                   |                         | –   |
|        | Requirements   |                         | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |                         | YES<br>Go to step 12.   |
|        |  | NO<br>Modify connector. |   |

|        |  |                         |   |
|--------|--|-------------------------|---|
| Step 7 | Inspection items                                       |                         | Inspection of sensor connector  |
|        | Maintenance item                                       |                         | Inspection of connector   |
|        | Inspection condition                                   |                         | –   |
|        | Requirements   |                         | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |                         | YES<br>Go to step 8.  |
|        |  | NO<br>Modify connector. |   |

|        |  |                     |   |
|--------|--|---------------------|---|
| Step 8 | Inspection items                                       |                     | Inspection of harness between electronic control unit and sensor (power supply)   |
|        | Maintenance item                                       |                     | Measure value of voltage between connector terminal No. 3 (+) and 1 (-).  |
|        | Inspection condition                                   |                     | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |                     | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) |                     | YES<br>Go to step 10.   |
|        |  | NO<br>Go to step 9. |   |

# TROUBLESHOOTING

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 11. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO     |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 13. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO      |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 38. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of sensor, go to step 12   |
| NO      |  | Modify harness. |  |

|         |  |                     |  |
|---------|--|---------------------|--|
| Step 12 | Inspection items                                       |                     | Inspection by control data   |
|         | Maintenance item                                       |                     | Measure item No. 1B "Actual Common Rail Pressure 2" of Service Data. |
|         | Inspection condition                                   |                     | Starter switch: ON   |
|         | Requirements   |                     | 0%   |
|         | Inspection result (Is the judging standard satisfied?) | YES                 | Go to step 13.   |
| NO      |  | Replacement of rail |  |

|         |  |                |                                  |
|---------|--|----------------|----------------------------------|
| Step 13 | Inspection items                                       |                | Checking of engine appearance    |
|         | Maintenance item                                       |                | Check fuel system for fuel leak. |
|         | Inspection condition                                   |                | Starter switch: OFF              |
|         | Requirements   |                | There is no fuel leak.           |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 14.                   |
| NO      |  | Go to step 17. |                                  |

|         |  |   |   |
|---------|--|---|---|
| Step 14 | Inspection items                                       |   | Inspection of low pressure piping (fuel tank – supply pump) |
|         | Maintenance item                                       |   | Check suction pipe or hose for bend.                        |
|         | Inspection condition                                   |   | Starter switch: OFF   |
|         | Requirements   |   | There is no bend on pipe or hose.                           |
|         | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 15.  |
| NO      |  | Correct and replace suction pipe or hose. |   |

|         |  |                |                                    |
|---------|--|----------------|------------------------------------|
| Step 15 | Inspection items                                       |                | Checking of air bleeding           |
|         | Maintenance item                                       |                | Bleed air from fuel filter.        |
|         | Inspection condition                                   |                | Starter switch: OFF                |
|         | Requirements   |                | Problem is solved by bleeding air. |
|         | Inspection result (Is the judging standard satisfied?) | YES            | –                                  |
| NO      |  | Go to step 16. |                                    |

|         |  |                |   |
|---------|--|----------------|---|
| Step 16 | Inspection items                                       |                | Inspection of low pressure piping           |
|         | Maintenance item                                       |                | Fuel filter                                 |
|         | Inspection condition                                   |                | Starter switch: OFF                         |
|         | Requirements   |                | Problem is solved by replacing fuel filter. |
|         | Inspection result (Is the judging standard satisfied?) | YES            | –   |
| NO      |  | Go to step 17. |   |

|         |  |                            |                                    |
|---------|--|----------------------------|------------------------------------|
| Step 17 | Inspection items                                       |                            | Checking of supply pump            |
|         | Maintenance item                                       |                            | Check supply pump for fuel leak.   |
|         | Inspection condition                                   |                            | Engine start: At idle              |
|         | Requirements   |                            | There is no leak from supply pump. |
|         | Inspection result (Is the judging standard satisfied?) | YES                        | Go to step 18.                     |
| NO      |  | Replacement of supply pump |                                    |

|         |  |                          |   |
|---------|--|--------------------------|---|
| Step 18 | Inspection items                                       |                          | Checking of fuel pipe between supply pump and rail            |
|         | Maintenance item                                       |                          | Check fuel pipe between supply pump and rail for fuel leak.   |
|         | Inspection condition                                   |                          | Engine start: At idle   |
|         | Requirements   |                          | There is no leak from fuel pipe between supply pump and rail. |
|         | Inspection result (Is the judging standard satisfied?) | YES                      | Go to step 19.  |
| NO      |  | Replacement of fuel pipe |   |

|         |  |                     |                             |
|---------|--|---------------------|-----------------------------|
| Step 19 | Inspection items                                       |                     | Checking of rail            |
|         | Maintenance item                                       |                     | Check rail for fuel leak.   |
|         | Inspection condition                                   |                     | Engine start: At idle       |
|         | Requirements   |                     | There is no leak from rail. |
|         | Inspection result (Is the judging standard satisfied?) | YES                 | Go to step 20.              |
| NO      |  | Replacement of rail |                             |

|         |  |                               |  |
|---------|--|-------------------------------|--|
| Step 20 | Inspection items                                       |                               | Checking of injection pipes (four) between injector and rail                 |
|         | Maintenance item                                       |                               | Check injection pipes (four) between injector and rail for fuel leak.        |
|         | Inspection condition                                   |                               | Engine start: At idle  |
|         | Requirements   |                               | There is no leak from fuel injection pipes (four) between injector and rail. |
|         | Inspection result (Is the judging standard satisfied?) | YES                           | Go to step 21.   |
| NO      |  | Replacement of injection pipe |  |

# TROUBLESHOOTING

|         |  |                         |   |
|---------|--|-------------------------|---|
| Step 21 | Inspection items                                       |                         | Checking of injectors (four)            |
|         | Maintenance item                                       |                         | Check injectors (four) for fuel leak.   |
|         | Inspection condition                                   |                         | Engine start: At idle                   |
|         | Requirements   |                         | There is no leak from injectors (four). |
|         | Inspection result (Is the judging standard satisfied?) | YES                     | Go to step 22.                          |
| NO      |  | Replacement of injector |   |

|         |  |  |  |
|---------|--|--|--|
| Step 22 | Inspection items                                       |  | Check inside of combustion chamber.  |
|         | Maintenance item                                       |  | Check for fuel leak.   |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>After performing actuator test item No. B2 "Fuel Leak Check", stop engine.</li> <li>Remove glow plug, and check from glow plug mounting hole using bore scope.</li> </ul> |
|         | Requirements   |  | Inside of combustion chamber is not wet.   |
|         | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 23.   |
| NO      |  | Replacement of injector of object cylinder |  |

|         |  |                |  |
|---------|--|----------------|--|
| Step 23 | Inspection items                                       |                | Replacement of rail (common rail pressure sensor, flow damper and pressure limiter abnormal) |
|         | Maintenance item                                       |                | –  |
|         | Inspection condition                                   |                | –  |
|         | Requirements   |                | Problem is solved by replacing rail.   |
|         | Inspection result (Is the judging standard satisfied?) | YES            | –  |
| NO      |  | Go to step 24. |  |

|         |  |                                 |   |
|---------|--|---------------------------------|---|
| Step 24 | Inspection items                                       |                                 | Replacement of supply pump                  |
|         | Maintenance item                                       |                                 | –   |
|         | Inspection condition                                   |                                 | –   |
|         | Requirements   |                                 | Problem is solved by replacing supply pump. |
|         | Inspection result (Is the judging standard satisfied?) | YES                             | –   |
| NO      |  | Replacement of injectors (four) |   |

**[Fault code]**

Diagnosis code: P0192/Flash code: 11

**[Monitor]**

Failure of common rail pressure sensor

**[Fault (outline)]**

Low signal range check

**[Diagnosis check]**

- Common rail pressure sensor output voltage after engine start is monitored.

**[Code generation condition]**

- Value of voltage from common rail pressure sensor remains below 0.2 V for 0.25 seconds. (common rail pressure: below –150 bar)  
(Diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

–

**[Control effected by electronic control unit during fault]**

- Engine torque is limited.
- Common rail pressure control is switched to open loop control mode.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Traction control is stopped <Automatic transmission>
- Diesel particulate filter regeneration is stopped.
- Injector actuator test is inhibited.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

**[Probable cause of trouble]**

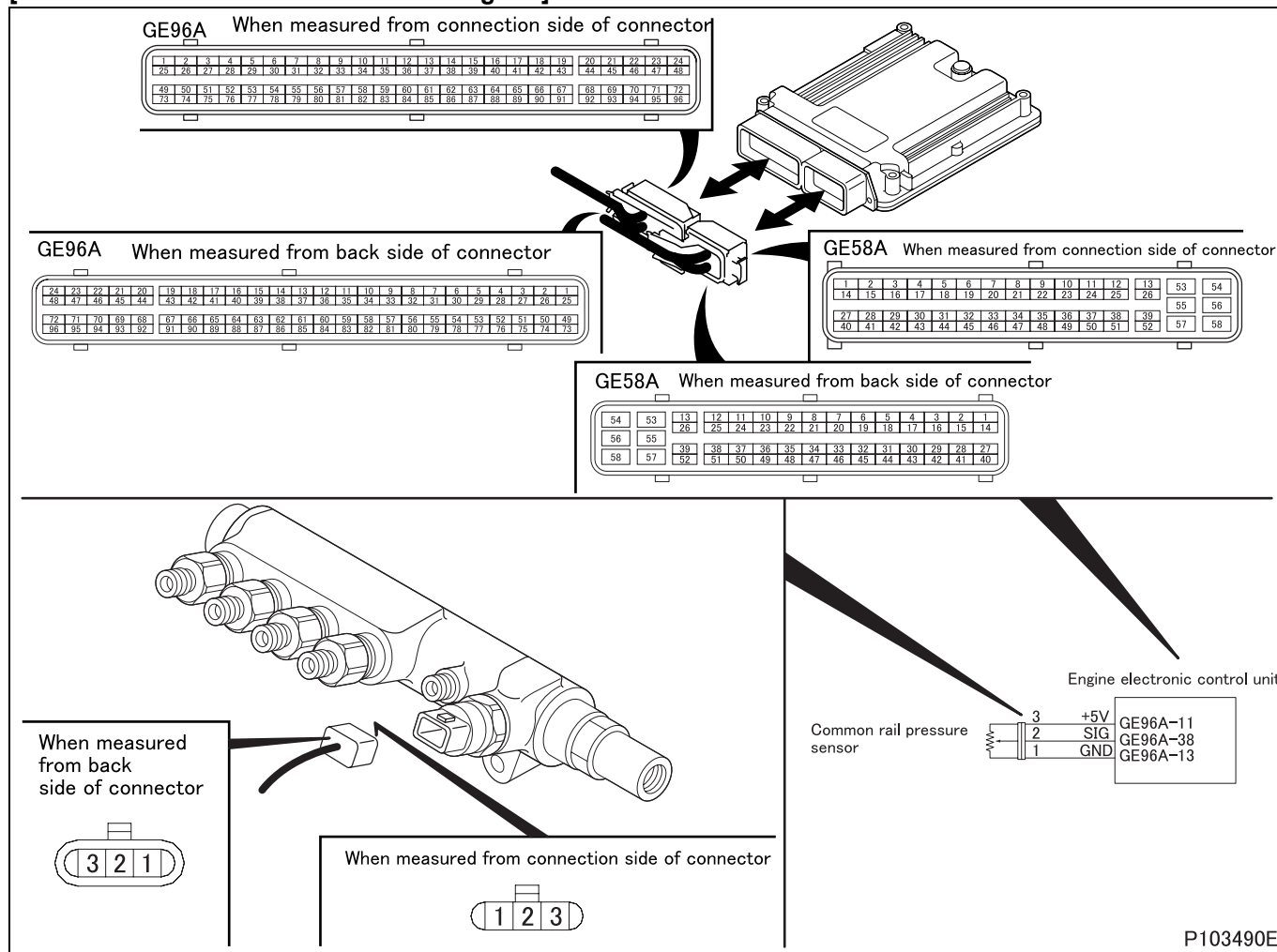
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

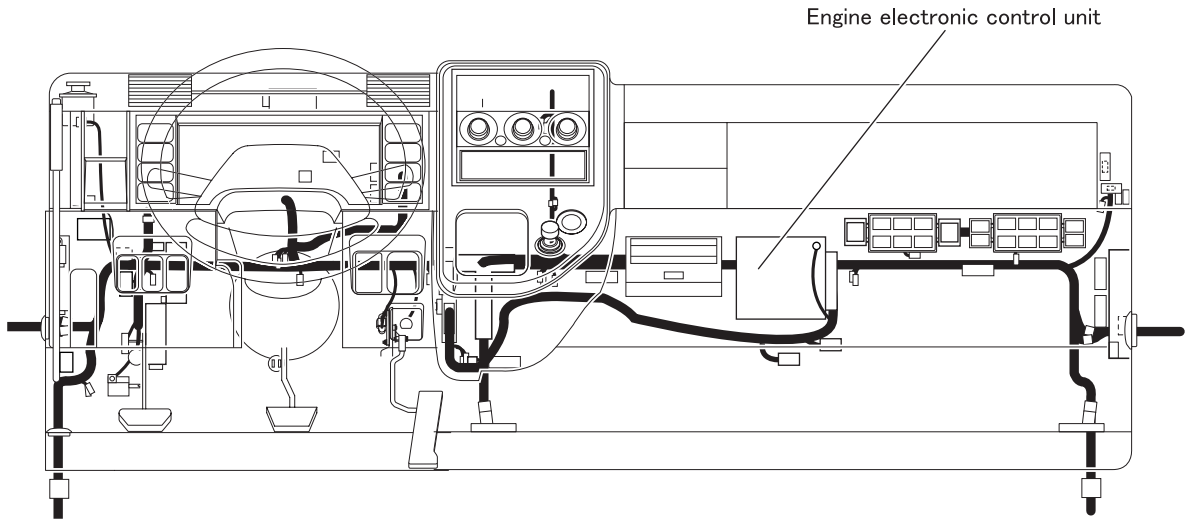
## [Electronic Control Unit Connection Diagram]



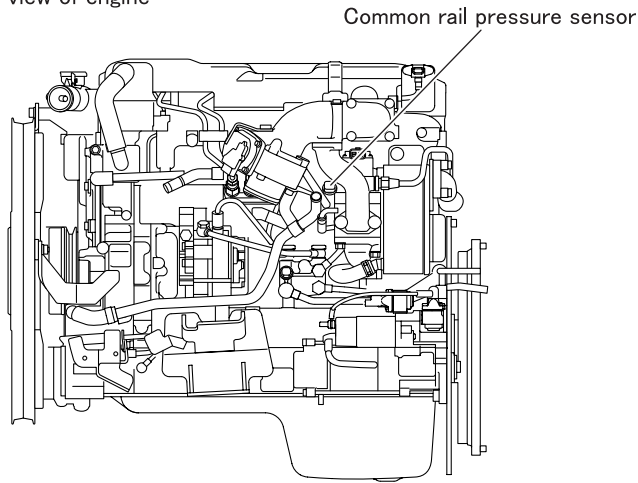
P103490E



[Parts Identification and Location]



Left side view of engine



P103618E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Measure item No. 0A "Reference Injection Quantity" of Service Data. |
|        | Inspection condition                                   |  | Starter switch: ON  |
|        | Requirements   |  | 0%  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection by electronic control unit connector (signal)  |
|        | Maintenance item                                       |  | Measure value of voltage between connector (GE96A) terminal No. 38 (+) and 13 (-).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |  | 0.5 to 4.5 V  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |  | Measure value of voltage between connector (GE96A) terminal No. 11 (+) and 13 (-).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |  | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection by electronic control unit connector (ground)  |
|        | Maintenance item                                       |  | Measure value of voltage between connector (GE96A) terminal No. 13 (+) and (GE58A) terminal No. 53 (-).   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |  | 0 V   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 5 | Inspection items                                       |  | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | -   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of sensor connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 7 | Inspection items                                       |               | Inspection of harness between electronic control unit and sensor (power supply)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector terminal No. 3 (+) and 1 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 9.   |
| NO     |  | Go to step 8. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 8 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 11. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 13. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 10.   |
| NO     |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 38. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of sensor, go to step 11   |
| NO      |  | Modify harness. |  |

# TROUBLESHOOTING

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|         |  |  |   |
|---------|--|--|---|
| Step 11 | Inspection items                                       |  | Inspection by control data  |
|         | Maintenance item                                       |  | Measure item No. 0A "Reference Injection Quantity" of Service Data. |
|         | Inspection condition                                   |  | Starter switch: ON  |
|         | Requirements   |  | 0%  |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).                                  |
| NO      |  | Replacement of electronic control unit |   |

**[Fault code]**

Diagnosis code: P0193/Flash code: 11

**[Monitor]**

Failure of common rail pressure sensor

**[Fault (outline)]**

High signal range check

**[Diagnosis check]**

- Common rail pressure sensor output voltage after engine start is monitored.

**[Code generation condition]**

- Value of voltage from common rail pressure sensor remains above 4.8 V for 0.25 seconds. (common rail pressure: above 2300 bar)  
(Diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Engine torque is limited.
- Common rail pressure control is switched to open loop control mode.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Traction control is stopped <Automatic transmission>
- Diesel particulate filter regeneration is stopped.
- Injector actuator test is inhibited.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

**[Probable cause of trouble]**

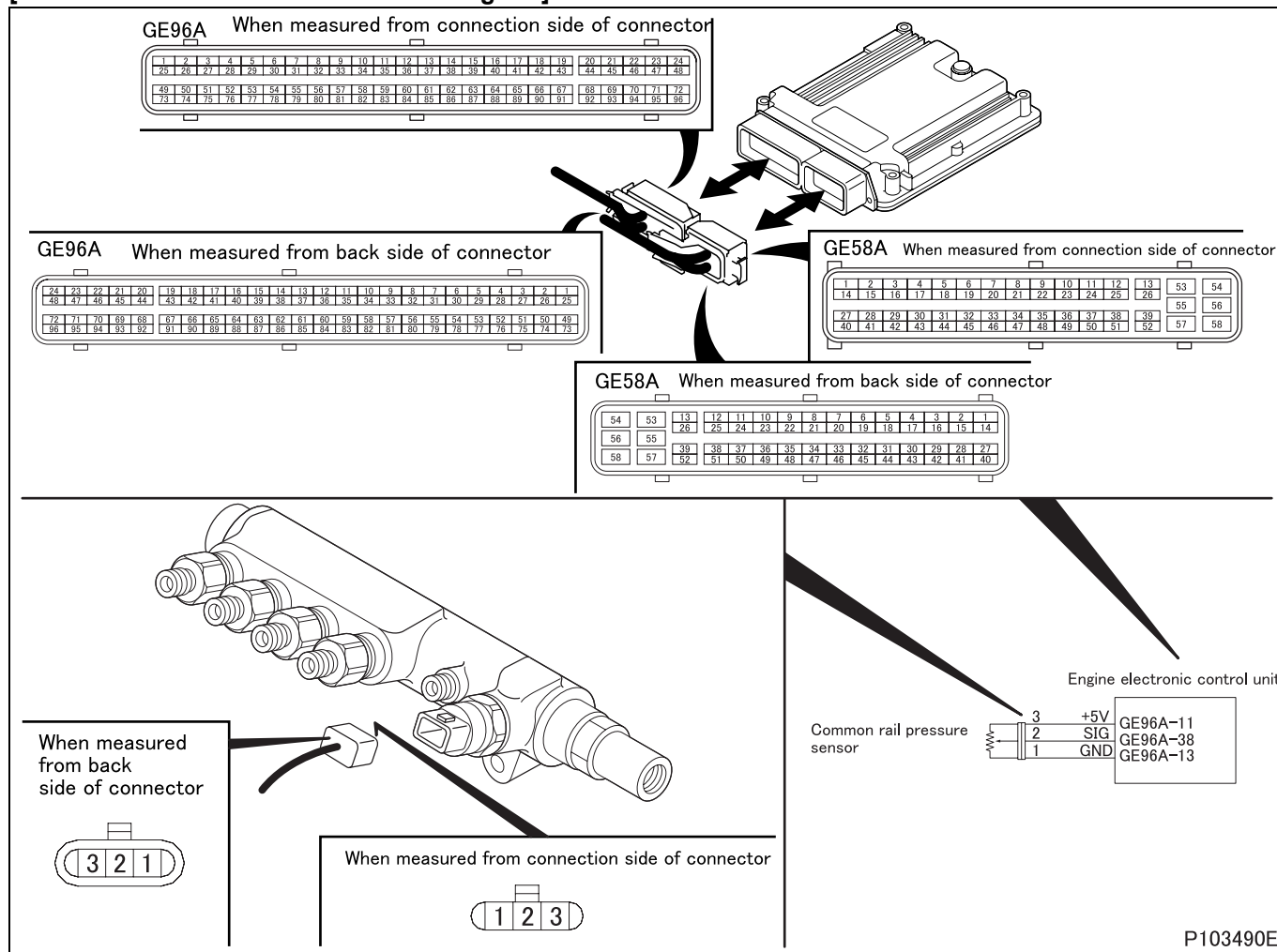
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

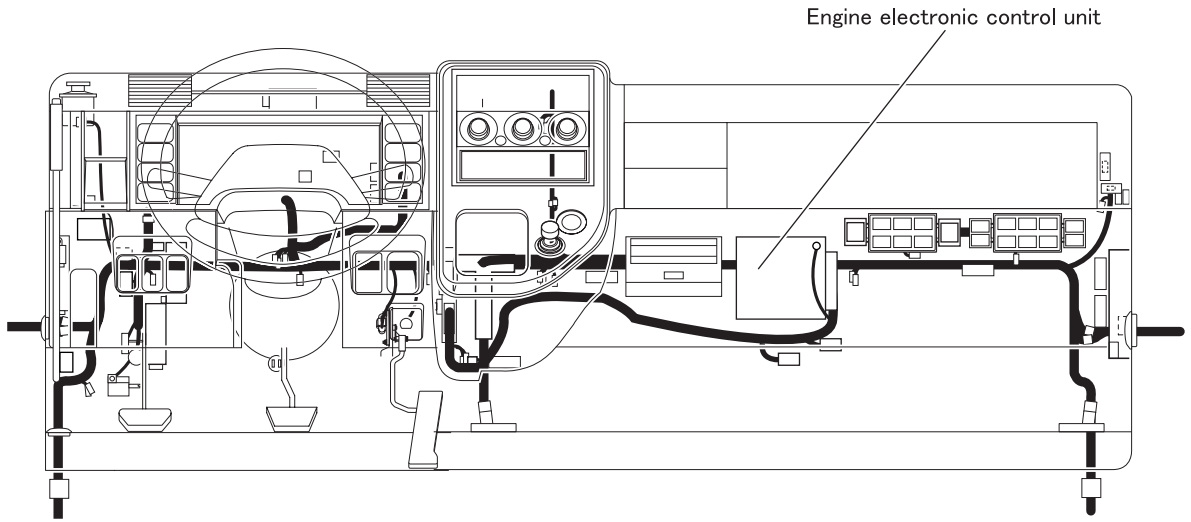
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

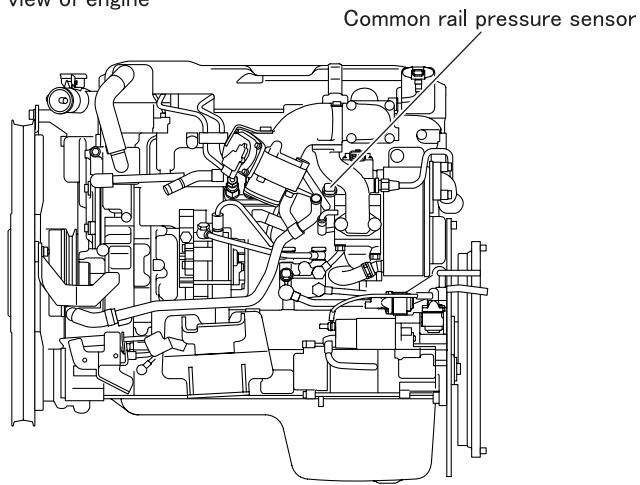


P103490E

[Parts Identification and Location]



Left side view of engine



P103618E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Measure item No. 0A "Reference Injection Quantity" of Service Data. |
|        | Inspection condition                                   |  | Starter switch: ON  |
|        | Requirements   |  | 0%  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection by electronic control unit connector (signal)  |
|        | Maintenance item                                       |  | Measure value of voltage between connector (GE96A) terminal No. 38 (+) and 13 (-).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |  | 0.5 to 4.5 V  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |  | Measure value of voltage between connector (GE96A) terminal No. 11 (+) and 13 (-).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |  | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection by electronic control unit connector (ground)  |
|        | Maintenance item                                       |  | Measure value of voltage between connector (GE96A) terminal No. 13 (+) and (GE58A) terminal No. 53 (-).   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |  | 0 V   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 5 | Inspection items                                       |  | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | -   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |



|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of sensor connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 7 | Inspection items                                       |               | Inspection of harness between electronic control unit and sensor (power supply)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector terminal No. 3 (+) and 1 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 9.   |
| NO     |  | Go to step 8. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 8 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 11. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 13. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 10.   |
| NO     |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 38. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of sensor, go to step 11   |
| NO      |  | Modify harness. |  |

# TROUBLESHOOTING

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|         |  |  |   |
|---------|--|--|---|
| Step 11 | Inspection items                                       |  | Inspection by control data  |
|         | Maintenance item                                       |  | Measure item No. 0A "Reference Injection Quantity" of Service Data. |
|         | Inspection condition                                   |  | Starter switch: ON  |
|         | Requirements   |  | 0%  |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).                                  |
| NO      |  | Replacement of electronic control unit |   |

**[Fault code]**

Diagnosis code: P0201/Flash code: 37

**[Monitor]**

Failure of injector magnetic valve (No. 1 cylinder)

**[Fault (outline)]**

Injector open circuit (No. 1 cylinder)

**[Diagnosis check]**

- Injector magnetic valve (No. 1 cylinder) circuit is monitored for fault.

**[Code generation condition]**

- Injector magnetic valve (No. 1 cylinder) circuit remains open as detected for 3 cycles.  
(Diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

Electronic control unit differs in the way of control by the diagnosis check item.

<Short-circuit>

- Injector magnetic valve (No. 1 and No. 4 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Controller area network torque output is fixed at backup valve.
- Related fault check is stopped.

<Open-circuit>

- Injector magnetic valve (No. 1 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

**[Probable cause of trouble]**

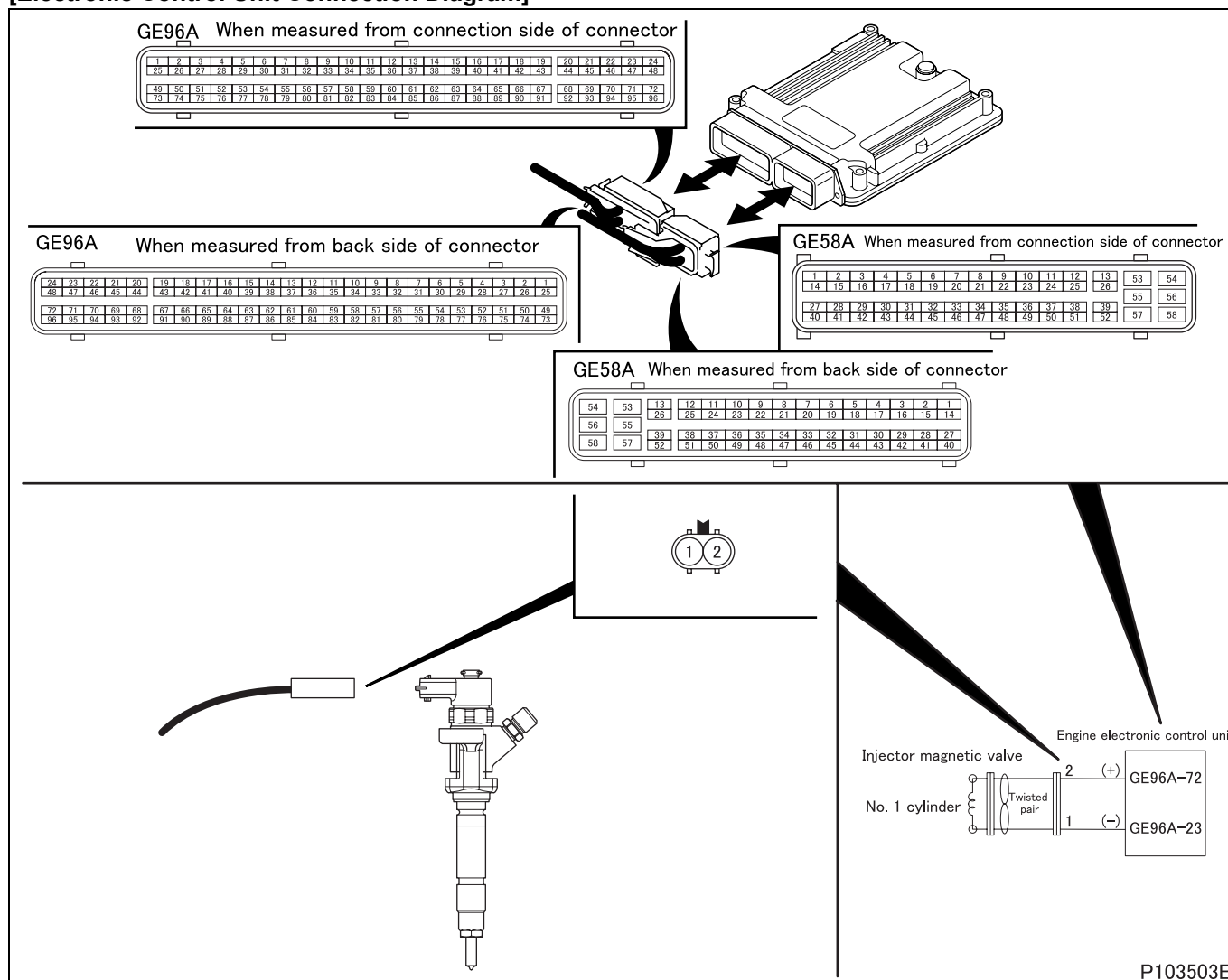
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

**[Recoverability]**

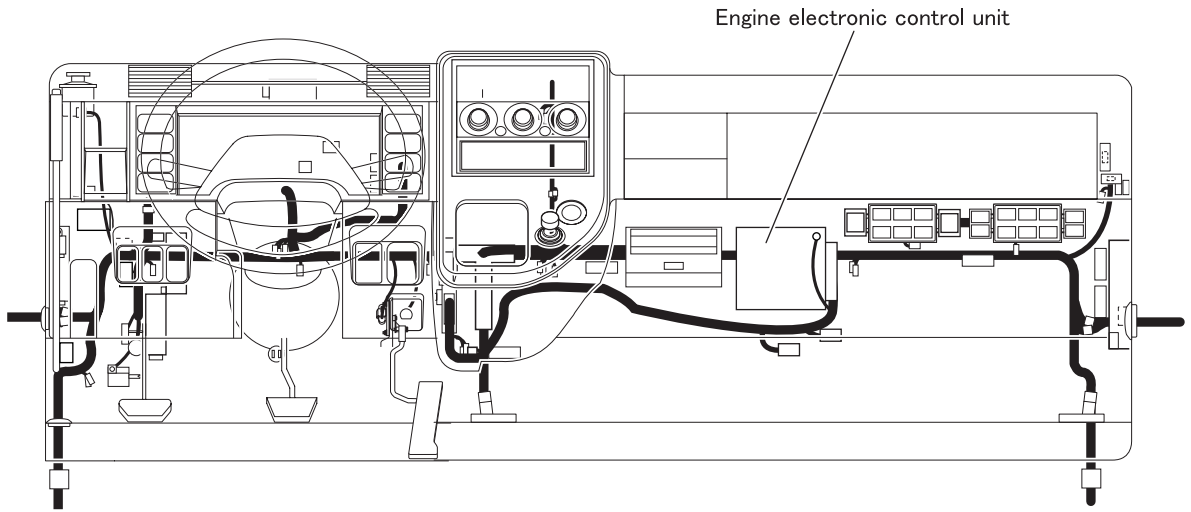
- Short-circuit: System recovers if any valid signal is input when starter switch is turned from OFF to ON (power on again of electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)
- Open-circuit: System recovers if any valid signal is input with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

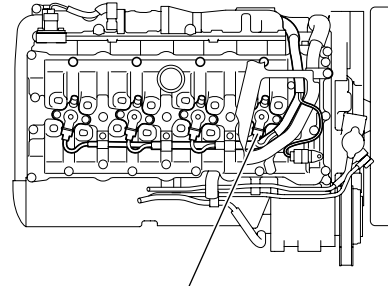
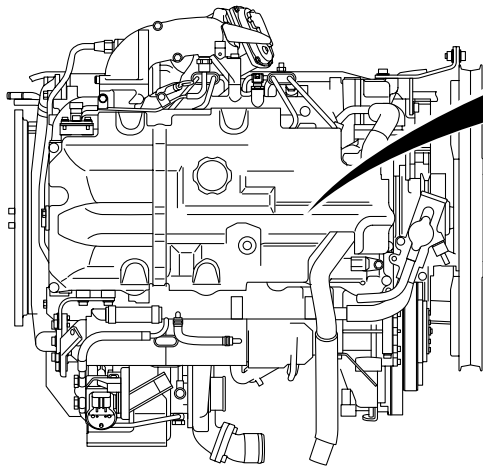
## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



Upper view of engine



P103629E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. BB "Injector Test 1".  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Engine speed: 1500 rpm or less</li> <li>Transmission: neutral</li> <li>The current diagnosis code does not occur.</li> </ul> |
|        | Requirements   |               | Injector (No. 1 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

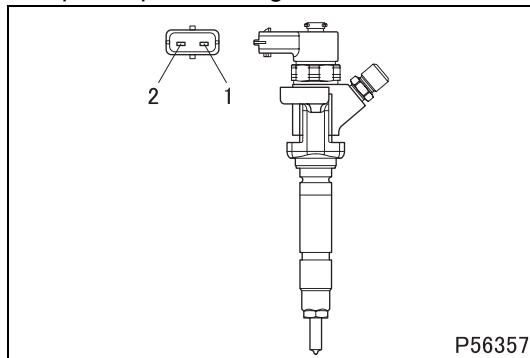
|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 23 and 72.                          |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | $0.255 \pm 0.04 \Omega$ (20°C {68°F})  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |

|        |  |   |                         |  |
|--------|--|---|-------------------------|--|
| Step 5 | Inspection items                                       | Inspection of injector magnetic valve unit                          |                         |  |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and 2. |                         |  |
|        | Inspection condition                                   | -   |                         |  |
|        | Requirements   | 0.255 ± 0.04 Ω (20°C {68°F})  |                         |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.           |  |
|        |  | NO  | Replacement of injector |  |

<Step 5 inspection diagram>



|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 6 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (power supply)                                      |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 72. |                 |  |
|        | Inspection condition                                   | Disconnect electronic control unit from harness and measure from connection side of harness connector.                                |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 7 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 23. |                 |  |
|        | Inspection condition                                   | Disconnect electronic control unit from harness and measure from connection side of harness connector.                                |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |  |  |
|--------|--|---|--|--|
| Step 8 | Inspection items                                       | Inspection by control data  |  |  |
|        | Maintenance item                                       | Perform actuator test item No. BB "Injector Test 1".  |  |  |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Engine speed: 1500 rpm or less</li> <li>Transmission: neutral</li> <li>The current diagnosis code does not occur.</li> </ul> |  |  |
|        | Requirements   | Injector (No. 1 cylinder) stops injection and engine vibrations become slightly larger.   |  |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.).     |  |
|        |  | NO  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

---

## [Fault code]

Diagnosis code: P0202/Flash code: 8

## [Monitor]

Failure of injector magnetic valve (No. 2 cylinder)

## [Fault (outline)]

Injector open circuit (No. 2 cylinder)

## [Diagnosis check]

- Injector magnetic valve (No. 2 cylinder) circuit is monitored for fault.

## [Code generation condition]

- Injector magnetic valve (No. 2 cylinder) circuit remains open as detected for 3 cycles.  
(Diagnosis code is displayed on first establishment of code generation condition.)

## [Diagnosis check timing]

- Fault diagnosis is continuously performed during the driving cycle.

## [Diagnostic requirement]

—

## [Control effected by electronic control unit during fault]

Electronic control unit differs in the way of control by the diagnosis check item.

<Short-circuit>

- Injector magnetic valve (No. 2 and No. 3 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

<Open-circuit>

- Injector magnetic valve (No. 2 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

## [Probable cause of trouble]

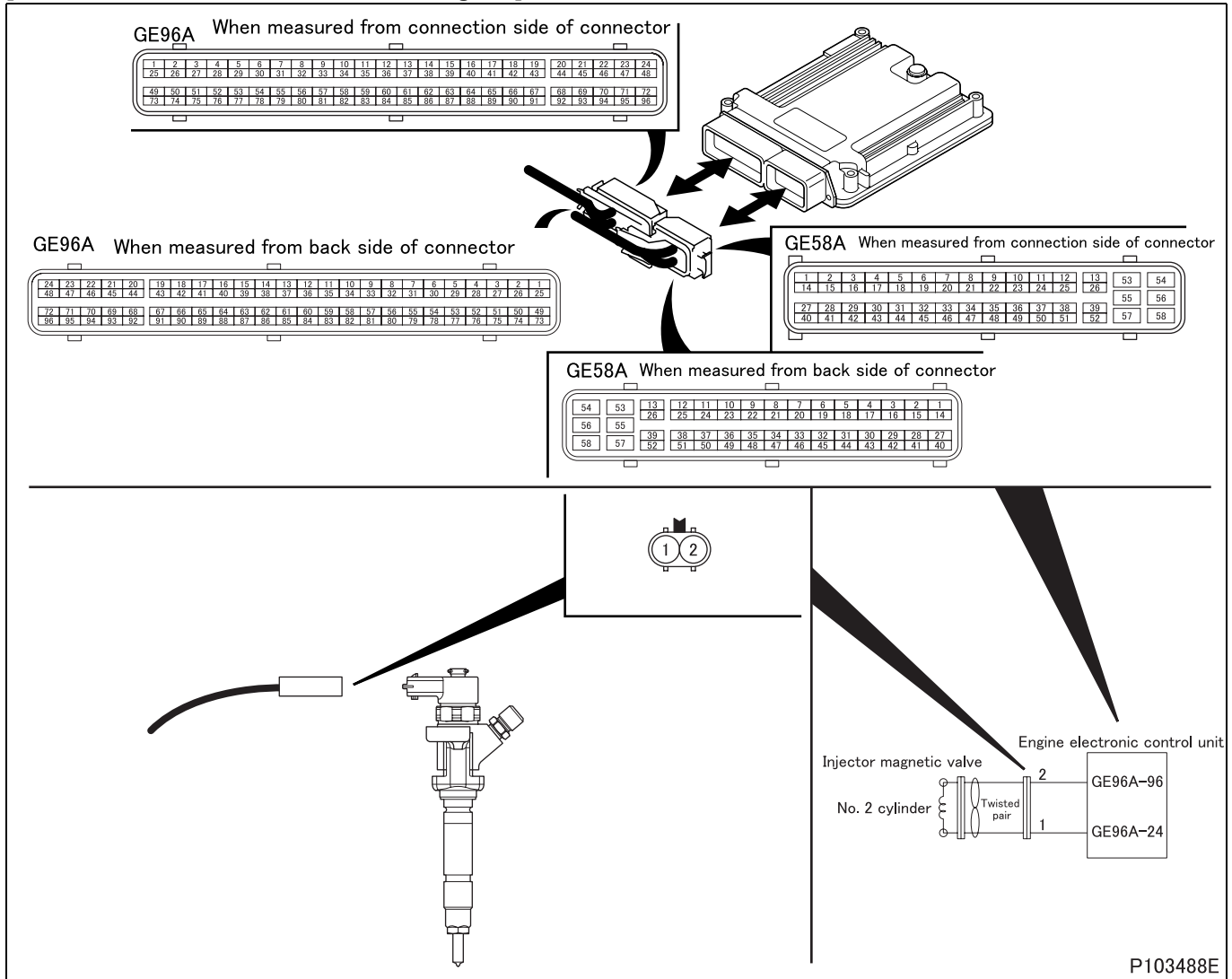
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

## [Recoverability]

- Short-circuit: System recovers if any valid signal is input when starter switch is turned from OFF to ON (power on again of electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)
- Open-circuit: System recovers if any valid signal is input with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



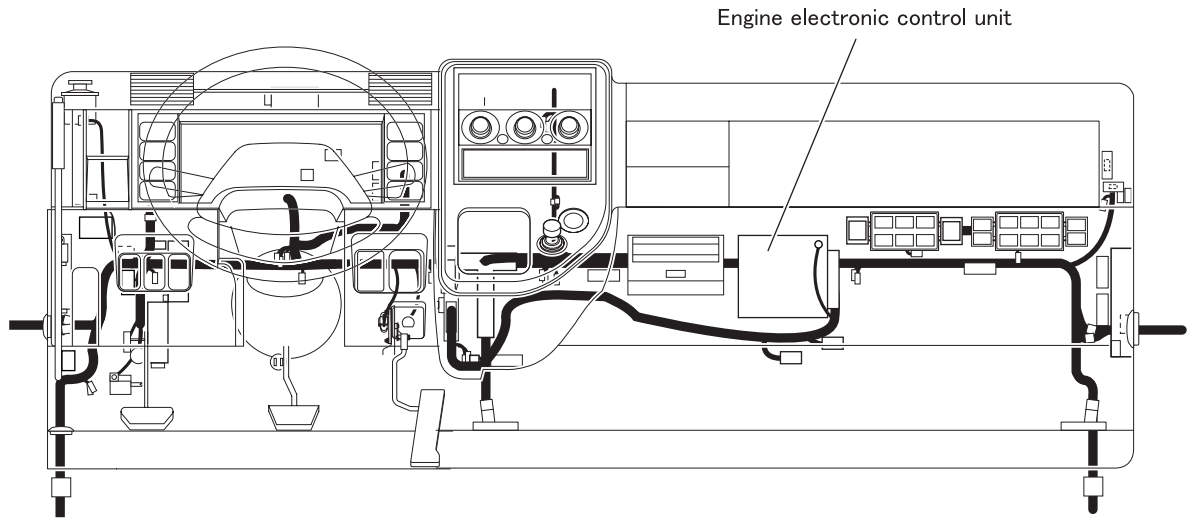
[Electronic Control Unit Connection Diagram]



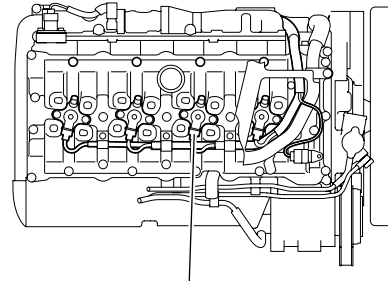
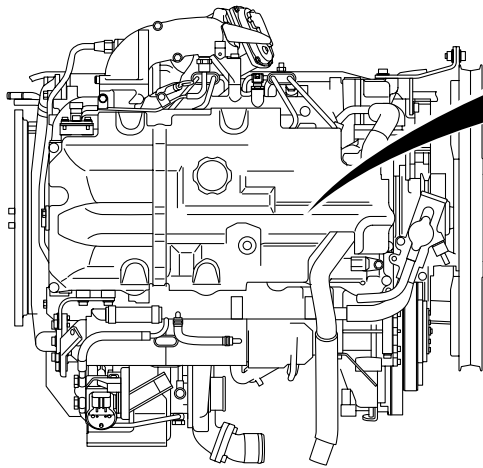
P103488E

# TROUBLESHOOTING

## [Parts Identification and Location]



Upper view of engine



P103616E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. BD "Injector Test 3".  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul> |
|        | Requirements   |               | Injector (No. 2 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 24 and 96.                          |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | 0.255 ± 0.04 Ω (20°C {68°F})   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

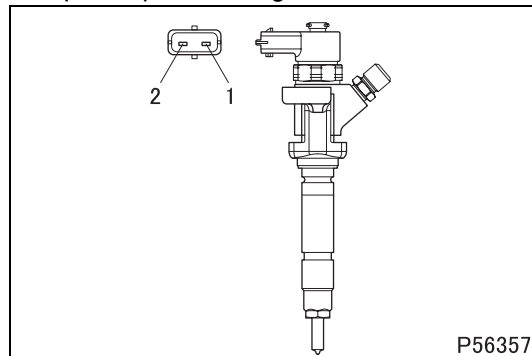
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |

# TROUBLESHOOTING

|        |  |   |                         |  |
|--------|--|---|-------------------------|--|
| Step 5 | Inspection items                                       | Inspection of injector magnetic valve unit                          |                         |  |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and 2. |                         |  |
|        | Inspection condition                                   | -   |                         |  |
|        | Requirements   | 0.255 ± 0.04 Ω (20°C {68°F})  |                         |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.           |  |
|        |  | NO  | Replacement of injector |  |

<Step 5 inspection diagram>



|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 6 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (power supply)                                      |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 96. |                 |  |
|        | Inspection condition                                   | Disconnect electronic control unit from harness and measure from connection side of harness connector.                                |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 7 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 24. |                 |  |
|        | Inspection condition                                   | Disconnect electronic control unit from harness and measure from connection side of harness connector.                                |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |  |  |
|--------|--|---|--|--|
| Step 8 | Inspection items                                       | Inspection by control data  |  |  |
|        | Maintenance item                                       | Perform actuator test item No. BD "Injector Test 3".  |  |  |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul> |  |  |
|        | Requirements   | Injector (No. 2 cylinder) stops injection and engine vibrations become slightly larger.   |  |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.).     |  |
|        |  | NO  | Replacement of electronic control unit |  |

**[Fault code]**

Diagnosis code: P0203/Flash code: 38

**[Monitor]**

Failure of injector magnetic valve (No. 3 cylinder)

**[Fault (outline)]**

Injector open circuit (No. 3 cylinder)

**[Diagnosis check]**

- Injector magnetic valve (No. 3 cylinder) circuit is monitored for fault.

**[Code generation condition]**

- Injector magnetic valve (No. 3 cylinder) circuit remains open as detected for 3 cycles.  
(Diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

Electronic control unit differs in the way of control by the diagnosis check item.

<Short-circuit>

- Injector magnetic valve (No. 2 and No. 3 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

<Open-circuit>

- Injector magnetic valve (No. 3 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

**[Probable cause of trouble]**

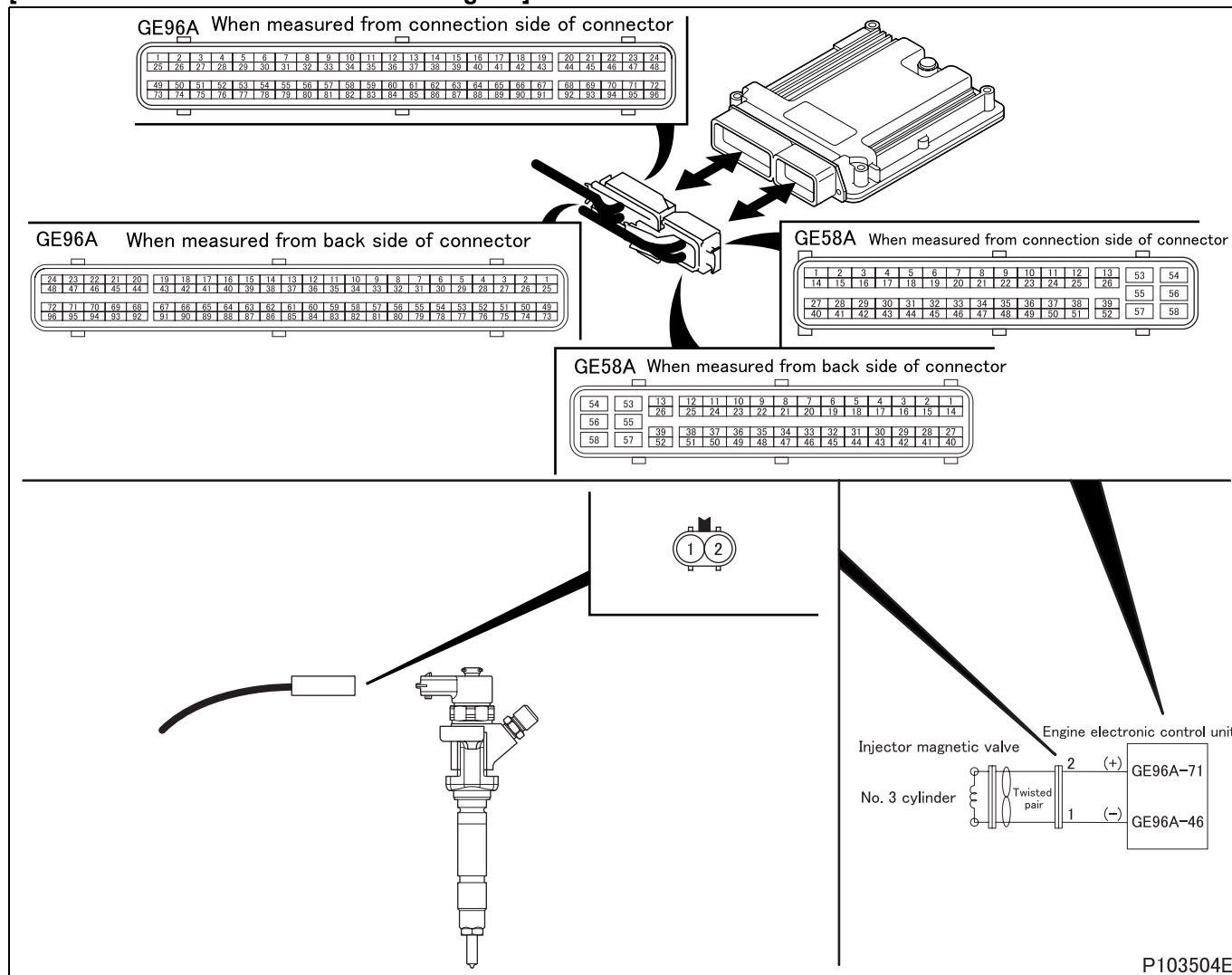
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

**[Recoverability]**

- Short-circuit: System recovers if any valid signal is input when starter switch is turned from OFF to ON (power on again of electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)
- Open-circuit: System recovers if any valid signal is input with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

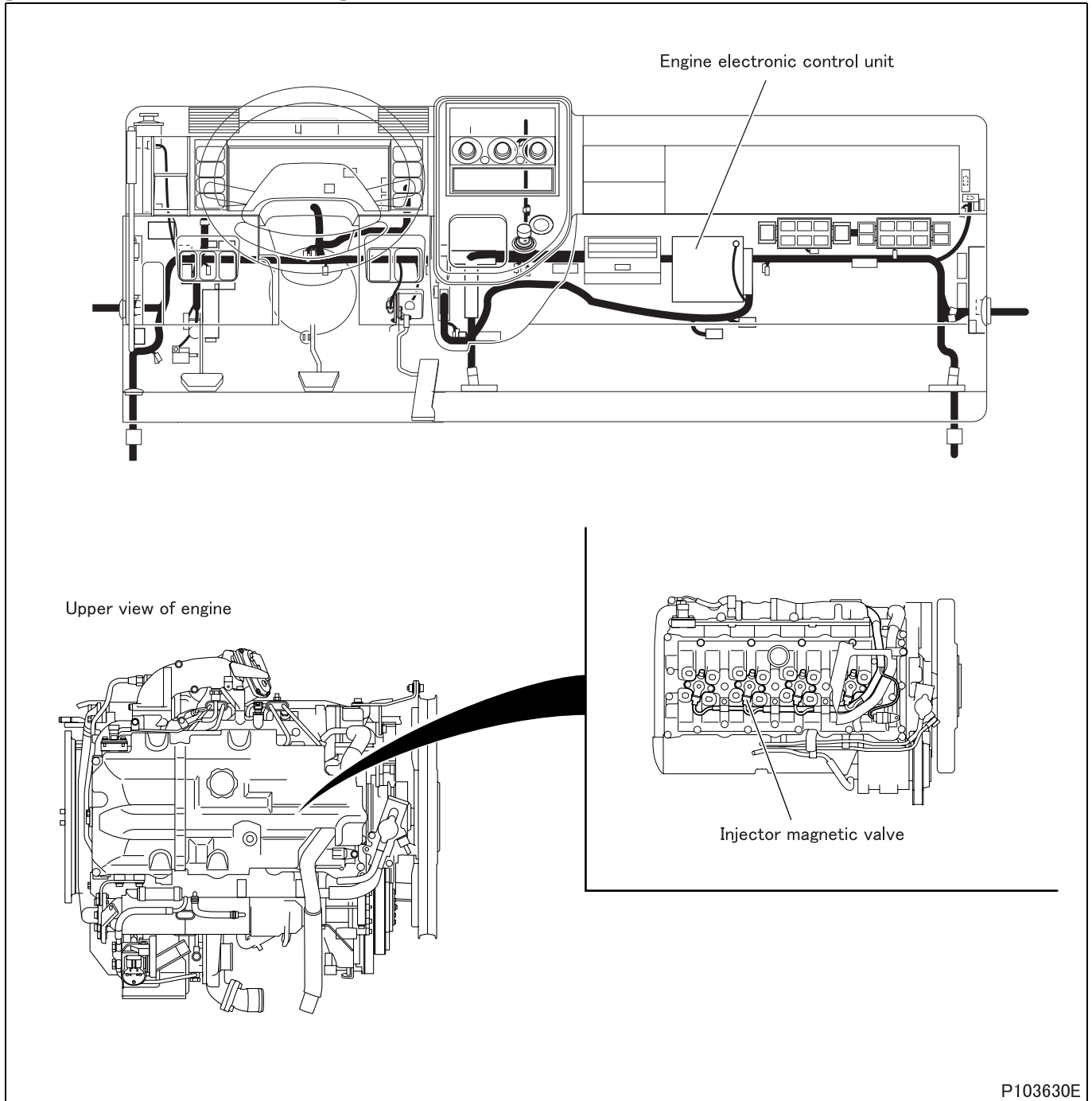
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P103504E

[Parts Identification and Location]



P103630E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. BE "Injector Test 4".  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h)</li> <li>Engine speed: 1500 rpm or less</li> <li>Transmission: neutral</li> <li>The current diagnosis code does not occur.</li> </ul> |
|        | Requirements   |               | Injector (No. 3 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 46 and 71.                          |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | $0.255 \pm 0.04 \Omega$ (20°C {68°F})  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

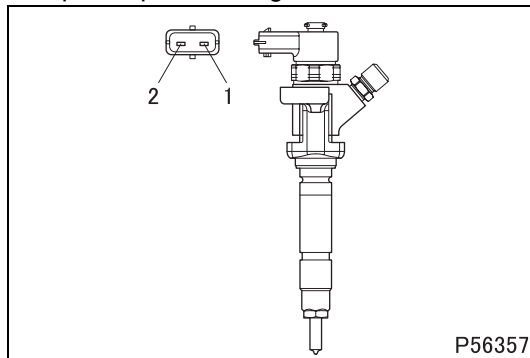
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |



|        |  |   |                         |  |
|--------|--|---|-------------------------|--|
| Step 5 | Inspection items                                       | Inspection of injector magnetic valve unit                          |                         |  |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and 2. |                         |  |
|        | Inspection condition                                   | -   |                         |  |
|        | Requirements   | 0.255 ± 0.04 Ω (20°C {68°F})  |                         |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.           |  |
|        |  | NO  | Replacement of injector |  |

<Step 5 inspection diagram>



|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 6 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (power supply)                                      |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 71. |                 |  |
|        | Inspection condition                                   | Disconnect electronic control unit from harness and measure from connection side of harness connector.                                |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 7 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 46. |                 |  |
|        | Inspection condition                                   | Disconnect electronic control unit from harness and measure from connection side of harness connector.                                |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |  |  |
|--------|--|---|--|--|
| Step 8 | Inspection items                                       | Inspection by control data  |  |  |
|        | Maintenance item                                       | Perform actuator test item No. BE "Injector Test 4".  |  |  |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Engine speed: 1500 rpm or less</li> <li>Transmission: neutral</li> <li>The current diagnosis code does not occur.</li> </ul> |  |  |
|        | Requirements   | Injector (No. 3 cylinder) stops injection and engine vibrations become slightly larger.   |  |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.).     |  |
|        |  | NO  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

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## [Fault code]

Diagnosis code: P0204/Flash code: 39

## [Monitor]

Failure of injector magnetic valve (No. 4 cylinder)

## [Fault (outline)]

Injector open circuit (No. 4 cylinder)

## [Diagnosis check]

- Injector magnetic valve (No. 4 cylinder) circuit is monitored for fault.

## [Code generation condition]

- Injector magnetic valve (No. 4 cylinder) circuit remains open as detected for 3 cycles.  
(Diagnosis code is displayed on first establishment of code generation condition.)

## [Diagnosis check timing]

- Fault diagnosis is continuously performed during the driving cycle.

## [Diagnostic requirement]

—

## [Control effected by electronic control unit during fault]

Electronic control unit differs in the way of control by the diagnosis check item.

<Short-circuit>

- Injector magnetic valve (No. 1 and No. 4 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

<Open-circuit>

- Injector magnetic valve (No. 4 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

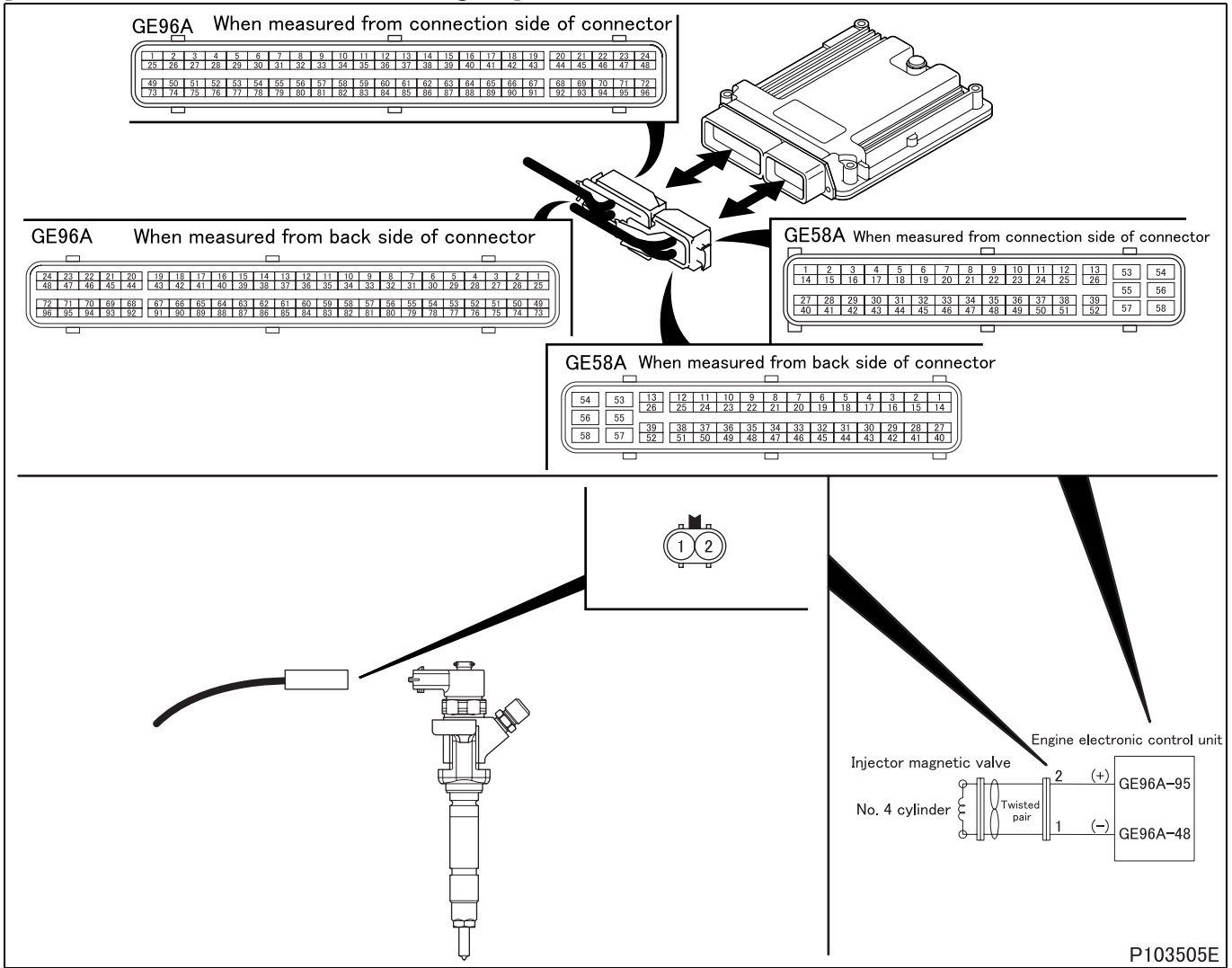
## [Probable cause of trouble]

- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

## [Recoverability]

- Short-circuit: System recovers if any valid signal is input when starter switch is turned from OFF to ON (power on again of electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)
- Open-circuit: System recovers if any valid signal is input with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

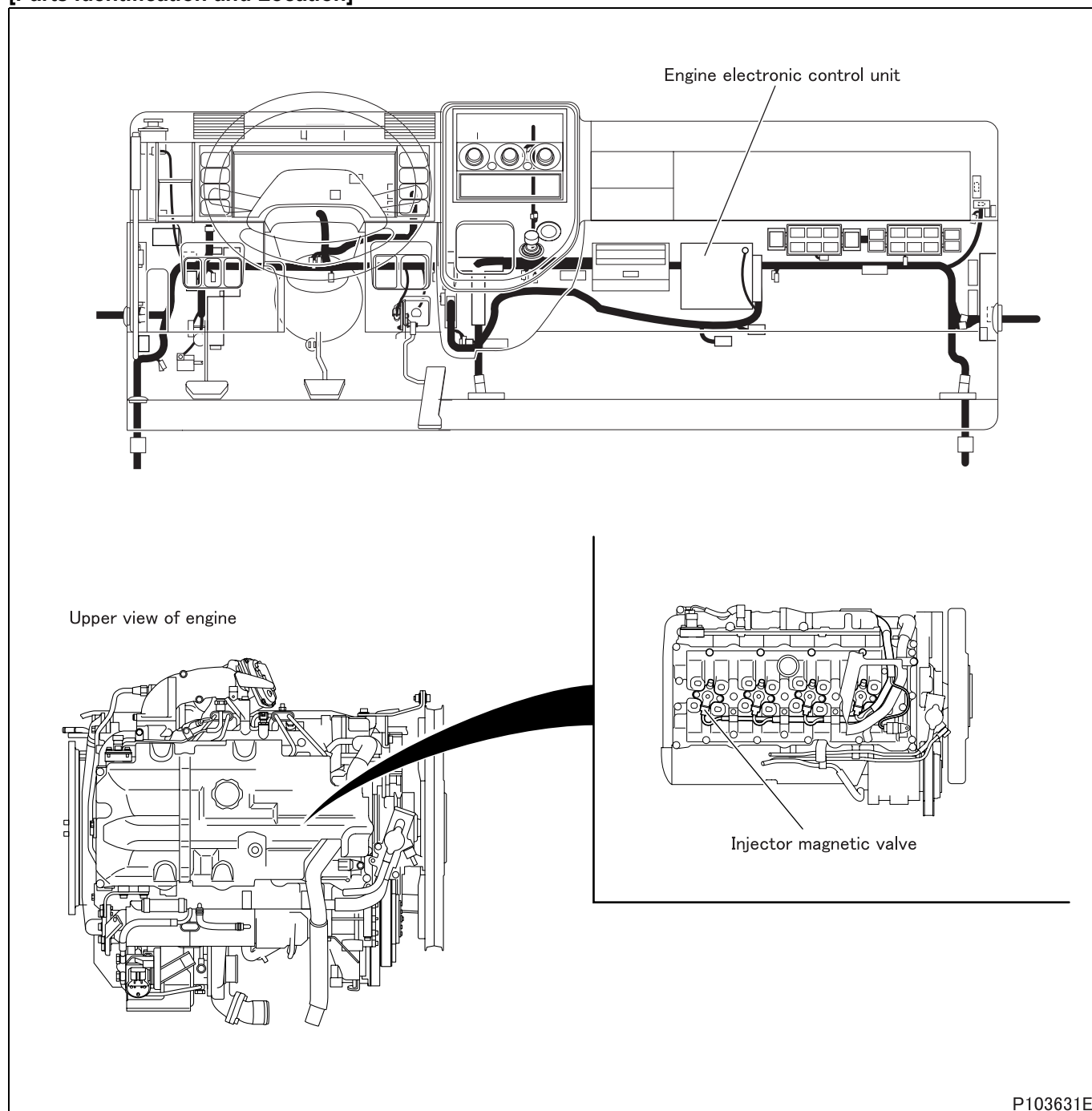
[Electronic Control Unit Connection Diagram]



P103505E

# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | <ul style="list-style-type: none"> <li>• Perform actuator test item No. BC "Injector Test 2".</li> </ul>  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul> |
|        | Requirements   |               | Injector (No. 4 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 48 and 95.                          |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | 0.255 ± 0.04 Ω (20°C {68°F})   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

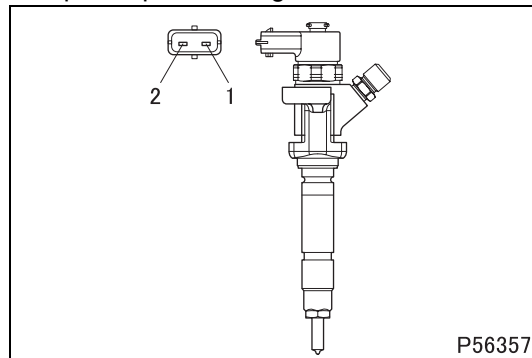
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |

# TROUBLESHOOTING

|        |  |   |                         |  |
|--------|--|---|-------------------------|--|
| Step 5 | Inspection items                                       | Inspection of injector magnetic valve unit                          |                         |  |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and 2. |                         |  |
|        | Inspection condition                                   | -   |                         |  |
|        | Requirements   | 0.255 ± 0.04 Ω (20°C {68°F})  |                         |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.           |  |
|        |  | NO  | Replacement of injector |  |

<Step 5 inspection diagram>



|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 6 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (power supply)                                      |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 95. |                 |  |
|        | Inspection condition                                   | Disconnect electronic control unit from harness and measure from connection side of harness connector.                                |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 7 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 48. |                 |  |
|        | Inspection condition                                   | Disconnect electronic control unit from harness and measure from connection side of harness connector.                                |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |  |  |
|--------|--|---|--|--|
| Step 8 | Inspection items                                       | Inspection by control data  |  |  |
|        | Maintenance item                                       | Perform actuator test item No. BC "Injector Test 2".  |  |  |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul> |  |  |
|        | Requirements   | Injector (No. 4 cylinder) stops injection and engine vibrations become slightly larger.   |  |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.).     |  |
|        |  | NO  | Replacement of electronic control unit |  |

**[Fault code]**

Diagnosis code: P0219/Flash code: 7

**[Monitor]**

Abnormality of engine speed

**[Fault (outline)]**

High signal range check

**[Diagnosis check]**

- Engine speed is monitored for abnormal increase.

**[Code generation condition]**

- Engine speed exceeds 3700 rpm.  
(Diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

–

**[Control effected by electronic control unit during fault]**

- Engine stopped

**[Probable cause of trouble]**

- Shifting Mistake

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |     |   |
|--------|--|-----|---|
| Step 1 | Inspection items                                       |     | Inspection by control data  |
|        | Maintenance item                                       |     | Check if this diagnosis code occurs except in red zone.   |
|        | Inspection condition                                   |     | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine start (condition except in red zone)</li> </ul> |
|        | Requirements   |     | Codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) | YES | Replacement of electronic control unit  |
| NO     |  | –   |   |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0222/Flash code: 16

## **[Monitor]**

Failure of accelerator pedal position sensor 2

## **[Fault (outline)]**

Low signal range check

## **[Diagnosis check]**

- Accelerator pedal position sensor is monitored for output within specification.

## **[Code generation condition]**

- Voltage from accelerator pedal position sensor 2 remains below 0.5 V for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Accelerator pedal position sensor 1 is computed with accelerator pedal position sensor 2 only.
- In-use performance counter is stopped.
- Related fault check is stopped.

## **[Probable cause of trouble]**

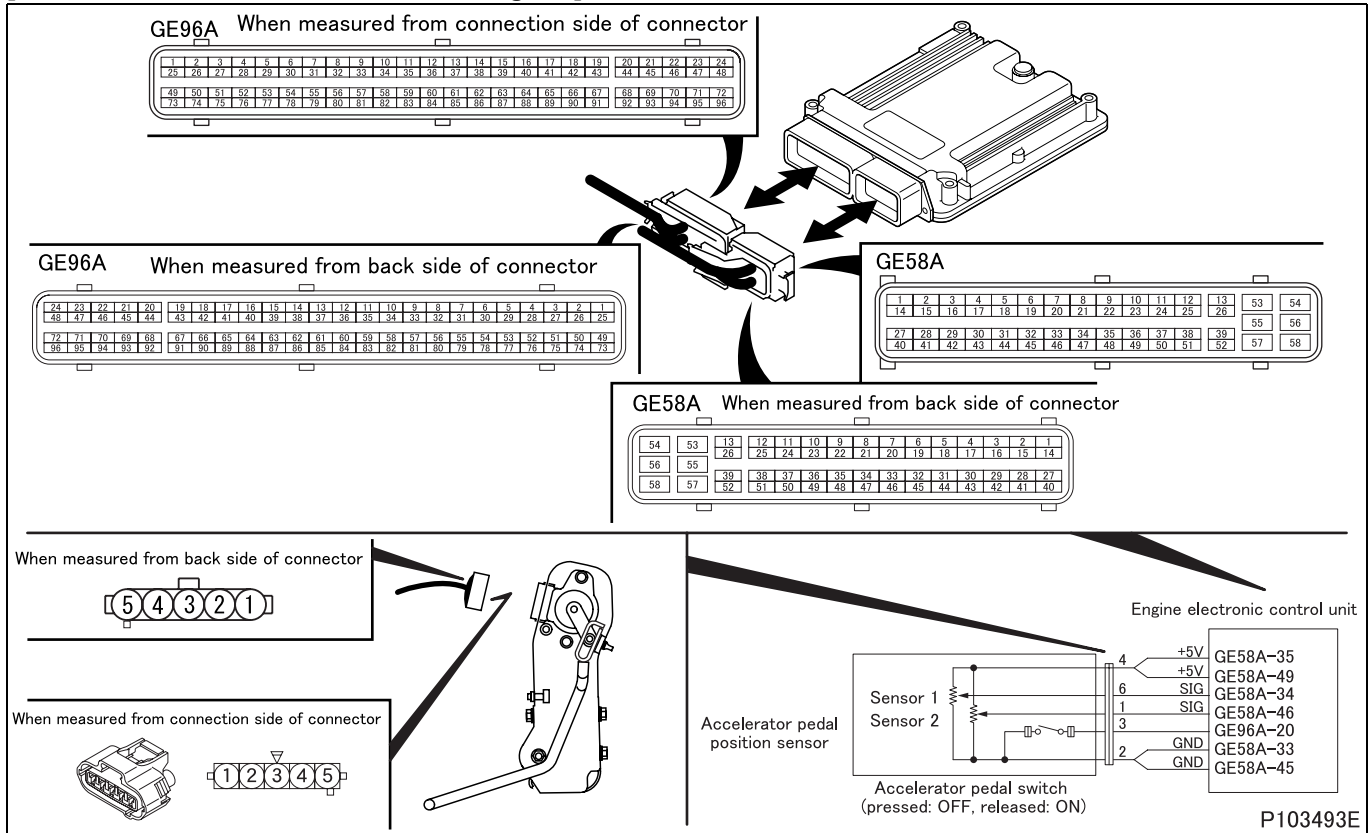
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

## **[Recoverability]**

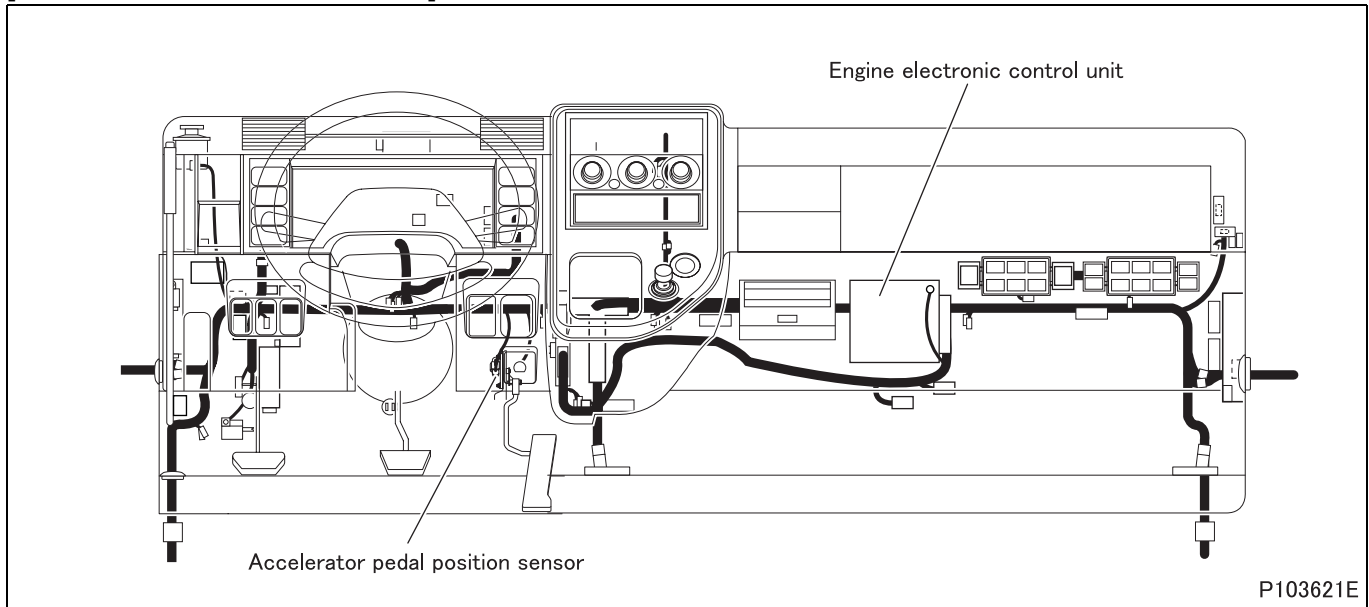
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item "Accelerator Pedal Position 2".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item No. 41 "Accelerator sensor voltage 2" of Service Data.</li> </ul>  |
|        | Inspection condition                                   |               | –  |
|        | Requirements   |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>Accelerator pedal not pressed: 0%</li> <li>Accelerator pedal pressed: 100%</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>Accelerator pedal not pressed: <math>0.85 \pm 0.1</math> V</li> <li>Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
|        | NO   | Go to step 2. |  |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (signal)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE58A) terminal No. 46 (+) and No. 45 and No. 33 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Starter switch: ON.</li> <li>Engine is stopped.</li> <li>Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>Accelerator pedal not pressed: <math>0.85 \pm 0.1</math> V</li> <li>Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul>                     |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 5.  |
|        | NO   | Go to step 3. |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 3 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE58A) terminal No. 49 (+) and No. 45 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Starter switch: ON</li> <li>Engine is stopped.</li> <li>Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.   |
|        | NO   | Go to step 5. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 4 | Inspection items                                       |               | Inspection by electronic control unit connector (ground)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE58A) terminal No. 45 (+) and No. 53 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Starter switch: ON</li> <li>Engine is stopped.</li> <li>Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |               | 0 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 6.   |
|        | NO   | Go to step 5. |   |

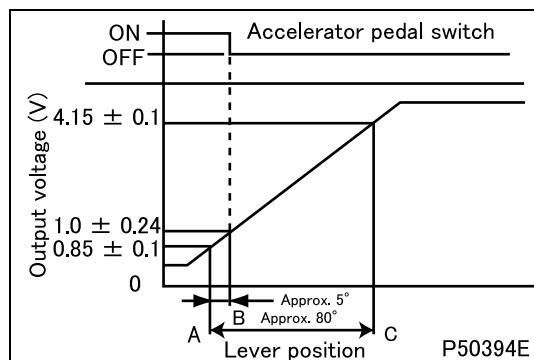
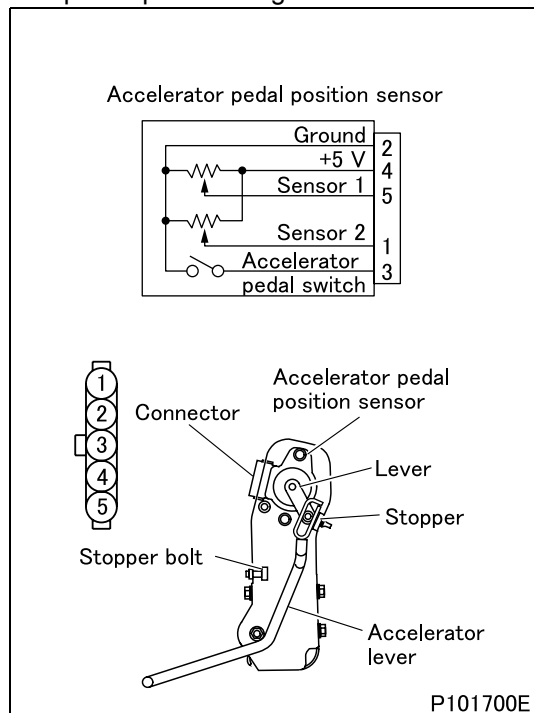
|        |  |   |                |
|--------|--|---|----------------|
| Step 5 | Inspection items                                       | Inspection of electronic control unit connector   |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 12. |
| NO     |  | Modify connector.   |                |

|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify connector.   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of accelerator pedal position sensor 2 unit   |               |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 1 (+) and 2 (-).   |               |
|        | Inspection condition                                   | Apply voltage DC 5 V across connector terminals No. 4 (+) and 2 (-).   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Idle position A: <math>0.85 \pm 0.1</math> V</li> <li>• Accelerator switch operating position B: <math>1.0 \pm 0.24</math> V</li> <li>• Full load position C: <math>4.15 \pm 0.1</math> V <ul style="list-style-type: none"> <li>• A: When accelerator lever is in contact with stopper</li> <li>• B: When accelerator pedal is pressed until there is no continuity between terminals 2 and 3.</li> <li>• C: When lever is in contact with full load stopper bolt</li> </ul> </li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Adjustment of sensor (If the measurement deviates from the standard value after adjustment, replace the sensor.) (See "INSPECTION OF ELECTRICAL PARTS" – "INSPECTION OF ACCELERATOR PEDAL POSITION SENSOR".)   |               |

# TROUBLESHOOTING

<Step 7 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by sensor connector  |
|        | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 4 (+) and 2 (-).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine is stopped.</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |  | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 10.<br>NO Go to step 9.  |

|        |  |  |  |
|--------|--|--|--|
| Step 9 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |  | Check circuit between electronic control unit connector (GE58A) terminal No. 49 and sensor connector terminal No. 4. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 12.<br>NO Modify harness.   |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE58A) terminal No. 45 and sensor connector terminal No. 2. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO      |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE58A) terminal No. 46 and sensor connector terminal No. 1. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |  |  |
|---------|--|--|--|
| Step 12 | Inspection items                                       |  | Inspection by control data   |
|         | Maintenance item                                       |  | <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Measure item "Accelerator Pedal Position 2".</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Measure item No. 41 "Accelerator sensor voltage 2" of Service Data.</li> </ul>  |
|         | Inspection condition                                   |  | –  |
|         | Requirements   |  | <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Accelerator pedal not pressed: 0%</li> <li>• Accelerator pedal pressed: 100%</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Accelerator pedal not pressed: <math>0.85 \pm 0.1</math> V</li> <li>• Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul> |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0223/Flash code: 16

## **[Monitor]**

Failure of accelerator pedal position sensor 2

## **[Fault (outline)]**

High signal range check

## **[Diagnosis check]**

- Accelerator pedal position sensor is monitored for output within specification.

## **[Code generation condition]**

- Voltage from accelerator pedal position sensor 2 remains over 4.7 V for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Accelerator pedal position sensor 1 is computed with accelerator pedal position sensor 2 only.
- In-use performance counter is stopped.
- Related fault check is stopped.

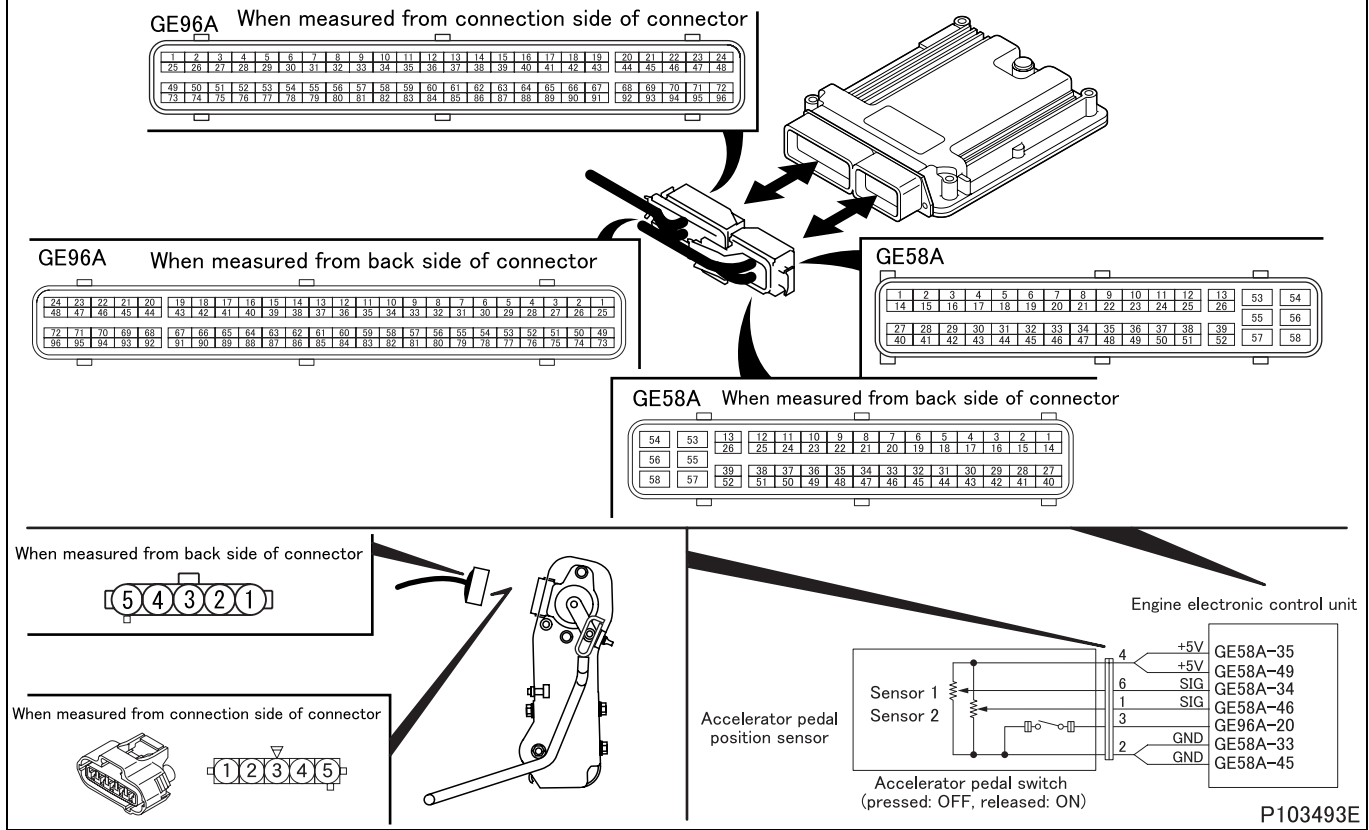
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

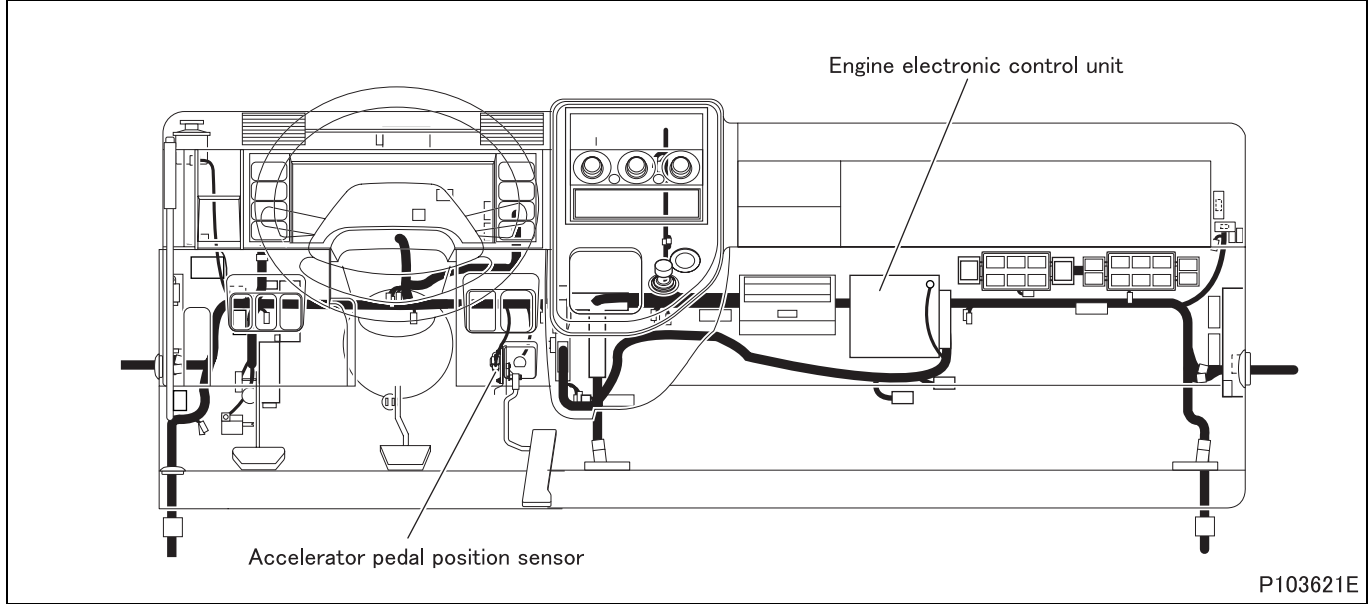
## **[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |    |  |
|--------|--|----|--|
| Step 1 | Inspection items                                       |    | Inspection by control data   |
|        | Maintenance item                                       |    | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item "Accelerator Pedal Position 2".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item No. 41 "Accelerator sensor voltage 2" of Service Data.</li> </ul>  |
|        | Inspection condition                                   |    | –  |
|        | Requirements   |    | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>Accelerator pedal not pressed: 0%</li> <li>Accelerator pedal pressed: 100%</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>Accelerator pedal not pressed: <math>0.85 \pm 0.1</math> V</li> <li>Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |    | YES  |
|        |  | NO | Go to step 2.  |

|        |  |    |  |
|--------|--|----|--|
| Step 2 | Inspection items                                       |    | Inspection by electronic control unit connector (signal)   |
|        | Maintenance item                                       |    | Measure value of voltage between connector (GE58A) terminal No. 46 (+) and No. 45 and No. 33 (-).  |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>Starter switch: ON.</li> <li>Engine is stopped.</li> <li>Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |    | <ul style="list-style-type: none"> <li>Accelerator pedal not pressed: <math>0.85 \pm 0.1</math> V</li> <li>Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul>                     |
|        | Inspection result (Is the judging standard satisfied?) |    | YES  |
|        |  | NO | Go to step 3.  |

|        |  |    |   |
|--------|--|----|---|
| Step 3 | Inspection items                                       |    | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |    | Measure value of voltage between connector (GE58A) terminal No. 49 (+) and No. 45 (-).  |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>Starter switch: ON</li> <li>Engine is stopped.</li> <li>Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |    | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) |    | YES   |
|        |  | NO | Go to step 5.   |

|        |  |    |   |
|--------|--|----|---|
| Step 4 | Inspection items                                       |    | Inspection by electronic control unit connector (ground)  |
|        | Maintenance item                                       |    | Measure value of voltage between connector (GE58A) terminal No. 45 (+) and No. 53 (-).  |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>Starter switch: ON</li> <li>Engine is stopped.</li> <li>Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |    | 0 V   |
|        | Inspection result (Is the judging standard satisfied?) |    | YES   |
|        |  | NO | Go to step 5.   |

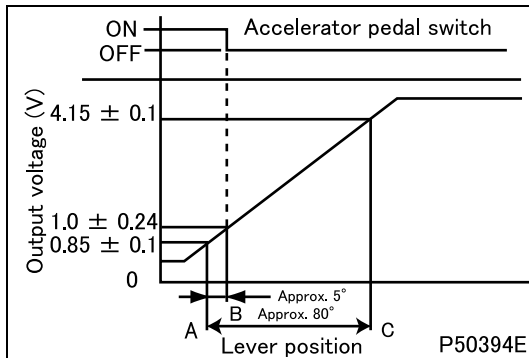
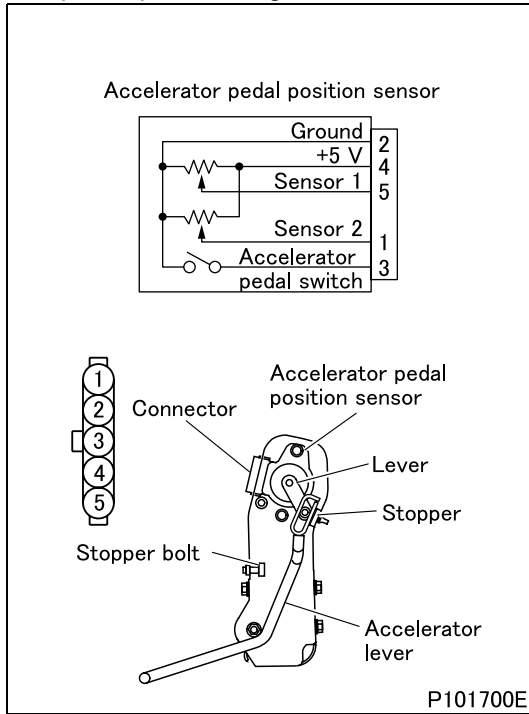


|        |  |   |                |
|--------|--|---|----------------|
| Step 5 | Inspection items                                       | Inspection of electronic control unit connector   |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 12. |
| NO     |  | Inspection of connector   |                |

|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Inspection of connector   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of accelerator pedal position sensor 2 unit   |               |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 1 (+) and 2 (-).   |               |
|        | Inspection condition                                   | Apply voltage DC 5 V across connector terminals No. 4 (+) and 2 (-).   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Idle position A: <math>0.85 \pm 0.1</math> V</li> <li>• Accelerator switch operating position B: <math>1.0 \pm 0.24</math> V</li> <li>• Full load position C: <math>4.15 \pm 0.1</math> V <ul style="list-style-type: none"> <li>• A: When accelerator lever is in contact with stopper</li> <li>• B: When accelerator pedal is pressed until there is no continuity between terminals 2 and 3.</li> <li>• C: When lever is in contact with full load stopper bolt</li> </ul> </li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Adjustment of sensor (If the measurement deviates from the standard value after adjustment, replace the sensor.) (See "INSPECTION OF ELECTRICAL PARTS" – "INSPECTION OF ACCELERATOR PEDAL POSITION SENSOR".)   |               |

<Step 7 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by sensor connector  |
|        | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 4 (+) and 2 (-).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Starter switch: ON</li> <li>Engine is stopped.</li> <li>Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |  | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 10.<br>NO Go to step 9.  |

|        |  |  |  |
|--------|--|--|--|
| Step 9 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |  | Check circuit between electronic control unit connector (GE58A) terminal No. 49 and sensor connector terminal No. 4. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 12.<br>NO Modify harness.   |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE58A) terminal No. 45 and sensor connector terminal No. 2. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO      |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE58A) terminal No. 46 and sensor connector terminal No. 1. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |  |  |
|---------|--|--|--|
| Step 12 | Inspection items                                       |  | Inspection by control data   |
|         | Maintenance item                                       |  | <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Measure item "Accelerator Pedal Position 2".</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Measure item No. 41 "Accelerator sensor voltage 2" of Service Data.</li> </ul>  |
|         | Inspection condition                                   |  | –  |
|         | Requirements   |  | <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Accelerator pedal not pressed: 0%</li> <li>• Accelerator pedal pressed: 100%</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Accelerator pedal not pressed: <math>0.85 \pm 0.1</math> V</li> <li>• Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul> |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0226/Flash code: 28

## **[Monitor]**

Failure of intake throttle

## **[Fault (outline)]**

- Signal range check
- Ref voltage

## **[Diagnosis check]**

- Throttle electronic drive unit monitors intake throttle internal circuit for fault (through throttle position sensor).

## **[Code generation condition]**

- Diagnosis code is generated under either of the following conditions.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)
- Position sensor output voltage remains out of specification (open: above 4.7 V, close: below 0.2 V) for 1 second.
- Position sensor power voltage remains below 4.1 V for 1 second.

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

- Controller area network communication in order

## **[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Intake throttle actuator test is inhibited.
- Related fault check is stopped.

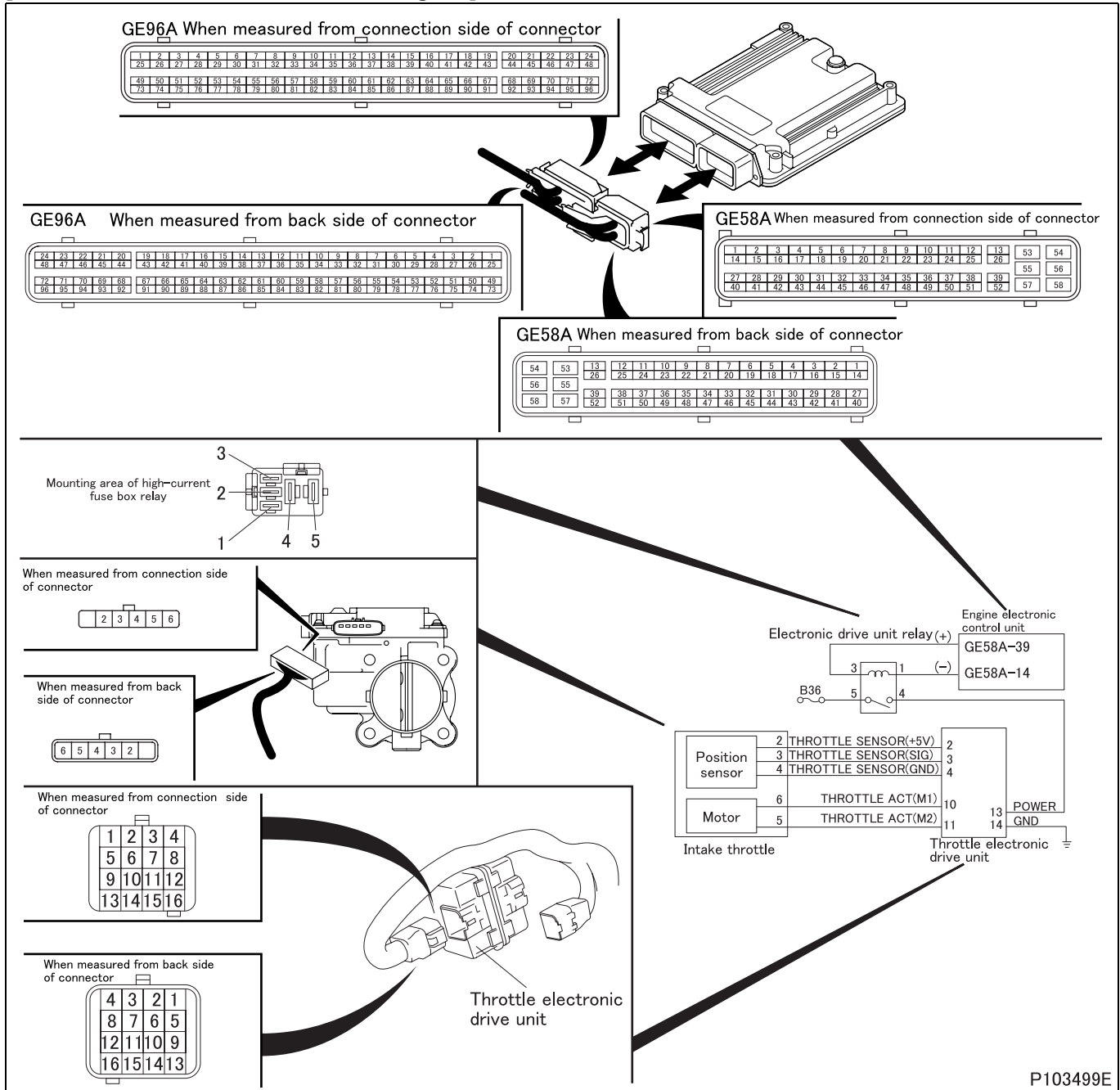
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic drive unit and throttle actuator
- Malfunction of each connector
- Malfunction of throttle motor (built in throttle actuator)
- Malfunction of throttle position sensor (built in throttle actuator)
- Malfunction of electronic drive unit
- Malfunction of electronic drive unit relay

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

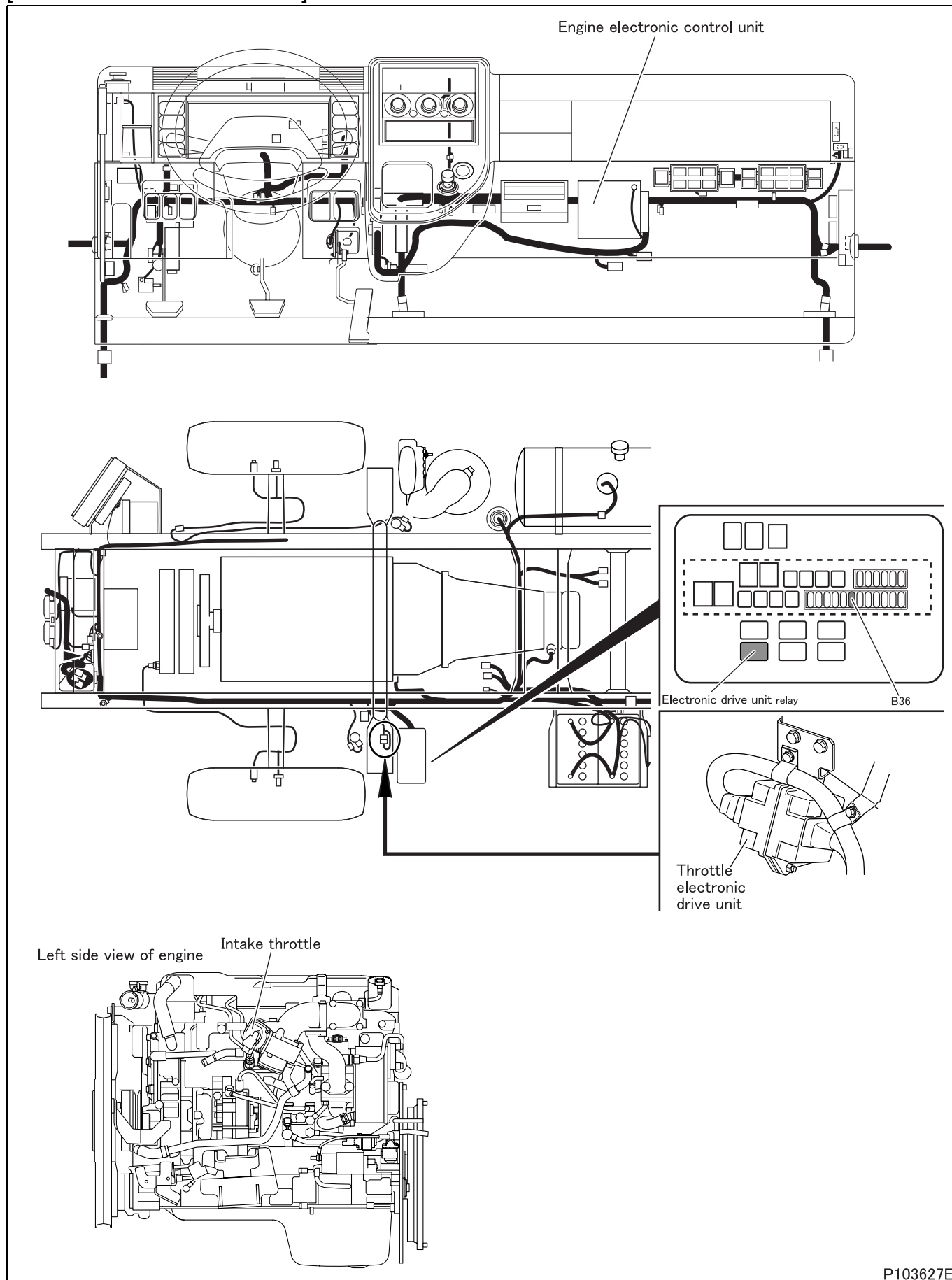
[Electronic Control Unit Connection Diagram]



P103499E

# TROUBLESHOOTING

## [Parts Identification and Location]



P103627E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |  |                                    |
|--------|--|--|------------------------------------|
| Step 1 | Inspection items                                       | Inspection by control data   |                                    |
|        | Maintenance item                                       | Perform actuator test item No. A3 "Intake Throttle 1"  |                                    |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Transmission: neutral</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul> |                                    |
|        | Requirements   | Actual position matches with target value set by Multi-Use Tester. (check with service data "53: Actual Intake Throttle Position")   |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to transient fault (See Gr00.). |
|        | NO   | Go to step 2.  |                                    |

|        |  |   |               |
|--------|--|---|---------------|
| Step 2 | Inspection items                                       | Inspection of electronic drive unit connector   |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 3. |
|        | NO   | Modify connector.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 3 | Inspection items                                       | Inspection of throttle actuator connector   |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 4. |
|        | NO   | Modify connector.   |               |

|        |  |  |   |  |
|--------|--|--|---|--|
| Step 4 | Inspection items                                       | Inspection by control data   |   |  |
|        | Maintenance item                                       | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0685 "EDU Relay (Open)"</li> <li>• P0686 "EDU Relay (Low)"</li> <li>• P0687 "EDU Relay (High)"</li> </ul> |   |  |
|        | Inspection condition                                   | Starter switch: ON   |   |  |
|        | Requirements   | Codes occur.   |   |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Inspect diagnosis code that is occurring. |  |
|        |  | NO   | Go to step 5.                             |  |

|        |  |  |                |
|--------|--|--|----------------|
| Step 5 | Inspection items                                       | Inspection of electronic drive unit connector (power supply)   |                |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 13 (+) and 14 (-).   |                |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Remove connector and measure from harness side.</li> <li>• Starter switch: ON</li> <li>• Perform actuator test item No. AF "EDU Relay"</li> </ul> |                |
|        | Requirements   | Same as battery voltage.   |                |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 10. |
|        | NO   | Go to step 6.  |                |

# TROUBLESHOOTING

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between fuse and relay   |
|        | Maintenance item                                       |                 | Check circuit between fuse No. B35 and relay connector terminal No. 5                      |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 8 | Inspection items                                       |                 | Inspection of harness between relay and electronic drive unit  |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 4 and electronic drive unit connector terminal No. 13 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.               |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of relay, go to step 9.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and ground   |
|        | Maintenance item                                       |                 | Check circuit between following electronic drive unit connector terminals <ul style="list-style-type: none"> <li>• Electronic drive unit ground: terminal No. 14 - chassis ground</li> <li>• Sensor ground: terminal No. 4 - 14</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 10.   |
| NO     |  | Modify harness. |  |

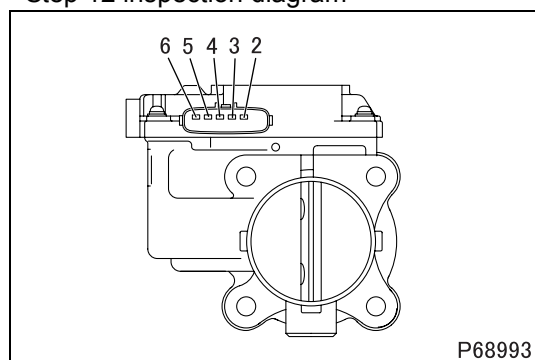
|         |  |                |   |
|---------|--|----------------|---|
| Step 10 | Inspection items                                       |                | Inspection of electronic drive unit connector (motor)                 |
|         | Maintenance item                                       |                | Measure value of resistance between connector terminal No. 10 and 11. |
|         | Inspection condition                                   |                | Remove connector and measure from harness side.                       |
|         | Requirements   |                | 0.3 to 80 Ω   |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 13.  |
| NO      |  | Go to step 11. |   |



|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and throttle actuator (motor)  |
|         | Maintenance item                                       |                 | Check circuit between following connector terminals.<br><ul style="list-style-type: none"> <li>• Motor (1) : electronic drive unit connector terminal No. 10 - throttle actuator connector terminal No. 6</li> <li>• Motor (2) : electronic drive unit connector terminal No. 11 - throttle actuator connector terminal No. 5</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |                                  |   |
|---------|--|----------------------------------|---|
| Step 12 | Inspection items                                       |                                  | Inspection of throttle actuator unit (motor)  |
|         | Maintenance item                                       |                                  | Measure value of resistance between connector terminal No. 5 and 6.   |
|         | Inspection condition                                   |                                  | <ul style="list-style-type: none"> <li>• Keep throttle actuator installed on vehicle.</li> <li>• Remove connector, and measure throttle actuator side.</li> </ul> |
|         | Requirements   |                                  | 0.3 to 80 Ω   |
|         | Inspection result (Is the judging standard satisfied?) | YES                              | Go to step 13.  |
| NO      |  | Replacement of throttle actuator |   |

<Step 12 inspection diagram>



|         |  |                |   |
|---------|--|----------------|---|
| Step 13 | Inspection items                                       |                | Inspection of throttle actuator connector (position sensor: power supply)   |
|         | Maintenance item                                       |                | Measure value of voltage between connector terminal No. 2 (+) and 4 (-).  |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|         | Requirements   |                | 5 V   |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 14.  |
| NO      |  | Go to step 15. |   |

|         |  |                         |  |
|---------|--|-------------------------|--|
| Step 14 | Inspection items                                       |                         | Inspection of electronic drive unit connector (position sensor: signal)  |
|         | Maintenance item                                       |                         | Measure value of voltage between connector terminal No. 3 (+) and 4 (-).   |
|         | Inspection condition                                   |                         | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> <li>• Perform actuator test item No. A3 "Intake Throttle 1"</li> </ul> |
|         | Requirements   |                         | <ul style="list-style-type: none"> <li>• Valve fully closed: 0.5 V</li> <li>• Valve fully opened: 4.375 V</li> </ul>   |
|         | Inspection result (Is the judging standard satisfied?) | YES                     | Go to step 16.   |
| NO      |  | Go to step 15.back side |  |

# TROUBLESHOOTING

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 15 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and throttle actuator (position sensor)   |
|         | Maintenance item                                       |                 | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Sensor (power supply): electronic drive unit connector terminal No. 2 - throttle actuator connector terminal No. 2</li> <li>• Sensor (signal): electronic drive unit connector terminal No. 3 - throttle actuator connector terminal No. 3</li> <li>• Sensor (ground): electronic drive unit connector terminal No. 4 - throttle actuator connector terminal No. 4</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of throttle actuator, go to step 16   |
| NO      |  | Modify harness. |   |

|         |  |                                      |  |
|---------|--|--------------------------------------|--|
| Step 16 | Inspection items                                       |                                      | Inspection by control data   |
|         | Maintenance item                                       |                                      | Perform actuator test item No. A3 "Intake Throttle 1"  |
|         | Inspection condition                                   |                                      | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Transmission: neutral</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul> |
|         | Requirements   |                                      | Actual position matches with target value set by Multi-Use Tester. (check with service data "53: Actual Intake Throttle Position")   |
|         | Inspection result (Is the judging standard satisfied?) | YES                                  | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic drive unit |  |

**[Fault code]**

Diagnosis code: P0234/Flash code: 32, 54

**[Monitor]**

Overboost

**[Fault (outline)]**

Overboost

**[Diagnosis check]**

Either of the following is monitored.

<Condition (1)>

- Actual boost pressure is detected by boost pressure sensor and compared with standard pressure recorded in engine electronic control unit.

<Condition (2), (3)>

- Actual boost pressure is detected by boost pressure sensor and compared with permissible pressure recorded in engine electronic control unit (engine protection).

**[Code generation condition]**

Diagnosis code is generated under either of the following conditions.

<Condition (1)>

- Difference between target boost pressure and actual boost pressure remains more than specified for 10 seconds (overboost status). (Warning lamp (orange) is lit and diagnosis code is displayed on third establishment of code generation condition.)

<Condition (2)>

- The remaining of actual boost pressure higher than permissible pressure recorded in engine electronic control unit for 10 seconds is repeated five times (pre-diagnosis). (Diagnosis code is displayed on first establishment of code generation condition.)

<Condition (3)>

- Status of condition (2) remaining for another 10 seconds is repeated 5 times (final diagnosis). (Warning lamp (red) is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine operating mode: normal (engine in operation)
- Water temperature: 65 to 120°C {149 to 248°F}
- Atmospheric pressure: 828 to 1100 mbar {12 to 15.95 psi}
- Intake air temperature: -7 to 60°C {19 to 140°F}
- Engine speed: 600 to 3000 rpm
- Variation in engine speed: less than 300 rpm/s
- Diesel particulate filter regeneration control: not effected
- Exhaust gas recirculation valve: in order
- Intake throttle: in order
- Turbocharger actuator: in order
- Controller area network communication of each electronic drive unit (exhaust gas recirculation, intake throttle and turbocharger): in order
- Atmospheric pressure sensor: in order
- Boost pressure sensor: in order
- Water temperature sensor: in order
- Intake air temperature sensor: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order
- Exhaust shutter: in order
- Exhaust gas recirculation cooler: in order
- Starter switch circuit: in order

# TROUBLESHOOTING

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## **[Control effected by electronic control unit during fault]**

Electronic control unit differs in the way of control by the diagnosis check item.

<Overboost>

- Engine torque is limited.
- Turbocharger is controlled to open side.

<Deviation in boost pressure>

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Related fault check is stopped.

## **[Probable cause of trouble]**

- Boost pressure incorrectly adjusted
- Mechanical failure of turbocharger unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Timing of warning lamp/diagnosis code OFF depends on condition.)

<Condition (1)>

- Lamp is extinguished and code is cleared at fourth diagnosis code display after recovery.

<Condition (2)>

- Diagnosis code is cleared simultaneously with recovery.

<Condition (3)>

- Lamp is extinguished and code is cleared simultaneously with recovery.

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |                     |  |
|--------|--|---------------------|--|
| Step 1 | Inspection items                                       |                     | Inspection by control data   |
|        | Maintenance item                                       |                     | <p>Check if following diagnosis codes occur simultaneously.</p> <ul style="list-style-type: none"> <li>• P0045 "VGT Acuator (Open)"</li> <li>• P0046 "VGT Acuator (Performance)"</li> <li>• P0047 "VGT Acuator (Low)"</li> <li>• P0069 "Boost Press SNSR (Correlation)"</li> <li>• P0236 "Boost Press SNSR (Plausi)"</li> <li>• P0237 "Boost Press SNSR (Low)"</li> <li>• P0238 "Boost Press SNSR (High)"</li> <li>• P0401 "EGR Flow (Insufficient)"</li> <li>• P0402 "EGR Flow (Excessive)"</li> <li>• P0403 "EGR1 (Acutuator Circuit)"</li> <li>• P0404 "EGR System"</li> <li>• P0409 "EGR1 (Position Sensor)"</li> <li>• P0562 "Power Supply Voltage (Low)"</li> <li>• P0563 "Power Supply Voltage (High)"</li> <li>• P0600 "CAN Communication"</li> <li>• P0607 "ECU System"</li> <li>• P060B "A/D Converter"</li> <li>• P061B "ECU Performance (Calc)"</li> <li>• P061C "ECU Performance (Ne)"</li> <li>• P0685 "EDU Relay (Open)"</li> <li>• P0686 "EDU Relay (Low)"</li> <li>• P0687 "EDU Relay (High)"</li> <li>• P2002 "DPF MFF"</li> <li>• P2228 "Atm Press SNSR (Low)"</li> <li>• P2229 "Atm Press SNSR (High)"</li> <li>• P2263 "VGT System"</li> <li>• P2413 "EGR System"</li> <li>• P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>• P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>• P2455 "DPF Diff SNSR (High) &amp; MFF"</li> <li>• P2457 "EGR Cooler Performance"</li> </ul> |
|        | Inspection condition                                   |                     | Starter switch: ON<br>Do not start engine.   |
|        | Requirements   |                     | Codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) |                     | YES<br>Inspect diagnosis code that is occurring.   |
|        |  | NO<br>Go to step 2. |  |

|        |  |                     |  |
|--------|--|---------------------|--|
| Step 2 | Inspection items                                       |                     | Check of exhaust system                          |
|        | Maintenance item                                       |                     | Front pipe, diesel particulate filter, tail pipe |
|        | Inspection condition                                   |                     | Starter switch: OFF                              |
|        | Requirements   |                     | Blocked  |
|        | Inspection result (Is the judging standard satisfied?) |                     | YES<br>Clean or replace parts.                   |
|        |  | NO<br>Go to step 3. |  |

|        |  |                     |                                    |
|--------|--|---------------------|------------------------------------|
| Step 3 | Inspection items                                       |                     | Check of turbocharger appearance   |
|        | Maintenance item                                       |                     | Appearance of turbocharger         |
|        | Inspection condition                                   |                     | Starter switch: OFF                |
|        | Requirements   |                     | Air cylinder binds.                |
|        | Inspection result (Is the judging standard satisfied?) |                     | YES<br>Replacement of turbocharger |
|        |  | NO<br>Go to step 4. |                                    |

# TROUBLESHOOTING

|        |  |                             |   |
|--------|--|-----------------------------|---|
| Step 4 | Inspection items                                       |                             | Inspection by control data  |
|        | Maintenance item                                       |                             | <b>&lt;General Scanning Tool used&gt;</b> <ul style="list-style-type: none"> <li>• Measure item "Intake MAP".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b> <ul style="list-style-type: none"> <li>• Measure item No. 21 "Boost Pressure" of Service Data.</li> </ul> |
|        | Inspection condition                                   |                             | For boost pressure measurement and correction data calculation, see Gr15.   |
|        | Requirements   |                             | Boost pressure is normal.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                         | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of turbocharger |   |

**[Fault code]**

Diagnosis code: P0236/Flash code: 32

**[Monitor]**

Characteristic abnormality of boost pressure sensor

**[Fault (outline)]**

- Offset and gain drift (High)
- Offset and gain drift (Low)

**[Diagnosis check]**

Boost pressure is monitored with engine in the following conditions.

<Low speed operation>

- Engine speed: 800 rpm
- Intake throttle opening: 14% or more

<High speed operation>

- Engine speed: 2100 rpm
- Intake throttle opening: 60% or more
- Turbocharger opening: 50% or more

**[Code generation condition]**

<Low speed operation>

- Boost pressure: Remains at 1125 mbar {16.31 psi} or higher for 10 consecutive seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

<High speed operation>

- Boost pressure: Remains at 1300 mbar {18.85 psi} or lower for 10 consecutive seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

<High speed operation>

- Engine operating mode: normal (engine in operation)
- Engine speed: less than 800 rpm
- Fuel injection quantity: below 25 mg/cyc
- Intake throttle valve opening: more than 14%
- Air flow sensor: in order
- Exhaust gas recirculation valve: in order
- Intake throttle: in order
- Turbocharger actuator: in order
- Controller area network communication of each electronic drive unit (exhaust gas recirculation, intake throttle and turbocharger): in order
- Exhaust gas recirculation flow rate and exhaust gas recirculation valve operation: in order
- Atmospheric pressure sensor: normal in output signal
- Boost pressure sensor: in order
- Water temperature sensor: in order
- Intake air temperature sensor: in order
- Exhaust gas recirculation cooler: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- Injector: in order
- MPROP (rail pressure control valve): in order
- Fuel feed when engine is idling: in order
- Exhaust shutter 3-way magnetic valve: in order

# TROUBLESHOOTING

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## <Low speed operation>

- Engine operating mode: normal (engine in operation)
- Engine speed: more than 2100 rpm
- Fuel injection quantity: above 67 mg/cyc
- Intake throttle valve opening: more than 60%
- Turbocharger position: more than 40%
- Air flow sensor: in order
- Exhaust gas recirculation valve: in order
- Intake throttle: in order
- Turbocharger actuator: in order
- Controller area network communication of each electronic drive unit (exhaust gas recirculation, intake throttle and turbocharger): in order
- Exhaust gas recirculation flow rate and exhaust gas recirculation valve operation: in order
- Atmospheric pressure sensor: in order
- Boost pressure sensor: normal in output signal
- Water temperature sensor: in order
- Intake air temperature sensor: in order
- Exhaust gas recirculation cooler: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- Injector: in order
- MPROP (rail pressure control valve): in order
- Fuel feed when engine is idling: in order
- Exhaust shutter 3-way magnetic valve: in order

## **[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Related fault check is stopped.

## **[Probable cause of trouble]**

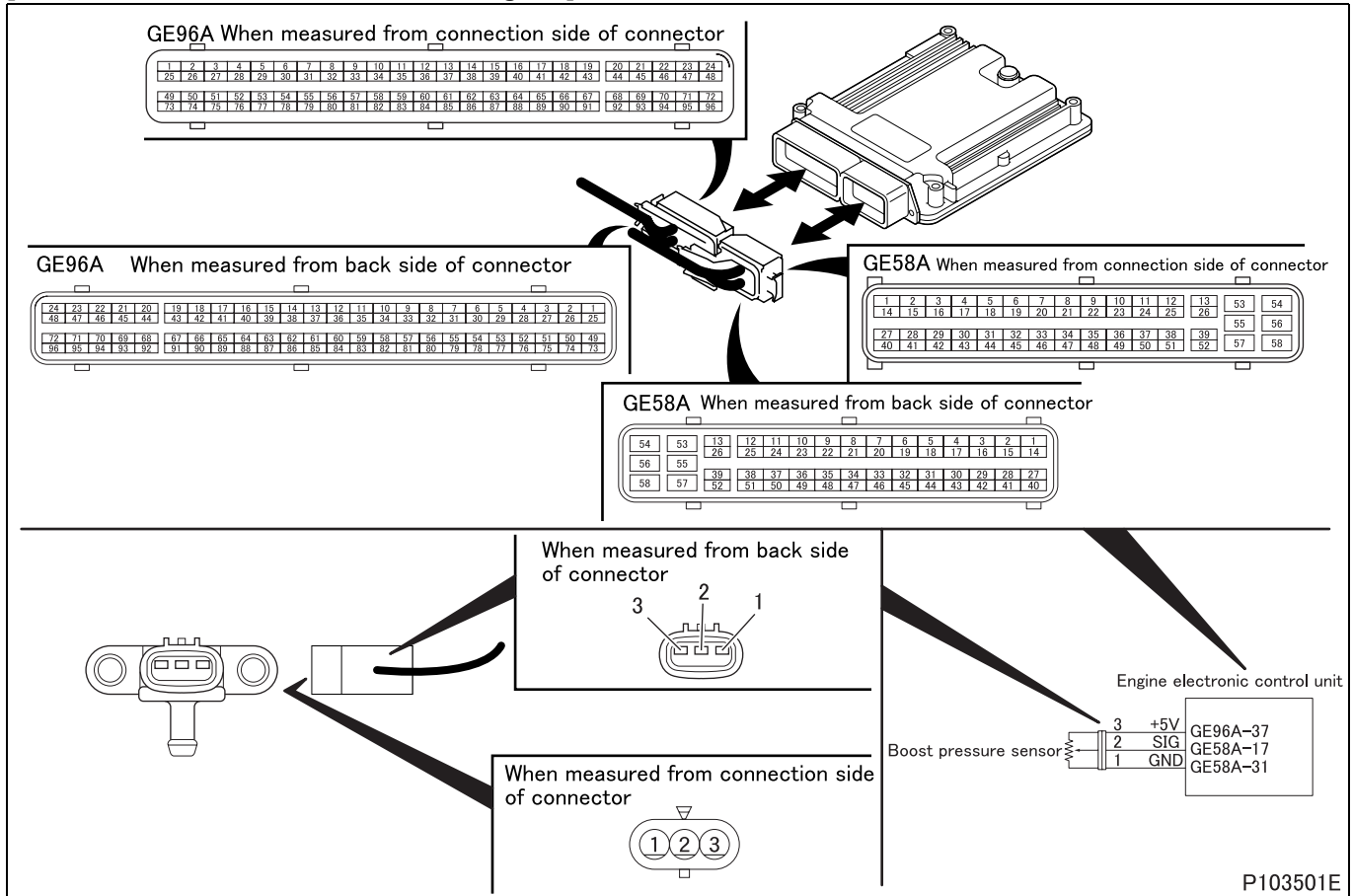
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

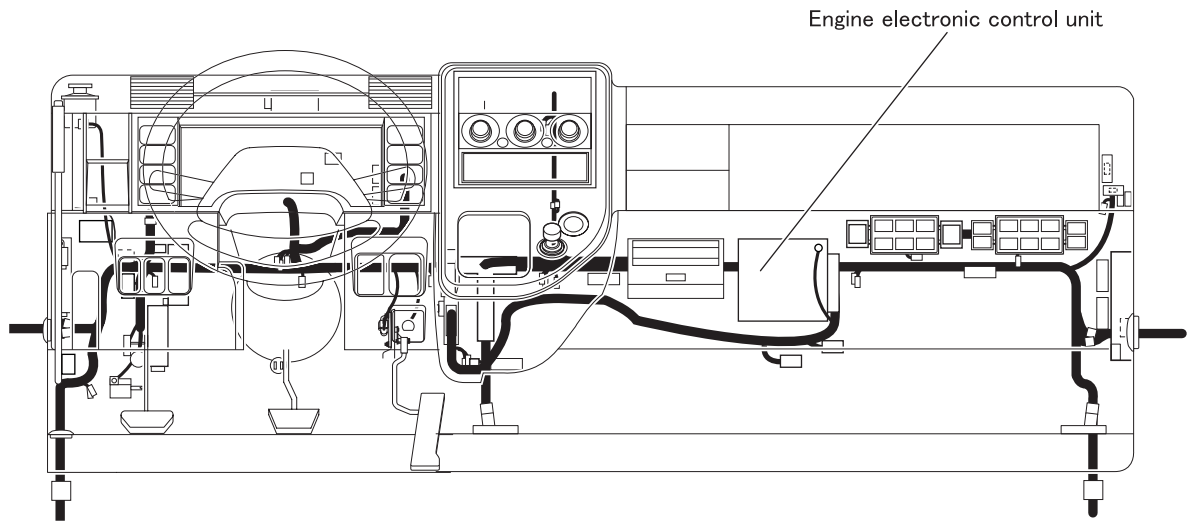


## [Electronic Control Unit Connection Diagram]

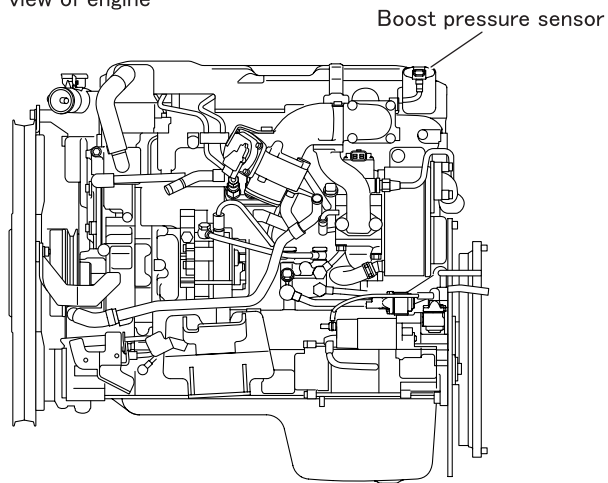


# TROUBLESHOOTING

## [Parts Identification and Location]



Left side view of engine



P103628E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Intake MAP".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 21 "Boost Pressure" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | Starter switch ON (engine stationary) → After engine has started, press accelerator pedal.  |
|        | Requirements   |               | Coincides with atmospheric pressure → Gradually increases   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
|        | NO   | Go to step 2. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (signal)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 34 (+) and 14 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Engine started</li> </ul> |
|        | Requirements   |               | 0.5 to 4.5 V  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 5.   |
|        | NO   | Go to step 3. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 3 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 37 (+) and 14 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.   |
|        | NO   | Go to step 5. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 4 | Inspection items                                       |               | Inspection by electronic control unit connector (ground)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 14 (+) and (GE58A) terminal No. 53 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 0 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 6.   |
|        | NO   | Go to step 5. |   |

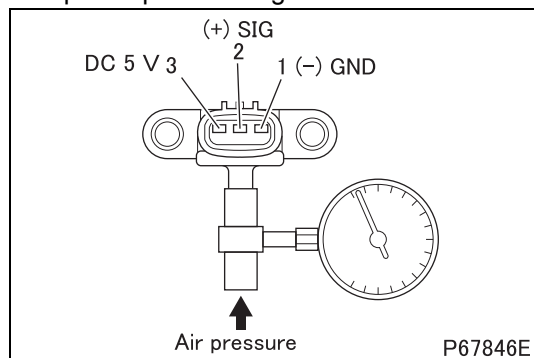
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 5 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 12.  |
|        | NO   | Modify connector. |   |

# TROUBLESHOOTING

|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify connector.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 7 | Inspection items                                       | Inspection of sensor unit   |               |
|        | Maintenance item                                       | Measure voltage developing across connector terminal No. 2 (+) and 1 (-) when air pressure (gauge pressure) is gradually applied.   |               |
|        | Inspection condition                                   | Apply voltage DC 5 V across connector terminals No. 3 (+) and 1 (-).  |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• 99 kPa {14 psi, 1.0 kgf/cm<sup>2</sup>}: Approx. 2.5 V</li> <li>• 232.3 kPa {34 psi, 2.4 kgf/cm<sup>2</sup>}: Approx. 4.5 V</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8. |
| NO     |  | Replacement of sensor   |               |

<Step 7 inspection diagram>



|        |  |   |                |
|--------|--|---|----------------|
| Step 8 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)   |                |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 3 (+) and 1 (-).  |                |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |                |
|        | Requirements   | 5 V   |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 10. |
| NO     |  | Go to step 9.   |                |

|        |  |  |                |
|--------|--|--|----------------|
| Step 9 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)                                      |                |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 37. |                |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                           |                |
|        | Requirements   | There is continuity.   |                |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 12. |
| NO     |  | Modify harness.  |                |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 14. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO      |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 34. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |  |   |
|---------|--|--|---|
| Step 12 | Inspection items                                       |  | Inspection by control data  |
|         | Maintenance item                                       |  | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Intake MAP".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 21 "Boost Pressure" of Service Data.</li> </ul> |
|         | Inspection condition                                   |  | Starter switch ON (engine stationary) → After engine has started, press accelerator pedal.  |
|         | Requirements   |  | Coincides with atmospheric pressure → Gradually increases   |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO      |  | Replacement of electronic control unit |   |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0237/Flash code: 32

## **[Monitor]**

Failure of boost pressure sensor

## **[Fault (outline)]**

Low signal range check

## **[Diagnosis check]**

- Boost sensor output voltage is monitored.

## **[Code generation condition]**

- Boost sensor output voltage remains below 0.098 V for 1 second. (sensor pressure: 400 mbar {5.8 psi} or less)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

- Fault diagnosis starts when one of the following requirements are met (The diagnosis does not start when both requirements are simultaneously met.).
  - Engine speed: less than 500 rpm
  - Fuel injection quantity: below 5 mg/cyc

## **[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Particulate matter deposit computation is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

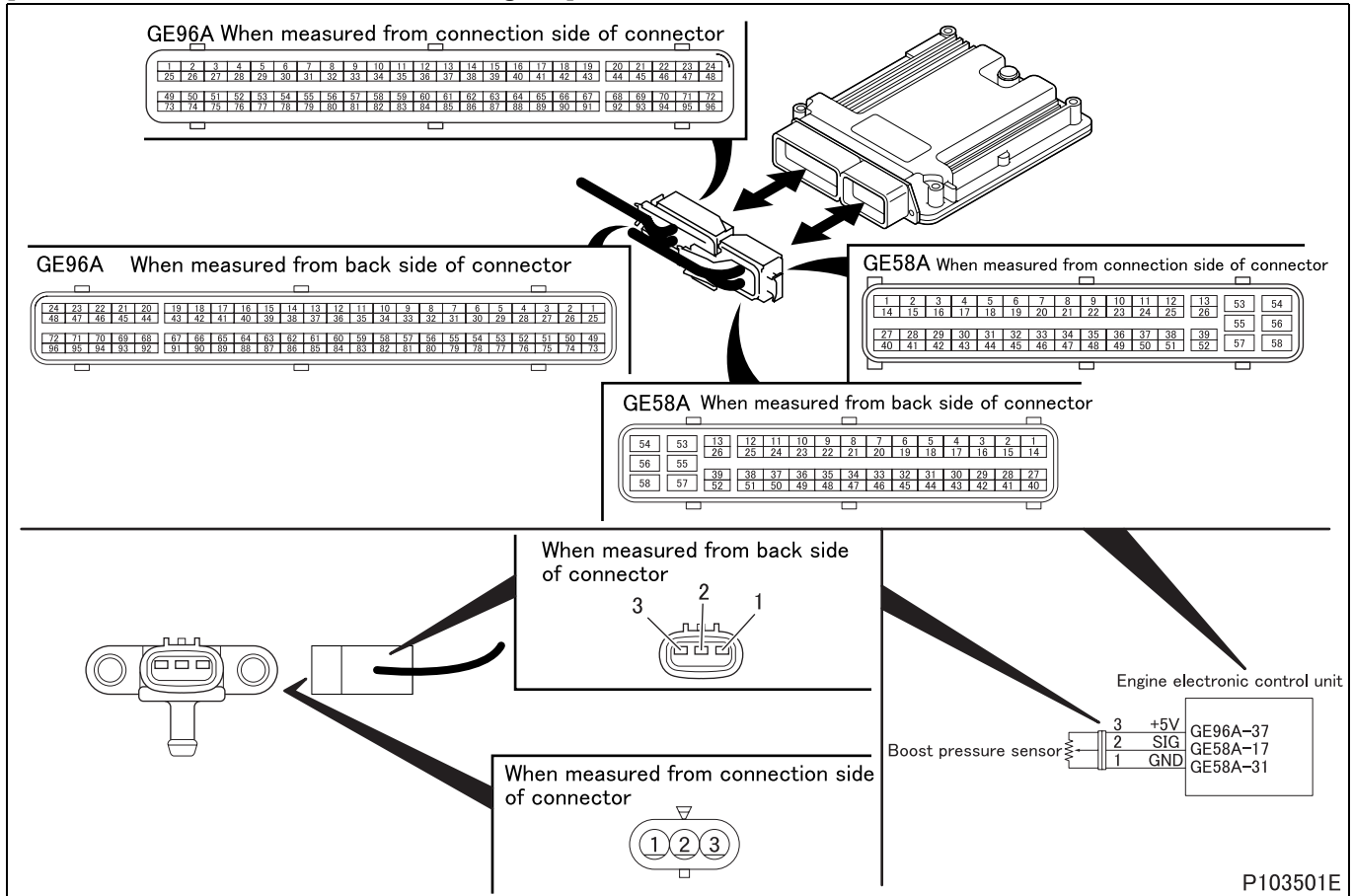
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

## **[Recoverability]**

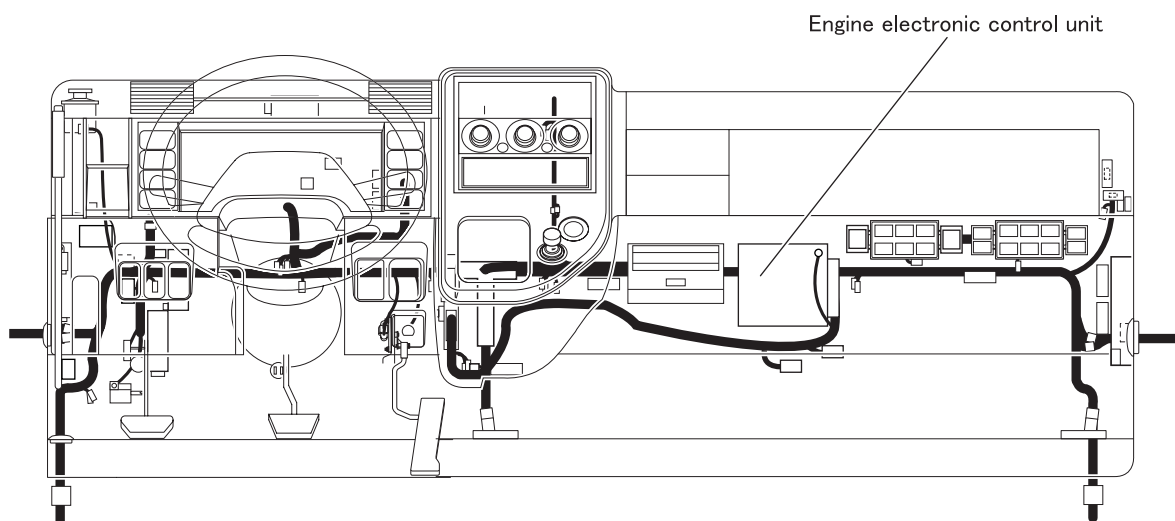
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

## [Electronic Control Unit Connection Diagram]

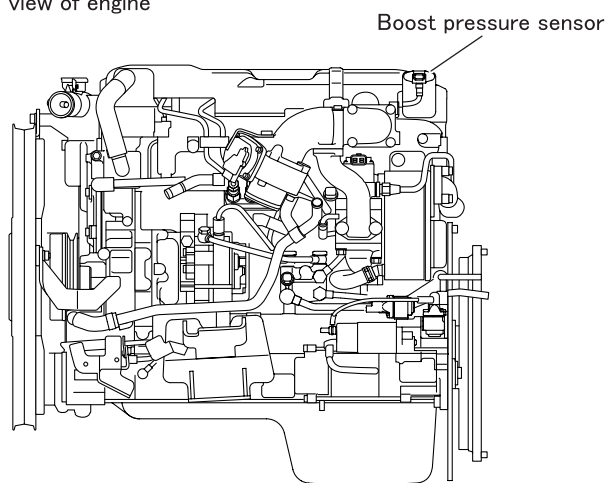


# TROUBLESHOOTING

## [Parts Identification and Location]



Left side view of engine



P103628E



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |   |                                    |
|--------|--|---|------------------------------------|
| Step 1 | Inspection items                                       | Inspection by control data  |                                    |
|        | Maintenance item                                       | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Intake MAP".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 21 "Boost Pressure" of Service Data.</li> </ul> |                                    |
|        | Inspection condition                                   | Starter switch ON (engine stationary) → After engine has started, press accelerator pedal.  |                                    |
|        | Requirements   | Coincides with atmospheric pressure → Gradually increases   |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.). |
|        |  | NO  | Go to step 2.                      |

|        |  |   |               |
|--------|--|---|---------------|
| Step 2 | Inspection items                                       | Inspection by electronic control unit connector (signal)  |               |
|        | Maintenance item                                       | Measure value of voltage between connector (GE96A) terminal No. 34 (+) and 14 (-).  |               |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Engine started</li> </ul> |               |
|        | Requirements   | 0.5 to 4.5 V  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5. |
|        |  | NO  | Go to step 3. |

|        |  |   |               |
|--------|--|---|---------------|
| Step 3 | Inspection items                                       | Inspection by electronic control unit connector (power supply)  |               |
|        | Maintenance item                                       | Measure value of voltage between connector (GE96A) terminal No. 37 (+) and 14 (-).  |               |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |               |
|        | Requirements   | 5 V   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 4. |
|        |  | NO  | Go to step 5. |

|        |  |   |               |
|--------|--|---|---------------|
| Step 4 | Inspection items                                       | Inspection by electronic control unit connector (ground)  |               |
|        | Maintenance item                                       | Measure value of voltage between connector (GE96A) terminal No. 14 (+) and (GE58A) terminal No. 53 (-).   |               |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |               |
|        | Requirements   | 0 V   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6. |
|        |  | NO  | Go to step 5. |

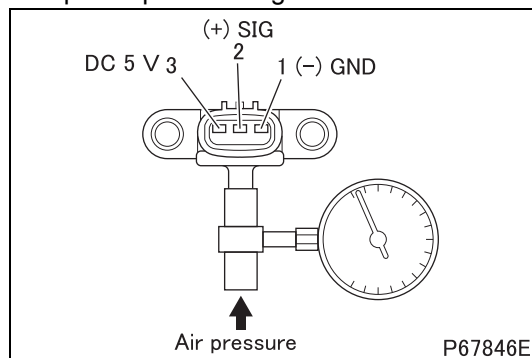
|        |  |   |                   |
|--------|--|---|-------------------|
| Step 5 | Inspection items                                       | Inspection of electronic control unit connector   |                   |
|        | Maintenance item                                       | Inspection of connector   |                   |
|        | Inspection condition                                   | -   |                   |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                   |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 12.    |
|        |  | NO  | Modify connector. |

# TROUBLESHOOTING

|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify connector.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 7 | Inspection items                                       | Inspection of sensor unit   |               |
|        | Maintenance item                                       | Measure voltage developing across connector terminal No. 2 (+) and 1 (-) when air pressure (gauge pressure) is gradually applied.   |               |
|        | Inspection condition                                   | Apply voltage DC 5 V across connector terminals No. 3 (+) and 1 (-).  |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• 99 kPa {14 psi, 1.0 kgf/cm<sup>2</sup>}: Approx. 2.5 V</li> <li>• 232.3 kPa {34 psi, 2.4 kgf/cm<sup>2</sup>}: Approx. 4.5 V</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8. |
| NO     |  | Replacement of sensor   |               |

<Step 7 inspection diagram>



|        |  |   |                |
|--------|--|---|----------------|
| Step 8 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)   |                |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 3 (+) and 1 (-).  |                |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |                |
|        | Requirements   | 5 V   |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 10. |
| NO     |  | Go to step 9.   |                |

|        |  |  |                |
|--------|--|--|----------------|
| Step 9 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)                                      |                |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 37. |                |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                           |                |
|        | Requirements   | There is continuity.   |                |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 12. |
| NO     |  | Modify harness.  |                |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 14. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO      |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 34. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |  |   |
|---------|--|--|---|
| Step 12 | Inspection items                                       |  | Inspection by control data  |
|         | Maintenance item                                       |  | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Intake MAP".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 21 "Boost Pressure" of Service Data.</li> </ul> |
|         | Inspection condition                                   |  | Starter switch ON (engine stationary) → After engine has started, press accelerator pedal.  |
|         | Requirements   |  | Coincides with atmospheric pressure → Gradually increases   |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO      |  | Replacement of electronic control unit |   |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0238/Flash code: 32

## **[Monitor]**

Failure of boost pressure sensor

## **[Fault (outline)]**

High signal range check

## **[Diagnosis check]**

- Boost sensor output voltage is monitored.

## **[Code generation condition]**

- Boost sensor output voltage remains over 4.87 V for 1 second. (sensor pressure: 3533 mbar {51.23 psi} or more)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Particulate matter deposit computation is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

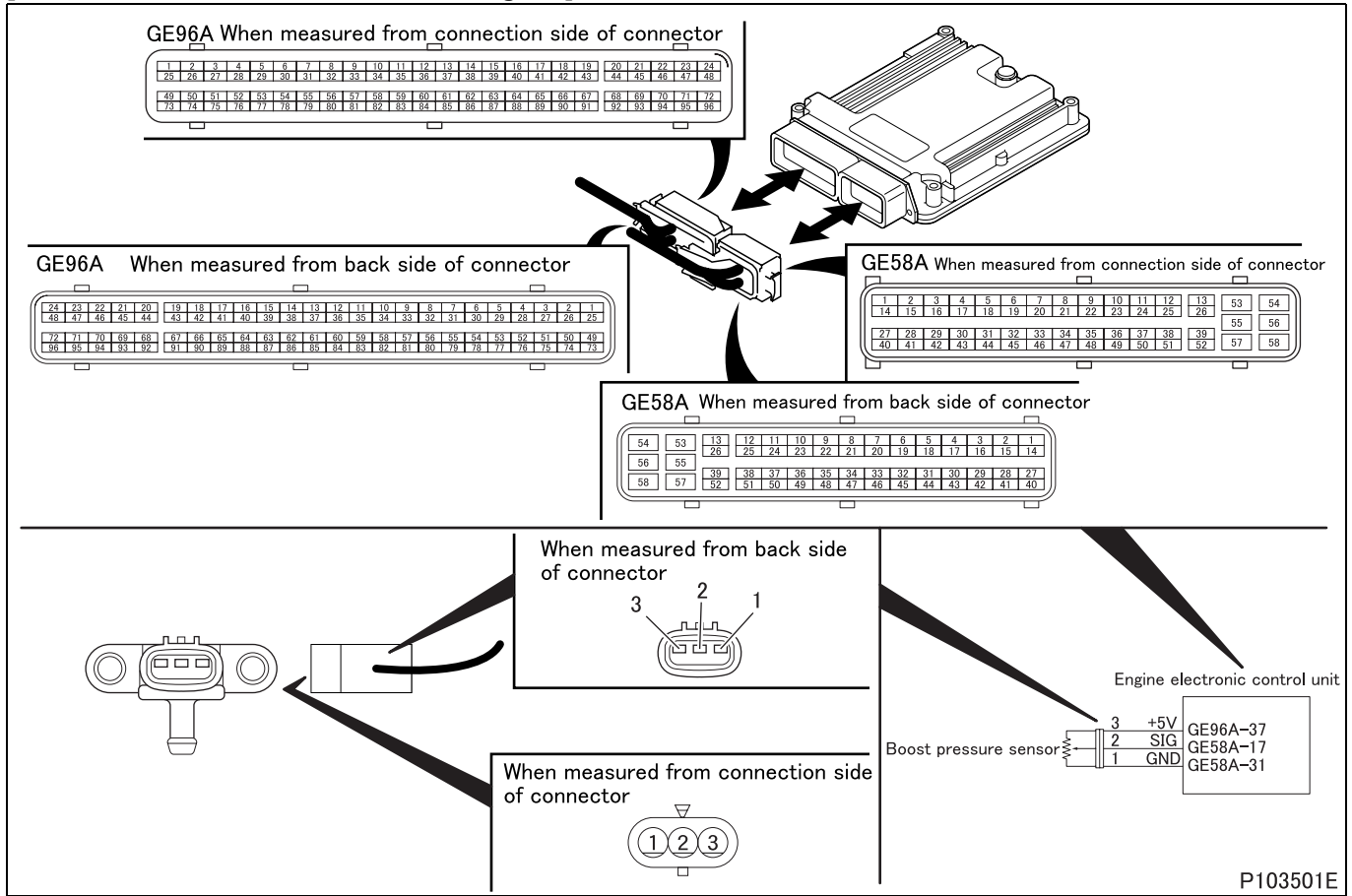
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

## **[Recoverability]**

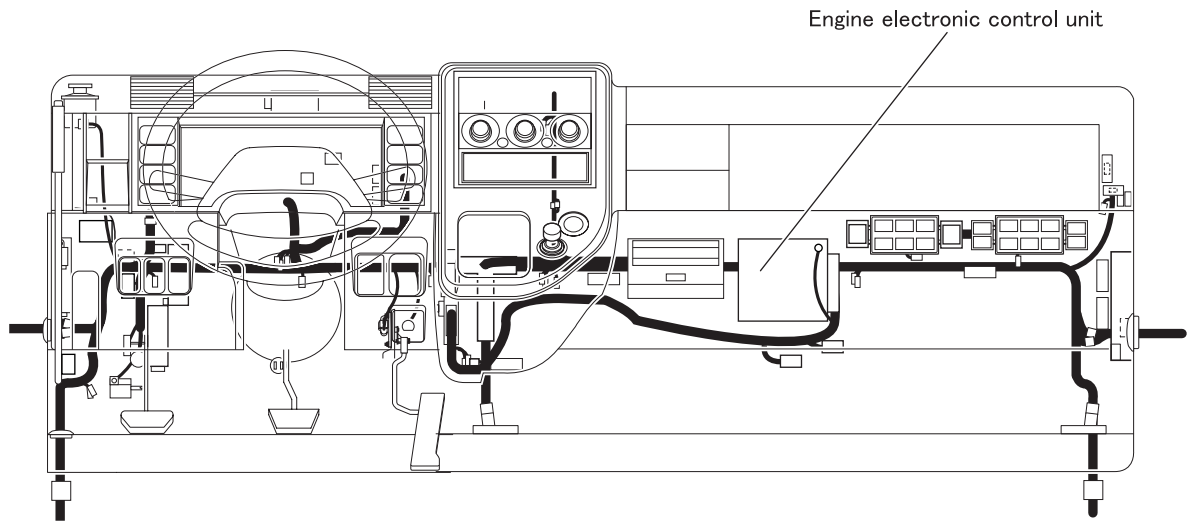
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]

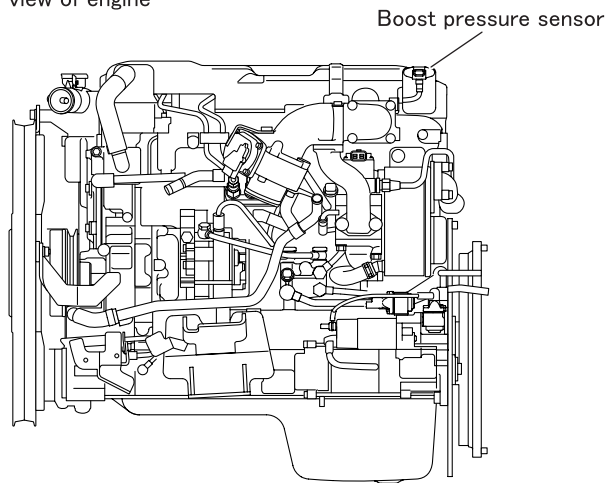


# TROUBLESHOOTING

## [Parts Identification and Location]



Left side view of engine



P103628E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |                     |   |
|--------|--|---------------------|---|
| Step 1 | Inspection items                                       |                     | Inspection by control data  |
|        | Maintenance item                                       |                     | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Intake MAP".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 21 "Boost Pressure" of Service Data.</li> </ul> |
|        | Inspection condition                                   |                     | Starter switch ON (engine stationary) → After engine has started, press accelerator pedal.  |
|        | Requirements   |                     | Coincides with atmospheric pressure → Gradually increases   |
|        | Inspection result (Is the judging standard satisfied?) |                     | YES<br>Go to transient fault (See Gr00.).   |
|        |  | NO<br>Go to step 2. |   |

|        |  |                     |   |
|--------|--|---------------------|---|
| Step 2 | Inspection items                                       |                     | Inspection by electronic control unit connector (signal)  |
|        | Maintenance item                                       |                     | Measure value of voltage between connector (GE96A) terminal No. 34 (+) and 14 (-).  |
|        | Inspection condition                                   |                     | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Engine started</li> </ul> |
|        | Requirements   |                     | 0.5 to 4.5 V  |
|        | Inspection result (Is the judging standard satisfied?) |                     | YES<br>Go to step 5.  |
|        |  | NO<br>Go to step 3. |   |

|        |  |                     |   |
|--------|--|---------------------|---|
| Step 3 | Inspection items                                       |                     | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |                     | Measure value of voltage between connector (GE96A) terminal No. 37 (+) and 14 (-).  |
|        | Inspection condition                                   |                     | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |                     | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) |                     | YES<br>Go to step 4.  |
|        |  | NO<br>Go to step 5. |   |

|        |  |                     |   |
|--------|--|---------------------|---|
| Step 4 | Inspection items                                       |                     | Inspection by electronic control unit connector (ground)  |
|        | Maintenance item                                       |                     | Measure value of voltage between connector (GE96A) terminal No. 14 (+) and (GE58A) terminal No. 53 (-).   |
|        | Inspection condition                                   |                     | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |                     | 0 V   |
|        | Inspection result (Is the judging standard satisfied?) |                     | YES<br>Go to step 6.  |
|        |  | NO<br>Go to step 5. |   |

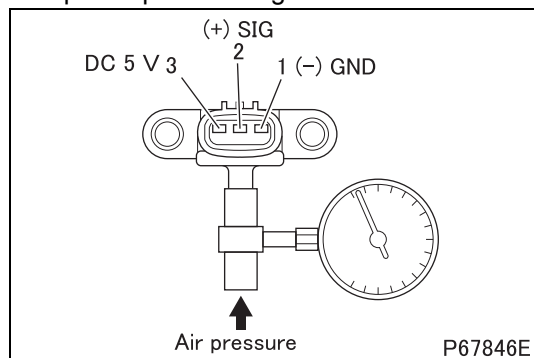
|        |  |                         |   |
|--------|--|-------------------------|---|
| Step 5 | Inspection items                                       |                         | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                         | Inspection of connector   |
|        | Inspection condition                                   |                         | –   |
|        | Requirements   |                         | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |                         | YES<br>Go to step 12.   |
|        |  | NO<br>Modify connector. |   |

# TROUBLESHOOTING

|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify connector.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 7 | Inspection items                                       | Inspection of sensor unit   |               |
|        | Maintenance item                                       | Measure voltage developing across connector terminal No. 2 (+) and 1 (-) when air pressure (gauge pressure) is gradually applied.   |               |
|        | Inspection condition                                   | Apply voltage DC 5 V across connector terminals No. 3 (+) and 1 (-).  |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• 99 kPa {14 psi, 1.0 kgf/cm<sup>2</sup>}: Approx. 2.5 V</li> <li>• 232.3 kPa {34 psi, 2.4 kgf/cm<sup>2</sup>}: Approx. 4.5 V</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8. |
| NO     |  | Replacement of sensor   |               |

<Step 7 inspection diagram>



|        |  |   |                |
|--------|--|---|----------------|
| Step 8 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)   |                |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 3 (+) and 1 (-).  |                |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |                |
|        | Requirements   | 5 V   |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 10. |
| NO     |  | Go to step 9.   |                |

|        |  |  |                |
|--------|--|--|----------------|
| Step 9 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)                                      |                |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 37. |                |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                           |                |
|        | Requirements   | There is continuity.   |                |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 12. |
| NO     |  | Modify harness.  |                |



|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 14. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO      |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 34. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |  |   |
|---------|--|--|---|
| Step 12 | Inspection items                                       |  | Inspection by control data  |
|         | Maintenance item                                       |  | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Intake MAP".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 21 "Boost Pressure" of Service Data.</li> </ul> |
|         | Inspection condition                                   |  | Starter switch ON (engine stationary) → After engine has started, press accelerator pedal.  |
|         | Requirements   |  | Coincides with atmospheric pressure → Gradually increases   |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO      |  | Replacement of electronic control unit |   |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0251/Flash code: 36

## **[Monitor]**

Valve opening of common rail safety valve (DBV)

## **[Fault (outline)]**

Common rail pressure (maximum)

## **[Diagnosis check]**

- Safety valve (DBV) was activated after abnormal rise in common rail pressure.

## **[Code generation condition]**

- Common rail pressure exceeded 190 MPa {27560 psi, 1937 kgf/cm<sup>2</sup>} once, then dropped and stabilized at a level near a safety valve (DBV) operating pressure of 80 MPa {11604 psi, 816 kgf/cm<sup>2</sup>}.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

–

## **[Control effected by electronic control unit during fault]**

- Engine torque is limited.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.

## **[Probable cause of trouble]**

- Airtight malfunction of injector
- Malfunction of supply pump
- Plugged fuel system
- Malfunction of pressure limiter
- Malfunction of common rail pressure sensor

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(At the same time as recovery, warning lamp is extinguished and diagnosis code is cleared.)

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0192 "CRS Pressure SNSR (Low)"</li> <li>• P0193 "CRS Pressure SNSR (High)"</li> <li>• P0201 "Injector M/V-Cylinder 1 (Load)"</li> <li>• P0202 "Injector M/V-Cylinder 2 (Load)"</li> <li>• P0203 "Injector M/V-Cylinder 3 (Load)"</li> <li>• P0204 "Injector M/V-Cylinder 4 (Load)"</li> <li>• P0253 "Common Rail Pressure Defect"</li> <li>• P0605 "ECU System (Hardware)"</li> <li>• P0607 "ECU System"</li> </ul> |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> </ul>  |
|        | Requirements   |               | Codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Inspect diagnosis code that is occurring.  |
|        | NO   | Go to step 2. |  |

|        |  |               |                                  |
|--------|--|---------------|----------------------------------|
| Step 2 | Inspection items                                       |               | Checking of engine appearance    |
|        | Maintenance item                                       |               | Check fuel system for fuel leak. |
|        | Inspection condition                                   |               | Starter switch: OFF              |
|        | Requirements   |               | There is fuel leak.              |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.                    |
|        | NO   | Go to step 6. |                                  |

|        |  |   |   |
|--------|--|---|---|
| Step 3 | Inspection items                                       |   | Inspection of low pressure piping (fuel tank – supply pump) |
|        | Maintenance item                                       |   | Check suction pipe or hose for bend.                        |
|        | Inspection condition                                   |   | Starter switch: OFF   |
|        | Requirements   |   | There is no bend on hose.                                   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 4.   |
|        | NO   | Correct and replace suction pipe or hose. |   |

|        |  |               |                                    |
|--------|--|---------------|------------------------------------|
| Step 4 | Inspection items                                       |               | Checking of air bleeding           |
|        | Maintenance item                                       |               | Bleed air from fuel filter.        |
|        | Inspection condition                                   |               | Starter switch: OFF                |
|        | Requirements   |               | Problem is solved by bleeding air. |
|        | Inspection result (Is the judging standard satisfied?) | YES           | End of inspection                  |
|        | NO   | Go to step 5. |                                    |

|        |  |               |   |
|--------|--|---------------|---|
| Step 5 | Inspection items                                       |               | Inspection of low pressure piping           |
|        | Maintenance item                                       |               | Fuel filter                                 |
|        | Inspection condition                                   |               | Starter switch: OFF                         |
|        | Requirements   |               | Problem is solved by replacing fuel filter. |
|        | Inspection result (Is the judging standard satisfied?) | YES           | End of inspection                           |
|        | NO   | Go to step 6. |   |

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|        |  |                                  |   |
|--------|--|----------------------------------|---|
| Step 6 | Inspection items                                       |                                  | Inspection by control data  |
|        | Maintenance item                                       |                                  | Perform actuator test item No. B2 "Fuel Leak Check"   |
|        | Inspection condition                                   |                                  | Rail pressure is increased for a certain period of time (6 seconds).<br><ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Transmission: neutral</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul> |
|        | Requirements   |                                  | There is no leak from supply pump.  |
|        | Inspection result (Is the judging standard satisfied?) |                                  | YES<br>Go to step 7.  |
|        |  | NO<br>Replacement of supply pump |   |

|        |  |                                |   |
|--------|--|--------------------------------|---|
| Step 7 | Inspection items                                       |                                | Inspection by control data  |
|        | Maintenance item                                       |                                | Perform actuator test item No. B2 "Fuel Leak Check"   |
|        | Inspection condition                                   |                                | Rail pressure is increased for a certain period of time (6 seconds).<br><ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Transmission: neutral</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul> |
|        | Requirements   |                                | There is no leak from fuel pipe between supply pump and rail.   |
|        | Inspection result (Is the judging standard satisfied?) |                                | YES<br>Go to step 8.  |
|        |  | NO<br>Replacement of fuel pipe |   |

|        |  |                           |   |
|--------|--|---------------------------|---|
| Step 8 | Inspection items                                       |                           | Inspection by control data  |
|        | Maintenance item                                       |                           | Perform actuator test item No. B2 "Fuel Leak Check"   |
|        | Inspection condition                                   |                           | Rail pressure is increased for a certain period of time (6 seconds).<br><ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Transmission: neutral</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul> |
|        | Requirements   |                           | There is no leak from rail.   |
|        | Inspection result (Is the judging standard satisfied?) |                           | YES<br>Go to step 9.  |
|        |  | NO<br>Replacement of rail |   |

|        |  |                                     |   |
|--------|--|-------------------------------------|---|
| Step 9 | Inspection items                                       |                                     | Inspection by control data  |
|        | Maintenance item                                       |                                     | Perform actuator test item No. B2 "Fuel Leak Check"   |
|        | Inspection condition                                   |                                     | Rail pressure is increased for a certain period of time (6 seconds).<br><ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Transmission: neutral</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul> |
|        | Requirements   |                                     | There is no leak from fuel injection pipes (four) between injector and rail.  |
|        | Inspection result (Is the judging standard satisfied?) |                                     | YES<br>Go to step 10.   |
|        |  | NO<br>Replacement of injection pipe |   |

|         |  |                               |   |
|---------|--|-------------------------------|---|
| Step 10 | Inspection items                                       |                               | Inspection by control data  |
|         | Maintenance item                                       |                               | Perform actuator test item No. B2 "Fuel Leak Check"   |
|         | Inspection condition                                   |                               | Rail pressure is increased for a certain period of time (6 seconds).<br><ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Transmission: neutral</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul> |
|         | Requirements   |                               | There is no leak from injectors (four).   |
|         | Inspection result (Is the judging standard satisfied?) |                               | YES<br>Go to step 11.   |
|         |  | NO<br>Replacement of injector |   |

|         |  |  |  |
|---------|--|--|--|
| Step 11 | Inspection items                                       |  | Check inside of combustion chamber.  |
|         | Maintenance item                                       |  | Check for fuel leak.   |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>After performing actuator test item No. B2 "Fuel Leak Check", stop engine.</li> <li>Remove glow plug, and check from glow plug mounting hole using bore scope.</li> </ul> |
|         | Requirements   |  | Inside of combustion chamber is not wet.   |
|         | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 12.   |
| NO      |  | Replacement of injector of object cylinder |  |

|         |  |     |   |
|---------|--|-----|---|
| Step 12 | Inspection items                                       |     | Replacement of rail (flow damper and pressure limiter abnormal) |
|         | Maintenance item                                       |     | –   |
|         | Inspection condition                                   |     | –   |
|         | Requirements   |     | Problem is solved by replacing rail.                            |
|         | Inspection result (Is the judging standard satisfied?) | YES | Go to step 13.  |
| NO      |  | –   |   |

|         |  |                                 |   |
|---------|--|---------------------------------|---|
| Step 13 | Inspection items                                       |                                 | Replacement of supply pump                  |
|         | Maintenance item                                       |                                 | –   |
|         | Inspection condition                                   |                                 | –   |
|         | Requirements   |                                 | Problem is solved by replacing supply pump. |
|         | Inspection result (Is the judging standard satisfied?) | YES                             | –   |
| NO      |  | Replacement of injectors (four) |   |

# TROUBLESHOOTING

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**[Fault code]**

Diagnosis code: P0253/Flash code: 22

**[Monitor]**

Rail pressure is abnormal (to low) during opening of safety valve (DBV).

**[Fault (outline)]**

Common rail pressure (minimum)

**[Diagnosis check]**

- Safety valve (DBV) is monitored for abnormal drop in operating pressure during opening of DBV (diagnosis code P0251).

**[Code generation condition]**

- Common rail pressure remains below 50 MPa {7253 psi, 510 kgf/cm<sup>2</sup>} for 100 consecutive seconds. (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the limp mode control is activated.

**[Diagnostic requirement]**

- After diagnosis code P0191, P0192, P0193 occurs.

**[Control effected by electronic control unit during fault]**

- Engine stopped

**[Probable cause of trouble]**

- Malfunction of safety valve (DBV)

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(At the same time as recovery, warning lamp is extinguished and diagnosis code is cleared.)

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously.<br>• P0251 "Common Rail Pressure Defect" |
|        | Inspection condition                                   |  | • Starter switch: ON<br>• Engine: stopped   |
|        | Requirements   |  | Codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES: Inspect diagnosis code that is occurring.<br>NO: Replacement of rail                         |

**[Fault code]**

Diagnosis code: P0254/Flash code: 23

**[Monitor]**

Rail pressure is abnormal (to high) during opening of safety valve (DBV).

**[Fault (outline)]**

- Pressure shock
- Not open
- Common rail pressure (maximum)

**[Diagnosis check]**

- Safety valve (DBV) is monitored for abnormal drop in operating pressure during opening of DBV (diagnosis code P0251).

**[Code generation condition]**

Diagnosis code is generated under either of the following conditions.

<Condition (1)>

- Actual common rail pressure remains over 195 MPa {28286 psi, 1988 kgf/cm<sup>2</sup>} for 2 consecutive seconds. (Diagnosis code is displayed on first establishment of code generation condition.)

<Condition (2)>

- Actual common rail pressure remains over 195 MPa {28286 psi, 1988 kgf/cm<sup>2</sup>} for 10 consecutive seconds. (Warning lamp (red) is lit and diagnosis code is displayed on first establishment of code generation condition.)

<Condition (3)>

- Common rail pressure remains at 126 MPa {18277 psi, 1285 kgf/cm<sup>2</sup>} or higher for 100 consecutive seconds. (Warning lamp (red) is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

<Condition (1), (2)>

- Fault diagnosis is performed only once during the driving cycle.

<Condition (3)>

- Fault diagnosis is performed each time when the limp mode control is activated.

**[Diagnostic requirement]**

<When common rail pressure exceeds 195 MPa {28286 psi, 1988 kgf/cm<sup>2</sup>}>

—

<When common rail pressure exceeds 126 MPa {18277 psi, 1285 kgf/cm<sup>2</sup>}>

- After diagnosis code P0191, P0192, P0193 occurs.

**[Control effected by electronic control unit during fault]**

Electronic control unit varies in the way of control by the status of warning lamp.

<Warning lamp (red) lit>

- Engine stopped

<Warning lamp extinguished (diagnosis code only)>

- Diesel particulate filter regeneration is stopped.

**[Probable cause of trouble]**

- Malfunction of safety valve (DBV)

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Timing of warning lamp/diagnosis code OFF depends on condition.)

<Condition (1)>

- Diagnosis code is cleared simultaneously with recovery.

<Condition (2)>

- Lamp is extinguished and code is cleared simultaneously with recovery.

<Condition (3)>

- Lamp is extinguished and code is cleared simultaneously with recovery.

# TROUBLESHOOTING

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## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |                     |   |
|--------|--|---------------------|---|
| Step 1 | Inspection items                                       |                     | Inspection by control data  |
|        | Maintenance item                                       |                     | Check if following diagnosis codes occur simultaneously.<br>• P0251 "Common Rail Pressure Defect" |
|        | Inspection condition                                   |                     | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> </ul> |
|        | Requirements   |                     | Codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                 | Inspect diagnosis code that is occurring.   |
| NO     |  | Replacement of rail |   |



**[Fault code]**

Diagnosis code: P0261/Flash code: 37

**[Monitor]**

Failure of injector magnetic valve (No. 1 cylinder)

**[Fault (outline)]**

Injector short circuit (No. 1 cylinder)

**[Diagnosis check]**

- Injector magnetic valve (No. 1 cylinder) circuit is monitored for fault.

**[Code generation condition]**

- Injector magnetic valve (No. 1 cylinder) circuit remains shorted to ground as detected for 3 consecutive cycles.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Injector magnetic valve (No. 1 and No. 4 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

**[Probable cause of trouble]**

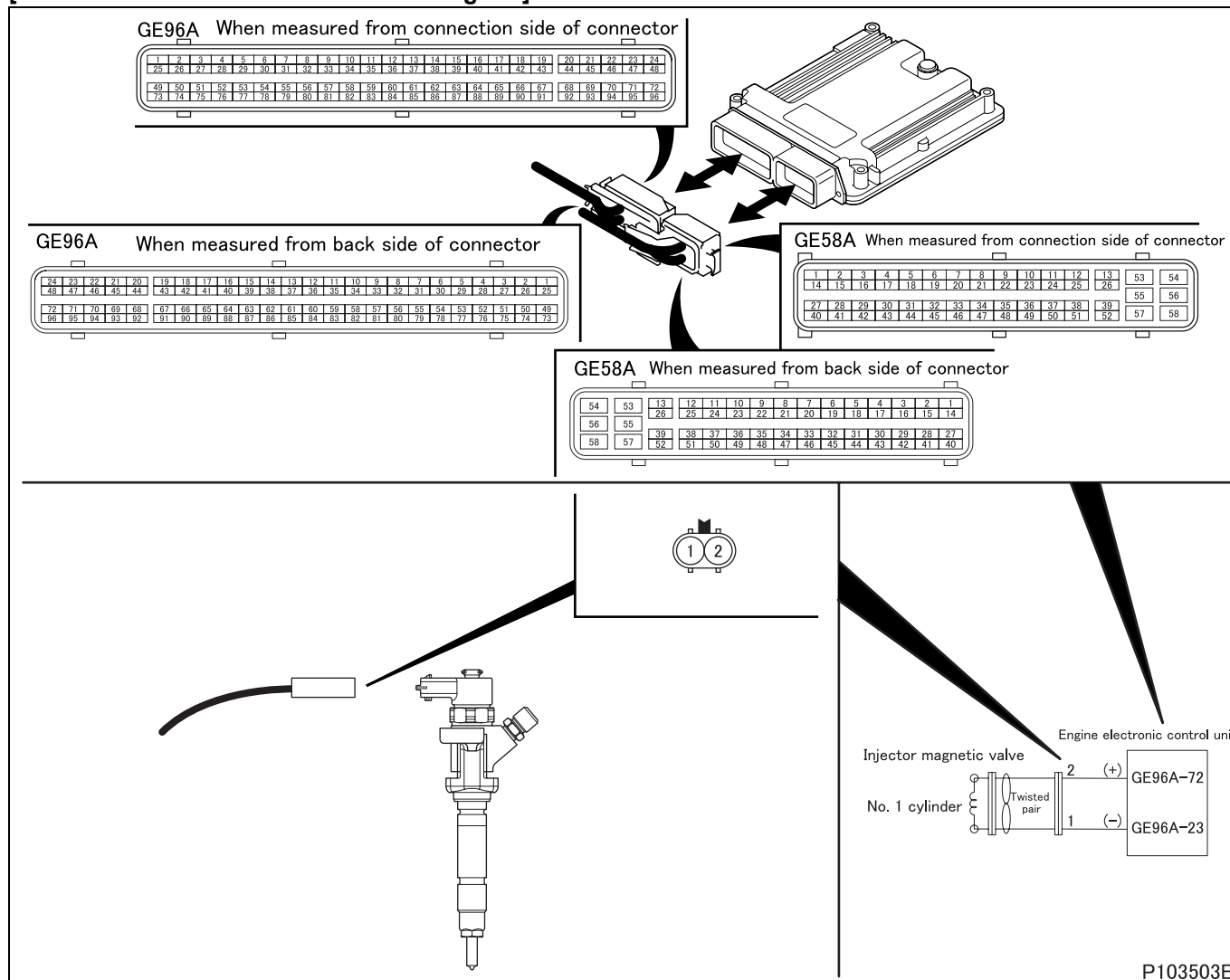
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

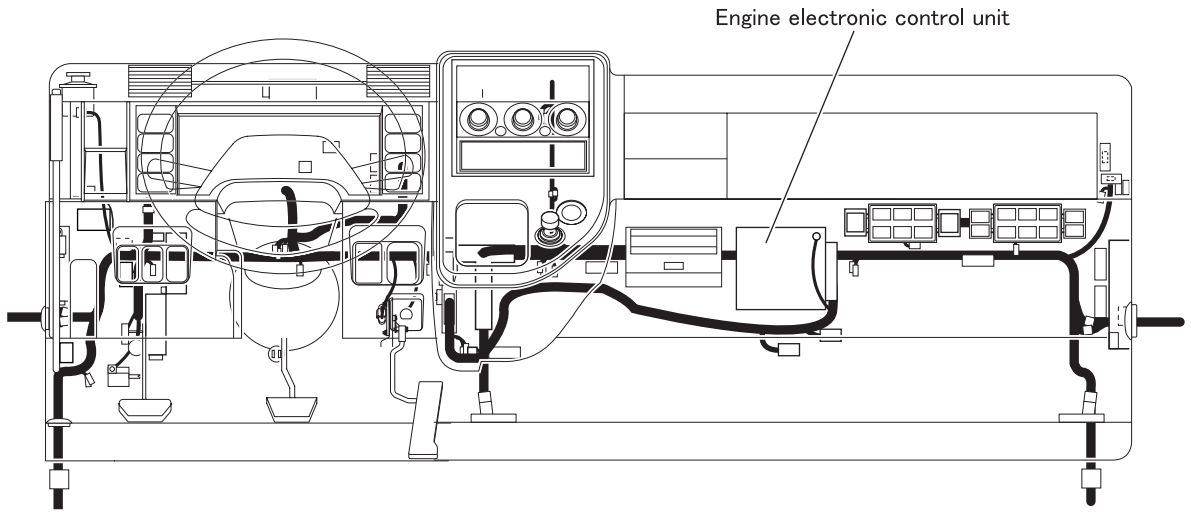
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

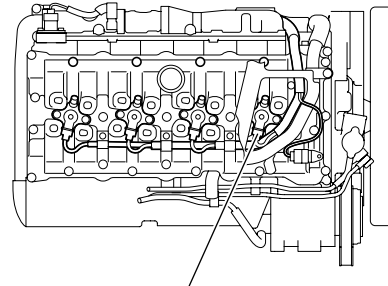
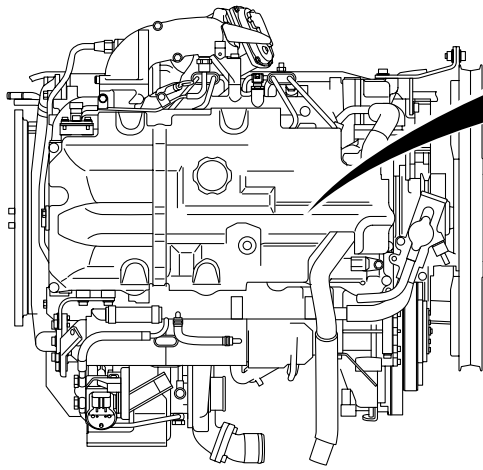


P103503E

[Parts Identification and Location]



Upper view of engine



P103629E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. BB "Injector Test 1"   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Engine speed: 1500 rpm or less</li> <li>Transmission: neutral</li> <li>The current diagnosis code does not occur.</li> </ul> |
|        | Requirements   |               | Injector (No. 1 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

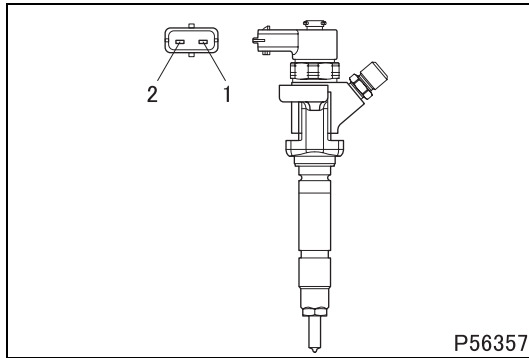
|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic drive unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 23 and 72.                          |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | $0.255 \pm 0.04 \Omega$ (20°C {68°F})  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |

|        |  |   |                         |  |
|--------|--|---|-------------------------|--|
| Step 5 | Inspection items                                       | Inspection of injector magnetic valve unit                          |                         |  |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and 2. |                         |  |
|        | Inspection condition                                   | -   |                         |  |
|        | Requirements   | 0.255 ± 0.04 Ω (20°C {68°F})  |                         |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.           |  |
|        |  | NO  | Replacement of injector |  |

<Step 5 inspection diagram>



|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 6 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (power supply)                                      |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 72. |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 7 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 23. |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |  |  |
|--------|--|---|--|--|
| Step 8 | Inspection items                                       | Inspection by control data  |  |  |
|        | Maintenance item                                       | Perform actuator test item No. BB "Injector Test 1"   |  |  |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Engine speed: 1500 rpm or less</li> <li>Transmission: neutral</li> <li>The current diagnosis code does not occur.</li> </ul> |  |  |
|        | Requirements   | Injector (No. 1 cylinder) stops injection and engine vibrations become slightly larger.   |  |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.).     |  |
|        |  | NO  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0262/Flash code: 37

## **[Monitor]**

Failure of injector magnetic valve (No. 1 cylinder)

## **[Fault (outline)]**

Injector short circuit (No. 1 cylinder)

## **[Diagnosis check]**

- Injector magnetic valve (No. 1 cylinder) circuit is monitored for fault.

## **[Code generation condition]**

- Injector magnetic valve (No. 1 cylinder) circuit remains shorted to power supply as detected for 3 consecutive cycles. (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Injector magnetic valve (No. 1 and No. 4 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

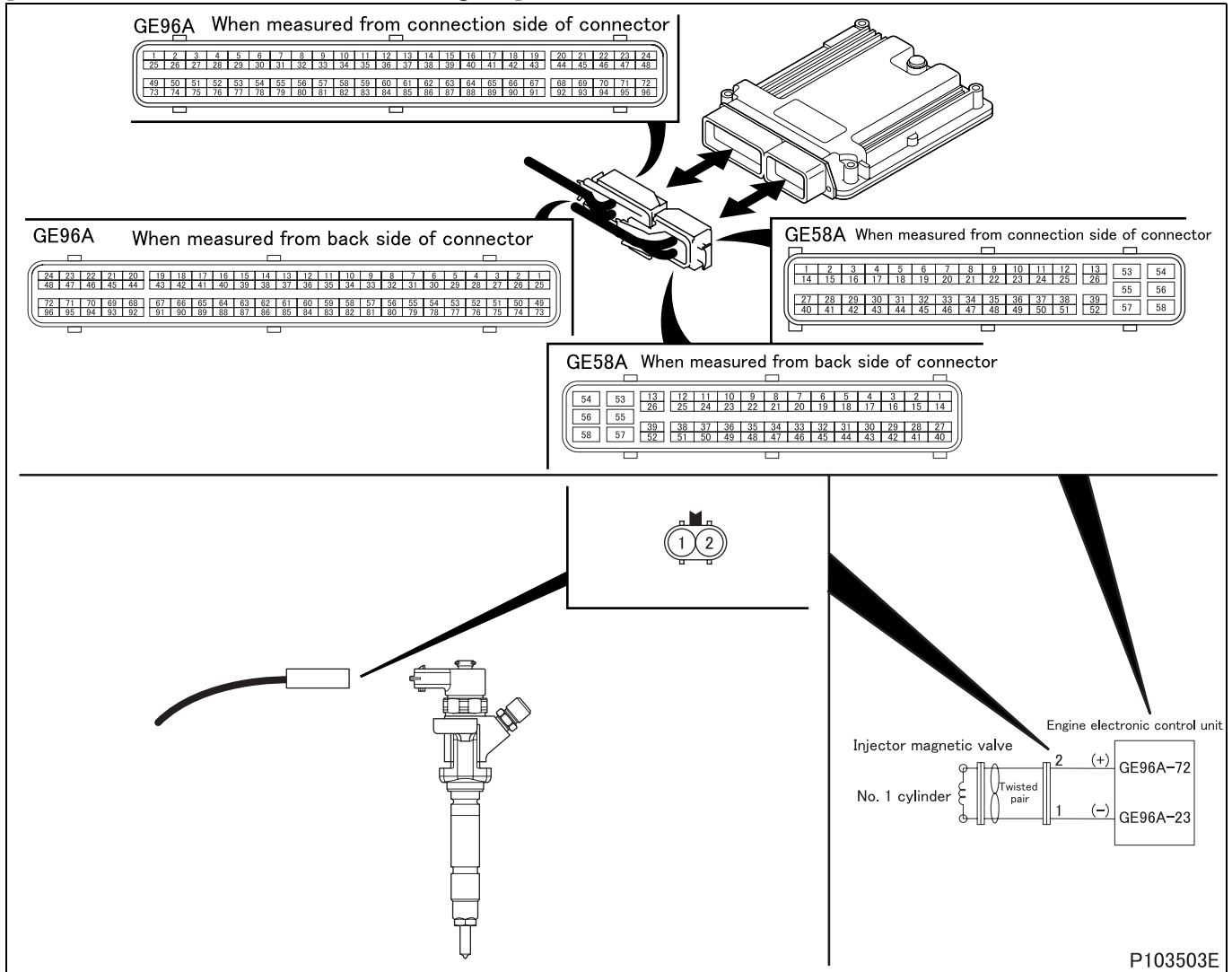
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

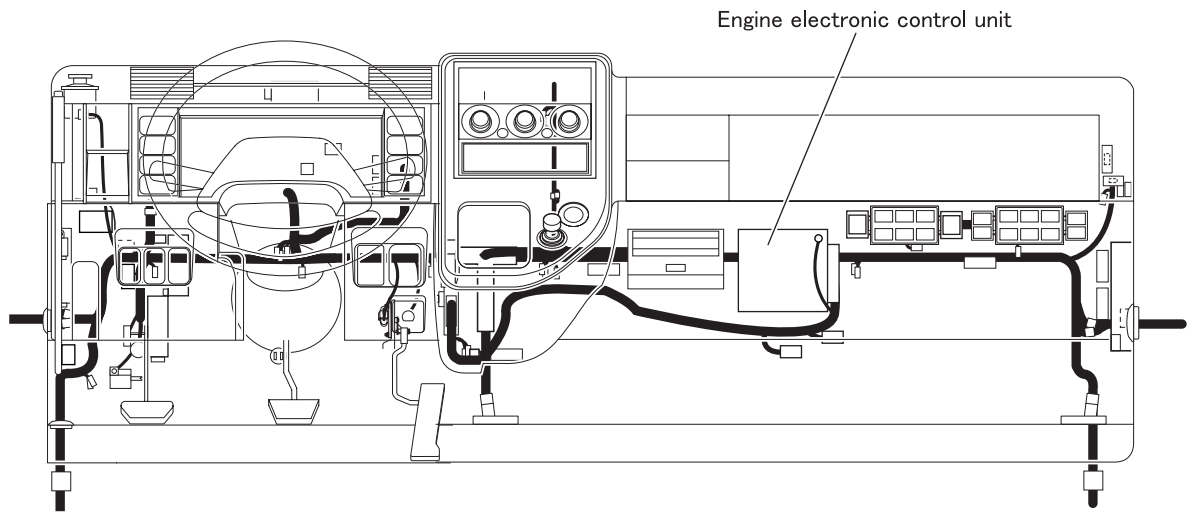
[Electronic Control Unit Connection Diagram]



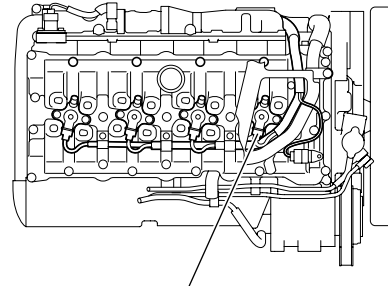
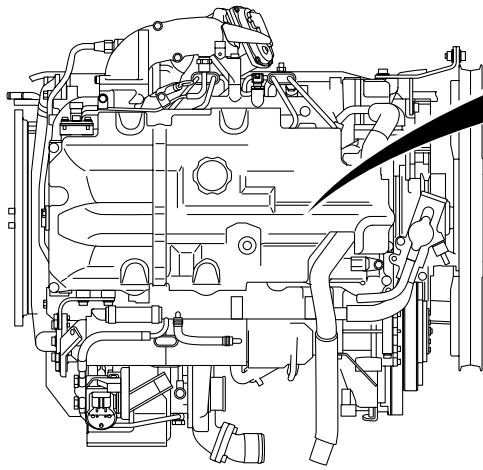
P103503E

# TROUBLESHOOTING

## [Parts Identification and Location]



Upper view of engine



P103629E



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. BB "Injector Test 1"   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul> |
|        | Requirements   |               | Injector (No. 1 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic drive unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 23 and 72.                          |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | 0.255 ± 0.04 Ω (20°C {68°F})   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

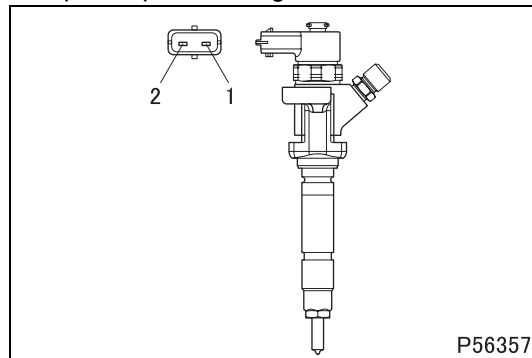
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |

# TROUBLESHOOTING

|        |  |  |   |
|--------|--|--|---|
| Step 5 | Inspection items                                       |  | Inspection of injector magnetic valve unit                          |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2. |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | $0.255 \pm 0.04 \Omega$ (20°C {68°F})                               |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 6.<br>NO<br>Replacement of injector               |

<Step 5 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of harness between injector magnetic valve and electronic control unit (power supply)                                      |
|        | Maintenance item                                       |  | Check circuit between injector magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 72. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 7.<br>NO<br>Modify harness.   |

|        |  |  |   |
|--------|--|--|---|
| Step 7 | Inspection items                                       |  | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |
|        | Maintenance item                                       |  | Check circuit between injector magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 23. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 8.<br>NO<br>Modify harness.   |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform actuator test item No. BB "Injector Test 1"   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Engine speed: 1500 rpm or less</li> <li>Transmission: neutral</li> <li>The current diagnosis code does not occur.</li> </ul> |
|        | Requirements   |  | Injector (No. 1 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to transient fault (See Gr00.).<br>NO<br>Replacement of electronic control unit   |

**[Fault code]**

Diagnosis code: P0263/Flash code: 53

**[Monitor]**

Abnormality in cylinder balance correction

**[Fault (outline)]**

Cylinder balancing out of range

**[Diagnosis check]**

- Check is made to determine if variation to correct in injection quantity between cylinders is excessive.

**[Code generation condition]**

- Corrected fuel injection quantity remains 5 mg/cycle or more for 10 consecutive seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Water temperature: above 65°C {149°F}
- PTO status: OFF
- Cylinder balance: closed loop control  
<Under closed loop control>
  - Engine speed: 630 to 820 rpm
  - Fuel injection quantity: 2 to 99 mg/cyc
- Engine operating mode: normal (engine in operation)
- Time till above conditions were met: more than 10 seconds
- The fuel balancing compensation (FBC) value for a cylinder deviates by 5 mg/cyc larger than that for any other cylinders.
- Fuel Balancing Compensation (FBC) monitor: in order
- Water temperature sensor: in order
- Engine speed sensor: in order
- Cylinder recognition sensor: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

- Malfunction of injector

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |   |   |
|--------|--|---|---|
| Step 1 | Inspection items                                       |   | Inspection by control data  |
|        | Maintenance item                                       |   | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0261 "Injector #1-A (Low)"</li> <li>• P0262 "Injector #1-A (High)"</li> <li>• P0264 "Injector #2-A (Low)"</li> <li>• P0265 "Injector #2-A (High)"</li> <li>• P0267 "Injector #3-A (Low)"</li> <li>• P0268 "Injector #3-A (High)"</li> <li>• P0270 "Injector #4-A (Low)"</li> <li>• P0271 "Injector #4-A (High)"</li> </ul> |
|        | Inspection condition                                   |   | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: started</li> </ul>   |
|        | Requirements   |   | No codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) |   |   |
|        | YES  | Replacement of injector (No. 1 cylinder)  |   |
|        | NO   | Inspect diagnosis code that is occurring. |   |

**[Fault code]**

Diagnosis code: P0264/Flash code: 8

**[Monitor]**

Failure of injector magnetic valve (No. 2 cylinder)

**[Fault (outline)]**

Injector short circuit (No. 2 cylinder)

**[Diagnosis check]**

- Injector magnetic valve (No. 2 cylinder) circuit is monitored for fault.

**[Code generation condition]**

- Injector magnetic valve (No. 2 cylinder) circuit remains shorted to ground as detected for 3 consecutive cycles.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Injector magnetic valve (No. 2 and No. 3 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

**[Probable cause of trouble]**

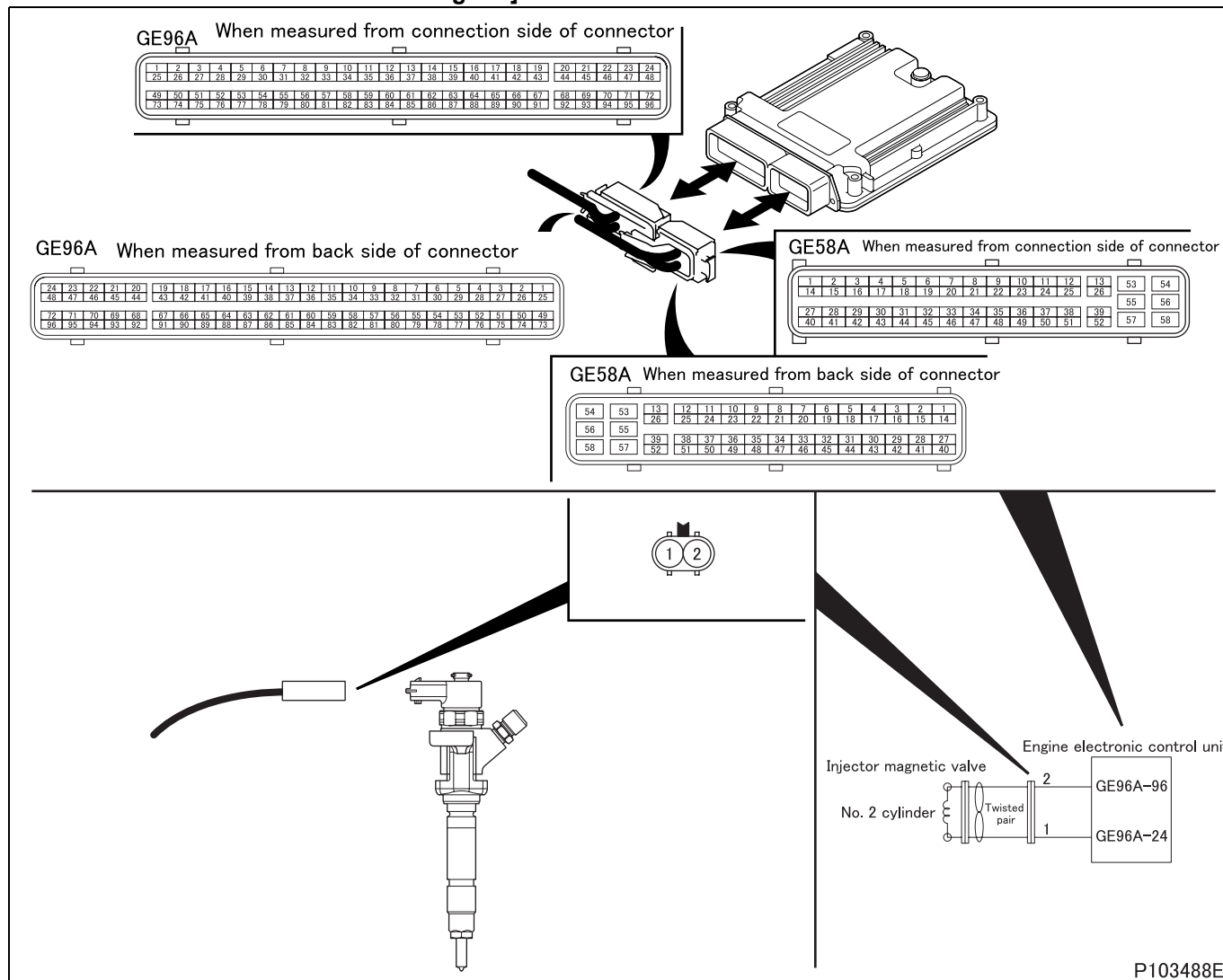
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

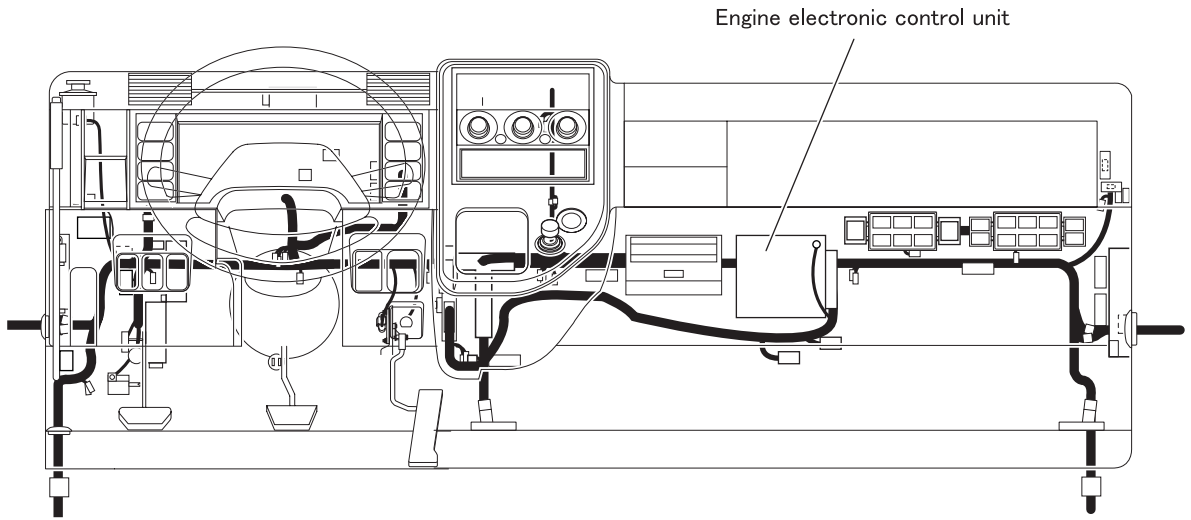
# TROUBLESHOOTING

## Electronic Control Unit Connection Diagram]

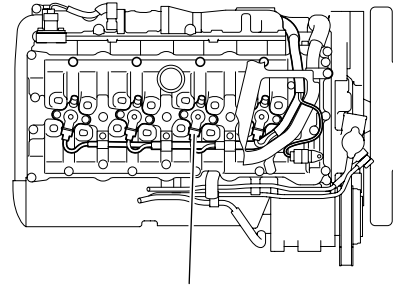
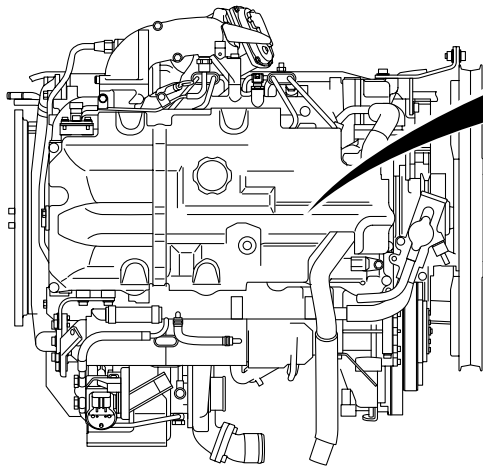


P103488E

[Parts Identification and Location]



Upper view of engine



P103616E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. BD "Injector Test 3"   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Engine speed: 1500 rpm or less</li> <li>Transmission: neutral</li> <li>The current diagnosis code does not occur.</li> </ul> |
|        | Requirements   |               | Injector (No. 2 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 24 and 96.                          |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | $0.255 \pm 0.04 \Omega$ (20°C {68°F})  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

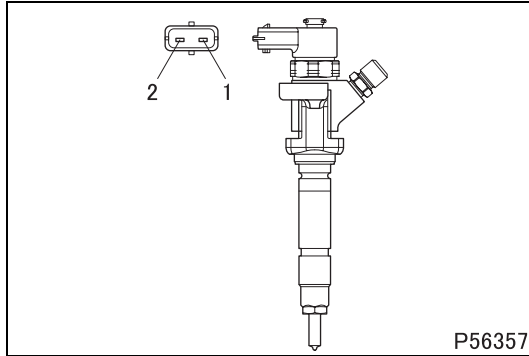
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |



|        |  |   |                         |  |
|--------|--|---|-------------------------|--|
| Step 5 | Inspection items                                       | Inspection of injector magnetic valve unit                          |                         |  |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and 2. |                         |  |
|        | Inspection condition                                   | -   |                         |  |
|        | Requirements   | 0.255 ± 0.04 Ω (20°C {68°F})  |                         |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.           |  |
|        |  | NO  | Replacement of injector |  |

<Step 5 inspection diagram>



|        |  |   |                   |  |
|--------|--|---|-------------------|--|
| Step 6 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (power supply)                                      |                   |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 96. |                   |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                   |  |
|        | Requirements   | There is continuity.  |                   |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7.     |  |
|        |  | NO  | Modify connector. |  |

|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 7 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 24. |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |  |  |
|--------|--|---|--|--|
| Step 8 | Inspection items                                       | Inspection by control data  |  |  |
|        | Maintenance item                                       | Perform actuator test item No. BD "Injector Test 3"   |  |  |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Engine speed: 1500 rpm or less</li> <li>Transmission: neutral</li> <li>The current diagnosis code does not occur.</li> </ul> |  |  |
|        | Requirements   | Injector (No. 2 cylinder) stops injection and engine vibrations become slightly larger.   |  |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.).     |  |
|        |  | NO  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0265/Flash code: 8

## **[Monitor]**

Failure of injector magnetic valve (No. 2 cylinder)

## **[Fault (outline)]**

Injector short circuit (No. 2 cylinder)

## **[Diagnosis check]**

- Injector magnetic valve (No. 2 cylinder) circuit is monitored for fault.

## **[Code generation condition]**

- Injector magnetic valve (No. 2 cylinder) circuit remains shorted to power supply as detected for 3 consecutive cycles.

(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Injector magnetic valve (No. 2 and No. 3 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

## **[Probable cause of trouble]**

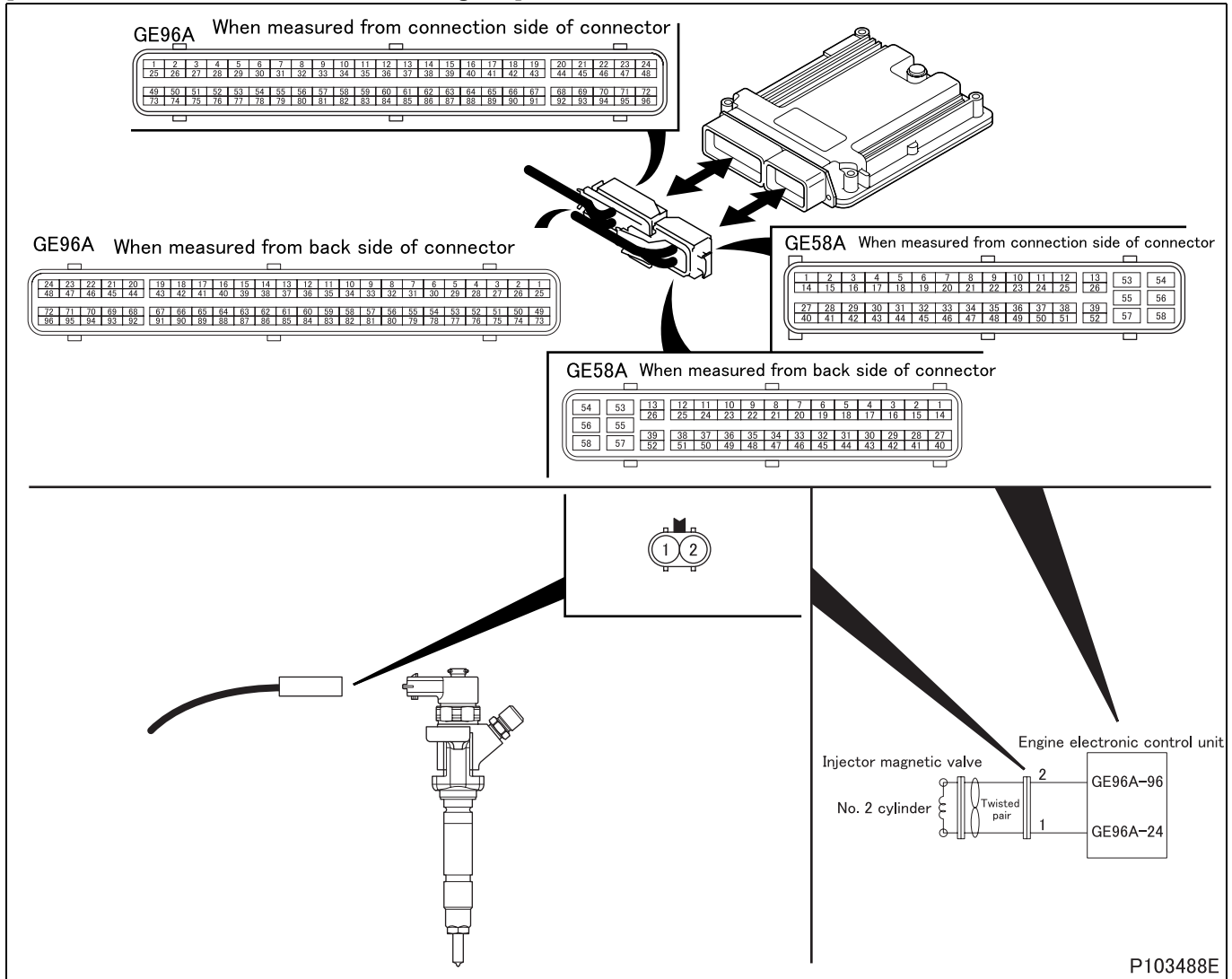
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

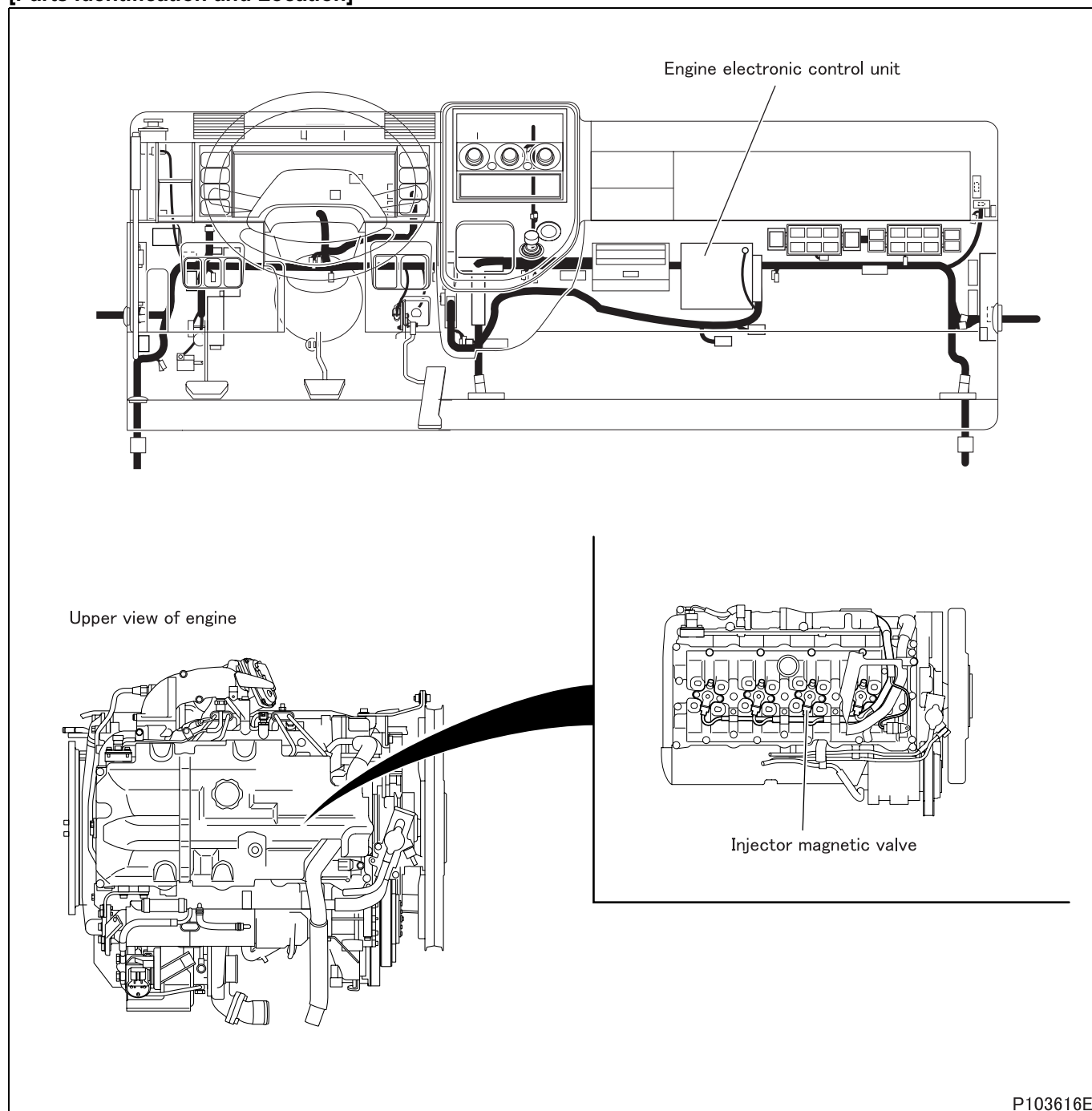
[Electronic Control Unit Connection Diagram]



P103488E

# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. BD "Injector Test 3"   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul> |
|        | Requirements   |               | Injector (No. 2 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 24 and 96.                          |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | $0.255 \pm 0.04 \Omega$ (20°C {68°F})  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

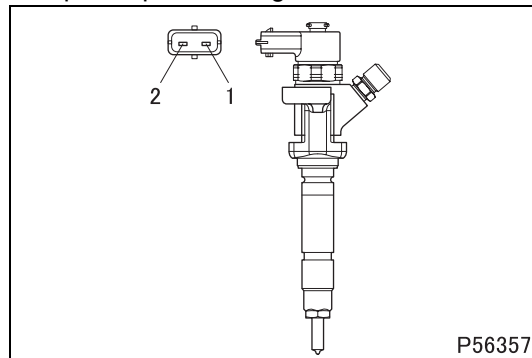
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |

# TROUBLESHOOTING

|        |  |   |                         |  |
|--------|--|---|-------------------------|--|
| Step 5 | Inspection items                                       | Inspection of injector magnetic valve unit                          |                         |  |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and 2. |                         |  |
|        | Inspection condition                                   | -   |                         |  |
|        | Requirements   | 0.255 ± 0.04 Ω (20°C {68°F})  |                         |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.           |  |
|        |  | NO  | Replacement of injector |  |

<Step 5 inspection diagram>



|        |  |   |                   |  |
|--------|--|---|-------------------|--|
| Step 6 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (power supply)                                      |                   |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 96. |                   |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                   |  |
|        | Requirements   | There is continuity.  |                   |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7.     |  |
|        |  | NO  | Modify connector. |  |

|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 7 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 24. |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |  |  |
|--------|--|---|--|--|
| Step 8 | Inspection items                                       | Inspection by control data  |  |  |
|        | Maintenance item                                       | Perform actuator test item No. BD "Injector Test 3"   |  |  |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Engine speed: 1500 rpm or less</li> <li>Transmission: neutral</li> <li>The current diagnosis code does not occur.</li> </ul> |  |  |
|        | Requirements   | Injector (No. 2 cylinder) stops injection and engine vibrations become slightly larger.   |  |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.).     |  |
|        |  | NO  | Replacement of electronic control unit |  |

**[Fault code]**

Diagnosis code: P0266/Flash code: 53

**[Monitor]**

Abnormality in cylinder balance correction

**[Fault (outline)]**

- Cylinder balancing out of range
- Sensor signal range check
- Ref voltage

**[Diagnosis check]**

- Check is made to determine if variation to correct in injection quantity between cylinders is excessive.

**[Code generation condition]**

- Corrected fuel injection quantity remains 5 mg/cycle or more for 10 consecutive seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Water temperature: above 65°C {149°F}
- PTO status: OFF
- Cylinder balance: closed loop control

<Under closed loop control>

- Engine speed: 630 to 820 rpm
- Fuel injection quantity: 2 to 99 mg/cyc
- Engine operating mode: normal (engine in operation)
- Time till above conditions were met: more than 10 seconds
- The fuel balancing compensation (FBC) value for a cylinder deviates by 5 mg/cyc larger than that for any other cylinders.
- Fuel Balancing Compensation (FBC) monitor: in order
- Injector ignition: in order
- Water temperature sensor: in order
- Engine speed sensor: in order
- Cylinder recognition sensor: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

- Malfunction of injector

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |   |   |
|--------|--|---|---|
| Step 1 | Inspection items                                       |   | Inspection by control data  |
|        | Maintenance item                                       |   | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0261 "Injector #1-A (Low)"</li> <li>• P0262 "Injector #1-A (High)"</li> <li>• P0264 "Injector #2-A (Low)"</li> <li>• P0265 "Injector #2-A (High)"</li> <li>• P0267 "Injector #3-A (Low)"</li> <li>• P0268 "Injector #3-A (High)"</li> <li>• P0270 "Injector #4-A (Low)"</li> <li>• P0271 "Injector #4-A (High)"</li> </ul> |
|        | Inspection condition                                   |   | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: started</li> </ul>   |
|        | Requirements   |   | No codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) |   |   |
|        | YES  | Replacement of injector (No. 2 cylinder)  |   |
|        | NO   | Inspect diagnosis code that is occurring. |   |



**[Fault code]**

Diagnosis code: P0267/Flash code: 38

**[Monitor]**

Failure of injector magnetic valve (No. 3 cylinder)

**[Fault (outline)]**

Injector short circuit (No. 3 cylinder)

**[Diagnosis check]**

- Injector magnetic valve (No. 3 cylinder) circuit is monitored for fault.

**[Code generation condition]**

- Injector magnetic valve (No. 3 cylinder) circuit remains shorted to ground as detected for 3 consecutive cycles.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Injector magnetic valve (No. 2 and No. 3 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

**[Probable cause of trouble]**

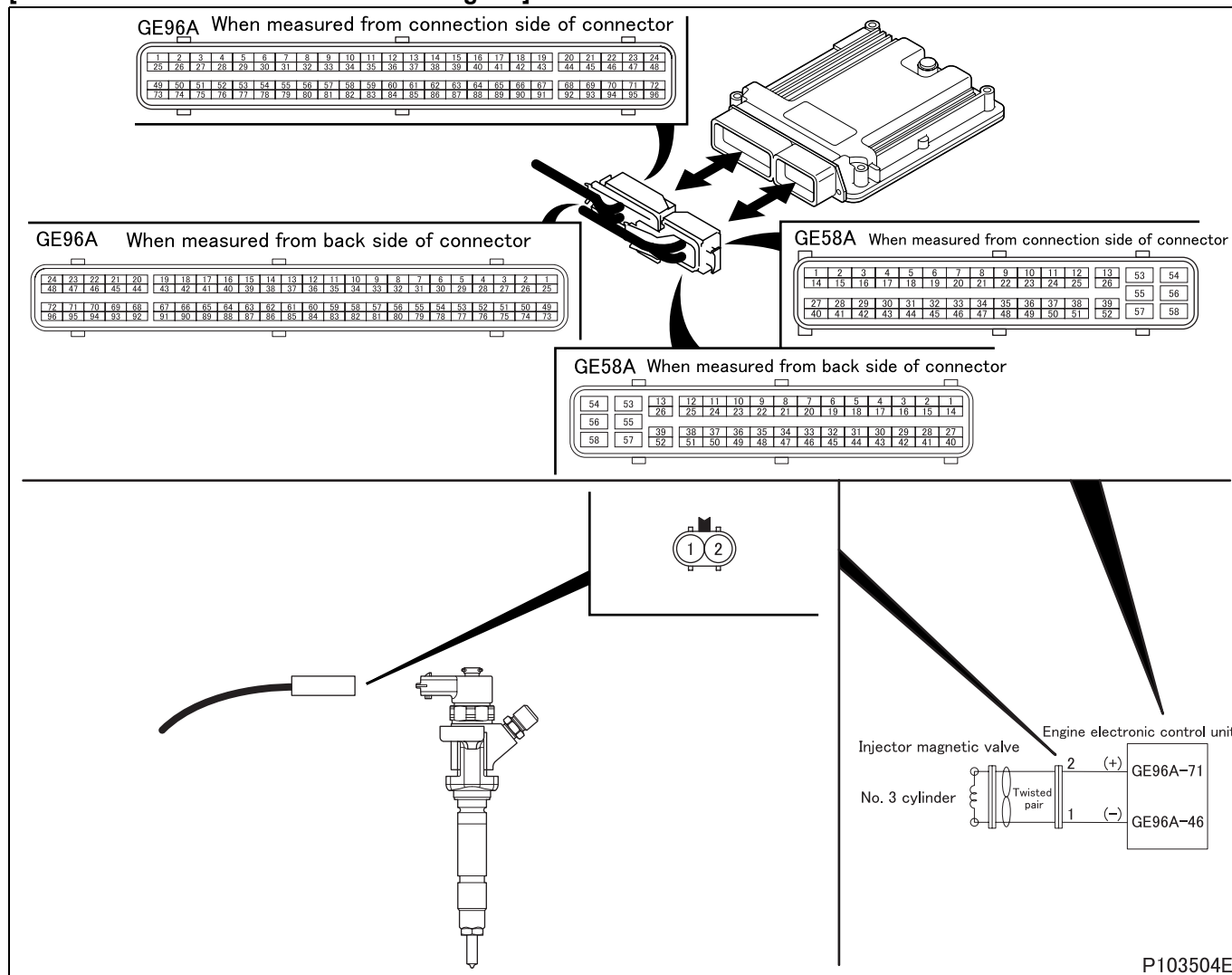
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

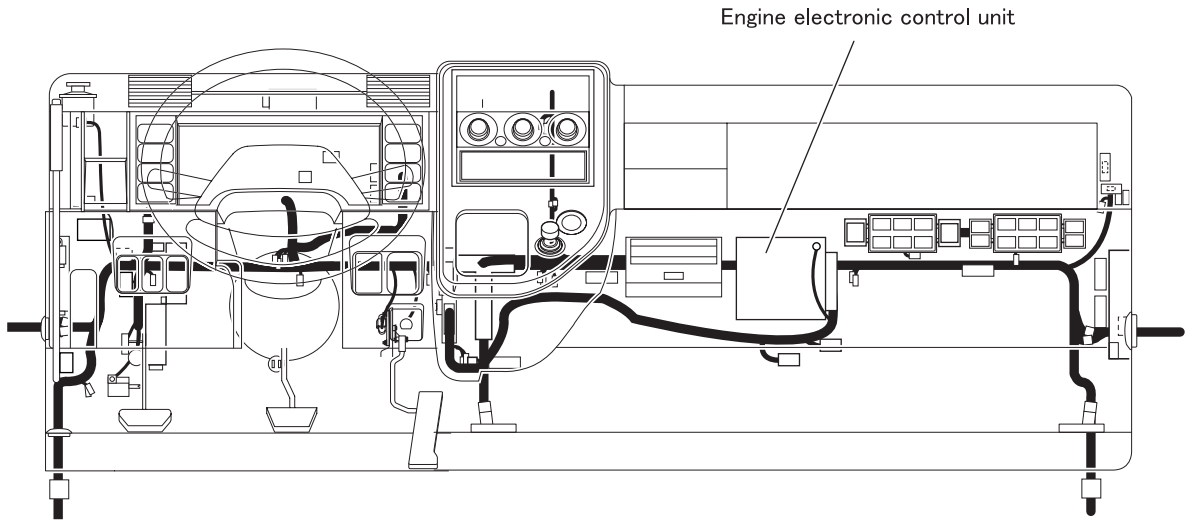
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

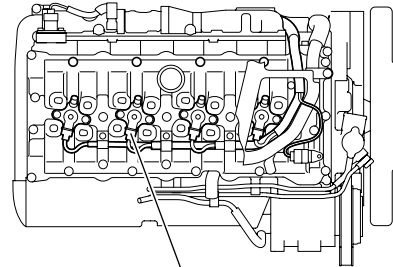
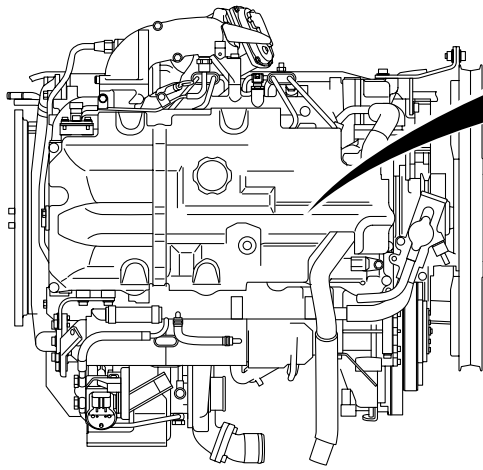


P103504E

[Parts Identification and Location]



Upper view of engine



P103630E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. BE "Injector Test 4"   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Engine speed: 1500 rpm or less</li> <li>Transmission: neutral</li> <li>The current diagnosis code does not occur.</li> </ul> |
|        | Requirements   |               | Injector (No. 3 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

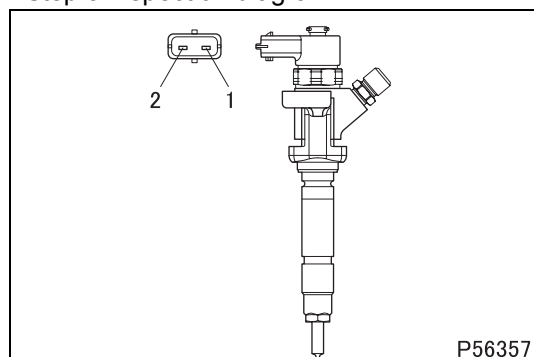
|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 46 and 71.                          |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | $0.255 \pm 0.04 \Omega$ (20°C {68°F})  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |

|        |  |   |                         |  |
|--------|--|---|-------------------------|--|
| Step 5 | Inspection items                                       | Inspection of injector magnetic valve unit                          |                         |  |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and 2. |                         |  |
|        | Inspection condition                                   | -   |                         |  |
|        | Requirements   | 0.255 ± 0.04 Ω (20°C {68°F})  |                         |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.           |  |
|        |  | NO  | Replacement of injector |  |

<Step 5 inspection diagram>



|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 6 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (power supply)                                      |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 71. |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 7 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 46. |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |                                      |  |
|--------|--|---|--------------------------------------|--|
| Step 8 | Inspection items                                       | Inspection by control data  |                                      |  |
|        | Maintenance item                                       | Perform actuator test item No. BE "Injector Test 4"   |                                      |  |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Engine speed: 1500 rpm or less</li> <li>Transmission: neutral</li> <li>The current diagnosis code does not occur.</li> </ul> |                                      |  |
|        | Requirements   | Injector (No. 3 cylinder) stops injection and engine vibrations become slightly larger.   |                                      |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.).   |  |
|        |  | NO  | Replacement of electronic drive unit |  |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0268/Flash code: 38

## **[Monitor]**

Failure of injector magnetic valve (No. 3 cylinder)

## **[Fault (outline)]**

Injector short circuit (No. 3 cylinder)

## **[Diagnosis check]**

- Injector magnetic valve (No. 3 cylinder) circuit is monitored for fault.

