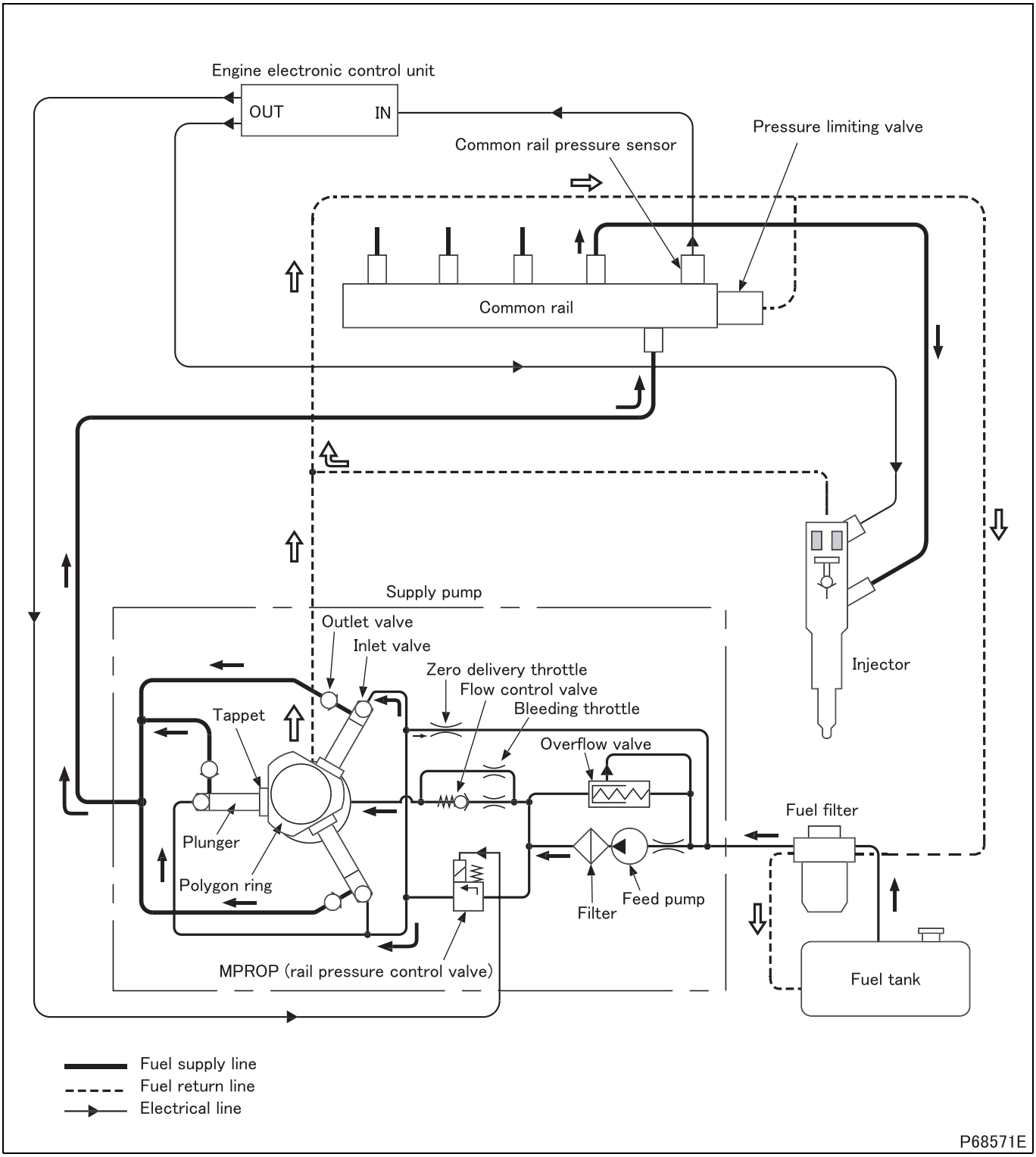
INDEX

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	MPROP
		Rated voltage V	12
	Max. common rail pressure MPa {psi, kgf/cm^2}		180 {26100, 1840}
Common rail	Manufacturer		Bosch
	Common rail volume cm^3 {cu. in., ml}		18.7 {1.14, 18.7}
	Pressure limiting valve opening pressure MPa {psi, kgf/cm^2}		210 to 220 {30450 to 31900, 2141 to 2243}
	Common rail pressure sensor supply voltage V		5
Injectors	Manufacturer		Bosch
	Control method		Electrical
	Max. operating pressure MPa {psi, kgf/cm^2}		180 {26100, 1840}
	Min. operating pressure MPa {psi, kgf/cm^2}		25 {3630, 255}
Common rail electronic control unit	Manufacturer		Bosch
	Rated voltage V		12

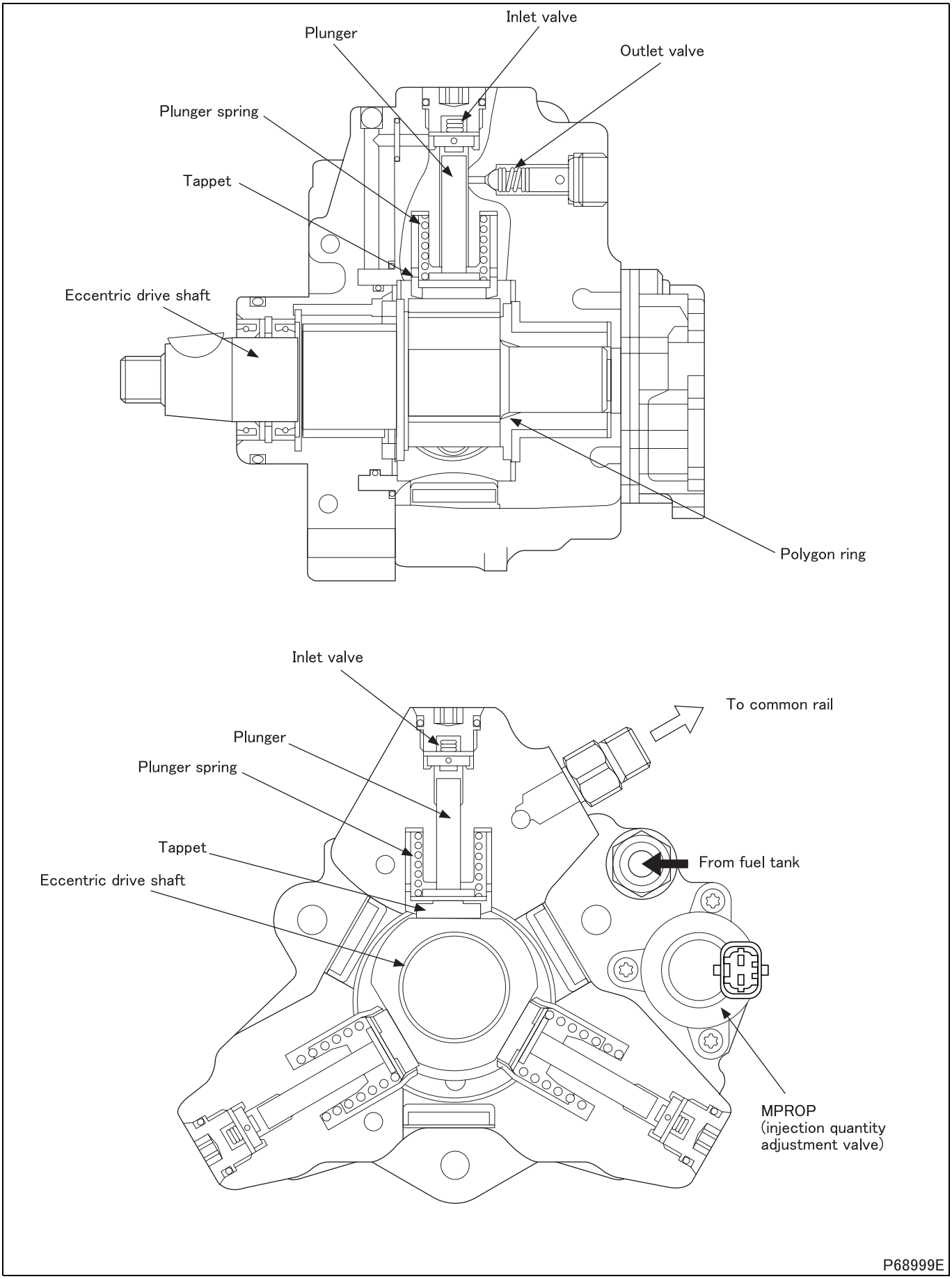
1. Overview

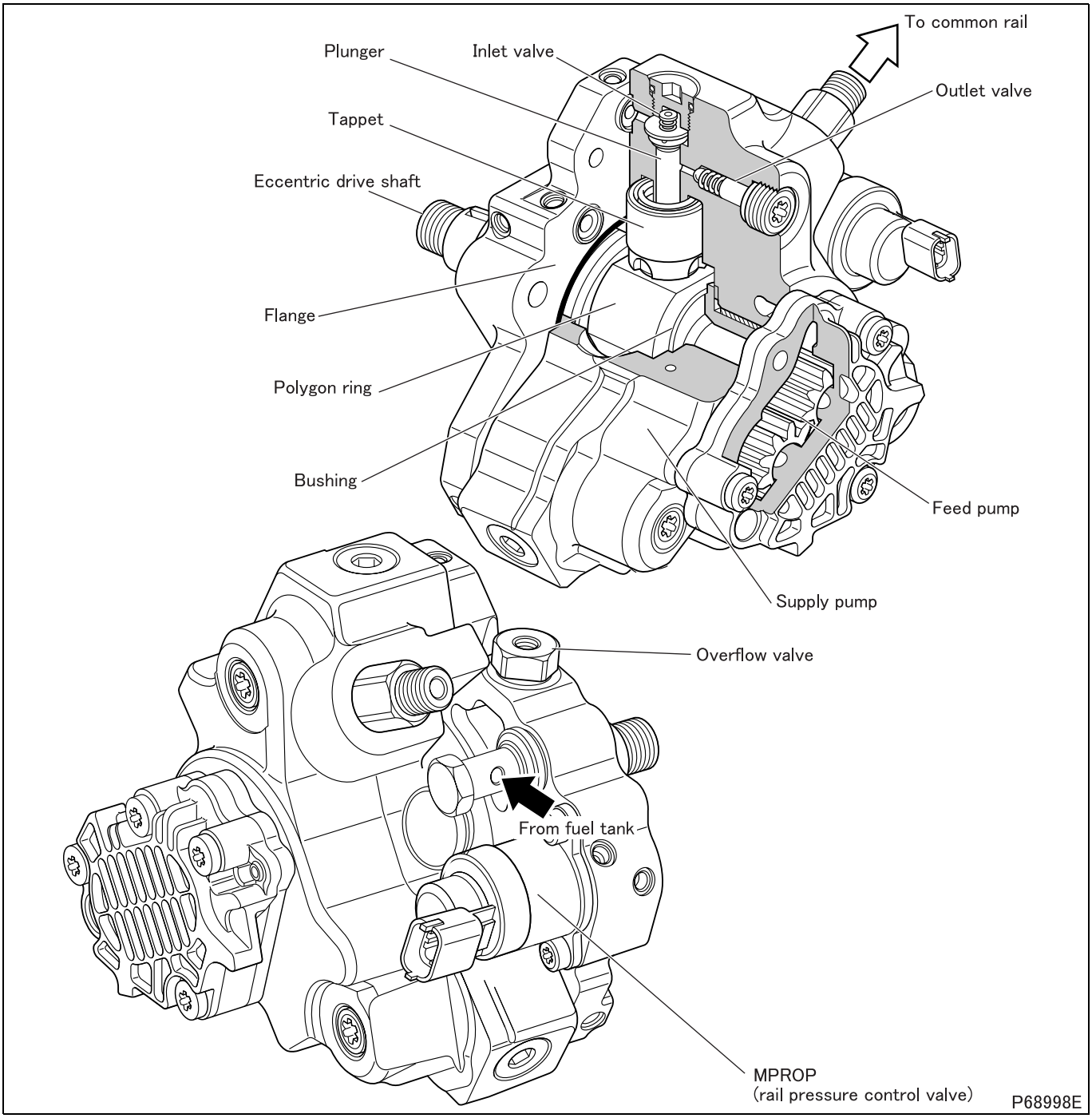
- In the common rail system, an electronic control unit monitors various aspects of the engine (engine speed, throttle opening, coolant temperature, etc.) using information from sensors. In accordance with these data, the electronic control unit effects control over the fuel injection quantity, fuel 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.