## **[Code generation condition]**

- Injector magnetic valve (No. 3 cylinder) circuit remains shorted to power supply as detected for 3 consecutive cycles.

(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Injector magnetic valve (No. 2 and No. 3 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

## **[Probable cause of trouble]**

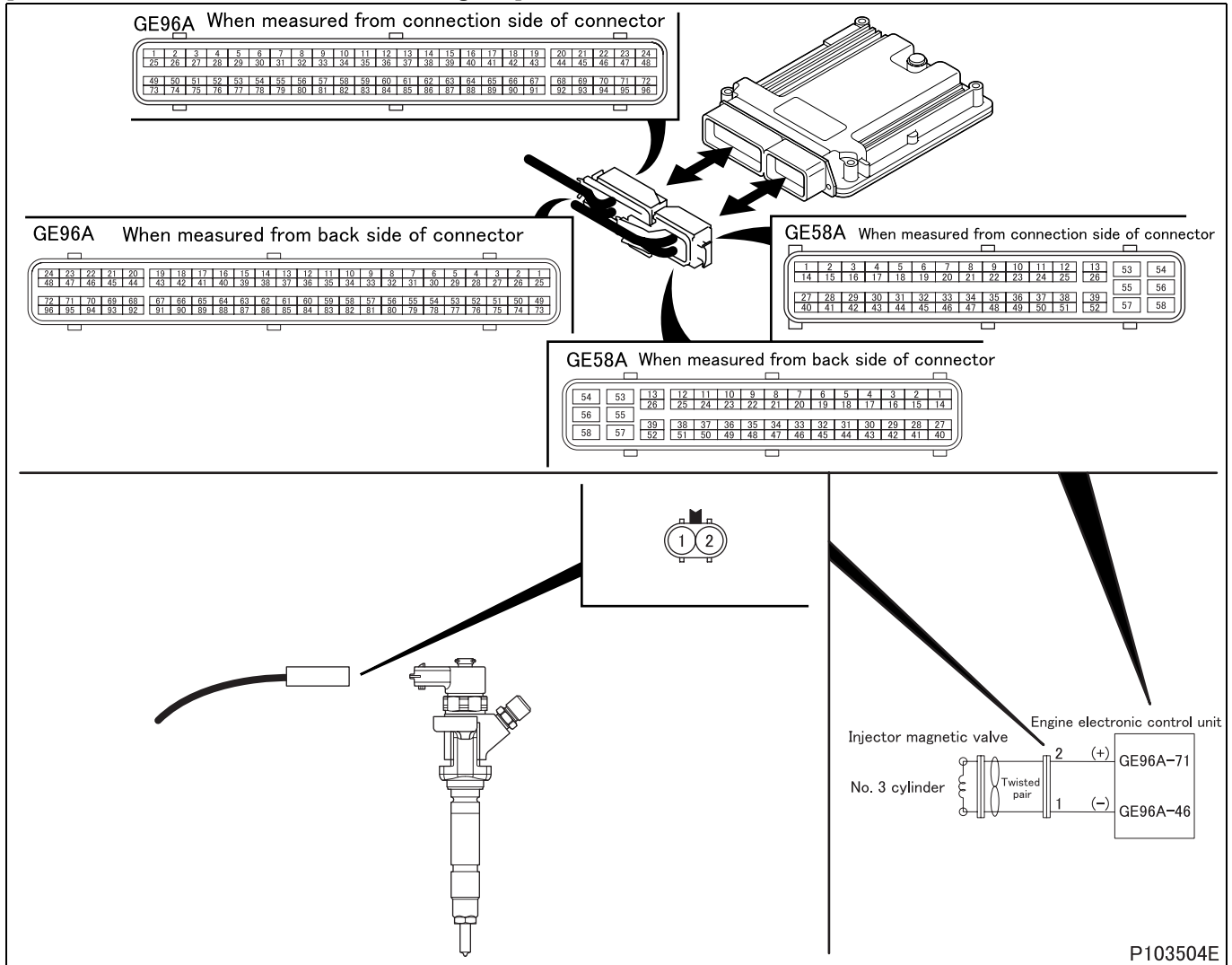
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

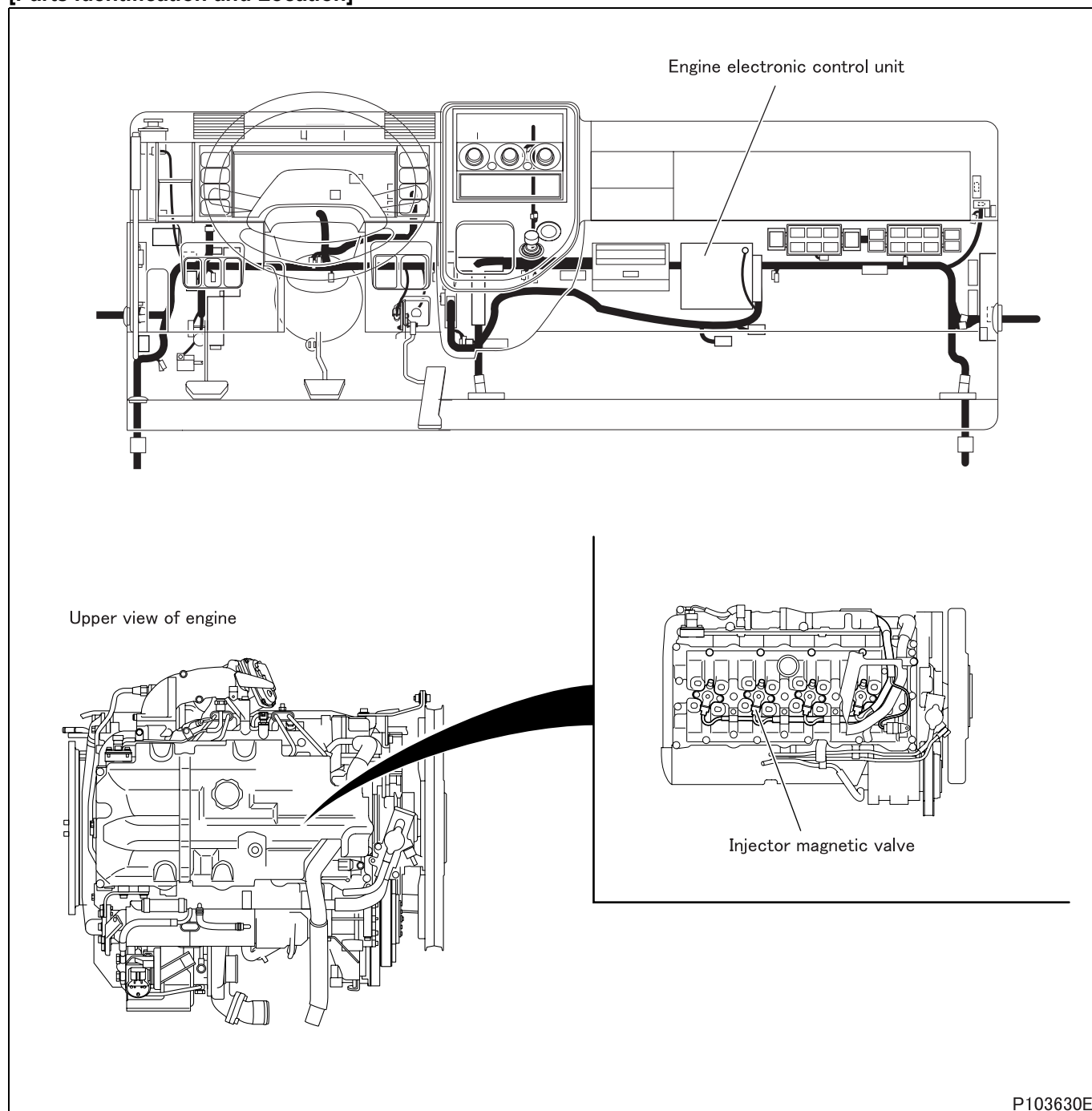
[Electronic Control Unit Connection Diagram]



P103504E

# TROUBLESHOOTING

## [Parts Identification and Location]





**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. BE "Injector Test 4"   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul> |
|        | Requirements   |               | Injector (No. 3 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 46 and 71.                          |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | $0.255 \pm 0.04 \Omega$ (20°C {68°F})  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

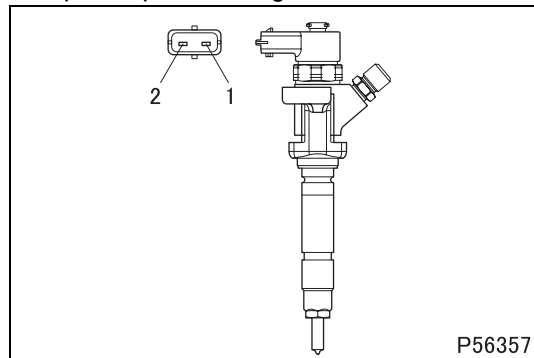
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |

# TROUBLESHOOTING

|        |  |   |                         |  |
|--------|--|---|-------------------------|--|
| Step 5 | Inspection items                                       | Inspection of injector magnetic valve unit                          |                         |  |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and 2. |                         |  |
|        | Inspection condition                                   | -   |                         |  |
|        | Requirements   | 0.255 ± 0.04 Ω (20°C {68°F})  |                         |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.           |  |
|        |  | NO  | Replacement of injector |  |

<Step 5 inspection diagram>



|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 6 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (power supply)                                      |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 71. |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 7 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 46. |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |                                      |  |
|--------|--|---|--------------------------------------|--|
| Step 8 | Inspection items                                       | Inspection by control data  |                                      |  |
|        | Maintenance item                                       | Perform actuator test item No. BE "Injector Test 4"   |                                      |  |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul> |                                      |  |
|        | Requirements   | Injector (No. 3 cylinder) stops injection and engine vibrations become slightly larger.   |                                      |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.).   |  |
|        |  | NO  | Replacement of electronic drive unit |  |

**[Fault code]**

Diagnosis code: P0269/Flash code: 53

**[Monitor]**

Abnormality in cylinder balance correction

**[Fault (outline)]**

Cylinder balancing out of range

**[Diagnosis check]**

- Check is made to determine if variation to correct in injection quantity between cylinders is excessive.

**[Code generation condition]**

- Corrected fuel injection quantity remains 5 mg/cycle or more for 10 consecutive seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Water temperature: above 65°C {149°F}
- PTO status: OFF
- Cylinder balance: closed loop control  
<Under closed loop control>
  - Engine speed: 630 to 820 rpm
  - Fuel injection quantity: 2 to 99 mg/cyc
- Engine operating mode: normal (engine in operation)
- Time till above conditions were met: more than 10 seconds
- The fuel balancing compensation (FBC) value for a cylinder deviates by 5 mg/cyc larger than that for any other cylinders.
- Fuel Balancing Compensation (FBC) monitor: in order
- Injector ignition: in order
- Water temperature sensor: in order
- Engine speed sensor: in order
- Cylinder recognition sensor: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

- Malfunction of injector

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |   |   |
|--------|--|---|---|
| Step 1 | Inspection items                                       |   | Inspection by control data  |
|        | Maintenance item                                       |   | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0261 "Injector #1-A (Low)"</li> <li>• P0262 "Injector #1-A (High)"</li> <li>• P0264 "Injector #2-A (Low)"</li> <li>• P0265 "Injector #2-A (High)"</li> <li>• P0267 "Injector #3-A (Low)"</li> <li>• P0268 "Injector #3-A (High)"</li> <li>• P0270 "Injector #4-A (Low)"</li> <li>• P0271 "Injector #4-A (High)"</li> </ul> |
|        | Inspection condition                                   |   | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: started</li> </ul>   |
|        | Requirements   |   | No codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) |   |   |
|        | YES  | Replacement of injector (No. 3 cylinder)  |   |
|        | NO   | Inspect diagnosis code that is occurring. |   |

**[Fault code]**

Diagnosis code: P0270/Flash code: 39

**[Monitor]**

Failure of injector magnetic valve (No. 4 cylinder)

**[Fault (outline)]**

Injector short circuit (No. 4 cylinder)

**[Diagnosis check]**

- Injector magnetic valve (No. 4 cylinder) circuit is monitored for fault.

**[Code generation condition]**

- Injector magnetic valve (No. 4 cylinder) circuit remains shorted to ground as detected for 3 consecutive cycles.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Injector magnetic valve (No. 1 and No. 4 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

**[Probable cause of trouble]**

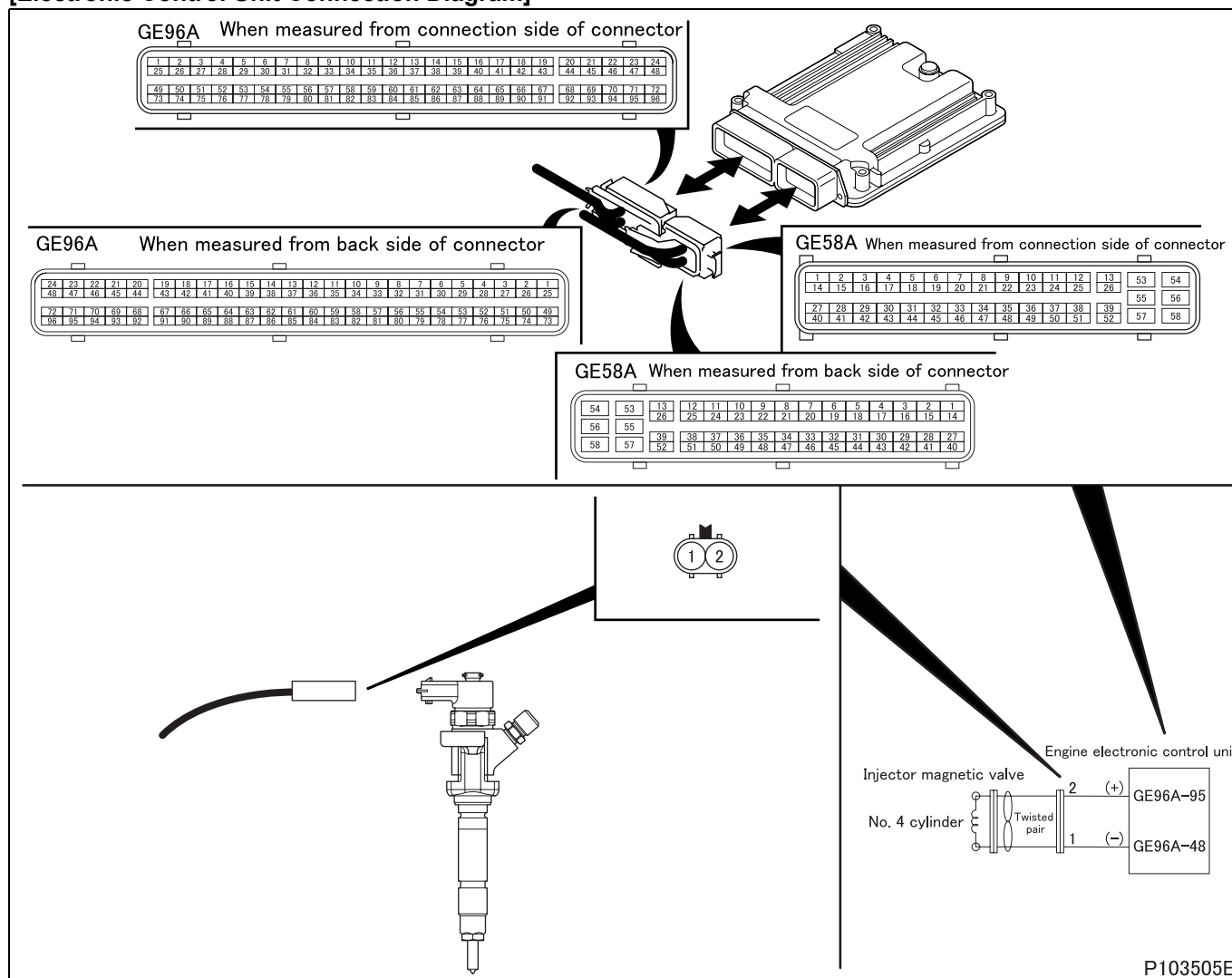
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

**[Recoverability]**

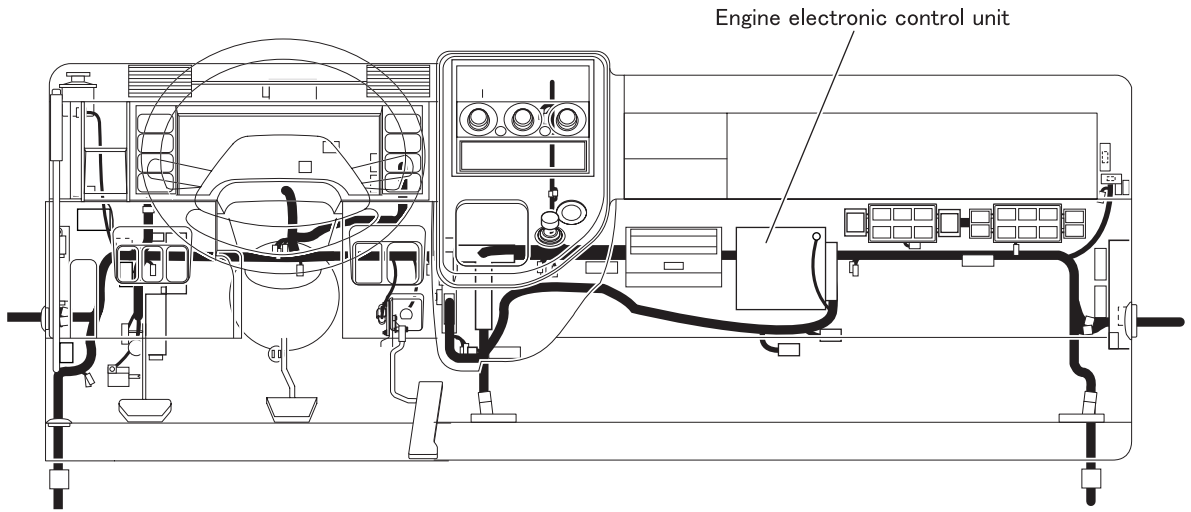
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

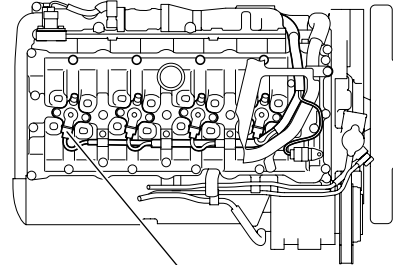
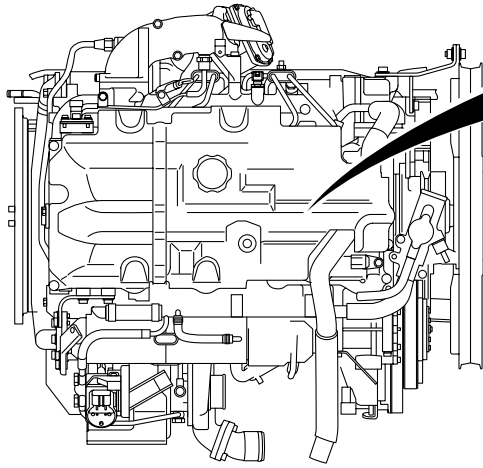
## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



Upper view of engine



Injector magnetic valve

P103631E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. BC "Injector Test 2"   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Engine speed: 1500 rpm or less</li> <li>Transmission: neutral</li> <li>The current diagnosis code does not occur.</li> </ul> |
|        | Requirements   |               | Injector (No. 4 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 48 and 95.                          |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | $0.255 \pm 0.04 \Omega$ (20°C {68°F})  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

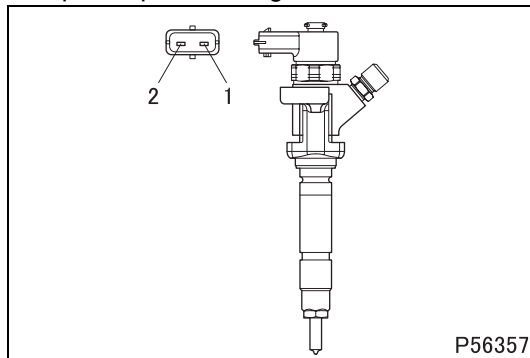
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |



|        |  |   |                         |  |
|--------|--|---|-------------------------|--|
| Step 5 | Inspection items                                       | Inspection of injector magnetic valve unit                          |                         |  |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and 2. |                         |  |
|        | Inspection condition                                   | -   |                         |  |
|        | Requirements   | 0.255 ± 0.04 Ω (20°C {68°F})  |                         |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.           |  |
|        |  | NO  | Replacement of injector |  |

<Step 5 inspection diagram>



|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 6 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (power supply)                                      |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 95. |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 7 | Inspection items                                       | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |                 |  |
|        | Maintenance item                                       | Check circuit between injector magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 48. |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |  |  |
|--------|--|---|--|--|
| Step 8 | Inspection items                                       | Inspection by control data  |  |  |
|        | Maintenance item                                       | Perform actuator test item No. BC "Injector Test 2"   |  |  |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Engine speed: 1500 rpm or less</li> <li>Transmission: neutral</li> <li>The current diagnosis code does not occur.</li> </ul> |  |  |
|        | Requirements   | Injector (No. 4 cylinder) stops injection and engine vibrations become slightly larger.   |  |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.).     |  |
|        |  | NO  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0271/Flash code: 39

## **[Monitor]**

Failure of injector magnetic valve (No. 4 cylinder)

## **[Fault (outline)]**

Injector short circuit (No. 4 cylinder)

## **[Diagnosis check]**

- Injector magnetic valve (No. 4 cylinder) circuit is monitored for fault.

## **[Code generation condition]**

- Injector magnetic valve (No. 4 cylinder) circuit remains shorted to power supply as detected for 3 consecutive cycles.

(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Injector magnetic valve (No. 1 and No. 4 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

## **[Probable cause of trouble]**

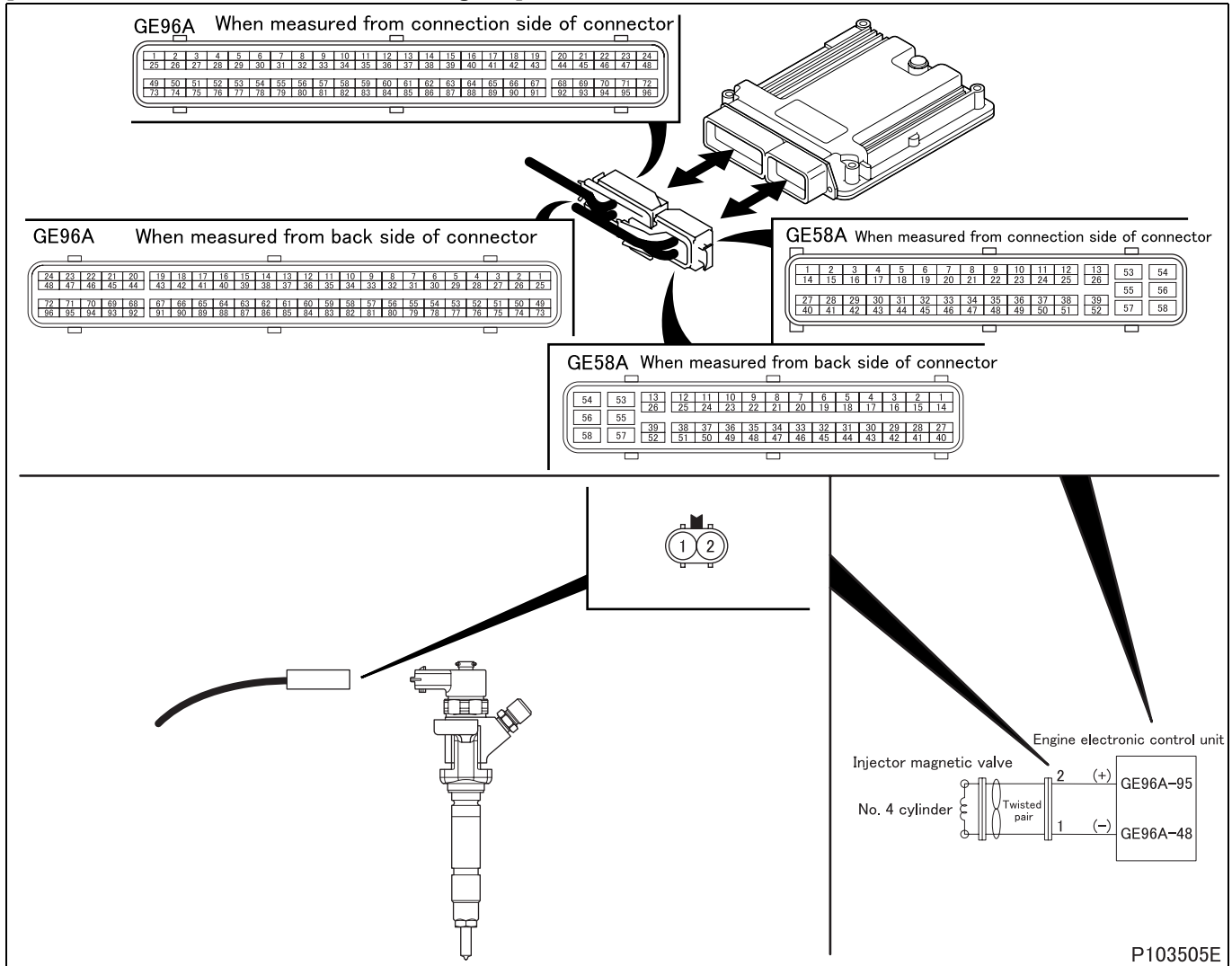
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

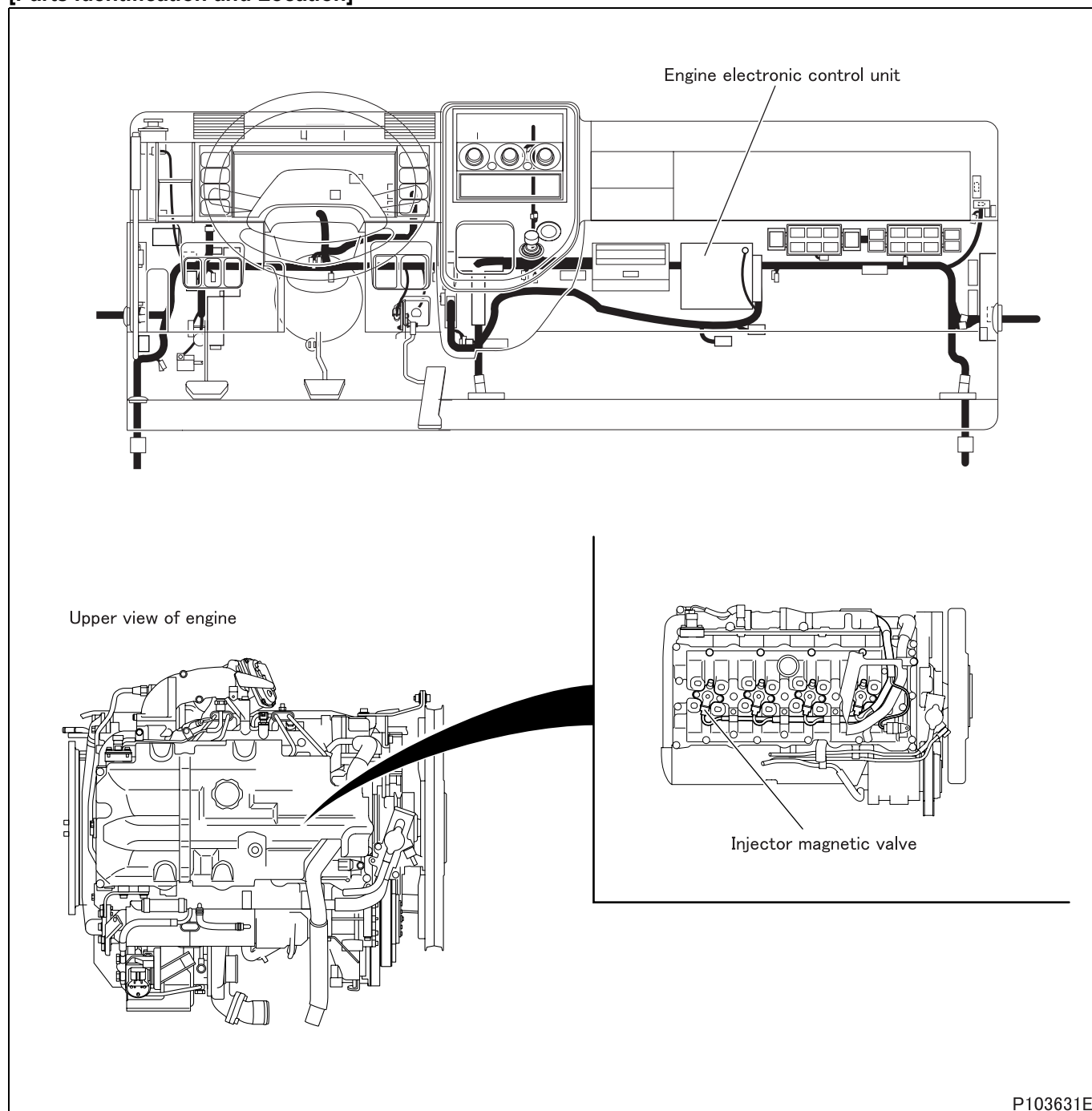
[Electronic Control Unit Connection Diagram]



P103505E

# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. BC "Injector Test 2"   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul> |
|        | Requirements   |               | Injector (No. 4 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 48 and 95.                          |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | $0.255 \pm 0.04 \Omega$ (20°C {68°F})  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

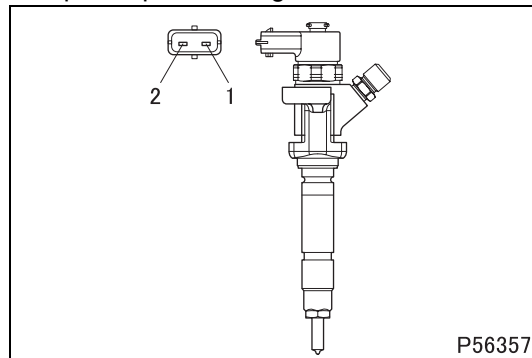
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |

# TROUBLESHOOTING

|        |  |  |   |
|--------|--|--|---|
| Step 5 | Inspection items                                       |  | Inspection of injector magnetic valve unit                          |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2. |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | $0.255 \pm 0.04 \Omega$ (20°C {68°F})                               |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 6.<br>NO<br>Replacement of injector               |

<Step 5 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of harness between injector magnetic valve and electronic control unit (power supply)                                      |
|        | Maintenance item                                       |  | Check circuit between injector magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 95. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 7.<br>NO<br>Modify harness.   |

|        |  |  |   |
|--------|--|--|---|
| Step 7 | Inspection items                                       |  | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |
|        | Maintenance item                                       |  | Check circuit between injector magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 48. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 8.<br>NO<br>Modify harness.   |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform actuator test item No. BC "Injector Test 2"   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Engine speed: 1500 rpm or less</li> <li>Transmission: neutral</li> <li>The current diagnosis code does not occur.</li> </ul> |
|        | Requirements   |  | Injector (No. 4 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to transient fault (See Gr00.).<br>NO<br>Replacement of electronic control unit   |

**[Fault code]**

Diagnosis code: P0272/Flash code: 53

**[Monitor]**

Abnormality in cylinder balance correction

**[Fault (outline)]**

Cylinder balancing out of range

**[Diagnosis check]**

- Check is made to determine if variation to correct in injection quantity between cylinders is excessive.

**[Code generation condition]**

- Corrected fuel injection quantity remains 5 mg/cycle or more for 10 consecutive seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Water temperature: above 65°C {149°F}
- PTO status: OFF
- Cylinder balance: closed loop control  
<Under closed loop control>
  - Engine speed: 630 to 820 rpm
  - Fuel injection quantity: 2 to 99 mg/cyc
- Engine operating mode: normal (engine in operation)
- Time till above conditions were met: more than 10 seconds
- The fuel balancing compensation (FBC) value for a cylinder deviates by 5 mg/cyc larger than that for any other cylinders.
- Fuel Balancing Compensation (FBC) monitor: in order
- Injector ignition: in order
- Water temperature sensor: in order
- Engine speed sensor: in order
- Cylinder recognition sensor: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

- Malfunction of injector

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |   |   |
|--------|--|---|---|
| Step 1 | Inspection items                                       |   | Inspection by control data  |
|        | Maintenance item                                       |   | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0261 "Injector #1-A (Low)"</li> <li>• P0262 "Injector #1-A (High)"</li> <li>• P0264 "Injector #2-A (Low)"</li> <li>• P0265 "Injector #2-A (High)"</li> <li>• P0267 "Injector #3-A (Low)"</li> <li>• P0268 "Injector #3-A (High)"</li> <li>• P0270 "Injector #4-A (Low)"</li> <li>• P0271 "Injector #4-A (High)"</li> </ul> |
|        | Inspection condition                                   |   | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: started</li> </ul>   |
|        | Requirements   |   | No codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) |   |   |
|        | YES  | Replacement of injector (No. 4 cylinder)  |   |
|        | NO   | Inspect diagnosis code that is occurring. |   |



**[Fault code]**

Diagnosis code: P0299/Flash code: 32

**[Monitor]**

Underboost

**[Fault (outline)]**

Underboost

**[Diagnosis check]**

- Actual boost pressure is detected by boost pressure sensor and compared with standard pressure recorded in engine electronic control unit.

**[Code generation condition]**

- Difference between target boost pressure and actual boost pressure remains less than specified for 10 seconds (underboost status)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine operating mode: normal (engine in operation)
- Water temperature: 65 to 120°C {149 to 248°F}
- Atmospheric pressure: 828 to 1100 mbar {12 to 15.95 psi}
- Intake air temperature: -7 to 60°C {19 to 140°F}
- Engine speed: 600 to 3000 rpm
- Variation in engine speed: less than 300 rpm/s
- Diesel particulate filter regeneration control: not effected
- Exhaust gas recirculation valve: in order
- Intake throttle: in order
- Turbocharger actuator: in order
- Controller area network communication of each electronic drive unit (exhaust gas recirculation, intake throttle and turbocharger): in order
- Atmospheric pressure sensor: in order
- Boost pressure sensor: in order
- Water temperature sensor: in order
- Intake air temperature sensor: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order
- Exhaust shutter: in order
- Exhaust gas recirculation cooler: in order
- Starter switch circuit: in order

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Related fault check is stopped.

**[Probable cause of trouble]**

- Boost pressure incorrectly adjusted
- Mechanical failure of turbocharger unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |     |   |    |
|--------|--|--|--|-----|---|----|
| Step 1 | Inspection items                                       |  | Inspection by control data   |     |   |    |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>P0045 "VGT Acuator (Open)"</li> <li>P0046 "VGT Acuator (Performance)"</li> <li>P0047 "VGT Acuator (Low)"</li> <li>P0069 "Boost Press SNSR (Correlation)"</li> <li>P0237 "Boost Press SNSR (Low)"</li> <li>P0238 "Boost Press SNSR (High)"</li> <li>P0401 "EGR Flow (Insufficient)"</li> <li>P0402 "EGR Flow (Excessive)"</li> <li>P0403 "EGR1 (Acuator Circuit)"</li> <li>P0409 "EGR1 (Position Sensor)"</li> <li>P0562 "Power Supply Voltage (Low)"</li> <li>P0563 "Power Supply Voltage (High)"</li> <li>P0600 "CAN Communication"</li> <li>P0607 "ECU System"</li> <li>P060B "A/D Converter"</li> <li>P061B "ECU Performance (Calc)"</li> <li>P061C "ECU Performance (Ne)"</li> <li>P0685 "EDU Relay (Open)"</li> <li>P0686 "EDU Relay (Low)"</li> <li>P0687 "EDU Relay (High)"</li> <li>P2002 "DPF MFF"</li> <li>P2228 "Atm Press SNSR (Low)"</li> <li>P2229 "Atm Press SNSR (High)"</li> <li>P2263 "VGT System"</li> <li>P2413 "EGR System"</li> <li>P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>P2455 "DPF Diff SNSR (High) &amp; MFF"</li> <li>P2457 "EGR Cooler Performance"</li> </ul> |     |   |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Starter switch: ON</li> <li>Do not start engine.</li> </ul>   |     |   |    |
|        | Requirements   |  | Codes occur.   |     |   |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Inspect diagnosis code that is occurring.</td> </tr> <tr> <td>NO</td> <td>Go to step 2.</td> </tr> </table>   | YES | Inspect diagnosis code that is occurring. | NO |
| YES    | Inspect diagnosis code that is occurring.              |  |  |     |   |    |
| NO     | Go to step 2.  |  |  |     |   |    |

|        |  |  |  |     |                         |    |
|--------|--|--|--|-----|-------------------------|----|
| Step 2 | Inspection items                                       |  | Check of exhaust system  |     |                         |    |
|        | Maintenance item                                       |  | Front pipe, diesel particulate filter, tail pipe (See Gr15.)   |     |                         |    |
|        | Inspection condition                                   |  | Starter switch: OFF  |     |                         |    |
|        | Requirements   |  | Blocked  |     |                         |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Clean or replace parts.</td> </tr> <tr> <td>NO</td> <td>Go to step 3.</td> </tr> </table> | YES | Clean or replace parts. | NO |
| YES    | Clean or replace parts.                                |  |  |     |                         |    |
| NO     | Go to step 3.  |  |  |     |                         |    |

|        |  |  |  |     |                             |    |
|--------|--|--|--|-----|-----------------------------|----|
| Step 3 | Inspection items                                       |  | Check of turbocharger appearance   |     |                             |    |
|        | Maintenance item                                       |  | Appearance of turbocharger (See Gr15.)   |     |                             |    |
|        | Inspection condition                                   |  | Starter switch: OFF  |     |                             |    |
|        | Requirements   |  | Turbine vane binds.  |     |                             |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Replacement of turbocharger</td> </tr> <tr> <td>NO</td> <td>Go to step 4.</td> </tr> </table> | YES | Replacement of turbocharger | NO |
| YES    | Replacement of turbocharger                            |  |  |     |                             |    |
| NO     | Go to step 4.  |  |  |     |                             |    |

|        |  |                             |   |
|--------|--|-----------------------------|---|
| Step 4 | Inspection items                                       |                             | Inspection by control data  |
|        | Maintenance item                                       |                             | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Intake MAP".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 21 "Boost Pressure" of Service Data.</li> </ul> |
|        | Inspection condition                                   |                             | For boost pressure measurement and correction data calculation, see Gr15.   |
|        | Requirements   |                             | Coincides with atmospheric pressure → Gradually increases   |
|        | Inspection result (Is the judging standard satisfied?) | YES                         | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of turbocharger |   |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0300/Flash code: 45

## **[Monitor]**

Cylinder misfire (multiple cylinders)

## **[Fault (outline)]**

Misfire multiple cylinders

## **[Diagnosis check]**

- Misfire is detected at two or more cylinders

## **[Code generation condition]**

- Misfire in one cylinder is detected after another.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

- Misfire in one cylinder

## **[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

## **[Probable cause of trouble]**

- Malfunction of injector
- Malfunction of electronic control unit
- Malfunction of fuel
- Malfunction of engine compression pressure

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

**[Fault code]**

Diagnosis code: P0301/Flash code: 45

**[Monitor]**

Cylinder misfire (individual cylinders)

**[Fault (outline)]**

Misfire individual cylinder 1

**[Diagnosis check]**

- Misfire at No. 1 cylinder is detected.

**[Code generation condition]**

- Misfire has been detected for a total of 250 times.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine speed: 600 to 900 rpm
- Fuel injection quantity: 3 to 25 mg/cyc
- Water temperature: above 64°C {147°F}
- Vehicle speed: less than 2 km/h {1.24 MPH}
- Engine operating mode: normal (engine in operation)
- PTO status: OFF
- Water temperature sensor: in order
- Engine speed sensor: in order
- Cylinder recognition sensor: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order
- Vehicle speed sensor: in order

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

- Malfunction of injector
- Malfunction of electronic control unit
- Malfunction of fuel
- Malfunction of engine compression pressure

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0302/Flash code: 45

## **[Monitor]**

Cylinder misfire (individual cylinders)

## **[Fault (outline)]**

Misfire individual cylinder 2

## **[Diagnosis check]**

- Misfire at No. 2 cylinder is detected.

## **[Code generation condition]**

- Misfire has been detected for a total of 250 times. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

- Engine speed: 600 to 900 rpm
- Fuel injection quantity: 3 to 25 mg/cyc
- Water temperature: above 64°C {147°F}
- Vehicle speed: less than 2 km/h {1.24 MPH}
- Engine operating mode: normal (engine in operation)
- PTO status: OFF
- Water temperature sensor: in order
- Engine speed sensor: in order
- Cylinder recognition sensor: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order
- Vehicle speed sensor: in order

## **[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

## **[Probable cause of trouble]**

- Malfunction of injector
- Malfunction of electronic control unit
- Malfunction of fuel
- Malfunction of engine compression pressure

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

**[Fault code]**

Diagnosis code: P0303/Flash code: 45

**[Monitor]**

Cylinder misfire (individual cylinders)

**[Fault (outline)]**

Misfire individual cylinder 3

**[Diagnosis check]**

- Misfire at No. 3 cylinder is detected.

**[Code generation condition]**

- Misfire has been detected for a total of 250 times. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine speed: 600 to 900 rpm
- Fuel injection quantity: 3 to 25 mg/cyc
- Water temperature: above 64°C {147°F}
- Vehicle speed: less than 2 km/h {1.24 MPH}
- Engine operating mode: normal (engine in operation)
- PTO status: OFF
- Water temperature sensor: in order
- Engine speed sensor: in order
- Cylinder recognition sensor: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order
- Vehicle speed sensor: in order

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

- Malfunction of injector
- Malfunction of electronic control unit
- Malfunction of fuel
- Malfunction of engine compression pressure

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0304/Flash code: 45

## **[Monitor]**

Cylinder misfire (individual cylinders)

## **[Fault (outline)]**

Misfire individual cylinder 4

## **[Diagnosis check]**

- Misfire at No. 4 cylinder is detected.

## **[Code generation condition]**

- Misfire has been detected for a total of 250 times. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

- Engine speed: 600 to 900 rpm
- Fuel injection quantity: 3 to 25 mg/cyc
- Water temperature: above 64°C {147°F}
- Vehicle speed: less than 2 km/h {1.24 MPH}
- Engine operating mode: normal (engine in operation)
- PTO status: OFF
- Water temperature sensor: in order
- Engine speed sensor: in order
- Cylinder recognition sensor: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order
- Vehicle speed sensor: in order

## **[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

## **[Probable cause of trouble]**

- Malfunction of injector
- Malfunction of electronic control unit
- Malfunction of fuel
- Malfunction of engine compression pressure

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



**[Fault code]**

Diagnosis code: P0335/Flash code: 15

**[Monitor]**

Failure of engine speed sensor

**[Fault (outline)]**

No pulse check

**[Diagnosis check]**

- Engine speed sensor output signal during engine operation is monitored.

**[Code generation condition]**

- No signal is received from engine speed sensor during engine operation.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine operating mode: normal (engine in operation)

**[Control effected by electronic control unit during fault]**

- Control is effected using cylinder recognition sensor only.
- Misfire detection is stopped.
- Engine torque is limited.
- Auto cruise control stopped
- Related fault check is stopped.

**[Probable cause of trouble]**

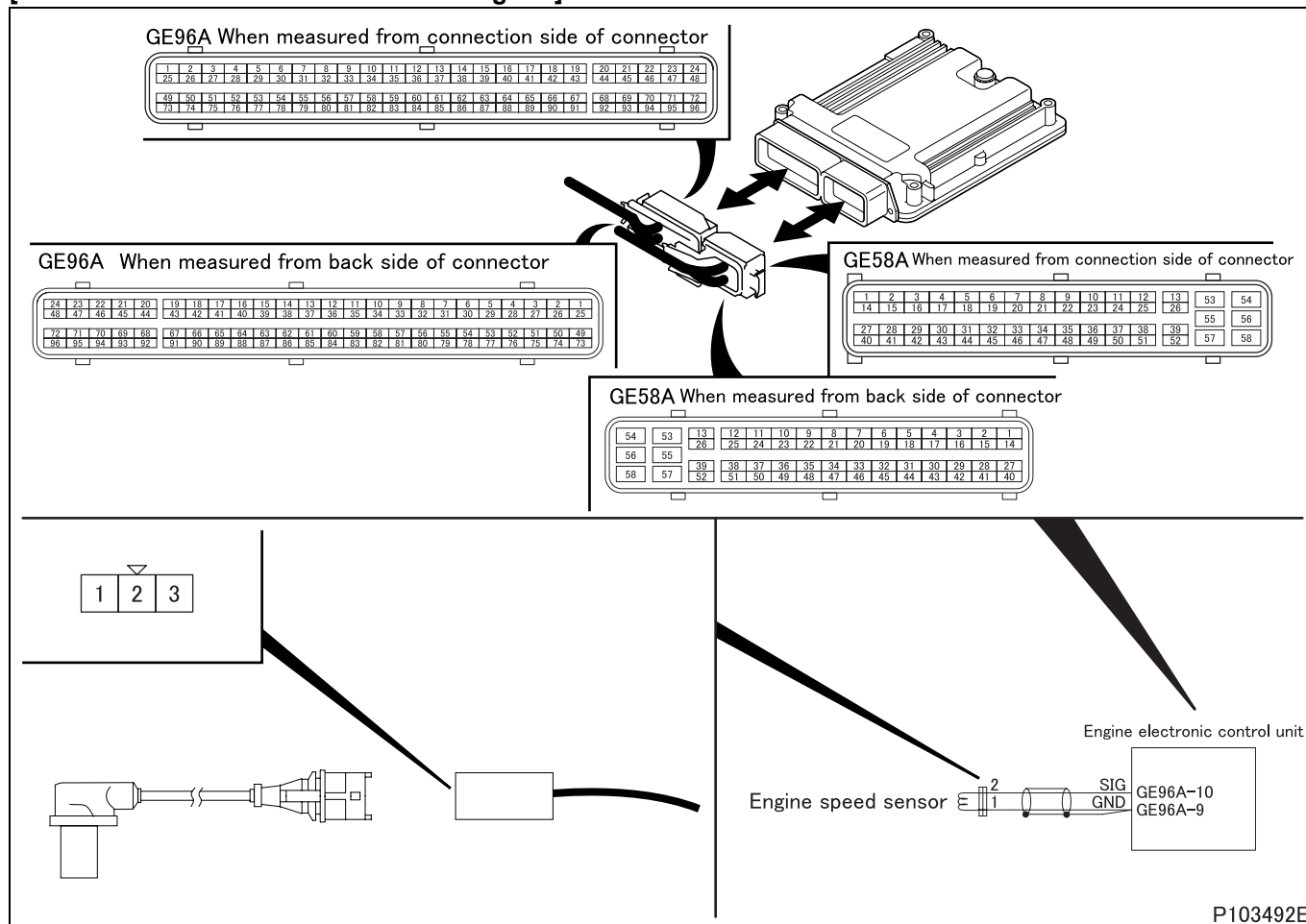
- Open-circuit or short-circuit of harness between electronic control unit and engine speed sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

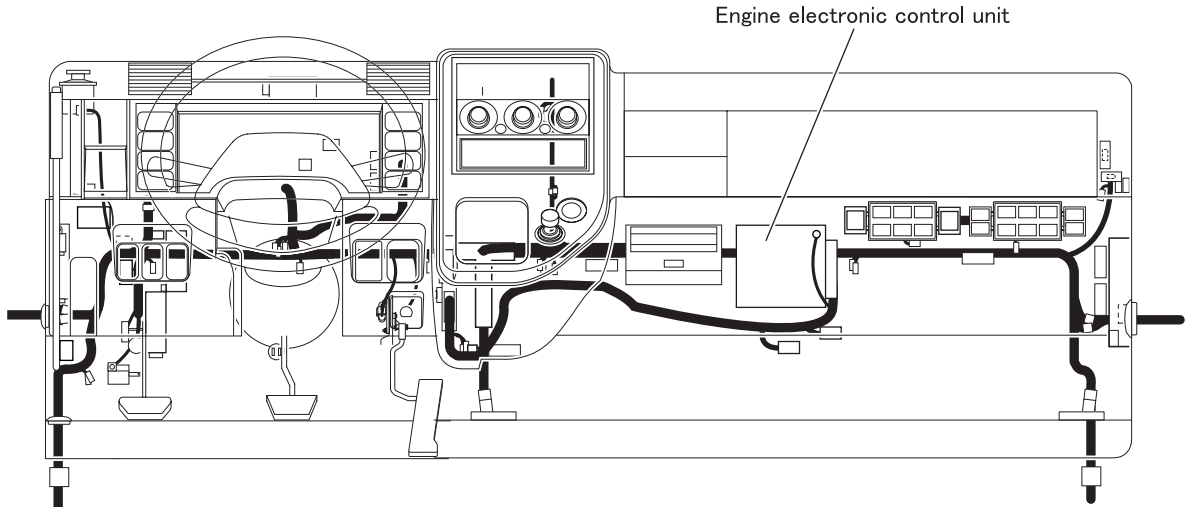
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

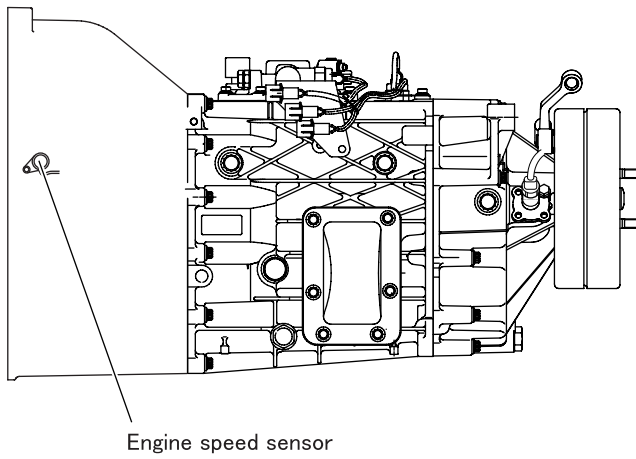


P103492E

[Parts Identification and Location]



Left side view of transmission



P103620E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Ne"</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 01 "Engine Revolution" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | –   |
|        | Requirements   |               | Same indication as tachometer is given.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

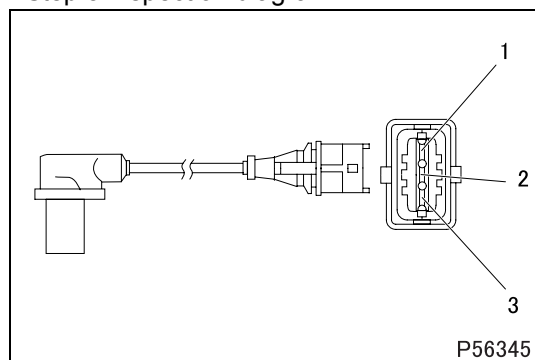
|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 9 and 10.                           |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | 860 ± 86 Ω (20°C {68°F})   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of engine speed sensor connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

|        |  |   |                       |  |
|--------|--|---|-----------------------|--|
| Step 5 | Inspection items                                       | Inspection of engine speed sensor unit                              |                       |  |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and 2. |                       |  |
|        | Inspection condition                                   | -   |                       |  |
|        | Requirements   | 860 ± 86 Ω (20°C {68°F})  |                       |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.         |  |
|        |  | NO  | Replacement of sensor |  |

<Step 5 inspection diagram>



|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 6 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)                                      |                 |  |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 10. |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                           |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7.   |  |
|        |  | NO   | Modify harness. |  |

|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 7 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (ground)   |                 |  |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 9. |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                          |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |   |  |  |
|--------|--|---|--|--|
| Step 8 | Inspection items                                       | Inspection by control data  |  |  |
|        | Maintenance item                                       | <b>&lt;General Scanning Tool used&gt;</b><br>• Measure item "Ne".<br><b>&lt;Multi-Use Tester used&gt;</b><br>• Measure item No. 01 "Engine Revolution" of Service Data. |  |  |
|        | Inspection condition                                   | -   |  |  |
|        | Requirements   | Same indication as tachometer is given.   |  |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.).     |  |
|        |  | NO  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

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## [Fault code]

Diagnosis code: P0339/Flash code: 15

## [Monitor]

Failure of engine speed sensor

## [Fault (outline)]

Abnormality of pulse count

## [Diagnosis check]

- Output pulses from engine speed sensor during engine operation are counted on basis of output signal from normal cylinder recognition sensor.

## [Code generation condition]

Diagnosis code is generated under either of the following conditions.

<Condition (1)>

- Engine speed output from engine speed sensor remains over 6000 rpm for 10 seconds.  
(Warning lamp (red) is lit and diagnosis code is displayed on first establishment of code generation condition.)

<Condition (2)>

- Engine speed remains below 300 rpm for 6 seconds during backup.  
(Warning lamp (orange) is lit and diagnosis code is displayed on first establishment of code generation condition.)

## [Diagnosis check timing]

- Fault diagnosis is performed only once during the driving cycle.

## [Diagnostic requirement]

- Engine operating mode: starting
- Engine speed: more than 500 rpm
- Engine speed: less than 400 rpm

## [Control effected by electronic control unit during fault]

Electronic control unit varies in the way of control by the color of warning lamp.

<Warning lamp: Orange>

- Effects no special control.

<Warning lamp: Red>

- Control is effected using cylinder recognition sensor only.
- Misfire detection is stopped.
- Engine torque is limited.
- Auto cruise control stopped
- Related fault check is stopped.

## [Probable cause of trouble]

- Open-circuit or short-circuit of harness between electronic control unit and engine speed sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

## [Recoverability]

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Timing of warning lamp/diagnosis code OFF depends on condition.)

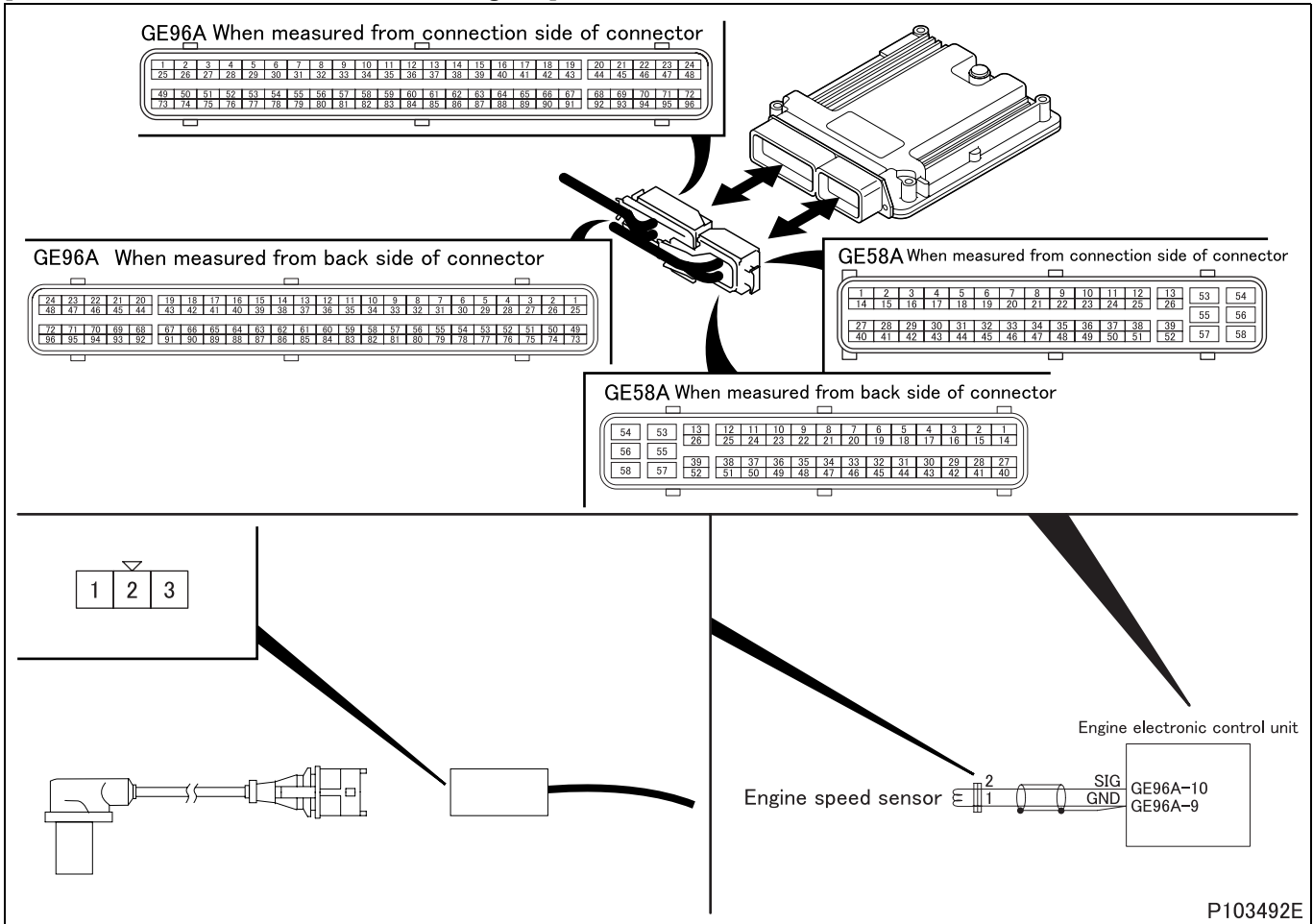
<Condition (1)>

- Lamp is extinguished and code is cleared at fourth diagnosis code display after recovery.

<Condition (2)>

- Lamp is extinguished and code is cleared simultaneously with recovery.

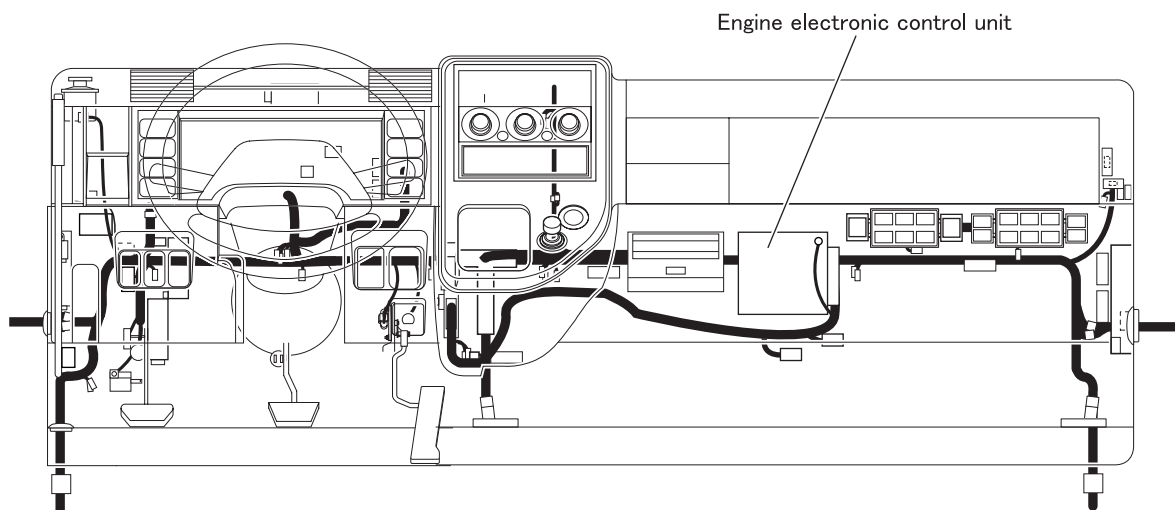
[Electronic Control Unit Connection Diagram]



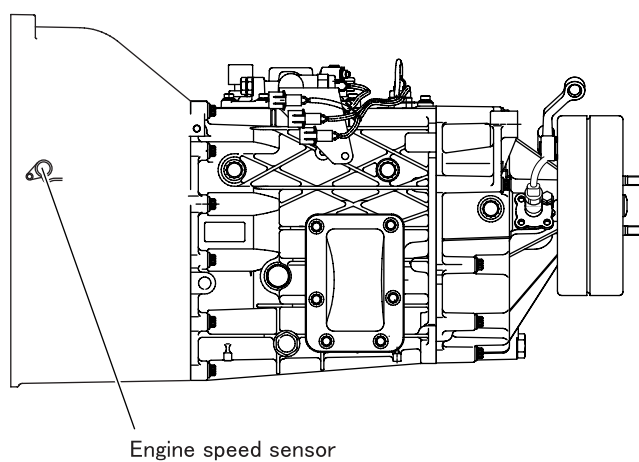
P103492E

# TROUBLESHOOTING

## [Parts Identification and Location]



Left side view of transmission



P103620E



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Ne".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 01 "Engine Revolution" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | –  |
|        | Requirements   |               | Same indication as tachometer is given.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 9 and 10.                           |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | 860 ± 86 Ω (20°C {68°F})   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

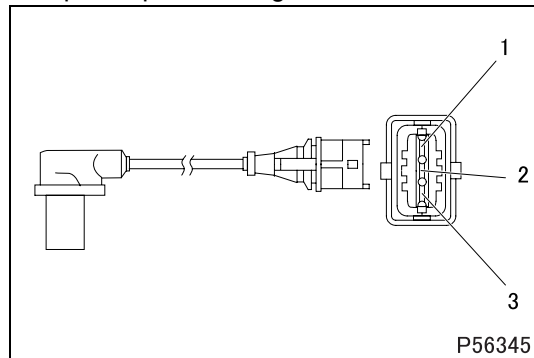
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of engine speed sensor connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

|        |  |                       |   |
|--------|--|-----------------------|---|
| Step 5 | Inspection items                                       |                       | Inspection of engine speed sensor unit                              |
|        | Maintenance item                                       |                       | Measure value of resistance between connector terminal No. 1 and 2. |
|        | Inspection condition                                   |                       | —   |
|        | Requirements   |                       | $860 \pm 86 \Omega$ (20°C {68°F})                                   |
|        | Inspection result (Is the judging standard satisfied?) | YES                   | Go to step 6.   |
| NO     |  | Replacement of sensor |   |

<Step 5 inspection diagram>



|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 10. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)   |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 9. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                          |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.   |
| NO     |  | Modify harness. |   |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | <b>&lt;General Scanning Tool used&gt;</b><br>• Measure item “Ne”.<br><b>&lt;Multi-Use Tester used&gt;</b><br>• Measure item No. 01 “Engine Revolution” of Service Data. |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | Same indication as tachometer is given.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

**[Fault code]**

Diagnosis code: P0340/Flash code: 12

**[Monitor]**

Failure of cylinder recognition sensor

**[Fault (outline)]**

No pulse check

**[Diagnosis check]**

- Output pulses from engine speed sensor are counted to check pulse output from cylinder recognition sensor during engine operation.

**[Code generation condition]**

- No pulse is output from cylinder recognition sensor despite more than 132 pulses from engine speed sensor at engine start. (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Starter switch: ON
- Engine speed: more than 20 rpm

**[Control effected by electronic control unit during fault]**

- Control is effected with engine speed sensor only.
- Misfire detection is stopped.
- Auto cruise control stopped
- Related fault check is stopped.

**[Probable cause of trouble]**

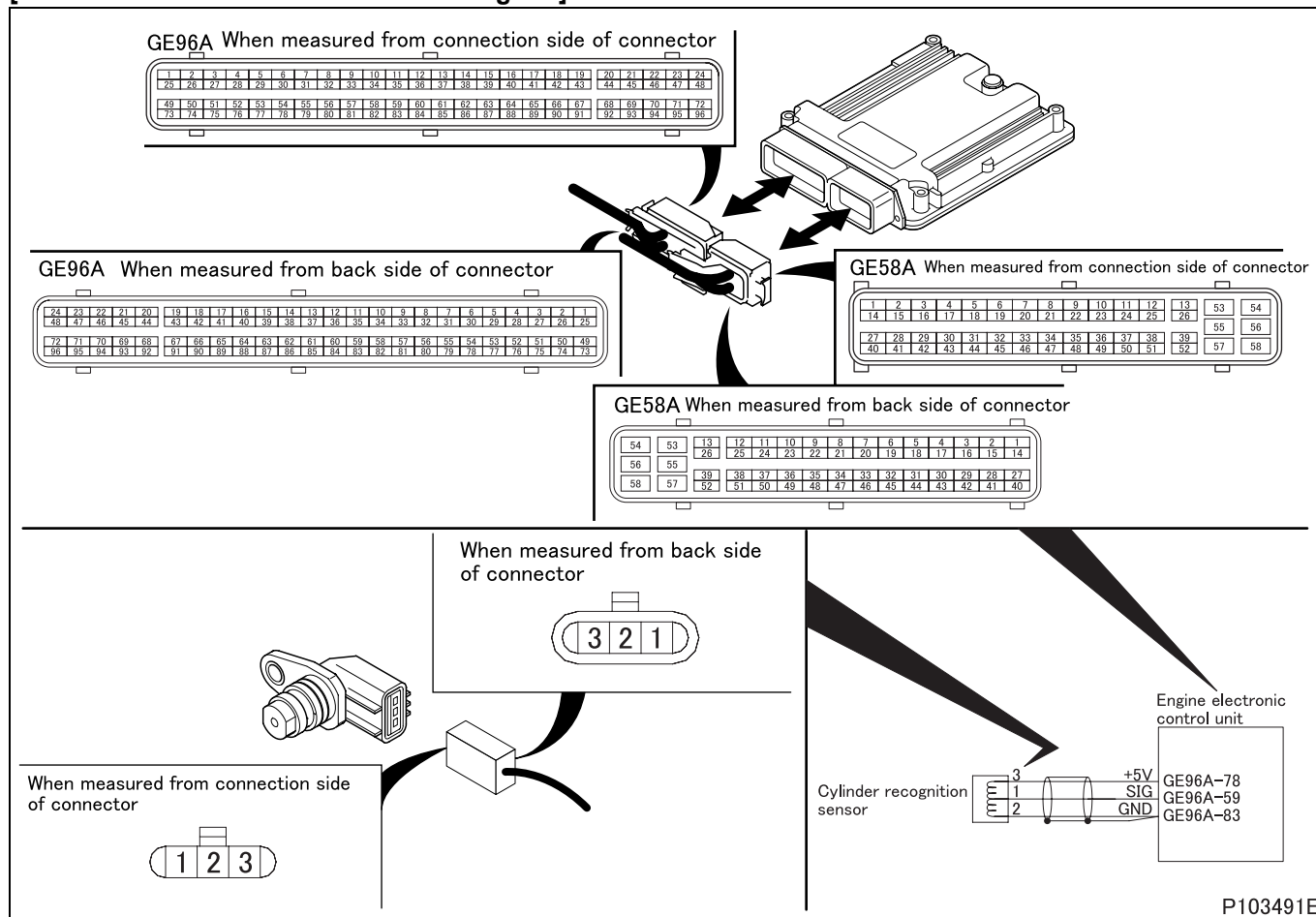
- Open-circuit or short-circuit of harness between electronic control unit and engine speed sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

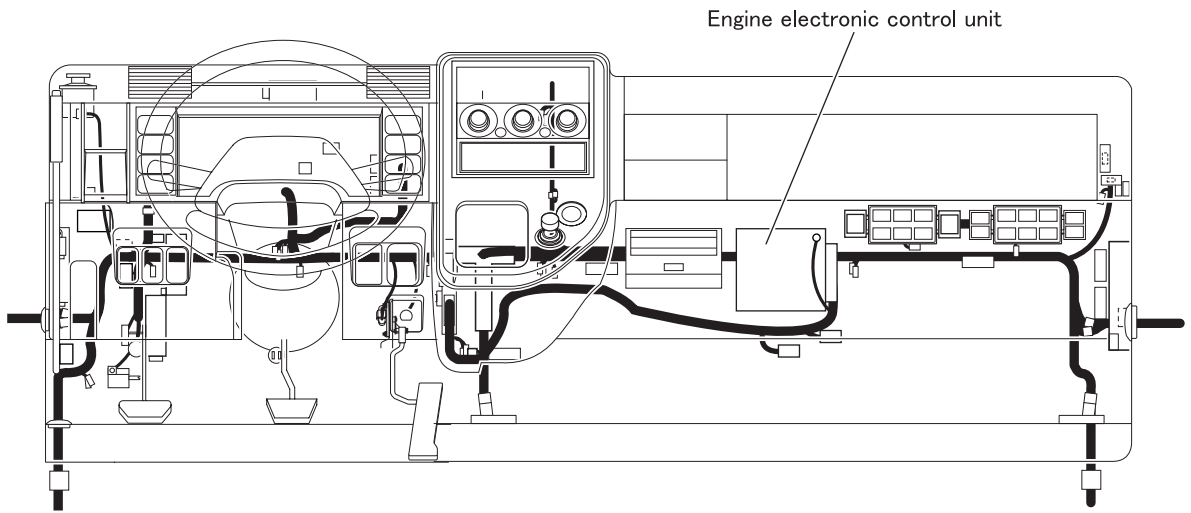
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

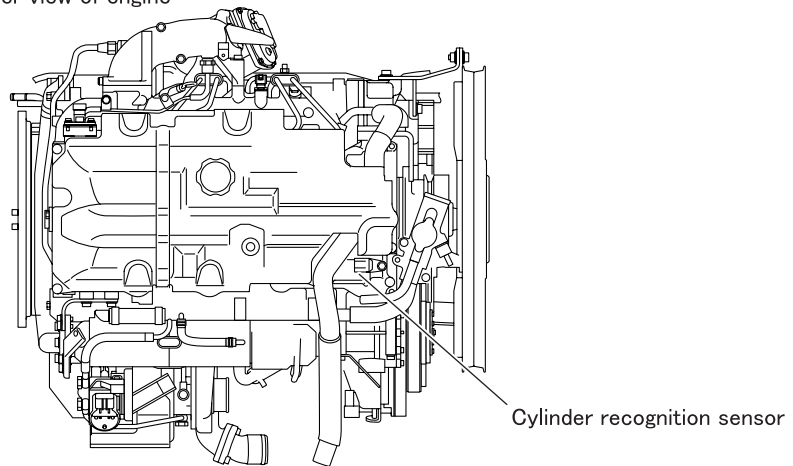


P103491E

[Parts Identification and Location]



Upper view of engine



P103619E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Ne".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 01 "Engine Revolution" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | –  |
|        | Requirements   |               | Same indication as tachometer is given.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (signal)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 59 (+) and 83 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 1 V or more   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 5.   |
| NO     |  | Go to step 3. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 3 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 78 (+) and 83 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.   |
| NO     |  | Go to step 5. |   |

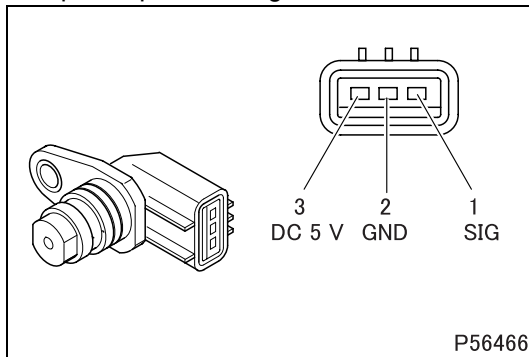
|        |  |               |   |
|--------|--|---------------|---|
| Step 4 | Inspection items                                       |               | Inspection by electronic control unit connector (ground)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 83 (+) and 53 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 0 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 6.   |
| NO     |  | Go to step 5. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 5 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 12.  |
| NO     |  | Modify connector. |   |

|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify connector.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 7 | Inspection items                                       | Inspection of sensor unit   |               |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 2 and 3. |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | 200 to 1800 Ω   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8. |
| NO     |  | Replacement of sensor   |               |

<Step 7 inspection diagram>



|        |  |   |                |
|--------|--|---|----------------|
| Step 8 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)   |                |
|        | Maintenance item                                       | Measure value of voltage between sensor connector terminal No. 3 (+) and 2 (-).   |                |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Remove connector and measure from harness side.</li> <li>• Starter switch: ON</li> </ul> |                |
|        | Requirements   | 5 V   |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 10. |
| NO     |  | Go to step 9.   |                |

|        |  |  |                |
|--------|--|--|----------------|
| Step 9 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)                                      |                |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 78. |                |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                           |                |
|        | Requirements   | There is continuity.   |                |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 12. |
| NO     |  | Modify harness.  |                |

# TROUBLESHOOTING

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 83. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO      |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 59. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |  |   |
|---------|--|--|---|
| Step 12 | Inspection items                                       |  | Inspection by control data  |
|         | Maintenance item                                       |  | <b>&lt;General Scanning Tool used&gt;</b><br>• Measure item "Ne".<br><b>&lt;Multi-Use Tester used&gt;</b><br>• Measure item No. 01 "Engine Revolution" of Service Data. |
|         | Inspection condition                                   |  | –   |
|         | Requirements   |  | Same indication as tachometer is given.   |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO      |  | Replacement of electronic control unit |   |



**[Fault code]**

Diagnosis code: P0344/Flash code: 12

**[Monitor]**

Failure of cylinder recognition sensor

**[Fault (outline)]**

Abnormality of pulse count

**[Diagnosis check]**

- Output pulses from cylinder recognition sensor during engine operation are counted.

**[Code generation condition]**

- Number of output pulses from cylinder recognition sensor at engine start exceeds 240.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

- Starter switch: ON
- Engine speed: more than 20 rpm

**[Control effected by electronic control unit during fault]**

- Control is effected with engine speed sensor only.
- Misfire detection is stopped.
- Auto cruise control stopped
- Related fault check is stopped.

**[Probable cause of trouble]**

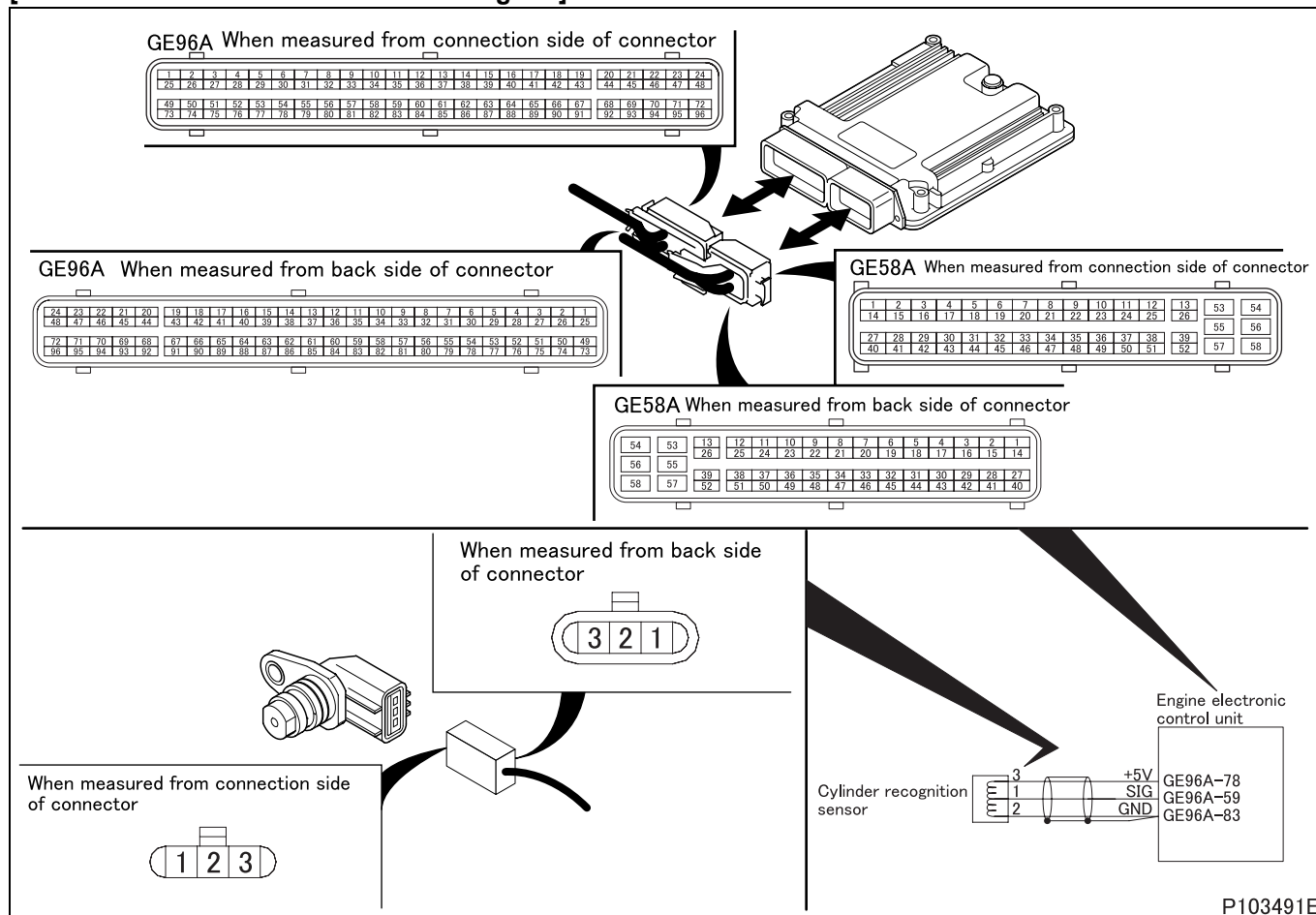
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

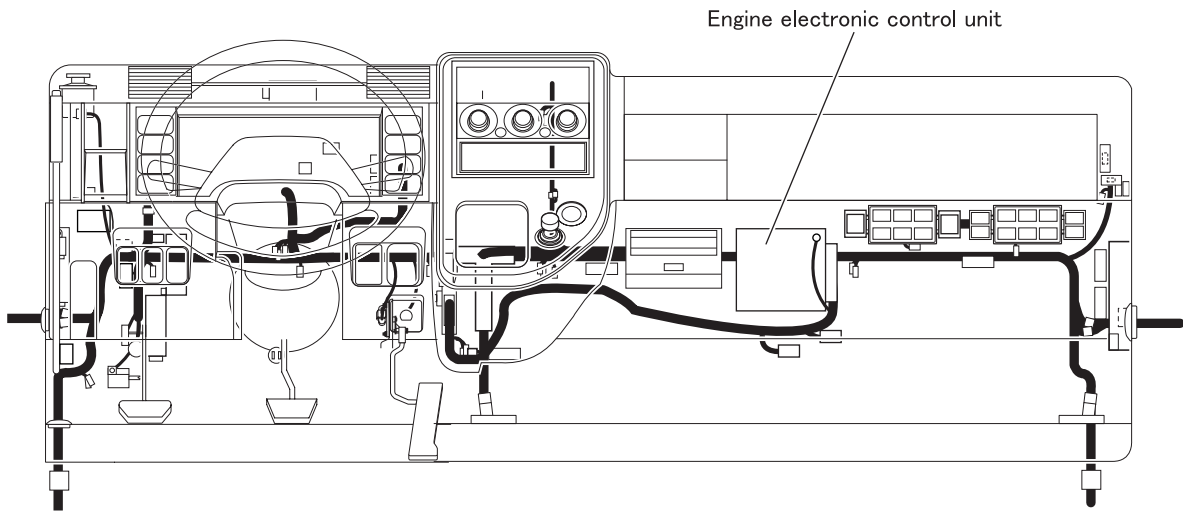
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

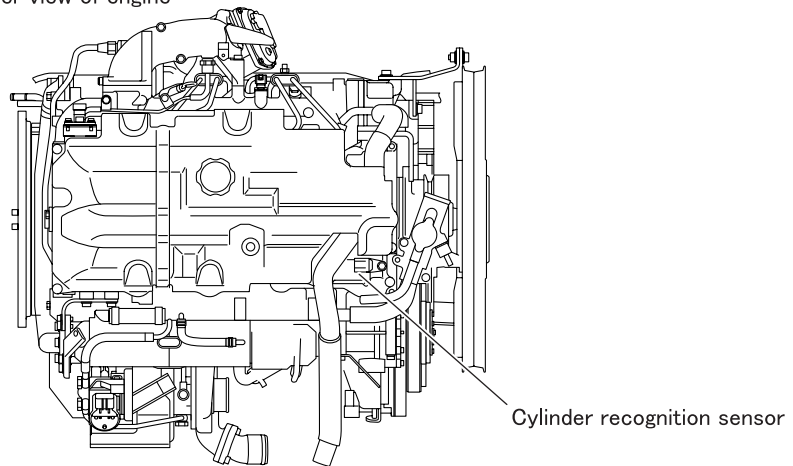


P103491E

[Parts Identification and Location]



Upper view of engine



P103619E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item "Ne".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item No. 01 "Engine Revolution" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | –  |
|        | Requirements   |               | Same indication as tachometer is given.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (signal)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 59 (+) and 83 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |               | 1 V or more   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 5.   |
| NO     |  | Go to step 3. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 3 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 78 (+) and 83 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.   |
| NO     |  | Go to step 5. |   |

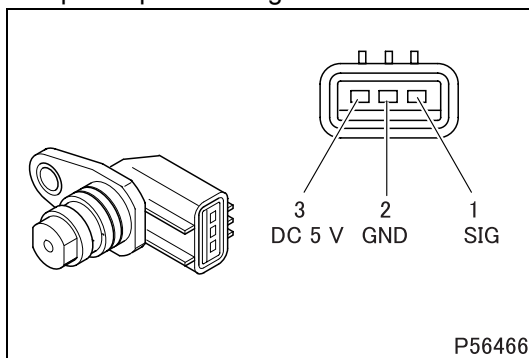
|        |  |               |   |
|--------|--|---------------|---|
| Step 4 | Inspection items                                       |               | Inspection by electronic control unit connector (ground)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 83 (+) and 53 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |               | 0 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 6.   |
| NO     |  | Go to step 5. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 5 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 12.  |
| NO     |  | Modify connector. |   |

|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify connector.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 7 | Inspection items                                       | Inspection of sensor unit   |               |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 2 and 3. |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | 200 to 1800 Ω   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8. |
| NO     |  | Replacement of sensor   |               |

<Step 7 inspection diagram>



|        |  |   |                |
|--------|--|---|----------------|
| Step 8 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)   |                |
|        | Maintenance item                                       | Measure value of voltage between sensor connector terminal No. 3 (+) and 2 (-).   |                |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Remove connector and measure from harness side.</li> <li>• Starter switch: ON</li> </ul> |                |
|        | Requirements   | 5 V   |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 10. |
| NO     |  | Go to step 9.   |                |

|        |  |  |                |
|--------|--|--|----------------|
| Step 9 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)                                      |                |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 78. |                |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                           |                |
|        | Requirements   | There is continuity.   |                |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 12. |
| NO     |  | Modify harness.  |                |

# TROUBLESHOOTING

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 83. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO      |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 59. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |  |  |
|---------|--|--|--|
| Step 12 | Inspection items                                       |  | Inspection by control data   |
|         | Maintenance item                                       |  | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Ne".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 01 "Engine Revolution" of Service Data.</li> </ul> |
|         | Inspection condition                                   |  | –  |
|         | Requirements   |  | Same indication as tachometer is given.  |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic control unit |  |

**[Fault code]**

Diagnosis code: P0381/Flash code: 26

**[Monitor]**

Failure of preheating indicator lamp

**[Fault (outline)]**

- Short circuit battery
- Short circuit ground
- Open circuit
- Overload

**[Diagnosis check]**

- Preheating indicator lamp circuit is monitored for fault.

**[Code generation condition]**

- Preheating indicator lamp circuit remains open, shorted or overcurrent as detected for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.
- Fault diagnosis is performed each time when the control is halted.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Effects no special control.

**[Probable cause of trouble]**

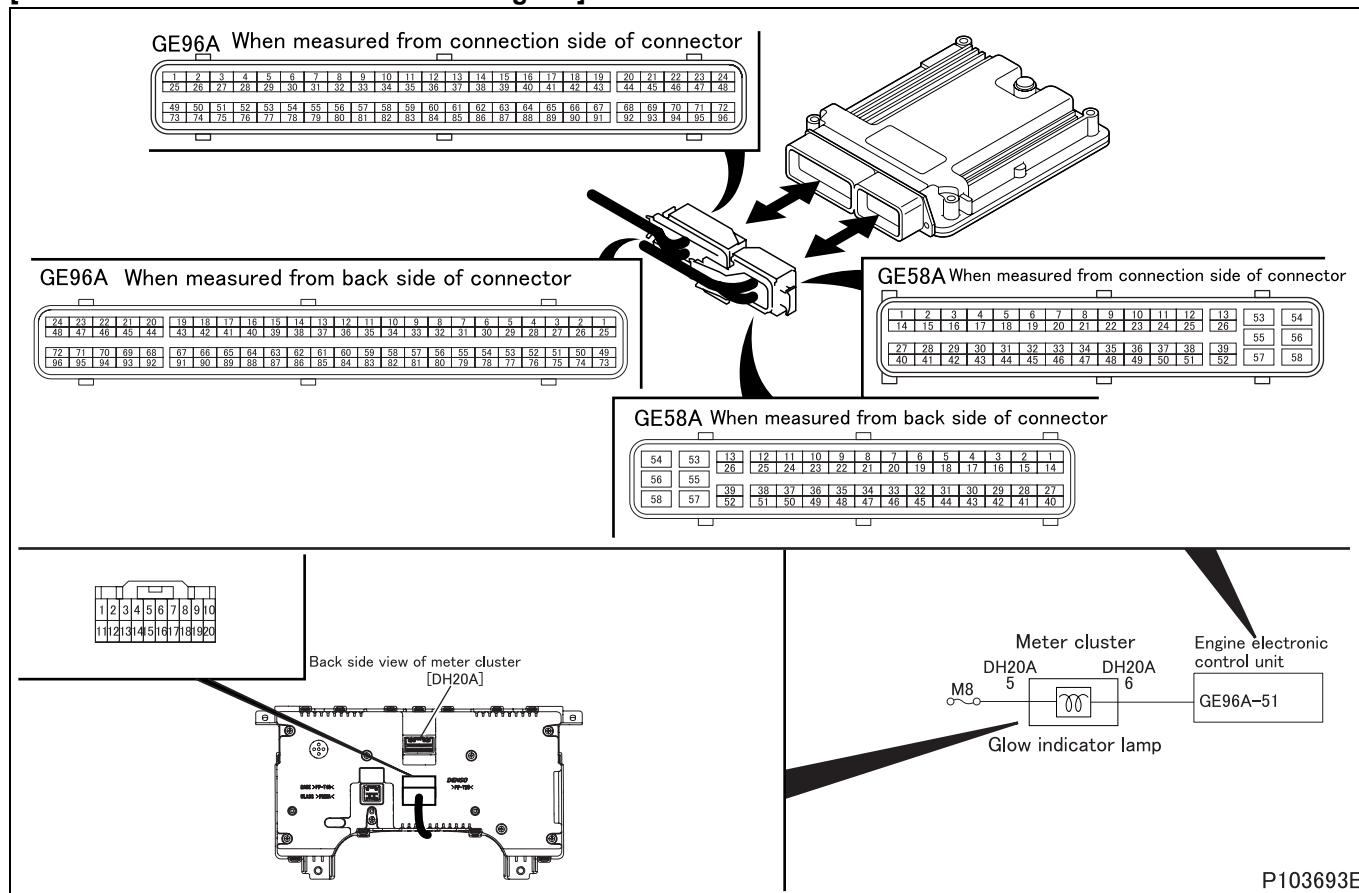
- Open-circuit or short-circuit of harness between electronic control unit and meter cluster (preheating indicator lamp)
- Malfunction of each connector
- Malfunction of meter cluster (preheating indicator lamp)
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

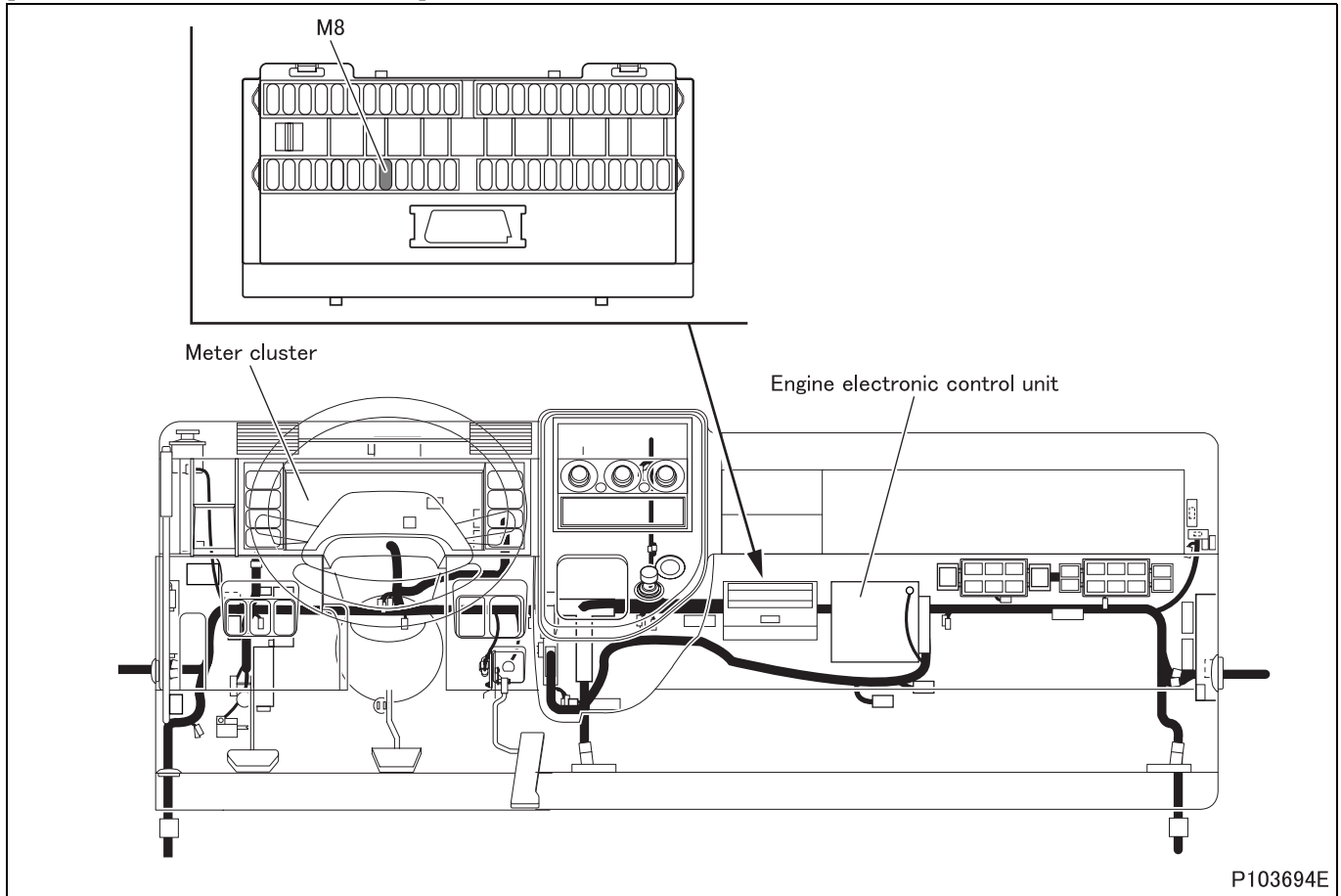
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]





[Parts Identification and Location]



[Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by control data                                 |
|        | Maintenance item                                       |  | Perform item No. AD "Glow Indicator Lamp" of Service Data. |
|        | Inspection condition                                   |  | Starter switch: ON   |
|        | Requirements   |  | Lamp illuminates for six seconds.                          |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to transient fault (See Gr00.).<br>NO Go to step 2. |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of electronic control unit connector                       |
|        | Maintenance item                                       |  | Ground connector (GE96A) terminal No. 51.                             |
|        | Inspection condition                                   |  | Measure from back side of connector of harness with harness connected |
|        | Requirements   |  | Lamp illuminates.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 3.<br>NO Go to step 4.                                 |

# TROUBLESHOOTING

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of electronic control unit  |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 4 | Inspection items                                       |                 | Inspection of harness between fuse and meter cluster                                       |
|        | Maintenance item                                       |                 | Check circuit between fuse M8 and meter cluster connector (DH20A) terminal No. 5.          |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 5.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 5 | Inspection items                                       |                 | Inspection of harness between meter cluster and electronic control unit  |
|        | Maintenance item                                       |                 | Check circuit between meter cluster connector (DH20A) terminal No. 6 and electronic control unit connector (GE96A) terminal No. 51 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.  |
| NO     |  | Modify harness. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of meter cluster   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of meter cluster or lamp  |
| NO     |  | Modify connector. |   |

**[Fault code]**

Diagnosis code: P0383/Flash code: 26

<FE83>

**[Monitor]**

Failure of preheating control

**[Fault (outline)]**

Short circuit ground

**[Diagnosis check]**

- Diesel particulate filter indicator lamp circuit is monitored for preheater in operation.

**[Code generation condition]**

- Preheating control circuit remains shorted to ground as detected for 0.2 second.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is halted.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Effects no special control.

**[Probable cause of trouble]**

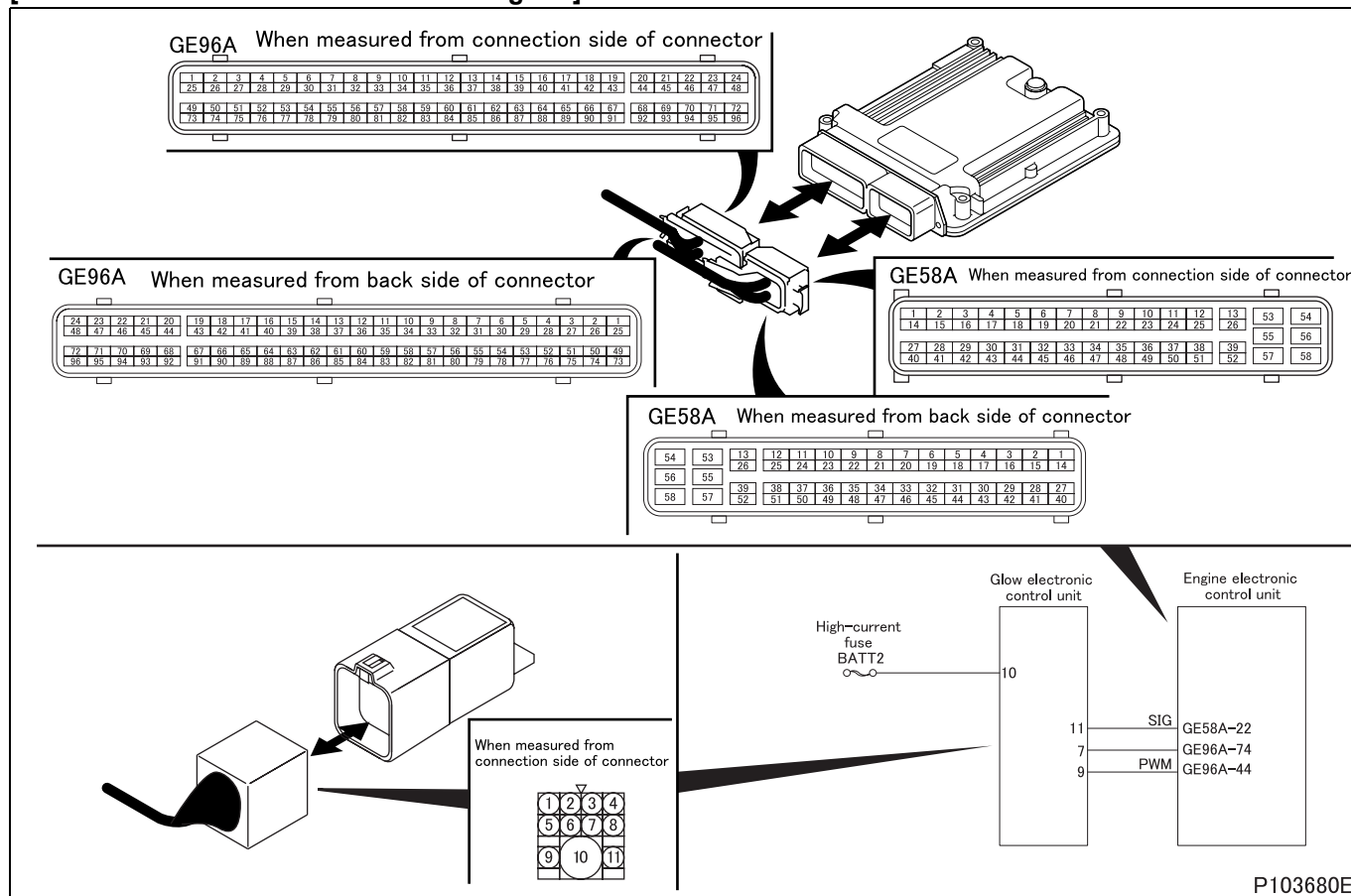
- Open-circuit or short-circuit of harness between electronic control unit and glow electronic control unit
- Malfunction of each connector
- Malfunction of glow electronic control unit
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

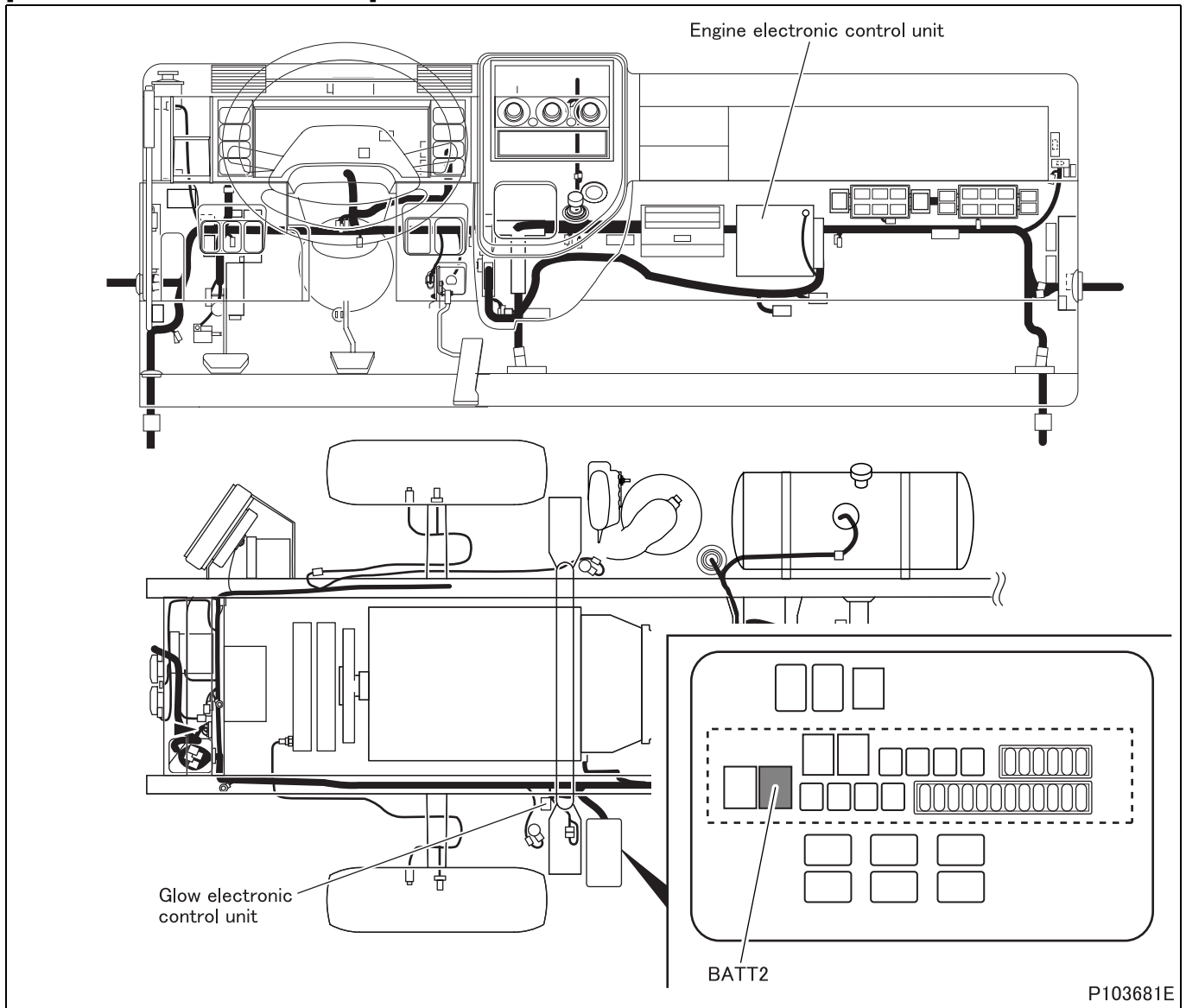
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P103680E

[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

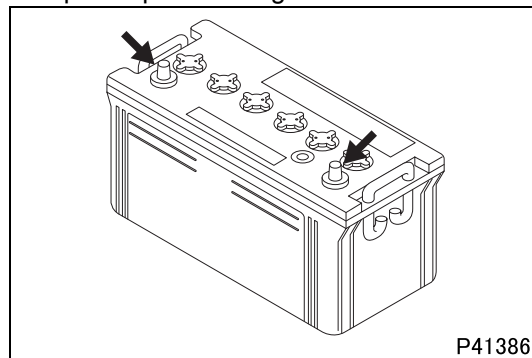
|        |  |  |  |     |                                    |    |
|--------|--|--|--|-----|------------------------------------|----|
| Step 1 | Inspection items                                       |  | Inspection by control data   |     |                                    |    |
|        | Maintenance item                                       |  | Perform actuator test item No. B5 "GCU (GLOW PLUG)".   |     |                                    |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0MPH})</li> <li>Starter switch: ON</li> <li>Engine: stopped</li> </ul> |     |                                    |    |
|        | Requirements   |  | Power ON to glow plug  |     |                                    |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to transient fault (See Gr00.).</td> </tr> <tr> <td>NO</td> <td>Go to step 2.</td> </tr> </table>            | YES | Go to transient fault (See Gr00.). | NO |
| YES    | Go to transient fault (See Gr00.).                     |  |  |     |                                    |    |
| NO     | Go to step 2.  |  |  |     |                                    |    |

|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 2 | Inspection items                                       |  | Inspection of high-current fuse (BATT2)  |     |               |    |
|        | Maintenance item                                       |  | Check open circuit of high-current fuse (BATT2)  |     |               |    |
|        | Inspection condition                                   |  | –  |     |               |    |
|        | Requirements   |  | There is continuity.   |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 3.</td> </tr> <tr> <td>NO</td> <td>Replacement of fuse</td> </tr> </table> | YES | Go to step 3. | NO |
| YES    | Go to step 3.  |  |  |     |               |    |
| NO     | Replacement of fuse                                    |  |  |     |               |    |

|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 3 | Inspection items                                       |  | Inspection of harness between glow electronic control unit and high-current fuse (BATT2)                                   |     |               |    |
|        | Maintenance item                                       |  | Check circuit between glow electronic control unit connector terminal No. 10 and high-current fuse (BATT2).                |     |               |    |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                                 |     |               |    |
|        | Requirements   |  | There is continuity.   |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 4.</td> </tr> <tr> <td>NO</td> <td>Modify harness.</td> </tr> </table> | YES | Go to step 4. | NO |
| YES    | Go to step 4.  |  |  |     |               |    |
| NO     | Modify harness.  |  |  |     |               |    |

|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 4 | Inspection items                                       |  | Inspection of battery  |     |               |    |
|        | Maintenance item                                       |  | Measure value of voltage between battery terminals (+) and (–).  |     |               |    |
|        | Inspection condition                                   |  | –  |     |               |    |
|        | Requirements   |  | 8 to 16 V  |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 5.</td> </tr> <tr> <td>NO</td> <td>Inspection of battery (See Gr54.)</td> </tr> </table> | YES | Go to step 5. | NO |
| YES    | Go to step 5.  |  |  |     |               |    |
| NO     | Inspection of battery (See Gr54.)                      |  |  |     |               |    |

<Step 4 inspection diagram>



|        |  |                 |  |
|--------|--|-----------------|--|
| Step 5 | Inspection items                                       |                 | Inspection of harness between glow electronic control unit and engine electronic control unit  |
|        | Maintenance item                                       |                 | <p>Check circuit between following connector terminals.</p> <ul style="list-style-type: none"> <li>• Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22</li> <li>• Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74</li> <li>• Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) terminal No. 44</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.  |
| NO     |  | Modify harness. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of glow electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | After replacement of glow electronic control unit, go to step 7.  |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 7 | Inspection items                                       |                   | Inspection of engine electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of engine electronic control unit   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

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<Except FE83>

**[Monitor]**

Failure of preheating control

**[Fault (outline)]**

Short circuit ground

**[Diagnosis check]**

- Glow drive relay circuit is monitored for fault when glow drive relay is operated.

**[Code generation condition]**

- Glow drive relay circuit remains shorted to ground as detected for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is halted.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

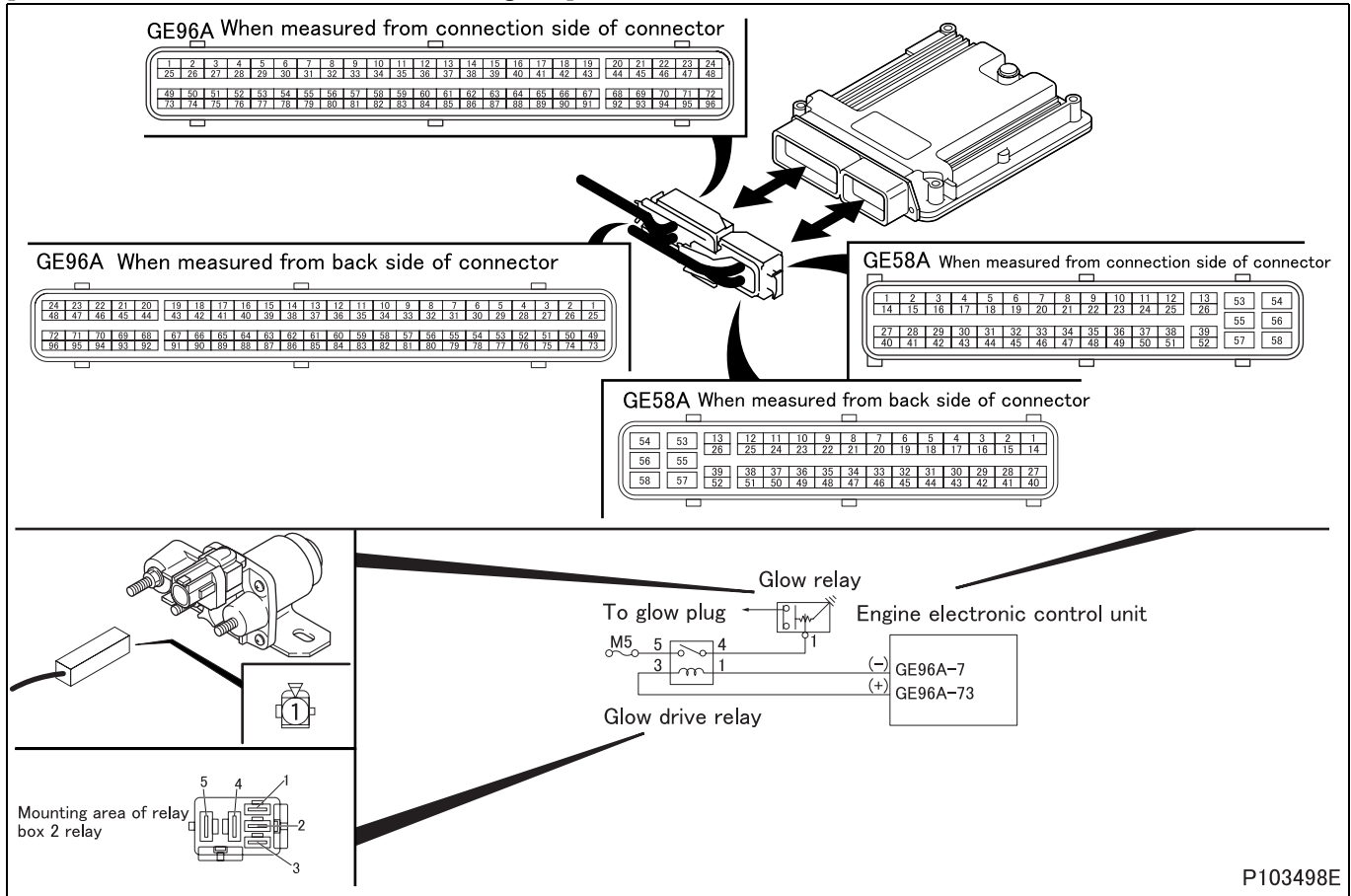
- Open-circuit or short-circuit of harness between electronic control unit and glow drive relay
- Malfunction of each connector
- Malfunction of glow drive relay
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



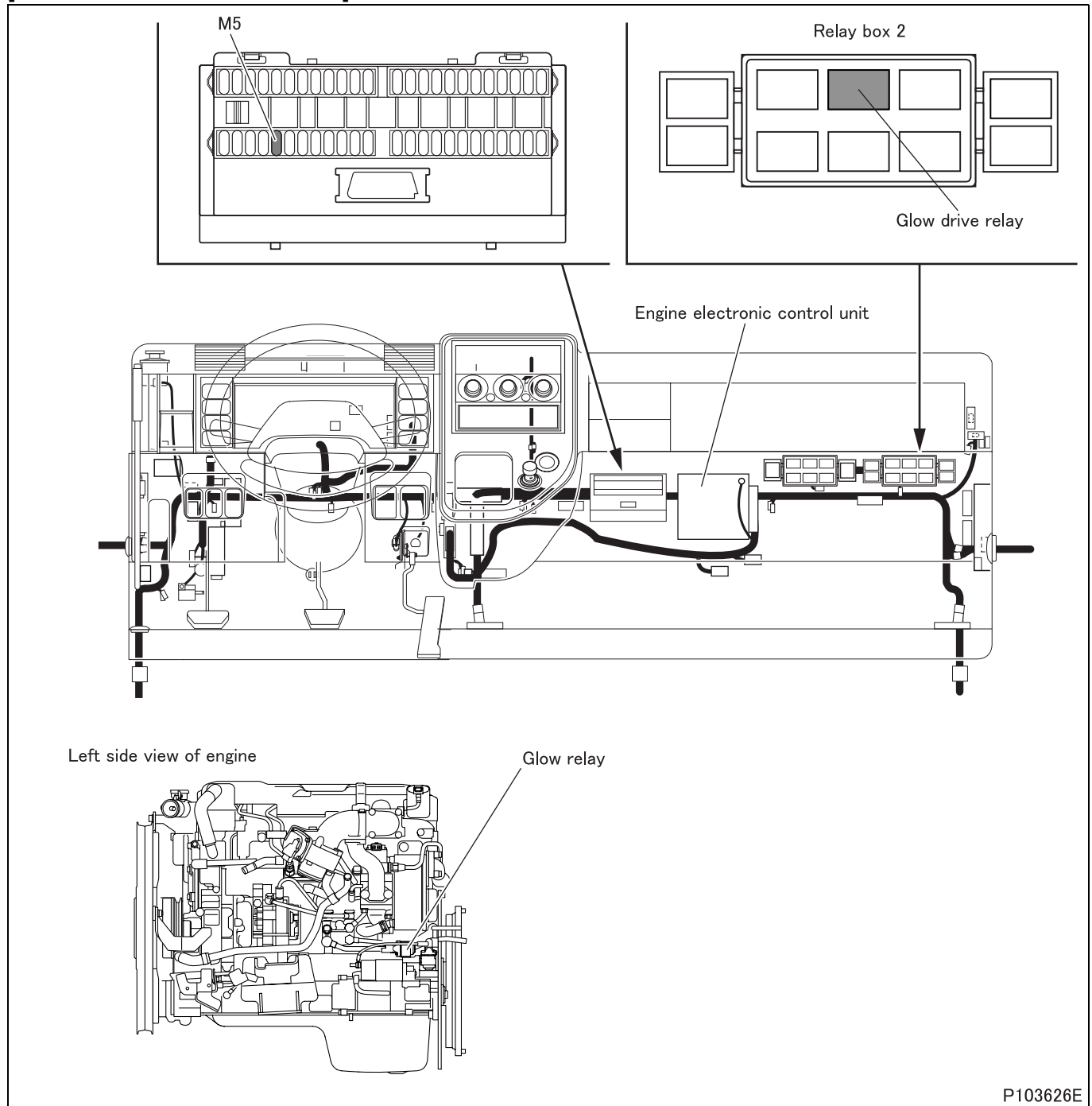
[Electronic Control Unit Connection Diagram]



P103498E

# TROUBLESHOOTING

## [Parts Identification and Location]



P103626E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data                               |
|        | Maintenance item                                       |               | Perform actuator test item No. AC "Relay for Glow Relay" |
|        | Inspection condition                                   |               | –  |
|        | Requirements   |               | Relay operation sound is noted.                          |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).                       |
| NO     |  | Go to step 2. |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection of electronic control unit connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 73 (+) and 7 (–).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Perform actuator test item No. AC "Relay for Glow Relay"</li> </ul> |
|        | Requirements   |               | Same as battery voltage.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.   |
| NO     |  | Go to step 3. |   |

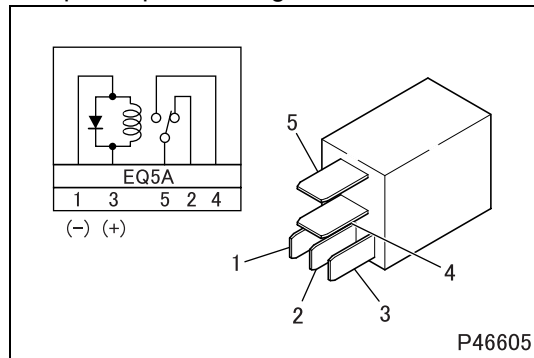
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

|        |  |   |               |
|--------|--|---|---------------|
| Step 5 | Inspection items                                       | Inspection of relay unit  |               |
|        | Maintenance item                                       | Measure continuity between terminals No. 4 and 5 when relay operates. |               |
|        | Inspection condition                                   | Apply battery voltage across terminals No. 3 (+) and 1 (-)            |               |
|        | Requirements   | There is continuity.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6. |
| NO     |  | Replacement of relay  |               |

<Step 5 inspection diagram>



|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of harness between relay and electronic control unit (power supply)                                      |               |
|        | Maintenance item                                       | Check circuit between relay connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 73. |               |
|        | Inspection condition                                   | Disconnect electronic control unit from harness and measure from connection side of harness connector.              |               |
|        | Requirements   | There is continuity.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify harness.   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of harness between relay and electronic control unit (ground)   |               |
|        | Maintenance item                                       | Check circuit between relay connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 7. |               |
|        | Inspection condition                                   | Disconnect electronic control unit from harness and measure from connection side of harness connector.             |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Modify harness.  |               |

|        |  |  |                                    |
|--------|--|--|------------------------------------|
| Step 8 | Inspection items                                       | Inspection by control data                               |                                    |
|        | Maintenance item                                       | Perform actuator test item No. AC "Relay for Glow Relay" |                                    |
|        | Inspection condition                                   | -  |                                    |
|        | Requirements   | Relay operation sound is noted.                          |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to transient fault (See Gr00.). |
| NO     |  | Replacement of electronic control unit                   |                                    |

**[Fault code]**

Diagnosis code: P0384/Flash code: 26

<FE83>

**[Monitor]**

Failure of preheating control

**[Fault (outline)]**

Short circuit battery

**[Diagnosis check]**

- Diesel particulate filter indicator lamp circuit is monitored for preheater in operation.

**[Code generation condition]**

- Preheating control circuit remains shorted to power supply as detected for 0.5 second.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Effects no special control.

**[Probable cause of trouble]**

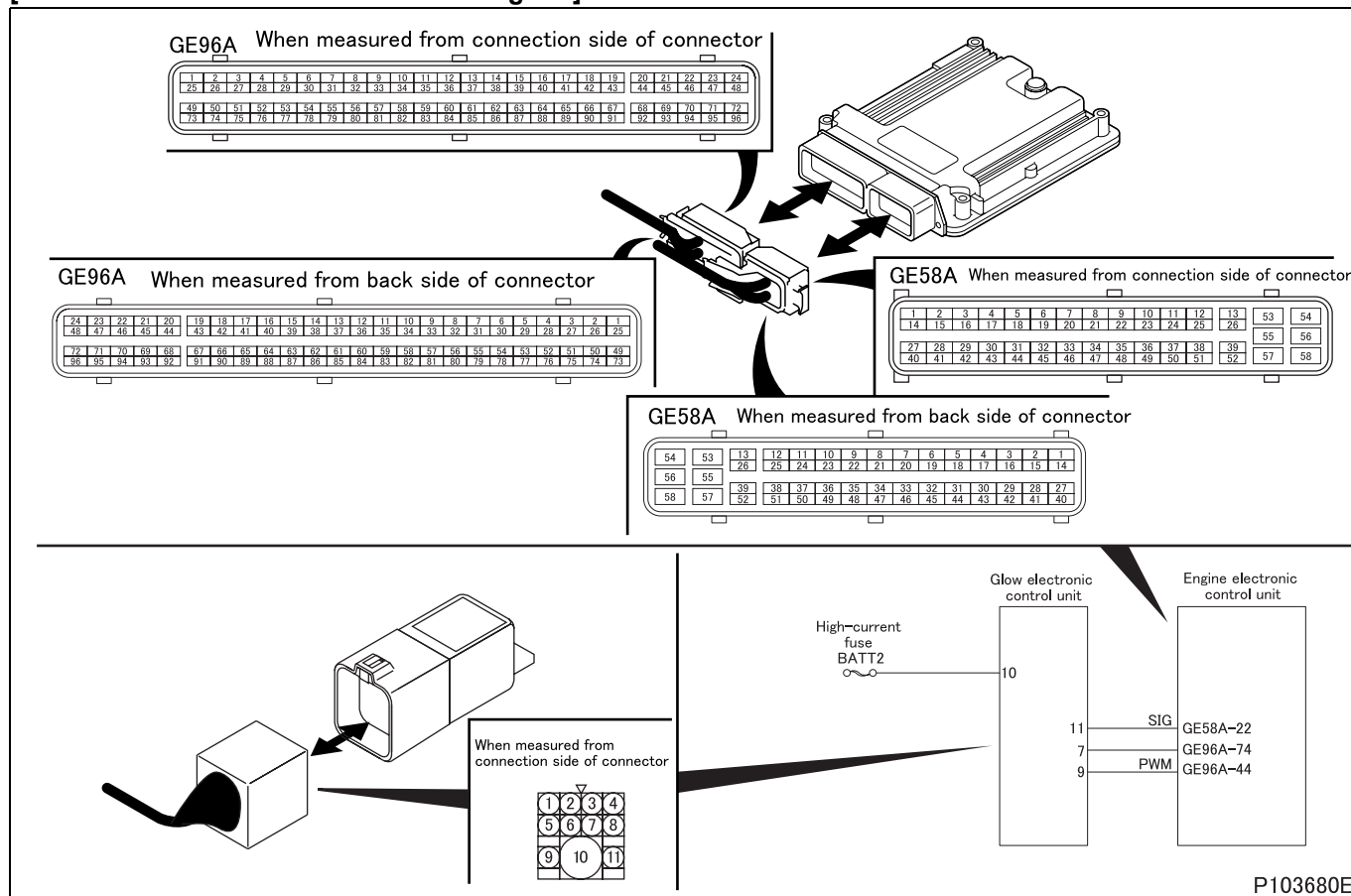
- Open-circuit or short-circuit of harness between electronic control unit and glow electronic control unit
- Malfunction of each connector
- Malfunction of glow electronic control unit
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

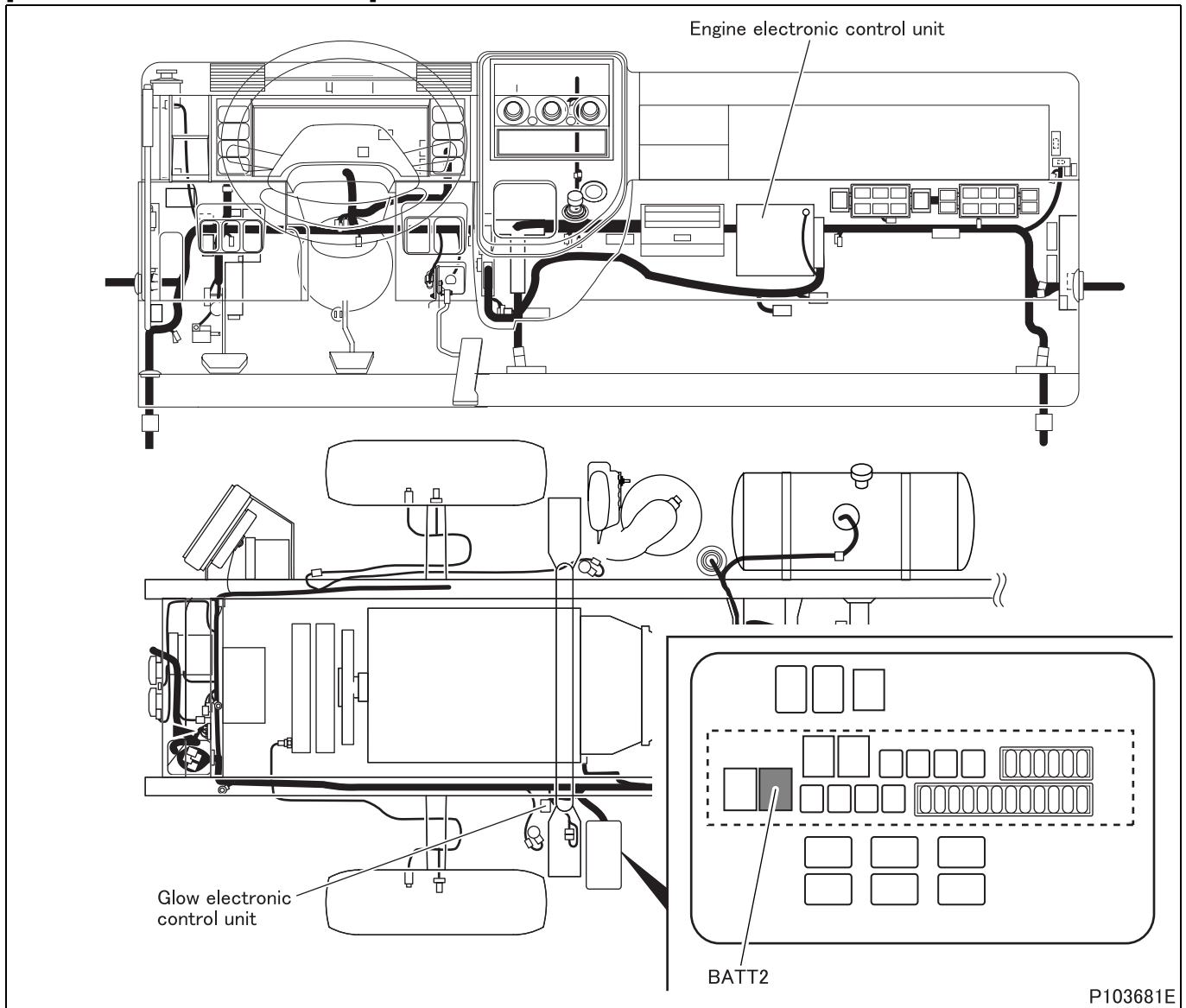
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P103680E

[Parts Identification and Location]



P103681E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

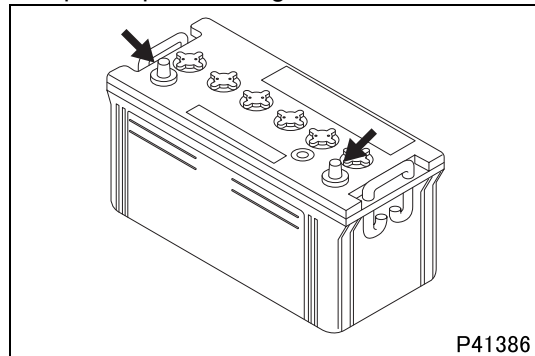
|        |  |  |  |     |                                    |    |
|--------|--|--|--|-----|------------------------------------|----|
| Step 1 | Inspection items                                       |  | Inspection by control data   |     |                                    |    |
|        | Maintenance item                                       |  | Perform actuator test item No. B5 "GCU (GLOW PLUG)".   |     |                                    |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0MPH})</li> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> </ul> |     |                                    |    |
|        | Requirements   |  | Power ON to glow plug  |     |                                    |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to transient fault (See Gr00.).</td> </tr> <tr> <td>NO</td> <td>Go to step 2.</td> </tr> </table>                  | YES | Go to transient fault (See Gr00.). | NO |
| YES    | Go to transient fault (See Gr00.).                     |  |  |     |                                    |    |
| NO     | Go to step 2.  |  |  |     |                                    |    |

|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 2 | Inspection items                                       |  | Inspection of high-current fuse (BATT2)  |     |               |    |
|        | Maintenance item                                       |  | Check open circuit of high-current fuse (BATT2)  |     |               |    |
|        | Inspection condition                                   |  | –  |     |               |    |
|        | Requirements   |  | There is continuity.   |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 3.</td> </tr> <tr> <td>NO</td> <td>Replacement of fuse</td> </tr> </table> | YES | Go to step 3. | NO |
| YES    | Go to step 3.  |  |  |     |               |    |
| NO     | Replacement of fuse                                    |  |  |     |               |    |

|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 3 | Inspection items                                       |  | Inspection of harness between glow electronic control unit and high-current fuse (BATT2)                                   |     |               |    |
|        | Maintenance item                                       |  | Check circuit between glow electronic control unit connector terminal No. 10 and high-current fuse (BATT2).                |     |               |    |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                                 |     |               |    |
|        | Requirements   |  | There is continuity.   |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 4.</td> </tr> <tr> <td>NO</td> <td>Modify harness.</td> </tr> </table> | YES | Go to step 4. | NO |
| YES    | Go to step 4.  |  |  |     |               |    |
| NO     | Modify harness.  |  |  |     |               |    |

|        |  |  |   |     |               |    |
|--------|--|--|---|-----|---------------|----|
| Step 4 | Inspection items                                       |  | Inspection of battery   |     |               |    |
|        | Maintenance item                                       |  | Measure value of voltage between battery terminals (+) and (–).   |     |               |    |
|        | Inspection condition                                   |  | –   |     |               |    |
|        | Requirements   |  | 8 to 16 V   |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 5.</td> </tr> <tr> <td>NO</td> <td>Inspection of battery (See Gr54.).</td> </tr> </table> | YES | Go to step 5. | NO |
| YES    | Go to step 5.  |  |   |     |               |    |
| NO     | Inspection of battery (See Gr54.).                     |  |   |     |               |    |

<Step 4 inspection diagram>





|        |  |                 |  |
|--------|--|-----------------|--|
| Step 5 | Inspection items                                       |                 | Inspection of harness between glow electronic control unit and engine electronic control unit  |
|        | Maintenance item                                       |                 | <p>Check circuit between following connector terminals.</p> <ul style="list-style-type: none"> <li>• Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22</li> <li>• Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74</li> <li>• Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) terminal No. 44</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.  |
| NO     |  | Modify harness. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of glow electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | —   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | After replacement of glow electronic control unit, go to step 7.  |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 7 | Inspection items                                       |                   | Inspection of engine electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | —   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of engine electronic control unit   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

---

<Except FE83>

**[Monitor]**

Failure of preheating control

**[Fault (outline)]**

Short circuit battery

**[Diagnosis check]**

- Glow drive relay circuit is monitored for fault when glow drive relay is operated.

**[Code generation condition]**

- Glow drive relay circuit remains shorted to power supply as detected for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

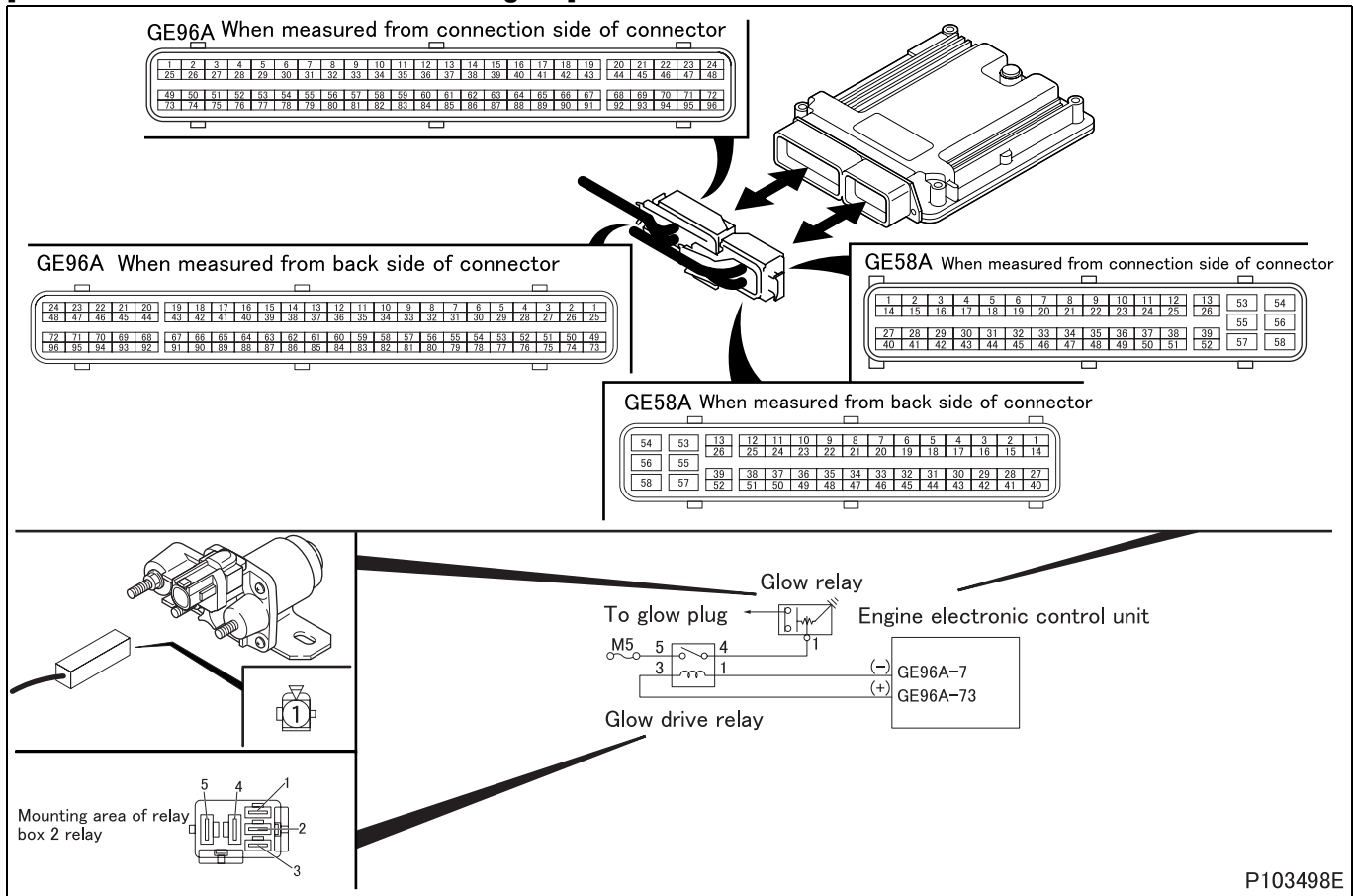
**[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and glow drive relay
- Malfunction of each connector
- Malfunction of glow drive relay
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

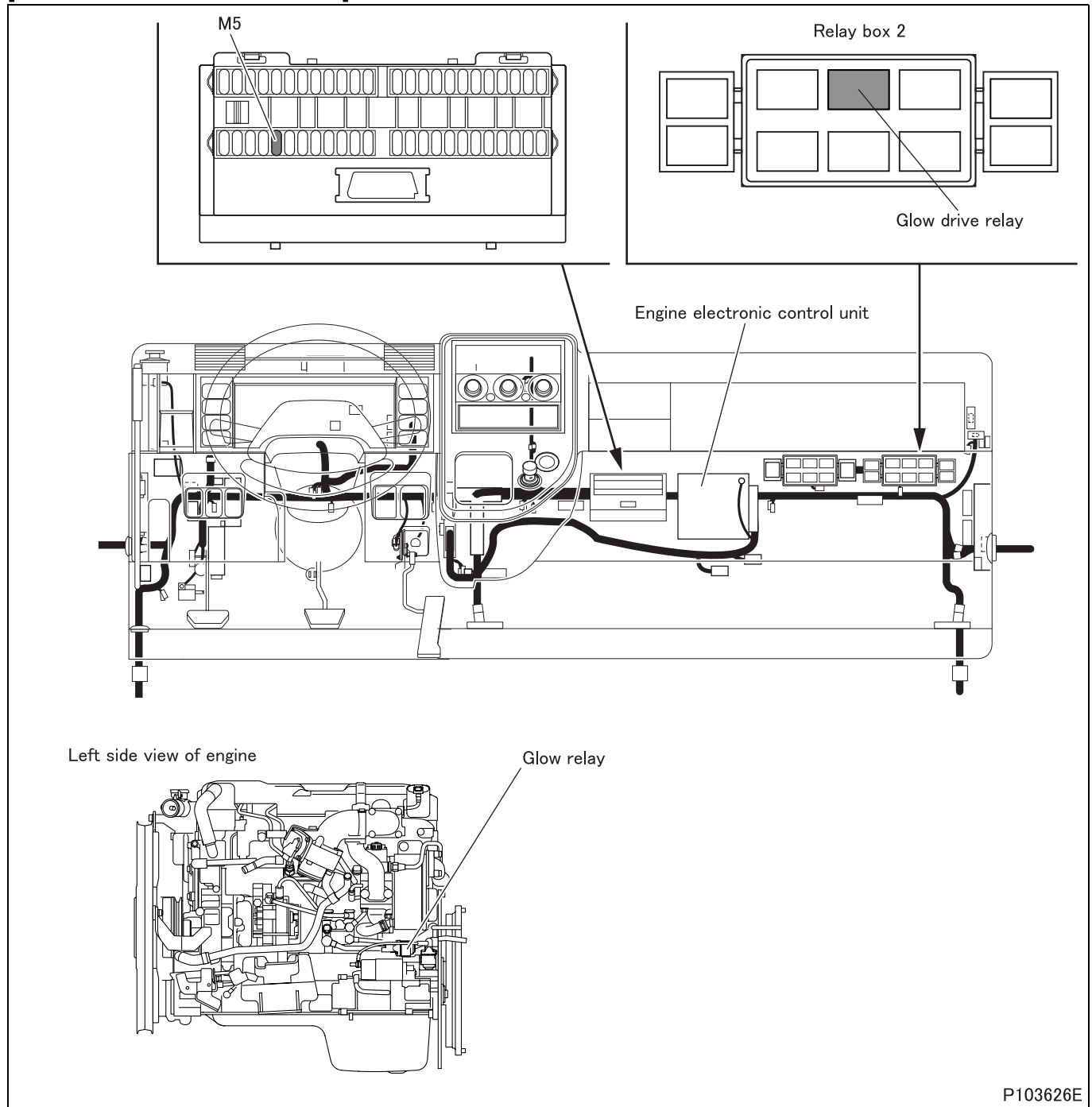
[Electronic Control Unit Connection Diagram]



P103498E

# TROUBLESHOOTING

## [Parts Identification and Location]



P103626E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data                               |
|        | Maintenance item                                       |               | Perform actuator test item No. AC "Relay for Glow Relay" |
|        | Inspection condition                                   |               | –  |
|        | Requirements   |               | Relay operation sound is noted.                          |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).                       |
| NO     |  | Go to step 2. |  |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection of electronic control unit connector (power supply)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 73 (+) and 7 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Perform actuator test item No. AC "Relay for Glow Relay "</li> </ul> |
|        | Requirements   |               | Same as battery voltage.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.  |
| NO     |  | Go to step 3. |  |

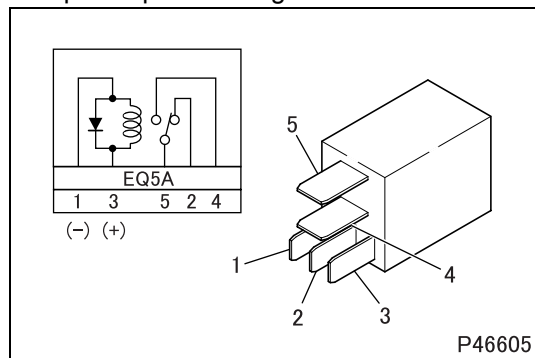
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

|        |  |   |               |
|--------|--|---|---------------|
| Step 5 | Inspection items                                       | Inspection of relay unit  |               |
|        | Maintenance item                                       | Measure continuity between terminals No. 4 and 5 when relay operates. |               |
|        | Inspection condition                                   | Apply battery voltage across terminals No. 3 (+) and 1 (-)            |               |
|        | Requirements   | There is continuity.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6. |
| NO     |  | Replacement of relay  |               |

<Step 5 inspection diagram>



|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of harness between relay and electronic control unit (power supply)                                      |               |
|        | Maintenance item                                       | Check circuit between relay connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 73. |               |
|        | Inspection condition                                   | Disconnect electronic control unit from harness and measure from connection side of harness connector.              |               |
|        | Requirements   | There is continuity.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify harness.   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of harness between relay and electronic control unit (ground)   |               |
|        | Maintenance item                                       | Check circuit between relay connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 7. |               |
|        | Inspection condition                                   | Disconnect electronic control unit from harness and measure from connection side of harness connector.             |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Modify harness.  |               |

|        |  |  |                                    |
|--------|--|--|------------------------------------|
| Step 8 | Inspection items                                       | Inspection by control data                               |                                    |
|        | Maintenance item                                       | Perform actuator test item No. AC "Relay for Glow Relay" |                                    |
|        | Inspection condition                                   | -  |                                    |
|        | Requirements   | Relay operation sound is noted.                          |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to transient fault (See Gr00.). |
| NO     |  | Replacement of electronic control unit                   |                                    |

**[Fault code]**

Diagnosis code: P0401/Flash code: 2

**[Monitor]**

Insufficient air flow rate in exhaust gas recirculation system

**[Fault (outline)]**

- Exhaust gas recirculation system insufficient flow
- Exhaust gas recirculation mass flow too low

**[Diagnosis check]**

Either of the following is monitored.

<Condition (1)>

- $\lambda$  value computed by engine electronic control unit is compared with pre-mapped specified value.

<Condition (2)>

- Exhaust gas recirculation flow rate (rate at which gas flows through exhaust gas recirculation valve) calculated by engine electronic control unit is compared with pre-mapped specified value.

**[Code generation condition]**

When either of the following is determined (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.).

<Condition (1)>

- Difference between target  $\lambda$  value and computed  $\lambda$  value remains less than specified for 4 seconds.

<Condition (2)>

- Computed exhaust gas recirculation flow rate remains below specified value for 10 seconds.

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

<Condition (1)>

- Exhaust gas recirculation control: closed loop
- Water temperature: 65 to 120°C {149 to 248°F}
- Atmospheric pressure: 828 to 1100 mbar {12 to 15.95 psi}
- Intake air temperature: -7 to 65°C {19 to 149°F}
- Diesel particulate filter regeneration control: not effected
- Exhaust gas recirculation valve: in order
- Intake throttle: in order
- Turbocharger actuator: in order
- Controller area network communication of each electronic drive unit (exhaust gas recirculation, intake throttle and turbocharger): in order
- Air flow sensor: in order
- Atmospheric pressure sensor: in order
- Boost pressure sensor: in order
- Water temperature sensor: in order
- Intake air temperature sensor: in order
- Boost air temperature sensor: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order
- Exhaust gas recirculation cooler: in order
- Starter switch circuit: in order
- Fuel feed when engine is idling: in order

# TROUBLESHOOTING

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## <Condition (2)>

- Water temperature: 65 to 120°C {149 to 248°F}
- Atmospheric pressure: 828 to 1100 mbar {12 to 15.95 psi}
- Intake air temperature: -7 to 65°C {19 to 149°F}
- Exhaust gas recirculation valve: closed
- Diesel particulate filter regeneration control: not effected
- Exhaust gas recirculation valve: in order
- Intake throttle: in order
- Turbocharger actuator: in order
- Controller area network communication of each electronic drive unit (exhaust gas recirculation, intake throttle and turbocharger): in order
- Air flow sensor: in order
- Atmospheric pressure sensor: in order
- Boost pressure sensor: in order
- Water temperature sensor: in order
- Intake air temperature sensor: in order
- Boost air temperature sensor: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order
- Exhaust gas recirculation cooler: in order
- Starter switch circuit: in order
- Fuel feed when engine is idling: in order

## **[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).
- Related fault check is stopped.

## **[Probable cause of trouble]**

- Exhaust gas recirculation valve stuck (remains fully closed)
- Plugged exhaust gas recirculation pipe and hose
- Plugged exhaust gas recirculation cooler

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0403 "EGR1 (Actuator Circuit)"</li> <li>• P0409 "EGR1 (Position Sensor)"</li> <li>• P0562 "Power Supply Voltage (Low)"</li> <li>• P0563 "Power Supply Voltage (High)"</li> <li>• P0600 "CAN Communication"</li> <li>• P0607 "ECU System"</li> <li>• P060B "A/D Converter"</li> <li>• P061B "ECU Performance (Calc)"</li> <li>• P061C "ECU Performance (Ne)"</li> <li>• P0685 "EDU Relay (Open)"</li> <li>• P0686 "EDU Relay (Low)"</li> <li>• P0687 "EDU Relay (High)"</li> <li>• P2413 "EGR System"</li> </ul> |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Do not start engine</li> </ul>  |
|        | Requirements   |  | Codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Inspect diagnosis code that is occurring.  |
| NO     |  | Inspection of exhaust gas recirculation system (exhaust gas recirculation pipe, exhaust gas recirculation cooler, exhaust gas recirculation valve) |  |

# TROUBLESHOOTING

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## [Fault code]

Diagnosis code: P0402/Flash code: 2

## [Monitor]

Excessive air flow rate in exhaust gas recirculation system

## [Fault (outline)]

- Exhaust gas recirculation system excessive flow
- Exhaust gas recirculation mass flow too high

## [Diagnosis check]

Either of the following is monitored.

<Condition (1)>

- $\lambda$  value computed by engine electronic control unit is compared with pre-mapped specified value.

<Condition (2)>

- Exhaust gas recirculation flow rate (rate at which gas flows through exhaust gas recirculation valve) calculated by engine electronic control unit is compared with pre-mapped specified value.

## [Code generation condition]

When either of the following is determined (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.).

<Condition (1)>

- Difference between target  $\lambda$  value and computed  $\lambda$  value remains more than specified for 4 seconds.

<Condition (2)>

- Computed exhaust gas recirculation flow rate remains more than specified value for 10 seconds.

## [Diagnosis check timing]

- Fault diagnosis is performed only once during the driving cycle.

## [Diagnostic requirement]

<Condition (1)>

- Exhaust gas recirculation control: closed loop
- Water temperature: 65 to 120°C {149 to 248°F}
- Atmospheric pressure: 828 to 1100 mbar {12 to 15.95 psi}
- Intake air temperature: -7 to 65°C {19 to 149°F}
- Diesel particulate filter regeneration control: not effected
- Exhaust gas recirculation valve: in order
- Intake throttle: in order
- Turbocharger actuator: in order
- Controller area network communication of each electronic drive unit (exhaust gas recirculation, intake throttle and turbocharger): in order
- Air flow sensor: in order
- Atmospheric pressure sensor: in order
- Boost pressure sensor: in order
- Water temperature sensor: in order
- Intake air temperature sensor: in order
- Boost air temperature sensor: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order
- Exhaust gas recirculation cooler: in order
- Starter switch circuit: in order
- Fuel feed when engine is idling: in order

## &lt;Condition (2)&gt;

- Water temperature: 65 to 120°C {149 to 248°F}
- Atmospheric pressure: 828 to 1100 mbar {12 to 15.95 psi}
- Intake air temperature: -7 to 65°C {19 to 149°F}
- Exhaust gas recirculation valve: closed
- Diesel particulate filter regeneration control: not effected
- Exhaust gas recirculation valve: in order
- Intake throttle: in order
- Turbocharger actuator: in order
- Controller area network communication of each electronic drive unit (exhaust gas recirculation, intake throttle and turbocharger): in order
- Air flow sensor: in order
- Atmospheric pressure sensor: in order
- Boost pressure sensor: in order
- Water temperature sensor: in order
- Intake air temperature sensor: in order
- Boost air temperature sensor: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order
- Exhaust gas recirculation cooler: in order
- Starter switch circuit: in order
- Fuel feed when engine is idling: in order

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).
- Related fault check is stopped.

**[Probable cause of trouble]**

- Exhaust gas recirculation valve stuck (remains fully open)
- Exhaust gas recirculation pipe and hose broken
- Exhaust gas recirculation cooler broken

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0403 "EGR1 (Actuator Circuit)"</li> <li>• P0409 "EGR1 (Position Sensor)"</li> <li>• P0562 "Power Supply Voltage (Low)"</li> <li>• P0563 "Power Supply Voltage (High)"</li> <li>• P0600 "CAN Communication"</li> <li>• P0607 "ECU System"</li> <li>• P060B "A/D Converter"</li> <li>• P061B "ECU Performance (Calc)"</li> <li>• P061C "ECU Performance (Ne)"</li> <li>• P0685 "EDU Relay (Open)"</li> <li>• P0686 "EDU Relay (Low)"</li> <li>• P0687 "EDU Relay (High)"</li> <li>• P2413 "EGR System"</li> </ul> |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Do not start engine</li> </ul>  |
|        | Requirements   |  | Codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Inspect diagnosis code that is occurring.  |
| NO     |  | Inspection of exhaust gas recirculation system (exhaust gas recirculation pipe, exhaust gas recirculation cooler, exhaust gas recirculation valve) |  |

**[Fault code]**

Diagnosis code: P0403/Flash code: 2, 67

**[Monitor]**

Failure of exhaust gas recirculation system

**[Fault (outline)]**

- Circuit
- Plausibility

**[Diagnosis check]**

- Exhaust gas recirculation electronic drive unit monitors built-in motor of exhaust gas recirculation valve for circuit fault and sends fault information to engine electronic control unit through controller area network communication.
- Monitoring by exhaust gas recirculation electronic drive unit is performed from initial operational status of motor at starter switch ON.

**[Code generation condition]**

When either of the following is determined (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

- Motor circuit remains open or shorted as detected by electronic drive unit for 2 seconds.
- Exhaust gas recirculation valve keeps operating 95% or more for 3 seconds.

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.

**[Diagnostic requirement]**

- Controller area network communication in order

**[Control effected by electronic control unit during fault]**

Electronic control unit differs in the way of control by the diagnosis check item.

<Power supply circuit>

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).
- Related fault check is stopped.

<Motor circuit>

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Post injection is inhibited.
- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).
- Related fault check is stopped.

**[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic drive unit and exhaust gas recirculation valve
- Malfunction of each connector
- Malfunction of exhaust gas recirculation motor (built in exhaust gas recirculation valve)
- Malfunction of exhaust gas recirculation position sensor (built in exhaust gas recirculation valve)
- Malfunction of electronic drive unit
- Malfunction of electronic drive unit relay

**[Recoverability]**

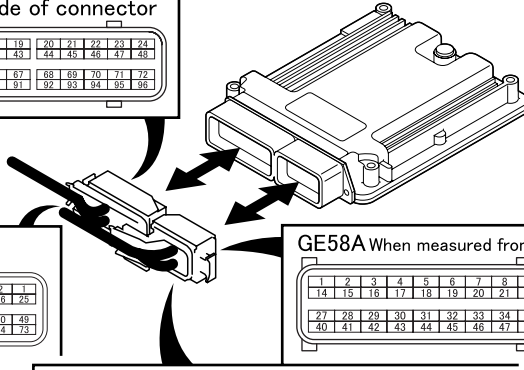
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |    |
| 26 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |



GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

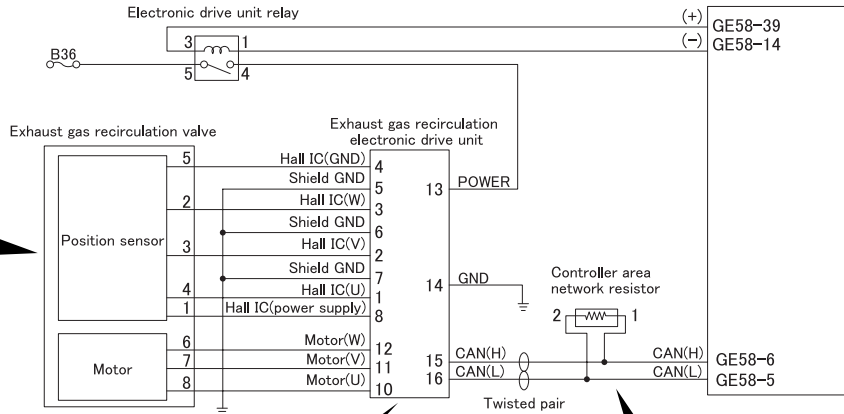
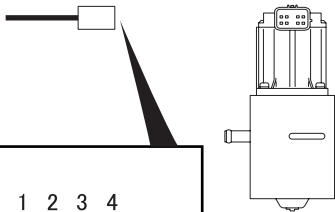
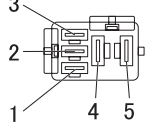
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |    |

Mounting area of high-current fuse box relay



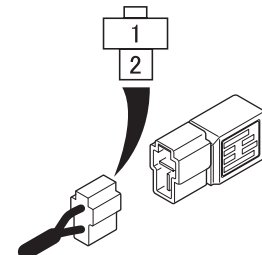
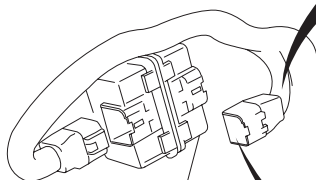
When measured from back side of connector

|    |    |    |    |
|----|----|----|----|
| 4  | 3  | 2  | 1  |
| 8  | 7  | 6  | 5  |
| 12 | 11 | 10 | 9  |
| 16 | 15 | 14 | 13 |

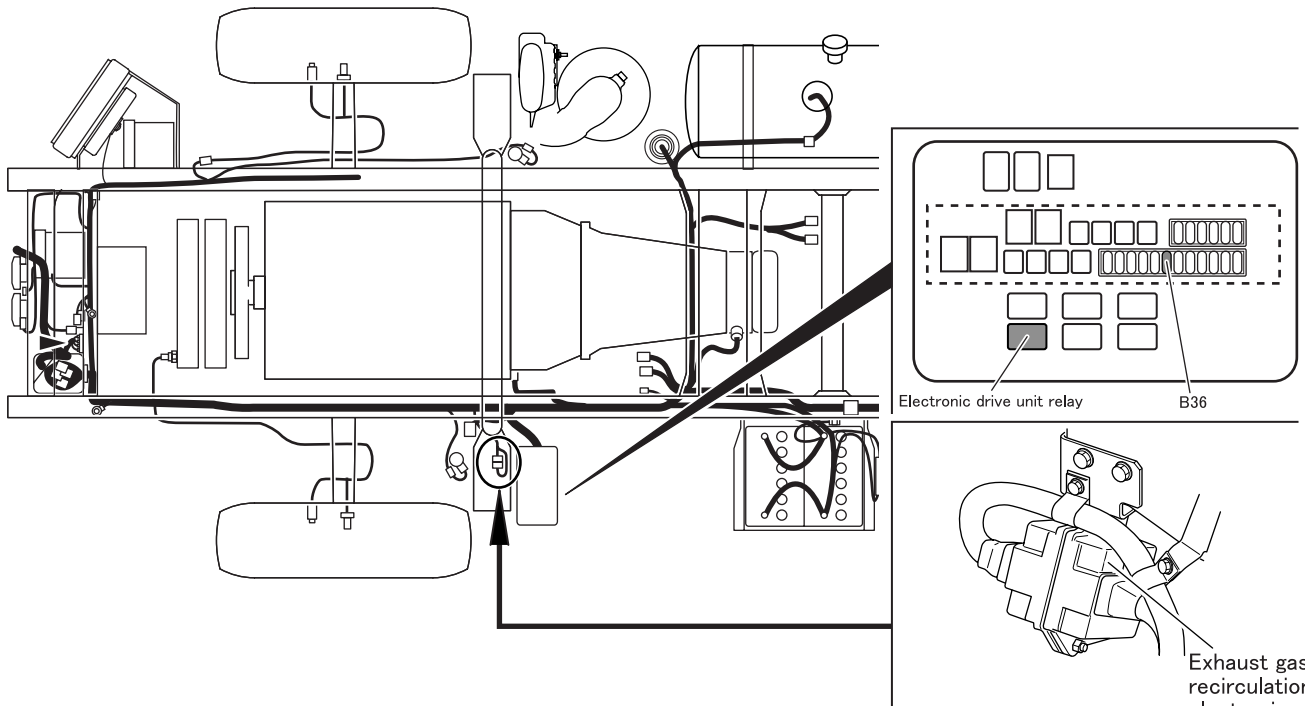
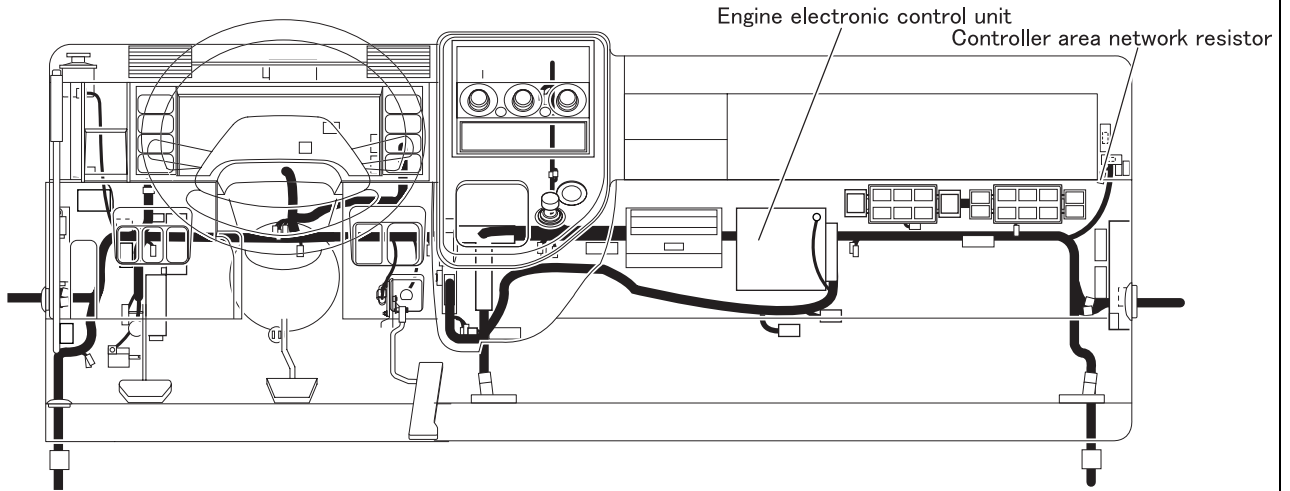
When measured from connection side of connector

|    |    |    |    |
|----|----|----|----|
| 1  | 2  | 3  | 4  |
| 5  | 6  | 7  | 8  |
| 9  | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |

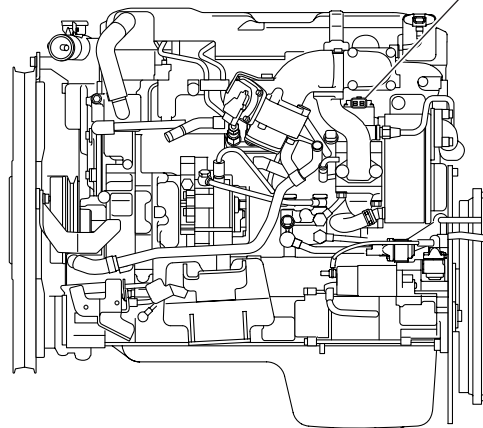
Exhaust gas recirculation electronic drive unit



[Parts Identification and Location]



Left side view of engine Exhaust gas recirculation valve



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. A0 "EGR 1"   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Transmission: neutral (parking satisfactory for automatic transmission)</li> <li>Diagnosis switch: OFF (fuse removed)</li> </ul>  |
|        | Requirements   |               | Actual position matches with target value set by Multi-Use Tester. (check with service data "51: Actual EGR Valve Position")<br><b>NOTE</b> <ul style="list-style-type: none"> <li>As initial operational check of exhaust gas recirculation valve is automatically effected immediately after starter switch is ON, perform actuator test by Multi-Use Tester after that check (approximately 5 seconds later).</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic drive unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of exhaust gas recirculation valve connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

|        |  |     |  |
|--------|--|-----|--|
| Step 4 | Inspection items                                       |     | Inspection by control data   |
|        | Maintenance item                                       |     | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>P0685 "EDU Relay (Open)"</li> <li>P0686 "EDU Relay (Low)"</li> <li>P0687 "EDU Relay (High)"</li> </ul> |
|        | Inspection condition                                   |     | Starter switch: ON   |
|        | Requirements   |     | No codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) | YES | Go to step 5.  |
|        |  | NO  | Inspect diagnosis code that is occurring.  |



|        |  |               |  |
|--------|--|---------------|--|
| Step 5 | Inspection items                                       |               | Inspection of electronic drive unit connector (power supply)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector terminal No. 13 (+) and 14 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Remove connector and measure from harness side.</li> <li>Starter switch: ON</li> <li>Perform actuator test item No. AF "EDU Relay"</li> </ul> |
|        | Requirements   |               | Same as battery voltage.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 10.   |
| NO     |  | Go to step 6. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between fuse and relay   |
|        | Maintenance item                                       |                 | Check circuit between fuse No. B35 and relay connector terminal No. 5                      |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 8 | Inspection items                                       |                 | Inspection of harness between relay and electronic drive unit  |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 4 and electronic drive unit connector terminal No. 13 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.               |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of electronic drive unit relay, go to step 9   |
| NO     |  | Modify harness. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and ground  |
|        | Maintenance item                                       |                 | Check circuit between following electronic drive unit connector <ul style="list-style-type: none"> <li>Electronic drive unit ground: terminal No. 14 - chassis ground</li> <li>Sensor shield ground (U): terminal No. 5 - 14</li> <li>Sensor shield ground (V): terminal No. 6 - 14</li> <li>Sensor shield ground (W): terminal No. 7 - 14</li> <li>Sensor ground: terminal No. 4 - 14</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 10.  |
| NO     |  | Modify harness. |   |

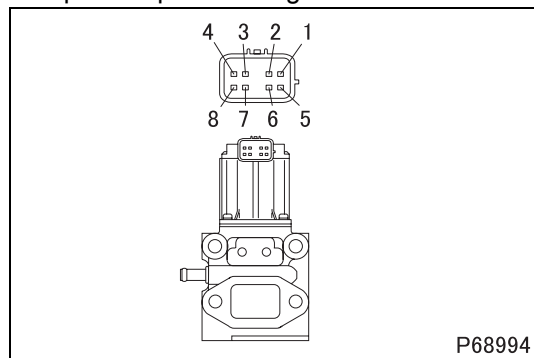
# TROUBLESHOOTING

|         |  |                      |   |
|---------|--|----------------------|---|
| Step 10 | Inspection items                                       |                      | Inspection of electronic drive unit connector (motor)   |
|         | Maintenance item                                       |                      | Measure value of resistance between following connector terminals. <ul style="list-style-type: none"> <li>Between U - V: 10 - 11</li> <li>Between U - W: 10 - 12</li> <li>Between V - W: 11 - 12</li> </ul> |
|         | Inspection condition                                   |                      | —   |
|         | Requirements   |                      | 2.1 ± 0.3 Ω   |
|         | Inspection result (Is the judging standard satisfied?) |                      | YES<br>Go to step 13.   |
|         |  | NO<br>Go to step 11. |   |

|         |  |                       |  |
|---------|--|-----------------------|--|
| Step 11 | Inspection items                                       |                       | Inspection of harness between electronic drive unit and exhaust gas recirculation valve (motor)  |
|         | Maintenance item                                       |                       | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>Motor (U): electronic drive unit connector terminal No. 10 - exhaust gas recirculation valve connector terminal No. 8</li> <li>Motor (V): electronic drive unit connector terminal No. 11 - exhaust gas recirculation valve connector terminal No. 7</li> <li>Motor (W): electronic drive unit connector terminal No. 12 - exhaust gas recirculation valve connector terminal No. 6</li> </ul> |
|         | Inspection condition                                   |                       | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |                       | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) |                       | YES<br>Go to step 12.  |
|         |  | NO<br>Modify harness. |  |

|         |  |  |  |
|---------|--|--|--|
| Step 12 | Inspection items                                       |  | Inspection of exhaust gas recirculation valve unit (motor)   |
|         | Maintenance item                                       |  | Measure value of resistance between following exhaust gas recirculation valve connector terminals <ul style="list-style-type: none"> <li>Between U - V: 8 - 7</li> <li>Between U - W: 8 - 6</li> <li>Between V - W: 7 - 6</li> </ul> |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Keep exhaust gas recirculation valve installed on vehicle.</li> <li>Remove harness connector, and measure exhaust gas recirculation valve side.</li> </ul>                                    |
|         | Requirements   |  | 2.1 ± 0.3 Ω  |
|         | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 13.  |
|         |  | NO<br>Replacement of exhaust gas recirculation valve |  |

<Step 12 inspection diagram>



|         |  |                |   |
|---------|--|----------------|---|
| Step 13 | Inspection items                                       |                | Inspection of exhaust gas recirculation valve connector (position sensor: power supply)   |
|         | Maintenance item                                       |                | Measure value of voltage between connector terminal No. 1 (+) and 5 (-).  |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|         | Requirements   |                | 10 V  |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 14.  |
| NO      |  | Go to step 15. |   |

|         |  |                |  |
|---------|--|----------------|--|
| Step 14 | Inspection items                                       |                | Inspection of electronic drive unit connector (position sensor: signal)  |
|         | Maintenance item                                       |                | Measure value of voltage between following electronic drive unit connector terminals <ul style="list-style-type: none"> <li>• U signal output: terminal 1 (+) - 4 (-)</li> <li>• V signal output: terminal 2 (+) - 4 (-)</li> <li>• W signal output: terminal 3 (+) - 4 (-)</li> </ul> |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> <li>• Perform actuator test item No. A0 "EGR 1"</li> </ul>   |
|         | Requirements   |                | 8 to 11 V  |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 16.   |
| NO      |  | Go to step 15. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 15 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and exhaust gas recirculation valve (position sensor)  |
|         | Maintenance item                                       |                 | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Sensor (power supply): electronic drive unit connector terminal No. 8 - exhaust gas recirculation valve connector terminal No. 1</li> <li>• Sensor (U): electronic drive unit connector terminal No. 1 - exhaust gas recirculation valve connector terminal No. 4</li> <li>• Sensor (V): electronic drive unit connector terminal No. 2 - exhaust gas recirculation valve connector terminal No. 3</li> <li>• Sensor (W): electronic drive unit connector terminal No. 3 - exhaust gas recirculation valve connector terminal No. 2</li> <li>• Sensor (ground): electronic drive unit connector terminal No. 4 - exhaust gas recirculation valve connector terminal No. 5</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of exhaust gas recirculation valve, go to step 16  |
| NO      |  | Modify harness. |  |

# TROUBLESHOOTING

|         | Inspection items                                       | Inspection by control data   |                                      |
|---------|--|--|--------------------------------------|
| Step 16 | Maintenance item                                       | Perform actuator test item No. A0 "EGR 1"<br><b>NOTE</b> <ul style="list-style-type: none"> <li>As initial operational check of exhaust gas recirculation valve is automatically effected immediately after starter switch is ON, perform actuator test by Multi-Use Tester after that check (approximately 5 seconds later).</li> </ul> |                                      |
|         | Inspection condition                                   | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Transmission: neutral</li> <li>Diagnosis switch: OFF (fuse removed)</li> </ul>   |                                      |
|         | Requirements   | Actual position matches with target value set by Multi-Use Tester. (check with service data "51: Actual EGR Valve Position")   |                                      |
|         | Inspection result (Is the judging standard satisfied?) | YES  | Go to transient fault (See Gr00.).   |
|         |  | NO   | Replacement of electronic drive unit |

**[Fault code]**

Diagnosis code: P0404/Flash code: 67

**[Monitor]**

Failure of exhaust gas recirculation valve

**[Fault (outline)]**

- Circuit
- Open valve

**[Diagnosis check]**

- Exhaust gas recirculation electronic drive unit monitors for sticking of built-in motor and opening status by exhaust gas recirculation valve for circuit fault and sends fault information to engine electronic control unit through controller area network communication.
- Exhaust gas recirculation electronic drive unit determines valve condition according to valve position detected through position sensor.

**[Code generation condition]**

Diagnosis code is generated under either of the following conditions. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

- Motor circuit remains stuck as detected by electronic drive unit for 2 seconds.
- Actual valve position remains 10 mm {0.39 in.} or more apart from target full opening position for 10 seconds.

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

- Controller area network communication in order

**[Control effected by electronic control unit during fault]**

Electronic control unit differs in the way of control by the diagnosis check item.

<Power supply circuit>

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).
- Related fault check is stopped.

<Valve opening>

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Post injection is inhibited.
- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).
- Related fault check is stopped.

**[Probable cause of trouble]**

- Failure of exhaust gas recirculation system

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0403 "EGR1 (Actuator Circuit)"</li> <li>• P0404 "EGR System"</li> <li>• P0605 "ECU System (Hardware)"</li> <li>• P0607 "ECU System"</li> <li>• P0685 "EDU Relay (Open)"</li> <li>• P0686 "EDU Relay (Low)"</li> <li>• P0687 "EDU Relay (High)"</li> <li>• P1632 "CAN (EGR1 Time out)"</li> <li>• U0001 "High Speed CAN Communication"</li> <li>• U0002 "High Speed CAN Communication"</li> </ul> |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> </ul>   |
|        | Requirements   |  | Codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Inspect diagnosis code that is occurring.   |
| NO     |  | Replacement of exhaust gas recirculation valve |   |

**[Fault code]**

Diagnosis code: P0409/Flash code: 67

**[Monitor]**

Failure of exhaust gas recirculation valve

**[Fault (outline)]**

- Low signal range check
- High signal range check

**[Diagnosis check]**

- Exhaust gas recirculation electronic drive unit monitors exhaust gas recirculation valve internal circuit for fault (through throttle position sensor).

**[Code generation condition]**

- Position sensor output voltage remains 0 V (low pulse) or 8 to 11 V (high pulse) for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

- Controller area network communication in order

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).
- Related fault check is stopped.

**[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic drive unit and exhaust gas recirculation valve (position sensor)
- Malfunction of each connector
- Malfunction of electronic drive unit

**[Recoverability]**

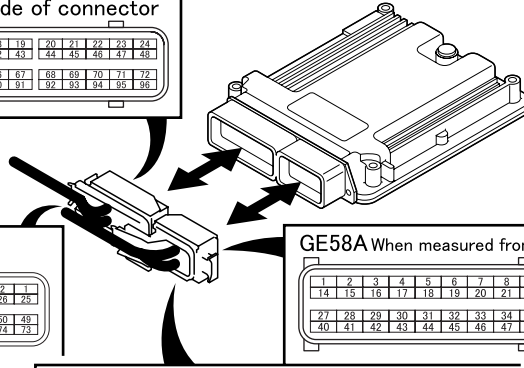
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |



GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

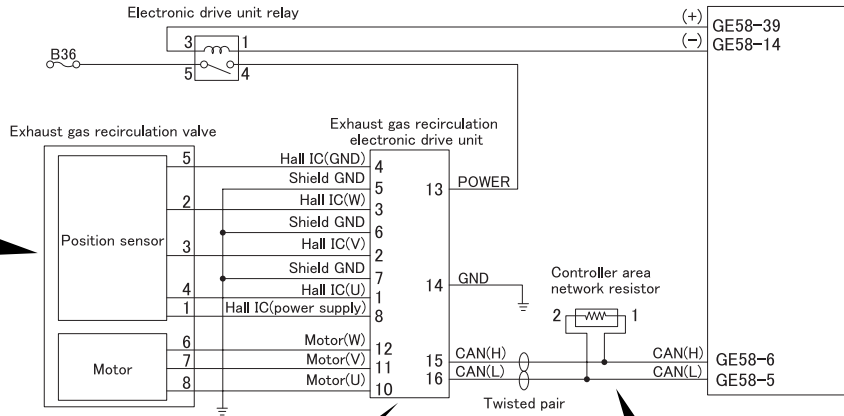
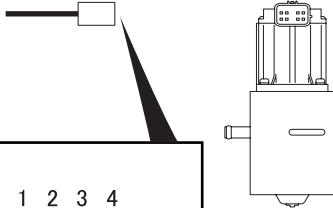
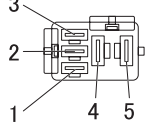
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |    |

Mounting area of high-current fuse box relay



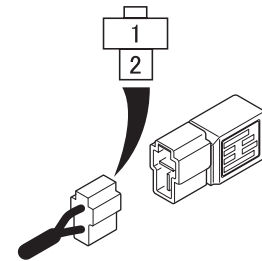
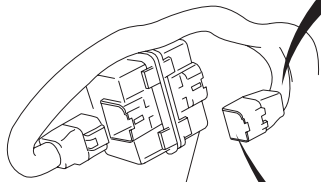
When measured from back side of connector

|    |    |    |    |
|----|----|----|----|
| 4  | 3  | 2  | 1  |
| 8  | 7  | 6  | 5  |
| 12 | 11 | 10 | 9  |
| 16 | 15 | 14 | 13 |

|    |    |    |    |
|----|----|----|----|
| 1  | 2  | 3  | 4  |
| 5  | 6  | 7  | 8  |
| 9  | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |

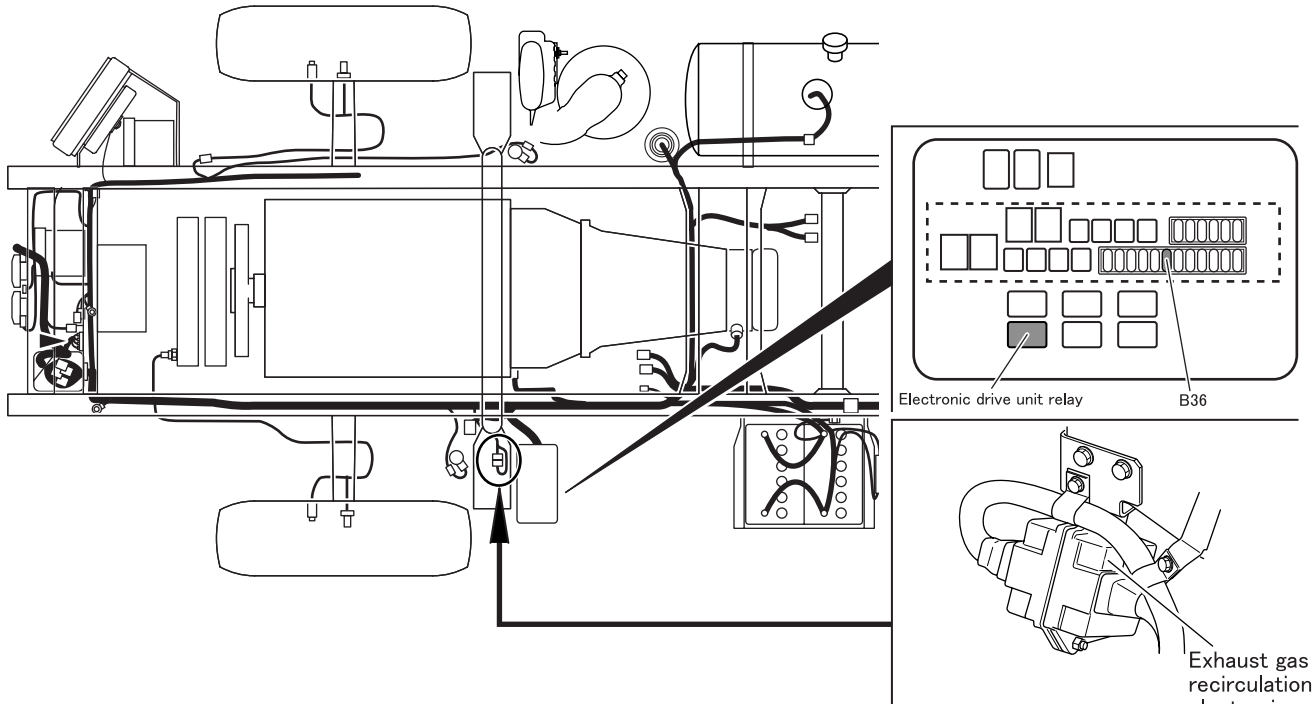
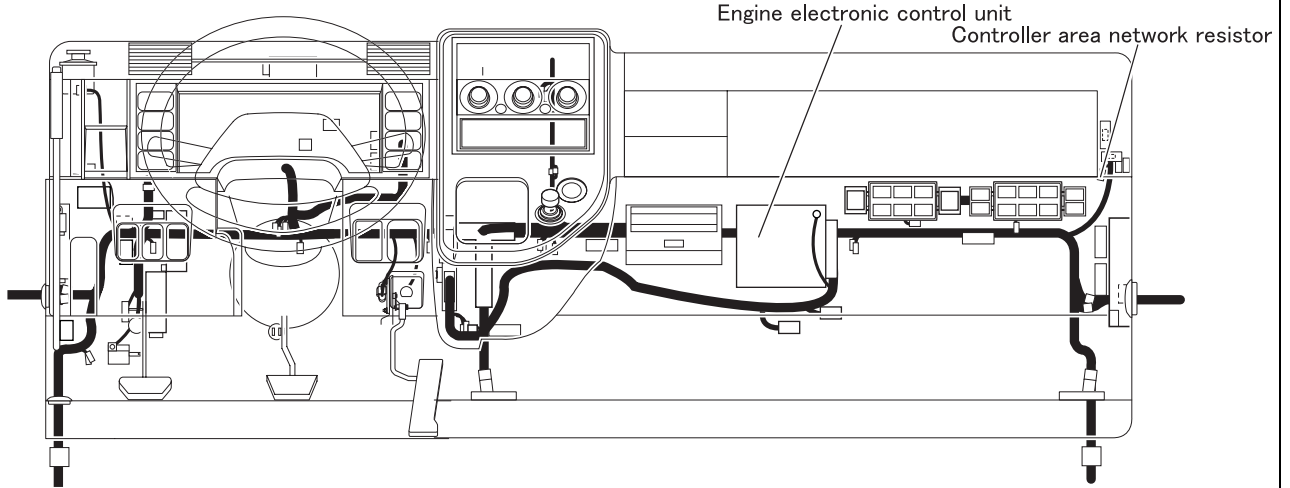
When measured from connection side of connector

Exhaust gas recirculation electronic drive unit

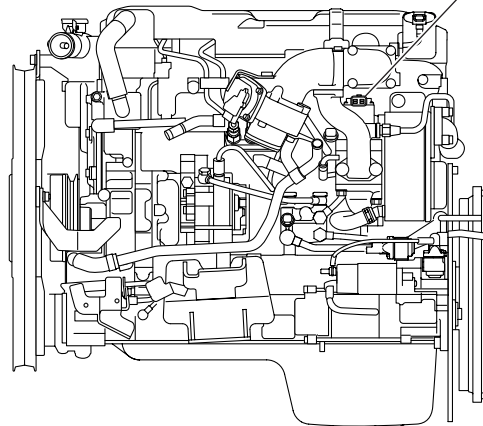




[Parts Identification and Location]



Left side view of engine Exhaust gas recirculation valve



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. A0 "EGR 1"<br><b>NOTE</b><br><ul style="list-style-type: none"> <li>As initial operational check of exhaust gas recirculation valve is automatically effected immediately after starter switch is ON, perform actuator test by Multi-Use Tester after that check (approximately 5 seconds later).</li> </ul> |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Transmission: neutral</li> <li>Diagnosis switch: OFF (fuse removed)</li> </ul>  |
|        | Requirements   |               | Actual position matches with target value set by Multi-Use Tester. (check with service data "51: Actual EGR Valve Position")  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic drive unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of exhaust gas recirculation valve connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

|        |  |     |  |
|--------|--|-----|--|
| Step 4 | Inspection items                                       |     | Inspection by control data   |
|        | Maintenance item                                       |     | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>P0685 "EDU Relay (Open)"</li> <li>P0686 "EDU Relay (Low)"</li> <li>P0687 "EDU Relay (High)"</li> </ul> |
|        | Inspection condition                                   |     | Starter switch: ON   |
|        | Requirements   |     | No codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) | YES | Go to step 5.  |
|        |  | NO  | Inspect diagnosis code that is occurring.  |

|        |  |               |  |
|--------|--|---------------|--|
| Step 5 | Inspection items                                       |               | Inspection of electronic drive unit connector (power supply)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector terminal No. 13 (+) and 14 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Remove connector and measure from harness side.</li> <li>Starter switch: ON</li> <li>Perform actuator test item No. AF "EDU Relay"</li> </ul> |
|        | Requirements   |               | Same as battery voltage.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 10.   |
| NO     |  | Go to step 6. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | -   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between fuse and relay   |
|        | Maintenance item                                       |                 | Check circuit between fuse No. B35 and relay connector terminal No. 5                      |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 8 | Inspection items                                       |                 | Inspection of harness between relay and electronic drive unit  |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 4 and electronic drive unit connector terminal No. 13 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.               |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of electronic drive unit relay, go to step 9   |
| NO     |  | Modify harness. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and ground  |
|        | Maintenance item                                       |                 | Check circuit between following electronic drive unit connector <ul style="list-style-type: none"> <li>Electronic drive unit ground: terminal No. 14 - chassis ground</li> <li>Sensor shield ground (U): terminal No. 5 - 14</li> <li>Sensor shield ground (V): terminal No. 6 - 14</li> <li>Sensor shield ground (W): terminal No. 7 - 14</li> <li>Sensor ground: terminal No. 4 - 14</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 10.  |
| NO     |  | Modify harness. |   |

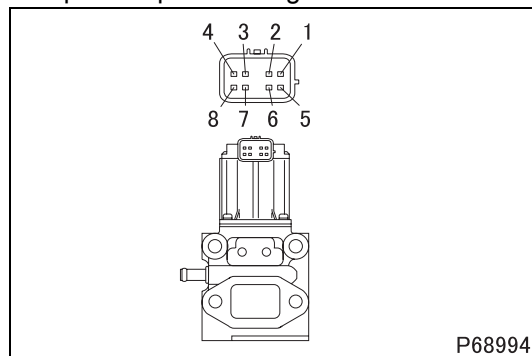
# TROUBLESHOOTING

|         |  |                      |  |
|---------|--|----------------------|--|
| Step 10 | Inspection items                                       |                      | Inspection of electronic drive unit connector (motor)  |
|         | Maintenance item                                       |                      | Measure value of resistance between following connector terminals.<br><ul style="list-style-type: none"> <li>Between U - V: 10 - 11</li> <li>Between U - W: 10 - 12</li> <li>Between V - W: 11 - 12</li> </ul> |
|         | Inspection condition                                   |                      | —  |
|         | Requirements   |                      | 2.1 ± 0.3 Ω  |
|         | Inspection result (Is the judging standard satisfied?) |                      | YES<br>Go to step 13.  |
|         |  | NO<br>Go to step 11. |  |

|         |  |                       |   |
|---------|--|-----------------------|---|
| Step 11 | Inspection items                                       |                       | Inspection of harness between electronic drive unit and exhaust gas recirculation valve (motor)   |
|         | Maintenance item                                       |                       | Check circuit between following connector terminals.<br><ul style="list-style-type: none"> <li>Motor (U): electronic drive unit connector terminal No. 10 - exhaust gas recirculation valve connector terminal No. 8</li> <li>Motor (V): electronic drive unit connector terminal No. 11 - exhaust gas recirculation valve connector terminal No. 7</li> <li>Motor (W): electronic drive unit connector terminal No. 12 - exhaust gas recirculation valve connector terminal No. 6</li> </ul> |
|         | Inspection condition                                   |                       | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                       | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) |                       | YES<br>Go to step 12.   |
|         |  | NO<br>Modify harness. |   |

|         |  |  |   |
|---------|--|--|---|
| Step 12 | Inspection items                                       |  | Inspection of exhaust gas recirculation valve unit (motor)  |
|         | Maintenance item                                       |  | Measure value of resistance between following exhaust gas recirculation valve connector terminals<br><ul style="list-style-type: none"> <li>Between U - V: 8 - 7</li> <li>Between U - W: 8 - 6</li> <li>Between V - W: 7 - 6</li> </ul> |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Keep exhaust gas recirculation valve installed on vehicle.</li> <li>Remove harness connector, and measure exhaust gas recirculation valve side.</li> </ul>                                       |
|         | Requirements   |  | 2.1 ± 0.3 Ω   |
|         | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 13.   |
|         |  | NO<br>Replacement of exhaust gas recirculation valve |   |

<Step 12 inspection diagram>



|         |  |                |   |
|---------|--|----------------|---|
| Step 13 | Inspection items                                       |                | Inspection of exhaust gas recirculation valve connector (position sensor: power supply)   |
|         | Maintenance item                                       |                | Measure value of voltage between connector terminal No. 1 (+) and 5 (-).  |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|         | Requirements   |                | 10 V  |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 14.  |
| NO      |  | Go to step 15. |   |

|         |  |                |  |
|---------|--|----------------|--|
| Step 14 | Inspection items                                       |                | Inspection of electronic drive unit connector (position sensor: signal)  |
|         | Maintenance item                                       |                | Measure value of voltage between following electronic drive unit connector terminals <ul style="list-style-type: none"> <li>• U signal output: terminal 1 (+) - 4 (-)</li> <li>• V signal output: terminal 2 (+) - 4 (-)</li> <li>• W signal output: terminal 3 (+) - 4 (-)</li> </ul> |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> <li>• Perform Multi-Use Tester actuator test item No. A0 "EGR 1"</li> </ul>  |
|         | Requirements   |                | 8 to 11 V  |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 16.   |
| NO      |  | Go to step 15. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 15 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and exhaust gas recirculation valve (position sensor)  |
|         | Maintenance item                                       |                 | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Sensor (power supply): electronic drive unit connector terminal No. 8 - exhaust gas recirculation valve connector terminal No. 1</li> <li>• Sensor (U): electronic drive unit connector terminal No. 1 - exhaust gas recirculation valve connector terminal No. 4</li> <li>• Sensor (V): electronic drive unit connector terminal No. 2 - exhaust gas recirculation valve connector terminal No. 3</li> <li>• Sensor (W): electronic drive unit connector terminal No. 3 - exhaust gas recirculation valve connector terminal No. 2</li> <li>• Sensor (ground): electronic drive unit connector terminal No. 4 - exhaust gas recirculation valve connector terminal No. 5</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of exhaust gas recirculation valve, go to step 16.   |
| NO      |  | Modify harness. |  |

# TROUBLESHOOTING

|         | Inspection items                                       | Inspection by control data   |                                      |
|---------|--|--|--------------------------------------|
| Step 16 | Maintenance item                                       | Perform actuator test item No. A0 "EGR 1"<br><b>NOTE</b><br>• <b>As initial operational check of exhaust gas recirculation valve is automatically effected immediately after starter switch is ON, perform actuator test by Multi-Use Tester after that check (approximately 5 seconds later).</b> |                                      |
|         | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Transmission: neutral</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul>   |                                      |
|         | Requirements   | Actual position matches with target value set by Multi-Use Tester. (check with service data "51: Actual EGR Valve Position")   |                                      |
|         | Inspection result (Is the judging standard satisfied?) | YES  | Go to transient fault (See Gr00.).   |
|         |  | NO   | Replacement of electronic drive unit |

**[Fault code]**

Diagnosis code: P0426/Flash code: 42

**[Monitor]**

Characteristic abnormality of catalytic temperature sensor

**[Fault (outline)]**

Gain and offset drift

**[Diagnosis check]**

- Catalytic temperature sensor and DPF temperature sensor 1 are compared.

**[Code generation condition]**

- Difference in temperature output remains excessively high (over 150°C {302°F}) or low (below -150°C {-238°F}) for 10 seconds <Relative check> and 20 seconds <Separate check>. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Diesel particulate filter regeneration control: not effected
- Engine running time: more than 300 seconds
- Time after diesel particulate filter regeneration control was effected: more than 1500 seconds
- Engine speed and load: logical output is 1
- Time till above conditions were met: more than 30 seconds
- Catalytic temperature sensor: normal in output signal
- DPF temperature sensor 1: normal in output signal
- DPF temperature sensor 2: normal in output signal
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

- Malfunction of catalytic temperature sensor

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0427/Flash code: 42

## **[Monitor]**

Failure of catalytic temperature sensor

## **[Fault (outline)]**

Low signal range check

## **[Diagnosis check]**

- Catalytic temperature sensor output voltage is monitored.

## **[Code generation condition]**

- Catalytic temperature sensor output voltage remains below 0.36 V for 3 seconds. (sensor temperature: 1000°C {1832°F} or more)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).
- Related fault check is stopped.

## **[Probable cause of trouble]**

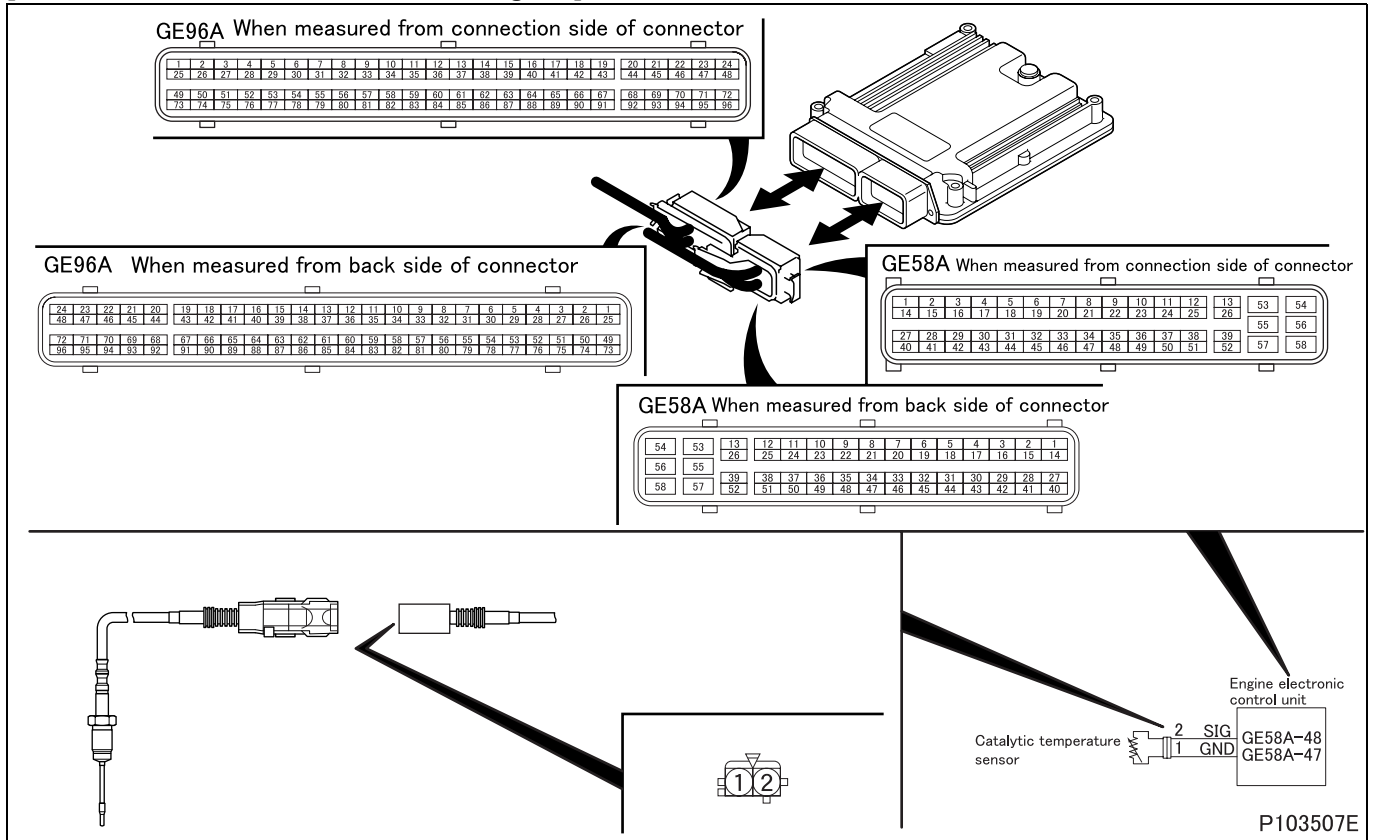
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit
- Malfunction of catalytic temperature sensor

## **[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

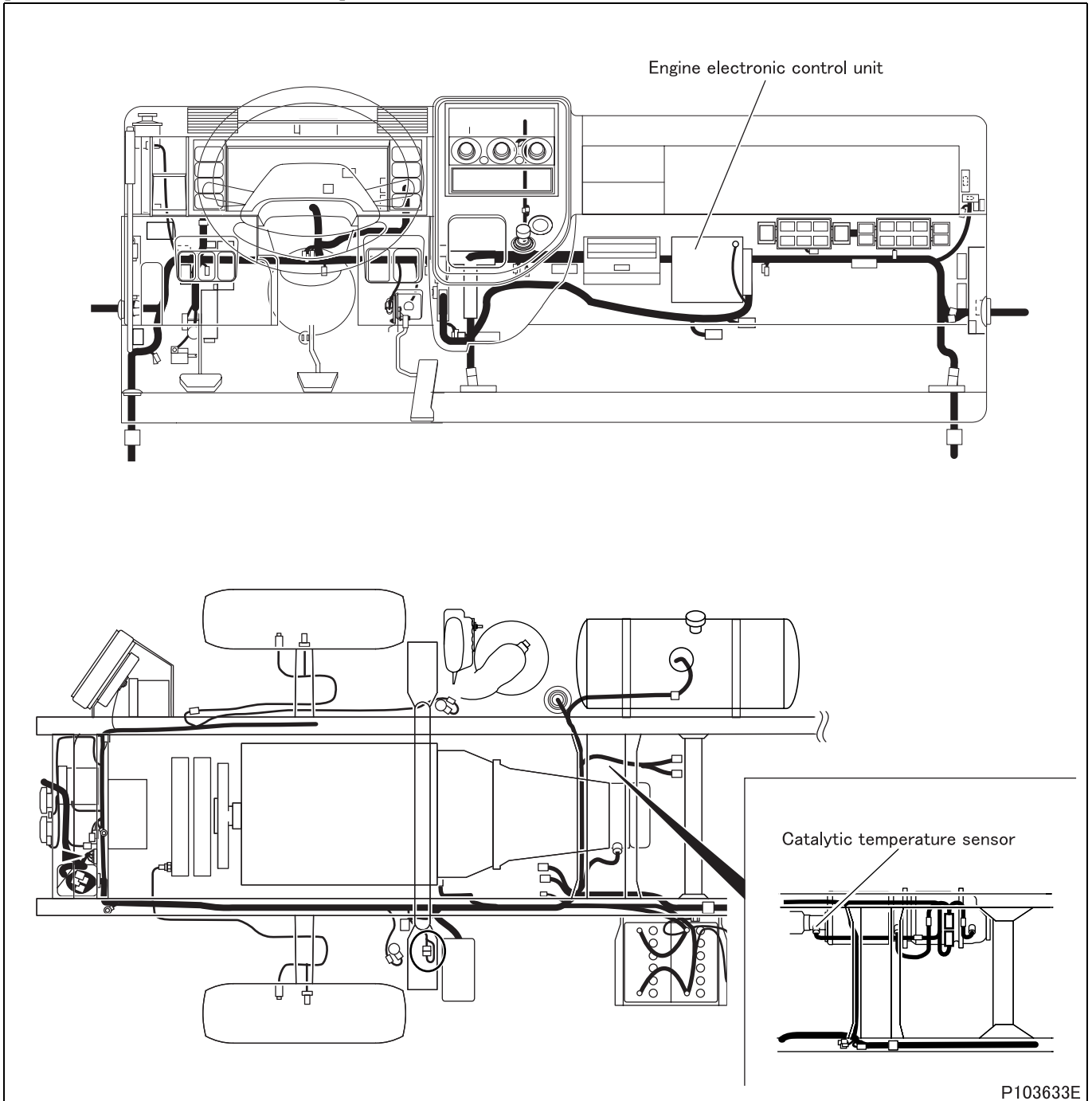


[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "OXI CAT Temperature".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 24 "OXI CAT Temperature" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | While engine is warmed up   |
|        | Requirements   |               | Temperature gradually increases.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE58A) terminal No. 48 and 47.   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Starter switch: OFF</li> <li>• Disconnect electronic control unit from harness and measure at vehicle-side connector half.</li> </ul>  |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• 20°C {68°F} : 241.8 kΩ</li> <li>• 50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>• 100°C {212°F} : 33.56<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>• 150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>• 200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

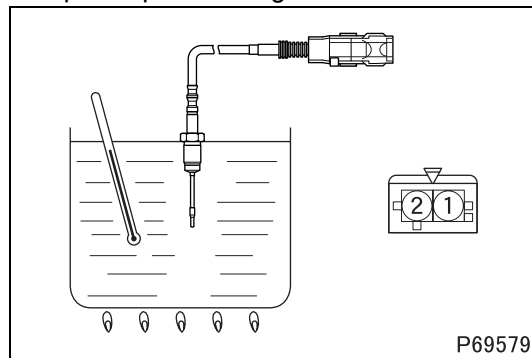
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of sensor connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

|        |  |                       |   |
|--------|--|-----------------------|---|
| Step 5 | Inspection items                                       |                       | Inspection of catalytic temperature sensor unit   |
|        | Maintenance item                                       |                       | Measure value of resistance between connector terminal No. 1 and 2.   |
|        | Inspection condition                                   |                       | <ul style="list-style-type: none"> <li>Put catalytic temperature sensor in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |
|        | Requirements   |                       | <ul style="list-style-type: none"> <li>20°C {68°F} : 241.8 kΩ</li> <li>50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>100°C {212°F} : 33.56<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                   | Go to step 6.   |
| NO     |  | Replacement of sensor |   |

<Step 5 inspection diagram>



|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE96A) terminal No. 39 and sensor connector terminal No. 2. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|        | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE96A) terminal No. 68 and sensor connector terminal No. 1. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>Measure item "OXI CAT Temperature".</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>Measure item No. 24 "OXI CAT Temperature" of Service Data.</li> </ul> |
|        | Inspection condition                                   |  | While engine is warmed up   |
|        | Requirements   |  | Temperature gradually increases.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

**[Fault code]**

Diagnosis code: P0428/Flash code: 42

**[Monitor]**

Failure of catalytic temperature sensor

**[Fault (outline)]**

High signal range check

**[Diagnosis check]**

- Catalytic temperature sensor output voltage is monitored.

**[Code generation condition]**

- Catalytic temperature sensor output voltage remains over 4.93 V for 30 seconds when engine speed is set at 1000 to 5000 rpm. (sensor temperature: 40°C {118°F} or less) (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine speed: 1000 to 5000 rpm
- Fuel injection quantity: 30 to 200 mg/cyc
- Water temperature: above -7°C {19°F}

**[Control effected by electronic control unit during fault]**

- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).
- Related fault check is stopped.

**[Probable cause of trouble]**

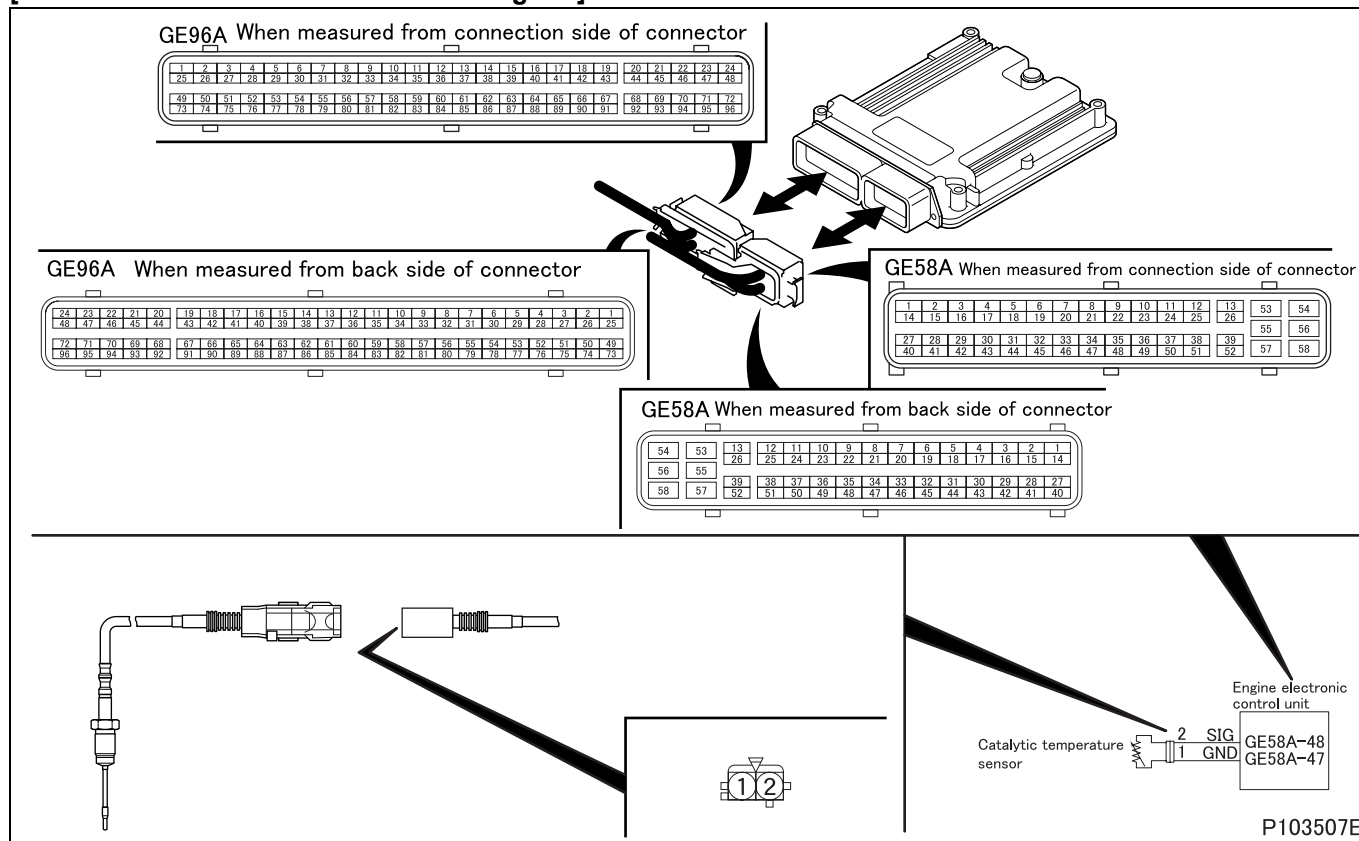
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit
- Malfunction of catalytic temperature sensor

**[Recoverability]**

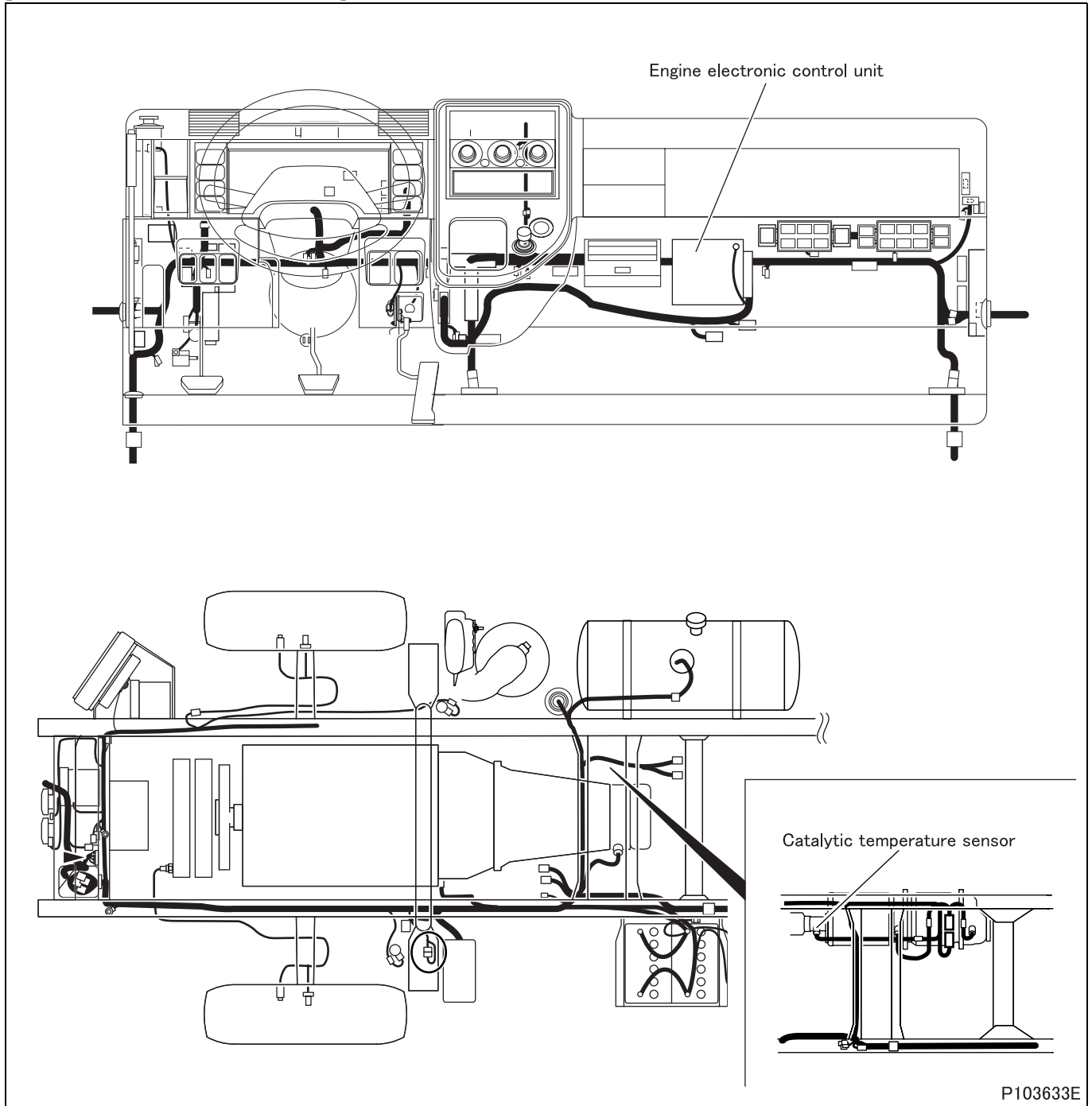
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item "OXI CAT Temperature".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item No. 24 "OXI CAT Temperature" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | While engine is warmed up   |
|        | Requirements   |               | Temperature gradually increases.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE58A) terminal No. 48 and 47.   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Starter switch: OFF</li> <li>Disconnect electronic control unit from harness and measure at vehicle-side connector half.</li> </ul>  |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>20°C {68°F} : 241.8 kΩ</li> <li>50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>100°C {212°F} : 33.56<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

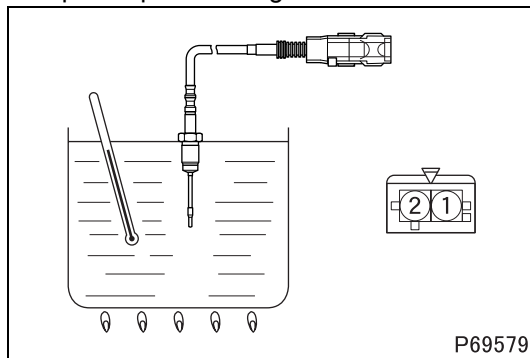
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of sensor connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |



|        |  |                       |   |
|--------|--|-----------------------|---|
| Step 5 | Inspection items                                       |                       | Inspection of catalytic temperature sensor unit   |
|        | Maintenance item                                       |                       | Measure value of resistance between connector terminal No. 1 and 2.   |
|        | Inspection condition                                   |                       | <ul style="list-style-type: none"> <li>Put catalytic temperature sensor in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |
|        | Requirements   |                       | <ul style="list-style-type: none"> <li>20°C {68°F} : 241.8 kΩ</li> <li>50°C {122°F} : 106.2 <math>\begin{smallmatrix} +74.3 \\ -41.8 \end{smallmatrix}</math> kΩ</li> <li>100°C {212°F} : 33.56 <math>\begin{smallmatrix} +17.60 \\ -10.60 \end{smallmatrix}</math> kΩ</li> <li>150°C {302°F} : 13.90 <math>\begin{smallmatrix} +5.36 \\ -3.60 \end{smallmatrix}</math> kΩ</li> <li>200°C {392°F} : 6.896 <math>\begin{smallmatrix} +2.064 \\ -1.252 \end{smallmatrix}</math> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                   | Go to step 6.   |
| NO     |  | Replacement of sensor |   |

<Step 5 inspection diagram>



|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE96A) terminal No. 39 and sensor connector terminal No. 2. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|        | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE96A) terminal No. 68 and sensor connector terminal No. 1. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | <p>&lt;General Scanning Tool used&gt;</p> <ul style="list-style-type: none"> <li>Measure item "OXI CAT Temperature".</li> </ul> <p>&lt;Multi-Use Tester used&gt;</p> <ul style="list-style-type: none"> <li>Measure item No. 24 "OXI CAT Temperature" of Service Data.</li> </ul> |
|        | Inspection condition                                   |  | While engine is warmed up   |
|        | Requirements   |  | Temperature gradually increases.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

# TROUBLESHOOTING

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## [Fault code]

Diagnosis code: P0470/Flash code: 92

## [Monitor]

Characteristic abnormality of DPF absolute pressure sensor and DPF pressure sensor (DIFF)

## [Fault (outline)]

- Gain drift
- Offset and gain drift

## [Diagnosis check]

- Relative check of DPF absolute pressure sensor and DPF pressure sensor (DIFF)

## [Code generation condition]

- Difference in output between DPF pressure sensor (DIFF) and DPF absolute pressure sensor remains more than specified for 10 seconds. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## [Diagnosis check timing]

- Fault diagnosis is performed only once during the driving cycle.

## [Diagnostic requirement]

- Engine speed: 500 to 3000 rpm
- Air flow rate: 80 to 650 kg/hr
- Water temperature: 0 to 110°C {32 to 230°F}
- Fuel injection quantity: 15 to 100 mg/cyc
- Atmospheric pressure: 900 to 1050 mbar {13.05 to 15.22 psi}
- Intake air temperature: 0 to 60°C {32 to 140°F}
- Air flow sensor: in order
- Atmospheric pressure sensor: in order
- Water temperature sensor: in order
- Intake air temperature sensor: in order
- DPF absolute pressure sensor: normal in output signal
- DPF pressure sensor (DIFF): normal in output signal
- DPF temperature sensor 1: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Relative check of DPF absolute pressure sensor

## [Control effected by electronic control unit during fault]

- Related fault check is stopped.

## [Probable cause of trouble]

- Malfunction of DPF absolute pressure sensor and DPF pressure sensor (DIFF)

## [Recoverability]

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

**[Fault code]**

Diagnosis code: P0471/Flash code: 98

**[Monitor]**

Failure of DPF absolute pressure sensor

**[Fault (outline)]**

Offset drift

**[Diagnosis check]**

- Difference in pressure output between atmospheric pressure sensor and DPF absolute pressure sensor is monitored for deviation from specified value after engine start.

**[Code generation condition]**

- Difference in pressure output between atmospheric pressure sensor and DPF absolute pressure sensor exceeds 10 kPa {1.5 psi, 0.1 kgf/cm<sup>2</sup>} after engine run.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine status: after-run

**[Control effected by electronic control unit during fault]**

- Pressure before ceramic diesel particulate filter is fixed at backup value.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.
- Malfunction of DPF absolute pressure sensor

**[Probable cause of trouble]**

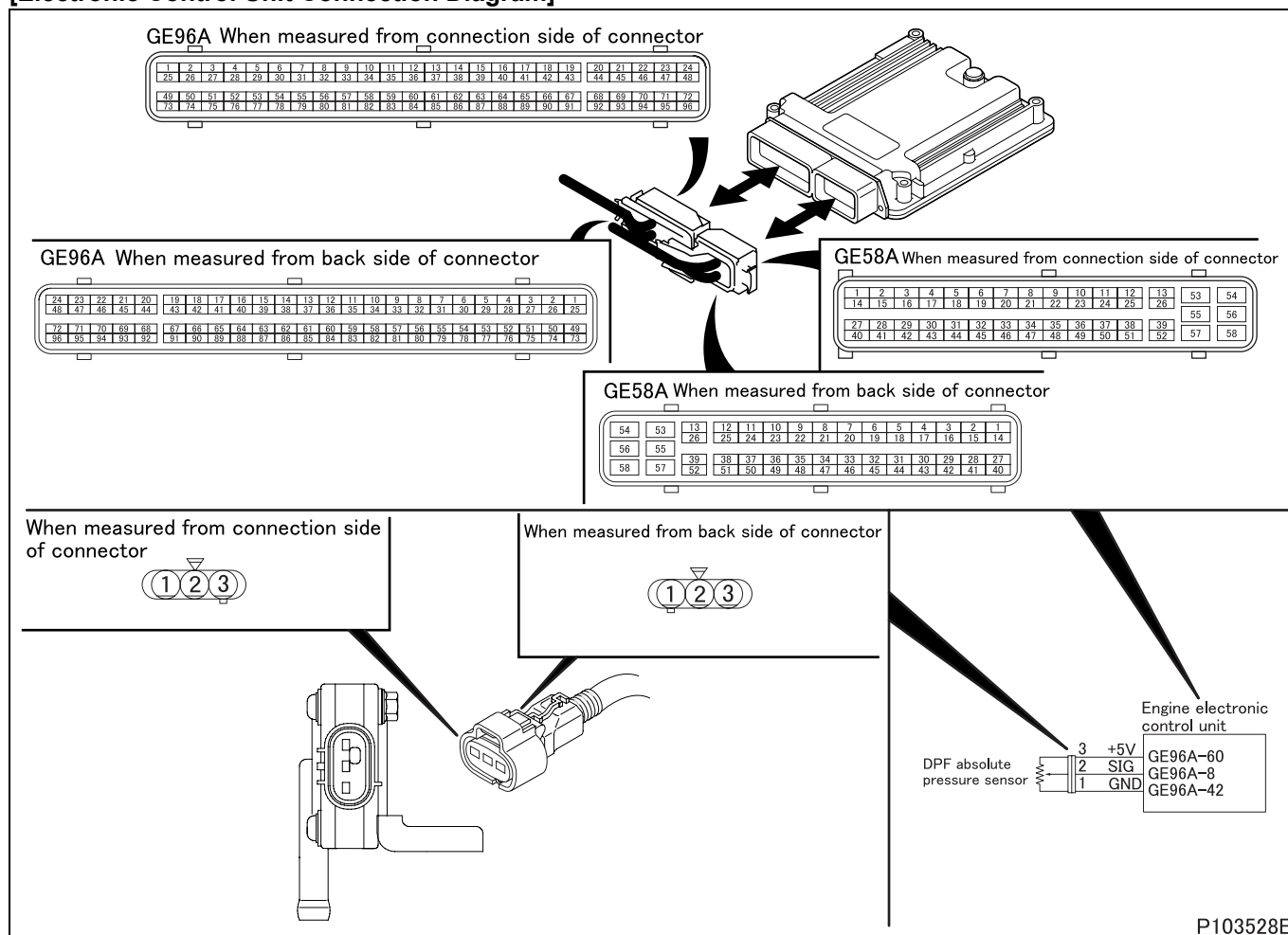
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- High pressure side (upper stream) pressure hose slipped off or clogged
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

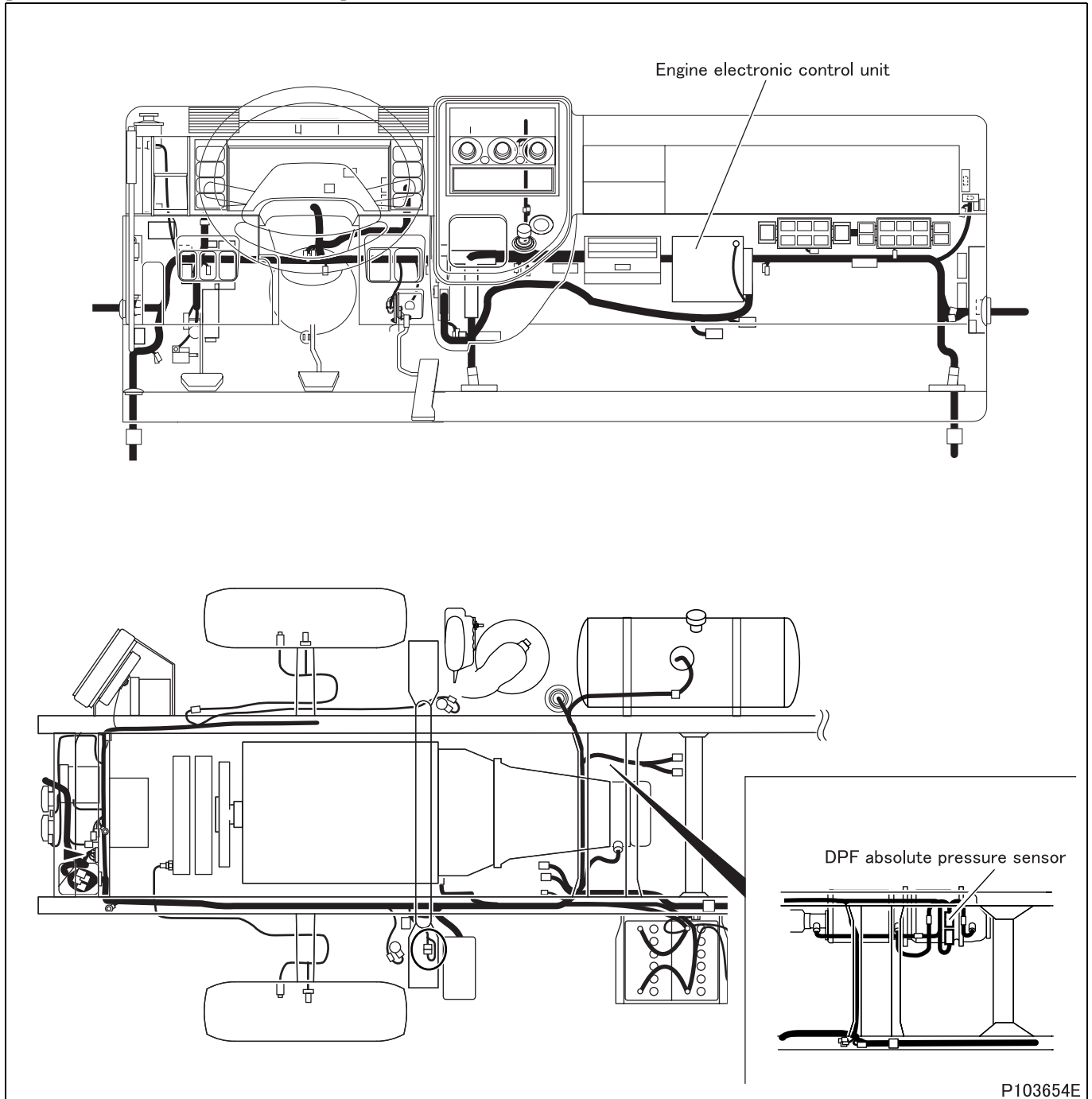
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P103528E

[Parts Identification and Location]



P103654E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>• P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>• P2455 "DPF Diff SNSR (High) &amp; MFF"</li> </ul> |
|        | Inspection condition                                   |  | Starter switch: ON<br>Engine: stopped  |
|        | Requirements   |  | Codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection by control data                                  |
|        | Maintenance item                                       |  | Measure item No. 23 "Exhaust gas pressure" of Service Data. |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | 0 kPa {0 psi, 0 kgf/cm <sup>2</sup> }                       |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |  |
|--------|--|--|--|
| Step 3 | Inspection items                                       |  | Inspection by electronic control unit connector (signal)   |
|        | Maintenance item                                       |  | Measure value of voltage between connector (GE96A) terminal No. 8 (+) and 42 (–).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |  | 1.875 to 4.5 V   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |  |
|--------|--|--|--|
| Step 4 | Inspection items                                       |  | Inspection by electronic control unit connector (power supply)   |
|        | Maintenance item                                       |  | Measure value of voltage between connector (GE96A) terminal No. 60 (+) and 42 (–).   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |  | 5 V  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

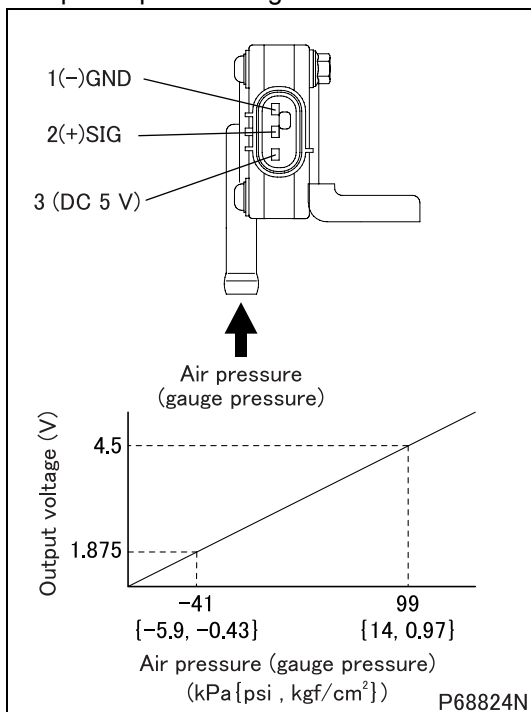
|        |  |  |  |
|--------|--|--|--|
| Step 5 | Inspection items                                       |  | Inspection by electronic control unit connector (ground)   |
|        | Maintenance item                                       |  | Measure value of voltage between connector (GE96A) terminal No. 42 (+) and (GE58A) terminal No. 53 (–).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |  | 0 V  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |   |                |
|--------|--|---|----------------|
| Step 6 | Inspection items                                       | Inspection of electronic control unit connector   |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 13. |
| NO     |  | Modify connector.   |                |

|        |  |   |               |
|--------|--|---|---------------|
| Step 7 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8. |
| NO     |  | Modify connector.   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 8 | Inspection items                                       | Inspection of DPF absolute pressure sensor unit  |               |
|        | Maintenance item                                       | Measure value of voltage between terminal No. 2 (+) and 1 (-).   |               |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Apply voltage DC 5 V across connector terminals No. 3 (+) and 1 (-).</li> <li>• Gradually increase applied air pressure.</li> </ul>   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• <math>41 \pm 3.2</math> kPa {<math>5.9 \pm 0.5</math> psi, <math>0.43 \pm 0.03</math> kgf/cm<sup>2</sup>}: 1.875 V</li> <li>• <math>99 \pm 3.2</math> kPa {<math>14 \pm 0.5</math> psi, <math>1.0 \pm 0.03</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 9. |
| NO     |  | Replacement of sensor  |               |

<Step 8 inspection diagram>



# TROUBLESHOOTING

|        |  |  |  |
|--------|--|--|--|
| Step 9 | Inspection items                                       |  | Inspection by sensor connector   |
|        | Maintenance item                                       |  | Measure value of voltage between terminal No. 3 (+) and 1 (-)  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Starter switch: ON</li> <li>Engine: stopped</li> <li>Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |  | 5 V  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES  |
| NO     |  |  | Go to step 10.   |

|         |  |  |  |
|---------|--|--|--|
| Step 10 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|         | Maintenance item                                       |  | Check circuit between electronic control unit connector (GE96A) terminal No. 60 and sensor connector terminal No. 3. |
|         | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |  | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) |  | YES  |
| NO      |  |  | Modify harness.  |

|         |  |  |  |
|---------|--|--|--|
| Step 11 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |  | Check circuit between electronic control unit connector (GE96A) terminal No. 42 and sensor connector terminal No. 1. |
|         | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |  | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) |  | YES  |
| NO      |  |  | Modify harness.  |

|         |  |  |   |
|---------|--|--|---|
| Step 12 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (signal)   |
|         | Maintenance item                                       |  | Check circuit between electronic control unit connector (GE96A) terminal No. 8 and sensor connector terminal No. 2. |
|         | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                          |
|         | Requirements   |  | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) |  | YES   |
| NO      |  |  | Modify harness.   |

|         |  |  |   |
|---------|--|--|---|
| Step 13 | Inspection items                                       |  | Inspection by control data                                  |
|         | Maintenance item                                       |  | Measure item No. 23 "Exhaust gas pressure" of Service Data. |
|         | Inspection condition                                   |  | -   |
|         | Requirements   |  | 0 kPa {0 psi, 0 kgf/cm <sup>2</sup> }                       |
|         | Inspection result (Is the judging standard satisfied?) |  | YES   |
| NO      |  |  | Replacement of electronic control unit                      |



**[Fault code]**

Diagnosis code: P0472/Flash code: 98

**[Monitor]**

Failure of DPF absolute pressure sensor

**[Fault (outline)]**

Low signal range check

**[Diagnosis check]**

- Output voltage of DPF absolute pressure sensor is monitored.

**[Code generation condition]**

- Output voltage of DPF absolute pressure sensor remains below 0.2 V for 1 second. (sensor pressure: -29 kPa {-4.2 psi, -0.3 kgf/cm<sup>2</sup>} or less)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

-

**[Control effected by electronic control unit during fault]**

- Pressure before ceramic diesel particulate filter is fixed at backup value.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

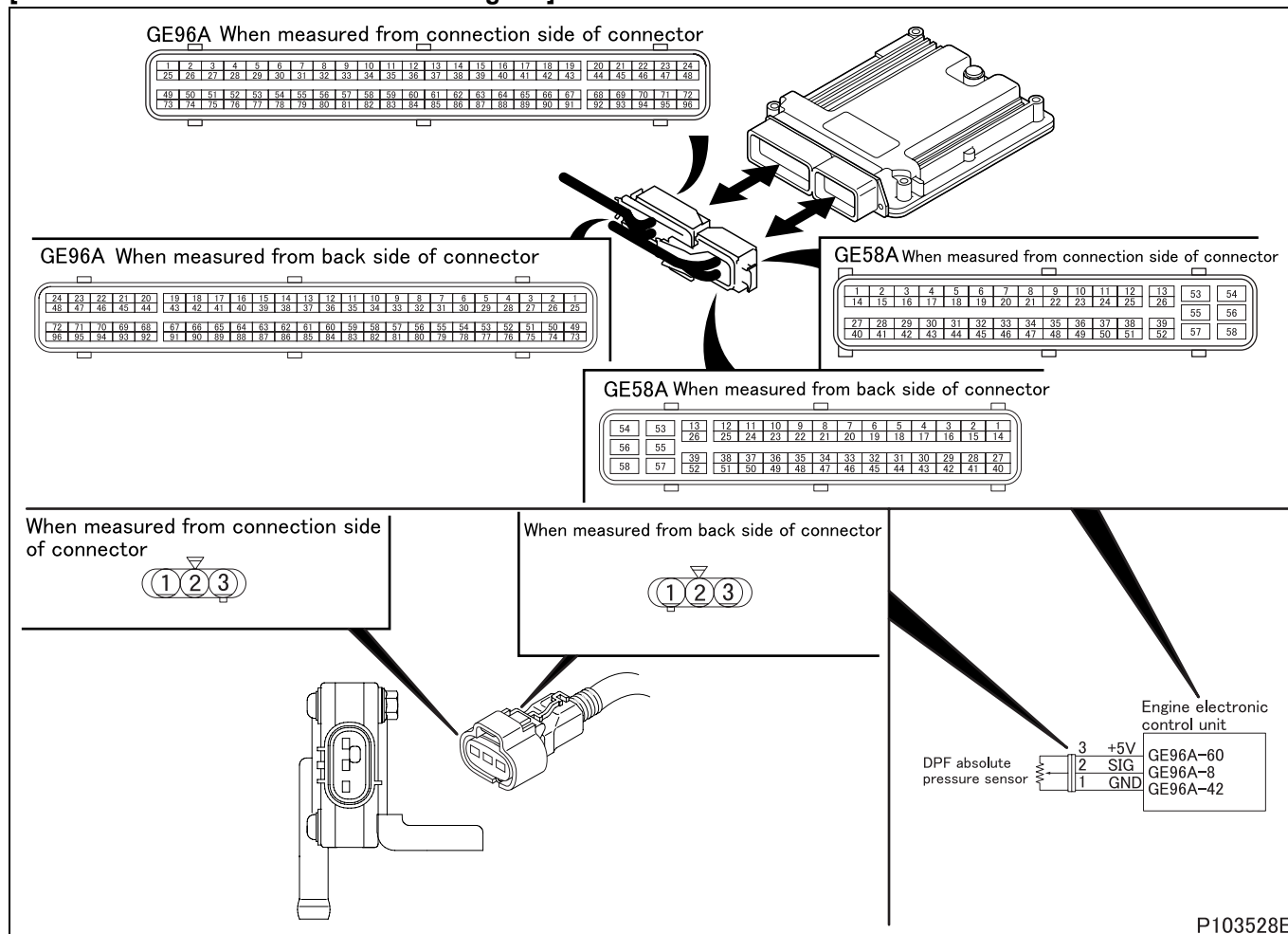
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

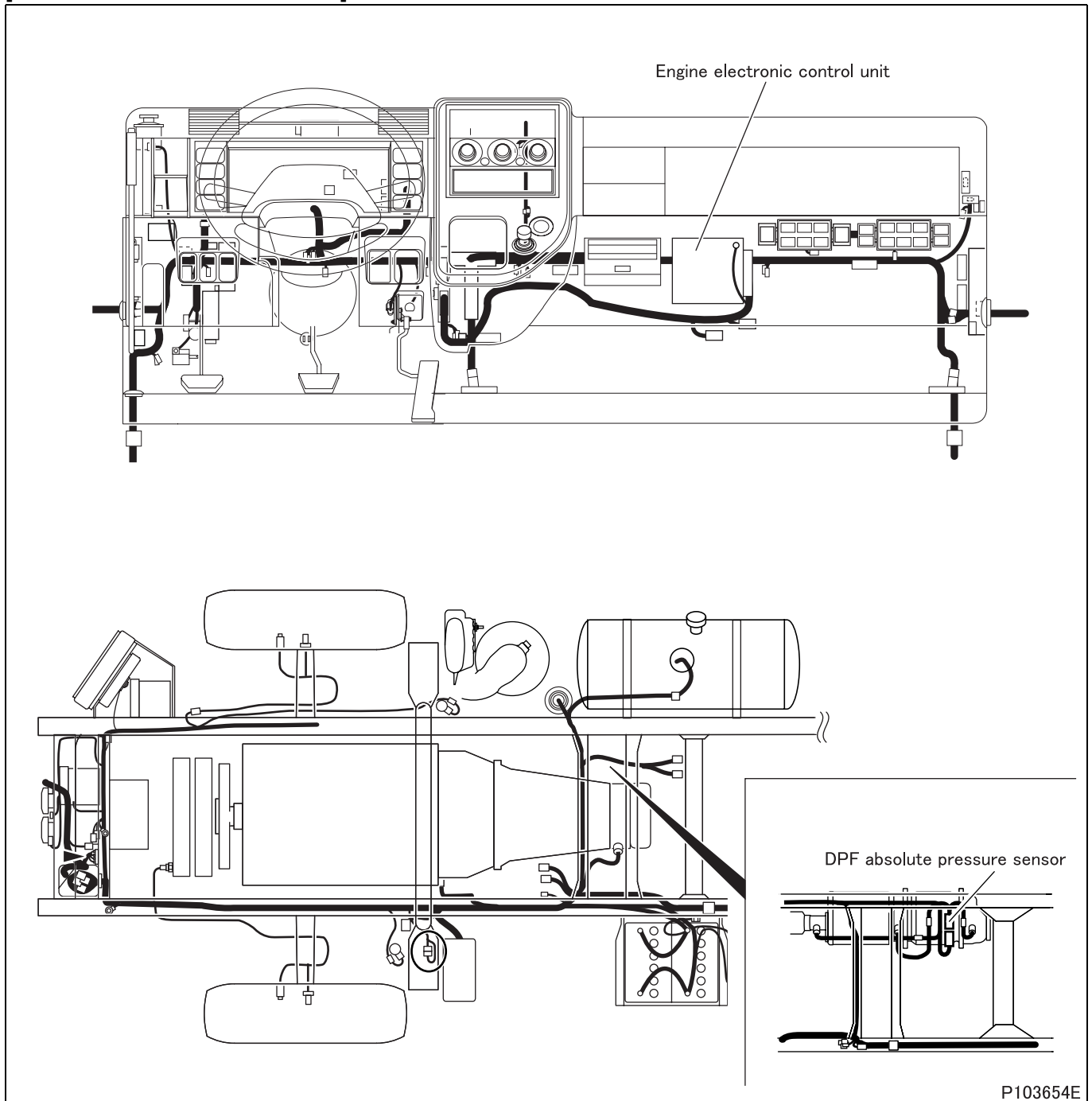
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P103528E

[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>• P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>• P2455 "DPF Diff SNSR (High) &amp; MFF"</li> </ul> |
|        | Inspection condition                                   |  | Starter switch: ON<br>Engine: stopped  |
|        | Requirements   |  | Codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection by control data                                  |
|        | Maintenance item                                       |  | Measure item No. 23 "Exhaust gas pressure" of Service Data. |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | 0 kPa {0 psi, 0 kgf/cm <sup>2</sup> }                       |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |  |
|--------|--|--|--|
| Step 3 | Inspection items                                       |  | Inspection by electronic control unit connector (signal)   |
|        | Maintenance item                                       |  | Measure value of voltage between connector (GE96A) terminal No. 8 (+) and 42 (–).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |  | 1.875 to 4.5 V   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |  |
|--------|--|--|--|
| Step 4 | Inspection items                                       |  | Inspection by electronic control unit connector (power supply)   |
|        | Maintenance item                                       |  | Measure value of voltage between connector (GE96A) terminal No. 60 (+) and 42 (–).   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |  | 5 V  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

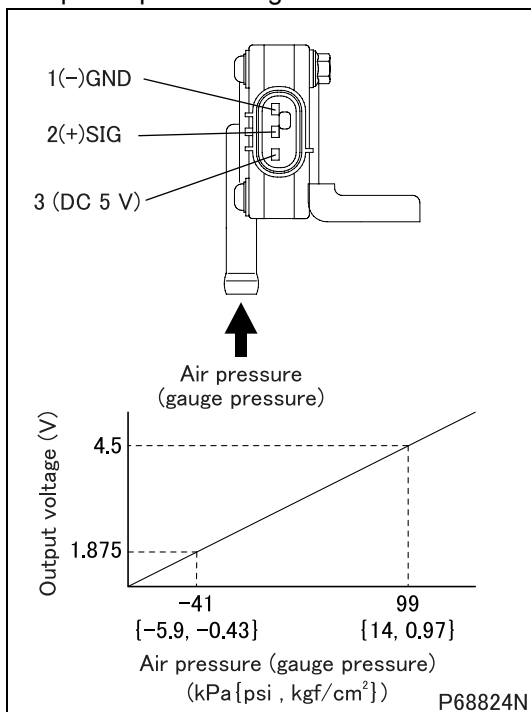
|        |  |  |  |
|--------|--|--|--|
| Step 5 | Inspection items                                       |  | Inspection by electronic control unit connector (ground)   |
|        | Maintenance item                                       |  | Measure value of voltage between connector (GE96A) terminal No. 42 (+) and (GE58A) terminal No. 53 (–).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |  | 0 V  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |   |                |
|--------|--|---|----------------|
| Step 6 | Inspection items                                       | Inspection of electronic control unit connector   |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 13. |
| NO     |  | Modify connector.   |                |

|        |  |   |               |
|--------|--|---|---------------|
| Step 7 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8. |
| NO     |  | Modify connector.   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 8 | Inspection items                                       | Inspection of DPF absolute pressure sensor unit  |               |
|        | Maintenance item                                       | Measure value of voltage between terminal No. 2 (+) and 1 (-).   |               |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Apply voltage DC 5 V across connector terminals No. 3 (+) and 1 (-).</li> <li>• Gradually increase applied air pressure.</li> </ul>   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• <math>41 \pm 3.2</math> kPa {<math>5.9 \pm 0.5</math> psi, <math>0.43 \pm 0.03</math> kgf/cm<sup>2</sup>}: 1.875 V</li> <li>• <math>99 \pm 3.2</math> kPa {<math>14 \pm 0.5</math> psi, <math>1.0 \pm 0.03</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 9. |
| NO     |  | Replacement of sensor  |               |

<Step 8 inspection diagram>



# TROUBLESHOOTING

|        |  |  |  |     |                |    |
|--------|--|--|--|-----|----------------|----|
| Step 9 | Inspection items                                       |  | Inspection by sensor connector   |     |                |    |
|        | Maintenance item                                       |  | Measure value of voltage between terminal No. 3 (+) and 1 (-).   |     |                |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Starter switch: ON</li> <li>Engine: stopped</li> <li>Measure from back side of connector of harness with each device connected to harness.</li> </ul> |     |                |    |
|        | Requirements   |  | 5 V  |     |                |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 11.</td> </tr> <tr> <td>NO</td> <td>Go to step 10.</td> </tr> </table>   | YES | Go to step 11. | NO |
| YES    | Go to step 11.   |  |  |     |                |    |
| NO     | Go to step 10.   |  |  |     |                |    |

|         |  |  |   |     |                |    |
|---------|--|--|---|-----|----------------|----|
| Step 10 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (power supply)   |     |                |    |
|         | Maintenance item                                       |  | Check circuit between electronic control unit connector (GE96A) terminal No. 60 and sensor connector terminal No. 3.        |     |                |    |
|         | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                                  |     |                |    |
|         | Requirements   |  | There is continuity.  |     |                |    |
|         | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 13.</td> </tr> <tr> <td>NO</td> <td>Modify harness.</td> </tr> </table> | YES | Go to step 13. | NO |
| YES     | Go to step 13.   |  |   |     |                |    |
| NO      | Modify harness.  |  |   |     |                |    |

|         |  |  |   |     |                |    |
|---------|--|--|---|-----|----------------|----|
| Step 11 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (ground)   |     |                |    |
|         | Maintenance item                                       |  | Check circuit between electronic control unit connector (GE96A) terminal No. 42 and sensor connector terminal No. 1.        |     |                |    |
|         | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                                  |     |                |    |
|         | Requirements   |  | There is continuity.  |     |                |    |
|         | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 12.</td> </tr> <tr> <td>NO</td> <td>Modify harness.</td> </tr> </table> | YES | Go to step 12. | NO |
| YES     | Go to step 12.   |  |   |     |                |    |
| NO      | Modify harness.  |  |   |     |                |    |

|         |  |  |   |     |                |    |
|---------|--|--|---|-----|----------------|----|
| Step 12 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (signal)   |     |                |    |
|         | Maintenance item                                       |  | Check circuit between electronic control unit connector (GE96A) terminal No. 8 and sensor connector terminal No. 2.         |     |                |    |
|         | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                                  |     |                |    |
|         | Requirements   |  | There is continuity.  |     |                |    |
|         | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 13.</td> </tr> <tr> <td>NO</td> <td>Modify harness.</td> </tr> </table> | YES | Go to step 13. | NO |
| YES     | Go to step 13.   |  |   |     |                |    |
| NO      | Modify harness.  |  |   |     |                |    |

|         |  |  |  |     |                                    |    |
|---------|--|--|--|-----|------------------------------------|----|
| Step 13 | Inspection items                                       |  | Inspection by control data   |     |                                    |    |
|         | Maintenance item                                       |  | Measure item No. 23 "Exhaust gas pressure" of Service Data.  |     |                                    |    |
|         | Inspection condition                                   |  | -  |     |                                    |    |
|         | Requirements   |  | 0 kPa {0 psi, 0 kgf/cm <sup>2</sup> }  |     |                                    |    |
|         | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to transient fault (See Gr00.).</td> </tr> <tr> <td>NO</td> <td>Replacement of electronic control unit</td> </tr> </table> | YES | Go to transient fault (See Gr00.). | NO |
| YES     | Go to transient fault (See Gr00.).                     |  |  |     |                                    |    |
| NO      | Replacement of electronic control unit                 |  |  |     |                                    |    |

**[Fault code]**

Diagnosis code: P0473/Flash code: 98

**[Monitor]**

Failure of DPF absolute pressure sensor

**[Fault (outline)]**

High signal range check

**[Diagnosis check]**

- Output voltage of DPF absolute pressure sensor is monitored.

**[Code generation condition]**

- Output voltage of DPF absolute pressure sensor remains over 4.8 V for 1 second. (sensor pressure: 216 kPa {31 psi, 2.2 kgf/cm<sup>2</sup>} or more)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Pressure before ceramic diesel particulate filter is fixed at backup value.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

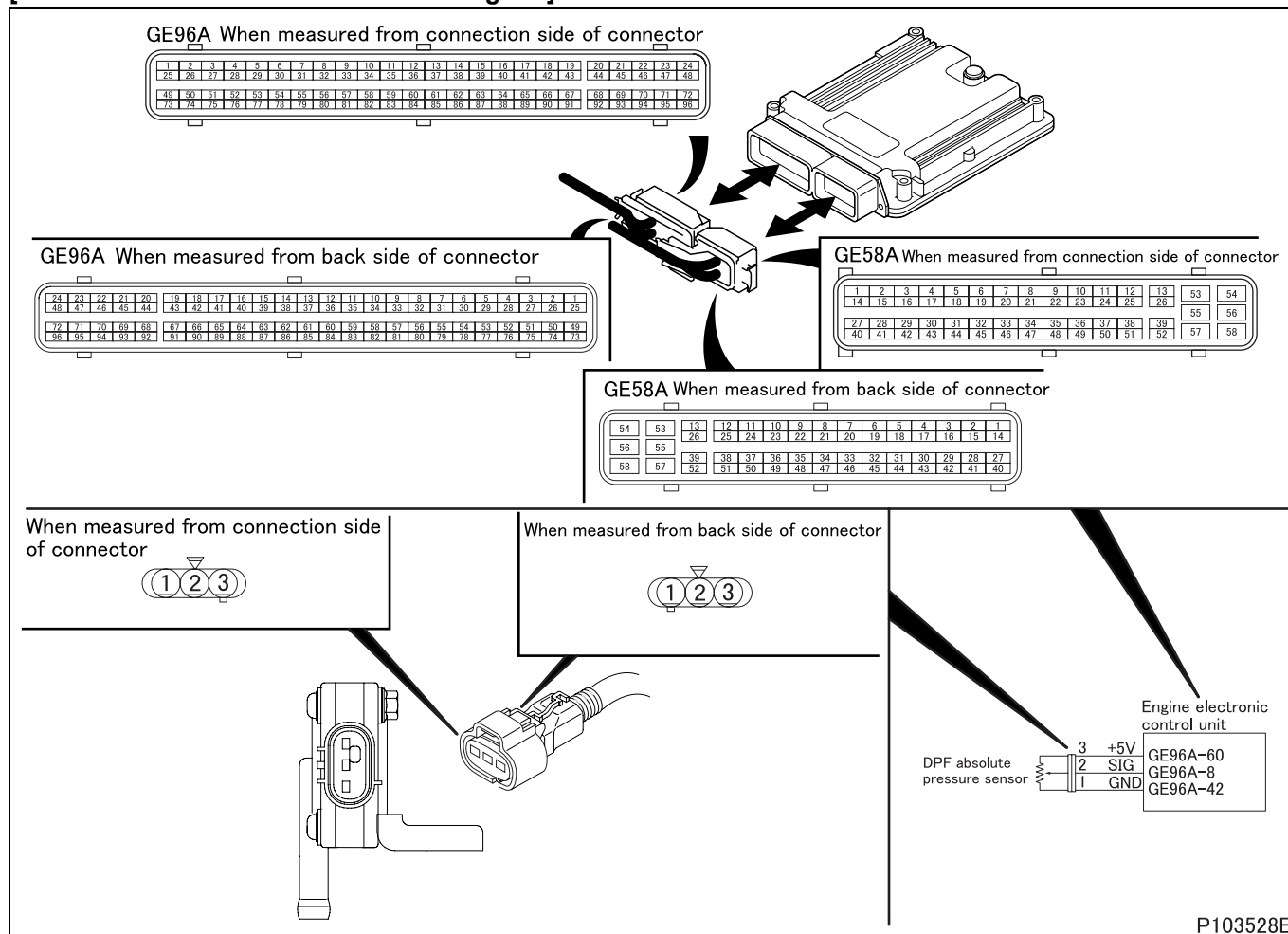
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

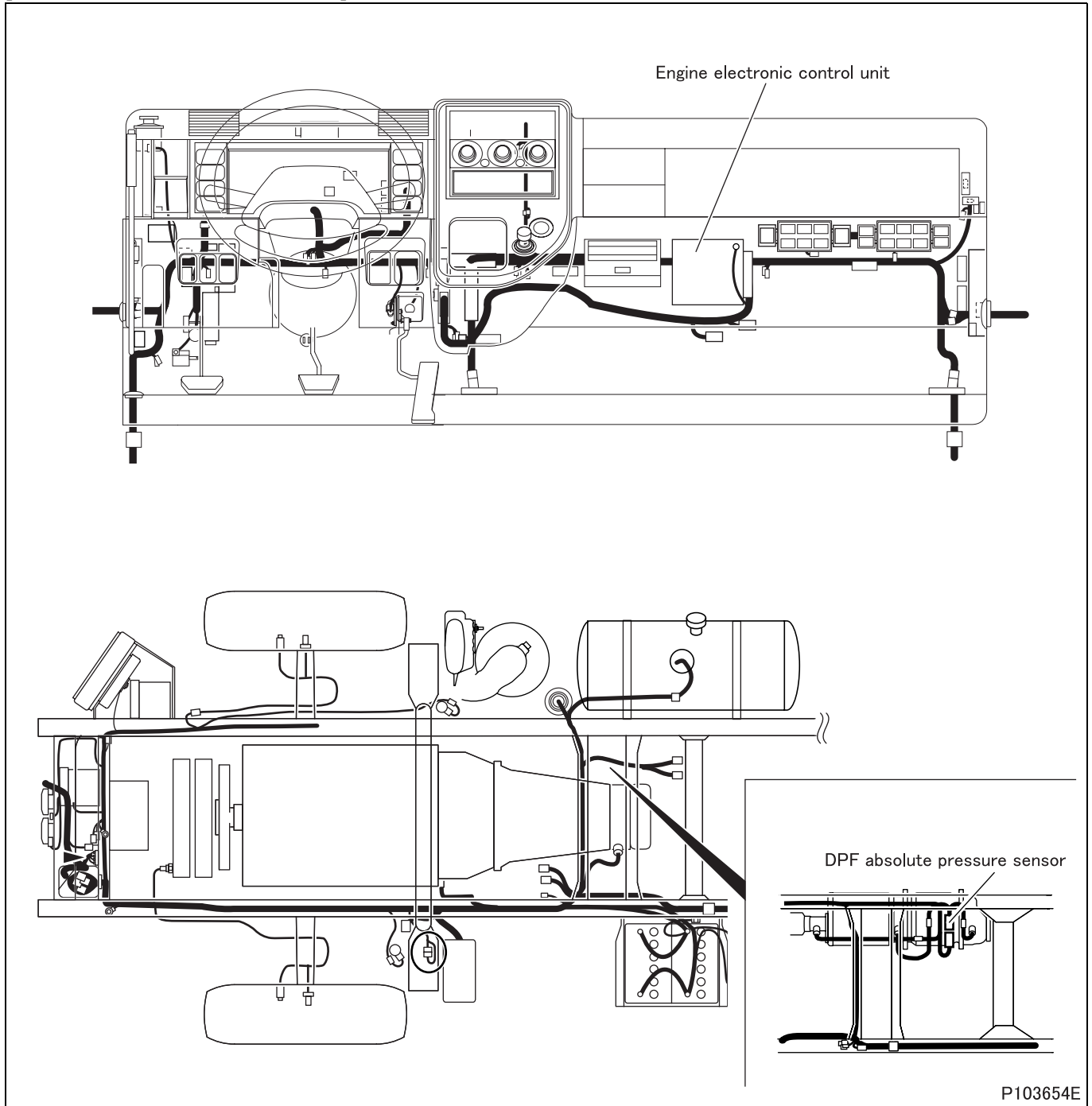
## [Electronic Control Unit Connection Diagram]



P103528E



[Parts Identification and Location]



P103654E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously.<br><ul style="list-style-type: none"> <li>• P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>• P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>• P2455 "DPF Diff SNSR (High) &amp; MFF"</li> </ul> |
|        | Inspection condition                                   |  | Starter switch: ON<br>Engine: stopped   |
|        | Requirements   |  | Codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection by control data                                  |
|        | Maintenance item                                       |  | Measure item No. 23 "Exhaust gas pressure" of Service Data. |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | 0 kPa {0 psi, 0 kgf/cm <sup>2</sup> }                       |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |  |
|--------|--|--|--|
| Step 3 | Inspection items                                       |  | Inspection by electronic control unit connector (signal)   |
|        | Maintenance item                                       |  | Measure value of voltage between connector (GE96A) terminal No. 8 (+) and 42 (–).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |  | 1.875 to 4.5 V   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |  |
|--------|--|--|--|
| Step 4 | Inspection items                                       |  | Inspection by electronic control unit connector (power supply)   |
|        | Maintenance item                                       |  | Measure value of voltage between connector (GE96A) terminal No. 60 (+) and 42 (–).   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |  | 5 V  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

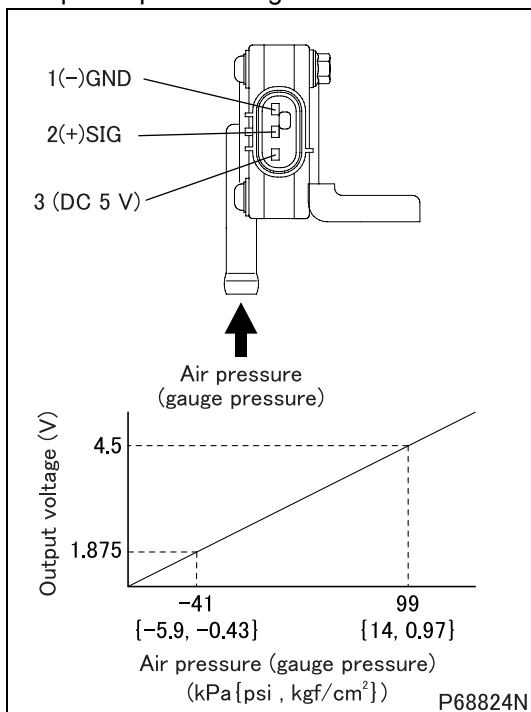
|        |  |  |  |
|--------|--|--|--|
| Step 5 | Inspection items                                       |  | Inspection by electronic control unit connector (ground)   |
|        | Maintenance item                                       |  | Measure value of voltage between connector (GE96A) terminal No. 42 (+) and (GE58A) terminal No. 53 (–).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |  | 0 V  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |   |                |
|--------|--|---|----------------|
| Step 6 | Inspection items                                       | Inspection of electronic control unit connector   |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 13. |
| NO     |  | Modify connector.   |                |

|        |  |   |               |
|--------|--|---|---------------|
| Step 7 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8. |
| NO     |  | Modify connector.   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 8 | Inspection items                                       | Inspection of DPF absolute pressure sensor unit  |               |
|        | Maintenance item                                       | Measure value of voltage between terminal No. 2 (+) and 1 (-).   |               |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across connector terminals No. 3 (+) and 1 (-).</li> <li>Gradually increase applied air pressure.</li> </ul>   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li><math>41 \pm 3.2</math> kPa {<math>5.9 \pm 0.5</math> psi, <math>0.43 \pm 0.03</math> kgf/cm<sup>2</sup>}: 1.875 V</li> <li><math>99 \pm 3.2</math> kPa {<math>14 \pm 0.5</math> psi, <math>1.0 \pm 0.03</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 9. |
| NO     |  | Replacement of sensor  |               |

<Step 8 inspection diagram>



# TROUBLESHOOTING

|        |  |  |  |
|--------|--|--|--|
| Step 9 | Inspection items                                       |  | Inspection by sensor connector   |
|        | Maintenance item                                       |  | Measure value of voltage between terminal No. 3 (+) and 1 (-).   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> </ul> |
|        | Requirements   |  | 5 V  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES  |
| NO     |  |  | Go to step 10.   |

|         |  |  |  |
|---------|--|--|--|
| Step 10 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|         | Maintenance item                                       |  | Check circuit between electronic control unit connector (GE96A) terminal No. 60 and sensor connector terminal No. 3. |
|         | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |  | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) |  | YES  |
| NO      |  |  | Modify harness.  |

|         |  |  |  |
|---------|--|--|--|
| Step 11 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |  | Check circuit between electronic control unit connector (GE96A) terminal No. 42 and sensor connector terminal No. 1. |
|         | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |  | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) |  | YES  |
| NO      |  |  | Modify harness.  |

|         |  |  |   |
|---------|--|--|---|
| Step 12 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (signal)   |
|         | Maintenance item                                       |  | Check circuit between electronic control unit connector (GE96A) terminal No. 8 and sensor connector terminal No. 2. |
|         | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                          |
|         | Requirements   |  | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) |  | YES   |
| NO      |  |  | Modify harness.   |

|         |  |  |   |
|---------|--|--|---|
| Step 13 | Inspection items                                       |  | Inspection by control data                                  |
|         | Maintenance item                                       |  | Measure item No. 23 "Exhaust gas pressure" of Service Data. |
|         | Inspection condition                                   |  | —   |
|         | Requirements   |  | 0 kPa {0 psi, 0 kgf/cm <sup>2</sup> }                       |
|         | Inspection result (Is the judging standard satisfied?) |  | YES   |
| NO      |  |  | Replacement of electronic control unit                      |

**[Fault code]**

Diagnosis code: P0476/Flash code: 93

**[Monitor]**

Failure of exhaust brake

**[Fault (outline)]**

Valve stuck open/shut

**[Diagnosis check]**

- Air flow sensor output (intake air flow rate) is monitored for valve being stuck in that state when commanded to open or close by engine electronic control unit.

**[Code generation condition]**

Diagnosis code is generated under either of the following conditions. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

<When valve is commanded to open>

- Intake air flow rate remains less than specified for 5 seconds.

<When valve is commanded to close>

- Intake air flow rate remains more than specified for 5 seconds.

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine operating mode: normal (engine in operation)
- Engine speed: 1250 to 2750 rpm
- Accelerator pedal position: less than 2%
- Water temperature: 64 to 100°C {147 to 212°F}
- Intake air temperature: -7 to 60°C {19 to 140°F}
- Boost pressure: more than 750 rpm
- Exhaust gas recirculation valve position: 0 to 2 mm {0 to 0.079 in.}
- Air flow sensor: in order
- Accelerator pedal position sensor: in order
- Exhaust gas recirculation flow rate and exhaust gas recirculation valve operation: in order
- Exhaust gas recirculation valve position sensor: in order
- Battery voltage: in order
- Boost pressure sensor: in order
- Water temperature sensor: in order
- Exhaust shutter 2-way magnetic valve: in order
- Intake air temperature sensor: in order
- Sensor 5 V power supply: in order

**[Control effected by electronic control unit during fault]**

- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

- Short-circuit of harness between electronic control unit and exhaust shutter 2-way magnetic valve
- Malfunction of each connector
- Malfunction of exhaust shutter 2-way magnetic valve
- Malfunction of electronic control unit
- Malfunction of exhaust shutter unit

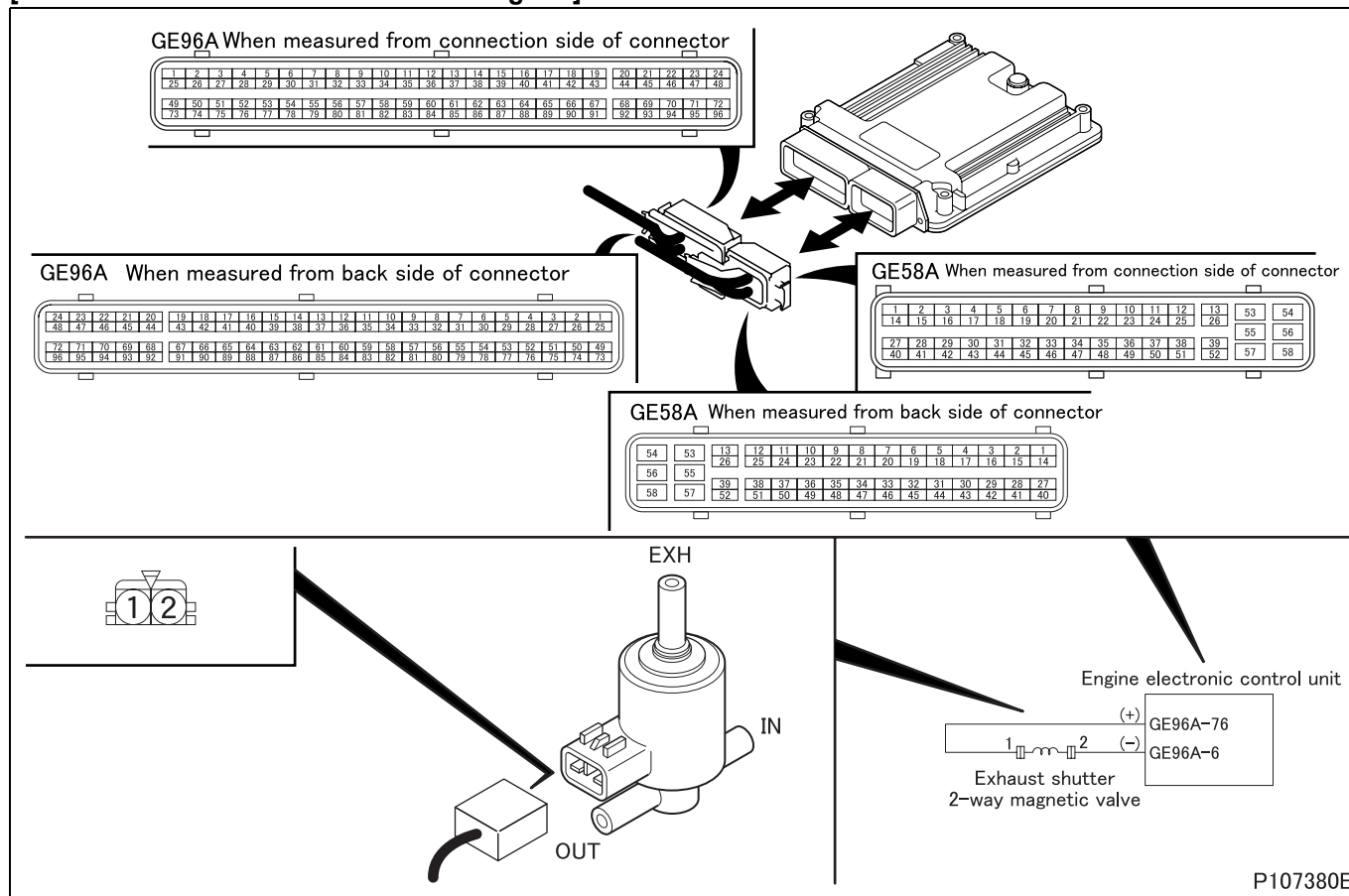
**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

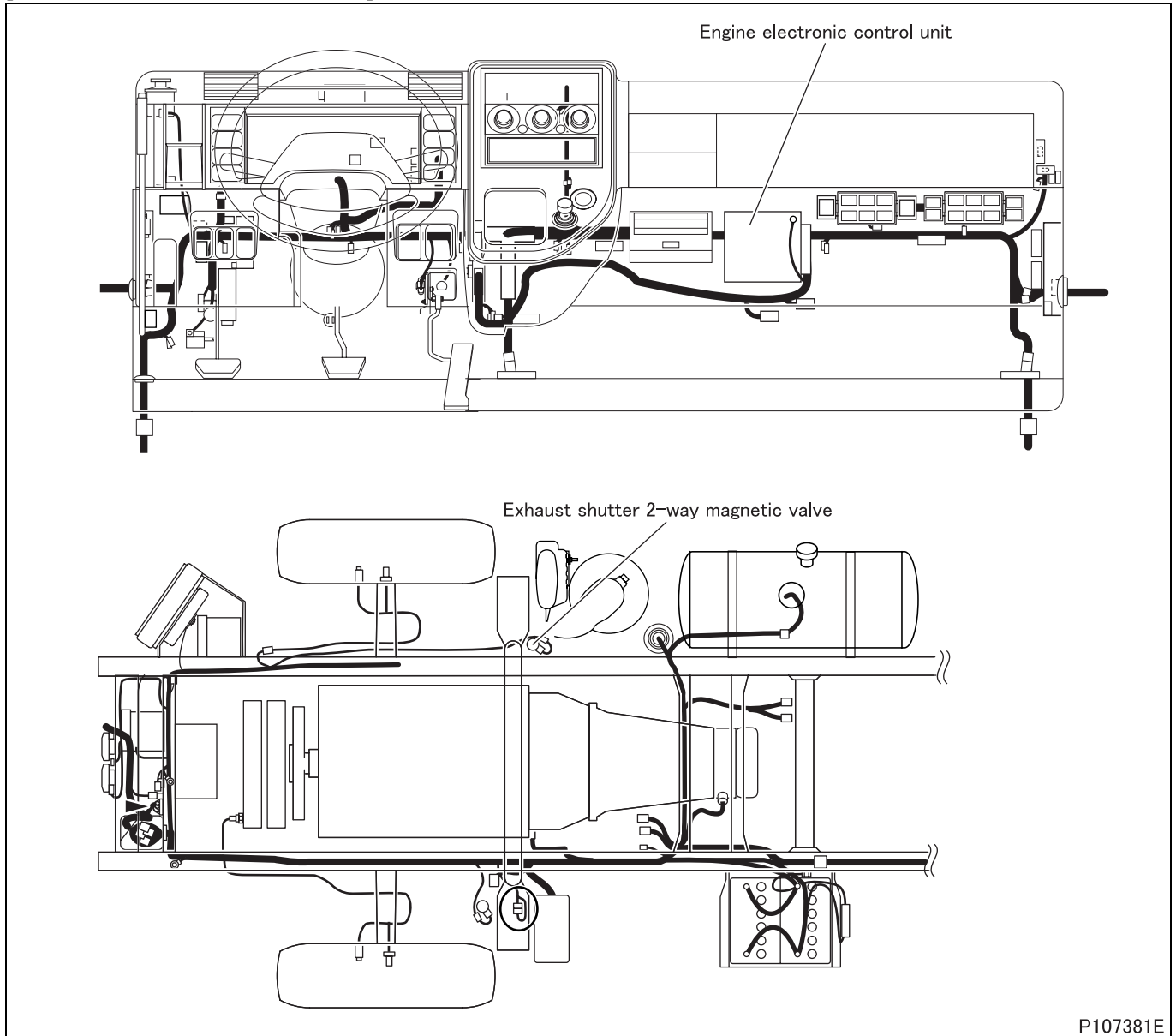
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P107380E

[Parts Identification and Location]



P107381E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 6 and 76.                           |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | 48 Ω or more   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 8.  |
| NO     |  | Go to step 2. |  |

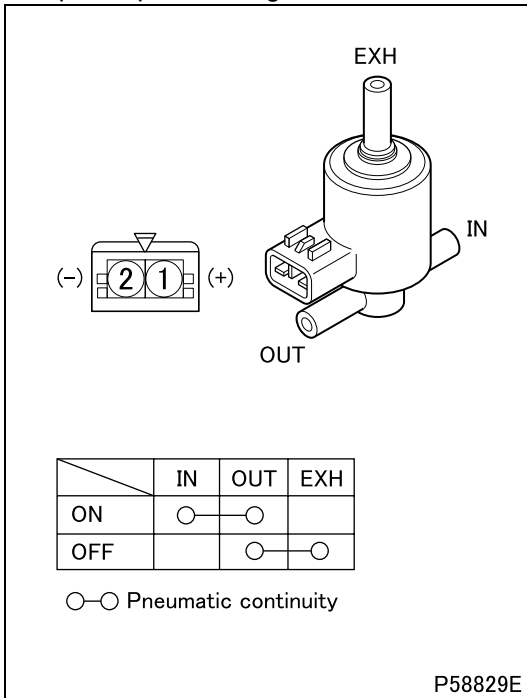
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of exhaust shutter 2-way magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |



|        |  |  |  |
|--------|--|--|--|
| Step 4 | Inspection items                                       |  | Inspection of exhaust shutter 2-way magnetic valve unit  |
|        | Maintenance item                                       |  | Measure minimum operating voltage when 2-way magnetic valve operates (judge by operation sound). |
|        | Inspection condition                                   |  | Gradually increase from zero the voltage applied to terminals No. 1 (+) and 2 (-).               |
|        | Requirements   |  | 11 V or less   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

<Step 4 inspection diagram>



|        |  |  |  |
|--------|--|--|--|
| Step 5 | Inspection items                                       |  | Inspection of harness between exhaust shutter 2-way magnetic valve and electronic control unit (power supply)                                      |
|        | Maintenance item                                       |  | Check circuit between exhaust shutter 2-way magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 76. |
|        | Inspection condition                                   |  | Disconnect electronic control unit from harness and measure from connection side of harness connector.   |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of harness between exhaust shutter 2-way magnetic valve and electronic control unit (power supply) |
|        | Maintenance item                                       |  | Check circuit between exhaust shutter 2-way magnetic valve connector terminal No. 1 and chassis ground.       |
|        | Inspection condition                                   |  | Disconnect electronic control unit from harness and measure from connection side of harness connector.        |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

# TROUBLESHOOTING

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 7 | Inspection items                                       |                 | Inspection of harness between exhaust shutter 2-way magnetic valve and electronic control unit (ground)   |
|        | Maintenance item                                       |                 | Check circuit between exhaust shutter 2-way magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 6. |
|        | Inspection condition                                   |                 | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.   |
| NO     |  | Modify harness. |   |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data                                |
|        | Maintenance item                                       |  | Perform actuator test item No. AA "Auxiliary Brake M/V 1" |
|        | Inspection condition                                   |  | Starter switch: ON  |
|        | Requirements   |  | 3-way magnetic valve operation sound is noted.            |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).                        |
| NO     |  | Replacement of electronic control unit |   |

**[Fault code]**

Diagnosis code: P0489/Flash code: 67

**[Monitor]**

Failure of exhaust gas recirculation system

**[Fault (outline)]**

Power out of range

**[Diagnosis check]**

- Exhaust gas recirculation electronic drive unit monitors power supply voltage of electronic drive unit and sends fault information to engine electronic control unit through controller area network communication.

**[Code generation condition]**

- Voltage of exhaust gas recirculation electronic drive unit remains below 7 V for 13 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

- Controller area network communication in order

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Related fault check is stopped.

**[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic drive unit and battery
- Malfunction of each connector
- Malfunction of battery
- Malfunction of electronic drive unit relay
- Malfunction of electronic drive unit

**[Recoverability]**

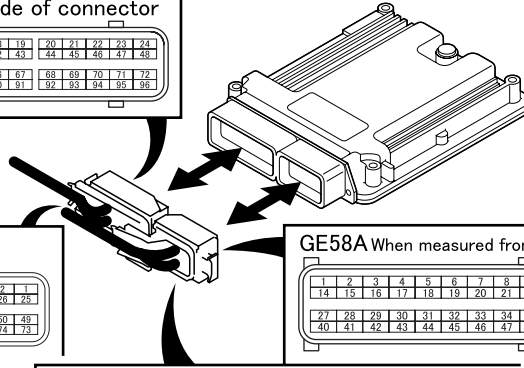
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |    |
| 26 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |



GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

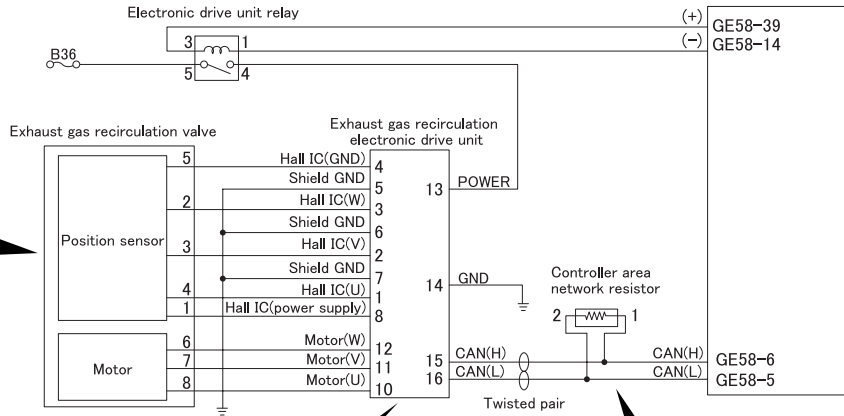
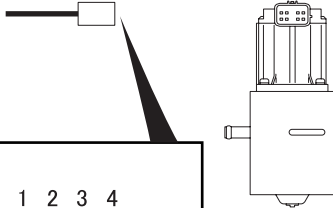
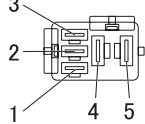
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |    |

Mounting area of high-current fuse box relay



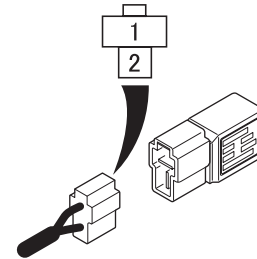
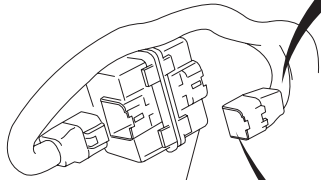
When measured from back side of connector

|    |    |    |    |
|----|----|----|----|
| 4  | 3  | 2  | 1  |
| 8  | 7  | 6  | 5  |
| 12 | 11 | 10 | 9  |
| 16 | 15 | 14 | 13 |

|    |    |    |    |
|----|----|----|----|
| 1  | 2  | 3  | 4  |
| 5  | 6  | 7  | 8  |
| 9  | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |

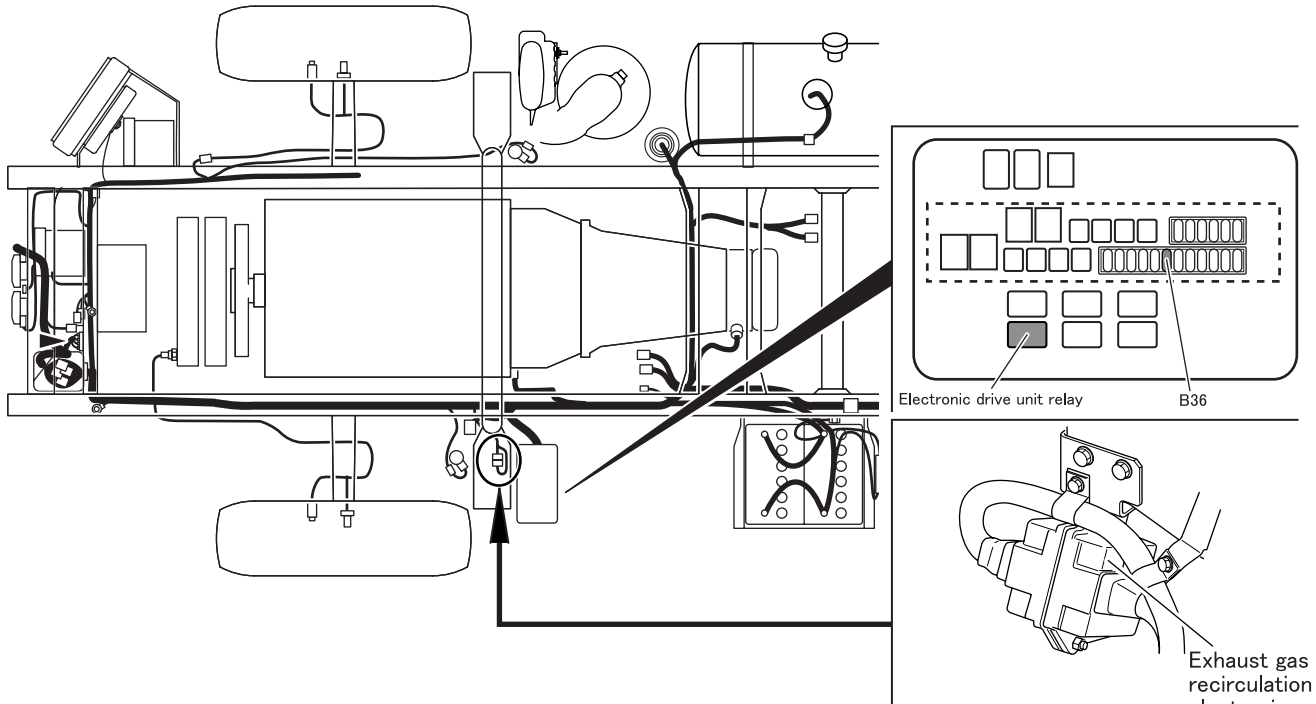
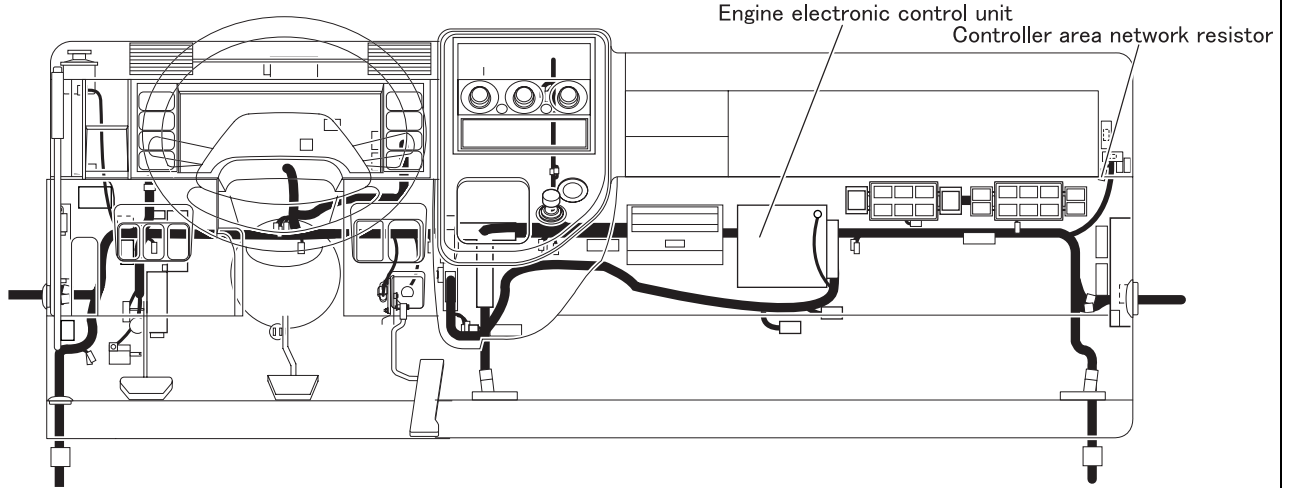
When measured from connection side of connector

Exhaust gas recirculation electronic drive unit

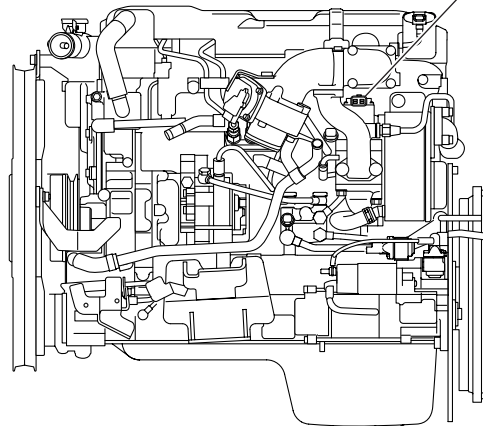


P100193E

[Parts Identification and Location]



Left side view of engine  
Exhaust gas recirculation valve



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0685 "EDU Relay (Open)"</li> <li>• P0686 "EDU Relay (Low)"</li> <li>• P0687 "EDU Relay (High)"</li> <li>• P0688 "EDU Relay (Over Load)"</li> </ul> |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> </ul>   |
|        | Requirements   |  | Codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of electronic drive unit connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of electronic drive unit connector (power supply)  |
|        | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 13 (+) and 14 (–).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> <li>• Remove connector and measure from harness side.</li> <li>• Perform actuator test item No. AF "EDU Relay"</li> </ul> |
|        | Requirements   |  | Same as battery voltage.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of relay connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |  |
|--------|--|--|--|
| Step 5 | Inspection items                                       |  | Inspection of harness between fuse and relay   |
|        | Maintenance item                                       |  | Check circuit between fuse No. B36 and relay connector terminal No. 5.                     |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 6 | Inspection items                                       |                 | Inspection of harness between relay and electronic drive unit   |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 4 and electronic drive unit connector terminal No. 13. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of electronic drive unit relay, go to step 7  |
| NO     |  | Modify harness. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and ground                             |
|        | Maintenance item                                       |                 | Check circuit between electronic drive unit connector terminal No. 14 and chassis ground.  |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Replacement of electronic drive unit   |
| NO     |  | Modify harness. |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0490/Flash code: 67

## **[Monitor]**

Failure of exhaust gas recirculation system

## **[Fault (outline)]**

Power out of range

## **[Diagnosis check]**

- Exhaust gas recirculation electronic drive unit monitors power supply voltage of electronic control drive unit and sends fault information to engine electronic control unit through controller area network communication.

## **[Code generation condition]**

- Voltage of exhaust gas recirculation electronic drive unit remains over 19 V for 5 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

- Controller area network communication in order

## **[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Related fault check is stopped.

## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic drive unit and battery
- Malfunction of each connector
- Malfunction of battery
- Malfunction of electronic drive unit relay
- Malfunction of electronic drive unit

## **[Recoverability]**

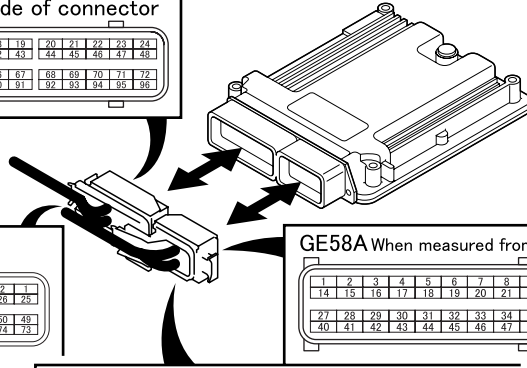
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



[Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |



GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

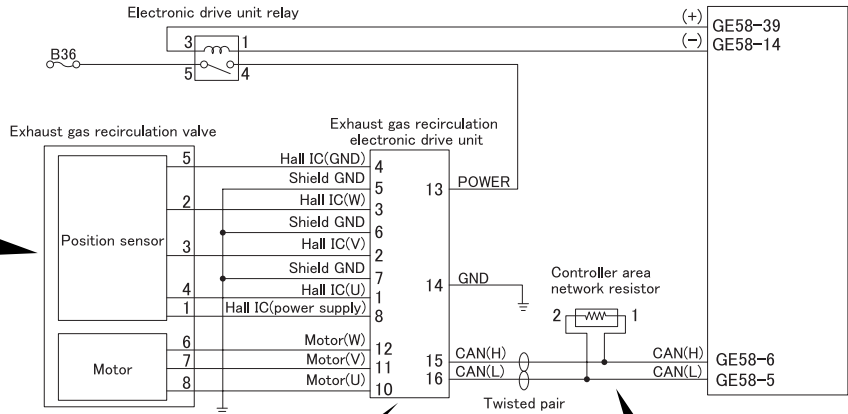
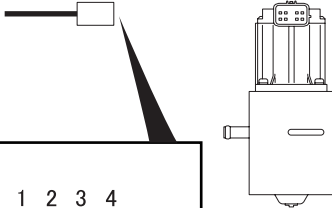
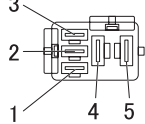
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

Mounting area of high-current fuse box relay



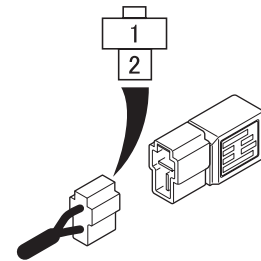
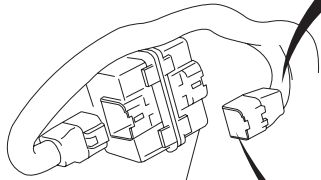
When measured from back side of connector

|    |    |    |    |
|----|----|----|----|
| 4  | 3  | 2  | 1  |
| 8  | 7  | 6  | 5  |
| 12 | 11 | 10 | 9  |
| 16 | 15 | 14 | 13 |

|    |    |    |    |
|----|----|----|----|
| 1  | 2  | 3  | 4  |
| 5  | 6  | 7  | 8  |
| 9  | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |

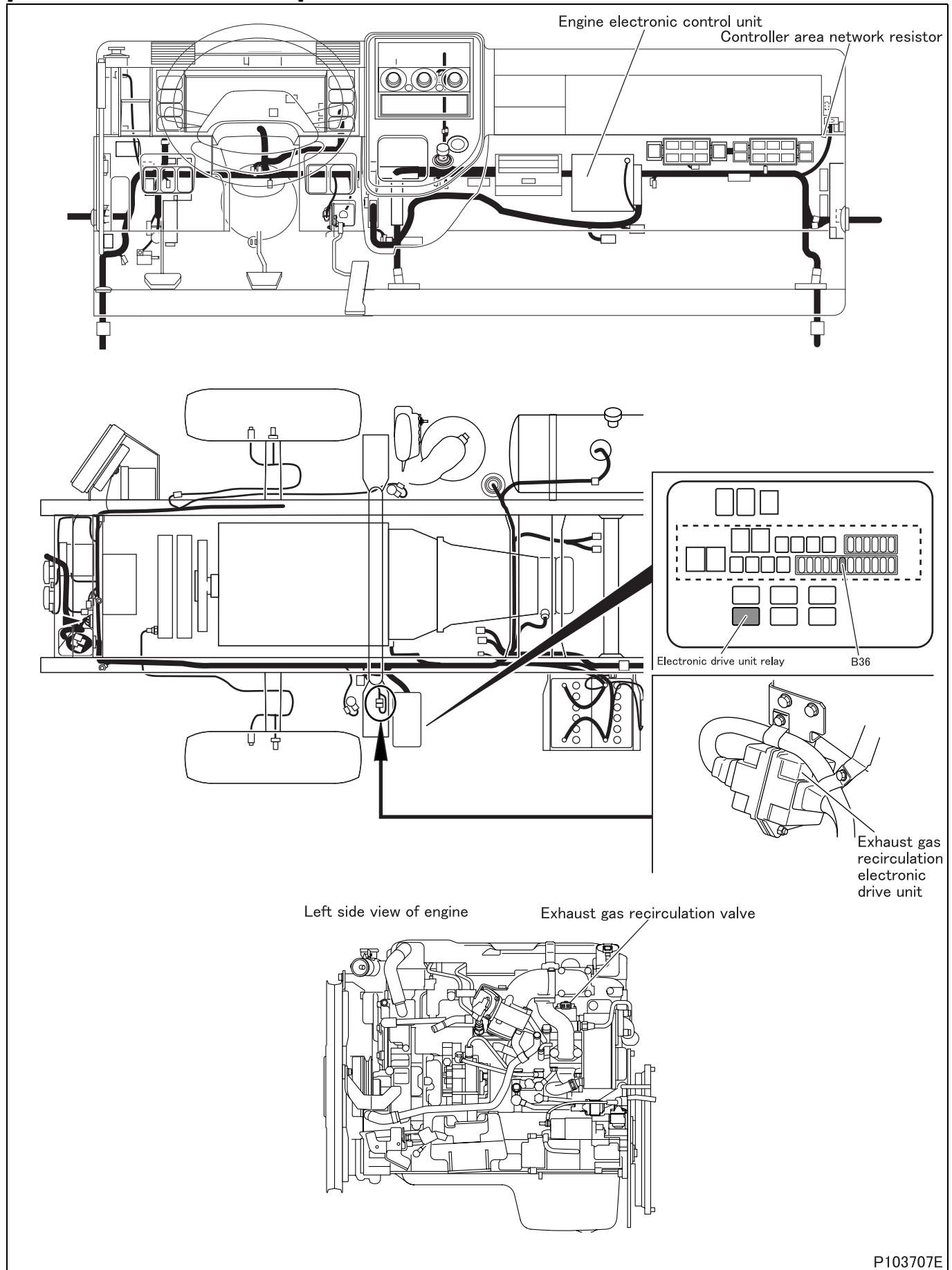
When measured from connection side of connector

Exhaust gas recirculation electronic drive unit



# TROUBLESHOOTING

## [Parts Identification and Location]



P103707E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0685 "EDU Relay (Open)"</li> <li>• P0686 "EDU Relay (Low)"</li> <li>• P0687 "EDU Relay (High)"</li> <li>• P0688 "EDU Relay (Over Load)"</li> </ul> |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> </ul>   |
|        | Requirements   |  | Codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of electronic drive unit connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of electronic drive unit connector (power supply)  |
|        | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 13 (+) and 14 (–).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> <li>• Remove connector and measure from harness side.</li> <li>• Perform actuator test item No. AF "EDU Relay"</li> </ul> |
|        | Requirements   |  | Same as battery voltage.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of relay connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |  |
|--------|--|--|--|
| Step 5 | Inspection items                                       |  | Inspection of harness between fuse and relay   |
|        | Maintenance item                                       |  | Check circuit between fuse No. B36 and relay connector terminal No. 5.                     |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

# TROUBLESHOOTING

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 6 | Inspection items                                       |                 | Inspection of harness between relay and electronic drive unit   |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 4 and electronic drive unit connector terminal No. 13. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of electronic drive unit relay, go to step 7.   |
| NO     |  | Modify harness. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and ground                             |
|        | Maintenance item                                       |                 | Check circuit between electronic drive unit connector terminal No. 14 and chassis ground.  |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Replacement of electronic drive unit   |
| NO     |  | Modify harness. |  |

**[Fault code]**

Diagnosis code: P0500/Flash code: 25

**[Monitor]**

Failure of vehicle speed sensor

**[Fault (outline)]**

Signal

**[Diagnosis check]**

- Vehicle speed sensor output signal is monitored. (no pulse)

**[Code generation condition]**

Diagnosis code is generated under either of the following conditions.

<Condition (1)>

- Error in vehicle speed processing function in engine electronic control unit occurs and remains for 0.1 second. (Warning lamp (red) is lit and diagnosis code is displayed on third establishment of code generation condition.)

<Condition (2)>

- Vehicle speed remains below 2 km/h {1.24 MPH} as detected for 20 or 60 seconds when engine speed is 1000 rpm and transmission is in neutral. (Warning lamp (orange) is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

<Condition (1)>

- Fault diagnosis is performed only once during the driving cycle.

<Condition (2)>

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

Electronic control unit varies in the way of control by the color of warning lamp.

<Warning lamp: Orange>

- Vehicle speed is fixed at backup value.
- Misfire detection is stopped.
- In-use performance counter is stopped.
- Auto cruise control stopped
- Speed limitation device control is stopped.
- Idle up is stopped.
- Related fault check is stopped.

<Warning lamp: Red>

- Vehicle speed is fixed at backup value.
- Auto cruise control stopped
- Speed limitation device control is stopped.
- Traveled distance computation is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and pulse divider (built in meter cluster)
- Malfunction of each connector
- Malfunction of pulse divider (built in meter cluster)
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position. (Timing of warning lamp/diagnosis code OFF depends on condition.)

<Condition (1)>

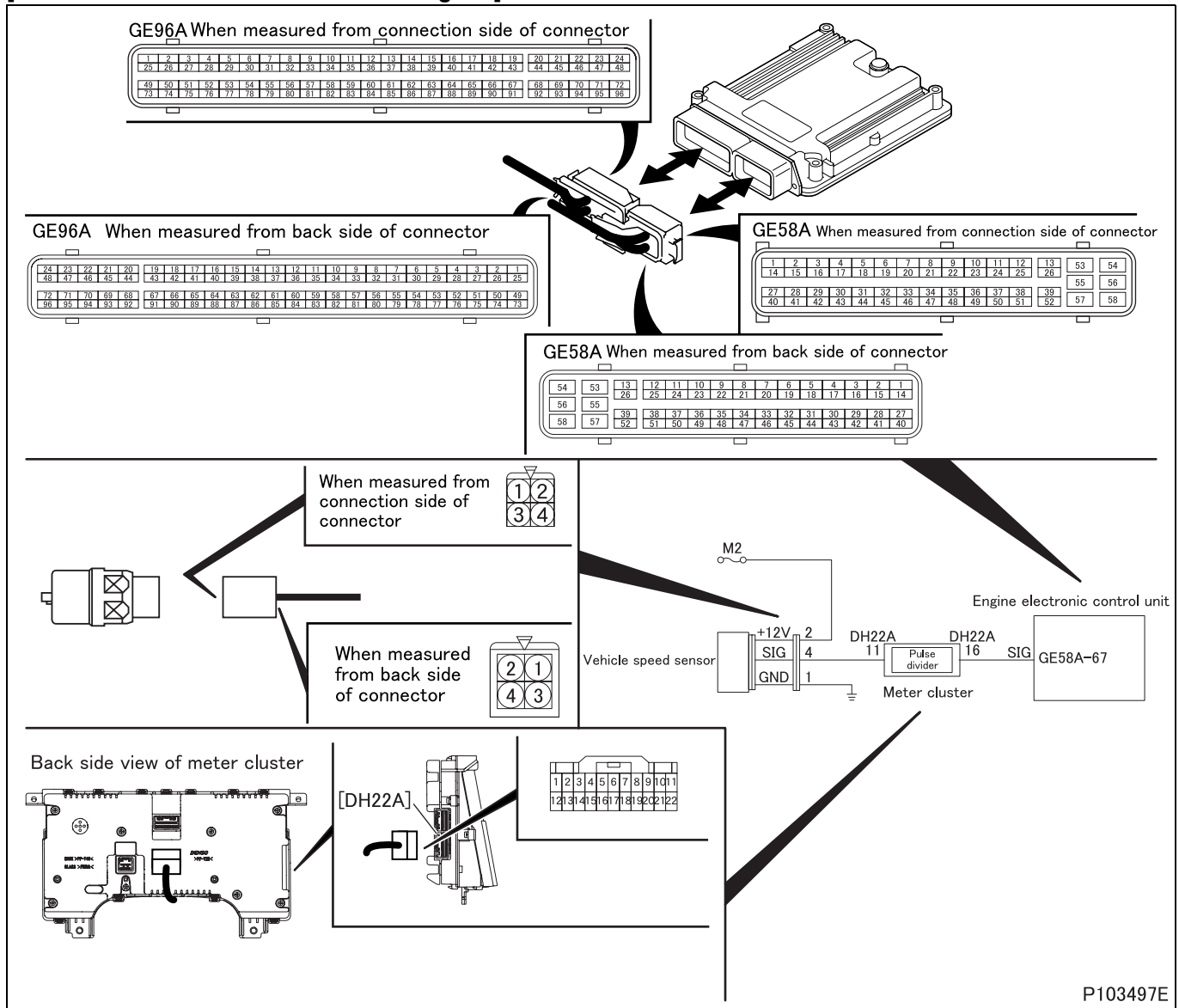
- Lamp is extinguished and code is cleared at fourth diagnosis code display after recovery.

<Condition (2)>

- Lamp is extinguished and code is cleared simultaneously with recovery.

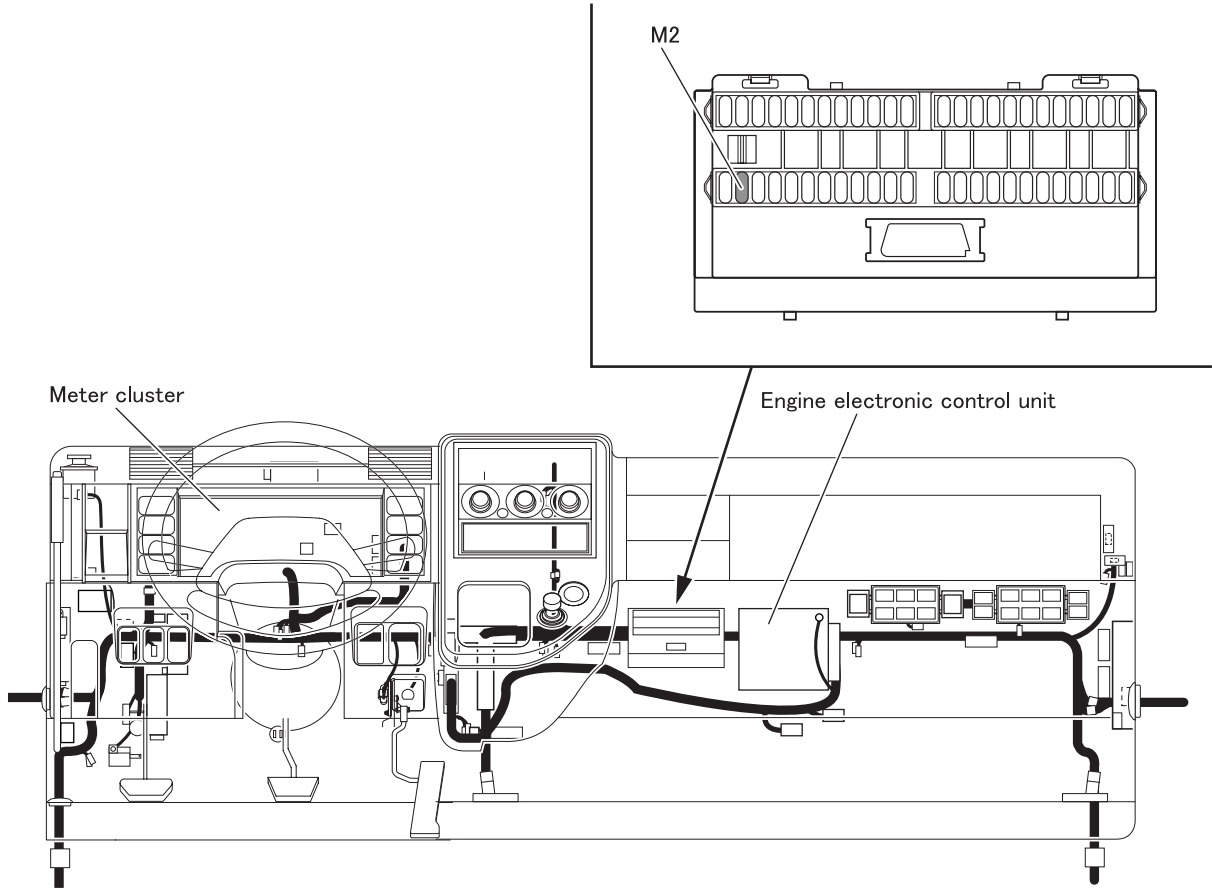
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

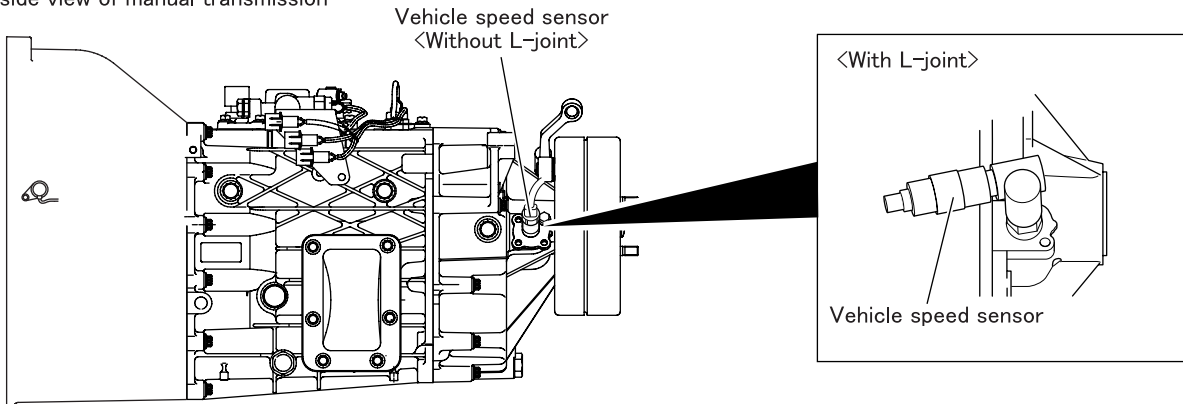


P103497E

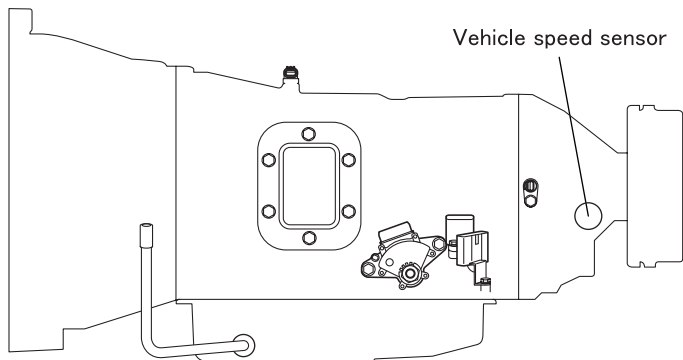
[Parts Identification and Location]



Left side view of manual transmission



Left side view of automatic transmission



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Vehicle Speed Sensor".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 90 "Vehicle Speed" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | During vehicle operation   |
|        | Requirements   |               | Same indication as speedometer is given.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (signal)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 67 (+) and chassis ground.  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Remove sensor and slowly turn sensor shaft.</li> </ul> |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• Low pulse: 0.5 V or less</li> <li>• High pulse: <math>8 \pm 1</math> V</li> </ul>  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

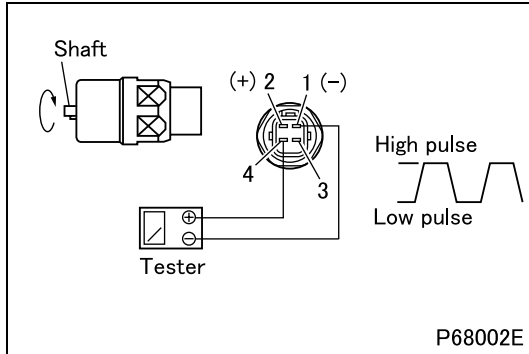
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 10.  |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 4 | Inspection items                                       |                 | Inspection of harness between electronic control unit and pulse divider  |
|        | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE96A) terminal No. 67 and meter cluster connector (DH22A) terminal No. 18. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 5.  |
| NO     |  | Modify harness. |  |



|        |  |  |                       |  |
|--------|--|--|-----------------------|--|
| Step 5 | Inspection items                                       | Inspection of vehicle speed sensor   |                       |  |
|        | Maintenance item                                       | Measure maximum value A (high pulse voltage) and minimum value B (low pulse voltage) of voltage generated between connector terminals No. 4 (+) and 1 (-). |                       |  |
|        | Inspection condition                                   | Slowly turn sensor shaft with voltage DC 12 V applied between terminals No. 2 (+) and No. 1 (-).   |                       |  |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Low pulse: 0.5 V or less</li> <li>• High pulse: <math>8 \pm 1</math> V</li> </ul>                                 |                       |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 6.         |  |
|        |  | NO   | Replacement of sensor |  |

<Step 5 inspection diagram>



|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 6 | Inspection items                                       | Inspection of sensor harness (power supply)  |                 |  |
|        | Maintenance item                                       | Check circuit between connector terminal No. 2 and fuse (M2).                              |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector. |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7.   |  |
|        |  | NO   | Modify harness. |  |

|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 7 | Inspection items                                       | Inspection of sensor harness (ground)  |                 |  |
|        | Maintenance item                                       | Check circuit between connector terminal No. 1 and chassis ground.                         |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector. |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8.   |  |
|        |  | NO   | Modify harness. |  |

|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 8 | Inspection items                                       | Inspection of sensor harness (signal)  |                 |  |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 4 and meter cluster connector (DH22A) terminal No. 11. |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                 |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 9.   |  |
|        |  | NO   | Modify harness. |  |

# TROUBLESHOOTING

|        |  |  |  |
|--------|--|--|--|
| Step 9 | Inspection items                                       |  | Inspection by pulse divider connector (meter cluster)  |
|        | Maintenance item                                       |  | Measure value of voltage between connector (DH22A) terminal No. 16 (+) and No. 6 (-).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> <li>• Remove sensor and slowly turn sensor shaft.</li> </ul> |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Low pulse: 0.5 V or less</li> <li>• High pulse: <math>8 \pm 1</math> V</li> </ul>   |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 10.   |
| NO     |  | Replacement of pulse divider (meter cluster) |  |

|         |  |  |  |
|---------|--|--|--|
| Step 10 | Inspection items                                       |  | Inspection by control data   |
|         | Maintenance item                                       |  | <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Measure item "Vehicle Speed Sensor".</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Measure item No. 90 "Vehicle Speed" of Service Data.</li> </ul> |
|         | Inspection condition                                   |  | During vehicle operation   |
|         | Requirements   |  | Same indication as speedometer is given.   |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic control unit |  |

**[Fault code]**

Diagnosis code: P0502/Flash code: 25

**[Monitor]**

Failure of vehicle speed sensor

**[Fault (outline)]**

Too low

**[Diagnosis check]**

- Vehicle speed sensor output signal is monitored. (too low)

**[Code generation condition]**

- Vehicle speed output from vehicle speed sensor remains less than 1 km/h {0.62 MPH} for 3 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine speed: more than 2000 rpm
- Fuel injection quantity: above 50 mg/cyc
- Time till above conditions were met: more than 2 seconds
- Battery voltage: in order
- MPROP (rail pressure control valve): in order

**[Control effected by electronic control unit during fault]**

- Vehicle speed is fixed at backup value.
- Misfire detection is stopped.
- In-use performance counter is stopped.
- Auto cruise control stopped
- Speed limitation device control is stopped.
- Idle up is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

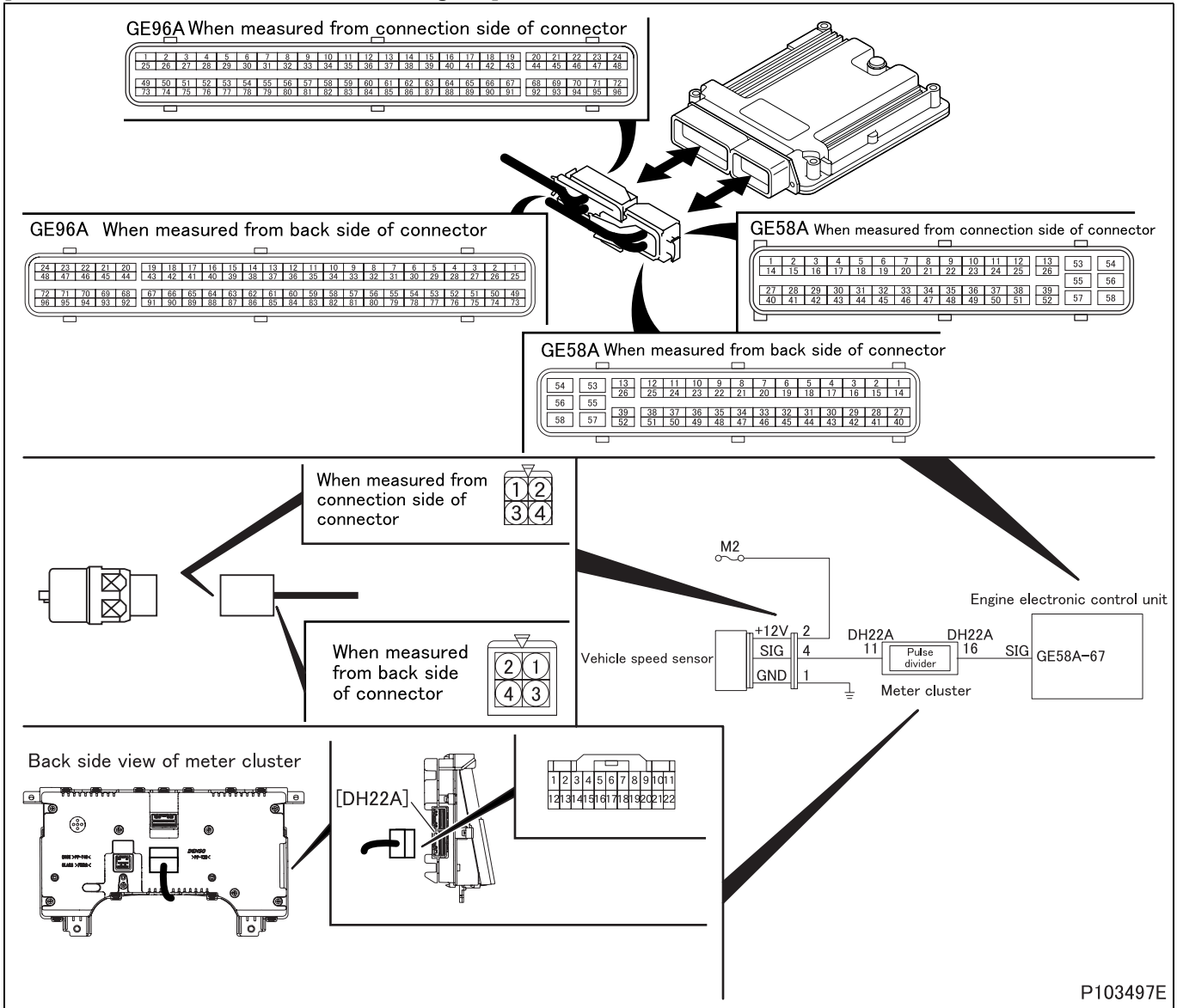
- Open-circuit or short-circuit of harness between electronic control unit and pulse divider (built in meter cluster)
- Malfunction of each connector
- Malfunction of pulse divider (built in meter cluster)
- Malfunction of electronic control unit

**[Recoverability]**

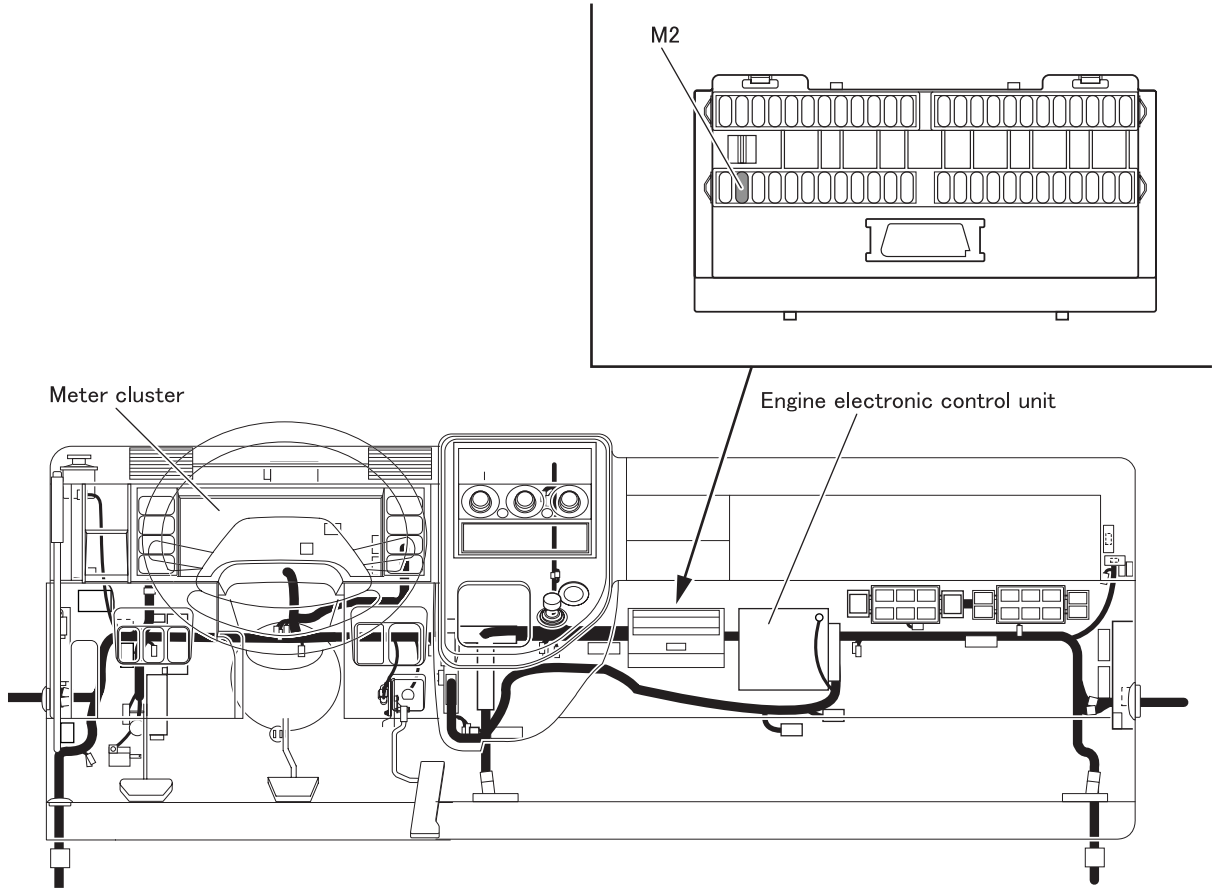
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

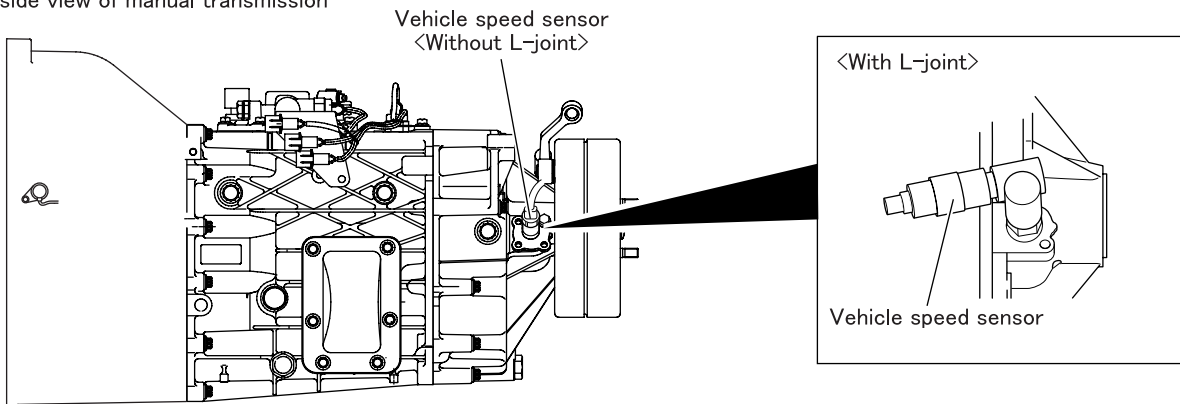
## [Electronic Control Unit Connection Diagram]



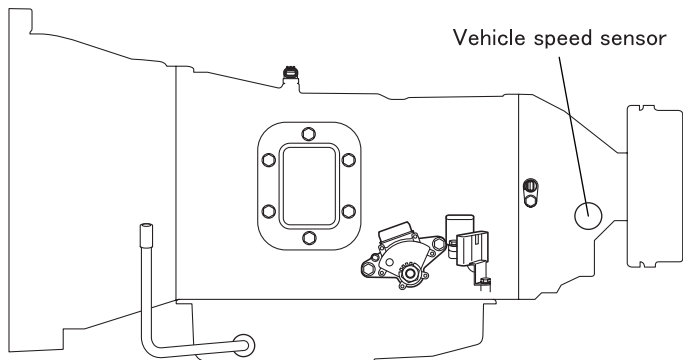
[Parts Identification and Location]



Left side view of manual transmission



Left side view of automatic transmission



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item "Vehicle Speed Sensor".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>Measure item No. 90 "Vehicle Speed" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | During vehicle operation   |
|        | Requirements   |               | Same indication as speedometer is given.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

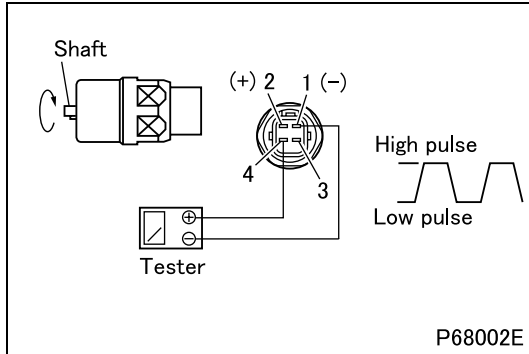
|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (signal)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 67 (+) and chassis ground.  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Starter switch: ON</li> <li>Engine: stopped</li> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Remove sensor and slowly turn sensor shaft.</li> </ul> |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>Low pulse: 0.5 V or less</li> <li>High pulse: <math>8 \pm 1</math> V</li> </ul>  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 10.  |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 4 | Inspection items                                       |                 | Inspection of harness between electronic control unit and pulse divider  |
|        | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE96A) terminal No. 67 and meter cluster connector (DH22A) terminal No. 18. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 5.  |
| NO     |  | Modify harness. |  |

|        |  |  |                       |  |
|--------|--|--|-----------------------|--|
| Step 5 | Inspection items                                       | Inspection of vehicle speed sensor   |                       |  |
|        | Maintenance item                                       | Measure maximum value A (high pulse voltage) and minimum value B (low pulse voltage) of voltage generated between connector terminals No. 4 (+) and 1 (-). |                       |  |
|        | Inspection condition                                   | Slowly turn sensor shaft with voltage DC 12 V applied between terminals No. 2 (+) and No. 1 (-).   |                       |  |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Low pulse: 0.5 V or less</li> <li>• High pulse: 8 ± 1 V</li> </ul>  |                       |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 6.         |  |
|        |  | NO   | Replacement of sensor |  |

<Step 5 inspection diagram>



|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 6 | Inspection items                                       | Inspection of sensor harness (power supply)  |                 |  |
|        | Maintenance item                                       | Check circuit between connector terminal No. 2 and fuse (M2).                              |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector. |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7.   |  |
|        |  | NO   | Modify harness. |  |

|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 7 | Inspection items                                       | Inspection of sensor harness (ground)  |                 |  |
|        | Maintenance item                                       | Check circuit between connector terminal No. 1 and chassis ground.                         |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector. |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8.   |  |
|        |  | NO   | Modify harness. |  |

|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 8 | Inspection items                                       | Inspection of sensor harness (signal)  |                 |  |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 4 and meter cluster connector (DH22A) terminal No. 11. |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                 |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 9.   |  |
|        |  | NO   | Modify harness. |  |

# TROUBLESHOOTING

|        |  |  |  |
|--------|--|--|--|
| Step 9 | Inspection items                                       |  | Inspection by pulse divider connector (meter cluster)  |
|        | Maintenance item                                       |  | Measure value of voltage between connector (DH22A) terminal No. 16 (+) and No. 6 (-).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> <li>• Remove sensor and slowly turn sensor shaft.</li> </ul> |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Low pulse: 0.5 V or less</li> <li>• High pulse: <math>8 \pm 1</math> V</li> </ul>   |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 10.   |
| NO     |  | Replacement of pulse divider (meter cluster) |  |

|         |  |  |  |
|---------|--|--|--|
| Step 10 | Inspection items                                       |  | Inspection by control data   |
|         | Maintenance item                                       |  | <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Measure item "Vehicle Speed Sensor".</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Measure item No. 90 "Vehicle Speed" of Service Data.</li> </ul> |
|         | Inspection condition                                   |  | During vehicle operation   |
|         | Requirements   |  | Same indication as speedometer is given.   |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic control unit |  |



**[Fault code]**

Diagnosis code: P0503/Flash code: 25

**[Monitor]**

Failure of vehicle speed sensor

**[Fault (outline)]**

Too high

**[Diagnosis check]**

- Vehicle speed sensor output signal is monitored. (too high)

**[Code generation condition]**

- Vehicle speed output from vehicle speed sensor remains more than 70 km/h {43.5 MPH} for 3 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine speed: 600 to 1500 rpm
- Fuel injection quantity: above 35 mg/cyc
- Time till above conditions were met: more than 2 seconds
- Battery voltage: in order
- MPROP (rail pressure control valve): in order

**[Control effected by electronic control unit during fault]**

- Vehicle speed is fixed at backup value.
- Misfire detection is stopped.
- In-use performance counter is stopped.
- Auto cruise control stopped
- Speed limitation device control is stopped.
- Idle up is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

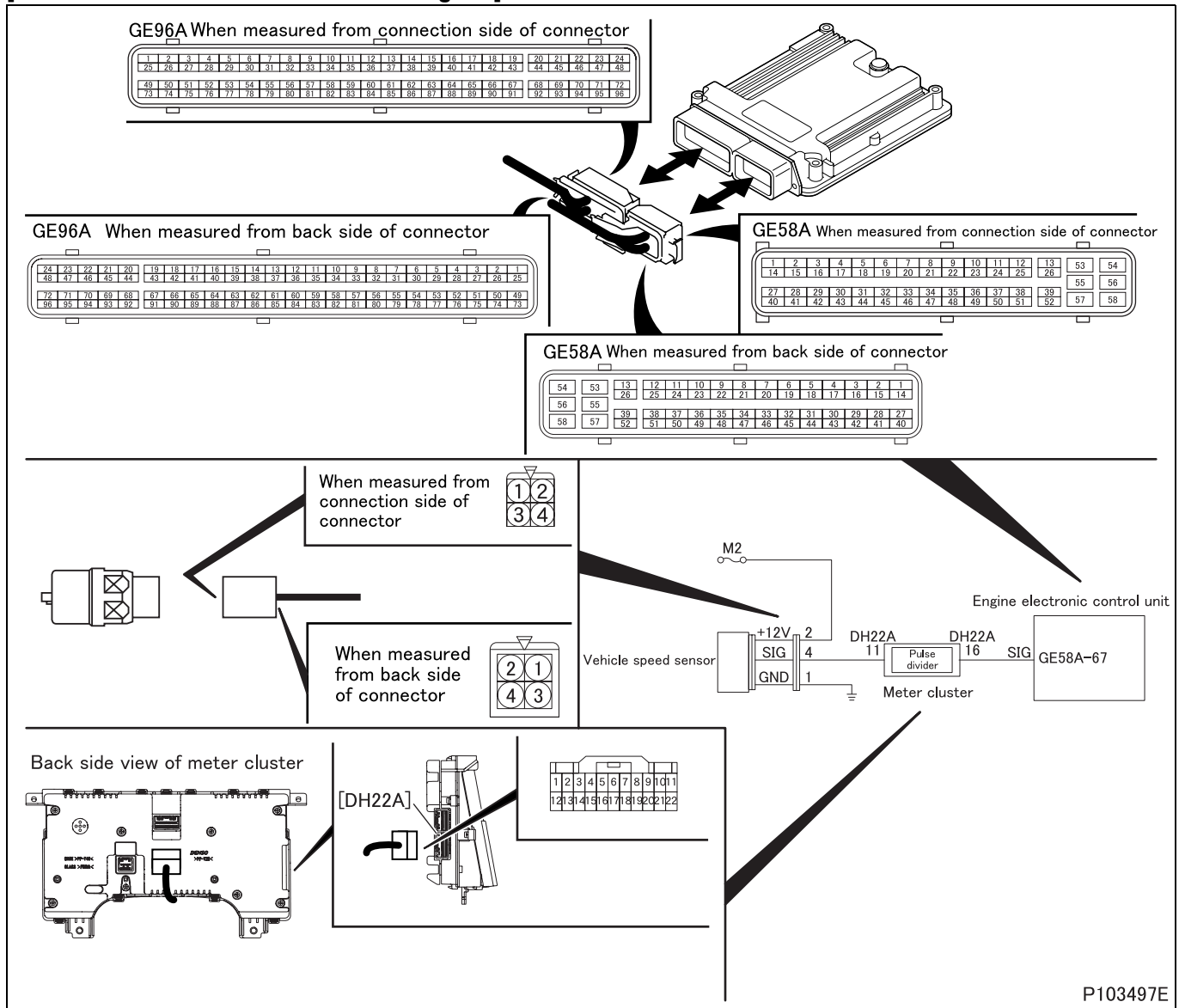
- Open-circuit or short-circuit of harness between electronic control unit and pulse divider (built in meter cluster)
- Malfunction of each connector
- Malfunction of pulse divider (built in meter cluster)
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

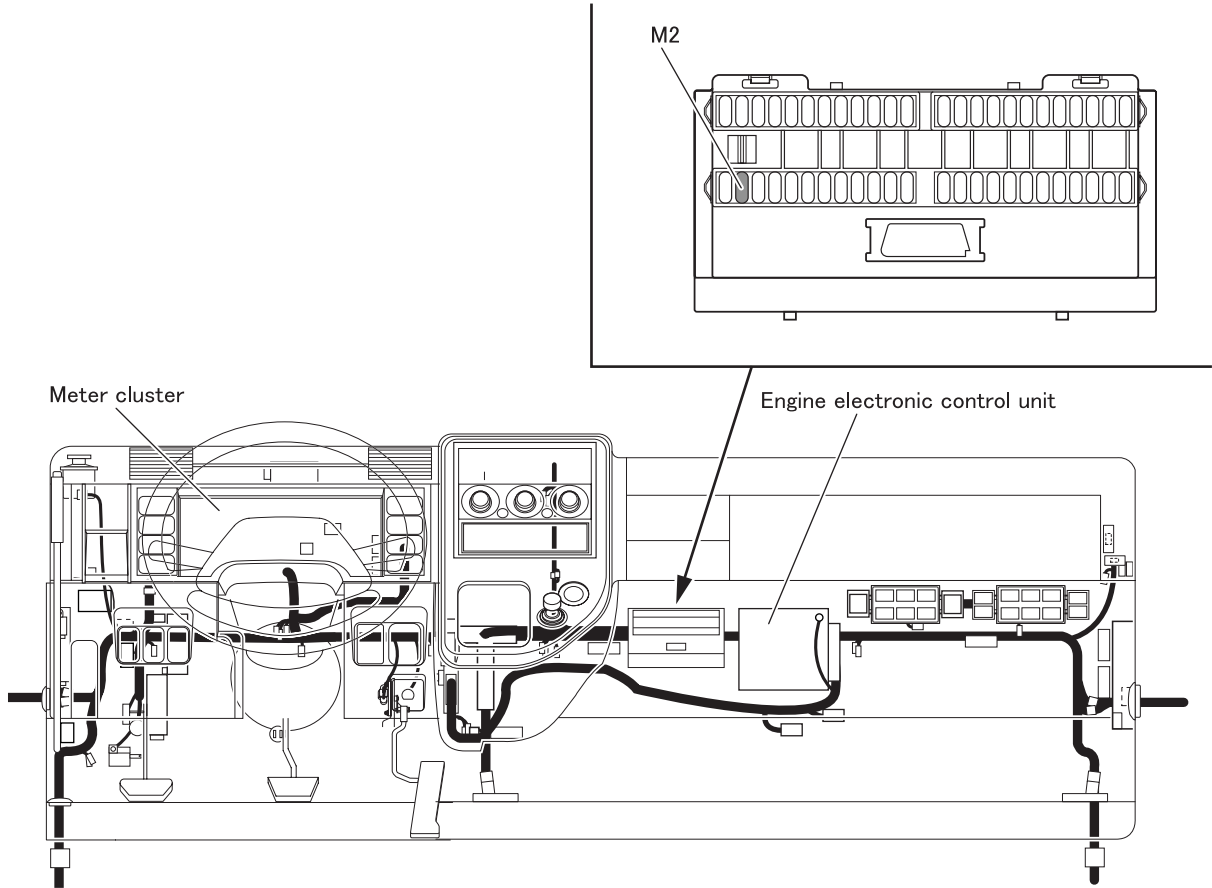
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

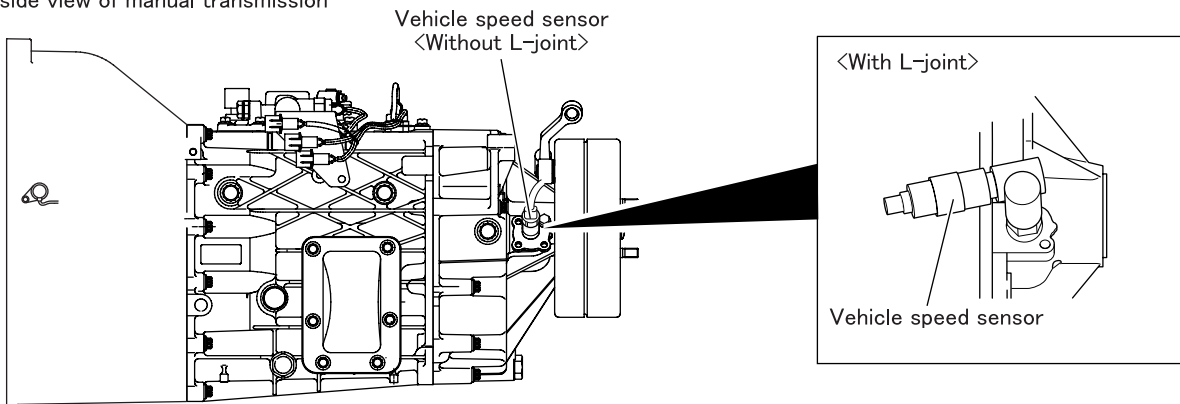


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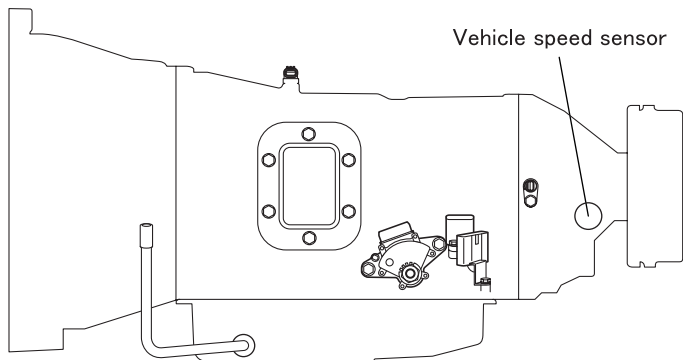
[Parts Identification and Location]



Left side view of manual transmission



Left side view of automatic transmission



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Vehicle Speed Sensor".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 90 "Vehicle Speed" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | During vehicle operation   |
|        | Requirements   |               | Same indication as speedometer is given.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

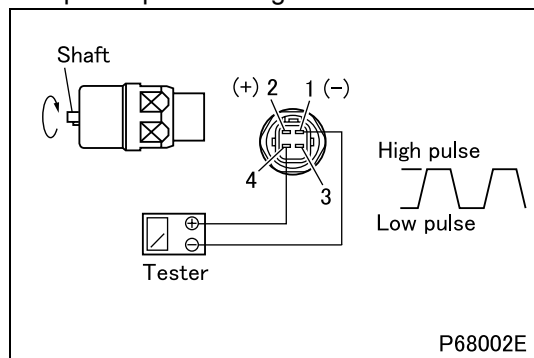
|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (signal)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 67 (+) and chassis ground.  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Remove sensor and slowly turn sensor shaft.</li> </ul> |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• Low pulse: 0.5 V or less</li> <li>• High pulse: <math>8 \pm 1</math> V</li> </ul>  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 10.  |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 4 | Inspection items                                       |                 | Inspection of harness between electronic control unit and pulse divider  |
|        | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE96A) terminal No. 67 and meter cluster connector (DH22A) terminal No. 18. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 5.  |
| NO     |  | Modify harness. |  |

|        |  |  |                       |  |
|--------|--|--|-----------------------|--|
| Step 5 | Inspection items                                       | Inspection of vehicle speed sensor   |                       |  |
|        | Maintenance item                                       | Measure maximum value A (high pulse voltage) and minimum value B (low pulse voltage) of voltage generated between connector terminals No. 4 (+) and 1 (-). |                       |  |
|        | Inspection condition                                   | Slowly turn sensor shaft with voltage DC 12 V applied between terminals No. 2 (+) and No. 1 (-).   |                       |  |
|        | Requirements   | <ul style="list-style-type: none"> <li>Low pulse: 0.5 V or less</li> <li>High pulse: <math>8 \pm 1</math> V</li> </ul>                                     |                       |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 6.         |  |
|        |  | NO   | Replacement of sensor |  |

<Step 5 inspection diagram>



|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 6 | Inspection items                                       | Inspection of sensor harness (power supply)  |                 |  |
|        | Maintenance item                                       | Check circuit between connector terminal No. 2 and fuse (M2).                              |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector. |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7.   |  |
|        |  | NO   | Modify harness. |  |

|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 7 | Inspection items                                       | Inspection of sensor harness (ground)  |                 |  |
|        | Maintenance item                                       | Check circuit between connector terminal No. 1 and chassis ground.                         |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector. |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8.   |  |
|        |  | NO   | Modify harness. |  |

|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 8 | Inspection items                                       | Inspection of sensor harness (signal)  |                 |  |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 4 and meter cluster connector (DH22A) terminal No. 11. |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                 |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 9.   |  |
|        |  | NO   | Modify harness. |  |

# TROUBLESHOOTING

|        |  |  |  |
|--------|--|--|--|
| Step 9 | Inspection items                                       |  | Inspection by pulse divider connector (meter cluster)  |
|        | Maintenance item                                       |  | Measure value of voltage between connector (DH22A) terminal No. 16 (+) and No. 6 (-).  |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> <li>• Remove sensor and slowly turn sensor shaft.</li> </ul> |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Low pulse: 0.5 V or less</li> <li>• High pulse: <math>8 \pm 1</math> V</li> </ul>   |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 10.   |
| NO     |  | Replacement of pulse divider (meter cluster) |  |

|         |  |  |  |
|---------|--|--|--|
| Step 10 | Inspection items                                       |  | Inspection by control data   |
|         | Maintenance item                                       |  | <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Measure item "Vehicle Speed Sensor".</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Measure item No. 90 "Vehicle Speed" of Service Data.</li> </ul> |
|         | Inspection condition                                   |  | During vehicle operation   |
|         | Requirements   |  | Same indication as speedometer is given.   |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic control unit |  |

**[Fault code]**

Diagnosis code: P0506/Flash code: 52

**[Monitor]**

Abnormality in idling control (idling speed is too low)

**[Fault (outline)]**

Idle speed too low

**[Diagnosis check]**

- Idling speed of vehicle at a stop (in parked condition) is detected by engine speed sensor as actual engine speed and compared with target engine speed for control by engine electronic control unit.

**[Code generation condition]**

- Actual engine speed remains –100 rpm or less below target engine speed (short of target) for 10 seconds. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine status: normal (engine in operation)
- Vehicle speed: less than 2 km/h {1.24 MPH}
- Accelerator pedal position: less than 1%
- Brake is not applied.
- Accelerator pedal position sensor: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Vehicle speed sensor: in order
- Water temperature sensor: in order

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

- Malfunction of injector

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position. (Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0507/Flash code: 52

## **[Monitor]**

Abnormality in idling control (idling speed is too high)

## **[Fault (outline)]**

Idle speed too high

## **[Diagnosis check]**

- Idling speed of vehicle at a stop (in parked condition) is detected by engine speed sensor as actual engine speed and compared with target engine speed for control by engine electronic control unit.

## **[Code generation condition]**

- Actual engine speed remains 200 rpm or more above target engine speed (over target value at a large margin) for 10 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

- Engine status: normal (engine in operation)
- Vehicle speed: less than 2 km/h {1.24 MPH}
- Accelerator pedal position: less than 1%
- Brake is not applied.
- Accelerator pedal position sensor: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Vehicle speed sensor: in order
- Water temperature sensor: in order

## **[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

## **[Probable cause of trouble]**

- Malfunction of injector

## **[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



**[Fault code]**

Diagnosis code: P0544/Flash code: 87

**[Monitor]**

Characteristic abnormality of DPF temperature sensor 1

**[Fault (outline)]**

Gain and offset drift

**[Diagnosis check]**

- Difference in voltage output (temperature) between catalytic temperature sensor and DPF temperature sensor 1 is monitored for clogging of front oxidation catalyst.

**[Code generation condition]**

- Difference in temperature output remains excessively high (over 150°C {302°F}) or low (below –150°C {–238°F}) for 10 seconds <Relative check> and 20 seconds <Separate check>. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- When catalytic temperature sensor and DPF temperature sensor 2 are the same in output.

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

- Malfunction of DPF temperature sensor 1

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0545/Flash code: 87

## **[Monitor]**

Failure of DPF temperature sensor 1

## **[Fault (outline)]**

Low signal range check

## **[Diagnosis check]**

- Output voltage of DPF temperature sensor 1 is monitored.

## **[Code generation condition]**

- Output voltage of DPF temperature sensor 1 remains below 0.36 V for 3 seconds. (sensor temperature: 1000°C {1832°F} or more)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Pressure before ceramic diesel particulate filter is fixed at backup value.
- Diesel particulate filter regeneration is stopped.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

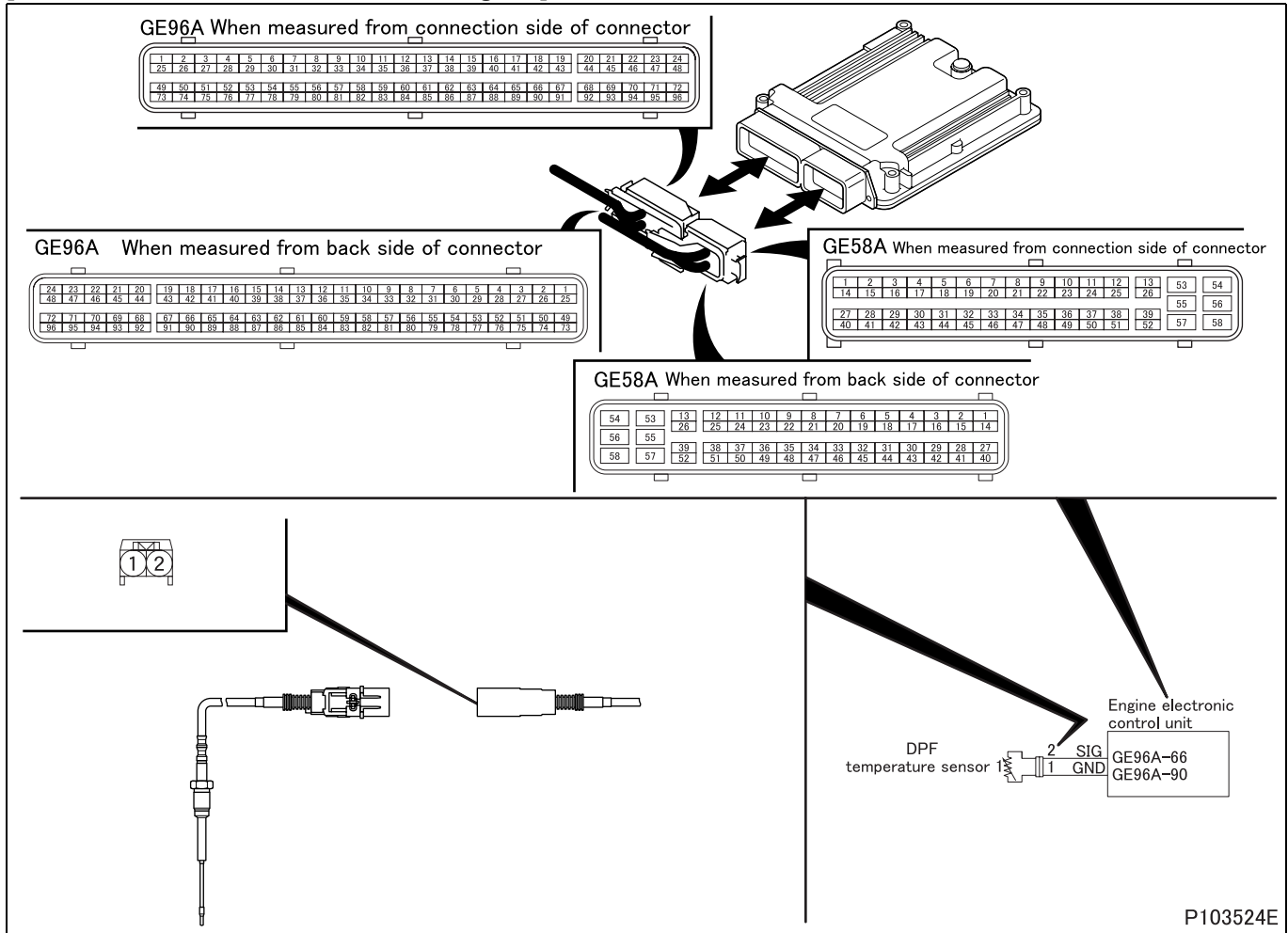
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit
- Malfunction of DPF temperature sensor 1

## **[Recoverability]**

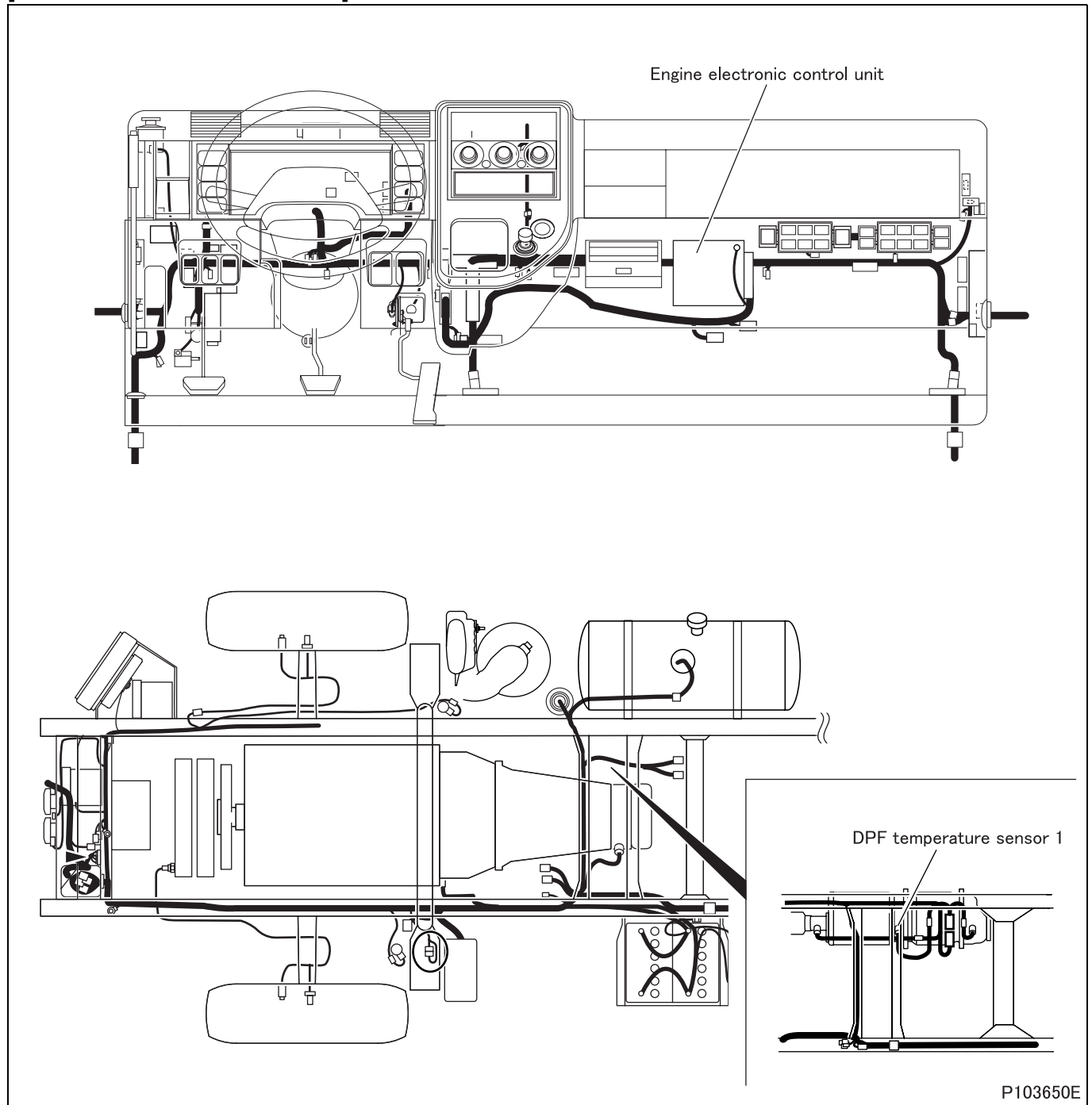
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]



P103650E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Measure item No. 25 "DPF Temperature (UpStream)" of Service Data. |
|        | Inspection condition                                   |  | While engine is warmed up   |
|        | Requirements   |  | Temperature gradually increases.                                  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to transient fault (See Gr00.).<br>NO : Go to step 2.    |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |  | Measure value of resistance between connector (GE96A) terminal No. 66 and 90.   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: OFF</li> <li>• Disconnect electronic control unit from harness and measure at vehicle-side connector half.</li> </ul>  |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• 20°C {68°F} : 241.8 kΩ</li> <li>• 50°C {122°F} : 106.2 <sup>+74.3</sup>/<sub>-41.8</sub> kΩ</li> <li>• 100°C {212°F} : 33.58 <sup>+17.60</sup>/<sub>-10.60</sub> kΩ</li> <li>• 150°C {302°F} : 13.90 <sup>+5.36</sup>/<sub>-3.60</sub> kΩ</li> <li>• 200°C {392°F} : 6.896 <sup>+2.064</sup>/<sub>-1.252</sub> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to step 3.<br>NO : Go to step 4.   |

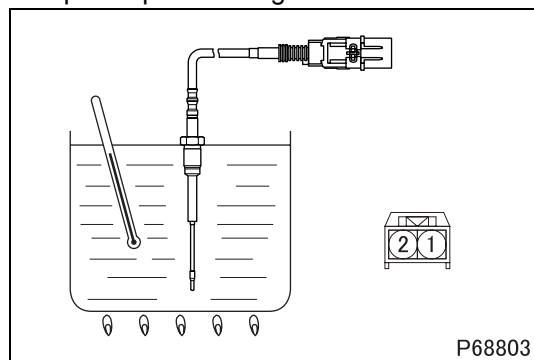
|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to step 8.<br>NO : Modify connector.   |

|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of sensor connector  |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to step 5.<br>NO : Modify connector.   |

# TROUBLESHOOTING

|        |  |                       |  |
|--------|--|-----------------------|--|
| Step 5 | Inspection items                                       |                       | Inspection of DPF temperature sensor 1 unit  |
|        | Maintenance item                                       |                       | Measure value of resistance between connector terminal No. 1 and 2.  |
|        | Inspection condition                                   |                       | <ul style="list-style-type: none"> <li>Put DPF temperature sensor 1 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>   |
|        | Requirements   |                       | <ul style="list-style-type: none"> <li>20°C {68°F}: 241.8 kΩ</li> <li>50°C {122°F}: 106.2 <math>\begin{smallmatrix} +74.3 \\ -41.8 \end{smallmatrix}</math> kΩ</li> <li>100°C {212°F}: 33.58 <math>\begin{smallmatrix} +17.60 \\ -10.60 \end{smallmatrix}</math> kΩ</li> <li>150°C {302°F}: 13.90 <math>\begin{smallmatrix} +5.36 \\ -3.60 \end{smallmatrix}</math> kΩ</li> <li>200°C {392°F}: 6.896 <math>\begin{smallmatrix} +2.064 \\ -1.252 \end{smallmatrix}</math> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                   | Go to step 6.  |
| NO     |  | Replacement of sensor |  |

<Step 5 inspection diagram>



|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE96A) terminal No. 66 and sensor connector terminal No. 2. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|        | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE96A) terminal No. 90 and sensor connector terminal No. 1. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Measure item No. 25 "DPF Temperature (UpStream)" of Service Data. |
|        | Inspection condition                                   |  | While engine is warmed up   |
|        | Requirements   |  | Temperature gradually increases.                                  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).                                |
| NO     |  | Replacement of electronic control unit |   |

**[Fault code]**

Diagnosis code: P0546/Flash code: 87

**[Monitor]**

Failure of DPF temperature sensor 1

**[Fault (outline)]**

High signal range check

**[Diagnosis check]**

- Output voltage of DPF temperature sensor 1 is monitored.

**[Code generation condition]**

- Output voltage of DPF temperature sensor 1 remains over 4.93 V for 30 seconds when engine speed is set at 1200 to 5000 rpm. (sensor temperature: 40°C {118°F} or less)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation conditions.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine speed: 1200 to 5000 rpm
- Fuel injection quantity: 32 to 200 mg/cyc
- Water temperature: above -7°C {19°F}

**[Control effected by electronic control unit during fault]**

- Pressure before ceramic diesel particulate filter is fixed at backup value.
- Diesel particulate filter regeneration is stopped.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

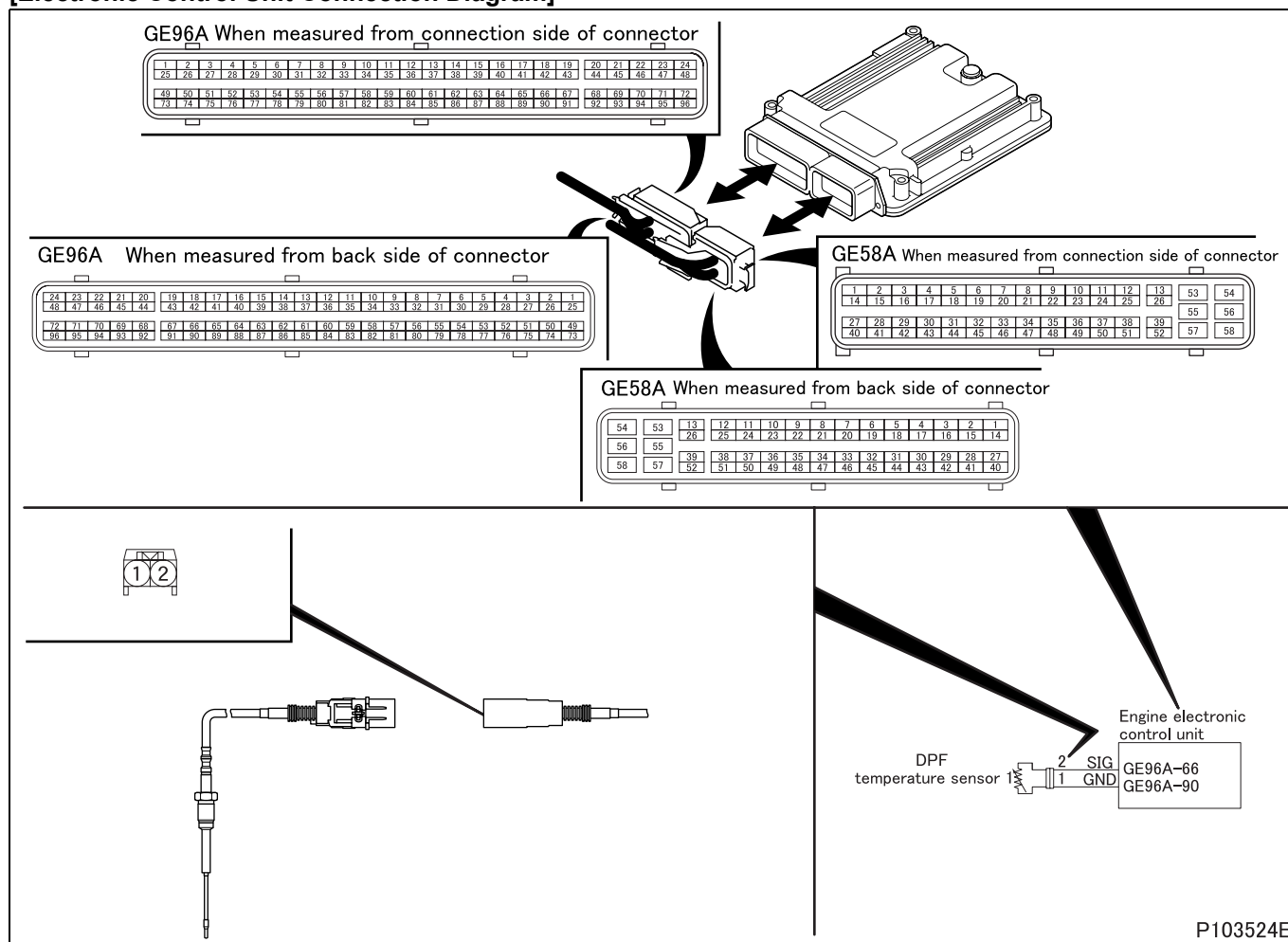
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit
- Malfunction of DPF temperature sensor 1

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

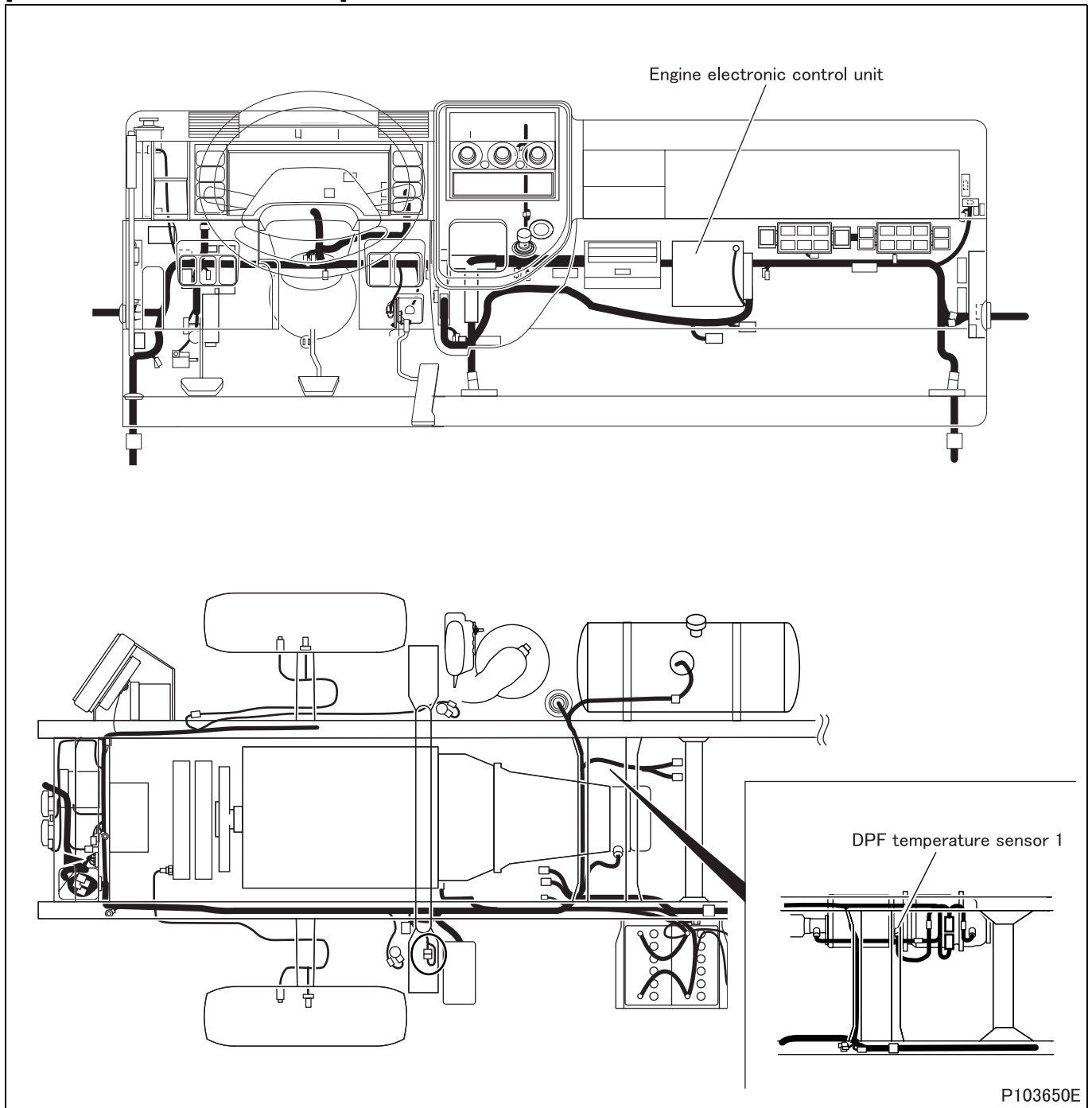
## [Electronic Control Unit Connection Diagram]



P103524E



[Parts Identification and Location]



P103650E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Measure item No. 25 "DPF Temperature (UpStream)" of Service Data. |
|        | Inspection condition                                   |  | While engine is warmed up   |
|        | Requirements   |  | Temperature gradually increases.                                  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to transient fault (See Gr00.).<br>NO : Go to step 2.    |

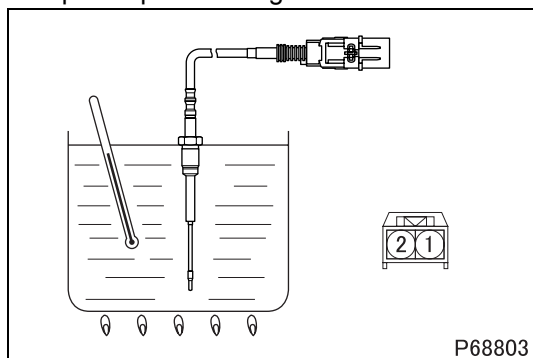
|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |  | Measure value of resistance between connector (GE96A) terminal No. 66 and 90.   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Starter switch: OFF</li> <li>Disconnect electronic control unit from harness and measure at vehicle-side connector half.</li> </ul>  |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>20°C {68°F} : 241.8 kΩ</li> <li>50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>100°C {212°F} : 33.58<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to step 3.<br>NO : Go to step 4.   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to step 8.<br>NO : Modify connector.   |

|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of sensor connector  |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to step 5.<br>NO : Modify connector.   |

|        |  |    |  |
|--------|--|----|--|
| Step 5 | Inspection items                                       |    | Inspection of DPF temperature sensor 1 unit  |
|        | Maintenance item                                       |    | Measure value of resistance between connector terminal No. 1 and 2.  |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>Put DPF temperature sensor 1 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>   |
|        | Requirements   |    | <ul style="list-style-type: none"> <li>20°C {68°F}: 241.8 kΩ</li> <li>50°C {122°F}: 106.2 <math>^{+74.3}_{-41.8}</math> kΩ</li> <li>100°C {212°F}: 33.58 <math>^{+17.60}_{-10.60}</math> kΩ</li> <li>150°C {302°F}: 13.90 <math>^{+5.36}_{-3.60}</math> kΩ</li> <li>200°C {392°F}: 6.896 <math>^{+2.064}_{-1.252}</math> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |    | YES  |
|        |  | NO | Replacement of sensor  |

<Step 5 inspection diagram>



|        |  |    |  |
|--------|--|----|--|
| Step 6 | Inspection items                                       |    | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |    | Check circuit between electronic control unit connector (GE96A) terminal No. 66 and sensor connector terminal No. 2. |
|        | Inspection condition                                   |    | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |    | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |    | YES  |
|        |  | NO | Modify harness.  |

|        |  |    |  |
|--------|--|----|--|
| Step 7 | Inspection items                                       |    | Inspection of harness between electronic control unit and sensor (ground)  |
|        | Maintenance item                                       |    | Check circuit between electronic control unit connector (GE96A) terminal No. 90 and sensor connector terminal No. 1. |
|        | Inspection condition                                   |    | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |    | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |    | YES  |
|        |  | NO | Modify harness.  |

|        |  |    |   |
|--------|--|----|---|
| Step 8 | Inspection items                                       |    | Inspection by control data  |
|        | Maintenance item                                       |    | Measure item No. 25 "DPF Temperature (UpStream)" of Service Data. |
|        | Inspection condition                                   |    | While engine is warmed up   |
|        | Requirements   |    | Temperature gradually increases.                                  |
|        | Inspection result (Is the judging standard satisfied?) |    | YES   |
|        |  | NO | Replacement of electronic control unit                            |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0562/Flash code: 33

## **[Monitor]**

Failure inside engine electronic control unit

## **[Fault (outline)]**

Low signal range check

## **[Diagnosis check]**

- Power supply voltage in engine electronic control unit at engine stop is monitored.

## **[Code generation condition]**

Diagnosis code is generated under either of the following conditions.

<Condition (1)>

- Power supply voltage monitoring function in engine electronic control unit remains below 0 V for 3 seconds.  
(Warning lamp (red) is lit and diagnosis code is displayed on third establishment of code generation condition.)

<Condition (2)>

- Error flag (low limit) indicating power voltage in engine electronic control unit remains for 0.1 second.  
(Warning lamp (orange) is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

<Condition (1)>

- Fault diagnosis is continuously performed during the driving cycle.

<Condition (2)>

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

- Engine cranking: not controlled

## **[Control effected by electronic control unit during fault]**

Electronic control unit varies in the way of control by the color of warning lamp.

<Warning lamp: Orange>

- Turbocharger initialization is stopped.
- Intake throttle initialization is inhibited.
- Misfire detection is stopped.
- Related fault check is stopped.

<Warning lamp: Red>

- Effects no special control.

## **[Probable cause of trouble]**

- Malfunction of electronic control unit (replacement of electronic control unit)

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Timing of warning lamp/diagnosis code OFF depends on condition.)

<Condition (1)>

- Lamp is extinguished and code is cleared at fourth diagnosis code display after recovery.

<Condition (2)>

- Lamp is extinguished and code is cleared simultaneously with recovery.

**[Fault code]**

Diagnosis code: P0563/Flash code: 33

**[Monitor]**

Failure inside engine electronic control unit

**[Fault (outline)]**

High signal range check

**[Diagnosis check]**

- Power supply voltage in engine electronic control unit at engine stop is monitored.

**[Code generation condition]**

Diagnosis code is generated under either of the following conditions.

<Condition (1)>

- Power supply voltage monitoring function in engine electronic control unit remains over 2.3 V for 3 seconds.  
(Warning lamp (red) is lit and diagnosis code is displayed on third establishment of code generation condition.)

<Condition (2)>

- Error flag (high limit) indicating power voltage in engine electronic control unit remains for 0.1 second (Warning lamp (orange) is lit and diagnosis code is displayed on third establishment of code generation condition).

**[Diagnosis check timing]**

<Condition (1)>

- Fault diagnosis is continuously performed during the driving cycle.

<Condition (2)>

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine cranking: not controlled

**[Control effected by electronic control unit during fault]**

Electronic control unit varies in the way of control by the color of warning lamp.

<Warning lamp: Orange>

- Turbocharger initialization is stopped.
- Intake throttle initialization is inhibited.
- Misfire detection is stopped.
- Related fault check is stopped.

<Warning lamp: Red>

- Effects no special control.

**[Probable cause of trouble]**

- Malfunction of electronic control unit (replacement of electronic control unit)

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Timing of warning lamp/diagnosis code OFF depends on condition.)

<Condition (1)>

- Lamp is extinguished and code is cleared at fourth diagnosis code display after recovery.

<Condition (2)>

- Lamp is extinguished and code is cleared simultaneously with recovery.

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0600/Flash code: 64, 76

## **[Monitor]**

Abnormality of speed limitation device system

## **[Fault (outline)]**

- Controller area network
- Message timeout

## **[Diagnosis check]**

- Controller area network communication between engine electronic control unit and multifunction vehicle control unit is monitored for abnormality.

## **[Code generation condition]**

- No controller area network signal is received from multifunction vehicle control unit within specified time after engine start (time out).  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

- Controller area network communication in order

## **[Control effected by electronic control unit during fault]**

- Speed limitation device control is stopped.

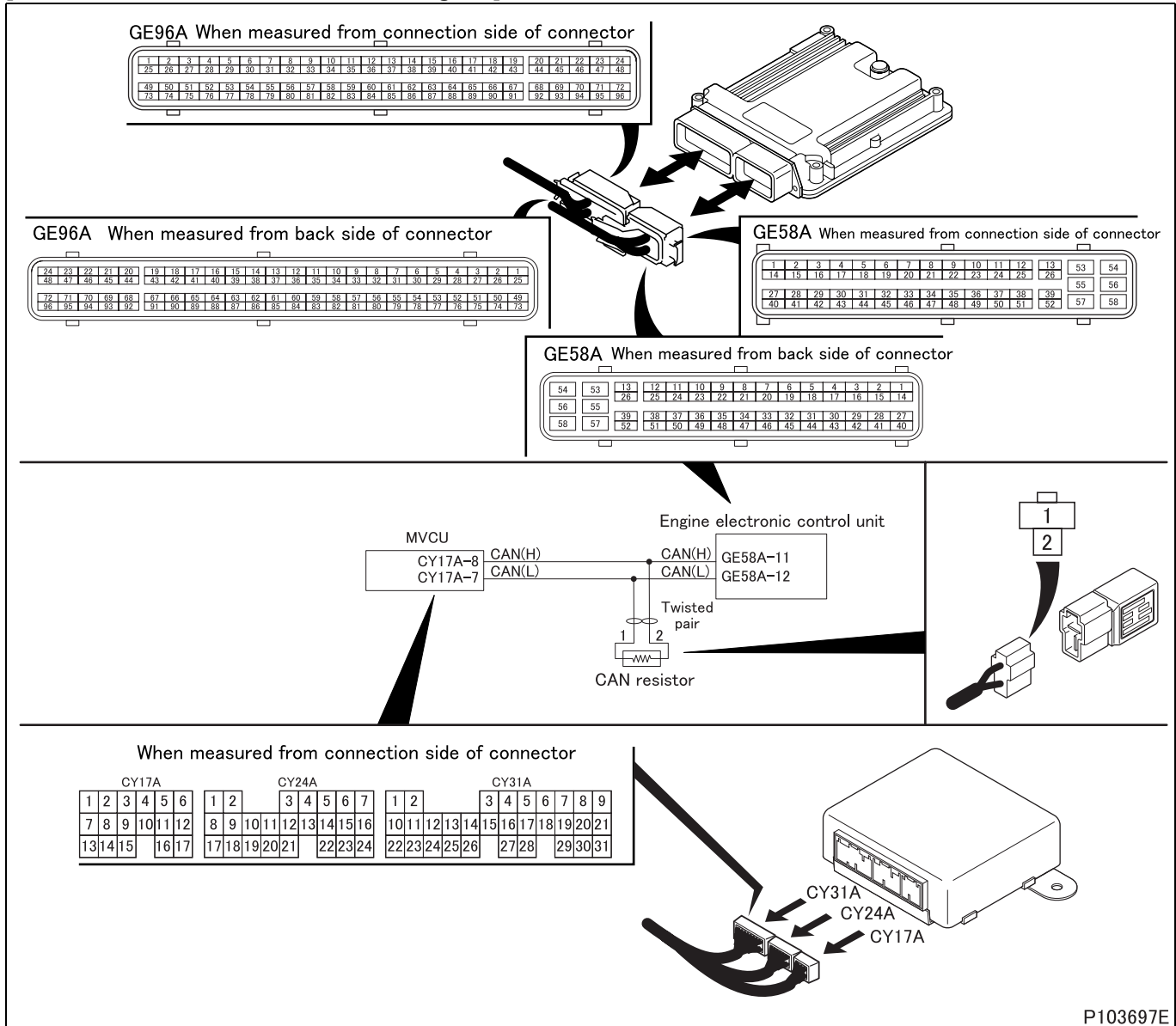
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and multifunction vehicle control unit
- Malfunction of each connector
- Malfunction of electronic control unit
- Malfunction of multifunction vehicle control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

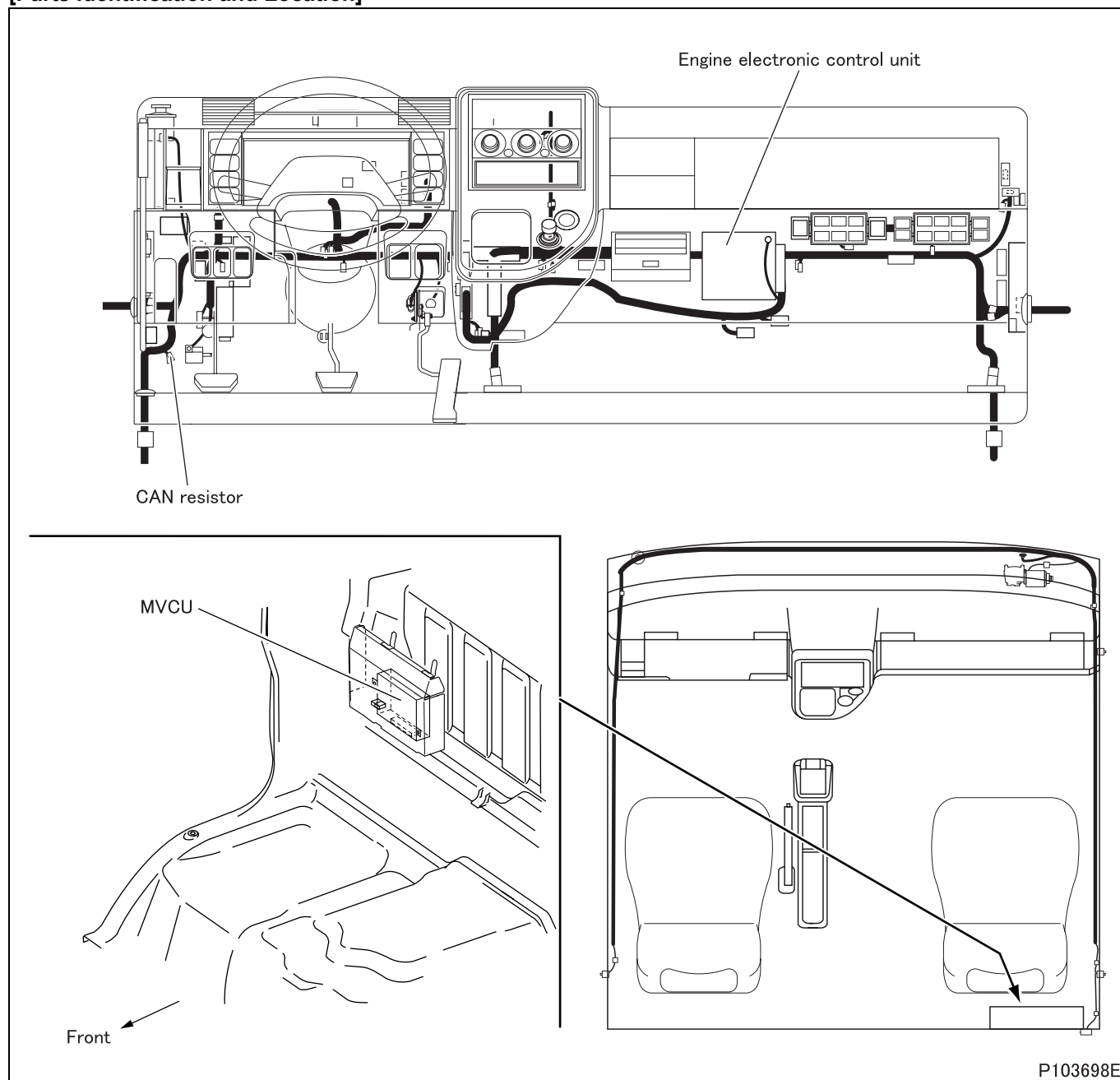
[Electronic Control Unit Connection Diagram]



P103697E

# TROUBLESHOOTING

## [Parts Identification and Location]





**[Fault diagnosis]**

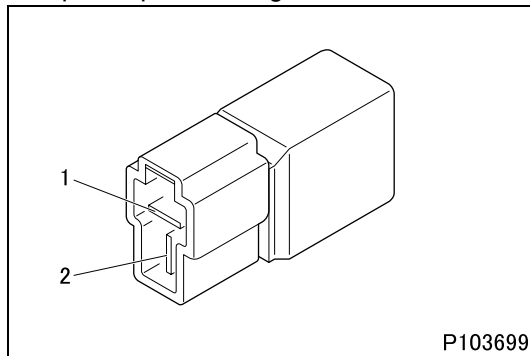
- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |  | Measure value of resistance between engine electronic control unit connector (GE58A) terminal No. 11 and 12. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                   |
|        | Requirements   |  | 120 ± 6 Ω  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of controller area network resistor connector  |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of controller area network resistor unit                 |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2. |
|        | Inspection condition                                   |  | Remove connector and measure resistance.                            |
|        | Requirements   |  | 120 ± 6 Ω   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

<Step 3 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of harness between engine electronic control unit and controller area network resistor (HIGH)  |
|        | Maintenance item                                       |  | Check circuit between controller area network resistor connector terminal No. 1 and engine electronic control unit connector (GE58A) terminal No. 11. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

# TROUBLESHOOTING

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 5 | Inspection items                                       |                 | Inspection of harness between engine electronic control unit and controller area network resistor (LOW)   |
|        | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 2 and engine electronic control unit connector (GE58A) terminal No. 12. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.   |
| NO     |  | Modify harness. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 10.  |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between multifunction vehicle control unit and controller area network resistor (HIGH)   |
|        | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 1 and multifunction vehicle control unit connector (CY17A) terminal No. 8. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 8 | Inspection items                                       |                 | Inspection of harness between multifunction vehicle control unit and controller area network resistor (LOW)  |
|        | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 2 and multifunction vehicle control unit connector (CY17A) terminal No. 7. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 9.  |
| NO     |  | Modify harness. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 9 | Inspection items                                       |                   | Inspection of multifunction vehicle control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replace the engine electronic control unit as well if this diagnosis code occurs after the replacement of multifunction vehicle control unit.   |
| NO     |  | Modify connector. |   |

**[Fault code]**

Diagnosis code: P0605/Flash code: 33

**[Monitor]**

Failure inside engine electronic control unit

**[Fault (outline)]**

Electronic control unit

**[Diagnosis check]**

- Program involving data processing function in engine electronic control unit is monitored for abnormality.

**[Code generation condition]**

- Abnormality occurred during access to EEPROM (write device in electronic control unit).  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Effects no special control.

**[Probable cause of trouble]**

- Malfunction of electronic control unit (replacement of electronic control unit)

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position, or no recovery is made unless the diagnosis code is erased.  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0607/Flash code: 33

## **[Monitor]**

Failure inside engine electronic control unit

## **[Fault (outline)]**

Injector driver circuit

## **[Diagnosis check]**

- Program involving injector drive circuit in engine electronic control unit is monitored for abnormality.

## **[Code generation condition]**

Diagnosis code is generated under either of the following conditions.

(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

- Internal reset
- Initialization error
- Sum check error
- Program flow error
- Signal timeout error

## **[Diagnosis check timing]**

- Fault diagnosis is performed each time when the starter switch is turned from “stop” to “start” position.
- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Engine stopped

## **[Probable cause of trouble]**

- Malfunction of electronic control unit (replacement of electronic control unit)

## **[Recoverability]**

- When output signal returns to normal with the starter switch set to ON from OFF (power supply to the electronic control unit resumed), a reset is made.

(Timing of warning lamp/diagnosis code OFF depends on condition.)

<Condition (1)>

- Code is cleared simultaneously with recovery.

<Condition (2)>

- Lamp is extinguished and code is cleared simultaneously with recovery.

<Condition (3)>

- Lamp is extinguished and code is cleared at fourth diagnosis code display after recovery.

**[Fault code]**

Diagnosis code: P060B/Flash code: 33

**[Monitor]**

Failure inside engine electronic control unit

**[Fault (outline)]**

A/D Converter fault

**[Diagnosis check]**

- Analog-to-digital signal conversion circuit in engine electronic control unit is monitored for abnormality.

**[Code generation condition]**

- Circuit remains abnormal as detected for 0.15 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Engine stopped

**[Probable cause of trouble]**

- Malfunction of electronic control unit (replacement of electronic control unit)

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0611/Flash code: 47

## **[Monitor]**

Injector adjustment data

## **[Fault (outline)]**

Electronic control unit

## **[Diagnosis check]**

- Availability of stored injector adjustment data in engine electronic control unit is monitored.

## **[Code generation condition]**

- Injector adjustment data are found missing.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Engine stopped

## **[Probable cause of trouble]**

- No injection correction data stored in engine electronic control unit  
(For data alteration/registration and data write operation, see Gr13ECU "ECU Rewrite and Programming".)

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

**[Fault code]**

Diagnosis code: P0615/Flash code: 48

**[Monitor]**

Failure of safety relay

**[Fault (outline)]**

Overload

**[Diagnosis check]**

- Engine electronic control unit internal function monitors safety relay circuit for overcurrent.

**[Code generation condition]**

- Overcurrent remains as detected by engine electronic control unit internal function for 3 seconds.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Effects no special control.

**[Probable cause of trouble]**

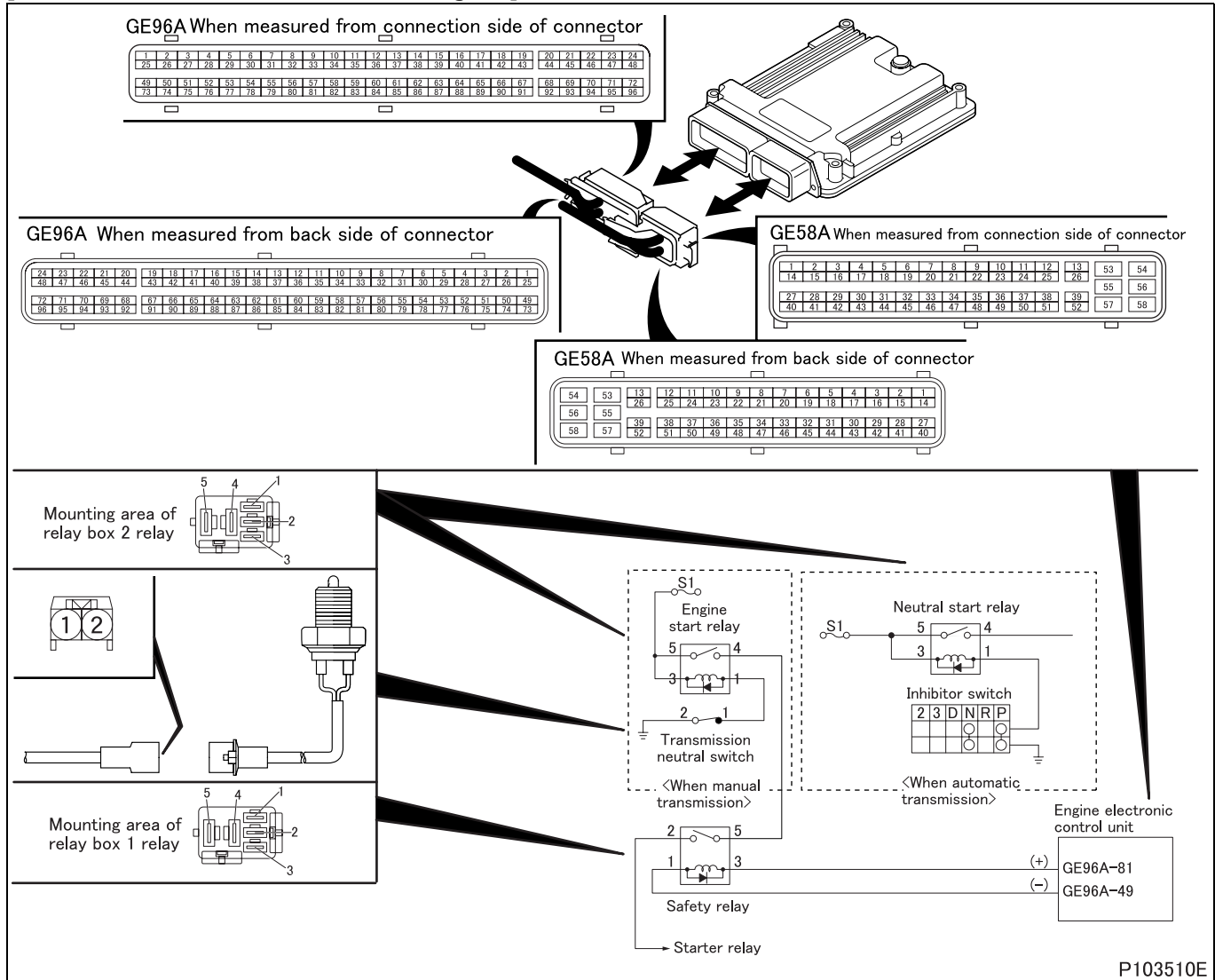
- Short-circuited harness between electronic control unit and safety relay
- Malfunction of each connector
- Malfunction of safety relay
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

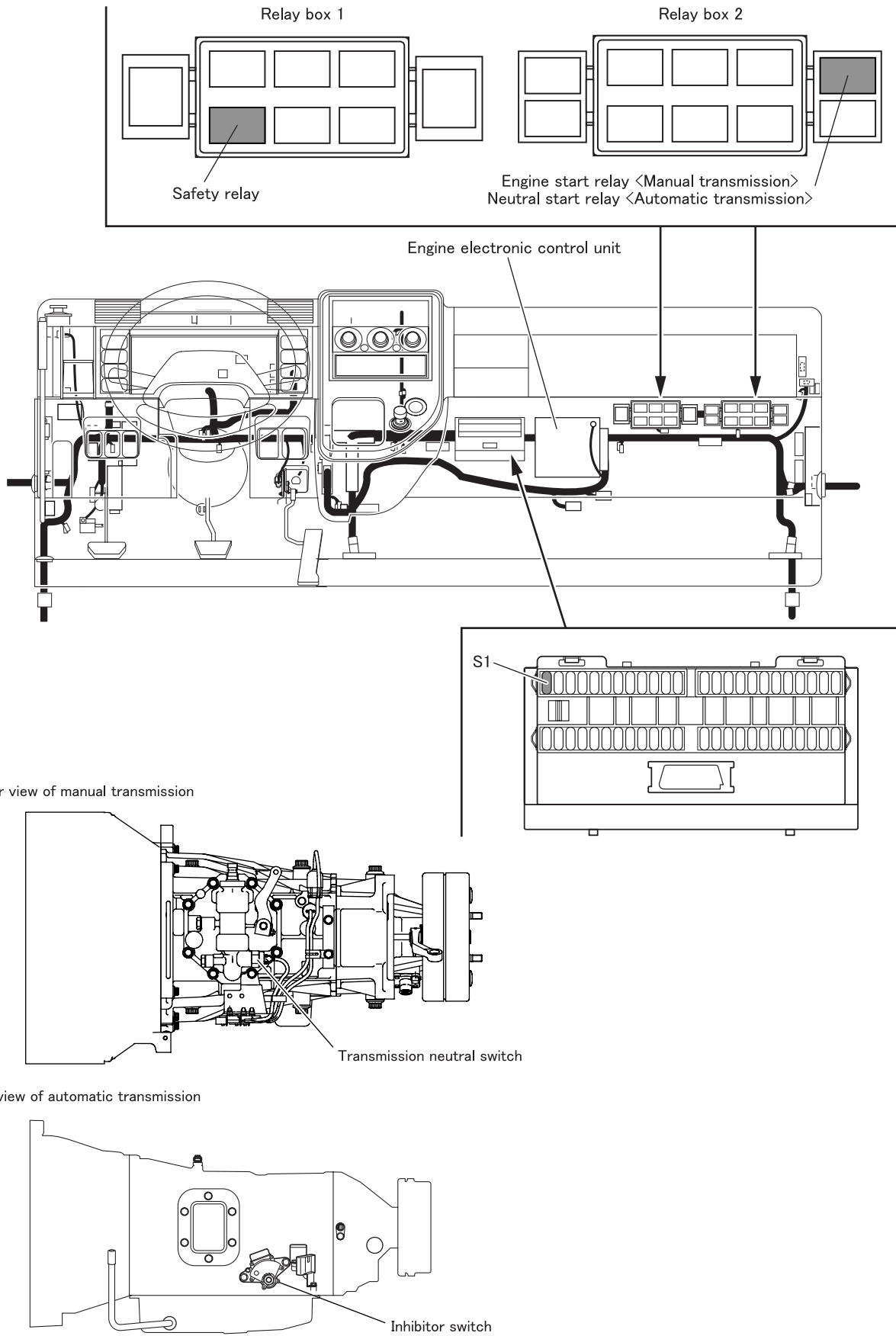
## [Electronic Control Unit Connection Diagram]



P103510E



[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

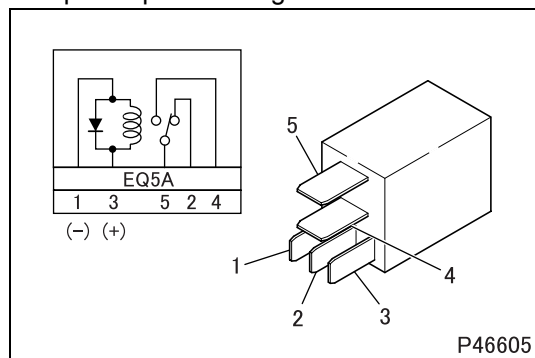
|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by electronic control unit connector                                       |
|        | Maintenance item                                       |  | Check circuit between connector (GE96A) terminal No. 81 (+) and No. 49 (-).           |
|        | Inspection condition                                   |  | Measure from back side of connector of harness with each device connected to harness. |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of relay connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of relay unit  |
|        | Maintenance item                                       |  | Measure continuity between terminals No. 2 and 5 when relay operates. |
|        | Inspection condition                                   |  | Apply battery voltage across connector terminals No. 3 (+) and 1 (-)  |
|        | Requirements   |  | There is no continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

<Step 4 inspection diagram>



|        |  |                 |   |
|--------|--|-----------------|---|
| Step 5 | Inspection items                                       |                 | Inspection of harness between relay and electronic control unit (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 81. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                          |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.   |
| NO     |  | Modify harness. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 6 | Inspection items                                       |                 | Inspection of harness between relay and electronic control unit (ground)  |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 49. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                          |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.   |
| NO     |  | Modify harness. |   |

|        |  |  |  |
|--------|--|--|--|
| Step 7 | Inspection items                                       |  | Inspection by control data                               |
|        | Maintenance item                                       |  | Perform actuator test item No. AE "Starter Safety Relay" |
|        | Inspection condition                                   |  | –  |
|        | Requirements   |  | This diagnosis code is not displayed again.              |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).                       |
| NO     |  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0616/Flash code: 48

## **[Monitor]**

Failure of safety relay

## **[Fault (outline)]**

- Short circuit ground
- Open circuit

## **[Diagnosis check]**

- Engine electronic control unit internal function monitors safety relay for short or open circuit to ground.

## **[Code generation condition]**

- Safety relay circuit remains short or open circuited to ground as detected by engine electronic control unit internal function for 3 seconds.

(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is halted.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Effects no special control.

## **[Probable cause of trouble]**

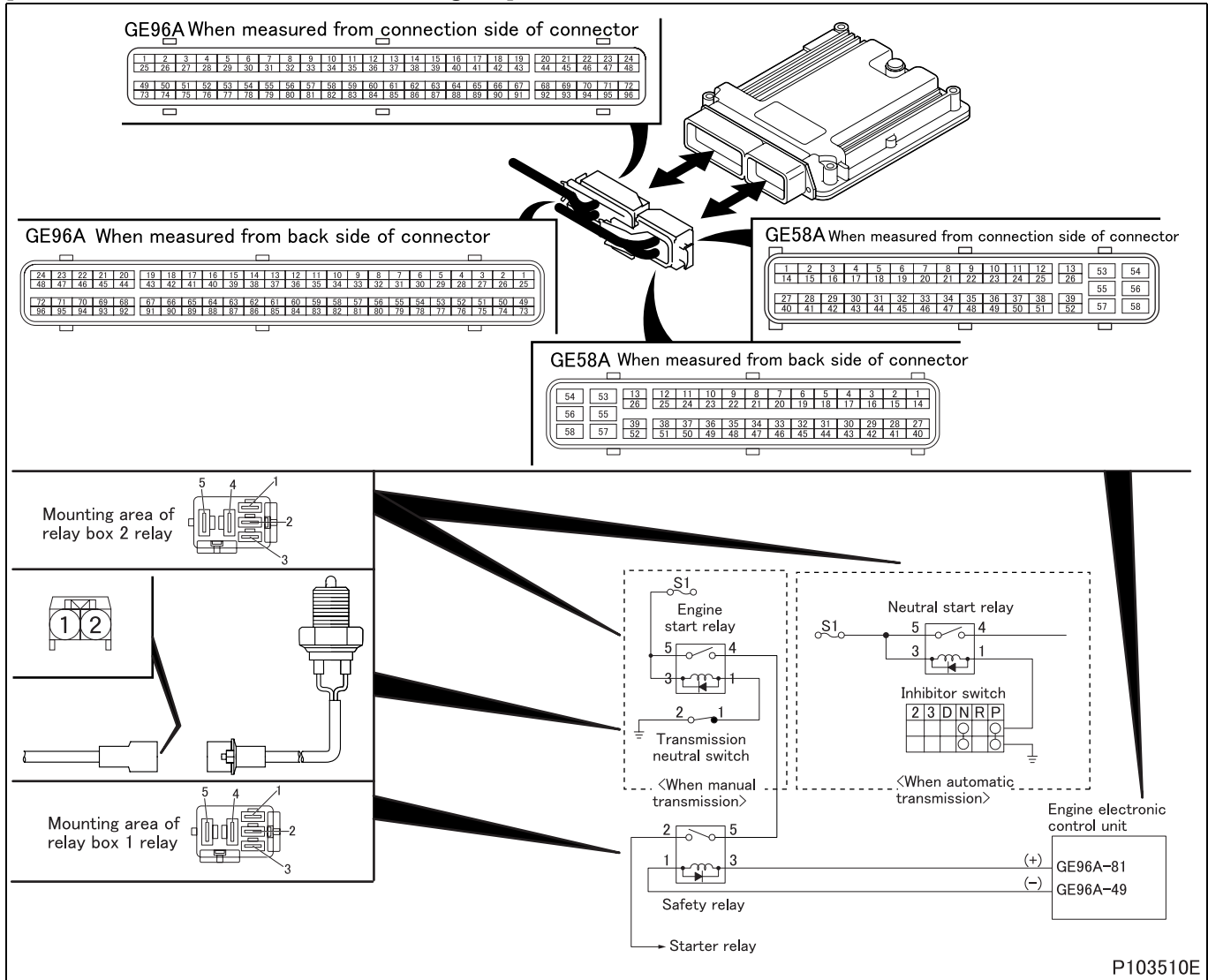
- Open-circuit or short-circuit of harness between electronic control unit and safety relay
- Malfunction of each connector
- Malfunction of safety relay
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

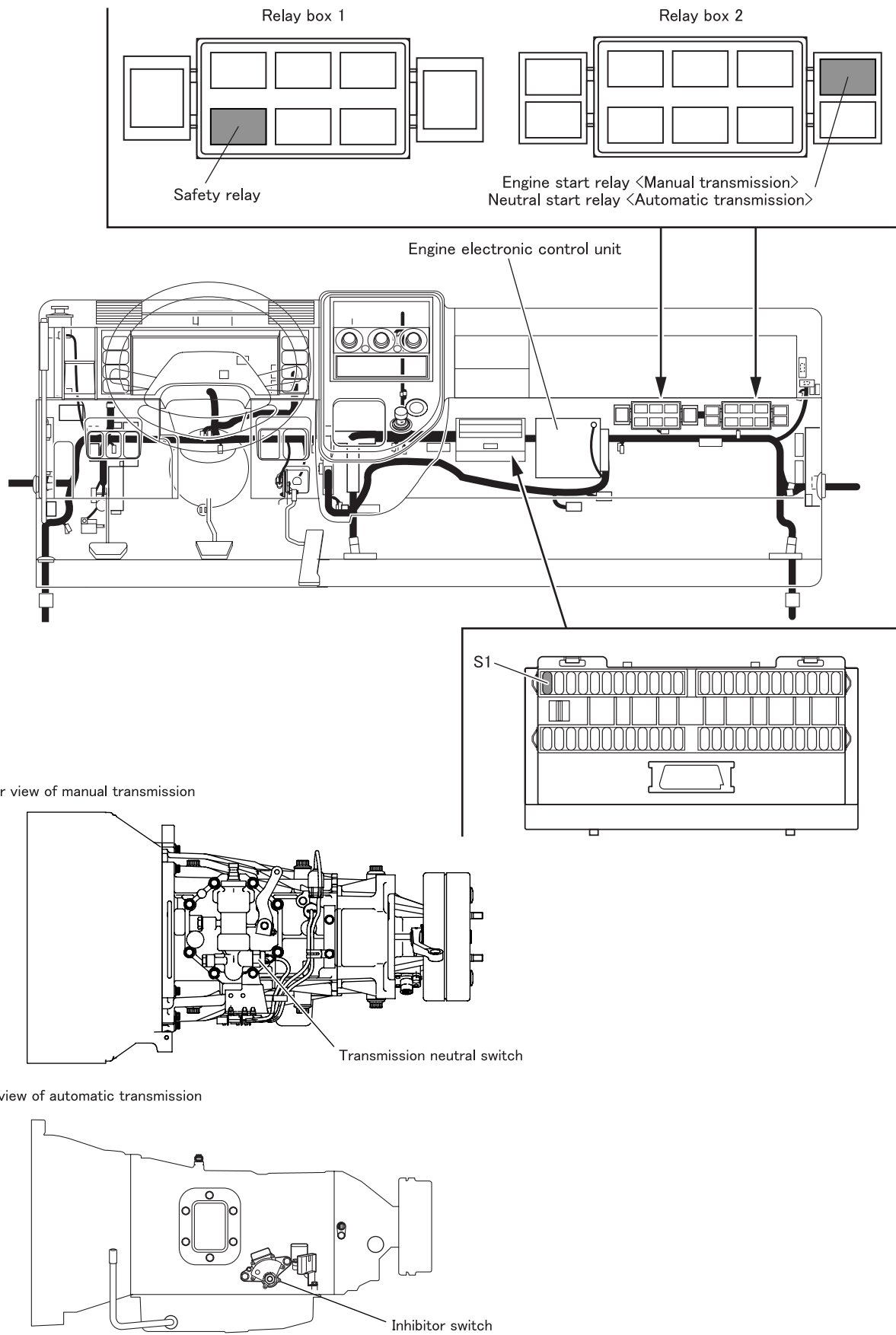
[Electronic Control Unit Connection Diagram]



P103510E

# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. AE "Starter Safety Relay"            |
|        | Inspection condition                                   |               | –   |
|        | Requirements   |               | Relay operation sound is noted (automatic reset after six seconds). |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).                                  |
| NO     |  | Go to step 2. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 81 (+) and 49 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Perform actuator test item No. AE "Starter Safety Relay"</li> </ul> |
|        | Requirements   |               | Same as battery voltage (automatic reset after six seconds)   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.   |
| NO     |  | Go to step 3. |   |

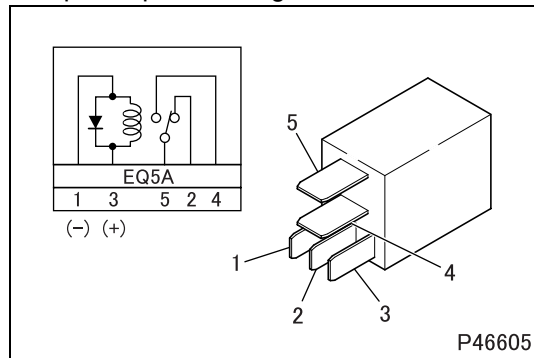
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

|        |  |   |               |
|--------|--|---|---------------|
| Step 5 | Inspection items                                       | Inspection of relay unit  |               |
|        | Maintenance item                                       | Measure continuity between terminals No. 2 and 5 when relay operates. |               |
|        | Inspection condition                                   | Apply battery voltage across connector terminals No. 3 (+) and 1 (-)  |               |
|        | Requirements   | There is no continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6. |
| NO     |  | Replacement of relay  |               |

<Step 5 inspection diagram>



|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of harness between relay and electronic control unit (power supply)                                      |               |
|        | Maintenance item                                       | Check circuit between relay connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 81. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                          |               |
|        | Requirements   | There is continuity.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6. |
| NO     |  | Modify harness.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 7 | Inspection items                                       | Inspection of harness between relay and electronic control unit (ground)  |               |
|        | Maintenance item                                       | Check circuit between relay connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 49. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                          |               |
|        | Requirements   | There is continuity.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8. |
| NO     |  | Modify harness.   |               |

|        |  |   |                                    |
|--------|--|---|------------------------------------|
| Step 8 | Inspection items                                       | Inspection by control data  |                                    |
|        | Maintenance item                                       | Perform actuator test item No. AE "Starter Safety Relay"            |                                    |
|        | Inspection condition                                   | -   |                                    |
|        | Requirements   | Relay operation sound is noted (automatic reset after six seconds). |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.). |
| NO     |  | Replacement of electronic control unit                              |                                    |



**[Fault code]**

Diagnosis code: P0617/Flash code: 48

**[Monitor]**

Failure of safety relay

**[Fault (outline)]**

Short circuit battery

**[Diagnosis check]**

- Engine electronic control unit internal function monitors safety relay for short circuit to power supply.

**[Code generation condition]**

- Safety relay circuit remains shorted to power supply as detected by engine electronic control unit internal function for 3 seconds.

(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Effects no special control.

**[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and relay
- Malfunction of each connector
- Malfunction of safety relay
- Malfunction of electronic control unit

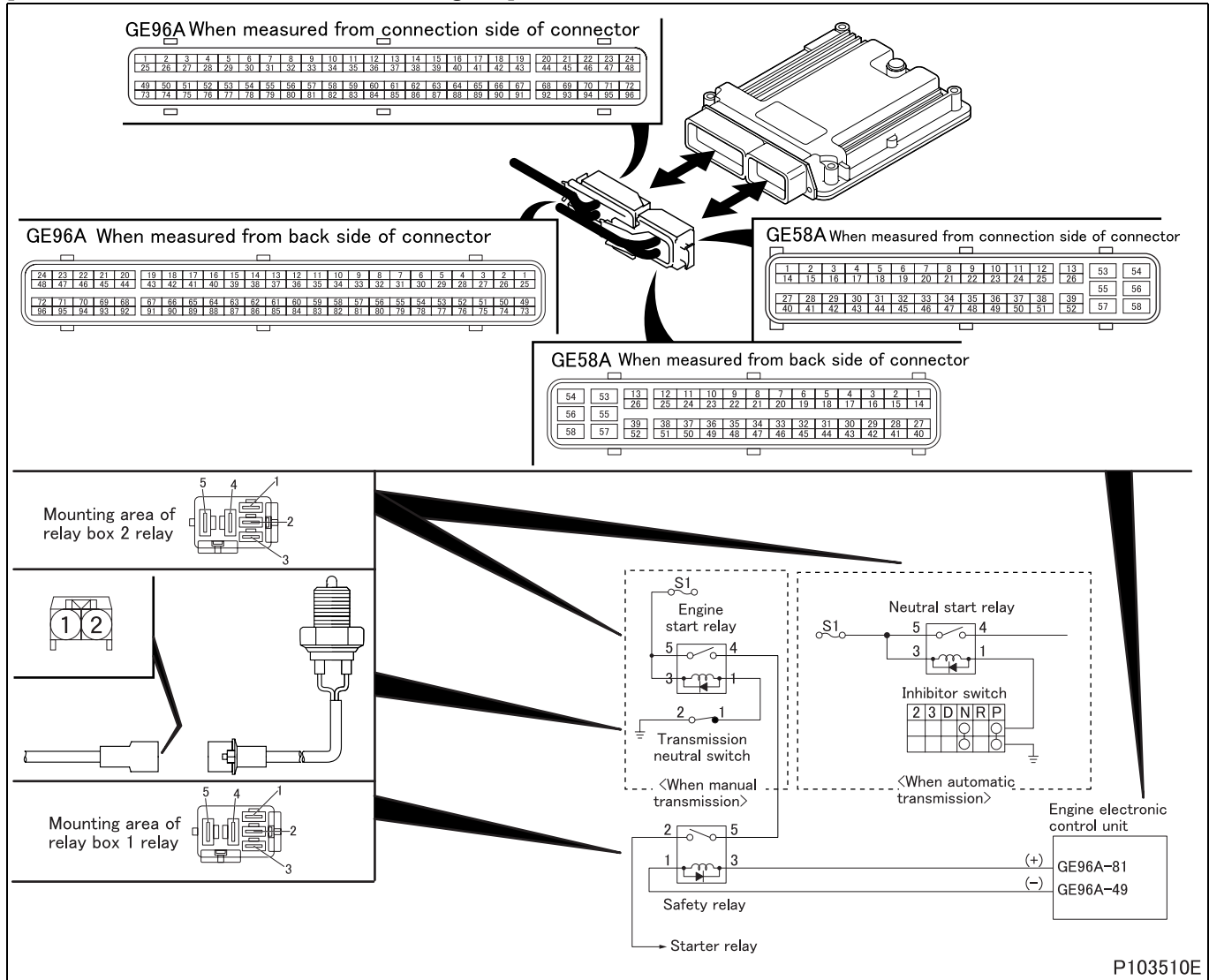
**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

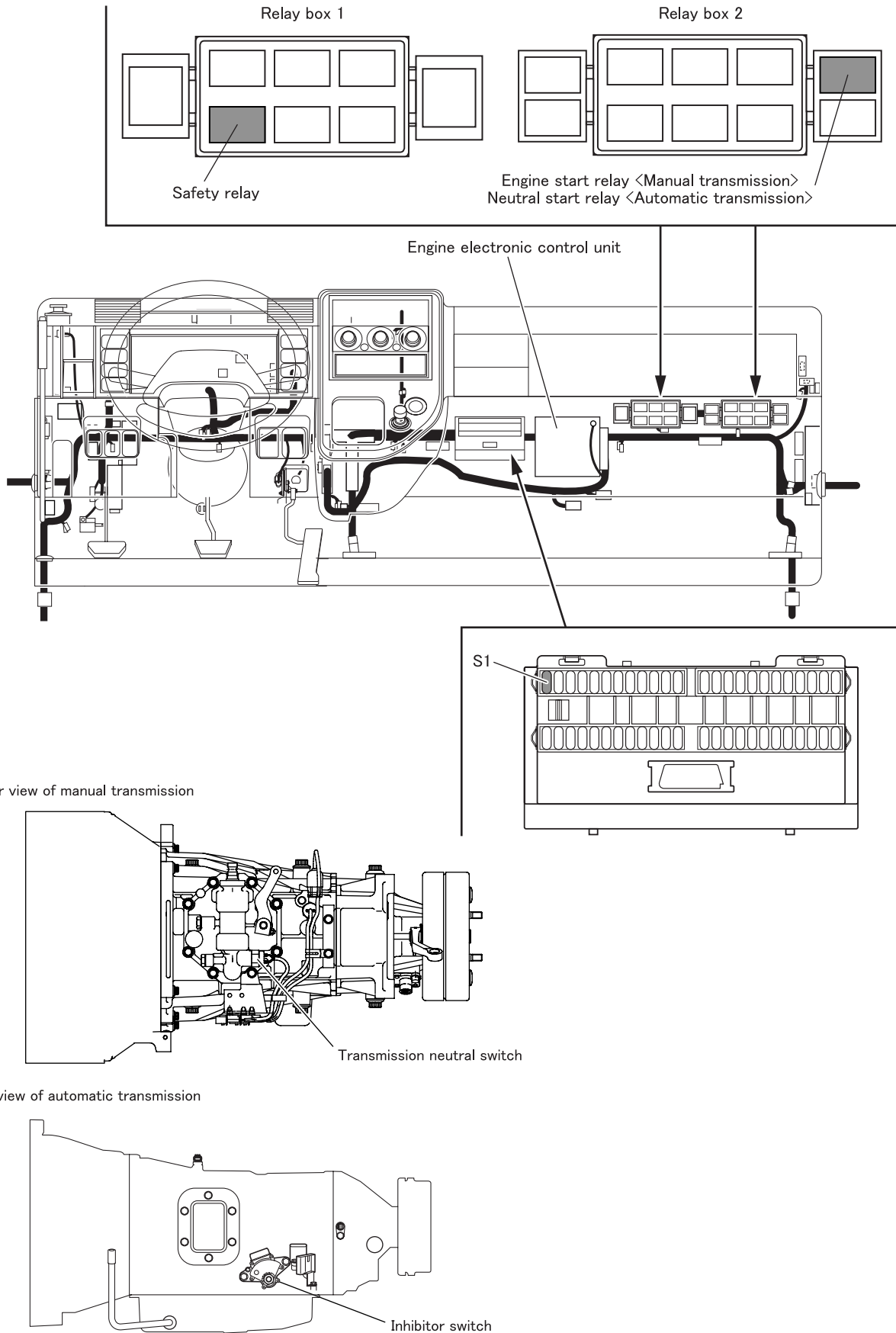
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P103510E

[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

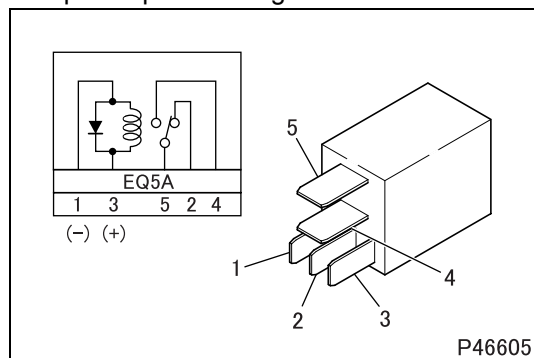
|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by electronic control unit connector                               |
|        | Maintenance item                                       |  | Measure value of resistance between connector (GE96A) terminal No. 49 and 81. |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | 343 Ω or more   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of relay connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of relay unit  |
|        | Maintenance item                                       |  | Measure continuity between terminals No. 2 and 5 when relay operates. |
|        | Inspection condition                                   |  | Apply battery voltage across connector terminals No. 3 (+) and 1 (–). |
|        | Requirements   |  | There is no continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

<Step 4 inspection diagram>



|        |  |                 |  |
|--------|--|-----------------|--|
| Step 5 | Inspection items                                       |                 | Inspection of harness between relay and electronic control unit (power supply)                                     |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 81 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                         |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness between relay and electronic control unit (power supply)             |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 3 and cab ground                        |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is no continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between relay and electronic control unit (ground)   |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 49 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                         |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform actuator test item No. AE "Starter Safety Relay"            |
|        | Inspection condition                                   |  | -   |
|        | Requirements   |  | Relay operation sound is noted (automatic reset after six seconds). |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).                                  |
| NO     |  | Replacement of electronic control unit |   |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P061B/Flash code: 33

## **[Monitor]**

Failure inside engine electronic control unit

## **[Fault (outline)]**

Plausibility

## **[Diagnosis check]**

- Injecting quantity computing function in engine electronic control unit is monitored.

## **[Code generation condition]**

- Abnormal condition has occurred in injection quantity arithmetic processing inside engine electronic control unit.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Effects no special control.

## **[Probable cause of trouble]**

- Malfunction of electronic control unit (replacement of electronic control unit)

## **[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

**[Fault code]**

Diagnosis code: P061C/Flash code: 33

**[Monitor]**

Failure inside engine electronic control unit

**[Fault (outline)]**

Plausibility

**[Diagnosis check]**

- Engine speed computing function in engine electronic control unit is monitored.

**[Code generation condition]**

- Abnormal condition has occurred in engine speed processing inside engine electronic control unit.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Effects no special control.

**[Probable cause of trouble]**

- Malfunction of electronic control unit (replacement of electronic control unit)

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P062D/Flash code: 82

## **[Monitor]**

Failure of injector circuit inside engine electronic control unit

## **[Fault (outline)]**

Injector driver circuit (No. 1 and 3 cylinders)

## **[Diagnosis check]**

- Failure of injector circuit inside engine electronic control unit

## **[Code generation condition]**

- Injector (No. 1, No. 3 cylinder) power supply voltage in engine electronic control unit remains over 61.8 V or below 43.2 V for 3 consecutive cycles (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition).

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Injector magnetic valve (No. 1 and No. 4 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Injector actuator test is inhibited.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

## **[Probable cause of trouble]**

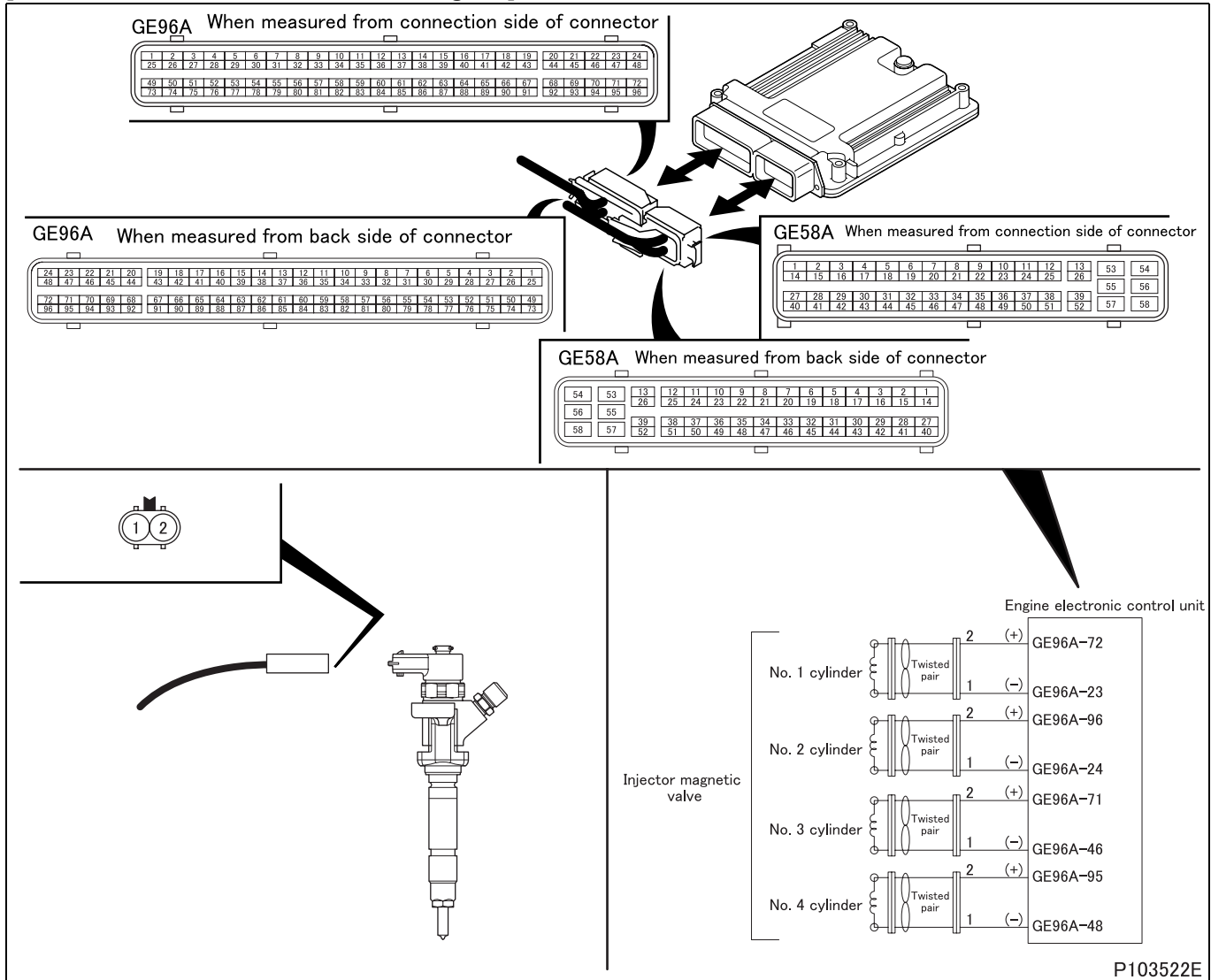
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valves
- Malfunction of each connector
- Malfunction of injector magnetic valves
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



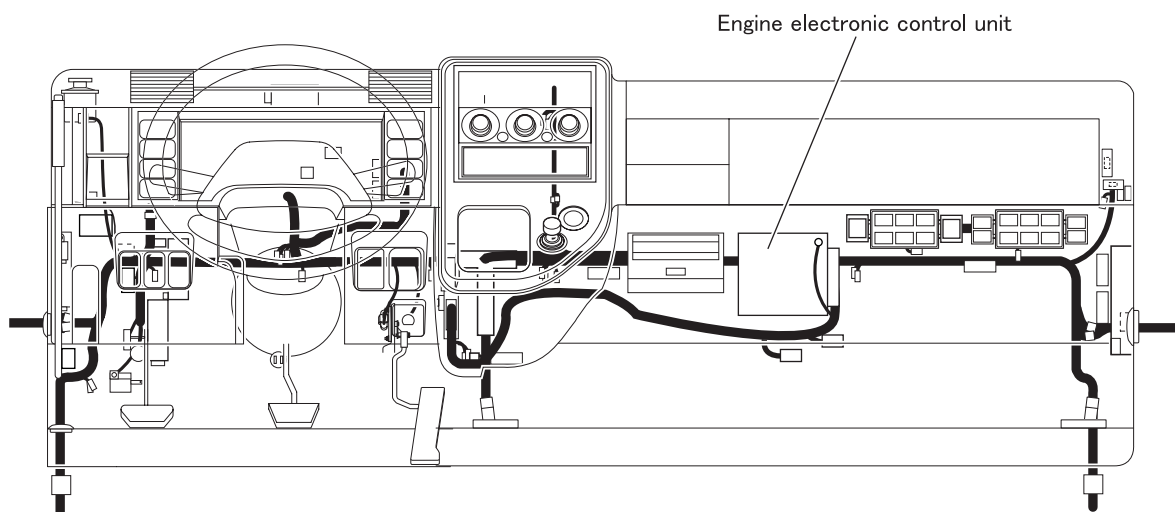
## [Electronic Control Unit Connection Diagram]



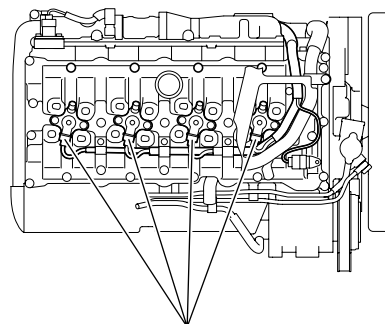
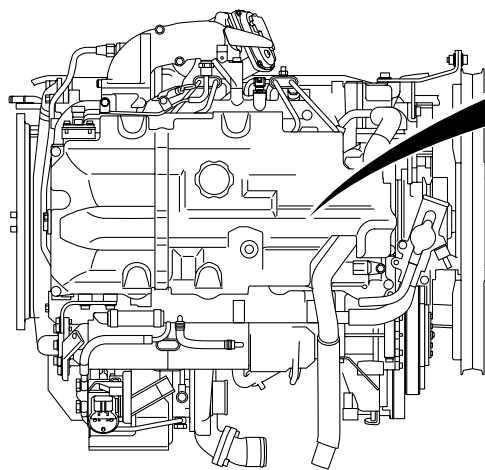
P103522E

# TROUBLESHOOTING

## [Parts Identification and Location]



Top view of engine



Injector magnetic valve

P103648E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |  |  |     |                                    |    |
|--------|--|--|--|-----|------------------------------------|----|
| Step 1 | Inspection items                                       |  | Inspection by control data   |     |                                    |    |
|        | Maintenance item                                       |  | Perform the following actuator tests. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 1 cylinder): Perform item No. BB "Injector Test 1".</li> <li>• Injector magnetic valve (No. 3 cylinder): Perform item No. BE "Injector Test 4".</li> </ul> |     |                                    |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul>                                |     |                                    |    |
|        | Requirements   |  | Injector (No. 1 cylinder) or Injector (No. 3 cylinder) stops injection and engine vibrations become slightly larger.   |     |                                    |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to transient fault (See Gr00.).</td> </tr> <tr> <td>NO</td> <td>Go to step 2.</td> </tr> </table>  | YES | Go to transient fault (See Gr00.). | NO |
| YES    | Go to transient fault (See Gr00.).                     |  |  |     |                                    |    |
| NO     | Go to step 2.  |  |  |     |                                    |    |

|        |  |  |   |     |               |    |
|--------|--|--|---|-----|---------------|----|
| Step 2 | Inspection items                                       |  | Inspection by electronic control unit connector   |     |               |    |
|        | Maintenance item                                       |  | Measure value of resistance between following connector (GE96A) terminals. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 1 cylinder): 72 (+) and 23 (-)</li> <li>• Injector magnetic valve (No. 3 cylinder): 71 (+) and 46 (-)</li> </ul> |     |               |    |
|        | Inspection condition                                   |  | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |     |               |    |
|        | Requirements   |  | 0.255 ± 0.04 Ω (20°C {68°F})  |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 3.</td> </tr> <tr> <td>NO</td> <td>Go to step 4.</td> </tr> </table>  | YES | Go to step 3. | NO |
| YES    | Go to step 3.  |  |   |     |               |    |
| NO     | Go to step 4.  |  |   |     |               |    |

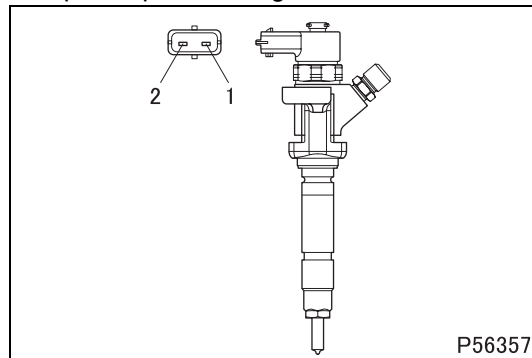
|        |  |  |   |     |               |    |
|--------|--|--|---|-----|---------------|----|
| Step 3 | Inspection items                                       |  | Inspection of electronic control unit connector   |     |               |    |
|        | Maintenance item                                       |  | Inspection of connector   |     |               |    |
|        | Inspection condition                                   |  | –   |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 8.</td> </tr> <tr> <td>NO</td> <td>Modify connector.</td> </tr> </table>  | YES | Go to step 8. | NO |
| YES    | Go to step 8.  |  |   |     |               |    |
| NO     | Modify connector.                                      |  |   |     |               |    |

|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 4 | Inspection items                                       |  | Inspection of injector magnetic valve connector  |     |               |    |
|        | Maintenance item                                       |  | Inspection of connector  |     |               |    |
|        | Inspection condition                                   |  | –  |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• Connection to terminal is appropriate.</li> </ul> |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 5.</td> </tr> <tr> <td>NO</td> <td>Modify connector.</td> </tr> </table>           | YES | Go to step 5. | NO |
| YES    | Go to step 5.  |  |  |     |               |    |
| NO     | Modify connector.                                      |  |  |     |               |    |

# TROUBLESHOOTING

|        |  |  |   |
|--------|--|--|---|
| Step 5 | Inspection items                                       |  | Inspection of injector magnetic valve unit                          |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2. |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | 0.255 ± 0.04 Ω (20°C {68°F})  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 6.<br>NO Replacement of injector                     |

<Step 5 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of harness between injector magnetic valve and electronic control unit (power supply)  |
|        | Maintenance item                                       |  | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 1 cylinder): magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 72</li> <li>• Injector magnetic valve (No. 3 cylinder): magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 71</li> </ul> |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 7.<br>NO Modify harness.   |

|        |  |  |   |
|--------|--|--|---|
| Step 7 | Inspection items                                       |  | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |
|        | Maintenance item                                       |  | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 1 cylinder): magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 23</li> <li>• Injector magnetic valve (No. 3 cylinder): magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 46</li> </ul> |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 8.<br>NO Modify harness.   |

|        |  |  |  |
|--------|--|--|--|
| Step 8 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Perform the following actuator tests. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 1 cylinder): Perform item No. BB "Injector Test 1".</li> <li>• Injector magnetic valve (No. 3 cylinder): Perform item No. BE "Injector Test 4".</li> </ul> |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul>                                |
|        | Requirements   |  | Injector (No. 1 cylinder) or Injector (No. 3 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO     |  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P062E/Flash code: 82

## **[Monitor]**

Failure of injector circuit inside engine electronic control unit

## **[Fault (outline)]**

Injector driver circuit (No. 2 and 4 cylinders)

## **[Diagnosis check]**

- Injector power supply voltage in engine electronic control unit is monitored.

## **[Code generation condition]**

- Injector (No. 2, No. 4 cylinder) power supply voltage in engine electronic control unit remains over 61.8 V or below 43.2 V for 3 consecutive cycles (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition).