- 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

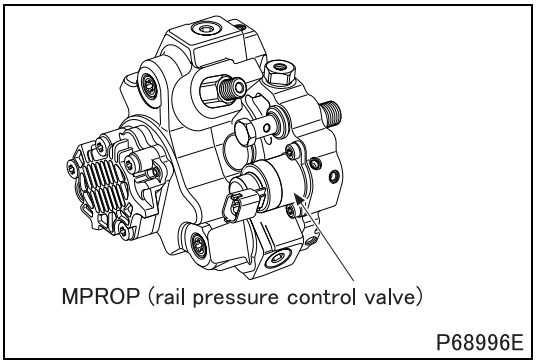




CAUTION ⚠

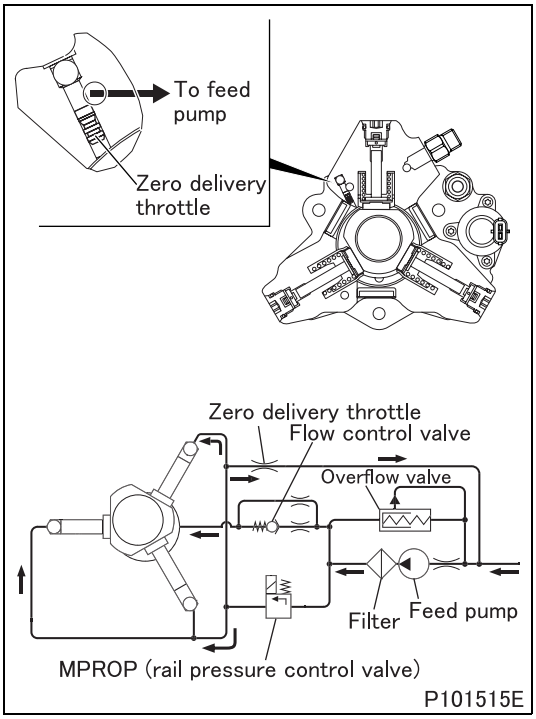
- **Be sure to connect the MPROP (rail pressure control valve) connector to the engine harness before starting the engine. If the engine were started with the MPROP connector not connected, control of the supply pump by the engine electronic control unit would not be possible and a fault would ensue.**

- 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.



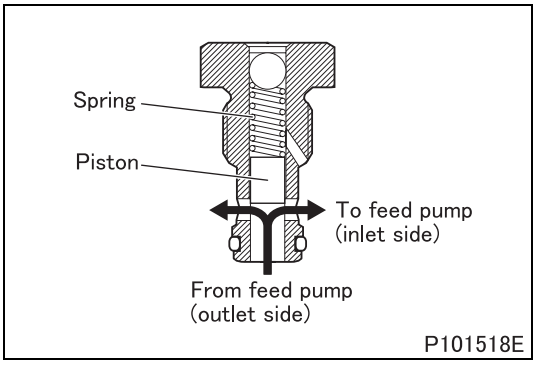
(1) MPROP (rail pressure control valve)

- 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.