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Injector magnetic valve (No. 2 and No. 3 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Injector actuator test is inhibited.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

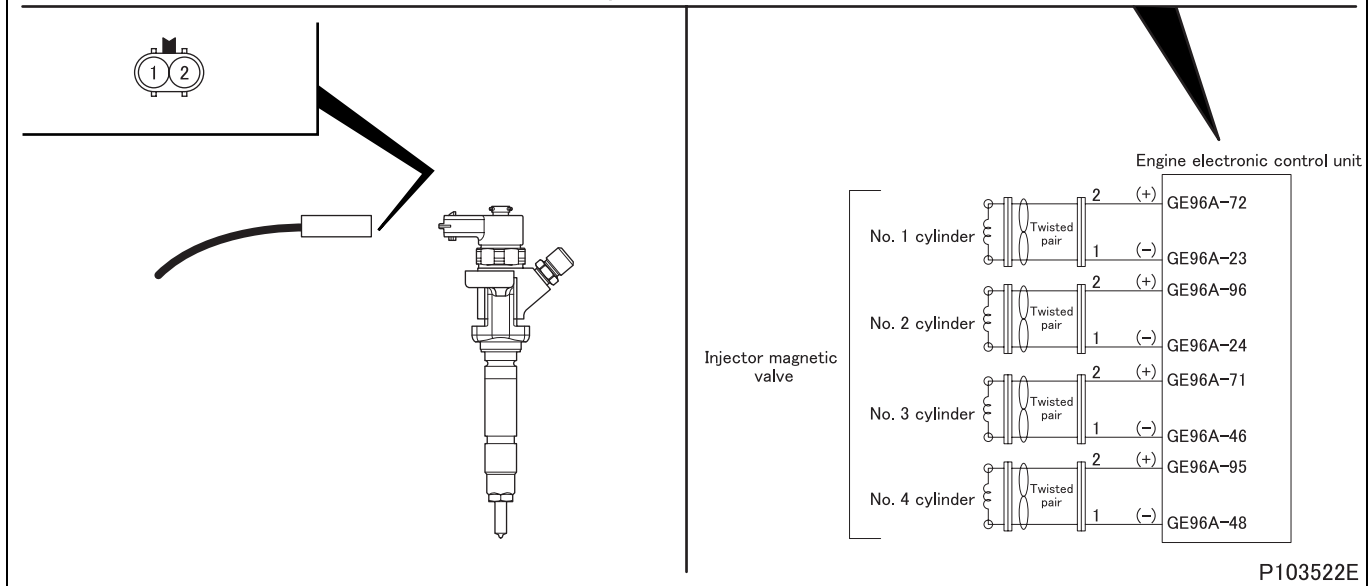
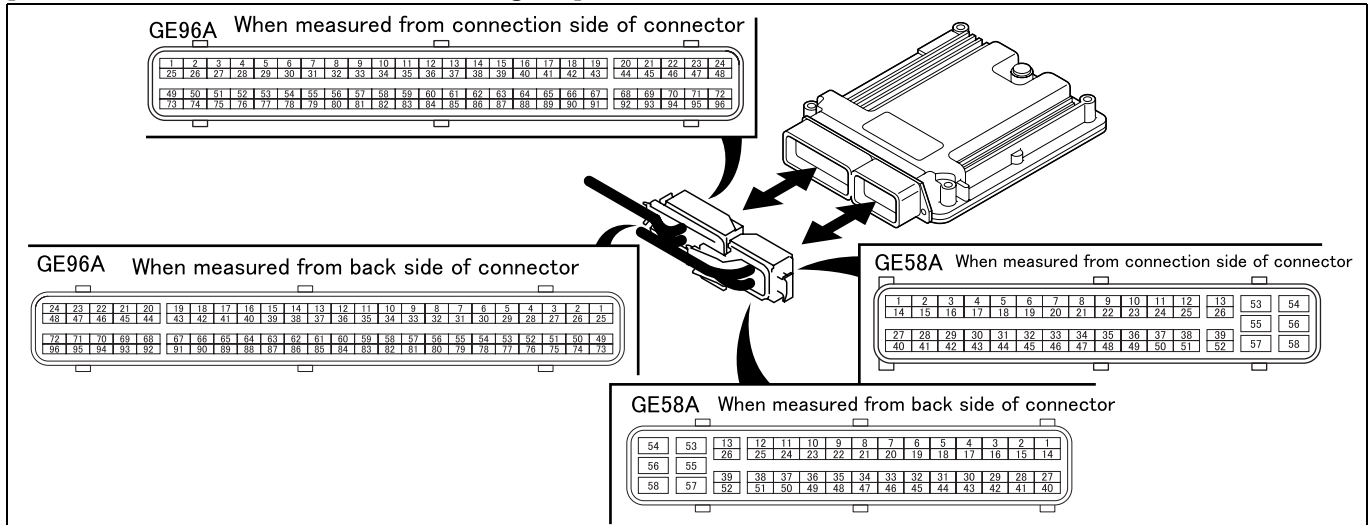
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valves
- Malfunction of each connector
- Malfunction of injector magnetic valves
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

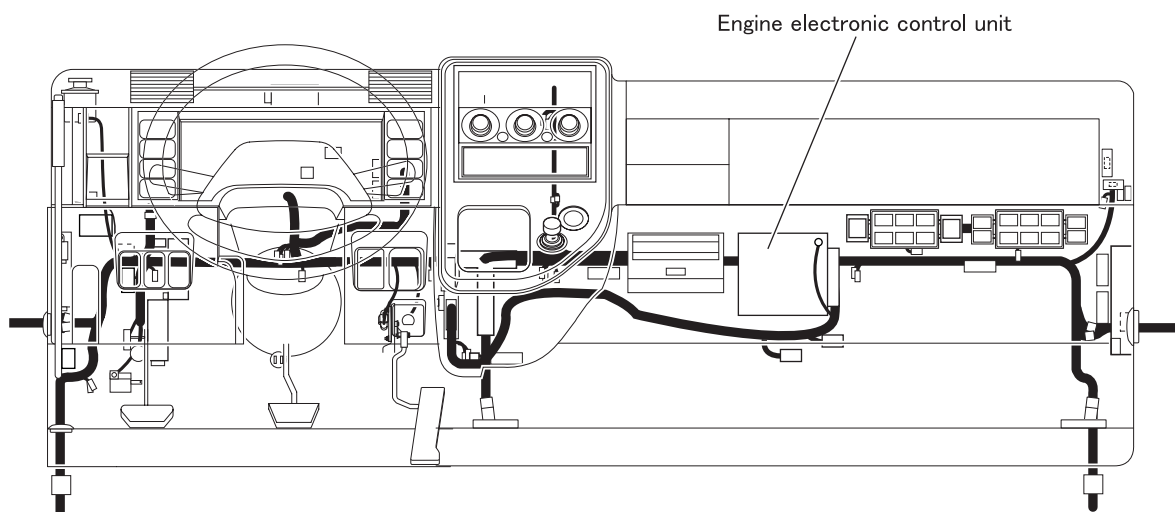
[Electronic Control Unit Connection Diagram]



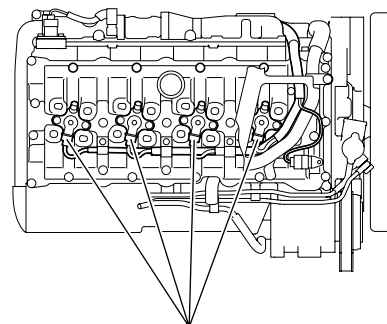
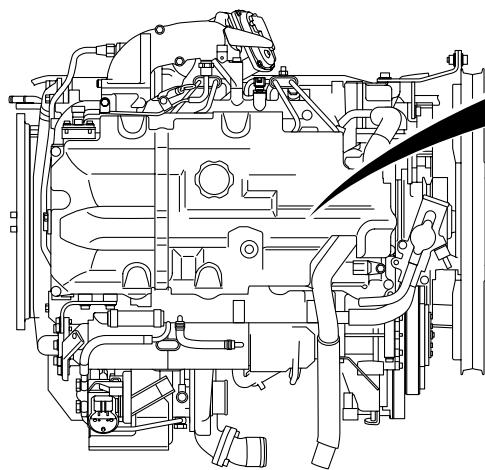
P103522E

# TROUBLESHOOTING

## [Parts Identification and Location]



Top view of engine



Injector magnetic valve

P103648E



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | Perform the following actuator tests. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 2 cylinder): Perform item No. BD "Injector Test 3".</li> <li>• Injector magnetic valve (No. 4 cylinder): Perform item No. BC "Injector Test 2".</li> </ul> |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul>                                |
|        | Requirements   |               | Injector (No. 2 cylinder) or Injector (No. 4 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |               | Measure value of resistance between following connector (GE96A) terminals. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 2 cylinder): 96 (+) and 24 (-)</li> <li>• Injector magnetic valve (No. 4 cylinder): 95 (+) and 48 (-)</li> </ul> |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |
|        | Requirements   |               | 0.255 ± 0.04 Ω (20°C {68°F})  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

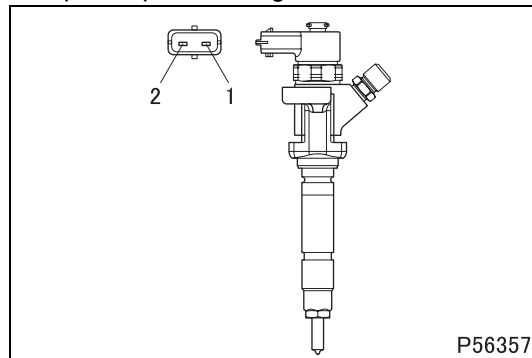
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |

# TROUBLESHOOTING

|        |  |  |   |
|--------|--|--|---|
| Step 5 | Inspection items                                       |  | Inspection of injector magnetic valve unit                          |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2. |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | $0.255 \pm 0.04 \Omega$ (20°C {68°F})                               |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 6.<br>NO Replacement of injector                     |

<Step 5 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of harness between injector magnetic valve and electronic control unit (power supply)  |
|        | Maintenance item                                       |  | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 2 cylinder): magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 96</li> <li>• Injector magnetic valve (No. 4 cylinder): magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 95</li> </ul> |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 7.<br>NO Modify harness.   |

|        |  |  |   |
|--------|--|--|---|
| Step 7 | Inspection items                                       |  | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |
|        | Maintenance item                                       |  | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 2 cylinder): magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 24</li> <li>• Injector magnetic valve (No. 4 cylinder): magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 48</li> </ul> |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 8.<br>NO Modify harness.   |

|        |  |  |  |
|--------|--|--|--|
| Step 8 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Perform the following actuator tests. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 2 cylinder): Perform item No. BD "Injector Test 3".</li> <li>• Injector magnetic valve (No. 4 cylinder): Perform item No. BC "Injector Test 2".</li> </ul> |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul>                                |
|        | Requirements   |  | Injector (No. 2 cylinder) or Injector (No. 4 cylinder) stops injection and engine vibrations become slightly larger.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO     |  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0642/Flash code: 81

## **[Monitor]**

Sensor power supply abnormal

## **[Fault (outline)]**

Low signal range check

## **[Diagnosis check]**

- Sensor supply voltage 1 in engine electronic control unit is monitored.
- Units served by sensor supply voltage 1
- Accelerator pedal position sensor (sensor 1)
- Intake air temperature sensor

## **[Code generation condition]**

- Supply voltage to units remain below 4.7 V for 0.5 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

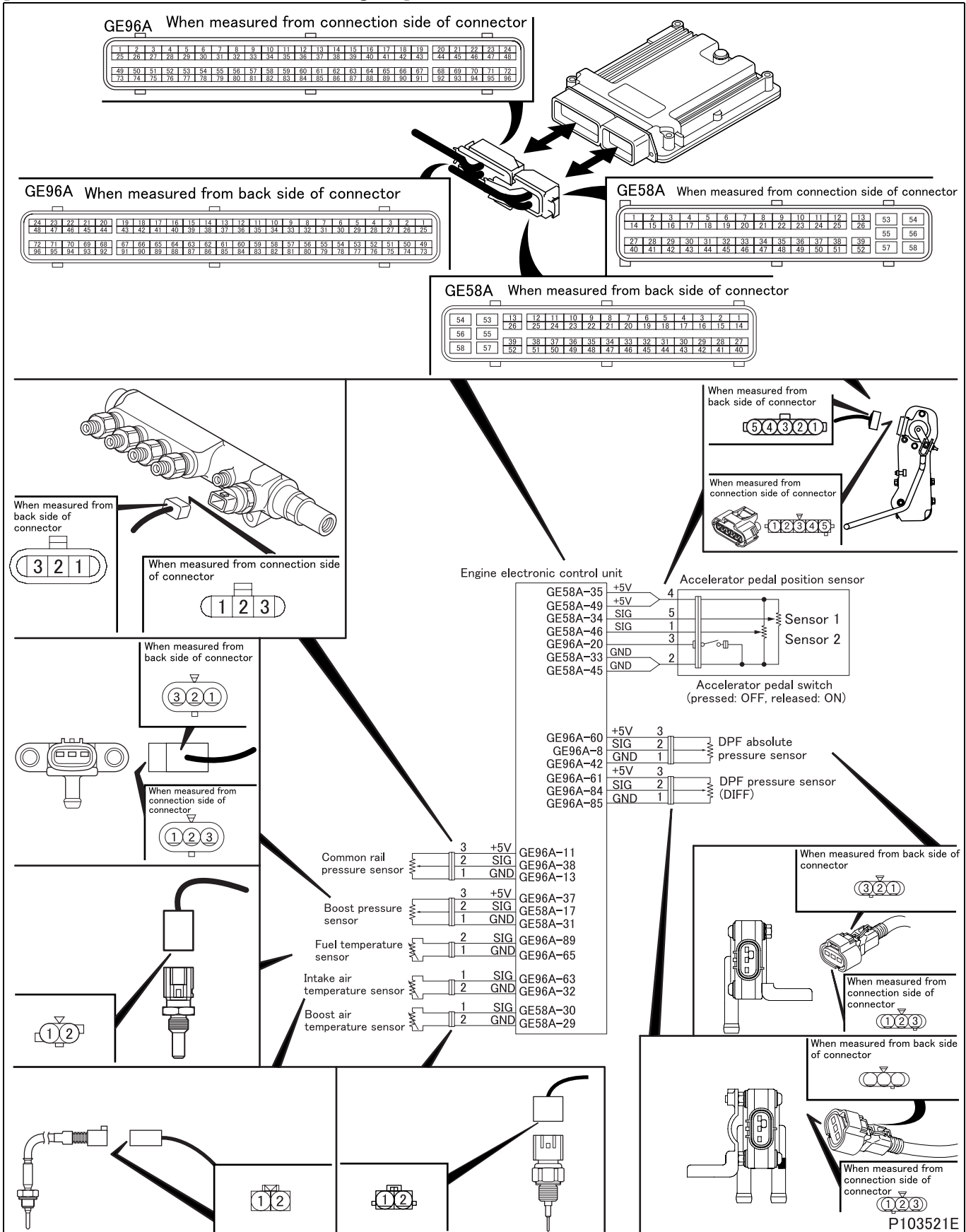
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and each sensor
- Malfunction of each connector
- Malfunction of each sensor
- Malfunction of electronic control unit

## **[Recoverability]**

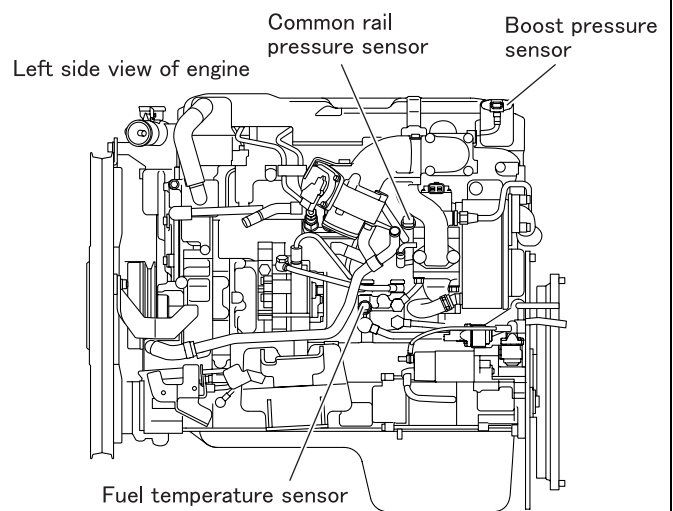
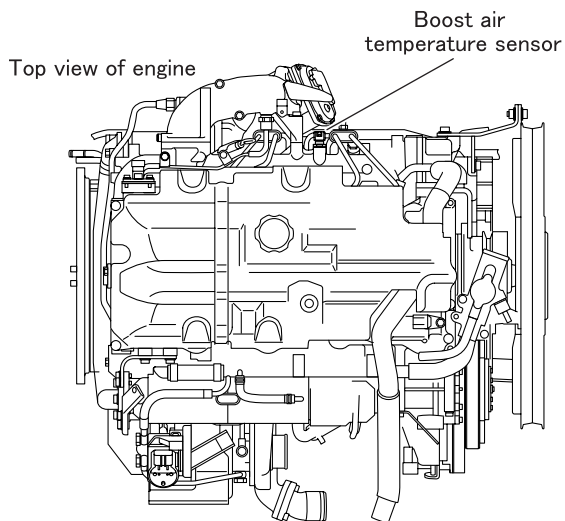
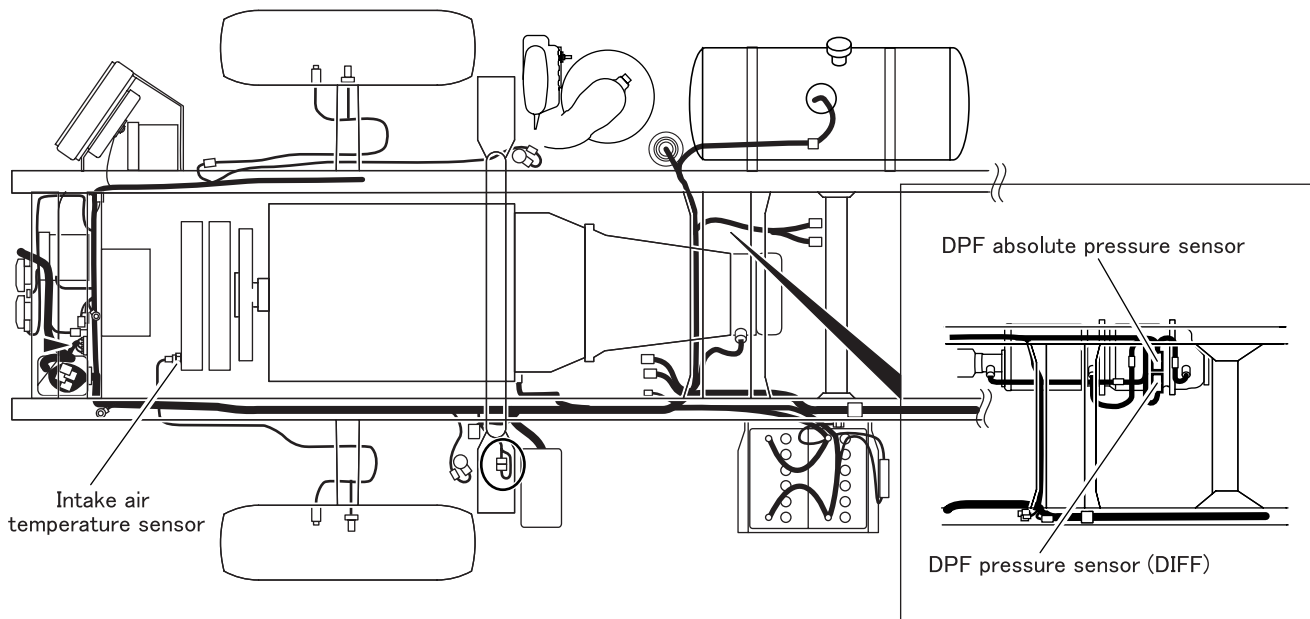
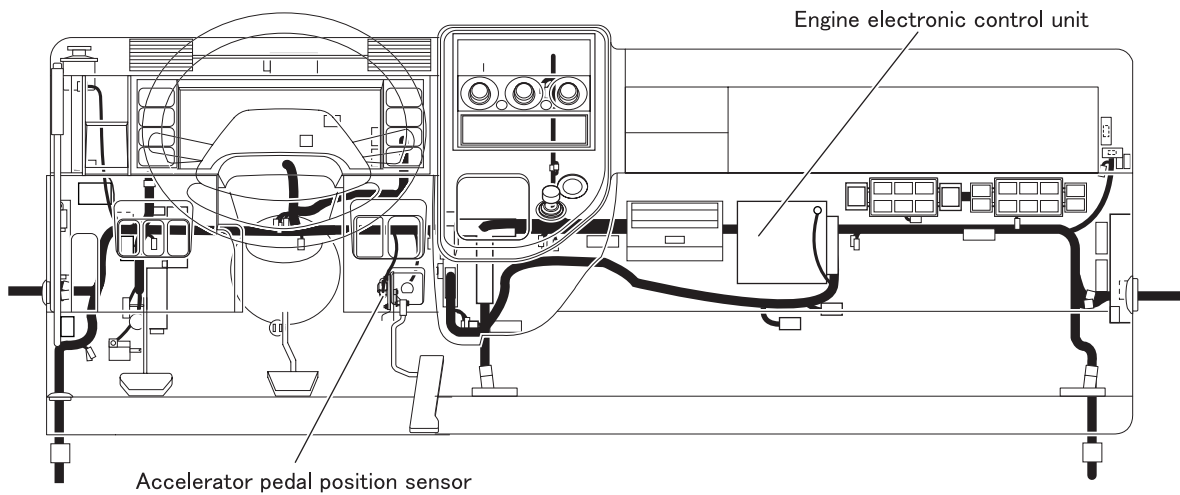
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |   |               |
|--------|--|---|---------------|
| Step 1 | Inspection items                                       | Inspection of electronic control unit connector   |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | –   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 2. |
| NO     |  | Modify connector.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 2 | Inspection items                                       | Inspection by electronic control unit connector (power supply): accelerator pedal position sensor (sensor 1)  |               |
|        | Maintenance item                                       | Measure value of voltage between connector (GE58A) terminal No. 35 (+) and No. 33 (–).  |               |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |               |
|        | Requirements   | 5 V   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5. |
| NO     |  | Go to step 3.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 3 | Inspection items                                       | Inspection of accelerator pedal position sensor (sensor 1) connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | –   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 4. |
| NO     |  | Modify connector.   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 4 | Inspection items                                       | Inspection of harness between electronic control unit and accelerator pedal position sensor (sensor 1) (power supply)                                      |               |
|        | Maintenance item                                       | Check circuit between accelerator pedal position sensor (sensor 1) connector terminal No. 4 and electronic control unit connector (GE58A) terminal No. 35. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.   |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 5. |
| NO     |  | Modify harness.  |               |

|        |  |   |                                    |
|--------|--|---|------------------------------------|
| Step 5 | Inspection items                                       | Inspection by electronic control unit connector: intake air temperature sensor  |                                    |
|        | Maintenance item                                       | Measure value of voltage between connector (GE96A) terminal No. 63 (+) and No. 32 (–).  |                                    |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |                                    |
|        | Requirements   | 5 V   |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.). |
| NO     |  | Go to step 6.   |                                    |

# TROUBLESHOOTING

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of intake air temperature sensor connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic control unit and intake air temperature sensor (power supply)                                     |
|        | Maintenance item                                       |                 | Check circuit between intake air temperature sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 63 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Replacement of electronic control unit   |
| NO     |  | Modify harness. |  |



**[Fault code]**

Diagnosis code: P0643/Flash code: 81

**[Monitor]**

Sensor power supply abnormal

**[Fault (outline)]**

High signal range check

**[Diagnosis check]**

- Sensor supply voltage 1 in engine electronic control unit is monitored.
- Units served by sensor supply voltage 1
- Accelerator pedal position sensor (sensor 1)
- Intake air temperature sensor

**[Code generation condition]**

- Supply voltage to units remain over 5.3 V for 0.5 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

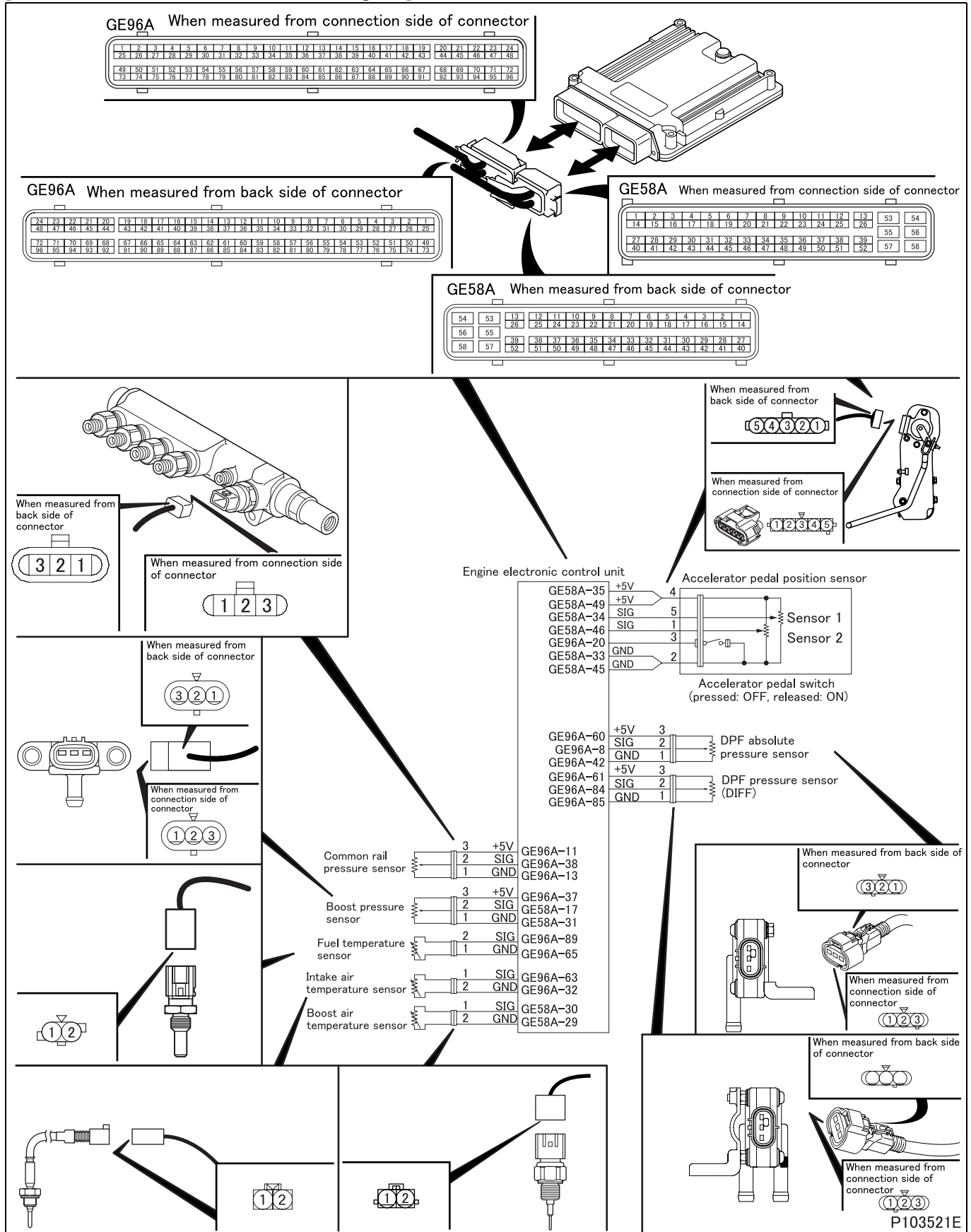
- Open-circuit or short-circuit of harness between electronic control unit and each sensor
- Malfunction of each connector
- Malfunction of each sensor
- Malfunction of electronic control unit

**[Recoverability]**

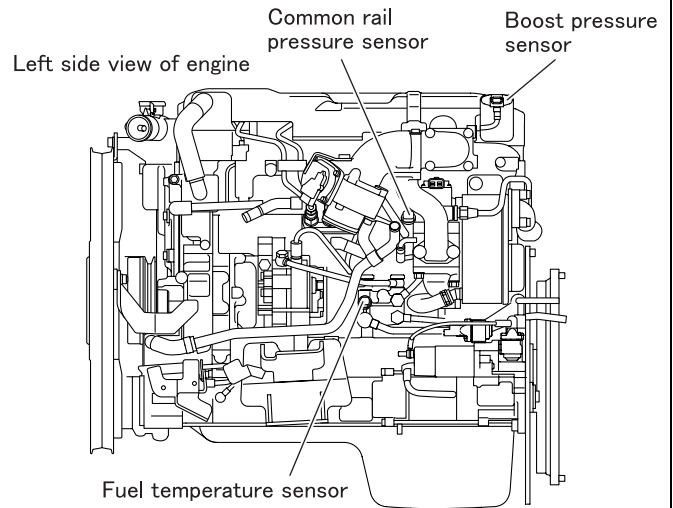
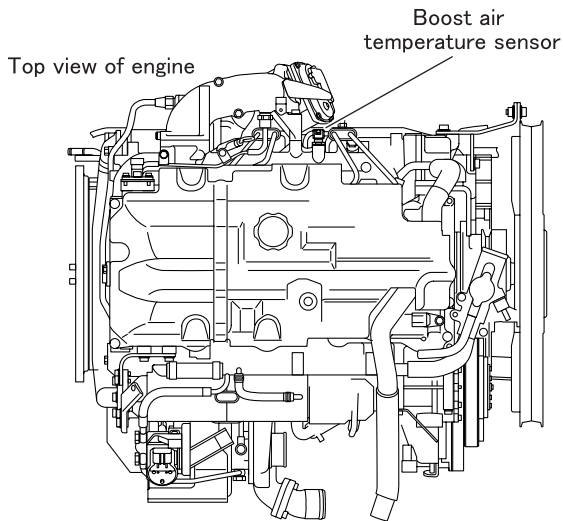
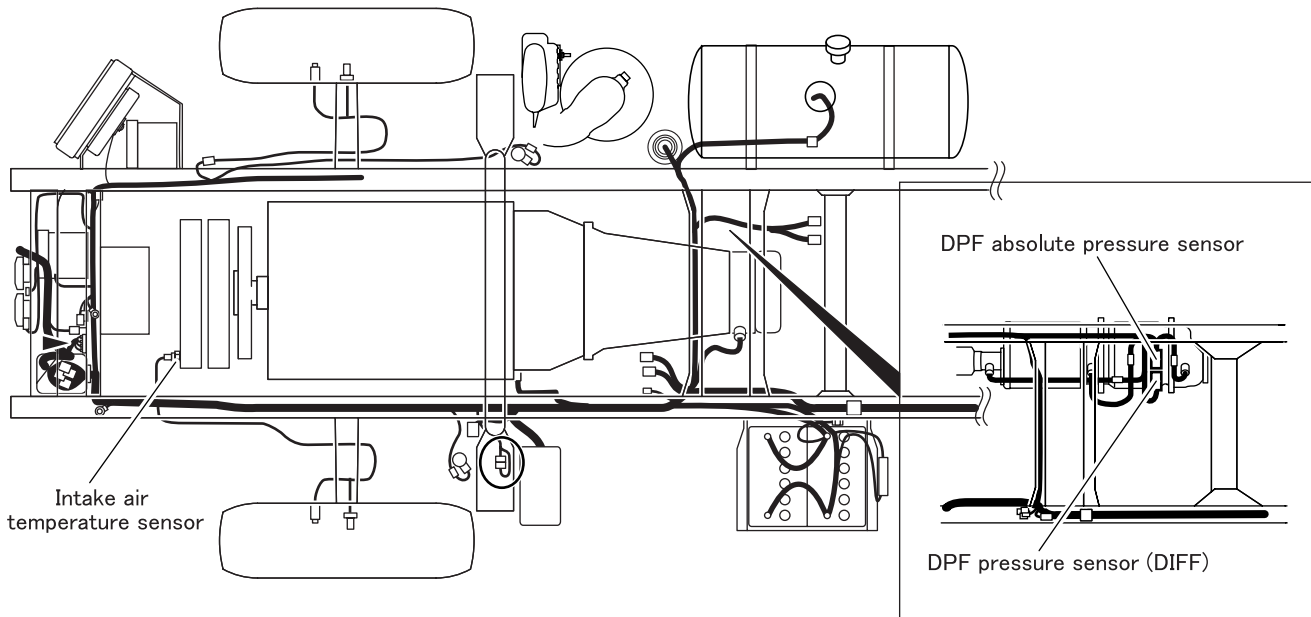
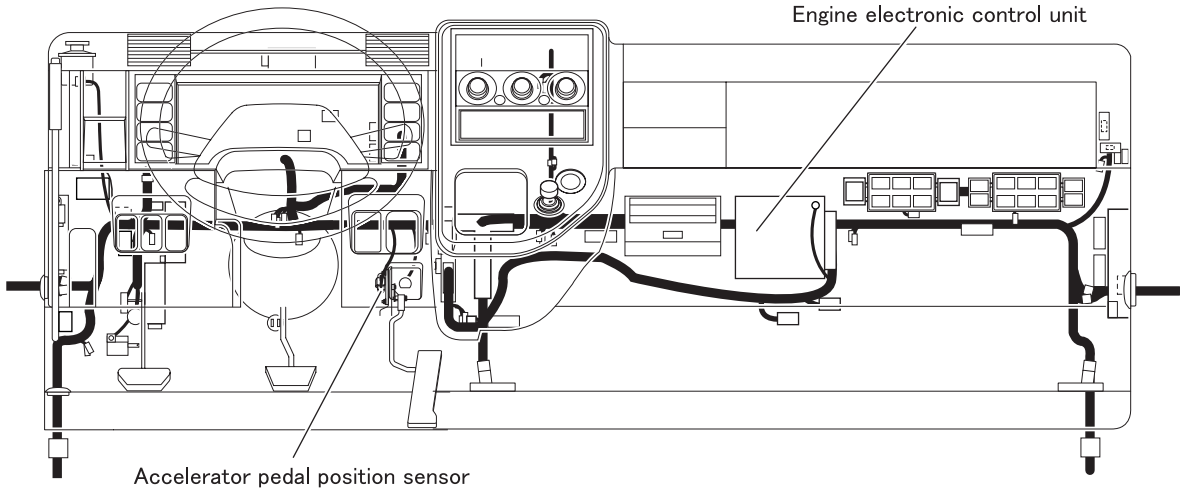
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 1 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 2.   |
| NO     |  | Modify connector. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply): accelerator pedal position sensor (sensor 1)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE58A) terminal No. 35 (+) and No. 33 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 5.   |
| NO     |  | Go to step 3. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of accelerator pedal position sensor (sensor 1) connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 4 | Inspection items                                       |                 | Inspection of harness between electronic control unit and accelerator pedal position sensor (sensor 1) (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between accelerator pedal position sensor (sensor 1) connector terminal No. 4 and electronic control unit connector (GE58A) terminal No. 35. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 5.  |
| NO     |  | Modify harness. |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 5 | Inspection items                                       |               | Inspection by electronic control unit connector: intake air temperature sensor  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 63 (+) and No. 32 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 6. |   |

|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of intake air temperature sensor connector   |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify connector.   |               |

|        |  |  |  |
|--------|--|--|--|
| Step 7 | Inspection items                                       | Inspection of harness between electronic control unit and intake air temperature sensor (power supply)                                     |  |
|        | Maintenance item                                       | Check circuit between intake air temperature sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 63 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.   |  |
|        | Requirements   | There is continuity.   |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Replacement of electronic control unit |
| NO     |  | Modify harness.  |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0650/Flash code: 3

## **[Monitor]**

Failure of engine warning lamp (orange)

## **[Fault (outline)]**

- Short circuit battery
- Short circuit ground
- Open circuit
- Overload

## **[Diagnosis check]**

- Engine warning lamp (orange) circuit is monitored for fault.

## **[Code generation condition]**

- Engine warning lamp (orange) circuit remains open, shorted or overcurrent as detected for 5 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.
- Fault diagnosis is performed each time when the control is halted.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Effects no special control.

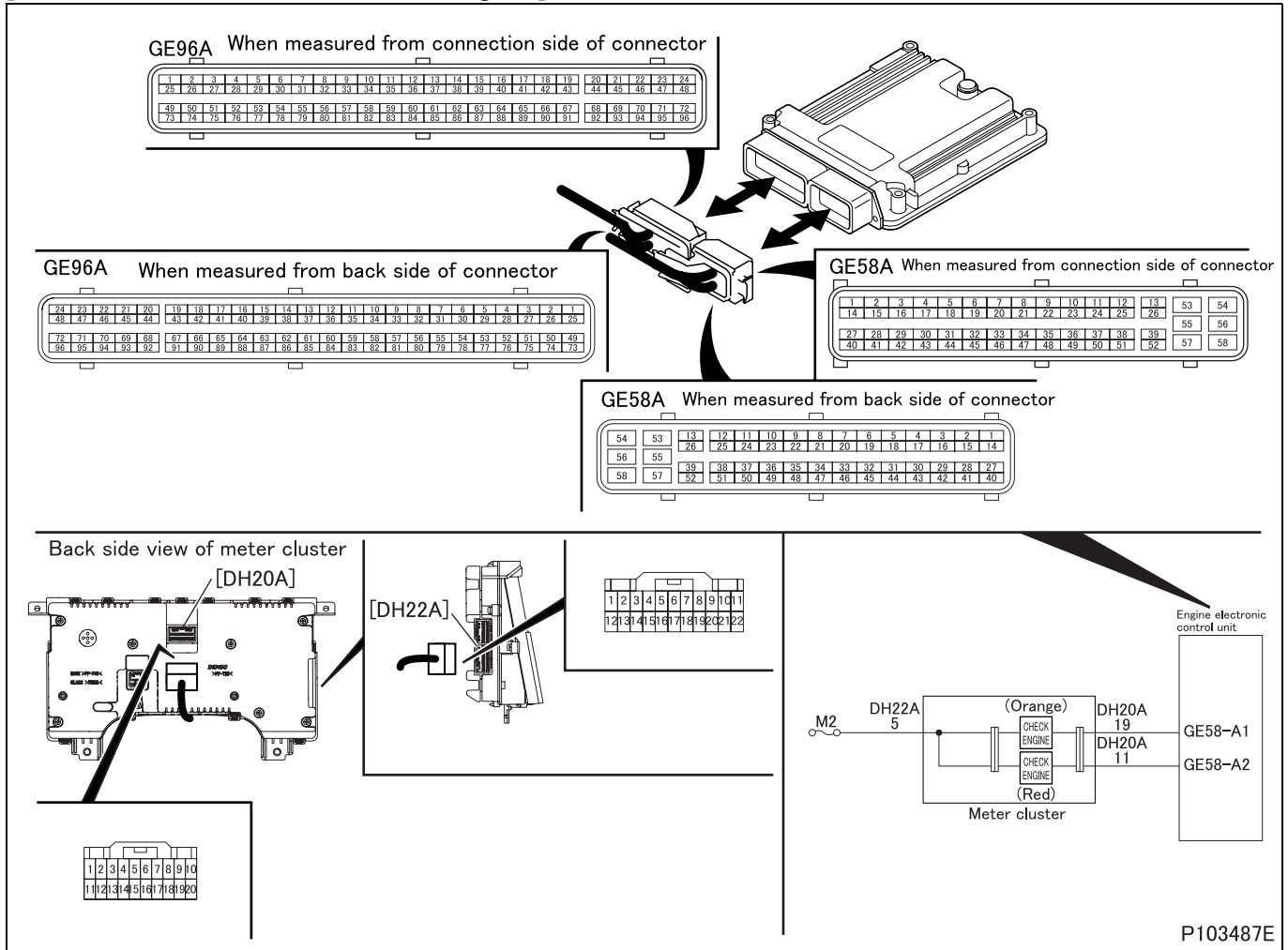
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and meter cluster (engine warning lamp (orange))
- Malfunction of each connector
- Malfunction of meter cluster (engine warning lamp (orange))
- Malfunction of electronic control unit

## **[Recoverability]**

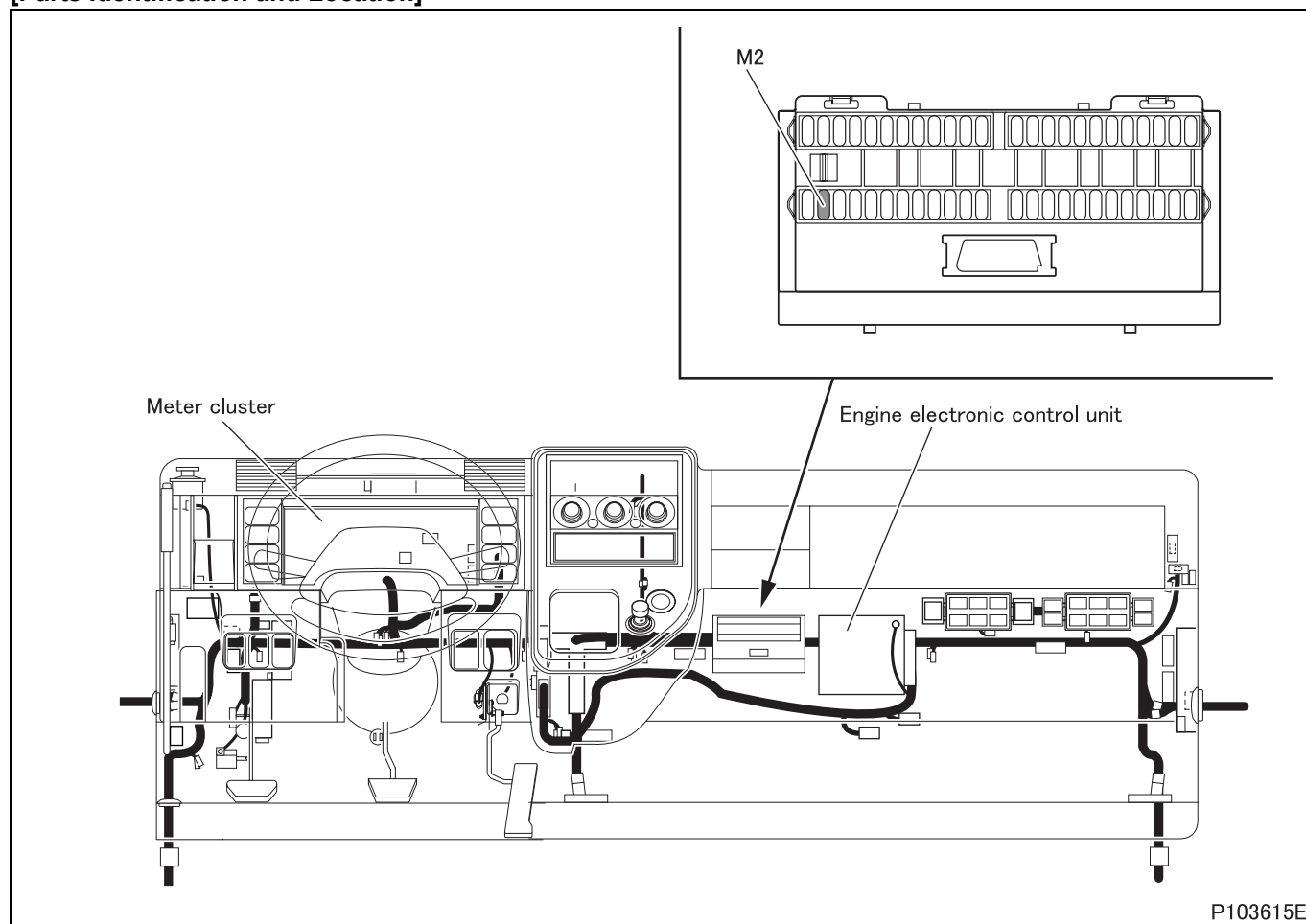
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]





**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data               |
|        | Maintenance item                                       |               | Perform actuator test item No. B0 "MIL". |
|        | Inspection condition                                   |               | Starter switch: ON                       |
|        | Requirements   |               | Lamp illuminates for six seconds.        |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).       |
| NO     |  | Go to step 2. |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection of electronic control unit connector                       |
|        | Maintenance item                                       |               | Ground connector (GE58A) terminal No. 1.                              |
|        | Inspection condition                                   |               | It wires for the ground harness from the other side of the connector. |
|        | Requirements   |               | Lamp illuminates.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of electronic control unit  |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 4 | Inspection items                                       |                 | Inspection of harness between fuse and meter cluster                                       |
|        | Maintenance item                                       |                 | Check circuit between fuse (M2) and meter cluster connector (DH22A) terminal No. 5         |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 5.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 5 | Inspection items                                       |                 | Inspection of harness between meter cluster and electronic control unit  |
|        | Maintenance item                                       |                 | Check circuit between meter cluster connector (DH20A) terminal No. 19 and electronic control unit connector (GE58A) terminal No. 1 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.  |
| NO     |  | Modify harness. |  |

# TROUBLESHOOTING

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|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of meter cluster   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of meter cluster or lamp  |
| NO     |  | Modify connector. |   |

**[Fault code]**

Diagnosis code: P0652/Flash code: 81

**[Monitor]**

Sensor power supply abnormal

**[Fault (outline)]**

Low signal range check

**[Diagnosis check]**

- Sensor supply voltage 2 in engine electronic control unit is monitored.
- Units served by sensor supply voltage 2
- Boost pressure sensor
- Accelerator pedal position sensor (sensor 2)
- Fuel temperature sensor

**[Code generation condition]**

- Supply voltage to units remain below 4.7 V for 0.5 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

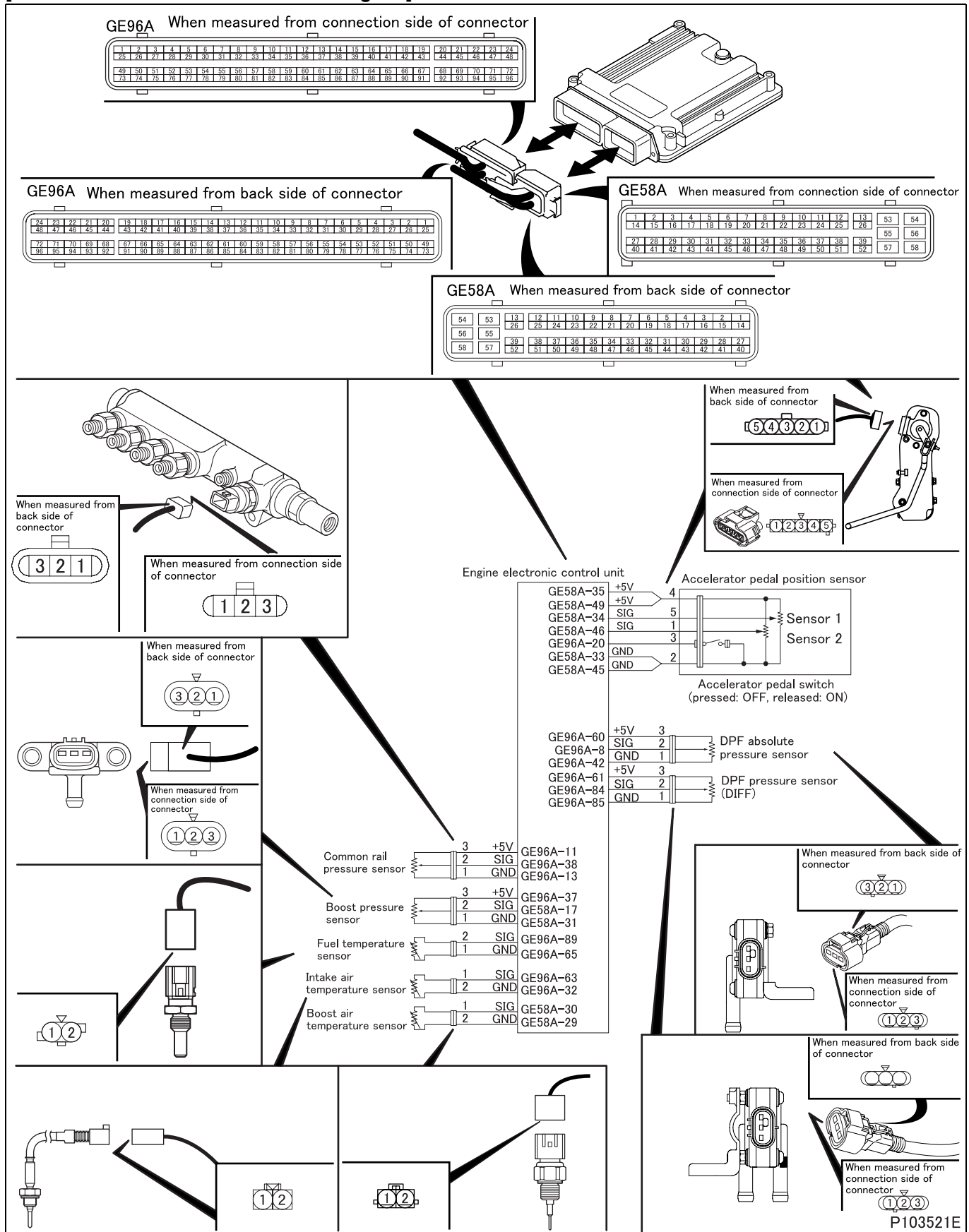
- Open-circuit or short-circuit of harness between electronic control unit and each sensor
- Malfunction of each connector
- Malfunction of each sensor
- Malfunction of electronic control unit

**[Recoverability]**

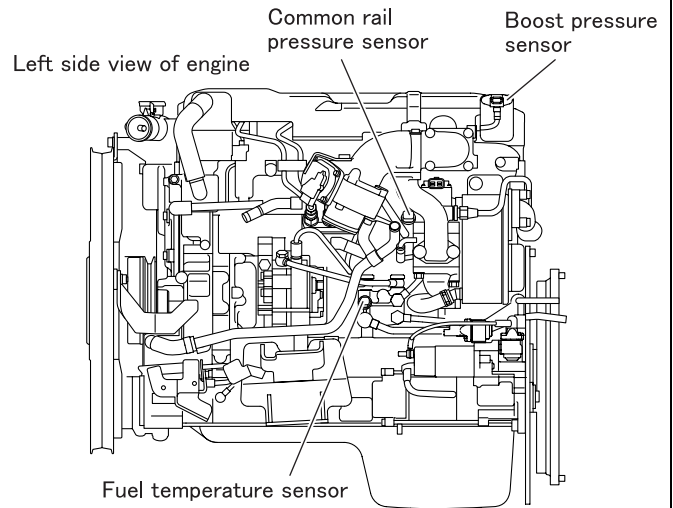
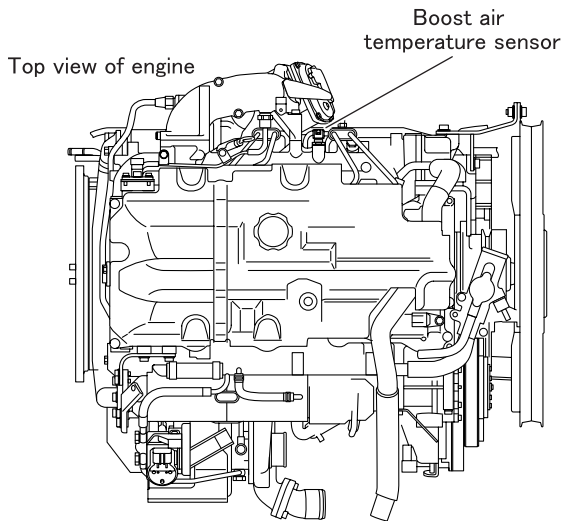
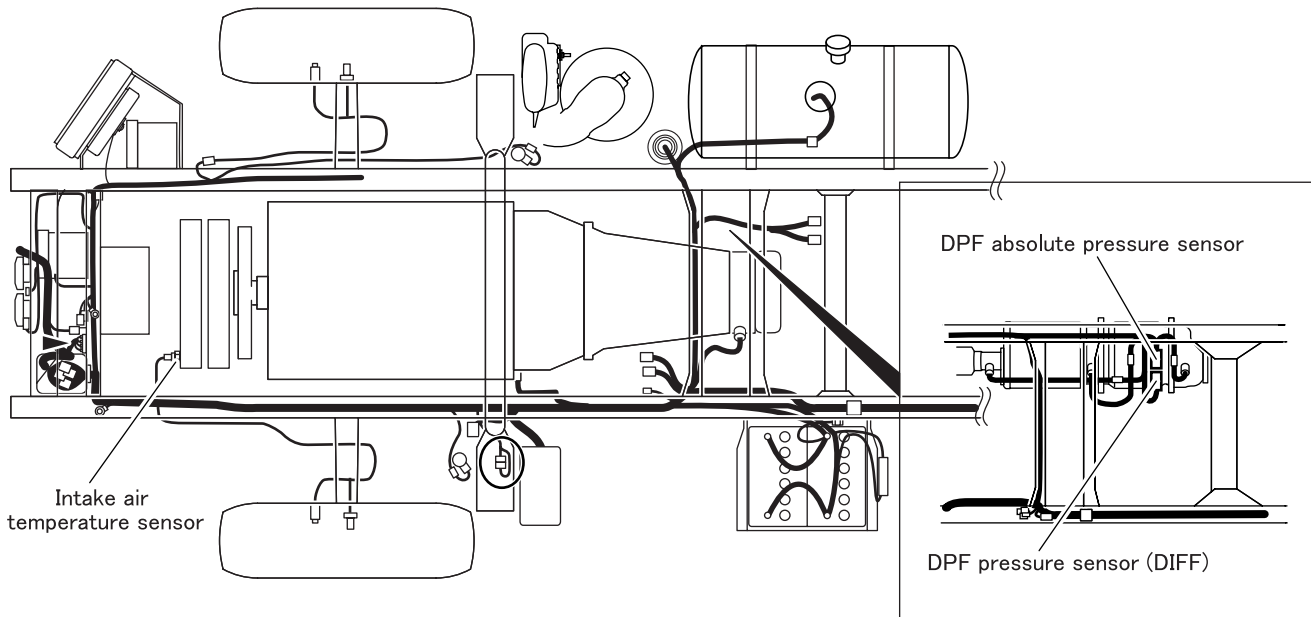
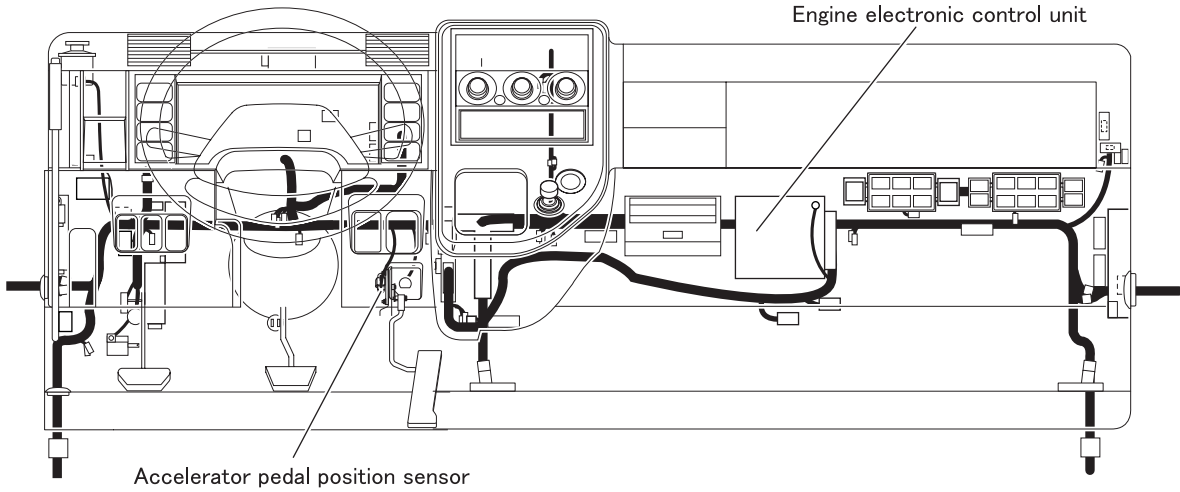
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 1 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 2.   |
| NO     |  | Modify connector. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply): boost pressure sensor   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 37 (+) and No. 14 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 5.   |
| NO     |  | Go to step 3. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of boost pressure sensor connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 4 | Inspection items                                       |                 | Inspection of harness between electronic control unit and boost pressure sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between boost pressure sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 37. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 5.   |
| NO     |  | Modify harness. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 5 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply): accelerator pedal position sensor (sensor 2)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE58A) terminal No. 49 (+) and No. 45 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 8.   |
| NO     |  | Go to step 6. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of accelerator pedal position sensor (sensor 2) connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic control unit and accelerator pedal position sensor (sensor 2) (power supply)                                     |
|        | Maintenance item                                       |                 | Check circuit between accelerator pedal position sensor (sensor 2) connector terminal No. 4 and electronic control unit connector (GE58A) terminal No. 49 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.   |
| NO     |  | Modify harness. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 8 | Inspection items                                       |               | Inspection by electronic control unit connector: fuel temperature sensor  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 89 (+) and No. 65 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 9. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 9 | Inspection items                                       |                   | Inspection of fuel temperature sensor connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 10.  |
| NO     |  | Modify connector. |   |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and fuel temperature sensor (power supply)                                     |
|         | Maintenance item                                       |                 | Check circuit between fuel temperature sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 89 |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Replacement of electronic control unit   |
| NO      |  | Modify harness. |  |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0653/Flash code: 81

## **[Monitor]**

Sensor power supply abnormal

## **[Fault (outline)]**

High signal range check

## **[Diagnosis check]**

- Sensor supply voltage 2 in engine electronic control unit is monitored.
- Units served by sensor supply voltage 2
- Boost pressure sensor
- Accelerator pedal position sensor (sensor 2)
- Fuel temperature sensor

## **[Code generation condition]**

- Supply voltage to units remain over 5.3 V for 0.5 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

## **[Probable cause of trouble]**

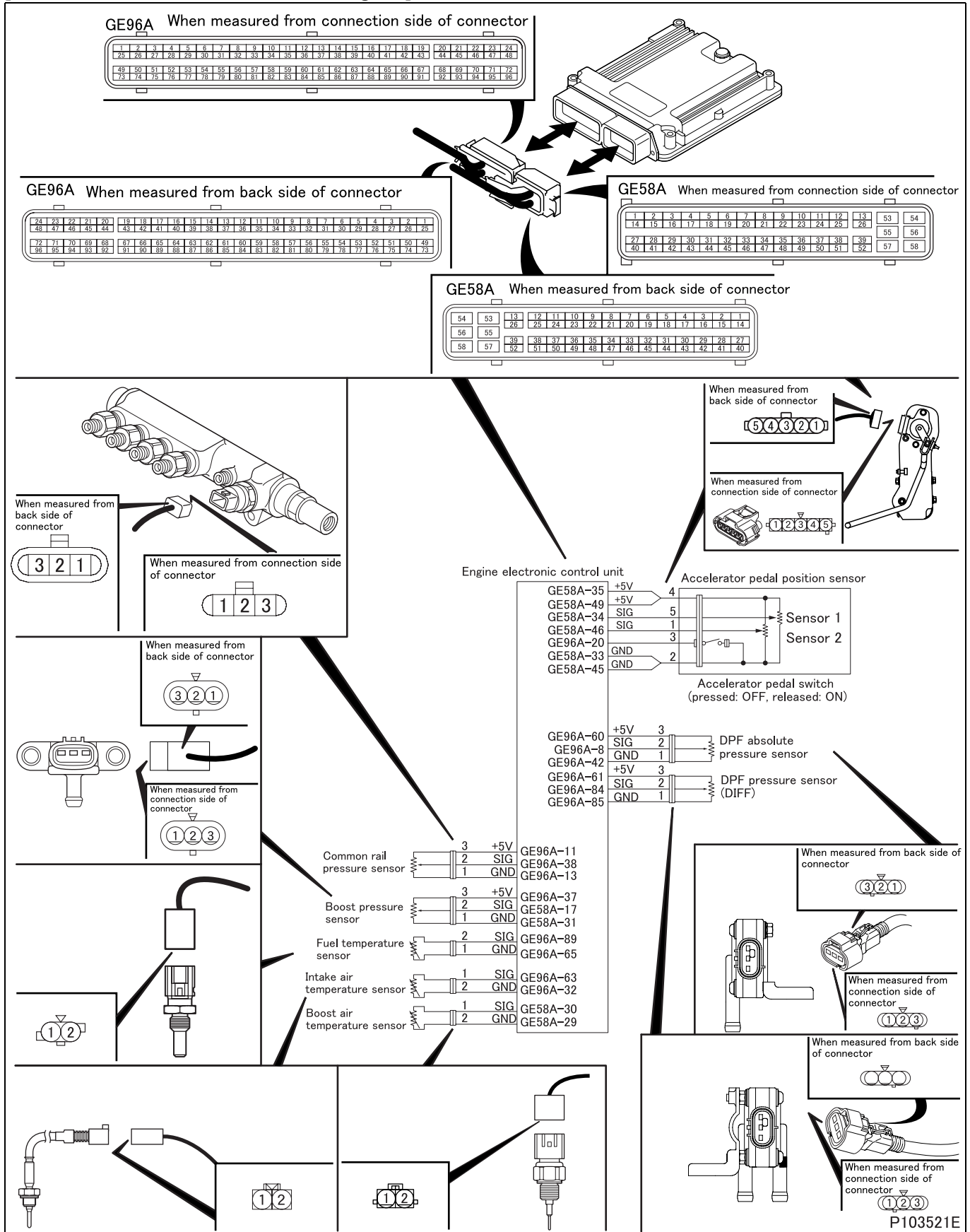
- Open-circuit or short-circuited harness between electronic control unit and each sensor
- Malfunction of each connector
- Malfunction of each sensor
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

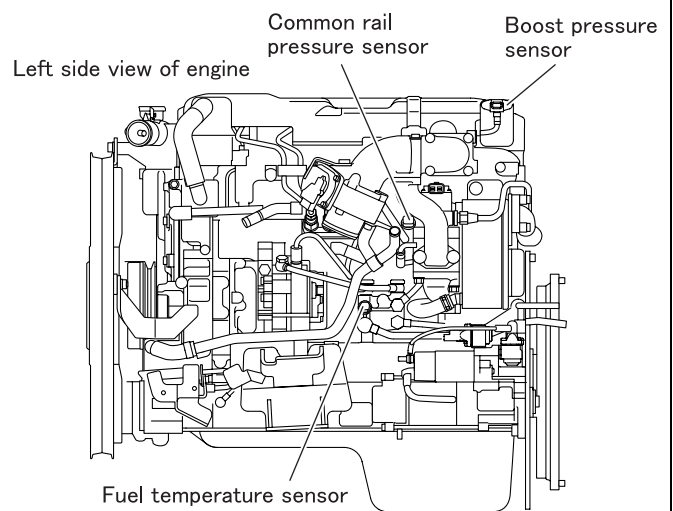
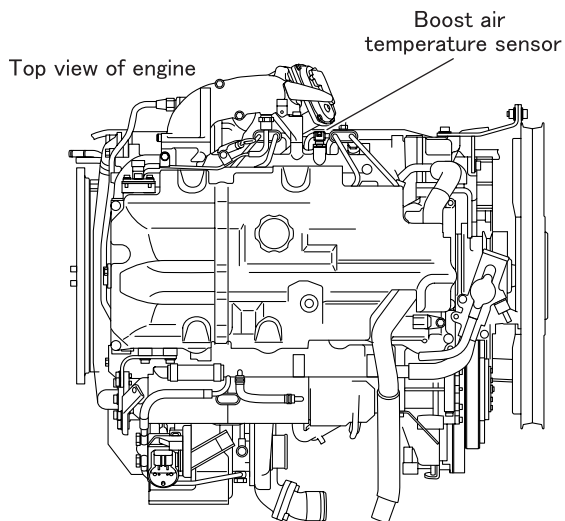
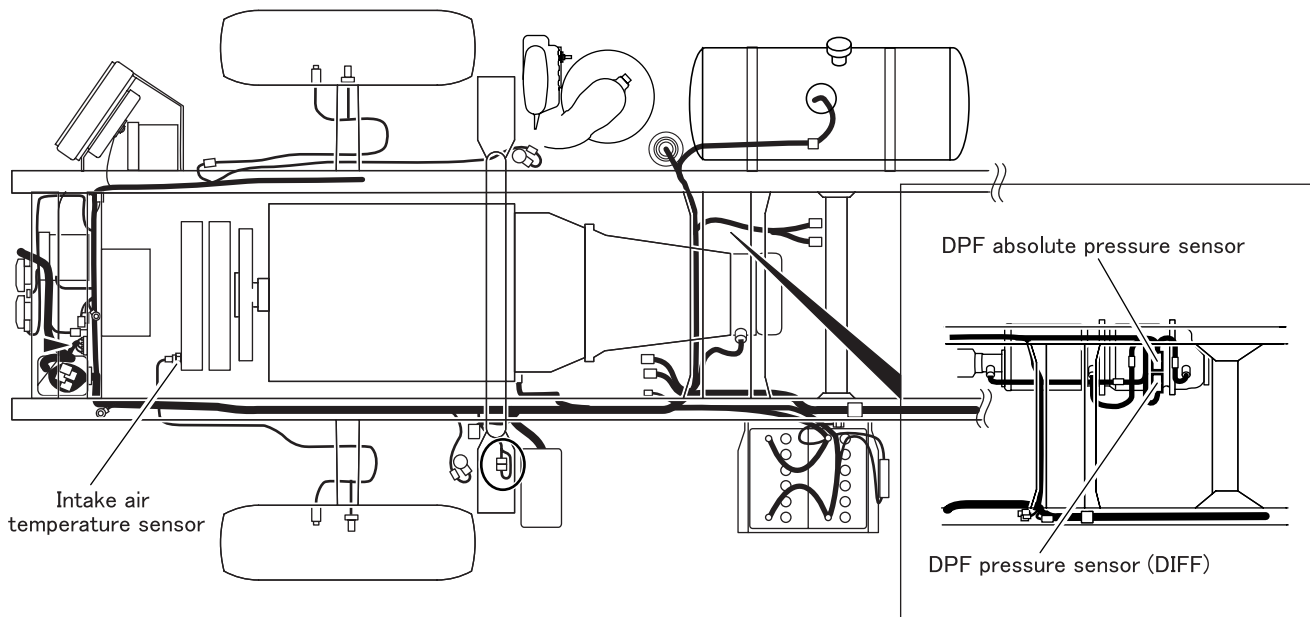
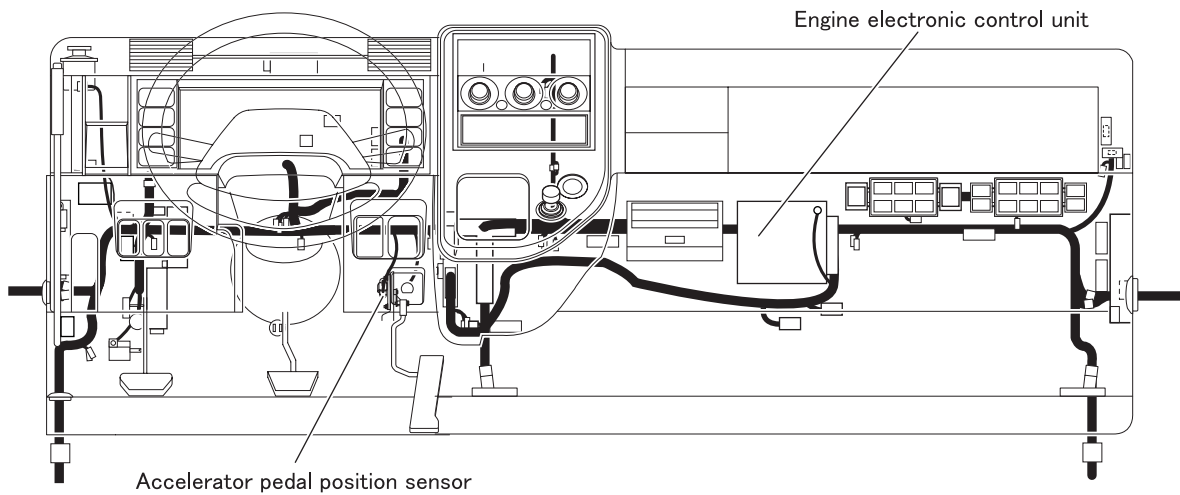


[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 1 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 2.   |
| NO     |  | Modify connector. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply): boost pressure sensor   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 37 (+) and No. 14 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 5.   |
| NO     |  | Go to step 3. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of boost pressure sensor connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 4 | Inspection items                                       |                 | Inspection of harness between electronic control unit and boost pressure sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between boost pressure sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 37. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 5.   |
| NO     |  | Modify harness. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 5 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply): accelerator pedal position sensor (sensor 2)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE58A) terminal No. 49 (+) and No. 45 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 8.   |
| NO     |  | Go to step 6. |   |

# TROUBLESHOOTING

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of accelerator pedal position sensor (sensor 2) connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic control unit and accelerator pedal position sensor (sensor 2) (power supply)                                     |
|        | Maintenance item                                       |                 | Check circuit between accelerator pedal position sensor (sensor 2) connector terminal No. 4 and electronic control unit connector (GE58A) terminal No. 49 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.   |
| NO     |  | Modify harness. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 8 | Inspection items                                       |               | Inspection by electronic control unit connector: fuel temperature sensor  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 89 (+) and No. 65 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 9. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 9 | Inspection items                                       |                   | Inspection of fuel temperature sensor connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 10.  |
| NO     |  | Modify connector. |   |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and fuel temperature sensor (power supply)                                     |
|         | Maintenance item                                       |                 | Check circuit between fuel temperature sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 89 |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Replacement of electronic control unit   |
| NO      |  | Modify harness. |  |

**[Fault code]**

Diagnosis code: P0657/Flash code: 79

**[Monitor]**

Abnormality of magnetic valve power supply

**[Fault (outline)]**

Short circuit ground

**[Diagnosis check]**

- Exhaust shutter 2-way magnetic valve circuit is monitored for fault.

**[Code generation condition]**

- Exhaust shutter 2-way magnetic valve circuit remains shorted to ground as detected for 0.5 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Exhaust shutter 2-way magnetic valve is turned off.

**[Probable cause of trouble]**

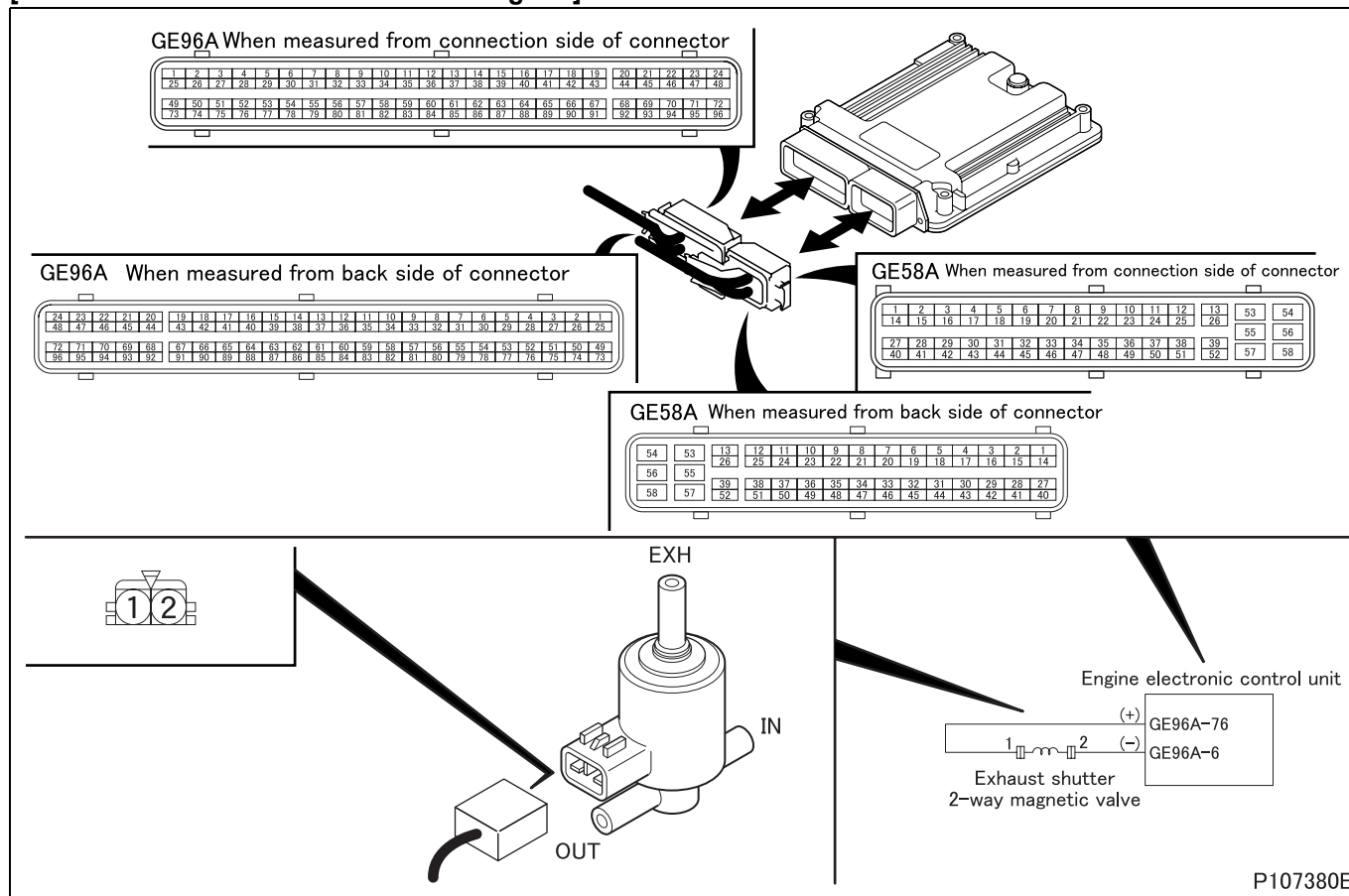
- Open-circuit or short-circuit of harness between electronic control unit and exhaust shutter 2-way magnetic valve
- Malfunction of each connector
- Malfunction of exhaust shutter 2-way magnetic valve
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

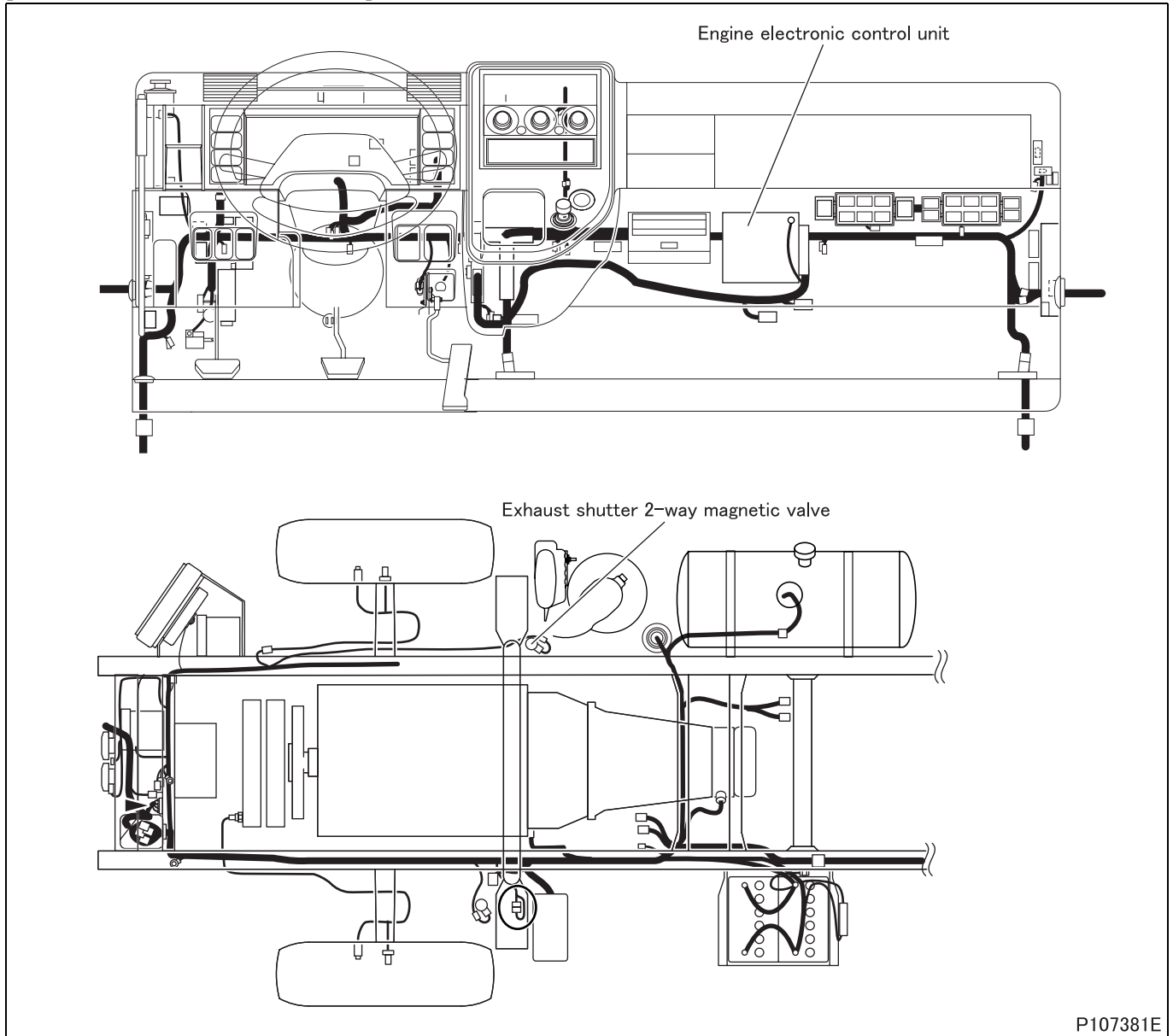
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P107380E

[Parts Identification and Location]



P107381E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 6 and 76.                           |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | 48 Ω or more   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 8.  |
| NO     |  | Go to step 2. |  |

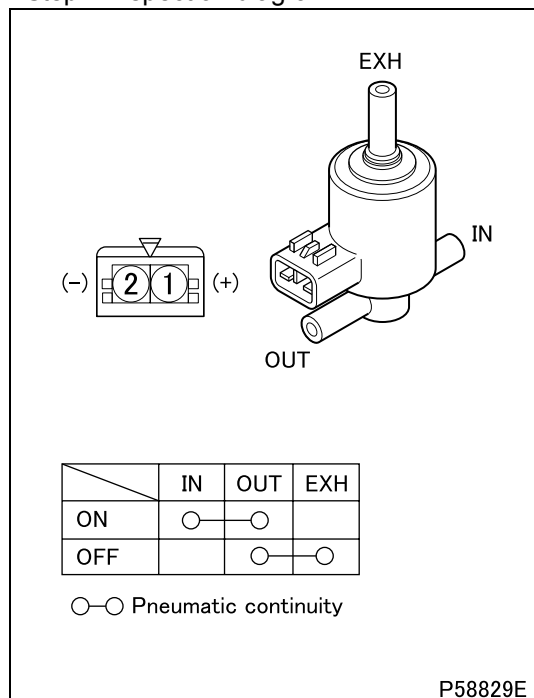
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of 2-way magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |



|        |  |  |  |
|--------|--|--|--|
| Step 4 | Inspection items                                       |  | Inspection of 2-way magnetic valve unit  |
|        | Maintenance item                                       |  | Measure minimum operating voltage when 2-way magnetic valve operates (judge by operation sound). |
|        | Inspection condition                                   |  | Gradually increase from zero the voltage applied to terminals No. 1 (+) and 2 (-).               |
|        | Requirements   |  | 11 V or less   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

<Step 4 inspection diagram>



|        |  |  |  |
|--------|--|--|--|
| Step 5 | Inspection items                                       |  | Inspection of harness between exhaust shutter 2-way magnetic valve and electronic control unit (power supply)                                      |
|        | Maintenance item                                       |  | Check circuit between exhaust shutter 2-way magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 76. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness  |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of harness between exhaust shutter 2-way magnetic valve and electronic control unit (power supply) |
|        | Maintenance item                                       |  | Check circuit between exhaust shutter 2-way magnetic valve connector terminal No. 1 and chassis ground        |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness                               |
|        | Requirements   |  | There is no continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

# TROUBLESHOOTING

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 7 | Inspection items                                       |                 | Inspection of harness between exhaust shutter 2-way magnetic valve and electronic control unit (ground)   |
|        | Maintenance item                                       |                 | Check circuit between exhaust shutter 2-way magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 6. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness   |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.   |
| NO     |  | Modify harness. |   |

|        |  |  |  |
|--------|--|--|--|
| Step 8 | Inspection items                                       |  | Inspection by control data                                 |
|        | Maintenance item                                       |  | Perform actuator test item No. AA "Auxiliary Brake M/V 1". |
|        | Inspection condition                                   |  | Starter switch: ON   |
|        | Requirements   |  | 2-way magnetic valve operation sound is noted              |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).                         |
| NO     |  | Replacement of electronic control unit |  |

**[Fault code]**

Diagnosis code: P0670/Flash code: 26

**[Monitor]**

Failure of preheating control system

**[Fault (outline)]**

- Open circuit
- Overload
- GCU communication error

**[Diagnosis check]**

- Engine electronic control unit receives fault information from glow electronic control unit.
- Glow electronic control unit monitors condition of electronic control unit.

**[Code generation condition]**

Diagnosis code is generated under either of the following conditions. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

- Glow electronic control unit power supply circuit remains open as detected for 0.2 second.
- Power supply temperature in glow electronic control unit remains at 100°C {212°F} for 0.2 second.
- High current fuse (BATT2) directly connected to battery remains blown for 2.3 seconds.
- Glow plug drive terminal voltage remains below 8 V or over 18.5 V for 2.3 seconds when engine requires no warming-up.
- Upper limit temperature remains over 135°C {275°F} for 2.3 seconds.

**[Diagnosis check timing]**

<Fault diagnosis for PWM (Pulse Width Modulation)>

- Fault diagnosis is performed each time when the control is initiated.
- Fault diagnosis is performed each time when the control is halted.

<Fault diagnosis for other than those above>

- Fault diagnosis is continuously performed.

**[Diagnostic requirement]**

<Fault diagnosis for PWM (Pulse Width Modulation)>

- Preheating control: stopped
- Preheating control: being effected
- Water temperature: below 65°C {149°F}
- Preheating control: no other error occurs

<Fault diagnosis for other than those above>

- Not applicable.

**[Control effected by electronic control unit during fault]**

Electronic control unit varies in the way of control by the status of warning lamp.

<Warning lamp (orange) lit>

- Effects no special control.

<Warning lamp extinguished (diagnosis code only)>

- Related fault check is stopped.

**[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between glow electronic control unit and high-current fuse (BATT2)
- Blown high-current fuse (BATT2)
- Malfunction of each connector
- Malfunction of glow electronic control unit

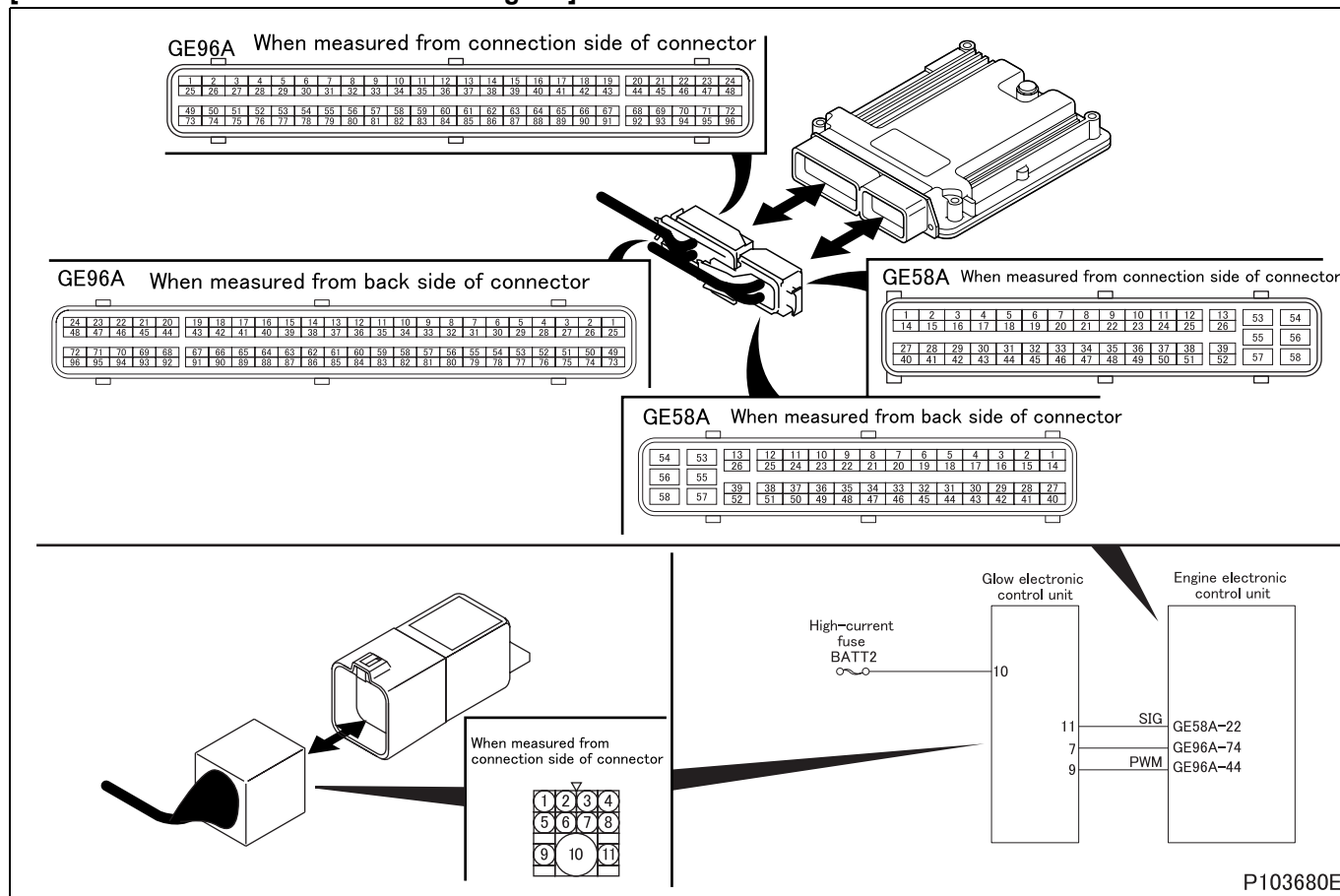
**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.

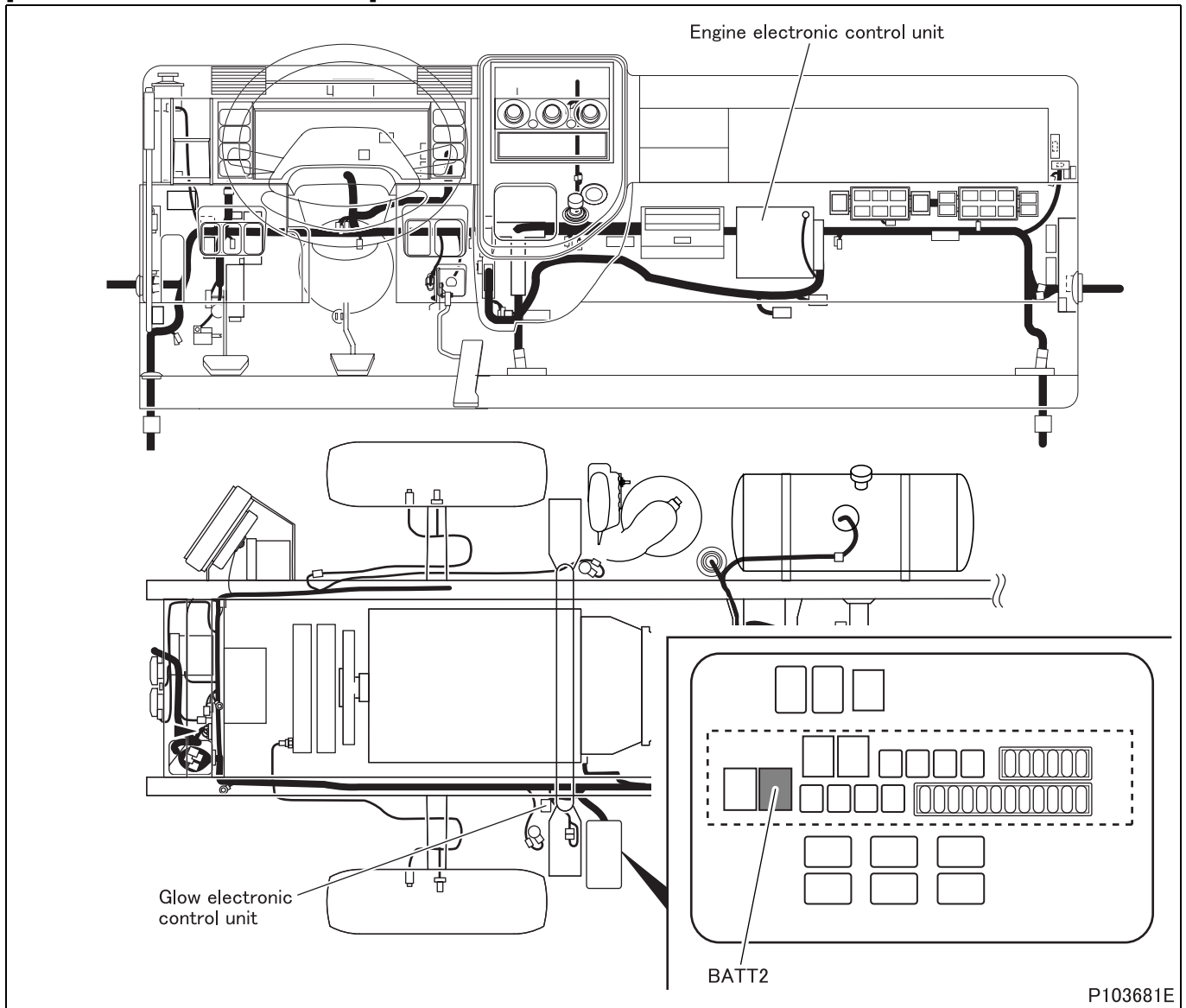
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



P103681E

# TROUBLESHOOTING

## [Fault diagnosis]

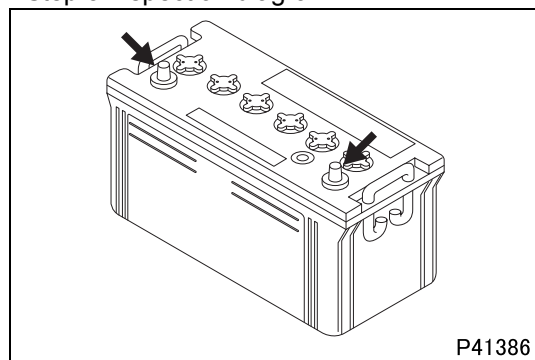
- Perform checks in the sequence of the following steps.

|        |  |    |   |
|--------|--|----|---|
| Step 1 | Inspection items                                       |    | Inspection of high-current fuse (BATT2)         |
|        | Maintenance item                                       |    | Check open circuit of high-current fuse (BATT2) |
|        | Inspection condition                                   |    | –   |
|        | Requirements   |    | There is continuity.                            |
|        | Inspection result (Is the judging standard satisfied?) |    | YES   |
|        |  | NO | Replacement of fuse                             |

|        |  |    |  |
|--------|--|----|--|
| Step 2 | Inspection items                                       |    | Inspection of harness between glow electronic control unit and high-current fuse (BATT2)                   |
|        | Maintenance item                                       |    | Check circuit between glow electronic control unit terminal No. 10 and high-current fuse (BATT2) terminal. |
|        | Inspection condition                                   |    | Disconnect each device from harness and measure from connection side of harness connector.                 |
|        | Requirements   |    | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |    | YES  |
|        |  | NO | Modify harness.  |

|        |  |    |   |
|--------|--|----|---|
| Step 3 | Inspection items                                       |    | Inspection of battery   |
|        | Maintenance item                                       |    | Measure value of voltage between battery terminal (+) and (–) |
|        | Inspection condition                                   |    | –   |
|        | Requirements   |    | 8 to 16 V   |
|        | Inspection result (Is the judging standard satisfied?) |    | YES   |
|        |  | NO | Inspection of battery (See Gr54.)                             |

<Step 3 inspection diagram>



|        |  |    |   |
|--------|--|----|---|
| Step 4 | Inspection items                                       |    | Inspection of harness between glow electronic control unit and engine electronic control unit   |
|        | Maintenance item                                       |    | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22</li> <li>Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74</li> <li>Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) terminal No. 44</li> </ul> |
|        | Inspection condition                                   |    | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |    | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |    | YES   |
|        |  | NO | Modify harness.   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 5 | Inspection items                                       |                   | Inspection of glow electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | After replacement of glow electronic control unit, go to step 6   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of engine electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of engine electronic control unit   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0671/Flash code: 26

## **[Monitor]**

Failure of preheating control system

## **[Fault (outline)]**

No. 1 cylinder fault

## **[Diagnosis check]**

- Engine electronic control unit receives fault information from glow electronic control unit.
- Glow electronic control unit monitors current in No. 1 cylinder glow plug circuit for open or short circuit failure.

## **[Code generation condition]**

Diagnosis code is generated under either of the following conditions.

<Open-circuit>

- Current remains below 1.9 A for 2.3 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

<Short-circuit>

- Current remains over 21 A for 2.3 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.

## **[Diagnostic requirement]**

- Glow electronic control unit operating voltage: higher than 8 V

## **[Control effected by electronic control unit during fault]**

- Effects no special control.

## **[Probable cause of trouble]**

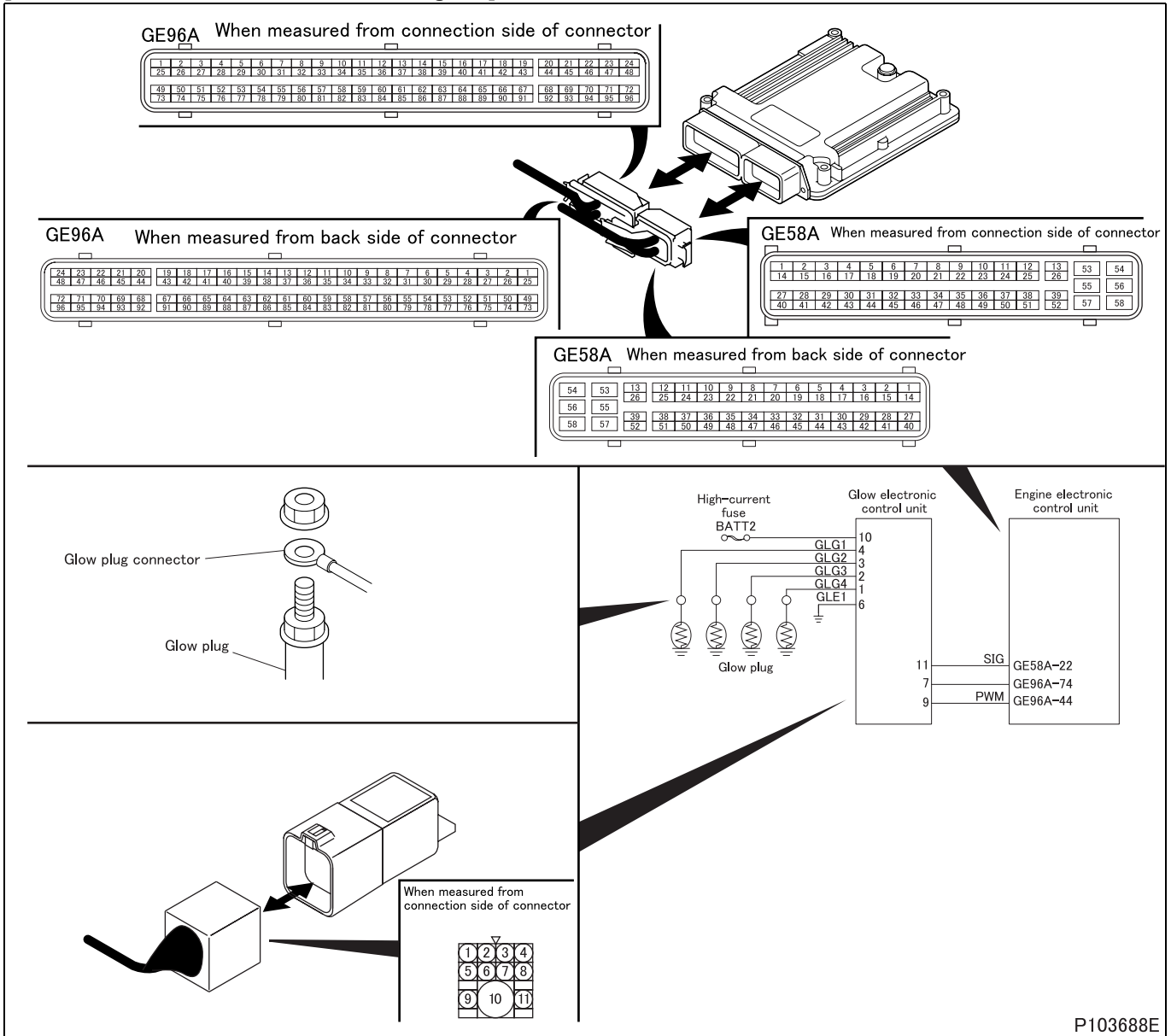
- Open-circuit or short-circuit of harness between glow electronic control unit and glow plug
- Malfunction of each connector
- Malfunction of glow plug
- Malfunction of glow electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



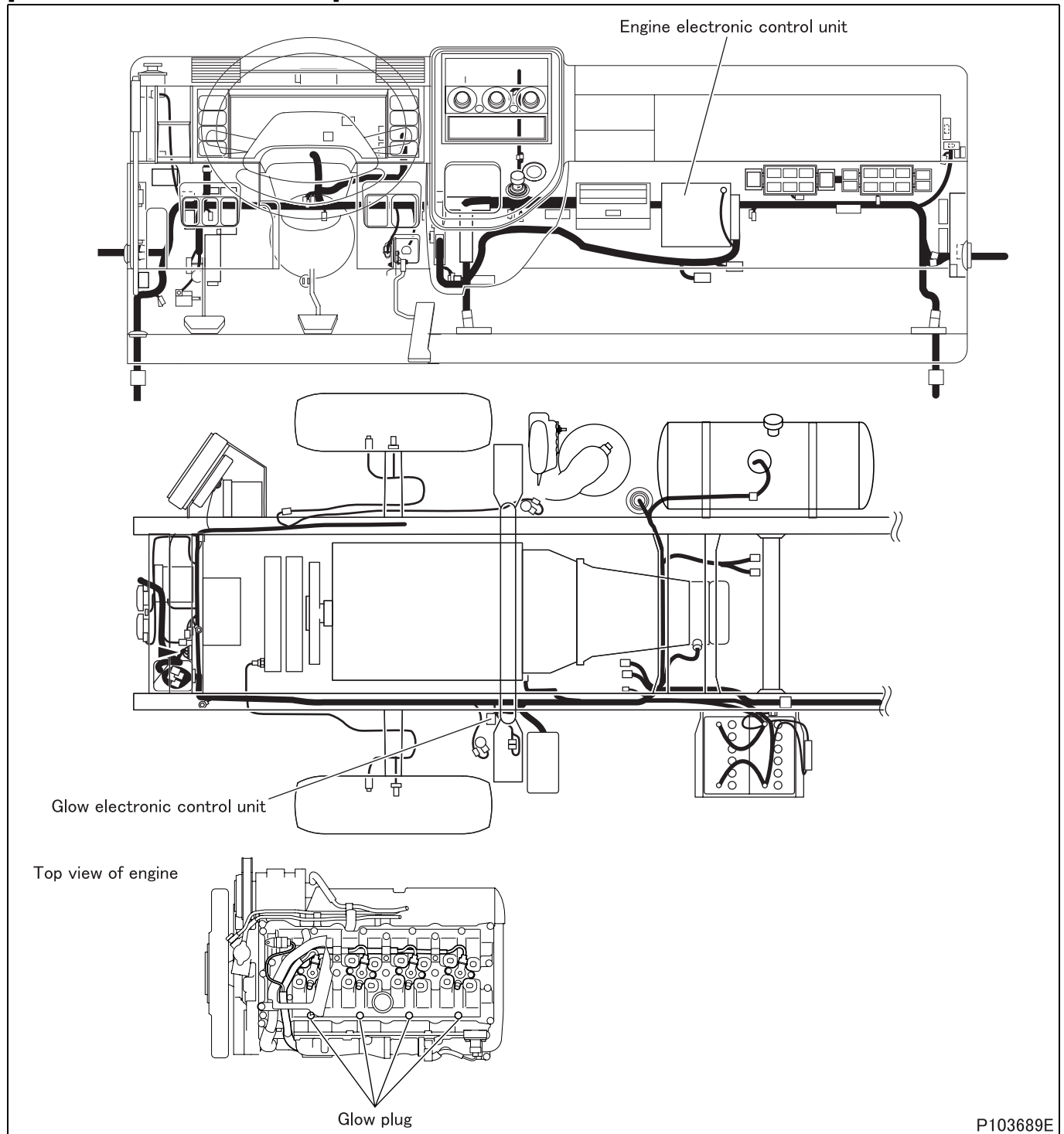
## [Electronic Control Unit Connection Diagram]



P103688E

# TROUBLESHOOTING

## [Parts Identification and Location]



P103689E

**[Fault diagnosis]**

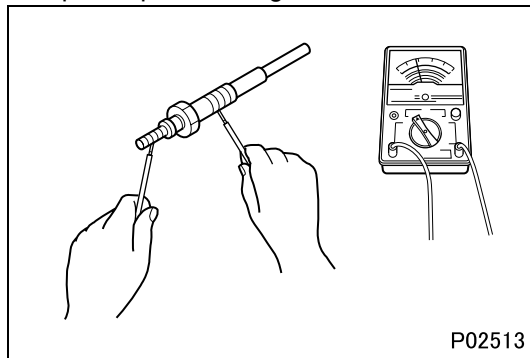
- Perform checks in the sequence of the following steps.

|        |  |  |                                    |  |
|--------|--|--|------------------------------------|--|
| Step 1 | Inspection items                                       | Inspection of harness between glow electronic control unit and chassis ground              |                                    |  |
|        | Maintenance item                                       | Check circuit between glow electronic control unit terminal No. 4 and chassis ground       |                                    |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector. |                                    |  |
|        | Requirements   | There is continuity.   |                                    |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to transient fault (See Gr00.). |  |
|        |  | NO   | Go to step 2.                      |  |

|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 2 | Inspection items                                       | Inspection of harness between glow electronic control unit and glow plug                                       |                 |  |
|        | Maintenance item                                       | Check circuit between glow electronic control unit terminal No. 4 and glow plug connector (for No. 1 cylinder) |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                     |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 3.   |  |
|        |  | NO   | Modify harness. |  |

|        |  |  |                          |  |
|--------|--|--|--------------------------|--|
| Step 3 | Inspection items                                       | Inspection of glow plug unit   |                          |  |
|        | Maintenance item                                       | Measure value of resistance of glow plug as shown in inspection diagram. |                          |  |
|        | Inspection condition                                   | -  |                          |  |
|        | Requirements   | 1 Ω  |                          |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 4.            |  |
|        |  | NO   | Replacement of glow plug |  |

<Step 3 inspection diagram>



|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 4 | Inspection items                                       | Inspection of harness between glow electronic control unit and engine electronic control unit   |                 |  |
|        | Maintenance item                                       | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22</li> <li>• Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74</li> <li>• Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) terminal No. 44</li> </ul> |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5.   |  |
|        |  | NO  | Modify harness. |  |

# TROUBLESHOOTING

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 5 | Inspection items                                       |                   | Inspection of glow electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | After replacement of glow electronic control unit, go to step 6   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of engine electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of engine electronic control unit   |
| NO     |  | Modify connector. |   |

**[Fault code]**

Diagnosis code: P0672/Flash code: 26

**[Monitor]**

Failure of preheating control system

**[Fault (outline)]**

No. 2 cylinder fault

**[Diagnosis check]**

- Engine electronic control unit receives fault information from glow electronic control unit.
- Glow electronic control unit monitors current in No. 2 cylinder glow plug circuit for open or short circuit failure.

**[Code generation condition]**

Diagnosis code is generated under either of the following conditions. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

<Open-circuit>

- Current remains below 1.9 A for 2.3 seconds.

<Short-circuit>

- Current remains over 21 A for 2.3 seconds.

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.

**[Diagnostic requirement]**

- Glow electronic control unit operating voltage: higher than 8 V

**[Control effected by electronic control unit during fault]**

- Effects no special control.

**[Probable cause of trouble]**

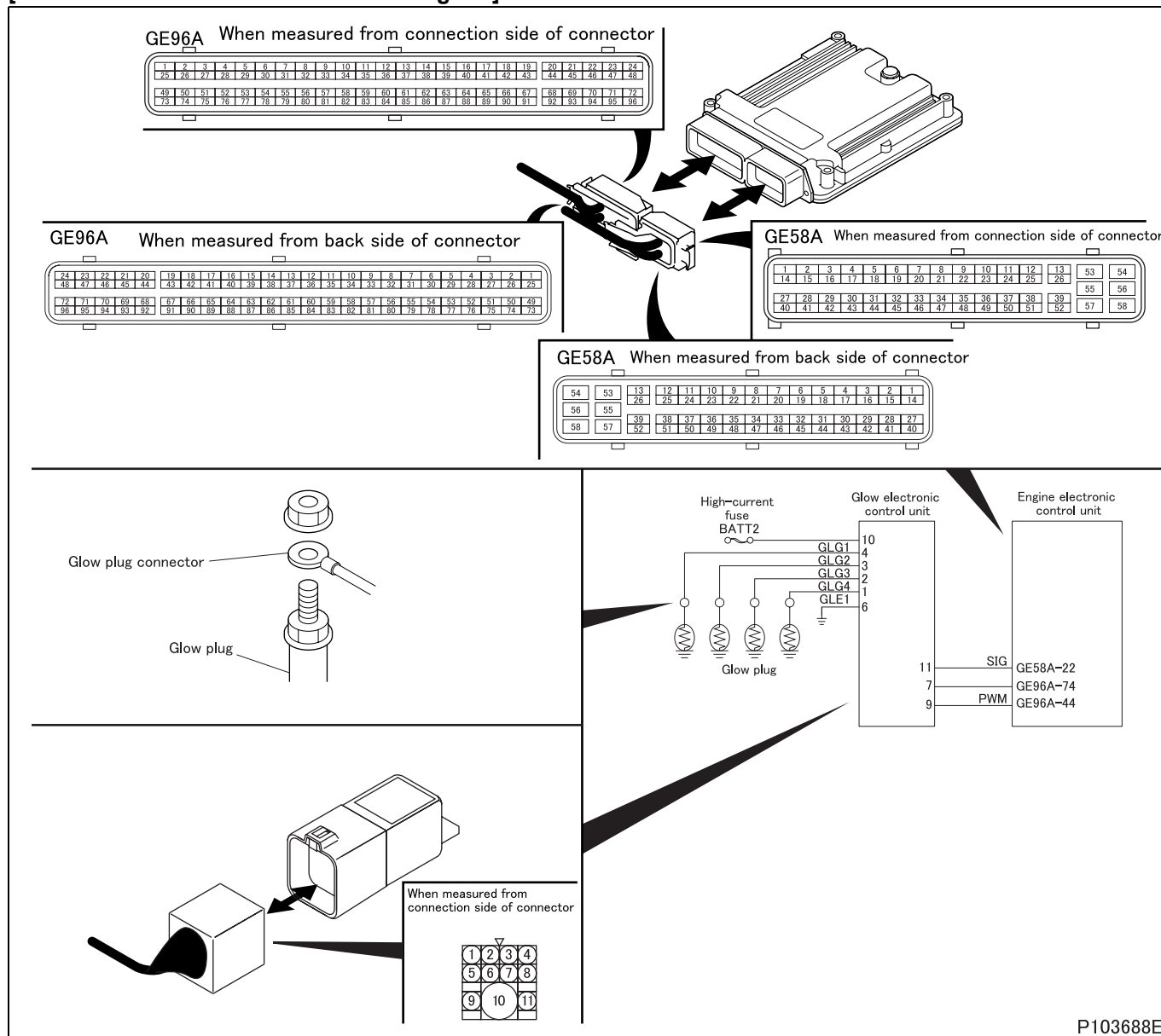
- Open-circuit or short-circuit of harness between glow electronic control unit and glow plug
- Malfunction of each connector
- Malfunction of glow plug
- Malfunction of glow electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

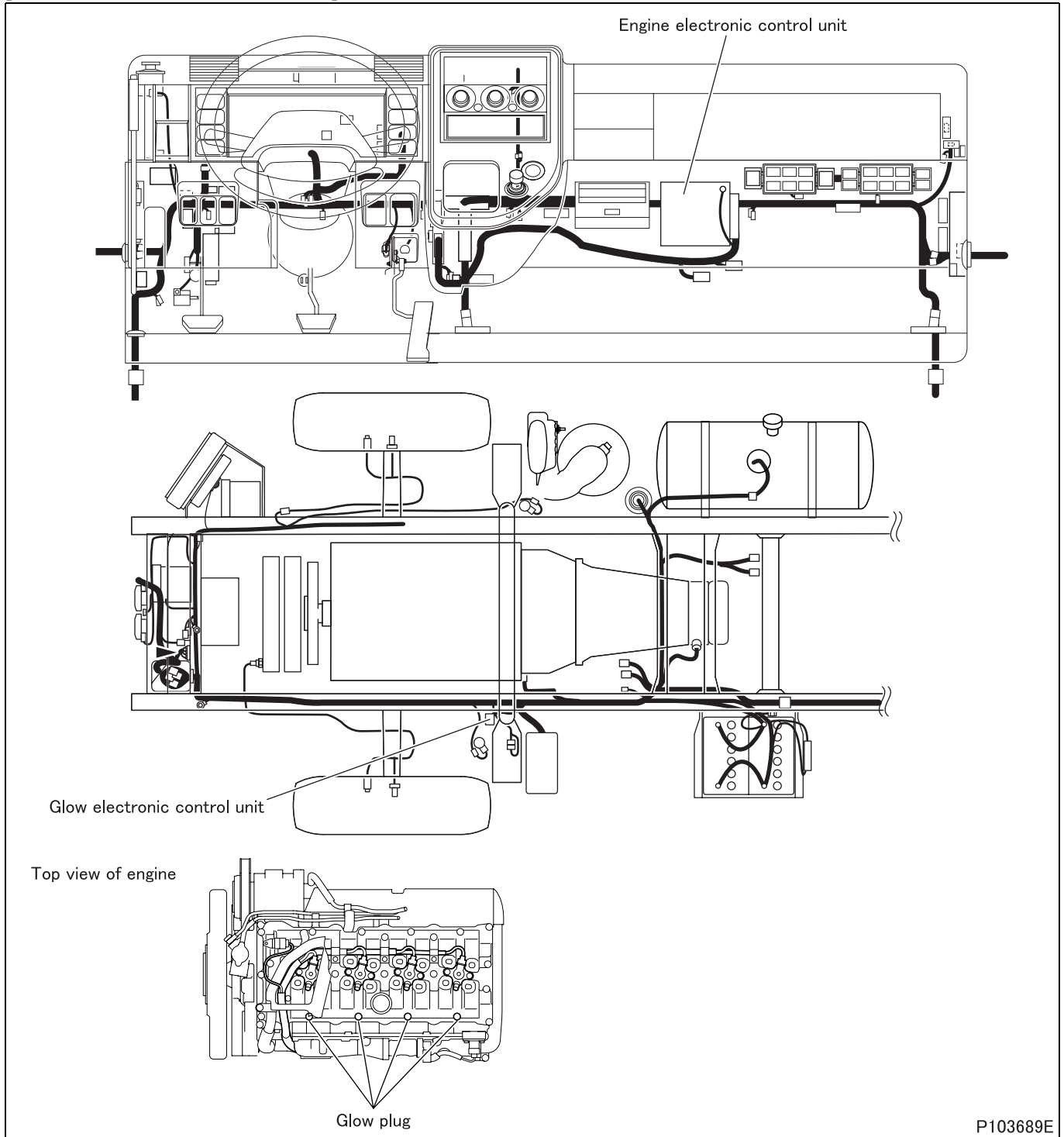
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P103688E

[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

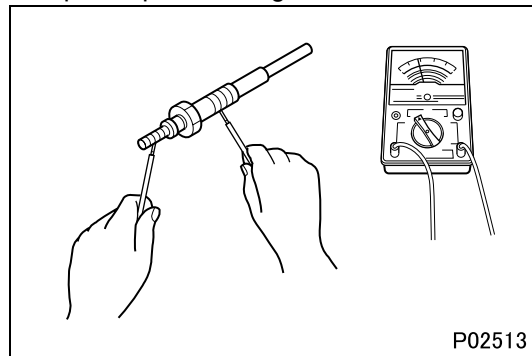
- Perform checks in the sequence of the following steps.

|        |  |  |                                    |  |
|--------|--|--|------------------------------------|--|
| Step 1 | Inspection items                                       | Inspection of harness between glow electronic control unit and chassis ground              |                                    |  |
|        | Maintenance item                                       | Check circuit between glow electronic control unit terminal No. 3 and chassis ground       |                                    |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector. |                                    |  |
|        | Requirements   | There is continuity.   |                                    |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to transient fault (See Gr00.). |  |
|        |  | NO   | Go to step 2.                      |  |

|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 2 | Inspection items                                       | Inspection of harness between glow electronic control unit and glow plug                                       |                 |  |
|        | Maintenance item                                       | Check circuit between glow electronic control unit terminal No. 3 and glow plug connector (for No. 2 cylinder) |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                     |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 3.   |  |
|        |  | NO   | Modify harness. |  |

|        |  |  |                          |  |
|--------|--|--|--------------------------|--|
| Step 3 | Inspection items                                       | Inspection of glow plug unit   |                          |  |
|        | Maintenance item                                       | Measure value of resistance of glow plug as shown in inspection diagram. |                          |  |
|        | Inspection condition                                   | -  |                          |  |
|        | Requirements   | 1 $\Omega$   |                          |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 4.            |  |
|        |  | NO   | Replacement of glow plug |  |

<Step 3 inspection diagram>



|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 4 | Inspection items                                       | Inspection of harness between glow electronic control unit and engine electronic control unit   |                 |  |
|        | Maintenance item                                       | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22</li> <li>Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74</li> <li>Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) terminal No. 44</li> </ul> |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5.   |  |
|        |  | NO  | Modify harness. |  |



|        |  |                   |   |
|--------|--|-------------------|---|
| Step 5 | Inspection items                                       |                   | Inspection of glow electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | After replacement of glow electronic control unit, go to step 6   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of engine electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of engine electronic control unit   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0673/Flash code: 26

## **[Monitor]**

Failure of preheating control system

## **[Fault (outline)]**

No. 3 cylinder fault

## **[Diagnosis check]**

- Engine electronic control unit receives fault information from glow electronic control unit.
- Glow electronic control unit monitors current in No. 3 cylinder glow plug circuit for open or short circuit failure.

## **[Code generation condition]**

Diagnosis code is generated under either of the following conditions. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

<Open-circuit>

- Current remains below 1.9 A for 2.3 seconds.

<Short-circuit>

- Current remains over 21 A for 2.3 seconds.

## **[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.

## **[Diagnostic requirement]**

- Glow electronic control unit operating voltage: higher than 8 V

## **[Control effected by electronic control unit during fault]**

- Effects no special control.

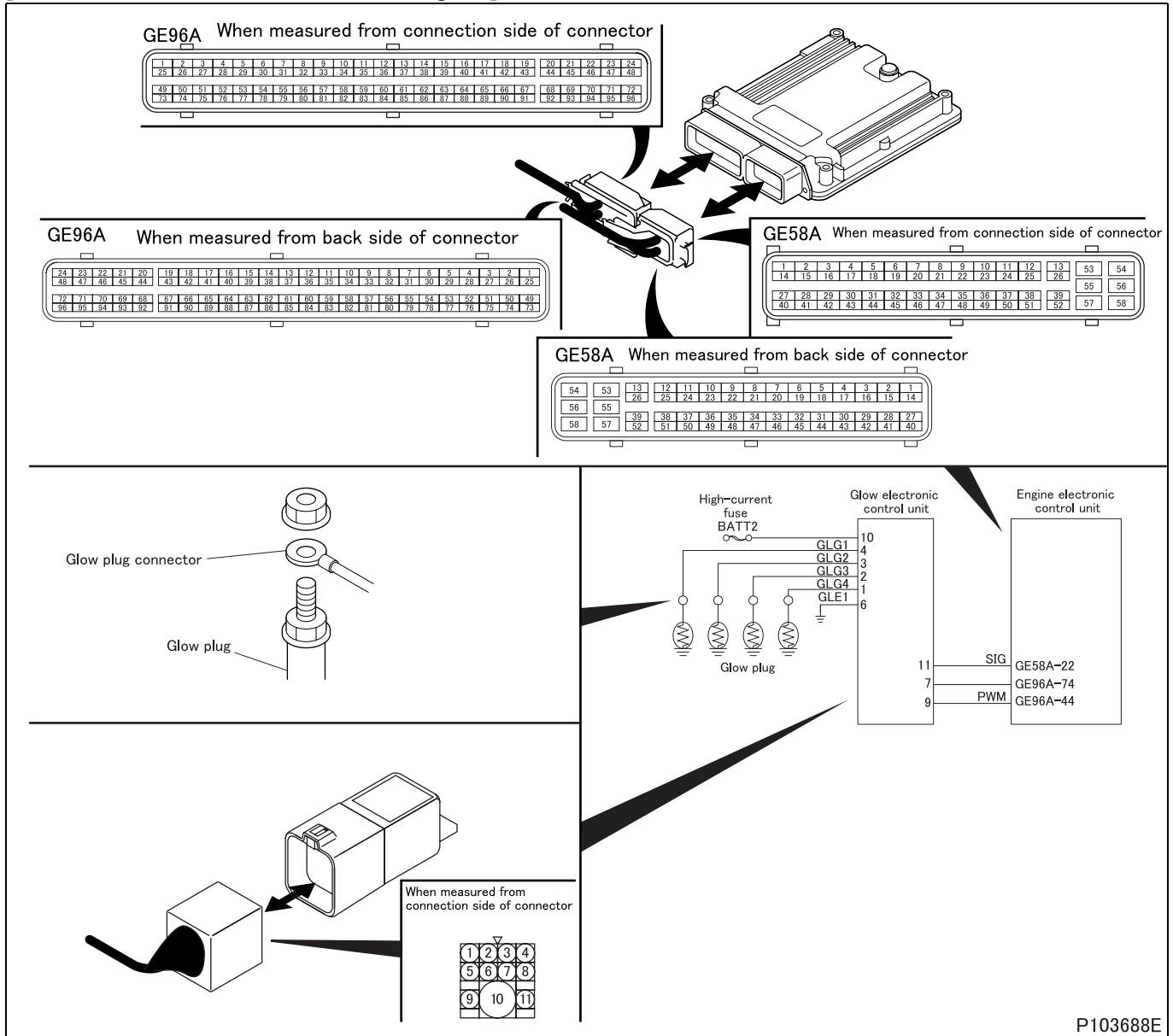
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between glow electronic control unit and glow plug
- Malfunction of each connector
- Malfunction of glow plug
- Malfunction of glow electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

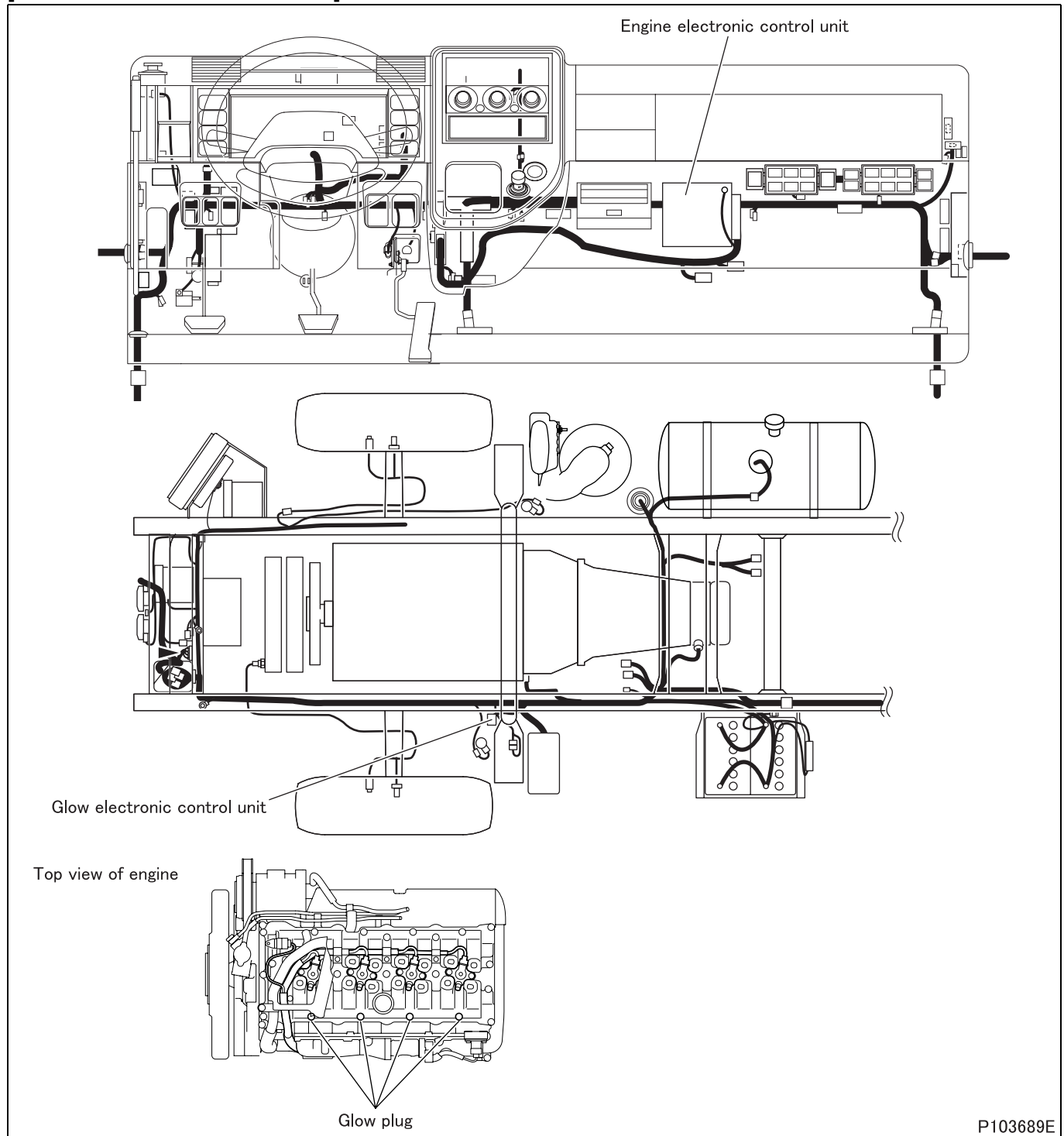
[Electronic Control Unit Connection Diagram]



P103688E

# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

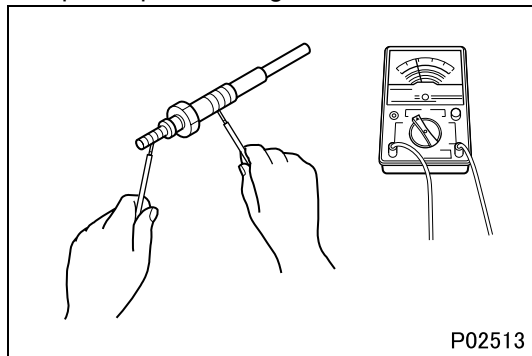
- Perform checks in the sequence of the following steps.

|        |  |  |                                    |  |
|--------|--|--|------------------------------------|--|
| Step 1 | Inspection items                                       | Inspection of harness between glow electronic control unit and chassis ground              |                                    |  |
|        | Maintenance item                                       | Check circuit between glow electronic control unit terminal No. 2 and chassis ground       |                                    |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector. |                                    |  |
|        | Requirements   | There is continuity.   |                                    |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to transient fault (See Gr00.). |  |
|        |  | NO   | Go to step 2.                      |  |

|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 2 | Inspection items                                       | Inspection of harness between glow electronic control unit and glow plug                                       |                 |  |
|        | Maintenance item                                       | Check circuit between glow electronic control unit terminal No. 2 and glow plug connector (for No. 3 cylinder) |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                     |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 3.   |  |
|        |  | NO   | Modify harness. |  |

|        |  |  |                          |  |
|--------|--|--|--------------------------|--|
| Step 3 | Inspection items                                       | Inspection of glow plug unit   |                          |  |
|        | Maintenance item                                       | Measure value of resistance of glow plug as shown in inspection diagram. |                          |  |
|        | Inspection condition                                   | -  |                          |  |
|        | Requirements   | 1 Ω  |                          |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 4.            |  |
|        |  | NO   | Replacement of glow plug |  |

<Step 3 inspection diagram>



|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 4 | Inspection items                                       | Inspection of harness between glow electronic control unit and engine electronic control unit   |                 |  |
|        | Maintenance item                                       | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22</li> <li>• Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74</li> <li>• Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) terminal No. 44</li> </ul> |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5.   |  |
|        |  | NO  | Modify harness. |  |

# TROUBLESHOOTING

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 5 | Inspection items                                       |                   | Inspection of glow electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | After replacement of glow electronic control unit, go to step 6   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of engine electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of engine electronic control unit   |
| NO     |  | Modify connector. |   |

**[Fault code]**

Diagnosis code: P0674/Flash code: 26

**[Monitor]**

Failure of preheating control system

**[Fault (outline)]**

No. 4 cylinder fault

**[Diagnosis check]**

- Engine electronic control unit receives fault information from glow electronic control unit.
- Glow electronic control unit monitors current in No. 4 cylinder glow plug circuit for open or short circuit failure.

**[Code generation condition]**

Diagnosis code is generated under either of the following conditions. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

<Open-circuit>

- Current remains below 1.9 A for 2.3 seconds.

<Short-circuit>

- Current remains over 21 A for 2.3 seconds.

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.

**[Diagnostic requirement]**

- Glow electronic control unit operating voltage: higher than 8 V

**[Control effected by electronic control unit during fault]**

- Effects no special control.

**[Probable cause of trouble]**

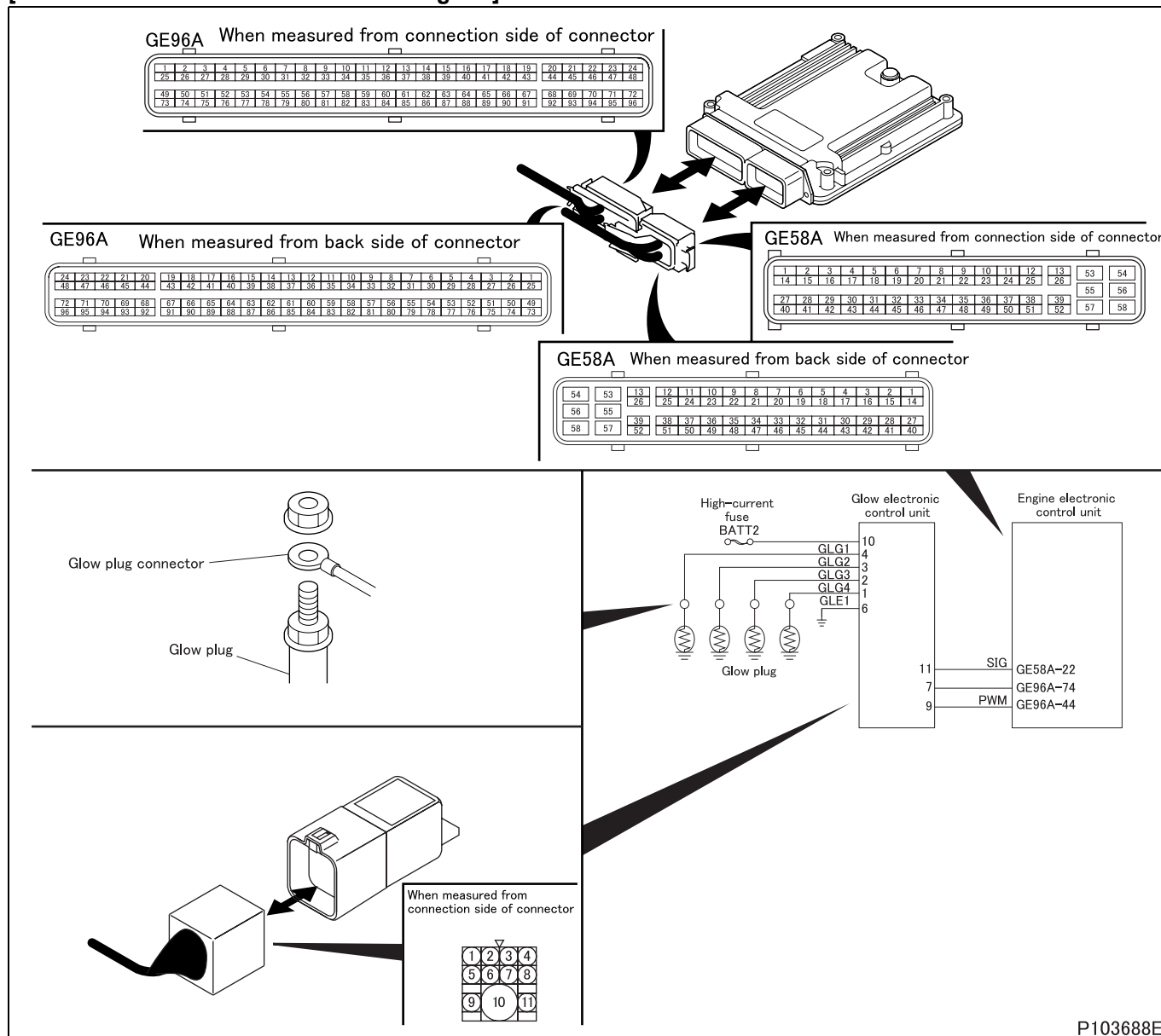
- Open-circuit or short-circuit of harness between glow electronic control unit and glow plug
- Malfunction of each connector
- Malfunction of glow plug
- Malfunction of glow electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

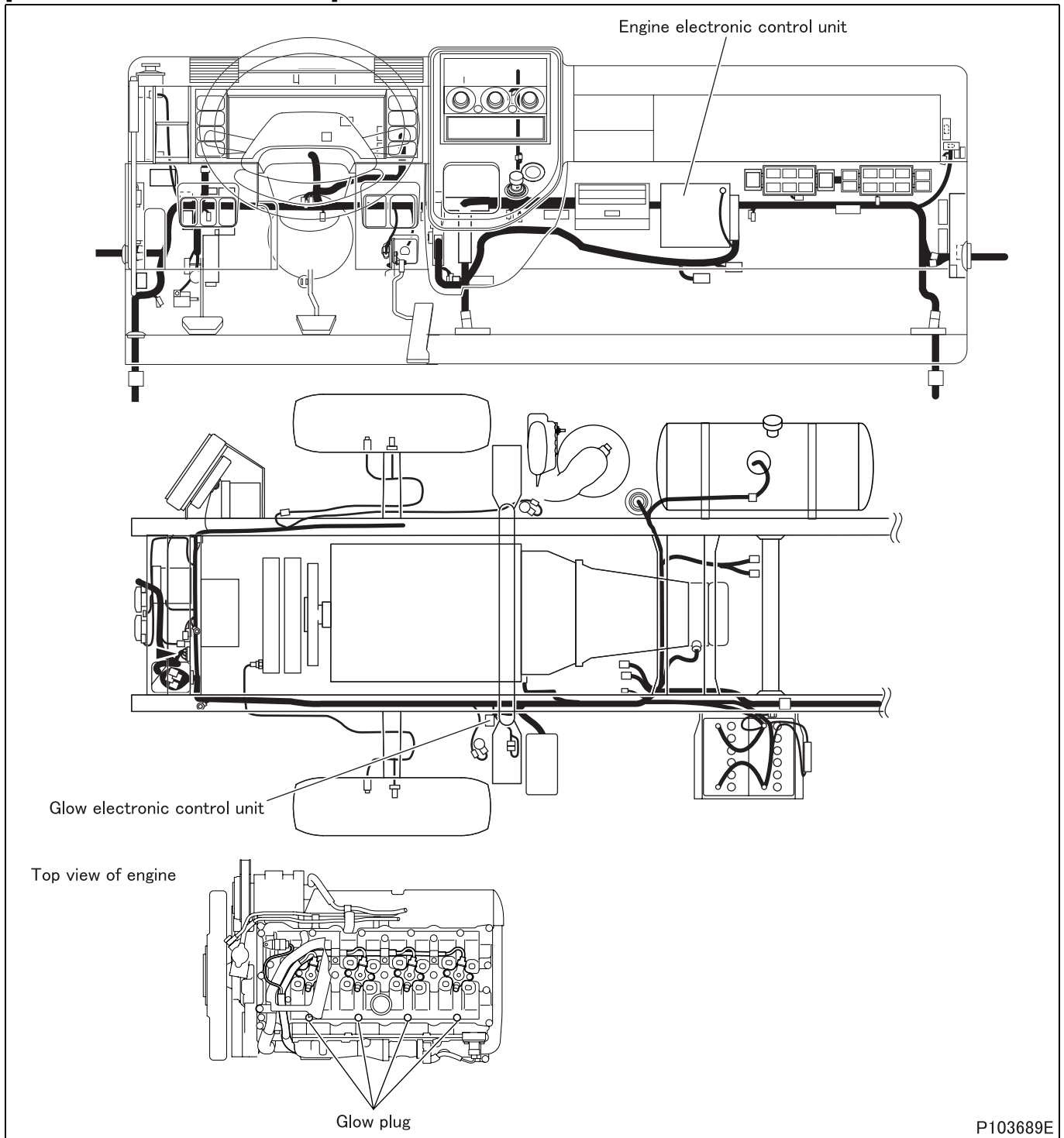
## [Electronic Control Unit Connection Diagram]



P103688E



[Parts Identification and Location]



P103689E

# TROUBLESHOOTING

## [Fault diagnosis]

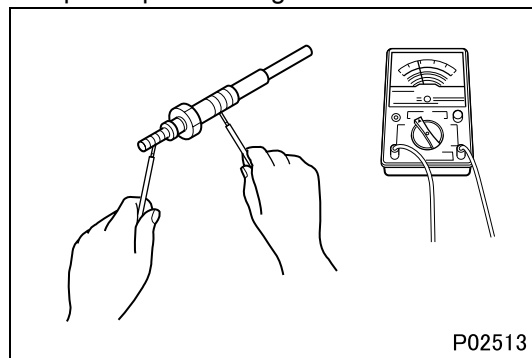
- Perform checks in the sequence of the following steps.

|        |  |  |                                    |  |
|--------|--|--|------------------------------------|--|
| Step 1 | Inspection items                                       | Inspection of harness between glow electronic control unit and chassis ground              |                                    |  |
|        | Maintenance item                                       | Check circuit between glow electronic control unit terminal No. 1 and chassis ground       |                                    |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector. |                                    |  |
|        | Requirements   | There is continuity.   |                                    |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to transient fault (See Gr00.). |  |
|        |  | NO   | Go to step 2.                      |  |

|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 2 | Inspection items                                       | Inspection of harness between glow electronic control unit and glow plug                                       |                 |  |
|        | Maintenance item                                       | Check circuit between glow electronic control unit terminal No. 1 and glow plug connector (for No. 4 cylinder) |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                     |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 3.   |  |
|        |  | NO   | Modify harness. |  |

|        |  |  |                          |  |
|--------|--|--|--------------------------|--|
| Step 3 | Inspection items                                       | Inspection of glow plug unit   |                          |  |
|        | Maintenance item                                       | Measure value of resistance of glow plug as shown in inspection diagram. |                          |  |
|        | Inspection condition                                   | -  |                          |  |
|        | Requirements   | 1 $\Omega$   |                          |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 4.            |  |
|        |  | NO   | Replacement of glow plug |  |

<Step 3 inspection diagram>



|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 4 | Inspection items                                       | Inspection of harness between glow electronic control unit and engine electronic control unit   |                 |  |
|        | Maintenance item                                       | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22</li> <li>Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74</li> <li>Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) terminal No. 44</li> </ul> |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 5 | Inspection items                                       |                   | Inspection of glow electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | —   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | After replacement of glow electronic control unit, go to step 6   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of engine electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | —   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of engine electronic control unit   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0684/Flash code: 26

## **[Monitor]**

Failure of preheating control

## **[Fault (outline)]**

Overload

## **[Diagnosis check]**

- Engine electronic control unit monitors data transfer from glow electronic control unit for abnormality (by glow electronic control unit feedback signal).

## **[Code generation condition]**

When either of the following conditions continues for 2, 3 seconds (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.).

- Transmitted signal is too low or too high.
- Transmission time is too long (over).

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Effects no special control.

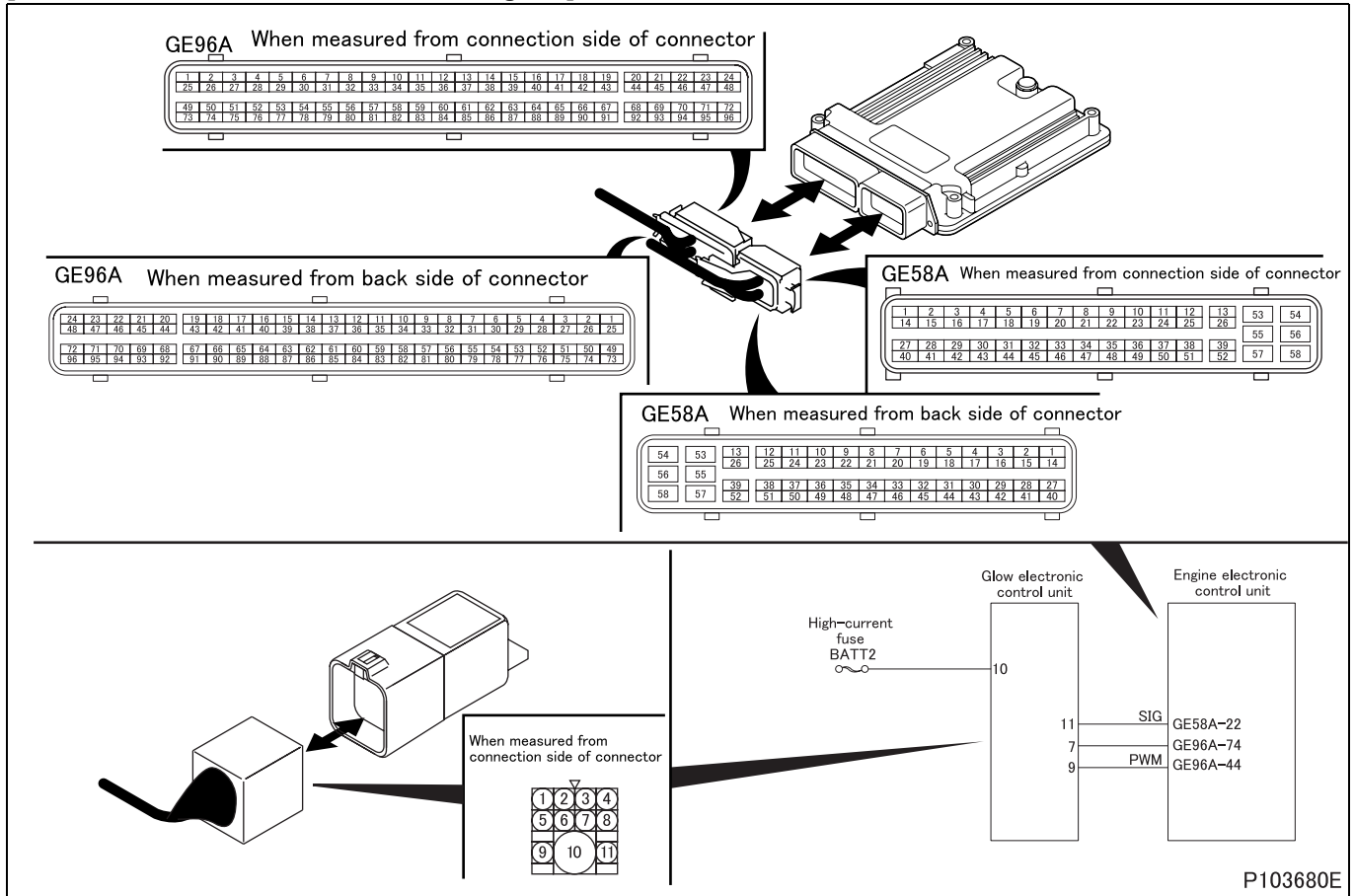
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between glow electronic control unit and engine electronic control unit
- Malfunction of each connector
- Malfunction of glow electronic control unit
- Malfunction of engine electronic control unit

## **[Recoverability]**

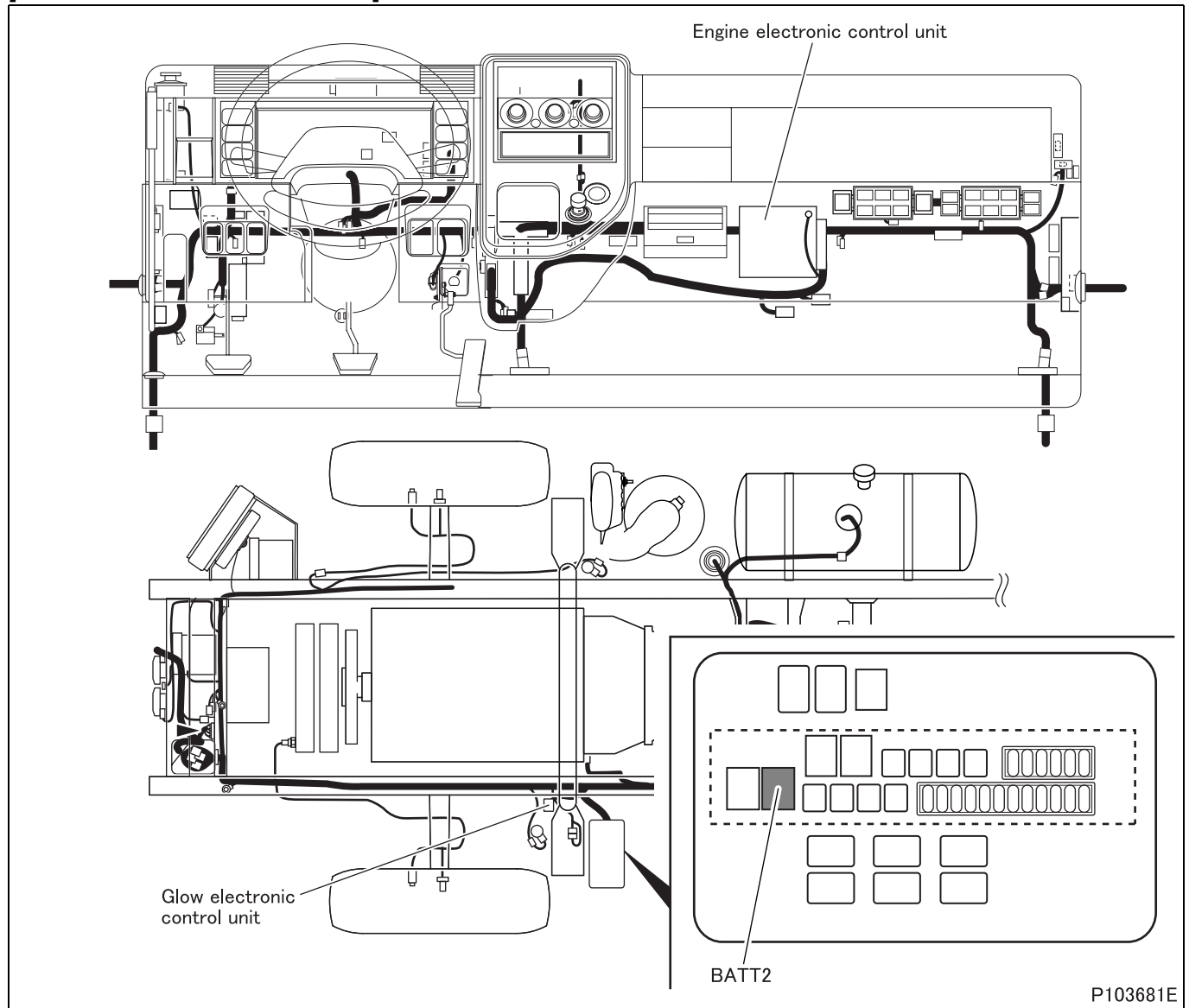
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 1 | Inspection items                                       |                 | Inspection of harness between glow electronic control unit and engine electronic control unit   |
|        | Maintenance item                                       |                 | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22</li> <li>• Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74</li> <li>• Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) terminal No. 44</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 2.   |
| NO     |  | Modify harness. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of glow electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | After replacement of glow electronic control unit, go to step 3   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of engine electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of engine electronic control unit   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0685/Flash code: 84

## **[Monitor]**

Failure of electronic drive unit relay

## **[Fault (outline)]**

Open circuit

## **[Diagnosis check]**

- Electronic drive unit relay circuit is monitored for fault.

## **[Code generation condition]**

- Electronic drive unit relay circuit remains open as detected for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is halted.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Post injection is inhibited.
- Diesel particulate filter regeneration is stopped.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

## **[Probable cause of trouble]**

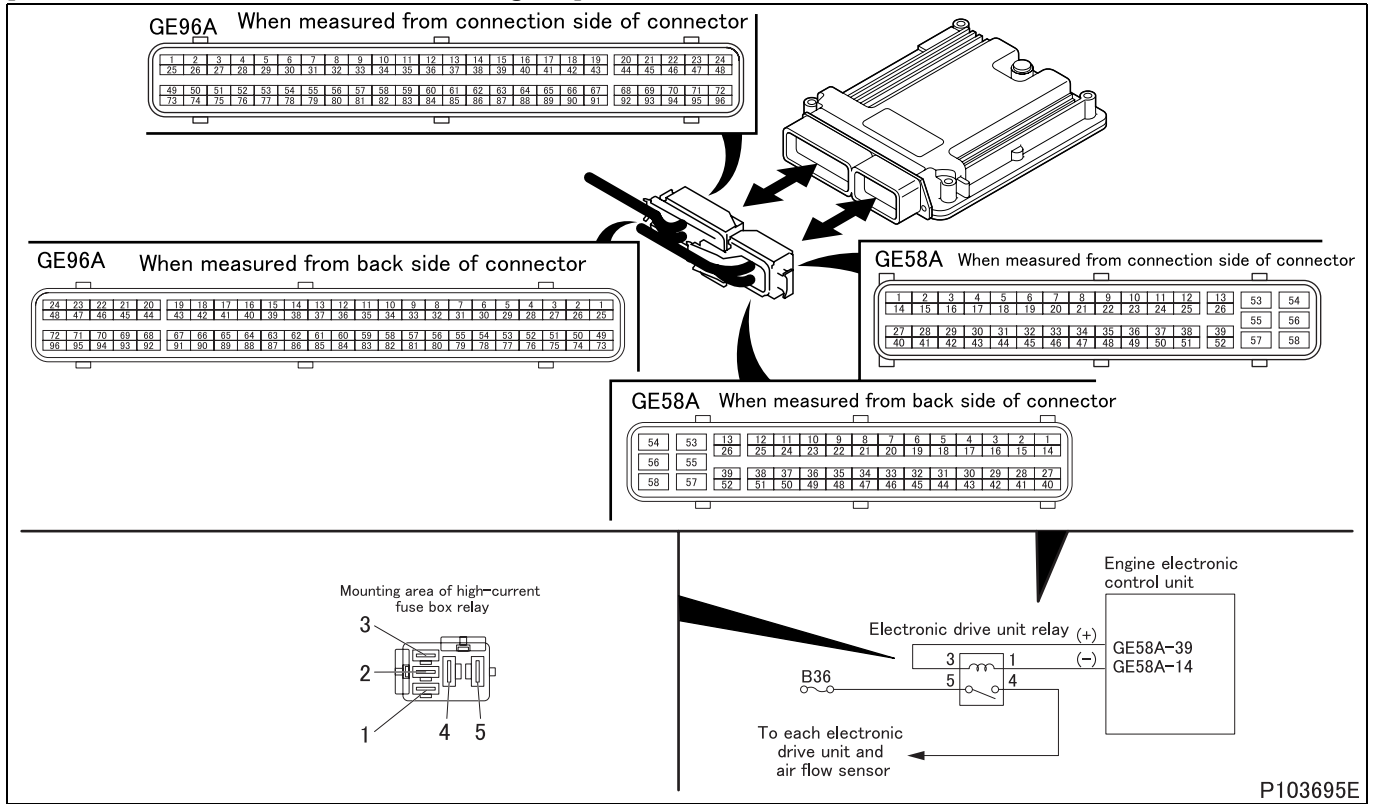
- Open-circuit of harness between electronic control unit and electronic drive unit relay
- Malfunction of each connector
- Malfunction of electronic drive unit relay
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



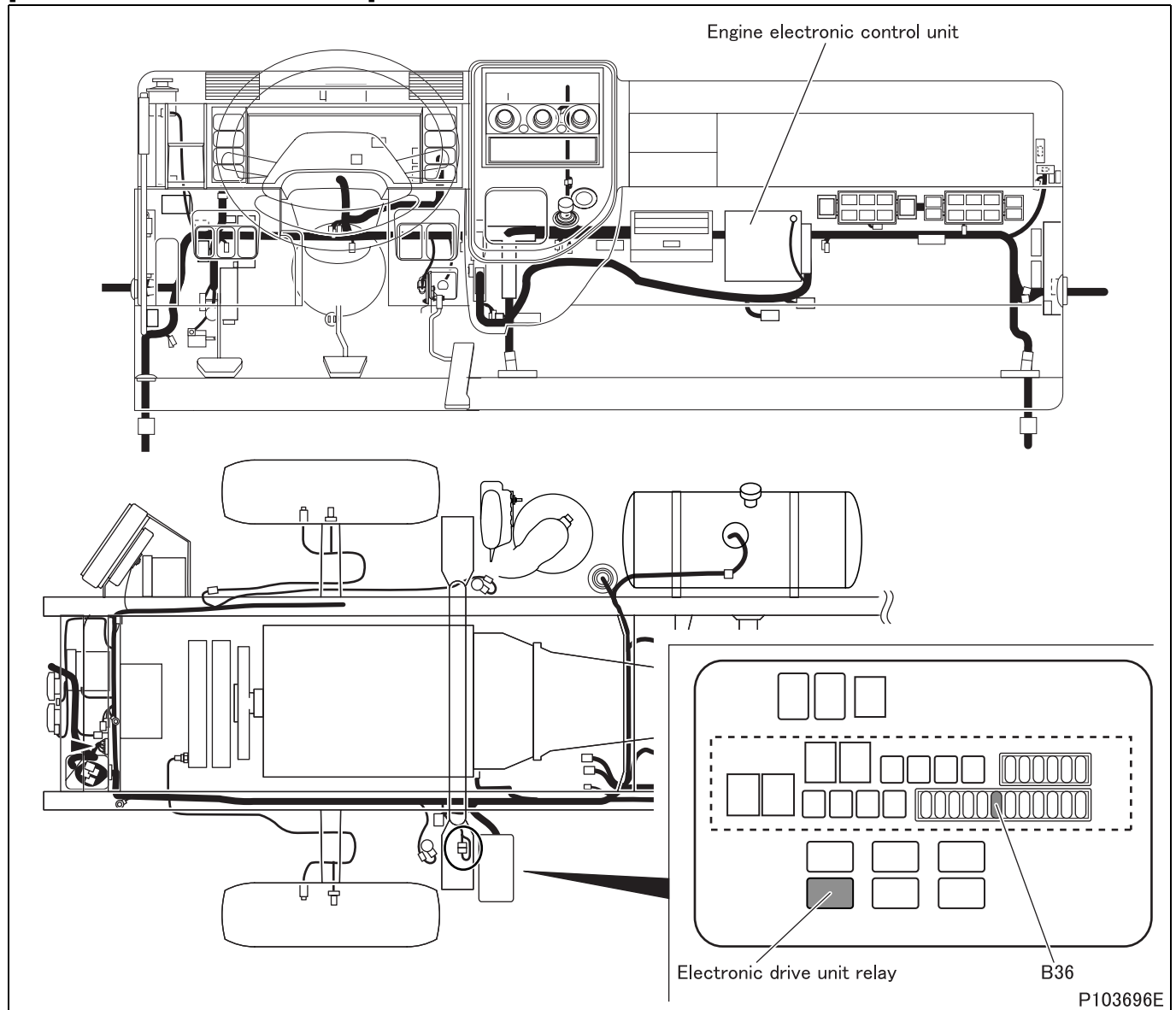
[Electronic Control Unit Connection Diagram]



P103695E

# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. AF "EDU Relay".                      |
|        | Inspection condition                                   |               | –   |
|        | Requirements   |               | Relay operation sound is noted (automatic reset after six seconds). |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).                                  |
| NO     |  | Go to step 2. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE58A) terminal No. 39 (+) and No. 14 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Perform actuator test item No. AF "EDU Relay".</li> </ul> |
|        | Requirements   |               | Same as battery voltage (automatic reset after six seconds)   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.   |
| NO     |  | Go to step 3. |   |

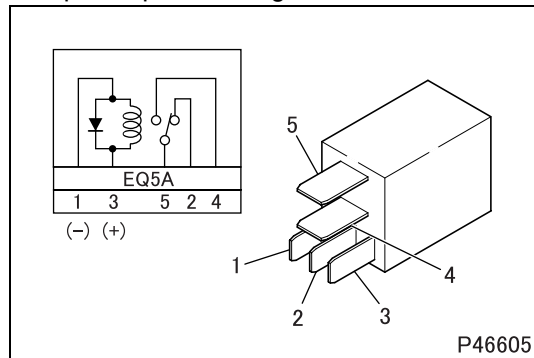
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

|        |  |  |   |
|--------|--|--|---|
| Step 5 | Inspection items                                       |  | Inspection of relay unit  |
|        | Maintenance item                                       |  | Measure continuity between terminals No. 4 and 5 when relay operates. |
|        | Inspection condition                                   |  | Apply battery voltage across connector terminals No. 3 (+) and 1 (-). |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

<Step 5 inspection diagram>



|        |  |  |  |
|--------|--|--|--|
| Step 6 | Inspection items                                       |  | Inspection of harness between relay and electronic control unit (power supply)                                   |
|        | Maintenance item                                       |  | Check circuit between relay connector terminal No. 3 and electronic drive unit connector (GE58A) terminal No. 39 |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                       |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |  |
|--------|--|--|--|
| Step 7 | Inspection items                                       |  | Inspection of harness between relay and electronic control unit (ground)   |
|        | Maintenance item                                       |  | Check circuit between relay connector terminal No. 1 and electronic drive unit connector (GE58A) terminal No. 14 |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                       |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform actuator test item No. AF "EDU Relay".                      |
|        | Inspection condition                                   |  | -   |
|        | Requirements   |  | Relay operation sound is noted (automatic reset after six seconds). |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

**[Fault code]**

Diagnosis code: P0686/Flash code: 84

**[Monitor]**

Failure of electronic drive unit relay

**[Fault (outline)]**

Short circuit ground

**[Diagnosis check]**

- Electronic drive unit relay circuit is monitored for fault.

**[Code generation condition]**

- Electronic drive unit relay circuit remains shorted to ground as detected for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is halted.

**[Diagnostic requirement]**

- After-run executed
- Electronic drive unit relay request signal: OFF

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Post injection is inhibited.
- Diesel particulate filter regeneration is stopped.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

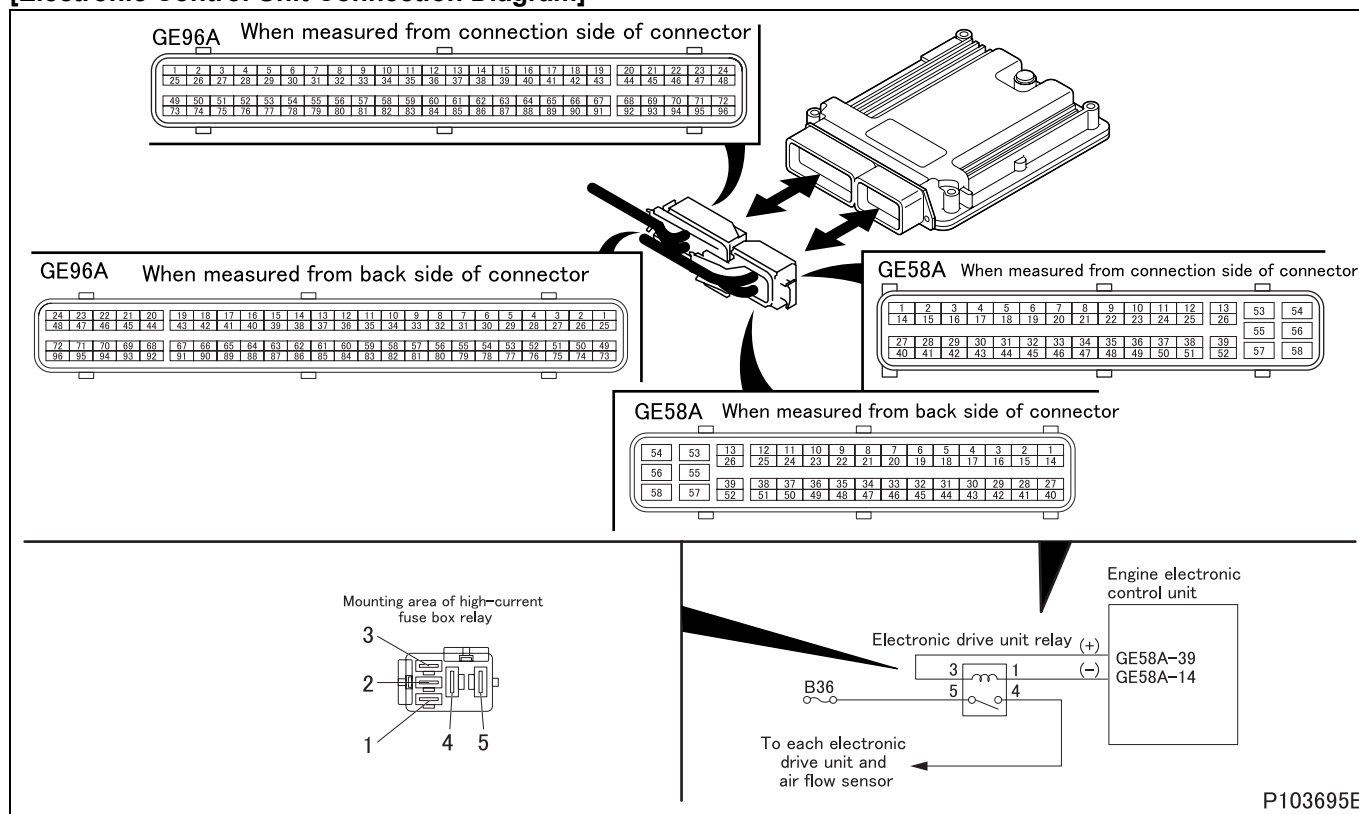
- Short-circuit of harness between electronic control unit and electronic drive unit relay
- Malfunction of each connector
- Malfunction of electronic drive unit relay
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

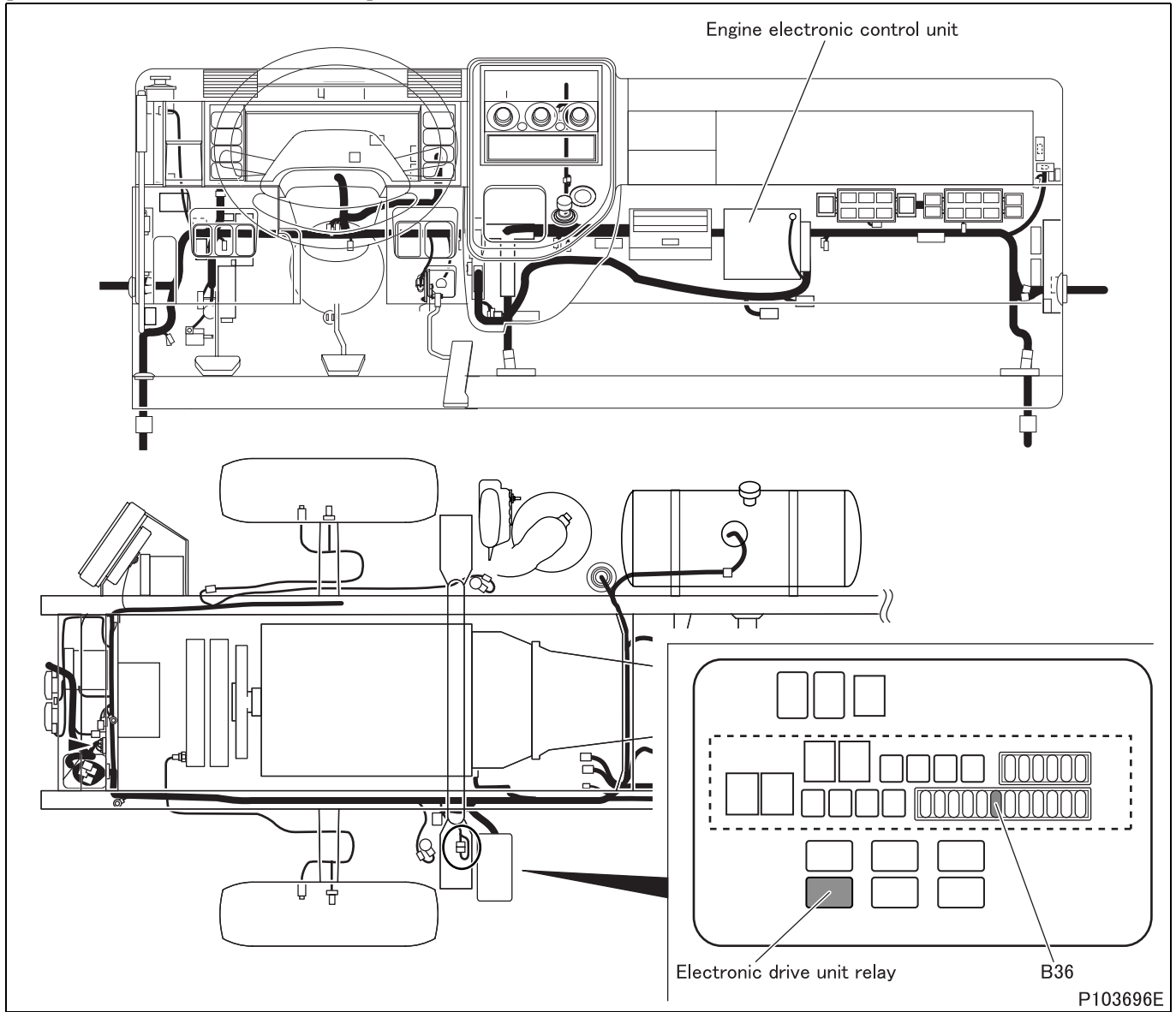
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P103695E

[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. AF "EDU Relay".                      |
|        | Inspection condition                                   |               | –   |
|        | Requirements   |               | Relay operation sound is noted (automatic reset after six seconds). |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).                                  |
| NO     |  | Go to step 2. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE58A) terminal No. 39 (+) and No. 14 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Perform actuator test item No. AF "EDU Relay".</li> </ul> |
|        | Requirements   |               | Same as battery voltage (automatic reset after six seconds)   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.   |
| NO     |  | Go to step 3. |   |

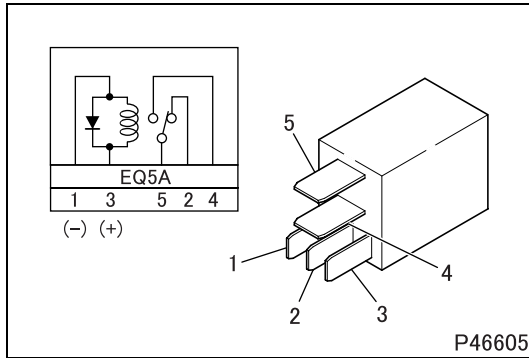
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |



|        |  |   |                      |  |
|--------|--|---|----------------------|--|
| Step 5 | Inspection items                                       | Inspection of relay unit  |                      |  |
|        | Maintenance item                                       | Measure continuity between terminals No. 4 and 5 when relay operates. |                      |  |
|        | Inspection condition                                   | Apply battery voltage across connector terminals No. 3 (+) and 1 (-). |                      |  |
|        | Requirements   | There is continuity.  |                      |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.        |  |
|        |  | NO  | Replacement of relay |  |

<Step 5 inspection diagram>



|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 6 | Inspection items                                       | Inspection of harness between relay and electronic control unit (power supply)                                   |                 |  |
|        | Maintenance item                                       | Check circuit between relay connector terminal No. 3 and electronic drive unit connector (GE58A) terminal No. 39 |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                       |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7.   |  |
|        |  | NO   | Modify harness. |  |

|        |  |  |                 |  |
|--------|--|--|-----------------|--|
| Step 7 | Inspection items                                       | Inspection of harness between relay and electronic control unit (ground)   |                 |  |
|        | Maintenance item                                       | Check circuit between relay connector terminal No. 1 and electronic drive unit connector (GE58A) terminal No. 14 |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                       |                 |  |
|        | Requirements   | There is continuity.   |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8.   |  |
|        |  | NO   | Modify harness. |  |

|        |  |   |  |  |
|--------|--|---|--|--|
| Step 8 | Inspection items                                       | Inspection by control data  |  |  |
|        | Maintenance item                                       | Perform actuator test item No. AF "EDU Relay".                      |  |  |
|        | Inspection condition                                   | -   |  |  |
|        | Requirements   | Relay operation sound is noted (automatic reset after six seconds). |  |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.).     |  |
|        |  | NO  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0687/Flash code: 84

## **[Monitor]**

Failure of electronic drive unit relay

## **[Fault (outline)]**

Short circuit battery

## **[Diagnosis check]**

- Electronic drive unit relay circuit is monitored for fault.

## **[Code generation condition]**

- Electronic drive unit relay circuit remains shorted to power supply as detected for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.

## **[Diagnostic requirement]**

- Electronic drive unit relay is on.
- Electronic drive unit relay request signal: ON

## **[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Post injection is inhibited.
- Diesel particulate filter regeneration is stopped.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

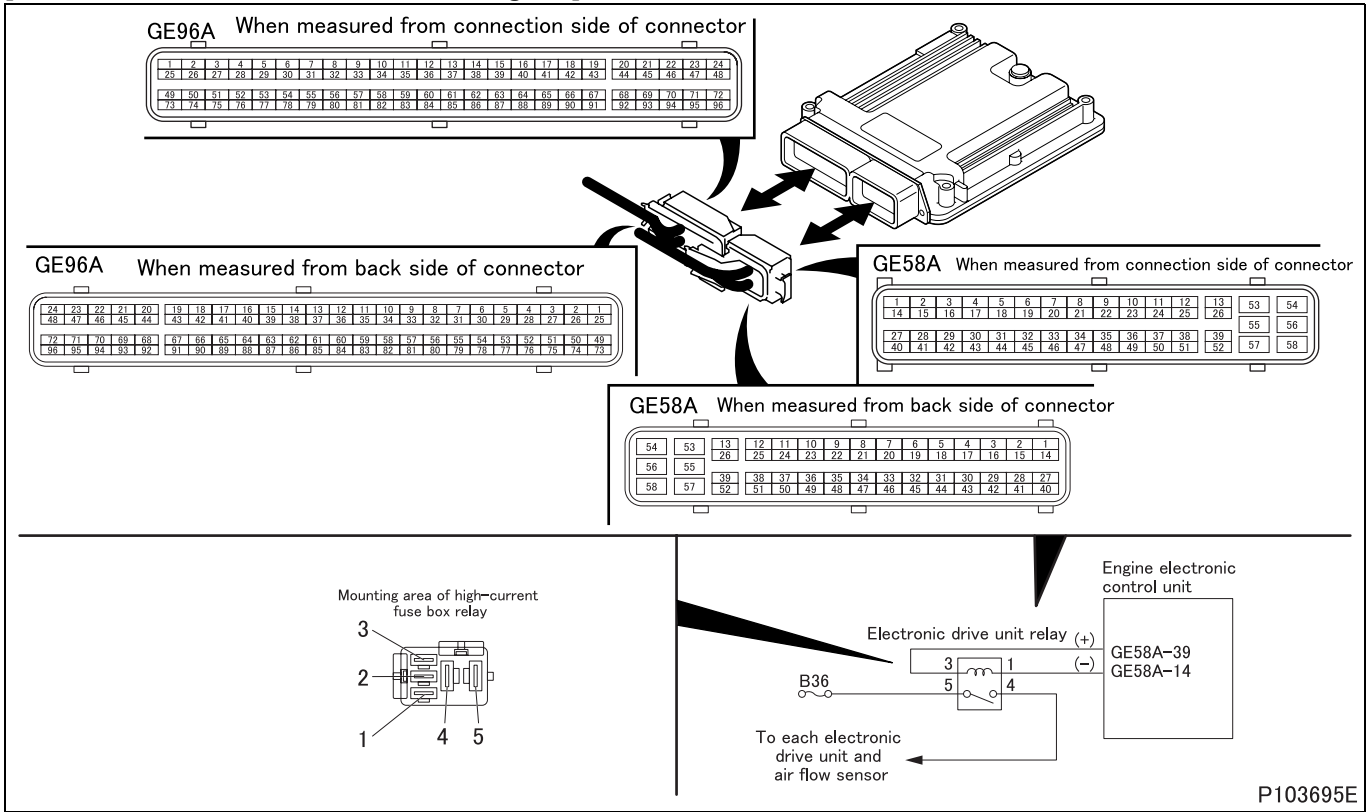
## **[Probable cause of trouble]**

- Short-circuit of harness between electronic control unit and electronic drive unit relay
- Malfunction of each connector
- Malfunction of electronic drive unit relay
- Malfunction of electronic control unit

## **[Recoverability]**

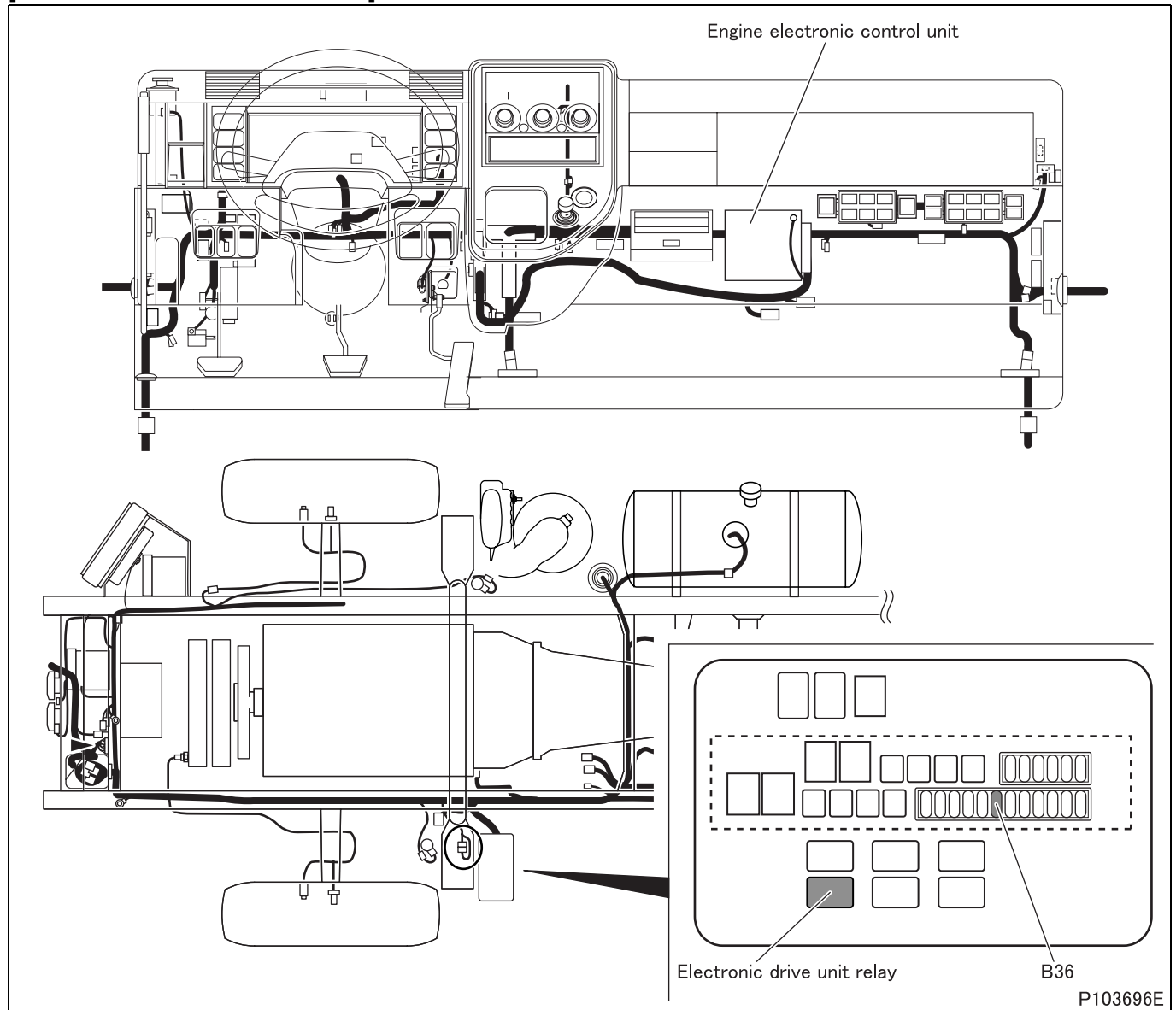
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. AF "EDU Relay".                      |
|        | Inspection condition                                   |               | –   |
|        | Requirements   |               | Relay operation sound is noted (automatic reset after six seconds). |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).                                  |
| NO     |  | Go to step 2. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE58A) terminal No. 39 (+) and No. 14 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Perform actuator test item No. AF "EDU Relay".</li> </ul> |
|        | Requirements   |               | Same as battery voltage (automatic reset after six seconds)   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.   |
| NO     |  | Go to step 3. |   |

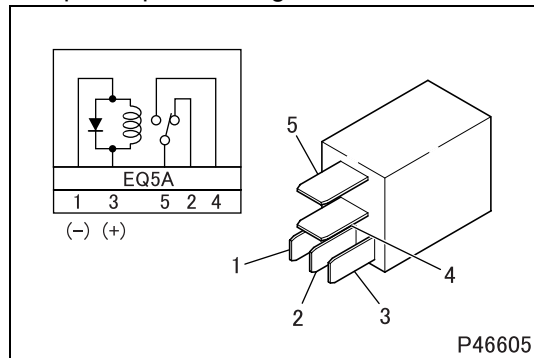
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

|        |  |  |   |
|--------|--|--|---|
| Step 5 | Inspection items                                       |  | Inspection of relay unit  |
|        | Maintenance item                                       |  | Measure continuity between terminals No. 4 and 5 when relay operates. |
|        | Inspection condition                                   |  | Apply battery voltage across connector terminals No. 3 (+) and 1 (-). |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

<Step 5 inspection diagram>



|        |  |  |  |
|--------|--|--|--|
| Step 6 | Inspection items                                       |  | Inspection of harness between relay and electronic control unit (power supply)                                   |
|        | Maintenance item                                       |  | Check circuit between relay connector terminal No. 3 and electronic drive unit connector (GE58A) terminal No. 39 |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                       |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |  |
|--------|--|--|--|
| Step 7 | Inspection items                                       |  | Inspection of harness between relay and electronic control unit (ground)   |
|        | Maintenance item                                       |  | Check circuit between relay connector terminal No. 1 and electronic drive unit connector (GE58A) terminal No. 14 |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                       |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform actuator test item No. AF "EDU Relay".                      |
|        | Inspection condition                                   |  | -   |
|        | Requirements   |  | Relay operation sound is noted (automatic reset after six seconds). |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

**[Fault code]**

Diagnosis code: P0688/Flash code: 84

**[Monitor]**

Failure of electronic drive unit relay

**[Fault (outline)]**

Overload

**[Diagnosis check]**

- Electronic drive unit relay circuit is monitored for fault.

**[Code generation condition]**

- Power supply temperature in electronic drive unit relay circuit remains at 100°C {212°F} for 1 second (overcurrent).

(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.

**[Diagnostic requirement]**

- Electronic drive unit relay is on.
- Electronic drive unit relay request signal: ON

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Post injection is inhibited.
- Diesel particulate filter regeneration is stopped.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

- Short-circuit of harness between electronic control unit and electronic drive unit
- Malfunction of each connector
- Malfunction of electronic drive unit relay
- Malfunction of electronic control unit

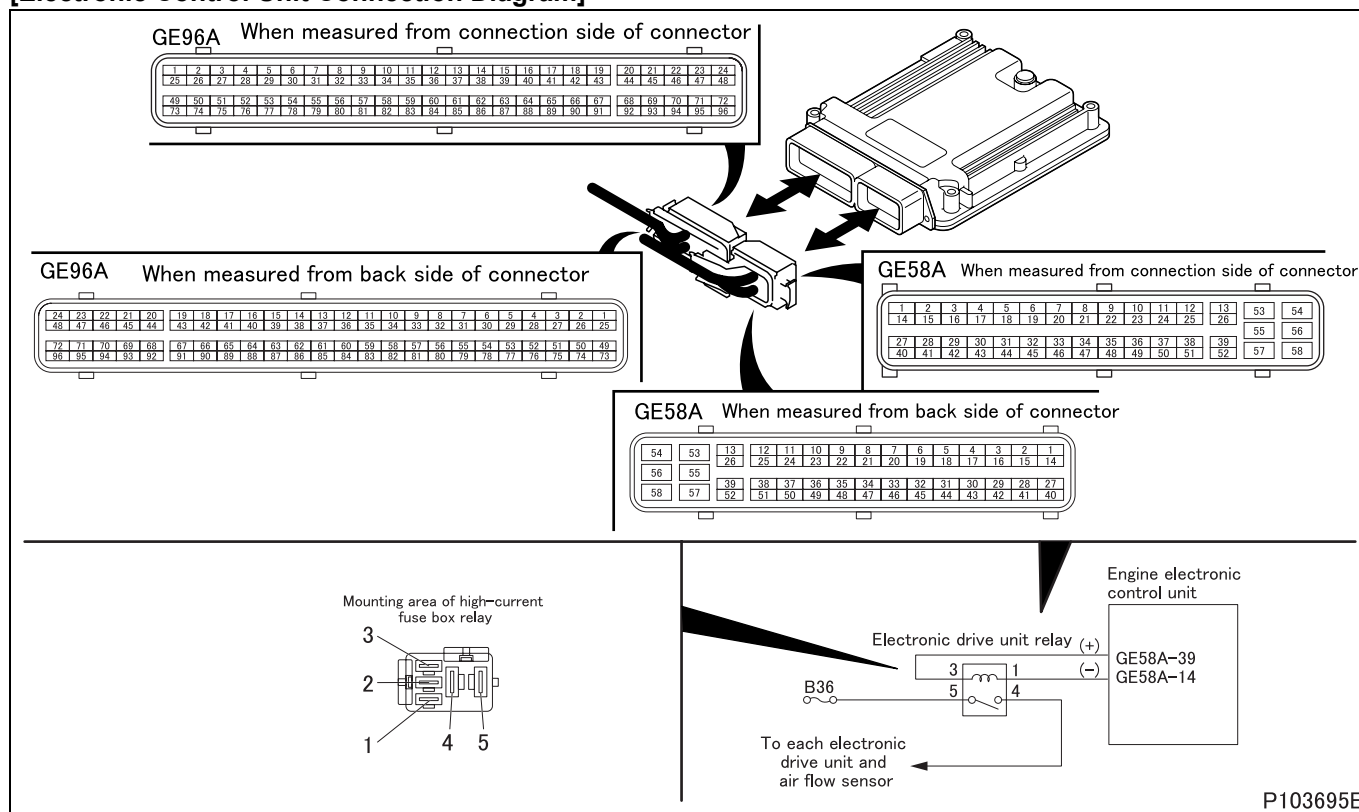
**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

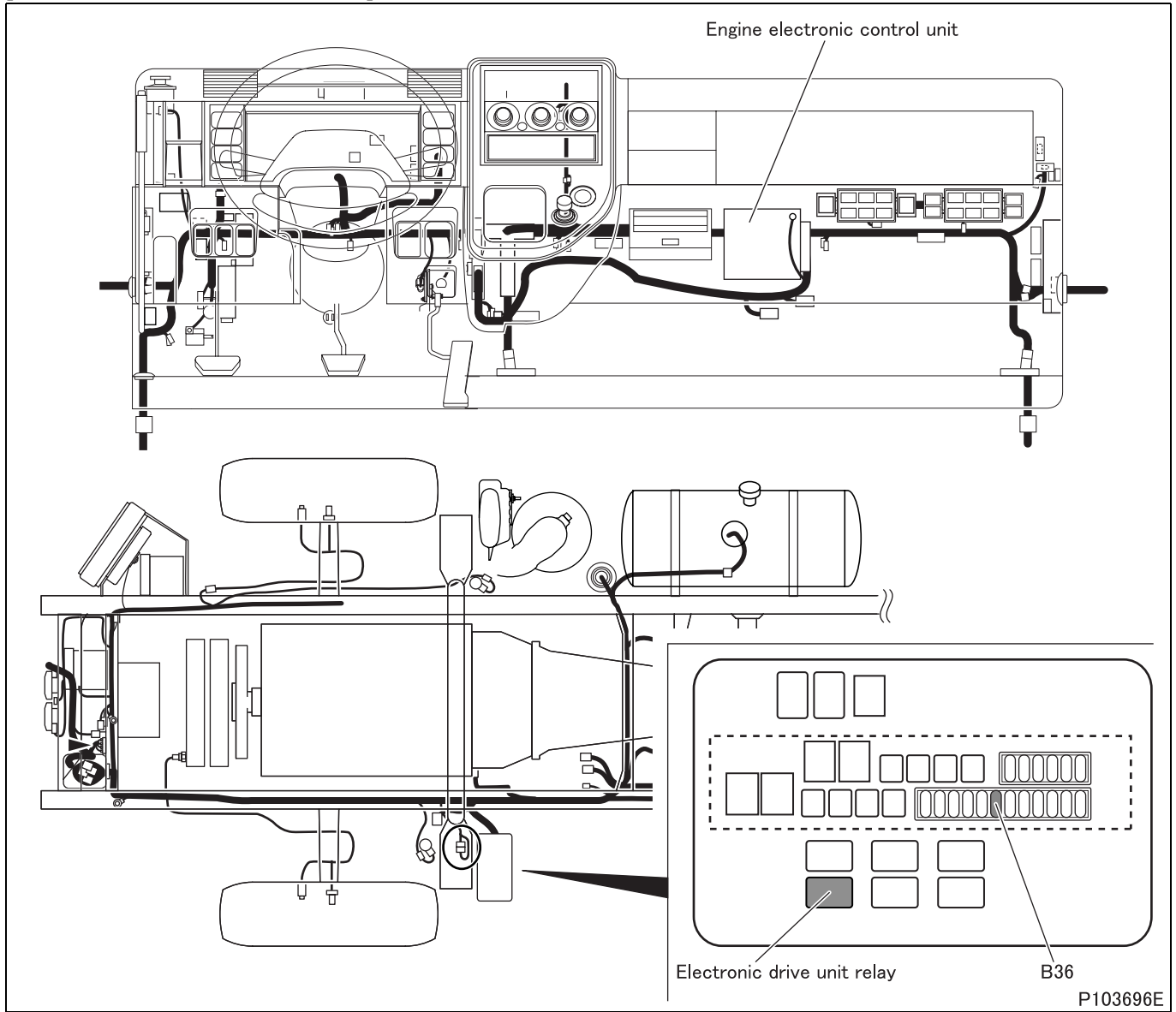
## [Electronic Control Unit Connection Diagram]



P103695E



[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. AF "EDU Relay".                      |
|        | Inspection condition                                   |               | –   |
|        | Requirements   |               | Relay operation sound is noted (automatic reset after six seconds). |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).                                  |
| NO     |  | Go to step 2. |   |

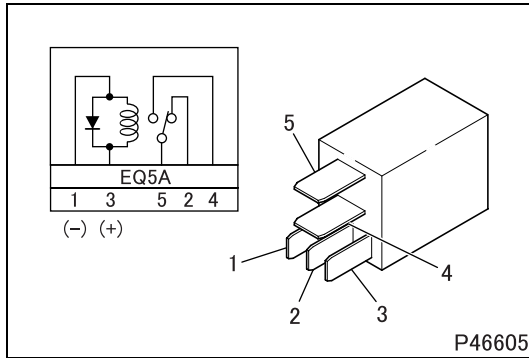
|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE58A) terminal No. 39 (+) and No. 14 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Perform actuator test item No. AF "EDU Relay".</li> </ul> |
|        | Requirements   |               | Same as battery voltage (automatic reset after six seconds)   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.   |
| NO     |  | Go to step 3. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

|        |  |   |               |
|--------|--|---|---------------|
| Step 5 | Inspection items                                       | Inspection of relay unit  |               |
|        | Maintenance item                                       | Measure continuity between terminals No. 4 and 5 when relay operates. |               |
|        | Inspection condition                                   | Apply battery voltage across connector terminals No. 3 (+) and 1 (-). |               |
|        | Requirements   | There is continuity.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6. |
| NO     |  | Replacement of relay  |               |

<Step 5 inspection diagram>



|        |  |  |               |
|--------|--|--|---------------|
| Step 6 | Inspection items                                       | Inspection of harness between relay and electronic control unit (power supply)                                   |               |
|        | Maintenance item                                       | Check circuit between relay connector terminal No. 3 and electronic drive unit connector (GE58A) terminal No. 39 |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                       |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7. |
| NO     |  | Modify harness.  |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of harness between relay and electronic control unit (ground)   |               |
|        | Maintenance item                                       | Check circuit between relay connector terminal No. 1 and electronic drive unit connector (GE58A) terminal No. 14 |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                       |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Modify harness.  |               |

|        |  |   |                                    |
|--------|--|---|------------------------------------|
| Step 8 | Inspection items                                       | Inspection by control data  |                                    |
|        | Maintenance item                                       | Perform actuator test item No. AF "EDU Relay".                      |                                    |
|        | Inspection condition                                   | -   |                                    |
|        | Requirements   | Relay operation sound is noted (automatic reset after six seconds). |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.). |
| NO     |  | Replacement of electronic control unit                              |                                    |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P0698/Flash code: 81

## **[Monitor]**

Sensor power supply abnormal

## **[Fault (outline)]**

Low signal range check

## **[Diagnosis check]**

- Sensor supply voltage 3 in engine electronic control unit is monitored.
- Units served by sensor supply voltage 3
- Common rail pressure sensor
- DPF pressure sensor (DIFF)
- Boost air temperature sensor

## **[Code generation condition]**

- Supply voltage to units remain below 4.7 V for 0.5 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

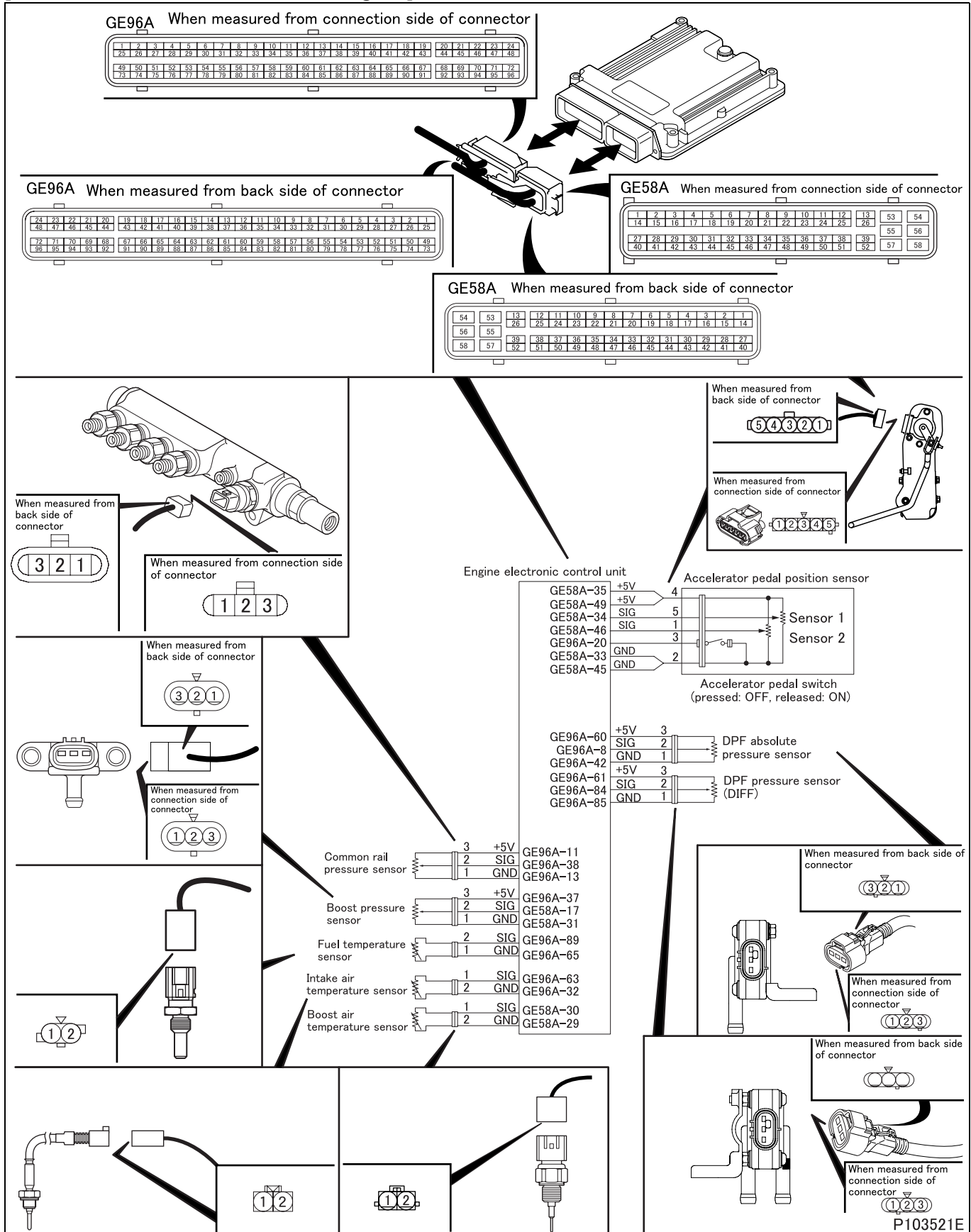
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and each sensor
- Malfunction of each connector
- Malfunction of each sensor
- Malfunction of electronic control unit

## **[Recoverability]**

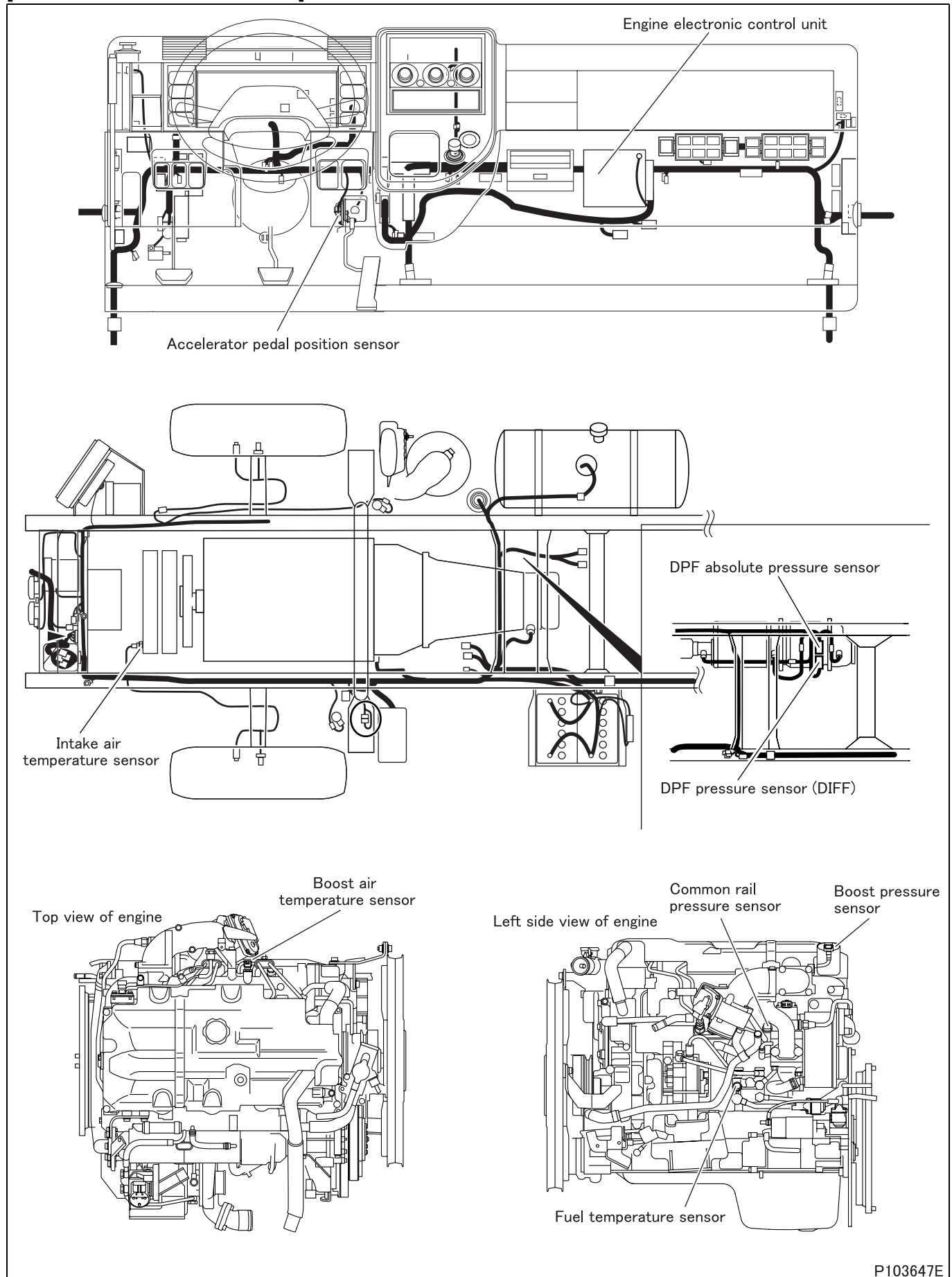
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]



P103647E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 1 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 2.   |
| NO     |  | Modify connector. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply): common rail pressure sensor   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 11 (+) and No. 13 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 5.   |
| NO     |  | Go to step 3. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of common rail pressure sensor connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 4 | Inspection items                                       |                 | Inspection of harness between electronic control unit and common rail pressure sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between common rail pressure sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 11. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 5.   |
| NO     |  | Modify harness. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 5 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply): DPF pressure sensor (DIFF)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 61 (+) and No. 85 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 8.   |
| NO     |  | Go to step 6. |   |

# TROUBLESHOOTING

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of DPF pressure sensor (DIFF) connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic control unit and DPF pressure sensor (DIFF) (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between DPF pressure sensor (DIFF) connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 61. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 8 | Inspection items                                       |               | Inspection by electronic control unit connector: boost air temperature sensor   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE58A) terminal No. 30 (+) and No. 29 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 9. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 9 | Inspection items                                       |                   | Inspection of boost air temperature sensor  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 10.  |
| NO     |  | Modify connector. |   |

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and boost air temperature sensor (power supply)                                     |
|         | Maintenance item                                       |                 | Check circuit between boost air temperature sensor connector terminal No. 1 and electronic control unit connector (GE58A) terminal No. 30 |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Replacement of electronic control unit  |
| NO      |  | Modify harness. |   |



**[Fault code]**

Diagnosis code: P0699/Flash code: 81

**[Monitor]**

Sensor power supply abnormal

**[Fault (outline)]**

High signal range check

**[Diagnosis check]**

- Sensor supply voltage 3 in engine electronic control unit is monitored.
- Units served by sensor supply voltage 3
- Common rail pressure sensor
- DPF pressure sensor (DIFF)
- Boost air temperature sensor

**[Code generation condition]**

- Supply voltage to units remain over 5.3 V for 0.5 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

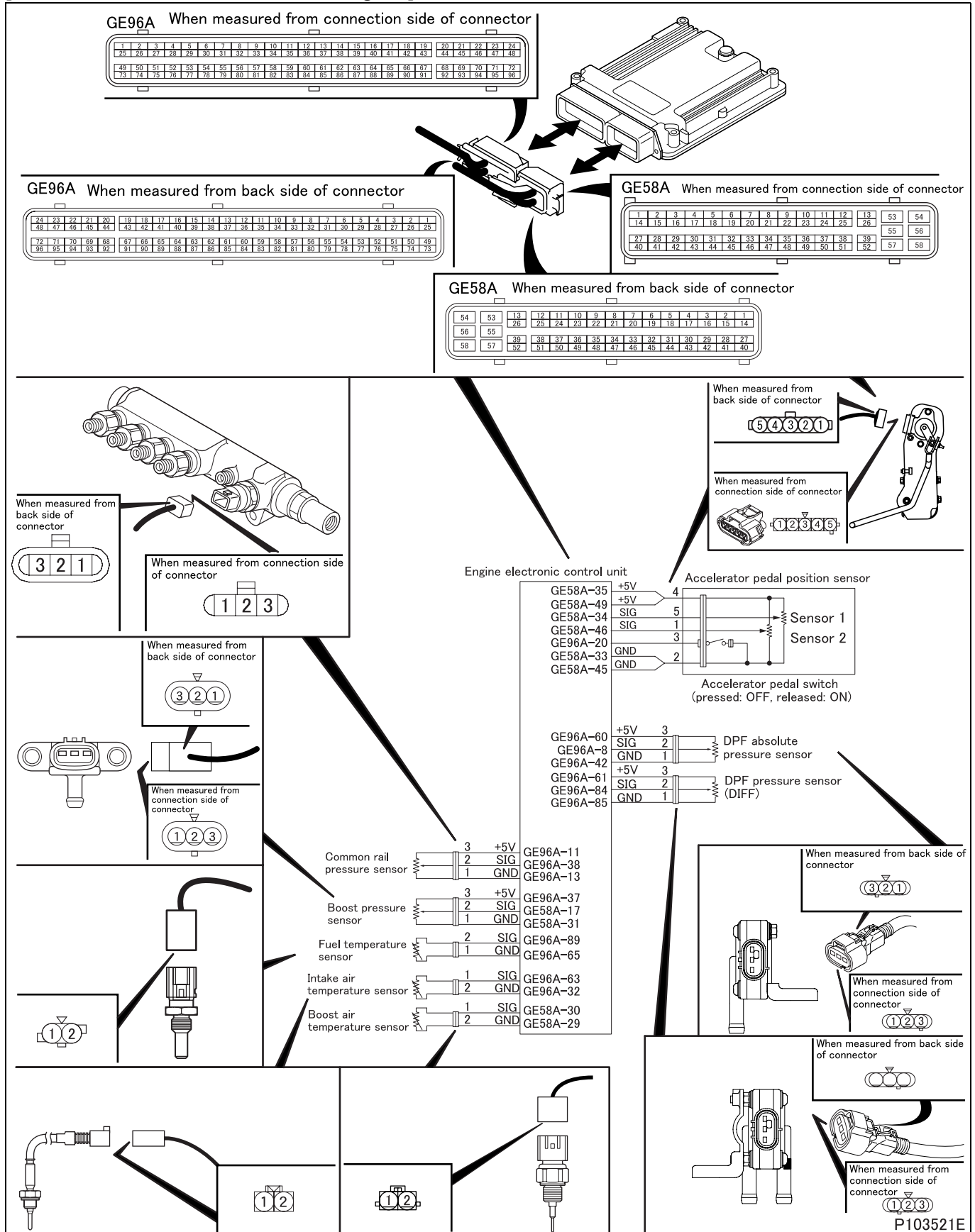
- Open-circuit or short-circuit of harness between electronic control unit and each sensor
- Malfunction of each connector
- Malfunction of each sensor
- Malfunction of electronic control unit

**[Recoverability]**

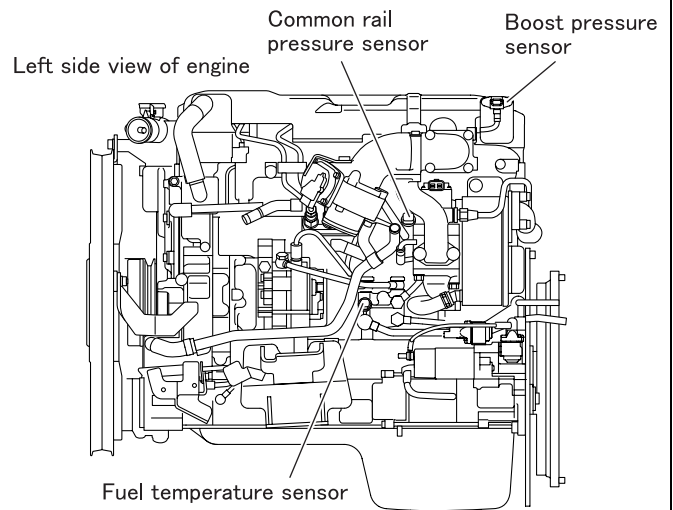
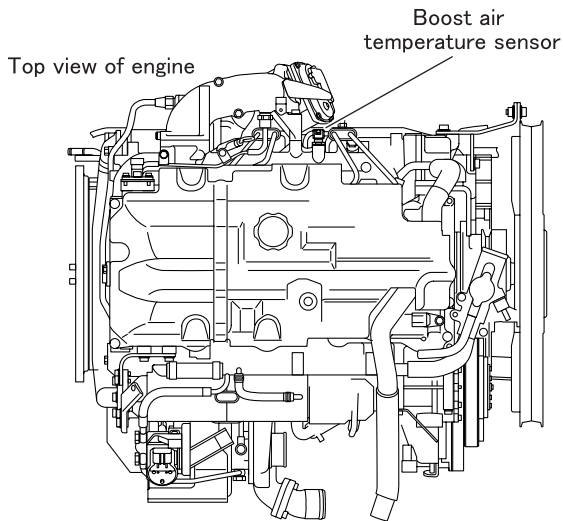
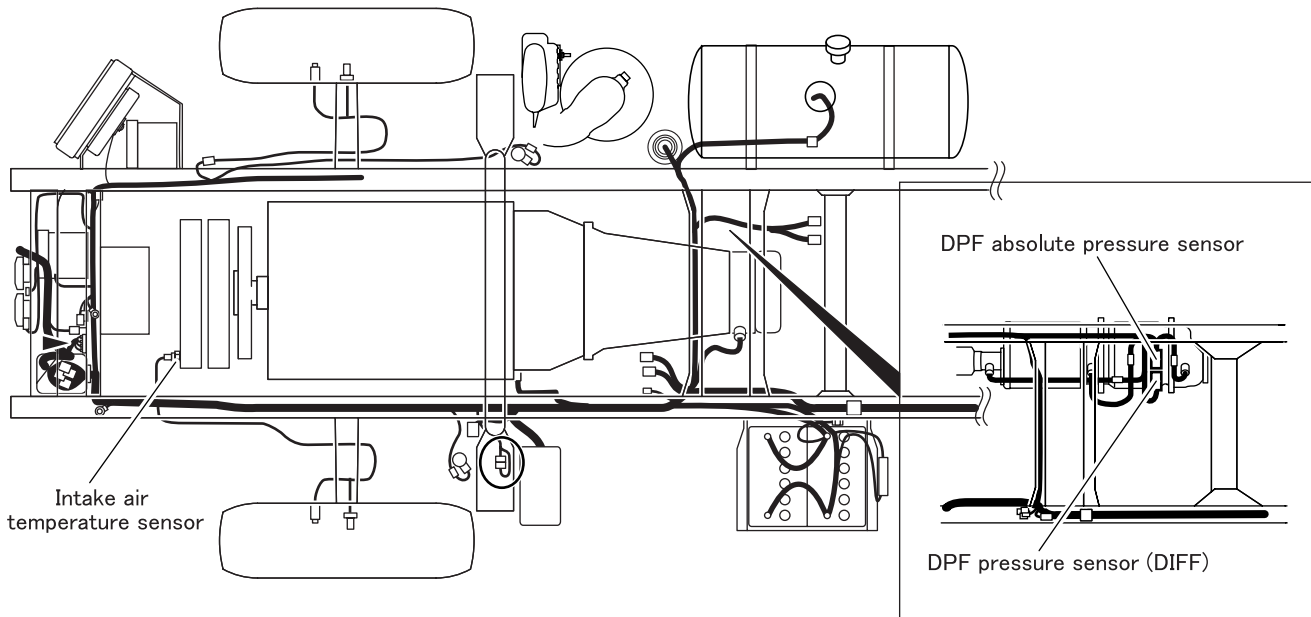
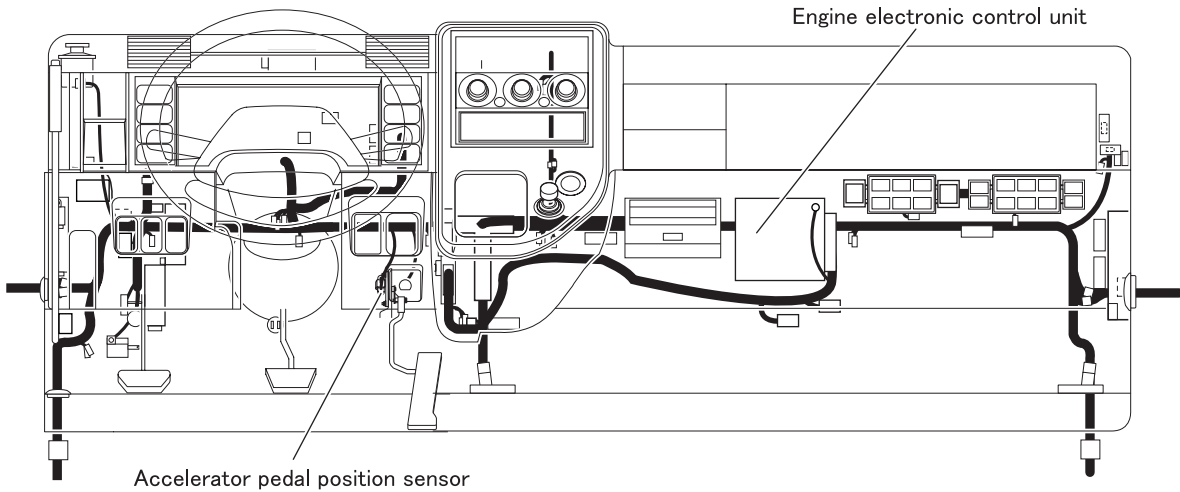
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 1 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | —   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 2.   |
| NO     |  | Modify connector. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply): common rail pressure sensor   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 11 (+) and No. 13 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 5.   |
| NO     |  | Go to step 3. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of common rail pressure sensor connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | —   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 4 | Inspection items                                       |                 | Inspection of harness between electronic control unit and common rail pressure sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between common rail pressure sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 11. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 5.   |
| NO     |  | Modify harness. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 5 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply): DPF pressure sensor (DIFF)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 61 (+) and No. 85 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of connector of harness with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 8.   |
| NO     |  | Go to step 6. |   |

|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of DPF pressure sensor (DIFF) connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify connector.   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of harness between electronic control unit and DPF pressure sensor (DIFF) (power supply)                                      |               |
|        | Maintenance item                                       | Check circuit between DPF pressure sensor (DIFF) connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 61. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.   |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Modify harness.  |               |

|        |  |   |                                    |
|--------|--|---|------------------------------------|
| Step 8 | Inspection items                                       | Inspection by electronic control unit connector: boost air temperature sensor   |                                    |
|        | Maintenance item                                       | Measure value of voltage between connector (GE58A) terminal No. 30 (+) and No. 29 (-).  |                                    |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Measure from back side of connector of harness with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |                                    |
|        | Requirements   | 5 V   |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.). |
| NO     |  | Go to step 9.   |                                    |

|        |  |   |                |
|--------|--|---|----------------|
| Step 9 | Inspection items                                       | Inspection of boost air temperature sensor  |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 10. |
| NO     |  | Modify connector.   |                |

|         |  |   |  |
|---------|--|---|--|
| Step 10 | Inspection items                                       | Inspection of harness between electronic control unit and boost air temperature sensor (power supply)                                     |  |
|         | Maintenance item                                       | Check circuit between boost air temperature sensor connector terminal No. 1 and electronic control unit connector (GE58A) terminal No. 30 |  |
|         | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |  |
|         | Requirements   | There is continuity.  |  |
|         | Inspection result (Is the judging standard satisfied?) | YES   | Replacement of electronic control unit |
| NO      |  | Modify harness.   |  |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P0700/Flash code: 71

## **[Monitor]**

Failure of automatic transmission control

## **[Fault (outline)]**

Fault present in TCM

(TCM: Transmission Control Module)

## **[Diagnosis check]**

- Transfer of fault status information from automatic transmission electronic control unit is monitored.

## **[Code generation condition]**

- Fault information from automatic transmission electronic control unit has been received for more than 2 seconds.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Effects no special control.

## **[Probable cause of trouble]**

- Failure of automatic transmission system (See Gr23.)

## **[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

**[Fault code]**

Diagnosis code: P1169/Flash code: 56

**[Monitor]**

Characteristic value in air flow sensor

**[Fault (outline)]**

Electronic control unit

**[Diagnosis check]**

- Availability of stored air flow sensor data in engine electronic control unit is checked.

**[Code generation condition]**

- Air flow sensor data are found missing.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Effects no special control.

**[Probable cause of trouble]**

- No air flow sensor data stored in engine electronic control unit  
(For data alteration/registration and data write operation, see Gr13ECU "ECU Rewrite and Programming".)

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P1170/Flash code: 34

## **[Monitor]**

Injection quantity adjustment data

## **[Fault (outline)]**

Electronic control unit

## **[Diagnosis check]**

- Availability of stored injection quantity adjustment data in engine electronic control unit is checked.

## **[Code generation condition]**

- Injection quantity adjustment data are found missing.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Injection quantity adjustment data is fixed at backup value.

## **[Probable cause of trouble]**

- No injection quantity adjustment data stored in engine electronic control unit  
(For data alteration/registration and data write operation, see Gr13ECU "ECU Rewrite and Programming".)

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)



**[Fault code]**

Diagnosis code: P1410/Flash code: 92

**[Monitor]**

Excessive exhaust pressure

**[Fault (outline)]**

- Low signal range check
- High signal range check

**[Diagnosis check]**

- Pressure before ceramic filter is monitored by DPF absolute pressure sensor for clogging of ceramic filter.

**[Code generation condition]**

- Pressure before ceramic filter remains over specified value for 3 seconds.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Engine torque is limited.
- Exhaust gas recirculation control is stopped.
- Throttle control disabled.
- Diesel particulate filter regeneration is stopped.
- Particulate matter deposit computation is stopped.

**[Probable cause of trouble]**

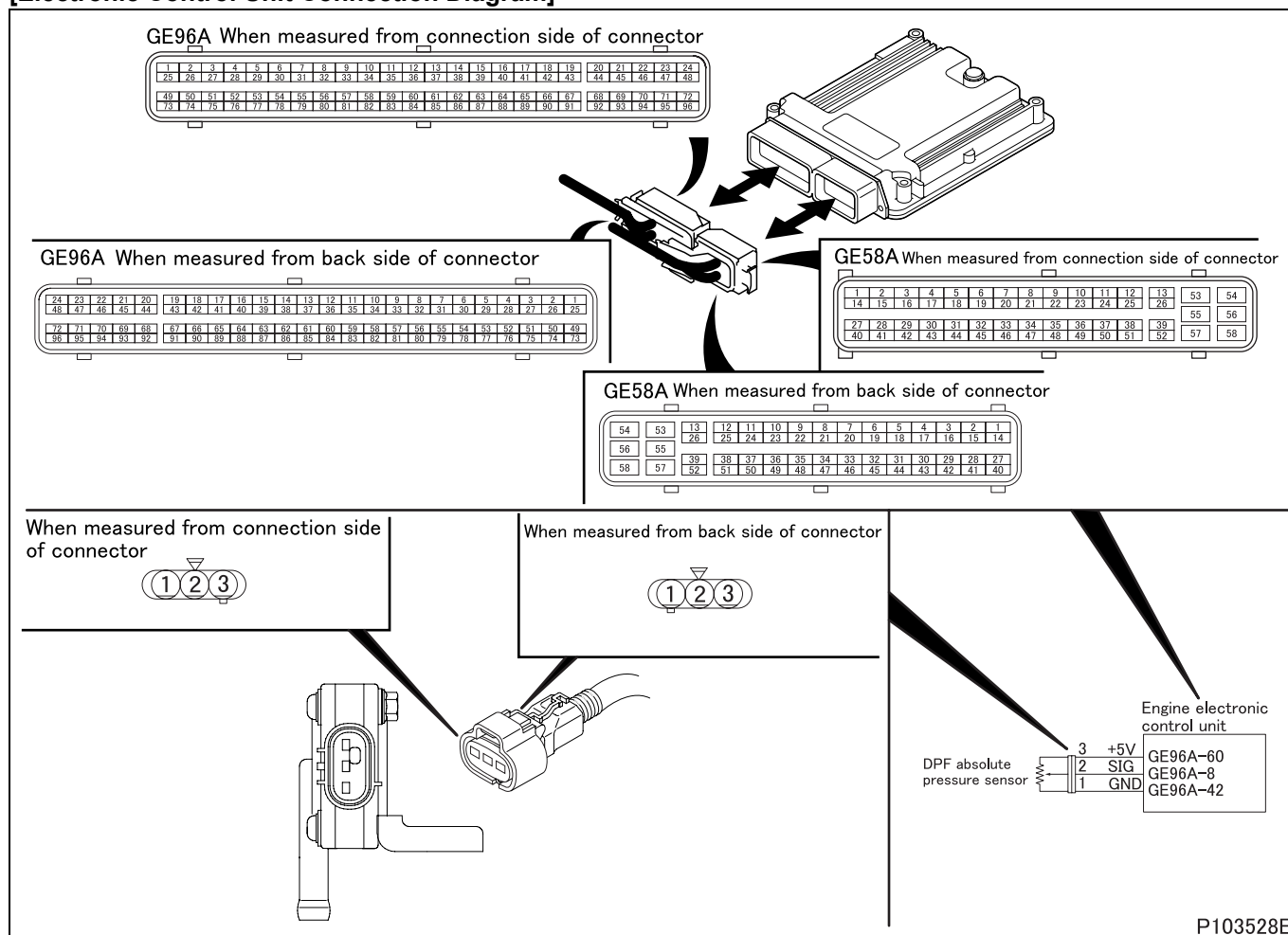
- Excessive smoke emission (due to malfunction of engine proper, common rail or exhaust gas recirculation system)
- Malfunction of diesel particulate filter regeneration control
- Excessive particulate matter (PM) deposit
- Malfunction of DPF absolute pressure sensor.
- Malfunction of engine electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

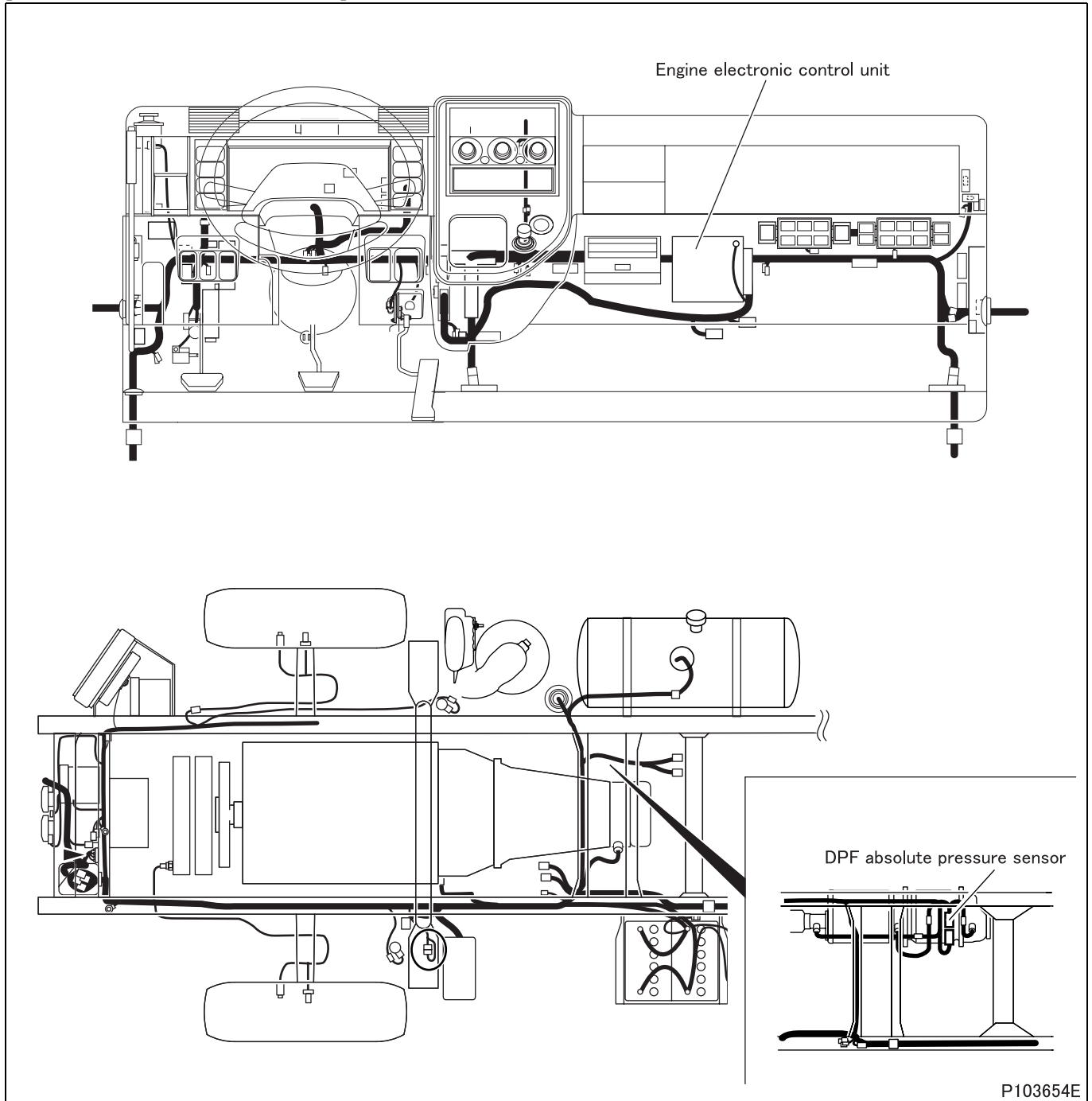
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P103528E

[Parts Identification and Location]



# TROUBLESHOOTING

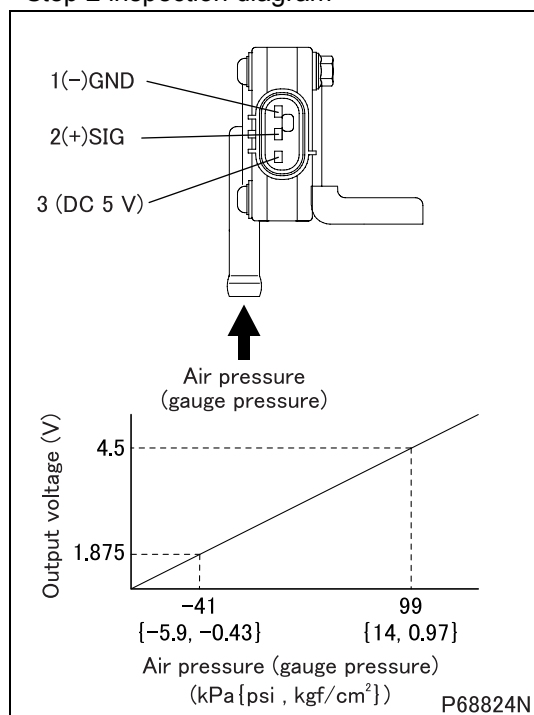
## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>P0045 "VGT Actuator (Open)"</li> <li>P0046 "VGT Actuator (Performance)"</li> <li>P0047 "VGT Actuator (Low)"</li> <li>P0102 "Airflow sensor (Low)"</li> <li>P0103 "Airflow sensor (High)"</li> <li>P0426 "EXH Gas Temp SNSR1 (Plausibility)"</li> <li>P0427 "EXH Gas Temp SNSR1 (Low)"</li> <li>P0428 "EXH Gas Temp SNSR1 (High)"</li> <li>P0545 "DPF Temp SNSR (upstream) Low"</li> <li>P0546 "DPF Temp SNSR (upstream) High"</li> <li>P1430 "DPF Regeneration Switch"</li> <li>P1660 "DPF Lamp Control Circuit (Low)"</li> <li>P2031 "Exhaust Gas Temp"</li> <li>P2032 "Exhaust Gas Temp (Low)"</li> <li>P2033 "Exhaust Gas Temp (High)"</li> <li>P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>P2455 "DPF Diff SNSR (High) &amp; MFF"</li> </ul> |
|        | Inspection condition                                   |  | Ensure that each sensor mounting condition is free of abnormalities.  |
|        | Requirements   |  | Codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES After inspection of diagnosis cord that is occurring, go to step 2.<br>NO Go to step 2.   |

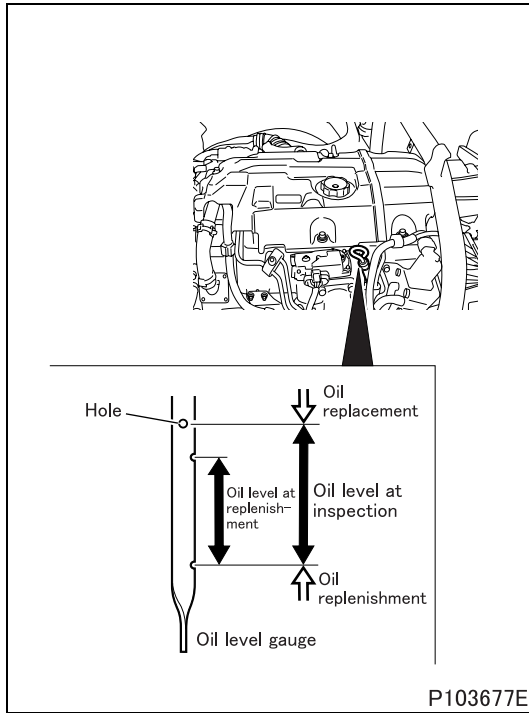
|        |  |  |  |
|--------|--|--|--|
| Step 2 | Inspection items                                       |  | Inspection of DPF absolute pressure sensor unit  |
|        | Maintenance item                                       |  | Measure value of voltage between terminal No. 2 (+) and 1 (-).   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across connector terminals No. 3 (+) and 1 (-).</li> <li>Gradually increase applied air pressure.</li> </ul>   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li><math>41 \pm 3.2</math> kPa {<math>5.9 \pm 0.5</math> psi, <math>0.43 \pm 0.03</math> kgf/cm<sup>2</sup>}: 1.875 V</li> <li><math>99 \pm 3.2</math> kPa {<math>14 \pm 0.5</math> psi, <math>1.0 \pm 0.03</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 3.<br>NO Replacement of sensor  |

<Step 2 inspection diagram>



|        |  |   |   |
|--------|--|---|---|
| Step 3 | Inspection items                                       |   | Inspection of oil level                   |
|        | Maintenance item                                       |   | Inspection of engine oil level            |
|        | Inspection condition                                   |   | Engine is stopped.                        |
|        | Requirements   |   | Oil level for inspection is not exceeded. |
|        | Inspection result (Is the judging standard satisfied?) | YES                                     | Go to step 4.                             |
| NO     |  | After replacement of oil, go to step 4. |   |

<Step 3 inspection diagram>

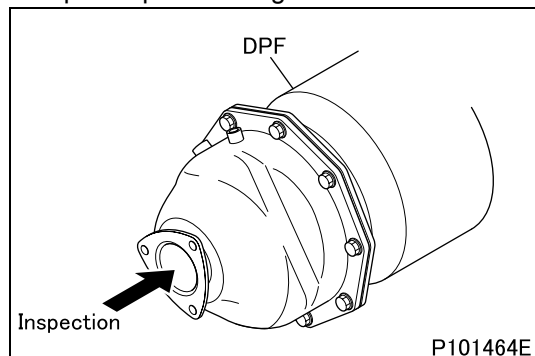


|        |  |   |   |
|--------|--|---|---|
| Step 4 | Inspection items                                       |   | Inspection of pressure hose   |
|        | Maintenance item                                       |   | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |
|        | Inspection condition                                   |   | —   |
|        | Requirements   |   | Nothing abnormal detected   |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5.   |
| NO     |  | After correction and replacement of hose, go to step 5. |   |

# TROUBLESHOOTING

|        |  |  |  |
|--------|--|--|--|
| Step 5 | Inspection items                                       |  | Unit inspection of diesel particulate filter   |
|        | Maintenance item                                       |  | Check the exhaust passage inside the diesel particulate filter for adhesion of soot in large quantity. |
|        | Inspection condition                                   |  | Remove diesel particulate filter.  |
|        | Requirements   |  | No soot is deposited.  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 6.  |
| NO     |  | After replacement of ceramic filter, perform resetting the DPF-related information and go to step 7. |  |

<Step 5 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of diesel particulate filter unit for clogging and cleaning of the diesel particulate filter unit  |
|        | Maintenance item                                       |  | See Gr15 "Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit".  |
|        | Inspection condition                                   |  | <p>Perform the following preparatory works.</p> <ul style="list-style-type: none"> <li>Place the transmission in neutral. (place the automatic transmission in P range)</li> <li>Turn the steering wheel in neutral position and securely apply the parking brake.</li> <li>Turn off air conditioner not to increase the engine speed.</li> <li>Check diagnosis code of each electronic control system. If any fault exists, rectify it.</li> <li>Resetting the DPF-related information (perform "History reset" of Multi-Use Tester) (See Gr15 "Resetting the DPF-related Information".)</li> <li>Warm up the engine until the engine coolant has been heated to more than 70°C {158°F}. (verify from Service Data "Engine Coolant Temperature" or "31: Water Temperature")</li> </ul> |
|        | Requirements   |  | This diagnosis code does not occur again.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | End of inspection.  |
| NO     |  | Replacement of electronic control unit |   |

**[Fault code]**

Diagnosis code: P1411/Flash code: 88

**[Monitor]**

Diesel particulate filter is overheated.

**[Fault (outline)]**

- Low signal range check
- High signal range check
- Plausibility

**[Diagnosis check]**

- Temperature after ceramic diesel particulate filter is monitored and manual filter regeneration is stopped if filter temperature excessively rises.

**[Code generation condition]**

- Temperature output from DPF temperature sensor 2 remains over 700°C {1292°F} for 10 seconds.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

<Fault diagnosis for signals>

- Fault diagnosis is continuously performed during the driving cycle.

<Fault diagnosis by comparison with other information>

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Engine torque is limited.
- Auto cruise control stopped
- Traction control is stopped <Automatic transmission>
- Diesel particulate filter regeneration is stopped.

**[Probable cause of trouble]**

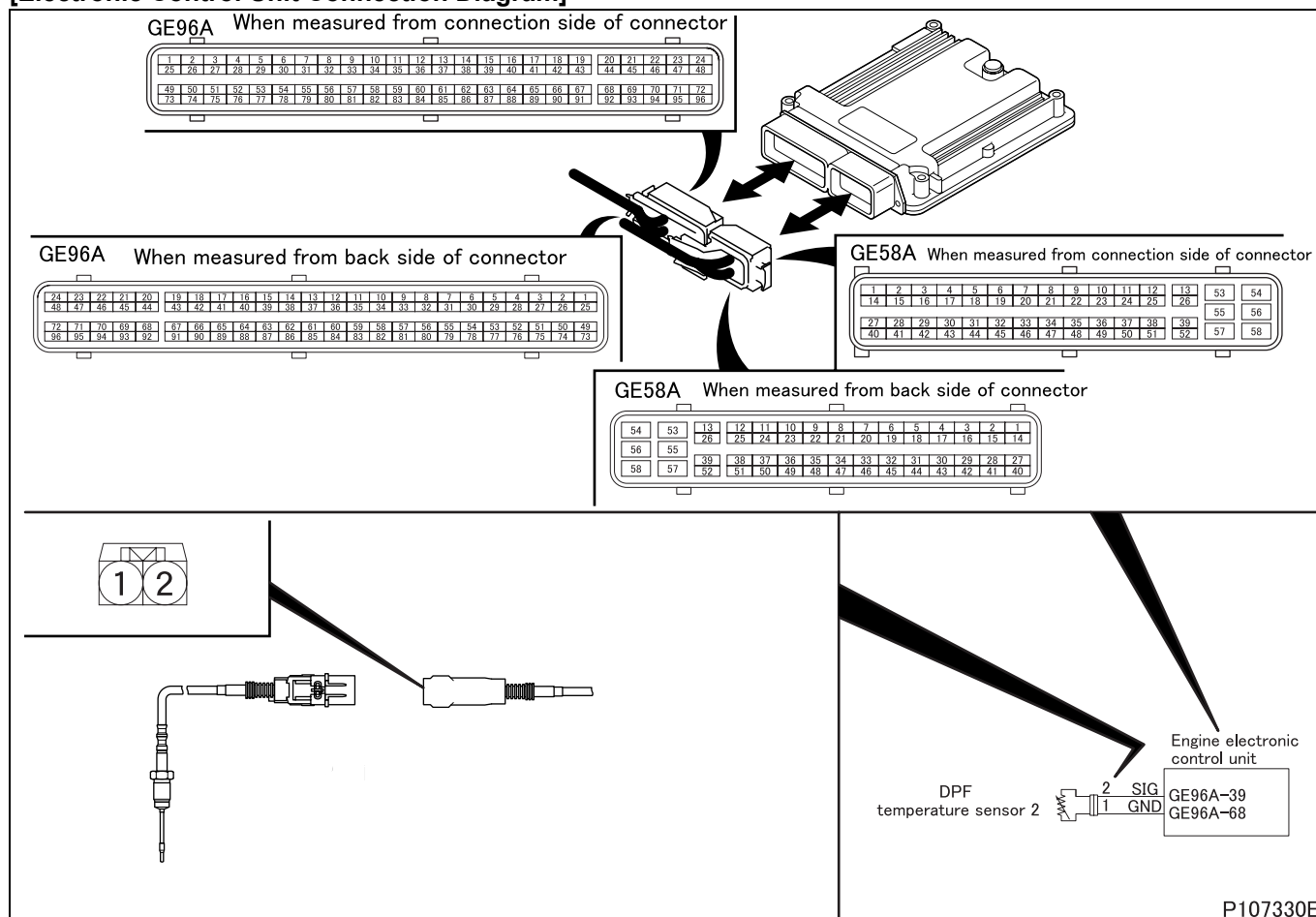
- Excessive smoke emission (due to malfunction of engine proper, common rail or exhaust gas recirculation system)
- Malfunction of diesel particulate filter regeneration control
- Excessive particulate matter (PM) deposit
- Malfunction of engine electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

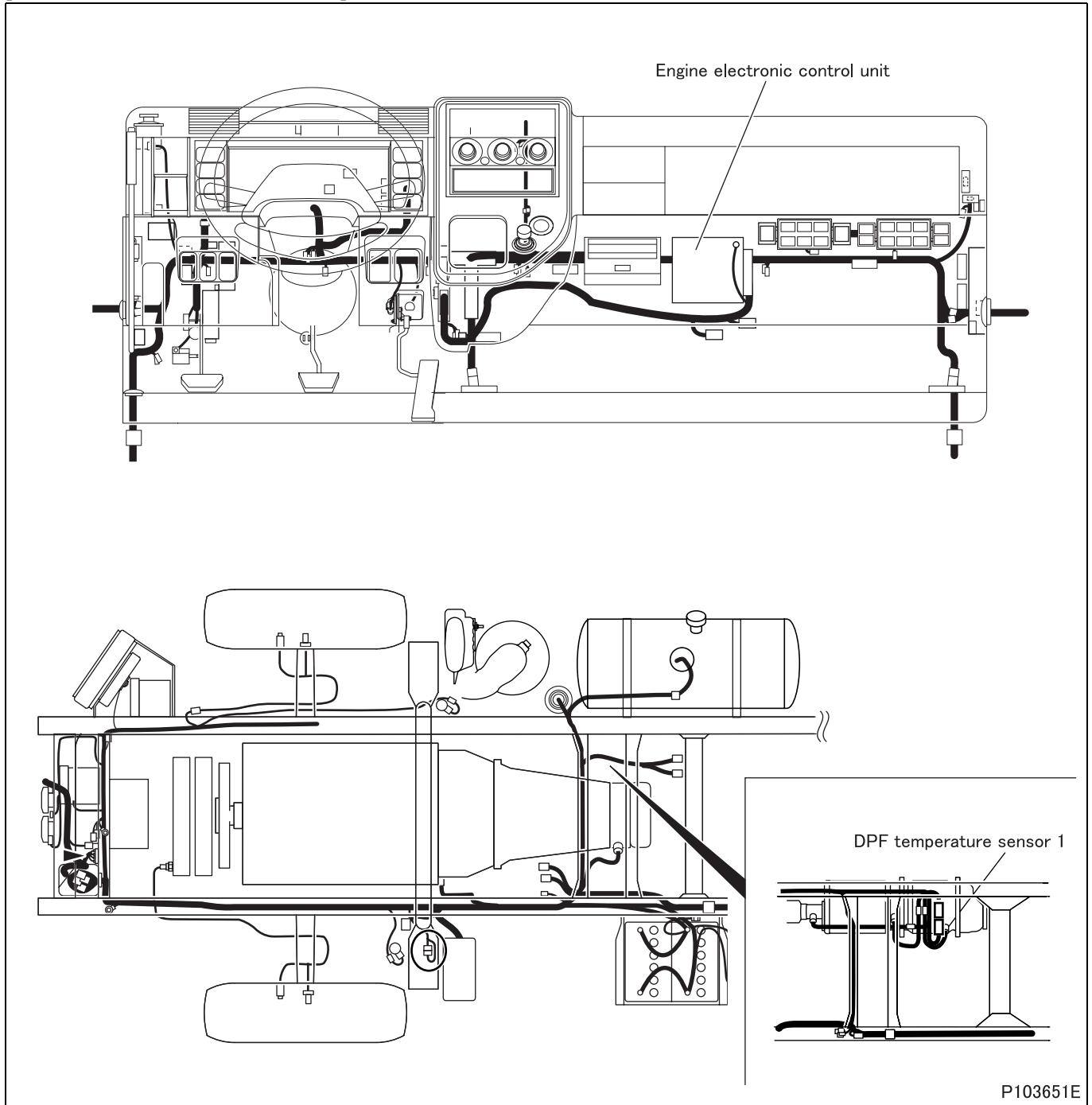
## [Electronic Control Unit Connection Diagram]



P107330E



[Parts Identification and Location]



P103651E

# TROUBLESHOOTING

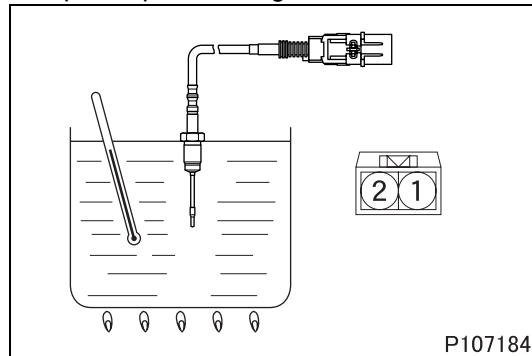
## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |   |  |  |     |   |    |
|--------|---|--|--|-----|---|----|
| Step 1 | Inspection items  |  | Inspection by control data   |     |   |    |
|        | Maintenance item  |  | <p>Check if following diagnosis codes occur simultaneously.</p> <ul style="list-style-type: none"> <li>P0045 "VGT Actuator (Open)"</li> <li>P0046 "VGT Actuator (Performance)"</li> <li>P0047 "VGT Actuator (Low)"</li> <li>P0102 "Airflow Sensor (Low)"</li> <li>P0103 "Airflow Sensor (High)"</li> <li>P0426 "EXH Gas Temp SNSR1 (Plausibility)"</li> <li>P0427 "EXH Gas Temp SNSR1 (Low)"</li> <li>P0428 "EXH Gas Temp SNSR1 (High)"</li> <li>P0545 "DPF Temp SNSR (upstream) Low"</li> <li>P0546 "DPF Temp SNSR (upstream) High"</li> <li>P1430 "DPF Regeneration Switch"</li> <li>P1660 "DPF Lamp Control Circuit (Low)"</li> <li>P2031 "Exhaust Gas Temp"</li> <li>P2032 "Exhaust Gas Temp (Low)"</li> <li>P2033 "Exhaust Gas Temp (High)"</li> <li>P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>P2455 "DPF Diff SNSR (High) &amp; MFF"</li> </ul> |     |   |    |
|        | Inspection condition  |  | Ensure that each sensor mounting condition is free of abnormalities.   |     |   |    |
|        | Requirements  |  | Codes occur.   |     |   |    |
|        | Inspection result (Is the judging standard satisfied?)              |  | <table border="1"> <tr> <td>YES</td> <td>After inspection of diagnosis code that is occurring, go to step 2.</td> </tr> <tr> <td>NO</td> <td>Go to step 2.</td> </tr> </table>   | YES | After inspection of diagnosis code that is occurring, go to step 2. | NO |
| YES    | After inspection of diagnosis code that is occurring, go to step 2. |  |  |     |   |    |
| NO     | Go to step 2.   |  |  |     |   |    |

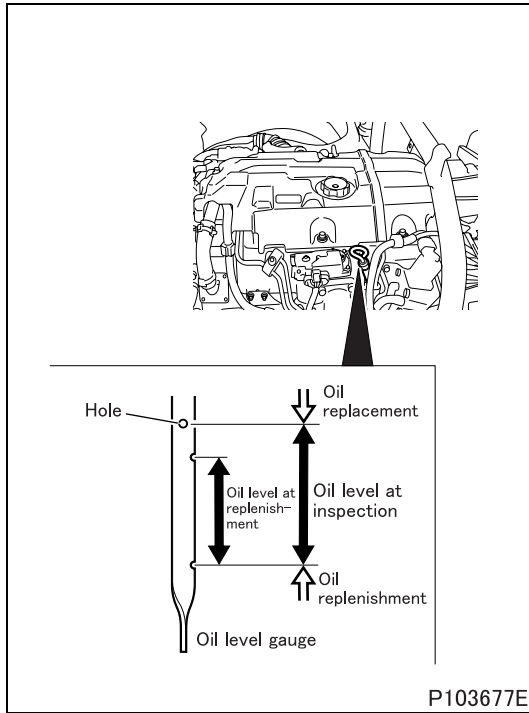
|        |  |  |   |     |               |    |
|--------|--|--|---|-----|---------------|----|
| Step 2 | Inspection items                                       |  | Inspection of DPF temperature sensor 2 unit   |     |               |    |
|        | Maintenance item                                       |  | Measure value of resistance between terminal No. 1 and 2.   |     |               |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Put DPF temperature sensor 2 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>20°C {68°F} : 241.8 kΩ</li> <li>50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>100°C {212°F} : 33.56<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 3.</td> </tr> <tr> <td>NO</td> <td>Cleaning of sensor</td> </tr> </table>   | YES | Go to step 3. | NO |
| YES    | Go to step 3.  |  |   |     |               |    |
| NO     | Cleaning of sensor                                     |  |   |     |               |    |

<Step 2 inspection diagram>



|        |  |   |   |
|--------|--|---|---|
| Step 3 | Inspection items                                       |   | Inspection of oil level                   |
|        | Maintenance item                                       |   | Inspection of engine oil level            |
|        | Inspection condition                                   |   | Engine is stopped.                        |
|        | Requirements   |   | Oil level for inspection is not exceeded. |
|        | Inspection result (Is the judging standard satisfied?) | YES                                     | Go to step 4.                             |
| NO     |  | After replacement of oil, go to step 4. |   |

<Step 3 inspection diagram>

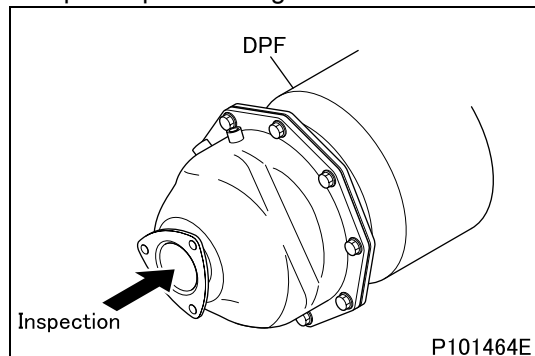


|        |  |   |   |
|--------|--|---|---|
| Step 4 | Inspection items                                       |   | Inspection of pressure hose   |
|        | Maintenance item                                       |   | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |
|        | Inspection condition                                   |   | —   |
|        | Requirements   |   | Nothing abnormal detected   |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5.   |
| NO     |  | After correction and replacement of hose, go to step 5. |   |

# TROUBLESHOOTING

|        |  |  |  |
|--------|--|--|--|
| Step 5 | Inspection items                                       |  | Unit inspection of diesel particulate filter   |
|        | Maintenance item                                       |  | Check the exhaust passage inside the diesel particulate filter for adhesion of soot in large quantity. |
|        | Inspection condition                                   |  | Remove diesel particulate filter.  |
|        | Requirements   |  | No soot is deposited.  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 6.  |
| NO     |  | After replacement of ceramic filter, perform resetting the DPF-related information and go to step 7. |  |

<Step 5 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of diesel particulate filter unit for clogging and cleaning of the diesel particulate filter unit  |
|        | Maintenance item                                       |  | See Gr15 "Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit".  |
|        | Inspection condition                                   |  | <p>Perform following preparatory works.</p> <ul style="list-style-type: none"> <li>Place the transmission in neutral. (place the automatic transmission in P range)</li> <li>Turn the steering wheel in neutral position and securely apply the parking brake.</li> <li>Turn off air conditioner not to increase the engine speed.</li> <li>Check diagnosis code of each electronic control system. If any fault exists, rectify it.</li> <li>Resetting the DPF-related information (perform "History reset" of Multi-Use Tester) (See Gr15 "Resetting the DPF-related information".)</li> <li>Warm up the engine until the engine coolant has been heated to more than 70°C {158°F}. (verify from Service Data "Engine Coolant Temperature" or "31: Water Temperature")</li> </ul> |
|        | Requirements   |  | This diagnosis code does not occur again.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | End of inspection.  |
| NO     |  | Replacement of electronic control unit |   |

**[Fault code]**

Diagnosis code: P1412/Flash code: 92

**[Monitor]**

Temperature increase is insufficient for automatic diesel particulate filter regeneration control

**[Fault (outline)]**

Plausibility

**[Diagnosis check]**

- Temperature in diesel particulate filter during automatic filter regeneration is monitored through DPF temperature sensor 1.

**[Code generation condition]**

- Abnormality is determined if the remaining of temperature below 250°C {482°F} during 5 km {3.11 miles} of running after start of automatic diesel particulate filter regeneration is repeated three times.

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Diesel particulate filter regeneration is stopped (manual regeneration is feasible)

**[Probable cause of trouble]**

- Malfunction of diesel particulate filter regeneration control
- Malfunction of DPF temperature sensor 1
- Malfunction of engine electronic control unit
- Malfunction of common rail
- Malfunction of diesel particulate filter (front oxidation catalyst)

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |

GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

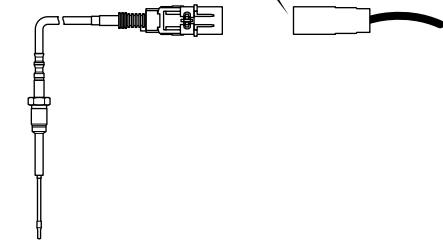
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

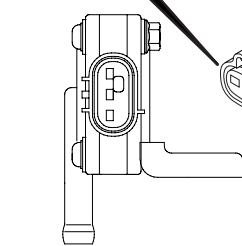
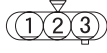
GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

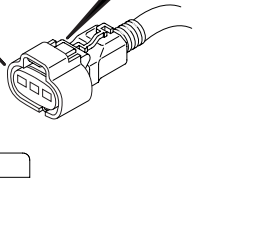
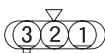
When measured from connection side of connector



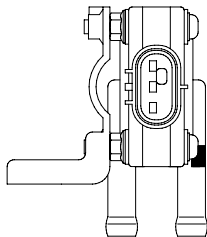
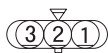
When measured from connection side of connector



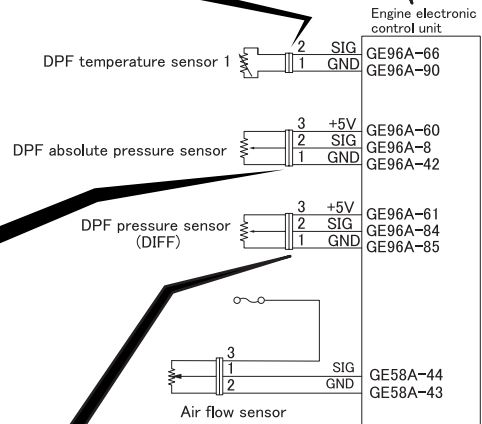
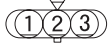
When measured from back side of connector



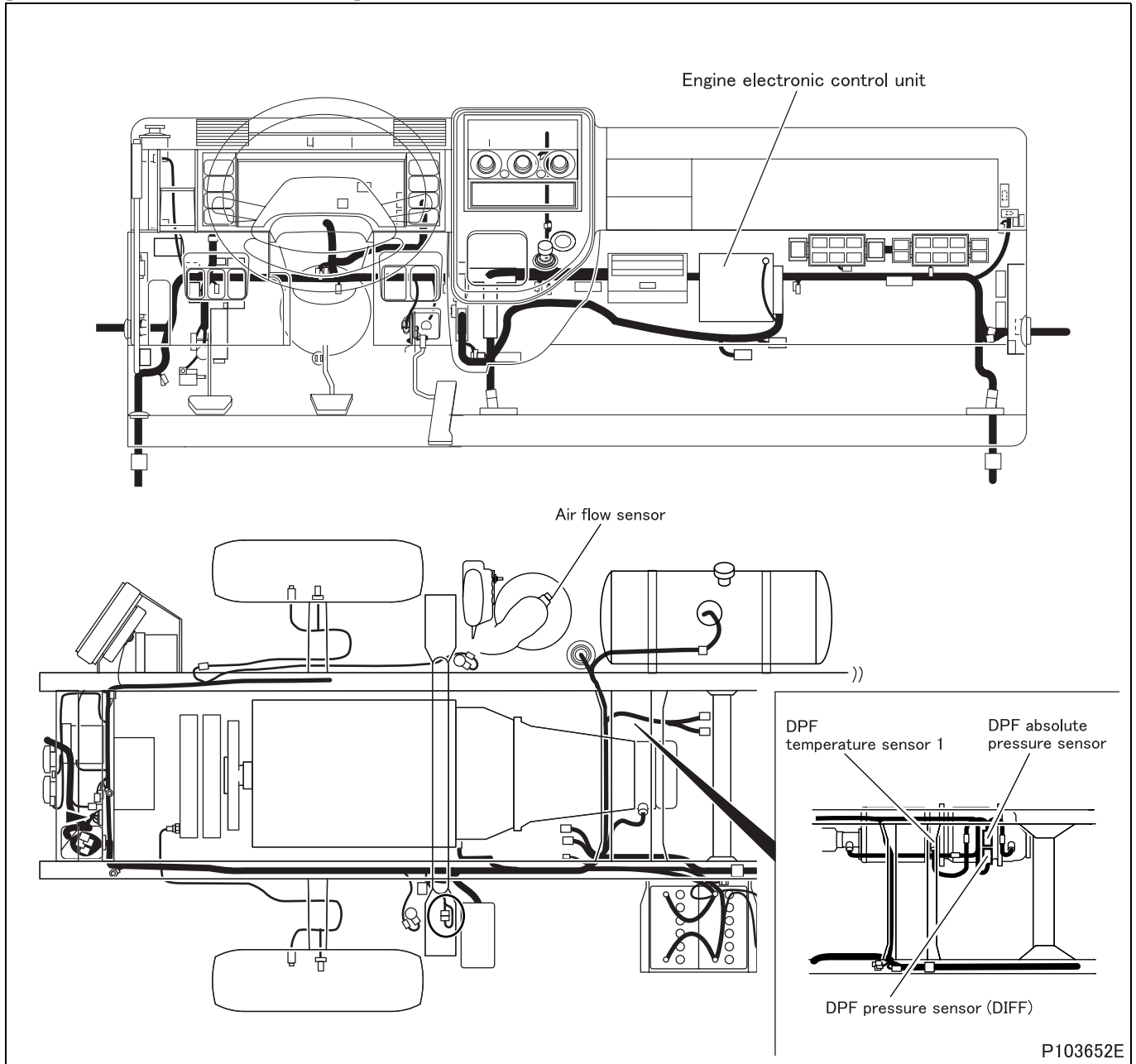
When measured from back side of connector



When measured from connection side of connector



[Parts Identification and Location]



# TROUBLESHOOTING

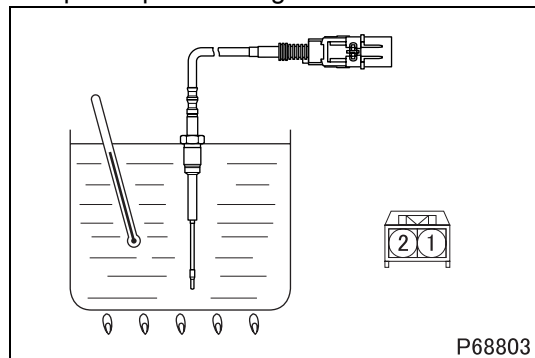
## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | <p>Check if following diagnosis codes occur simultaneously.</p> <ul style="list-style-type: none"> <li>P0045 "VGT Actuator (Open)"</li> <li>P0046 "VGT Actuator (Performance)"</li> <li>P0047 "VGT Actuator (Low)"</li> <li>P0102 "Airflow Sensor (Low)"</li> <li>P0103 "Airflow Sensor (High)"</li> <li>P0426 "EXH Gas Temp SNSR1 (Plausibility)"</li> <li>P0427 "EXH Gas Temp SNSR1 (Low)"</li> <li>P0428 "EXH Gas Temp SNSR1 (High)"</li> <li>P0545 "DPF Temp SNSR (upstream) Low"</li> <li>P0546 "DPF Temp SNSR (upstream) High"</li> <li>P1430 "DPF Regeneration Switch"</li> <li>P1660 "DPF Lamp Control Circuit (Low)"</li> <li>P2031 "Exhaust Gas Temp"</li> <li>P2032 "Exhaust Gas Temp (Low)"</li> <li>P2033 "Exhaust Gas Temp (High)"</li> <li>P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>P2455 "DPF Diff SNSR (High) &amp; MFF"</li> </ul> |
|        | Inspection condition                                   |  | Ensure that each sensor mounting condition is free of abnormalities.   |
|        | Requirements   |  | Codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES After inspection of diagnosis code that is occurring, go to step 2.</p> <p>NO Go to step 2.</p>   |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of DPF temperature sensor 1 unit   |
|        | Maintenance item                                       |  | Measure value of resistance between terminal No. 1 and 2.   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Put DPF temperature sensor 1 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>20°C {68°F} : 241.8 kΩ</li> <li>50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>100°C {212°F} : 33.56<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Go to step 3.</p> <p>NO Cleaning of sensor</p>   |

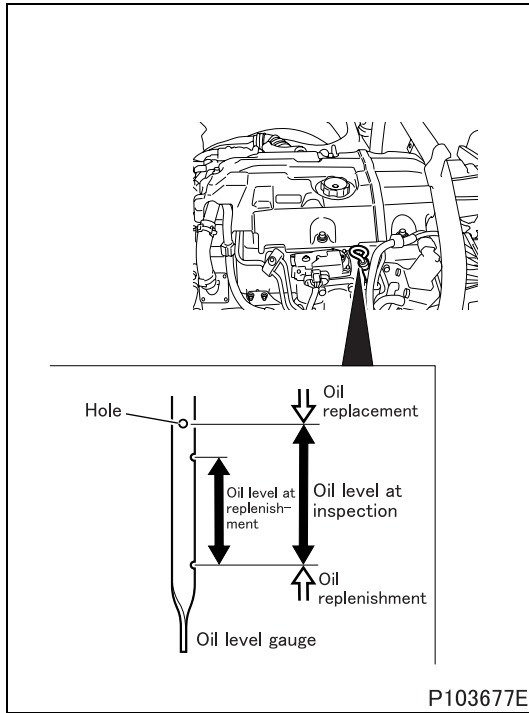
<Step 2 inspection diagram>





|        |  |   |   |
|--------|--|---|---|
| Step 3 | Inspection items                                       |   | Inspection of oil level                   |
|        | Maintenance item                                       |   | Inspection of engine oil level            |
|        | Inspection condition                                   |   | Engine is stopped.                        |
|        | Requirements   |   | Oil level for inspection is not exceeded. |
|        | Inspection result (Is the judging standard satisfied?) | YES                                     | Go to step 4.                             |
| NO     |  | After replacement of oil, go to step 4. |   |

<Step 3 inspection diagram>

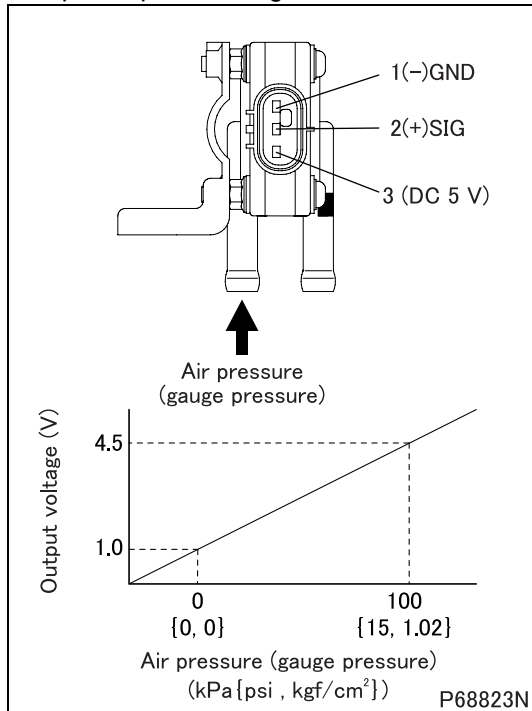


|        |  |                                    |   |
|--------|--|------------------------------------|---|
| Step 4 | Inspection items                                       |                                    | Inspection of pressure hose   |
|        | Maintenance item                                       |                                    | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |
|        | Inspection condition                                   |                                    | —   |
|        | Requirements   |                                    | Nothing abnormal detected   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                | Go to step 5.   |
| NO     |  | Correction and replacement of hose |   |

# TROUBLESHOOTING

| Inspection items |  | Inspection of sensor unit  |                       |
|------------------|--|--|-----------------------|
| Step 5           | Maintenance item                                       | Measure value of voltage between connector terminal No. 2 (+) and 1 (-).   |                       |
|                  | Inspection condition                                   | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across terminals No. 3 (+) and 1 (-).</li> <li>Gradually increase applied air pressure.</li> </ul>   |                       |
|                  | Requirements   | <ul style="list-style-type: none"> <li><math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>}: 1 V</li> <li><math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |                       |
|                  | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 6.         |
|                  |  | NO   | Replacement of sensor |

<Step 5 inspection diagram>



|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor unit   |               |
|        | Maintenance item                                       | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among “Service data”.</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: “Ne” (rpm)</li> <li>• Intake air flow rate: “Air Flow Rate from MAFS” (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 “Engine Revolution” (rpm)</li> <li>• Intake air flow rate: 60 “Air mass flow” (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”.</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | 10% or less   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
|        | NO   | Replacement of sensor   |               |

|        |  |  |  |
|--------|--|--|--|
| Step 7 | Inspection items                                       | Inspection by control data                           |  |
|        | Maintenance item                                       | Perform actuator test item No. B2 “Fuel Leak Check”. |  |
|        | Inspection condition                                   | Engine start: At idle                                |  |
|        | Requirements   | There is no leak from injectors (four).              |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Replacement of diesel particulate filter |
|        | NO   | Replacement of injector                              |  |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P1413/Flash code: 92

## **[Monitor]**

Temperature increase is insufficient for automatic diesel particulate filter regeneration control

## **[Fault (outline)]**

Plausibility

## **[Diagnosis check]**

- Temperature in diesel particulate filter during automatic filter regeneration is monitored through DPF temperature sensor 1.

## **[Code generation condition]**

- Abnormality is determined if the remaining of temperature below 500°C {932°F} for 30 minutes after start of automatic diesel particulate filter regeneration is repeated three times.

## **[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).

## **[Probable cause of trouble]**

- Malfunction of diesel particulate filter regeneration control
- Malfunction of DPF temperature sensor 1
- Malfunction of engine electronic control unit
- Malfunction of common rail
- Malfunction of diesel particulate filter (front oxidation catalyst)

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

[Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |

GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

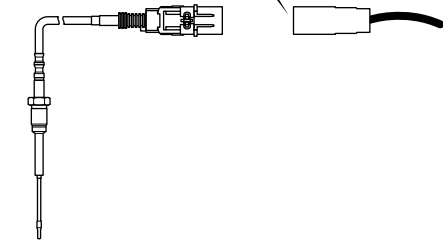
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

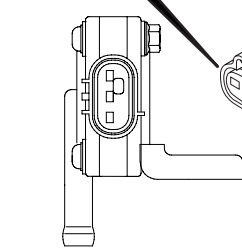
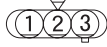
GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

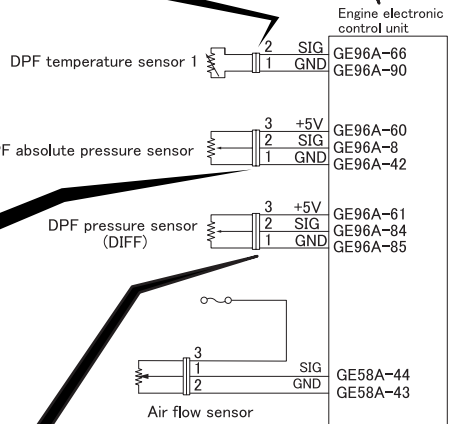
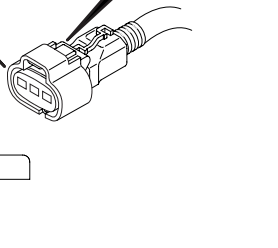
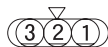
When measured from connection side of connector



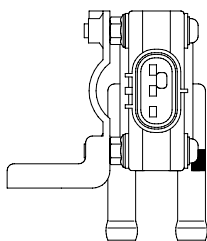
When measured from connection side of connector



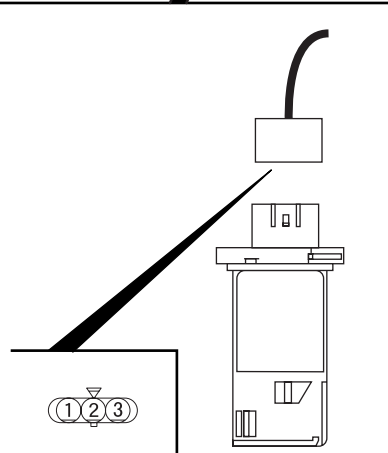
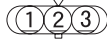
When measured from back side of connector



When measured from back side of connector

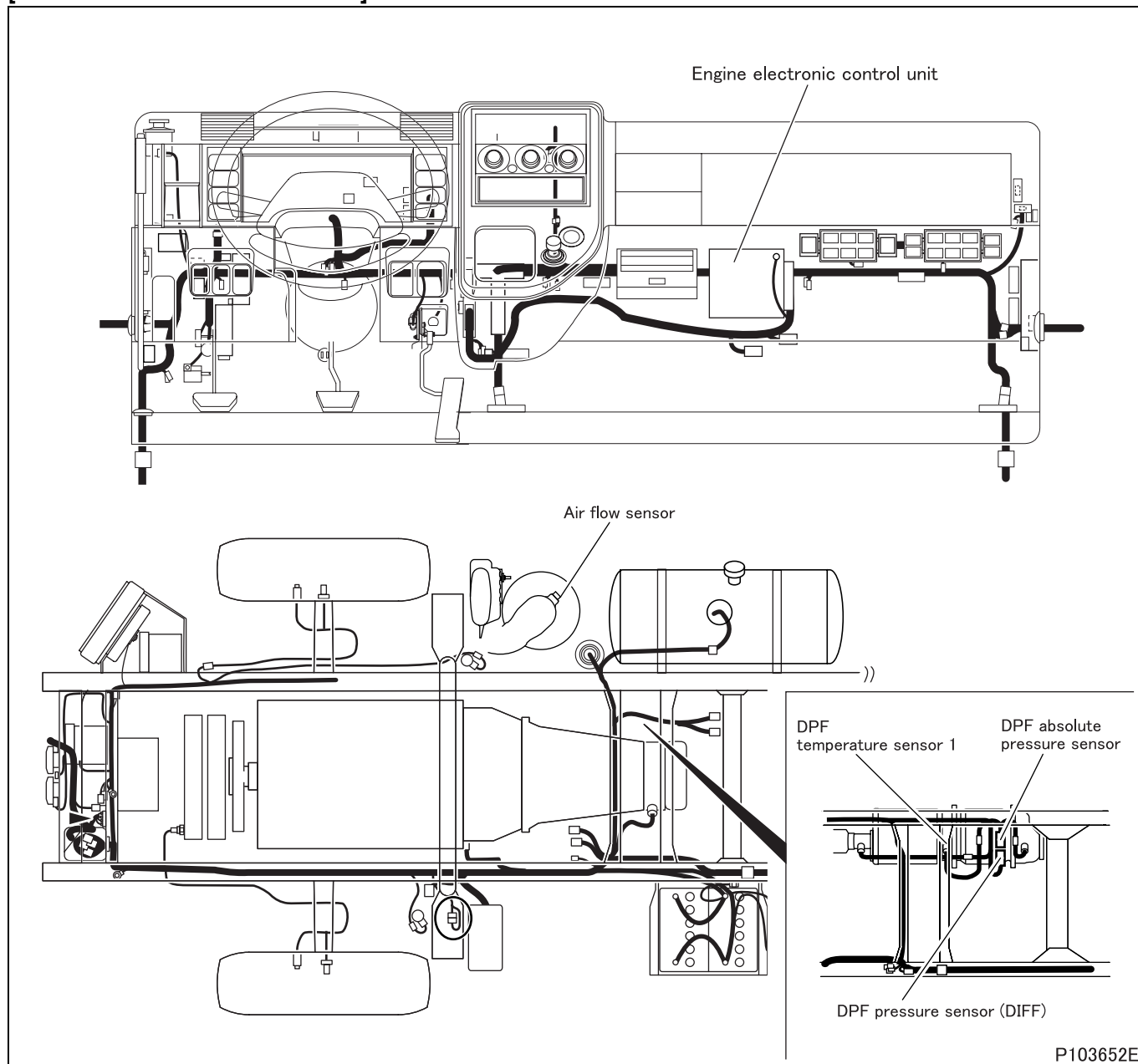


When measured from connection side of connector



# TROUBLESHOOTING

## [Parts Identification and Location]



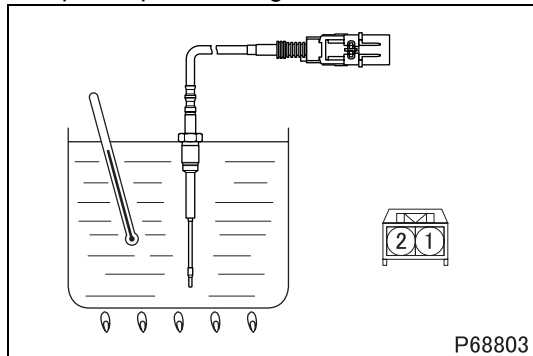
[Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | <p>Check if following diagnosis codes occur simultaneously.</p> <ul style="list-style-type: none"> <li>• P0045 "VGT Actuator (Open)"</li> <li>• P0046 "VGT Actuator (Performance)"</li> <li>• P0047 "VGT Actuator (Low)"</li> <li>• P0102 "Airflow Sensor (Low)"</li> <li>• P0103 "Airflow Sensor (High)"</li> <li>• P0426 "EXH Gas Temp SNSR1 (Plausibility)"</li> <li>• P0427 "EXH Gas Temp SNSR1 (Low)"</li> <li>• P0428 "EXH Gas Temp SNSR1 (High)"</li> <li>• P0545 "DPF Temp SNSR (upstream) Low"</li> <li>• P0546 "DPF Temp SNSR (upstream) High"</li> <li>• P1430 "DPF Regeneration Switch"</li> <li>• P1660 "DPF Lamp Control Circuit (Low)"</li> <li>• P2031 "Exhaust Gas Temp"</li> <li>• P2032 "Exhaust Gas Temp (Low)"</li> <li>• P2033 "Exhaust Gas Temp (High)"</li> <li>• P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>• P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>• P2455 "DPF Diff SNSR (High) &amp; MFF"</li> </ul> |
|        | Inspection condition                                   |  | Ensure that each sensor mounting condition is free of abnormalities.   |
|        | Requirements   |  | Codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES After inspection of diagnosis code that is occurring, go to step 2.</p> <p>NO Go to step 2.</p>   |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of DPF temperature sensor 1 unit   |
|        | Maintenance item                                       |  | Measure value of resistance between terminal No. 1 and 2.   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Put DPF temperature sensor 1 in container filled with engine oil.</li> <li>• Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• 20°C {68°F} : 241.8 kΩ</li> <li>• 50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>• 100°C {212°F} : 33.56<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>• 150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>• 200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Go to step 3.</p> <p>NO Cleaning of sensor</p>   |

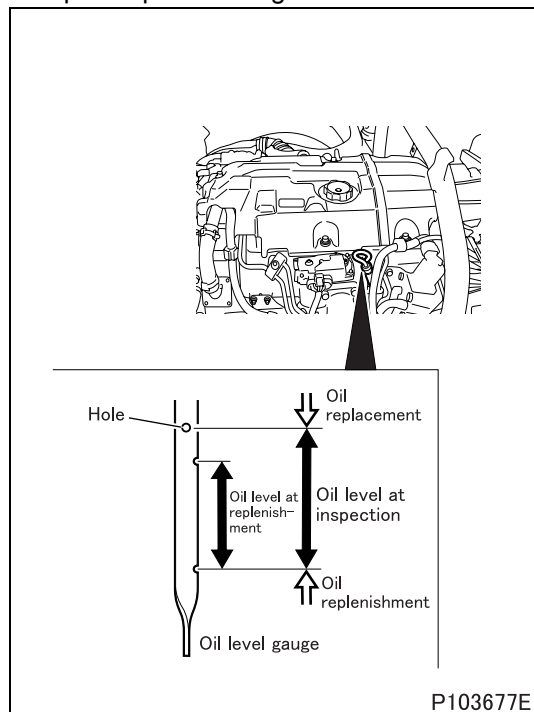
<Step 2 inspection diagram>



# TROUBLESHOOTING

|        |  |   |   |
|--------|--|---|---|
| Step 3 | Inspection items                                       |   | Inspection of oil level                   |
|        | Maintenance item                                       |   | Inspection of engine oil level            |
|        | Inspection condition                                   |   | Engine is stopped.                        |
|        | Requirements   |   | Oil level for inspection is not exceeded. |
|        | Inspection result (Is the judging standard satisfied?) | YES                                     | Go to step 4.                             |
| NO     |  | After replacement of oil, go to step 4. |   |

<Step 3 inspection diagram>

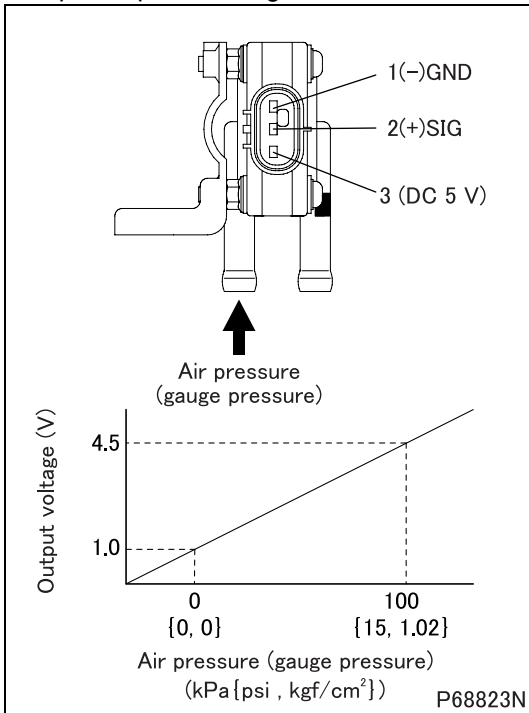


|        |  |                                    |   |
|--------|--|------------------------------------|---|
| Step 4 | Inspection items                                       |                                    | Inspection of pressure hose   |
|        | Maintenance item                                       |                                    | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |
|        | Inspection condition                                   |                                    | —   |
|        | Requirements   |                                    | Nothing abnormal detected   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                | Go to step 5.   |
| NO     |  | Correction and replacement of hose |   |



| Inspection items |  | Inspection of sensor unit  |                       |
|------------------|--|--|-----------------------|
| Step 5           | Maintenance item                                       | Measure value of voltage between connector terminal No. 2 (+) and 1 (-).   |                       |
|                  | Inspection condition                                   | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across terminals No. 3 (+) and 1 (-).</li> <li>Gradually increase applied air pressure.</li> </ul>   |                       |
|                  | Requirements   | <ul style="list-style-type: none"> <li><math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>}: 1 V</li> <li><math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |                       |
|                  | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 6.         |
|                  |  | NO   | Replacement of sensor |

<Step 5 inspection diagram>



# TROUBLESHOOTING

|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of sensor unit   |
|        | Maintenance item                                       |  | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among “Service data”.</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: “Ne” (rpm)</li> <li>• Intake air flow rate: “Air Flow Rate from MAFS” (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 “Engine Revolution” (rpm)</li> <li>• Intake air flow rate: 60 “Air mass flow” (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”.</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | 10% or less   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Go to step 7.</p> <p>NO Replacement of sensor</p>  |

|        |  |  |   |
|--------|--|--|---|
| Step 7 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform actuator test item No. B2 “Fuel Leak Check”.                                  |
|        | Inspection condition                                   |  | Engine start: At idle   |
|        | Requirements   |  | There is no leak from injectors (four).   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Replacement of diesel particulate filter</p> <p>NO Replacement of injector</p> |

**[Fault code]**

Diagnosis code: P1414/Flash code: 92

**[Monitor]**

Temperature increase is insufficient for automatic diesel particulate filter regeneration control

**[Fault (outline)]**

Plausibility

**[Diagnosis check]**

- Temperature in diesel particulate filter during automatic filter regeneration is monitored through DPF temperature sensor 1.

**[Code generation condition]**

- Abnormality is determined if the remaining of temperature over 620°C {1148°F} for 10 minutes after start of automatic diesel particulate filter regeneration is repeated three times.

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).

**[Probable cause of trouble]**

- Malfunction of diesel particulate filter regeneration control
- Malfunction of DPF temperature sensor 1
- Malfunction of engine electronic control unit
- Malfunction of common rail
- Malfunction of diesel particulate filter (front oxidation catalyst)

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |

GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

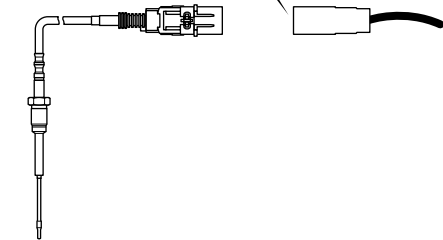
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

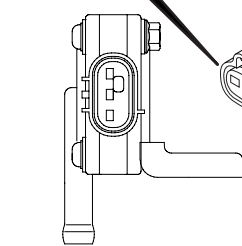
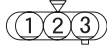
GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

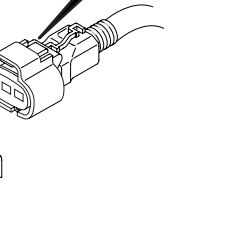
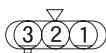
When measured from connection side of connector



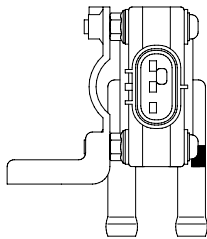
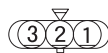
When measured from connection side of connector



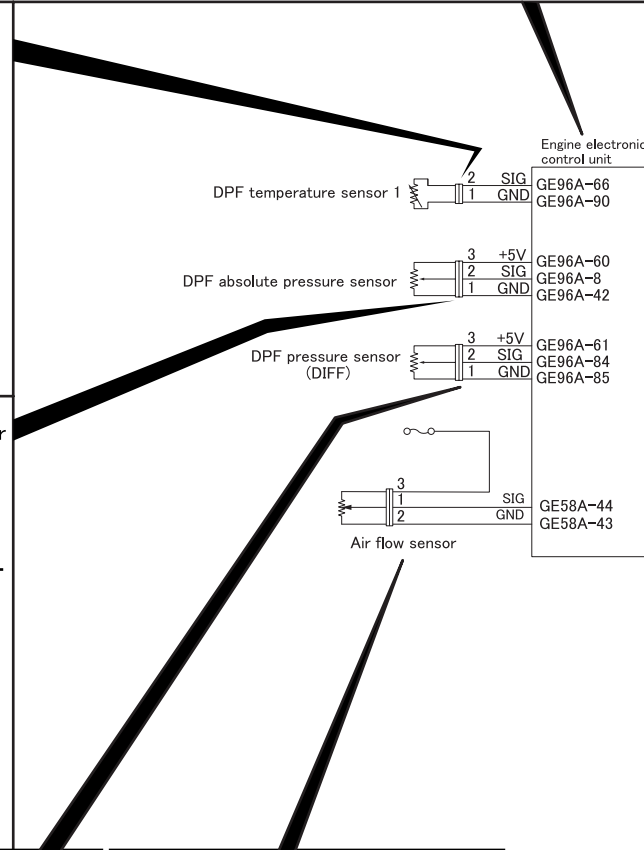
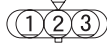
When measured from back side of connector



When measured from back side of connector



When measured from connection side of connector



Engine electronic control unit

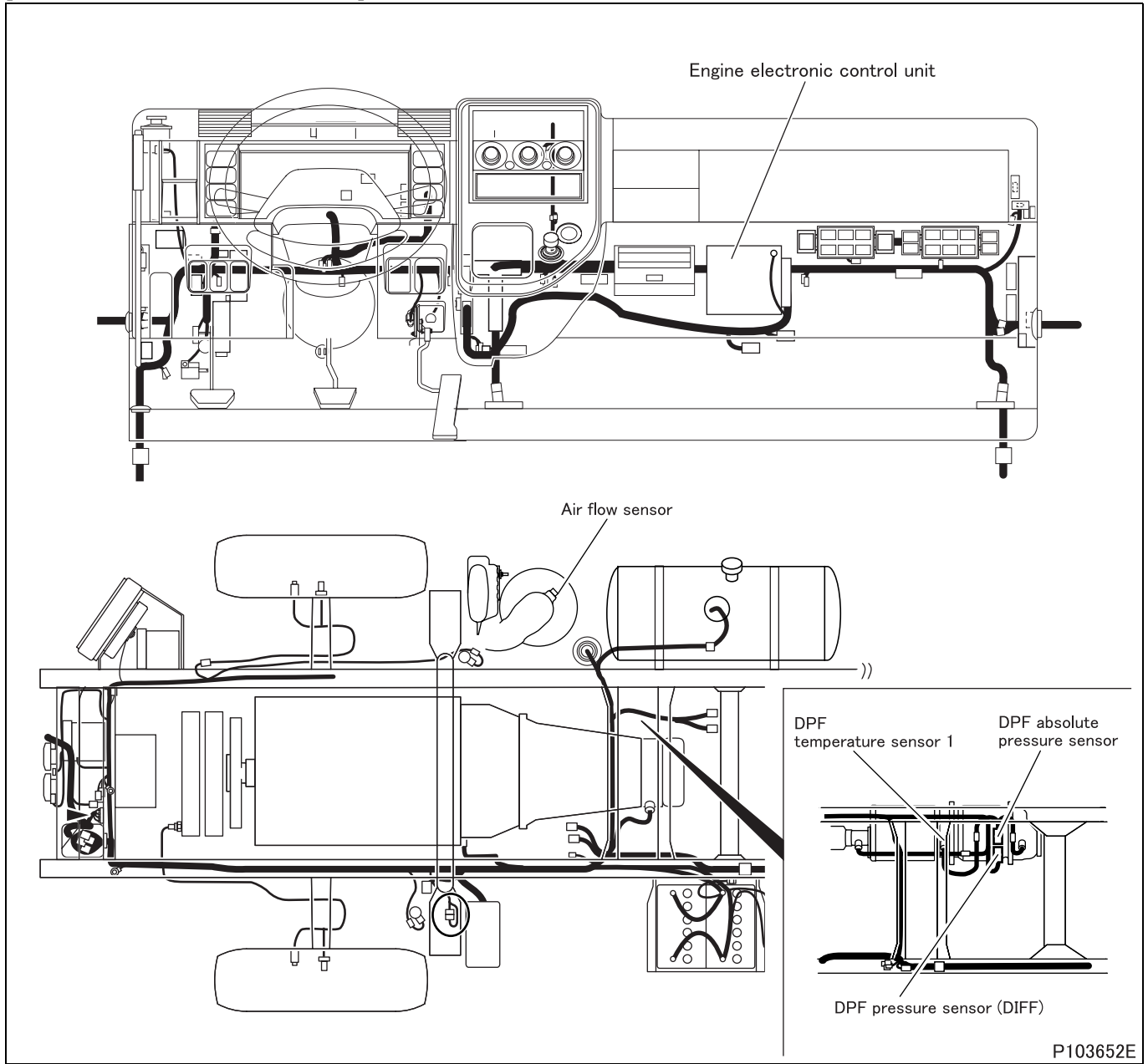
GE96A-66  
GE96A-90

GE96A-60  
GE96A-8  
GE96A-42

GE96A-61  
GE96A-84  
GE96A-85

GE58A-44  
GE58A-43

[Parts Identification and Location]



# TROUBLESHOOTING

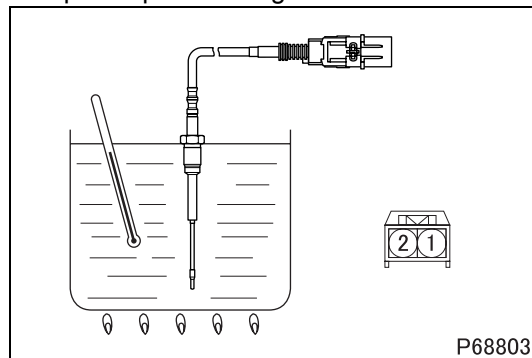
## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |   |  |  |     |   |    |
|--------|---|--|--|-----|---|----|
| Step 1 | Inspection items  |  | Inspection by control data   |     |   |    |
|        | Maintenance item  |  | <p>Check if following diagnosis codes occur simultaneously.</p> <ul style="list-style-type: none"> <li>• P0045 "VGT Actuator (Open)"</li> <li>• P0046 "VGT Actuator (Performance)"</li> <li>• P0047 "VGT Actuator (Low)"</li> <li>• P0102 "Airflow Sensor (Low)"</li> <li>• P0103 "Airflow Sensor (High)"</li> <li>• P0426 "EXH Gas Temp SNSR1 (Plausibility)"</li> <li>• P0427 "EXH Gas Temp SNSR1 (Low)"</li> <li>• P0428 "EXH Gas Temp SNSR1 (High)"</li> <li>• P0545 "DPF Temp SNSR (upstream) Low"</li> <li>• P0546 "DPF Temp SNSR (upstream) High"</li> <li>• P1430 "DPF Regeneration Switch"</li> <li>• P1660 "DPF Lamp Control Circuit (Low)"</li> <li>• P2031 "Exhaust Gas Temp"</li> <li>• P2032 "Exhaust Gas Temp (Low)"</li> <li>• P2033 "Exhaust Gas Temp (High)"</li> <li>• P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>• P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>• P2455 "DPF Diff SNSR (High) &amp; MFF"</li> </ul> |     |   |    |
|        | Inspection condition  |  | Ensure that each sensor mounting condition is free of abnormalities.   |     |   |    |
|        | Requirements  |  | Codes occur.   |     |   |    |
|        | Inspection result (Is the judging standard satisfied?)              |  | <table border="1"> <tr> <td>YES</td> <td>After inspection of diagnosis code that is occurring, go to step 2.</td> </tr> <tr> <td>NO</td> <td>Go to step 2.</td> </tr> </table>   | YES | After inspection of diagnosis code that is occurring, go to step 2. | NO |
| YES    | After inspection of diagnosis code that is occurring, go to step 2. |  |  |     |   |    |
| NO     | Go to step 2.   |  |  |     |   |    |

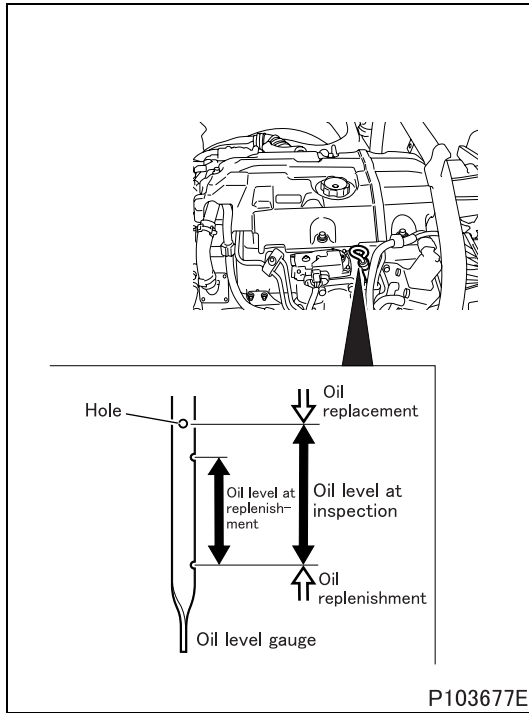
|        |  |  |   |     |               |    |
|--------|--|--|---|-----|---------------|----|
| Step 2 | Inspection items                                       |  | Inspection of DPF temperature sensor 1 unit   |     |               |    |
|        | Maintenance item                                       |  | Measure value of resistance between terminal No. 1 and 2.   |     |               |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Put DPF temperature sensor 1 in container filled with engine oil.</li> <li>• Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• 20°C {68°F} : 241.8 kΩ</li> <li>• 50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>• 100°C {212°F} : 33.56<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>• 150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>• 200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 3.</td> </tr> <tr> <td>NO</td> <td>Cleaning of sensor</td> </tr> </table>   | YES | Go to step 3. | NO |
| YES    | Go to step 3.  |  |   |     |               |    |
| NO     | Cleaning of sensor                                     |  |   |     |               |    |

<Step 2 inspection diagram>



|        |  |   |               |
|--------|--|---|---------------|
| Step 3 | Inspection items                                       | Inspection of oil level                   |               |
|        | Maintenance item                                       | Inspection of engine oil level            |               |
|        | Inspection condition                                   | Engine is stopped.                        |               |
|        | Requirements   | Oil level for inspection is not exceeded. |               |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 4. |
| NO     |  | After replacement of oil, go to step 4.   |               |

<Step 3 inspection diagram>

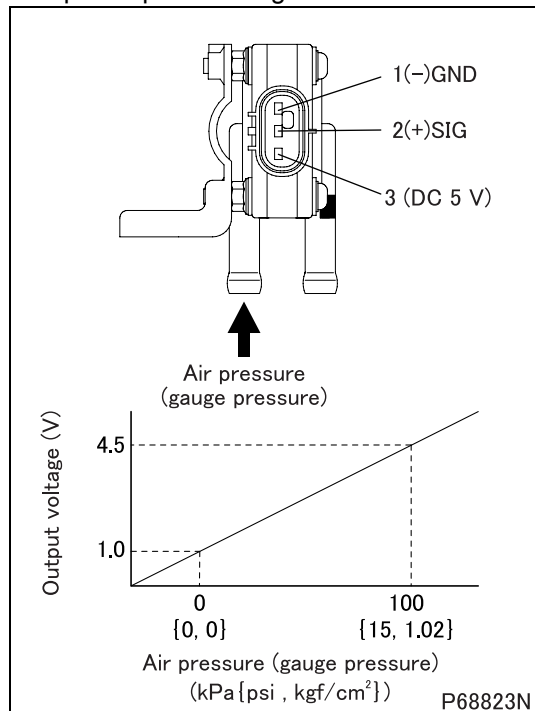


|        |  |   |               |
|--------|--|---|---------------|
| Step 4 | Inspection items                                       | Inspection of pressure hose   |               |
|        | Maintenance item                                       | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | Nothing abnormal detected   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5. |
| NO     |  | Correction and replacement of hose  |               |

# TROUBLESHOOTING

| Inspection items |  | Inspection of sensor unit  |                       |
|------------------|--|--|-----------------------|
| Step 5           | Maintenance item                                       | Measure value of voltage between connector terminal No. 2 (+) and 1 (-).   |                       |
|                  | Inspection condition                                   | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across terminals No. 3 (+) and 1 (-).</li> <li>Gradually increase applied air pressure.</li> </ul>   |                       |
|                  | Requirements   | <ul style="list-style-type: none"> <li><math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>}: 1 V</li> <li><math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |                       |
|                  | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 6.         |
|                  |  | NO   | Replacement of sensor |

<Step 5 inspection diagram>





|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor unit   |               |
|        | Maintenance item                                       | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among “Service data”.</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: “Ne” (rpm)</li> <li>• Intake air flow rate: “Air Flow Rate from MAFS” (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 “Engine Revolution” (rpm)</li> <li>• Intake air flow rate: 60 “Air mass flow” (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”.</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | 10% or less   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
|        | NO   | Replacement of sensor   |               |

|        |  |  |  |
|--------|--|--|--|
| Step 7 | Inspection items                                       | Inspection by control data                           |  |
|        | Maintenance item                                       | Perform actuator test item No. B2 “Fuel Leak Check”. |  |
|        | Inspection condition                                   | Engine start: At idle                                |  |
|        | Requirements   | There is no leak from injectors (four).              |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Replacement of diesel particulate filter |
|        | NO   | Replacement of injector                              |  |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P1415/Flash code: 92

## **[Monitor]**

Failure of automatic diesel particulate filter regeneration control

## **[Fault (outline)]**

Plausibility

## **[Diagnosis check]**

- Duration of automatic diesel particulate filter regeneration is monitored.

## **[Code generation condition]**

- Regeneration exceeds specified time. (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).

## **[Probable cause of trouble]**

- Malfunction of diesel particulate filter regeneration control
- Malfunction of DPF temperature sensor 1
- Malfunction of engine electronic control unit
- Malfunction of common rail
- Malfunction of diesel particulate filter (front oxidation catalyst)

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

[Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |

GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

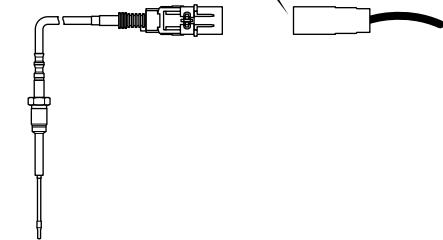
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

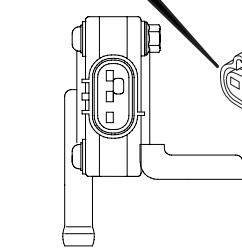
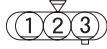
GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

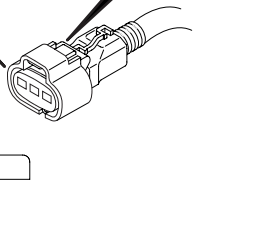
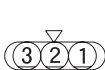
When measured from connection side of connector



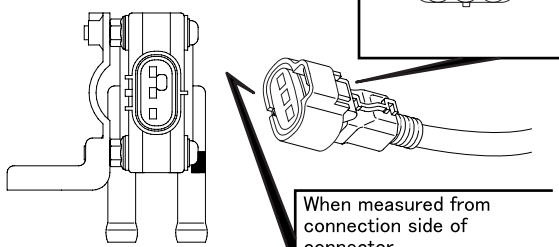
When measured from connection side of connector



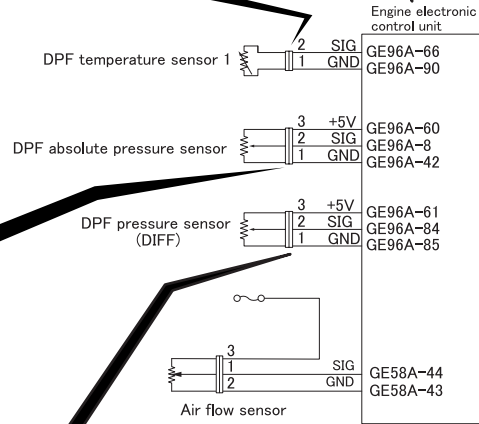
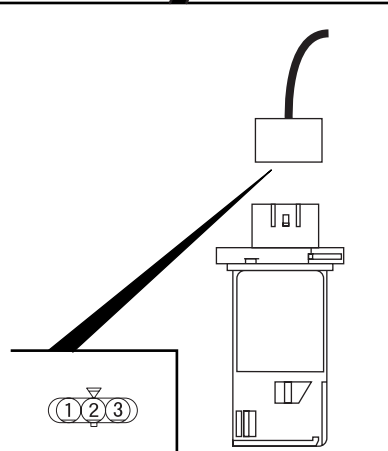
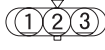
When measured from back side of connector



When measured from back side of connector

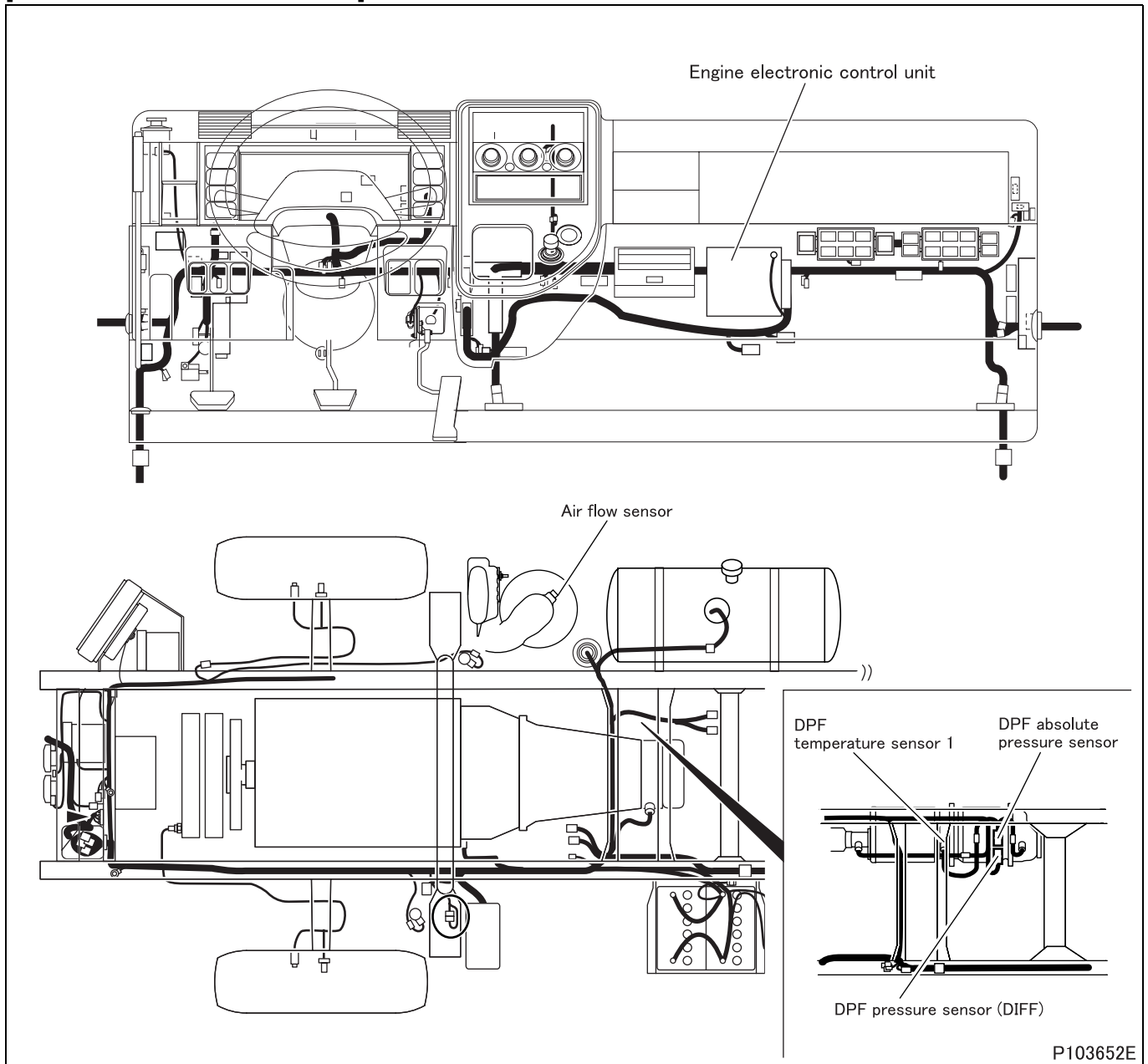


When measured from connection side of connector



# TROUBLESHOOTING

## [Parts Identification and Location]



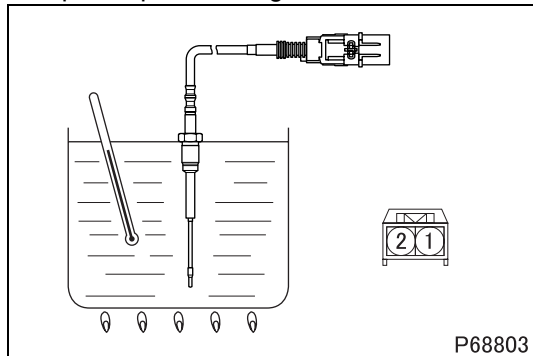
[Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | <p>Check if following diagnosis codes occur simultaneously.</p> <ul style="list-style-type: none"> <li>• P0045 "VGT Actuator (Open)"</li> <li>• P0046 "VGT Actuator (Performance)"</li> <li>• P0047 "VGT Actuator (Low)"</li> <li>• P0102 "Airflow Sensor (Low)"</li> <li>• P0103 "Airflow Sensor (High)"</li> <li>• P0426 "EXH Gas Temp SNSR1 (Plausibility)"</li> <li>• P0427 "EXH Gas Temp SNSR1 (Low)"</li> <li>• P0428 "EXH Gas Temp SNSR1 (High)"</li> <li>• P0545 "DPF Temp SNSR (upstream) Low"</li> <li>• P0546 "DPF Temp SNSR (upstream) High"</li> <li>• P1430 "DPF Regeneration Switch"</li> <li>• P1660 "DPF Lamp Control Circuit (Low)"</li> <li>• P2031 "Exhaust Gas Temp"</li> <li>• P2032 "Exhaust Gas Temp (Low)"</li> <li>• P2033 "Exhaust Gas Temp (High)"</li> <li>• P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>• P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>• P2455 "DPF Diff SNSR (High) &amp; MFF"</li> </ul> |
|        | Inspection condition                                   |  | Ensure that each sensor mounting condition is free of abnormalities.   |
|        | Requirements   |  | Codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES After inspection of diagnosis code that is occurring, go to step 2.</p> <p>NO Go to step 2.</p>   |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of DPF temperature sensor 1 unit   |
|        | Maintenance item                                       |  | Measure value of resistance between terminal No. 1 and 2.   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Put DPF temperature sensor 1 in container filled with engine oil.</li> <li>• Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• 20°C {68°F} : 241.8 kΩ</li> <li>• 50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>• 100°C {212°F} : 33.56<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>• 150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>• 200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Go to step 3.</p> <p>NO Cleaning of sensor</p>   |

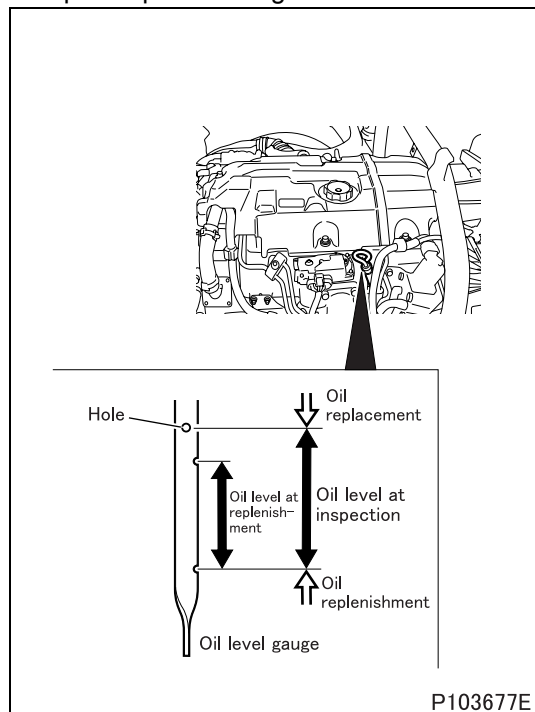
<Step 2 inspection diagram>



# TROUBLESHOOTING

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of oil level                   |
|        | Maintenance item                                       |  | Inspection of engine oil level            |
|        | Inspection condition                                   |  | Engine stopped                            |
|        | Requirements   |  | Oil level for inspection is not exceeded. |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to step 4.                             |
| NO     |  | After replacement of oil, go to step 4 |   |

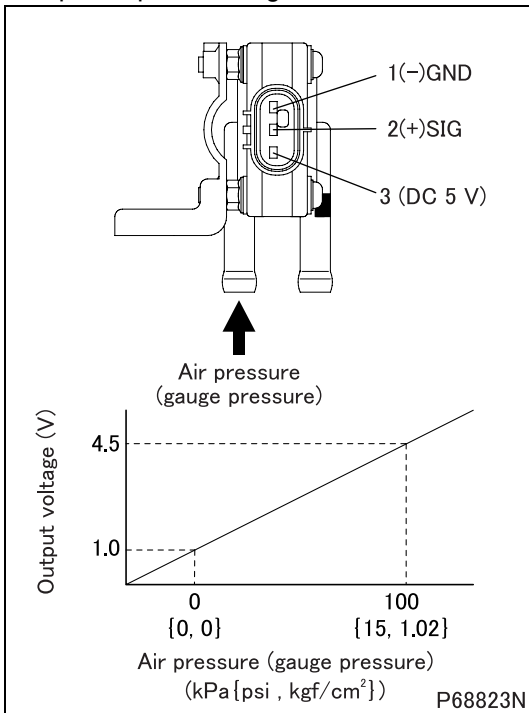
<Step 3 inspection diagram>



|        |  |                                    |   |
|--------|--|------------------------------------|---|
| Step 4 | Inspection items                                       |                                    | Inspection of pressure hose   |
|        | Maintenance item                                       |                                    | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |
|        | Inspection condition                                   |                                    | —   |
|        | Requirements   |                                    | Nothing abnormal detected   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                | Go to step 5.   |
| NO     |  | Correction and replacement of hose |   |

| Inspection items |  | Inspection of sensor unit  |                       |
|------------------|--|--|-----------------------|
| Step 5           | Maintenance item                                       | Measure value of voltage between connector terminal No. 2 (+) and 1 (-).   |                       |
|                  | Inspection condition                                   | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across terminals No. 3 (+) and 1 (-).</li> <li>Gradually increase applied air pressure.</li> </ul>   |                       |
|                  | Requirements   | <ul style="list-style-type: none"> <li><math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>}: 1 V</li> <li><math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |                       |
|                  | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 6.         |
|                  |  | NO   | Replacement of sensor |

<Step 5 inspection diagram>



# TROUBLESHOOTING

|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of sensor unit   |
|        | Maintenance item                                       |  | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among “Service data”.</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: “Ne” (rpm)</li> <li>• Intake air flow rate: “Air Flow Rate from MAFS” (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 “Engine Revolution” (rpm)</li> <li>• Intake air flow rate: 60 “Air mass flow” (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”.</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | 10% or less   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Go to step 7.</p> <p>NO Replacement of sensor</p>  |

|        |  |  |   |
|--------|--|--|---|
| Step 7 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform actuator test item No. B2 “Fuel Leak Check”.                                  |
|        | Inspection condition                                   |  | Engine start: At idle   |
|        | Requirements   |  | There is no leak from injectors (four).   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Replacement of diesel particulate filter</p> <p>NO Replacement of injector</p> |



**[Fault code]**

Diagnosis code: P1416/Flash code: 92

**[Monitor]**

Temperature increase is insufficient for manual diesel particulate filter regeneration control

**[Fault (outline)]**

Plausibility

**[Diagnosis check]**

- Temperature in diesel particulate filter during manual diesel particulate filter regeneration is monitored through DPF temperature sensor 1.

**[Code generation condition]**

- If temperature does not exceed 250°C {482°F} in 5 minutes after start of manual diesel particulate filter regeneration.

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Diesel particulate filter regeneration is stopped.

**[Probable cause of trouble]**

- Malfunction of diesel particulate filter regeneration control
- Malfunction of DPF temperature sensor 1
- Malfunction of engine electronic control unit
- Malfunction of common rail
- Malfunction of diesel particulate filter (front oxidation catalyst)

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |

GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

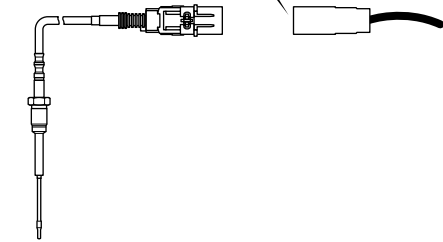
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

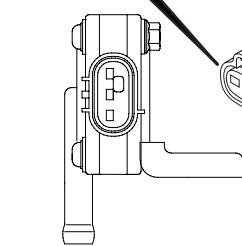
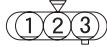
GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

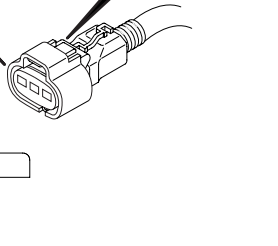
When measured from connection side of connector



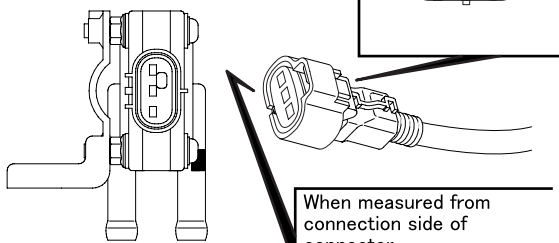
When measured from connection side of connector



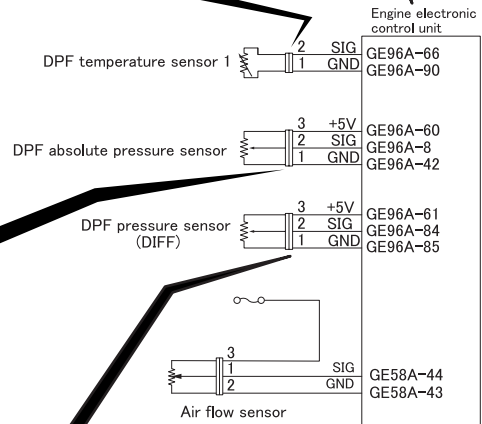
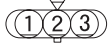
When measured from back side of connector



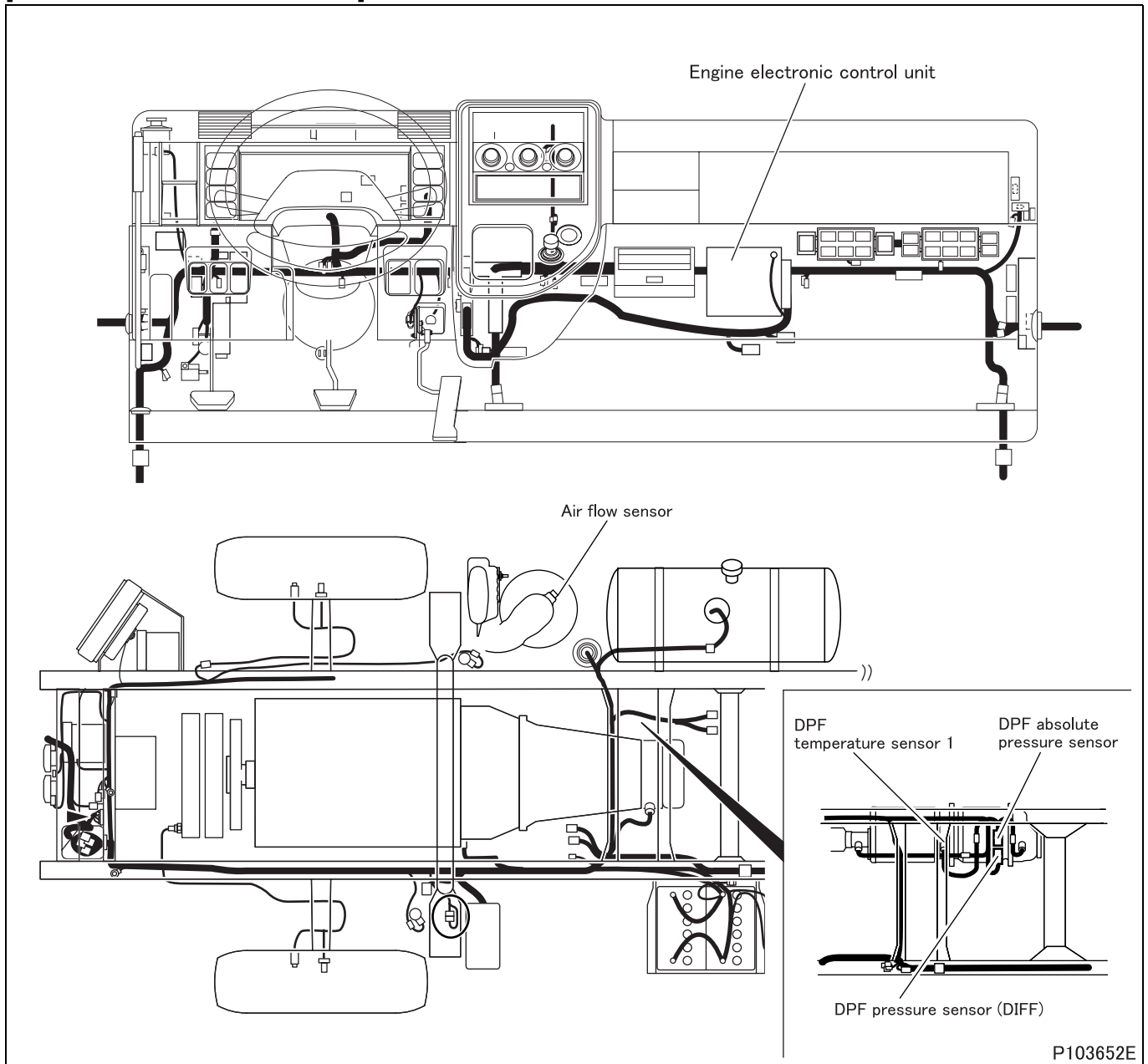
When measured from back side of connector



When measured from connection side of connector



[Parts Identification and Location]



# TROUBLESHOOTING

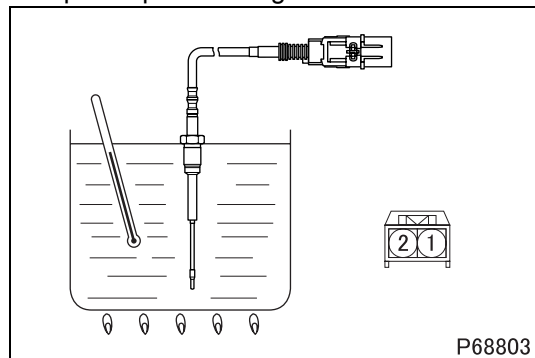
## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |     |  |    |
|--------|--|--|--|-----|--|----|
| Step 1 | Inspection items   |  | Inspection by control data   |     |  |    |
|        | Maintenance item   |  | <p>Check if following diagnosis codes occur simultaneously.</p> <ul style="list-style-type: none"> <li>P0045 "VGT Actuator (Open)"</li> <li>P0046 "VGT Actuator (Performance)"</li> <li>P0047 "VGT Actuator (Low)"</li> <li>P0102 "Airflow Sensor (Low)"</li> <li>P0103 "Airflow Sensor (High)"</li> <li>P0426 "EXH Gas Temp SNSR1 (Plausibility)"</li> <li>P0427 "EXH Gas Temp SNSR1 (Low)"</li> <li>P0428 "EXH Gas Temp SNSR1 (High)"</li> <li>P0545 "DPF Temp SNSR (upstream) Low"</li> <li>P0546 "DPF Temp SNSR (upstream) High"</li> <li>P1430 "DPF Regeneration Switch"</li> <li>P1660 "DPF Lamp Control Circuit (Low)"</li> <li>P2031 "Exhaust Gas Temp"</li> <li>P2032 "Exhaust Gas Temp (Low)"</li> <li>P2033 "Exhaust Gas Temp (High)"</li> <li>P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>P2455 "DPF Diff SNSR (High) &amp; MFF"</li> </ul> |     |  |    |
|        | Inspection condition                                       |  | Ensure that each sensor mounting condition is free of abnormalities.   |     |  |    |
|        | Requirements   |  | Codes occur.   |     |  |    |
|        | Inspection result (Is the judging standard satisfied?)     |  | <table border="1"> <tr> <td>YES</td> <td>Inspect diagnosis code that is occurring and go to step 2.</td> </tr> <tr> <td>NO</td> <td>Go to step 2.</td> </tr> </table>  | YES | Inspect diagnosis code that is occurring and go to step 2. | NO |
| YES    | Inspect diagnosis code that is occurring and go to step 2. |  |  |     |  |    |
| NO     | Go to step 2.  |  |  |     |  |    |

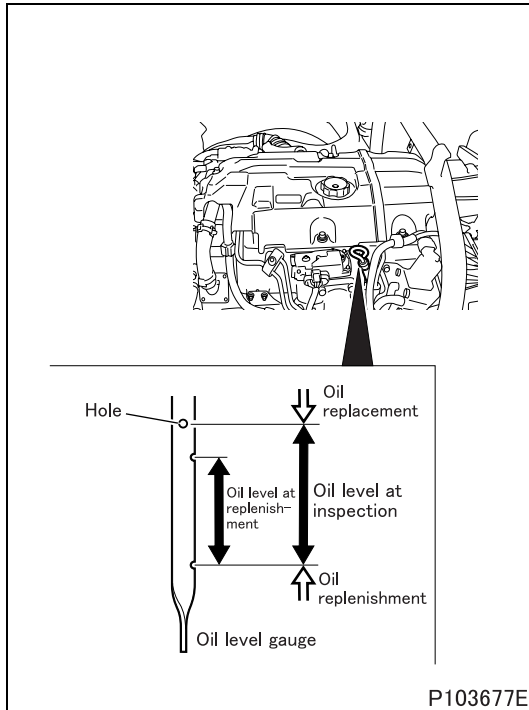
|        |  |  |   |     |               |    |
|--------|--|--|---|-----|---------------|----|
| Step 2 | Inspection items                                       |  | Inspection of DPF temperature sensor 1 unit   |     |               |    |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No.1 and 2.  |     |               |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Put DPF temperature sensor 1 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>20°C {68°F} : 241.8 kΩ</li> <li>50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>100°C {212°F} : 33.56<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 3.</td> </tr> <tr> <td>NO</td> <td>Cleaning of sensor</td> </tr> </table>   | YES | Go to step 3. | NO |
| YES    | Go to step 3.  |  |   |     |               |    |
| NO     | Cleaning of sensor                                     |  |   |     |               |    |

<Step 2 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of oil level                   |
|        | Maintenance item                                       |  | Inspection of engine oil level            |
|        | Inspection condition                                   |  | Engine stopped                            |
|        | Requirements   |  | Oil level for inspection is not exceeded. |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to step 4.                             |
| NO     |  | After replacement of oil, go to step 4 |   |

<Step 3 inspection diagram>

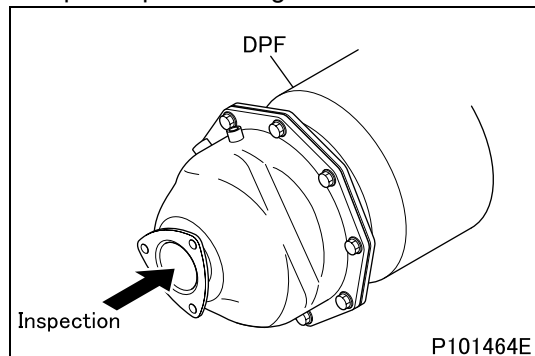


|        |  |   |   |
|--------|--|---|---|
| Step 4 | Inspection items                                       |   | Inspection of pressure hose   |
|        | Maintenance item                                       |   | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |
|        | Inspection condition                                   |   | —   |
|        | Requirements   |   | Nothing abnormal detected   |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5.   |
| NO     |  | After correction and replacement of hose, go to step 5. |   |

# TROUBLESHOOTING

|        |  |   |  |
|--------|--|---|--|
| Step 5 | Inspection items                                       |   | Unit inspection of diesel particulate filter   |
|        | Maintenance item                                       |   | Check the exhaust passage inside the diesel particulate filter for adhesion of soot in large quantity. |
|        | Inspection condition                                   |   | Remove diesel particulate filter.  |
|        | Requirements   |   | No soot is deposited.  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.  |
| NO     |  | After replacement of ceramic filter, perform resetting the DPF-related information. |  |

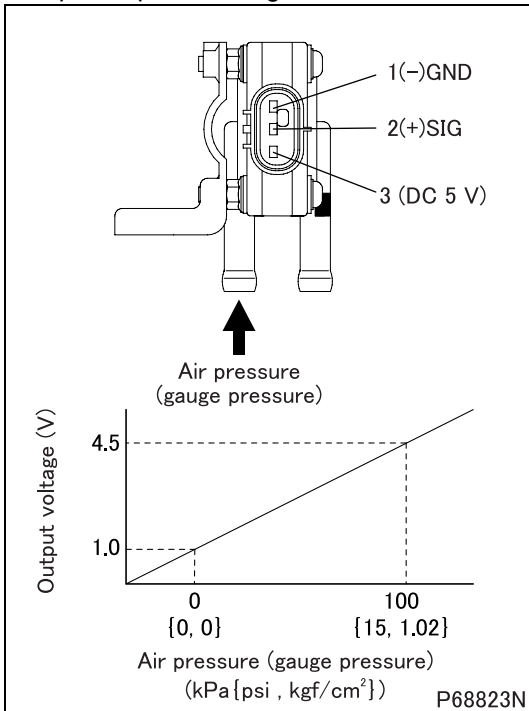
<Step 5 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit  |
|        | Maintenance item                                       |  | See Gr15 "Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit"   |
|        | Inspection condition                                   |  | <p>Perform the following preparatory works.</p> <ul style="list-style-type: none"> <li>Place the transmission in neutral (place the automatic transmission in P range).</li> <li>Turn the steering wheel in neutral position and securely apply the parking brake.</li> <li>Turn off air conditioner not to increase the engine speed.</li> <li>Check diagnosis code of each electronic control system. If any fault exists, rectify it.</li> <li>Resetting the DPF-related information (perform "History reset" of Multi-Use Tester) (See Gr15 "Resetting the DPF-related Information".)</li> <li>Warm up the engine until the engine coolant has been heated to more than 70°C {158°F} (verify from Service Data "Engine Coolant Temperature" or "31: Water Temperature").</li> </ul> |
|        | Requirements   |  | This diagnosis code does not occur again.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to step 7.   |
| NO     |  | Replacement of electronic control unit |   |

| Inspection items |  | Inspection of sensor unit  |                       |
|------------------|--|--|-----------------------|
| Step 7           | Maintenance item                                       | Measure value of voltage between connector terminal No. 2 (+) and 1 (-).   |                       |
|                  | Inspection condition                                   | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across terminals No. 3 (+) and 1 (-).</li> <li>Gradually increase applied air pressure.</li> </ul>   |                       |
|                  | Requirements   | <ul style="list-style-type: none"> <li><math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>}: 1 V</li> <li><math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |                       |
|                  | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8.         |
|                  |  | NO   | Replacement of sensor |

<Step 7 inspection diagram>



# TROUBLESHOOTING

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection of sensor unit   |
|        | Maintenance item                                       |  | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among “Service data”.</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: “Ne” (rpm)</li> <li>• Intake air flow rate: “Air Flow Rate from MAFS” (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 “Engine Revolution” (rpm)</li> <li>• Intake air flow rate: 60 “Air mass flow” (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”.</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | 10% or less   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Go to step 9.</p> <p>NO Replacement of sensor</p>  |

|        |  |  |   |
|--------|--|--|---|
| Step 9 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform actuator test item No. B2 “Fuel Leak Check”.                                  |
|        | Inspection condition                                   |  | Engine start: At idle   |
|        | Requirements   |  | There is no leak from injectors (four).   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Replacement of diesel particulate filter</p> <p>NO Replacement of injector</p> |



**[Fault code]**

Diagnosis code: P1417/Flash code: 92

**[Monitor]**

Temperature increase is insufficient for manual diesel particulate filter regeneration control

**[Fault (outline)]**

Plausibility

**[Diagnosis check]**

- Temperature in diesel particulate filter during manual diesel particulate filter regeneration is monitored through DPF temperature sensor 1.

**[Code generation condition]**

- If temperature remains below 500°C {932°F} for 30 minutes after start of manual diesel particulate filter regeneration.

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Diesel particulate filter regeneration is stopped.

**[Probable cause of trouble]**

- Malfunction of diesel particulate filter regeneration control
- Malfunction of DPF temperature sensor 1
- Malfunction of engine electronic control unit
- Malfunction of common rail
- Malfunction of diesel particulate filter (front oxidation catalyst)

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |

GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

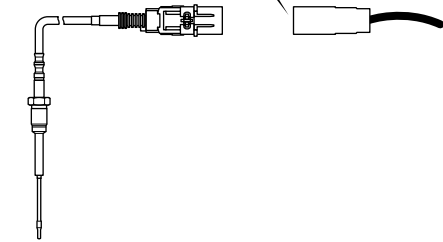
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

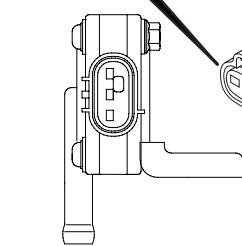
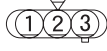
GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

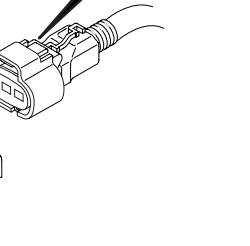
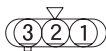
When measured from connection side of connector



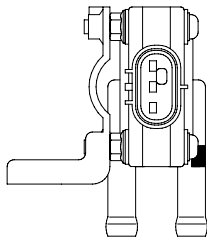
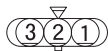
When measured from connection side of connector



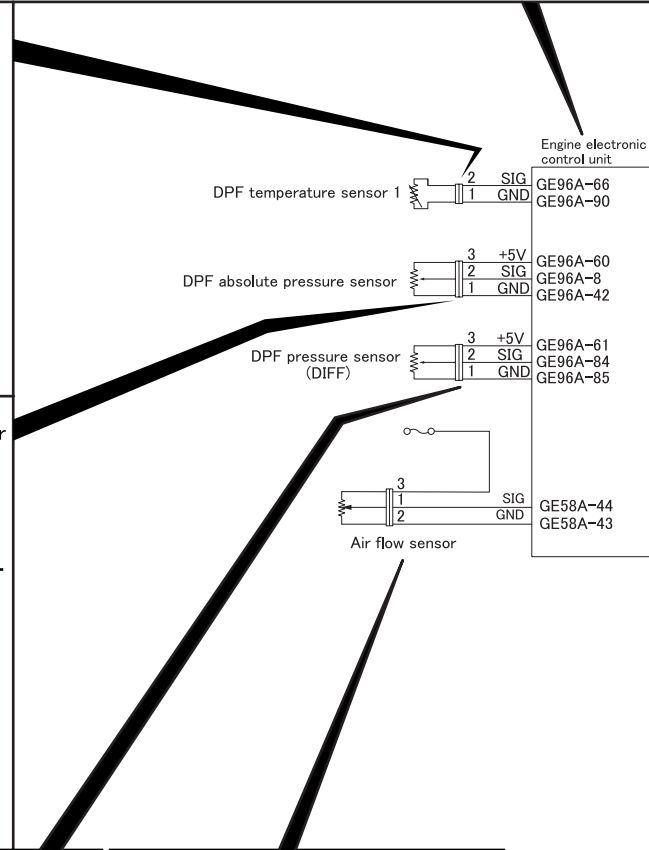
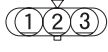
When measured from back side of connector



When measured from back side of connector



When measured from connection side of connector



Engine electronic control unit

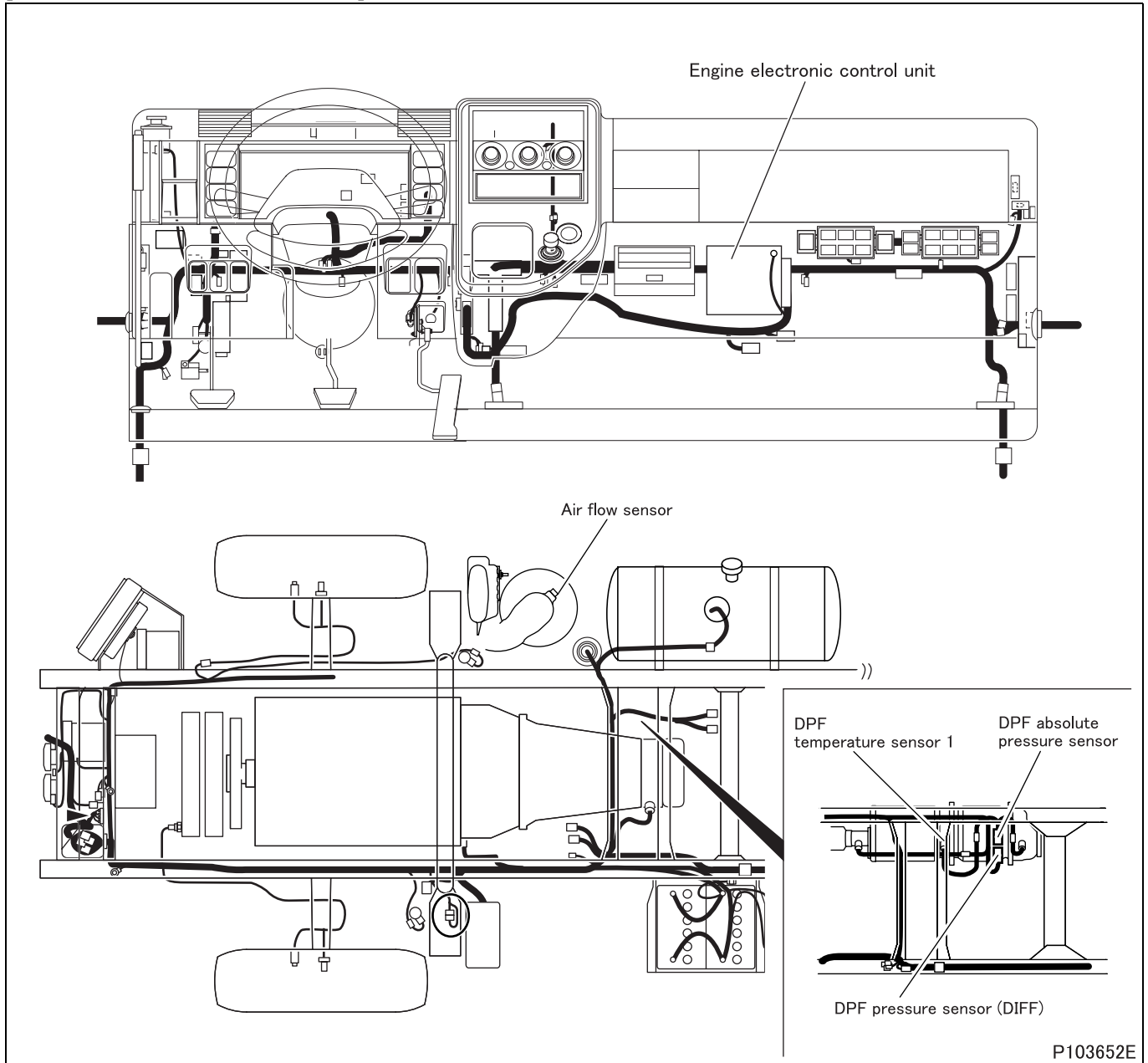
GE96A-66  
GE96A-90

GE96A-60  
GE96A-8  
GE96A-42

GE96A-61  
GE96A-84  
GE96A-85

GE58A-44  
GE58A-43

[Parts Identification and Location]



# TROUBLESHOOTING

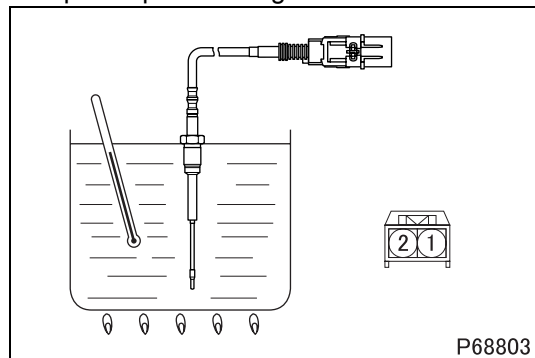
## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |     |  |    |
|--------|--|--|--|-----|--|----|
| Step 1 | Inspection items   |  | Inspection by control data   |     |  |    |
|        | Maintenance item   |  | <p>Check if following diagnosis codes occur simultaneously.</p> <ul style="list-style-type: none"> <li>P0045 "VGT Actuator (Open)"</li> <li>P0046 "VGT Actuator (Performance)"</li> <li>P0047 "VGT Actuator (Low)"</li> <li>P0102 "Airflow Sensor (Low)"</li> <li>P0103 "Airflow Sensor (High)"</li> <li>P0426 "EXH Gas Temp SNSR1 (Plausibility)"</li> <li>P0427 "EXH Gas Temp SNSR1 (Low)"</li> <li>P0428 "EXH Gas Temp SNSR1 (High)"</li> <li>P0545 "DPF Temp SNSR (upstream) Low"</li> <li>P0546 "DPF Temp SNSR (upstream) High"</li> <li>P1430 "DPF Regeneration Switch"</li> <li>P1660 "DPF Lamp Control Circuit (Low)"</li> <li>P2031 "Exhaust Gas Temp"</li> <li>P2032 "Exhaust Gas Temp (Low)"</li> <li>P2033 "Exhaust Gas Temp (High)"</li> <li>P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>P2455 "DPF Diff SNSR (High) &amp; MFF"</li> </ul> |     |  |    |
|        | Inspection condition                                       |  | Ensure that each sensor mounting condition is free of abnormalities.   |     |  |    |
|        | Requirements   |  | Codes occur.   |     |  |    |
|        | Inspection result (Is the judging standard satisfied?)     |  | <table border="1"> <tr> <td>YES</td> <td>Inspect diagnosis code that is occurring and go to step 2.</td> </tr> <tr> <td>NO</td> <td>Go to step 2.</td> </tr> </table>  | YES | Inspect diagnosis code that is occurring and go to step 2. | NO |
| YES    | Inspect diagnosis code that is occurring and go to step 2. |  |  |     |  |    |
| NO     | Go to step 2.  |  |  |     |  |    |

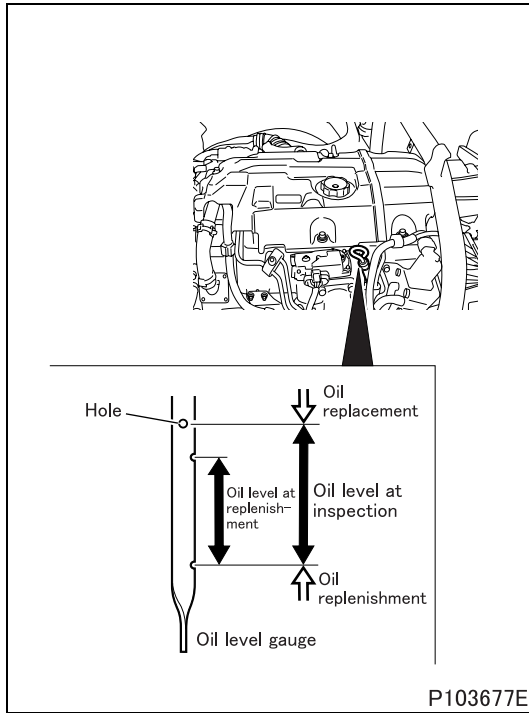
|        |  |  |   |     |               |    |
|--------|--|--|---|-----|---------------|----|
| Step 2 | Inspection items                                       |  | Inspection of DPF temperature sensor 1 unit   |     |               |    |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2.   |     |               |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Put DPF temperature sensor 1 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>20°C {68°F} : 241.8 kΩ</li> <li>50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>100°C {212°F} : 33.56<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 3.</td> </tr> <tr> <td>NO</td> <td>Cleaning of sensor</td> </tr> </table>   | YES | Go to step 3. | NO |
| YES    | Go to step 3.  |  |   |     |               |    |
| NO     | Cleaning of sensor                                     |  |   |     |               |    |

<Step 2 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of oil level                   |
|        | Maintenance item                                       |  | Inspection of engine oil level            |
|        | Inspection condition                                   |  | Engine stopped                            |
|        | Requirements   |  | Oil level for inspection is not exceeded. |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to step 4.                             |
| NO     |  | After replacement of oil, go to step 4 |   |

<Step 3 inspection diagram>

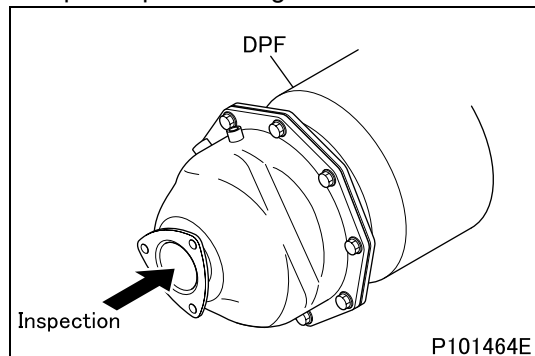


|        |  |   |   |
|--------|--|---|---|
| Step 4 | Inspection items                                       |   | Inspection of pressure hose   |
|        | Maintenance item                                       |   | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |
|        | Inspection condition                                   |   | —   |
|        | Requirements   |   | Nothing abnormal detected   |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5.   |
| NO     |  | After correction and replacement of hose, go to step 5. |   |

# TROUBLESHOOTING

|        |  |   |  |
|--------|--|---|--|
| Step 5 | Inspection items                                       |   | Unit inspection of diesel particulate filter   |
|        | Maintenance item                                       |   | Check the exhaust passage inside the diesel particulate filter for adhesion of soot in large quantity. |
|        | Inspection condition                                   |   | Remove diesel particulate filter.  |
|        | Requirements   |   | No soot is deposited.  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.  |
| NO     |  | After replacement of ceramic filter, perform resetting the DPF-related information. |  |

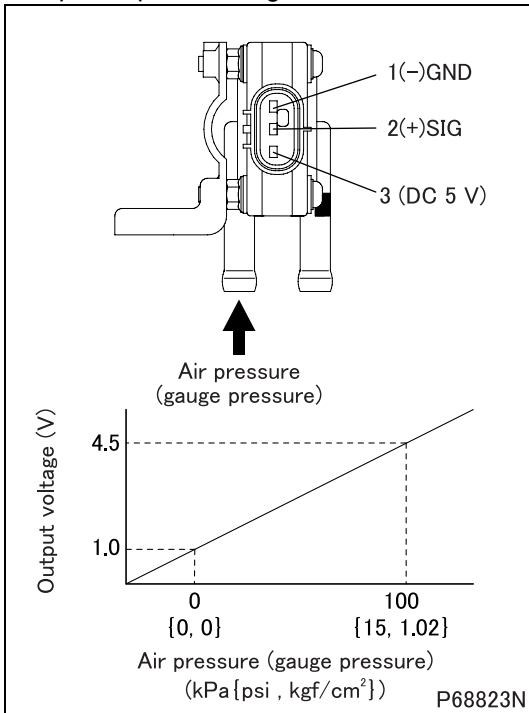
<Step 5 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit  |
|        | Maintenance item                                       |  | See Gr15 "Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit"   |
|        | Inspection condition                                   |  | <p>Perform the following preparatory works.</p> <ul style="list-style-type: none"> <li>Place the transmission in neutral (place the automatic transmission in P range).</li> <li>Turn the steering wheel in neutral position and securely apply the parking brake.</li> <li>Turn off air conditioner not to increase the engine speed.</li> <li>Check diagnosis code of each electronic control system. If any fault exists, rectify it.</li> <li>Resetting the DPF-related information (perform "History reset" of Multi-Use Tester) (See Gr15 "Resetting the DPF-related Information".)</li> <li>Warm up the engine until the engine coolant has been heated to more than 70°C {158°F} (verify from Service Data "Engine Coolant Temperature" or "31: Water Temperature").</li> </ul> |
|        | Requirements   |  | This diagnosis code does not occur again.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to step 7.   |
| NO     |  | Replacement of electronic control unit |   |

| Inspection items |  | Inspection of sensor unit  |                       |
|------------------|--|--|-----------------------|
| Step 7           | Maintenance item                                       | Measure value of voltage between connector terminal No. 2 (+) and 1 (-).   |                       |
|                  | Inspection condition                                   | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across terminals No. 3 (+) and 1 (-).</li> <li>Gradually increase applied air pressure.</li> </ul>   |                       |
|                  | Requirements   | <ul style="list-style-type: none"> <li><math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>}: 1 V</li> <li><math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |                       |
|                  | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8.         |
|                  |  | NO   | Replacement of sensor |

<Step 7 inspection diagram>



# TROUBLESHOOTING

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection of sensor unit   |
|        | Maintenance item                                       |  | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among “Service data”.</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: “Ne” (rpm)</li> <li>• Intake air flow rate: “Air Flow Rate from MAFS” (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 “Engine Revolution” (rpm)</li> <li>• Intake air flow rate: 60 “Air mass flow” (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”.</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | 10% or less   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Go to step 9.</p> <p>NO Replacement of sensor</p>  |

|        |  |  |   |
|--------|--|--|---|
| Step 9 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform actuator test item No. B2 “Fuel Leak Check”.                                  |
|        | Inspection condition                                   |  | Engine start: At idle   |
|        | Requirements   |  | There is no leak from injectors (four).   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Replacement of diesel particulate filter</p> <p>NO Replacement of injector</p> |



**[Fault code]**

Diagnosis code: P1418/Flash code: 92

**[Monitor]**

Temperature increase is insufficient for manual diesel particulate filter regeneration control

**[Fault (outline)]**

Plausibility

**[Diagnosis check]**

- Temperature in diesel particulate filter during manual diesel particulate filter regeneration is monitored through DPF temperature sensor 1.

**[Code generation condition]**

- If temperature remains over 620°C {1148°F} for 10 minutes after start of manual diesel particulate filter regeneration.

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Diesel particulate filter regeneration is stopped.

**[Probable cause of trouble]**

- Malfunction of diesel particulate filter regeneration control
- Malfunction of DPF temperature sensor 1
- Malfunction of engine electronic control unit
- Malfunction of common rail
- Malfunction of diesel particulate filter (front oxidation catalyst)

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |

GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

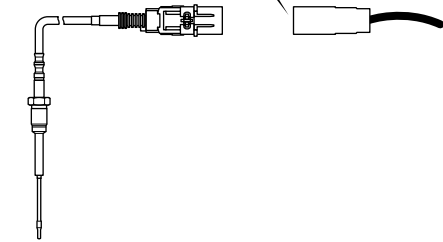
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

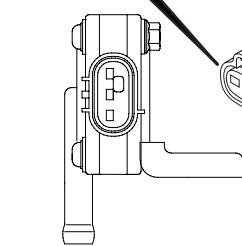
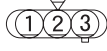
GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

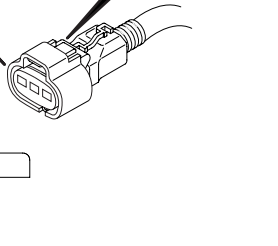
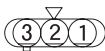
When measured from connection side of connector



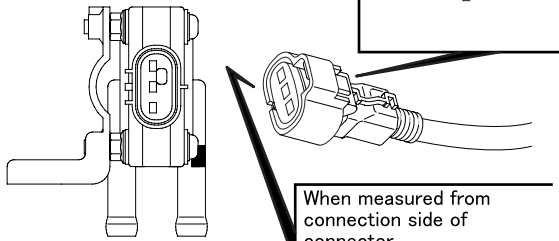
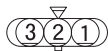
When measured from connection side of connector



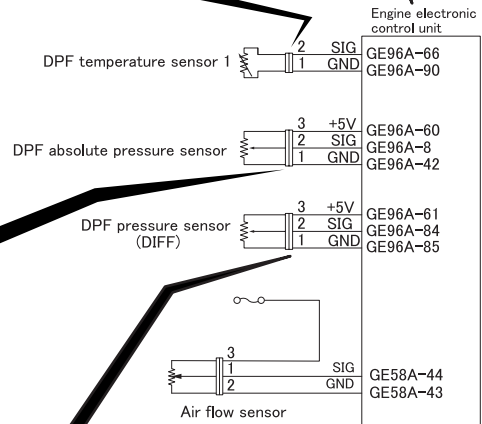
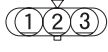
When measured from back side of connector



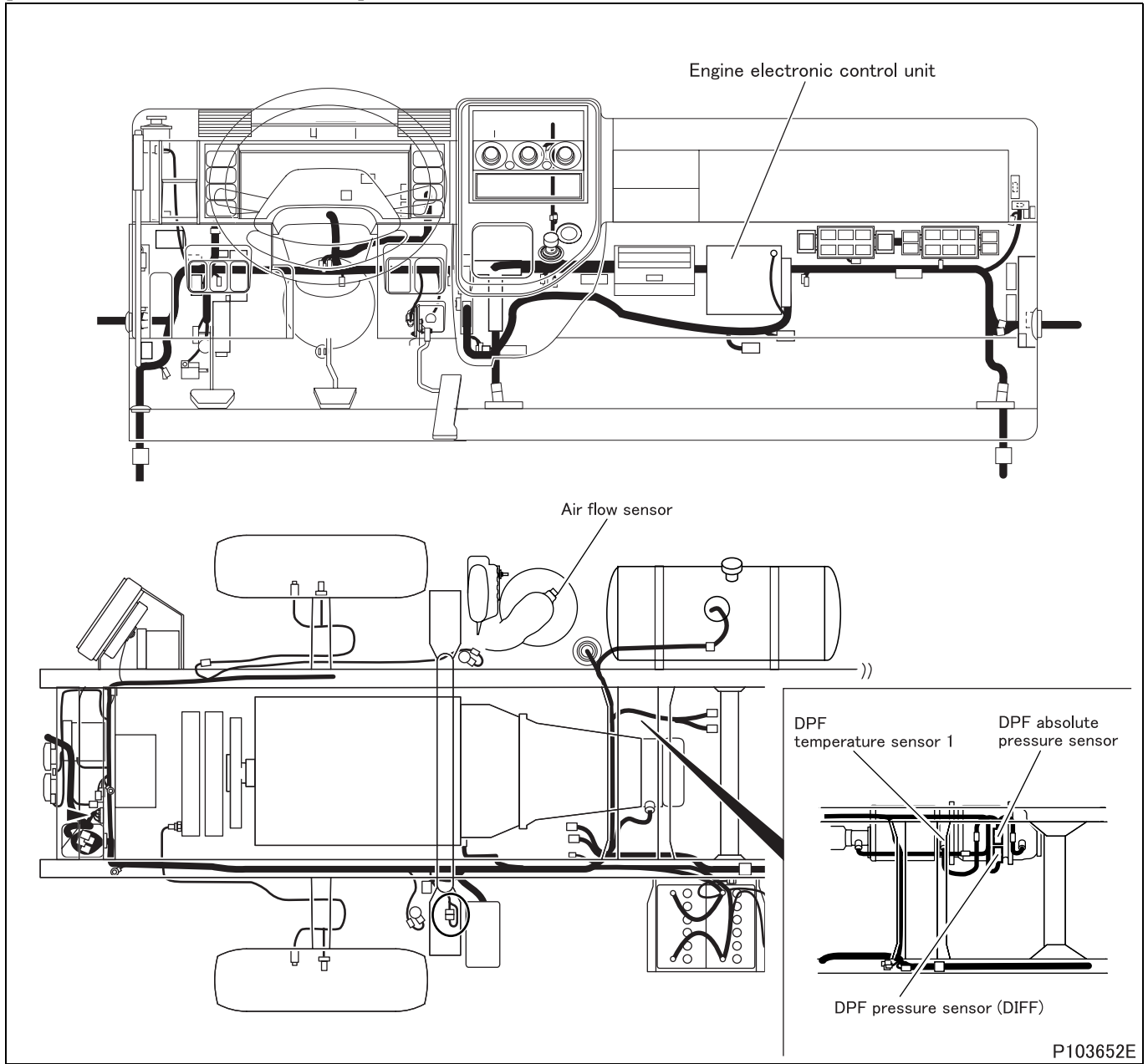
When measured from back side of connector



When measured from connection side of connector



[Parts Identification and Location]



# TROUBLESHOOTING

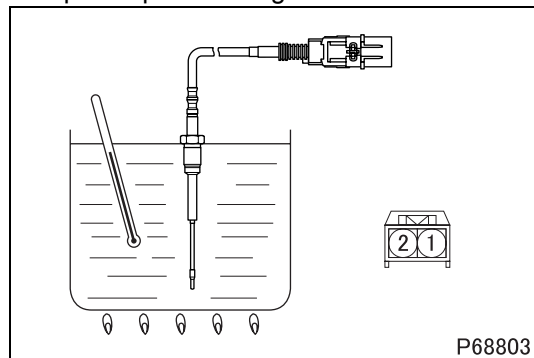
## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |     |  |    |
|--------|--|--|--|-----|--|----|
| Step 1 | Inspection items   |  | Inspection by control data   |     |  |    |
|        | Maintenance item   |  | <p>Check if following diagnosis codes occur simultaneously.</p> <ul style="list-style-type: none"> <li>P0045 "VGT Actuator (Open)"</li> <li>P0046 "VGT Actuator (Performance)"</li> <li>P0047 "VGT Actuator (Low)"</li> <li>P0102 "Airflow Sensor (Low)"</li> <li>P0103 "Airflow Sensor (High)"</li> <li>P0426 "EXH Gas Temp SNSR1 (Plausibility)"</li> <li>P0427 "EXH Gas Temp SNSR1 (Low)"</li> <li>P0428 "EXH Gas Temp SNSR1 (High)"</li> <li>P0545 "DPF Temp SNSR (upstream) Low"</li> <li>P0546 "DPF Temp SNSR (upstream) High"</li> <li>P1430 "DPF Regeneration Switch"</li> <li>P1660 "DPF Lamp Control Circuit (Low)"</li> <li>P2031 "Exhaust Gas Temp"</li> <li>P2032 "Exhaust Gas Temp (Low)"</li> <li>P2033 "Exhaust Gas Temp (High)"</li> <li>P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>P2455 "DPF Diff SNSR (High) &amp; MFF"</li> </ul> |     |  |    |
|        | Inspection condition                                       |  | Ensure that each sensor mounting condition is free of abnormalities.   |     |  |    |
|        | Requirements   |  | Codes occur.   |     |  |    |
|        | Inspection result (Is the judging standard satisfied?)     |  | <table border="1"> <tr> <td>YES</td> <td>Inspect diagnosis code that is occurring and go to step 2.</td> </tr> <tr> <td>NO</td> <td>Go to step 2.</td> </tr> </table>  | YES | Inspect diagnosis code that is occurring and go to step 2. | NO |
| YES    | Inspect diagnosis code that is occurring and go to step 2. |  |  |     |  |    |
| NO     | Go to step 2.  |  |  |     |  |    |

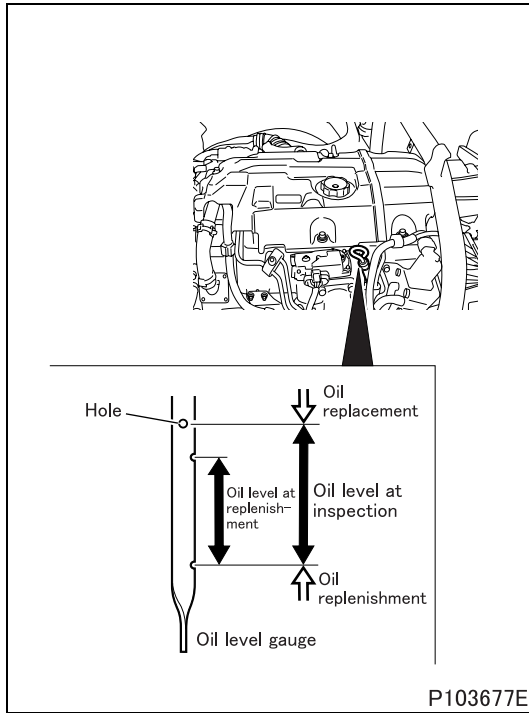
|        |  |  |   |     |               |    |
|--------|--|--|---|-----|---------------|----|
| Step 2 | Inspection items                                       |  | Inspection of DPF temperature sensor 1 unit   |     |               |    |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2.   |     |               |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Put DPF temperature sensor 1 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>20°C {68°F} : 241.8 kΩ</li> <li>50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>100°C {212°F} : 33.56<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 3.</td> </tr> <tr> <td>NO</td> <td>Cleaning of sensor</td> </tr> </table>   | YES | Go to step 3. | NO |
| YES    | Go to step 3.  |  |   |     |               |    |
| NO     | Cleaning of sensor                                     |  |   |     |               |    |

<Step 2 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of oil level                   |
|        | Maintenance item                                       |  | Inspection of engine oil level            |
|        | Inspection condition                                   |  | Engine stopped                            |
|        | Requirements   |  | Oil level for inspection is not exceeded. |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to step 4.                             |
| NO     |  | After replacement of oil, go to step 4 |   |

<Step 3 inspection diagram>

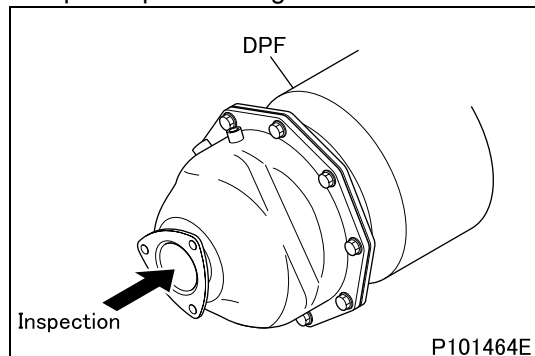


|        |  |   |   |
|--------|--|---|---|
| Step 4 | Inspection items                                       |   | Inspection of pressure hose   |
|        | Maintenance item                                       |   | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |
|        | Inspection condition                                   |   | —   |
|        | Requirements   |   | Nothing abnormal detected   |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5.   |
| NO     |  | After correction and replacement of hose, go to step 5. |   |

# TROUBLESHOOTING

|        |  |  |  |
|--------|--|--|--|
| Step 5 | Inspection items                                       |  | Unit inspection of diesel particulate filter   |
|        | Maintenance item                                       |  | Check the exhaust passage inside the diesel particulate filter for adhesion of soot in large quantity. |
|        | Inspection condition                                   |  | Remove diesel particulate filter.  |
|        | Requirements   |  | No soot is deposited.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

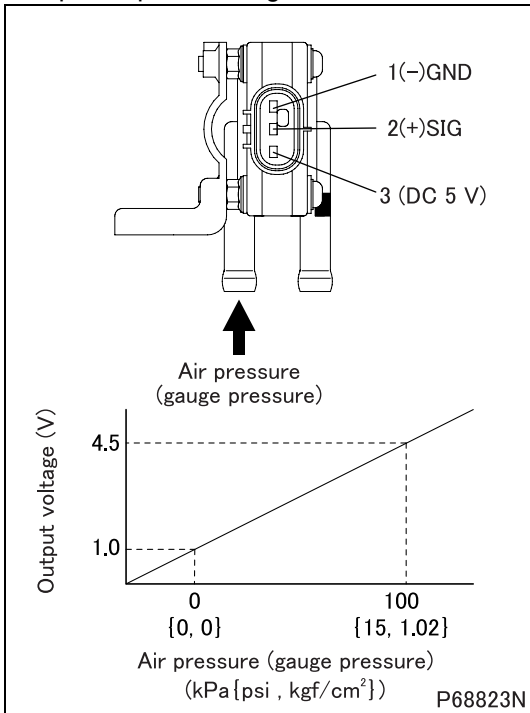
<Step 5 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit  |
|        | Maintenance item                                       |  | See Gr15 "Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit"   |
|        | Inspection condition                                   |  | <p>Perform the following preparatory works.</p> <ul style="list-style-type: none"> <li>Place the transmission in neutral (place the automatic transmission in P range).</li> <li>Turn the steering wheel in neutral position and securely apply the parking brake.</li> <li>Turn off air conditioner not to increase the engine speed.</li> <li>Check diagnosis code of each electronic control system. If any fault exists, rectify it.</li> <li>Resetting the DPF-related information (perform "History reset" of Multi-Use Tester) (See Gr15 "Resetting the DPF-related Information".)</li> <li>Warm up the engine until the engine coolant has been heated to more than 70°C {158°F} (verify from Service Data "Engine Coolant Temperature" or "31: Water Temperature").</li> </ul> |
|        | Requirements   |  | This diagnosis code does not occur again.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

| Inspection items |  | Inspection of sensor unit  |                       |
|------------------|--|--|-----------------------|
| Step 7           | Maintenance item                                       | Measure value of voltage between connector terminal No. 2 (+) and 1 (-).   |                       |
|                  | Inspection condition                                   | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across terminals No. 3 (+) and 1 (-).</li> <li>Gradually increase applied air pressure.</li> </ul>   |                       |
|                  | Requirements   | <ul style="list-style-type: none"> <li><math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>}: 1 V</li> <li><math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |                       |
|                  | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8.         |
|                  |  | NO   | Replacement of sensor |

<Step 7 inspection diagram>



# TROUBLESHOOTING

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection of sensor unit   |
|        | Maintenance item                                       |  | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among “Service data”.</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: “Ne” (rpm)</li> <li>• Intake air flow rate: “Air Flow Rate from MAFS” (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 “Engine Revolution” (rpm)</li> <li>• Intake air flow rate: 60 “Air mass flow” (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”.</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | 10% or less   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Go to step 9.</p> <p>NO Replacement of sensor</p>  |

|        |  |  |   |
|--------|--|--|---|
| Step 9 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform actuator test item No. B2 “Fuel Leak Check”.                                  |
|        | Inspection condition                                   |  | Engine start: At idle   |
|        | Requirements   |  | There is no leak from injectors (four).   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Replacement of diesel particulate filter</p> <p>NO Replacement of injector</p> |



**[Fault code]**

Diagnosis code: P1419/Flash code: 92

**[Monitor]**

Failure of manual diesel particulate filter regeneration control

**[Fault (outline)]**

Plausibility

**[Diagnosis check]**

- Duration of manual diesel particulate filter regeneration is monitored.

**[Code generation condition]**

- Regeneration exceeds specified time. (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Diesel particulate filter regeneration is stopped.

**[Probable cause of trouble]**

- Malfunction of diesel particulate filter regeneration control
- Malfunction of DPF temperature sensor 1
- Malfunction of engine electronic control unit
- Malfunction of common rail
- Malfunction of diesel particulate filter (front oxidation catalyst)

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |

GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

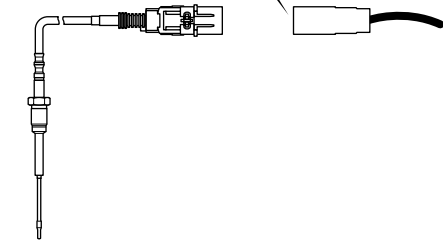
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

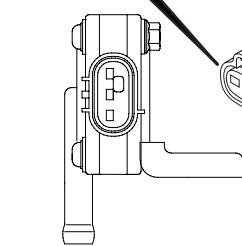
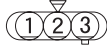
GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

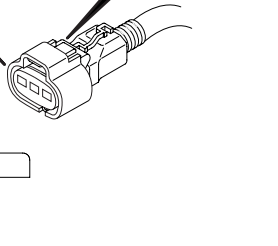
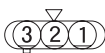
When measured from connection side of connector



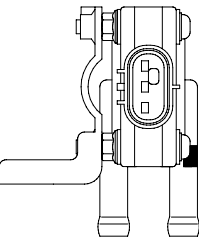
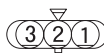
When measured from connection side of connector



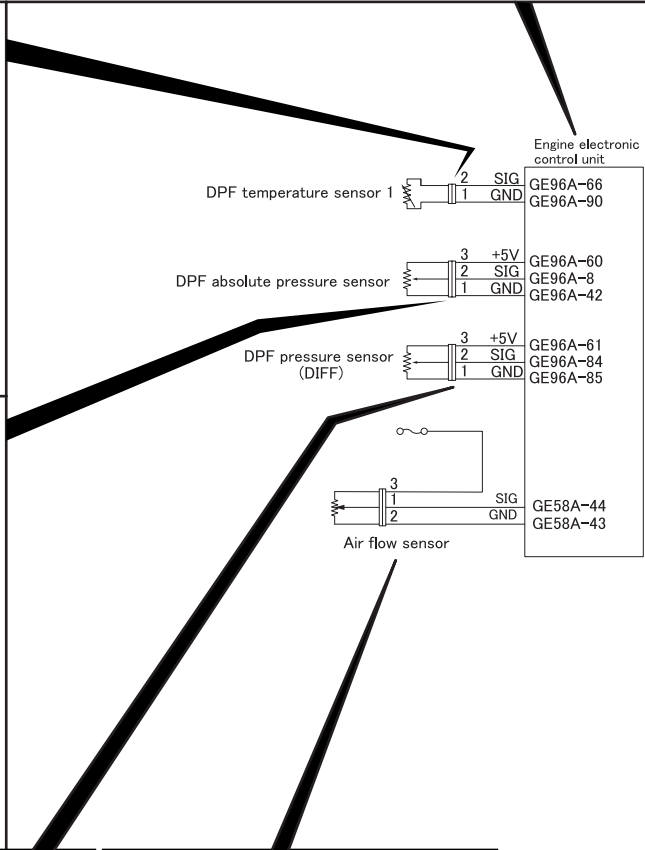
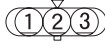
When measured from back side of connector



When measured from back side of connector

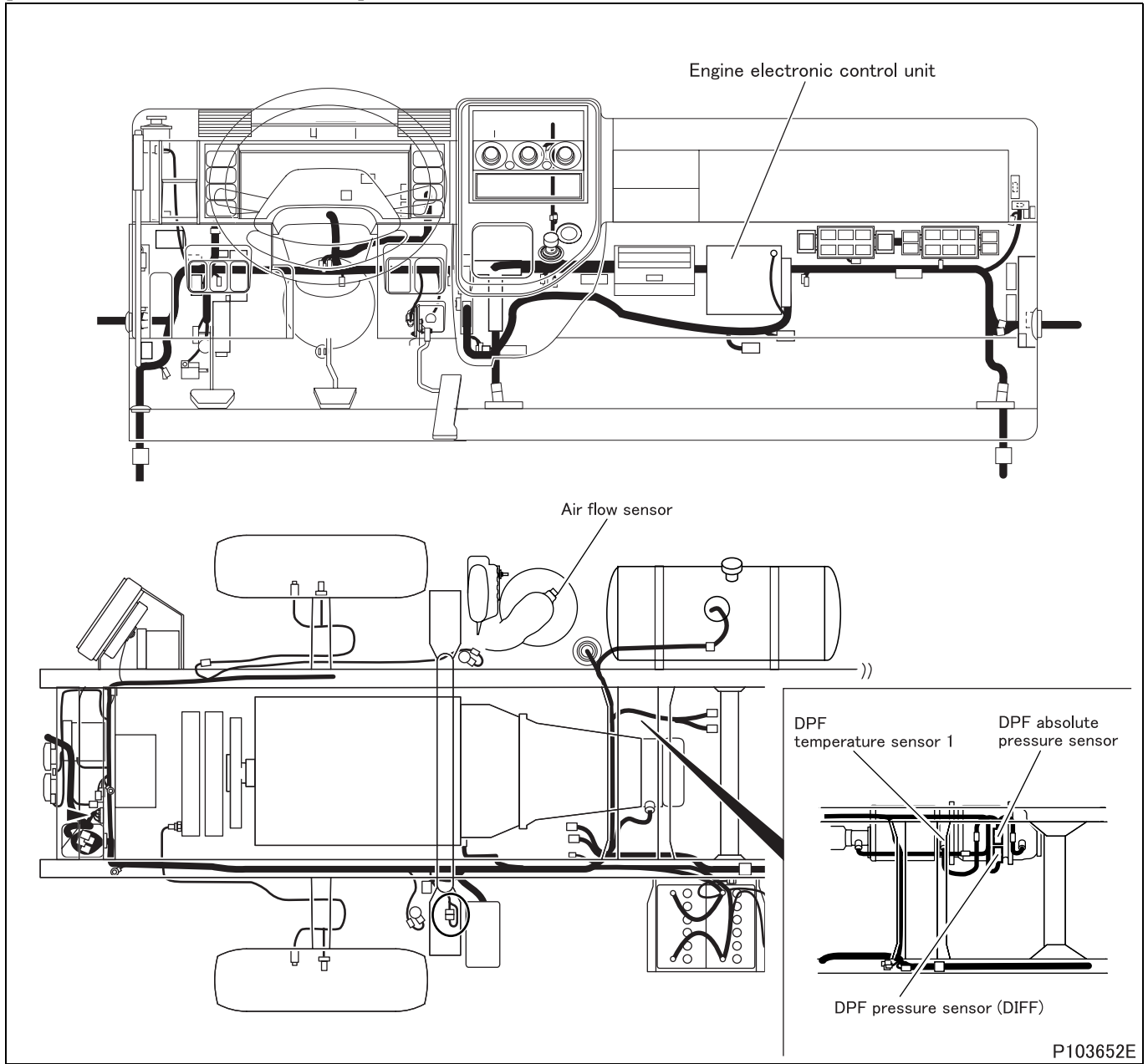


When measured from connection side of connector



- Engine electronic control unit
- GE96A-66
  - GE96A-90
  - GE96A-60
  - GE96A-8
  - GE96A-42
  - GE96A-61
  - GE96A-84
  - GE96A-85
  - GE58A-44
  - GE58A-43

[Parts Identification and Location]



# TROUBLESHOOTING

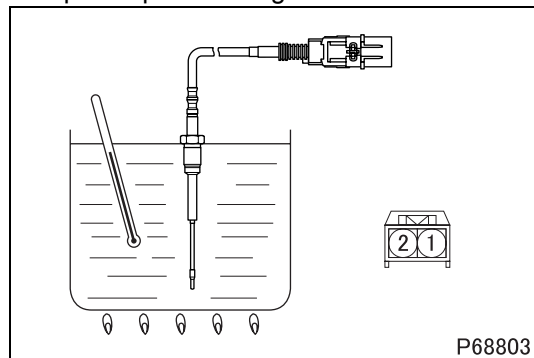
## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |     |  |    |
|--------|--|--|--|-----|--|----|
| Step 1 | Inspection items   |  | Inspection by control data   |     |  |    |
|        | Maintenance item   |  | <p>Check if following diagnosis codes occur simultaneously.</p> <ul style="list-style-type: none"> <li>P0045 "VGT Actuator (Open)"</li> <li>P0046 "VGT Actuator (Performance)"</li> <li>P0047 "VGT Actuator (Low)"</li> <li>P0102 "Airflow Sensor (Low)"</li> <li>P0103 "Airflow Sensor (High)"</li> <li>P0426 "EXH Gas Temp SNSR1 (Plausibility)"</li> <li>P0427 "EXH Gas Temp SNSR1 (Low)"</li> <li>P0428 "EXH Gas Temp SNSR1 (High)"</li> <li>P0545 "DPF Temp SNSR (upstream) Low"</li> <li>P0546 "DPF Temp SNSR (upstream) High"</li> <li>P1430 "DPF Regeneration Switch"</li> <li>P1660 "DPF Lamp Control Circuit (Low)"</li> <li>P2031 "Exhaust Gas Temp"</li> <li>P2032 "Exhaust Gas Temp (Low)"</li> <li>P2033 "Exhaust Gas Temp (High)"</li> <li>P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>P2455 "DPF Diff SNSR (High) &amp; MFF"</li> </ul> |     |  |    |
|        | Inspection condition                                       |  | Ensure that each sensor mounting condition is free of abnormalities.   |     |  |    |
|        | Requirements   |  | Codes occur.   |     |  |    |
|        | Inspection result (Is the judging standard satisfied?)     |  | <table border="1"> <tr> <td>YES</td> <td>Inspect diagnosis code that is occurring and go to step 2.</td> </tr> <tr> <td>NO</td> <td>Go to step 2.</td> </tr> </table>  | YES | Inspect diagnosis code that is occurring and go to step 2. | NO |
| YES    | Inspect diagnosis code that is occurring and go to step 2. |  |  |     |  |    |
| NO     | Go to step 2.  |  |  |     |  |    |

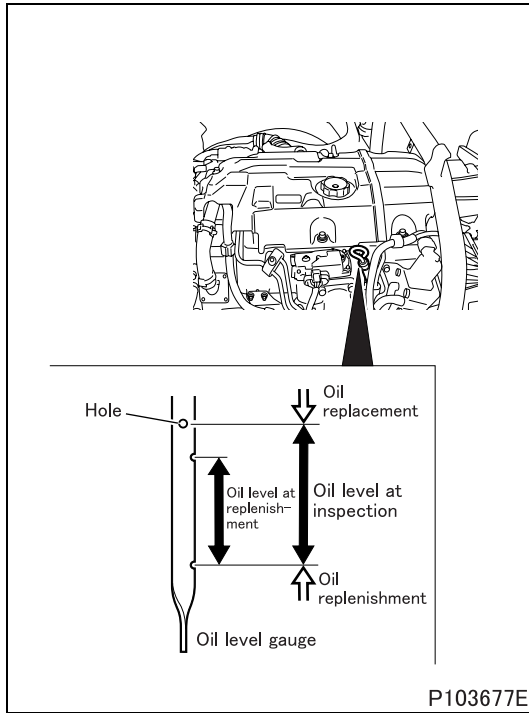
|        |  |  |   |     |               |    |
|--------|--|--|---|-----|---------------|----|
| Step 2 | Inspection items                                       |  | Inspection of DPF temperature sensor 1 unit   |     |               |    |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2.   |     |               |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Put DPF temperature sensor 1 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>20°C {68°F} : 241.8 kΩ</li> <li>50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>100°C {212°F} : 33.56<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 3.</td> </tr> <tr> <td>NO</td> <td>Cleaning of sensor</td> </tr> </table>   | YES | Go to step 3. | NO |
| YES    | Go to step 3.  |  |   |     |               |    |
| NO     | Cleaning of sensor                                     |  |   |     |               |    |

<Step 2 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of oil level                   |
|        | Maintenance item                                       |  | Inspection of engine oil level            |
|        | Inspection condition                                   |  | Engine stopped                            |
|        | Requirements   |  | Oil level for inspection is not exceeded. |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to step 4.                             |
| NO     |  | After replacement of oil, go to step 4 |   |

<Step 3 inspection diagram>

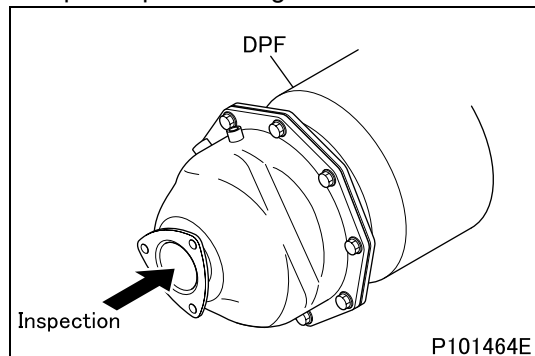


|        |  |   |   |
|--------|--|---|---|
| Step 4 | Inspection items                                       |   | Inspection of pressure hose   |
|        | Maintenance item                                       |   | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |
|        | Inspection condition                                   |   | —   |
|        | Requirements   |   | Nothing abnormal detected   |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5.   |
| NO     |  | After correction and replacement of hose, go to step 5. |   |

# TROUBLESHOOTING

|        |  |   |  |
|--------|--|---|--|
| Step 5 | Inspection items                                       |   | Unit inspection of diesel particulate filter   |
|        | Maintenance item                                       |   | Check the exhaust passage inside the diesel particulate filter for adhesion of soot in large quantity. |
|        | Inspection condition                                   |   | Remove diesel particulate filter.  |
|        | Requirements   |   | No soot is deposited.  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.  |
| NO     |  | After replacement of ceramic filter, perform resetting the DPF-related information. |  |

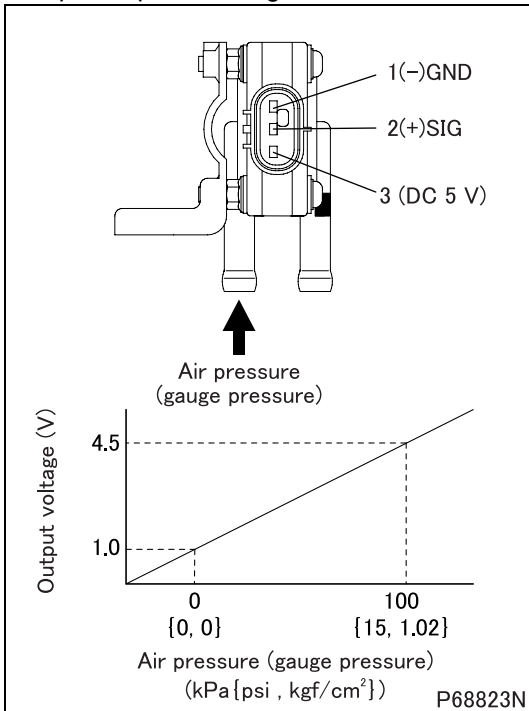
<Step 5 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit  |
|        | Maintenance item                                       |  | See Gr15 "Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit"   |
|        | Inspection condition                                   |  | <p>Perform the following preparatory works.</p> <ul style="list-style-type: none"> <li>Place the transmission in neutral (place the automatic transmission in P range).</li> <li>Turn the steering wheel in neutral position and securely apply the parking brake.</li> <li>Turn off air conditioner not to increase the engine speed.</li> <li>Check diagnosis code of each electronic control system. If any fault exists, rectify it.</li> <li>Resetting the DPF-related information (perform "History reset" of Multi-Use Tester) (See Gr15 "Resetting the DPF-related Information".)</li> <li>Warm up the engine until the engine coolant has been heated to more than 70°C {158°F} (verify from Service Data "Engine Coolant Temperature" or "31: Water Temperature").</li> </ul> |
|        | Requirements   |  | This diagnosis code does not occur again.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to step 7.   |
| NO     |  | Replacement of electronic control unit |   |

| Inspection items |  | Inspection of sensor unit  |                       |
|------------------|--|--|-----------------------|
| Step 7           | Maintenance item                                       | Measure value of voltage between connector terminal No. 2 (+) and 1 (-).   |                       |
|                  | Inspection condition                                   | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across terminals No. 3 (+) and 1 (-).</li> <li>Gradually increase applied air pressure.</li> </ul>   |                       |
|                  | Requirements   | <ul style="list-style-type: none"> <li><math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>}: 1 V</li> <li><math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |                       |
|                  | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8.         |
|                  |  | NO   | Replacement of sensor |

<Step 7 inspection diagram>



# TROUBLESHOOTING

|        |  |   |               |
|--------|--|---|---------------|
| Step 8 | Inspection items                                       | Inspection of sensor unit   |               |
|        | Maintenance item                                       | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among “Service data”.</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: “Ne” (rpm)</li> <li>• Intake air flow rate: “Air Flow Rate from MAFS” (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 “Engine Revolution” (rpm)</li> <li>• Intake air flow rate: 60 “Air mass flow” (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”.</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |               |
|        | Inspection condition                                   | –   |               |
|        | Requirements   | 10% or less   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 9. |
|        | NO   | Replacement of sensor   |               |

|        |  |  |  |
|--------|--|--|--|
| Step 9 | Inspection items                                       | Inspection by control data                           |  |
|        | Maintenance item                                       | Perform actuator test item No. B2 “Fuel Leak Check”. |  |
|        | Inspection condition                                   | Engine start: At idle                                |  |
|        | Requirements   | There is no leak from injectors (four).              |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Replacement of diesel particulate filter |
|        | NO   | Replacement of injector                              |  |



**[Fault code]**

Diagnosis code: P1421/Flash code: 92

**[Monitor]**

Diesel particulate filter clogged

**[Fault (outline)]**

Plausibility

**[Diagnosis check]**

- Particulate matter (PM) deposit estimated by engine electronic control unit exceeded specified value.

**[Code generation condition]**

- Particulate matter (PM) deposit is more than specified value (clogging level: low).  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Engine torque is limited.
- Auto cruise control stopped
- Traction control is stopped <Automatic transmission>

**[Probable cause of trouble]**

- Failure of diesel particulate filter indicator lamp
- Failure of diesel particulate filter cleaning switch
- Manual diesel particulate filter regeneration is not performed.
- Excessive smoke emission (due to malfunction of engine proper, common rail or exhaust gas recirculation system)
- Malfunction of air flow sensor
- Malfunction of DPF absolute pressure sensor or DPF pressure sensor (DIFF)
- Malfunction of diesel particulate filter

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |

GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

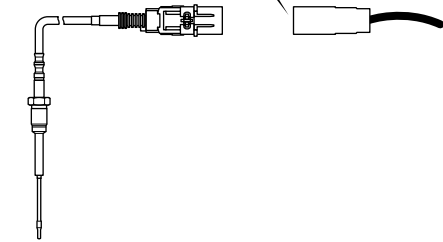
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

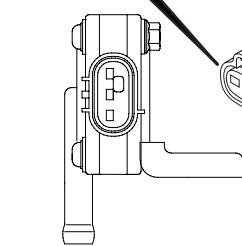
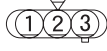
GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

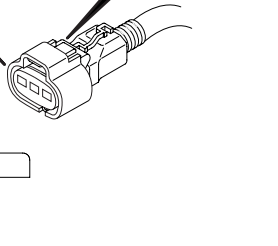
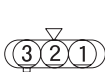
When measured from connection side of connector



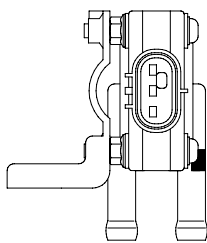
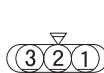
When measured from connection side of connector



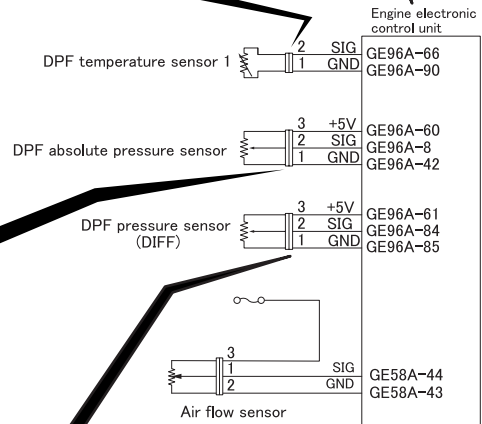
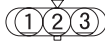
When measured from back side of connector



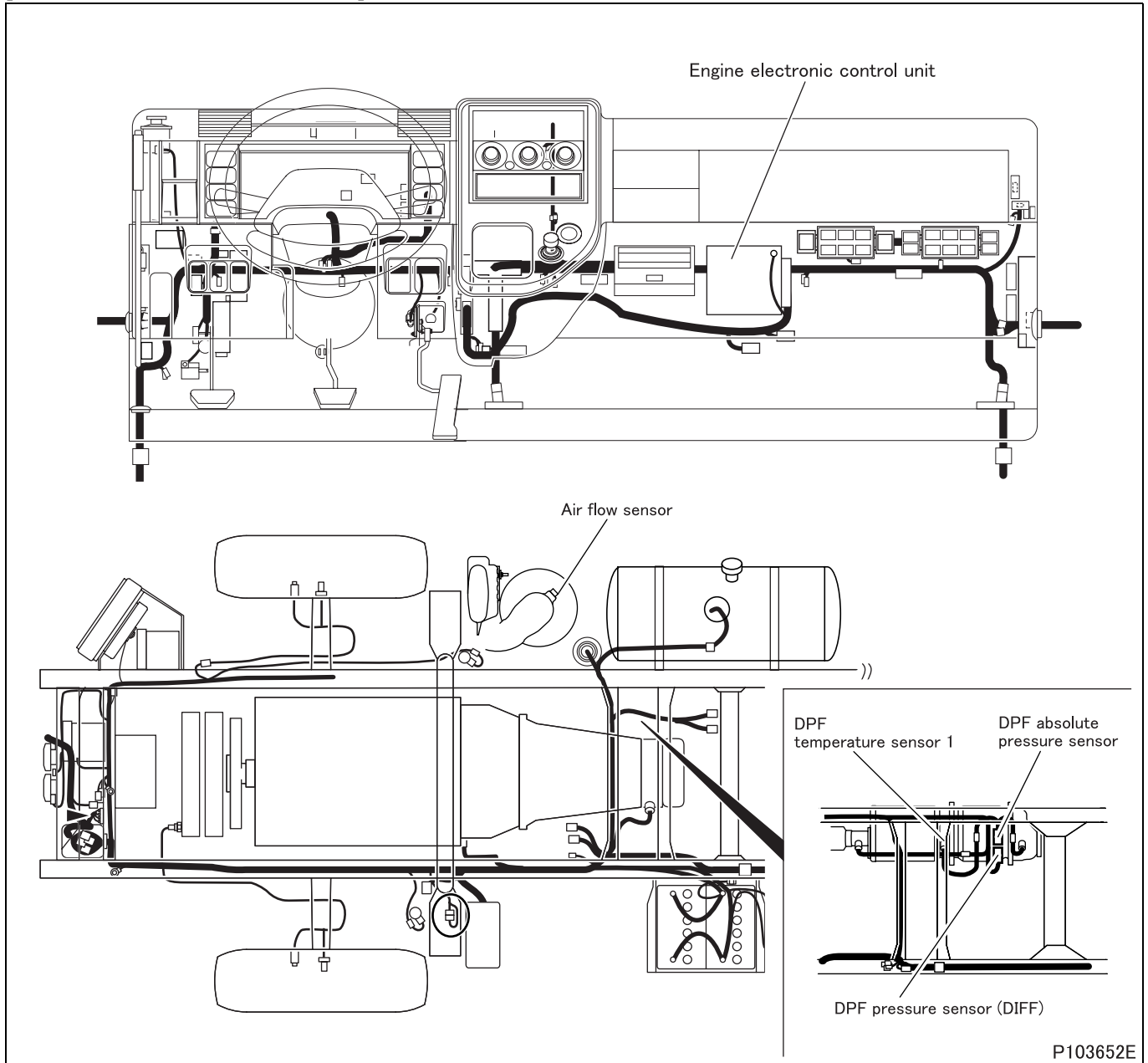
When measured from back side of connector



When measured from connection side of connector



[Parts Identification and Location]



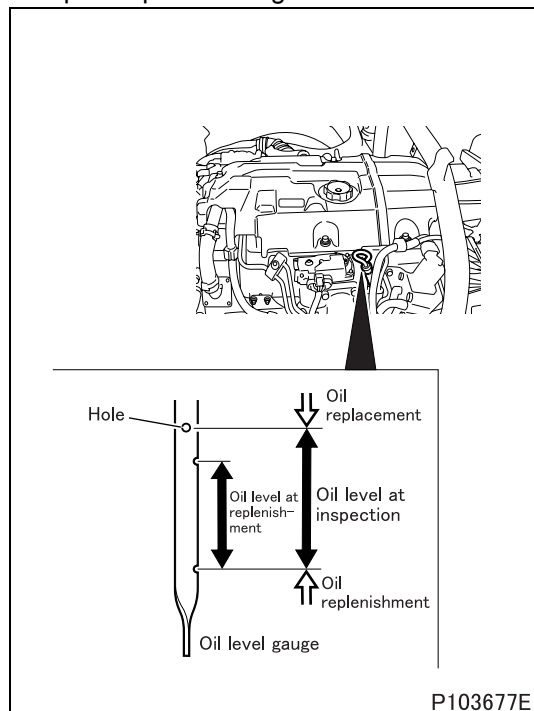
# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |    |   |
|--------|--|----|---|
| Step 1 | Inspection items                                       |    | Inspection of oil level                   |
|        | Maintenance item                                       |    | Inspection of engine oil level            |
|        | Inspection condition                                   |    | Engine stopped                            |
|        | Requirements   |    | Oil level for inspection is not exceeded. |
|        | Inspection result (Is the judging standard satisfied?) |    | YES                                       |
|        |  | NO | After replacement of oil, go to step 2    |

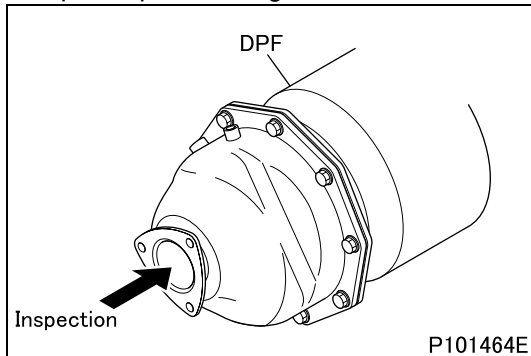
<Step 1 inspection diagram>



|        |  |    |   |
|--------|--|----|---|
| Step 2 | Inspection items                                       |    | Inspection by manual diesel particulate filter regeneration   |
|        | Maintenance item                                       |    | Perform Multi-Use Tester actuator test item No. A5 "DPF Regeneration (Manual)", and clean ceramic diesel particulate filter.  |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Engine: idling</li> <li>Place the transmission in neutral. (place the automatic transmission in P range)</li> <li>Parking brake: vehicle parked (parking brake switch: ON)</li> <li>After engine warm-up</li> </ul> |
|        | Requirements   |    | This diagnosis code does not occur again.   |
|        | Inspection result (Is the judging standard satisfied?) |    | YES   |
|        |  | NO | Go to step 3.   |

|        |  |   |  |
|--------|--|---|--|
| Step 3 | Inspection items                                       |   | Unit inspection of diesel particulate filter   |
|        | Maintenance item                                       |   | Check the exhaust passage inside the diesel particulate filter for adhesion of soot in large quantity. |
|        | Inspection condition                                   |   | Remove diesel particulate filter.  |
|        | Requirements   |   | No soot is deposited.  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 4.  |
| NO     |  | After replacement of ceramic filter, perform resetting the DPF-related information. |  |

<Step 3 inspection diagram>



|        |  |               |   |
|--------|--|---------------|---|
| Step 4 | Inspection items                                       |               | Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit  |
|        | Maintenance item                                       |               | See Gr15 "Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit"   |
|        | Inspection condition                                   |               | <p>Perform the following preparatory works.</p> <ul style="list-style-type: none"> <li>Place the transmission in neutral. (place the automatic transmission in P range)</li> <li>Turn the steering wheel in neutral position and securely apply the parking brake.</li> <li>Turn off air conditioner not to increase the engine speed.</li> <li>Check diagnosis code of each electronic control system. If any fault exists, rectify it.</li> <li>Resetting the DPF-related information (perform "History reset" of Multi-Use Tester) (See Gr15 "Resetting the DPF-related information".)</li> <li>Warm up the engine until the engine coolant has been heated to more than 70°C {158°F}. (verify from Service Data "Engine Coolant Temperature" or "31: Water Temperature")</li> </ul> |
|        | Requirements   |               | This diagnosis code does not occur again.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | End of inspection   |
| NO     |  | Go to step 5. |   |

|        |  |   |   |
|--------|--|---|---|
| Step 5 | Inspection items                                       |   | Inspection by control data  |
|        | Maintenance item                                       |   | Measure item No. B8 "DPF Indicator Lamp" of Service Data.                               |
|        | Inspection condition                                   |   | Perform Multi-Use Tester actuator test item No. A6 "DPF Lamp".                          |
|        | Requirements   |   | Diesel particulate filter indicator lamp illuminates (automatic reset after 15 seconds) |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.   |
| NO     |  | Replacement of engine electronic control unit |   |

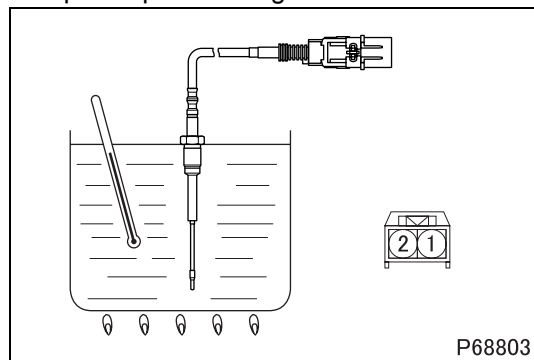
# TROUBLESHOOTING

|        |  |  |  |
|--------|--|--|--|
| Step 6 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Measure item No. A4 "DPF SW" of Service Data.  |
|        | Inspection condition                                   |  | —  |
|        | Requirements   |  | Press diesel particulate filter cleaning switch and check that "DPF SW" display switches from OFF to ON. |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7.  |
| NO     |  | Replacement of diesel particulate filter cleaning switch or engine electronic control unit |  |

|        |  |   |   |
|--------|--|---|---|
| Step 7 | Inspection items                                       |   | Inspection of pressure hose   |
|        | Maintenance item                                       |   | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |
|        | Inspection condition                                   |   | —   |
|        | Requirements   |   | Nothing abnormal detected   |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8.   |
| NO     |  | After correction and replacement of hose, go to step 8. |   |

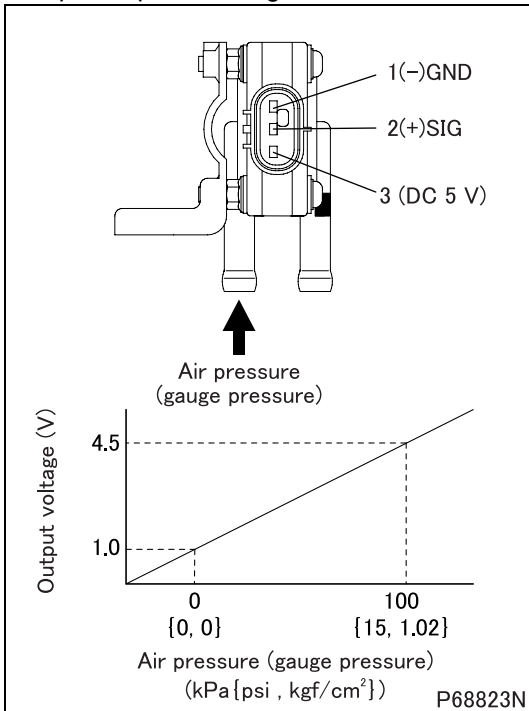
|        |  |                    |   |
|--------|--|--------------------|---|
| Step 8 | Inspection items                                       |                    | Inspection of DPF temperature sensor 1 unit   |
|        | Maintenance item                                       |                    | Measure value of resistance between connector terminal No. 1 and 2.   |
|        | Inspection condition                                   |                    | <ul style="list-style-type: none"> <li>Put DPF temperature sensor 1 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |
|        | Requirements   |                    | <ul style="list-style-type: none"> <li>20°C {68°F} : 241.8 kΩ</li> <li>50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>100°C {212°F} : 33.56<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                | Go to step 9.   |
| NO     |  | Cleaning of sensor |   |

<Step 8 inspection diagram>



|        |  |  |  |     |                |    |
|--------|--|--|--|-----|----------------|----|
| Step 9 | Inspection items                                       |  | Inspection of DPF pressure sensor (DIFF)   |     |                |    |
|        | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 2 (+) and 1 (-).   |     |                |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across terminals No. 3 (+) and 1 (-).</li> <li>Gradually increase applied air pressure.</li> </ul>   |     |                |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li><math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>}: 1 V</li> <li><math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |     |                |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 10.</td> </tr> <tr> <td>NO</td> <td>Replacement of DPF pressure sensor (DIFF)</td> </tr> </table>  | YES | Go to step 10. | NO |
| YES    | Go to step 10.   |  |  |     |                |    |
| NO     | Replacement of DPF pressure sensor (DIFF)              |  |  |     |                |    |

<Step 9 inspection diagram>



# TROUBLESHOOTING

|         |  |  |   |
|---------|--|--|---|
| Step 10 | Inspection items                                       |  | Inspection of air flow sensor unit  |
|         | Maintenance item                                       |  | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among “Service data”.</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: “Ne” (rpm)</li> <li>• Intake air flow rate: “Air Flow Rate from MAFS” (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 “Engine Revolution” (rpm)</li> <li>• Intake air flow rate: 60 “Air mass flow” (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”.</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |
|         | Inspection condition                                   |  | –   |
|         | Requirements   |  | 10% or less   |
|         | Inspection result (Is the judging standard satisfied?) |  | <p>YES Go to step 11.</p> <p>NO Replacement of air flow sensor</p>  |

|         |  |  |   |
|---------|--|--|---|
| Step 11 | Inspection items                                       |  | Inspection by control data  |
|         | Maintenance item                                       |  | Perform actuator test item No. B2 “Fuel Leak Check”.  |
|         | Inspection condition                                   |  | Engine start: At idle   |
|         | Requirements   |  | There is no leak from injectors (four).   |
|         | Inspection result (Is the judging standard satisfied?) |  | <p>YES</p> <ul style="list-style-type: none"> <li>• Inspection of exhaust gas recirculation system (exhaust gas recirculation pipe, exhaust gas recirculation cooler, exhaust gas recirculation valve)</li> <li>• Inspection of engine</li> </ul> <p>NO Replacement of injector</p> |



**[Fault code]**

Diagnosis code: P1422/Flash code: 92

**[Monitor]**

Diesel particulate filter clogged

**[Fault (outline)]**

Plausibility

**[Diagnosis check]**

- Particulate matter (PM) deposit estimated by engine electronic control unit exceeded specified value.

**[Code generation condition]**

- Particulate matter (PM) deposit is more than specified value (clogging level: medium to high).  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Engine torque is limited.
- Auto cruise control stopped
- Traction control is stopped <Automatic transmission>
- Diesel particulate filter regeneration is stopped.

**[Probable cause of trouble]**

- Failure of diesel particulate filter indicator lamp
- Failure of diesel particulate filter cleaning switch
- Manual diesel particulate filter regeneration is not performed.
- Excessive smoke emission (due to malfunction of engine proper, common rail or exhaust gas recirculation system)
- Malfunction of air flow sensor
- Malfunction of DPF absolute pressure sensor or DPF pressure sensor (DIFF)
- Malfunction of diesel particulate filter

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |

GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

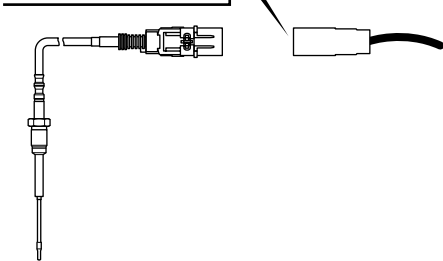
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

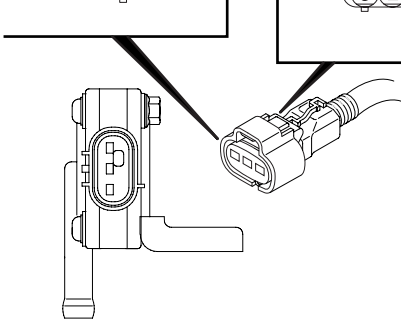
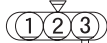
GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

When measured from connection side of connector



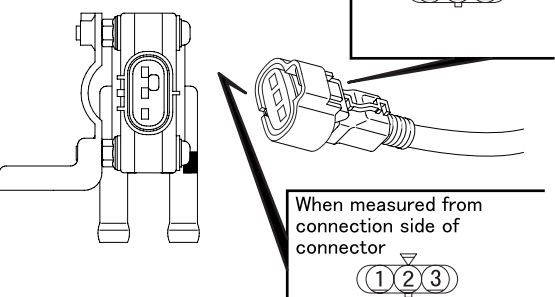
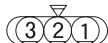
When measured from connection side of connector



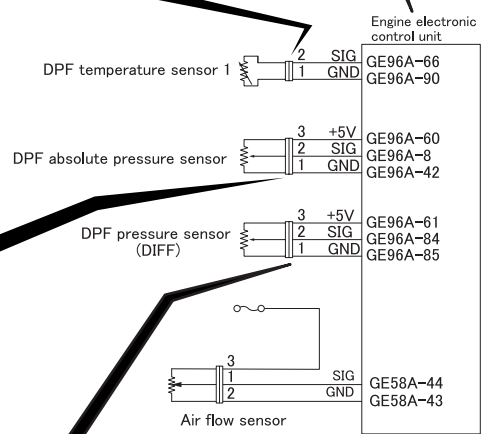
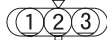
When measured from back side of connector



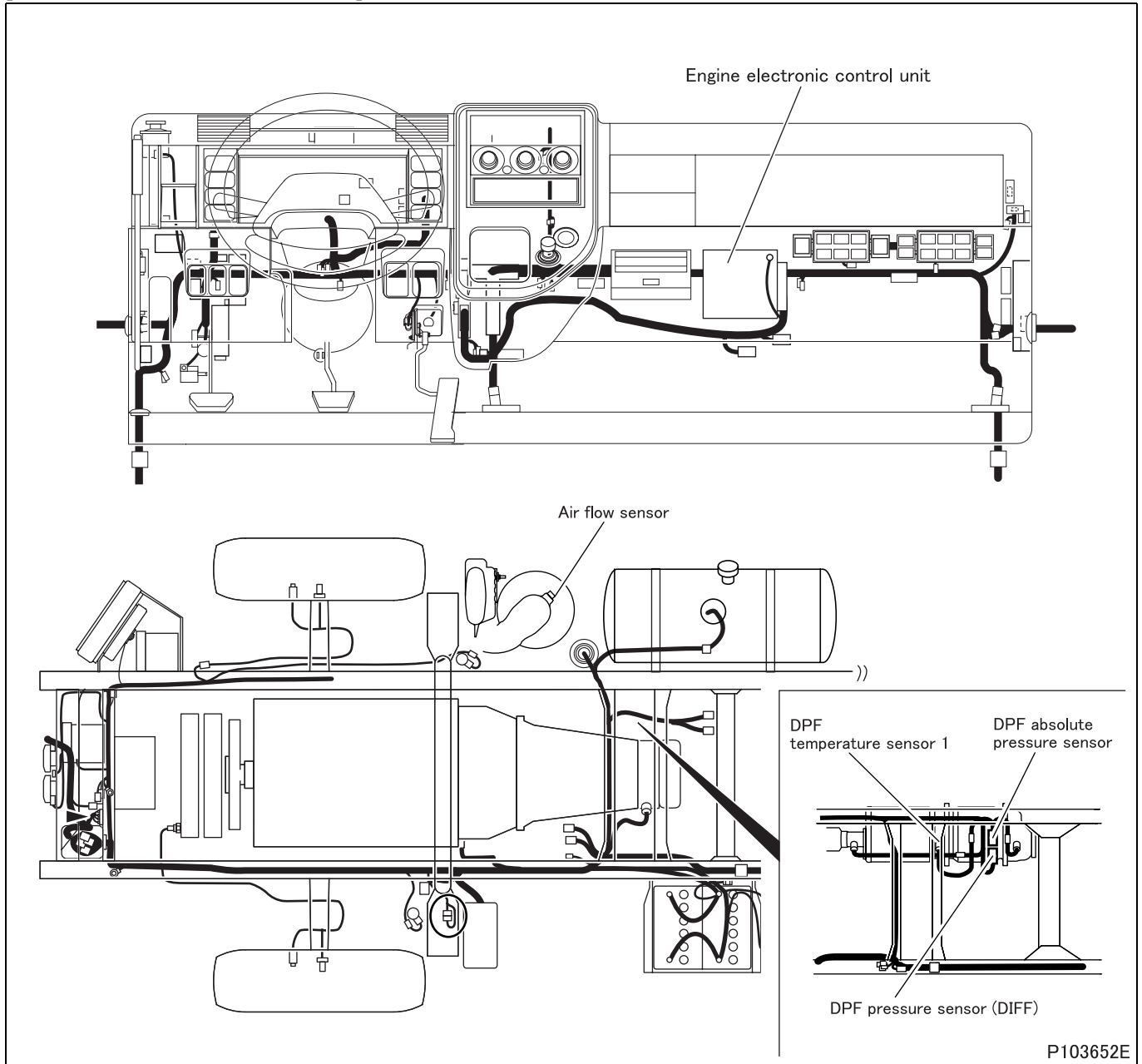
When measured from back side of connector



When measured from connection side of connector



[Parts Identification and Location]



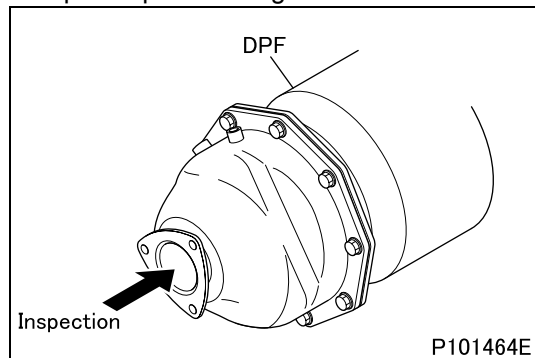
# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |   |  |
|--------|--|---|--|
| Step 1 | Inspection items                                       |   | Unit inspection of diesel particulate filter   |
|        | Maintenance item                                       |   | Check the exhaust passage inside the diesel particulate filter for adhesion of soot in large quantity. |
|        | Inspection condition                                   |   | Remove diesel particulate filter.  |
|        | Requirements   |   | No soot is deposited.  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 2.  |
| NO     |  | After replacement of ceramic filter, perform resetting the DPF-related information. |  |

<Step 1 inspection diagram>



|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit  |
|        | Maintenance item                                       |               | See Gr15 "Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit"   |
|        | Inspection condition                                   |               | <p>Perform the following preparatory works.</p> <ul style="list-style-type: none"> <li>• Place the transmission in neutral. (place the automatic transmission in P range)</li> <li>• Turn the steering wheel in neutral position and securely apply the parking brake.</li> <li>• Turn off air conditioner not to increase the engine speed.</li> <li>• Check diagnosis code of each electronic control system. If any fault exists, rectify it.</li> <li>• Resetting the DPF-related information (perform "History reset" of Multi-Use Tester) (See Gr15 "Resetting the DPF-related information".)</li> <li>• Warm up the engine until the engine coolant has been heated to more than 70°C {158°F}. (verify from Service Data "Engine Coolant Temperature" or "31: Water Temperature")</li> </ul> |
|        | Requirements   |               | This diagnosis code does not occur again.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | End of inspection   |
| NO     |  | Go to step 3. |   |

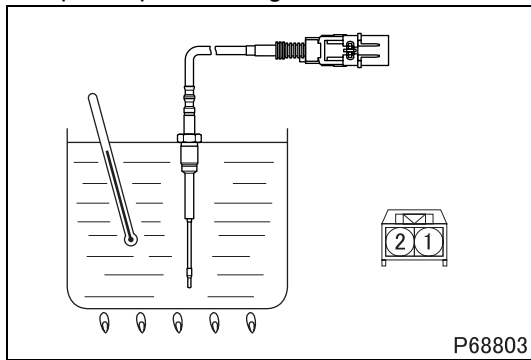
|        |  |   |   |
|--------|--|---|---|
| Step 3 | Inspection items                                       |   | Inspection by control data  |
|        | Maintenance item                                       |   | Measure item No. B8 "DPF Indicator Lamp" of Service Data.                               |
|        | Inspection condition                                   |   | Perform Multi-Use Tester actuator test item No. A6 "DPF Lamp".                          |
|        | Requirements   |   | Diesel particulate filter indicator lamp illuminates (automatic reset after 15 seconds) |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 4.   |
| NO     |  | Replacement of engine electronic control unit |   |

|        |  |  |  |
|--------|--|--|--|
| Step 4 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Measure item No. A4 "DPF SW" of Service Data.  |
|        | Inspection condition                                   |  | —  |
|        | Requirements   |  | Press diesel particulate filter cleaning switch and check that "DPF SW" display switches from OFF to ON. |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 5.  |
| NO     |  | Replacement of diesel particulate filter cleaning switch or engine electronic control unit |  |

|        |  |   |   |
|--------|--|---|---|
| Step 5 | Inspection items                                       |   | Inspection of pressure hose   |
|        | Maintenance item                                       |   | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |
|        | Inspection condition                                   |   | —   |
|        | Requirements   |   | Nothing abnormal detected   |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.   |
| NO     |  | After correction and replacement of hose, go to step 6. |   |

|        |  |                    |   |
|--------|--|--------------------|---|
| Step 6 | Inspection items                                       |                    | Inspection of DPF temperature sensor 1 unit   |
|        | Maintenance item                                       |                    | Measure value of resistance between connector terminal No. 1 and 2.   |
|        | Inspection condition                                   |                    | <ul style="list-style-type: none"> <li>Put DPF temperature sensor 1 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |
|        | Requirements   |                    | <ul style="list-style-type: none"> <li>20°C {68°F} : 241.8 kΩ</li> <li>50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>100°C {212°F} : 33.56<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                | Go to step 7.   |
| NO     |  | Cleaning of sensor |   |

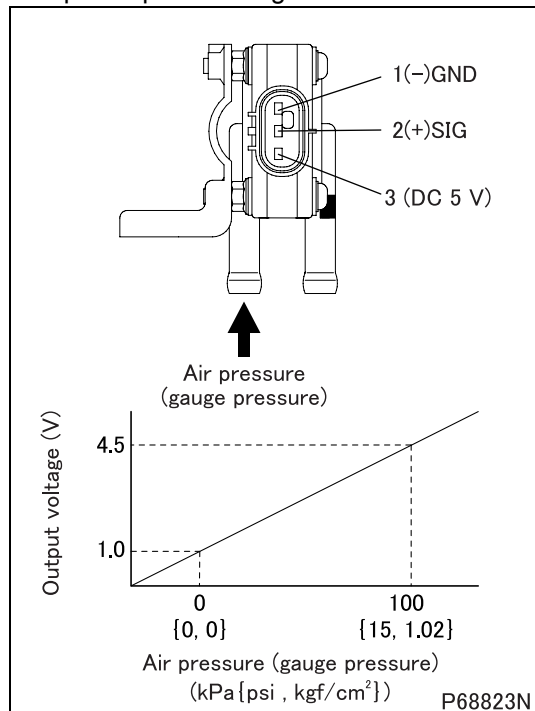
<Step 6 inspection diagram>



# TROUBLESHOOTING

|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 7 | Inspection items                                       |  | Inspection of DPF pressure sensor (DIFF)   |     |               |    |
|        | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 2 (+) and 1 (-).   |     |               |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across terminals No. 3 (+) and 1 (-).</li> <li>Gradually increase applied air pressure.</li> </ul>   |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li><math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>}: 1 V</li> <li><math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 8.</td> </tr> <tr> <td>NO</td> <td>Replacement of DPF pressure sensor (DIFF)</td> </tr> </table>   | YES | Go to step 8. | NO |
| YES    | Go to step 8.  |  |  |     |               |    |
| NO     | Replacement of DPF pressure sensor (DIFF)              |  |  |     |               |    |

<Step 7 inspection diagram>



|        |  |   |               |
|--------|--|---|---------------|
| Step 8 | Inspection items                                       | Inspection of air flow sensor unit  |               |
|        | Maintenance item                                       | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among “Service data”.</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: “Ne” (rpm)</li> <li>• Intake air flow rate: “Air Flow Rate from MAFS” (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 “Engine Revolution” (rpm)</li> <li>• Intake air flow rate: 60 “Air mass flow” (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”.</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | 10% or less   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 9. |
|        | NO   | Replacement of air flow sensor  |               |

|        |  |  |  |
|--------|--|--|--|
| Step 9 | Inspection items                                       | Inspection by control data                           |  |
|        | Maintenance item                                       | Perform actuator test item No. B2 “Fuel Leak Check”. |  |
|        | Inspection condition                                   | Engine start: At idle                                |  |
|        | Requirements   | There is no leak from injectors (four).              |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | <ul style="list-style-type: none"> <li>• Inspection of exhaust gas recirculation system (exhaust gas recirculation pipe, exhaust gas recirculation cooler, exhaust gas recirculation valve)</li> <li>• Inspection of engine</li> </ul> |
|        | NO   | Replacement of injector                              |  |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P1430/Flash code: 78

## **[Monitor]**

Failure of diesel particulate filter cleaning switch

## **[Fault (outline)]**

Plausibility

## **[Diagnosis check]**

- Working condition of diesel particulate filter cleaning switch during manual diesel particulate filter regeneration is monitored.

## **[Code generation condition]**

- Output signal remains ON for 60 seconds after diesel particulate filter cleaning switch turned ON for manual filter regeneration is turned OFF.

(Diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Effects no special control.

## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and switch
- Malfunction of each connector
- Malfunction of switch
- Malfunction of engine electronic control unit

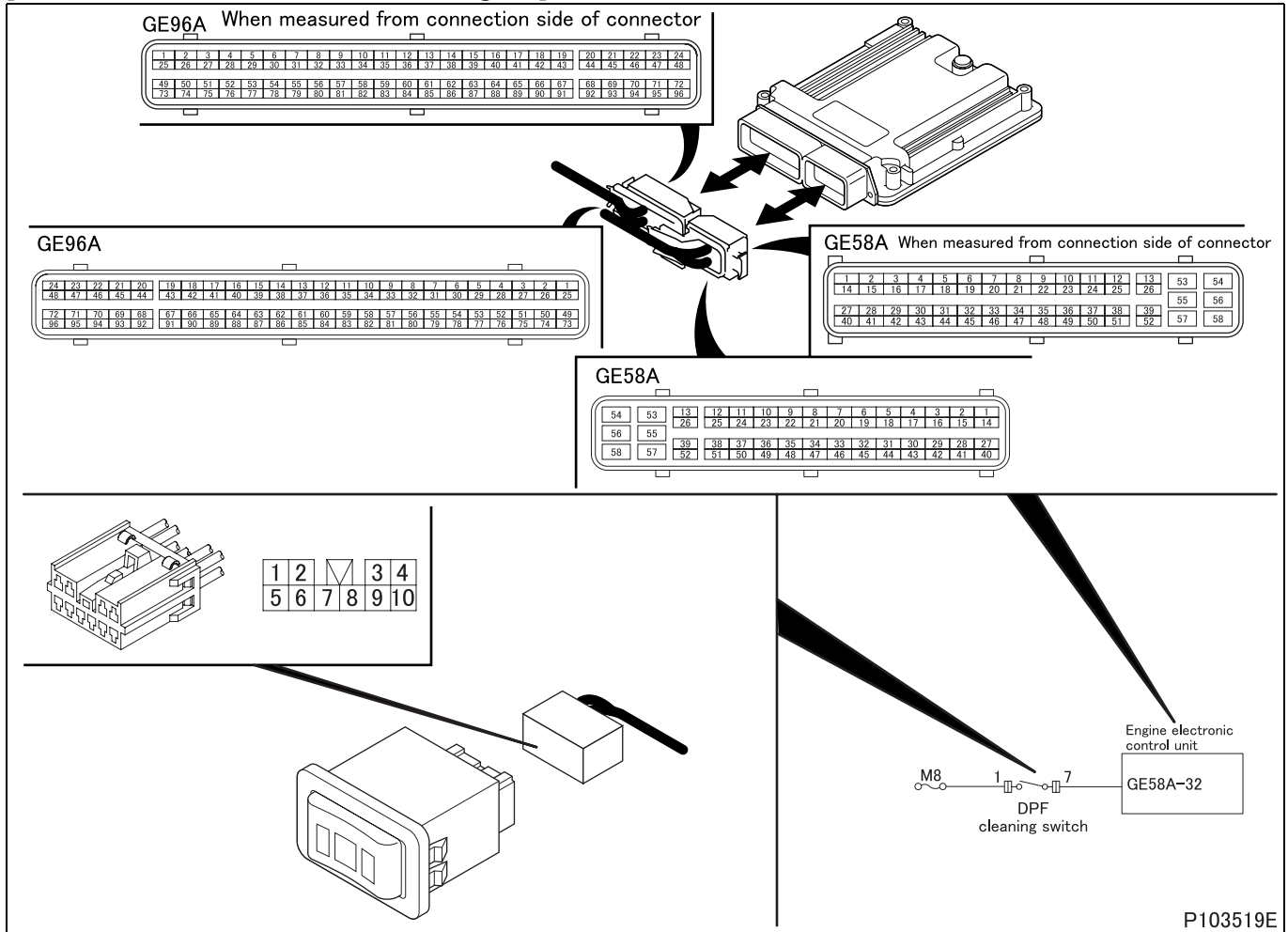
## **[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.

(Warning lamp and diagnosis code is cleared simultaneously with recovery.)



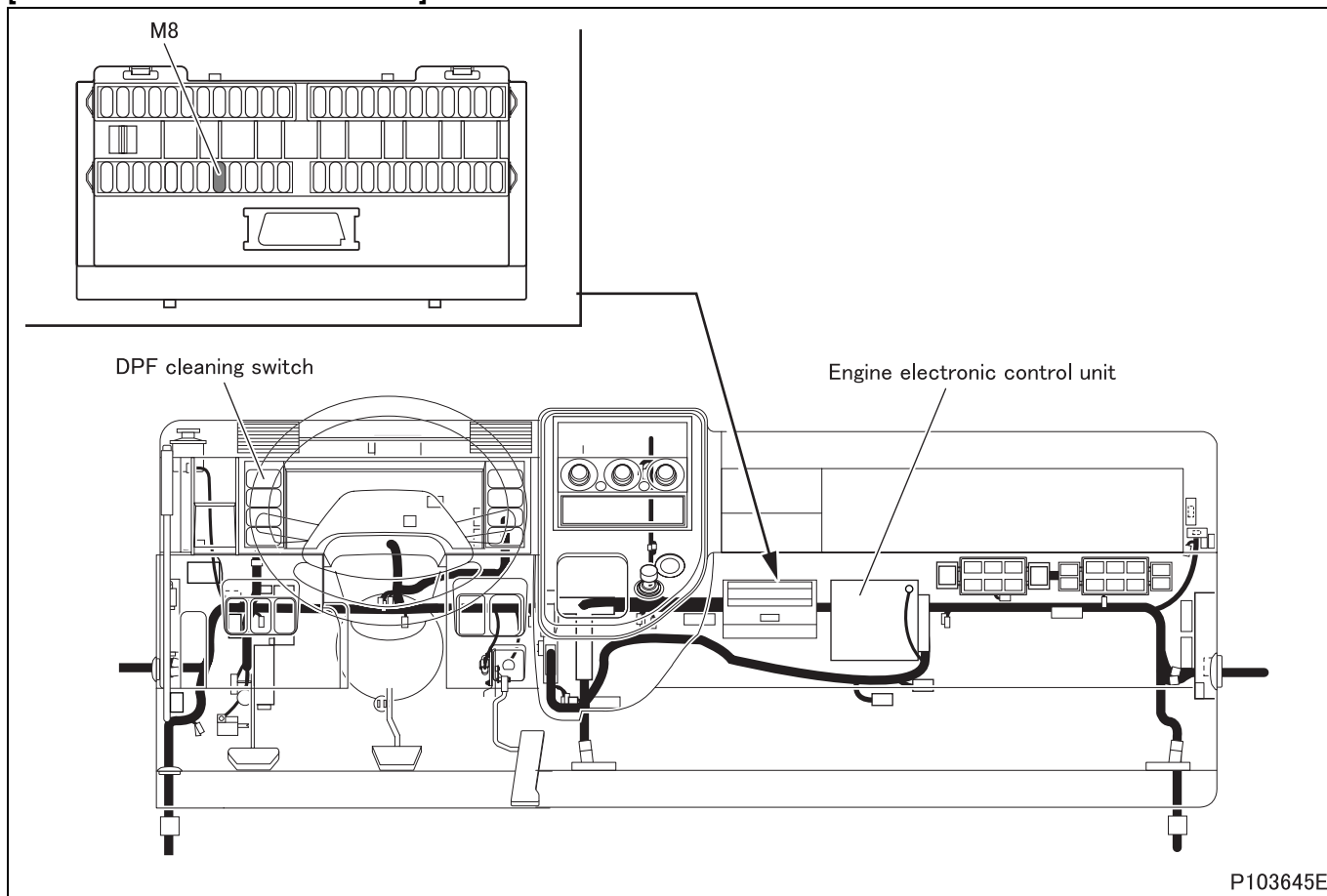
## [Electronic Control Unit Connection Diagram]



P103519E

# TROUBLESHOOTING

## [Parts Identification and Location]



P103645E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

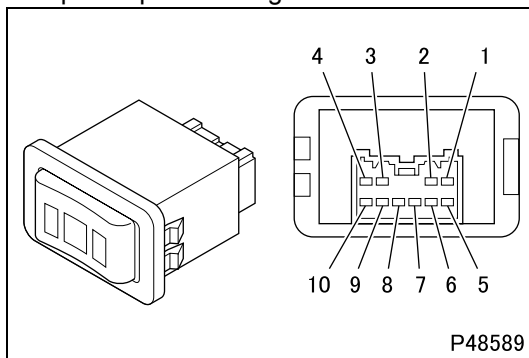
|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Measure item No. A4 "DPF SW" of Service Data.  |
|        | Inspection condition                                   |  | —  |
|        | Requirements   |  | Press diesel particulate filter cleaning switch and check that "DPF SW" display switches from OFF to ON. |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of diesel particulate filter cleaning switch connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of diesel particulate filter cleaning switch unit  |
|        | Maintenance item                                       |  | <ul style="list-style-type: none"> <li>• Switch: Check continuity between connector terminal No. 1 and 8.</li> <li>• Switch ON: Check continuity between connector terminal No. 1 and 7.</li> </ul> |
|        | Inspection condition                                   |  | Disconnect connector and measure switch side.   |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

<Step 4 inspection diagram>



# TROUBLESHOOTING

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 5 | Inspection items                                       |                 | Inspection of harness between electronic control unit and diesel particulate filter cleaning switch   |
|        | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE58A) terminal No. 32 and diesel particulate filter cleaning switch connector terminal No. 7. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.   |
| NO     |  | Modify harness. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 6 | Inspection items                                       |                 | Inspection of harness between fuse and diesel particulate filter cleaning switch                      |
|        | Maintenance item                                       |                 | Check circuit between fuse M8 and diesel particulate filter cleaning switch connector terminal No. 1. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.            |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.   |
| NO     |  | Modify harness. |   |

|        |  |  |  |
|--------|--|--|--|
| Step 7 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Measure item No. A4 "DPF SW" of Service Data.  |
|        | Inspection condition                                   |  | –  |
|        | Requirements   |  | Press diesel particulate filter cleaning switch and check that "DPF SW" display switches from OFF to ON. |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO     |  | Replacement of electronic control unit |  |

**[Fault code]**

Diagnosis code: P1435/Flash code: 92

**[Monitor]**

Diesel particulate filter broken

**[Fault (outline)]**

Efficiency below threshold (blocked diesel particulate filter)

**[Diagnosis check]**

- Ceramic filter is monitored for clogging through DPF pressure sensor (DIFF) during operation of diesel particulate filter regeneration function.

**[Code generation condition]**

- Difference between actual diesel particulate filter pressure and maximum pressure calculated by electronic control unit remains out of control map for 10 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine operating mode: normal (engine in operation)
- Pressure adjustment in DPF pressure sensor (DIFF):  
Has been carried out this drive cycle ; for drift correction, the following conditions exist for >5s :
  - Engine speed: less than 875 rpm
  - Fuel injection quantity: below 25 mg/cyc
  - Exhaust flow rate: less than 90 m<sup>3</sup>/h
  - Exhaust gas recirculation valve position: more than 8 mm {0.3 in.}
- Exhaust volume-flow rate: 500 to 900 m<sup>3</sup>/h
- Diesel particulate filter inlet temperature: 200 to 400°C {392 to 752°F}
- Water temperature: 65 to 110°C {149 to 230°F}
- Atmospheric pressure: more than 750 mbar {10.87 psi}
- Approximate environment atmospheric temperature: -7 to 50°C {19 to 122°F}
- Frequency of diesel particulate filter regeneration control: less than 3 times (discontinued after start of diesel particulate filter regeneration control)
- Soot deposit: 15 to 30 g {0.53 to 1.06 oz}
- Diesel particulate filter regeneration control: not effected
- Controller area network communication of exhaust gas recirculation electronic drive unit: in order
- DPF pressure sensor (DIFF): in order
- Air flow sensor: in order
- Atmospheric pressure sensor: in order
- Water temperature sensor: in order
- Intake air temperature sensor: in order
- Catalytic temperature sensor: in order
- DPF temperature sensor 1: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order

# TROUBLESHOOTING

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## **[Control effected by electronic control unit during fault]**

Electronic control unit differs in the way of control by the engine model.

<Except FE83>

- Engine torque is limited.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

<FE83>

- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

## **[Probable cause of trouble]**

- Damage of ceramic filter
- Failure of diesel particulate filter indicator lamp
- Failure of diesel particulate filter cleaning switch
- Manual diesel particulate filter regeneration is not performed.
- Excessive smoke emission (due to malfunction of engine proper, common rail or exhaust gas recirculation system)
- Malfunction of air flow sensor
- Malfunction of DPF absolute pressure sensor or DPF pressure sensor (DIFF)

## **[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |

GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

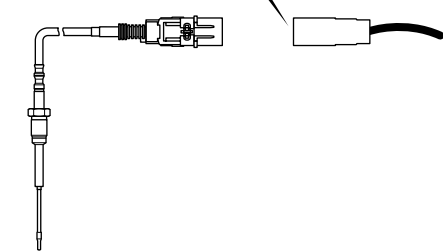
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

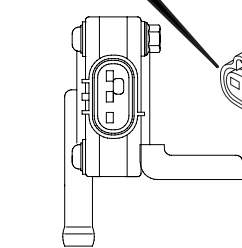
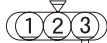
GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

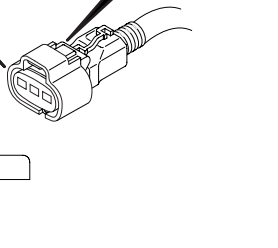
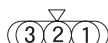
When measured from connection side of connector



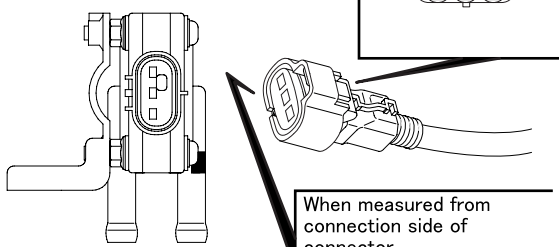
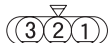
When measured from connection side of connector



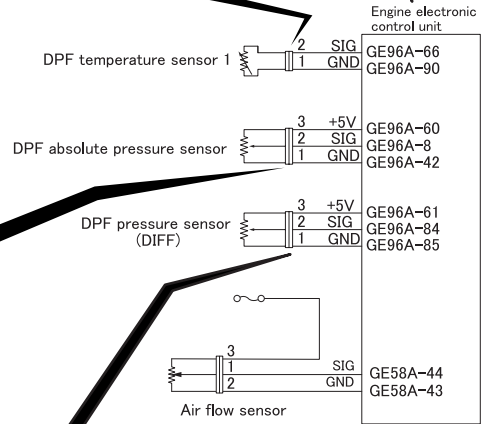
When measured from back side of connector



When measured from back side of connector

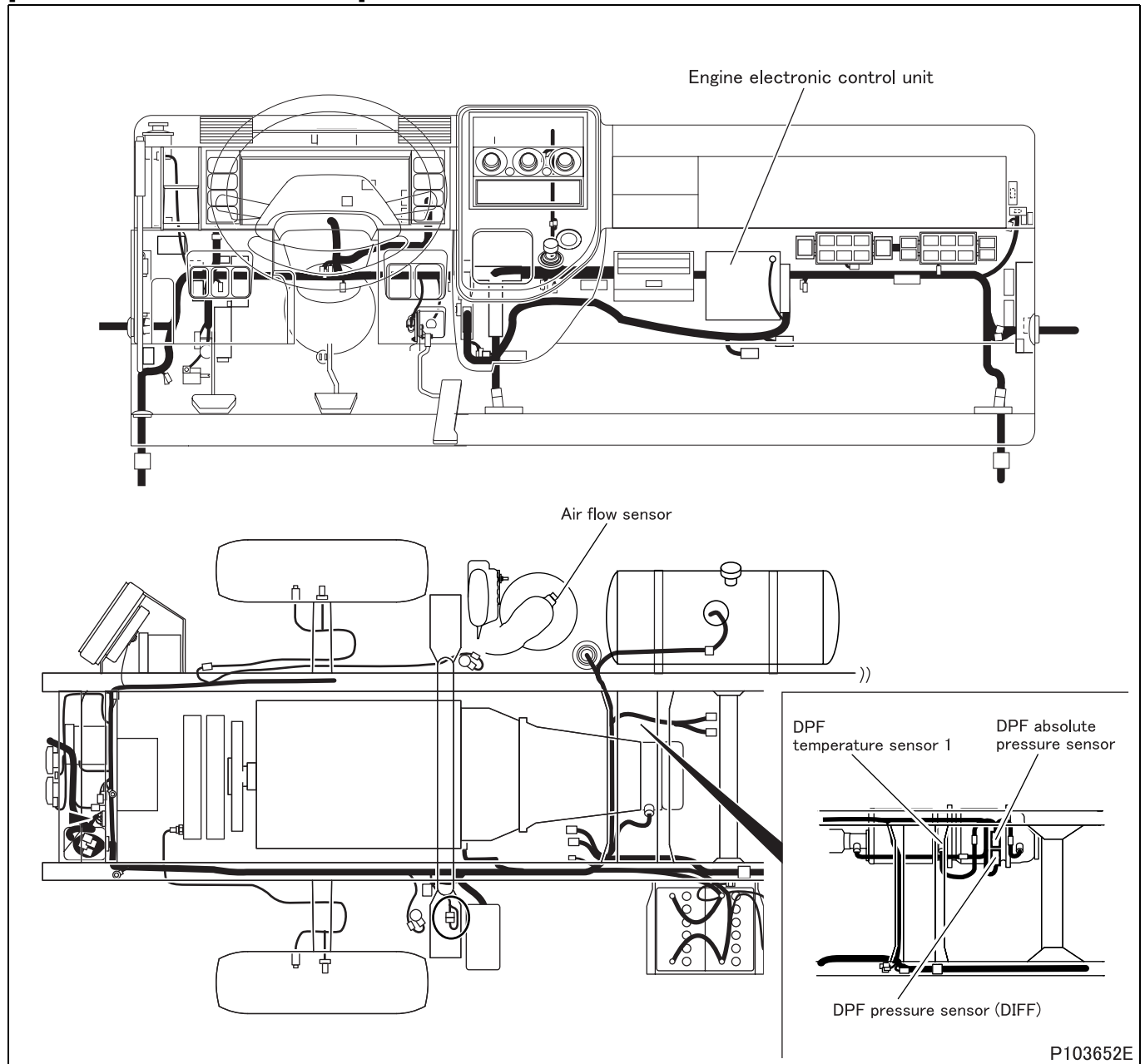


When measured from connection side of connector



# TROUBLESHOOTING

## [Parts Identification and Location]



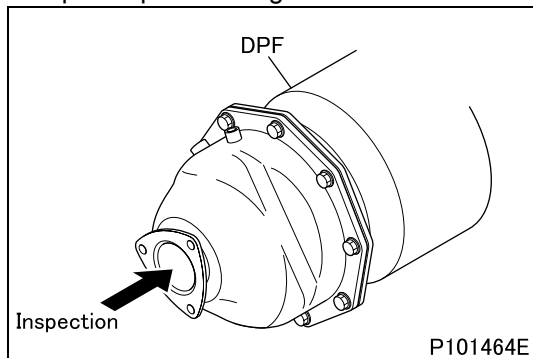


[Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Unit inspection of diesel particulate filter  |
|        | Maintenance item                                       |  | Check the exhaust passage inside the diesel particulate filter for adhesion of soot in large quantity.            |
|        | Inspection condition                                   |  | Remove diesel particulate filter.   |
|        | Requirements   |  | No soot is deposited.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 2.<br>NO<br>After replacement of ceramic filter, perform resetting the DPF-related information. |

<Step 1 inspection diagram>



|        |  |  |  |
|--------|--|--|--|
| Step 2 | Inspection items                                       |  | Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit   |
|        | Maintenance item                                       |  | See Gr15 "Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit"  |
|        | Inspection condition                                   |  | Perform the following preparatory works. <ul style="list-style-type: none"> <li>• Place the transmission in neutral. (place the automatic transmission in P range)</li> <li>• Turn the steering wheel in neutral position and securely apply the parking brake.</li> <li>• Turn off air conditioner not to increase the engine speed.</li> <li>• Check diagnosis code of each electronic control system. If any fault exists, rectify it.</li> <li>• Resetting the DPF-related information (perform "History reset" of Multi-Use Tester) (See Gr15 "Resetting the DPF-related information".)</li> <li>• Warm up the engine until the engine coolant has been heated to more than 70°C {158°F}. (verify from Service Data "Engine Coolant Temperature" or "31: Water Temperature")</li> </ul> |
|        | Requirements   |  | This diagnosis code does not occur again.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>End of inspection<br>NO<br>Go to step 3.  |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Measure item No. B8 "DPF Indicator Lamp" of Service Data.                               |
|        | Inspection condition                                   |  | Perform Multi-Use Tester actuator test item No. A6 "DPF Lamp".                          |
|        | Requirements   |  | Diesel particulate filter indicator lamp illuminates (automatic reset after 15 seconds) |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 4.<br>NO<br>Replacement of engine electronic control unit             |

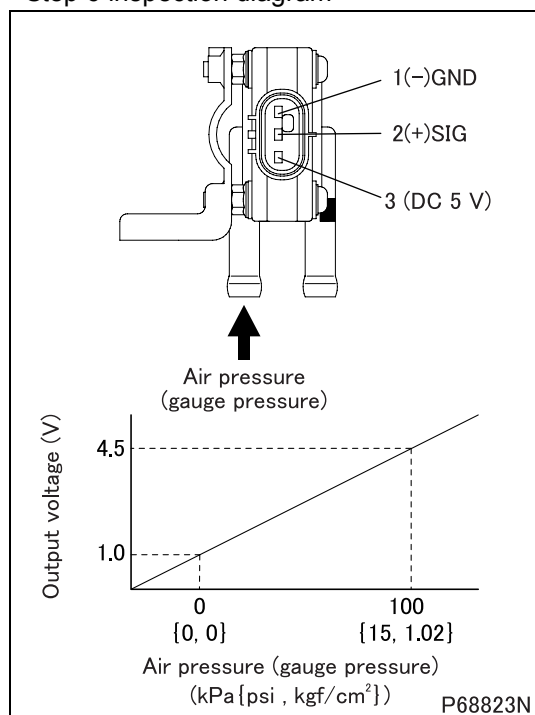
# TROUBLESHOOTING

|        |  |  |  |
|--------|--|--|--|
| Step 4 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Measure item No. A4 "DPF SW" of Service Data.  |
|        | Inspection condition                                   |  | –  |
|        | Requirements   |  | Press diesel particulate filter cleaning switch and check that "DPF SW" display switches from OFF to ON. |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 5.  |
| NO     |  | Replacement of diesel particulate filter cleaning switch or engine electronic control unit |  |

|        |  |   |   |
|--------|--|---|---|
| Step 5 | Inspection items                                       |   | Inspection of pressure hose   |
|        | Maintenance item                                       |   | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |
|        | Inspection condition                                   |   | –   |
|        | Requirements   |   | Nothing abnormal detected   |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6.   |
| NO     |  | After correction and replacement of hose, go to step 6. |   |

|        |  |   |  |
|--------|--|---|--|
| Step 6 | Inspection items                                       |   | Inspection of DPF pressure sensor (DIFF)   |
|        | Maintenance item                                       |   | Measure value of voltage between connector terminal No. 2 (+) and 1 (–).   |
|        | Inspection condition                                   |   | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–).</li> <li>Gradually increase applied air pressure.</li> </ul>   |
|        | Requirements   |   | <ul style="list-style-type: none"> <li><math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>}: 1 V</li> <li><math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 7.  |
| NO     |  | Replacement of DPF pressure sensor (DIFF) |  |

<Step 6 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 7 | Inspection items                                       |  | Inspection of air flow sensor unit  |
|        | Maintenance item                                       |  | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among “Service data”.</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: “Ne” (rpm)</li> <li>• Intake air flow rate: “Air Flow Rate from MAFS” (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 “Engine Revolution” (rpm)</li> <li>• Intake air flow rate: 60 “Air mass flow” (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”.</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | 10% or less   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Go to step 8.</p> <p>NO Replacement of air flow sensor</p>   |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform actuator test item No. B2 “Fuel Leak Check”.  |
|        | Inspection condition                                   |  | Engine start: At idle   |
|        | Requirements   |  | There is no leak from injectors (four).   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES</p> <ul style="list-style-type: none"> <li>• Inspection of exhaust gas recirculation system (exhaust gas recirculation pipe, exhaust gas recirculation cooler, exhaust gas recirculation valve)</li> <li>• Inspection of engine</li> </ul> <p>NO Replacement of injector</p> |

# TROUBLESHOOTING

## [Fault code]

Diagnosis code: P1440/Flash code: 92

## [Monitor]

For counter recording of diagnosis code P1412, P1413, P1414

## [Fault (outline)]

Plausibility

## [Diagnosis check]

- Exhaust gas temperature during automatic diesel particulate filter regeneration is monitored through DPF temperature sensor 1 for abnormality arising from transient diesel particulate filter temperature control failure or very slow vehicle run.

## [Code generation condition]

- Insufficient temperature rise occurred during automatic filter regeneration.  
(Diagnosis code is displayed on first establishment of code generation condition.)

## [Diagnosis check timing]

- Fault diagnosis is performed only once during the driving cycle.

## [Diagnostic requirement]

—

## [Control effected by electronic control unit during fault]

- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).

## [Probable cause of trouble]

- Diesel particulate filter temperature control failure (caused by transient fault)
- If automatic regeneration is difficult due to long-time idling or very slow vehicle run.

## [Recoverability]

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp and diagnosis code is cleared simultaneously with recovery.)

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>P1412 "DPF Temp Abnormal1 (Auto)(Low)"</li> <li>P1413 "DPF Temp Abnormal2 (Auto)(Low)"</li> <li>P1414 "DPF Temp Abnormal3 (Auto)(High)"</li> </ul> |
|        | Inspection condition                                   |  | Ensure that each sensor mounting condition is free of abnormalities.   |
|        | Requirements   |  | Codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Inspect diagnosis code that is occurring.  |
| NO     |  | Replacement of electronic control unit |  |

**[Fault code]**

Diagnosis code: P1441/Flash code: 92

**[Monitor]**

For counter recording of diagnosis code P1416, P1417, P1418

**[Fault (outline)]**

High signal range check

**[Diagnosis check]**

- Temperature in diesel particulate filter during manual diesel particular filter regeneration is monitored through DPF temperature sensor 1.

**[Code generation condition]**

- Insufficient temperature rise occurred during manual filter regeneration.  
(Diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

–

**[Control effected by electronic control unit during fault]**

- Diesel particulate filter regeneration is stopped.

**[Probable cause of trouble]**

- Diesel particulate filter temperature control failure (caused by transient fault)

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp and diagnosis code is cleared simultaneously with recovery.)

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously.<br><ul style="list-style-type: none"> <li>• P1416 "DPF Temp Abnormal1 (Auto)(Low)"</li> <li>• P1417 "DPF Temp Abnormal2 (Auto)(Low)"</li> <li>• P1418 "DPF Temp Abnormal3 (Auto)(High)"</li> </ul> |
|        | Inspection condition                                   |  | Ensure that each sensor mounting condition is free of abnormalities.  |
|        | Requirements   |  | Codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Inspect diagnosis code that is occurring.   |
| NO     |  | Replacement of electronic control unit |   |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P1632/Flash code: 73

## **[Monitor]**

Abnormality in controller area network 2 communication

## **[Fault (outline)]**

Message timeout

## **[Diagnosis check]**

- Controller area network communication between engine electronic control unit and exhaust gas recirculation electronic drive unit is monitored for abnormality.

## **[Code generation condition]**

- Engine electronic control unit fails to receive controller area network signal concerning throttle control from exhaust gas recirculation electronic drive unit within specified time (controller area network bus OFF).  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

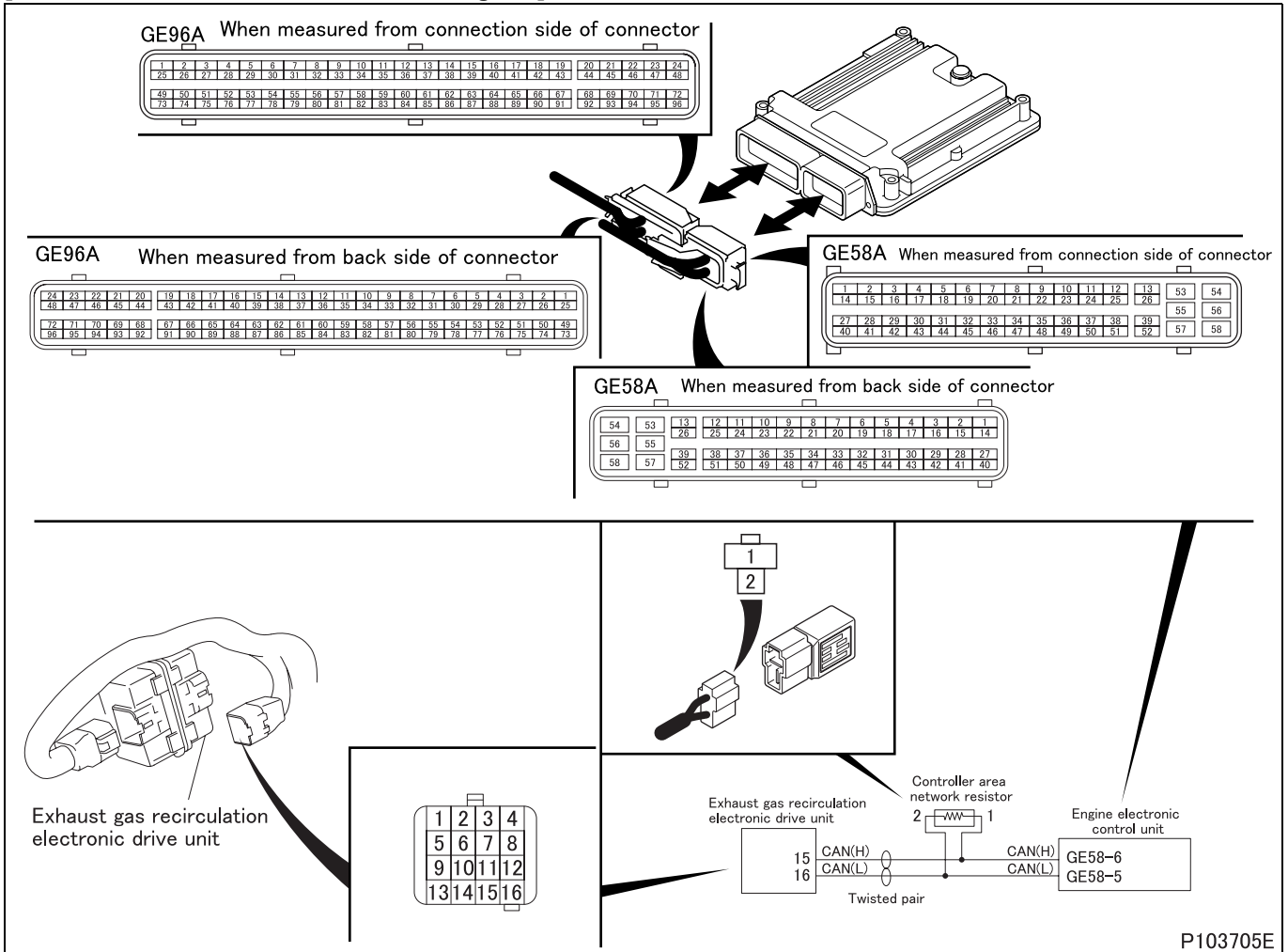
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between engine electronic control unit and exhaust gas recirculation electronic drive unit
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of exhaust gas recirculation electronic drive unit
- Malfunction of controller area network resistor

## **[Recoverability]**

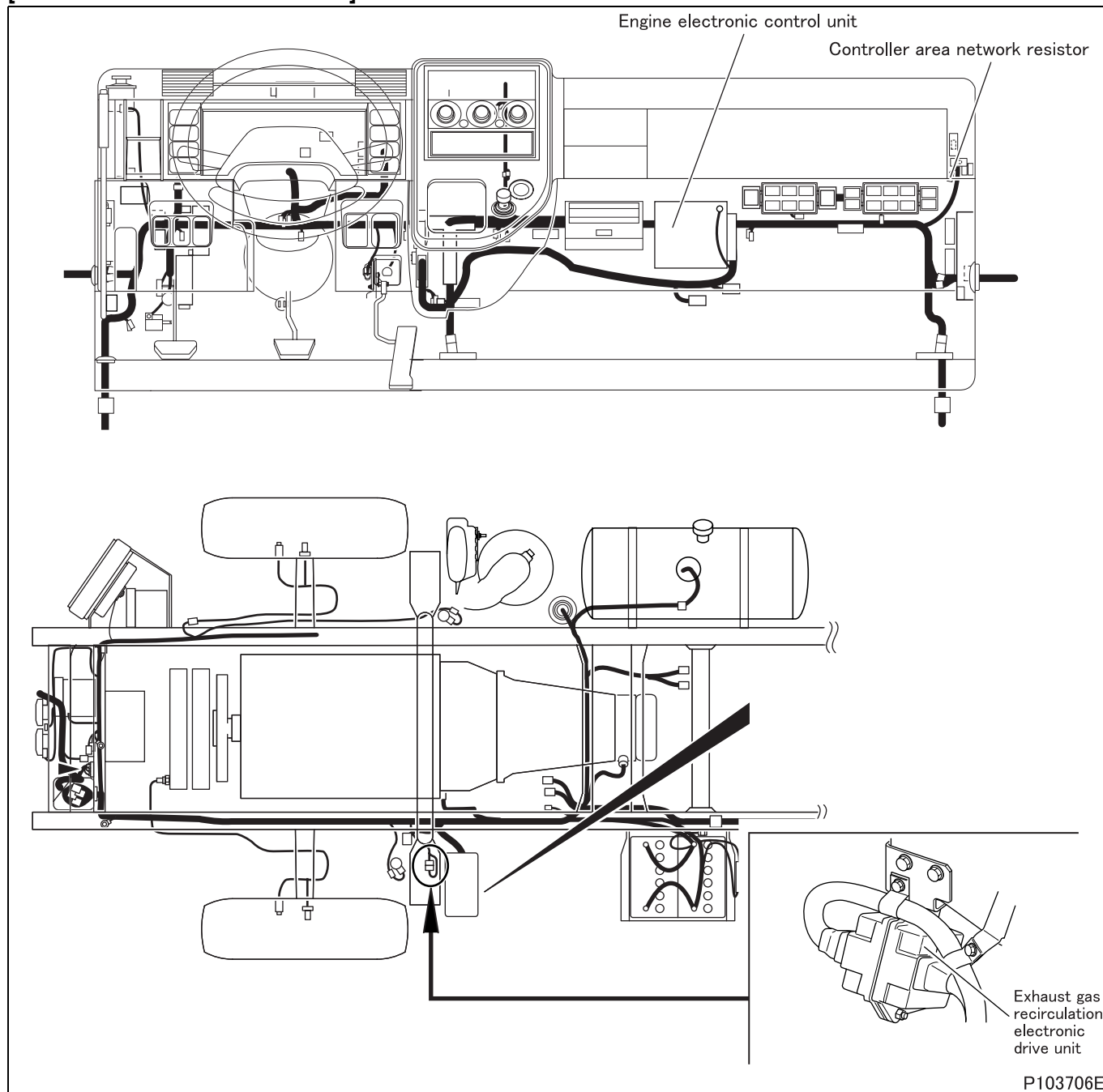
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]





[Fault diagnosis]

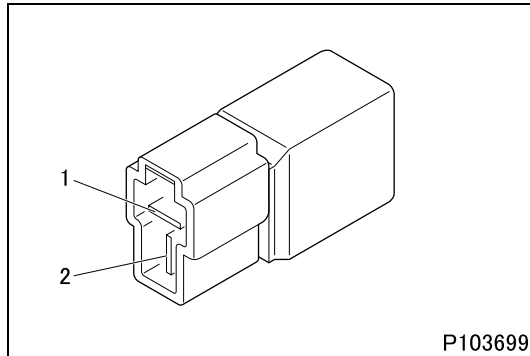
- Perform checks in the sequence of the following steps.

|        |  |  |               |
|--------|--|--|---------------|
| Step 1 | Inspection items                                       | Inspection by engine electronic control unit connector   |               |
|        | Maintenance item                                       | Measure value of resistance between engine electronic control unit connector (GE58A) terminal No. 5 and 6. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                 |               |
|        | Requirements   | 120 ± 6 Ω  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7. |
| NO     |  | Go to step 2.  |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 2 | Inspection items                                       | Inspection of controller area network resistor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 3. |
| NO     |  | Modify connector.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 3 | Inspection items                                       | Inspection of controller area network resistor unit                 |               |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and 2. |               |
|        | Inspection condition                                   | Disconnect connector and measure resistor side.                     |               |
|        | Requirements   | 120 ± 6 Ω   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 4. |
| NO     |  | Replacement of controller area network resistor                     |               |

<Step 3 inspection diagram>



|        |  |   |               |
|--------|--|---|---------------|
| Step 4 | Inspection items                                       | Inspection of harness between engine electronic control unit and controller area network resistor (HIGH)  |               |
|        | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 1 and engine electronic control unit connector (GE58A) terminal No. 6 |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |               |
|        | Requirements   | There is continuity.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5. |
| NO     |  | Modify harness.   |               |

# TROUBLESHOOTING

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 5 | Inspection items                                       |                 | Inspection of harness between engine electronic control unit and controller area network resistor (LOW)   |
|        | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 2 and engine electronic control unit connector (GE58A) terminal No. 5 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.   |
| NO     |  | Modify harness. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of engine electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 10.  |
| NO     |  | Modify connector. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 7 | Inspection items                                       |                 | Inspection of harness between engine electronic control unit and controller area network resistor (HIGH)                            |
|        | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 1 and electronic drive unit connector terminal No. 15 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.   |
| NO     |  | Modify harness. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 8 | Inspection items                                       |                 | Inspection of harness between engine electronic drive unit and controller area network resistor (LOW)                               |
|        | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 2 and electronic drive unit connector terminal No. 16 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 9.   |
| NO     |  | Modify harness. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 9 | Inspection items                                       |                   | Inspection of electronic drive unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replace the engine electronic control unit as well if this diagnosis code occurs after the replacement of electronic drive unit.  |
| NO     |  | Modify connector. |   |

**[Fault code]**

Diagnosis code: P1635/Flash code: 74

**[Monitor]**

Abnormality in controller area network 2 communication

**[Fault (outline)]**

Message timeout

**[Diagnosis check]**

- Controller area network communication between engine electronic control unit and throttle electronic drive unit is monitored for abnormality.

**[Code generation condition]**

- Engine electronic control unit fails to receive controller area network signal concerning throttle control from throttle electronic drive unit within specified time (controller area network bus OFF).  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Particulate matter deposit computation is stopped.
- Intake throttle actuator test is inhibited.
- Related fault check is stopped.