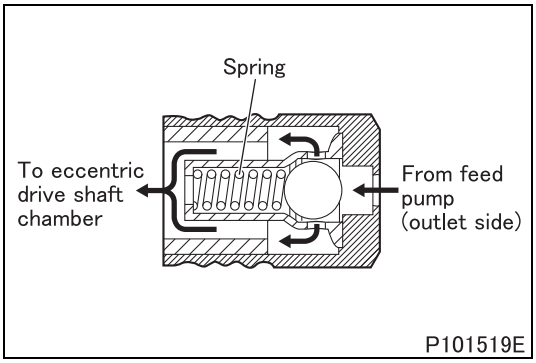
(2) Zero delivery throttle

- 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

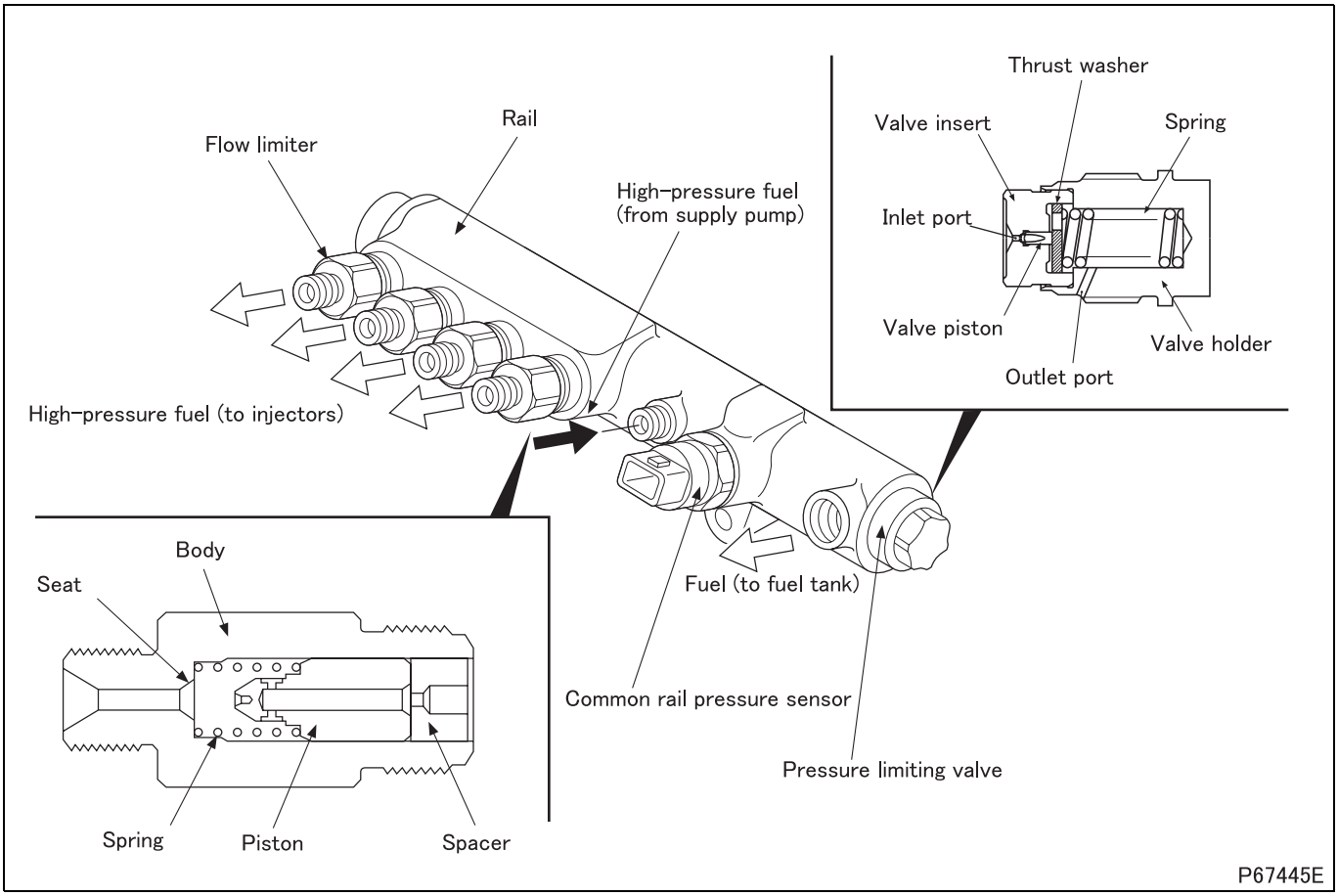
- The overflow valve limits the pressure of the fuel sent from the feed pump to the predetermined level.
- When fuel pressure exceeds the predetermined level, it overcomes the spring force of the overflow valve to move the piston, returning the fuel to the inlet side of the feed pump.
  The fuel which 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.