**[Probable cause of trouble]**

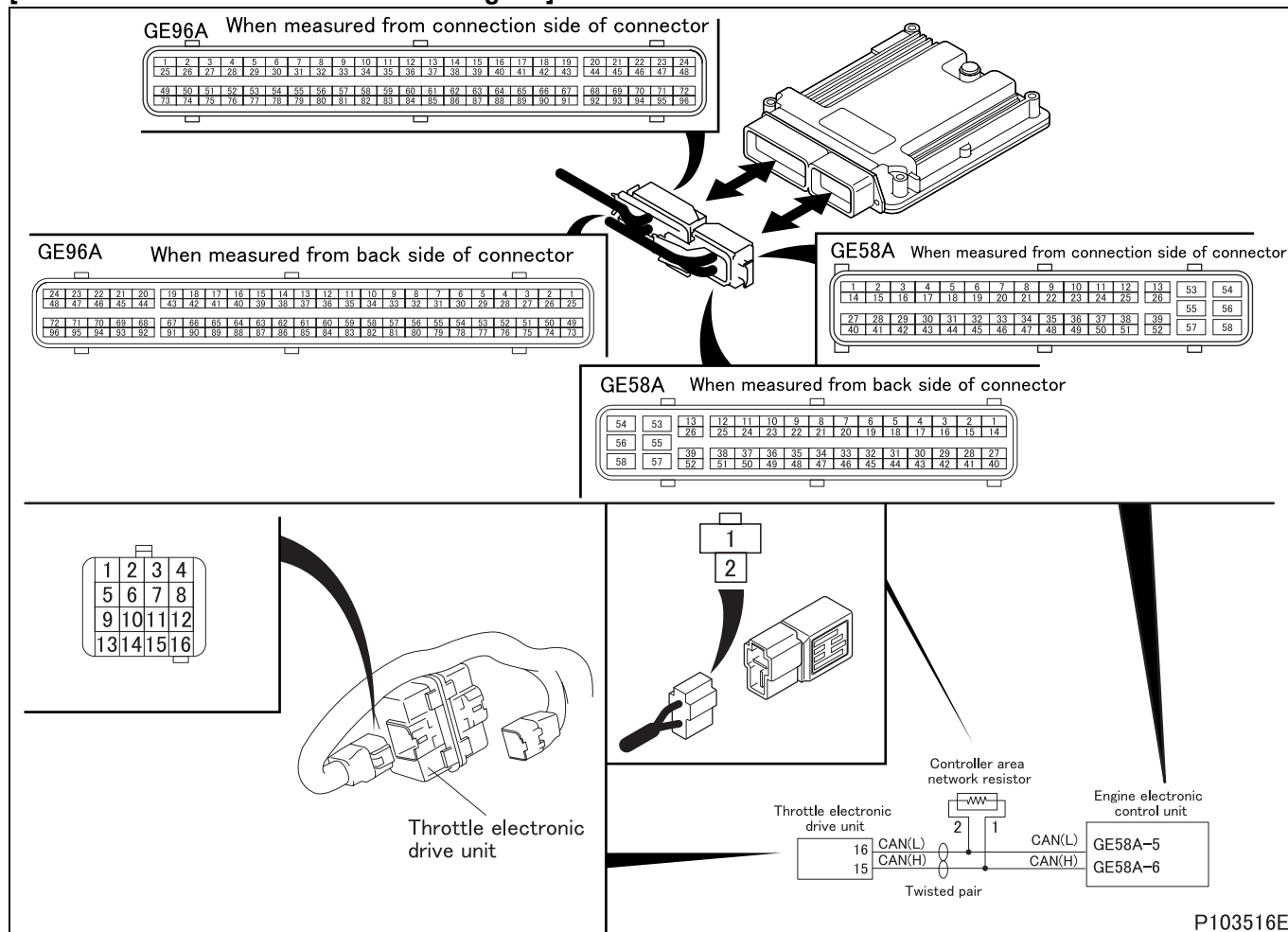
- Open-circuit or short-circuit of harness between engine electronic control unit and throttle electronic drive unit
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of throttle electronic drive unit
- Malfunction of controller area network resistor

**[Recoverability]**

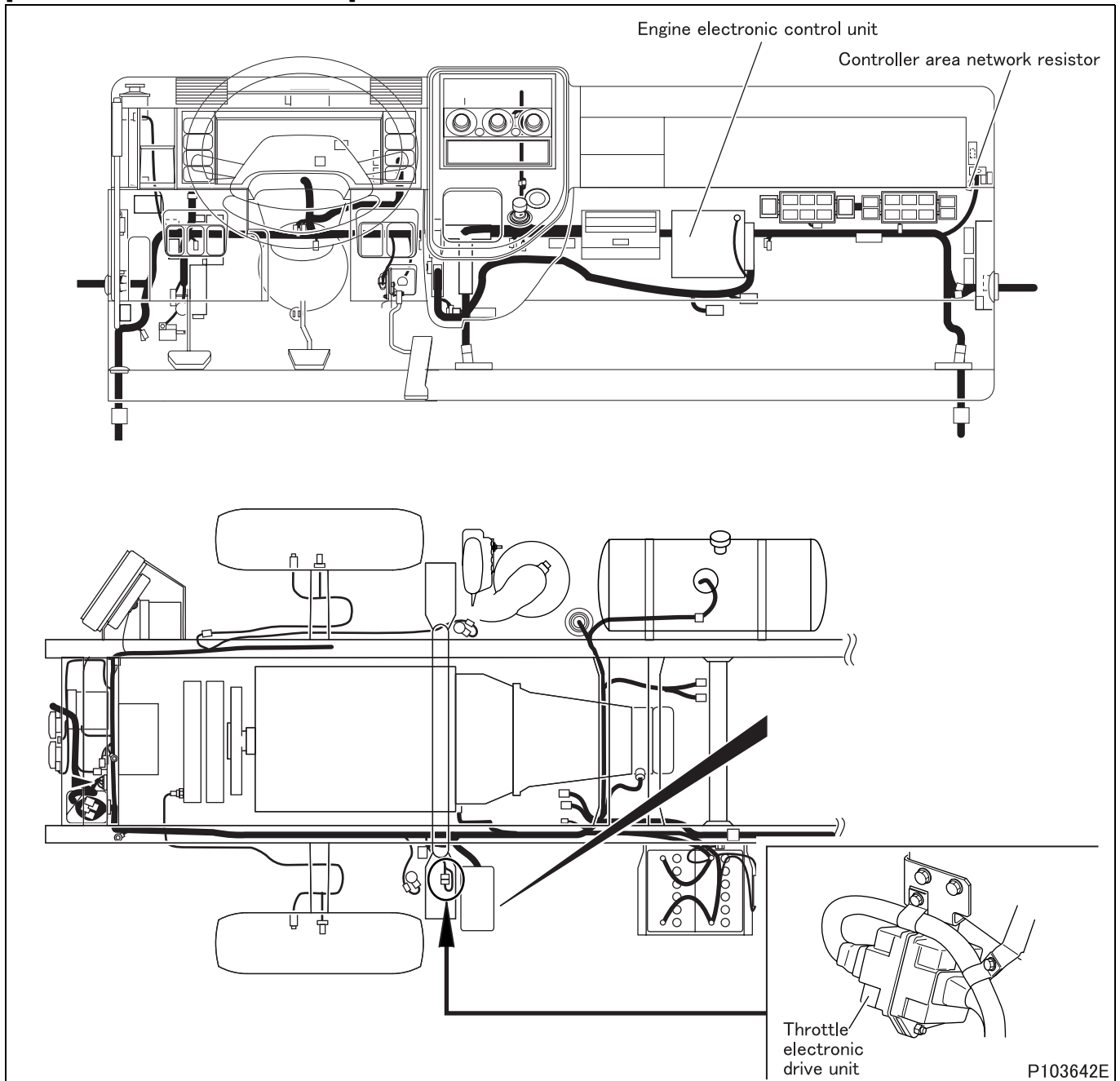
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

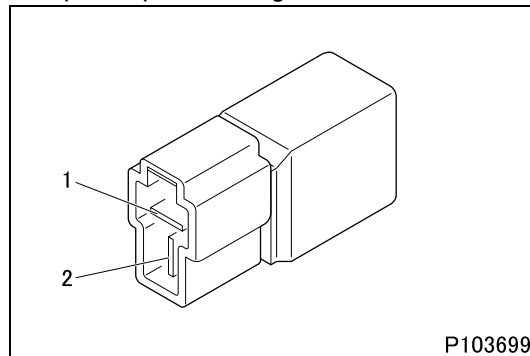
- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by engine electronic control unit connector   |
|        | Maintenance item                                       |  | Measure value of resistance between engine electronic control unit connector (GE58A) terminal No. 5 and 6. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                 |
|        | Requirements   |  | 120 ± 6 Ω  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 7.<br>NO Go to step 2.  |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of controller area network resistor connector  |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 3.<br>NO Modify connector.   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of controller area network resistor unit                     |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2.     |
|        | Inspection condition                                   |  | Disconnect connector and measure resistor side.                         |
|        | Requirements   |  | 120 ± 6 Ω   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 4.<br>NO Replacement of controller area network resistor |

<Step 3 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of harness between engine electronic control unit and controller area network resistor (HIGH)  |
|        | Maintenance item                                       |  | Check circuit between controller area network resistor connector terminal No. 1 and engine electronic control unit connector (GE58A) terminal No. 6 |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 5.<br>NO Modify harness.   |

|        |  |   |               |
|--------|--|---|---------------|
| Step 5 | Inspection items                                       | Inspection of harness between engine electronic control unit and controller area network resistor (LOW)   |               |
|        | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 2 and engine electronic control unit connector (GE58A) terminal No. 5 |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |               |
|        | Requirements   | There is continuity.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6. |
| NO     |  | Modify harness.   |               |

|        |  |   |                |
|--------|--|---|----------------|
| Step 6 | Inspection items                                       | Inspection of engine electronic control unit connector  |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 10. |
| NO     |  | Modify connector.   |                |

|        |  |   |               |
|--------|--|---|---------------|
| Step 7 | Inspection items                                       | Inspection of harness between engine electronic control unit and controller area network resistor (HIGH)                            |               |
|        | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 1 and electronic drive unit connector terminal No. 15 |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |               |
|        | Requirements   | There is continuity.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8. |
| NO     |  | Modify harness.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 8 | Inspection items                                       | Inspection of harness between engine electronic drive unit and controller area network resistor (LOW)                               |               |
|        | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 2 and electronic drive unit connector terminal No. 16 |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |               |
|        | Requirements   | There is continuity.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 9. |
| NO     |  | Modify harness.   |               |

|        |  |   |  |
|--------|--|---|--|
| Step 9 | Inspection items                                       | Inspection of electronic drive unit connector   |  |
|        | Maintenance item                                       | Inspection of connector   |  |
|        | Inspection condition                                   | -   |  |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Replace the engine electronic control unit as well if this diagnosis code occurs after the replacement of electronic drive unit. |
| NO     |  | Modify connector.   |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P1640/Flash code: 75

## **[Monitor]**

Abnormality in controller area network 2 communication

## **[Fault (outline)]**

Time out

## **[Diagnosis check]**

- Controller area network communication between engine electronic control unit and turbocharger electronic drive unit is monitored for abnormality.

## **[Code generation condition]**

- Engine electronic control unit fails to receive controller area network signal concerning turbocharger control from turbocharger electronic drive unit within specified time (controller area network bus OFF).  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

## **[Probable cause of trouble]**

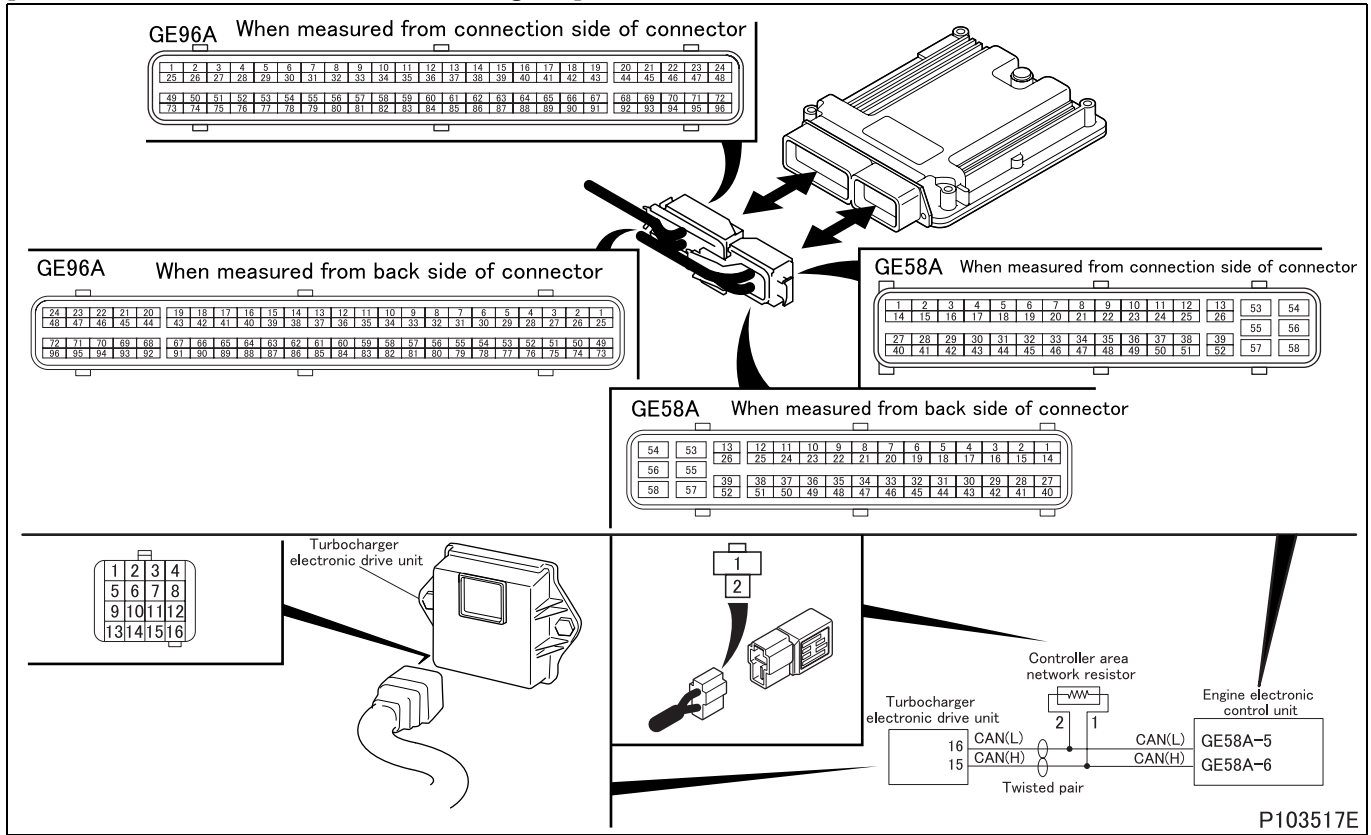
- Open-circuit or short-circuit of harness between engine electronic control unit and turbocharger electronic drive unit
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of turbocharger electronic drive unit
- Malfunction of controller area network resistor

## **[Recoverability]**

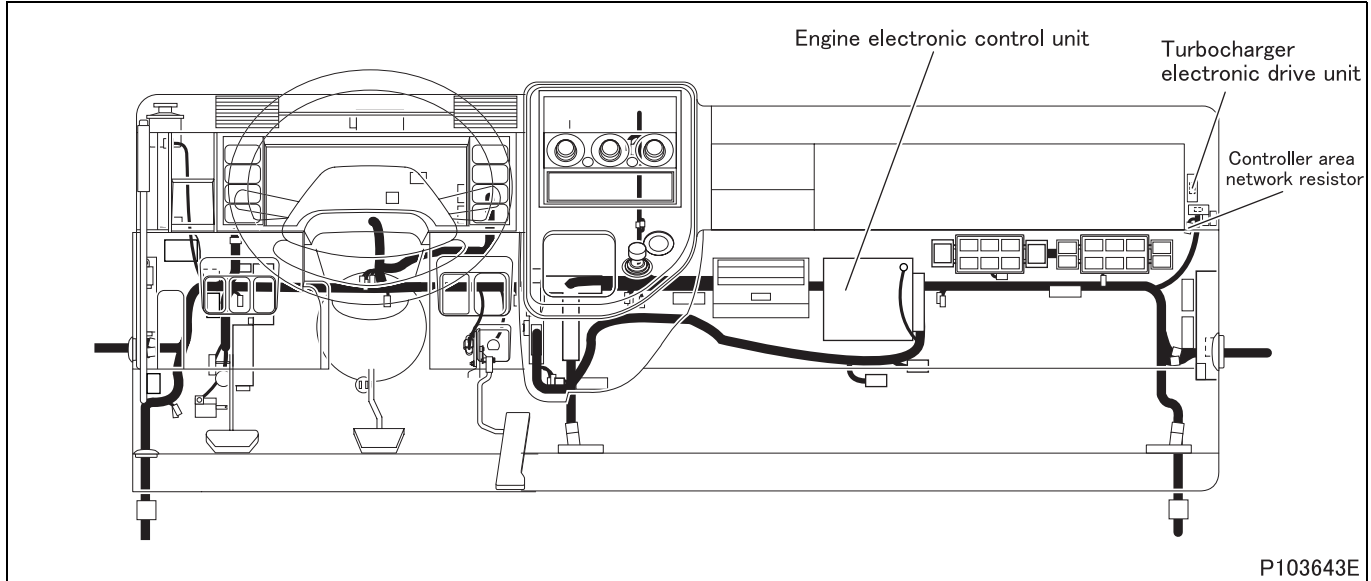
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

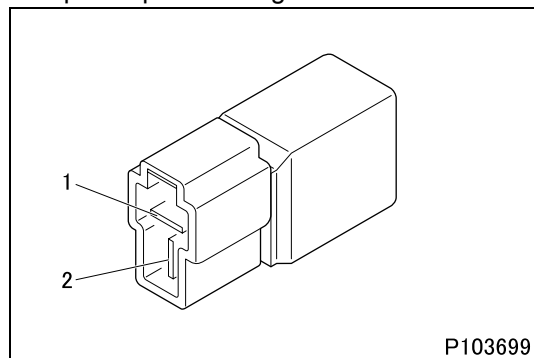
- Perform checks in the sequence of the following steps.

|        |  |  |               |  |
|--------|--|--|---------------|--|
| Step 1 | Inspection items                                       | Inspection by engine electronic control unit connector   |               |  |
|        | Maintenance item                                       | Measure value of resistance between engine electronic control unit connector (GE58A) terminal No. 5 and 6. |               |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                 |               |  |
|        | Requirements   | 120 ± 6 Ω  |               |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7. |  |
|        |  | NO   | Go to step 2. |  |

|        |  |   |                   |  |
|--------|--|---|-------------------|--|
| Step 2 | Inspection items                                       | Inspection of controller area network resistor connector  |                   |  |
|        | Maintenance item                                       | Inspection of connector   |                   |  |
|        | Inspection condition                                   | -   |                   |  |
|        | Requirements   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |                   |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 3.     |  |
|        |  | NO  | Modify connector. |  |

|        |  |   |   |  |
|--------|--|---|---|--|
| Step 3 | Inspection items                                       | Inspection of controller area network resistor unit                 |   |  |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and 2. |   |  |
|        | Inspection condition                                   | Disconnect connector and measure resistor side.                     |   |  |
|        | Requirements   | 120 ± 6 Ω   |   |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 4.                                   |  |
|        |  | NO  | Replacement of controller area network resistor |  |

<Step 3 inspection diagram>



|        |  |   |                 |  |
|--------|--|---|-----------------|--|
| Step 4 | Inspection items                                       | Inspection of harness between engine electronic control unit and controller area network resistor (HIGH)  |                 |  |
|        | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 1 and engine electronic control unit connector (GE58A) terminal No. 6 |                 |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                 |  |
|        | Requirements   | There is continuity.  |                 |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5.   |  |
|        |  | NO  | Modify harness. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 5 | Inspection items                                       |                 | Inspection of harness between engine electronic control unit and controller area network resistor (LOW)   |
|        | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 2 and engine electronic control unit connector (GE58A) terminal No. 5 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.   |
| NO     |  | Modify harness. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of engine electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 10.  |
| NO     |  | Modify connector. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 7 | Inspection items                                       |                 | Inspection of harness between engine electronic control unit and controller area network resistor (HIGH)                            |
|        | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 1 and electronic drive unit connector terminal No. 15 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.   |
| NO     |  | Modify harness. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 8 | Inspection items                                       |                 | Inspection of harness between engine electronic drive unit and controller area network resistor (LOW)                               |
|        | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 2 and electronic drive unit connector terminal No. 16 |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 9.   |
| NO     |  | Modify harness. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 9 | Inspection items                                       |                   | Inspection of electronic drive unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replace the engine electronic control unit as well if this diagnosis code occurs after the replacement of electronic drive unit.  |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P1660/Flash code: 29

## **[Monitor]**

Failure of diesel particulate filter indicator lamp

## **[Fault (outline)]**

- Short circuit battery
- Short circuit ground
- Open circuit
- Overload

## **[Diagnosis check]**

- Diesel particulate filter indicator lamp circuit is monitored for fault.

## **[Code generation condition]**

- Diesel particulate filter indicator lamp circuit remains open, shorted or overcurrent as detected for 0.2 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.
- Fault diagnosis is performed each time when the control is halted.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Effects no special control.

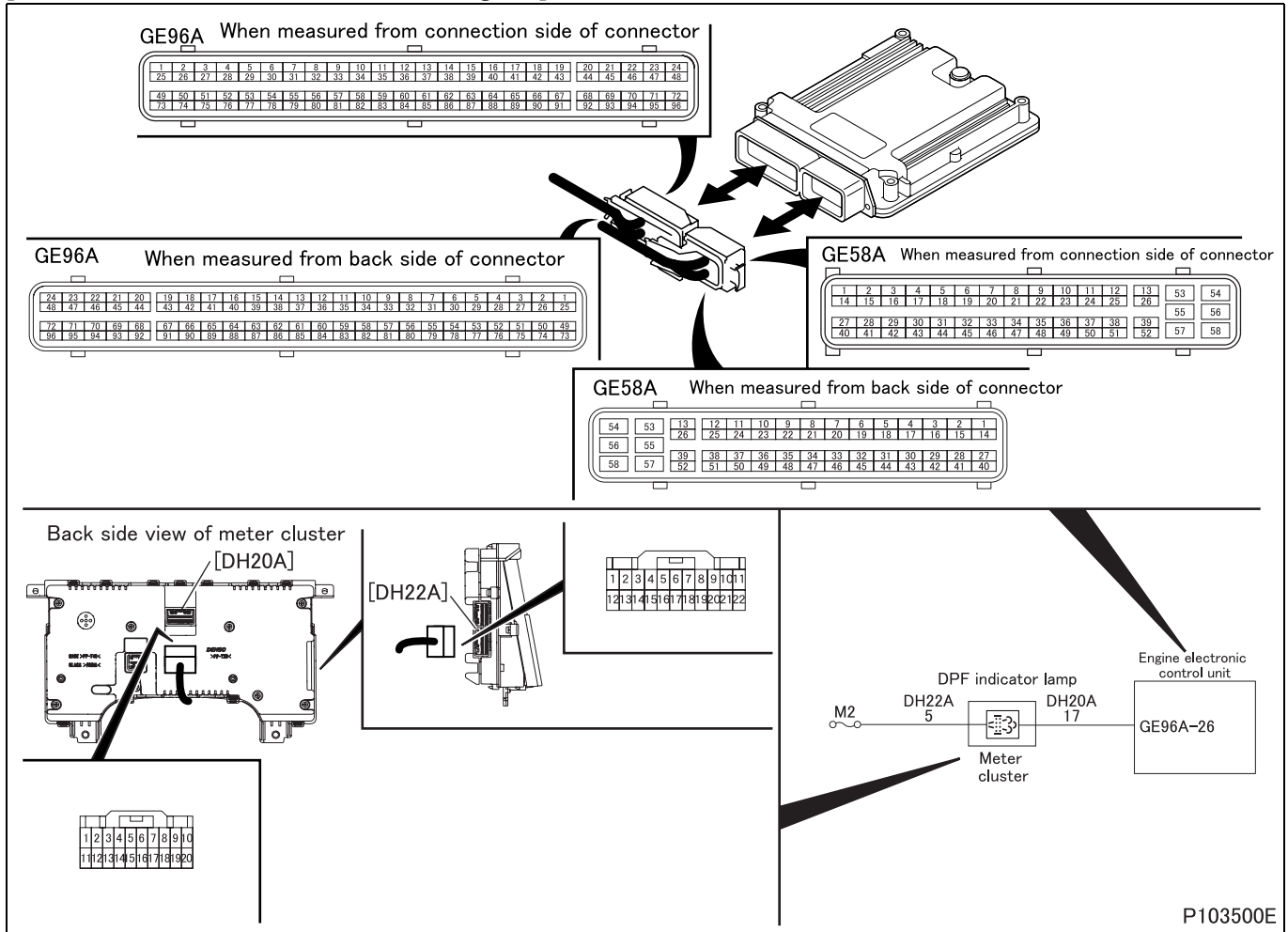
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and diesel particulate filter indicator lamp
- Malfunction of each connector
- Malfunction of diesel particulate filter indicator lamp
- Malfunction of electronic control unit

## **[Recoverability]**

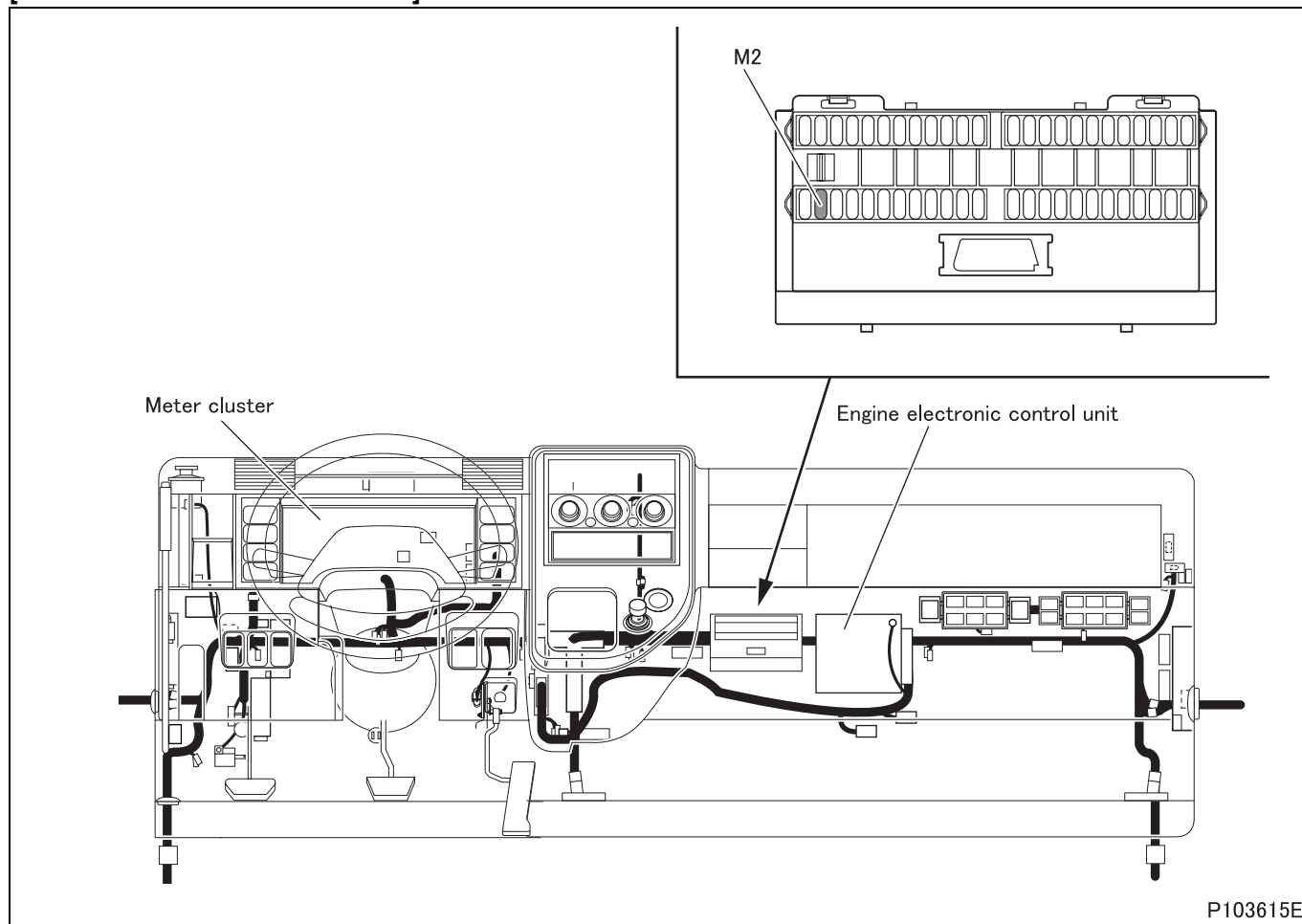
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

## [Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]



## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | Measure item No. B8 "DPF Indicator Lamp" of Service Data.                        |
|        | Inspection condition                                   |               | Perform Multi-Use Tester actuator test item No. A6 "DPF Lamp".                   |
|        | Requirements   |               | Diesel particulate filter indicator lamp lit (automatic reset after 15 seconds). |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
|        | NO   | Go to step 2. |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector                       |
|        | Maintenance item                                       |               | Ground connector (GE96A) terminal No. 26.                             |
|        | Inspection condition                                   |               | It wires for the ground harness from the other side of the connector. |
|        | Requirements   |               | Diesel particulate filter indicator lamp illuminates                  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
|        | NO   | Go to step 4. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 4 | Inspection items                                       |                 | Inspection of harness between fuse and meter cluster                                       |
|        | Maintenance item                                       |                 | Check circuit between fuse M2 and meter cluster connector (DH22A) terminal No. 5.          |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 5.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 5 | Inspection items                                       |                 | Inspection of harness between electronic control unit and meter cluster  |
|        | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE96A) terminal No. 26 and meter cluster connector (DH20A) terminal No. 10. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.  |
| NO     |  | Modify harness. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of meter cluster   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replacement of meter cluster or lamp  |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

---

## [Fault code]

Diagnosis code: P2002/Flash code: 92

## [Monitor]

Diesel particulate filter clogged

## [Fault (outline)]

Efficiency below threshold (leaking diesel particulate filter)

## [Diagnosis check]

- Ceramic filter is monitored for failure through DPF pressure sensor (DIFF) during operation of diesel particulate filter regeneration function.

## [Code generation condition]

- Difference between maximum pressure calculated by electronic control unit and actual diesel particulate filter pressure remains out of control map for 10 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## [Diagnosis check timing]

- Fault diagnosis is performed only once during the driving cycle.

## [Diagnostic requirement]

- Engine operating mode: normal (engine in operation)
- Pressure adjustment in DPF pressure sensor (DIFF):  
Has been carried out this drive cycle ; for drift correction, the following conditions exist for >5s :
  - Engine speed: less than 875 rpm
  - Fuel injection quantity: below 25 mg/cyc
  - Exhaust flow rate: less than 90 m<sup>3</sup>/h
  - Exhaust gas recirculation valve position: more than 8 mm {0.3 in.}
- Exhaust volume-flow rate: 500 to 900 m<sup>3</sup>/h
- Diesel particulate filter inlet temperature: 200 to 400°C {392 to 752°F}
- Water temperature: 65 to 110°C {149 to 230°F}
- Atmospheric pressure: more than 750 mbar {10.87 psi}
- Approximate environment atmospheric temperature: -7 to 50°C {19 to 122°F}
- Frequency of diesel particulate filter regeneration control: less than 3 times (discontinued after start of diesel particulate filter regeneration control)
- Soot deposit: 15 to 30 g {0.53 to 1.06 oz}
- Diesel particulate filter regeneration control: not effected
- Controller area network communication of exhaust gas recirculation electronic drive unit: in order
- DPF pressure sensor (DIFF): in order
- Air flow sensor: in order
- Atmospheric pressure sensor: in order
- Water temperature sensor: in order
- Intake air temperature sensor: in order
- Catalytic temperature sensor: in order
- DPF temperature sensor 1: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order



**[Control effected by electronic control unit during fault]**

Electronic control unit differs in the way of control by the engine model.

<Except FE83>

- Engine torque is limited.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

<FE83>

- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

- Failure of diesel particulate filter indicator lamp
- Failure of diesel particulate filter cleaning switch
- Manual diesel particulate filter regeneration is not performed.
- Excessive smoke emission (due to malfunction of engine proper, common rail or exhaust gas recirculation system)
- Malfunction of air flow sensor
- Malfunction of DPF absolute pressure sensor and DPF pressure sensor (DIFF)
- Malfunction of diesel particulate filter

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |

GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

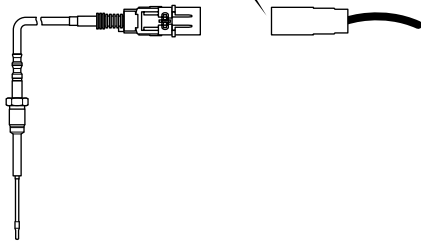
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

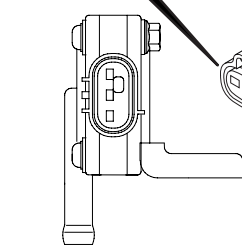
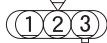
GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

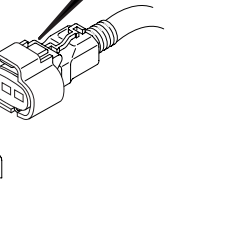
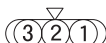
When measured from connection side of connector



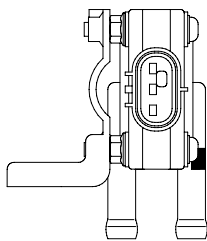
When measured from connection side of connector



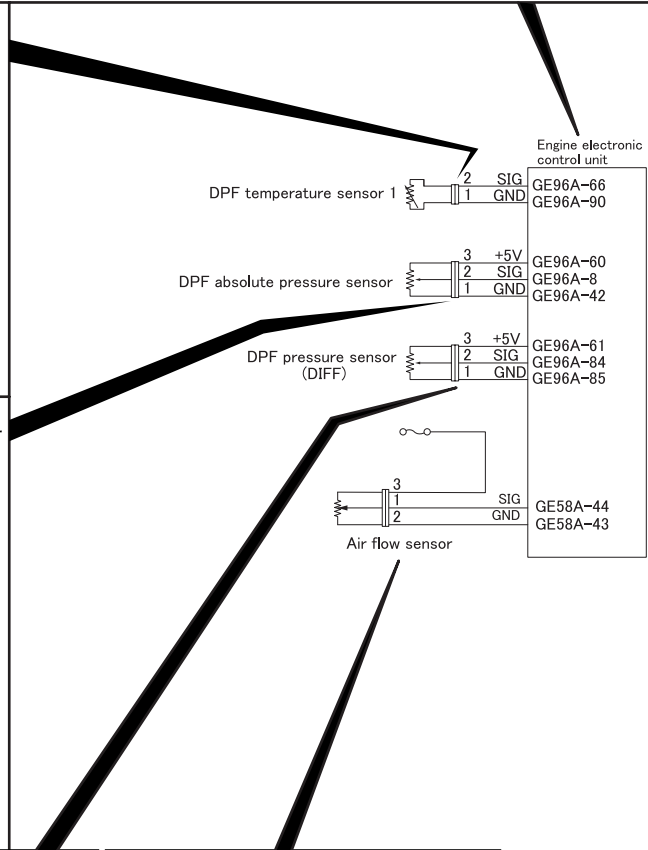
When measured from back side of connector



When measured from back side of connector

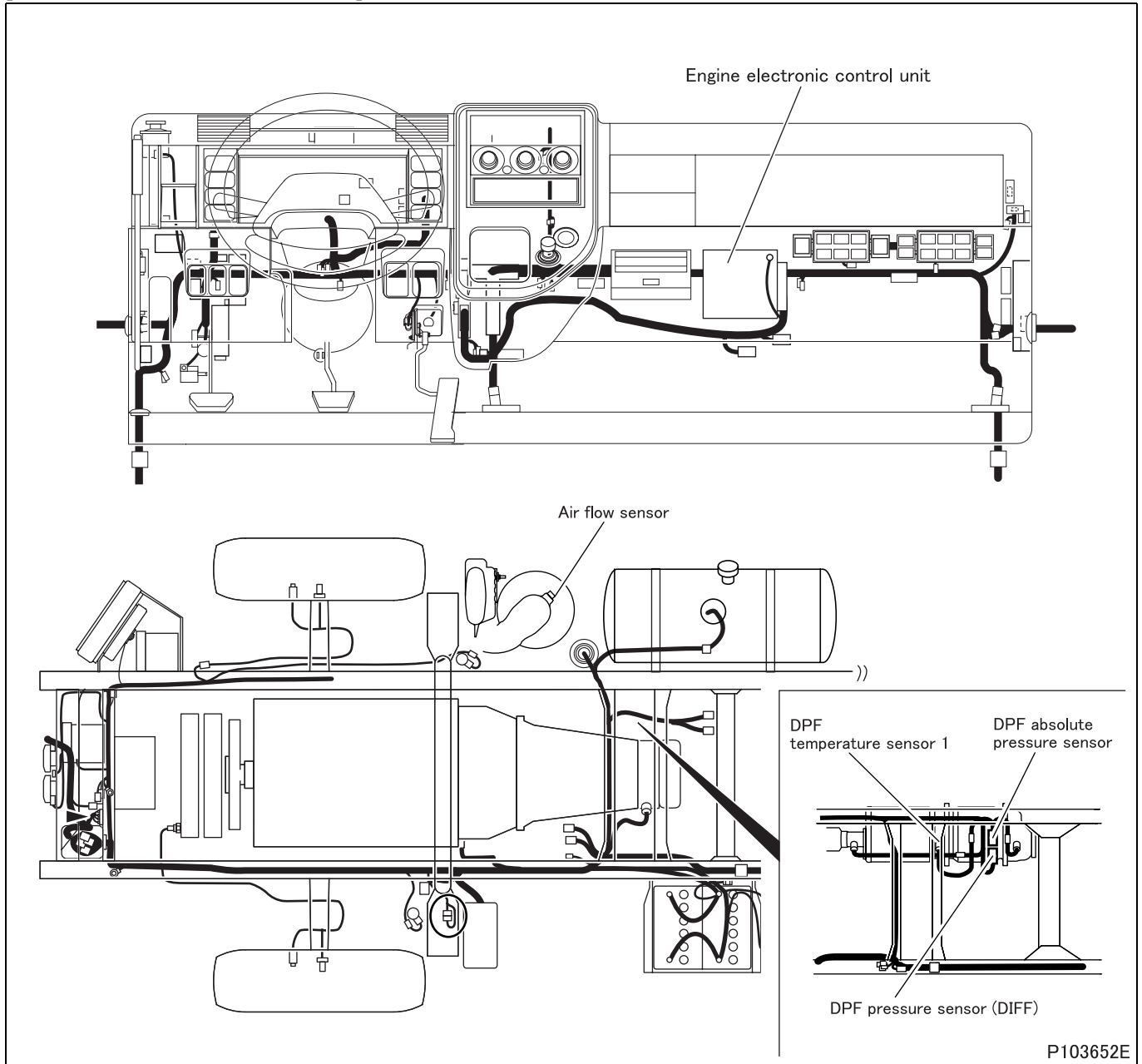


When measured from connection side of connector



- Engine electronic control unit
- GE96A-66
  - GE96A-90
  - GE96A-60
  - GE96A-8
  - GE96A-42
  - GE96A-61
  - GE96A-84
  - GE96A-85
  - GE58A-44
  - GE58A-43

[Parts Identification and Location]



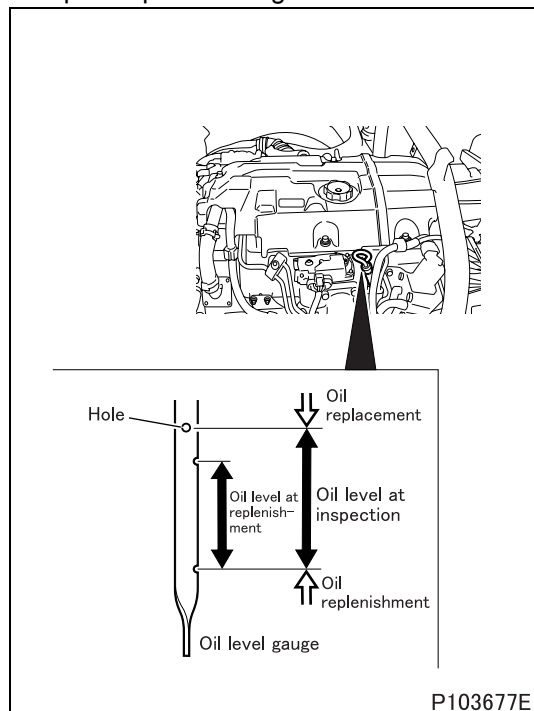
# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |    |   |
|--------|--|----|---|
| Step 1 | Inspection items                                       |    | Inspection of oil level                   |
|        | Maintenance item                                       |    | Inspection of engine oil level            |
|        | Inspection condition                                   |    | Engine stopped                            |
|        | Requirements   |    | Oil level for inspection is not exceeded. |
|        | Inspection result (Is the judging standard satisfied?) |    | YES                                       |
|        |  | NO | After replacement of oil, go to step 2    |

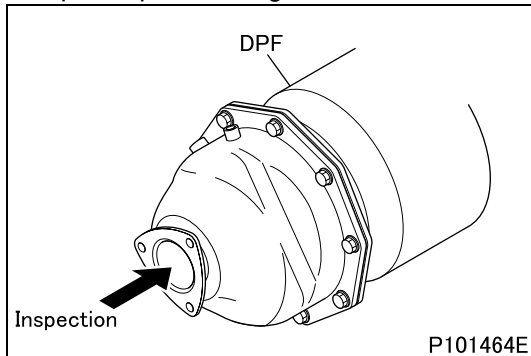
<Step 1 inspection diagram>



|        |  |    |   |
|--------|--|----|---|
| Step 2 | Inspection items                                       |    | Inspection by manual diesel particulate filter regeneration   |
|        | Maintenance item                                       |    | Perform Multi-Use Tester actuator test item No. A5 "DPF Regeneration (Manual)", and clean ceramic diesel particulate filter.  |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Engine: idling</li> <li>• Place the transmission in neutral. (place the automatic transmission in P range)</li> <li>• Parking brake: vehicle parked (parking brake switch: ON)</li> <li>• After engine warm-up</li> </ul> |
|        | Requirements   |    | This diagnosis code does not occur again.   |
|        | Inspection result (Is the judging standard satisfied?) |    | YES   |
|        |  | NO | Go to step 3.   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Unit inspection of diesel particulate filter  |
|        | Maintenance item                                       |  | Check the exhaust passage inside the diesel particulate filter for adhesion of soot in large quantity.            |
|        | Inspection condition                                   |  | Remove diesel particulate filter.   |
|        | Requirements   |  | No soot is deposited.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 4.<br>NO<br>After replacement of ceramic filter, perform resetting the DPF-related information. |

<Step 3 inspection diagram>



|        |  |  |  |
|--------|--|--|--|
| Step 4 | Inspection items                                       |  | Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit   |
|        | Maintenance item                                       |  | See Gr15 "Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit"  |
|        | Inspection condition                                   |  | Perform the following preparatory works. <ul style="list-style-type: none"> <li>Place the transmission in neutral. (place the automatic transmission in P range)</li> <li>Turn the steering wheel in neutral position and securely apply the parking brake.</li> <li>Turn off air conditioner not to increase the engine speed.</li> <li>Check diagnosis code of each electronic control system. If any fault exists, rectify it.</li> <li>Resetting the DPF-related information (perform "History reset" of Multi-Use Tester) (See Gr15 "Resetting the DPF-related information".)</li> <li>Warm up the engine until the engine coolant has been heated to more than 70°C {158°F}. (verify from Service Data "Engine Coolant Temperature" or "31: Water Temperature")</li> </ul> |
|        | Requirements   |  | This diagnosis code does not occur again.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>End of inspection<br>NO<br>Go to step 5.  |

|        |  |  |   |
|--------|--|--|---|
| Step 5 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Measure item No. B8 "DPF Indicator Lamp" of Service Data.                               |
|        | Inspection condition                                   |  | Perform Multi-Use Tester actuator test item No. A6 "DPF Lamp".                          |
|        | Requirements   |  | Diesel particulate filter indicator lamp illuminates (automatic reset after 15 seconds) |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 6.<br>NO<br>Replacement of engine electronic control unit             |

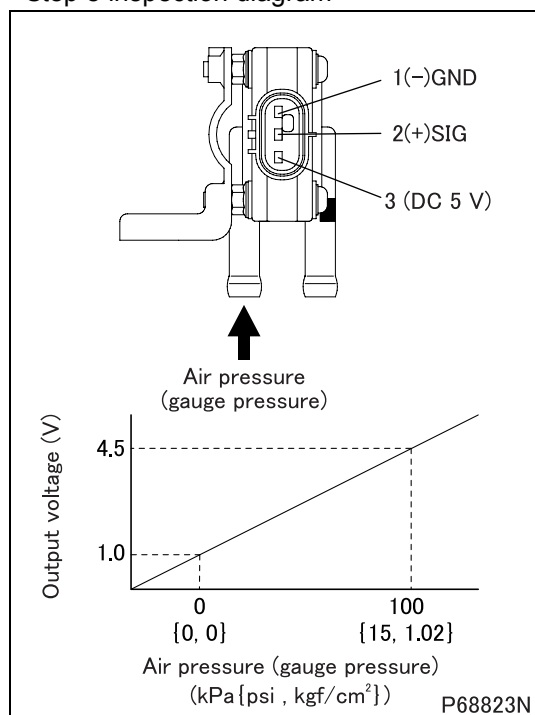
# TROUBLESHOOTING

|        |  |  |  |
|--------|--|--|--|
| Step 6 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Measure item No. A4 "DPF SW" of Service Data.  |
|        | Inspection condition                                   |  | –  |
|        | Requirements   |  | Press diesel particulate filter cleaning switch and check that "DPF SW" display switches from OFF to ON. |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7.  |
| NO     |  | Replacement of diesel particulate filter cleaning switch or engine electronic control unit |  |

|        |  |   |   |
|--------|--|---|---|
| Step 7 | Inspection items                                       |   | Inspection of pressure hose   |
|        | Maintenance item                                       |   | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |
|        | Inspection condition                                   |   | –   |
|        | Requirements   |   | Nothing abnormal detected   |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8.   |
| NO     |  | After correction and replacement of hose, go to step 8. |   |

|        |  |   |  |
|--------|--|---|--|
| Step 8 | Inspection items                                       |   | Inspection of DPF pressure sensor (DIFF)   |
|        | Maintenance item                                       |   | Measure value of voltage between connector terminal No. 2 (+) and 1 (–).   |
|        | Inspection condition                                   |   | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–).</li> <li>Gradually increase applied air pressure.</li> </ul>   |
|        | Requirements   |   | <ul style="list-style-type: none"> <li><math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>} : 1 V</li> <li><math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>} : 4.5 V</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 9.  |
| NO     |  | Replacement of DPF pressure sensor (DIFF) |  |

<Step 8 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 9 | Inspection items                                       |  | Inspection of air flow sensor unit  |
|        | Maintenance item                                       |  | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among “Service data”.</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: “Ne” (rpm)</li> <li>• Intake air flow rate: “Air Flow Rate from MAFS” (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 “Engine Revolution” (rpm)</li> <li>• Intake air flow rate: 60 “Air mass flow” (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”.</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | 10% or less   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Go to step 10.</p> <p>NO Replacement of air flow sensor</p>  |

|         |  |  |   |
|---------|--|--|---|
| Step 10 | Inspection items                                       |  | Inspection by control data  |
|         | Maintenance item                                       |  | Perform actuator test item No. B2 “Fuel Leak Check”.  |
|         | Inspection condition                                   |  | Engine start: At idle   |
|         | Requirements   |  | There is no leak from injectors (four).   |
|         | Inspection result (Is the judging standard satisfied?) |  | <p>YES</p> <ul style="list-style-type: none"> <li>• Inspection of exhaust gas recirculation system (exhaust gas recirculation pipe, exhaust gas recirculation cooler, exhaust gas recirculation valve)</li> <li>• Inspection of engine</li> </ul> <p>NO Replacement of injector</p> |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P2031/Flash code: 88

## **[Monitor]**

Characteristic abnormality of DPF temperature sensor 2

## **[Fault (outline)]**

Gain and offset drift

## **[Diagnosis check]**

- Difference in temperature output between DPF temperature sensors (1 and 2) is monitored for clogging of ceramic filter during stop of diesel particulate filter regeneration function (with vehicle in normal condition).

## **[Code generation condition]**

- Difference in temperature output remains excessively high (over 150°C {302°F}) or low (below -150°C {-238°F}) for 10 seconds <Relative check> and 20 seconds <Separate check> .  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

- Diesel particulate filter regeneration control: not effected
- Engine running time: more than 300 seconds
- Time after diesel particulate filter regeneration control was effected: more than 1500 seconds
- Engine speed and load: logical output is 1
- Time till above conditions were met: more than 30 seconds
- Catalytic temperature sensor: normal in output signal
- DPF temperature sensor 1: normal in output signal
- DPF temperature sensor 2: normal in output signal
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order

## **[Control effected by electronic control unit during fault]**

- Effects no special control.

## **[Probable cause of trouble]**

- Malfunction of DPF temperature sensor 2

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



**[Fault code]**

Diagnosis code: P2032/Flash code: 88

**[Monitor]**

Failure of DPF temperature sensor 2

**[Fault (outline)]**

Low signal range check

**[Diagnosis check]**

- Output voltage of DPF temperature sensor 2 is monitored.

**[Code generation condition]**

- Output voltage of DPF temperature sensor 2 remains below 0.36 V for 3 seconds. (sensor temperature: 1000°C {1832°F} or more)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Pressure after ceramic diesel particulate filter is fixed at backup value.
- Related fault check is stopped.

**[Probable cause of trouble]**

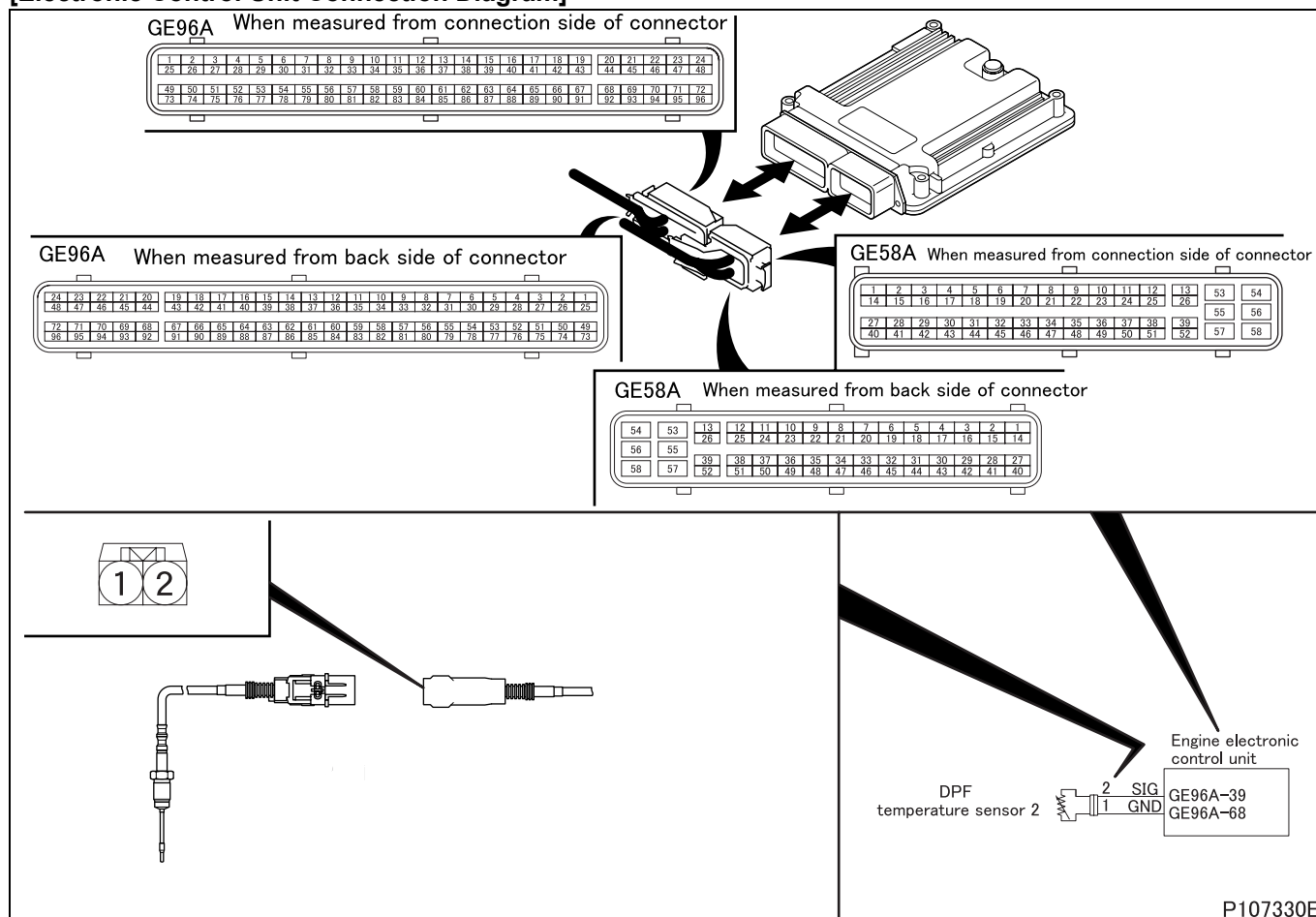
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of DPF temperature sensor 2
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

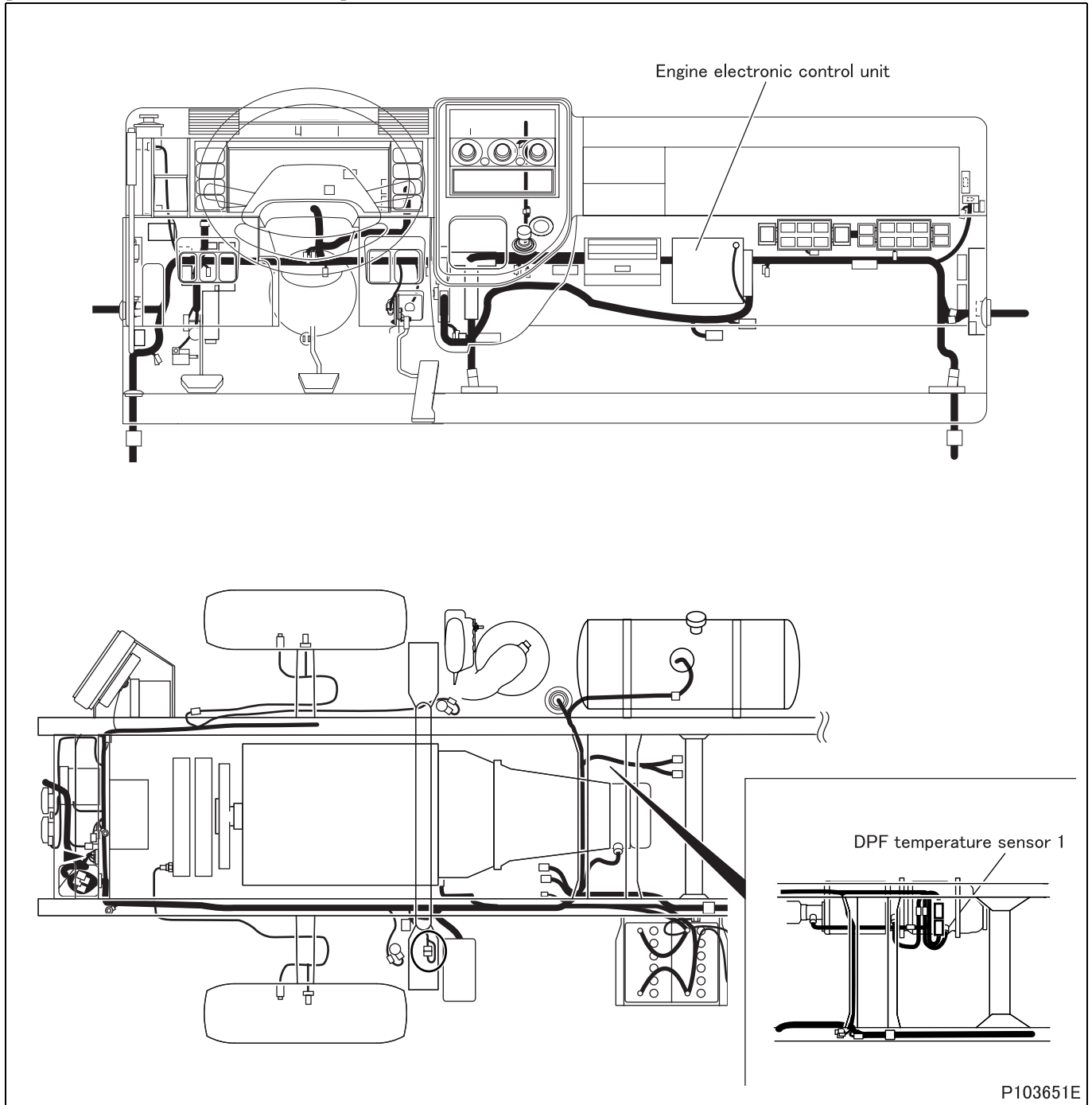
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P107330E

[Parts Identification and Location]



P103651E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Measure item No. 26 "DPF Temperature (DownStream)" of Service Data. |
|        | Inspection condition                                   |  | During warm-up  |
|        | Requirements   |  | Gradually increased   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to transient fault (See Gr00.).<br>NO : Go to step 2.      |

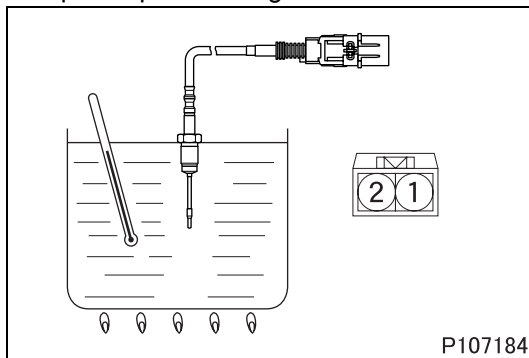
|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |  | Measure value of resistance between connector (GE96A) terminal No. 39 and 68.   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Starter switch: OFF</li> <li>Disconnect electronic control unit from harness and measure at vehicle side connector.</li> </ul>   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>20°C {68°F} : 241.8 kΩ</li> <li>50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>100°C {212°F} : 33.58<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to step 3.<br>NO : Go to step 4.   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to step 8.<br>NO : Modify connector.   |

|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of sensor connector  |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to step 5.<br>NO : Modify connector.   |

|        |  |   |              |
|--------|--|---|--------------|
| Step 5 | Inspection items                                       | Inspection of DPF temperature sensor 2 unit   |              |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and 2.   |              |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Put DPF temperature sensor 2 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |              |
|        | Requirements   | <ul style="list-style-type: none"> <li>20°C {68°F} : 241.8 kΩ</li> <li>50°C {122°F} : 106.2 <math>\begin{smallmatrix} +74.3 \\ -41.8 \end{smallmatrix}</math> kΩ</li> <li>100°C {212°F} : 33.58 <math>\begin{smallmatrix} +17.60 \\ -10.60 \end{smallmatrix}</math> kΩ</li> <li>150°C {302°F} : 13.90 <math>\begin{smallmatrix} +5.36 \\ -3.60 \end{smallmatrix}</math> kΩ</li> <li>200°C {392°F} : 6.896 <math>\begin{smallmatrix} +2.064 \\ -1.252 \end{smallmatrix}</math> kΩ</li> </ul> |              |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6 |
| NO     |  | Replacement of sensor   |              |

<Step 5 inspection diagram>



|        |  |  |               |
|--------|--|--|---------------|
| Step 6 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)                                      |               |
|        | Maintenance item                                       | Check circuit between electronic control unit connector (GE96A) terminal No. 39 and sensor connector terminal No. 2. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                           |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7. |
| NO     |  | Modify harness.  |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (ground)  |               |
|        | Maintenance item                                       | Check circuit between electronic control unit connector (GE96A) terminal No. 68 and sensor connector terminal No. 1. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                           |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Modify harness.  |               |

|        |  |   |                                    |
|--------|--|---|------------------------------------|
| Step 8 | Inspection items                                       | Inspection by control data  |                                    |
|        | Maintenance item                                       | Measure item No. 26 "DPF Temperature (DownStream)" of Service Data. |                                    |
|        | Inspection condition                                   | During warm-up  |                                    |
|        | Requirements   | Gradually increased   |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.). |
| NO     |  | Replacement of electronic control unit                              |                                    |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P2033/Flash code: 88

## **[Monitor]**

Failure of DPF temperature sensor 2

## **[Fault (outline)]**

High signal range check

## **[Diagnosis check]**

- Output voltage of DPF temperature sensor 2 is monitored.

## **[Code generation condition]**

- Output voltage of DPF temperature sensor 2 remains over 4.93 V for 30 seconds. (sensor temperature: 40°C {118°F} or less).  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

- Engine speed: 1400 to 5000 rpm
- Fuel injection quantity: 35 to 200 mg/cyc
- Water temperature: above 35°C {95°F}

## **[Control effected by electronic control unit during fault]**

- Pressure after ceramic diesel particulate filter is fixed at backup value.
- Related fault check is stopped.

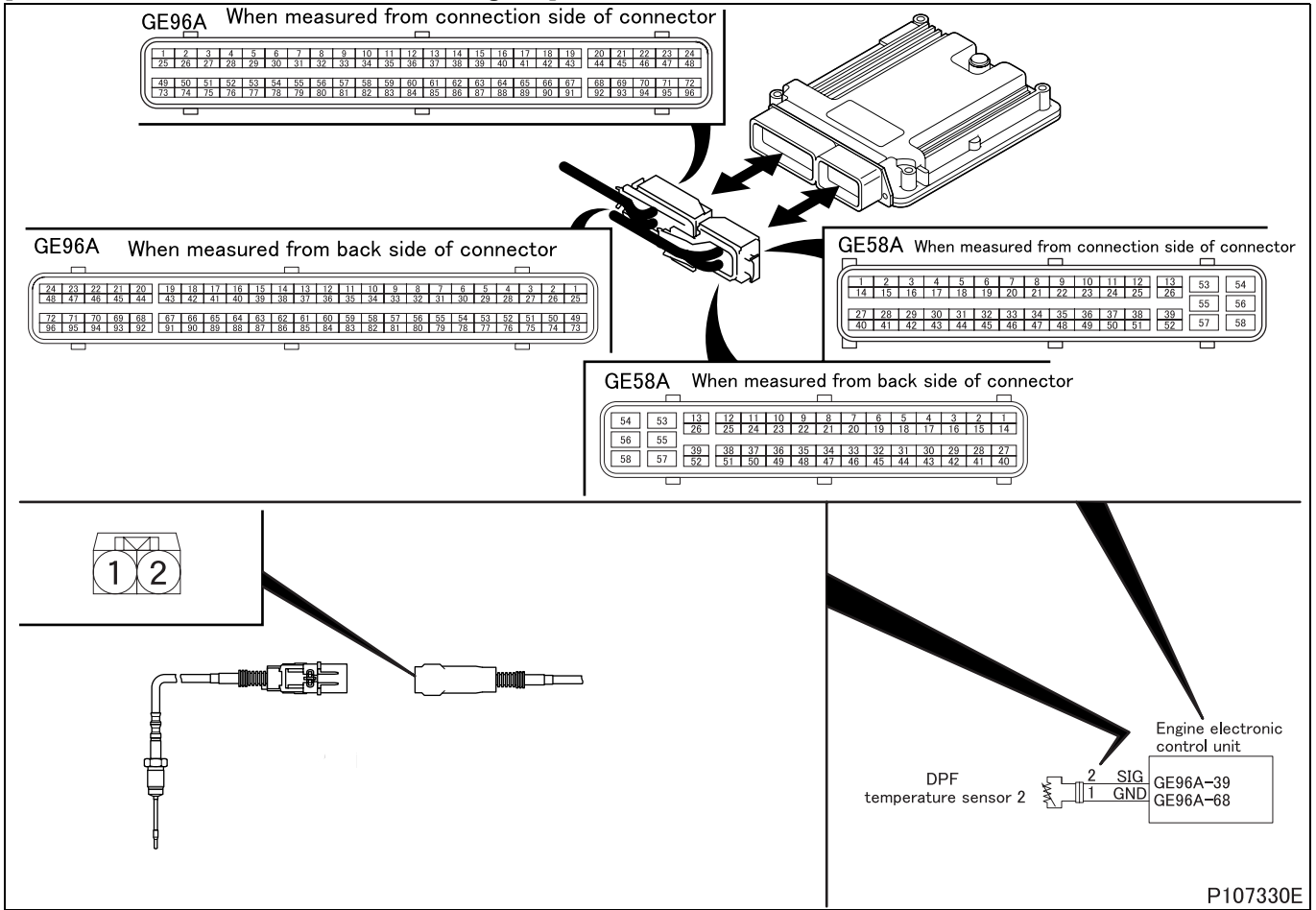
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of DPF temperature sensor 2
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

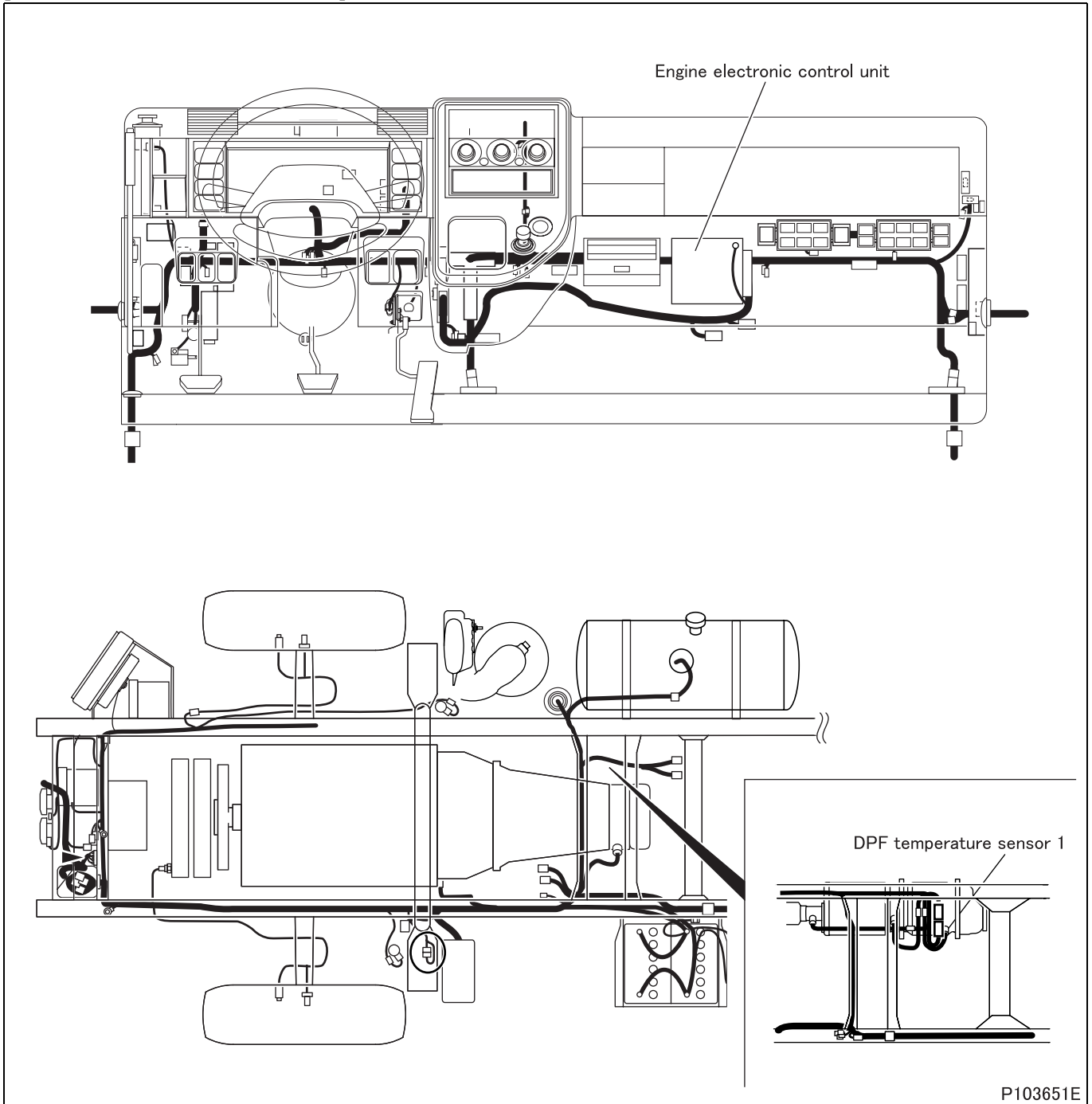
[Electronic Control Unit Connection Diagram]



P107330E

# TROUBLESHOOTING

## [Parts Identification and Location]



P103651E



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Measure item No. 26 "DPF Temperature (DownStream)" of Service Data. |
|        | Inspection condition                                   |  | During warm-up  |
|        | Requirements   |  | Gradually increased   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to transient fault (See Gr00.).<br>NO : Go to step 2.      |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |  | Measure value of resistance between connector (GE96A) terminal No. 39 and 68.   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: OFF</li> <li>• Disconnect electronic control unit from harness and measure at vehicle side connector.</li> </ul>   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• 20°C {68°F} : 241.8 kΩ</li> <li>• 50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>• 100°C {212°F} : 33.58<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>• 150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>• 200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to step 3.<br>NO : Go to step 4.   |

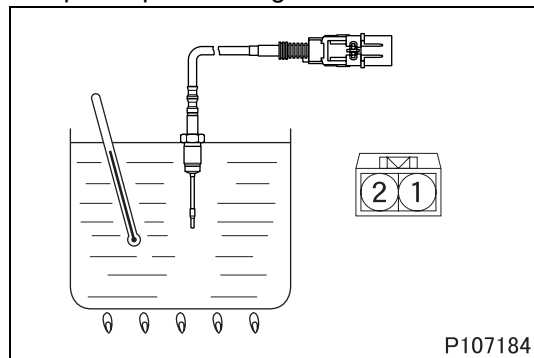
|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to step 8.<br>NO : Modify connector.   |

|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of sensor connector  |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES : Go to step 5.<br>NO : Modify connector.   |

# TROUBLESHOOTING

|        |  |   |              |
|--------|--|---|--------------|
| Step 5 | Inspection items                                       | Inspection of DPF temperature sensor 2 unit   |              |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and 2.   |              |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Put DPF temperature sensor 2 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |              |
|        | Requirements   | <ul style="list-style-type: none"> <li>20°C {68°F} : 241.8 kΩ</li> <li>50°C {122°F} : 106.2<sup>+74.3</sup><sub>-41.8</sub> kΩ</li> <li>100°C {212°F} : 33.58<sup>+17.60</sup><sub>-10.60</sub> kΩ</li> <li>150°C {302°F} : 13.90<sup>+5.36</sup><sub>-3.60</sub> kΩ</li> <li>200°C {392°F} : 6.896<sup>+2.064</sup><sub>-1.252</sub> kΩ</li> </ul> |              |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6 |
| NO     |  | Replacement of sensor   |              |

<Step 5 inspection diagram>



|        |  |  |               |
|--------|--|--|---------------|
| Step 6 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)                                      |               |
|        | Maintenance item                                       | Check circuit between electronic control unit connector (GE96A) terminal No. 39 and sensor connector terminal No. 2. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                           |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7. |
| NO     |  | Modify harness.  |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (ground)  |               |
|        | Maintenance item                                       | Check circuit between electronic control unit connector (GE96A) terminal No. 68 and sensor connector terminal No. 1. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                           |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Modify harness.  |               |

|        |  |   |                                    |
|--------|--|---|------------------------------------|
| Step 8 | Inspection items                                       | Inspection by control data  |                                    |
|        | Maintenance item                                       | Measure item No. 26 "DPF Temperature (DownStream)" of Service Data. |                                    |
|        | Inspection condition                                   | During warm-up  |                                    |
|        | Requirements   | Gradually increased   |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.). |
| NO     |  | Replacement of electronic control unit                              |                                    |

**[Fault code]**

Diagnosis code: P2080/Flash code: 42

**[Monitor]**

Relative check between catalytic temperature sensor and DPF temperature sensor 1

**[Fault (outline)]**

Gain and offset drift

**[Diagnosis check]**

- Relative temperature check is made between catalytic temperature sensor and DPF temperature sensor 1 during stop of diesel particulate filter regeneration function (with vehicle in normal condition).

**[Code generation condition]**

- Difference in temperature output remains high (over 150°C {302°F}) or low (below -150°C {-238°F}) for 10 seconds.

(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Diesel particulate filter regeneration control: not effected
- Engine running time: more than 300 seconds
- Time after diesel particulate filter regeneration control was effected: more than 1500 seconds
- Engine speed and load: logical output is 1
- Time till above conditions were met: more than 30 seconds
- Catalytic temperature sensor: normal in output signal
- DPF temperature sensor 1: normal in output signal
- DPF temperature sensor 2: normal in output signal
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order
- When catalytic temperature sensor and DPF temperature sensor 2 are the same in output.

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

<If diagnosis code P0284 was not recorded at the same time>

- Malfunction of catalytic temperature sensor

<If diagnosis code P0284 was recorded at the same time>

- Malfunction of DPF temperature sensor 2

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

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## [Fault code]

Diagnosis code: P2084/Flash code: 92

## [Monitor]

Relative check between DPF temperature sensors (1 and 2)

## [Fault (outline)]

Gain and offset drift

## [Diagnosis check]

- Relative temperature check is made between DPF temperature sensors (1 and 2) during stop of diesel particulate filter regeneration function (with vehicle in normal condition).

## [Code generation condition]

- Temperature difference remains for 10 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## [Diagnosis check timing]

- Fault diagnosis is performed only once during the driving cycle.

## [Diagnostic requirement]

- Diesel particulate filter regeneration control: not effected
- Engine running time: more than 300 seconds
- Time after diesel particulate filter regeneration control was effected: more than 1500 seconds
- Engine speed and load: logical output is 1
- Time till above conditions were met: more than 30 seconds
- Catalytic temperature sensor: normal in output signal
- DPF temperature sensor 1: normal in output signal
- DPF temperature sensor 2: normal in output signal
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order
- When catalytic temperature sensor and DPF temperature sensor 2 are the same in output.

## [Control effected by electronic control unit during fault]

- Related fault check is stopped.

## [Probable cause of trouble]

<If diagnosis code P2080 was not recorded at the same time>

- Malfunction of DPF temperature sensor 1

<If diagnosis code P2080 was recorded at the same time>

- Malfunction of DPF temperature sensor 2

## [Recoverability]

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

**[Fault code]**

Diagnosis code: P2100/Flash code: 28

**[Monitor]**

Failure of intake throttle system

**[Fault (outline)]**

Circuit check

**[Diagnosis check]**

- Throttle electronic drive unit monitors built in motor of intake throttle for circuit fault and sends fault information to engine electronic control unit through controller area network communication.
- Monitoring by throttle electronic drive unit is performed from initial operational status of motor at starter switch ON.

**[Code generation condition]**

- Motor circuit remains open as detected by electronic drive unit for 2 seconds (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition).

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

- Controller area network communication in order

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Intake throttle actuator test is inhibited.
- Related fault check is stopped.

**[Probable cause of trouble]**

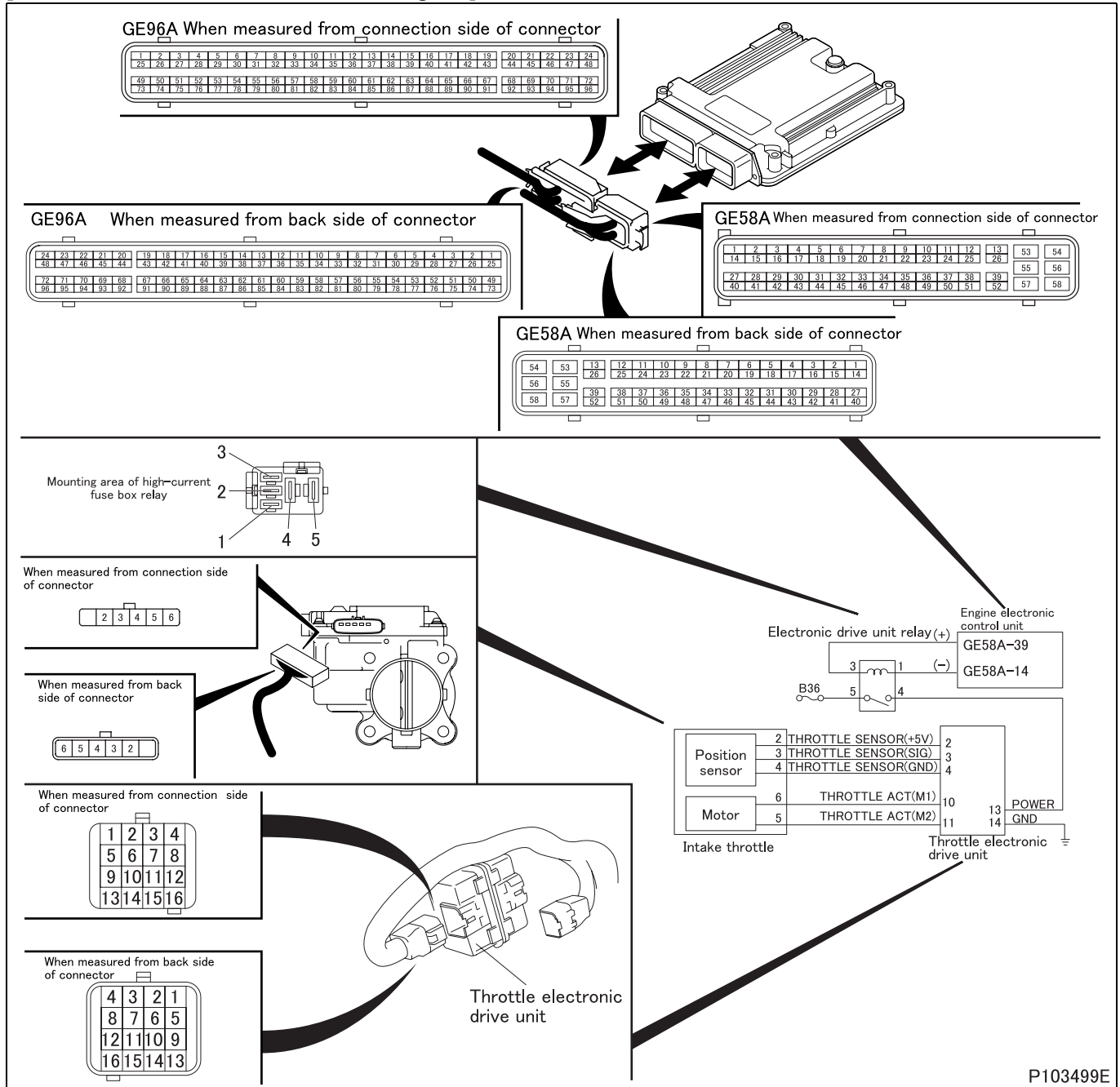
- Open-circuit or short-circuit of harness between electronic drive unit and throttle actuator
- Malfunction of each connector
- Malfunction of throttle motor (built in throttle actuator)
- Malfunction of throttle position sensor (built in throttle actuator)
- Malfunction of electronic drive unit
- Malfunction of electronic drive unit relay

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

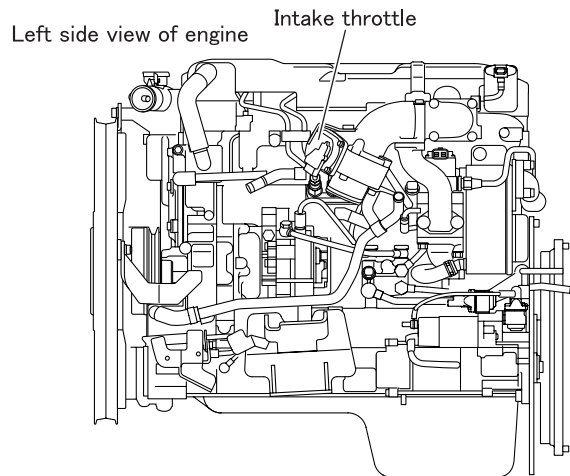
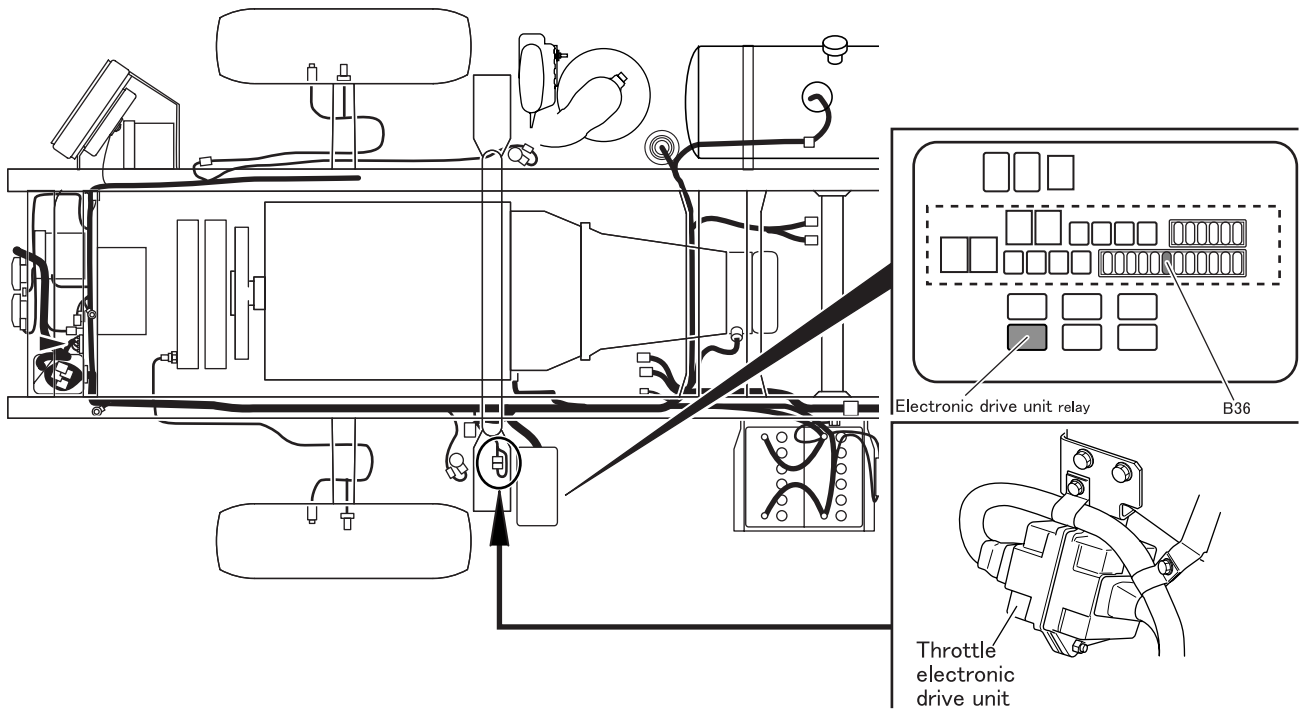
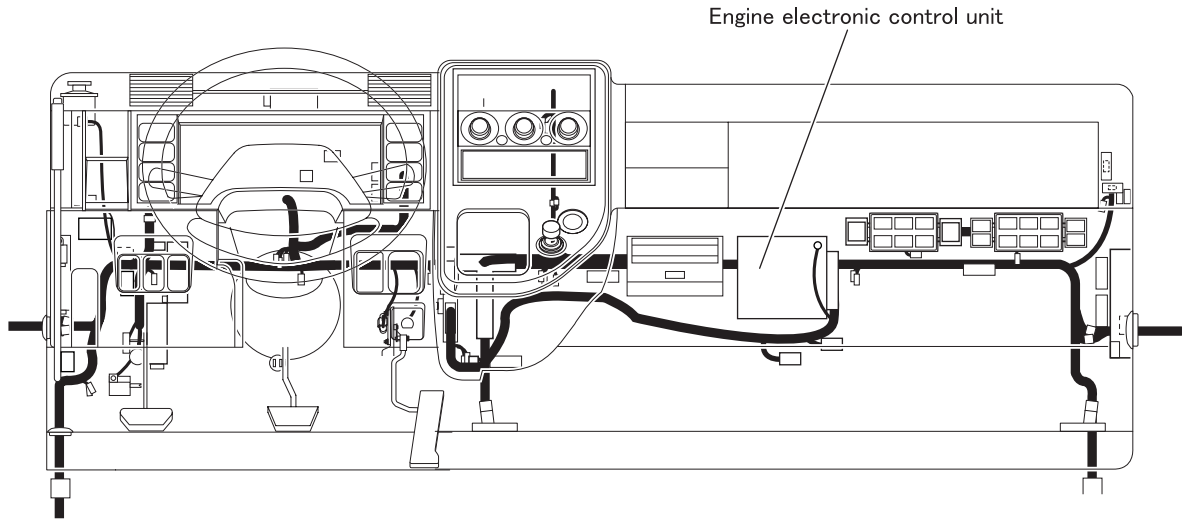
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P103499E

[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |     |                                    |    |
|--------|--|--|--|-----|------------------------------------|----|
| Step 1 | Inspection items                                       |  | Inspection by control data   |     |                                    |    |
|        | Maintenance item                                       |  | Perform actuator test item No. A3 "Intake Throttle 1".   |     |                                    |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Transmission: neutral</li> <li>Diagnosis switch: OFF (fuse removed)</li> </ul> |     |                                    |    |
|        | Requirements   |  | Actual position matches with target value set by Multi-Use Tester (check with service data "53: Actual Intake Throttle Position").   |     |                                    |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to transient fault (See Gr00.).</td> </tr> <tr> <td>NO</td> <td>Go to step 2.</td> </tr> </table>  | YES | Go to transient fault (See Gr00.). | NO |
| YES    | Go to transient fault (See Gr00.).                     |  |  |     |                                    |    |
| NO     | Go to step 2.  |  |  |     |                                    |    |

|        |  |  |   |     |               |    |
|--------|--|--|---|-----|---------------|----|
| Step 2 | Inspection items                                       |  | Inspection of electronic drive unit connector   |     |               |    |
|        | Maintenance item                                       |  | Inspection of connector   |     |               |    |
|        | Inspection condition                                   |  | –   |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 3.</td> </tr> <tr> <td>NO</td> <td>Modify connector.</td> </tr> </table>  | YES | Go to step 3. | NO |
| YES    | Go to step 3.  |  |   |     |               |    |
| NO     | Modify connector.                                      |  |   |     |               |    |

|        |  |  |   |     |               |    |
|--------|--|--|---|-----|---------------|----|
| Step 3 | Inspection items                                       |  | Inspection of throttle actuator connector   |     |               |    |
|        | Maintenance item                                       |  | Inspection of connector   |     |               |    |
|        | Inspection condition                                   |  | –   |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 4.</td> </tr> <tr> <td>NO</td> <td>Modify connector.</td> </tr> </table>  | YES | Go to step 4. | NO |
| YES    | Go to step 4.  |  |   |     |               |    |
| NO     | Modify connector.                                      |  |   |     |               |    |

|        |  |   |  |     |   |    |               |
|--------|--|---|--|-----|---|----|---------------|
| Step 4 | Inspection items                                       |   | Inspection by control data   |     |   |    |               |
|        | Maintenance item                                       |   | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>P0685 "EDU Relay (Open)"</li> <li>P0686 "EDU Relay (Low)"</li> <li>P0687 "EDU Relay (High)"</li> </ul> |     |   |    |               |
|        | Inspection condition                                   |   | Starter switch: ON   |     |   |    |               |
|        | Requirements   |   | Codes occur.   |     |   |    |               |
|        | Inspection result (Is the judging standard satisfied?) |   | <table border="1"> <tr> <td>YES</td> <td>Inspect diagnosis code that is occurring.</td> </tr> <tr> <td>NO</td> <td>Go to step 5.</td> </tr> </table>   | YES | Inspect diagnosis code that is occurring. | NO | Go to step 5. |
|        | YES  | Inspect diagnosis code that is occurring. |  |     |   |    |               |
| NO     | Go to step 5.  |   |  |     |   |    |               |

|        |  |  |   |     |                |    |
|--------|--|--|---|-----|----------------|----|
| Step 5 | Inspection items                                       |  | Inspection of electronic drive unit connector (power supply)  |     |                |    |
|        | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 13 (+) and 14 (–).  |     |                |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Disconnect connector and measure from harness side.</li> <li>Starter switch: ON</li> <li>Perform actuator test item No. AF "EDU Relay".</li> </ul> |     |                |    |
|        | Requirements   |  | Same as battery voltage.  |     |                |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 10.</td> </tr> <tr> <td>NO</td> <td>Go to step 6.</td> </tr> </table>   | YES | Go to step 10. | NO |
| YES    | Go to step 10.   |  |   |     |                |    |
| NO     | Go to step 6.  |  |   |     |                |    |



|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between fuse and relay   |
|        | Maintenance item                                       |                 | Check circuit between fuse No. B35 and relay connector terminal No. 5.                     |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 8 | Inspection items                                       |                 | Inspection of harness between relay and electronic drive unit   |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 4 and electronic drive unit connector terminal No. 13. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of relay, go to step 9  |
| NO     |  | Modify harness. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and ground  |
|        | Maintenance item                                       |                 | Check circuit between following electronic drive unit connector terminals. <ul style="list-style-type: none"> <li>• Electronic drive unit ground: terminal No. 14 - chassis ground</li> <li>• Sensor ground: terminal No. 4 and 14</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 10.  |
| NO     |  | Modify harness. |   |

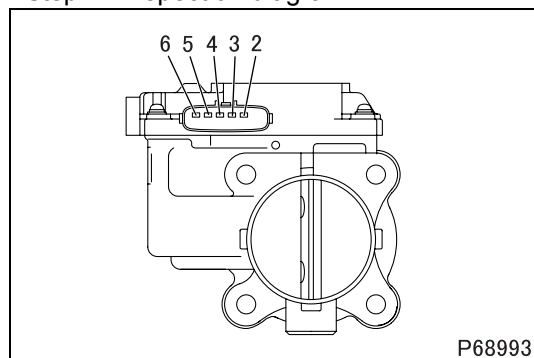
|         |  |                |   |
|---------|--|----------------|---|
| Step 10 | Inspection items                                       |                | Inspection of electronic drive unit connector (motor)                 |
|         | Maintenance item                                       |                | Measure value of resistance between connector terminal No. 10 and 11. |
|         | Inspection condition                                   |                | Disconnect connector and measure from harness side.                   |
|         | Requirements   |                | 0.3 to 80 Ω   |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 13.  |
| NO      |  | Go to step 11. |   |

# TROUBLESHOOTING

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and throttle actuator (motor)  |
|         | Maintenance item                                       |                 | Check circuit between following connector terminals.<br><ul style="list-style-type: none"> <li>Motor (1): electronic drive unit connector terminal No. 10 - throttle actuator connector terminal No. 6</li> <li>Motor (2): electronic drive unit connector terminal No. 11 - throttle actuator connector terminal No. 5</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |                                  |  |
|---------|--|----------------------------------|--|
| Step 12 | Inspection items                                       |                                  | Inspection of throttle actuator unit (motor)   |
|         | Maintenance item                                       |                                  | Measure value of resistance between connector terminal No. 5 and 6.  |
|         | Inspection condition                                   |                                  | <ul style="list-style-type: none"> <li>Keep throttle actuator installed on vehicle.</li> <li>Disconnect connector and measure throttle actuator side.</li> </ul> |
|         | Requirements   |                                  | 0.3 to 80 $\Omega$   |
|         | Inspection result (Is the judging standard satisfied?) | YES                              | Go to step 13.   |
| NO      |  | Replacement of throttle actuator |  |

<Step 12 inspection diagram>



|         |  |                |  |
|---------|--|----------------|--|
| Step 13 | Inspection items                                       |                | Inspection of throttle actuator connector (position sensor: power supply)  |
|         | Maintenance item                                       |                | Measure value of voltage between connector terminal No. 2 (+) and 4 (-).   |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|         | Requirements   |                | 5 V  |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 14.   |
| NO      |  | Go to step 15. |  |

|         |  |                |  |
|---------|--|----------------|--|
| Step 14 | Inspection items                                       |                | Inspection of electronic drive unit connector (position sensor: signal)  |
|         | Maintenance item                                       |                | Measure value of voltage between connector terminal No. 3 (+) and 4 (-).   |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> <li>Perform actuator test item No. A3 "Intake Throttle 1".</li> </ul> |
|         | Requirements   |                | <ul style="list-style-type: none"> <li>Valve fully closed: 0.5 V</li> <li>Valve fully opened: 4.375 V</li> </ul>   |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 16.   |
| NO      |  | Go to step 15. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 15 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and throttle actuator (position sensor)  |
|         | Maintenance item                                       |                 | <p>Check circuit between following connector terminals.</p> <ul style="list-style-type: none"> <li>• Sensor (power supply): electronic drive unit connector terminal No. 2 - throttle actuator connector terminal No. 2</li> <li>• Sensor (signal): electronic drive unit connector terminal No. 3 - throttle actuator connector terminal No. 3</li> <li>• Sensor (ground): electronic drive unit connector terminal No. 4 - throttle actuator connector terminal No. 4</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of throttle actuator, go to step 16  |
| NO      |  | Modify harness. |  |

|         |  |                                      |  |
|---------|--|--------------------------------------|--|
| Step 16 | Inspection items                                       |                                      | Inspection by control data   |
|         | Maintenance item                                       |                                      | Perform actuator test item No. A3 "Intake Throttle 1".   |
|         | Inspection condition                                   |                                      | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Transmission: neutral</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul> |
|         | Requirements   |                                      | Actual position matches with target value set by Multi-Use Tester (check with service data "53: Actual Intake Throttle Position").   |
|         | Inspection result (Is the judging standard satisfied?) | YES                                  | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic drive unit |  |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P2101/Flash code: 28

## **[Monitor]**

Failure of intake throttle system

## **[Fault (outline)]**

- Intake throttle valve slow response/steady state position deviation
- Circuit check

## **[Diagnosis check]**

- Throttle electronic drive unit monitors built in motor of intake throttle for sticking and sends fault information to engine electronic control unit through controller area network communication.
- Throttle electronic drive unit detects valve opening by position sensor output data and calculates target opening from such data.

## **[Code generation condition]**

Diagnosis code is generated under either of the following conditions (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition).

- Difference in valve opening between target and actual values remains more than 20 degrees for 2 seconds.
- Motor remains stuck as detected by electronic drive unit for 2 seconds.

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

- Battery voltage: in order
- Exhaust gas recirculation valve: in order
- Electronic drive unit controller area network: in order

## **[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Intake throttle actuator test is inhibited.
- Related fault check is stopped.

## **[Probable cause of trouble]**

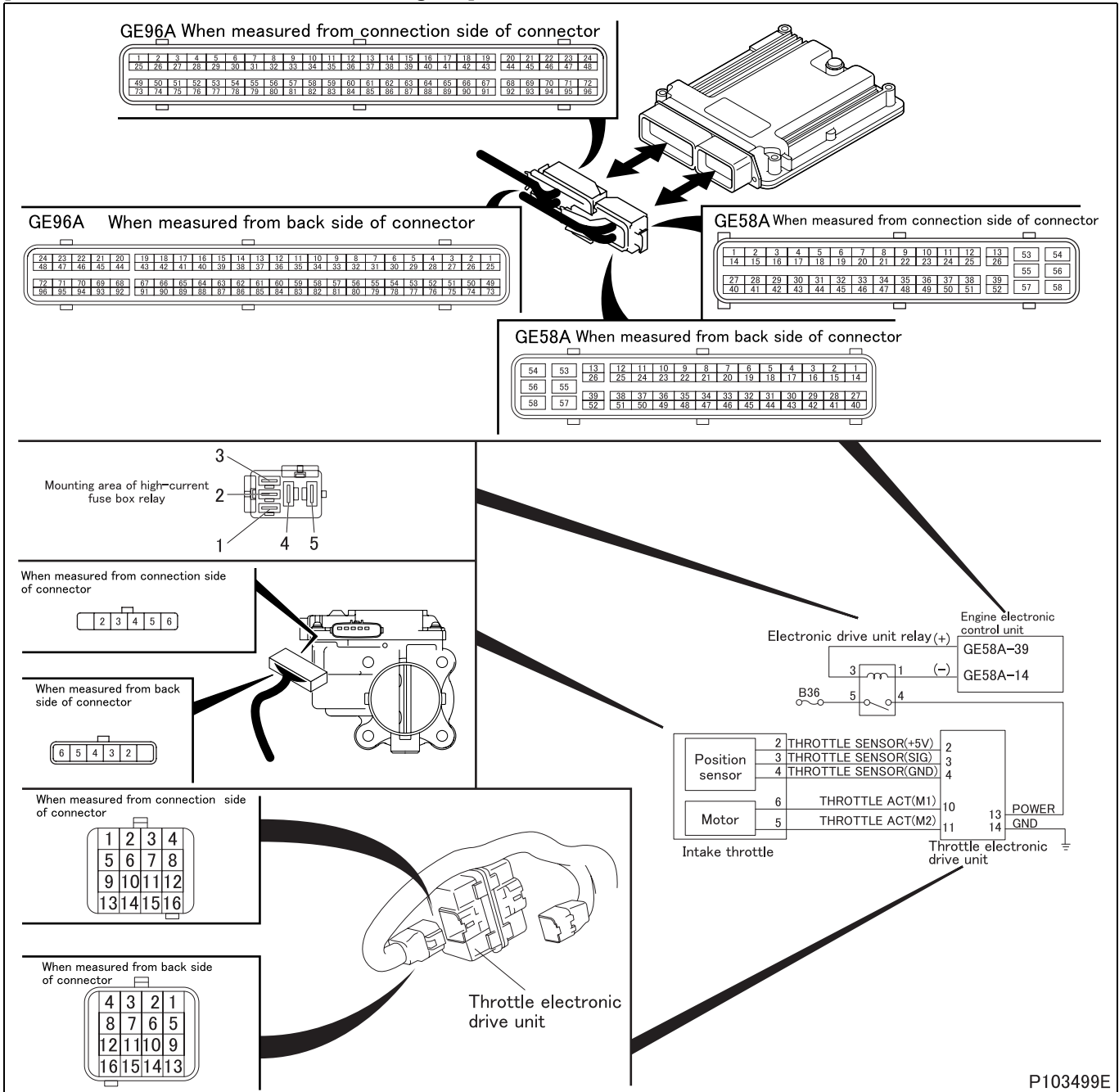
- Open-circuit or short-circuit of harness between electronic drive unit and throttle actuator
- Malfunction of each connector
- Malfunction of throttle motor (built in throttle actuator)
- Malfunction of throttle position sensor (built in throttle actuator)
- Malfunction of electronic drive unit
- Malfunction of electronic drive unit relay

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

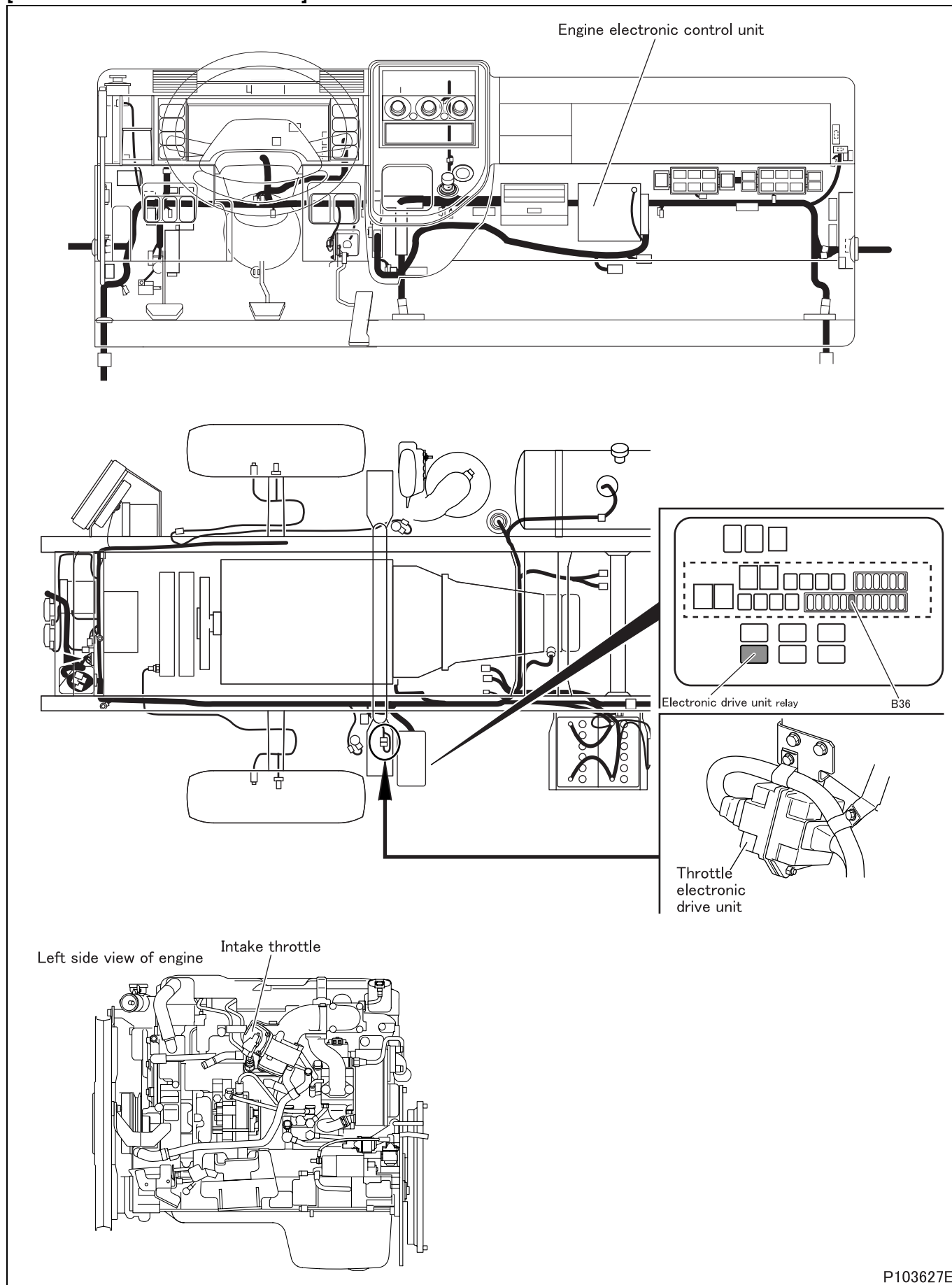
[Electronic Control Unit Connection Diagram]



P103499E

# TROUBLESHOOTING

## [Parts Identification and Location]



P103627E

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |     |                                    |    |
|--------|--|--|--|-----|------------------------------------|----|
| Step 1 | Inspection items                                       |  | Inspection by control data   |     |                                    |    |
|        | Maintenance item                                       |  | Perform actuator test item No. A3 "Intake Throttle 1".   |     |                                    |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Transmission: neutral</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul>                             |     |                                    |    |
|        | Requirements   |  | Actual position matches with target value set by Multi-Use Tester (check with service data "53: Actual Intake Throttle Position").   |     |                                    |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">YES</td> <td>Go to transient fault (See Gr00.).</td> </tr> <tr> <td style="text-align: center;">NO</td> <td>Go to step 2.</td> </tr> </table> | YES | Go to transient fault (See Gr00.). | NO |
| YES    | Go to transient fault (See Gr00.).                     |  |  |     |                                    |    |
| NO     | Go to step 2.  |  |  |     |                                    |    |

|        |  |  |   |     |               |    |
|--------|--|--|---|-----|---------------|----|
| Step 2 | Inspection items                                       |  | Inspection of electronic drive unit connector   |     |               |    |
|        | Maintenance item                                       |  | Inspection of connector   |     |               |    |
|        | Inspection condition                                   |  | –   |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul>                 |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">YES</td> <td>Go to step 3.</td> </tr> <tr> <td style="text-align: center;">NO</td> <td>Modify connector.</td> </tr> </table> | YES | Go to step 3. | NO |
| YES    | Go to step 3.  |  |   |     |               |    |
| NO     | Modify connector.                                      |  |   |     |               |    |

|        |  |  |   |     |               |    |
|--------|--|--|---|-----|---------------|----|
| Step 3 | Inspection items                                       |  | Inspection of throttle actuator connector   |     |               |    |
|        | Maintenance item                                       |  | Inspection of connector   |     |               |    |
|        | Inspection condition                                   |  | –   |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul>                 |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">YES</td> <td>Go to step 4.</td> </tr> <tr> <td style="text-align: center;">NO</td> <td>Modify connector.</td> </tr> </table> | YES | Go to step 4. | NO |
| YES    | Go to step 4.  |  |   |     |               |    |
| NO     | Modify connector.                                      |  |   |     |               |    |

|        |  |   |   |     |   |    |               |
|--------|--|---|---|-----|---|----|---------------|
| Step 4 | Inspection items                                       |   | Inspection by control data  |     |   |    |               |
|        | Maintenance item                                       |   | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0685 "EDU Relay (Open)"</li> <li>• P0686 "EDU Relay (Low)"</li> <li>• P0687 "EDU Relay (High)"</li> </ul>  |     |   |    |               |
|        | Inspection condition                                   |   | Starter switch: ON  |     |   |    |               |
|        | Requirements   |   | Codes occur.  |     |   |    |               |
|        | Inspection result (Is the judging standard satisfied?) |   | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">YES</td> <td>Inspect diagnosis code that is occurring.</td> </tr> <tr> <td style="text-align: center;">NO</td> <td>Go to step 5.</td> </tr> </table> | YES | Inspect diagnosis code that is occurring. | NO | Go to step 5. |
|        | YES  | Inspect diagnosis code that is occurring. |   |     |   |    |               |
| NO     | Go to step 5.  |   |   |     |   |    |               |

|        |  |  |  |     |                |    |
|--------|--|--|--|-----|----------------|----|
| Step 5 | Inspection items                                       |  | Inspection of electronic drive unit connector (power supply)   |     |                |    |
|        | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 13 (+) and 14 (–).   |     |                |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Disconnect connector and measure from harness side.</li> <li>• Starter switch: ON</li> <li>• Perform actuator test item No. AF "EDU Relay".</li> </ul>  |     |                |    |
|        | Requirements   |  | Same as battery voltage.   |     |                |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">YES</td> <td>Go to step 10.</td> </tr> <tr> <td style="text-align: center;">NO</td> <td>Go to step 6.</td> </tr> </table> | YES | Go to step 10. | NO |
| YES    | Go to step 10.   |  |  |     |                |    |
| NO     | Go to step 6.  |  |  |     |                |    |

# TROUBLESHOOTING

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between fuse and relay   |
|        | Maintenance item                                       |                 | Check circuit between fuse No. B35 and relay connector terminal No. 5.                     |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 8 | Inspection items                                       |                 | Inspection of harness between relay and electronic drive unit   |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 4 and electronic drive unit connector terminal No. 13. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of relay, go to step 9  |
| NO     |  | Modify harness. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and ground  |
|        | Maintenance item                                       |                 | Check circuit between following electronic drive unit connector terminals. <ul style="list-style-type: none"> <li>• Electronic drive unit ground: terminal No. 14 - chassis ground</li> <li>• Sensor ground: terminal No. 4 and 14</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 10.  |
| NO     |  | Modify harness. |   |

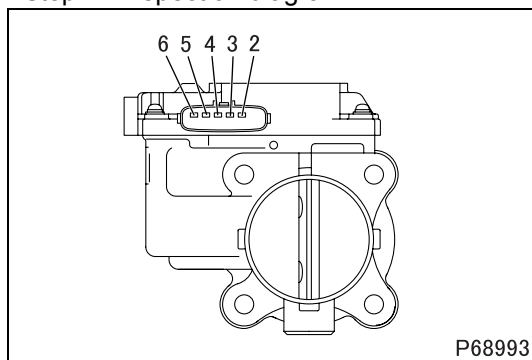
|         |  |                |   |
|---------|--|----------------|---|
| Step 10 | Inspection items                                       |                | Inspection of electronic drive unit connector (motor)                 |
|         | Maintenance item                                       |                | Measure value of resistance between connector terminal No. 10 and 11. |
|         | Inspection condition                                   |                | Disconnect connector and measure from harness side.                   |
|         | Requirements   |                | 0.3 to 80 Ω   |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 13.  |
| NO      |  | Go to step 11. |   |



|         |  |  |  |
|---------|--|--|--|
| Step 11 | Inspection items                                       |  | Inspection of harness between electronic drive unit and throttle actuator (motor)  |
|         | Maintenance item                                       |  | Check circuit between following connector terminals.<br><ul style="list-style-type: none"> <li>• Motor (1): electronic drive unit connector terminal No. 10 - throttle actuator connector terminal No. 6</li> <li>• Motor (2): electronic drive unit connector terminal No. 11 - throttle actuator connector terminal No. 5</li> </ul> |
|         | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |  | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 12.<br>NO Modify harness.   |

|         |  |  |  |
|---------|--|--|--|
| Step 12 | Inspection items                                       |  | Inspection of throttle actuator unit (motor)   |
|         | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 5 and 6.  |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Keep throttle actuator installed on vehicle.</li> <li>• Disconnect connector and measure throttle actuator side.</li> </ul> |
|         | Requirements   |  | 0.3 to 80 Ω  |
|         | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 13.<br>NO Replacement of throttle actuator  |

<Step 12 inspection diagram>



|         |  |  |  |
|---------|--|--|--|
| Step 13 | Inspection items                                       |  | Inspection of throttle actuator connector (position sensor: power supply)  |
|         | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 2 (+) and 4 (-).   |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|         | Requirements   |  | 5 V  |
|         | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 14.<br>NO Go to step 15.  |

|         |  |  |  |
|---------|--|--|--|
| Step 14 | Inspection items                                       |  | Inspection of electronic drive unit connector (position sensor: signal)  |
|         | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 3 (+) and 4 (-).   |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> <li>• Perform actuator test item No. A3 "Intake Throttle 1".</li> </ul> |
|         | Requirements   |  | <ul style="list-style-type: none"> <li>• Valve fully closed: 0.5 V</li> <li>• Valve fully opened: 4.375 V</li> </ul>   |
|         | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 16.<br>NO Go to step 15.  |

# TROUBLESHOOTING

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 15 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and throttle actuator (position sensor)   |
|         | Maintenance item                                       |                 | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Sensor (power supply): electronic drive unit connector terminal No. 2 - throttle actuator connector terminal No. 2</li> <li>• Sensor (signal): electronic drive unit connector terminal No. 3 - throttle actuator connector terminal No. 3</li> <li>• Sensor (ground): electronic drive unit connector terminal No. 4 - throttle actuator connector terminal No. 4</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of throttle actuator, go to step 16   |
| NO      |  | Modify harness. |   |

|         |  |                                      |  |
|---------|--|--------------------------------------|--|
| Step 16 | Inspection items                                       |                                      | Inspection by control data   |
|         | Maintenance item                                       |                                      | Perform actuator test item No. A3 "Intake Throttle 1".   |
|         | Inspection condition                                   |                                      | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Transmission: neutral</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul> |
|         | Requirements   |                                      | Actual position matches with target value set by Multi-Use Tester (check with service data "53: Actual Intake Throttle Position").   |
|         | Inspection result (Is the judging standard satisfied?) | YES                                  | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic drive unit |  |

**[Fault code]**

Diagnosis code: P2102/Flash code: 28

**[Monitor]**

Failure of intake throttle system

**[Fault (outline)]**

Circuit check

**[Diagnosis check]**

- Throttle electronic drive unit monitors built in motor of intake throttle for circuit fault and sends fault information to engine electronic control unit through controller area network communication.
- Monitoring by throttle electronic drive unit is performed from internal current detection circuit.

**[Code generation condition]**

- Motor circuit remains short as detected by electronic drive unit for 2 seconds. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

- Controller area network communication in order

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Intake throttle actuator test is inhibited.
- Related fault check is stopped.

**[Probable cause of trouble]**

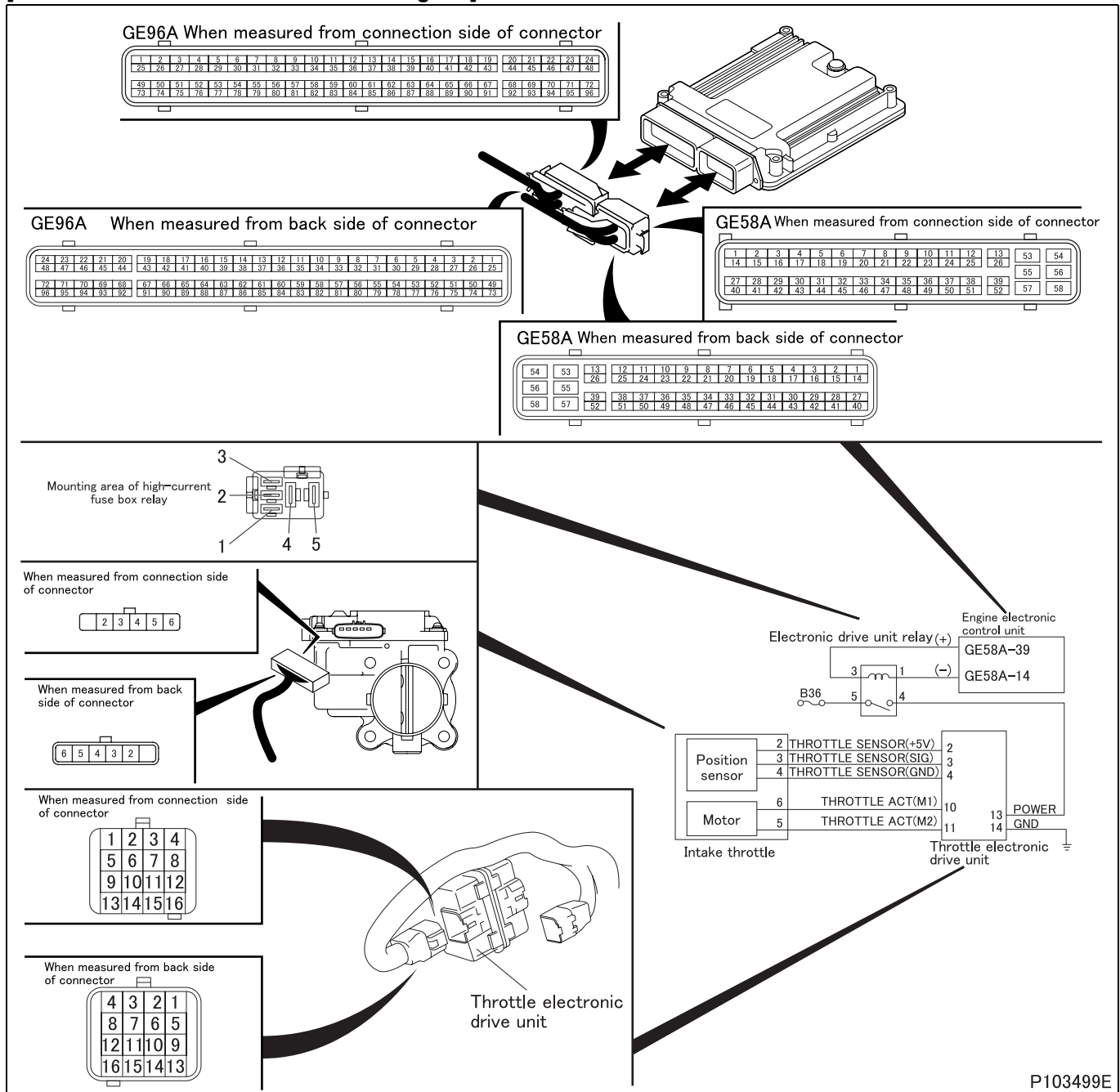
- Open-circuit or short-circuit of harness between electronic drive unit and throttle actuator
- Malfunction of each connector
- Malfunction of throttle motor (built in throttle actuator)
- Malfunction of throttle position sensor (built in throttle actuator)
- Malfunction of electronic drive unit
- Malfunction of electronic drive unit relay

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

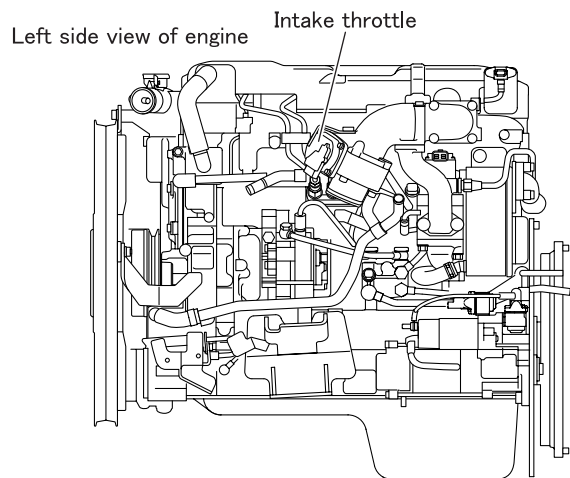
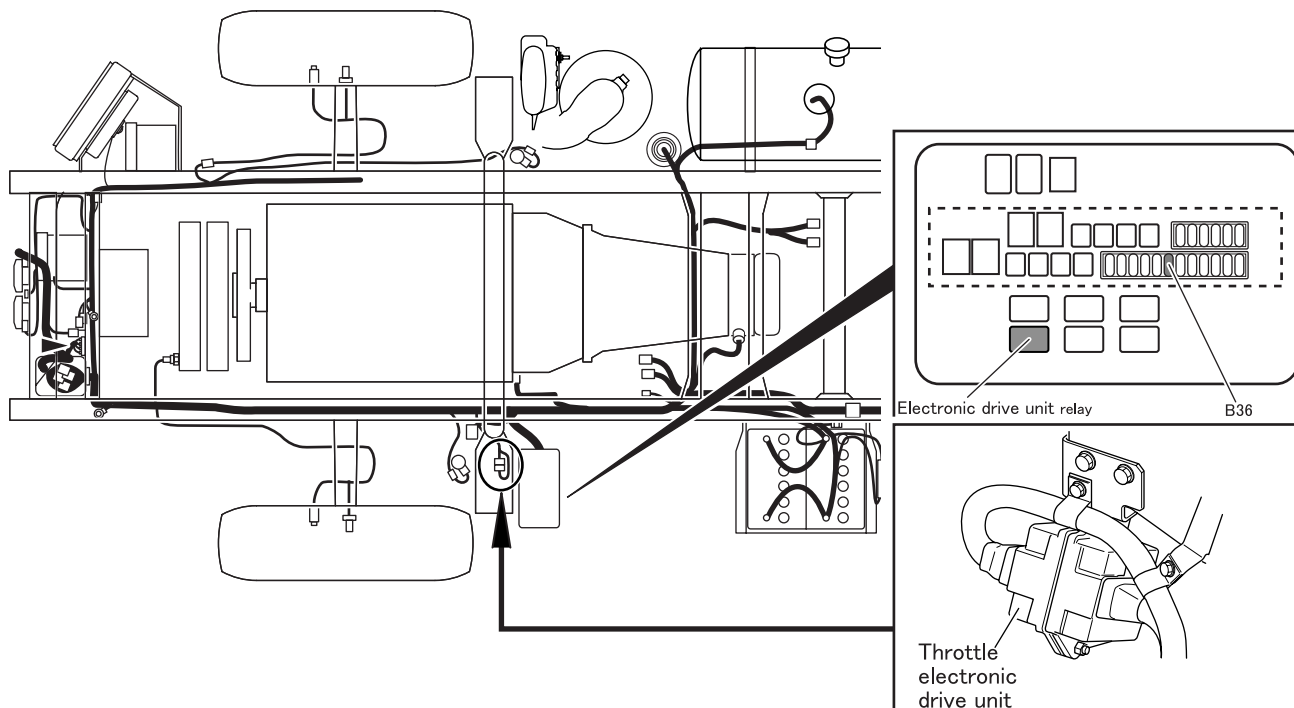
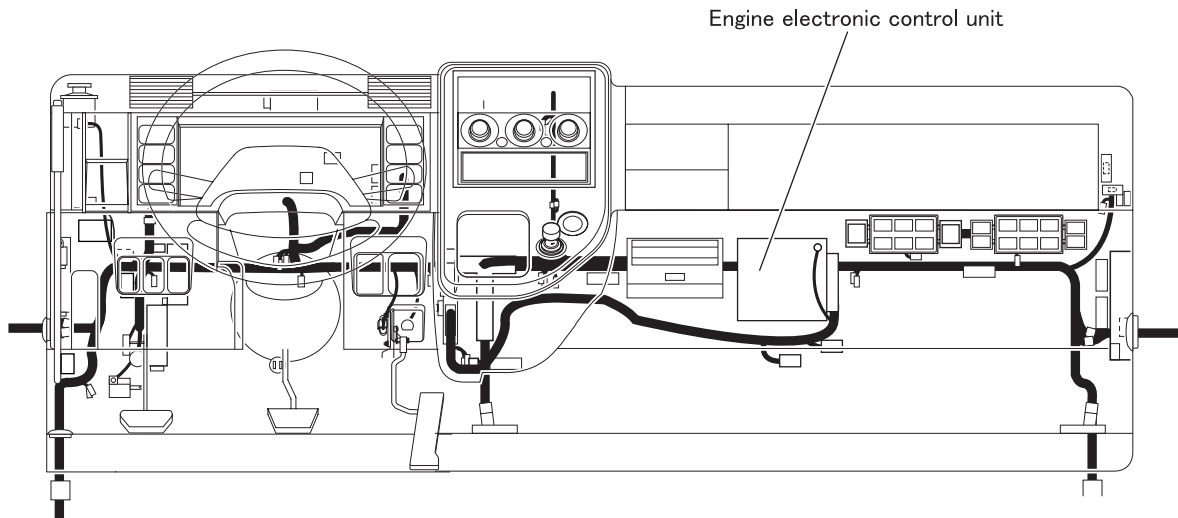
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P103499E

[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |     |                                    |    |
|--------|--|--|--|-----|------------------------------------|----|
| Step 1 | Inspection items                                       |  | Inspection by control data   |     |                                    |    |
|        | Maintenance item                                       |  | Perform actuator test item No. A3 "Intake Throttle 1".   |     |                                    |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Transmission: neutral</li> <li>Diagnosis switch: OFF (fuse removed)</li> </ul> |     |                                    |    |
|        | Requirements   |  | Actual position matches with target value set by Multi-Use Tester (check with service data "53: Actual Intake Throttle Position").   |     |                                    |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to transient fault (See Gr00.).</td> </tr> <tr> <td>NO</td> <td>Go to step 2.</td> </tr> </table>  | YES | Go to transient fault (See Gr00.). | NO |
| YES    | Go to transient fault (See Gr00.).                     |  |  |     |                                    |    |
| NO     | Go to step 2.  |  |  |     |                                    |    |

|        |  |  |   |     |               |    |
|--------|--|--|---|-----|---------------|----|
| Step 2 | Inspection items                                       |  | Inspection of electronic drive unit connector   |     |               |    |
|        | Maintenance item                                       |  | Inspection of connector   |     |               |    |
|        | Inspection condition                                   |  | –   |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 3.</td> </tr> <tr> <td>NO</td> <td>Modify connector.</td> </tr> </table>  | YES | Go to step 3. | NO |
| YES    | Go to step 3.  |  |   |     |               |    |
| NO     | Modify connector.                                      |  |   |     |               |    |

|        |  |  |   |     |               |    |
|--------|--|--|---|-----|---------------|----|
| Step 3 | Inspection items                                       |  | Inspection of throttle actuator connector   |     |               |    |
|        | Maintenance item                                       |  | Inspection of connector   |     |               |    |
|        | Inspection condition                                   |  | –   |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 4.</td> </tr> <tr> <td>NO</td> <td>Modify connector.</td> </tr> </table>  | YES | Go to step 4. | NO |
| YES    | Go to step 4.  |  |   |     |               |    |
| NO     | Modify connector.                                      |  |   |     |               |    |

|        |  |   |  |     |   |    |               |
|--------|--|---|--|-----|---|----|---------------|
| Step 4 | Inspection items                                       |   | Inspection by control data   |     |   |    |               |
|        | Maintenance item                                       |   | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>P0685 "EDU Relay (Open)"</li> <li>P0686 "EDU Relay (Low)"</li> <li>P0687 "EDU Relay (High)"</li> </ul> |     |   |    |               |
|        | Inspection condition                                   |   | Starter switch: ON   |     |   |    |               |
|        | Requirements   |   | Codes occur.   |     |   |    |               |
|        | Inspection result (Is the judging standard satisfied?) |   | <table border="1"> <tr> <td>YES</td> <td>Inspect diagnosis code that is occurring.</td> </tr> <tr> <td>NO</td> <td>Go to step 5.</td> </tr> </table>   | YES | Inspect diagnosis code that is occurring. | NO | Go to step 5. |
|        | YES  | Inspect diagnosis code that is occurring. |  |     |   |    |               |
| NO     | Go to step 5.  |   |  |     |   |    |               |

|        |  |  |   |     |                |    |
|--------|--|--|---|-----|----------------|----|
| Step 5 | Inspection items                                       |  | Inspection of electronic drive unit connector (power supply)  |     |                |    |
|        | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 13 (+) and 14 (–).  |     |                |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Disconnect connector and measure from harness side.</li> <li>Starter switch: ON</li> <li>Perform actuator test item No. AF "EDU Relay".</li> </ul> |     |                |    |
|        | Requirements   |  | Same as battery voltage.  |     |                |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 10.</td> </tr> <tr> <td>NO</td> <td>Go to step 6.</td> </tr> </table>   | YES | Go to step 10. | NO |
| YES    | Go to step 10.   |  |   |     |                |    |
| NO     | Go to step 6.  |  |   |     |                |    |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between fuse and relay   |
|        | Maintenance item                                       |                 | Check circuit between fuse No. B35 and relay connector terminal No. 5.                     |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 8 | Inspection items                                       |                 | Inspection of harness between relay and electronic drive unit   |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 4 and electronic drive unit connector terminal No. 13. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of relay, go to step 9  |
| NO     |  | Modify harness. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and ground  |
|        | Maintenance item                                       |                 | Check circuit between following electronic drive unit connector terminals. <ul style="list-style-type: none"> <li>• Electronic drive unit ground: terminal No. 14 - chassis ground</li> <li>• Sensor ground: terminal No. 4 and 14</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 10.  |
| NO     |  | Modify harness. |   |

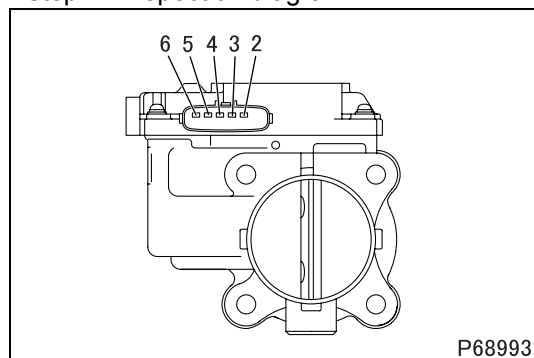
|         |  |                |   |
|---------|--|----------------|---|
| Step 10 | Inspection items                                       |                | Inspection of electronic drive unit connector (motor)                 |
|         | Maintenance item                                       |                | Measure value of resistance between connector terminal No. 10 and 11. |
|         | Inspection condition                                   |                | Disconnect connector and measure from harness side.                   |
|         | Requirements   |                | 0.3 to 80 Ω   |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 13.  |
| NO      |  | Go to step 11. |   |

# TROUBLESHOOTING

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and throttle actuator (motor)  |
|         | Maintenance item                                       |                 | Check circuit between following connector terminals.<br><ul style="list-style-type: none"> <li>• Motor (1): electronic drive unit connector terminal No. 10 - throttle actuator connector terminal No. 6</li> <li>• Motor (2): electronic drive unit connector terminal No. 11 - throttle actuator connector terminal No. 5</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |                                  |  |
|---------|--|----------------------------------|--|
| Step 12 | Inspection items                                       |                                  | Inspection of throttle actuator unit (motor)   |
|         | Maintenance item                                       |                                  | Measure value of resistance between connector terminal No. 5 and 6.  |
|         | Inspection condition                                   |                                  | <ul style="list-style-type: none"> <li>• Keep throttle actuator installed on vehicle.</li> <li>• Disconnect connector and measure throttle actuator side.</li> </ul> |
|         | Requirements   |                                  | 0.3 to 80 $\Omega$   |
|         | Inspection result (Is the judging standard satisfied?) | YES                              | Go to step 13.   |
| NO      |  | Replacement of throttle actuator |  |

<Step 12 inspection diagram>



|         |  |                |  |
|---------|--|----------------|--|
| Step 13 | Inspection items                                       |                | Inspection of throttle actuator connector (position sensor: power supply)  |
|         | Maintenance item                                       |                | Measure value of voltage between connector terminal No. 2 (+) and 4 (-).   |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|         | Requirements   |                | 5 V  |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 14.   |
| NO      |  | Go to step 15. |  |

|         |  |                |  |
|---------|--|----------------|--|
| Step 14 | Inspection items                                       |                | Inspection of electronic drive unit connector (position sensor: signal)  |
|         | Maintenance item                                       |                | Measure value of voltage between connector terminal No. 3 (+) and 4 (-).   |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> <li>• Perform actuator test item No. A3 "Intake Throttle 1".</li> </ul> |
|         | Requirements   |                | <ul style="list-style-type: none"> <li>• Valve fully closed: 0.5 V</li> <li>• Valve fully opened: 4.375 V</li> </ul>   |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 16.   |
| NO      |  | Go to step 15. |  |



|         |  |                 |  |
|---------|--|-----------------|--|
| Step 15 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and throttle actuator (position sensor)  |
|         | Maintenance item                                       |                 | <p>Check circuit between following connector terminals.</p> <ul style="list-style-type: none"> <li>• Sensor (power supply): electronic drive unit connector terminal No. 2 - throttle actuator connector terminal No. 2</li> <li>• Sensor (signal): electronic drive unit connector terminal No. 3 - throttle actuator connector terminal No. 3</li> <li>• Sensor (ground): electronic drive unit connector terminal No. 4 - throttle actuator connector terminal No. 4</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of throttle actuator, go to step 16  |
| NO      |  | Modify harness. |  |

|         |  |                                      |  |
|---------|--|--------------------------------------|--|
| Step 16 | Inspection items                                       |                                      | Inspection by control data   |
|         | Maintenance item                                       |                                      | Perform actuator test item No. A3 "Intake Throttle 1".   |
|         | Inspection condition                                   |                                      | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Transmission: neutral</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul> |
|         | Requirements   |                                      | Actual position matches with target value set by Multi-Use Tester (check with service data "53: Actual Intake Throttle Position").   |
|         | Inspection result (Is the judging standard satisfied?) | YES                                  | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic drive unit |  |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P2108/Flash code: 28

## **[Monitor]**

Failure of intake throttle system

## **[Fault (outline)]**

Plausibility

## **[Diagnosis check]**

- Degree of intake throttle butterfly valve opening is detected through position sensor as actual stop opening and compared with target opening for control by engine electronic control unit.

## **[Code generation condition]**

- Target valve position calculated by engine electronic control unit remains out of specified limits (upper limit: 90 degrees, lower limit: 6 degrees) for 1 second. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

- Controller area network communication in order

## **[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Intake throttle actuator test is inhibited.
- Related fault check is stopped.

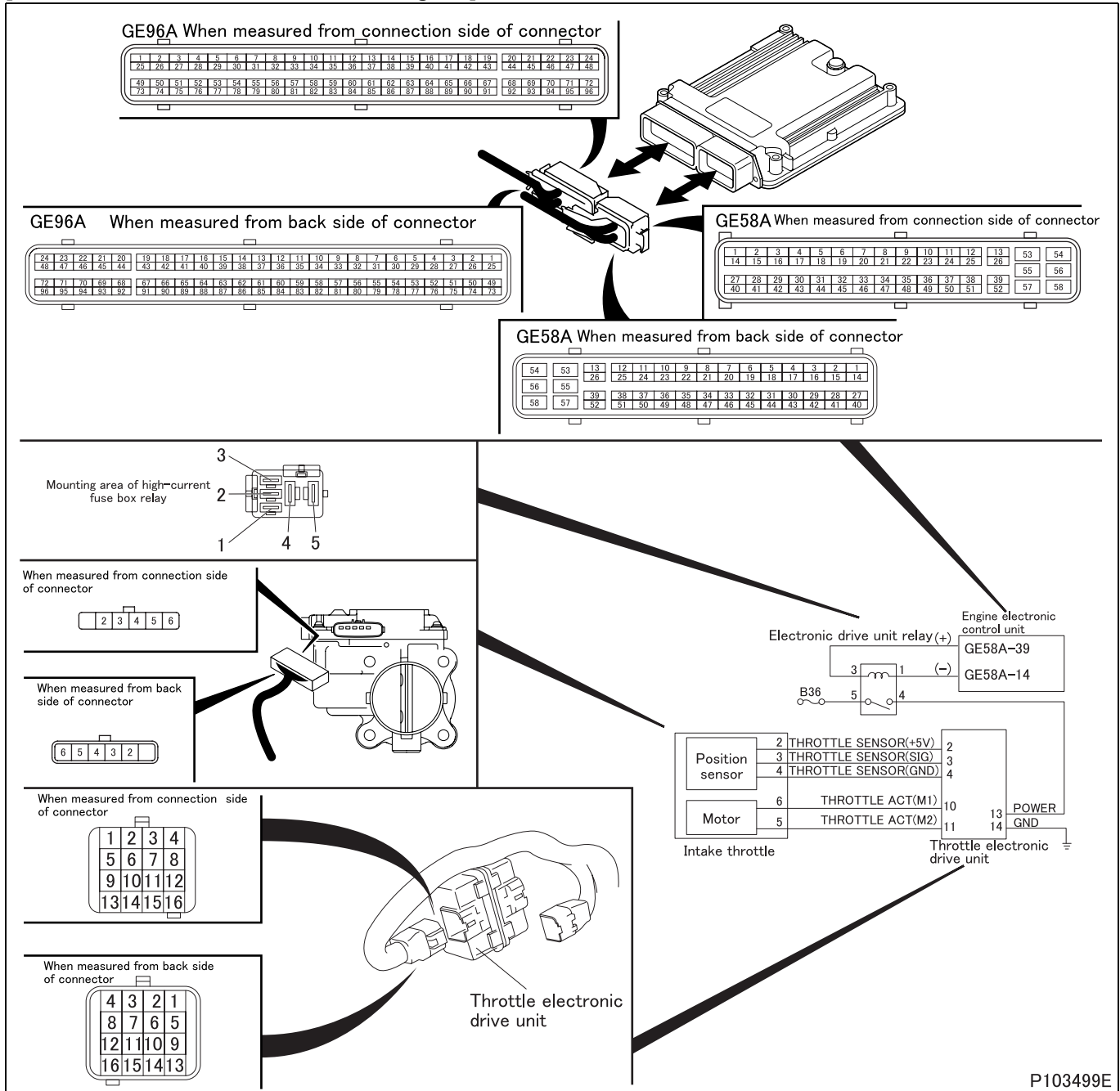
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic drive unit and throttle actuator
- Malfunction of each connector
- Malfunction of throttle motor (built in throttle actuator)
- Malfunction of throttle position sensor (built in throttle actuator)
- Malfunction of electronic drive unit
- Malfunction of electronic drive unit relay

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

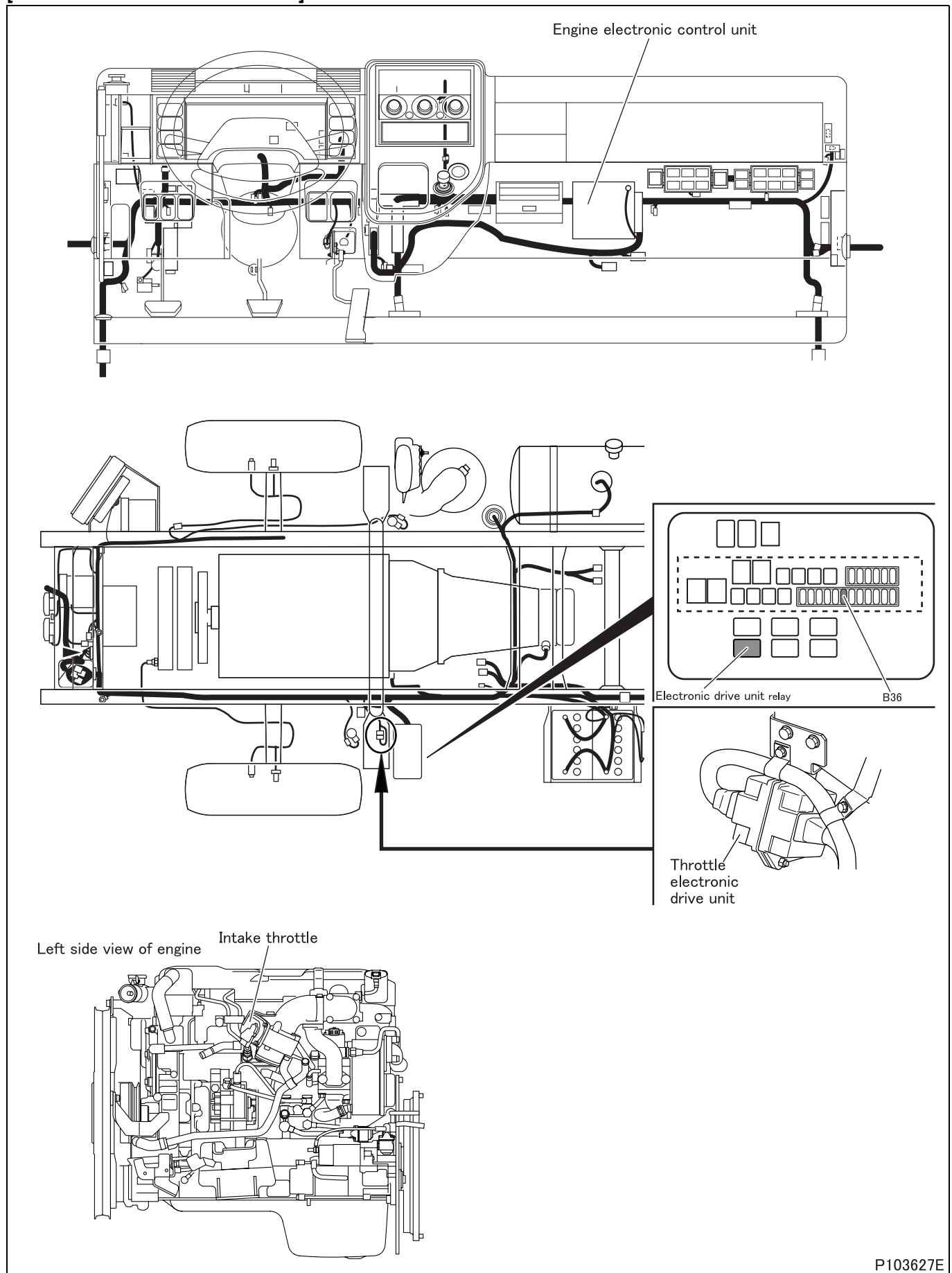
[Electronic Control Unit Connection Diagram]



P103499E

# TROUBLESHOOTING

## [Parts Identification and Location]



P103627E

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | Perform actuator test item No. A3 "Intake Throttle 1".   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Transmission: neutral</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul> |
|        | Requirements   |               | Actual position matches with target value set by Multi-Use Tester (check with service data "53: Actual Intake Throttle Position").   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic drive unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of throttle actuator connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

|        |  |     |  |  |
|--------|--|-----|--|--|
| Step 4 | Inspection items                                       |     | Inspection by control data   |  |
|        | Maintenance item                                       |     | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>• P0685 "EDU Relay (Open)"</li> <li>• P0686 "EDU Relay (Low)"</li> <li>• P0687 "EDU Relay (High)"</li> </ul> |  |
|        | Inspection condition                                   |     | Starter switch: ON   |  |
|        | Requirements   |     | Codes occur.   |  |
|        | Inspection result (Is the judging standard satisfied?) | YES | Inspect diagnosis code that is occurring.  |  |
|        |  | NO  | Go to step 5.  |  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 5 | Inspection items                                       |               | Inspection of electronic drive unit connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector terminal No. 13 (+) and 14 (–).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Disconnect connector and measure from harness side.</li> <li>• Starter switch: ON</li> <li>• Perform actuator test item No. AF "EDU Relay".</li> </ul> |
|        | Requirements   |               | Same as battery voltage.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 10.  |
| NO     |  | Go to step 6. |   |

# TROUBLESHOOTING

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between fuse and relay   |
|        | Maintenance item                                       |                 | Check circuit between fuse No. B35 and relay connector terminal No. 5.                     |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 8 | Inspection items                                       |                 | Inspection of harness between relay and electronic drive unit   |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 4 and electronic drive unit connector terminal No. 13. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of relay, go to step 9  |
| NO     |  | Modify harness. |   |

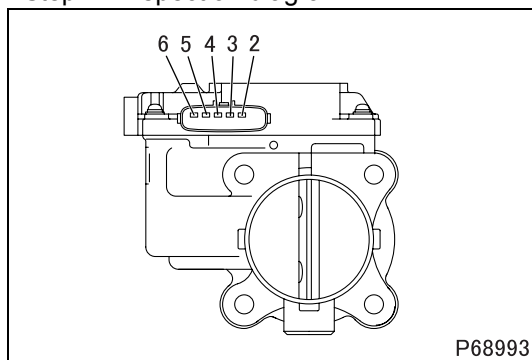
|        |  |                 |   |
|--------|--|-----------------|---|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and ground  |
|        | Maintenance item                                       |                 | Check circuit between following electronic drive unit connector terminals. <ul style="list-style-type: none"> <li>Electronic drive unit ground: terminal No. 14 - chassis ground</li> <li>Sensor ground: terminal No. 4 and 14</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 10.  |
| NO     |  | Modify harness. |   |

|         |  |                |   |
|---------|--|----------------|---|
| Step 10 | Inspection items                                       |                | Inspection of electronic drive unit connector (motor)                 |
|         | Maintenance item                                       |                | Measure value of resistance between connector terminal No. 10 and 11. |
|         | Inspection condition                                   |                | Disconnect connector and measure from harness side.                   |
|         | Requirements   |                | 0.3 to 80 Ω   |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 13.  |
| NO      |  | Go to step 11. |   |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and throttle actuator (motor)  |
|         | Maintenance item                                       |                 | Check circuit between following connector terminals.<br><ul style="list-style-type: none"> <li>• Motor (1): electronic drive unit connector terminal No. 10 - throttle actuator connector terminal No. 6</li> <li>• Motor (2): electronic drive unit connector terminal No. 11 - throttle actuator connector terminal No. 5</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |                                  |  |
|---------|--|----------------------------------|--|
| Step 12 | Inspection items                                       |                                  | Inspection of throttle actuator unit (motor)   |
|         | Maintenance item                                       |                                  | Measure value of resistance between connector terminal No. 5 and 6.  |
|         | Inspection condition                                   |                                  | <ul style="list-style-type: none"> <li>• Keep throttle actuator installed on vehicle.</li> <li>• Disconnect connector and measure throttle actuator side.</li> </ul> |
|         | Requirements   |                                  | 0.3 to 80 Ω  |
|         | Inspection result (Is the judging standard satisfied?) | YES                              | Go to step 13.   |
| NO      |  | Replacement of throttle actuator |  |

<Step 12 inspection diagram>



|         |  |                |  |
|---------|--|----------------|--|
| Step 13 | Inspection items                                       |                | Inspection of throttle actuator connector (position sensor: power supply)  |
|         | Maintenance item                                       |                | Measure value of voltage between connector terminal No. 2 (+) and 4 (-).   |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|         | Requirements   |                | 5 V  |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 14.   |
| NO      |  | Go to step 15. |  |

|         |  |                |  |
|---------|--|----------------|--|
| Step 14 | Inspection items                                       |                | Inspection of electronic drive unit connector (position sensor: signal)  |
|         | Maintenance item                                       |                | Measure value of voltage between connector terminal No. 3 (+) and 4 (-).   |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> <li>• Perform actuator test item No. A3 "Intake Throttle 1".</li> </ul> |
|         | Requirements   |                | <ul style="list-style-type: none"> <li>• Valve fully closed: 0.5 V</li> <li>• Valve fully opened: 4.375 V</li> </ul>   |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 16.   |
| NO      |  | Go to step 15. |  |

# TROUBLESHOOTING

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 15 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and throttle actuator (position sensor)   |
|         | Maintenance item                                       |                 | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Sensor (power supply): electronic drive unit connector terminal No. 2 - throttle actuator connector terminal No. 2</li> <li>• Sensor (signal): electronic drive unit connector terminal No. 3 - throttle actuator connector terminal No. 3</li> <li>• Sensor (ground): electronic drive unit connector terminal No. 4 - throttle actuator connector terminal No. 4</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of throttle actuator, go to step 16   |
| NO      |  | Modify harness. |   |

|         |  |                                      |  |
|---------|--|--------------------------------------|--|
| Step 16 | Inspection items                                       |                                      | Inspection by control data   |
|         | Maintenance item                                       |                                      | Perform actuator test item No. A3 "Intake Throttle 1".   |
|         | Inspection condition                                   |                                      | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Transmission: neutral</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul> |
|         | Requirements   |                                      | Actual position matches with target value set by Multi-Use Tester (check with service data "53: Actual Intake Throttle Position").   |
|         | Inspection result (Is the judging standard satisfied?) | YES                                  | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic drive unit |  |



**[Fault code]**

Diagnosis code: P2120/Flash code: 65

**[Monitor]**

Failure of accelerator pedal switch

**[Fault (outline)]**

Plausibility

**[Diagnosis check]**

- Pedal depressing angle output from accelerator pedal position sensor is monitored for abnormality in ON/OFF status of accelerator switch.

**[Code generation condition]**

- Accelerator switch remains OFF for 1 second at 30% depression of accelerator pedal. (Diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Effects no special control.

**[Probable cause of trouble]**

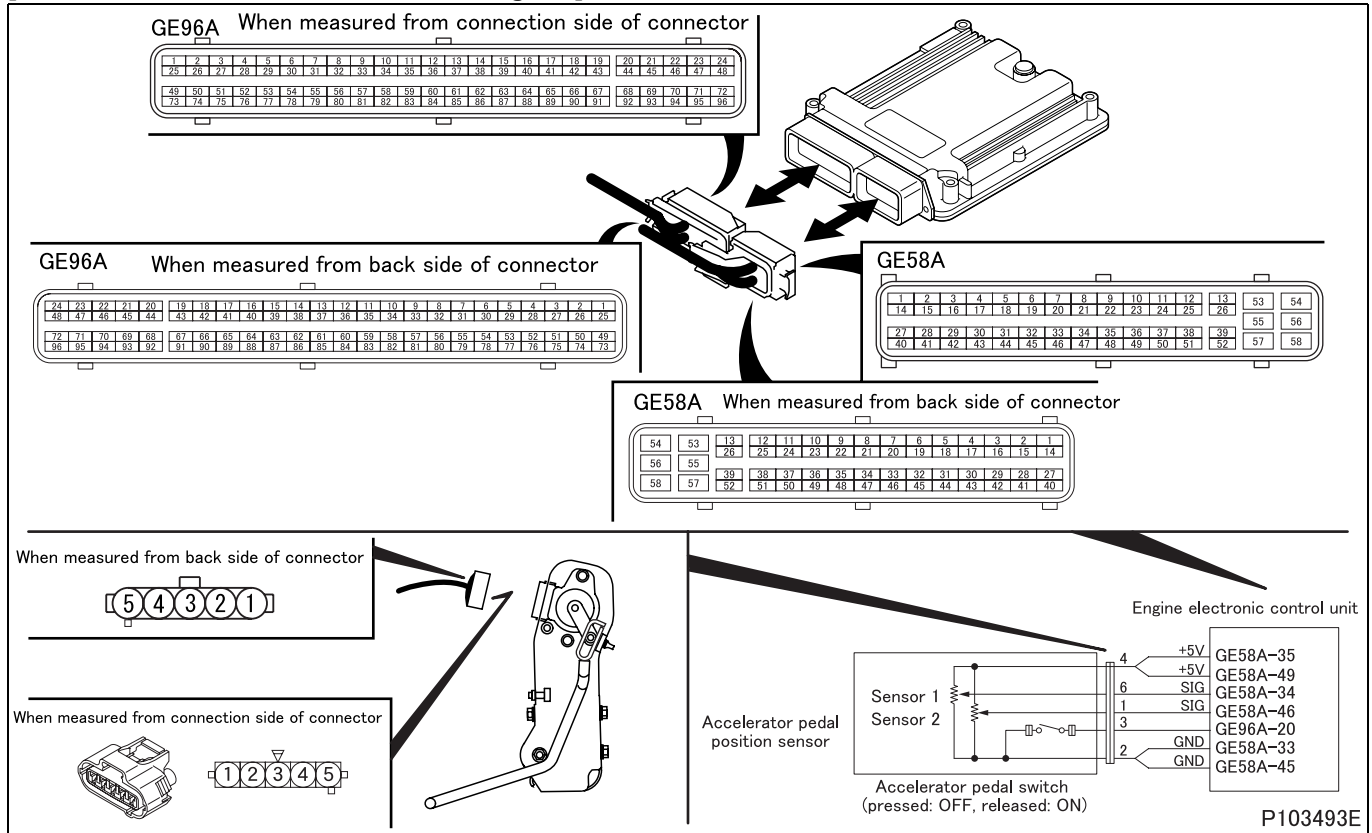
- Open-circuit or short-circuit of harness between electronic control unit and accelerator pedal position sensor (switch)
- Malfunction of each connector
- Malfunction of accelerator pedal position sensor (switch)
- Malfunction of electronic control unit

**[Recoverability]**

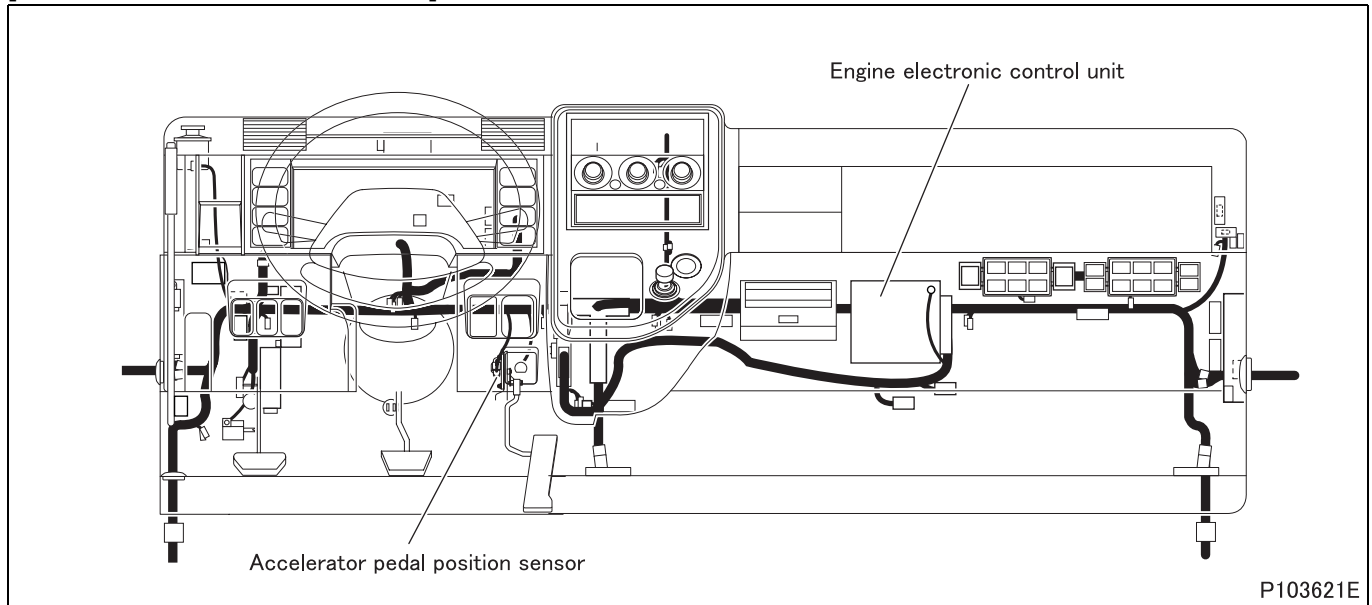
- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | Measure item No. A2 "Accel SW" of Service Data.  |
|        | Inspection condition                                   |               | —  |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• Accelerator pedal released: ON</li> <li>• Accelerator pedal pressed: OFF</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

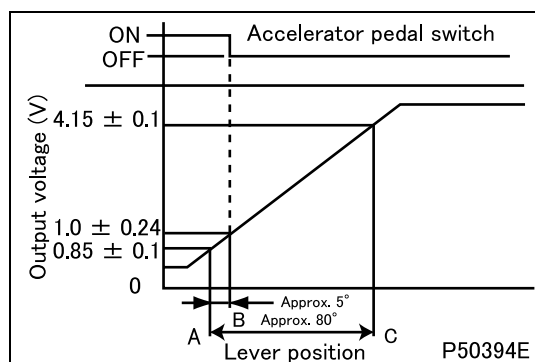
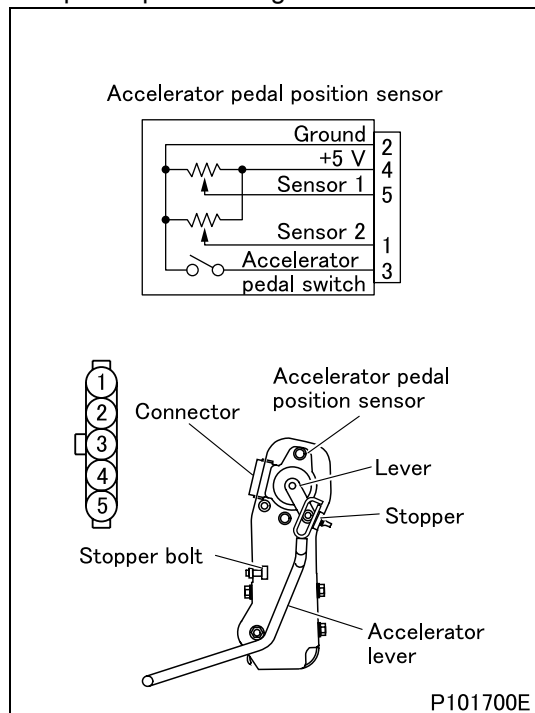
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | —   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of accelerator switch connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | —   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 4 | Inspection items                                       |  | Inspection of accelerator switch unit  |     |               |    |
|        | Maintenance item                                       |  | Check continuity between connector terminal No. 2 and 3.   |     |               |    |
|        | Inspection condition                                   |  | Disconnect connector and measure switch side.  |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Accelerator pedal released: There is continuity.</li> <li>Accelerator pedal pressed: There is no continuity.</li> </ul> |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 5.</td> </tr> <tr> <td>NO</td> <td>Adjustment of accelerator pedal position sensor</td> </tr> </table>     | YES | Go to step 5. | NO |
| YES    | Go to step 5.  |  |  |     |               |    |
| NO     | Adjustment of accelerator pedal position sensor        |  |  |     |               |    |

<Step 4 inspection diagram>



|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 5 | Inspection items                                       |  | Inspection of harness (power supply)   |     |               |    |
|        | Maintenance item                                       |  | Check circuit between accelerator switch connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 20. |     |               |    |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                                       |     |               |    |
|        | Requirements   |  | There is continuity.   |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 6.</td> </tr> <tr> <td>NO</td> <td>Modify harness.</td> </tr> </table>       | YES | Go to step 6. | NO |
| YES    | Go to step 6.  |  |  |     |               |    |
| NO     | Modify harness.  |  |  |     |               |    |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness (ground)   |
|        | Maintenance item                                       |                 | Check circuit between accelerator switch connector terminal No. 2 and electronic control unit connector (GE58A) terminal No. 33 or 45. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |  |  |
|--------|--|--|--|
| Step 7 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Measure item No. A2 "Accel SW" of Service Data.  |
|        | Inspection condition                                   |  | –  |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Accelerator pedal released: ON</li> <li>• Accelerator pedal pressed: OFF</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO     |  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

---

## [Fault code]

Diagnosis code: P2135/Flash code: 16, 24, 58

## [Monitor]

Failure of accelerator pedal position sensors (1 and 2)

## [Fault (outline)]

Gain and offset drift

## [Diagnosis check]

- Difference in output voltage between accelerator pedal position sensors 1 and 2 is monitored for deviation from specified value.

## [Code generation condition]

- Difference in output voltage between accelerator pedal position sensors 1 and 2 remains more than 10% out of specification for 6 seconds. (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

## [Diagnosis check timing]

- Fault diagnosis is continuously performed during the driving cycle.

## [Diagnostic requirement]

—

## [Control effected by electronic control unit during fault]

Electronic control unit differs in the way of control by the diagnosis check item.

<Accelerator pedal position sensor 1>

- Accelerator pedal position sensor 2 is computed with accelerator pedal position sensor 1 only.
- In-use performance counter is stopped.
- Related fault check is stopped.

<Accelerator pedal position sensor 2>

- Accelerator pedal position sensor 1 is computed with accelerator pedal position sensor 2 only.
- In-use performance counter is stopped.
- Related fault check is stopped.

<Accelerator pedal position sensors 1 and 2>

- Related fault check is stopped.

## [Probable cause of trouble]

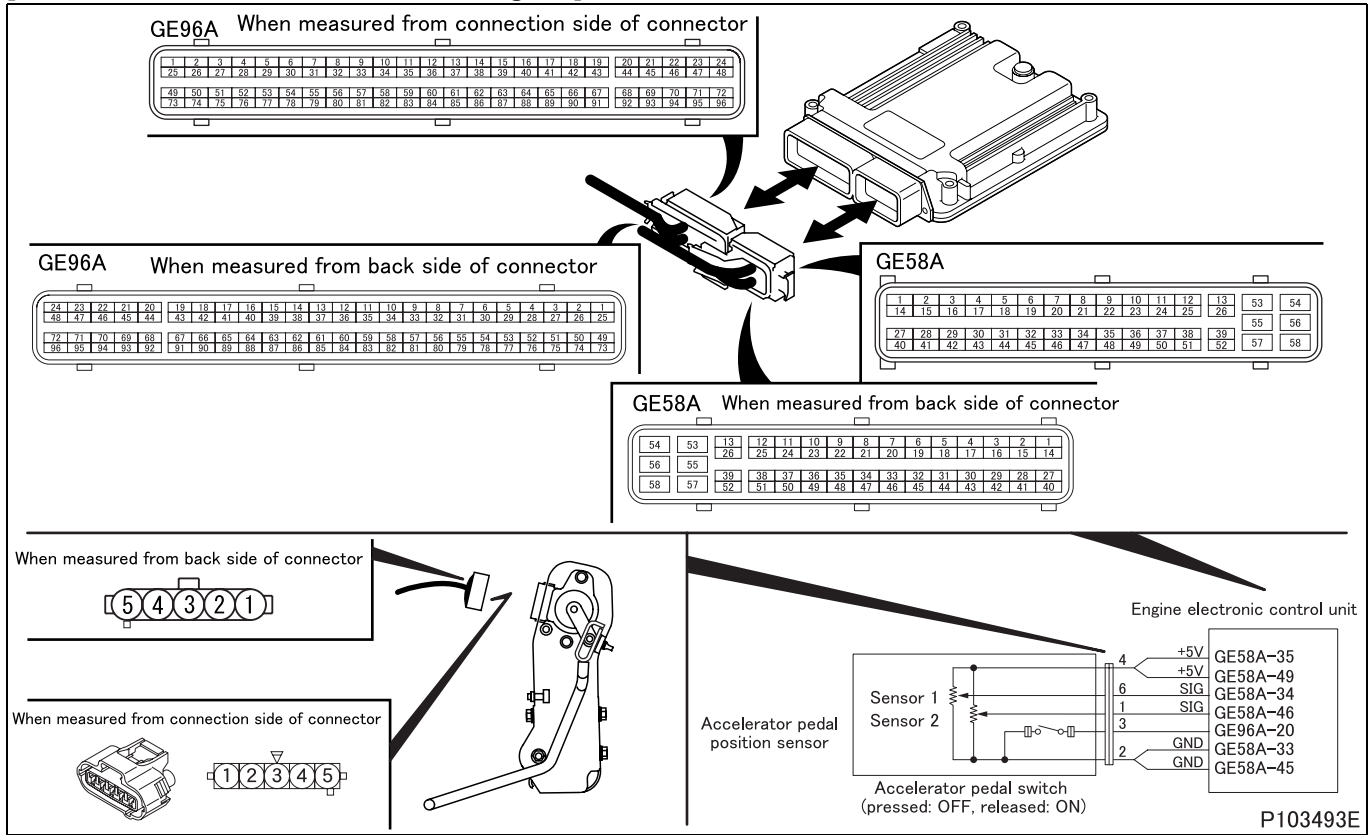
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

## [Recoverability]

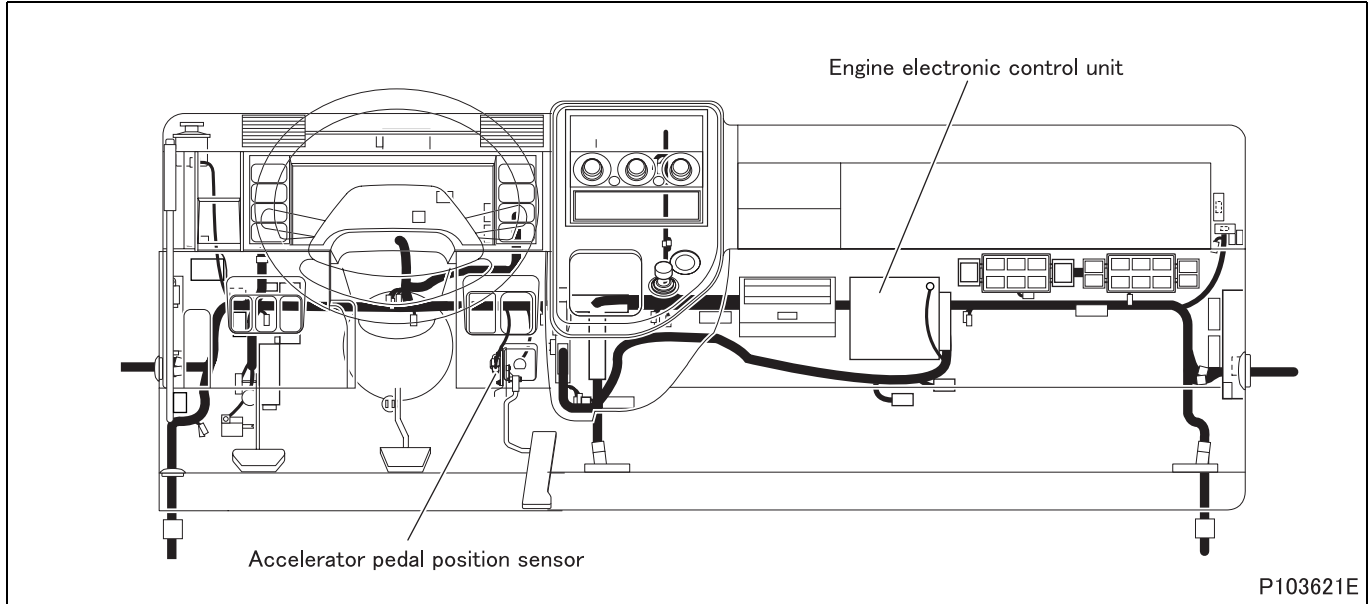
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|  |                      |     |  |
|--|----------------------|-----|--|
| Step 1   | Inspection items     |     | Inspection by control data   |
|  | Maintenance item     |     | <b>&lt;General Scanning Tool used&gt;</b><br>Measurement of following service data <ul style="list-style-type: none"> <li>Sensor 1: Item "Accelerator Pedal Position 1"</li> <li>Sensor 2: Item "Accelerator Pedal Position 2"</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br>Measurement of following service data <ul style="list-style-type: none"> <li>Sensor 1: Item No. 40 "Accelerator sensor voltage 1".</li> <li>Sensor 2: Item No. 41 "Accelerator sensor voltage 2".</li> </ul> |
|  | Inspection condition |     | —  |
|  | Requirements         |     | <b>&lt;General Scanning Tool used&gt;</b> <ul style="list-style-type: none"> <li>Accelerator pedal released: 0%</li> <li>Accelerator pedal pressed: 100%</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b> <ul style="list-style-type: none"> <li>Accelerator pedal released: <math>0.85 \pm 0.1</math> V</li> <li>Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul>   |
| Inspection result (Is the judging standard satisfied?) |                      | YES | Go to transient fault (See Gr00.).   |
|  |                      | NO  | Go to step 2.  |

|        |  |    |  |
|--------|--|----|--|
| Step 2 | Inspection items                                       |    | Inspection by electronic control unit connector (signal)   |
|        | Maintenance item                                       |    | Measure values of voltage between following connector (GE58A) terminals <ul style="list-style-type: none"> <li>Sensor 1: 34 (+) - 33 (-)</li> <li>Sensor 2: 46 (+) - 45 (-)</li> </ul> |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul>                       |
|        | Requirements   |    | <ul style="list-style-type: none"> <li>Accelerator pedal released: <math>0.85 \pm 0.1</math> V</li> <li>Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul>              |
|        | Inspection result (Is the judging standard satisfied?) |    | YES  |
|        |  | NO | Go to step 3.  |

|        |  |    |  |
|--------|--|----|--|
| Step 3 | Inspection items                                       |    | Inspection by electronic control unit connector (power supply)   |
|        | Maintenance item                                       |    | Measure values of voltage between following connector (GE58A) terminals <ul style="list-style-type: none"> <li>Sensor 1: 35 (+) - 33 (-)</li> <li>Sensor 2: 49 (+) - 45 (-)</li> </ul> |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul>                       |
|        | Requirements   |    | 5 V  |
|        | Inspection result (Is the judging standard satisfied?) |    | YES  |
|        |  | NO | Go to step 5.  |

|        |  |    |  |
|--------|--|----|--|
| Step 4 | Inspection items                                       |    | Inspection by electronic control unit connector (ground)   |
|        | Maintenance item                                       |    | Measure values of voltage between following connector (GE58A) terminals <ul style="list-style-type: none"> <li>Sensor 1: 33 (+) - 53 (-)</li> <li>Sensor 2: 45 (+) - 53 (-)</li> </ul> |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul>                       |
|        | Requirements   |    | 0 V  |
|        | Inspection result (Is the judging standard satisfied?) |    | YES  |
|        |  | NO | Go to step 5.  |



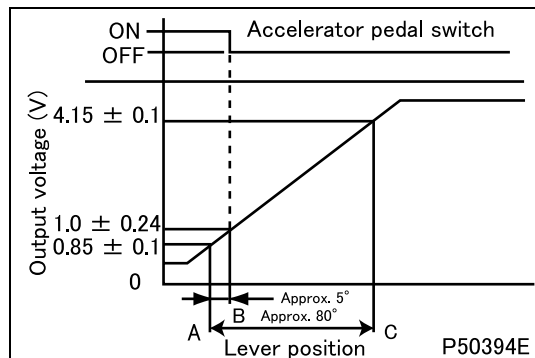
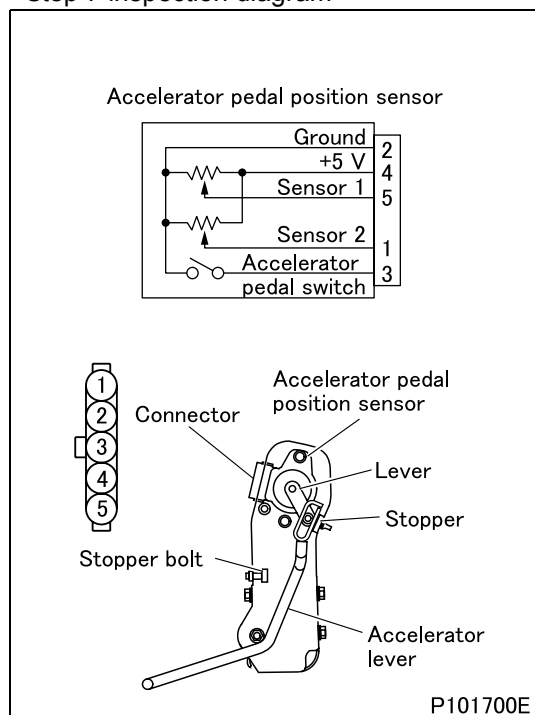
|        |  |   |                |
|--------|--|---|----------------|
| Step 5 | Inspection items                                       | Inspection of electronic control unit connector   |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 12. |
| NO     |  | Modify connector.   |                |

|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify connector.   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of sensor unit  |               |
|        | Maintenance item                                       | Measure values of voltage between the following connector terminals. <ul style="list-style-type: none"> <li>• Sensor 1: 5 (+) - 2 (-)</li> <li>• Sensor 2: 1 (+) - 2 (-)</li> </ul>  |               |
|        | Inspection condition                                   | Apply voltage DC 5 V across terminals No. 4 (+) and 2 (-).   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Idling position A: <math>0.85 \pm 0.1</math> V</li> <li>• Accelerator switch operating position B: <math>1.0 \pm 0.24</math> V</li> <li>• Full-load position C: <math>4.15 \pm 0.1</math> V</li> <li>A: When accelerator lever is in contact with stopper</li> <li>B: When accelerator pedal is pressed until there is no continuity between terminals 2 and 3.</li> <li>C: When accelerator lever is in contact with full load stopper bolt</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Adjustment of sensor   |               |

# TROUBLESHOOTING

<Step 7 inspection diagram>



|        |  |  |  |     |                |    |
|--------|--|--|--|-----|----------------|----|
| Step 8 | Inspection items                                       |  | Inspection of harness between electronic control unit and sensor (power supply)  |     |                |    |
|        | Maintenance item                                       |  | Measure value of voltage between sensor connector terminal No. 4 (+) and 2 (-).  |     |                |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul>                                       |     |                |    |
|        | Requirements   |  | 5 V  |     |                |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1" style="width: 100%;"> <tr> <td style="text-align: center;">YES</td> <td>Go to step 10.</td> </tr> <tr> <td style="text-align: center;">NO</td> <td>Go to step 9.</td> </tr> </table> | YES | Go to step 10. | NO |
| YES    | Go to step 10.   |  |  |     |                |    |
| NO     | Go to step 9.  |  |  |     |                |    |

|        |  |  |                |
|--------|--|--|----------------|
| Step 9 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)  |                |
|        | Maintenance item                                       | Check circuit between following connector terminals.<br>• Sensor 1: sensor connector terminal No. 4 - electronic control unit connector (GE58A) terminal No. 35<br>• Sensor 2: sensor connector terminal No. 4 - electronic control unit connector (GE58A) terminal No. 49 |                |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.   |                |
|        | Requirements   | There is continuity.   |                |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 12. |
| NO     |  | Modify harness.  |                |

|         |  |  |                |
|---------|--|--|----------------|
| Step 10 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (ground)  |                |
|         | Maintenance item                                       | Check circuit between following connector terminals.<br>• Sensor 1: sensor connector terminal No. 2 - electronic control unit connector (GE58A) terminal No. 33<br>• Sensor 2: sensor connector terminal No. 2 - electronic control unit connector (GE58A) terminal No. 45 |                |
|         | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.   |                |
|         | Requirements   | There is continuity.   |                |
|         | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 11. |
| NO      |  | Modify harness.  |                |

|         |  |  |                |
|---------|--|--|----------------|
| Step 11 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (signal)  |                |
|         | Maintenance item                                       | Check circuit between following connector terminals.<br>• Sensor 1: sensor connector terminal No. 5 - electronic control unit connector (GE58A) terminal No. 34<br>• Sensor 2: sensor connector terminal No. 1 - electronic control unit connector (GE58A) terminal No. 46 |                |
|         | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.   |                |
|         | Requirements   | There is continuity.   |                |
|         | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 12. |
| NO      |  | Modify harness.  |                |

|         |  |   |                                    |
|---------|--|---|------------------------------------|
| Step 12 | Inspection items                                       | Inspection by control data  |                                    |
|         | Maintenance item                                       | <b>&lt;General Scanning Tool used&gt;</b><br>Measurement of following service data<br>• Sensor 1: Item "Accelerator Pedal Position 1"<br>• Sensor 2: Item "Accelerator Pedal Position 2"<br><b>&lt;Multi-Use Tester used&gt;</b><br>Measurement of following service data<br>• Sensor 1: Item No. 40 "Accelerator sensor voltage 1".<br>• Sensor 2: Item No. 41 "Accelerator sensor voltage 2". |                                    |
|         | Inspection condition                                   | -   |                                    |
|         | Requirements   | <b>&lt;General Scanning Tool used&gt;</b><br>• Accelerator pedal released: 0%<br>• Accelerator pedal pressed: 100%<br><b>&lt;Multi-Use Tester used&gt;</b><br>• Accelerator pedal released: 0.85 ± 0.1 V<br>• Accelerator pedal pressed: 4.15 ± 0.1 V   |                                    |
|         | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.). |
| NO      |  | Replacement of electronic control unit  |                                    |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P2138/Flash code: 58

## **[Monitor]**

Failure of accelerator pedal position sensors (1 and 2)

## **[Fault (outline)]**

- Low signal range check
- High signal range check
- Plausibility

## **[Diagnosis check]**

- Status of accelerator pedal position sensor 1 and 2 is monitored for simultaneous fault.

## **[Code generation condition]**

Diagnosis code is generated under either of the following conditions. (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

- Output signal error (high, low) in accelerator pedal position sensors 1 and 2
- Different errors in accelerator pedal position sensors 1 and 2
- Relative check error between accelerator pedal position sensors 1 and 2

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Accelerator pedal position is computed with accelerator switch.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

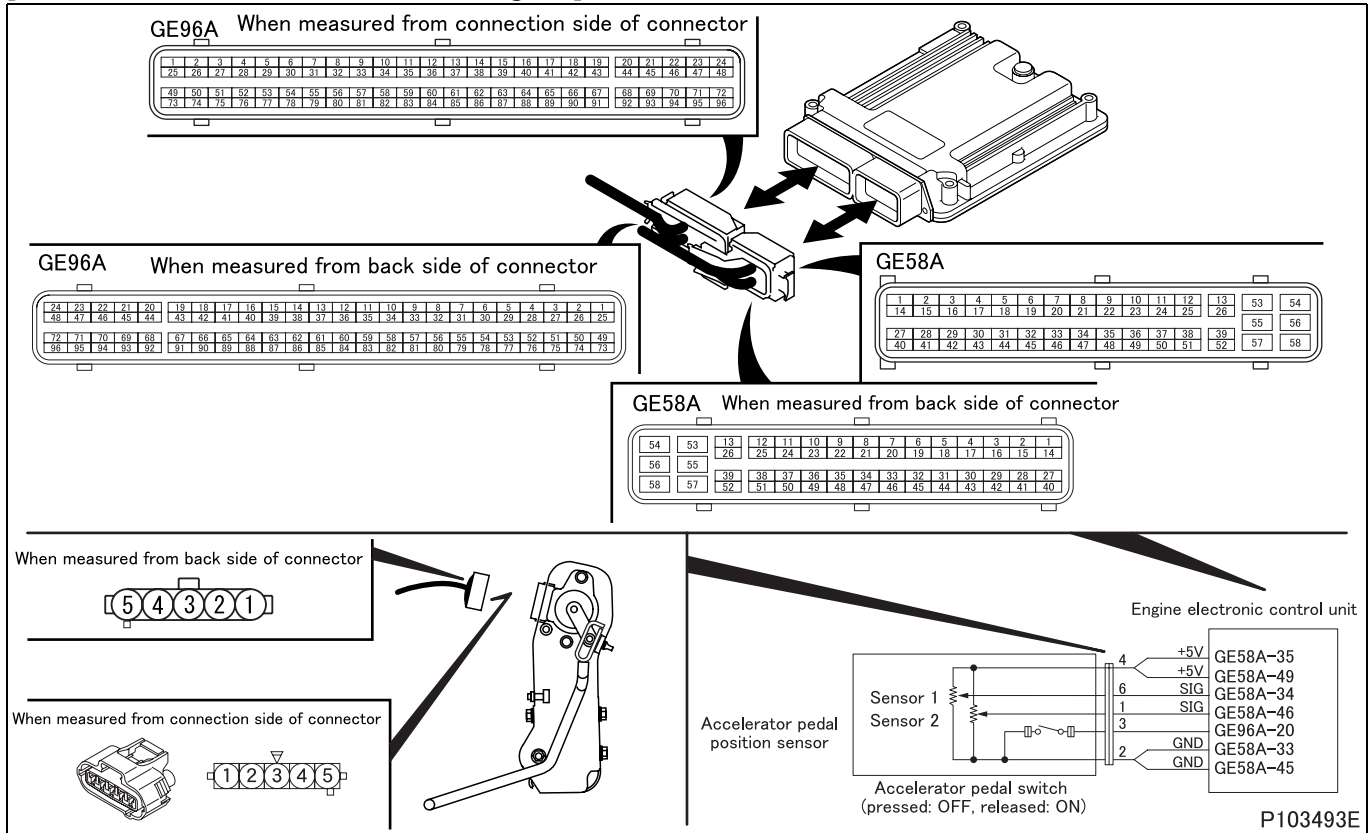
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

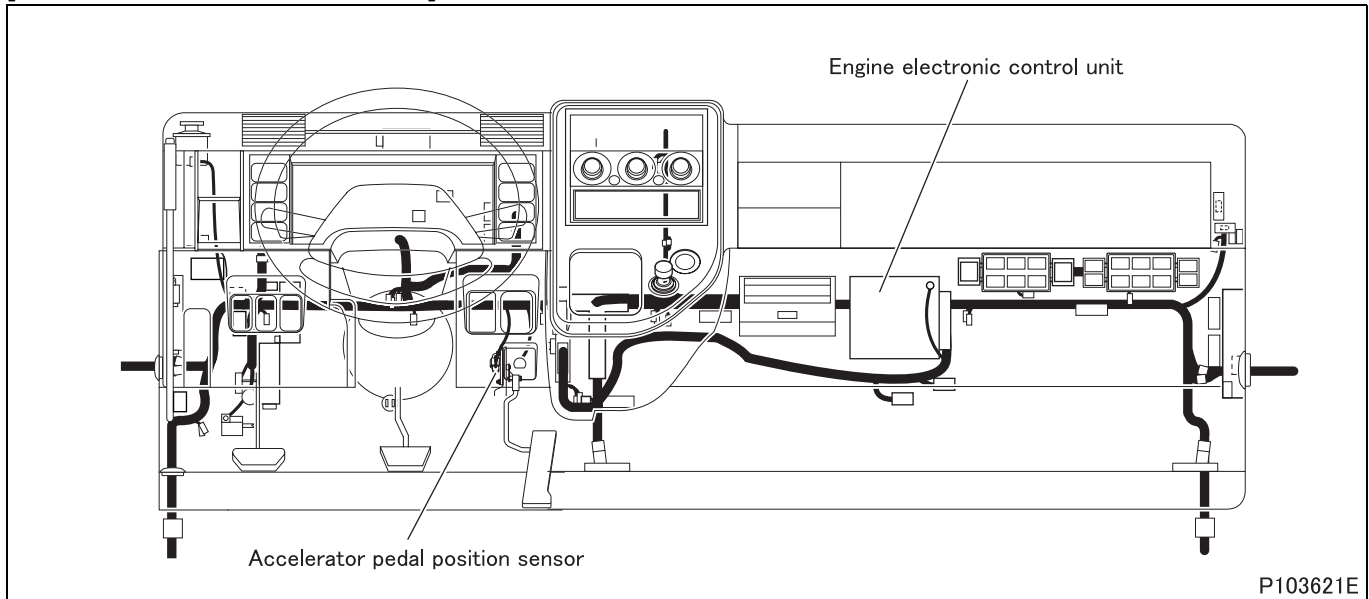
## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|  |                      |     |  |
|--|----------------------|-----|--|
| Step 1   | Inspection items     |     | Inspection by control data   |
|  | Maintenance item     |     | <b>&lt;General Scanning Tool used&gt;</b><br>Measurement of following service data <ul style="list-style-type: none"> <li>Sensor 1: Item "Accelerator Pedal Position 1"</li> <li>Sensor 2: Item "Accelerator Pedal Position 2"</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br>Measurement of following service data <ul style="list-style-type: none"> <li>Sensor 1: Item No. 40 "Accelerator sensor voltage 1".</li> <li>Sensor 2: Item No. 41 "Accelerator sensor voltage 2".</li> </ul> |
|  | Inspection condition |     | —  |
|  | Requirements         |     | <b>&lt;General Scanning Tool used&gt;</b> <ul style="list-style-type: none"> <li>Accelerator pedal released: 0%</li> <li>Accelerator pedal pressed: 100%</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b> <ul style="list-style-type: none"> <li>Accelerator pedal released: <math>0.85 \pm 0.1</math> V</li> <li>Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul>   |
| Inspection result (Is the judging standard satisfied?) |                      | YES | Go to transient fault (See Gr00.).   |
|  |                      | NO  | Go to step 2.  |

|        |  |    |  |
|--------|--|----|--|
| Step 2 | Inspection items                                       |    | Inspection by electronic control unit connector (signal)   |
|        | Maintenance item                                       |    | Measure values of voltage between following connector (GE58A) terminals <ul style="list-style-type: none"> <li>Sensor 1: 34 (+) - 33 (-)</li> <li>Sensor 2: 46 (+) - 45 (-)</li> </ul> |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul>                       |
|        | Requirements   |    | <ul style="list-style-type: none"> <li>Accelerator pedal released: <math>0.85 \pm 0.1</math> V</li> <li>Accelerator pedal pressed: <math>4.15 \pm 0.1</math> V</li> </ul>              |
|        | Inspection result (Is the judging standard satisfied?) |    | YES  |
|        |  | NO | Go to step 3.  |

|        |  |    |  |
|--------|--|----|--|
| Step 3 | Inspection items                                       |    | Inspection by electronic control unit connector (power supply)   |
|        | Maintenance item                                       |    | Measure values of voltage between following connector (GE58A) terminals <ul style="list-style-type: none"> <li>Sensor 1: 35 (+) - 33 (-)</li> <li>Sensor 2: 49 (+) - 45 (-)</li> </ul> |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul>                       |
|        | Requirements   |    | 5 V  |
|        | Inspection result (Is the judging standard satisfied?) |    | YES  |
|        |  | NO | Go to step 5.  |

|        |  |    |  |
|--------|--|----|--|
| Step 4 | Inspection items                                       |    | Inspection by electronic control unit connector (ground)   |
|        | Maintenance item                                       |    | Measure values of voltage between following connector (GE58A) terminals <ul style="list-style-type: none"> <li>Sensor 1: 33 (+) - 53 (-)</li> <li>Sensor 2: 45 (+) - 53 (-)</li> </ul> |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul>                       |
|        | Requirements   |    | 0 V  |
|        | Inspection result (Is the judging standard satisfied?) |    | YES  |
|        |  | NO | Go to step 5.  |

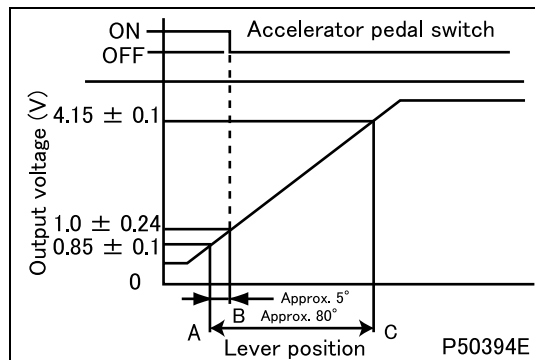
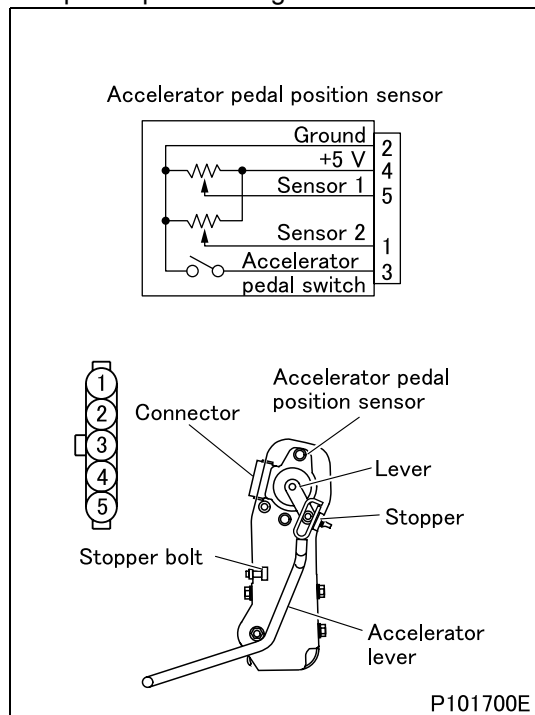
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 5 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 12.  |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of sensor connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                      |   |
|--------|--|----------------------|---|
| Step 7 | Inspection items                                       |                      | Inspection of sensor unit   |
|        | Maintenance item                                       |                      | Measure values of voltage between the following connector terminals. <ul style="list-style-type: none"> <li>• Sensor 1: 5 (+) - 2 (-)</li> <li>• Sensor 2: 1 (+) - 2 (-)</li> </ul>   |
|        | Inspection condition                                   |                      | Apply voltage DC 5 V across terminals No. 4 (+) and 2 (-).  |
|        | Requirements   |                      | <ul style="list-style-type: none"> <li>• Idling position A: <math>0.85 \pm 0.1</math> V</li> <li>• Accelerator switch operating position B: <math>1.0 \pm 0.24</math> V</li> <li>• Full-load position C: <math>4.15 \pm 0.1</math> V</li> </ul> A: When accelerator lever is in contact with stopper<br>B: When accelerator pedal is pressed until there is no continuity between terminals 2 and 3.<br>C: When accelerator lever is in contact with full load stopper bolt |
|        | Inspection result (Is the judging standard satisfied?) | YES                  | Go to step 8.   |
| NO     |  | Adjustment of sensor |   |

# TROUBLESHOOTING

<Step 7 inspection diagram>



|        |  |  |                |  |
|--------|--|--|----------------|--|
| Step 8 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)  |                |  |
|        | Maintenance item                                       | Measure value of voltage between sensor connector terminal No. 4 (+) and 2 (-).  |                |  |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |                |  |
|        | Requirements   | 5 V  |                |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 10. |  |
|        |  | NO   | Go to step 9.  |  |



|        |  |                 |   |
|--------|--|-----------------|---|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)   |
|        | Maintenance item                                       |                 | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Sensor 1: sensor connector terminal No. 4 - electronic control unit connector (GE58A) terminal No. 35</li> <li>• Sensor 2: sensor connector terminal No. 4 - electronic control unit connector (GE58A) terminal No. 49</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.  |
| NO     |  | Modify harness. |   |

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)   |
|         | Maintenance item                                       |                 | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Sensor 1: sensor connector terminal No. 2 - electronic control unit connector (GE58A) terminal No. 33</li> <li>• Sensor 2: sensor connector terminal No. 2 - electronic control unit connector (GE58A) terminal No. 45</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.  |
| NO      |  | Modify harness. |   |

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)   |
|         | Maintenance item                                       |                 | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Sensor 1: sensor connector terminal No. 5 - electronic control unit connector (GE58A) terminal No. 34</li> <li>• Sensor 2: sensor connector terminal No. 1 - electronic control unit connector (GE58A) terminal No. 46</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.  |
| NO      |  | Modify harness. |   |

|         |  |  |  |
|---------|--|--|--|
| Step 12 | Inspection items                                       |  | Inspection by control data   |
|         | Maintenance item                                       |  | <b>&lt;General Scanning Tool used&gt;</b><br>Measurement of following service data <ul style="list-style-type: none"> <li>• Sensor 1: Item "Accelerator Pedal Position 1"</li> <li>• Sensor 2: Item "Accelerator Pedal Position 2"</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br>Measurement of following service data <ul style="list-style-type: none"> <li>• Sensor 1: Item No. 40 "Accelerator sensor voltage 1".</li> <li>• Sensor 2: Item No. 41 "Accelerator sensor voltage 2".</li> </ul> |
|         | Inspection condition                                   |  | —  |
|         | Requirements   |  | <b>&lt;General Scanning Tool used&gt;</b> <ul style="list-style-type: none"> <li>• Accelerator pedal released: 0%</li> <li>• Accelerator pedal pressed: 100%</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b> <ul style="list-style-type: none"> <li>• Accelerator pedal released: 0.85 ± 0.1 V</li> <li>• Accelerator pedal pressed: 4.15 ± 0.1 V</li> </ul>   |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P2147/Flash code: 82

## **[Monitor]**

Injector magnetic valve

## **[Fault (outline)]**

Injector short circuit (No.1 and 3 cylinders)

## **[Diagnosis check]**

- Injector magnetic valve (No. 1, 3 cylinders) circuit is monitored for fault.

## **[Code generation condition]**

- Injector magnetic valve (No. 1, 3 cylinders) circuit remains shorted to ground as detected for 3 consecutive cycles (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition).

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Injector magnetic valve (No. 1 and No. 4 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Injector actuator test is inhibited.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

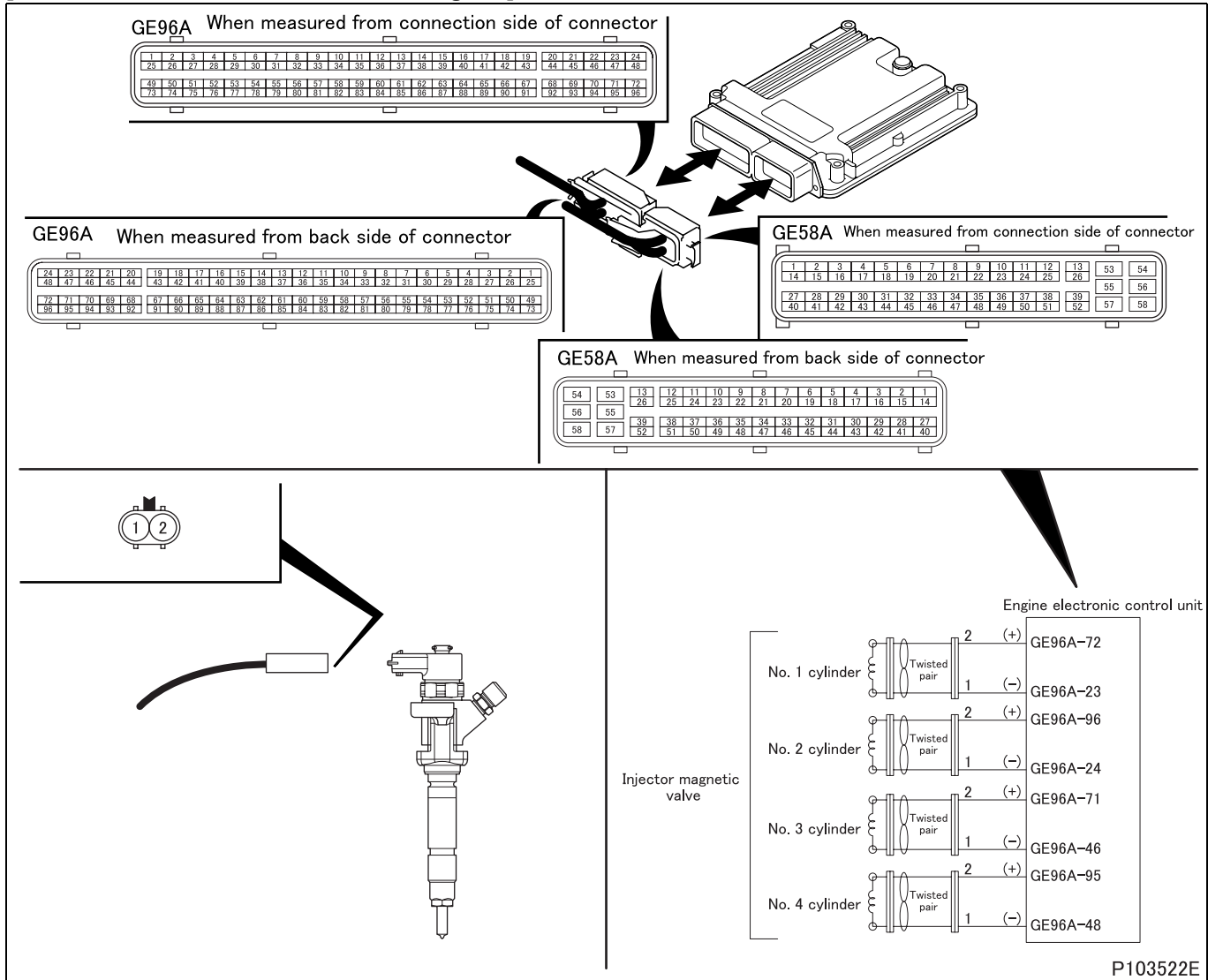
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

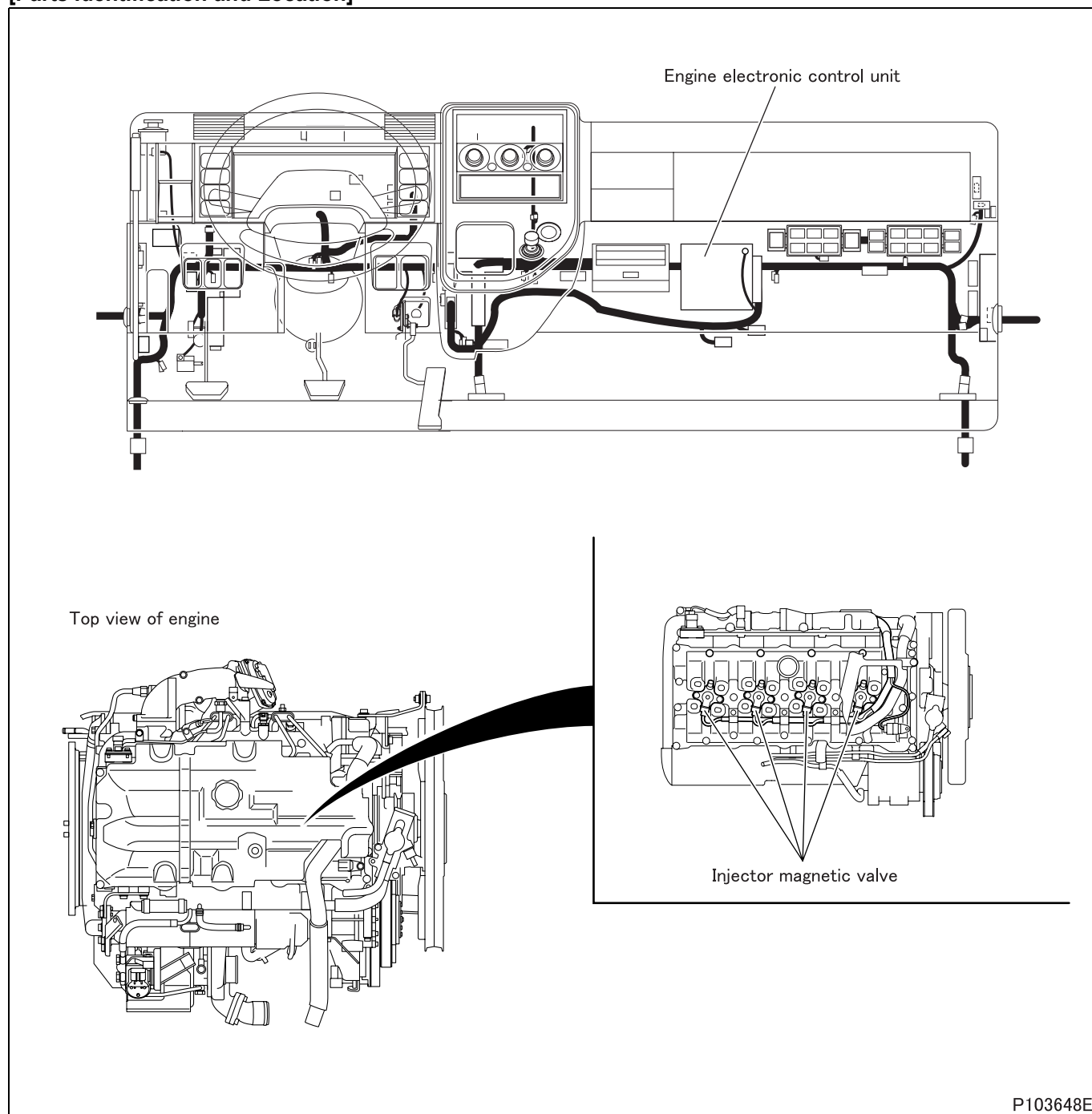
[Electronic Control Unit Connection Diagram]



P103522E

# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform following actuator test. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 1 cylinder): Perform item No. BB "Injector Test 1".</li> <li>• Injector magnetic valve (No. 4 cylinder): Perform item No. BC "Injector Test 2".</li> </ul> |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul>                           |
|        | Requirements   |               | Injector (No. 1 cylinder) or Injector (No. 3 cylinder) stops injection and engine vibrations become slightly larger.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |               | Measure values of resistance between following connector (GE96A) terminals <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 1 cylinder): 72 (+) - 23 (-)</li> <li>• Injector magnetic valve (No. 3 cylinder): 71 (+) - 46 (-)</li> </ul> |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |
|        | Requirements   |               | 0.255 ± 0.04 Ω (20°C {68°F})  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

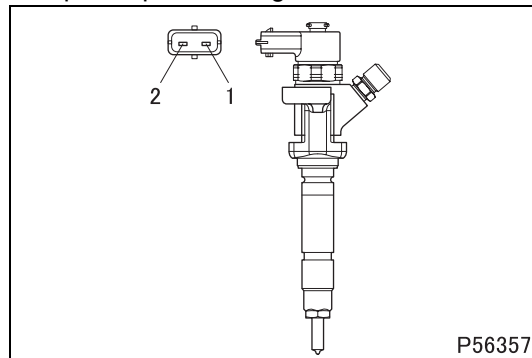
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |

# TROUBLESHOOTING

|        |  |  |   |
|--------|--|--|---|
| Step 5 | Inspection items                                       |  | Inspection of injector magnetic valve unit                          |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2. |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | $0.255 \pm 0.04 \Omega$ (20°C {68°F})                               |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 6.<br>NO Replacement of injector                     |

<Step 5 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of harness between injector magnetic valve and electronic control unit (power supply)  |
|        | Maintenance item                                       |  | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 1 cylinder): magnetic valve terminal No. 2 - electronic control unit (GE96A) terminal No. 72</li> <li>• Injector magnetic valve (No. 3 cylinder): magnetic valve terminal No. 2 - electronic control unit (GE96A) terminal No. 71</li> </ul> |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 7.<br>NO Modify harness.   |

|        |  |  |   |
|--------|--|--|---|
| Step 7 | Inspection items                                       |  | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |
|        | Maintenance item                                       |  | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 1 cylinder): magnetic valve terminal No. 1 - electronic control unit (GE96A) terminal No. 23</li> <li>• Injector magnetic valve (No. 3 cylinder): magnetic valve terminal No. 1 - electronic control unit (GE96A) terminal No. 46</li> </ul> |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 8.<br>NO Modify harness.   |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform following actuator test. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 1 cylinder): Perform item No. BB "Injector Test 1".</li> <li>• Injector magnetic valve (No. 4 cylinder): Perform item No. BC "Injector Test 2".</li> </ul> |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul>                           |
|        | Requirements   |  | Injector (No. 1 cylinder) or Injector (No. 3 cylinder) stops injection and engine vibrations become slightly larger.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P2148/Flash code: 82

## **[Monitor]**

Injector magnetic valve

## **[Fault (outline)]**

Injector short circuit (No. 1 and 3 cylinders)

## **[Diagnosis check]**

- Injector magnetic valve (No. 1, 3 cylinders) circuit is monitored for fault.

## **[Code generation condition]**

- Injector magnetic valve (No. 1, 3 cylinders) circuit remains shorted to power supply as detected for 3 consecutive cycles (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition).

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Injector magnetic valve (No. 1 and No. 4 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Injector actuator test is inhibited.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

## **[Probable cause of trouble]**

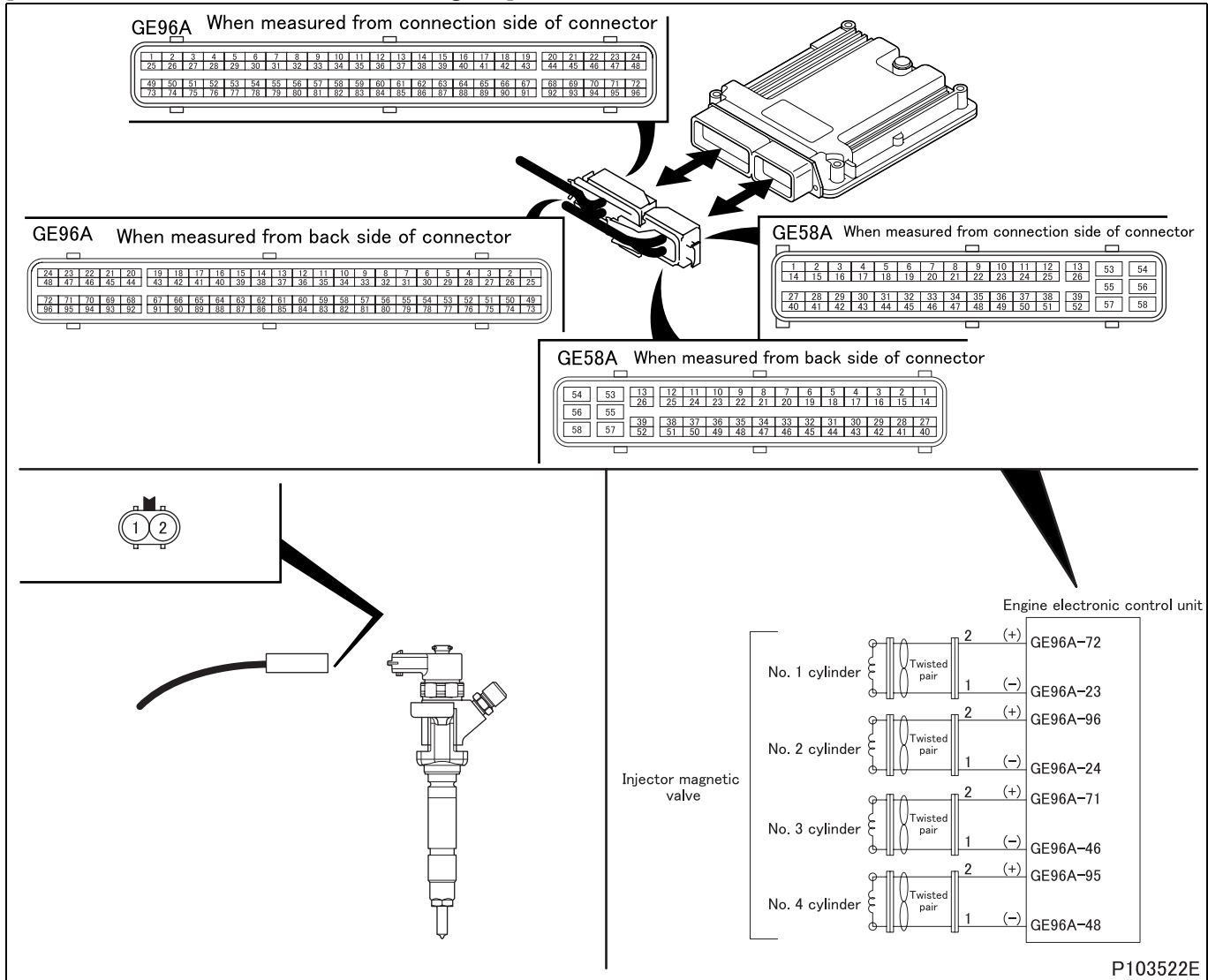
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



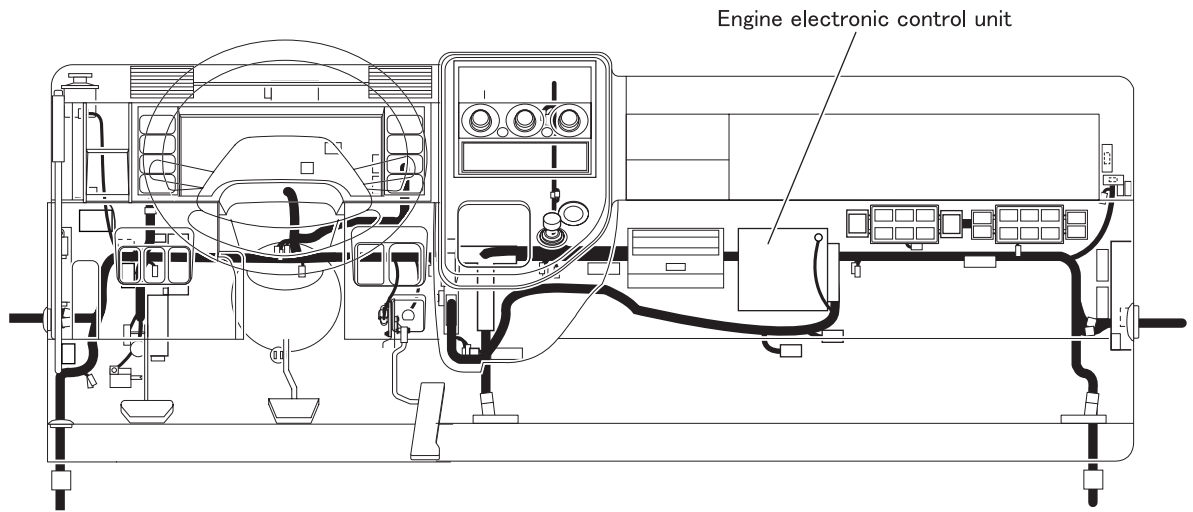
[Electronic Control Unit Connection Diagram]



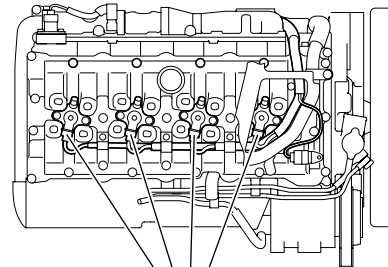
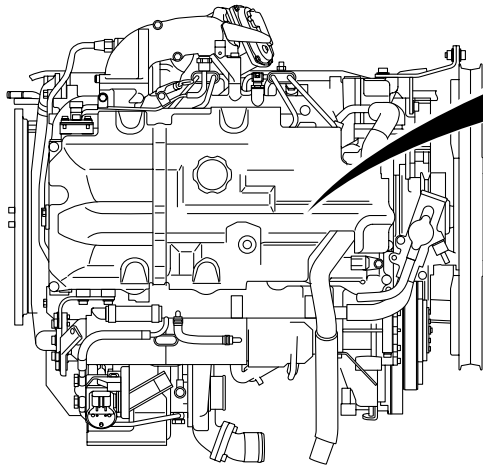
P103522E

# TROUBLESHOOTING

## [Parts Identification and Location]



Top view of engine



Injector magnetic valve

P103648E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform following actuator test. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 1 cylinder): Perform item No. BB "Injector Test 1".</li> <li>• Injector magnetic valve (No. 4 cylinder): Perform item No. BC "Injector Test 2".</li> </ul> |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul>                           |
|        | Requirements   |               | Injector (No. 1 cylinder) or Injector (No. 3 cylinder) stops injection and engine vibrations become slightly larger.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |               | Measure values of resistance between following connector (GE96A) terminals <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 1 cylinder): 72 (+) - 23 (-)</li> <li>• Injector magnetic valve (No. 3 cylinder): 71 (+) - 46 (-)</li> </ul> |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |
|        | Requirements   |               | 0.255 ± 0.04 Ω (20°C {68°F})  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

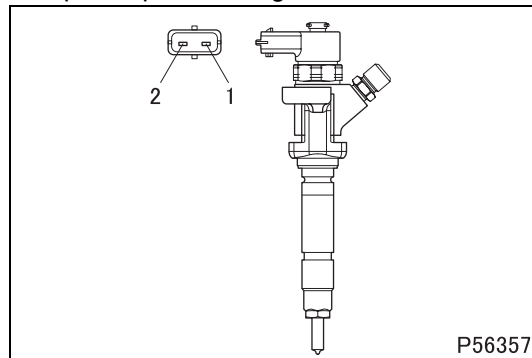
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |

# TROUBLESHOOTING

|        |  |  |   |
|--------|--|--|---|
| Step 5 | Inspection items                                       |  | Inspection of injector magnetic valve unit                          |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2. |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | $0.255 \pm 0.04 \Omega$ (20°C {68°F})                               |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 6.<br>NO Replacement of injector                     |

<Step 5 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of harness between injector magnetic valve and electronic control unit (power supply)  |
|        | Maintenance item                                       |  | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 1 cylinder): magnetic valve terminal No. 2 - electronic control unit (GE96A) terminal No. 72</li> <li>• Injector magnetic valve (No. 3 cylinder): magnetic valve terminal No. 2 - electronic control unit (GE96A) terminal No. 71</li> </ul> |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 7.<br>NO Modify harness.   |

|        |  |  |   |
|--------|--|--|---|
| Step 7 | Inspection items                                       |  | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |
|        | Maintenance item                                       |  | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 1 cylinder): magnetic valve terminal No. 1 - electronic control unit (GE96A) terminal No. 23</li> <li>• Injector magnetic valve (No. 3 cylinder): magnetic valve terminal No. 1 - electronic control unit (GE96A) terminal No. 46</li> </ul> |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 8.<br>NO Modify harness.   |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform following actuator test. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 1 cylinder): Perform item No. BB "Injector Test 1".</li> <li>• Injector magnetic valve (No. 4 cylinder): Perform item No. BC "Injector Test 2".</li> </ul> |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul>                           |
|        | Requirements   |  | Injector (No. 1 cylinder) or Injector (No. 3 cylinder) stops injection and engine vibrations become slightly larger.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P2150/Flash code: 82

## **[Monitor]**

Injector magnetic valve

## **[Fault (outline)]**

Injector short circuit (No. 2 and 4 cylinders)

## **[Diagnosis check]**

- Injector magnetic valve (No. 2, 4 cylinders) circuit is monitored for fault.

## **[Code generation condition]**

- Injector magnetic valve (No. 2, 4 cylinders) circuit remains shorted to ground as detected for 3 consecutive cycles (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition).

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Injector magnetic valve (No. 2 and No. 3 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Injector actuator test is inhibited.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

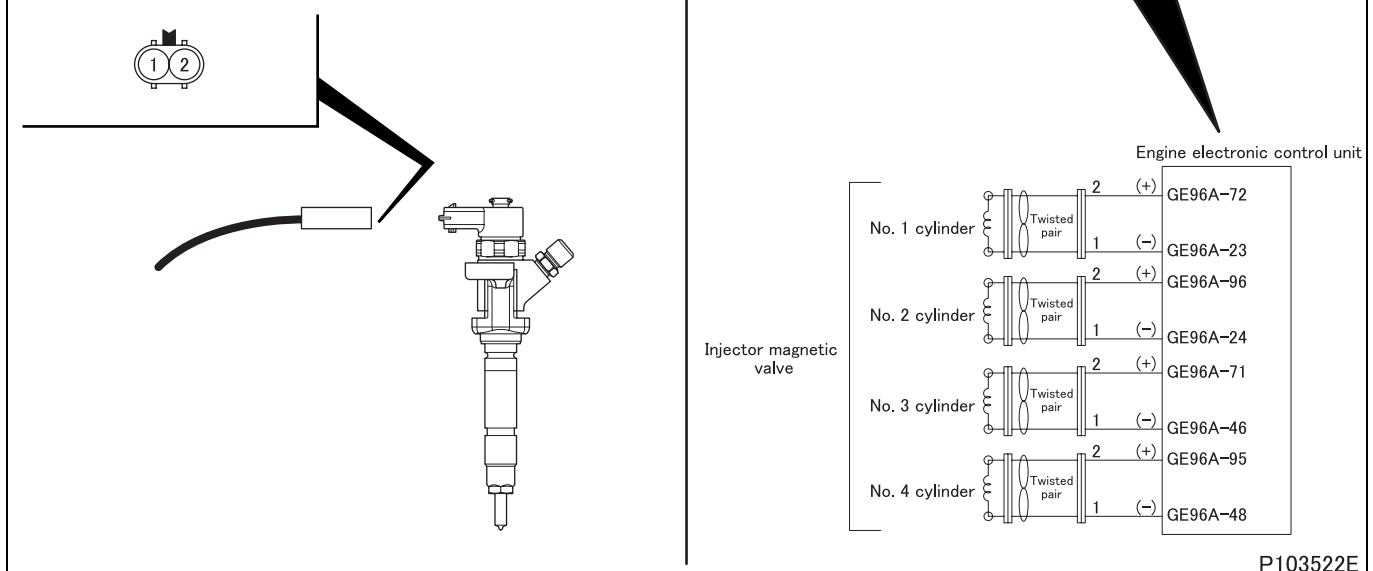
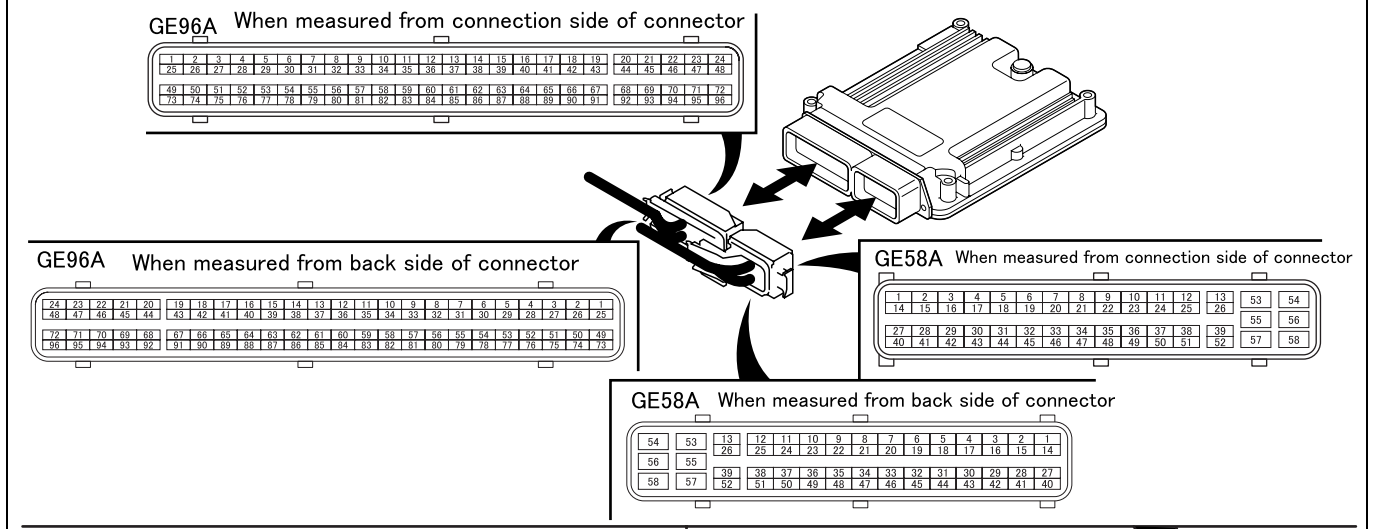
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

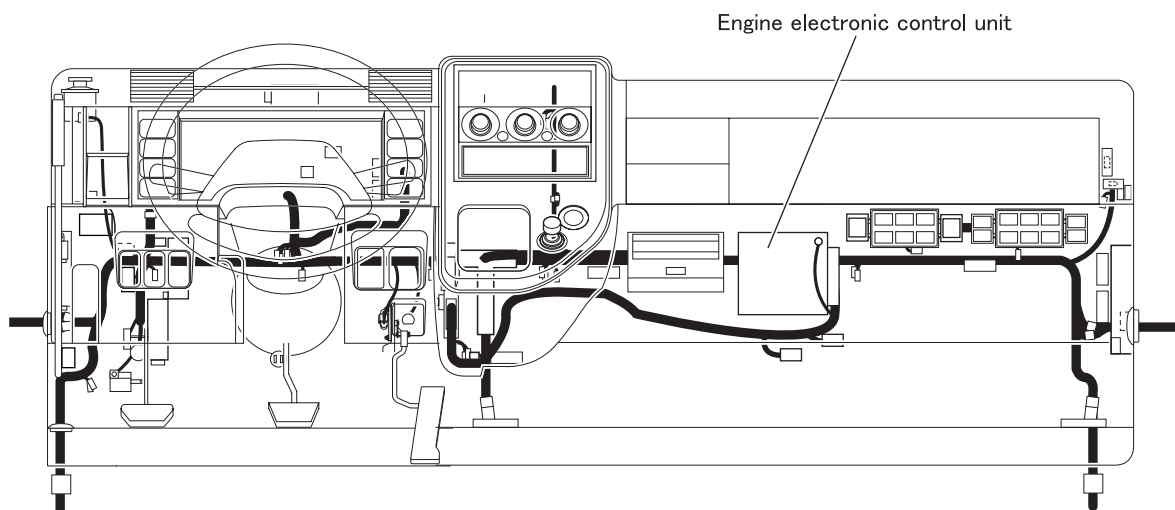
[Electronic Control Unit Connection Diagram]



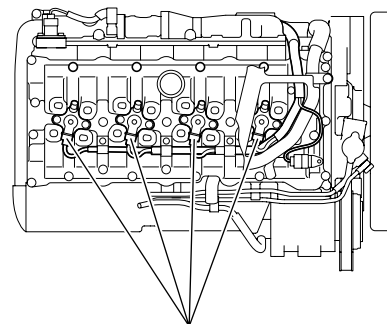
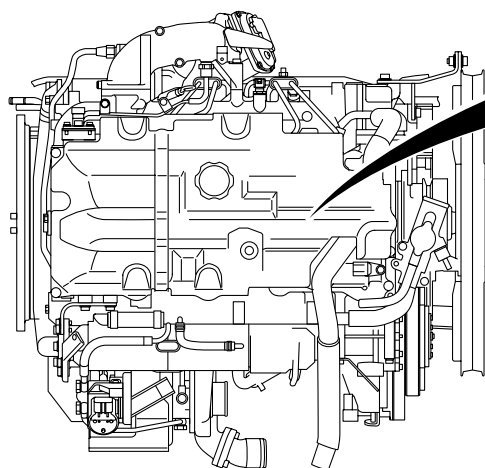
P103522E

# TROUBLESHOOTING

## [Parts Identification and Location]



Top view of engine



Injector magnetic valve

P103648E



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform following actuator test. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 2 cylinder): Perform item No. BD "Injector Test 3".</li> <li>• Injector magnetic valve (No. 4 cylinder): Perform item No. BC "Injector Test 2".</li> </ul> |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul>                           |
|        | Requirements   |               | Injector (No. 2 cylinder) or Injector (No. 4 cylinder) stops injection and engine vibrations become slightly larger.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |               | Measure values of resistance between following connector (GE96A) terminals <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 2 cylinder): 96 (+) - 24 (-)</li> <li>• Injector magnetic valve (No. 4 cylinder): 95 (+) - 48 (-)</li> </ul> |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |
|        | Requirements   |               | 0.255 ± 0.04 Ω (20°C {68°F})  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

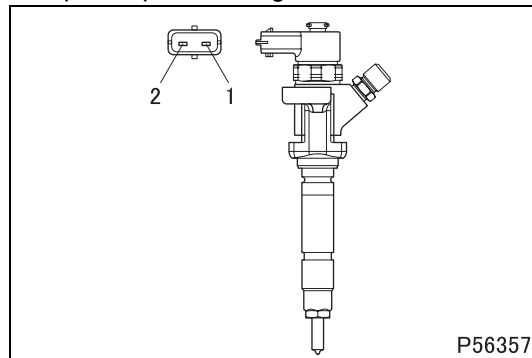
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |

# TROUBLESHOOTING

|        |  |  |   |
|--------|--|--|---|
| Step 5 | Inspection items                                       |  | Inspection of injector magnetic valve unit                          |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2. |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | $0.255 \pm 0.04 \Omega$ (20°C {68°F})                               |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 6.<br>NO Replacement of injector                     |

<Step 5 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of harness between injector magnetic valve and electronic control unit (power supply)  |
|        | Maintenance item                                       |  | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 2 cylinder): magnetic valve terminal No. 2 - electronic control unit (GE96A) terminal No. 96</li> <li>• Injector magnetic valve (No. 4 cylinder): magnetic valve terminal No. 2 - electronic control unit (GE96A) terminal No. 95</li> </ul> |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 7.<br>NO Modify harness.   |

|        |  |  |   |
|--------|--|--|---|
| Step 7 | Inspection items                                       |  | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |
|        | Maintenance item                                       |  | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 2 cylinder): magnetic valve terminal No. 1 - electronic control unit (GE96A) terminal No. 24</li> <li>• Injector magnetic valve (No. 4 cylinder): magnetic valve terminal No. 1 - electronic control unit (GE96A) terminal No. 48</li> </ul> |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES Go to step 8.<br>NO Modify harness.   |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform following actuator test. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 2 cylinder): Perform item No. BD "Injector Test 3".</li> <li>• Injector magnetic valve (No. 4 cylinder): Perform item No. BC "Injector Test 2".</li> </ul> |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul>                           |
|        | Requirements   |  | Injector (No. 2 cylinder) or Injector (No. 4 cylinder) stops injection and engine vibrations become slightly larger.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P2151/Flash code: 82

## **[Monitor]**

Injector magnetic valve

## **[Fault (outline)]**

Injector short circuit (No. 2 and 4 cylinders)

## **[Diagnosis check]**

- Injector magnetic valve (No. 2, 4 cylinders) circuit is monitored for fault.

## **[Code generation condition]**

- Injector magnetic valve (No. 2, 4 cylinders) circuit remains shorted to power supply as detected for 3 consecutive cycles (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition).

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Injector magnetic valve (No. 2 and No. 3 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Misfire detection is stopped.
- Auto cruise control stopped
- Diesel particulate filter regeneration is stopped.
- Injector actuator test is inhibited.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

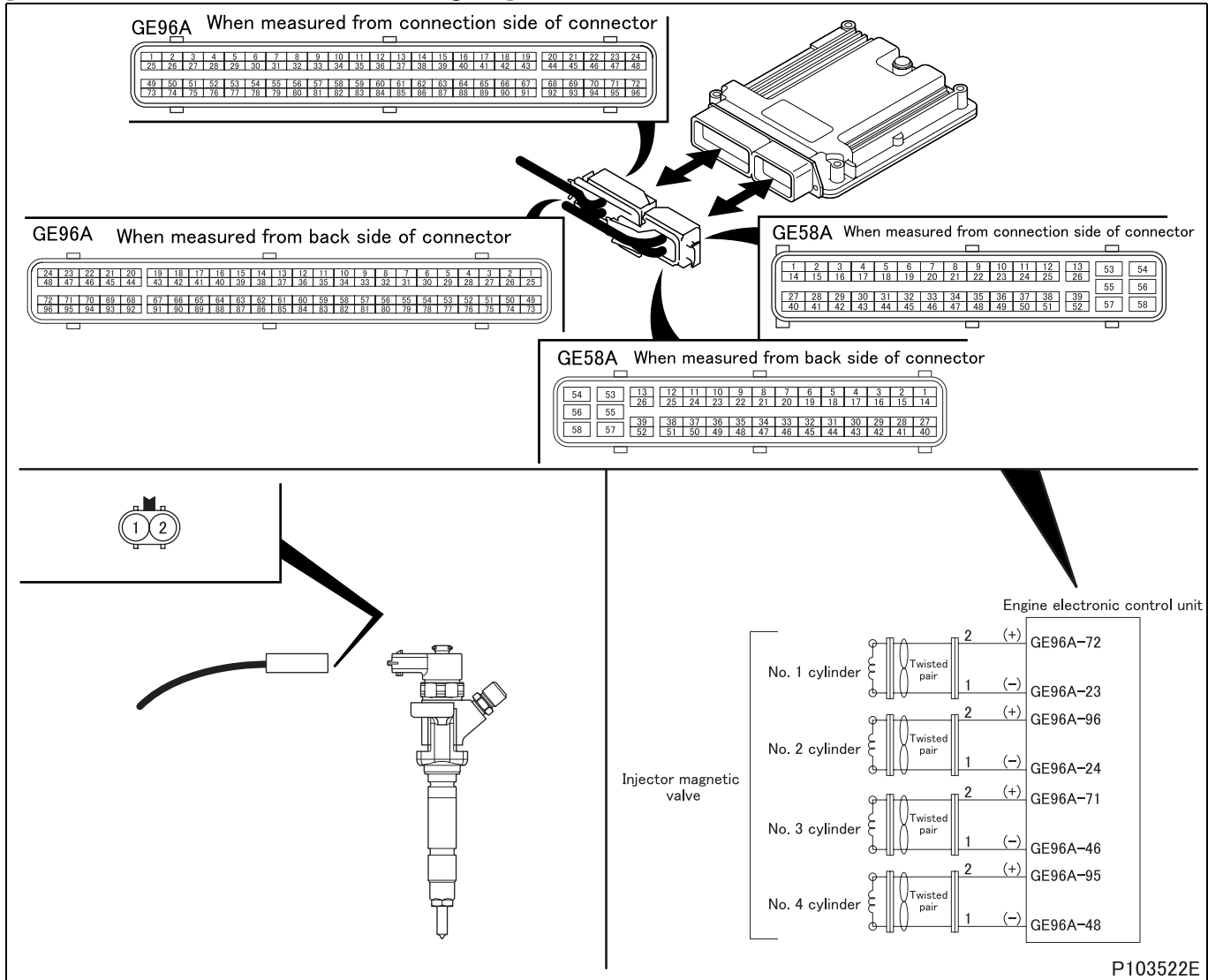
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

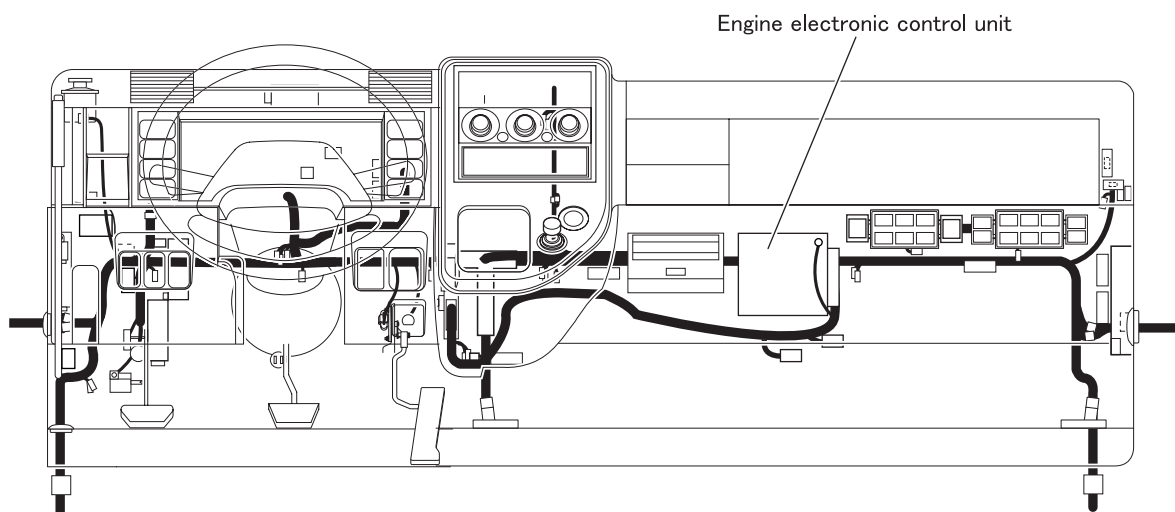
[Electronic Control Unit Connection Diagram]



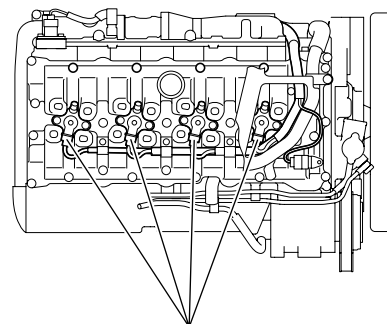
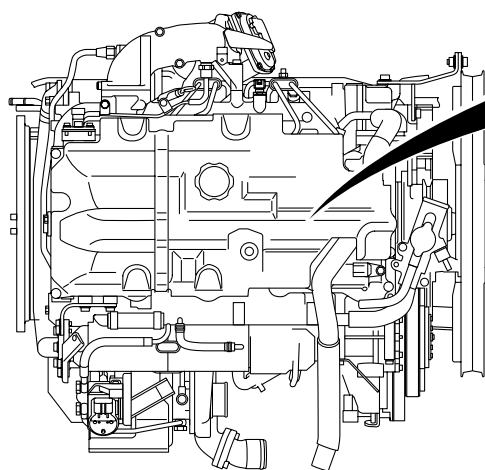
P103522E

# TROUBLESHOOTING

## [Parts Identification and Location]



Top view of engine



P103648E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform following actuator test. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 2 cylinder): Perform item No. BD "Injector Test 3".</li> <li>• Injector magnetic valve (No. 4 cylinder): Perform item No. BC "Injector Test 2".</li> </ul> |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul>                           |
|        | Requirements   |               | Injector (No. 2 cylinder) or Injector (No. 4 cylinder) stops injection and engine vibrations become slightly larger.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |               | Measure values of resistance between following connector (GE96A) terminals <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 2 cylinder): 96 (+) - 24 (-)</li> <li>• Injector magnetic valve (No. 4 cylinder): 95 (+) - 48 (-)</li> </ul> |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |
|        | Requirements   |               | 0.255 ± 0.04 Ω (20°C {68°F})  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

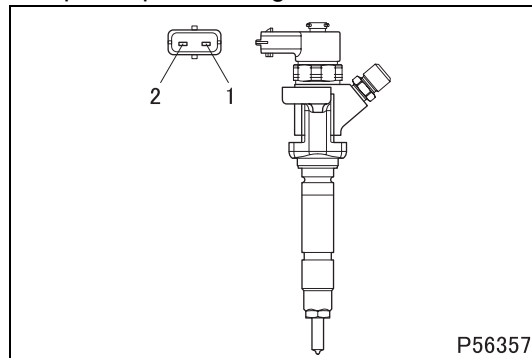
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 8.   |
| NO     |  | Modify connector. |   |

|        |  |                   |  |
|--------|--|-------------------|--|
| Step 4 | Inspection items                                       |                   | Inspection of injector magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector  |
|        | Inspection condition                                   |                   | –  |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.  |
| NO     |  | Modify connector. |  |

# TROUBLESHOOTING

|        |  |    |   |
|--------|--|----|---|
| Step 5 | Inspection items                                       |    | Inspection of injector magnetic valve unit                          |
|        | Maintenance item                                       |    | Measure value of resistance between connector terminal No. 1 and 2. |
|        | Inspection condition                                   |    | —   |
|        | Requirements   |    | $0.255 \pm 0.04 \Omega$ (20°C {68°F})                               |
|        | Inspection result (Is the judging standard satisfied?) |    | YES<br>Go to step 6.  |
|        |  | NO | Replacement of injector   |

<Step 5 inspection diagram>



|        |  |    |   |
|--------|--|----|---|
| Step 6 | Inspection items                                       |    | Inspection of harness between injector magnetic valve and electronic control unit (power supply)  |
|        | Maintenance item                                       |    | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 2 cylinder): magnetic valve terminal No. 2 - electronic control unit (GE96A) terminal No. 96</li> <li>• Injector magnetic valve (No. 4 cylinder): magnetic valve terminal No. 2 - electronic control unit (GE96A) terminal No. 95</li> </ul> |
|        | Inspection condition                                   |    | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |    | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |    | YES<br>Go to step 7.  |
|        |  | NO | Modify harness.   |

|        |  |    |   |
|--------|--|----|---|
| Step 7 | Inspection items                                       |    | Inspection of harness between injector magnetic valve and electronic control unit (ground)  |
|        | Maintenance item                                       |    | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 2 cylinder): magnetic valve terminal No. 1 - electronic control unit (GE96A) terminal No. 24</li> <li>• Injector magnetic valve (No. 4 cylinder): magnetic valve terminal No. 1 - electronic control unit (GE96A) terminal No. 48</li> </ul> |
|        | Inspection condition                                   |    | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |    | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |    | YES<br>Go to step 8.  |
|        |  | NO | Modify harness.   |



|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Perform following actuator test. <ul style="list-style-type: none"> <li>• Injector magnetic valve (No. 2 cylinder): Perform item No. BD "Injector Test 3".</li> <li>• Injector magnetic valve (No. 4 cylinder): Perform item No. BC "Injector Test 2".</li> </ul> |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul>                           |
|        | Requirements   |  | Injector (No. 2 cylinder) or Injector (No. 4 cylinder) stops injection and engine vibrations become slightly larger.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P2169/Flash code: 93

## **[Monitor]**

Failure of exhaust shutter 2-way magnetic valve

## **[Fault (outline)]**

Open circuit

## **[Diagnosis check]**

- Exhaust shutter 2-way magnetic valve circuit is monitored for fault.

## **[Code generation condition]**

- Exhaust shutter 2-way magnetic valve circuit remains open or overloaded as detected for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.
- Fault diagnosis is performed each time when the control is halted.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Auxiliary brake control is stopped.
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

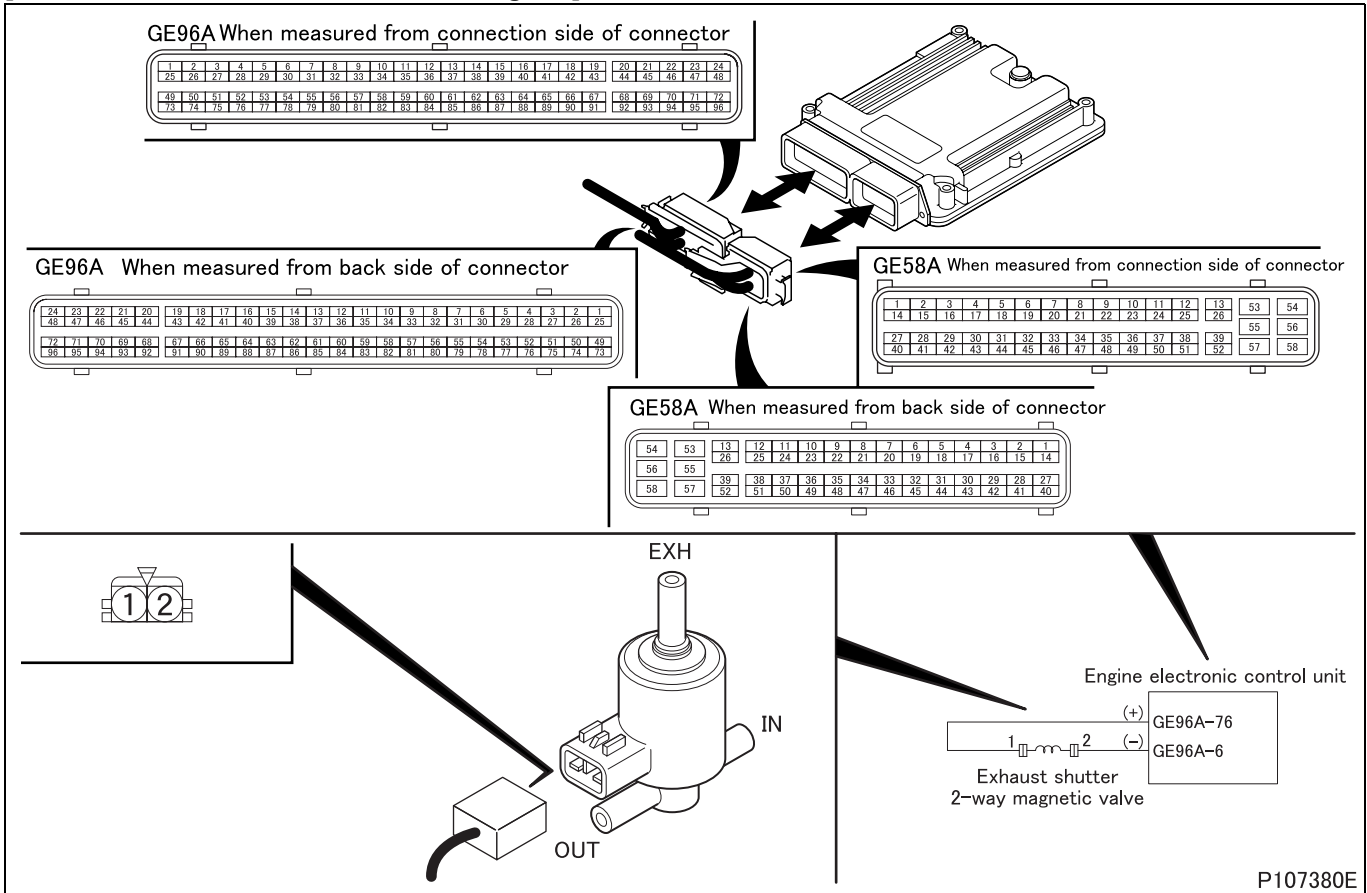
## **[Probable cause of trouble]**

- Open-circuit of harness between electronic control unit and exhaust shutter 2-way magnetic valve
- Malfunction of each connector
- Malfunction of exhaust shutter 2-way magnetic valve
- Malfunction of electronic control unit

## **[Recoverability]**

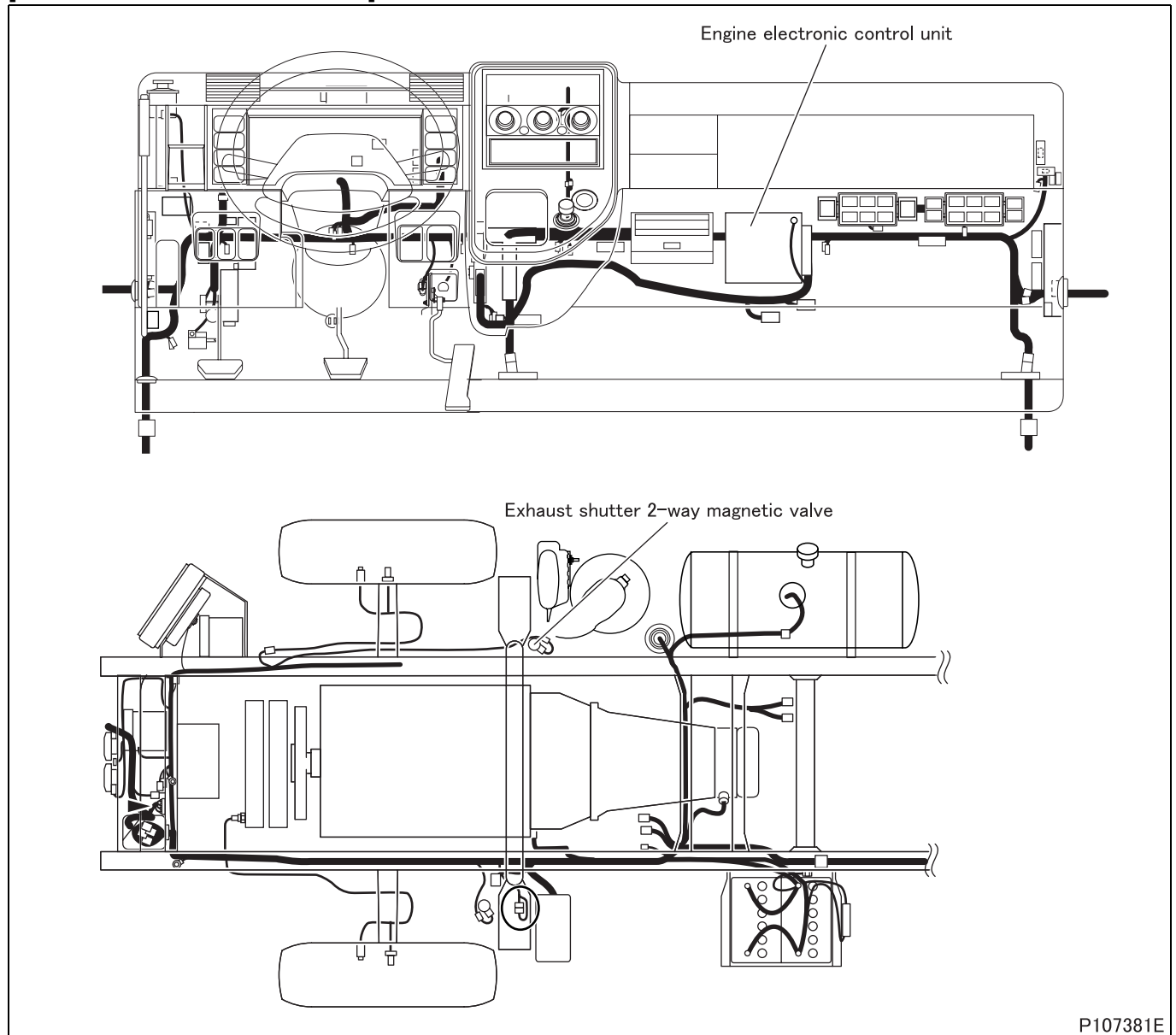
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]



P107381E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 6 and 76.                           |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | 48 Ω or more   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 8.  |
| NO     |  | Go to step 2. |  |

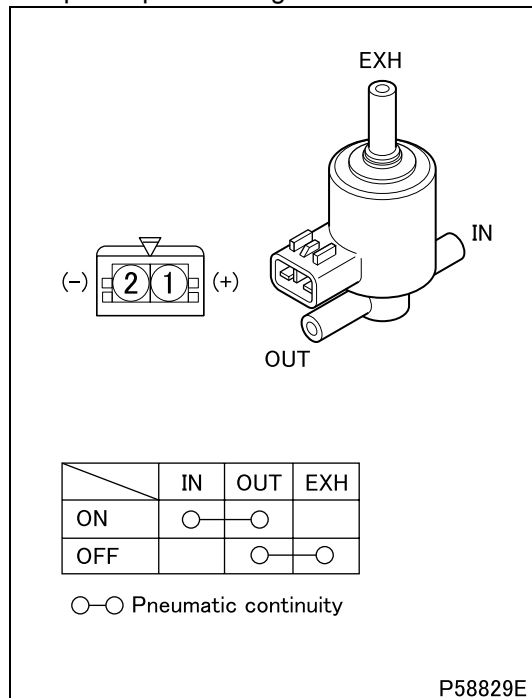
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of 2-way magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

|        |  |  |  |
|--------|--|--|--|
| Step 4 | Inspection items                                       |  | Inspection of 2-way magnetic valve unit  |
|        | Maintenance item                                       |  | Measure minimum operating voltage when 2-way magnetic valve operates (judge by operation sound). |
|        | Inspection condition                                   |  | Gradually increase from zero the voltage applied to terminals No. 1 (+) and 2 (-).               |
|        | Requirements   |  | 11 V or less   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

<Step 4 inspection diagram>



|        |  |  |  |
|--------|--|--|--|
| Step 5 | Inspection items                                       |  | Inspection of harness between exhaust shutter 2-way magnetic valve and electronic control unit (power supply)                                      |
|        | Maintenance item                                       |  | Check circuit between exhaust shutter 2-way magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 76. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of harness between exhaust shutter 2-way magnetic valve and electronic control unit (power supply) |
|        | Maintenance item                                       |  | Check circuit between exhaust shutter 2-way magnetic valve connector terminal No. 1 and chassis ground.       |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                    |
|        | Requirements   |  | There is no continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 7 | Inspection items                                       |                 | Inspection of harness between exhaust shutter 2-way magnetic valve and electronic control unit (ground)   |
|        | Maintenance item                                       |                 | Check circuit between exhaust shutter 2-way magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 6. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.   |
| NO     |  | Modify harness. |   |

|        |  |  |  |
|--------|--|--|--|
| Step 8 | Inspection items                                       |  | Inspection by control data                                 |
|        | Maintenance item                                       |  | Perform actuator test item No. AA "Auxiliary Brake M/V 1". |
|        | Inspection condition                                   |  | Starter switch: ON   |
|        | Requirements   |  | 2-way magnetic valve operation sound is noted              |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).                         |
| NO     |  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P2170/Flash code: 93

## **[Monitor]**

Failure of exhaust shutter 2-way magnetic valve

## **[Fault (outline)]**

Short circuit ground

## **[Diagnosis check]**

- Exhaust shutter 2-way magnetic valve circuit is monitored for fault.

## **[Code generation condition]**

- Exhaust shutter 2-way magnetic valve circuit remains shorted to ground as detected for 1 second. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is halted.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Auxiliary brake control is stopped.
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

## **[Probable cause of trouble]**

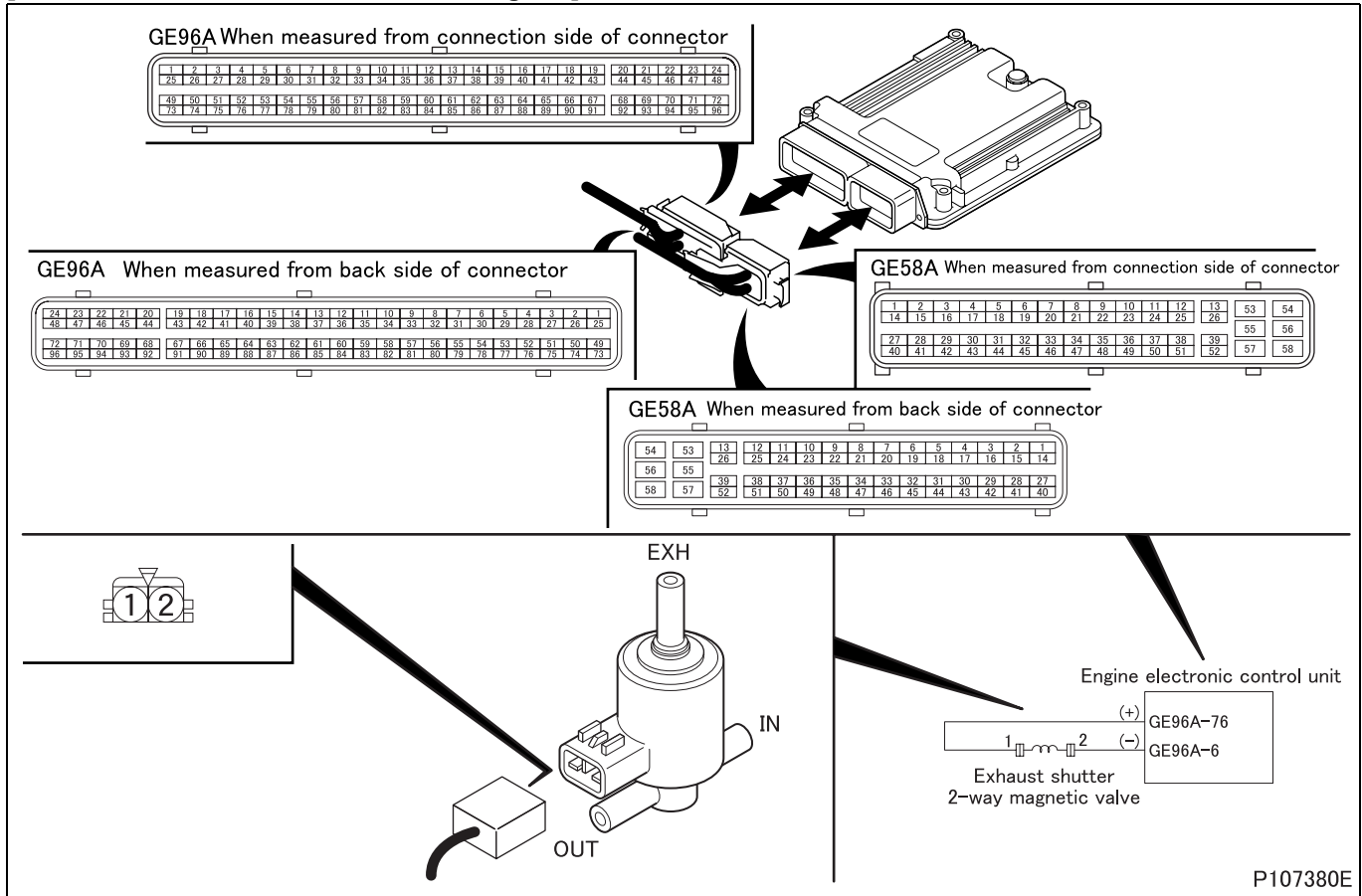
- Short-circuit of harness between electronic control unit and exhaust shutter 2-way magnetic valve
- Malfunction of each connector
- Malfunction of exhaust shutter 2-way magnetic valve
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



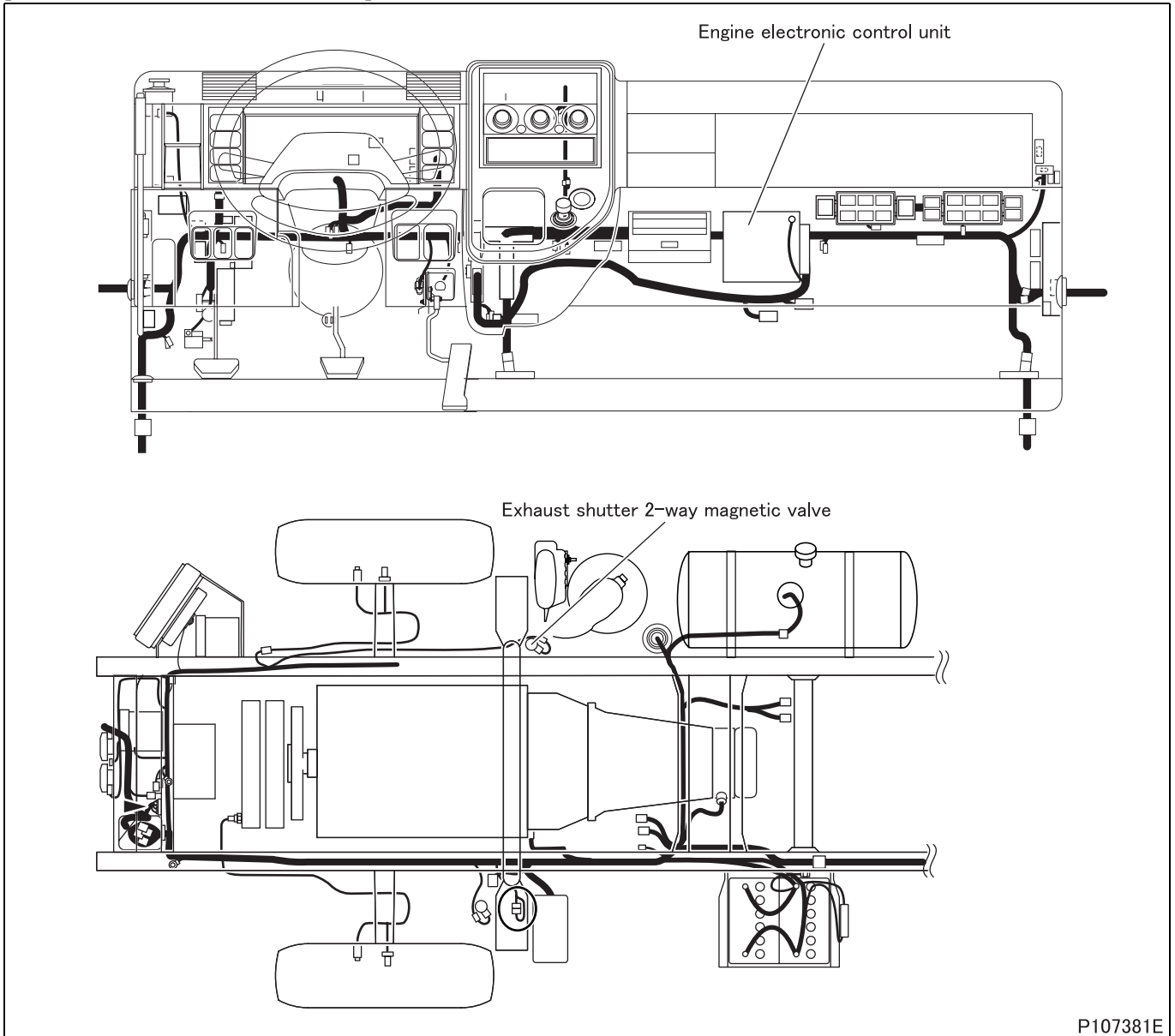
[Electronic Control Unit Connection Diagram]



P107380E

# TROUBLESHOOTING

## [Parts Identification and Location]



P107381E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 6 and 76.                           |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | 48 Ω or more   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 8.  |
| NO     |  | Go to step 2. |  |

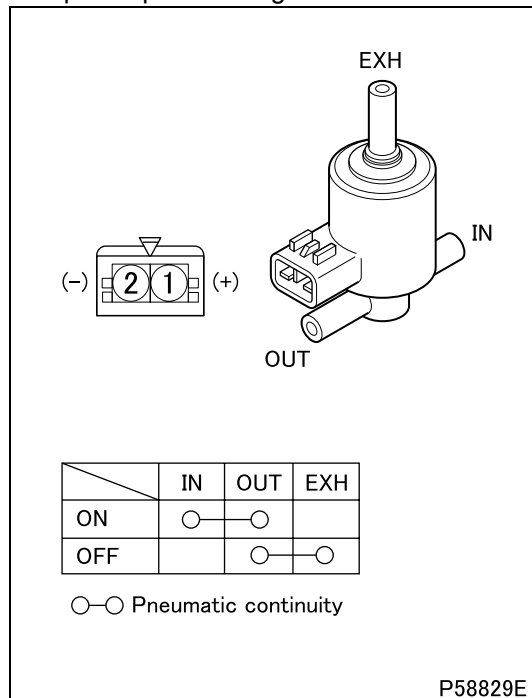
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of 2-way magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

|        |  |  |  |
|--------|--|--|--|
| Step 4 | Inspection items                                       |  | Inspection of 2-way magnetic valve unit  |
|        | Maintenance item                                       |  | Measure minimum operating voltage when 2-way magnetic valve operates (judge by operation sound). |
|        | Inspection condition                                   |  | Gradually increase from zero the voltage applied to terminals No. 1 (+) and 2 (-).               |
|        | Requirements   |  | 11 V or less   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

<Step 4 inspection diagram>



|        |  |  |  |
|--------|--|--|--|
| Step 5 | Inspection items                                       |  | Inspection of harness between exhaust shutter 2-way magnetic valve and electronic control unit (power supply)                                      |
|        | Maintenance item                                       |  | Check circuit between exhaust shutter 2-way magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 76. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of harness between exhaust shutter 2-way magnetic valve and electronic control unit (power supply) |
|        | Maintenance item                                       |  | Check circuit between exhaust shutter 2-way magnetic valve connector terminal No. 1 and chassis ground.       |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                    |
|        | Requirements   |  | There is no continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 7 | Inspection items                                       |                 | Inspection of harness between exhaust shutter 2-way magnetic valve and electronic control unit (ground)   |
|        | Maintenance item                                       |                 | Check circuit between exhaust shutter 2-way magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 6. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.   |
| NO     |  | Modify harness. |   |

|        |  |  |  |
|--------|--|--|--|
| Step 8 | Inspection items                                       |  | Inspection by control data                                 |
|        | Maintenance item                                       |  | Perform actuator test item No. AA "Auxiliary Brake M/V 1". |
|        | Inspection condition                                   |  | Starter switch: ON   |
|        | Requirements   |  | 2-way magnetic valve operation sound is noted              |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).                         |
| NO     |  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P2171/Flash code: 93

## **[Monitor]**

Failure of exhaust shutter 2-way magnetic valve

## **[Fault (outline)]**

Short circuit battery

## **[Diagnosis check]**

- Exhaust shutter 2-way magnetic valve circuit is monitored for fault.

## **[Code generation condition]**

- Exhaust shutter 2-way magnetic valve circuit remains shorted to power supply as detected for 1 second. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed each time when the control is initiated.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Auxiliary brake control is stopped.
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

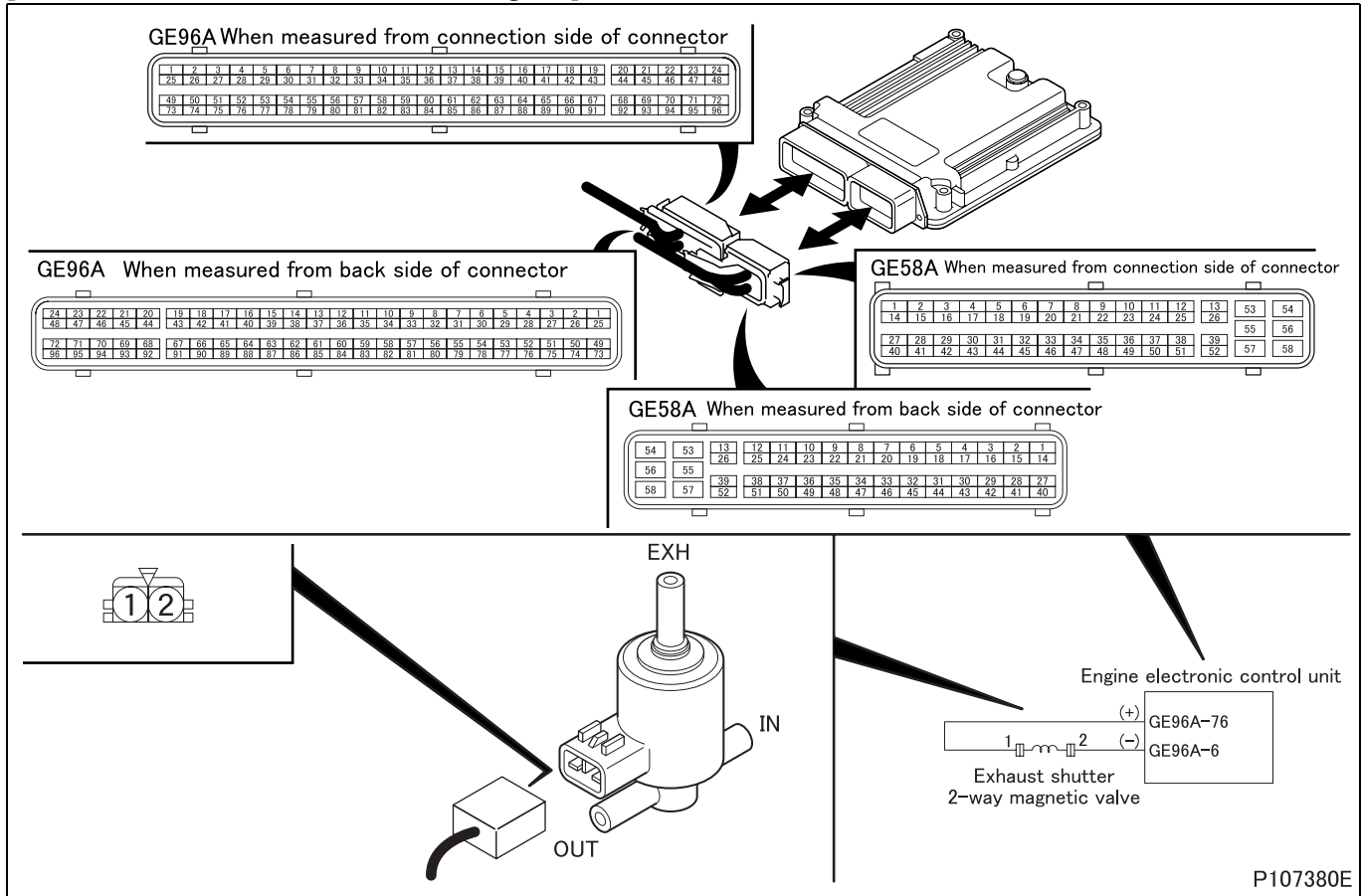
## **[Probable cause of trouble]**

- Short-circuit of harness between electronic control unit and exhaust shutter 2-way magnetic valve
- Malfunction of each connector
- Malfunction of exhaust shutter 2-way magnetic valve
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

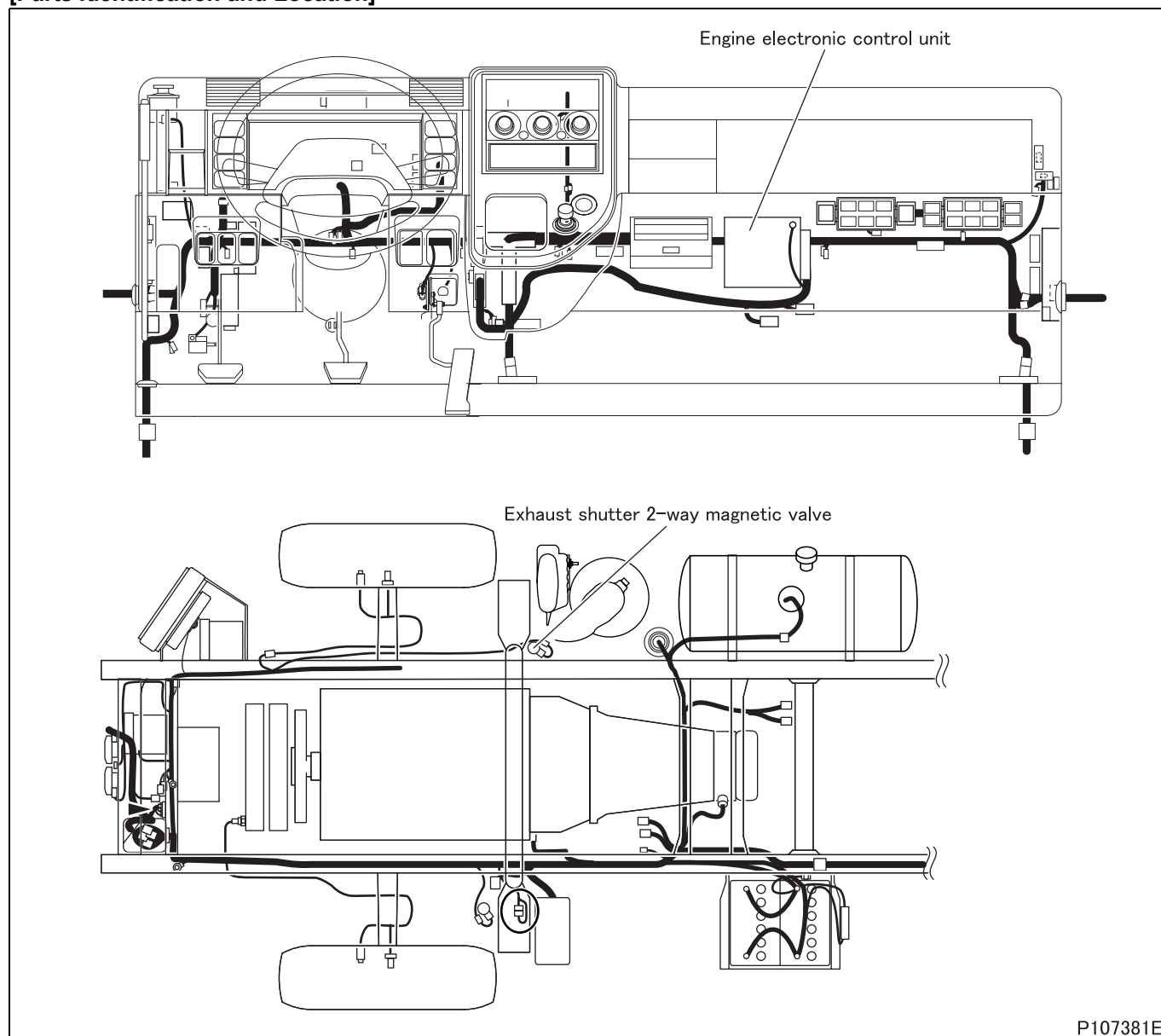
[Electronic Control Unit Connection Diagram]



P107380E

# TROUBLESHOOTING

## [Parts Identification and Location]



P107381E



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 6 and 76.                           |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector. |
|        | Requirements   |               | 48 Ω or more   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 8.  |
| NO     |  | Go to step 2. |  |

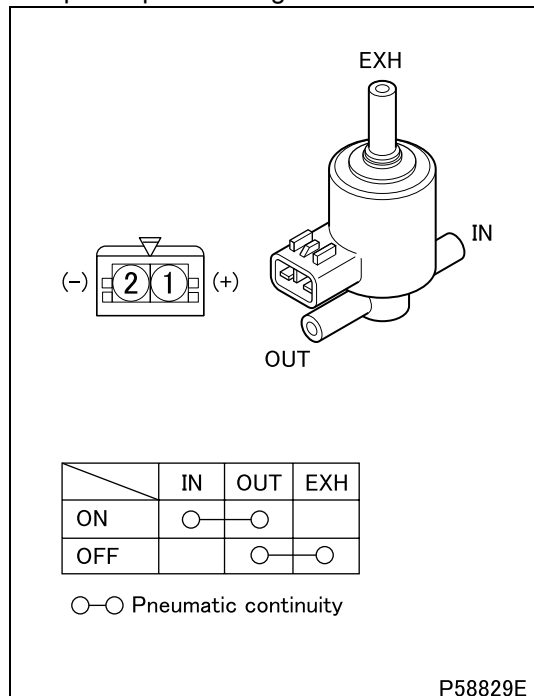
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of 2-way magnetic valve connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

|        |  |  |  |
|--------|--|--|--|
| Step 4 | Inspection items                                       |  | Inspection of 2-way magnetic valve unit  |
|        | Maintenance item                                       |  | Measure minimum operating voltage when 2-way magnetic valve operates (judge by operation sound). |
|        | Inspection condition                                   |  | Gradually increase from zero the voltage applied to terminals No. 1 (+) and 2 (-).               |
|        | Requirements   |  | 11 V or less   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

<Step 4 inspection diagram>



|        |  |  |  |
|--------|--|--|--|
| Step 5 | Inspection items                                       |  | Inspection of harness between exhaust shutter 2-way magnetic valve and electronic control unit (power supply)                                      |
|        | Maintenance item                                       |  | Check circuit between exhaust shutter 2-way magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 76. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 6 | Inspection items                                       |  | Inspection of harness between exhaust shutter 2-way magnetic valve and electronic control unit (power supply) |
|        | Maintenance item                                       |  | Check circuit between exhaust shutter 2-way magnetic valve connector terminal No. 1 and chassis ground.       |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                    |
|        | Requirements   |  | There is no continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 7 | Inspection items                                       |                 | Inspection of harness between exhaust shutter 2-way magnetic valve and electronic control unit (ground)   |
|        | Maintenance item                                       |                 | Check circuit between exhaust shutter 2-way magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 6. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.   |
| NO     |  | Modify harness. |   |

|        |  |  |  |
|--------|--|--|--|
| Step 8 | Inspection items                                       |  | Inspection by control data                                 |
|        | Maintenance item                                       |  | Perform actuator test item No. AA "Auxiliary Brake M/V 1". |
|        | Inspection condition                                   |  | Starter switch: ON   |
|        | Requirements   |  | 2-way magnetic valve operation sound is noted              |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).                         |
| NO     |  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P2184/Flash code: 21

## **[Monitor]**

Failure of water temperature sensor 2

## **[Fault (outline)]**

Low signal range check

## **[Diagnosis check]**

- Output voltage of water temperature sensor 2 is monitored.

## **[Code generation condition]**

- Voltage of water temperature sensor 2 remains below 0.1 V for 1 second. (sensor temperature: 150°C {302°F} or more) (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

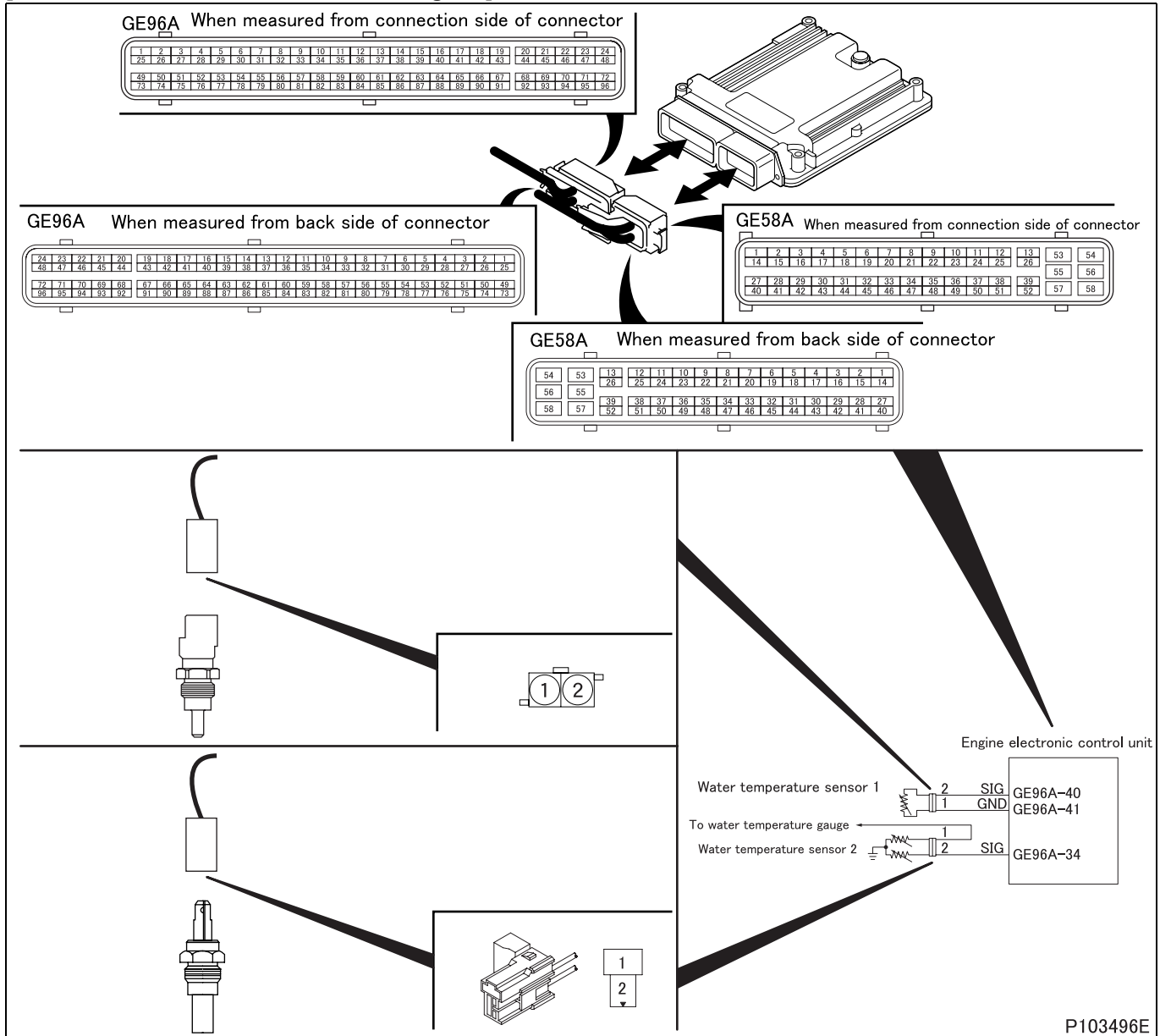
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and water temperature sensor 2
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

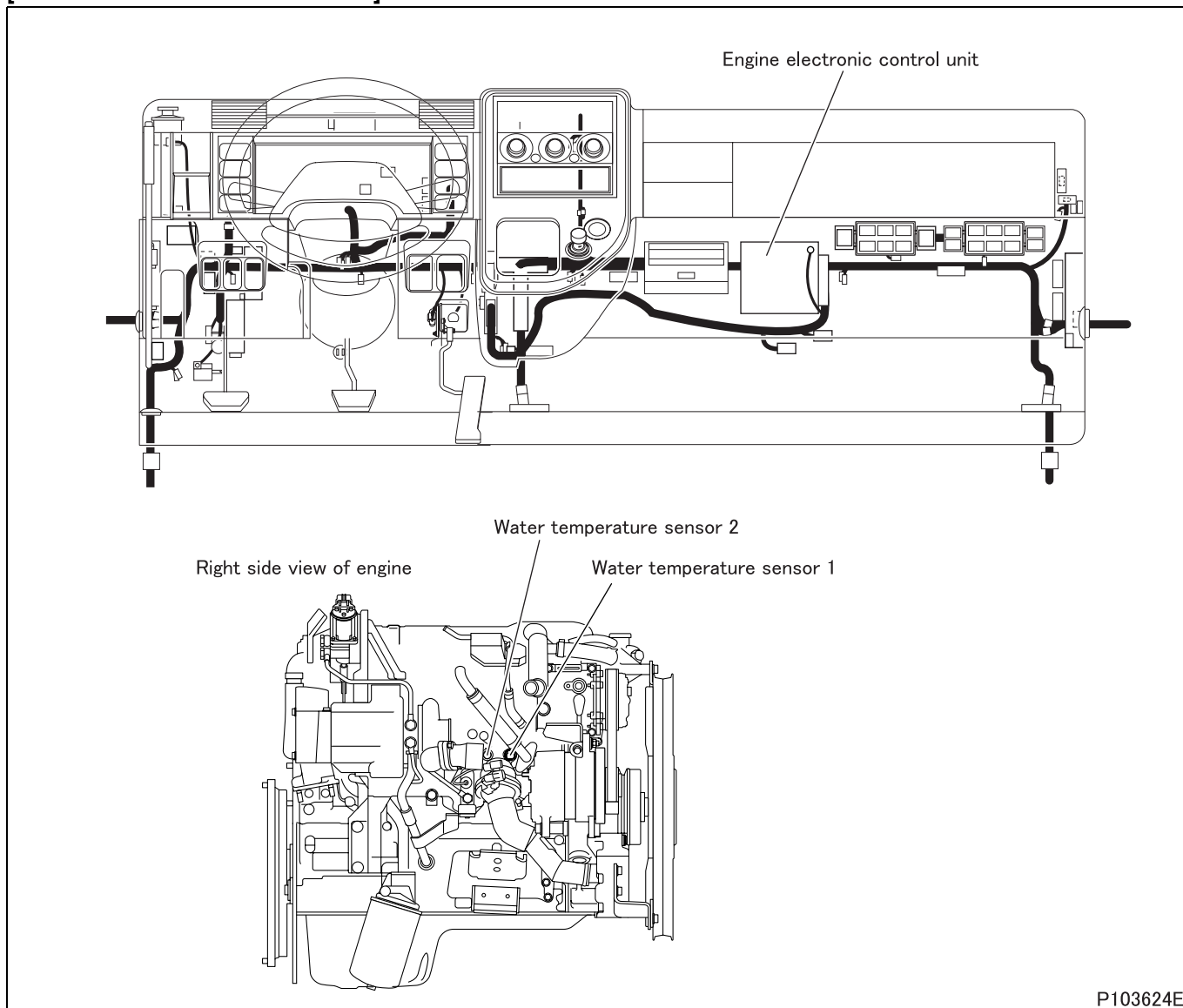
[Electronic Control Unit Connection Diagram]



P103496E

# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measurement of item "Engine Coolant Temperature".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 32 "Water Temperature 2" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | –   |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• Cold engine: Equivalent to outside air temperature</li> <li>• During warm-up: Temperature gradually increased.</li> <li>• When engine is stopped after warm-up: Temperature gradually declines.</li> </ul>   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector  |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 34 and ground.  |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector.   |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• <math>-20^{\circ}\text{C}</math> <math>\{-4^{\circ}\text{F}\}</math> : <math>24.8 \pm 2.5 \text{ k}\Omega</math></li> <li>• <math>0^{\circ}\text{C}</math> <math>\{32^{\circ}\text{F}\}</math> : <math>8.62 \text{ k}\Omega</math> (reference value)</li> <li>• <math>20^{\circ}\text{C}</math> <math>\{68^{\circ}\text{F}\}</math> : <math>3.25 \pm 0.33 \text{ k}\Omega</math></li> <li>• <math>60^{\circ}\text{C}</math> <math>\{140^{\circ}\text{F}\}</math> : <math>620 \Omega</math> (reference value)</li> <li>• <math>80^{\circ}\text{C}</math> <math>\{176^{\circ}\text{F}\}</math> : <math>300 \Omega</math> (reference value)</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.  |
| NO     |  | Go to step 4. |  |

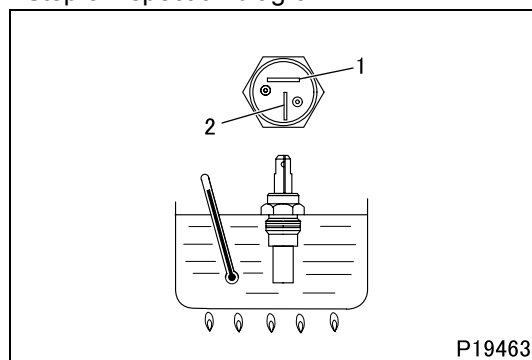
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of water temperature sensor 2 connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

# TROUBLESHOOTING

|        |  |  |              |
|--------|--|--|--------------|
| Step 5 | Inspection items                                       | Inspection of water temperature sensor 2 unit  |              |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 2 and body.   |              |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Put water temperature sensor 2 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>   |              |
|        | Requirements   | <ul style="list-style-type: none"> <li>-20°C {-4°F} : 24.8 ± 2.5 kΩ</li> <li>0°C {32°F} : 8.62 kΩ (reference value)</li> <li>20°C {68°F} : 3.25 ± 0.33 kΩ</li> <li>60°C {140°F} : 620 Ω (reference value)</li> <li>80°C {176°F} : 300 Ω (reference value)</li> </ul> |              |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 6 |
|        | NO   | Replacement of sensor  |              |

<Step 5 inspection diagram>



|        |  |  |               |
|--------|--|--|---------------|
| Step 6 | Inspection items                                       | Inspection of harness between electronic control unit and sensor   |               |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 34. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                           |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7. |
|        | NO   | Modify harness.  |               |

|        |  |   |                                    |
|--------|--|---|------------------------------------|
| Step 7 | Inspection items                                       | Inspection by control data  |                                    |
|        | Maintenance item                                       | <p>&lt;General Scanning Tool used&gt;</p> <ul style="list-style-type: none"> <li>Measurement of item "Engine Coolant Temperature".</li> </ul> <p>&lt;Multi-Use Tester used&gt;</p> <ul style="list-style-type: none"> <li>Measure item No. 32 "Water Temperature 2" of Service Data.</li> </ul> |                                    |
|        | Inspection condition                                   | -   |                                    |
|        | Requirements   | <ul style="list-style-type: none"> <li>Cold engine: Equivalent to outside air temperature</li> <li>During warm-up: Temperature gradually increased.</li> <li>When engine is stopped after warm-up: Temperature gradually declines.</li> </ul>   |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to transient fault (See Gr00.). |
|        | NO   | Replacement of electronic control unit  |                                    |



**[Fault code]**

Diagnosis code: P2185/Flash code: 21

**[Monitor]**

Failure of water temperature sensor 2

**[Fault (outline)]**

High signal range check

**[Diagnosis check]**

- Output voltage of water temperature sensor 2 is monitored.

**[Code generation condition]**

- Output voltage of water temperature sensor 2 remains over 4.9 V for 1 second. (sensor temperature:  $-37^{\circ}\text{C}$   $\{-34.6^{\circ}\text{F}\}$  or less)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

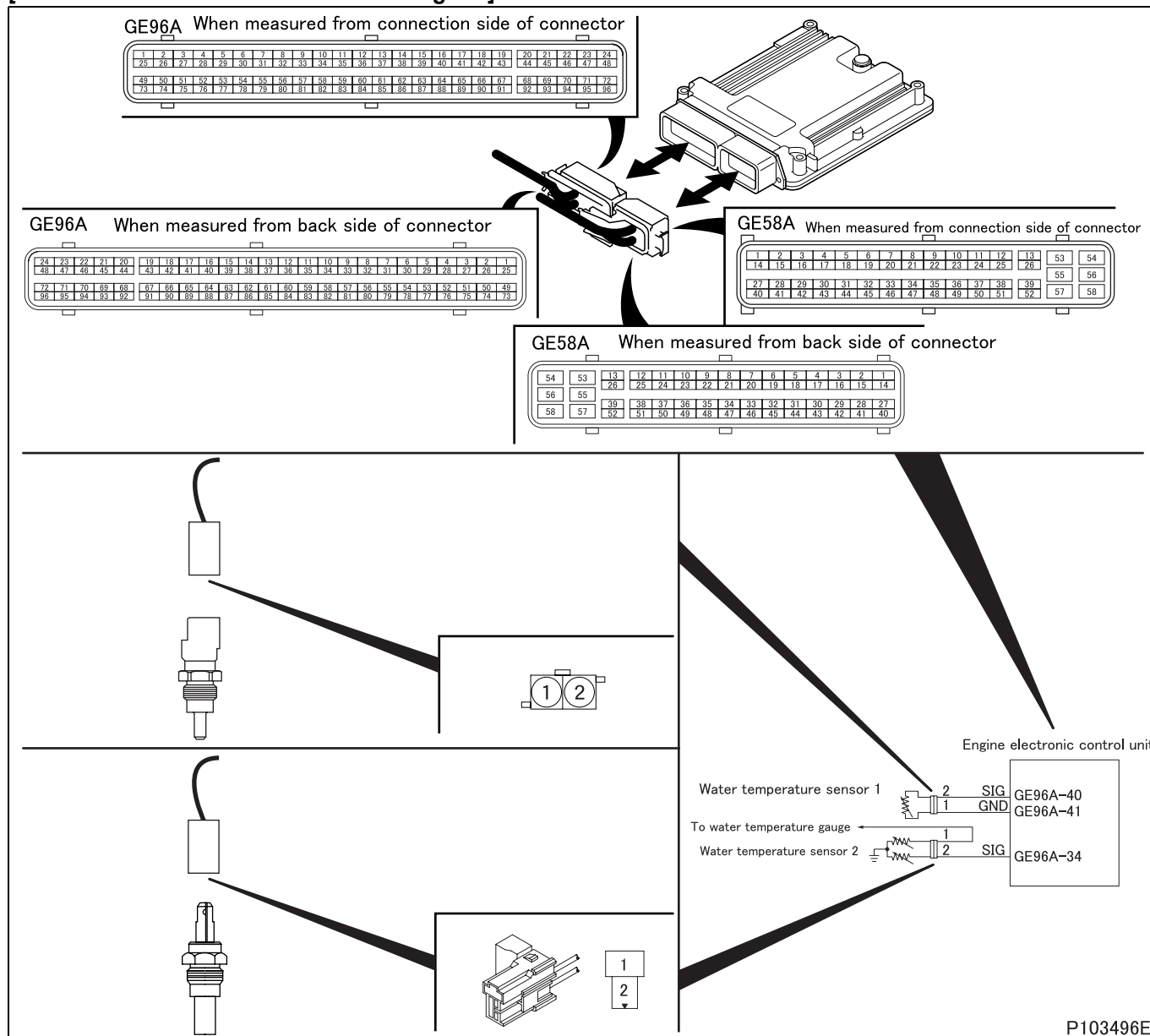
- Open-circuit or short-circuit of harness between electronic control unit and water temperature sensor 2
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal with starter switch in ON position.  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

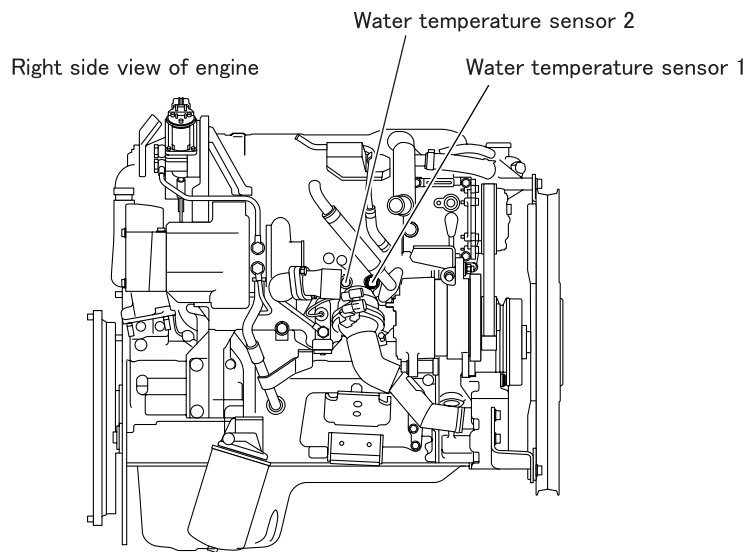
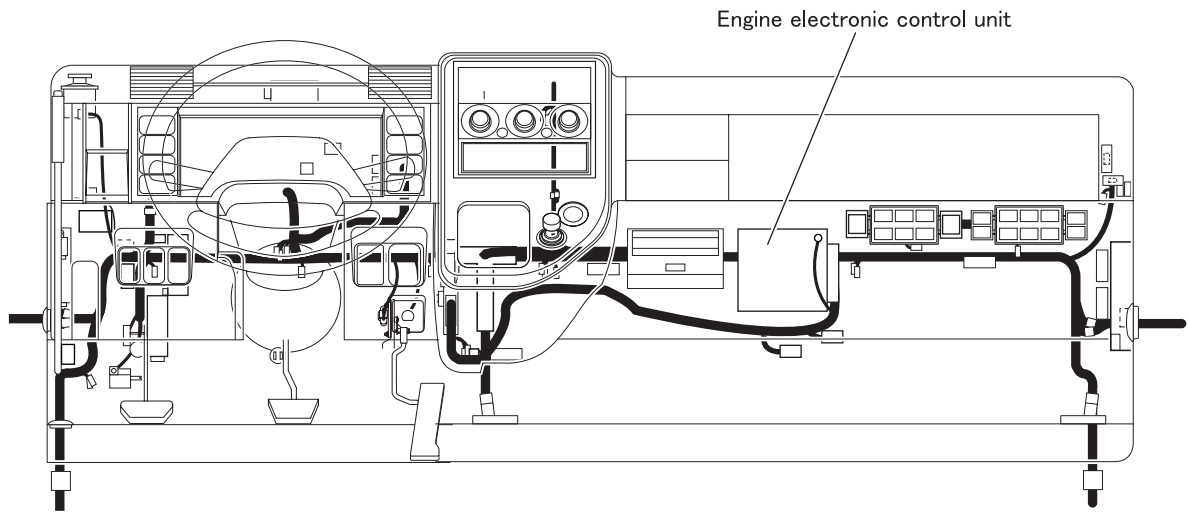
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P103496E

[Parts Identification and Location]



P103624E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measurement of item "Engine Coolant Temperature".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 32 "Water Temperature 2" of Service Data.</li> </ul> |
|        | Inspection condition                                   |               | –   |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• Cold engine: Equivalent to outside air temperature</li> <li>• During warm-up: Temperature gradually increased.</li> <li>• When engine is stopped after warm-up: Temperature gradually declines.</li> </ul>   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

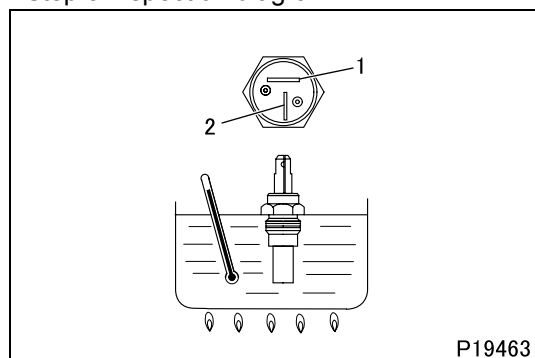
|        |  |               |   |
|--------|--|---------------|---|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |               | Measure value of resistance between connector (GE96A) terminal No. 34 and ground.   |
|        | Inspection condition                                   |               | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• <math>-20^{\circ}\text{C}</math> <math>\{-4^{\circ}\text{F}\}</math>: <math>24.8 \pm 2.5 \text{ k}\Omega</math></li> <li>• <math>0^{\circ}\text{C}</math> <math>\{32^{\circ}\text{F}\}</math>: <math>8.62 \text{ k}\Omega</math> (reference value)</li> <li>• <math>20^{\circ}\text{C}</math> <math>\{68^{\circ}\text{F}\}</math>: <math>3.25 \pm 0.33 \text{ k}\Omega</math></li> <li>• <math>60^{\circ}\text{C}</math> <math>\{140^{\circ}\text{F}\}</math>: <math>620 \Omega</math> (reference value)</li> <li>• <math>80^{\circ}\text{C}</math> <math>\{176^{\circ}\text{F}\}</math>: <math>300 \Omega</math> (reference value)</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.   |
| NO     |  | Go to step 4. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 4 | Inspection items                                       |                   | Inspection of water temperature sensor 2 connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 5.   |
| NO     |  | Modify connector. |   |

|        |  |   |               |
|--------|--|---|---------------|
| Step 5 | Inspection items                                       | Inspection of water temperature sensor 2 unit   |               |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 2 and body.  |               |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Put water temperature sensor 2 in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>-20°C {-4°F}: 24.8 ± 2.5 kΩ</li> <li>0°C {32°F}: 8.62 kΩ (reference value)</li> <li>20°C {68°F}: 3.25 ± 0.33 kΩ</li> <li>60°C {140°F}: 620 Ω (reference value)</li> <li>80°C {176°F}: 300 Ω (reference value)</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6. |
|        | NO   | Replacement of sensor   |               |

<Step 5 inspection diagram>



P19463

|        |  |  |               |
|--------|--|--|---------------|
| Step 6 | Inspection items                                       | Inspection of harness between electronic control unit and sensor   |               |
|        | Maintenance item                                       | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 34. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                           |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7. |
|        | NO   | Modify harness.  |               |

|        |  |  |                                    |
|--------|--|--|------------------------------------|
| Step 7 | Inspection items                                       | Inspection by control data   |                                    |
|        | Maintenance item                                       | <p>&lt;General Scanning Tool used&gt;</p> <ul style="list-style-type: none"> <li>Measurement of item "Engine Coolant Temperature".</li> </ul> <p>&lt;Multi-Use Tester used&gt;</p> <ul style="list-style-type: none"> <li>Measure item No. 32 "Water Temperature 2" of Service Data.</li> </ul>  |                                    |
|        | Inspection condition                                   | -  |                                    |
|        | Requirements   | <p>&lt;General Scanning Tool used&gt;</p> <ul style="list-style-type: none"> <li>During warm-up: Value of resistance gradually declines.</li> <li>When engine is stopped after warm-up: Value of resistance gradually increased.</li> </ul> <p>&lt;Multi-Use Tester used&gt;</p> <ul style="list-style-type: none"> <li>Cold engine: Equivalent to outside air temperature</li> <li>During warm-up: Temperature gradually increased.</li> <li>When engine is stopped after warm-up: Temperature gradually declines.</li> </ul> |                                    |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to transient fault (See Gr00.). |
|        | NO   | Replacement of electronic control unit   |                                    |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P2187/Flash code: 52

## **[Monitor]**

Abnormality in idling control

## **[Fault (outline)]**

Idle fuelling too low

## **[Diagnosis check]**

- Injection quantity during idling is monitored.

## **[Code generation condition]**

- Actual injection quantity during idling remains below 3 mg/cycle for 10 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

- Warming-up control: normal
- PTO SW: OFF
- Water temperature: above 55°C {131°F}
- Diesel particulate filter regeneration control: not effected

## **[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

## **[Probable cause of trouble]**

- Malfunction of injector

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

**[Fault code]**

Diagnosis code: P2188/Flash code: 52

**[Monitor]**

Abnormality in idling control

**[Fault (outline)]**

Idle fuelling too high

**[Diagnosis check]**

- Injection quantity during idling is monitored.

**[Code generation condition]**

- Actual injection quantity during idling remains excessive for 10 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Warming-up control: normal
- PTO SW: OFF
- Water temperature: above 55°C {131°F}
- Diesel particulate filter regeneration control: not effected

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

- Malfunction of injector

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P2199/Flash code: 44

## **[Monitor]**

Characteristic abnormality of intake air temperature sensor

## **[Fault (outline)]**

Gain and offset drift

## **[Diagnosis check]**

- Difference in temperature between intake air temperature sensor and boost air temperature sensor is monitored for deviation from specified value.

## **[Code generation condition]**

- Difference in output voltage remains below 0°C {32°F} or over 35°C {95°F} for 10 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

- Engine operating mode: normal (engine in operation)
- Engine speed: 400 to 2000 rpm
- Fuel injection quantity: 3 to 50 mg/cyc
- Water temperature: 65 to 110°C {149 to 230°F}
- Time till above conditions were met: more than 5 seconds
- Exhaust gas recirculation valve: in order
- Intake throttle: in order
- Turbocharger actuator: in order
- Controller area network communication of each electronic drive unit (exhaust gas recirculation, intake throttle and turbocharger): in order
- Exhaust gas recirculation flow rate and exhaust gas recirculation valve operation: in order
- Air flow sensor: in order
- Atmospheric pressure sensor: in order
- Boost pressure sensor: in order
- Water temperature sensor: normal in output signal
- Intake air temperature sensor: normal in output signal
- Boost air temperature sensor: in order
- Exhaust gas recirculation system: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- Injector: in order
- MPROP (rail pressure control valve): in order
- Fuel feed when engine is idling: in order
- Exhaust shutter 3-way magnetic valve: in order
- Exhaust gas recirculation temperature remains unchanged.

## **[Control effected by electronic control unit during fault]**

- Intake air temperature is fixed at backup value.
- Related fault check is stopped.

## **[Probable cause of trouble]**

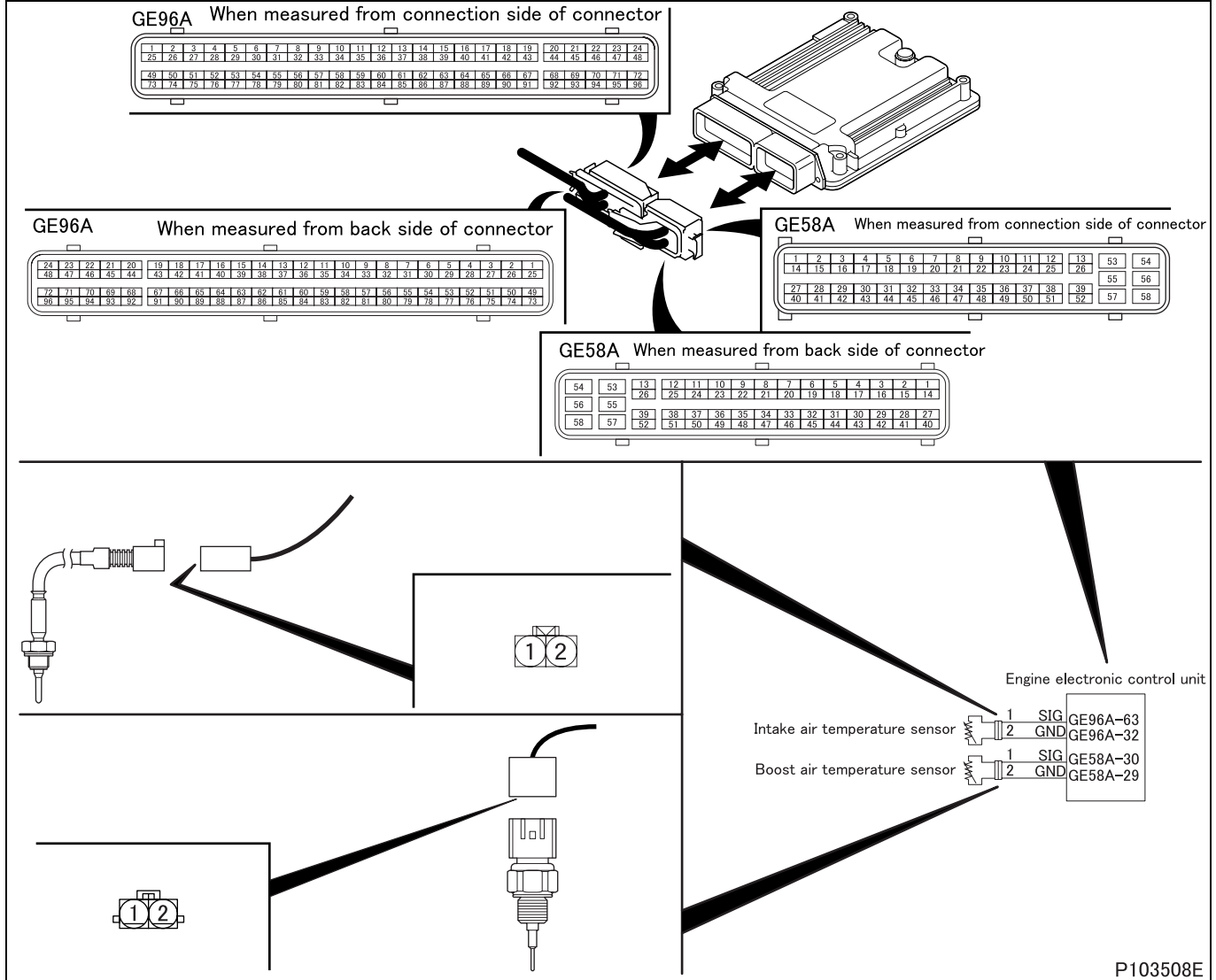
- Open-circuit or short-circuit of harness between electronic control unit and boost air temperature sensor and intake air temperature sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit



## [Recoverability]

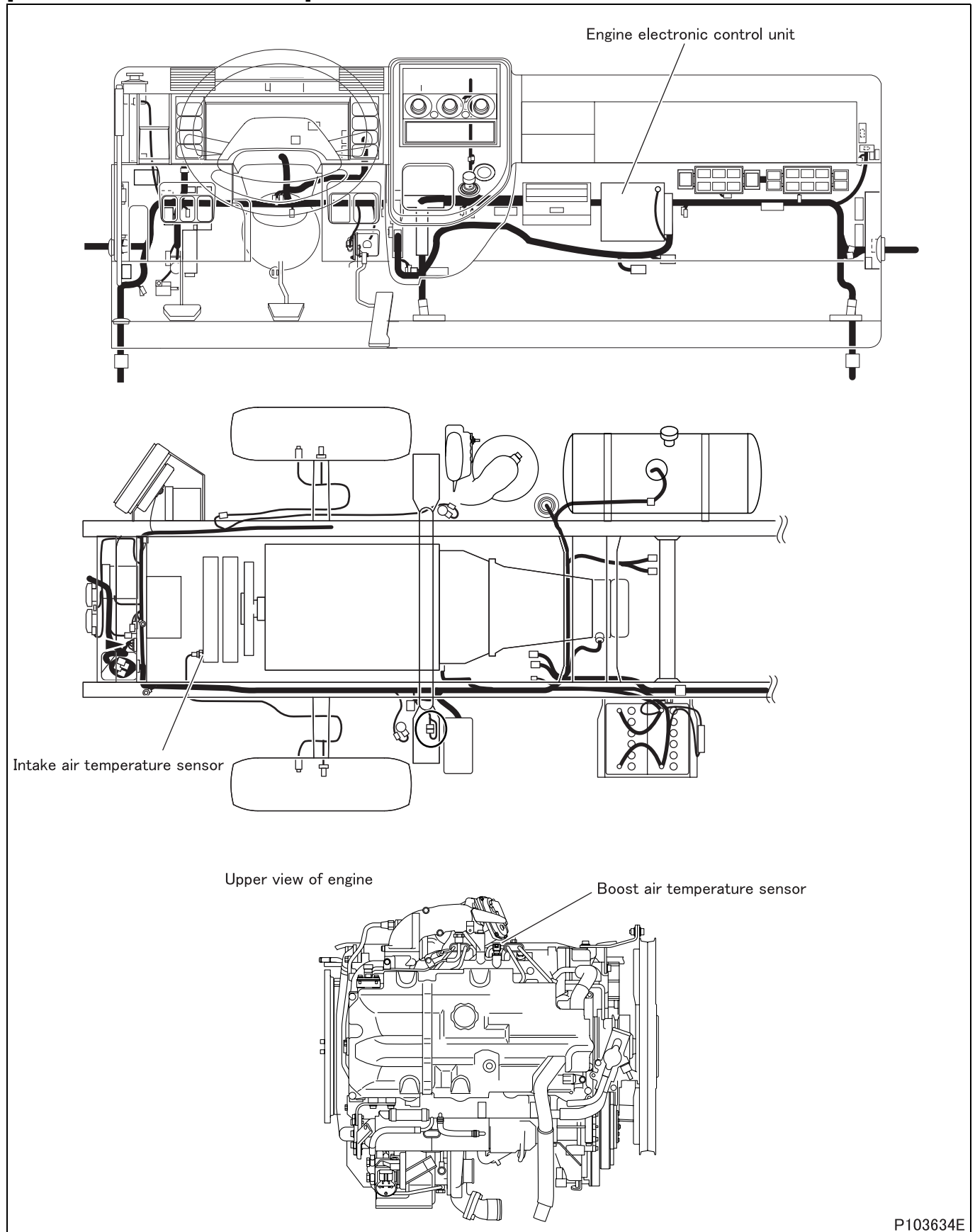
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

## [Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]



P103634E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item "Intake Air Temperature".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. 10 "Intake Air Temperature (EGR)" of Service Data.</li> </ul> |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | Cold engine: Equivalent to outside air temperature  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection by electronic control unit connector   |
|        | Maintenance item                                       |  | Measure value of resistance between connector (GE58A) terminal No. 29 and 30.   |
|        | Inspection condition                                   |  | Disconnect electronic control unit from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• 0°C {32°F}: 162.3<sup>+48.8</sup><sub>-36.5</sub> kΩ</li> <li>• 20°C {68°F}: 61.47<sup>+15.99</sup><sub>-12.35</sub> kΩ</li> <li>• 80°C {176°F}: 6.120<sup>+1.095</sup><sub>-0.907</sub> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

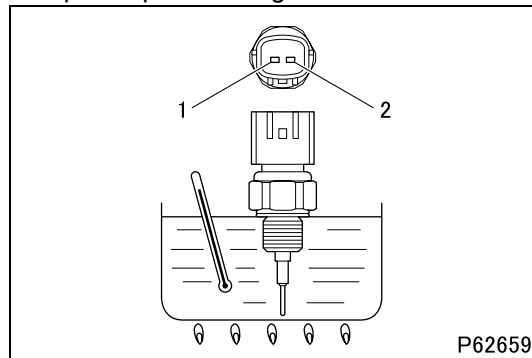
|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of boost air temperature sensor  |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

# TROUBLESHOOTING

|        |  |                       |   |
|--------|--|-----------------------|---|
| Step 5 | Inspection items                                       |                       | Inspection of boost air temperature sensor unit   |
|        | Maintenance item                                       |                       | Measure value of resistance between connector terminal No. 1 and No. 2.   |
|        | Inspection condition                                   |                       | <ul style="list-style-type: none"> <li>Put boost air temperature sensor in container filled with engine oil.</li> <li>Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>  |
|        | Requirements   |                       | <ul style="list-style-type: none"> <li>0°C {32°F}: 162.3 <math>\begin{smallmatrix} +48.8 \\ -36.5 \end{smallmatrix}</math> kΩ</li> <li>20°C {68°F}: 61.47 <math>\begin{smallmatrix} +15.99 \\ -12.35 \end{smallmatrix}</math> kΩ</li> <li>80°C {176°F}: 6.120 <math>\begin{smallmatrix} +1.095 \\ -0.907 \end{smallmatrix}</math> kΩ</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                   | Go to step 6.   |
| NO     |  | Replacement of sensor |   |

<Step 5 inspection diagram>



|        |  |                 |  |
|--------|--|-----------------|--|
| Step 6 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE58A) terminal No. 30. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 7.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE58A) terminal No. 29. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |  |   |
|--------|--|--|---|
| Step 8 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | <p>&lt;General Scanning Tool used&gt;</p> <ul style="list-style-type: none"> <li>Measure item "Intake Air Temperature".</li> </ul> <p>&lt;Multi-Use Tester used&gt;</p> <ul style="list-style-type: none"> <li>Measure item No. 10 "Intake Air Temperature (EGR)" of Service Data.</li> </ul> |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | Cold engine: Equivalent to outside air temperature  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

**[Fault code]**

Diagnosis code: P2228/Flash code: 19

**[Monitor]**

Failure of atmospheric pressure sensor (inside engine electronic control unit)

**[Fault (outline)]**

Low signal range check

**[Diagnosis check]**

- Output voltage of atmospheric pressure sensor (built in engine electronic control unit) is monitored.

**[Code generation condition]**

- Voltage from atmospheric pressure sensor (built in engine electronic control unit) remains below 2 V for 1 second. (sensor pressure: 507 mbar {7.35 psi} or less)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

–

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- In-use performance counter is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

- Malfunction of atmospheric pressure sensor
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |  |   |
|--------|--|--|---|
| Step 1 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | <b>&lt;General Scanning Tool used&gt;</b><br>• Measure item “Barometric Pressure”.<br><b>&lt;Multi-Use Tester used&gt;</b><br>• Measure item No. 20 “Atmospheric Pressure” of Service Data. |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | Standard atmospheric pressure (around 101.3 kPa {15 psi, 1.0 kgf/cm <sup>2</sup> })   |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO     |  | Replacement of electronic control unit |   |

# TROUBLESHOOTING

## [Fault code]

Diagnosis code: P2229/Flash code: 19

## [Monitor]

Failure of atmospheric pressure sensor (inside engine electronic control unit)

## [Fault (outline)]

High signal range check

## [Diagnosis check]

- Output voltage of atmospheric pressure sensor (built in engine electronic control unit) is monitored.

## [Code generation condition]

- Voltage from atmospheric pressure sensor (built in engine electronic control unit) remains over 4.8 V for 1 second. (sensor pressure: 1215 mbar {17.62 psi} or more)  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## [Diagnosis check timing]

- Fault diagnosis is continuously performed during the driving cycle.

## [Diagnostic requirement]

–

## [Control effected by electronic control unit during fault]

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- In-use performance counter is stopped.
- Related fault check is stopped.

## [Probable cause of trouble]

- Malfunction of atmospheric pressure sensor
- Malfunction of electronic control unit

## [Recoverability]

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | <b>&lt;General Scanning Tool used&gt;</b> <ul style="list-style-type: none"> <li>• Measure item "Barometric Pressure".</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b> <ul style="list-style-type: none"> <li>• Measure item No. 20 "Atmospheric Pressure" of Service Data.</li> </ul> |
|        | Inspection condition                                   |  | –  |
|        | Requirements   |  | Standard atmospheric pressure (around 101.3 kPa {15 psi, 1.0 kgf/cm <sup>2</sup> })  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO     |  | Replacement of electronic control unit |  |

**[Fault code]**

Diagnosis code: P2263/Flash code: 51

**[Monitor]**

Turbocharger actuator system

**[Fault (outline)]**

- Turbocharger actuator slow response/steady state position deviation
- Plausibility
- Motor lock

**[Diagnosis check]**

- Turbocharger actuator shaft position is detected as actual position through position sensor and compared with target position for control by engine electronic control unit.

**[Code generation condition]**

Diagnosis code is generated under either of the following conditions. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

- Actual position remains larger than target position by 15% or more for 5 seconds.
- Difference between actual position and target position remains less than 0 {0 in.} mm and more than 23 {0.9 in.} mm for 1 second.
- Initialization error remains for 1 second.

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

- Battery voltage: in order
- Turbocharger actuator: in order
- Controller area network communication of turbocharger electronic drive unit: in order

**[Control effected by electronic control unit during fault]**

Electronic control unit differs in the way of control by the diagnosis check item.

<Deviation in position, wiping (sliding)>

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Turbocharger control is stopped.
- Diesel particulate filter regeneration is stopped.
- Turbocharger actuator test is inhibited.
- Related fault check is stopped.

<Target value>

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic drive unit and turbocharger actuator
- Malfunction of each connector
- Malfunction of turbocharger motor (built in turbocharger actuator)
- Malfunction of turbocharger position sensor (built in turbocharger actuator)
- Malfunction of electronic drive unit
- Malfunction of electronic drive unit relay

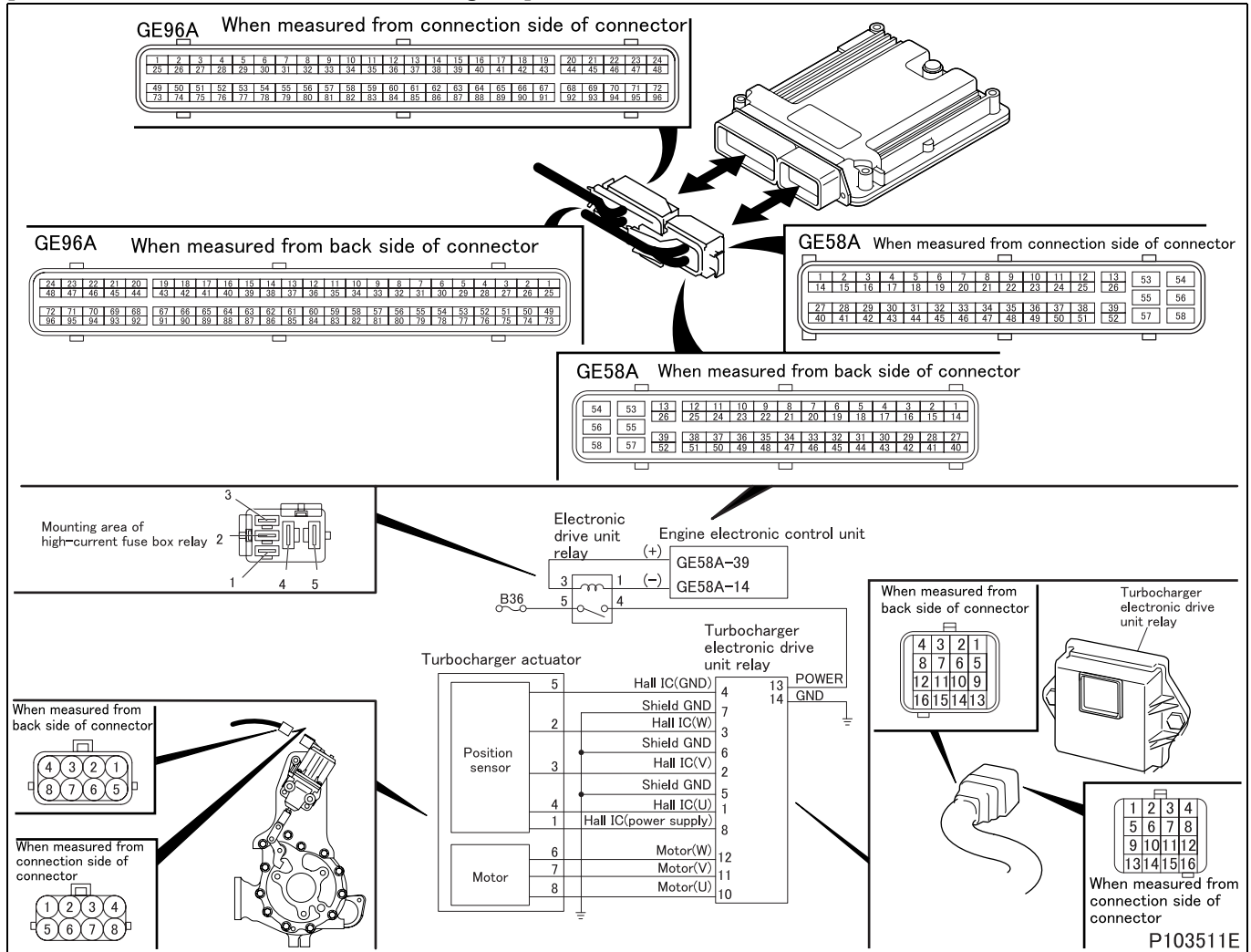
**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

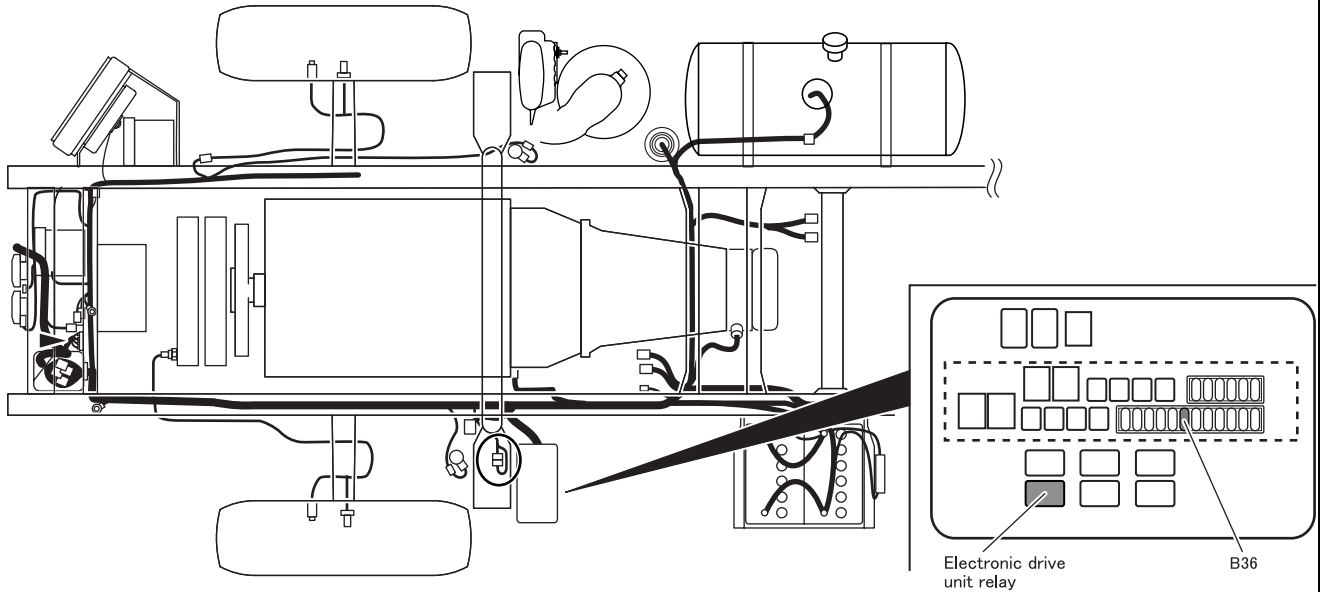
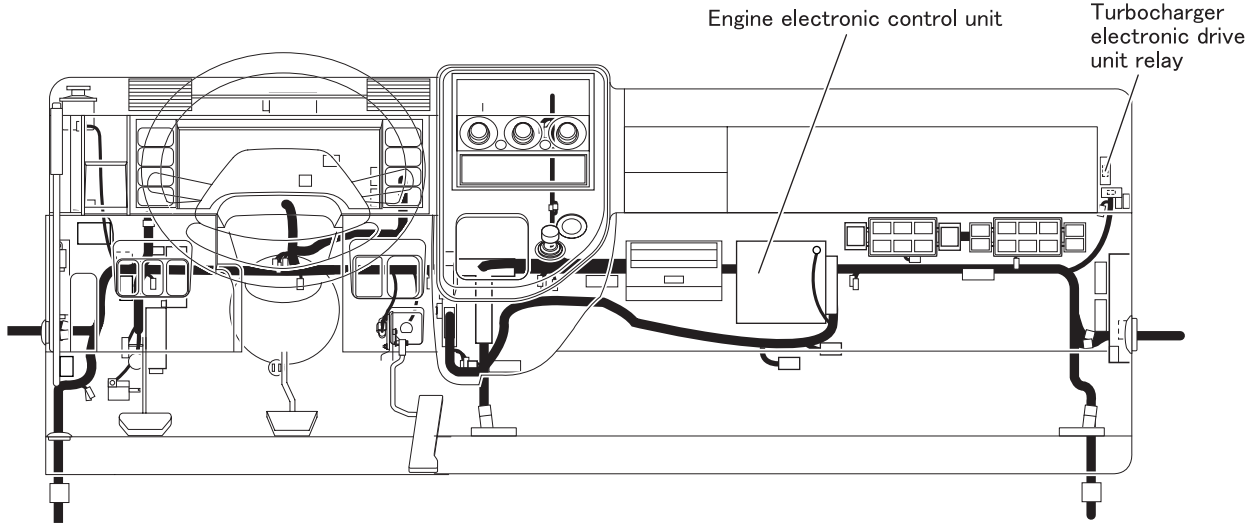
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## [Electronic Control Unit Connection Diagram]

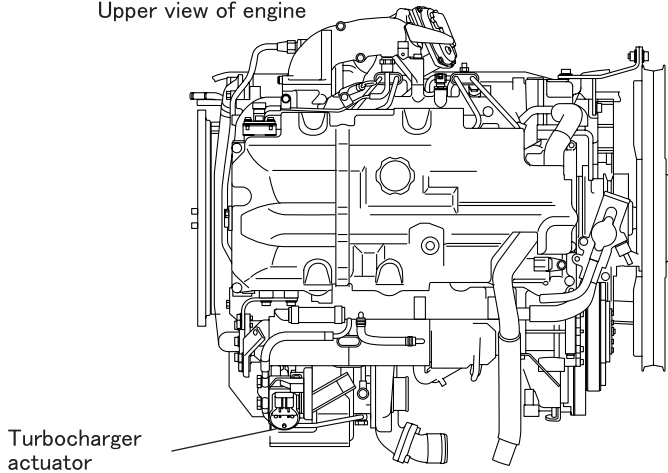




[Parts Identification and Location]



Upper view of engine



P103637E

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. A4 "VGT 1".  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Transmission: neutral (parking satisfactory for automatic transmission)</li> <li>Diagnosis switch: OFF (fuse removed)</li> </ul>  |
|        | Requirements   |               | Actual position matches with target value set by Multi-Use Tester (check with service data "54: Target VGT Position, 55: Actual VGT Position").<br><b>NOTE</b> <ul style="list-style-type: none"> <li>Set turbocharger opening to the range of 20 to 80%.</li> <li>As initial operational check of turbocharger actuator is automatically effected immediately after starter switch is ON, perform actuator test by Multi-Use Tester after that check (approximately 5 seconds later).</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic drive unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of turbocharger actuator connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

|        |  |     |  |
|--------|--|-----|--|
| Step 4 | Inspection items                                       |     | Inspection by control data   |
|        | Maintenance item                                       |     | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>P0685 "EDU Relay (Open)"</li> <li>P0686 "EDU Relay (Low)"</li> <li>P0687 "EDU Relay (High)"</li> </ul> |
|        | Inspection condition                                   |     | Starter switch: ON   |
|        | Requirements   |     | No codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) | YES | Go to step 5.  |
|        |  | NO  | Inspect diagnosis code that is occurring.  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 5 | Inspection items                                       |               | Inspection of electronic drive unit connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector terminal No. 13 (+) and 14 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Disconnect connector and measure from harness side.</li> <li>• Starter switch: ON</li> <li>• Perform actuator test item No. AF "EDU Relay".</li> </ul> |
|        | Requirements   |               | Same as battery voltage.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 10.  |
| NO     |  | Go to step 6. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between fuse and relay   |
|        | Maintenance item                                       |                 | Check circuit between fuse No. B35 and relay connector terminal No. 5.                     |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 8 | Inspection items                                       |                 | Inspection of harness between relay and electronic drive unit   |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 4 and electronic drive unit connector terminal No. 13. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of electronic drive unit relay, go to step 9.   |
| NO     |  | Modify harness. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and ground   |
|        | Maintenance item                                       |                 | Check circuit between following electronic drive unit connector terminals. <ul style="list-style-type: none"> <li>• Electronic drive unit ground: terminal No. 14 - chassis ground</li> <li>• Sensor shield ground (U): terminal No. 5 - 14</li> <li>• Sensor shield ground (V): terminal No. 6 - 14</li> <li>• Sensor shield ground (W): terminal No. 7 - 14</li> <li>• Sensor ground: terminal No. 4 - 14</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 10.   |
| NO     |  | Modify harness. |  |

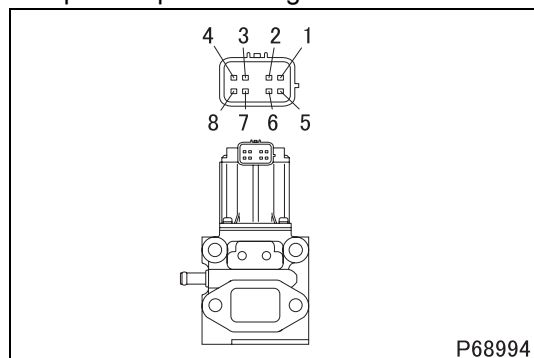
# TROUBLESHOOTING

|         |  |                      |  |
|---------|--|----------------------|--|
| Step 10 | Inspection items                                       |                      | Inspection of electronic drive unit connector (motor)  |
|         | Maintenance item                                       |                      | Measure value of resistance between following connector terminals <ul style="list-style-type: none"> <li>• Between U - V: 10 - 11</li> <li>• Between U - W: 10 - 12</li> <li>• Between V - W: 11 - 12</li> </ul> |
|         | Inspection condition                                   |                      | —  |
|         | Requirements   |                      | 2.1 ± 0.3 Ω  |
|         | Inspection result (Is the judging standard satisfied?) |                      | YES<br>Go to step 13.  |
|         |  | NO<br>Go to step 11. |  |

|         |  |                       |   |
|---------|--|-----------------------|---|
| Step 11 | Inspection items                                       |                       | Inspection of harness between electronic drive unit and turbocharger actuator (motor)   |
|         | Maintenance item                                       |                       | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Motor (U): electronic drive unit connector terminal No. 10 - turbocharger actuator connector No. 8</li> <li>• Motor (V): electronic drive unit connector terminal No. 11 - turbocharger actuator connector No. 7</li> <li>• Motor (W): electronic drive unit connector terminal No. 12 - turbocharger actuator connector No. 6</li> </ul> |
|         | Inspection condition                                   |                       | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                       | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) |                       | YES<br>Go to step 12.   |
|         |  | NO<br>Modify harness. |   |

|         |  |  |  |
|---------|--|--|--|
| Step 12 | Inspection items                                       |  | Inspection of turbocharger actuator unit (motor)   |
|         | Maintenance item                                       |  | Measure value of resistance between following turbocharger actuator connector terminals <ul style="list-style-type: none"> <li>• Between U - V: 8 - 7</li> <li>• Between U - W: 8 - 6</li> <li>• Between V - W: 7 - 6</li> </ul> |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Keep turbocharger actuator installed on vehicle.</li> <li>• Remove harness connector and measure turbocharger actuator side.</li> </ul>   |
|         | Requirements   |  | 2.1 ± 0.3 Ω  |
|         | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 13.  |
|         |  | NO<br>Replacement of turbocharger actuator |  |

<Step 12 inspection diagram>



|         |  |  |  |     |                |    |
|---------|--|--|--|-----|----------------|----|
| Step 13 | Inspection items                                       |  | Inspection of turbocharger actuator connector (position sensor: power supply)  |     |                |    |
|         | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 1 (+) and 5 (-).   |     |                |    |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |     |                |    |
|         | Requirements   |  | 10 V   |     |                |    |
|         | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 14.</td> </tr> <tr> <td>NO</td> <td>Go to step 15.</td> </tr> </table>   | YES | Go to step 14. | NO |
| YES     | Go to step 14.   |  |  |     |                |    |
| NO      | Go to step 15.   |  |  |     |                |    |

|         |  |  |  |     |                |    |
|---------|--|--|--|-----|----------------|----|
| Step 14 | Inspection items                                       |  | Inspection of electronic drive unit connector (position sensor: signal)  |     |                |    |
|         | Maintenance item                                       |  | Measure values of voltage between the following electronic drive unit connector terminals. <ul style="list-style-type: none"> <li>• U signal output: terminal 1 (+) - 4 (-)</li> <li>• V signal output: terminal 2 (+) - 4 (-)</li> <li>• W signal output: terminal 3 (+) - 4 (-)</li> </ul> |     |                |    |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> <li>• Perform actuator test item No. A4 "VGT 1".</li> </ul>   |     |                |    |
|         | Requirements   |  | 8 to 11 V  |     |                |    |
|         | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 16.</td> </tr> <tr> <td>NO</td> <td>Go to step 15.</td> </tr> </table>   | YES | Go to step 16. | NO |
| YES     | Go to step 16.   |  |  |     |                |    |
| NO      | Go to step 15.   |  |  |     |                |    |

|         |  |  |   |     |   |    |
|---------|--|--|---|-----|---|----|
| Step 15 | Inspection items                                       |  | Inspection of harness between electronic drive unit and turbocharger actuator (position sensor)   |     |   |    |
|         | Maintenance item                                       |  | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Sensor (power supply): electronic drive unit connector terminal No. 8 - turbocharger actuator connector No. 1</li> <li>• Sensor (U): electronic drive unit connector terminal No. 1 - turbocharger actuator connector No. 4</li> <li>• Sensor (V): electronic drive unit connector terminal No. 2 - turbocharger actuator connector No. 3</li> <li>• Sensor (W): electronic drive unit connector terminal No. 3 - turbocharger actuator connector No. 2</li> <li>• Sensor (ground): electronic drive unit connector terminal No. 4 - turbocharger actuator connector No. 5</li> </ul> |     |   |    |
|         | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |     |   |    |
|         | Requirements   |  | There is continuity.  |     |   |    |
|         | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>After replacement of turbocharger, go to step 16.</td> </tr> <tr> <td>NO</td> <td>Modify harness.</td> </tr> </table>  | YES | After replacement of turbocharger, go to step 16. | NO |
| YES     | After replacement of turbocharger, go to step 16.      |  |   |     |   |    |
| NO      | Modify harness.  |  |   |     |   |    |

# TROUBLESHOOTING

|         |  |                                      |  |
|---------|--|--------------------------------------|--|
| Step 16 | Inspection items                                       |                                      | Inspection by control data   |
|         | Maintenance item                                       |                                      | Perform actuator test item No. A4 "VGT 1".   |
|         | Inspection condition                                   |                                      | <ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON (engine started)</li> <li>• Transmission: neutral (parking satisfactory for automatic transmission)</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul>   |
|         | Requirements   |                                      | <p>Actual position matches with target value set by Multi-Use Tester (check with service data "54: Target VGT Position, 55: Actual VGT Position").</p> <p><b>NOTE</b></p> <ul style="list-style-type: none"> <li>• <b>Set turbocharger opening to the range of 20 to 80%.</b></li> <li>• <b>As initial operational check of turbocharger actuator is automatically effected immediately after starter switch is ON, perform actuator test by Multi-Use Tester after that check (approximately 5 seconds later).</b></li> </ul> |
|         | Inspection result (Is the judging standard satisfied?) | YES                                  | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic drive unit |  |

**[Fault code]**

Diagnosis code: P2413/Flash code: 67, 95

**[Monitor]**

Abnormality in exhaust gas recirculation valve position

**[Fault (outline)]**

- Exhaust gas recirculation valve slow response/steady state position deviation
- Plausibility

**[Diagnosis check]**

- Exhaust gas recirculation valve position is detected as actual position through position sensor and compared with target position for control by engine electronic control unit.

**[Code generation condition]**

Diagnosis code is generated under either of the following conditions. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

- Difference between actual valve position and target valve position remains more than 2 mm {0.08 in.} for 5 seconds.
- Target valve position calculated by engine electronic control unit remains out of specified limits (upper limit: 10 mm {0.39 in.}; lower limit: 0 mm {0 in.}) for 1 second.

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

- Battery voltage: in order
- Exhaust gas recirculation valve: in order
- Controller area network of electronic drive unit: in order

**[Control effected by electronic control unit during fault]**

Electronic control unit differs in the way of control by the diagnosis check item.

<Deviation in position>

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Turbocharger control is stopped.
- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).
- Related fault check is stopped.

<Target value>

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).
- Related fault check is stopped.

**[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic drive unit and exhaust gas recirculation valve
- Malfunction of each connector
- Malfunction of exhaust gas recirculation motor (built in exhaust gas recirculation valve)
- Malfunction of exhaust gas recirculation position sensor (built in exhaust gas recirculation valve)
- Malfunction of electronic drive unit
- Malfunction of electronic drive unit relay

**[Recoverability]**

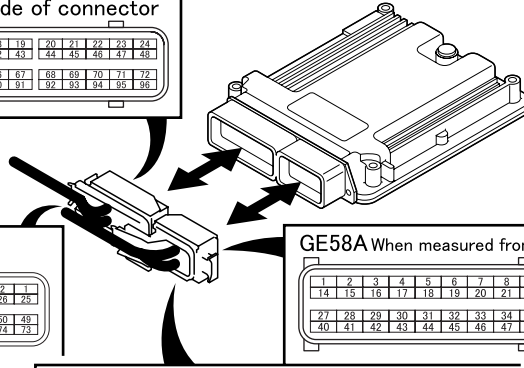
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |    |
| 26 | 26 | 27 | 28 | 28 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 38 | 40 | 41 | 42 | 43 | 44 | 46 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |



GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

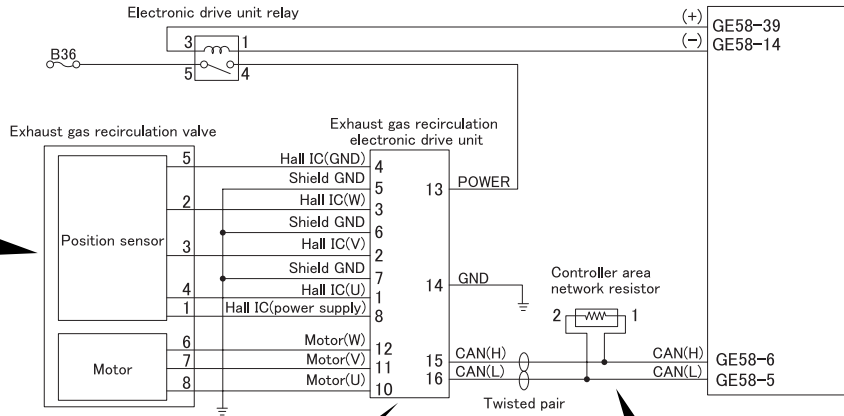
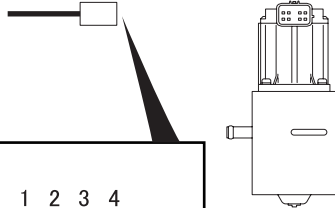
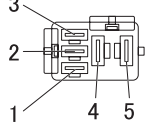
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |    |

Mounting area of high-current fuse box relay



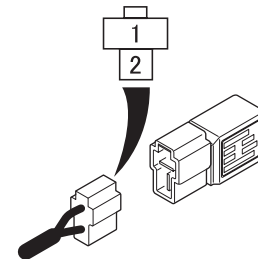
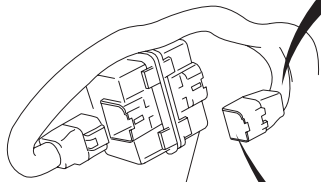
When measured from back side of connector

|    |    |    |    |
|----|----|----|----|
| 4  | 3  | 2  | 1  |
| 8  | 7  | 6  | 5  |
| 12 | 11 | 10 | 9  |
| 16 | 15 | 14 | 13 |

When measured from connection side of connector

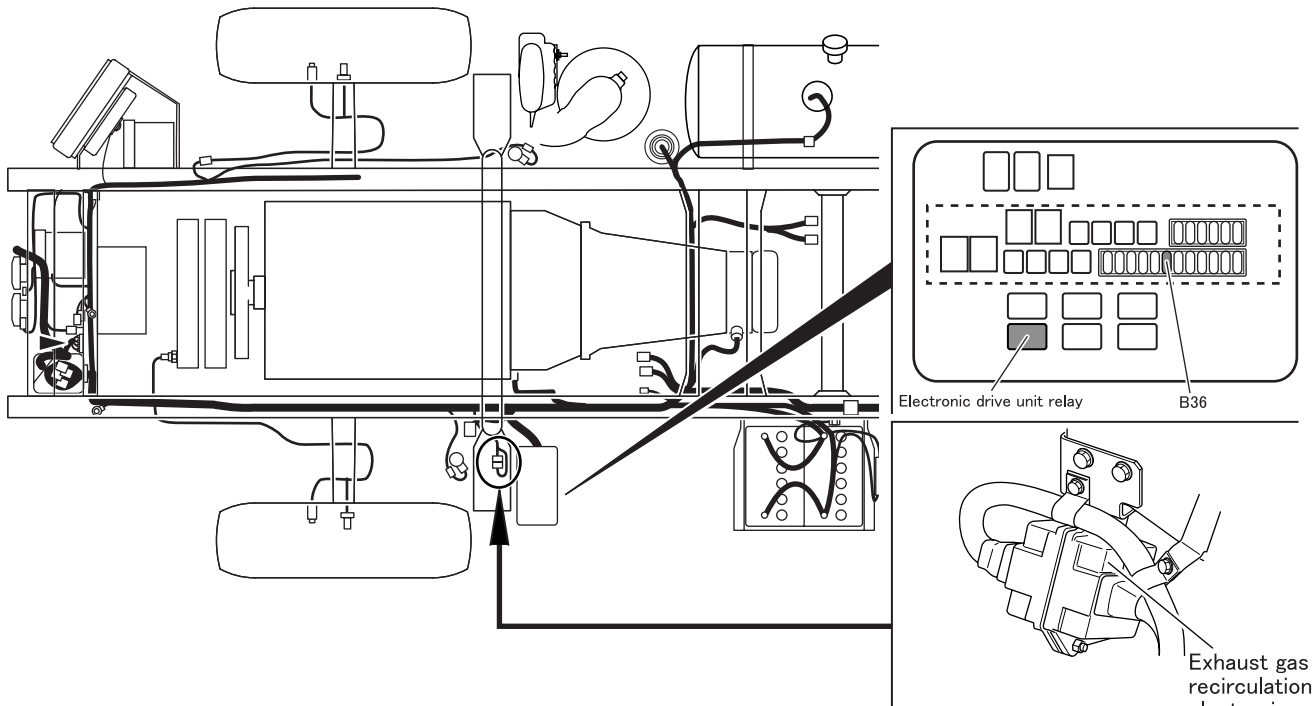
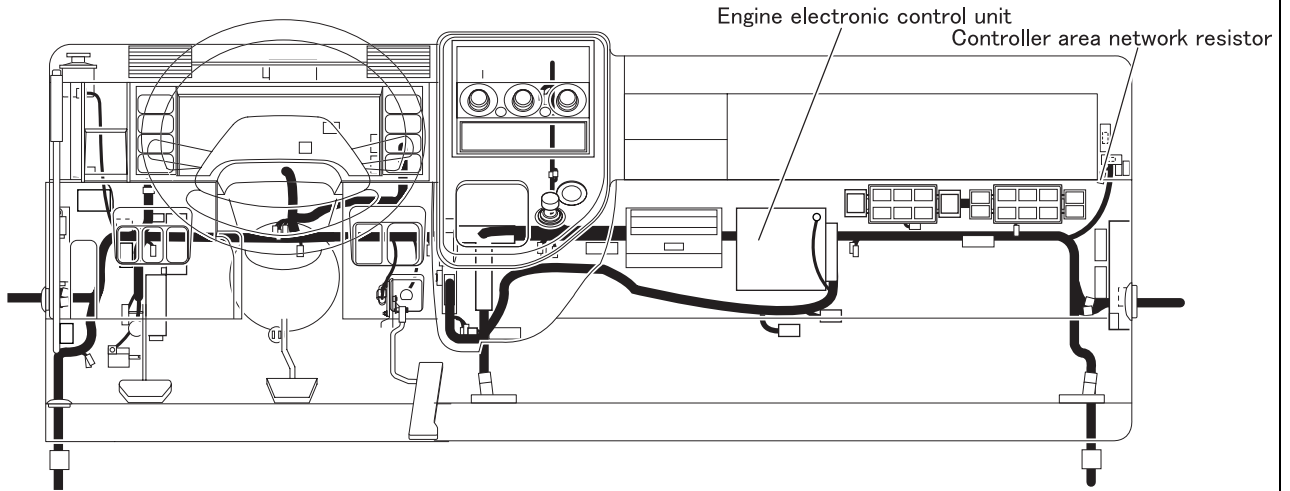
|    |    |    |    |
|----|----|----|----|
| 1  | 2  | 3  | 4  |
| 5  | 6  | 7  | 8  |
| 9  | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |

Exhaust gas recirculation electronic drive unit

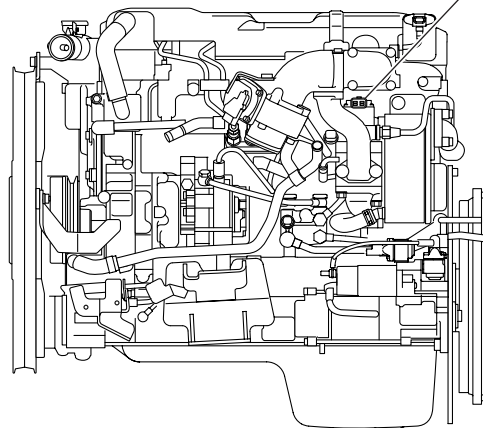




[Parts Identification and Location]



Left side view of engine Exhaust gas recirculation valve



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Perform actuator test item No. A0 "EGR 1".  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Transmission: neutral (parking satisfactory for automatic transmission)</li> <li>Diagnosis switch: OFF (fuse removed)</li> </ul>  |
|        | Requirements   |               | Actual position matches with target value set by Multi-Use Tester (check with service data "51: Actual EGR Valve Position").<br><b>NOTE</b> <ul style="list-style-type: none"> <li>As initial operational check of exhaust gas recirculation valve is automatically effected immediately after starter switch is ON, perform actuator test by Multi-Use Tester after that check (approximately 5 seconds later).</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 2 | Inspection items                                       |                   | Inspection of electronic drive unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 3.   |
| NO     |  | Modify connector. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 3 | Inspection items                                       |                   | Inspection of exhaust gas recirculation valve connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 4.   |
| NO     |  | Modify connector. |   |

|        |  |     |  |
|--------|--|-----|--|
| Step 4 | Inspection items                                       |     | Inspection by control data   |
|        | Maintenance item                                       |     | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>P0685 "EDU Relay (Open)"</li> <li>P0686 "EDU Relay (Low)"</li> <li>P0687 "EDU Relay (High)"</li> </ul> |
|        | Inspection condition                                   |     | Starter switch: ON   |
|        | Requirements   |     | No codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) | YES | Go to step 5.  |
|        |  | NO  | Inspect diagnosis code that is occurring.  |

|        |  |               |   |
|--------|--|---------------|---|
| Step 5 | Inspection items                                       |               | Inspection of electronic drive unit connector (power supply)  |
|        | Maintenance item                                       |               | Measure value of voltage between connector terminal No. 13 (+) and 14 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Disconnect connector and measure from harness side.</li> <li>• Starter switch: ON</li> <li>• Perform actuator test item No. AF "EDU Relay".</li> </ul> |
|        | Requirements   |               | Same as battery voltage.  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 10.  |
| NO     |  | Go to step 6. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of relay connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 7.   |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between fuse and relay   |
|        | Maintenance item                                       |                 | Check circuit between fuse No. B35 and relay connector terminal No. 5.                     |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 8 | Inspection items                                       |                 | Inspection of harness between relay and electronic drive unit   |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 4 and electronic drive unit connector terminal No. 13. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of electronic drive unit relay, go to step 9.   |
| NO     |  | Modify harness. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and ground   |
|        | Maintenance item                                       |                 | Check circuit between following electronic drive unit connector terminals. <ul style="list-style-type: none"> <li>• Electronic drive unit ground: terminal No. 14 - chassis ground</li> <li>• Sensor shield ground (U): terminal No. 5 - 14</li> <li>• Sensor shield ground (V): terminal No. 6 - 14</li> <li>• Sensor shield ground (W): terminal No. 7 - 14</li> <li>• Sensor ground: terminal No. 4 - 14</li> </ul> |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 10.   |
| NO     |  | Modify harness. |  |

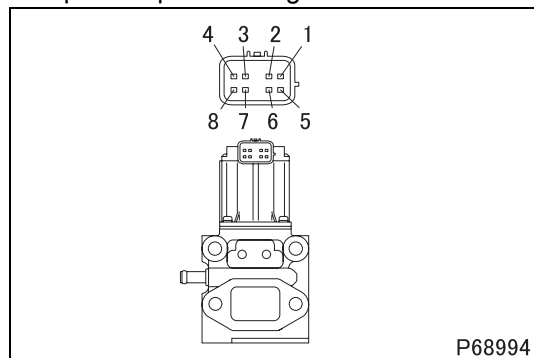
# TROUBLESHOOTING

|         |  |                      |  |
|---------|--|----------------------|--|
| Step 10 | Inspection items                                       |                      | Inspection of electronic drive unit connector (motor)  |
|         | Maintenance item                                       |                      | Measure value of resistance between following connector terminals <ul style="list-style-type: none"> <li>Between U - V: 10 - 11</li> <li>Between U - W: 10 - 12</li> <li>Between V - W: 11 - 12</li> </ul> |
|         | Inspection condition                                   |                      | —  |
|         | Requirements   |                      | 2.1 ± 0.3 Ω  |
|         | Inspection result (Is the judging standard satisfied?) |                      | YES<br>Go to step 13.  |
|         |  | NO<br>Go to step 11. |  |

|         |  |                       |   |
|---------|--|-----------------------|---|
| Step 11 | Inspection items                                       |                       | Inspection of harness between electronic drive unit and turbocharger actuator (motor)   |
|         | Maintenance item                                       |                       | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>Motor (U): electronic drive unit connector terminal No. 10 - turbocharger actuator connector No. 8</li> <li>Motor (V): electronic drive unit connector terminal No. 11 - turbocharger actuator connector No. 7</li> <li>Motor (W): electronic drive unit connector terminal No. 12 - turbocharger actuator connector No. 6</li> </ul> |
|         | Inspection condition                                   |                       | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                       | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) |                       | YES<br>Go to step 12.   |
|         |  | NO<br>Modify harness. |   |

|         |  |  |  |
|---------|--|--|--|
| Step 12 | Inspection items                                       |  | Inspection of exhaust gas recirculation valve unit (motor)   |
|         | Maintenance item                                       |  | Measure value of resistance between following exhaust gas recirculation valve connector terminals <ul style="list-style-type: none"> <li>Between U - V: 8 - 7</li> <li>Between U - W: 8 - 6</li> <li>Between V - W: 7 - 6</li> </ul> |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Keep exhaust gas recirculation valve installed on vehicle.</li> <li>Remove harness connector and measure exhaust gas recirculation valve side.</li> </ul>                                     |
|         | Requirements   |  | 2.1 ± 0.3 Ω  |
|         | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 13.  |
|         |  | NO<br>Replacement of turbocharger actuator |  |

<Step 12 inspection diagram>



|         |  |                |  |
|---------|--|----------------|--|
| Step 13 | Inspection items                                       |                | Inspection of exhaust gas recirculation valve connector (position sensor: power supply)  |
|         | Maintenance item                                       |                | Measure value of voltage between connector terminal No. 1 (+) and 5 (-).   |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|         | Requirements   |                | 10 V   |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 14.   |
| NO      |  | Go to step 15. |  |

|         |  |                |  |
|---------|--|----------------|--|
| Step 14 | Inspection items                                       |                | Inspection of electronic drive unit connector (position sensor: signal)  |
|         | Maintenance item                                       |                | Measure values of voltage between the following electronic drive unit connector terminals. <ul style="list-style-type: none"> <li>• U signal output: terminal 1 (+) - 4 (-)</li> <li>• V signal output: terminal 2 (+) - 4 (-)</li> <li>• W signal output: terminal 3 (+) - 4 (-)</li> </ul> |
|         | Inspection condition                                   |                | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> <li>• Perform actuator test item No. A0 "EGR 1".</li> </ul>   |
|         | Requirements   |                | 8 to 11 V  |
|         | Inspection result (Is the judging standard satisfied?) | YES            | Go to step 16.   |
| NO      |  | Go to step 15. |  |

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 15 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and exhaust gas recirculation valve (position sensor)   |
|         | Maintenance item                                       |                 | Check circuit between following connector terminals. <ul style="list-style-type: none"> <li>• Sensor (power supply): electronic drive unit connector terminal No. 8 - exhaust gas recirculation valve connector No. 1</li> <li>• Sensor (U): electronic drive unit connector terminal No. 1 - exhaust gas recirculation valve connector No. 4</li> <li>• Sensor (V): electronic drive unit connector terminal No. 2 - exhaust gas recirculation valve connector No. 3</li> <li>• Sensor (W): electronic drive unit connector terminal No. 3 - exhaust gas recirculation valve connector No. 2</li> <li>• Sensor (ground): electronic drive unit connector terminal No. 4 - exhaust gas recirculation valve connector No. 5</li> </ul> |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of exhaust gas recirculation, go to step 16.  |
| NO      |  | Modify harness. |   |

# TROUBLESHOOTING

|         |  |                                      |   |
|---------|--|--------------------------------------|---|
| Step 16 | Inspection items                                       |                                      | Inspection by control data  |
|         | Maintenance item                                       |                                      | <ul style="list-style-type: none"> <li>Perform actuator test item No. A0 "EGR 1".</li> </ul>  |
|         | Inspection condition                                   |                                      | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Transmission: neutral (parking satisfactory for automatic transmission)</li> <li>Diagnosis switch: OFF (fuse removed)</li> </ul>  |
|         | Requirements   |                                      | <p>Actual position matches with target value set by Multi-Use Tester (check with service data "51: Actual EGR Valve Position").</p> <p><b>NOTE</b></p> <ul style="list-style-type: none"> <li><b>As initial operational check of exhaust gas recirculation valve is automatically effected immediately after starter switch is ON, perform actuator test by Multi-Use Tester after that check (approximately 5 seconds later).</b></li> </ul> |
|         | Inspection result (Is the judging standard satisfied?) | YES                                  | Go to transient fault (See Gr00.).  |
| NO      |  | Replacement of electronic drive unit |   |

**[Fault code]**

Diagnosis code: P2423/Flash code: 46

**[Monitor]**

Failure of front oxidation catalyst

**[Fault (outline)]**

Inactive (unable to generate exotherm for diesel particulate filter regeneration)

**[Diagnosis check]**

- Heating condition of catalyst is monitored during diesel particulate filter regeneration.
- Actual post injection quantity during diesel particulate filter regeneration and post injection quantity estimated by engine electronic control unit are compared.

**[Code generation condition]**

Either of the following occurs. (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

- Post injection quantity used for diesel particulate filter regeneration exceeds 14.8 g {0.52 oz}.
- Difference in total between actual post injection quantity and estimated post injection quantity is more than specified value.
- When all of the following conditions occur;
  - Diesel particulate filter inlet temperature is below 450°C {842°F}.
  - Diesel particulate filter inlet temperature after start of filter regeneration is below 100°C {212°F}.
  - Difference between diesel particulate filter inlet temperature and catalytic inlet temperature is less than 150°C {302°F}.

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the diesel particulate filter regeneration control is activated.

**[Diagnostic requirement]**

- Diesel particulate filter regeneration control: normal (automatic or manual regeneration)
- Fuel injection quantity: above 2.5 mg/cyc
- Engine speed: 600 to 3000 rpm
- Water temperature: 65 to 110°C {149 to 230°F}
- Post injection quantity: above 0.05 mg/cyc
- Diesel particulate filter inlet temperature: above 250°C {482°F}
- Engine operating mode: normal (engine in operation)
- Time till above conditions were met: more than 3 seconds
- Once monitor has been enabled, monitoring continues unless any above conditions are not met for at time: >3s
- Estimated post injection quantity: more than 40 mg (automatic diesel particulate filter regeneration); more than 30 mg (manual diesel particulate filter regeneration)
- Exhaust gas recirculation valve: in order
- Intake throttle: in order
- Turbocharger actuator: in order
- Controller area network communication of each electronic drive unit (exhaust gas recirculation, intake throttle and turbocharger): in order
- Water temperature sensor: in order
- DPF temperature sensor 1: in order
- Catalytic temperature sensor: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order

**[Control effected by electronic control unit during fault]**

- Diesel particulate filter regeneration is stopped.

**[Probable cause of trouble]**

- Deterioration of diesel particulate filter (front oxidation catalyst)

# TROUBLESHOOTING

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## [Recoverability]

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)



[Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |

GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 46 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

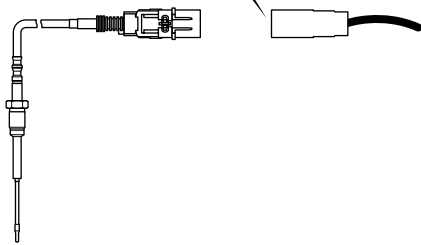
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

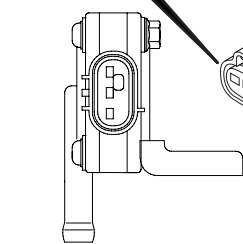
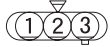
GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

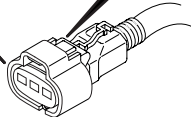
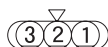
When measured from connection side of connector



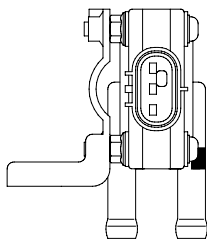
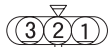
When measured from connection side of connector



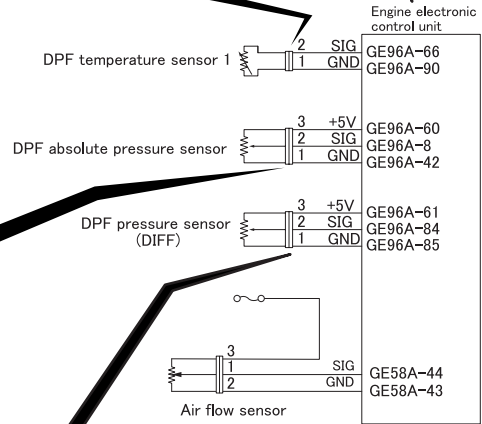
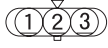
When measured from back side of connector



When measured from back side of connector

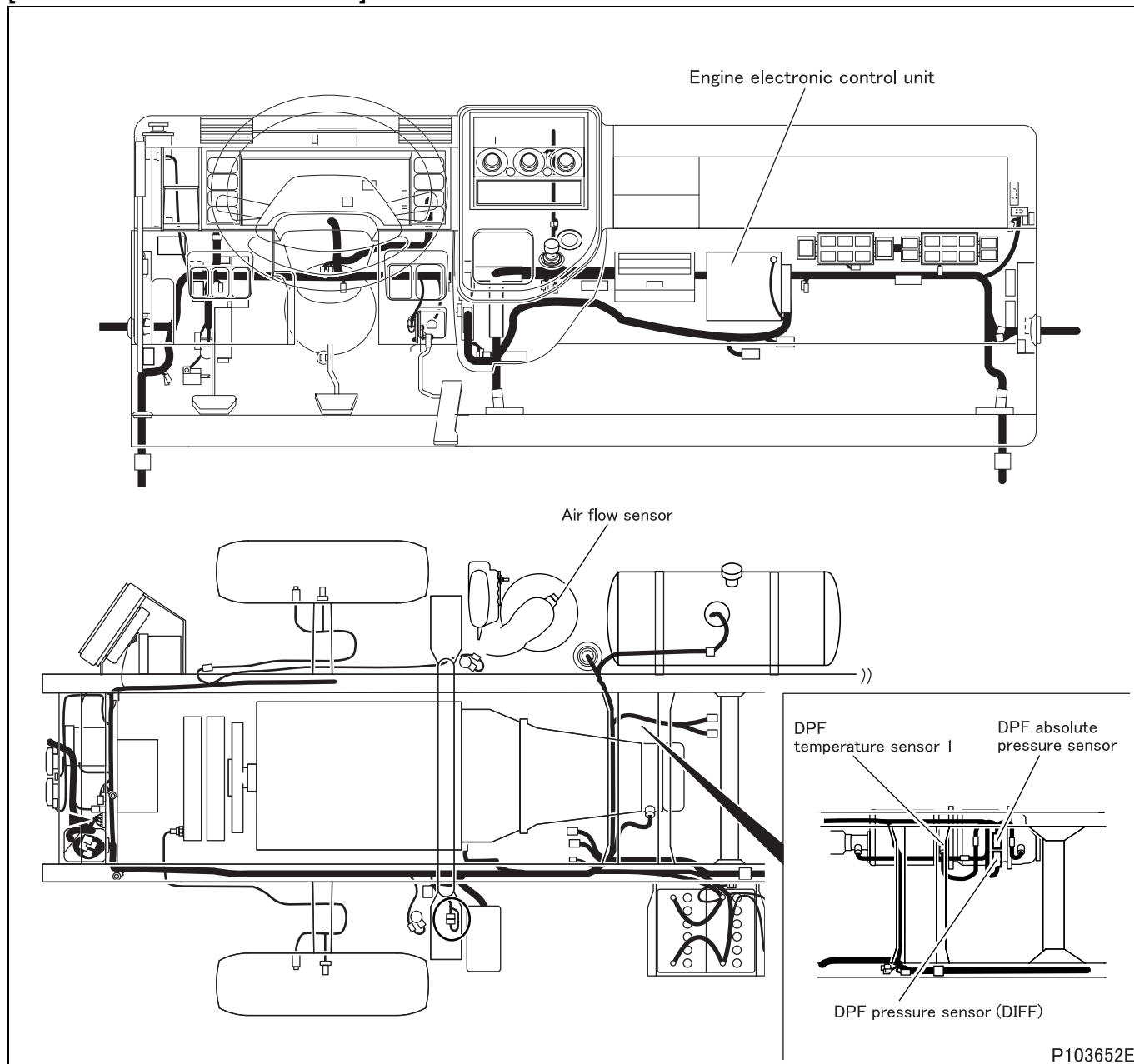


When measured from connection side of connector



# TROUBLESHOOTING

## [Parts Identification and Location]



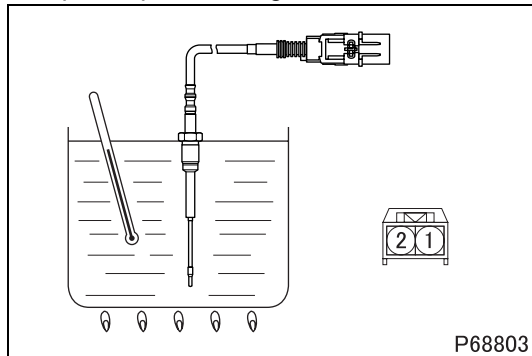
**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |  |  |     |  |    |
|--------|--|--|--|-----|--|----|
| Step 1 | Inspection items   |  | Inspection by control data   |     |  |    |
|        | Maintenance item   |  | <p>Check if following diagnosis codes occur simultaneously.</p> <ul style="list-style-type: none"> <li>• P0045 "VGT Actuator (Open)"</li> <li>• P0046 "VGT Actuator (Performance)"</li> <li>• P0047 "VGT Actuator (Low)"</li> <li>• P0102 "Airflow Sensor (Low)"</li> <li>• P0103 "Airflow Sensor (High)"</li> <li>• P0426 "EXH Gas Temp SNSR1 (Plausibility)"</li> <li>• P0427 "EXH Gas Temp SNSR1 (Low)"</li> <li>• P0428 "EXH Gas Temp SNSR1 (High)"</li> <li>• P0545 "DPF Temp SNSR (upstream) Low"</li> <li>• P0546 "DPF Temp SNSR (upstream) High"</li> <li>• P1430 "DPF Regeneration Switch"</li> <li>• P1660 "DPF Lamp Control Circuit (Low)"</li> <li>• P2031 "Exhaust Gas Temp"</li> <li>• P2032 "Exhaust Gas Temp (Low)"</li> <li>• P2033 "Exhaust Gas Temp (High)"</li> <li>• P2453 "DPF Diff SNSR (Plausi) &amp; MFF"</li> <li>• P2454 "DPF Diff SNSR (Low) &amp; MFF"</li> <li>• P2455 "DPF Diff SNSR (High) &amp; MFF"</li> </ul> |     |  |    |
|        | Inspection condition                                       |  | Ensure that each sensor mounting condition is free of abnormalities.   |     |  |    |
|        | Requirements   |  | Codes occur.   |     |  |    |
|        | Inspection result (Is the judging standard satisfied?)     |  | <table border="1"> <tr> <td>YES</td> <td>Inspect diagnosis code that is occurring and go to step 2.</td> </tr> <tr> <td>NO</td> <td>Go to step 2.</td> </tr> </table>  | YES | Inspect diagnosis code that is occurring and go to step 2. | NO |
| YES    | Inspect diagnosis code that is occurring and go to step 2. |  |  |     |  |    |
| NO     | Go to step 2.  |  |  |     |  |    |

|        |  |  |  |     |               |    |
|--------|--|--|--|-----|---------------|----|
| Step 2 | Inspection items                                       |  | Inspection of DPF temperature sensor 1 unit  |     |               |    |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and 2.  |     |               |    |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Put DPF temperature sensor 1 in container filled with engine oil.</li> <li>• Heat the oil to each of the specified temperatures. Stir the oil well while doing so.</li> </ul>   |     |               |    |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• 20°C {68°F}: 241.8 kΩ</li> <li>• 50°C {122°F}: 106.2 <sup>+74.3</sup>/<sub>-41.8</sub> kΩ</li> <li>• 100°C {212°F}: 33.56 <sup>+17.60</sup>/<sub>-10.60</sub> kΩ</li> <li>• 150°C {302°F}: 13.90 <sup>+5.36</sup>/<sub>-3.60</sub> kΩ</li> <li>• 200°C {392°F}: 6.896 <sup>+2.064</sup>/<sub>-1.252</sub> kΩ</li> </ul> |     |               |    |
|        | Inspection result (Is the judging standard satisfied?) |  | <table border="1"> <tr> <td>YES</td> <td>Go to step 3.</td> </tr> <tr> <td>NO</td> <td>Cleaning of sensor</td> </tr> </table>  | YES | Go to step 3. | NO |
| YES    | Go to step 3.  |  |  |     |               |    |
| NO     | Cleaning of sensor                                     |  |  |     |               |    |

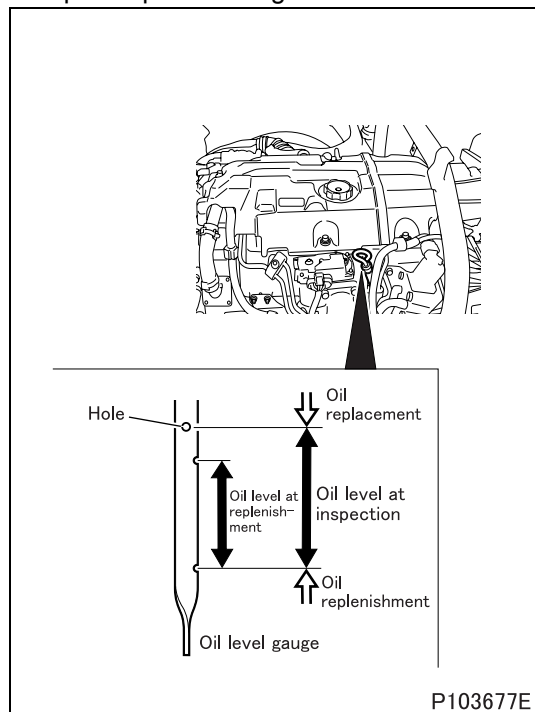
<Step 2 inspection diagram>



# TROUBLESHOOTING

|        |  |   |   |
|--------|--|---|---|
| Step 3 | Inspection items                                       |   | Inspection of oil level                   |
|        | Maintenance item                                       |   | Inspection of engine oil level            |
|        | Inspection condition                                   |   | Engine stopped                            |
|        | Requirements   |   | Oil level for inspection is not exceeded. |
|        | Inspection result (Is the judging standard satisfied?) | YES                                     | Go to step 4.                             |
| NO     |  | After replacement of oil, go to step 4. |   |

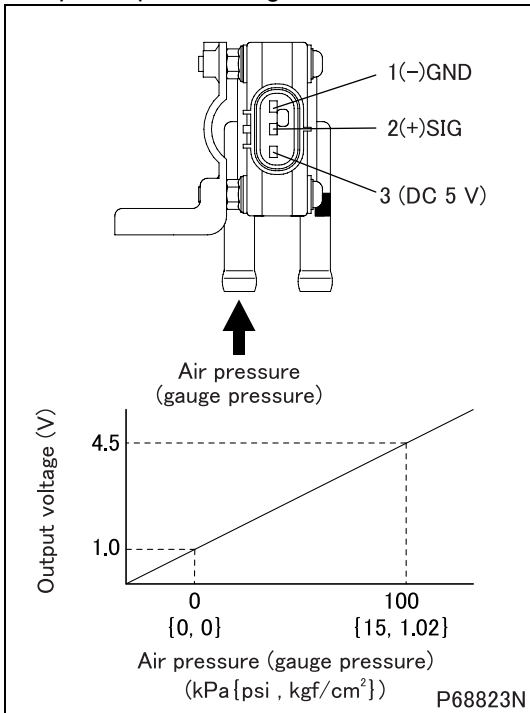
<Step 3 inspection diagram>



|        |  |   |   |
|--------|--|---|---|
| Step 4 | Inspection items                                       |   | Inspection of pressure hose   |
|        | Maintenance item                                       |   | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |
|        | Inspection condition                                   |   | —   |
|        | Requirements   |   | Nothing abnormal detected   |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5.   |
| NO     |  | After correction and replacement of hose, go to step 5. |   |

| Inspection items |  | Inspection of sensor unit  |                       |
|------------------|--|--|-----------------------|
| Step 5           | Maintenance item                                       | Measure value of voltage between connector terminal No. 2 (+) and 1 (-).   |                       |
|                  | Inspection condition                                   | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across terminals No. 3 (+) and 1 (-).</li> <li>Gradually increase applied air pressure.</li> </ul>   |                       |
|                  | Requirements   | <ul style="list-style-type: none"> <li><math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>}: 1 V</li> <li><math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |                       |
|                  | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 6.         |
|                  |  | NO   | Replacement of sensor |

<Step 5 inspection diagram>



# TROUBLESHOOTING

|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor unit   |               |
|        | Maintenance item                                       | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among “Service data”.</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: “Ne” (rpm)</li> <li>• Intake air flow rate: “Air Flow Rate from MAFS” (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 “Engine Revolution” (rpm)</li> <li>• Intake air flow rate: 60 “Air mass flow” (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”.</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |               |
|        | Inspection condition                                   | –   |               |
|        | Requirements   | 10% or less.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
|        | NO   | Replacement of sensor   |               |

|        |  |  |  |
|--------|--|--|--|
| Step 7 | Inspection items                                       | Inspection by control data                           |  |
|        | Maintenance item                                       | Perform actuator test item No. B2 “Fuel Leak Check”. |  |
|        | Inspection condition                                   | Engine start: At idle                                |  |
|        | Requirements   | There is no leak from injectors (four).              |  |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Replacement of diesel particulate filter |
|        | NO   | Replacement of injector                              |  |

**[Fault code]**

Diagnosis code: P2453/Flash code: 97

**[Monitor]**

Failure of DPF pressure sensor (DIFF)

**[Fault (outline)]**

- Dynamic check
- Offset check

**[Diagnosis check]**

Either of the following is monitored.

<Initial>

- Pressure output from DPF pressure sensor (DIFF) is monitored for 0 mbar {0 psi} during engine after run.

<During vehicle operation>

- Diesel particulate filter pressure calculated by engine electronic control unit is monitored for abnormality.

**[Code generation condition]**

Diagnosis code is generated under either of the following conditions.

<Initial>

- Pressure output from DPF pressure sensor (DIFF) exceeds 70 mbar {1.015 psi}.  
(Warning lamp (red) is lit and diagnosis code is displayed on third establishment of code generation condition.)

<During vehicle operation>

- Pressure output from DPF pressure sensor (DIFF) remains over  $-4$  mbar  $\{-0.058$  psi} and below 3 mbar {0.043 psi} for 1 second.  
(Warning lamp (orange) is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

<Initial>

- Engine status: after-run

<During vehicle operation>

- Variation of exhaust volume-flow rate: more than  $150$  m<sup>3</sup>/h/s or less than  $-200$  m<sup>3</sup>/h/s
- Air flow sensor: in order
- Atmospheric pressure sensor: in order
- Boost air temperature sensor: in order
- Intake air temperature sensor: in order
- DPF absolute pressure sensor: normal in output signal
- DPF pressure sensor (DIFF): normal in output signal
- DPF temperature sensor 1: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Diesel particulate filter regeneration control: in order

**[Control effected by electronic control unit during fault]**

- Diesel particulate filter regeneration is stopped.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit
- Dissolution, blockage, and damage of diesel particulate filter

# TROUBLESHOOTING

## [Recoverability]

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Timing of warning lamp/diagnosis code OFF depends on condition.)

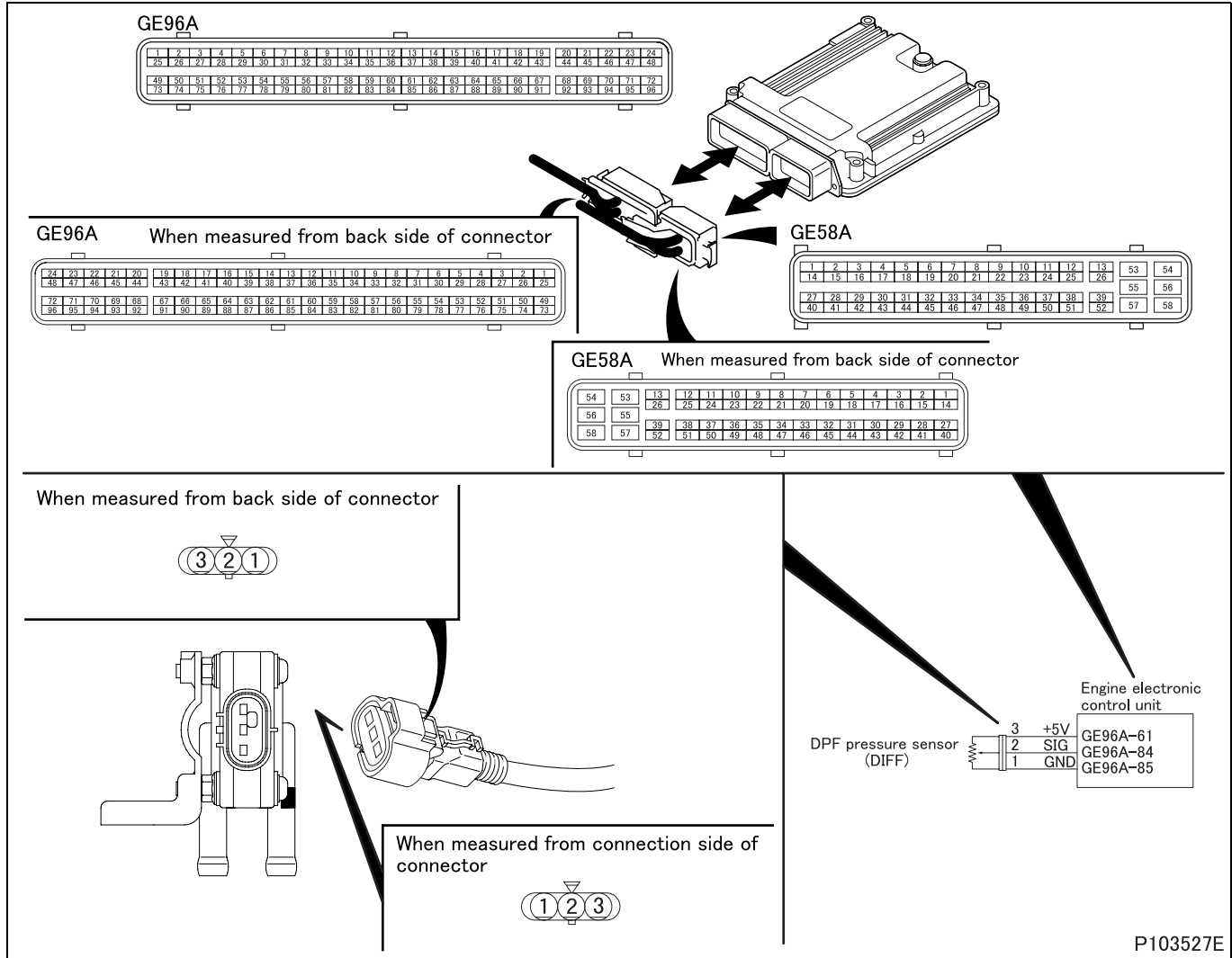
<Initial>

- Lamp is extinguished and code is cleared at fourth diagnosis code display after recovery.

<During vehicle operation>

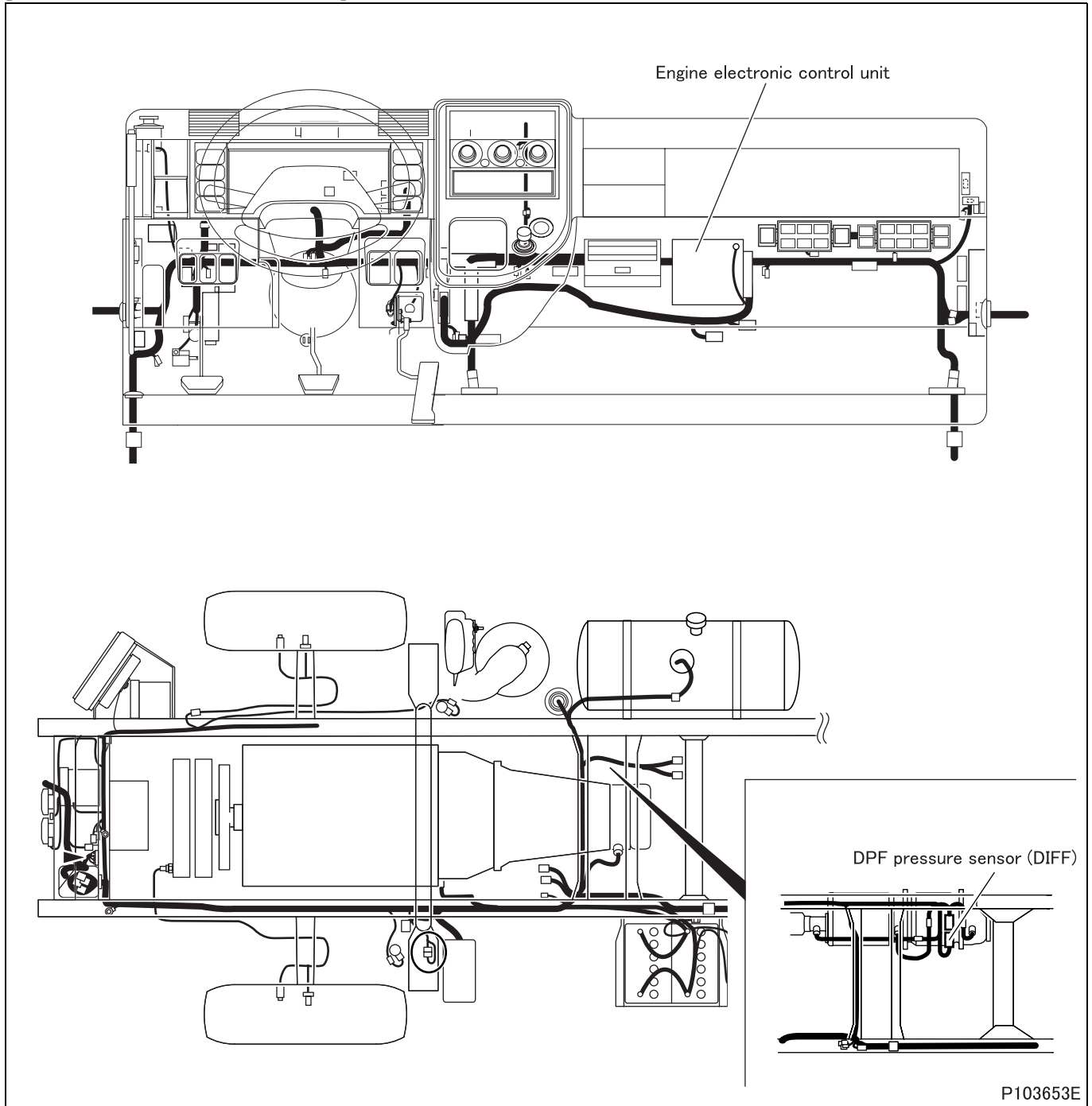
- Lamp is extinguished and code is cleared simultaneously with recovery.

## [Electronic Control Unit Connection Diagram]





[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Measurement of item No. 22 "Difference pressure across DPF" of Service Data.  |
|        | Inspection condition                                   |               | Past failures include diesel particulate filter pressure sensor, while the current failures do not include diesel particulate filter pressure sensor. |
|        | Requirements   |               | When engine is stationary: 0 kPa {0 psi, 0 kgf/cm <sup>2</sup> }  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (signal)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 84 (+) and 85 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 1 to 4.5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 5.  |
| NO     |  | Go to step 3. |  |

|        |  |               |  |
|--------|--|---------------|--|
| Step 3 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 61 (+) and 85 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.  |
| NO     |  | Go to step 5. |  |

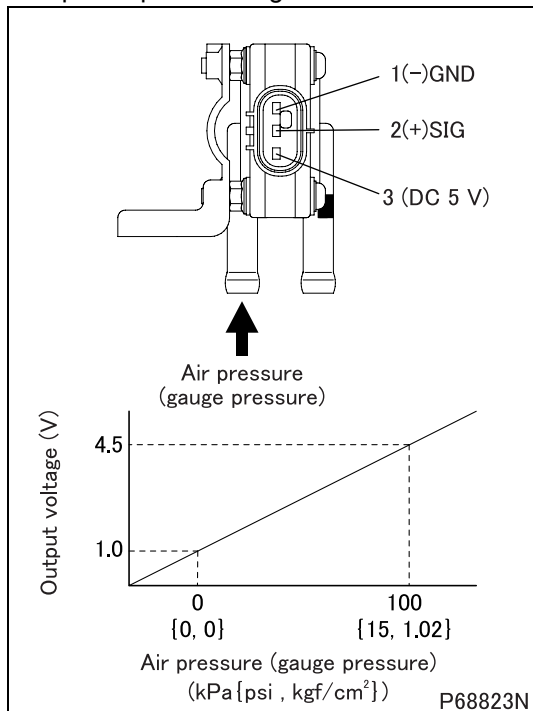
|        |  |               |  |
|--------|--|---------------|--|
| Step 4 | Inspection items                                       |               | Inspection by electronic control unit connector (ground)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 85 (+) and (GE58A) terminal No. 53 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |
|        | Requirements   |               | 0 V  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 6.  |
| NO     |  | Go to step 5. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 5 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 12.  |
| NO     |  | Modify connector. |   |

|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify connector.   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of sensor unit  |               |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 2 (+) and 1 (-).   |               |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (-).</li> <li>• Gradually increase applied air pressure.</li> </ul>   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• <math>0 \pm 3.5</math> kPa { <math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup> } : 1 V</li> <li>• <math>100 \pm 3.5</math> kPa { <math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup> } : 4.5 V</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Replacement of sensor  |               |

<Step 7 inspection diagram>



|        |  |  |                |
|--------|--|--|----------------|
| Step 8 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)  |                |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 3 (+) and 1 (-).   |                |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |                |
|        | Requirements   | 5 V  |                |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 10. |
| NO     |  | Go to step 9.  |                |

# TROUBLESHOOTING

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 61. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO     |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 85. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO      |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 84. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |  |   |
|---------|--|--|---|
| Step 12 | Inspection items                                       |  | Inspection by control data  |
|         | Maintenance item                                       |  | Measurement of item No. 22 "Difference pressure across DPF"   |
|         | Inspection condition                                   |  | Past failures include diesel particulate filter pressure sensor, while the current failures do not include diesel particulate filter pressure sensor. |
|         | Requirements   |  | When engine is stationary: 0 kPa {0 psi, 0 kgf/cm <sup>2</sup> }  |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO      |  | Replacement of electronic control unit |   |

**[Fault code]**

Diagnosis code: P2454/Flash code: 97

**[Monitor]**

Failure of DPF pressure sensor (DIFF)

**[Fault (outline)]**

Low signal range check

**[Diagnosis check]**

- Output voltage of DPF pressure sensor (DIFF) is monitored.

**[Code generation condition]**

- Pressure output from DPF pressure sensor (DIFF) remains below –179 hpa for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

–

**[Control effected by electronic control unit during fault]**

- Diesel particulate filter differential pressure is fixed at backup value.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

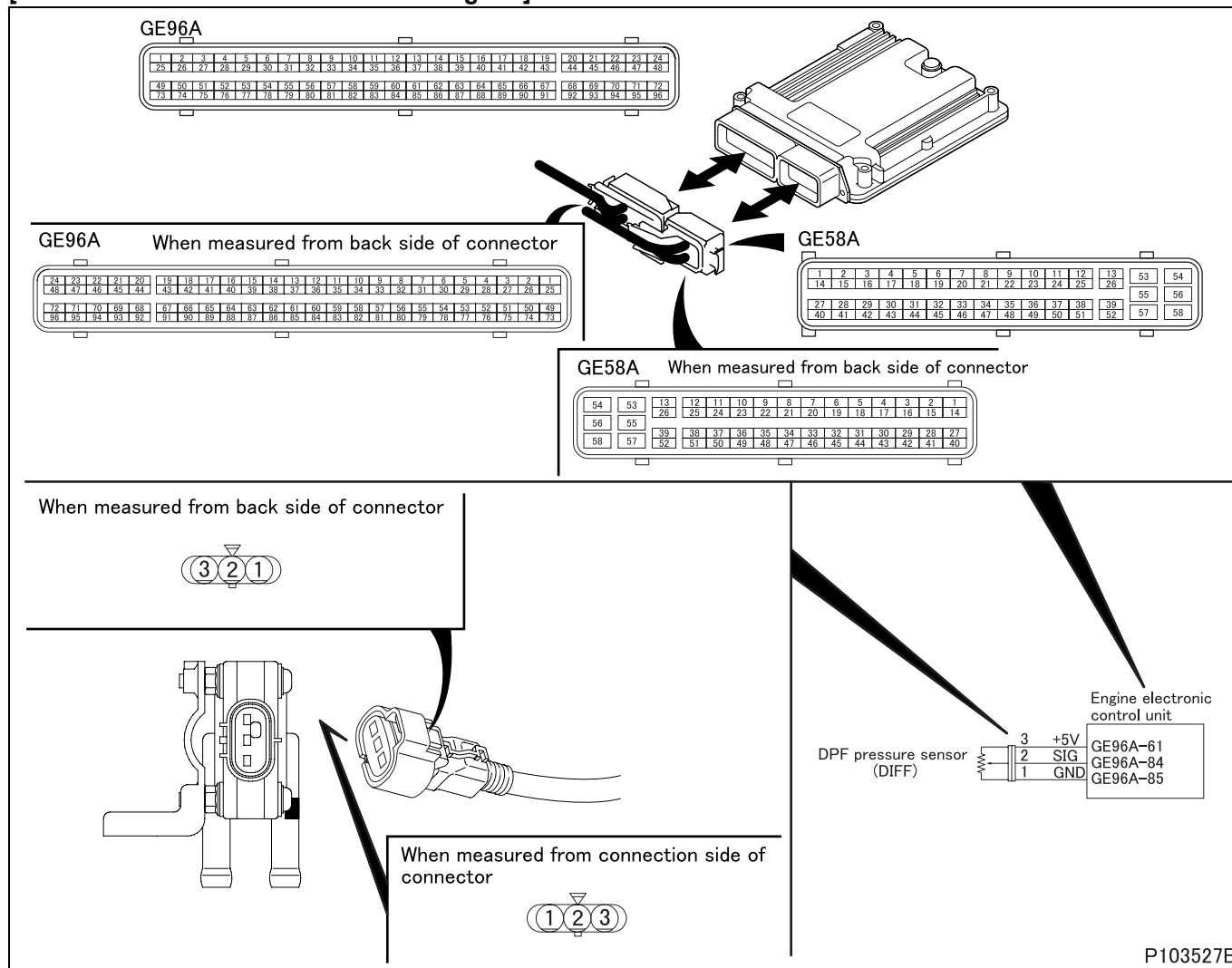
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

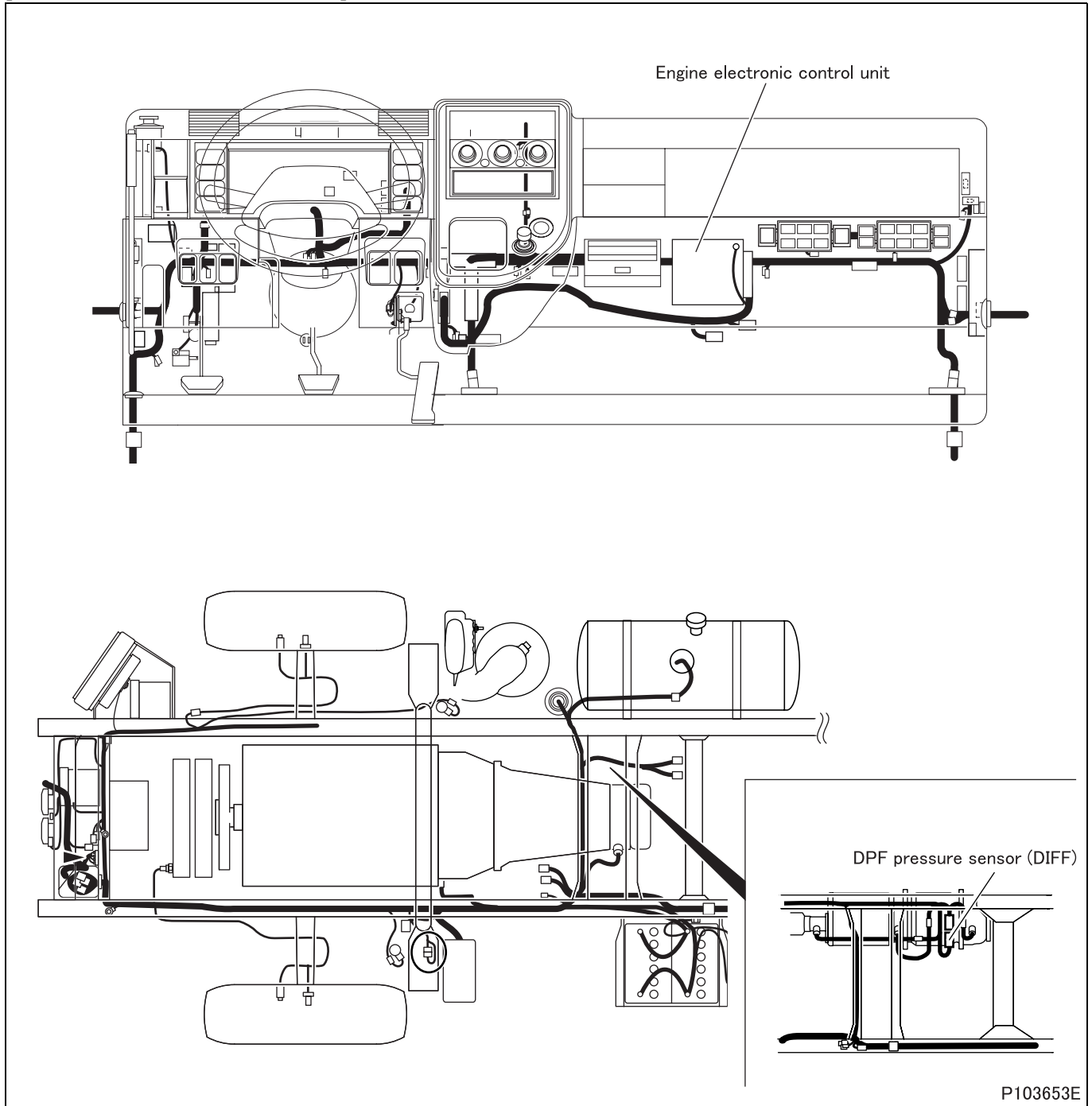
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P103527E

[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Measurement of item No. 22 "Difference pressure across DPF" of Service Data.  |
|        | Inspection condition                                   |               | Past failures include diesel particulate filter pressure sensor, while the current failures do not include diesel particulate filter pressure sensor. |
|        | Requirements   |               | When engine is stationary: 0 kPa {0 psi, 0 kgf/cm <sup>2</sup> }  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (signal)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 84 (+) and 85 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |               | 1 to 4.5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 5.  |
| NO     |  | Go to step 3. |  |

|        |  |               |  |
|--------|--|---------------|--|
| Step 3 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 61 (+) and 85 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.  |
| NO     |  | Go to step 5. |  |

|        |  |               |  |
|--------|--|---------------|--|
| Step 4 | Inspection items                                       |               | Inspection by electronic control unit connector (ground)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 85 (+) and (GE58A) terminal No. 53 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |               | 0 V  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 6.  |
| NO     |  | Go to step 5. |  |

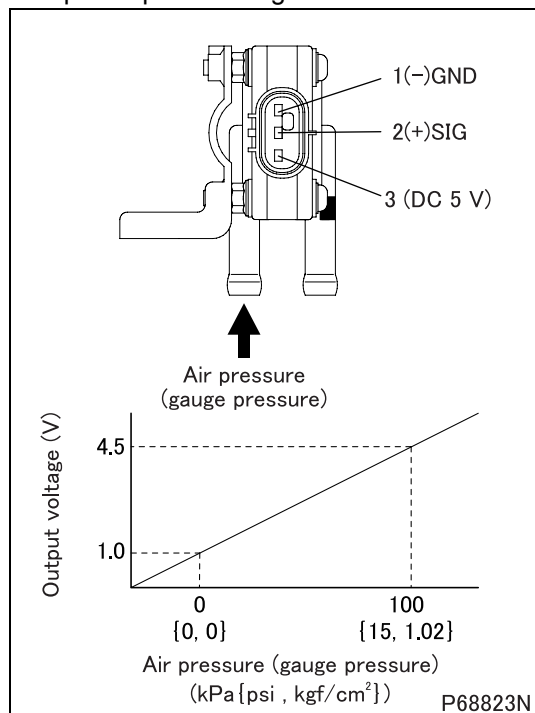
|        |  |                   |   |
|--------|--|-------------------|---|
| Step 5 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | -   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 12.  |
| NO     |  | Modify connector. |   |



|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify connector.   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of sensor unit  |               |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 2 (+) and 1 (-).   |               |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across terminals No. 3 (+) and 1 (-).</li> <li>Gradually increase applied air pressure.</li> </ul>   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li><math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>}: 1 V</li> <li><math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Replacement of sensor  |               |

<Step 7 inspection diagram>



|        |  |  |                |
|--------|--|--|----------------|
| Step 8 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)  |                |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 3 (+) and 1 (-).   |                |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |                |
|        | Requirements   | 5 V  |                |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 10. |
| NO     |  | Go to step 9.  |                |

# TROUBLESHOOTING

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 61. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO     |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 85. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO      |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 84. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |  |   |
|---------|--|--|---|
| Step 12 | Inspection items                                       |  | Inspection by control data  |
|         | Maintenance item                                       |  | Measurement of item No. 22 "Difference pressure across DPF"   |
|         | Inspection condition                                   |  | Past failures include diesel particulate filter pressure sensor, while the current failures do not include diesel particulate filter pressure sensor. |
|         | Requirements   |  | When engine is stationary: 0 kPa {0 psi, 0 kgf/cm <sup>2</sup> }  |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO      |  | Replacement of electronic control unit |   |

**[Fault code]**

Diagnosis code: P2455/Flash code: 97

**[Monitor]**

Failure of DPF pressure sensor (DIFF)

**[Fault (outline)]**

High signal range check

**[Diagnosis check]**

- Output voltage of DPF pressure sensor (DIFF) is monitored.

**[Code generation condition]**

- Pressure output from DPF pressure sensor (DIFF) remains below 1108 hpa for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Diesel particulate filter differential pressure is fixed at backup value.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

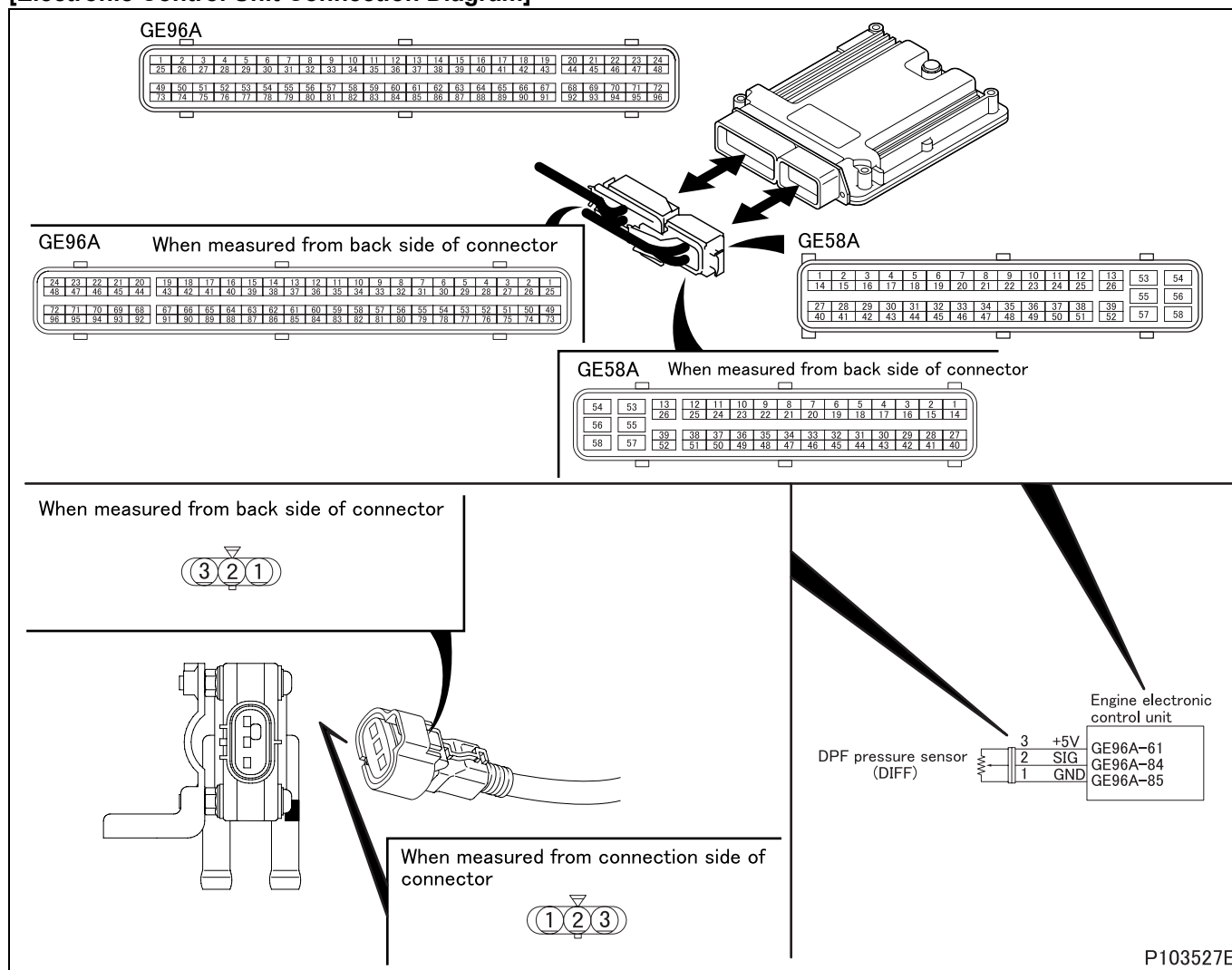
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

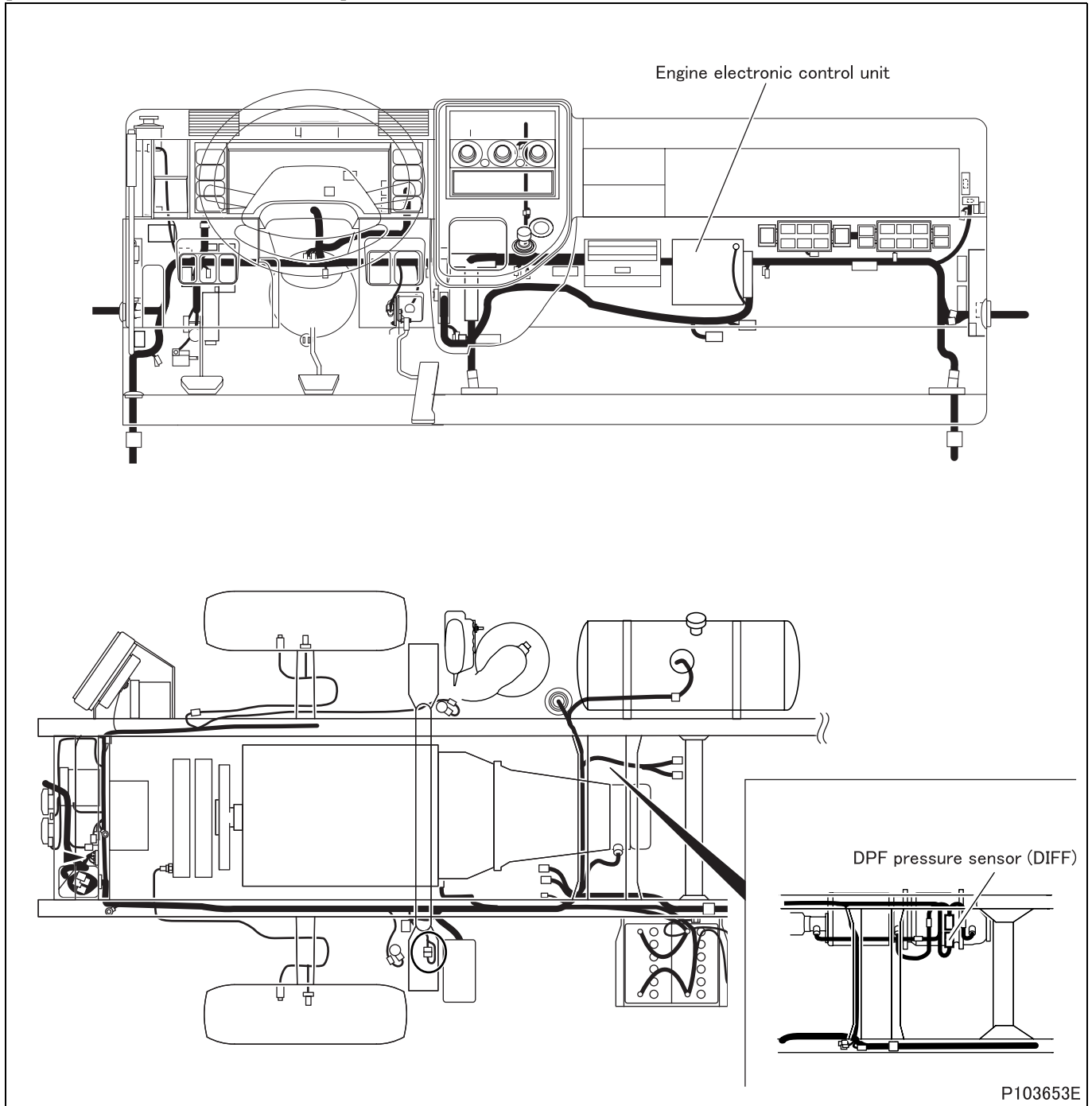
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P103527E

[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |               |   |
|--------|--|---------------|---|
| Step 1 | Inspection items                                       |               | Inspection by control data  |
|        | Maintenance item                                       |               | Measurement of item No. 22 "Difference pressure across DPF" of Service Data.  |
|        | Inspection condition                                   |               | Past failures include diesel particulate filter pressure sensor, while the current failures do not include diesel particulate filter pressure sensor. |
|        | Requirements   |               | When engine is stationary: 0 kPa {0 psi, 0 kgf/cm <sup>2</sup> }  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).  |
| NO     |  | Go to step 2. |   |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (signal)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 84 (+) and 85 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |               | 1 to 4.5 V   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 5.  |
| NO     |  | Go to step 3. |  |

|        |  |               |  |
|--------|--|---------------|--|
| Step 3 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 61 (+) and 85 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |               | 5 V  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.  |
| NO     |  | Go to step 5. |  |

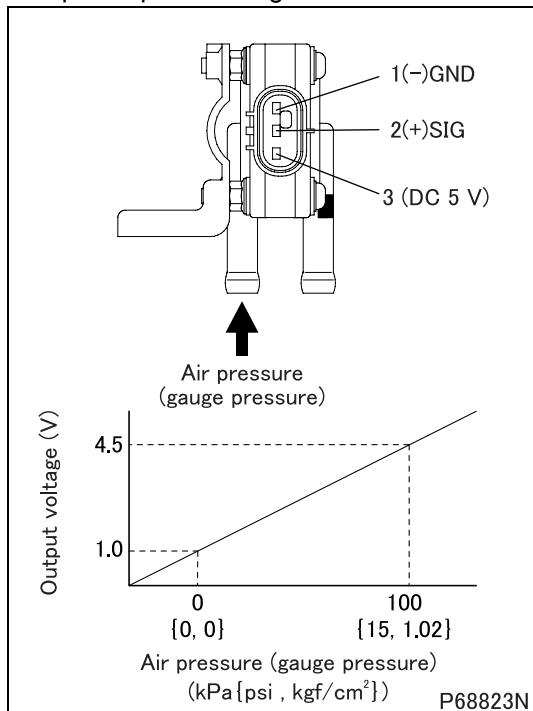
|        |  |               |  |
|--------|--|---------------|--|
| Step 4 | Inspection items                                       |               | Inspection by electronic control unit connector (ground)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 85 (+) and (GE58A) terminal No. 53 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Measure from back side of harness connector with each device connected to harness.</li> <li>Starter switch: ON</li> </ul> |
|        | Requirements   |               | 0 V  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 6.  |
| NO     |  | Go to step 5. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 5 | Inspection items                                       |                   | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | -   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 12.  |
| NO     |  | Modify connector. |   |

|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify connector.   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of sensor unit  |               |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 2 (+) and 1 (-).   |               |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (-).</li> <li>• Gradually increase applied air pressure.</li> </ul>   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• <math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>}: 1 V</li> <li>• <math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Replacement of sensor  |               |

<Step 7 inspection diagram>



|        |  |  |                |
|--------|--|--|----------------|
| Step 8 | Inspection items                                       | Inspection of harness between electronic control unit and sensor (power supply)  |                |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 3 (+) and 1 (-).   |                |
|        | Inspection condition                                   | <ul style="list-style-type: none"> <li>• Measure from back side of harness connector with each device connected to harness.</li> <li>• Starter switch: ON</li> </ul> |                |
|        | Requirements   | 5 V  |                |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 10. |
| NO     |  | Go to step 9.  |                |

# TROUBLESHOOTING

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 3 and electronic control unit connector (GE96A) terminal No. 61. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO     |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 85. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO      |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 84. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |  |   |
|---------|--|--|---|
| Step 12 | Inspection items                                       |  | Inspection by control data  |
|         | Maintenance item                                       |  | Measurement of item No. 22 "Difference pressure across DPF"   |
|         | Inspection condition                                   |  | Past failures include diesel particulate filter pressure sensor, while the current failures do not include diesel particulate filter pressure sensor. |
|         | Requirements   |  | When engine is stationary: 0 kPa {0 psi, 0 kgf/cm <sup>2</sup> }  |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).  |
| NO      |  | Replacement of electronic control unit |   |



**[Fault code]**

Diagnosis code: P2457/Flash code: 2

**[Monitor]**

Failure of exhaust gas recirculation cooler

**[Fault (outline)]**

Exhaust gas recirculation cooler failure

**[Diagnosis check]**

Cooling performance of exhaust gas recirculation cooler is monitored, with exhaust gas recirculation system temperature detected through boost air temperature sensor under the following conditions and compared with target temperature for control by engine electronic control unit.

- Engine: started
- Exhaust brake: OFF

**[Code generation condition]**

- Temperature output from boost air temperature sensor remains over maximum target temperature for 10 seconds. (Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

**[Diagnostic requirement]**

- Engine speed: 500 to 2700 rpm
- Variation in engine speed: less than 300 rpm/s
- Exhaust shutter: open
- Time till above conditions were met: more than 15 seconds

<Conditions after above conditions are met>

- Water temperature: below 95°C {203°F}
- Exhaust gas recirculation cooler temperature: -7 to 60°C {19 to 140°F}
- Engine running time: more than 60 seconds
- Exhaust gas recirculation valve: in order
- Intake throttle: in order
- Turbocharger actuator: in order
- Controller area network communication of each electronic drive unit (exhaust gas recirculation, intake throttle and turbocharger): in order
- Exhaust gas recirculation flow rate and exhaust gas recirculation valve operation: in order
- Atmospheric pressure sensor: in order
- Boost pressure sensor: in order
- Water temperature sensor: in order
- Boost air temperature sensor: in order
- Sensor 5 V power supply: in order
- Battery voltage: in order
- MPROP (rail pressure control valve): in order
- Injector: in order
- Intercooler: in order
- Starter switch circuit: in order

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

- Malfunction of exhaust gas recirculation cooler (breakage, clogging)
- Malfunction of exhaust gas recirculation pipe and hose (breakage, clogging)

# TROUBLESHOOTING

## [Recoverability]

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>P0403 "EGR1 (Actuator Circuit)"</li> <li>P0409 "EGR1 (Position Sensor)"</li> <li>P0562 "Power Supply Voltage (Low)"</li> <li>P0563 "Power Supply Voltage (High)"</li> <li>P0600 "CAN Communication"</li> <li>P0607 "ECU System"</li> <li>P060B "A/D Converter"</li> <li>P061B "ECU Performance (Calc)"</li> <li>P061C "ECU Performance (Ne)"</li> <li>P0685 "EDU Relay (Open)"</li> <li>P0686 "EDU Relay (Low)"</li> <li>P0687 "EDU Relay (High)"</li> <li>P2413 "EGR System"</li> </ul> |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>Starter switch: ON</li> <li>Do not start engine</li> </ul>  |
|        | Requirements   |  | Codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Inspect diagnosis code that is occurring.  |
| NO     |  | Inspection of exhaust gas recirculation system (exhaust gas recirculation pipe, exhaust gas recirculation cooler, exhaust gas recirculation valve) |  |

**[Fault code]**

Diagnosis code: P2459/Flash code: 92

**[Monitor]**

Frequent diesel particulate filter regeneration

**[Fault (outline)]**

Excessive diesel particulate filter regeneration frequency (diesel particulate filter clogged up)

**[Diagnosis check]**

- Diesel particulate filter is monitored for early clogging through measurement of traveled time and distance from last diesel particulate filter regeneration.

**[Code generation condition]**

- If regenerative control was effected 2 consecutive times within 90 minutes in traveled time and 80 km {49.7 miles} in traveled distance.

(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is performed each time when the diesel particulate filter regeneration control is activated.

**[Diagnostic requirement]**

- Diesel particulate filter regeneration control: active

**[Control effected by electronic control unit during fault]**

- Engine torque is limited.
- Auto cruise control stopped
- Traction control is stopped. <Automatic transmission>
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

**[Probable cause of trouble]**

- Failure of diesel particulate filter indicator lamp
- Failure of diesel particulate filter cleaning switch
- Manual diesel particulate filter regeneration is not performed.
- Excessive smoke emission (due to malfunction of engine proper, common rail or exhaust gas recirculation system)
- Malfunction of air flow sensor
- Malfunction of DPF absolute pressure sensor and DPF pressure sensor (DIFF)
- Malfunction of diesel particulate filter

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]

GE96A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |

GE96A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |
| 72 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 |
| 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 |

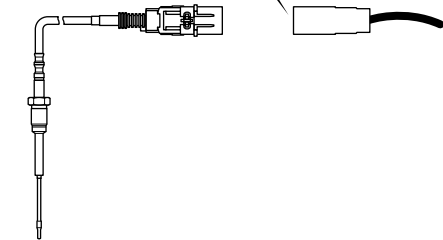
GE58A When measured from connection side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 53 | 54 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 55 | 56 |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 57 | 58 |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |    |    |

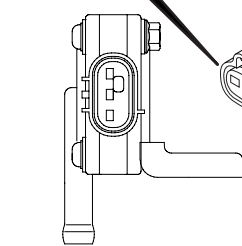
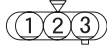
GE58A When measured from back side of connector

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 54 | 53 | 13 | 12 | 11 | 10 | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2  | 1  |
| 56 | 55 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 58 | 57 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 |
|    |    | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

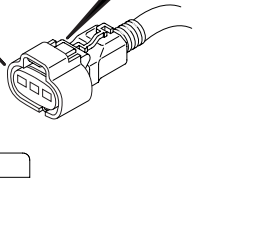
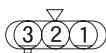
When measured from connection side of connector



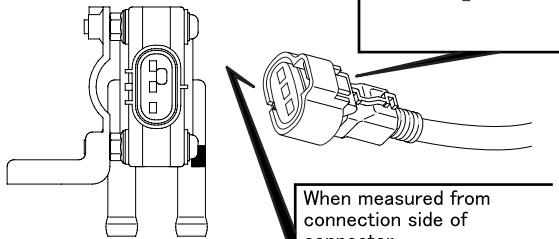
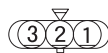
When measured from connection side of connector



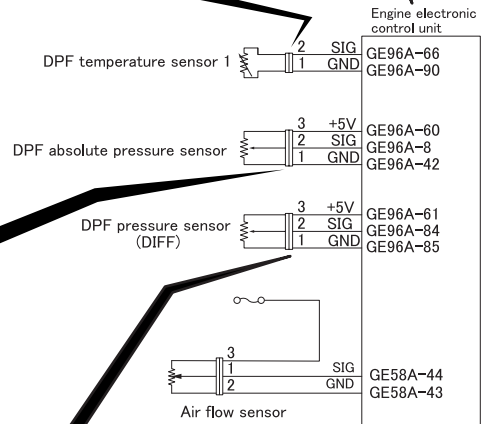
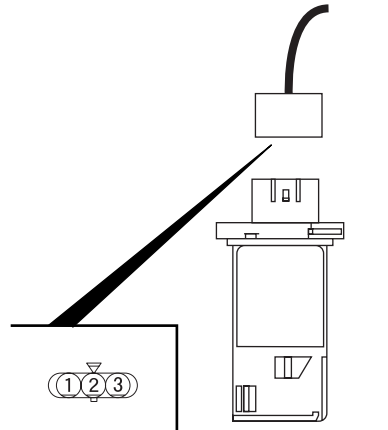
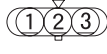
When measured from back side of connector



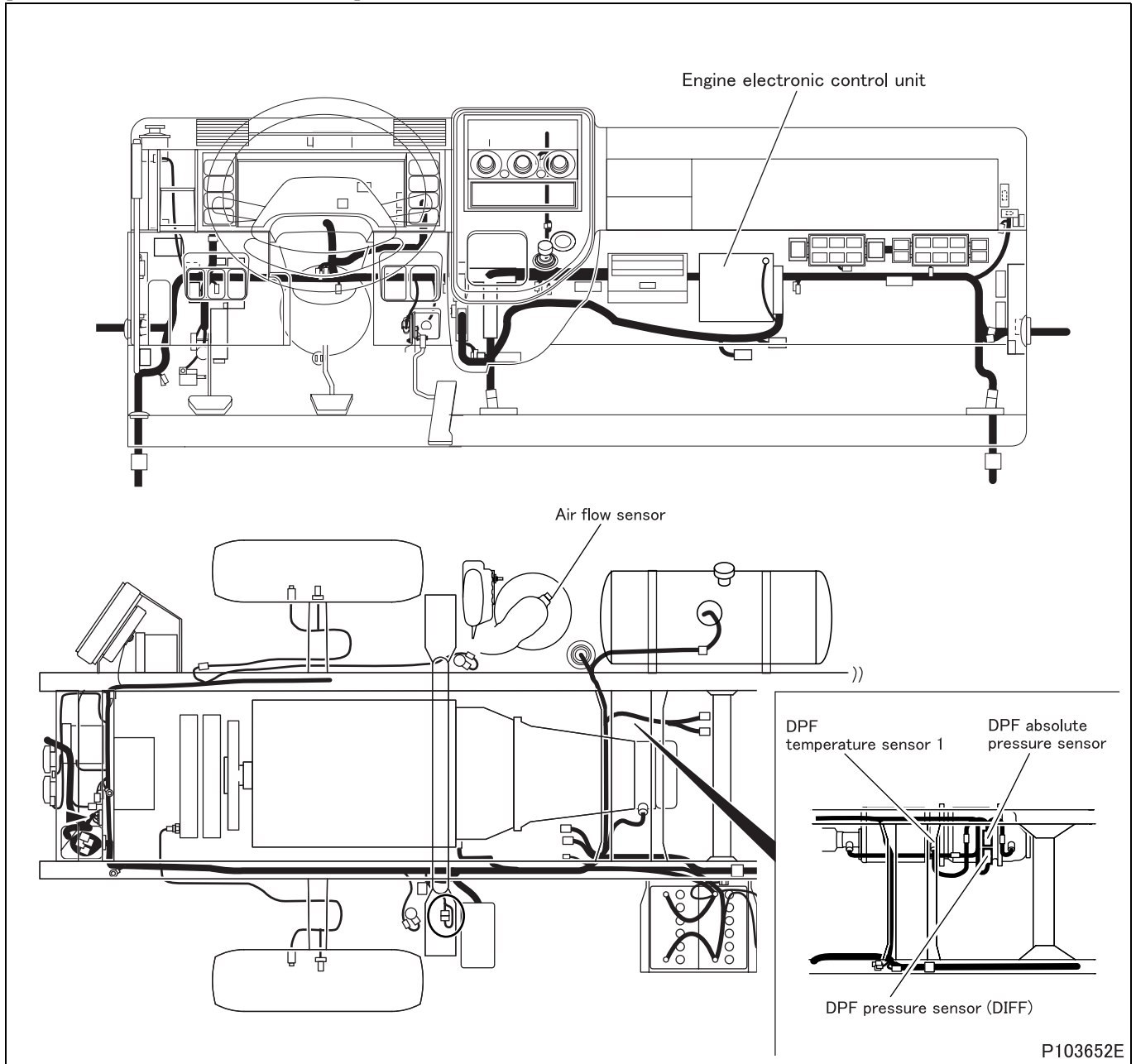
When measured from back side of connector



When measured from connection side of connector



[Parts Identification and Location]



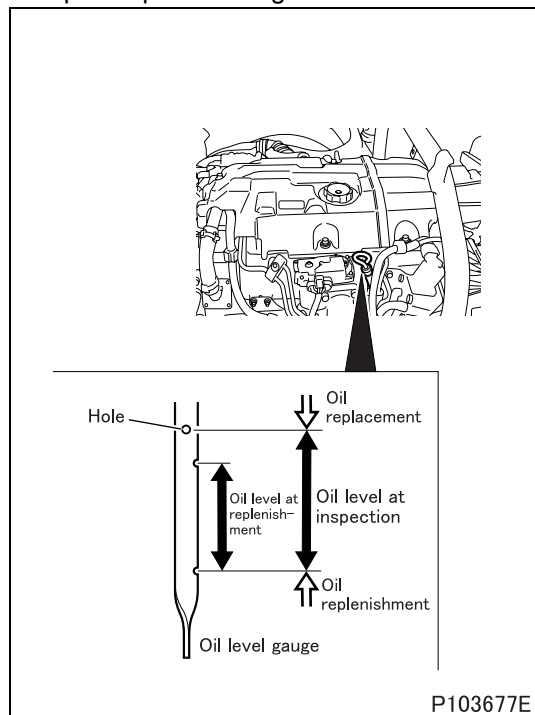
# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |    |   |
|--------|--|----|---|
| Step 1 | Inspection items                                       |    | Inspection of oil level                   |
|        | Maintenance item                                       |    | Inspection of engine oil level            |
|        | Inspection condition                                   |    | Engine stopped                            |
|        | Requirements   |    | Oil level for inspection is not exceeded. |
|        | Inspection result (Is the judging standard satisfied?) |    | YES                                       |
|        |  | NO | After replacement of oil, go to step 2.   |

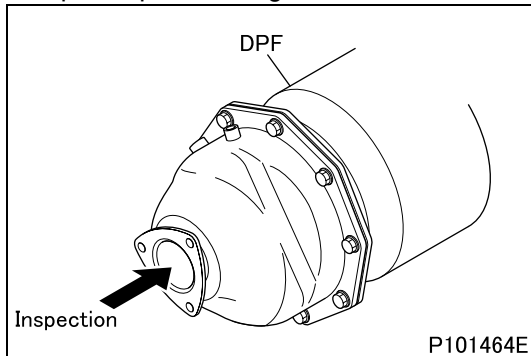
<Step 1 inspection diagram>



|        |  |    |   |
|--------|--|----|---|
| Step 2 | Inspection items                                       |    | Inspection by manual diesel particulate filter regeneration   |
|        | Maintenance item                                       |    | Perform Multi-Use Tester actuator test item No. A5 "DPF Regeneration (Manual)", and clean ceramic diesel particulate filter.  |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Engine: Idling</li> <li>Place the transmission in neutral. (place the automatic transmission in P range)</li> <li>Parking brake: vehicle parked (parking brake switch: ON)</li> <li>After engine warm-up</li> </ul> |
|        | Requirements   |    | This diagnosis code does not occur again.   |
|        | Inspection result (Is the judging standard satisfied?) |    | YES   |
|        |  | NO | Go to step 3.   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Unit inspection of diesel particulate filter  |
|        | Maintenance item                                       |  | Check the exhaust passage inside the diesel particulate filter for adhesion of soot in large quantity.            |
|        | Inspection condition                                   |  | Remove diesel particulate filter.   |
|        | Requirements   |  | No soot is deposited.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 4.<br>NO<br>After replacement of ceramic filter, perform resetting the DPF-related information. |

<Step 3 inspection diagram>



|        |  |  |  |
|--------|--|--|--|
| Step 4 | Inspection items                                       |  | Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit   |
|        | Maintenance item                                       |  | See Gr15 "Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit".   |
|        | Inspection condition                                   |  | Perform the following preparatory works. <ul style="list-style-type: none"> <li>Place the transmission in neutral. (place the automatic transmission in P range)</li> <li>Turn the steering wheel in neutral position and securely apply the parking brake.</li> <li>Turn off air conditioner not to increase the engine speed.</li> <li>Check diagnosis code of each electronic control system. If any fault exists, rectify it.</li> <li>Resetting the DPF-related information (perform "History reset" of Multi-Use Tester) (See Gr15 "Resetting the DPF-related information".)</li> <li>Warm up the engine until the engine coolant has been heated to more than 70°C {158°F}. (verify from Service Data "Engine Coolant Temperature" or "31: Water Temperature")</li> </ul> |
|        | Requirements   |  | This diagnosis code does not occur again.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>End of inspection<br>NO<br>Go to step 5.  |

|        |  |  |   |
|--------|--|--|---|
| Step 5 | Inspection items                                       |  | Inspection by control data  |
|        | Maintenance item                                       |  | Measure item No. B8 "DPF Indicator Lamp" of Service Data.                               |
|        | Inspection condition                                   |  | Perform Multi-Use Tester actuator test item No. A6 "DPF Lamp".                          |
|        | Requirements   |  | Diesel particulate filter indicator lamp illuminates (automatic reset after 15 seconds) |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>Go to step 6.<br>NO<br>Replacement of engine electronic control unit             |

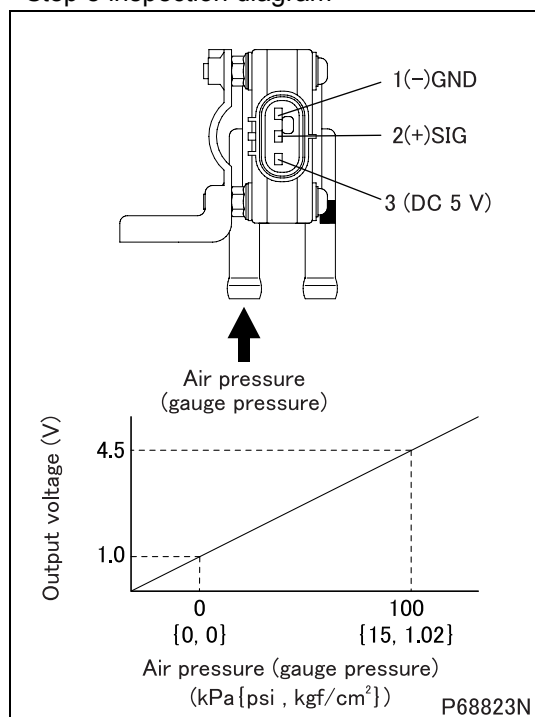
# TROUBLESHOOTING

|        |  |  |  |
|--------|--|--|--|
| Step 6 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Measure item No. A4 "DPF SW" of Service Data.  |
|        | Inspection condition                                   |  | –  |
|        | Requirements   |  | Press diesel particulate filter cleaning switch and check that "DPF SW" display switches from OFF to ON. |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7.  |
| NO     |  | Replacement of diesel particulate filter cleaning switch or engine electronic control unit |  |

|        |  |   |   |
|--------|--|---|---|
| Step 7 | Inspection items                                       |   | Inspection of pressure hose   |
|        | Maintenance item                                       |   | Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks. |
|        | Inspection condition                                   |   | –   |
|        | Requirements   |   | Nothing abnormal detected   |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 8.   |
| NO     |  | After correction and replacement of hose, go to step 8. |   |

|        |  |   |  |
|--------|--|---|--|
| Step 8 | Inspection items                                       |   | Inspection of DPF pressure sensor (DIFF)   |
|        | Maintenance item                                       |   | Measure value of voltage between connector terminal No.2 (+) and 1 (–).  |
|        | Inspection condition                                   |   | <ul style="list-style-type: none"> <li>Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–).</li> <li>Gradually increase applied air pressure.</li> </ul>   |
|        | Requirements   |   | <ul style="list-style-type: none"> <li><math>0 \pm 3.5</math> kPa {<math>0 \pm 0.5</math> psi, <math>0 \pm 0.04</math> kgf/cm<sup>2</sup>}: 1 V</li> <li><math>100 \pm 3.5</math> kPa {<math>15 \pm 0.5</math> psi, <math>1.02 \pm 0.04</math> kgf/cm<sup>2</sup>}: 4.5 V</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 9.  |
| NO     |  | Replacement of DPF pressure sensor (DIFF) |  |

<Step 8 inspection diagram>





|        |  |  |   |
|--------|--|--|---|
| Step 9 | Inspection items                                       |  | Inspection of air flow sensor unit  |
|        | Maintenance item                                       |  | <p>Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data.</p> <p><b>(1) Prepare for inspection</b></p> <ul style="list-style-type: none"> <li>• Clean or replace air cleaner element.</li> <li>• Prepare a new air flow sensor.</li> <li>• Warm up the engine fully.</li> </ul> <p><b>(2) Measure the intake air of current sensor</b></p> <ul style="list-style-type: none"> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure the following items from among “Service data”.</li> </ul> <p><b>&lt;General Scanning Tool used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: “Ne” (rpm)</li> <li>• Intake air flow rate: “Air Flow Rate from MAFS” (g/s)</li> </ul> <p><b>&lt;Multi-Use Tester used&gt;</b></p> <ul style="list-style-type: none"> <li>• Engine speed: 01 “Engine Revolution” (rpm)</li> <li>• Intake air flow rate: 60 “Air mass flow” (g/s)</li> </ul> <p><b>(3) Measure the intake air of new sensor</b></p> <ul style="list-style-type: none"> <li>• Replace the currently mounted sensor with a new sensor.</li> <li>• Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation)</li> <li>• Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”.</li> </ul> <p><b>(4) Comparison whether characteristics are deteriorated</b></p> <ul style="list-style-type: none"> <li>• Calculate the characteristics deterioration factor (%) by the following equation.</li> <li>• Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.</li> </ul> |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | 10% or less   |
|        | Inspection result (Is the judging standard satisfied?) |  | <p>YES Go to step 10.</p> <p>NO Replacement of air flow sensor</p>  |

|         |  |  |   |
|---------|--|--|---|
| Step 10 | Inspection items                                       |  | Inspection by control data  |
|         | Maintenance item                                       |  | Perform actuator test item No. B2 “Fuel Leak Check”.  |
|         | Inspection condition                                   |  | Engine start: At idle   |
|         | Requirements   |  | There is no leak from injectors (four).   |
|         | Inspection result (Is the judging standard satisfied?) |  | <p>YES</p> <ul style="list-style-type: none"> <li>• Inspection of exhaust gas recirculation system (exhaust gas recirculation pipe, exhaust gas recirculation cooler, exhaust gas recirculation valve)</li> <li>• Inspection of engine</li> </ul> <p>NO Replacement of injector</p> |

# TROUBLESHOOTING

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## **[Fault code]**

Diagnosis code: P2533/Flash code: 66

## **[Monitor]**

Failure of starter switch

## **[Fault (outline)]**

Open circuit at electronic control unit inout

## **[Diagnosis check]**

- Operational relation between starter switch and engine start is monitored.

## **[Code generation condition]**

- Engine starts (engine revolutions are counted) without start signal from starter switch.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed only once during the driving cycle.

## **[Diagnostic requirement]**

- Engine operating mode: starting
- Previous engine operation mode: OFF
- Speed increase from engine speed sensor: more than 100 rpm
- Speed increase from cylinder recognition sensor: more than 100 rpm
- Vehicle speed: less than 1 km/h {0.62 MPH}
- Vehicle speed sensor: in order

## **[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

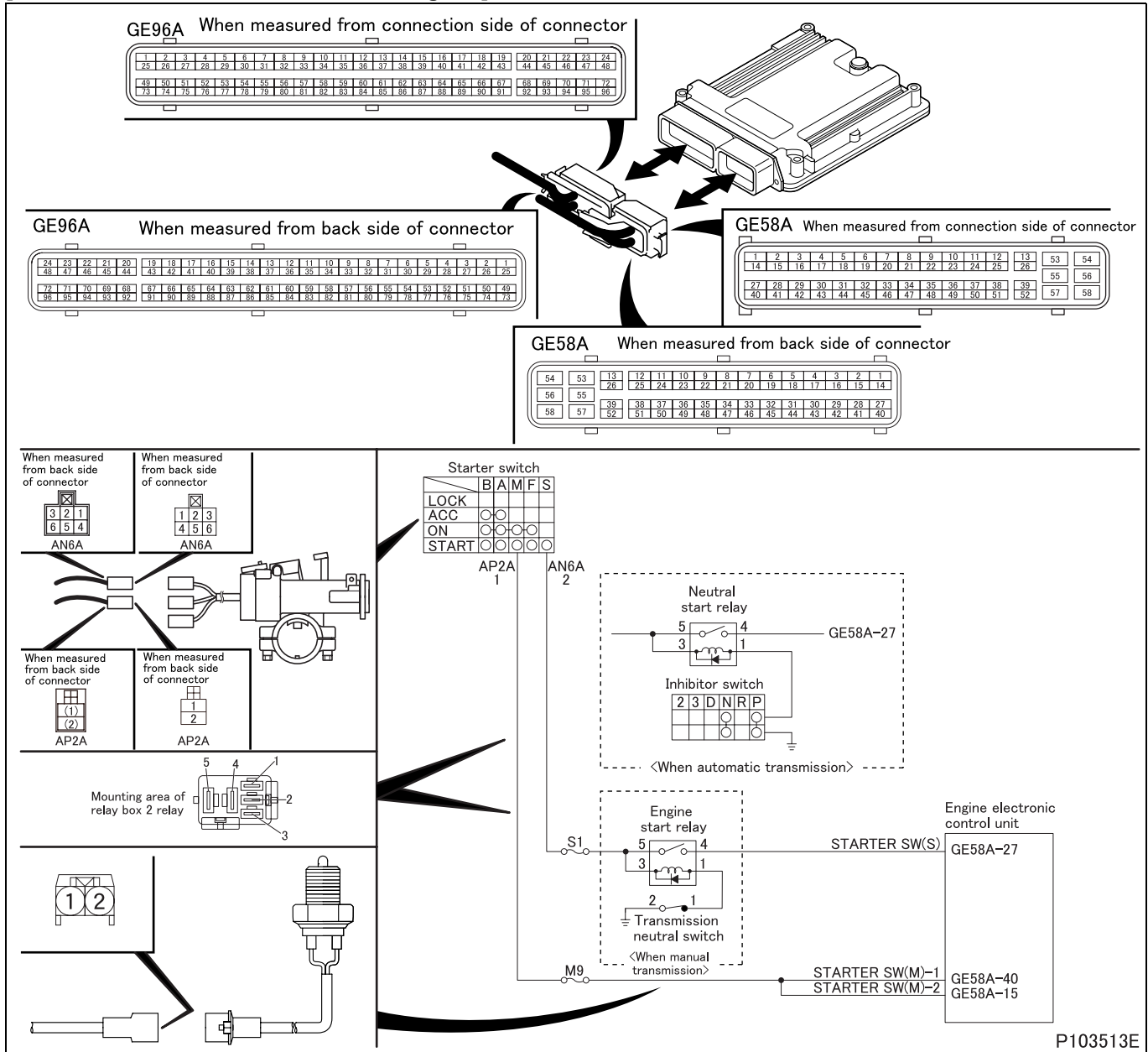
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and starter switch
- Malfunction of each connector
- Malfunction of starter switch
- Malfunction of engine start relay <Manual transmission>
- Malfunction of neutral start relay <Automatic transmission>
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

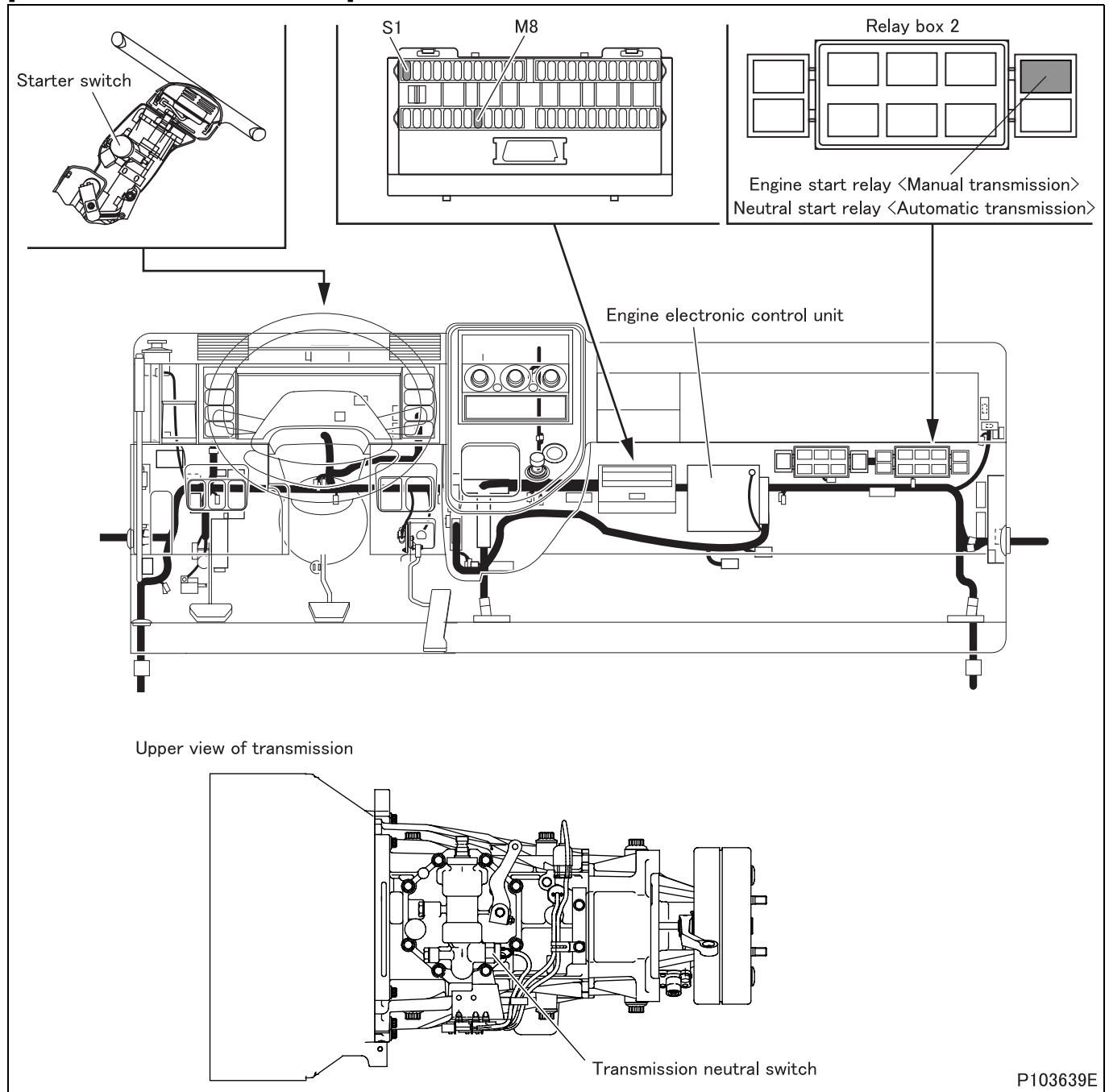
[Electronic Control Unit Connection Diagram]



P103513E

# TROUBLESHOOTING

## [Parts Identification and Location]



P103639E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |    |   |
|--------|--|----|---|
| Step 1 | Inspection items                                       |    | Inspection by control data  |
|        | Maintenance item                                       |    | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure value of voltage between electronic control unit connector (GE58A) terminal No. 27 (+) and ground (-).</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Measure item No. A0 "Starter SW (S)" of Service Data.</li> </ul> |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>• Transmission: neutral or P range</li> <li>• Starter switch: start</li> </ul>   |
|        | Requirements   |    | <b>&lt;General Scanning Tool used&gt;</b><br><ul style="list-style-type: none"> <li>• Same as battery voltage.</li> </ul> <b>&lt;Multi-Use Tester used&gt;</b><br><ul style="list-style-type: none"> <li>• Displayed as "ON".</li> </ul>  |
|        | Inspection result (Is the judging standard satisfied?) |    | YES   |
|        |  | NO | Go to step 2.   |

|        |  |    |   |
|--------|--|----|---|
| Step 2 | Inspection items                                       |    | Inspection of electronic control unit connector   |
|        | Maintenance item                                       |    | Inspection of connector   |
|        | Inspection condition                                   |    | –   |
|        | Requirements   |    | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |    | YES   |
|        |  | NO | Modify connector.   |

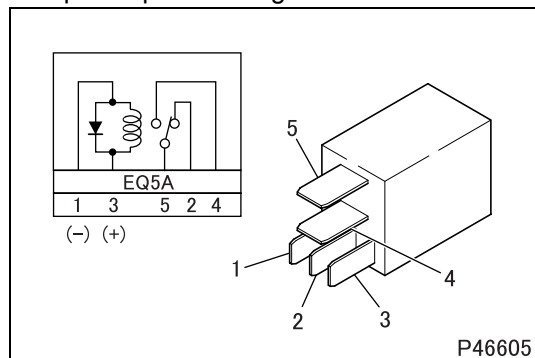
|        |  |    |   |
|--------|--|----|---|
| Step 3 | Inspection items                                       |    | Inspection of relay connector (power supply)  |
|        | Maintenance item                                       |    | Measure value of voltage between connector terminal No. 4 (+) and ground (-).   |
|        | Inspection condition                                   |    | <ul style="list-style-type: none"> <li>• Transmission: neutral or P range</li> <li>• Starter switch: start</li> </ul> |
|        | Requirements   |    | Same as battery voltage.  |
|        | Inspection result (Is the judging standard satisfied?) |    | YES   |
|        |  | NO | Go to step 4.   |

|        |  |    |  |
|--------|--|----|--|
| Step 4 | Inspection items                                       |    | Inspection of relay connector (signal)   |
|        | Maintenance item                                       |    | Check transmission signal between connector terminal No. 1 (+) and ground (-).   |
|        | Inspection condition                                   |    | Transmission: neutral or P range   |
|        | Requirements   |    | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |    | YES  |
|        |  | NO | <ul style="list-style-type: none"> <li>• Replacement of transmission neutral switch &lt;Manual transmission&gt;</li> <li>• Replacement of inhibitor switch &lt;Automatic transmission&gt;</li> </ul> |

# TROUBLESHOOTING

|        |  |                      |   |
|--------|--|----------------------|---|
| Step 5 | Inspection items                                       |                      | Inspection of relay unit  |
|        | Maintenance item                                       |                      | Measure continuity between terminals No. 4 and 5 when relay operates. |
|        | Inspection condition                                   |                      | Apply battery voltage across connector terminals No. 3 (+) and 1 (-). |
|        | Requirements   |                      | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                  | Go to step 6.   |
| NO     |  | Replacement of relay |   |

<Step 5 inspection diagram>

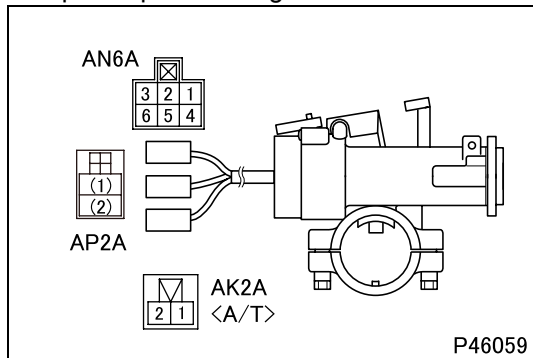


|        |  |               |  |
|--------|--|---------------|--|
| Step 6 | Inspection items                                       |               | Inspection of harness between starter switch and relay   |
|        | Maintenance item                                       |               | Check circuit between starter switch connector (AN6A) terminal No. 2 and relay connector terminal No. 5 and 3. |
|        | Inspection condition                                   |               | Disconnect each device from harness and measure from connection side of harness connector.                     |
|        | Requirements   |               | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 8.  |
| NO     |  | Go to step 7. |  |

|        |  |                     |                                 |
|--------|--|---------------------|---------------------------------|
| Step 7 | Inspection items                                       |                     | Inspection of fuse (S1)         |
|        | Maintenance item                                       |                     | Check open-circuit of fuse (S1) |
|        | Inspection condition                                   |                     | -                               |
|        | Requirements   |                     | There is continuity.            |
|        | Inspection result (Is the judging standard satisfied?) | YES                 | Go to step 8.                   |
| NO     |  | Replacement of fuse |                                 |

|        |  |   |               |
|--------|--|---|---------------|
| Step 8 | Inspection items                                       | Inspection of starter switch unit   |               |
|        | Maintenance item                                       | Check continuity between connector terminals.   |               |
|        | Inspection condition                                   | Check presence of continuity in each switch position.   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• LOCK: There is no continuity.</li> <li>• ACC: There is continuity between [2] and (3)</li> <li>• ON: There is continuity between [1], [2], (3) and (4)</li> <li>• START: There is continuity between [1], [2], (2), (3) and (4)</li> <li>• Terminal No. with [ ] shows connector terminal of AP2A and Terminal No. with ( ) shows connector terminal of AN6A.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 9. |
| NO     |  | Replacement of starter switch   |               |

<Step 8 inspection diagram>



|        |  |   |  |
|--------|--|---|--|
| Step 9 | Inspection items                                       | Inspection of harness between electronic control unit and relay   |  |
|        | Maintenance item                                       | Check circuit between electronic control unit connector (GE58A) terminal No. 27 and connector terminal No. 4. |  |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                    |  |
|        | Requirements   | There is continuity.  |  |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Replacement of electronic control unit |
| NO     |  | Modify harness.   |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P253C/Flash code: 61

## **[Monitor]**

Failure of auxiliary equipment sensor

## **[Fault (outline)]**

Low signal range check

## **[Diagnosis check]**

- Accelerator pedal position during cab back control is monitored through auxiliary equipment sensor for acceleration opening within specified value.

## **[Code generation condition]**

- Voltage from auxiliary equipment sensor remains below 0.49 V for 1 second.  
(Diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed each time when the power takeoff control is activated.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Power take-off accelerator pedal position is fixed at backup value.

## **[Probable cause of trouble]**

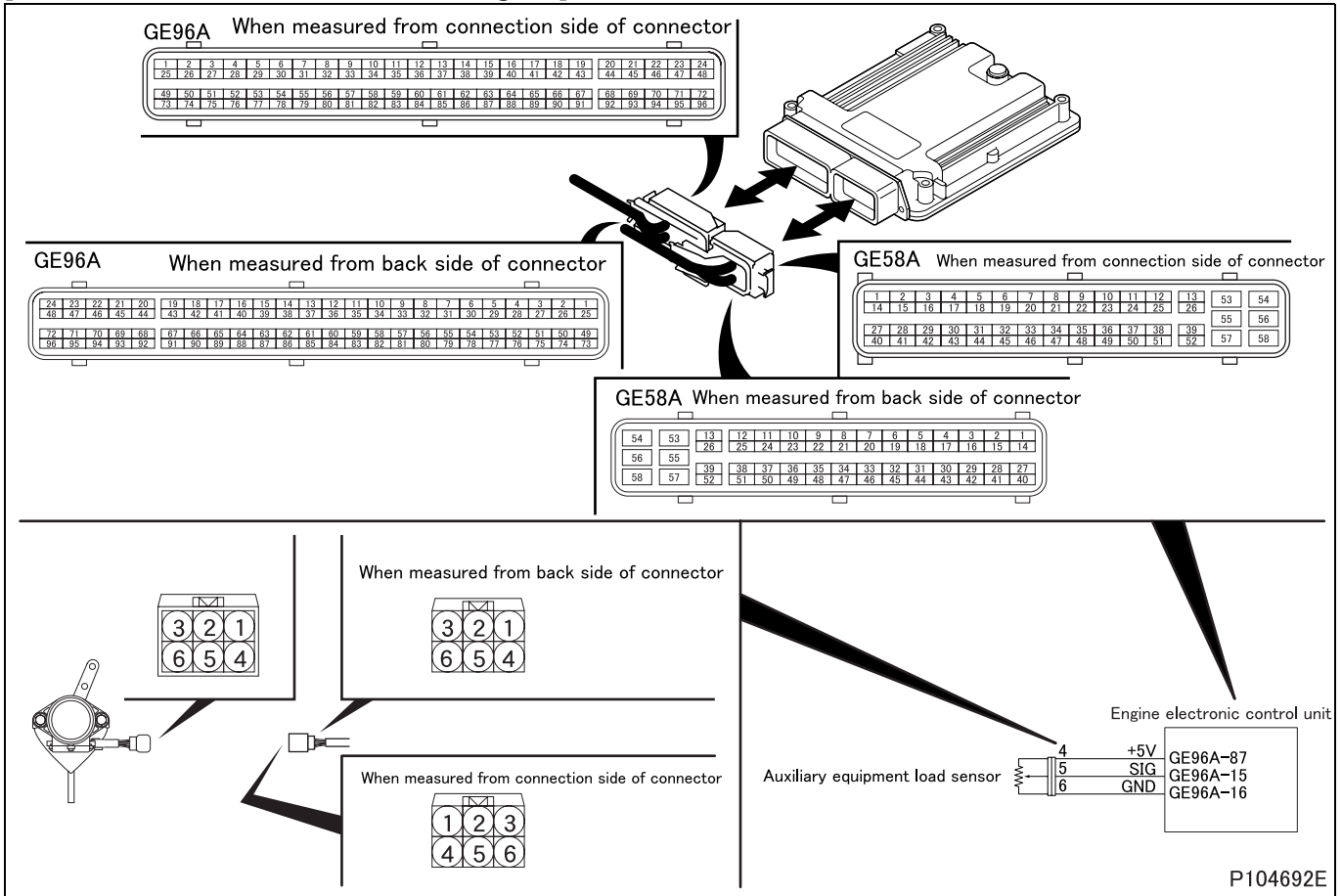
- Open-circuit or short-circuit of harness between electronic control unit and auxiliary equipment sensor
- Malfunction of each connector
- Malfunction of auxiliary equipment sensor
- Malfunction of electronic control unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is ON position.  
(Warning lamp and diagnosis code is cleared simultaneously with recovery.)

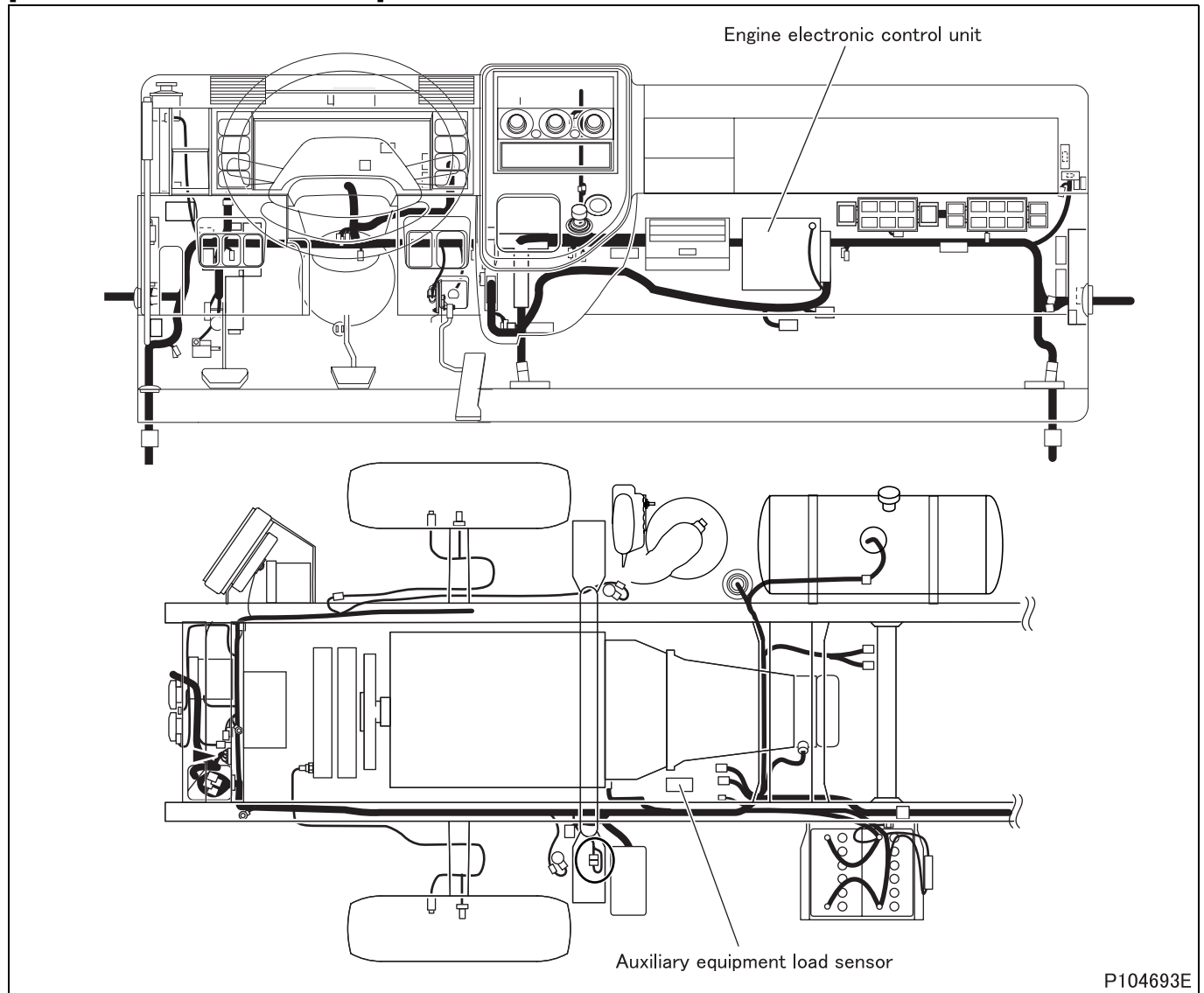


[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]



P104693E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |                     |  |
|--------|--|---------------------|--|
| Step 1 | Inspection items                                       |                     | Inspection by control data   |
|        | Maintenance item                                       |                     | Measurement of item No. 84 "PTO Accel Sensor Voltage" of Service Data.   |
|        | Inspection condition                                   |                     | —  |
|        | Requirements   |                     | <ul style="list-style-type: none"> <li>• Idling position: <math>0.85 \pm 0.1</math> V</li> <li>• Full-load position: <math>3.0 \pm 0.1</math> V</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |                     | YES<br>Go to transient fault (See Gr00.).  |
|        |  | NO<br>Go to step 2. |  |

|        |  |                     |  |
|--------|--|---------------------|--|
| Step 2 | Inspection items                                       |                     | Inspection by electronic control unit connector (signal)   |
|        | Maintenance item                                       |                     | Measure value of voltage between connector (GE96A) terminal No. 15 (+) and 16 (-).   |
|        | Inspection condition                                   |                     | <ul style="list-style-type: none"> <li>• Starter switch: ON (Do not start engine)</li> <li>• Measure from back side of harness connector with each device connected to harness.</li> </ul> |
|        | Requirements   |                     | <ul style="list-style-type: none"> <li>• Idling position: <math>0.85 \pm 0.1</math> V</li> <li>• Full-load position: <math>3.0 \pm 0.1</math> V</li> </ul>                                 |
|        | Inspection result (Is the judging standard satisfied?) |                     | YES<br>Go to step 5.   |
|        |  | NO<br>Go to step 3. |  |

|        |  |                     |  |
|--------|--|---------------------|--|
| Step 3 | Inspection items                                       |                     | Inspection by electronic control unit connector (power supply)   |
|        | Maintenance item                                       |                     | Measure value of voltage between connector (GE96A) terminal No. 87 (+) and 16 (-).   |
|        | Inspection condition                                   |                     | <ul style="list-style-type: none"> <li>• Starter switch: ON (Do not start engine)</li> <li>• Measure from back side of harness connector with each device connected to harness.</li> </ul> |
|        | Requirements   |                     | 5 V  |
|        | Inspection result (Is the judging standard satisfied?) |                     | YES<br>Go to step 4.   |
|        |  | NO<br>Go to step 5. |  |

|        |  |                     |  |
|--------|--|---------------------|--|
| Step 4 | Inspection items                                       |                     | Inspection by electronic control unit connector (ground)   |
|        | Maintenance item                                       |                     | Measure value of voltage between connector (GE96A) terminal No. 16 (+) and (GE58A) terminal No. 53 (-).  |
|        | Inspection condition                                   |                     | <ul style="list-style-type: none"> <li>• Starter switch: ON (Do not start engine)</li> <li>• Measure from back side of harness connector with each device connected to harness.</li> </ul> |
|        | Requirements   |                     | 0 V  |
|        | Inspection result (Is the judging standard satisfied?) |                     | YES<br>Go to step 6.   |
|        |  | NO<br>Go to step 5. |  |

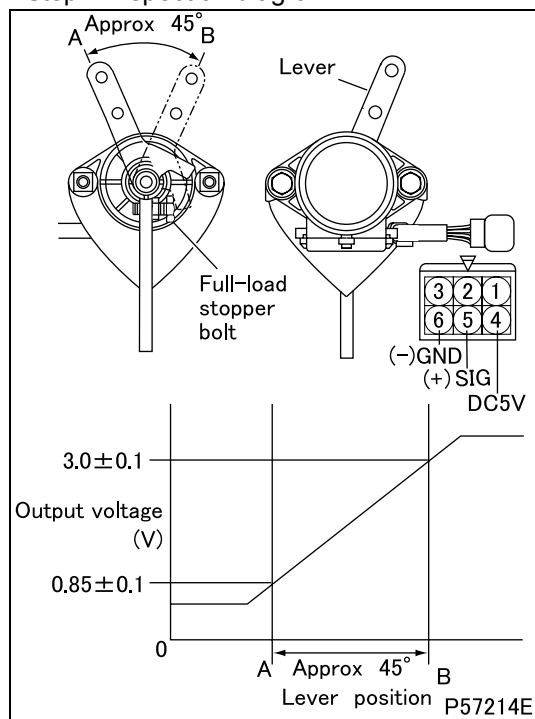
# TROUBLESHOOTING

|        |  |   |                |
|--------|--|---|----------------|
| Step 5 | Inspection items                                       | Inspection of electronic control unit connector   |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 12. |
| NO     |  | Modify connector.   |                |

|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify connector.   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of auxiliary equipment sensor unit  |               |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 5 (+) and 6 (-).   |               |
|        | Inspection condition                                   | Apply voltage DC 5 V across connector terminals No.4 (+) and 6 (-).  |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Idling position: <math>0.85 \pm 0.1</math> V</li> <li>• Full-load position: <math>3.0 \pm 0.1</math> V</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Replacement of sensor  |               |

<Step 7 inspection diagram>



|        |  |               |  |
|--------|--|---------------|--|
| Step 8 | Inspection items                                       |               | Inspection by sensor connector   |
|        | Maintenance item                                       |               | Measure value of voltage between connector terminal No. 4 (+) and 6 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Starter switch: ON (Do not start engine)</li> <li>Measure from back side of harness connector with each device connected to harness.</li> </ul> |
|        | Requirements   |               | 5 V  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 10.   |
| NO     |  | Go to step 9. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE96A) terminal No. 87 and sensor connector terminal No. 4. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO     |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 6 and electronic control unit connector (GE96A) terminal No. 16. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO      |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 5 and electronic control unit connector (GE96A) terminal No. 15. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |  |  |
|---------|--|--|--|
| Step 12 | Inspection items                                       |  | Inspection by control data   |
|         | Maintenance item                                       |  | Measurement of item No. 84 "PTO Accel Sensor Voltage" of Service Data.   |
|         | Inspection condition                                   |  | -  |
|         | Requirements   |  | <ul style="list-style-type: none"> <li>Idling position: <math>0.85 \pm 0.1</math> V</li> <li>Full-load position: <math>3.0 \pm 0.1</math> V</li> </ul> |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P253D/Flash code: 61

## **[Monitor]**

Failure of auxiliary equipment sensor

## **[Fault (outline)]**

High signal range check

## **[Diagnosis check]**

- Accelerator pedal position during cab back control is monitored through auxiliary equipment sensor for acceleration opening within specified value.

## **[Code generation condition]**

- Voltage from auxiliary equipment sensor remains over 3.49 V for 1 second.  
(Diagnosis code is displayed on first establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is performed each time when the power takeoff control is activated.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Power take-off accelerator pedal position is fixed at backup value.

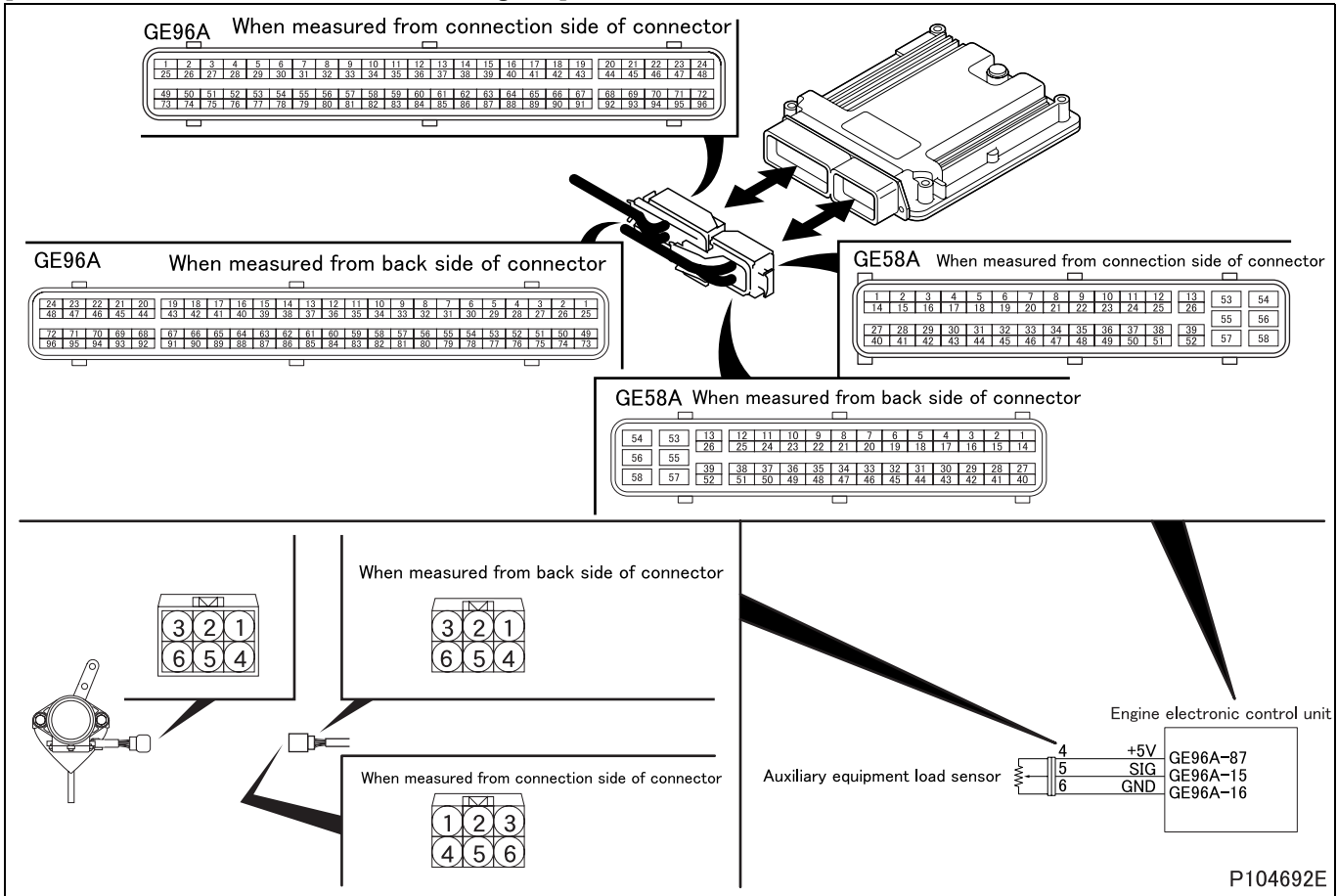
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic control unit and auxiliary equipment sensor
- Malfunction of each connector
- Malfunction of auxiliary equipment sensor
- Malfunction of electronic control unit

## **[Recoverability]**

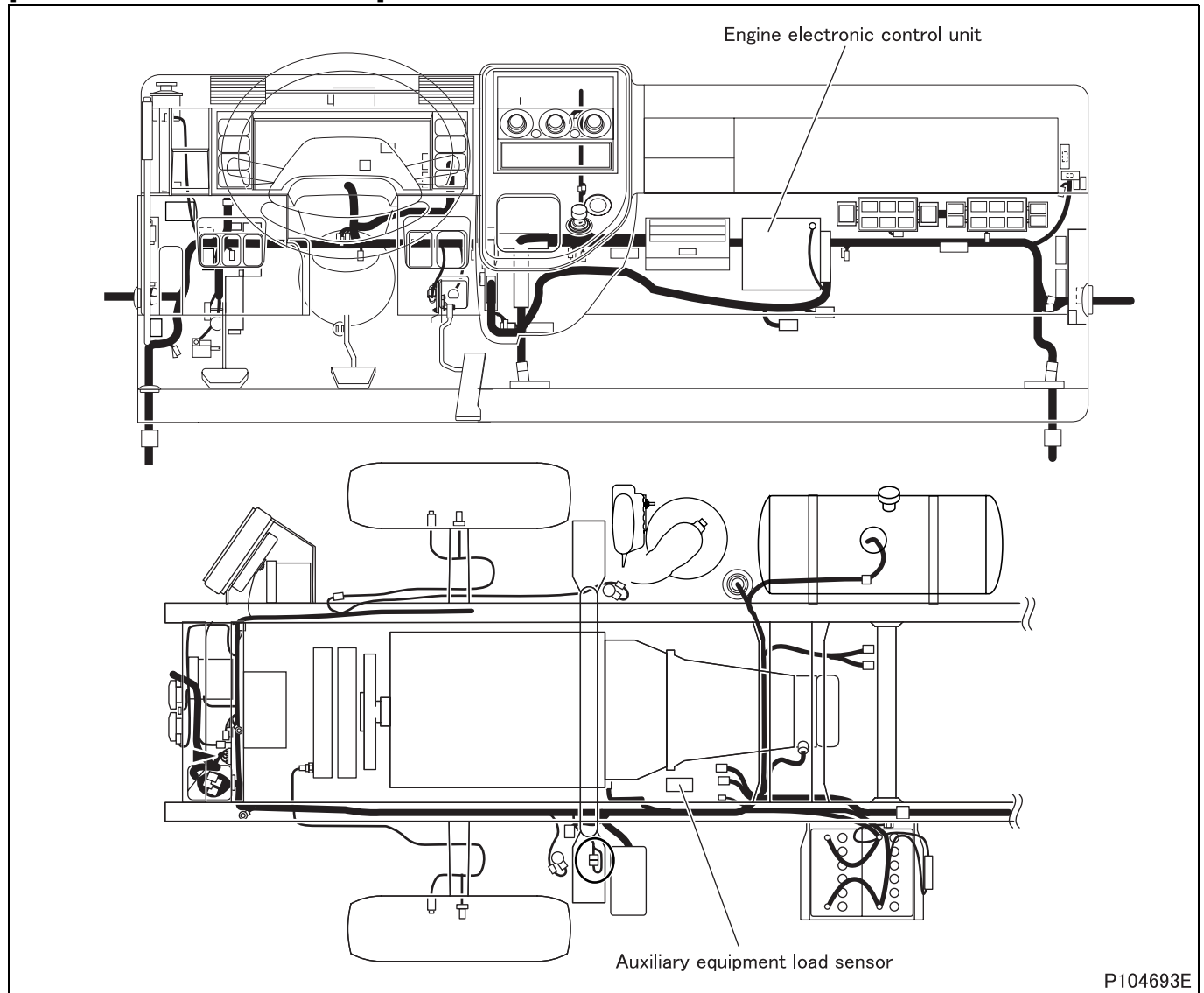
- Recovered if signal becomes normal when starter switch is ON position.  
(Warning lamp and diagnosis code is cleared simultaneously with recovery.)

[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]



P104693E



**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |               |  |
|--------|--|---------------|--|
| Step 1 | Inspection items                                       |               | Inspection by control data   |
|        | Maintenance item                                       |               | Measurement of item No. 84 "PTO Accel Sensor Voltage" of Service Data.   |
|        | Inspection condition                                   |               | —  |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• Idling position: <math>0.85 \pm 0.1</math> V</li> <li>• Full-load position: <math>3.0 \pm 0.1</math> V</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to transient fault (See Gr00.).   |
| NO     |  | Go to step 2. |  |

|        |  |               |  |
|--------|--|---------------|--|
| Step 2 | Inspection items                                       |               | Inspection by electronic control unit connector (signal)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 15 (+) and 16 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Starter switch: ON (Do not start engine)</li> <li>• Measure from back side of harness connector with each device connected to harness.</li> </ul> |
|        | Requirements   |               | <ul style="list-style-type: none"> <li>• Idling position: <math>0.85 \pm 0.1</math> V</li> <li>• Full-load position: <math>3.0 \pm 0.1</math> V</li> </ul>                                 |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 5.  |
| NO     |  | Go to step 3. |  |

|        |  |               |  |
|--------|--|---------------|--|
| Step 3 | Inspection items                                       |               | Inspection by electronic control unit connector (power supply)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 87 (+) and 16 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Starter switch: ON (Do not start engine)</li> <li>• Measure from back side of harness connector with each device connected to harness.</li> </ul> |
|        | Requirements   |               | 5 V  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 4.  |
| NO     |  | Go to step 5. |  |

|        |  |               |  |
|--------|--|---------------|--|
| Step 4 | Inspection items                                       |               | Inspection by electronic control unit connector (ground)   |
|        | Maintenance item                                       |               | Measure value of voltage between connector (GE96A) terminal No. 16 (+) and (GE58A) terminal No. 53 (-).  |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>• Starter switch: ON (Do not start engine)</li> <li>• Measure from back side of harness connector with each device connected to harness.</li> </ul> |
|        | Requirements   |               | 0 V  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 6.  |
| NO     |  | Go to step 5. |  |

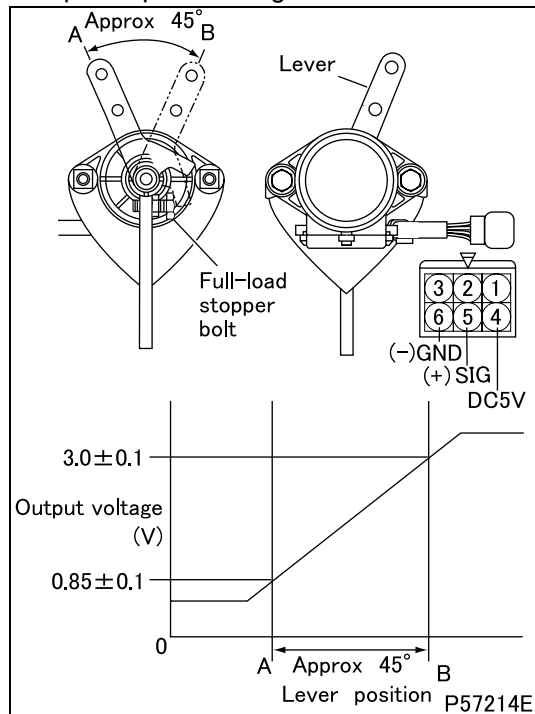
# TROUBLESHOOTING

|        |  |   |                |
|--------|--|---|----------------|
| Step 5 | Inspection items                                       | Inspection of electronic control unit connector   |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 12. |
| NO     |  | Modify connector.   |                |

|        |  |   |               |
|--------|--|---|---------------|
| Step 6 | Inspection items                                       | Inspection of sensor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 7. |
| NO     |  | Modify connector.   |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of auxiliary equipment sensor unit  |               |
|        | Maintenance item                                       | Measure value of voltage between connector terminal No. 5 (+) and 6 (-).   |               |
|        | Inspection condition                                   | Apply voltage DC 5 V across connector terminals No. 4 (+) and 6 (-).   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Idling position: <math>0.85 \pm 0.1</math> V</li> <li>• Full-load position: <math>3.0 \pm 0.1</math> V</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Replacement of sensor  |               |

<Step 7 inspection diagram>



|        |  |               |  |
|--------|--|---------------|--|
| Step 8 | Inspection items                                       |               | Inspection by sensor connector   |
|        | Maintenance item                                       |               | Measure value of voltage between connector terminal No. 4 (+) and 6 (-).   |
|        | Inspection condition                                   |               | <ul style="list-style-type: none"> <li>Starter switch: ON (Do not start engine)</li> <li>Measure from back side of harness connector with each device connected to harness.</li> </ul> |
|        | Requirements   |               | 5 V  |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 10.   |
| NO     |  | Go to step 9. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 9 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (power supply)                                      |
|        | Maintenance item                                       |                 | Check circuit between electronic control unit connector (GE96A) terminal No. 87 and sensor connector terminal No. 4. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO     |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 10 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (ground)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 6 and electronic control unit connector (GE96A) terminal No. 16. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.   |
| NO      |  | Modify harness. |  |

|         |  |                 |  |
|---------|--|-----------------|--|
| Step 11 | Inspection items                                       |                 | Inspection of harness between electronic control unit and sensor (signal)  |
|         | Maintenance item                                       |                 | Check circuit between sensor connector terminal No. 5 and electronic control unit connector (GE96A) terminal No. 15. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                           |
|         | Requirements   |                 | There is continuity.   |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.   |
| NO      |  | Modify harness. |  |

|         |  |  |  |
|---------|--|--|--|
| Step 12 | Inspection items                                       |  | Inspection by control data   |
|         | Maintenance item                                       |  | Measurement of item No. 84 "PTO Accel Sensor Voltage" of Service Data.   |
|         | Inspection condition                                   |  | -  |
|         | Requirements   |  | <ul style="list-style-type: none"> <li>Idling position: <math>0.85 \pm 0.1</math> V</li> <li>Full-load position: <math>3.0 \pm 0.1</math> V</li> </ul> |
|         | Inspection result (Is the judging standard satisfied?) | YES                                    | Go to transient fault (See Gr00.).   |
| NO      |  | Replacement of electronic control unit |  |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: P2563/Flash code: 51

## **[Monitor]**

Turbocharger actuator system

## **[Fault (outline)]**

- Low signal range check
- High signal range check

## **[Diagnosis check]**

- Turbocharger electronic drive unit monitors turbocharger actuator internal circuit for fault (through throttle position sensor).

## **[Code generation condition]**

- Position sensor output voltage remains 0 V (low pulse) or 8 to 11 V (high pulse) for 2 seconds.  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

- Controller area network communication in order

## **[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

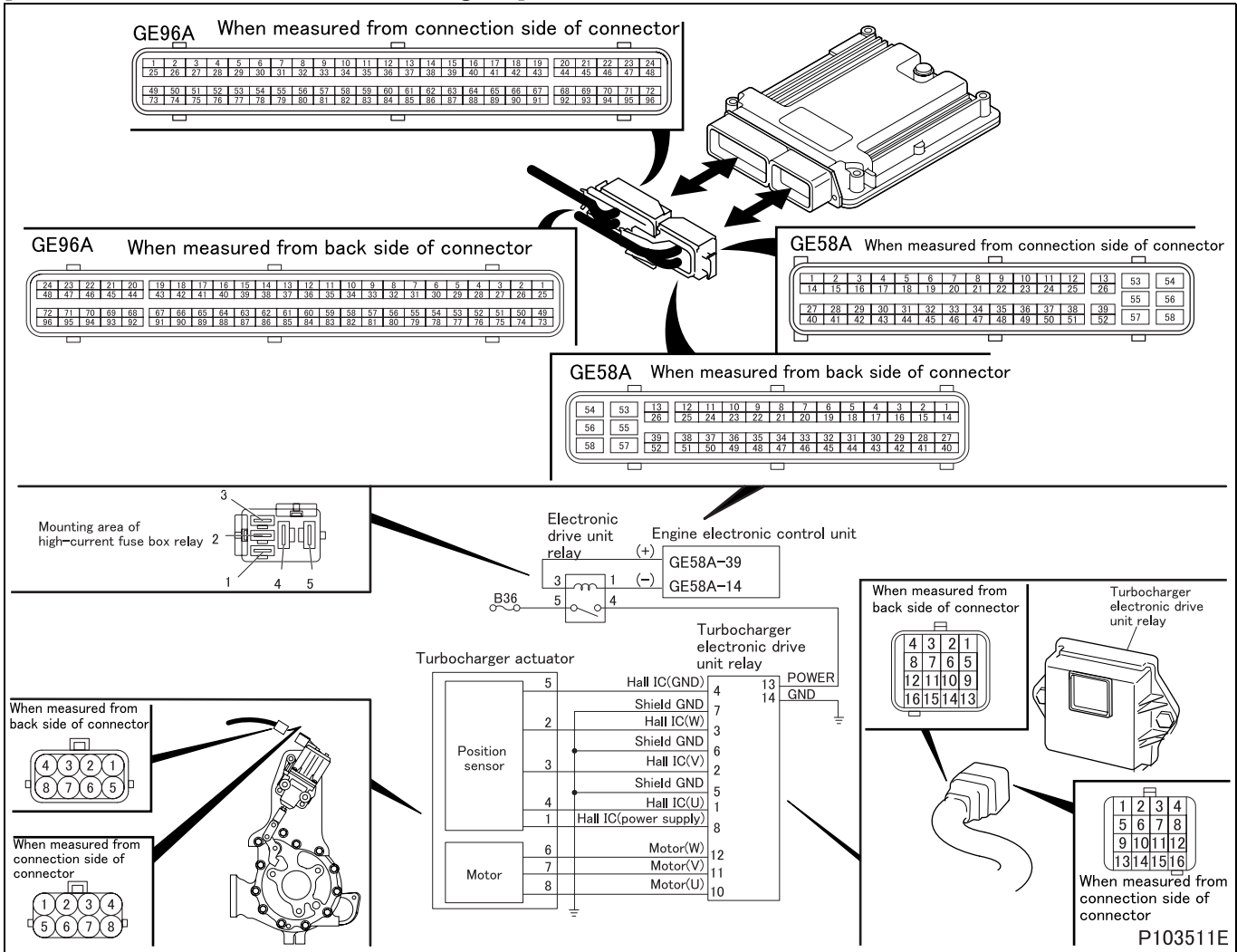
## **[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between electronic drive unit and turbocharger actuator
- Malfunction of each connector
- Malfunction of turbocharger motor (built in turbocharger actuator)
- Malfunction of turbocharger position sensor (built in turbocharger actuator)
- Malfunction of electronic drive unit
- Malfunction of electronic drive unit relay

## **[Recoverability]**

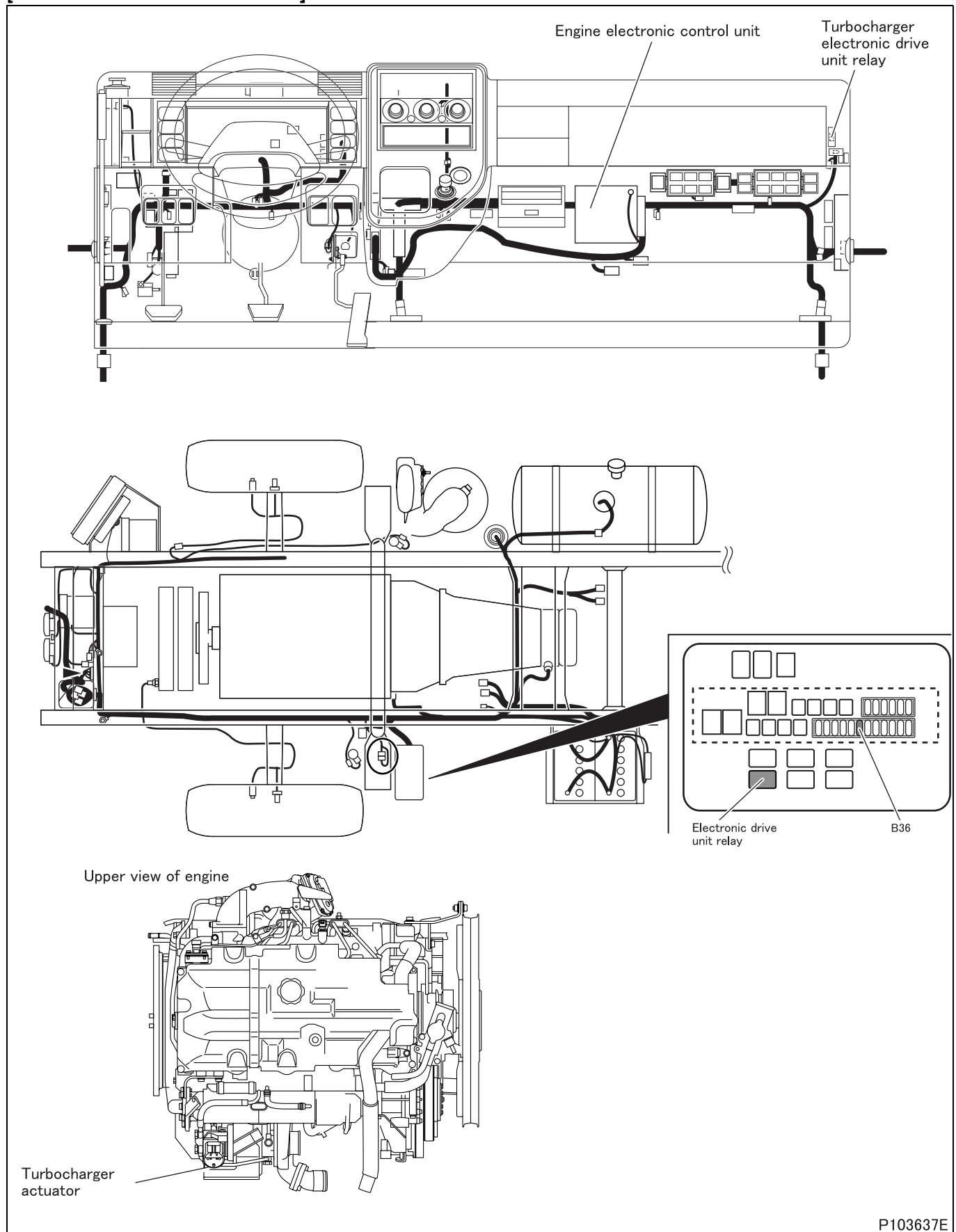
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]



P103637E

**[Fault diagnosis]**

- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by control data   |
|        | Maintenance item                                       |  | Check if following diagnosis codes occur simultaneously.<br><ul style="list-style-type: none"> <li>• P0685 "EDU Relay (Open)"</li> <li>• P0686 "EDU Relay (Low)"</li> <li>• P0687 "EDU Relay (High)"</li> <li>• P0688 "EDU Relay (Over Load)"</li> </ul> |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> </ul>  |
|        | Requirements   |  | Codes occur.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of electronic drive unit connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |  |
|--------|--|--|--|
| Step 3 | Inspection items                                       |  | Inspection of electronic drive unit connector (power supply)   |
|        | Maintenance item                                       |  | Measure value of voltage between connector terminal No. 13 (+) and 14 (–).   |
|        | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> <li>• Disconnect connector and measure from harness side.</li> <li>• Perform actuator test item No. AF "EDU Relay".</li> </ul> |
|        | Requirements   |  | Same as battery voltage.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of relay connector   |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |  |
|--------|--|--|--|
| Step 5 | Inspection items                                       |  | Inspection of harness between fuse and relay   |
|        | Maintenance item                                       |  | Check circuit between fuse No. B36 and relay connector terminal No. 5.                     |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

# TROUBLESHOOTING

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 6 | Inspection items                                       |                 | Inspection of harness between relay and electronic drive unit   |
|        | Maintenance item                                       |                 | Check circuit between relay connector terminal No. 4 and electronic drive unit connector terminal No. 13. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.                |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | After replacement of electronic drive unit relay, go to step 7.   |
| NO     |  | Modify harness. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between electronic drive unit and ground                             |
|        | Maintenance item                                       |                 | Check circuit between electronic drive unit connector terminal No. 14 and chassis ground.  |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector. |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Replacement of electronic drive unit   |
| NO     |  | Modify harness. |  |



**[Fault code]**

Diagnosis code: P2670/Flash code: 36

**[Monitor]**

Abnormality of common rail pressure (comparison)

**[Fault (outline)]**

Short circuit ground

**[Diagnosis check]**

- MPROP (rail pressure control valve) power of engine electronic control unit is monitored for fault.

**[Code generation condition]**

- Power OFF (shorted to ground) remains as detected for 1 second.  
(Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Vapor smoke emission control during long-time idling is stopped.
- Diesel particulate filter regeneration is stopped.

**[Probable cause of trouble]**

- Malfunction of supply pump
- Malfunction of pressure limiter
- Airtight malfunction of injector
- Plugged fuel system

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared simultaneously with recovery.)

# TROUBLESHOOTING

## [Fault diagnosis]

- Perform checks in the sequence of the following steps.

|        |  |   |  |
|--------|--|---|--|
| Step 1 | Inspection items                                       |   | Inspection by control data   |
|        | Maintenance item                                       |   | Check if following diagnosis codes occur simultaneously. <ul style="list-style-type: none"> <li>P0093 "CRS (Fuel Leak)"</li> <li>P0148 "CRS (Fuel Delivery)"</li> <li>P0191 "CRS Pressure SNSR (Plausibility)"</li> <li>P0192 "CRS Pressure SNSR (Low)"</li> <li>P0193 "CRS Pressure SNSR (High)"</li> <li>P0201 "Injector M/V-Cylinder 1 (Load)"</li> <li>P0202 "Injector M/V-Cylinder 2 (Load)"</li> <li>P0203 "Injector M/V-Cylinder 3 (Load)"</li> <li>P0204 "Injector M/V-Cylinder 4 (Load)"</li> <li>P0261 "Injector #1-A (Low)"</li> <li>P0262 "Injector #1-A (High)"</li> <li>P0263 "Injector #1-A (Plausibility)"</li> <li>P0264 "Injector #2-A (Low)"</li> <li>P0265 "Injector #2-A (High)"</li> <li>P0266 "Injector #2-A (Plausibility)"</li> <li>P0267 "Injector #3-A (Low)"</li> <li>P0268 "Injector #3-A (High)"</li> <li>P0269 "Injector #3-A (Plausibility)"</li> <li>P0270 "Injector #4-A (Low)"</li> <li>P0271 "Injector #4-A (High)"</li> <li>P0272 "Injector #4-A (Plausibility)"</li> <li>P0562 "Power Supply Voltage (Low)"</li> <li>P0563 "Power Supply Voltage (High)"</li> <li>P0607 "ECU System"</li> <li>P060B "A/D Converter"</li> <li>P061B "ECU Performance (Calc)"</li> <li>P061C "ECU Performance (Ne)"</li> </ul> |
|        | Inspection condition                                   |   | <ul style="list-style-type: none"> <li>Starter switch: ON</li> <li>Do not start engine</li> </ul>  |
|        | Requirements   |   | No codes occur.  |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 2.  |
|        | NO   | Inspect diagnosis code that is occurring. |  |

|        |  |               |                                  |
|--------|--|---------------|----------------------------------|
| Step 2 | Inspection items                                       |               | Checking of engine appearance    |
|        | Maintenance item                                       |               | Check fuel system for fuel leak. |
|        | Inspection condition                                   |               | Starter switch: OFF              |
|        | Requirements   |               | There is no fuel leak.           |
|        | Inspection result (Is the judging standard satisfied?) | YES           | Go to step 3.                    |
|        | NO   | Go to step 6. |                                  |

|        |  |   |   |
|--------|--|---|---|
| Step 3 | Inspection items                                       |   | Inspection of low pressure piping (fuel tank – supply pump) |
|        | Maintenance item                                       |   | Check suction pipe or hose for bend.                        |
|        | Inspection condition                                   |   | Starter switch: OFF   |
|        | Requirements   |   | There is no bend on pipe or hose.                           |
|        | Inspection result (Is the judging standard satisfied?) | YES                                       | Go to step 4.   |
|        | NO   | Correct and replace suction pipe or hose. |   |

|        |  |               |                                    |
|--------|--|---------------|------------------------------------|
| Step 4 | Inspection items                                       |               | Checking of air bleeding           |
|        | Maintenance item                                       |               | Bleed air from fuel filter.        |
|        | Inspection condition                                   |               | Starter switch: OFF                |
|        | Requirements   |               | Problem is solved by bleeding air. |
|        | Inspection result (Is the judging standard satisfied?) | YES           | –                                  |
| NO     |  | Go to step 5. |                                    |

|        |  |               |   |
|--------|--|---------------|---|
| Step 5 | Inspection items                                       |               | Inspection of low pressure piping           |
|        | Maintenance item                                       |               | Fuel filter                                 |
|        | Inspection condition                                   |               | Starter switch: OFF                         |
|        | Requirements   |               | Problem is solved by replacing fuel filter. |
|        | Inspection result (Is the judging standard satisfied?) | YES           | –   |
| NO     |  | Go to step 6. |   |

|        |  |                            |  |
|--------|--|----------------------------|--|
| Step 6 | Inspection items                                       |                            | Inspection by control data                           |
|        | Maintenance item                                       |                            | Perform actuator test item No. B2 “Fuel Leak Check”. |
|        | Inspection condition                                   |                            | Engine start: At idle                                |
|        | Requirements   |                            | There is no leak from supply pump.                   |
|        | Inspection result (Is the judging standard satisfied?) | YES                        | Go to step 7.  |
| NO     |  | Replacement of supply pump |  |

|        |  |                          |   |
|--------|--|--------------------------|---|
| Step 7 | Inspection items                                       |                          | Inspection by control data                                    |
|        | Maintenance item                                       |                          | Perform actuator test item No. B2 “Fuel Leak Check”.          |
|        | Inspection condition                                   |                          | Engine start: At idle   |
|        | Requirements   |                          | There is no leak from fuel pipe between supply pump and rail. |
|        | Inspection result (Is the judging standard satisfied?) | YES                      | Go to step 8.   |
| NO     |  | Replacement of fuel pipe |   |

|        |  |                     |  |
|--------|--|---------------------|--|
| Step 8 | Inspection items                                       |                     | Inspection by control data                           |
|        | Maintenance item                                       |                     | Perform actuator test item No. B2 “Fuel Leak Check”. |
|        | Inspection condition                                   |                     | Engine start: At idle                                |
|        | Requirements   |                     | There is no leak from rail.                          |
|        | Inspection result (Is the judging standard satisfied?) | YES                 | Go to step 9.  |
| NO     |  | Replacement of rail |  |

|        |  |                               |  |
|--------|--|-------------------------------|--|
| Step 9 | Inspection items                                       |                               | Inspection by control data   |
|        | Maintenance item                                       |                               | Perform actuator test item No. B2 “Fuel Leak Check”.                         |
|        | Inspection condition                                   |                               | Engine start: At idle  |
|        | Requirements   |                               | There is no leak from fuel injection pipes (four) between injector and rail. |
|        | Inspection result (Is the judging standard satisfied?) | YES                           | Go to step 10.   |
| NO     |  | Replacement of injection pipe |  |

# TROUBLESHOOTING

|         |  |                         |  |
|---------|--|-------------------------|--|
| Step 10 | Inspection items                                       |                         | Inspection by control data                           |
|         | Maintenance item                                       |                         | Perform actuator test item No. B2 "Fuel Leak Check". |
|         | Inspection condition                                   |                         | Engine start: At idle                                |
|         | Requirements   |                         | There is no leak from injectors (four).              |
|         | Inspection result (Is the judging standard satisfied?) | YES                     | Go to step 11.                                       |
| NO      |  | Replacement of injector |  |

|         |  |  |  |
|---------|--|--|--|
| Step 11 | Inspection items                                       |  | Inside inspection of combustion chamber  |
|         | Maintenance item                                       |  | Check for fuel leak.   |
|         | Inspection condition                                   |  | <ul style="list-style-type: none"> <li>After performing actuator test item No. B2 "Fuel Leak Check", stop engine.</li> <li>Remove glow plug, and check from glow plug mounting hole using bore scope.</li> </ul> |
|         | Requirements   |  | Inside of combustion chamber is not wet.   |
|         | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 12.   |
| NO      |  | Replacement of injector of object cylinder |  |

|         |  |                |   |
|---------|--|----------------|---|
| Step 12 | Inspection items                                       |                | Replacement of rail (flow damper and pressure limiter abnormal) |
|         | Maintenance item                                       |                | –   |
|         | Inspection condition                                   |                | –   |
|         | Requirements   |                | Problem is solved by replacing rail.                            |
|         | Inspection result (Is the judging standard satisfied?) | YES            | –   |
| NO      |  | Go to step 13. |   |

|         |  |                                 |   |
|---------|--|---------------------------------|---|
| Step 13 | Inspection items                                       |                                 | Replacement of supply pump                  |
|         | Maintenance item                                       |                                 | –   |
|         | Inspection condition                                   |                                 | –   |
|         | Requirements   |                                 | Problem is solved by replacing supply pump. |
|         | Inspection result (Is the judging standard satisfied?) | YES                             | –   |
| NO      |  | Replacement of injectors (four) |   |

**[Fault code]**

Diagnosis code: U0001/Flash code: 73

**[Monitor]**

Abnormality in controller area network 2 communication

**[Fault (outline)]**

Message timeout

**[Diagnosis check]**

- Controller area network communication between engine electronic control unit and each electronic drive unit (turbocharger, exhaust gas recirculation, throttle) is monitored for abnormality.

**[Code generation condition]**

- No controller area network signal is sent from each electronic drive unit within specified time after engine start (time out).

(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

- When engine is in normal condition during period from after-run to start.

**[Control effected by electronic control unit during fault]**

- Related fault check is stopped.

**[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between engine electronic control unit and each electronic drive unit (turbocharger, exhaust gas recirculation, throttle)
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of each electronic drive unit

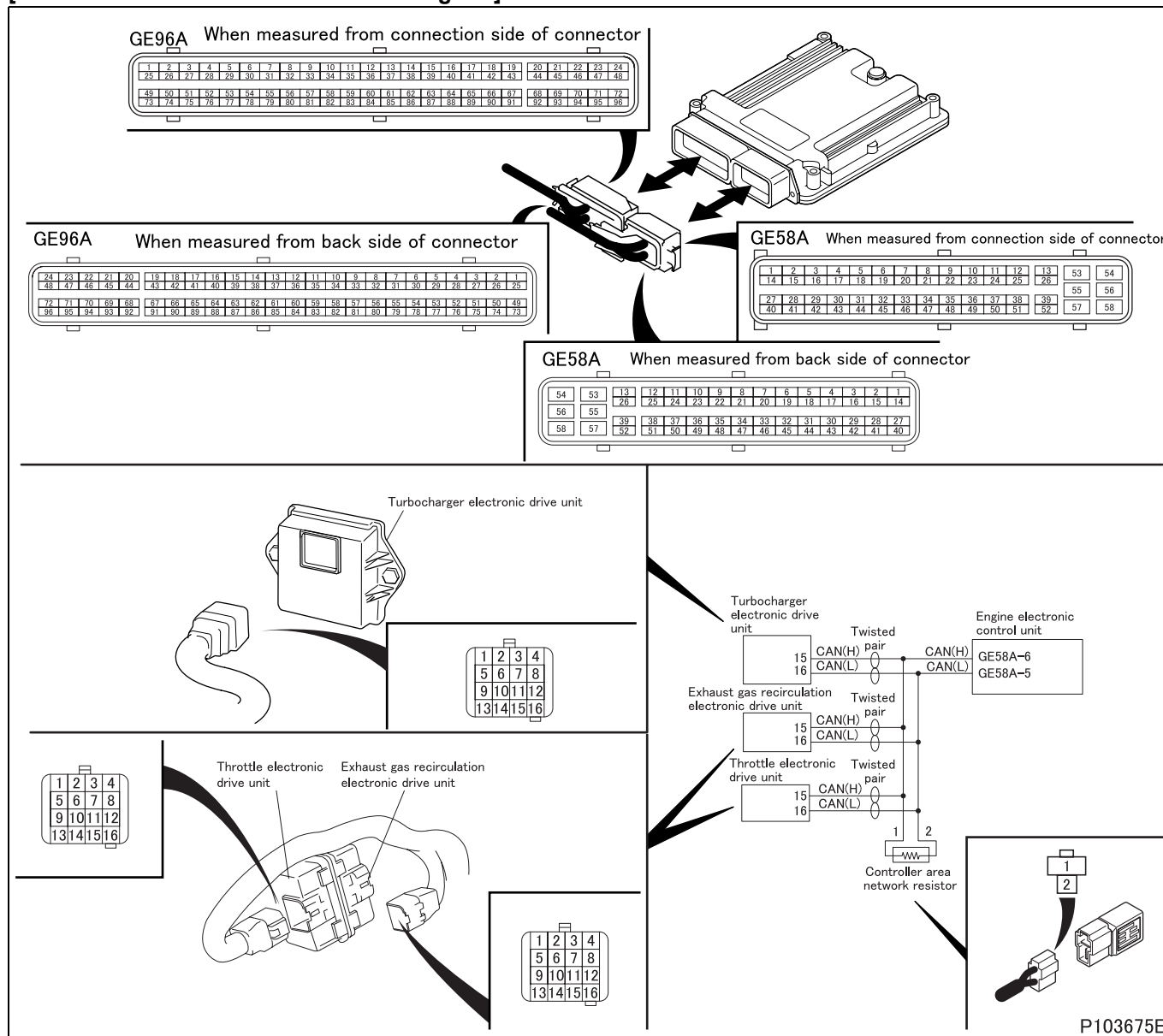
**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

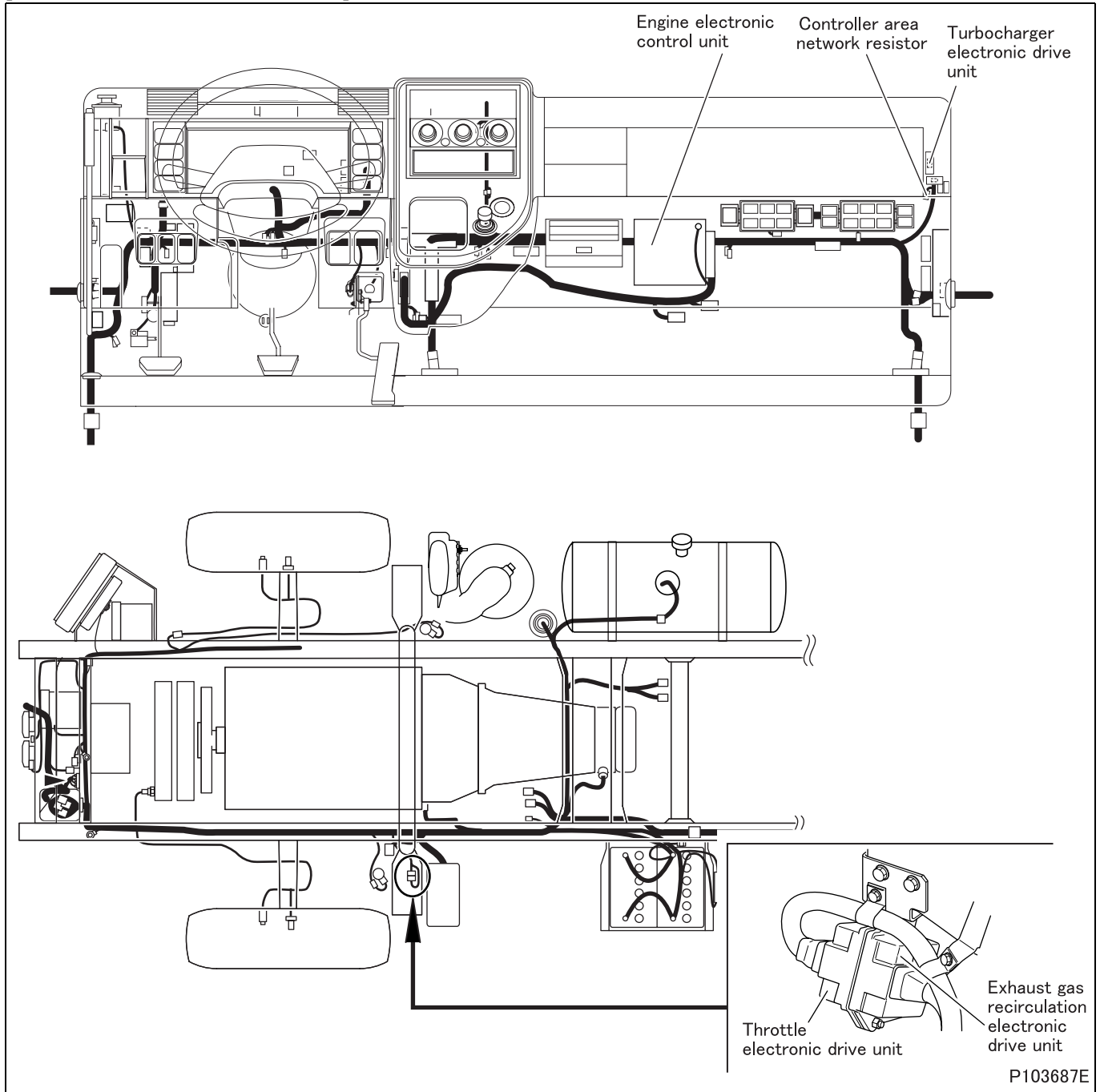
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



# TROUBLESHOOTING

## [Fault diagnosis]

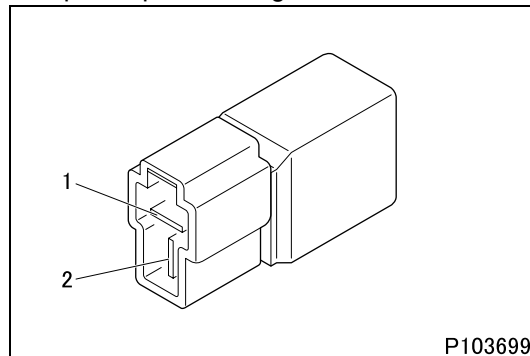
- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by engine electronic control unit connector   |
|        | Maintenance item                                       |  | Measure value of resistance between engine electronic control unit connector (GE58A) terminal No. 5 and 6. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                 |
|        | Requirements   |  | 120 ± 6 Ω  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of controller area network resistor connector  |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of controller area network resistor unit                     |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and No. 2. |
|        | Inspection condition                                   |  | Disconnect connector and measure resistor side.                         |
|        | Requirements   |  | 120 ± 6 Ω   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

<Step 3 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of harness between engine electronic control unit and controller area network resistor (HIGH)  |
|        | Maintenance item                                       |  | Check circuit between controller area network resistor connector terminal No. 1 and engine electronic control unit connector (GE58A) terminal No. 6 |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |



|        |  |  |               |
|--------|--|--|---------------|
| Step 5 | Inspection items                                       | Inspection of harness between engine electronic control unit and controller area network resistor (LOW)  |               |
|        | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 2 and engine electronic control unit connector (GE58A) terminal No. 5. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.   |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 6. |
| NO     |  | Modify harness.  |               |

|        |  |   |                |
|--------|--|---|----------------|
| Step 6 | Inspection items                                       | Inspection of engine electronic control unit connector  |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 10. |
| NO     |  | Modify connector.   |                |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of harness between exhaust gas recirculation electronic drive unit and controller area network resistor (HIGH)                                      |               |
|        | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 1 and exhaust gas recirculation electronic drive unit connector terminal No. 15. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.   |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Modify harness.  |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 8 | Inspection items                                       | Inspection of harness between exhaust gas recirculation electronic drive unit and controller area network resistor (LOW)                                       |               |
|        | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 2 and exhaust gas recirculation electronic drive unit connector terminal No. 16. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.   |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 9. |
| NO     |  | Modify harness.  |               |

|        |  |   |                |
|--------|--|---|----------------|
| Step 9 | Inspection items                                       | Inspection of exhaust gas recirculation electronic drive unit connector   |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 10. |
| NO     |  | Modify connector.   |                |

# TROUBLESHOOTING

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 10 | Inspection items                                       |                 | Inspection of harness between throttle electronic drive unit and controller area network resistor (HIGH)                                      |
|         | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 1 and throttle electronic drive unit connector terminal No. 15. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.  |
| NO      |  | Modify harness. |   |

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 11 | Inspection items                                       |                 | Inspection of harness between throttle electronic drive unit and controller area network resistor (LOW)                                       |
|         | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 2 and throttle electronic drive unit connector terminal No. 16. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.  |
| NO      |  | Modify harness. |   |

|         |  |                   |   |
|---------|--|-------------------|---|
| Step 12 | Inspection items                                       |                   | Inspection of throttle electronic drive unit connector  |
|         | Maintenance item                                       |                   | Inspection of connector   |
|         | Inspection condition                                   |                   | –   |
|         | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|         | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 13.  |
| NO      |  | Modify connector. |   |

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 13 | Inspection items                                       |                 | Inspection of harness between turbocharger electronic drive unit and controller area network resistor (HIGH)                                      |
|         | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 1 and turbocharger electronic drive unit connector terminal No. 15. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 14.  |
| NO      |  | Modify harness. |   |

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 14 | Inspection items                                       |                 | Inspection of harness between turbocharger electronic drive unit and controller area network resistor (LOW)                                       |
|         | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 2 and turbocharger electronic drive unit connector terminal No. 16. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 15.  |
| NO      |  | Modify harness. |   |

|         |  |                   |   |
|---------|--|-------------------|---|
| Step 15 | Inspection items                                       |                   | Inspection of turbocharger electronic drive unit connector  |
|         | Maintenance item                                       |                   | Inspection of connector   |
|         | Inspection condition                                   |                   | —   |
|         | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|         | Inspection result (Is the judging standard satisfied?) | YES               | Replace the engine electronic control unit as well if this diagnosis code occurs after the replacement of one of electronic drive units.  |
| NO      |  | Modify connector. |   |

# TROUBLESHOOTING

---

## **[Fault code]**

Diagnosis code: U0002/Flash code: 73

## **[Monitor]**

Abnormality in controller area network 2 communication

## **[Fault (outline)]**

Controller area network B bus off

## **[Diagnosis check]**

- Controller area network communication between engine electronic control unit and each electronic drive unit (turbocharger, exhaust gas recirculation, throttle) is monitored for abnormality.

## **[Code generation condition]**

- No controller area network signal is received from each electronic drive unit after engine start (controller area network bus OFF).

(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

## **[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

## **[Diagnostic requirement]**

—

## **[Control effected by electronic control unit during fault]**

- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Post injection is inhibited.
- Diesel particulate filter regeneration is stopped.
- Particulate matter deposit computation is stopped.
- Related fault check is stopped.

## **[Probable cause of trouble]**

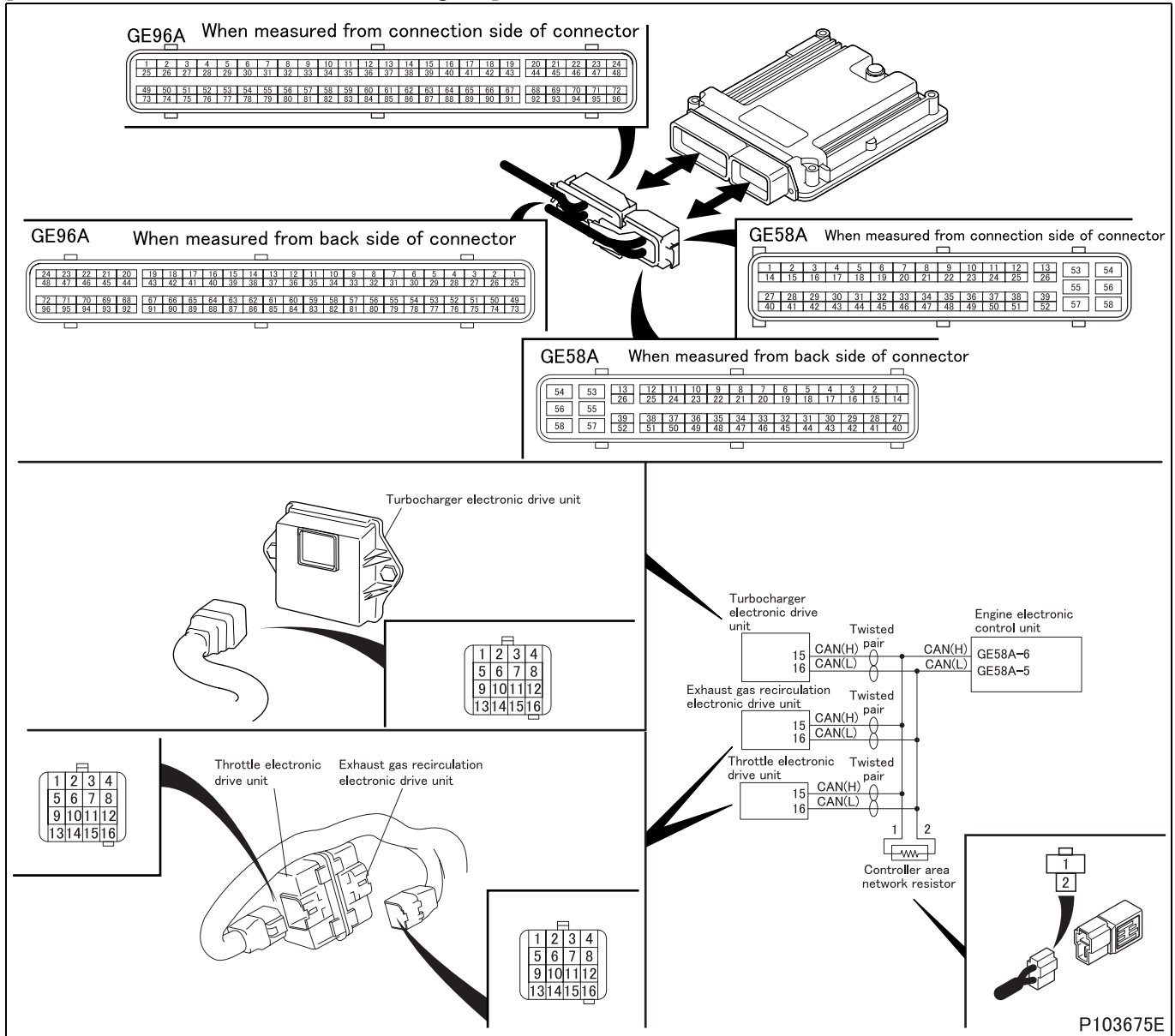
- Open-circuit or short-circuit of harness between engine electronic control unit and each electronic drive unit (turbocharger, exhaust gas recirculation, throttle)
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of each electronic drive unit

## **[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

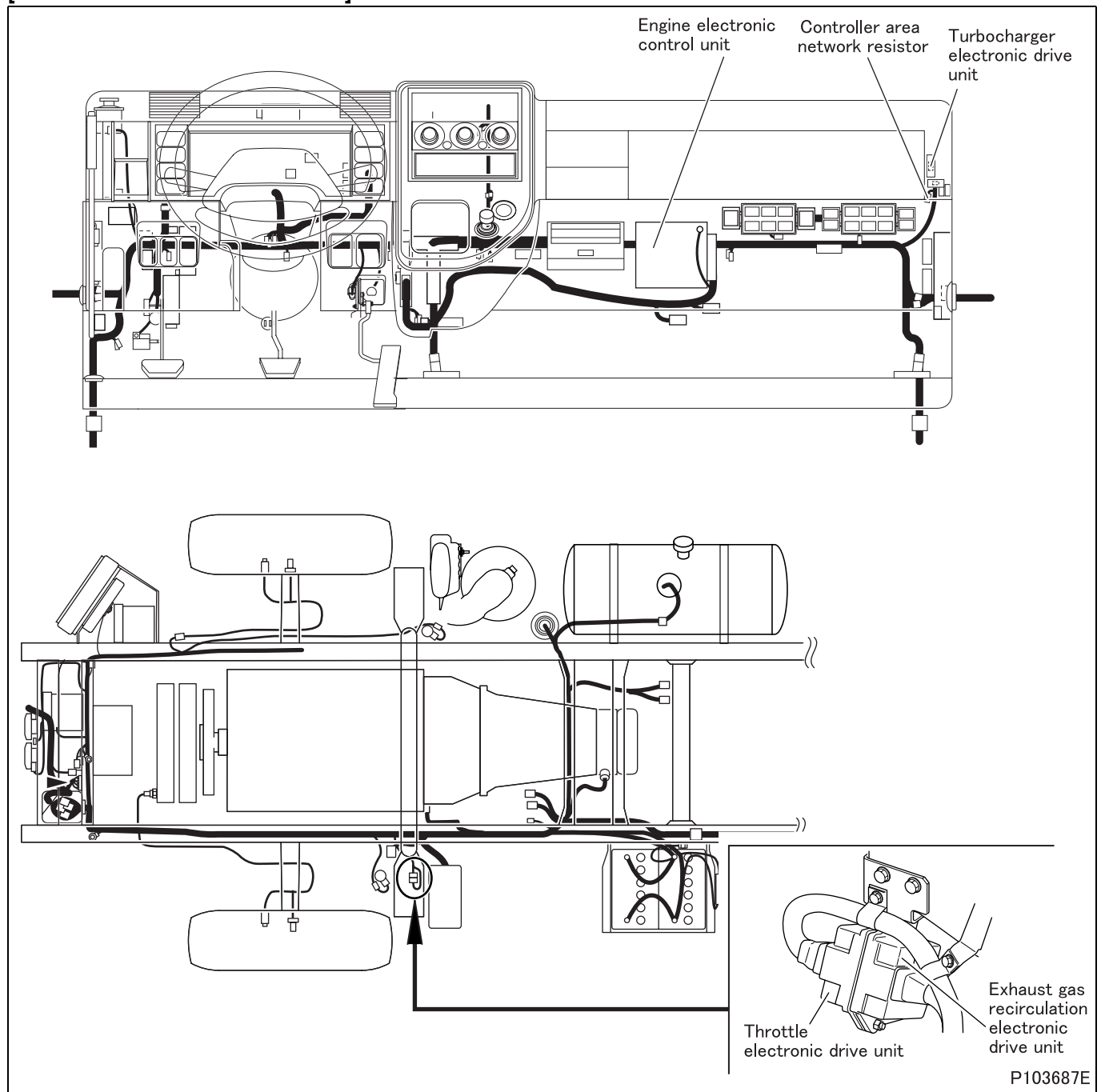
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



# TROUBLESHOOTING

## [Parts Identification and Location]



**[Fault diagnosis]**

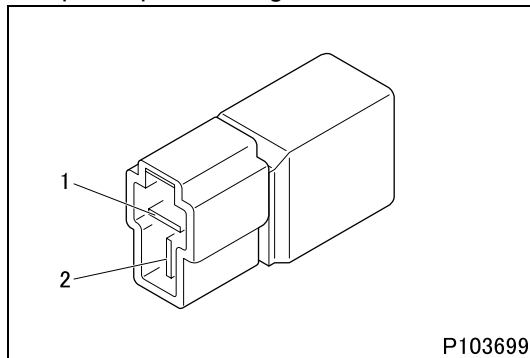
- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by engine electronic control unit connector   |
|        | Maintenance item                                       |  | Measure value of resistance between engine electronic control unit connector (GE58A) terminal No. 5 and 6. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                 |
|        | Requirements   |  | 120 ± 6 Ω  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of controller area network resistor connector  |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of controller area network resistor unit                     |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and No. 2. |
|        | Inspection condition                                   |  | Disconnect connector and measure resistor side.                         |
|        | Requirements   |  | 120 ± 6 Ω   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

<Step 3 inspection diagram>



|        |  |  |  |
|--------|--|--|--|
| Step 4 | Inspection items                                       |  | Inspection of harness between engine electronic control unit and controller area network resistor (HIGH)   |
|        | Maintenance item                                       |  | Check circuit between controller area network resistor connector terminal No. 1 and engine electronic control unit connector (GE58A) terminal No. 6. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |  | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

# TROUBLESHOOTING

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 5 | Inspection items                                       |                 | Inspection of harness between engine electronic control unit and controller area network resistor (LOW)  |
|        | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 2 and engine electronic control unit connector (GE58A) terminal No. 5. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.  |
| NO     |  | Modify harness. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of engine electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 10.  |
| NO     |  | Modify connector. |   |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 7 | Inspection items                                       |                 | Inspection of harness between exhaust gas recirculation electronic drive unit and controller area network resistor (HIGH)                                      |
|        | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 1 and exhaust gas recirculation electronic drive unit connector terminal No. 15. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.  |
| NO     |  | Modify harness. |  |

|        |  |                 |  |
|--------|--|-----------------|--|
| Step 8 | Inspection items                                       |                 | Inspection of harness between exhaust gas recirculation electronic drive unit and controller area network resistor (LOW)                                       |
|        | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 2 and exhaust gas recirculation electronic drive unit connector terminal No. 16. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.   |
|        | Requirements   |                 | There is continuity.   |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 9.  |
| NO     |  | Modify harness. |  |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 9 | Inspection items                                       |                   | Inspection of exhaust gas recirculation electronic drive unit connector   |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 10.  |
| NO     |  | Modify connector. |   |



|         |  |   |                |
|---------|--|---|----------------|
| Step 10 | Inspection items                                       | Inspection of harness between throttle electronic drive unit and controller area network resistor (HIGH)                                      |                |
|         | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 1 and throttle electronic drive unit connector terminal No. 15. |                |
|         | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                |
|         | Requirements   | There is continuity.  |                |
|         | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 11. |
| NO      |  | Modify harness.   |                |

|         |  |   |                |
|---------|--|---|----------------|
| Step 11 | Inspection items                                       | Inspection of harness between throttle electronic drive unit and controller area network resistor (LOW)                                       |                |
|         | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 2 and throttle electronic drive unit connector terminal No. 16. |                |
|         | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                |
|         | Requirements   | There is continuity.  |                |
|         | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 12. |
| NO      |  | Modify harness.   |                |

|         |  |   |                |
|---------|--|---|----------------|
| Step 12 | Inspection items                                       | Inspection of throttle electronic drive unit connector  |                |
|         | Maintenance item                                       | Inspection of connector   |                |
|         | Inspection condition                                   | -   |                |
|         | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|         | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 13. |
| NO      |  | Modify connector.   |                |

|         |  |   |                |
|---------|--|---|----------------|
| Step 13 | Inspection items                                       | Inspection of harness between turbocharger electronic drive unit and controller area network resistor (HIGH)                                      |                |
|         | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 1 and turbocharger electronic drive unit connector terminal No. 15. |                |
|         | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                |
|         | Requirements   | There is continuity.  |                |
|         | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 14. |
| NO      |  | Modify harness.   |                |

|         |  |   |                |
|---------|--|---|----------------|
| Step 14 | Inspection items                                       | Inspection of harness between turbocharger electronic drive unit and controller area network resistor (LOW)                                       |                |
|         | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 2 and turbocharger electronic drive unit connector terminal No. 16. |                |
|         | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |                |
|         | Requirements   | There is continuity.  |                |
|         | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 15. |
| NO      |  | Modify harness.   |                |

# TROUBLESHOOTING

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|         |  |                   |   |
|---------|--|-------------------|---|
| Step 15 | Inspection items                                       |                   | Inspection of turbocharger electronic drive unit connector  |
|         | Maintenance item                                       |                   | Inspection of connector   |
|         | Inspection condition                                   |                   | –   |
|         | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|         | Inspection result (Is the judging standard satisfied?) | YES               | Replace the engine electronic control unit as well if this diagnosis code occurs after the replacement of one of electronic drive units.  |
| NO      |  | Modify connector. |   |

**[Fault code]**

Diagnosis code: U0028/Flash code: 72

**[Monitor]**

Abnormality in controller area network 1 communication

**[Fault (outline)]**

Message timeout

**[Diagnosis check]**

- Controller area network communication between engine electronic control unit and each electronic control unit (automatic transmission, multifunction vehicle control unit) is monitored for abnormality.

**[Code generation condition]**

- No controller area network signal is sent from each electronic control unit within specified time after engine start (time out).  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

- When engine is in normal condition during period from after-run to start.

**[Control effected by electronic control unit during fault]**

- Effects no special control.

**[Probable cause of trouble]**

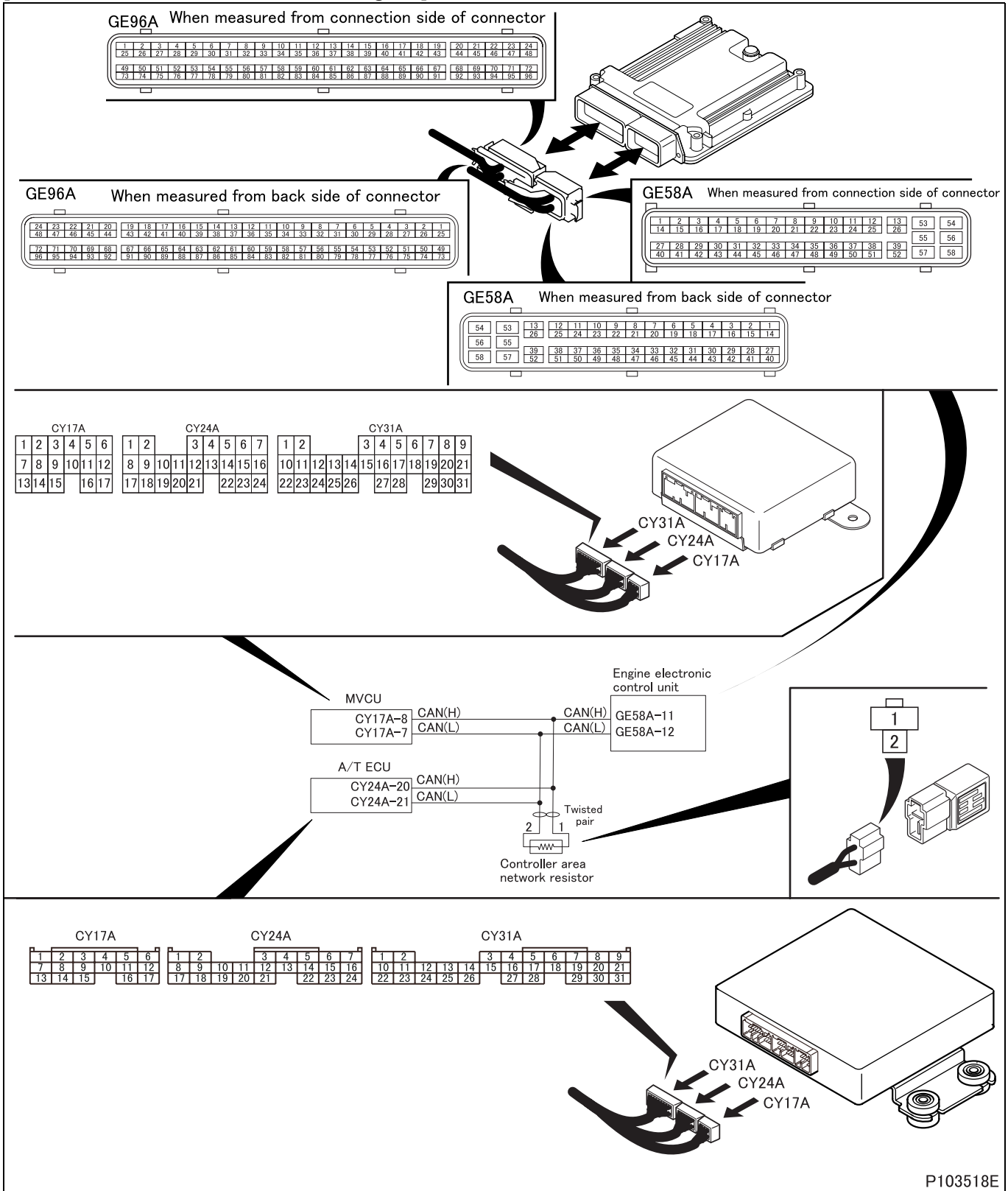
- Open-circuit or short-circuit of harness between engine electronic control unit and each electronic control unit (automatic transmission, multifunction vehicle control unit)
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of each electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

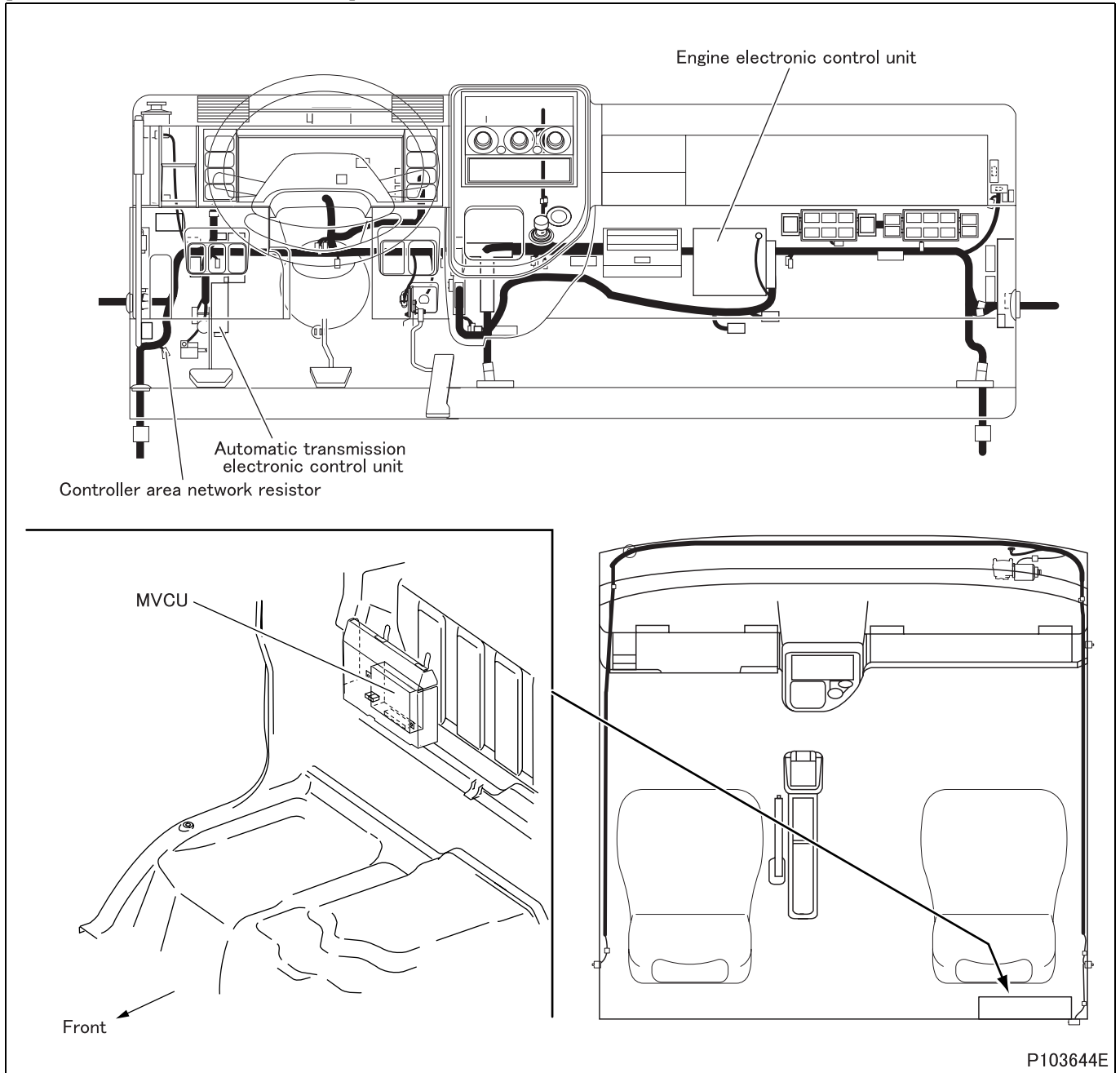
# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



P103518E

[Parts Identification and Location]



P103644E

# TROUBLESHOOTING

## [Fault diagnosis]

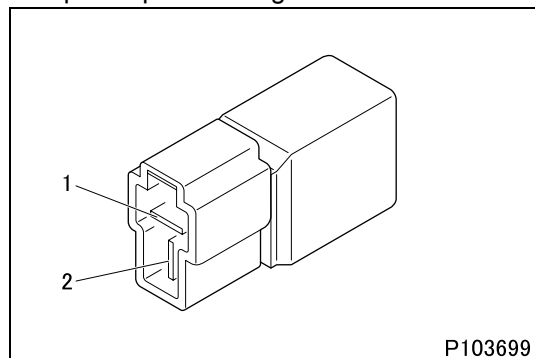
- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by engine electronic control unit connector   |
|        | Maintenance item                                       |  | Measure value of resistance between engine electronic control unit connector (GE58A) terminal No. 11 and 12. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                   |
|        | Requirements   |  | 120 ± 6 Ω  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of controller area network resistor connector  |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | —   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of controller area network resistor unit                     |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and No. 2. |
|        | Inspection condition                                   |  | Disconnect connector and measure resistor side.                         |
|        | Requirements   |  | 120 ± 6 Ω   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

<Step 3 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of harness between engine electronic control unit and controller area network resistor (HIGH)  |
|        | Maintenance item                                       |  | Check circuit between controller area network resistor connector terminal No. 1 and engine electronic control unit connector (GE58A) terminal No. 11. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |   |               |
|--------|--|---|---------------|
| Step 5 | Inspection items                                       | Inspection of harness between engine electronic control unit and controller area network resistor (LOW)   |               |
|        | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 2 and engine electronic control unit connector (GE58A) terminal No. 12. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |               |
|        | Requirements   | There is continuity.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6. |
| NO     |  | Modify harness.   |               |

|        |  |   |                |
|--------|--|---|----------------|
| Step 6 | Inspection items                                       | Inspection of engine electronic control unit connector  |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 10. |
| NO     |  | Modify connector.   |                |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of harness between multifunction vehicle control unit and controller area network resistor (HIGH)   |               |
|        | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 1 and multifunction vehicle control unit connector (CY17A) terminal No. 8. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.   |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Modify harness.  |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 8 | Inspection items                                       | Inspection of harness between multifunction vehicle control unit and controller area network resistor (LOW)  |               |
|        | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 2 and multifunction vehicle control unit connector (CY17A) terminal No. 7. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.   |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 9. |
| NO     |  | Modify harness.  |               |

|        |  |   |                |
|--------|--|---|----------------|
| Step 9 | Inspection items                                       | Inspection of multifunction vehicle control unit connector  |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 10. |
| NO     |  | Modify connector.   |                |

# TROUBLESHOOTING

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 10 | Inspection items                                       |                 | Inspection of harness between automatic transmission electronic control unit and controller area network resistor (HIGH)  |
|         | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 1 and automatic transmission electronic control unit connector (CY24A) terminal No. 20. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.  |
| NO      |  | Modify harness. |   |

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 11 | Inspection items                                       |                 | Inspection of harness between throttle electronic drive unit and controller area network resistor (LOW)   |
|         | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 2 and automatic transmission electronic control unit connector (CY24A) terminal No. 21. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.  |
| NO      |  | Modify harness. |   |

|         |  |                   |   |
|---------|--|-------------------|---|
| Step 12 | Inspection items                                       |                   | Inspection of automatic transmission electronic control unit connector  |
|         | Maintenance item                                       |                   | Inspection of connector   |
|         | Inspection condition                                   |                   | –   |
|         | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|         | Inspection result (Is the judging standard satisfied?) | YES               | Replace the engine electronic control unit as well if this diagnosis code occurs after the replacement of either multifunction vehicle control unit or automatic transmission electronic control unit.                            |
| NO      |  | Modify connector. |   |



**[Fault code]**

Diagnosis code: U0029/Flash code: 76

**[Monitor]**

Abnormality in controller area network 1 communication

**[Fault (outline)]**

Controller area network A bus off

**[Diagnosis check]**

- Controller area network communication between engine electronic control unit and each electronic control unit (automatic transmission, multifunction vehicle control unit) is monitored for abnormality.

**[Code generation condition]**

- No controller area network signal is received from each electronic control unit after engine start (controller area network bus OFF).  
(Warning lamp is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

- Auto cruise control stopped
- Speed limitation device control is stopped.
- Traction control is stopped. <Automatic transmission>

**[Probable cause of trouble]**

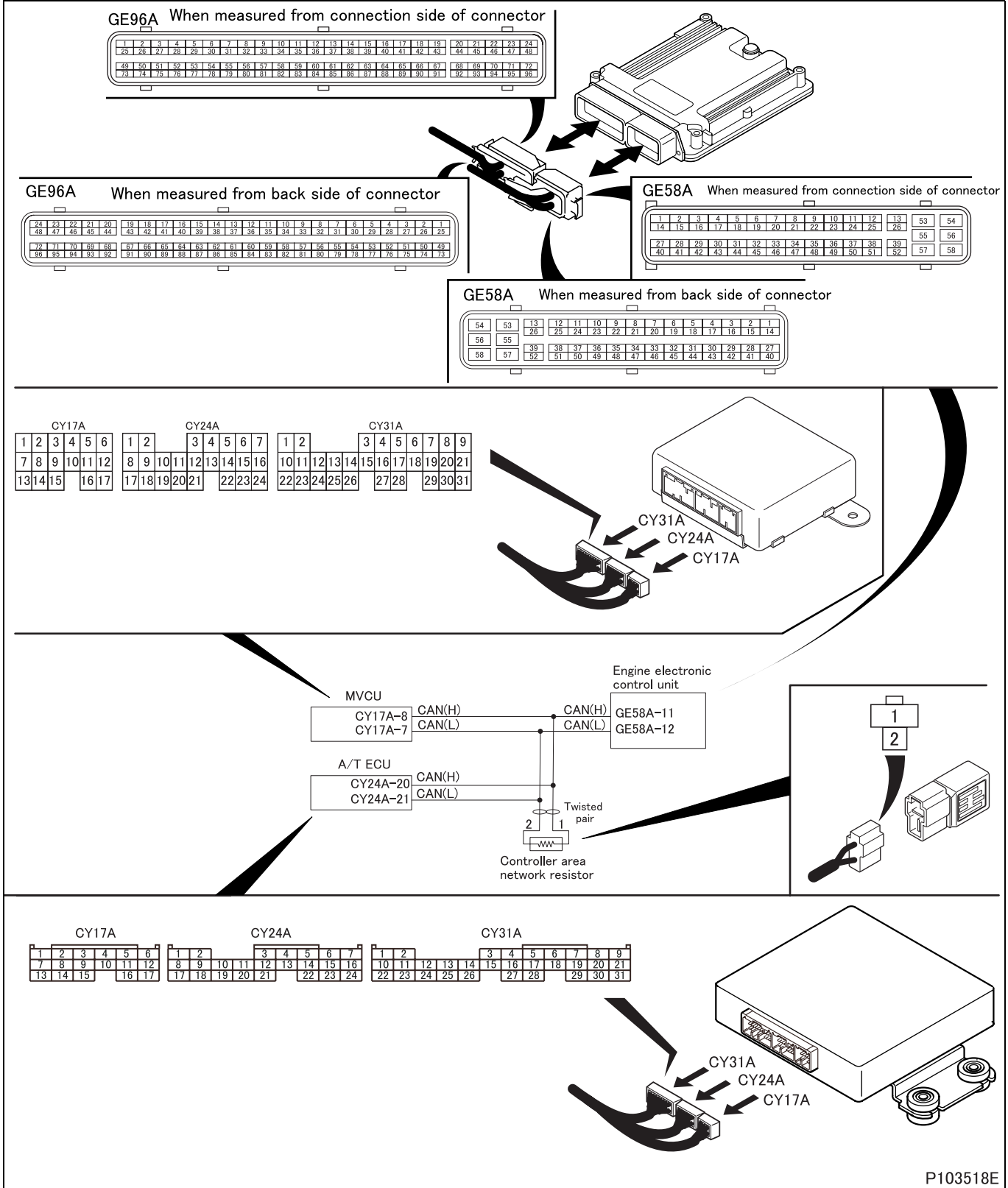
- Open-circuit or short-circuit of harness between engine electronic control unit and each electronic control unit (automatic transmission, multifunction vehicle control unit)
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of each electronic control unit

**[Recoverability]**

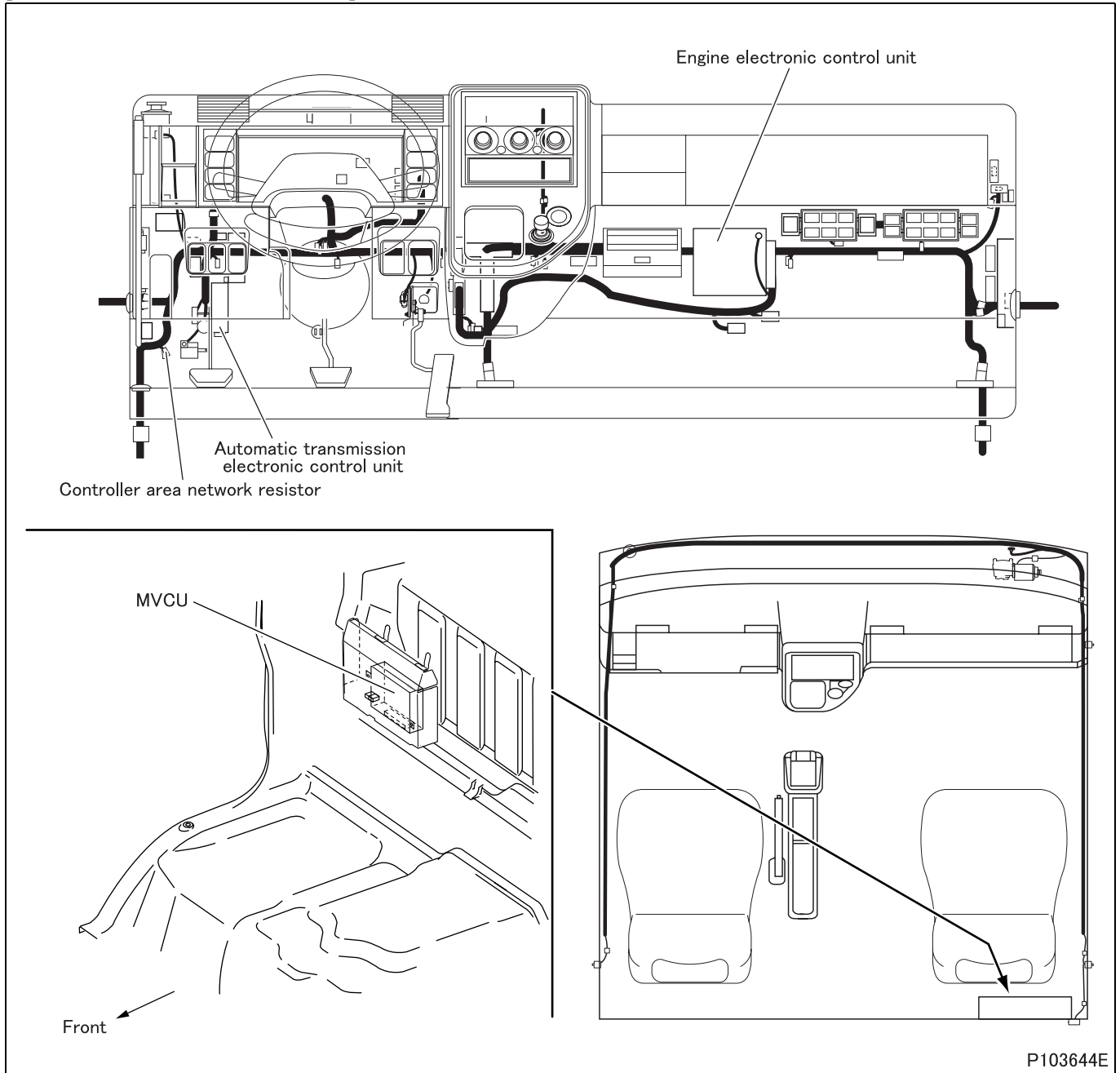
- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).  
(Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

# TROUBLESHOOTING

## [Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



P103644E

# TROUBLESHOOTING

## [Fault diagnosis]

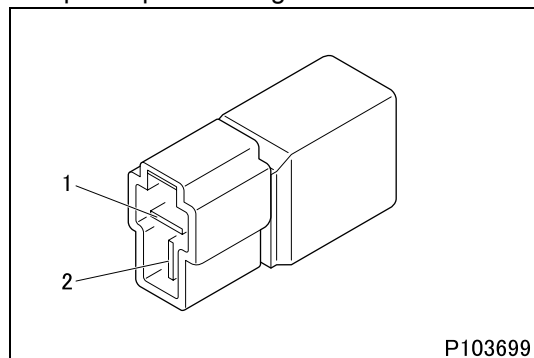
- Perform checks in the sequence of the following steps.

|        |  |  |               |
|--------|--|--|---------------|
| Step 1 | Inspection items                                       | Inspection by engine electronic control unit connector   |               |
|        | Maintenance item                                       | Measure value of resistance between engine electronic control unit connector (GE58A) terminal No. 11 and 12. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.                   |               |
|        | Requirements   | 120 ± 6 Ω  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 7. |
| NO     |  | Go to step 2.  |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 2 | Inspection items                                       | Inspection of controller area network resistor connector  |               |
|        | Maintenance item                                       | Inspection of connector   |               |
|        | Inspection condition                                   | -   |               |
|        | Requirements   | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 3. |
| NO     |  | Modify connector.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 3 | Inspection items                                       | Inspection of controller area network resistor unit                     |               |
|        | Maintenance item                                       | Measure value of resistance between connector terminal No. 1 and No. 2. |               |
|        | Inspection condition                                   | Disconnect connector and measure resistor side.                         |               |
|        | Requirements   | 120 ± 6 Ω   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 4. |
| NO     |  | Replacement of controller area network resistor                         |               |

<Step 3 inspection diagram>



|        |  |   |               |
|--------|--|---|---------------|
| Step 4 | Inspection items                                       | Inspection of harness between engine electronic control unit and controller area network resistor (HIGH)  |               |
|        | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 1 and engine electronic control unit connector (GE58A) terminal No. 11. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |               |
|        | Requirements   | There is continuity.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 5. |
| NO     |  | Modify harness.   |               |

|        |  |   |               |
|--------|--|---|---------------|
| Step 5 | Inspection items                                       | Inspection of harness between engine electronic control unit and controller area network resistor (LOW)   |               |
|        | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 2 and engine electronic control unit connector (GE58A) terminal No. 12. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.  |               |
|        | Requirements   | There is continuity.  |               |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 6. |
| NO     |  | Modify harness.   |               |

|        |  |   |                |
|--------|--|---|----------------|
| Step 6 | Inspection items                                       | Inspection of engine electronic control unit connector  |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 10. |
| NO     |  | Modify connector.   |                |

|        |  |  |               |
|--------|--|--|---------------|
| Step 7 | Inspection items                                       | Inspection of harness between multifunction vehicle control unit and controller area network resistor (HIGH)   |               |
|        | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 1 and multifunction vehicle control unit connector (CY17A) terminal No. 8. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.   |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 8. |
| NO     |  | Modify harness.  |               |

|        |  |  |               |
|--------|--|--|---------------|
| Step 8 | Inspection items                                       | Inspection of harness between multifunction vehicle control unit and controller area network resistor (LOW)  |               |
|        | Maintenance item                                       | Check circuit between controller area network resistor connector terminal No. 2 and multifunction vehicle control unit connector (CY17A) terminal No. 7. |               |
|        | Inspection condition                                   | Disconnect each device from harness and measure from connection side of harness connector.   |               |
|        | Requirements   | There is continuity.   |               |
|        | Inspection result (Is the judging standard satisfied?) | YES  | Go to step 9. |
| NO     |  | Modify harness.  |               |

|        |  |   |                |
|--------|--|---|----------------|
| Step 9 | Inspection items                                       | Inspection of multifunction vehicle control unit connector  |                |
|        | Maintenance item                                       | Inspection of connector   |                |
|        | Inspection condition                                   | -   |                |
|        | Requirements   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |                |
|        | Inspection result (Is the judging standard satisfied?) | YES   | Go to step 10. |
| NO     |  | Modify connector.   |                |

# TROUBLESHOOTING

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 10 | Inspection items                                       |                 | Inspection of harness between automatic transmission electronic control unit and controller area network resistor (HIGH)  |
|         | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 1 and automatic transmission electronic control unit connector (CY24A) terminal No. 20. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 11.  |
| NO      |  | Modify harness. |   |

|         |  |                 |   |
|---------|--|-----------------|---|
| Step 11 | Inspection items                                       |                 | Inspection of harness between throttle electronic drive unit and controller area network resistor (LOW)   |
|         | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 2 and automatic transmission electronic control unit connector (CY24A) terminal No. 21. |
|         | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|         | Requirements   |                 | There is continuity.  |
|         | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 12.  |
| NO      |  | Modify harness. |   |

|         |  |                   |   |
|---------|--|-------------------|---|
| Step 12 | Inspection items                                       |                   | Inspection of automatic transmission electronic control unit connector  |
|         | Maintenance item                                       |                   | Inspection of connector   |
|         | Inspection condition                                   |                   | –   |
|         | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|         | Inspection result (Is the judging standard satisfied?) | YES               | Replace the engine electronic control unit as well if this diagnosis code occurs after the replacement of either multifunction vehicle control unit or automatic transmission electronic control unit.                            |
| NO      |  | Modify connector. |   |

**[Fault code]**

Diagnosis code: U0101/Flash code: 76

**[Monitor]**

Abnormality in controller area network (automatic transmission) communication

**[Fault (outline)]**

Engine warning lamp (orange) request message timeout

**[Diagnosis check]**

- Controller area network communication between engine electronic control unit and automatic transmission electronic control unit is monitored for abnormality.

**[Code generation condition]**

Diagnosis code is generated under either of the following conditions.

<Condition (1)>

- Engine electronic control unit fails to receive controller area network signal containing automatic transmission warning information from automatic transmission electronic control unit within specified time.  
(Diagnosis code is displayed on first establishment of code generation condition.)

<Condition (2)>

- Abnormality in controller area network communication in other cases than condition (1) above  
(Warning lamp (red) is lit and diagnosis code is displayed on third establishment of code generation condition.)

**[Diagnosis check timing]**

- Fault diagnosis is continuously performed during the driving cycle.

**[Diagnostic requirement]**

—

**[Control effected by electronic control unit during fault]**

Electronic control unit differs in the way of control by the diagnosis check item.

<Transmission gear position>

- Engine torque is limited.

<Engine speed>

- Traction control is stopped. <Automatic transmission>

<Automatic transmission warning lamp>

- Effects no special control.

**[Probable cause of trouble]**

- Open-circuit or short-circuit of harness between engine electronic control unit and automatic transmission electronic control unit
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of automatic transmission electronic control unit

**[Recoverability]**

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

(Timing of warning lamp/diagnosis code OFF depends on condition.)

<Condition (1)>

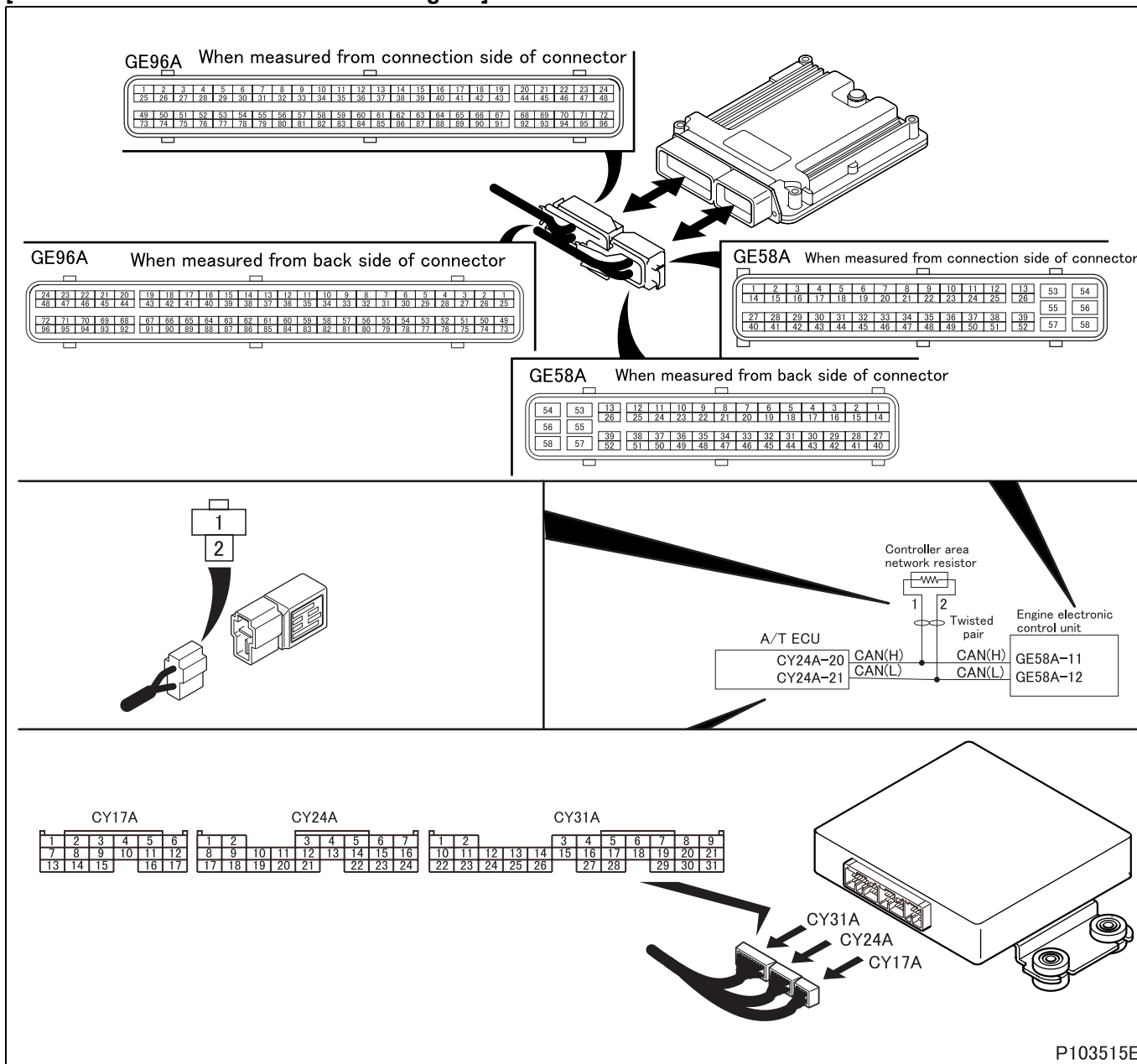
- Code is cleared simultaneously with recovery.

<Condition (2)>

- Lamp is extinguished and code is cleared at fourth diagnosis code display after recovery.

# TROUBLESHOOTING

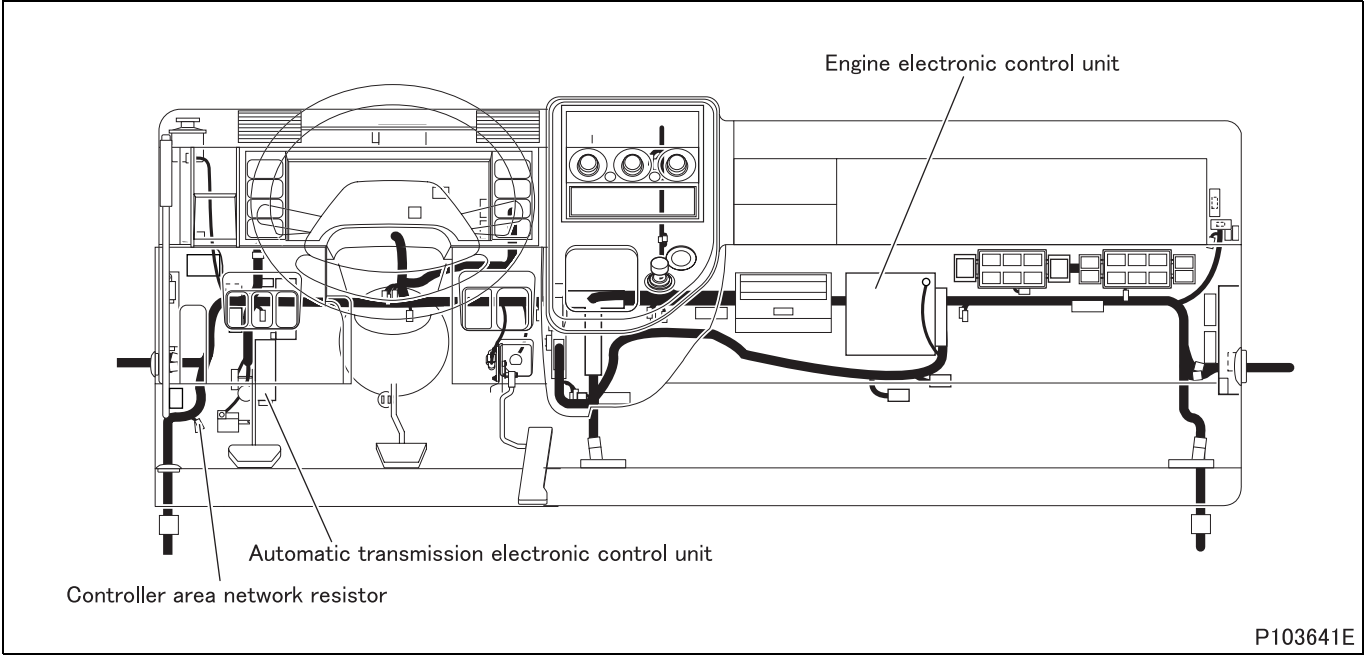
## [Electronic Control Unit Connection Diagram]



P103515E



[Parts Identification and Location]



P103641E

# TROUBLESHOOTING

## [Fault diagnosis]

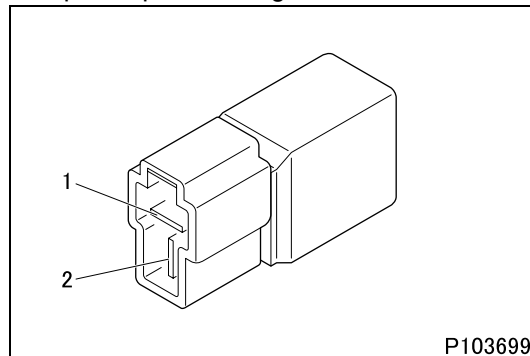
- Perform checks in the sequence of the following steps.

|        |  |  |  |
|--------|--|--|--|
| Step 1 | Inspection items                                       |  | Inspection by engine electronic control unit connector   |
|        | Maintenance item                                       |  | Measure value of resistance between engine electronic control unit connector (GE58A) terminal No. 11 and 12. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.                   |
|        | Requirements   |  | 120 ± 6 Ω  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO  |

|        |  |  |   |
|--------|--|--|---|
| Step 2 | Inspection items                                       |  | Inspection of controller area network resistor connector  |
|        | Maintenance item                                       |  | Inspection of connector   |
|        | Inspection condition                                   |  | –   |
|        | Requirements   |  | <ul style="list-style-type: none"> <li>Connector is properly connected.</li> <li>No trace of water entry is found.</li> <li>No corrosion is found in terminal.</li> <li>Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |  |   |
|--------|--|--|---|
| Step 3 | Inspection items                                       |  | Inspection of controller area network resistor unit                     |
|        | Maintenance item                                       |  | Measure value of resistance between connector terminal No. 1 and No. 2. |
|        | Inspection condition                                   |  | Disconnect connector and measure resistor side.                         |
|        | Requirements   |  | 120 ± 6 Ω   |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

<Step 3 inspection diagram>



|        |  |  |   |
|--------|--|--|---|
| Step 4 | Inspection items                                       |  | Inspection of harness between engine electronic control unit and controller area network resistor (HIGH)  |
|        | Maintenance item                                       |  | Check circuit between controller area network resistor connector terminal No. 1 and engine electronic control unit connector (GE58A) terminal No. 11. |
|        | Inspection condition                                   |  | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |  | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) |  | YES<br>NO   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 5 | Inspection items                                       |                 | Inspection of harness between engine electronic control unit and controller area network resistor (LOW)   |
|        | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 2 and engine electronic control unit connector (GE58A) terminal No. 12. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 6.   |
| NO     |  | Modify harness. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 6 | Inspection items                                       |                   | Inspection of engine electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Go to step 10.  |
| NO     |  | Modify connector. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 7 | Inspection items                                       |                 | Inspection of harness between automatic transmission electronic control unit and controller area network resistor (HIGH)  |
|        | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 1 and automatic transmission electronic control unit connector (CY24A) terminal No. 20. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 8.   |
| NO     |  | Modify harness. |   |

|        |  |                 |   |
|--------|--|-----------------|---|
| Step 8 | Inspection items                                       |                 | Inspection of harness between automatic transmission electronic control unit and controller area network resistor (LOW)   |
|        | Maintenance item                                       |                 | Check circuit between controller area network resistor connector terminal No. 2 and automatic transmission electronic control unit connector (CY24A) terminal No. 21. |
|        | Inspection condition                                   |                 | Disconnect each device from harness and measure from connection side of harness connector.  |
|        | Requirements   |                 | There is continuity.  |
|        | Inspection result (Is the judging standard satisfied?) | YES             | Go to step 9.   |
| NO     |  | Modify harness. |   |

|        |  |                   |   |
|--------|--|-------------------|---|
| Step 9 | Inspection items                                       |                   | Inspection of automatic transmission electronic control unit connector  |
|        | Maintenance item                                       |                   | Inspection of connector   |
|        | Inspection condition                                   |                   | –   |
|        | Requirements   |                   | <ul style="list-style-type: none"> <li>• Connector is properly connected.</li> <li>• No trace of water entry is found.</li> <li>• No corrosion is found in terminal.</li> <li>• Connection to terminal is appropriate.</li> </ul> |
|        | Inspection result (Is the judging standard satisfied?) | YES               | Replace the engine electronic control unit as well if this diagnosis code occurs after the replacement of automatic transmission electronic control unit.   |
| NO     |  | Modify connector. |   |

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## 4. Multi-Use Tester Service Data

- Both service data and actuator test results are indicated at the same time.

| No. | Item                              | Data                            | Inspection condition                              | Criterion for normality                  |
|-----|-----------------------------------|---------------------------------|---|--|
| 01  | Engine Revolution                 | ■■■■■.r/min                     | Racing (engine in operation)                      | Synchronous with tachometer              |
| 02  | LOAD Value                        | ■■■■■.%                         | Starter switch ON                                 | 0%                                       |
| 0A  | Reference Injection Quantity      | ■■■■■.%                         | Idling  | 0% or lower                              |
| 10  | Intake Air Temperature (EGR)      | ■■■■. ■°F                       | Engine cold                                       | Value corresponds to ambient temperature |
| 14  | Fuel Temperature (leak)           | ■■■■. ■°F                       | Engine cold                                       | Value corresponds to ambient temperature |
| 16  | PTO Adjustment Resistor No.       | 1/2/3/4/5/6/7/8/9/<br>10/11/NON | –   | –  |
| 17  | Exhaust Gas Flow                  | ■■■■■.m3/h                      | During warm-up                                    | Gradually increased                      |
| 19  | Reference Common Rail Pressure 2  | ■■■■. ■%                        | Idling  | 0% or lower                              |
| 1B  | Actual Common Rail Pressure 2     | ■■■■. ■%                        | Idling  | 0% or lower                              |
| 1C  | Difference Common Rail Pressure 2 | ■■■■. ■%                        | Idling  | 0% or lower                              |
| 1F  | Auto Cruise Reference Speed       | ■■■■■.mph                       | Vehicle in auto cruise mode                       | Same vehicle speed in auto cruise mode   |
| 20  | Atmospheric Pressure              | ■■■■■.psi                       | Altitude: 0 m {0 ft.}                             | 14.6 psi                                 |
|     |                                   |                                 | Altitude: 600 m {1970 ft.}                        | 13.8 psi                                 |
| 21  | Boost Pressure                    | ■■■■■.psi                       | Starter switch ON (engine stationary)             | Coincides with atmospheric pressure      |
|     |                                   |                                 | After engine has started, press accelerator pedal | Gradually increased                      |
| 22  | Difference pressure across DPF    | ■■■■■.psi                       | Accelerator pedal pressed                         | Gradually increased                      |
| 23  | Exhaust gas pressure              | ■■■■■.psi                       | Accelerator pedal pressed                         | Gradually increased                      |
| 24  | OXI CAT Temperature               | ■■■■■.°F                        | During warm-up                                    | Gradually increased                      |
| 25  | DPF Temperature (UpStream)        | ■■■■■.°F                        | During warm-up                                    | Gradually increased                      |
| 26  | DPF Temperature (DownStream)      | ■■■■■.°F                        | During warm-up                                    | Gradually increased                      |
| 27  | Downstream OXI CAT Temperature    | ■■■■■.°F                        | During warm-up                                    | Gradually increased                      |
| 28  | DPF Related Information           | Memory/No memory                | Before electronic control unit reset              | Memory                                   |
|     |                                   |                                 | After electronic control unit reset               | No memory                                |
| 30  | Intake Air Temp. (upstream)       | ■■■■■.°F                        | Engine cold                                       | Value corresponds to ambient temperature |
| 31  | Water Temperature                 | ■■■■■.°F                        | Engine cold                                       | Value corresponds to ambient temperature |
|     |                                   |                                 | During warm-up                                    | Gradually increased                      |
|     |                                   |                                 | When engine is stopped after warm-up              | Gradually declines                       |
| 32  | Water Temperature 2               | ■■■■■.°F                        | Engine cold                                       | Value corresponds to ambient temperature |
|     |                                   |                                 | During warm-up                                    | Gradually increased                      |
|     |                                   |                                 | When engine is stopped after warm-up              | Gradually declines                       |

| No. | Item                              | Data                            | Inspection condition  | Criterion for normality                   |
|-----|-----------------------------------|---------------------------------|---|---|
| 33  | Fuel Temperature (inlet)          | ■■■■■.°F                        | Engine cold   | Value corresponds to ambient temperature  |
|     |                                   |                                 | During warm-up  | Gradually increased                       |
|     |                                   |                                 | When engine is stopped after warm-up                        | Gradually declines                        |
| 40  | Accelerator sensor voltage 1      | ■■■. ■■■V                       | Accelerator pedal gradually pressed from released position. | 0.85 to 4.15 V                            |
| 41  | Accelerator sensor voltage 2      | ■■■. ■■■V                       | Accelerator pedal gradually pressed from released position. | 0.85 to 4.15 V                            |
| 42  | Accel Pedal Position (unfiltered) | ■■■■■.%                         | Accelerator pedal released                                  | 0%  |
|     |                                   |                                 | Gradually press.  | Gradually increased                       |
|     |                                   |                                 | Accelerator pedal fully pressed                             | 100%                                      |
| 43  | Accel Pedal Position (filtered)   | ■■■■■.%                         | Accelerator pedal released                                  | 0%  |
|     |                                   |                                 | Gradually press.  | Gradually increased                       |
|     |                                   |                                 | Accelerator pedal fully pressed                             | 100%                                      |
| 50  | Target EGR Valve Position         | ■■■■■.%                         | Idling  | 100%                                      |
| 51  | Actual EGR Valve Position         | ■■■■■.%                         | Idling  | 100%                                      |
|     |                                   |                                 | [Actuator test] A0: EGR 1                                   |   |
| 52  | Target Intake Throttle Position   | ■■■■■.%                         | Idling  | 10 to 20%                                 |
| 53  | Actual Intake Throttle Position   | ■■■■■.%                         | Idling  | 10 to 20%                                 |
|     |                                   |                                 | [Actuator test] A3: Intake Throttle 1                       |   |
| 54  | Target VGT Position               | ■■■■■.%                         | Starter switch ON   | 10%                                       |
| 55  | Actual VGT Position               | ■■■■■.%                         | Starter switch ON   | 10%                                       |
|     |                                   |                                 | [Actuator test] A4: VGT 1                                   |   |
| 56  | EGR Temperature                   | ■■■■■.°F                        | During warm-up  | Gradually increased                       |
| 60  | Air mass flow                     | ■■■■■.g/h                       | Gradually press accelerator pedal.                          | Gradually increased                       |
| 80  | Power Supply Voltage              | ■■■■. ■■■V                      | Starter switch ON   | Value matches battery voltage.            |
| 82  | Q Adjustment Resistor No.         | 1/2/3/4/5/6/7/8/9/<br>10/11/NON | –   | –   |
| 83  | PTO Accel Position                | ■■■■■.%                         | Power take-off is operated (MIN-MAX)                        | 0 to 100%                                 |
| 84  | PTO Accel Sensor Voltage          | ■■■. ■■■V                       | Power take-off is operated (MIN-MAX)                        | 1.0 to 3.0 V                              |
| 85  | PTO Engine Revolution             | ■■■■■.rpm                       | PTO in operation  | Value matches preset PTO idling speed     |
| 90  | Vehicle Speed                     | ■■■■■.mph                       | During vehicle operation                                    | Synchronous with speedometer              |
| 91  | Speed Limiter Reference Speed     | ■■■■■.mph                       | Vehicle speed being limited                                 | Same vehicle speed as that of speed limit |
| A0  | Starter SW (S)                    | ON/OFF                          | Engine cranked by means of starter switch                   | ON  |
|     |                                   |                                 | Starter switch except START position                        | OFF                                       |
| A1  | Starter SW (M)                    | ON/OFF                          | Starter switch ON position                                  | ON  |
|     |                                   |                                 | Starter switch except ON position                           | OFF                                       |
| A2  | Accel SW                          | ON/OFF                          | Accelerator pedal released                                  | ON  |
|     |                                   |                                 | Accelerator pedal released                                  | OFF                                       |
| A3  | Break SW                          | ON/OFF                          | Combination switch ON                                       | ON  |
|     |                                   |                                 | Combination switch OFF                                      | OFF                                       |

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| No. | Item                           | Data   | Inspection condition  | Criterion for normality |
|-----|--------------------------------|--------|---|-------------------------|
| A4  | DPF SW                         | ON/OFF | Diesel particulate filter cleaning switch ON  | ON                      |
|     |                                |        | Diesel particulate filter cleaning switch OFF   | OFF                     |
|     |                                |        | [Actuator test] A5: DPF Regeneration (Manual)   |                         |
| A5  | Parking Break SW               | ON/OFF | Vehicle parked  | ON                      |
|     |                                |        | Vehicle in motion   | OFF                     |
| A6  | Auxiliary Brake SW 1           | ON/OFF | Exhaust brake operating   | ON                      |
|     |                                |        | Exhaust brake not operating   | OFF                     |
| A7  | Clutch SW                      | ON/OFF | Clutch pedal pressed  | ON                      |
|     |                                |        | Clutch pedal released   | OFF                     |
| A8  | Neutral SW                     | ON/OFF | Transmission neutral position   | ON                      |
|     |                                |        | Transmission except neutral position  | OFF                     |
| A9  | Idle Up Cancel SW              | ON/OFF | Change lever in D position  | ON                      |
|     |                                |        | <Manual transmission><br>Normally<br><Automatic transmission><br>Change lever in N position   | OFF                     |
|     |                                |        | [Actuator test] B4: Idle Up Cancel SW   |                         |
| AA  | AC SW                          | ON/OFF | Air conditioner compressor running  | ON                      |
|     |                                |        | Air conditioner compressor not running  | OFF                     |
|     |                                |        | [Actuator test] B3: Air Conditioner SW  |                         |
| AB  | Warm up SW                     | ON/OFF | Warm-up switch ON   | ON                      |
|     |                                |        | Warm-up switch OFF  | OFF                     |
| AC  | Torque Cut SW                  | ON/OFF | Transmission in 1st or reverse  | ON                      |
|     |                                |        | Except above  | OFF                     |
| AD  | PTO SW                         | ON/OFF | Switch ON   | ON                      |
|     |                                |        | Switch OFF  | OFF                     |
| AE  | Diagnosis SW                   | ON/OFF | Diagnosis switch (fuse connected)   | ON                      |
|     |                                |        | Diagnosis switch (fuse disconnected)  | OFF                     |
| AF  | Auxiliary Brake Cut SW         | ON/OFF | Operated under following conditions<br><ul style="list-style-type: none"> <li>• Accelerator and clutch pedals are pressed</li> <li>• Transmission in neutral position</li> <li>• Anti-lock brake system in operation</li> </ul> | ON                      |
|     |                                |        | Except above conditions   | OFF                     |
| B0  | Auxiliary Brake M/V 1          | ON/OFF | Exhaust brake operating   | ON                      |
|     |                                |        | Exhaust brake not operating   | OFF                     |
|     |                                |        | [Actuator test] AA: Auxiliary Brake M/V 1   |                         |
| B1  | Auxiliary Brake Indicator Lamp | ON/OFF | Exhaust brake operating   | ON                      |
|     |                                |        | Exhaust brake not operating   | OFF                     |
|     |                                |        | [Actuator test] AB: Auxiliary Brake Indicator Lamp  |                         |

| No. | Item                 | Data   | Inspection condition                                 | Criterion for normality |
|-----|----------------------|--------|--|-------------------------|
| B2  | Glow Relay           | ON/OFF | Perform actuator test                                | ON                      |
|     |                      |        | Actuator test not performed                          | OFF                     |
|     |                      |        | [Actuator test] AC: Relay for Glow Relay             |                         |
| B3  | Glow Indicator Lamp  | ON/OFF | Preheater in operation                               | ON                      |
|     |                      |        | Preheater not in operation                           | OFF                     |
|     |                      |        | [Actuator test] AD: Glow Indicator Lamp              |                         |
| B4  | Starter Safety Relay | ON/OFF | Perform actuator test                                | ON                      |
|     |                      |        | Actuator test not performed                          | OFF                     |
|     |                      |        | [Actuator test] AE: Starter Safety Relay             |                         |
| B5  | EDU Power Relay      | ON/OFF | Starter switch ON                                    | ON                      |
|     |                      |        | Starter switch OFF                                   | OFF                     |
|     |                      |        | [Actuator test] AF: EDU Relay                        |                         |
| B6  | MIL                  | ON/OFF | Starter switch ON<br>(Do not start engine)           | ON                      |
|     |                      |        | No error after engine startup                        | OFF                     |
|     |                      |        | [Actuator test] B0: MIL                              |                         |
| B7  | Diagnosis Lamp       | ON/OFF | Starter switch ON<br>(Do not start engine)           | ON                      |
|     |                      |        | No error after engine startup                        | OFF                     |
|     |                      |        | [Actuator test] B1: Diagnosis Lamp                   |                         |
| B8  | DPF Indicator Lamp   | ON/OFF | During manual diesel particulate filter regeneration | ON                      |
|     |                      |        | Except above   | OFF                     |
|     |                      |        | [Actuator test] A6: DPF Lamp                         |                         |

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## 5. Mode 06 Data

### 5.1 General description

- Mode 06 data are used for checking if the system and its components are in order, using not a Multi-Use Tester but a commercial tester.
- Monitor IDs identify individual system components or entire systems under diagnostic test.
- Test IDs indicate specific diagnostic test items of the system components or systems identified by monitor IDs.

### 5.2 Mode 06 data conversion factor list

- Shown below is a list of conversion factors for commercial tester data of diagnostic test items.

#### Monitor ID \$21: Catalyst

| Test ID | Description of test data                                  | Description of test limit  | Conversion factor |
|---------|---|--|-------------------|
| \$A1    | Difference temperature between OxiCat inlet and DPF inlet | Malfunction criteria for diesel oxidation catalyst deterioration | 0.1°C per bit     |

#### Monitor ID \$31: EGR

| Test ID | Description of test data | Description of test limit  | Conversion factor  |
|---------|--------------------------|--|--------------------|
| \$91    | EGR mass flow            | Malfunction criteria for blockage and leaks in pipe work or cooler, or EGR valve stuck shut/open | 0.001 kg/h per bit |

#### Monitor ID \$81: Fuel system

| Test ID | Description of test data             | Description of test limit                     | Conversion factor |
|---------|--------------------------------------|---|-------------------|
| \$81    | Rail pressure voltage in offset test | Malfunction criteria for rail pressure sensor | 0.001 mV per bit  |

#### Monitor ID \$A2: Mis-fire Cylinder 1

| Test ID | Description of test data   | Description of test limit                      | Conversion factor |
|---------|--|--|-------------------|
| \$0B    | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles | Malfunction criteria for misfire of cylinder-1 | 1 per bit         |
| \$0C    | Misfire counts for last/current driving cycles                                       |  |                   |

#### Monitor ID \$A3: Mis-fire Cylinder 2

| Test ID | Description of test data   | Description of test limit                      | Conversion factor |
|---------|--|--|-------------------|
| \$0B    | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles | Malfunction criteria for misfire of cylinder-2 | 1 per bit         |
| \$0C    | Misfire counts for last/current driving cycles                                       |  |                   |

#### Monitor ID \$A4: Mis-fire Cylinder 3

| Test ID | Description of test data   | Description of test limit                      | Conversion factor |
|---------|--|--|-------------------|
| \$0B    | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles | Malfunction criteria for misfire of cylinder-3 | 1 per bit         |
| \$0C    | Misfire counts for last/current driving cycles                                       |  |                   |

#### Monitor ID \$A5: Mis-fire Cylinder 4

| Test ID | Description of test data   | Description of test limit                      | Conversion factor |
|---------|--|--|-------------------|
| \$0B    | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles | Malfunction criteria for misfire of cylinder-4 | 1 per bit         |
| \$0C    | Misfire counts for last/current driving cycles                                       |  |                   |



**Monitor ID \$B5: Boost**

| Test ID | Description of test data | Description of test limit                                | Conversion factor |
|---------|--------------------------|--|-------------------|
| \$B1    | Boost pressure           | Malfunction criteria for turbocharger actuator deviation | 0.001 kPa per bit |

**Monitor ID \$B2: DPF**

| Test ID | Description of test data | Description of test limit                      | Conversion factor |
|---------|--------------------------|--|-------------------|
| \$B1    | Filter pressure drop     | Malfunction criteria for soot and ash loadings | 0.001 kPa per bit |

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## 6. Actuator Tests Performed Using Multi-Use Tester

- Both service data and actuator test results are indicated at the same time.

| No. | Item                      | Description  | Check method   |
|-----|---------------------------|--|--|
| A0  | EGR 1                     | Exhaust gas recirculation valve opening maintained as commanded by Multi-Use Tester<br>NOTE:<br>Immediately after the starter switch is turned to ON, the exhaust gas recirculation valve is automatically checked for about 5 seconds. An actuator test using the Multi-Use Tester must be performed after waiting this period.<br>[Can be executed under following conditions]<br><ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Transmission: neutral or P range</li> <li>Diagnosis switch: OFF (fuse removed)</li> </ul>  | Check that exhaust gas recirculation valve opening changes.<br>[Service data]<br>51: Actual EGR Valve Position   |
| A3  | Intake Throttle 1         | Intake throttle valve opening maintained as commanded by Multi-Use Tester<br>[Can be executed under following conditions]<br><ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Transmission: neutral or P range</li> <li>Diagnosis switch: OFF (fuse removed)</li> </ul>   | Check that throttle valve opening changes.<br>[Service data]<br>53: Actual Intake Throttle Position  |
| A4  | VGT 1                     | Turbocharger opening maintained as commanded by Multi-Use Tester<br>NOTE:<br><ul style="list-style-type: none"> <li>Set turbocharger opening to the range of 20 to 80%.</li> <li>Immediately after the starter switch is turned to ON, the turbocharger actuator automatically undergoes an initial operational checkup for about 5 seconds. An actuator test using the Multi-Use Tester must be performed after waiting this period.</li> </ul> [Can be executed under following conditions]<br><ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Transmission: neutral or P range</li> <li>Diagnosis switch: OFF (fuse removed)</li> </ul> | Check that turbine vane opening changes.<br>Used for boost pressure measurement/adjustment (See Gr15.)<br>[Service data]<br>54: Target VGT Position<br>55: Actual VGT Position   |
| A5  | DPF Regeneration (Manual) | Request is output for manual diesel particulate filter regeneration<br>[Can be executed under following conditions]<br><ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Engine: Idling</li> <li>Parking brake: Vehicle parked (parking brake switch: ON)</li> <li>After engine warm-up</li> </ul>   | <ul style="list-style-type: none"> <li>Check that diesel particulate filter indicator lamp flickers</li> <li>Manual diesel particulate filter regeneration started with diesel particulate filter cleaning switch ON and engine speed increased.</li> </ul> [Service data]<br>A4: DPF SW |
| A6  | DPF Lamp                  | Diesel particulate filter indicator lamp turned ON/OFF<br>[Can be executed under following conditions]<br><ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON</li> <li>Engine: Idling</li> <li>Transmission: neutral or P range</li> </ul>   | Check that indicator lamp is turned on and off<br>[Service data]<br>B8: DPF Indicator Lamp   |

| No. | Item                           | Description  | Check method   |
|-----|--------------------------------|--|--|
| A8  | EGR, ETV, VGT                  | Exhaust gas recirculation, intake throttle and turbocharger opening maintained as commanded by Multi-Use Tester<br>NOTE:<br><ul style="list-style-type: none"> <li>Set turbocharger opening to the range of 20 to 80%.</li> <li>Immediately after the starter switch is turned to ON, the exhaust gas recirculation valve and turbocharger actuator automatically undergo initial operational checkups for about 5 seconds. An actuator test using the Multi-Use Tester must be performed after waiting this period.</li> </ul> [Can be executed under following conditions] <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON (engine started)</li> <li>Transmission: neutral or P range</li> <li>Diagnosis switch: OFF (fuse removed)</li> <li>Caution!: When actuator test is executed during engine stop, turn starter switch OFF after engine startup and then ON within 15 seconds (Do not start engine).</li> </ul> | Check that exhaust gas recirculation, intake throttle and turbine vane valve openings change.<br>Used for boost pressure measurement/adjustment (See Gr15.)<br>[Service data]<br>51: Actual EGR Valve Position<br>53: Actual Intake Throttle Position<br>55: Actual VGT Position |
| AA  | Auxiliary Brake M/V 1          | Exhaust shutter 2-way magnetic valve driving signal<br>[Can be executed under following conditions] <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON</li> <li>Engine: stopped</li> </ul>  | Magnetic valve operating sound<br>[Service data]<br>B0: Auxiliary Brake M/V 1  |
| AB  | Auxiliary Brake Indicator Lamp | Exhaust brake indicator lamp driving signal<br>[Can be executed under following conditions] <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON</li> <li>Engine: stopped</li> </ul>  | Check that indicator lamp is turned on and off<br>[Service data]<br>B1: Auxiliary Brake Indicator Lamp   |
| AC  | Relay for Glow Relay           | ON/OFF switchover of glow drive relay<br>[Can be executed under following conditions] <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON</li> <li>Engine: stopped</li> </ul>  | Relay operating sound<br>[Service data]<br>B2: Glow Relay  |
| AD  | Glow Indicator Lamp            | Preheating indicator lamp driving signal<br>[Can be executed under following conditions] <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON</li> <li>Engine: stopped</li> </ul>   | Check that indicator lamp is turned on and off<br>[Service data]<br>B3: Glow Indicator Lamp  |
| AE  | Starter Safety Relay           | ON/OFF switchover of starter continuous power-on preventive relay (safety relay)<br>[Can be executed under following conditions] <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON</li> <li>Engine: stopped</li> </ul>   | Relay operating sound<br>[Service data]<br>B4: Starter Safety Relay  |
| AF  | EDU Relay                      | ON/OFF switchover of electronic drive unit relay (errors involving exhaust gas recirculation, intake air throttle and turbocharger may be detected during this actuator test).<br>[Can be executed under following conditions] <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Starter switch: ON</li> <li>Engine: stopped</li> </ul>   | Relay operating sound<br>[Service data]<br>B5: EDU Power Relay   |
| B0  | MIL                            | Engine warning lamp (orange) driving signal<br>[Can be executed under following conditions] <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Transmission: neutral or P range</li> <li>Engine: stopped</li> </ul>  | Check that warning lamp (orange) is turned on and off<br>[Service data]<br>B6: MIL   |
| B1  | Diagnosis Lamp                 | Engine warning lamp (red) driving signal<br>[Can be executed under following conditions] <ul style="list-style-type: none"> <li>Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>Transmission: neutral or P range</li> <li>Engine: stopped</li> </ul>   | Check that warning lamp (red) is turned on and off<br>[Service data]<br>B7: Diagnosis Lamp   |

# TROUBLESHOOTING

| No. | Item               | Description  | Check method  |
|-----|--------------------|--|---|
| B2  | Fuel Leak Check    | Rail pressure is increased for a certain period of time (6 seconds).<br>[Can be executed under following conditions]<br><ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Transmission: neutral or P range</li> <li>• Diagnosis switch: OFF (fuse removed)</li> </ul>                     | Check for leakage from fuel system.   |
| B3  | Air Conditioner SW | ON/OFF switchover of air conditioner operation (idle up control) is performed.<br>[Can be executed under following conditions]<br><ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Transmission: neutral or P range</li> <li>• Engine: Idling</li> </ul>                                 | Check that engine speed increases and decreases.<br>[Service data]<br>AA: AC SW |
| B4  | Idle Up Cancel SW  | ON/OFF switchover of idle up inhibited status<br>[Can be executed under following conditions]<br><ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Transmission: neutral or P range</li> </ul>  | Check that idling speed remains low.<br>[Service data]<br>A9: Idle Up Cancel SW |
| B5  | GCU (GLOW PLUG)    | ON/OFF switchover of the glow plugs<br>[Can be executed under following conditions]<br><ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Starter switch: ON</li> <li>• Engine: stopped</li> </ul>   | Check to see that the glow plugs are energized.                                 |
| BB  | Injector Test 1    | Selected injector magnetic valve is forced to stop.<br>[Can be executed under following conditions]<br><ul style="list-style-type: none"> <li>• Vehicle: stationary (vehicle speed 0 km/h {0 MPH})</li> <li>• Engine speed: 1500 rpm or less</li> <li>• Transmission: neutral</li> <li>• The current diagnosis code does not occur.</li> </ul> | Check that No. 1 cylinder injector magnetic valve is stopped.                   |
| BC  | Injector Test 2    |  | Check that No. 4 cylinder injector magnetic valve is stopped.                   |
| BD  | Injector Test 3    |  | Check that No. 2 cylinder injector magnetic valve is stopped.                   |
| BE  | Injector Test 4    |  | Check that No. 3 cylinder injector magnetic valve is stopped.                   |

M E M O

# REGISTRATION AND ALTERATION OF DATA IN ENGINE ELECTRONIC CONTROL UNIT

## 1. Operation at Electronic Control Unit Replacement

- Vehicle information and equipment specifications are registered in each engine electronic control unit as coded data (coding data).
- Given in the chart below are the items on which registered data in the engine electronic control unit are necessary to alter or new data are necessary to register with the disposition of equipment.
- If the electronic control unit is left initialized with no necessary data registered, it is not capable of proper engine control.
- For data alteration/registration and data write operation, see Gr13ECU "ECU Rewrite and Programming".

| Engine electronic control unit data |                              | VIN (Vehicle Identification Number) | Injector correction   | Injection quantity correction | Air flow sensor characteristics | PTO idling speed      | Ash accumulation data transfer | Remarks  |
|-------------------------------------|------------------------------|-------------------------------------|-----------------------|-------------------------------|---------------------------------|-----------------------|--------------------------------|--|
| Disposition of equipment            |                              |                                     |                       |                               |                                 |                       |                                |  |
| Engine electronic control unit      | Replaced with new unit       | <input type="radio"/>               | <input type="radio"/> | <input type="radio"/>         | <input type="radio"/>           | <input type="radio"/> | <input type="radio"/>          |  |
|                                     | Relocated from other vehicle | <input type="radio"/>               | <input type="radio"/> | <input type="radio"/>         | <input type="radio"/>           | <input type="radio"/> | <input type="radio"/>          |  |
|                                     | Erasure of diagnosis codes   |                                     |                       |                               |                                 |                       |                                | No action is required.   |
| Replacement of injector             |                              |                                     | <input type="radio"/> |                               |                                 |                       |                                | Data code (IQA code) differs from injector to injector and is necessary to change. |
| Replacement of air flow sensor      |                              |                                     |                       |                               |                                 |                       |                                | Data is not necessary to change if the replacement is identical.                   |
| Change of PTO idling speed          |                              |                                     |                       |                               |                                 | <input type="radio"/> |                                |  |

: Denotes the necessity of data being updated or registered.

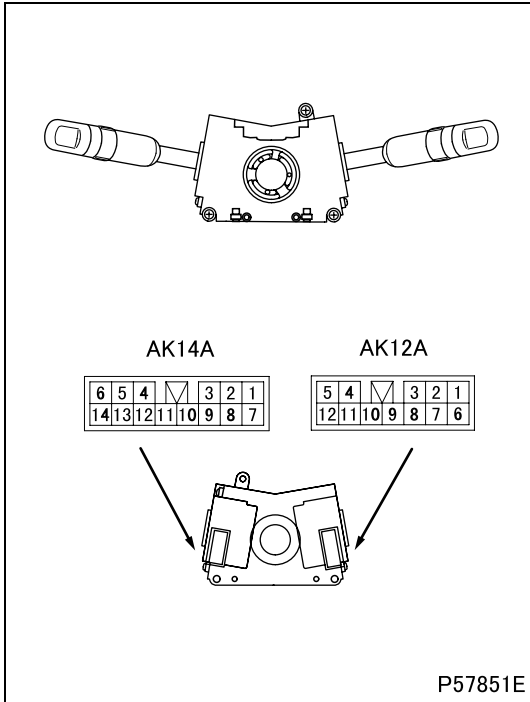
IQA: Injection Quantity Adjustment

## 2. Resetting the Diesel Particulate Filter Related Information (Resetting Electronic Control Unit)

- On the regeneration control type as diesel particulate filter system, the engine electronic control unit stores many diesel particulate filter related information to control the diesel particulate filter regeneration as diesel particulate filter history.
- If the ceramic filter is replaced or cleaned without regeneration, reset the history of diesel particulate filter using Multi-Use Tester. (For reset procedure, see Gr15.)
- In the case of diesel particulate filter regeneration by use of the diesel particulate filter cleaning switch, however, history reset with a Multi-Use Tester is not required because the history is automatically reset by engine electronic control unit.

M E M O

# INSPECTION OF ELECTRICAL EQUIPMENT

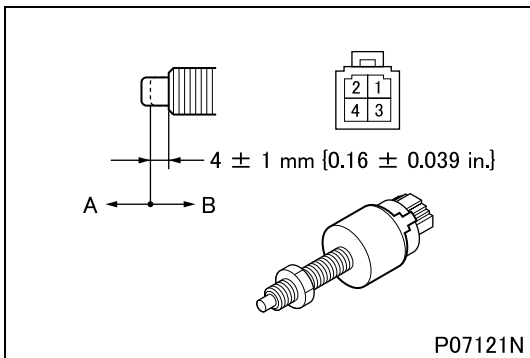


## #001 Inspection of combination switch

AK14A connector connection table

| Switch position      |     | Terminals with continuity |
|----------------------|-----|---------------------------|
| Exhaust brake switch | OFF | -                         |
|                      | ON  | 8 - 9                     |

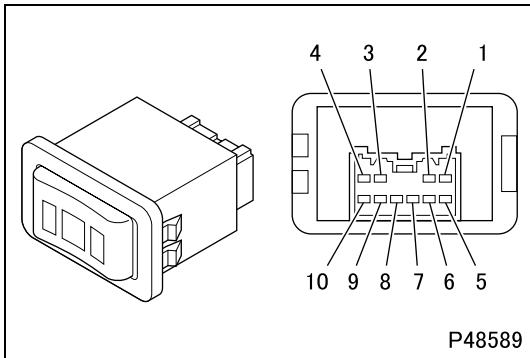
- For other inspections than shown above, see Electrical.
- If there is any abnormality, replace the switch.



## #031 Inspection of clutch switch

| Switch position | Terminals with continuity |
|-----------------|---------------------------|
| A               | 1 - 4                     |
| B               | 2 - 3                     |

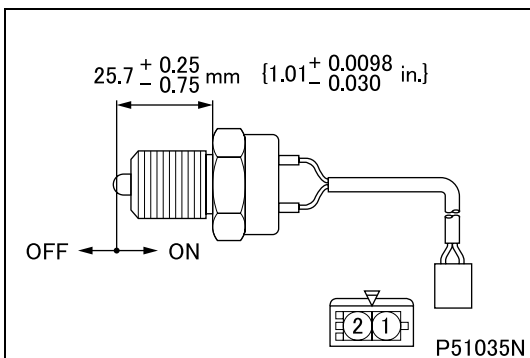
- If there is any abnormality, replace the switch.



## #089 Inspection of DPF cleaning switch

| Switch position | Terminals with continuity | Night lighting |
|-----------------|---------------------------|----------------|
| -               | 1 - 8                     | (+) 6 - 2 (-)  |
| ON              | 1 - 7                     |                |

- If there is any abnormality, replace the switch.

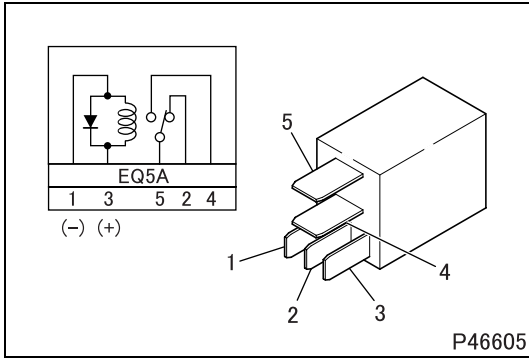


## #163 Inspection of torque limit switch

| Switch position | Terminals with continuity |
|-----------------|---------------------------|
| OFF             | -                         |
| ON              | 1 - 2                     |

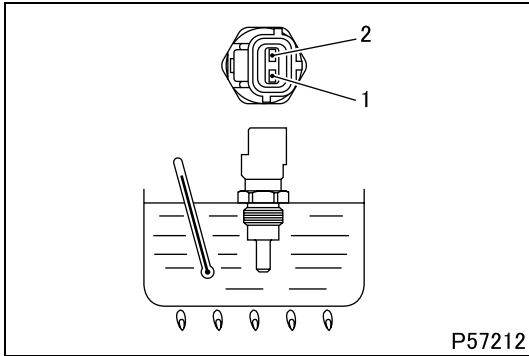
- If there is any abnormality, replace the switch.





**#201 Inspection of relay (normally open 5-pin)**

- Check continuity and operating condition of the relay. Replace the relay if necessary.



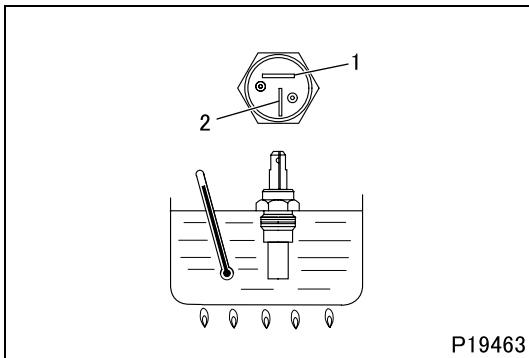
**#262 Inspection of water temperature sensor**

**<Water temperature sensor 1>**

- Place the water temperature sensor in a container filled with engine oil.
- Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
- Measure the resistance between terminals 1 and 2.

|                |               |                              |
|----------------|---------------|------------------------------|
| Standard value | 20°C {68°F}   | 2.45 ± 0.14 kΩ               |
|                | 80°C {176°F}  | 0.32 kΩ<br>(reference value) |
|                | 110°C {230°F} | 147.1 ± 2 Ω                  |

- If the measurement is out of specification, replace the sensor.

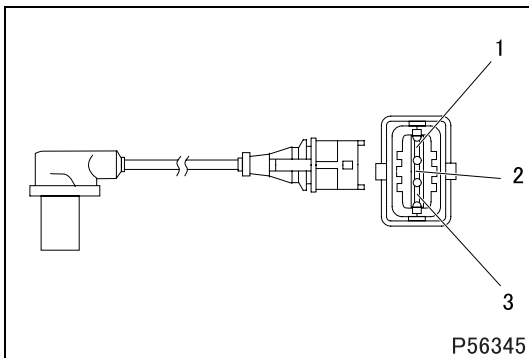


**<Water temperature sensor 2>**

- Place the water temperature sensor in a container filled with engine oil.
- Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
- Measure the resistance between terminals 2 and the body.

|                |              |                |
|----------------|--------------|----------------|
| Standard value | -20°C {-4°F} | 24.8 ± 2.5 kΩ  |
|                | 0°C {32°F}   | 8.62 kΩ        |
|                | 20°C {68°F}  | 3.25 ± 0.33 kΩ |
|                | 60°C {140°F} | 620 Ω          |
|                | 80°C {176°F} | 300 Ω          |

- If the measurement is out of specification, replace the sensor.



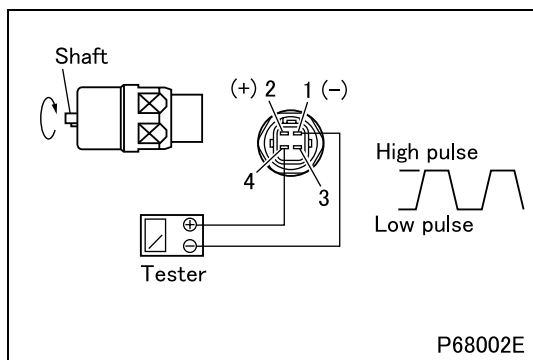
**#263 Inspection of engine speed sensor**

- Measure the resistance between terminals 1 and 2.

|                                 |            |
|---------------------------------|------------|
| Standard value (at 20°C {68°F}) | 860 ± 86 Ω |
|---------------------------------|------------|

- If the measurement is out of specification, replace the sensor.

# INSPECTION OF ELECTRICAL EQUIPMENT

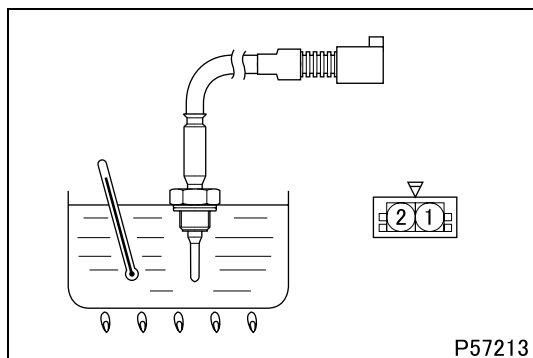


## #265 Inspection of vehicle speed sensor

- With the DC 12 V applied to terminals 1 and 2, slowly turn the shaft of the vehicle speed sensor.
- Measure the maximum voltage (high pulse voltage) and minimum voltage (low pulse voltage) occurring at each specified pair of terminals.

| Terminals                          | Inspection condition | Standard value |
|------------------------------------|----------------------|----------------|
| 25-pulse output: terminals 1 and 4 | Low pulse voltage    | 0.5 V or lower |
|                                    | High pulse voltage   | $8 \pm 1$ V    |

- If any measurement is out of specification, replace the sensor.



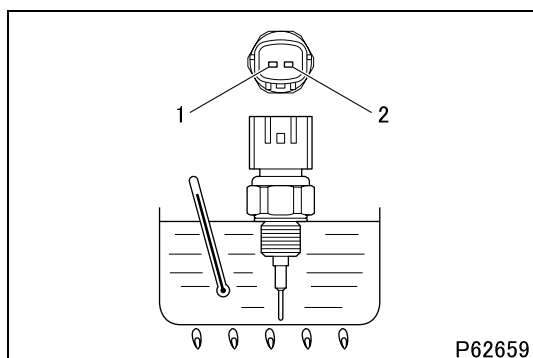
## #305 Inspection of air temperature sensor

### <Intake air temperature sensor>

- The intake air temperature sensor may output false signals if its tip is contaminated. Clean it if necessary. (See Gr15.)
- Place the sensor in a container filled with engine oil.
- Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
- Measure the resistance between terminals 1 and 2.

|                |               |                              |
|----------------|---------------|------------------------------|
| Standard value | 50°C {122°F}  | $2.202^{+0.233}_{-0.208}$ kΩ |
|                | 100°C {212°F} | $508.1^{+41.3}_{-37.7}$ Ω    |
|                | 150°C {302°F} | $160.4^{+10.3}_{-9.6}$ Ω     |

- If either measurement is out of specification, replace the sensor.



### <Boost air temperature sensor>

- The boost air temperature sensor may output false signals if its tip is contaminated. Clean it if necessary. (See Gr15.)
- Place the sensor in a container filled with engine oil.
- Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
- Measure the resistance between terminals 1 and 2.

|                |              |                              |
|----------------|--------------|------------------------------|
| Standard value | 0°C {32°F}   | $162.3^{+48.8}_{-36.5}$ kΩ   |
|                | 20°C {68°F}  | $61.47^{+15.99}_{-12.35}$ kΩ |
|                | 80°C {176°F} | $6.120^{+1.095}_{-0.907}$ kΩ |

- If the measurement is out of specification, replace the sensor.

## #306 Inspection of air flow sensor

- The sensor cannot be checked as a single unit. Instead, measure and compare the intake air flow rates of the existing sensor mounted on the vehicle and a new sensor installed in the place of the existing sensor for inspection using corresponding Multi-Use Tester Service Data items to determine characteristics deterioration in the existing sensor mounted on the vehicle.

### (1) Preparation for inspection

- Clean or replace the air cleaner element.
- Make a new air flow sensor ready for use.
- Warm up the engine enough.
- Connect a Multi-Use Tester. (See Gr00.)

**(2) Measurement of existing sensor intake air flow rate**

- Press the accelerator pedal from the idling position all the way down to the stopper bolt. (The engine is running at maximum speed under no load.)
- Measure the following items from “Service Data”.
  - <General Scanning Tool used>  
Engine speed: “Ne” (rpm)  
Intake air flow rate: “Air Flow Rate from MAFS” (g/s)
  - <Multi-Use Tester used>  
Engine speed: 01 “Engine Revolution” (rpm)  
Intake air flow rate: 60 “Air mass flow” (g/s)

**(3) Measurement of new sensor intake air flow rate**

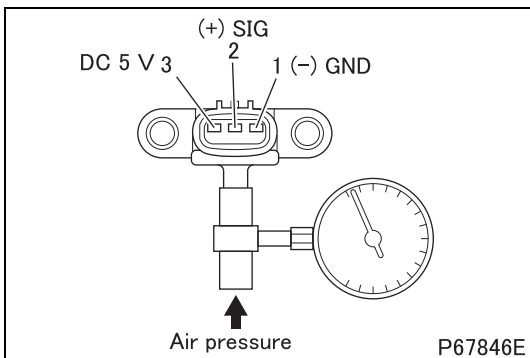
- Remove the existing sensor mounted on the vehicle and install a new sensor in its place.
- Press the accelerator pedal from the idling position all the way down to the stopper bolt. (The engine is running at maximum speed under no load.)
- From “Service Data”, measure intake air flow rate at the same speed as the engine speed under (2) above.

**(4) Comparison for characteristics deterioration**

- Calculate the characteristics deterioration rate (%) as follows.

$$\text{Characteristics deterioration rate} = \frac{\text{New sensor intake air flow rate} - \text{Existing sensor intake air flow rate}}{\text{New sensor intake air flow rate}} \times 100 (\%)$$

- If the calculated value is 10% or more, the characteristics of the existing sensor can be judged as deteriorated. In this case, replace it with the new sensor.



**#318 Inspection of boost pressure sensor**

- Apply DC 5 V to terminals 3 and 1.
- Apply air pressure. Gradually increase it and, while doing so, measure the output voltage occurring at terminals 2 and 1.

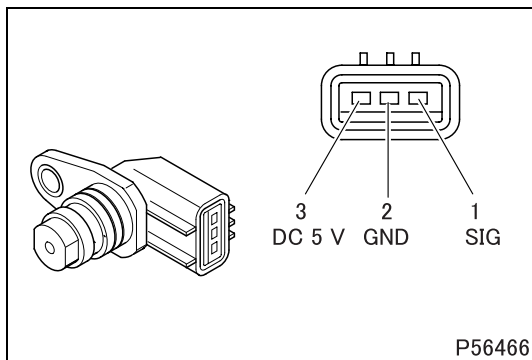
|                | Air pressure (gauge reading)                   | Voltage       |
|----------------|--|---------------|
| Standard value | 232.2 kPa<br>{34 psi, 2.3 kg/cm <sup>2</sup> } | Approx. 3.2 V |
|                | 99 kPa<br>{14 psi, 1.0 kg/cm <sup>2</sup> }    | Approx. 4.5 V |

- If any measurement is out of specification, replace the sensor.

**#319 Inspection of common rail pressure sensor**

- The sensor cannot easily be inspected in isolation, so you must evaluate it indirectly by inspection of system harnesses and related parts.
- If there is no abnormality in any related part but the system is abnormal, replace the common rail.

# INSPECTION OF ELECTRICAL EQUIPMENT

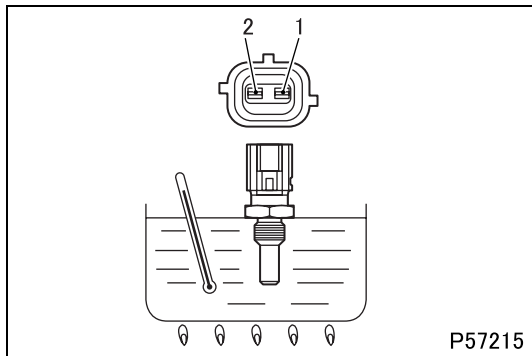


## #320 Inspection of cylinder recognition sensor

- Measure the resistance between terminals 2 and 3.

|                |                      |
|----------------|----------------------|
| Standard value | 200 to 1800 $\Omega$ |
|----------------|----------------------|

- If the measurement is out of specification, replace the sensor.

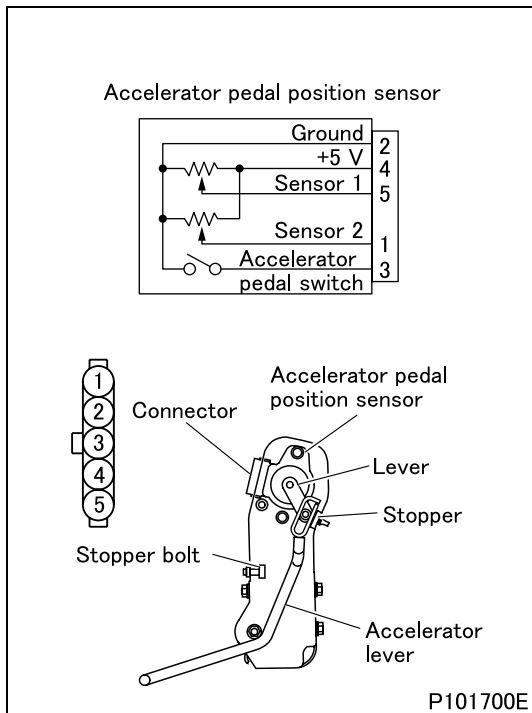


## #323 Inspection of fuel temperature sensor

- Measure the resistance between terminals 1 and 2.

|                |               |                                    |
|----------------|---------------|------------------------------------|
| Standard value | 20°C {68°F}   | 2.45 $^{+0.14}_{-0.13}$ k $\Omega$ |
|                | 80°C {176°F}  | 0.318 $\pm$ 0.01 k $\Omega$        |
|                | 110°C {230°F} | 0.1417 $\pm$ 0.0018 k $\Omega$     |

- If any measurement is out of specification, replace the sensor.



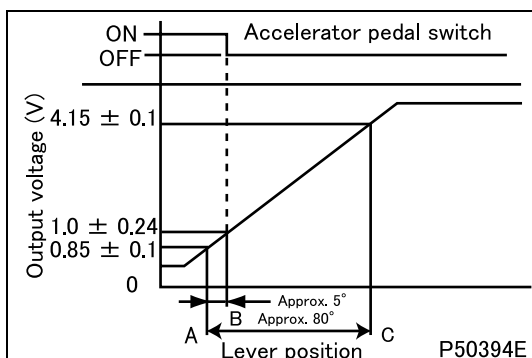
## #324 Inspection of accelerator pedal position sensor

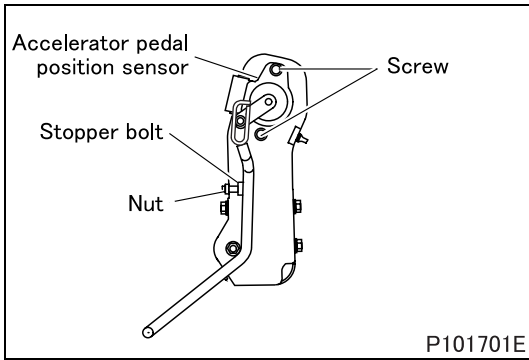
### [Inspection]

- Apply DC 5 V to terminals 4 and 2 of the accelerator pedal position sensor.
- Measure the output voltage at terminals 2 and 5 (sensor 1) and the output voltage at terminals 1 and 2 (sensor 2) with the accelerator lever in each specified position.

| Standard value | Accelerator lever position                    | Output voltage   |
|----------------|---|------------------|
|                | Idling position A                             | 0.85 $\pm$ 0.1 V |
|                | Accelerator pedal switch operating position B | 1.0 $\pm$ 0.24 V |
|                | Full load position C                          | 4.15 $\pm$ 0.1 V |

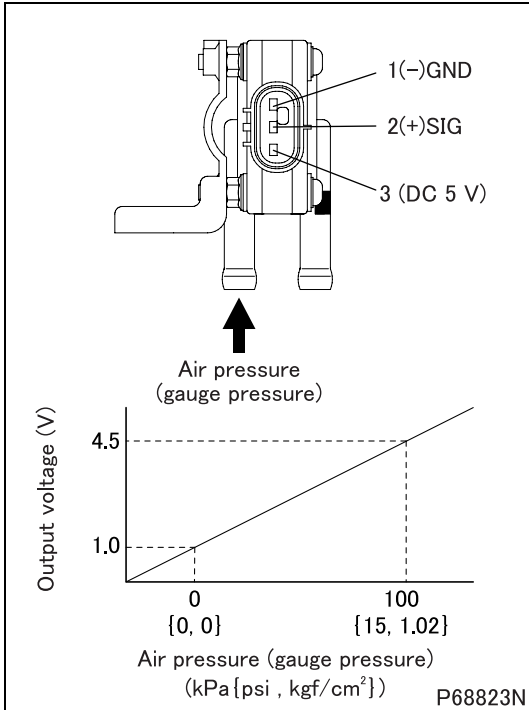
- A:** Position in which accelerator lever is touching stopper
- B:** Position at which continuity between terminals 2 and 3 disappears as accelerator pedal is pushed downward
- C:** Position in which accelerator lever is touching stopper bolt
- If any output voltage is out of specification, make an adjustment.
- If any output voltage is still out of specification when you have made an adjustment, replace the sensor.





**[Adjustment]**

- To adjust the output voltage for the idling position A, loosen the screws and move the accelerator pedal position sensor. Tighten the screws after making the adjustment.
- To adjust the output voltage for the full load position C, loosen the nut and make the adjustment using the stopper bolt. After making the adjustment, lock the stopper bolt in position with the nut.



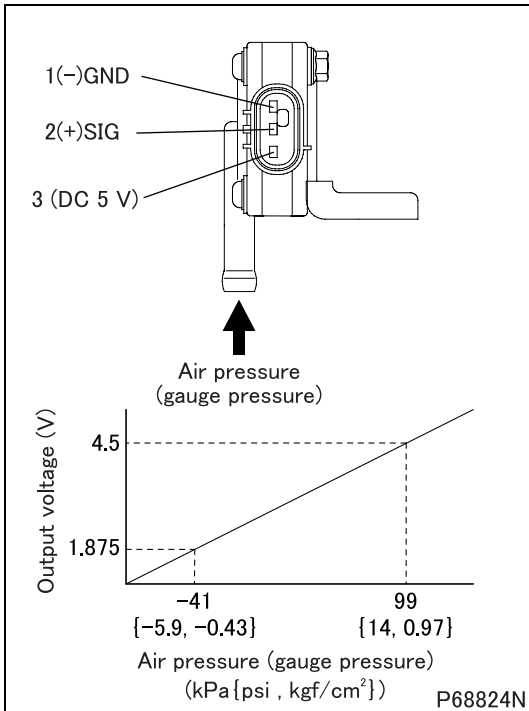
**#334 Inspection of DPF pressure sensor**

**<DPF pressure sensor (DIFF)>**

- Apply DC 5 V to terminals 3 and 1.
- Apply air pressure (gauge pressure) and measure the output voltage occurring at terminals 2 and 1 (left figure).

|                |  |       |
|----------------|--|-------|
| Standard value | 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm <sup>2</sup> }       | 1 V   |
|                | 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm <sup>2</sup> } | 4.5 V |

- If the measurement is out of specification, replace the sensor.



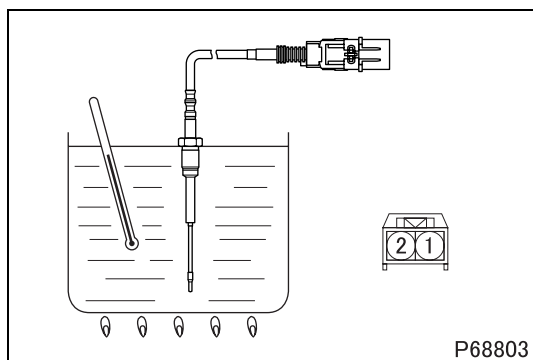
**<DPF absolute pressure sensor>**

- Apply DC 5 V to terminals 3 and 1.
- Apply air pressure (gauge pressure) and measure the output voltage occurring at terminals 2 and 1 (left figure).

|                |   |         |
|----------------|---|---------|
| Standard value | -41 ± 3.2 kPa {-5.9 ± 0.5 psi, -0.43 ± 0.03 kgf/cm <sup>2</sup> } | 1.875 V |
|                | 99 ± 3.2 kPa {14 ± 0.5 psi, 1.0 ± 0.03 kgf/cm <sup>2</sup> }      | 4.5 V   |

- If the measurement is out of specification, replace the sensor.

# INSPECTION OF ELECTRICAL EQUIPMENT



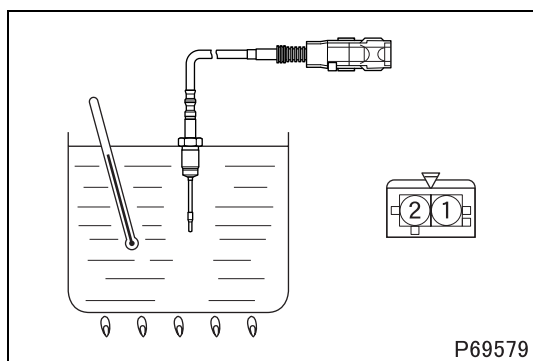
## #336 DPF temperature sensor

### <DPF temperature sensor 1>

- The DPF temperature sensor 1 may output false signals if its tip is contaminated. Clean it if necessary. (See Gr15.)
- Place the sensor in a container filled with engine oil.
- Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
- Measure the resistance between terminals 1 and 2.

|                |               |  |
|----------------|---------------|--|
| Standard value | 20°C {68°F}   | 241.8 kΩ                                     |
|                | 50°C {122°F}  | 106.2 <sup>+74.3</sup> <sub>-41.8</sub> kΩ   |
|                | 100°C {212°F} | 33.56 <sup>+17.60</sup> <sub>-10.60</sub> kΩ |
|                | 150°C {302°F} | 13.90 <sup>+5.36</sup> <sub>-3.60</sub> kΩ   |
|                | 200°C {392°F} | 6.896 <sup>+2.064</sup> <sub>-1.252</sub> kΩ |

- If the measurement is out of specification, replace the sensor.

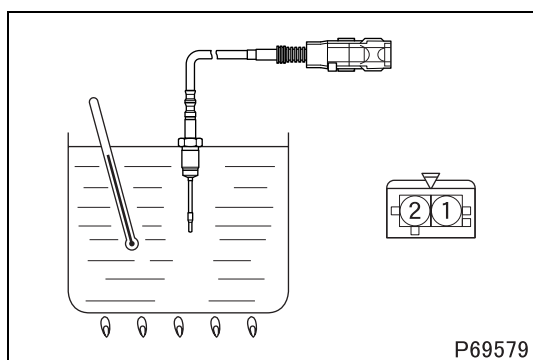


### <DPF temperature sensor 2>

- The DPF temperature sensor 2 may output false signals if its tip is contaminated. Clean it if necessary. (See Gr15.)
- Place the sensor in a container filled with engine oil.
- Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
- Measure the resistance between terminals 1 and 2.

|                |               |  |
|----------------|---------------|--|
| Standard value | 20°C {68°F}   | 241.8 kΩ                                     |
|                | 50°C {122°F}  | 106.2 <sup>+74.3</sup> <sub>-41.8</sub> kΩ   |
|                | 100°C {212°F} | 33.56 <sup>+17.60</sup> <sub>-10.60</sub> kΩ |
|                | 150°C {302°F} | 13.90 <sup>+5.36</sup> <sub>-3.60</sub> kΩ   |
|                | 200°C {392°F} | 6.896 <sup>+2.064</sup> <sub>-1.252</sub> kΩ |

- If the measurement is out of specification, replace the sensor.

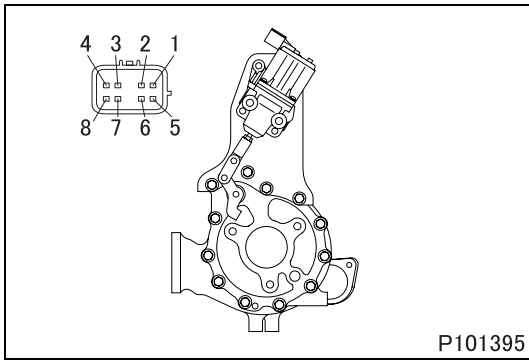


## #338 Inspection of catalytic temperature sensor

- The catalytic temperature sensor may output false signals if its tip is contaminated. Clean it if necessary. (See Gr15.)
- Place the sensor in a container filled with engine oil.
- Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
- Measure the resistance between terminals 1 and 2.

|                |               |  |
|----------------|---------------|--|
| Standard value | 20°C {68°F}   | 241.8 kΩ                                     |
|                | 50°C {122°F}  | 106.2 <sup>+74.3</sup> <sub>-41.8</sub> kΩ   |
|                | 100°C {212°F} | 33.56 <sup>+17.60</sup> <sub>-10.60</sub> kΩ |
|                | 150°C {302°F} | 13.90 <sup>+5.36</sup> <sub>-3.60</sub> kΩ   |
|                | 200°C {392°F} | 6.896 <sup>+2.064</sup> <sub>-1.252</sub> kΩ |

- If the measurement is out of specification, replace the sensor.



P101395

**#514 Inspection of turbocharger actuator**

- Perform the following checks. If there is any abnormality, replace the turbocharger actuator.

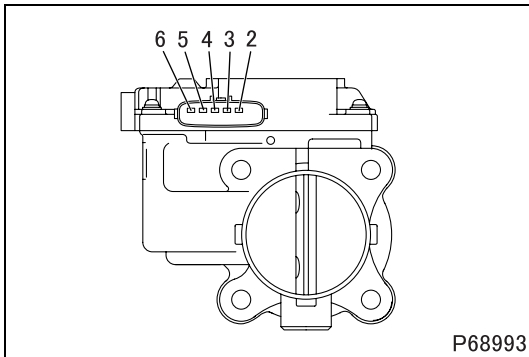
**(1) Coil resistance of motor**

- Measure the resistance between terminals 8 and 7, 8 and 6, and 7 and 6.

|                |             |
|----------------|-------------|
| Standard value | 2.1 ± 0.3 Ω |
|----------------|-------------|

**(2) Position sensor**

- The sensor cannot easily be inspected, so you must evaluate it indirectly by inspection of system harnesses and related parts.
- If there is no abnormality in any related part but the system is abnormal, replace the turbocharger actuator.



P68993

**#529 Inspection of intake throttle**

- Perform the following checks. If there is any abnormality, replace the intake throttle.

**(1) Coil resistance of motor**

- Measure the resistance between terminals 5 and 6.

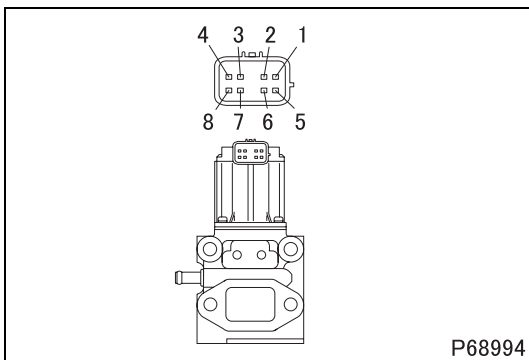
|                |             |
|----------------|-------------|
| Standard value | 0.3 to 80 Ω |
|----------------|-------------|

**CAUTION** ⚠

- If the measurement is out of specification, manually open and close the butterfly valve and measure the resistance again.

**(2) Position sensor**

- The sensor cannot easily be inspected, so you must evaluate it indirectly by inspection of system harnesses and related parts.
- If there is no abnormality in any related part but the system is abnormal, replace the intake throttle.



P68994

**#530 Inspection of EGR valve**

- Perform the following checks. If there is any abnormality, replace the EGR valve.

**(1) Coil resistance of motor**

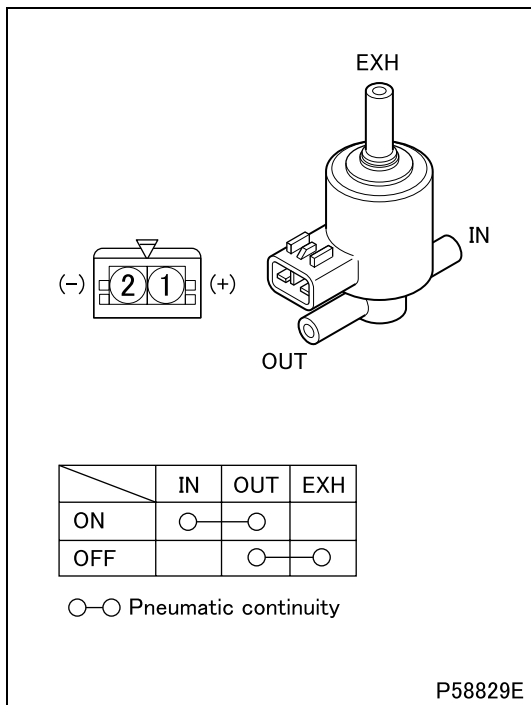
- Measure the resistance between terminals 8 and 7, 8 and 6, and 7 and 6.

|                |             |
|----------------|-------------|
| Standard value | 2.1 ± 0.3 Ω |
|----------------|-------------|

**(2) Position sensor**

- The sensor cannot easily be inspected, so you must evaluate it indirectly by inspection of system harnesses and related parts.
- If there is no abnormality in any related part but the system is abnormal, replace the EGR valve.

# INSPECTION OF ELECTRICAL EQUIPMENT



## #565 Inspection of exhaust shutter 2-way magnetic valve

- Perform the following checks. If there is any abnormality, replace the exhaust shutter 2-way magnetic valve.

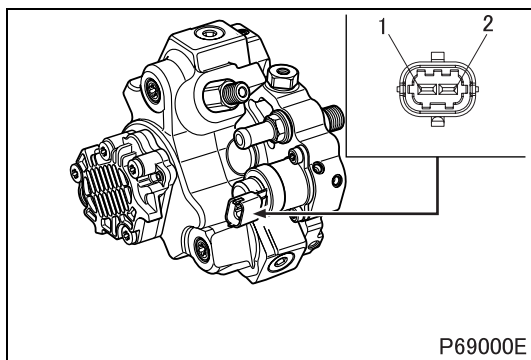
### (1) Check of operation

- Gradually increase from zero the voltage applied to terminals 1 and 2.
- Observe the voltage when the exhaust shutter 2-way magnetic valve operates.  
(Determine the magnet valve's OFF-ON operation from the operating sound.)

|   |               |
|---|---------------|
| Standard value (min. operating voltage) | 11 V or lower |
|---|---------------|

### (2) Check of continuity and airtightness

- Vacuum pressure applied during check:  
-100 kPa {-15 psi, -10 kgf/cm<sup>2</sup>}

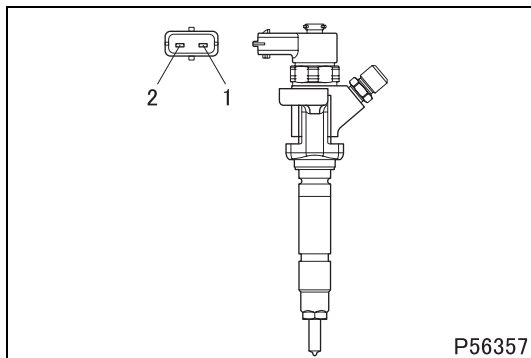


## #574 Inspection of MPROP (rail pressure control valve)

- Measure the resistance between terminals 1 and 2.

|                |               |
|----------------|---------------|
| Standard value | 2.6 to 3.15 Ω |
|----------------|---------------|

- If the measurement is out of specification, replace the supply pump.



## #582 Inspection of injector magnetic valve

- Measure the resistance between terminals 1 and 2.

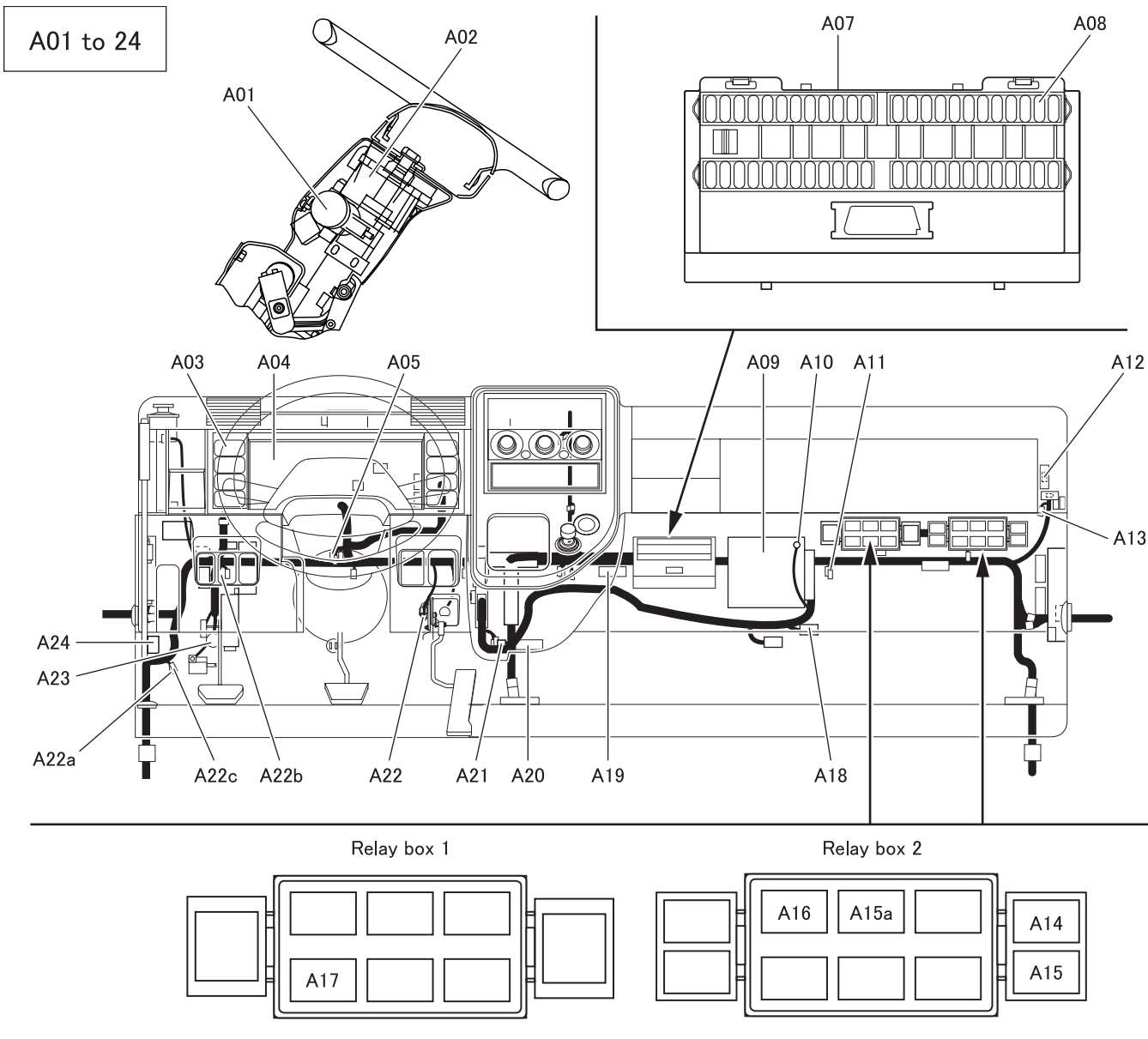
|                                 |                |
|---------------------------------|----------------|
| Standard value (at 20°C {68°F}) | 0.255 ± 0.04 Ω |
|---------------------------------|----------------|

- If the measurement is out of specification, replace the injector.
- If an injector is replaced with a new one, the injector correction data must be written in the engine electronic control unit.
- For storing of data in the engine electronic control unit, see Gr13ECU "ECU Rewrite and Programming".



M E M O

# INSTALLED LOCATIONS OF PARTS



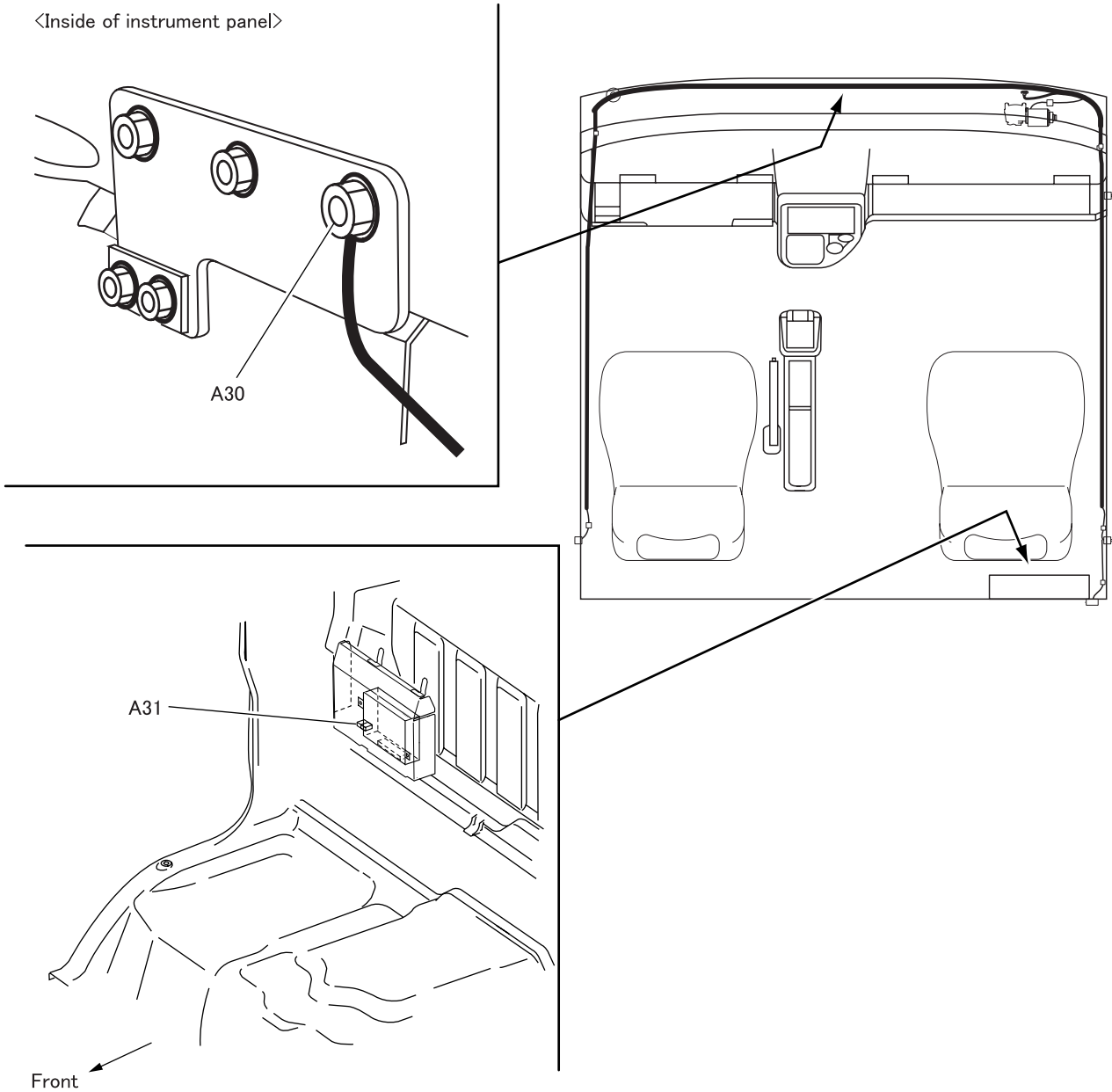
- A01 Starter switch
- A02 Combination switch
- A03 DPF cleaning switch
- A04 Meter cluster
- A05 Diode
- A07 Fuse box
- A08 Diagnosis switch
- A09 Engine ECU
- A10 Ground
- A11 Diode
- A12 Turbocharger EDU
- A13 Controller area network resistor
- A14 Engine start relay <M/T>  
Neutral start relay <A/T>
- A15 T/M neutral relay <M/T>  
Exhaust brake cut relay <A/T>
- A15a Glow drive relay <Except FE83>
- A16 ABS exhaust brake cut relay
- A17 Safety relay

- A18 Joint connector (J/C-2)
- A19 Joint connector (J/C-1)
- A20 Joint connector (J/C-M1)
- A21 Diode
- A22 Accelerator pedal position sensor
- A22a Joint connector (J/C-040)
- A22b Joint connector (J/C-040) <A/T>
- A22c Controller area network resistor
- A23 Clutch switch
- A24 Diagnostic connector

- ABS: Anti-lock brake system
- ECU: Electronic control unit
- DPF: Diesel particulate filter
- J/C: Joint connector
- EDU: Electronic drive unit
- M/T: Manual transmission
- A/T: Automatic transmission
- T/M: Transmission

A30-31

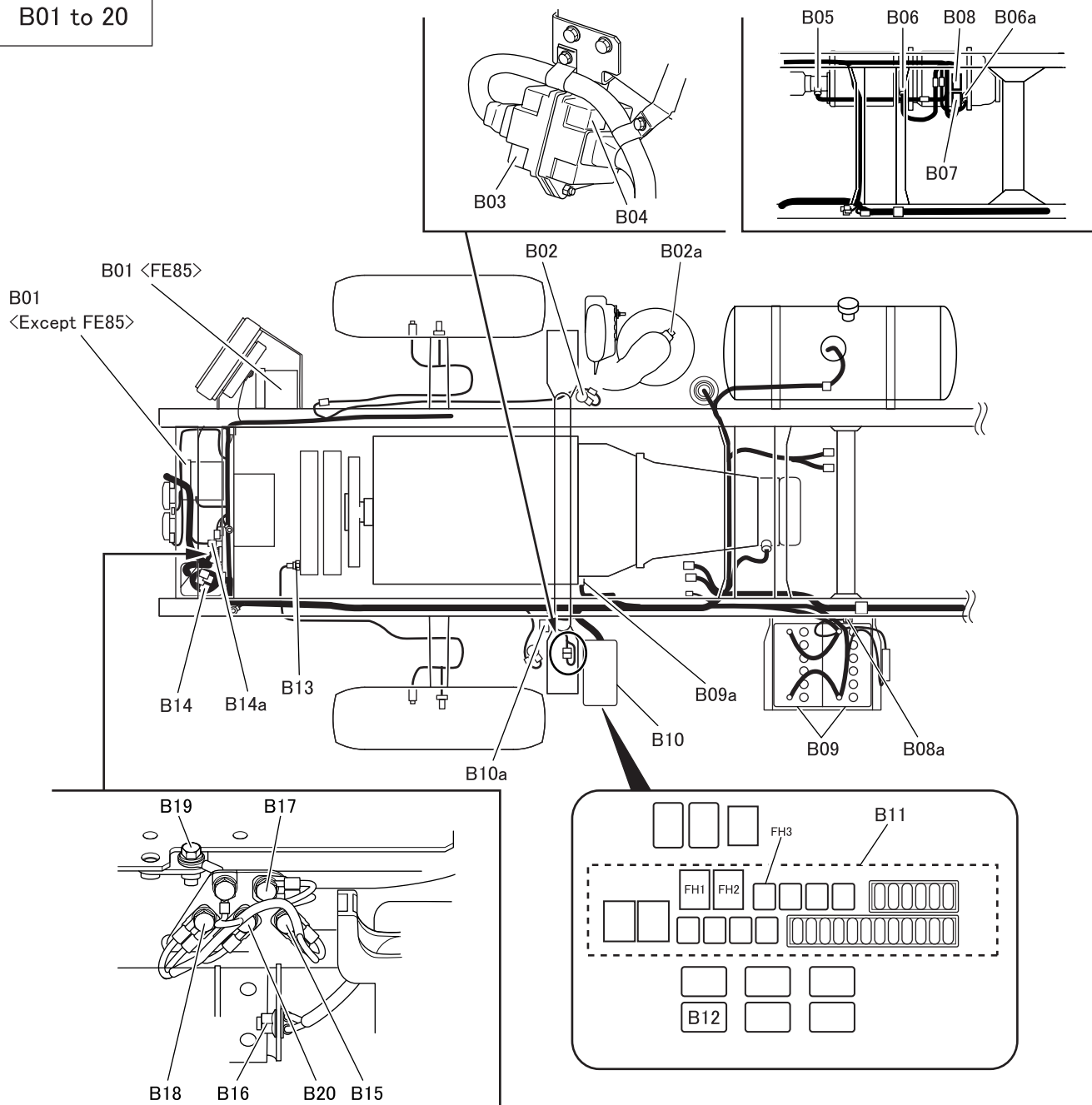
<Inside of instrument panel>



- A30 Ground
- A31 Controller area network resistor

# INSTALLED LOCATIONS OF PARTS

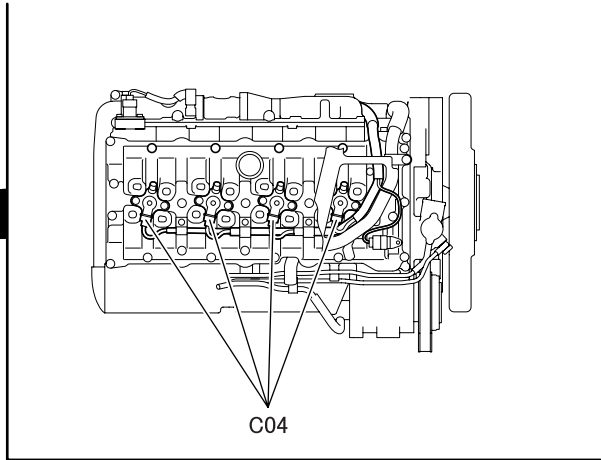
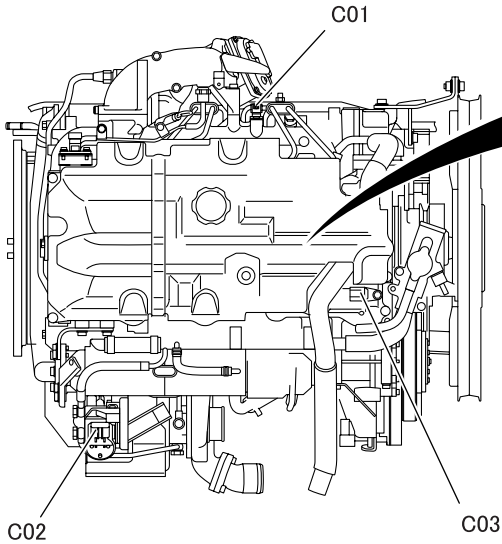
B01 to 20



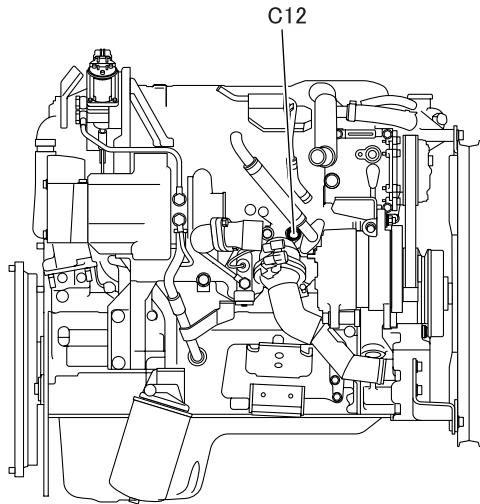
- |      |                                      |      |   |
|------|--------------------------------------|------|---|
| B01  | Hydraulic unit                       | B13  | Intake air temperature sensor                                   |
| B02  | Exhaust shutter 2-way magnetic valve | B14  | Connection of chassis harness and cab harness or engine harness |
| B02a | Air flow sensor                      | B14a | Connection of cab harness and engine harness                    |
| B03  | Throttle EDU                         | B15  | Ground  |
| B04  | EGR EDU                              | B16  | Ground  |
| B05  | Catalytic temperature sensor         | B17  | Ground  |
| B06  | DPF temperature sensor 1             | B18  | Ground  |
| B06a | DPF temperature sensor 2             | B19  | Ground  |
| B07  | DPF pressure sensor (DIFF)           | B20  | Ground  |
| B08  | DPF absolute pressure sensor         |      |   |
| B08a | Ground                               |      |   |
| B09  | Battery                              |      |   |
| B09a | Ground                               |      |   |
| B10  | High-current fuse box                |      |   |
| B10a | Glow ECU <FE83>                      |      |   |
| B11  | High-current fuse, fuse              |      |   |
| B12  | EDU relay                            |      |   |
- ECU : Electronic control unit  
 EDU : Electronic drive unit  
 EGR : Exhaust gas recirculation  
 DPF : Diesel particulate filter

C01 to 12

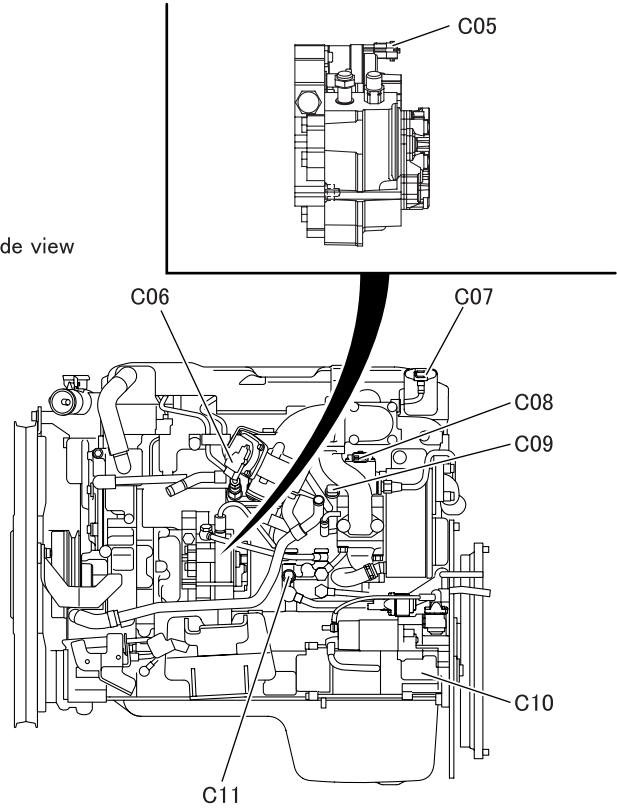
Upper view



Right side view



Left side view



- C01 Boost air temperature sensor
- C02 Turbocharger actuator
- C03 Cylinder recognition sensor
- C04 Injector magnetic valve
- C05 MPROP (Rail pressure control valve)
- C06 Throttle actuator (Building into motor, position sensor)
- C07 Boost pressure sensor
- C08 EGR valve (Building into motor, position sensor)
- C09 Common rail pressure sensor
- C10 Starter
- C11 Fuel temperature sensor
- C12 Water temperature sensor (Connects to engine ECU)

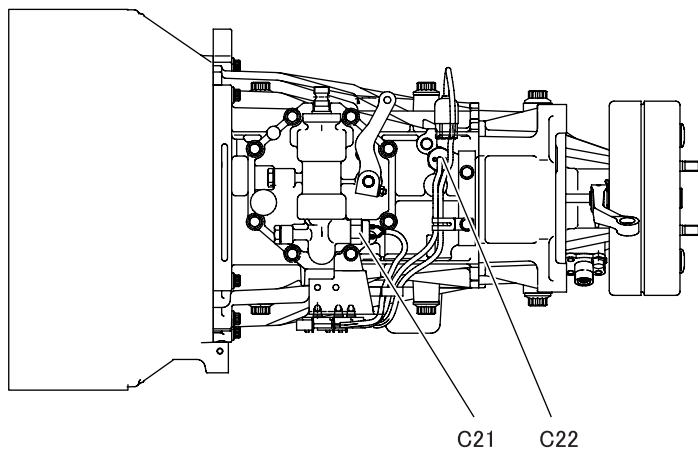
ECU: Electronic control unit  
EGR: Exhaust gas recirculation

# INSTALLED LOCATIONS OF PARTS

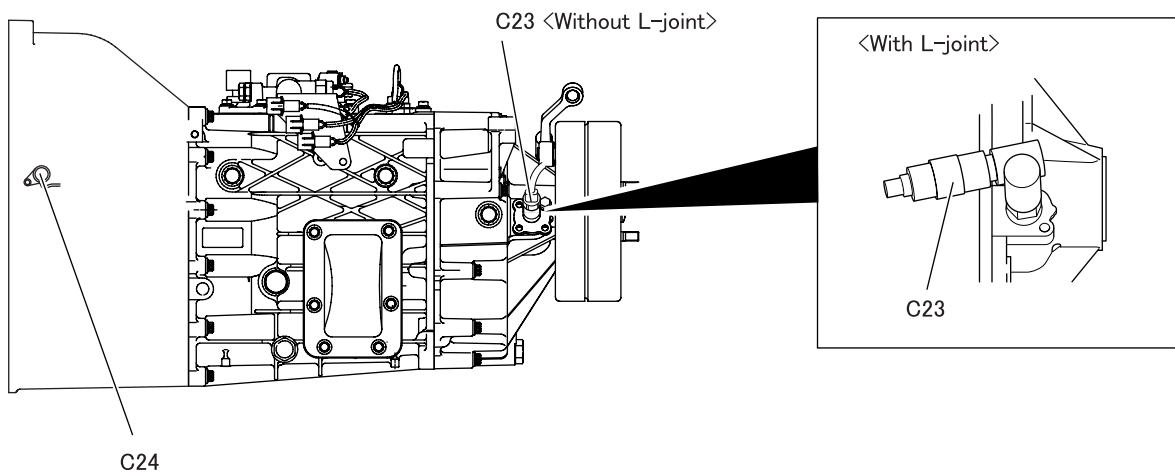
C21 to 24

<Manual transmission>

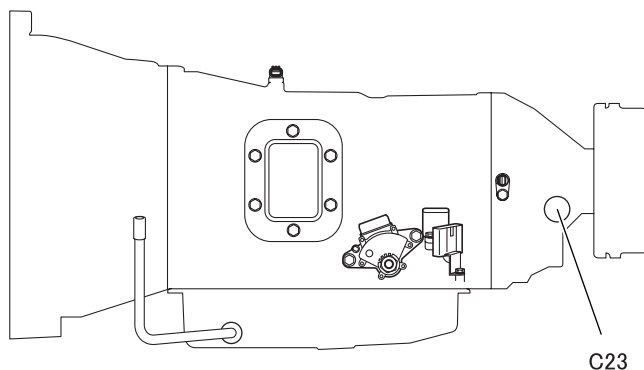
Upper view



Left side view



<Automatic transmission>



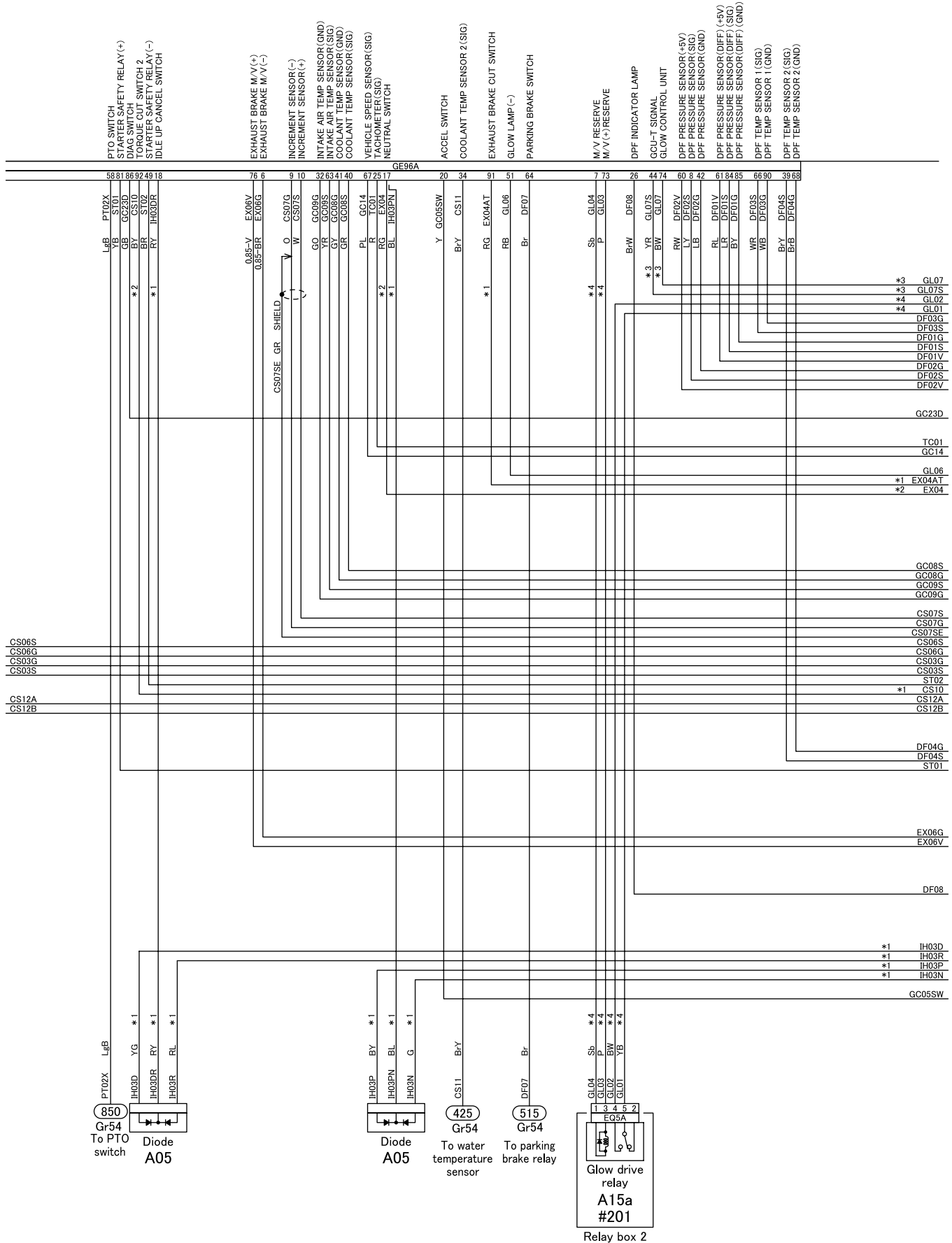
- C21 Transmission neutral switch
- C22 Torque limit switch
- C23 Vehicle speed sensor
- C24 Engine speed sensor

M E M O



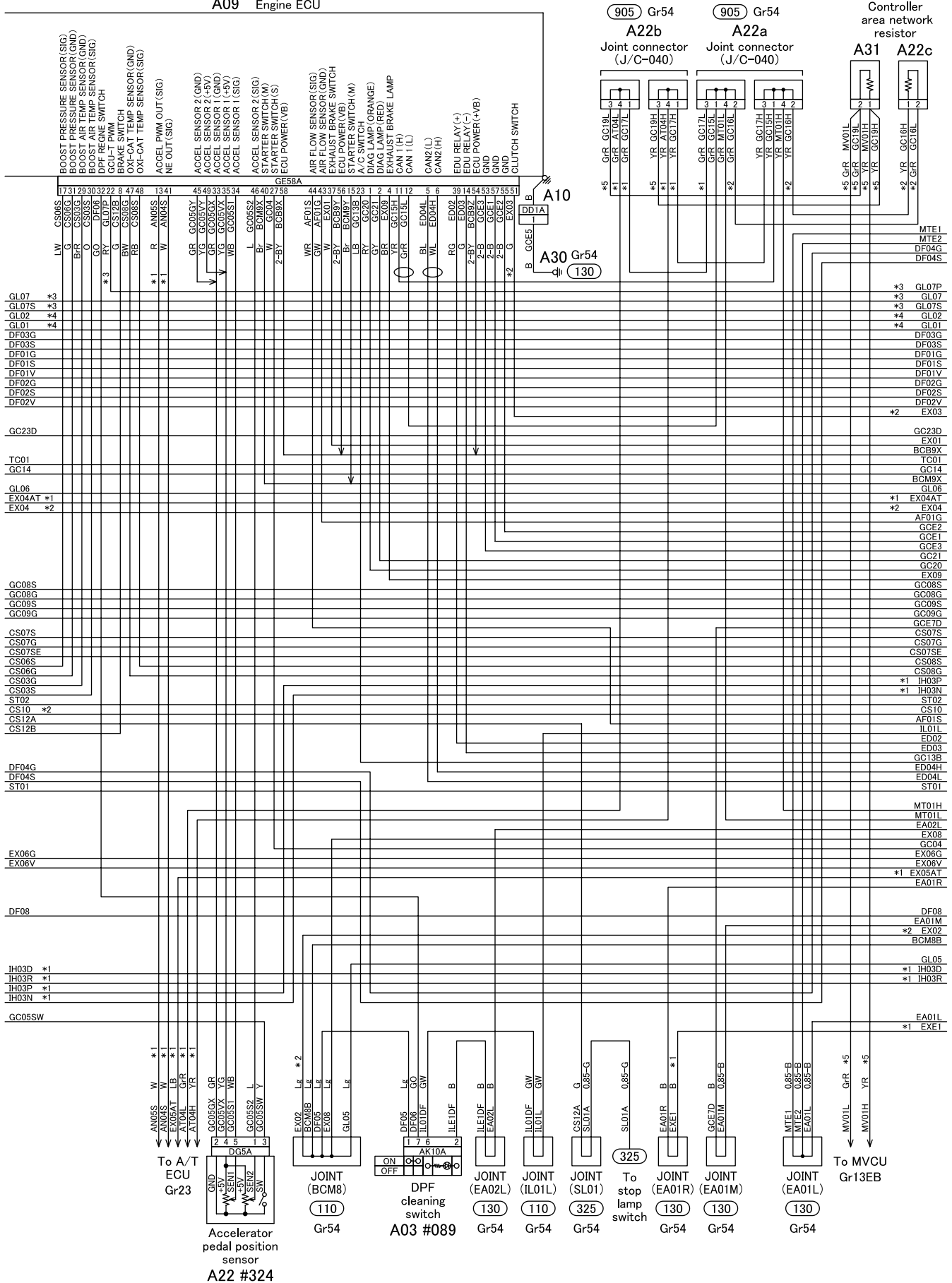


A09 Engine ECU

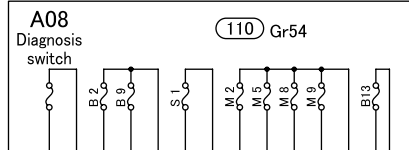


# ELECTRIC CIRCUIT DIAGRAM

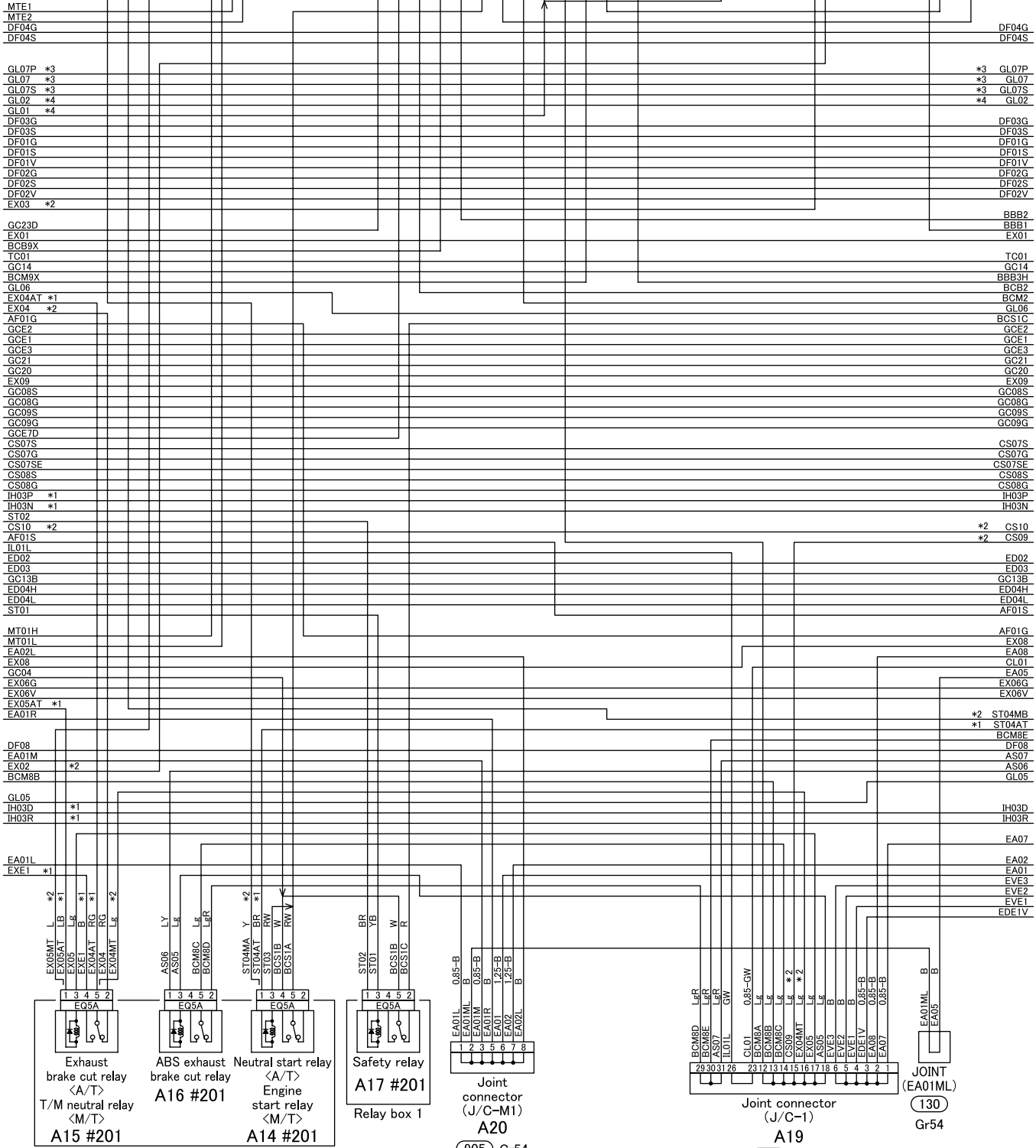
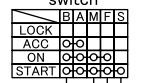
A09 Engine ECU



A07 Fuse box



Gr54 A01 #002 Starter switch







# ELECTRIC CIRCUIT DIAGRAM