1.2 Common rail

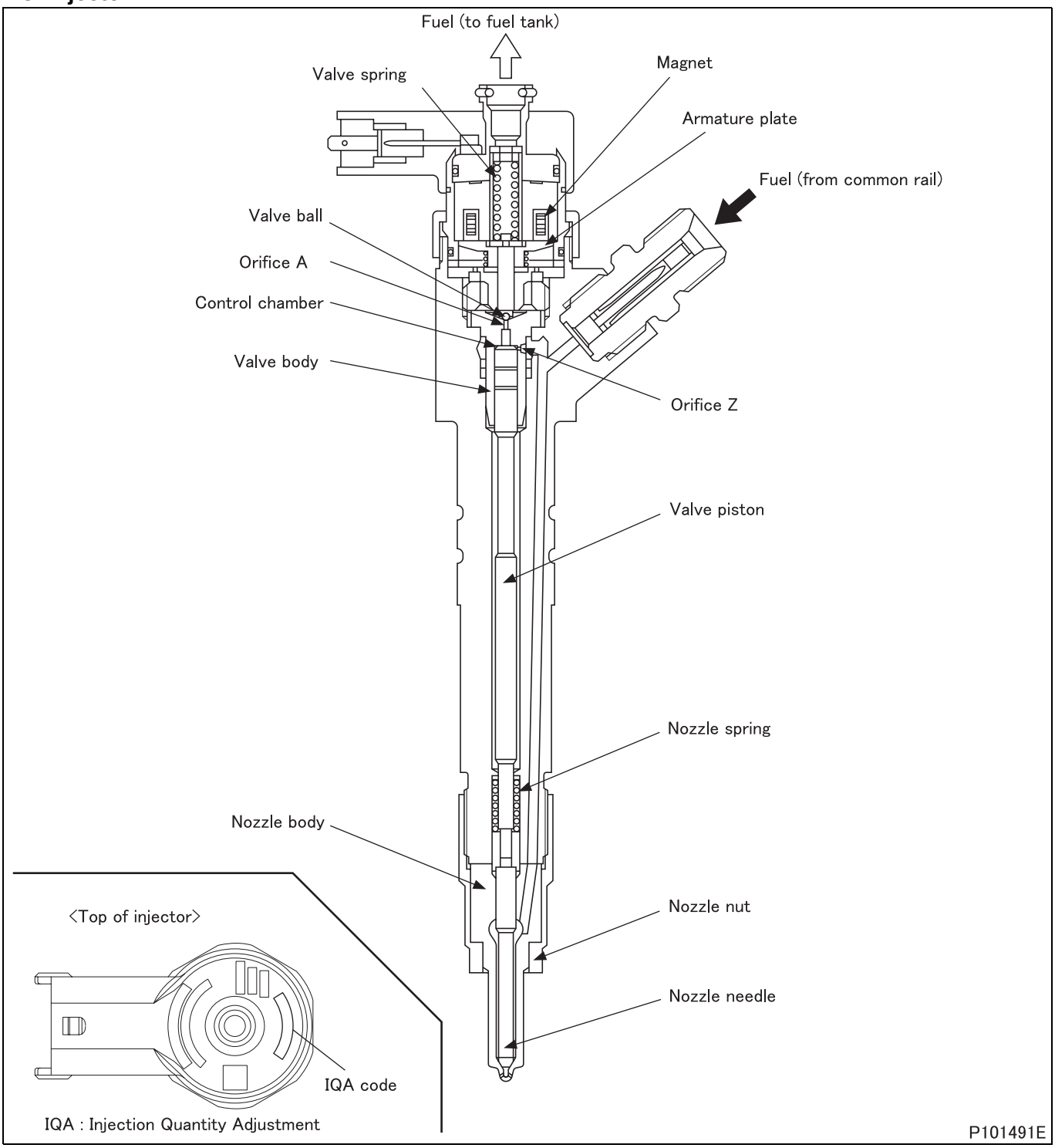


- The common rail distributes to the injectors high-pressure fuel that has been fed from the supply pump.
- Each flow limiter prevents an abnormal outflow of fuel. It does so by blocking the fuel passage in the event of fuel leakage from the injection pipe or excessive injection of fuel from the injector.
- 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.

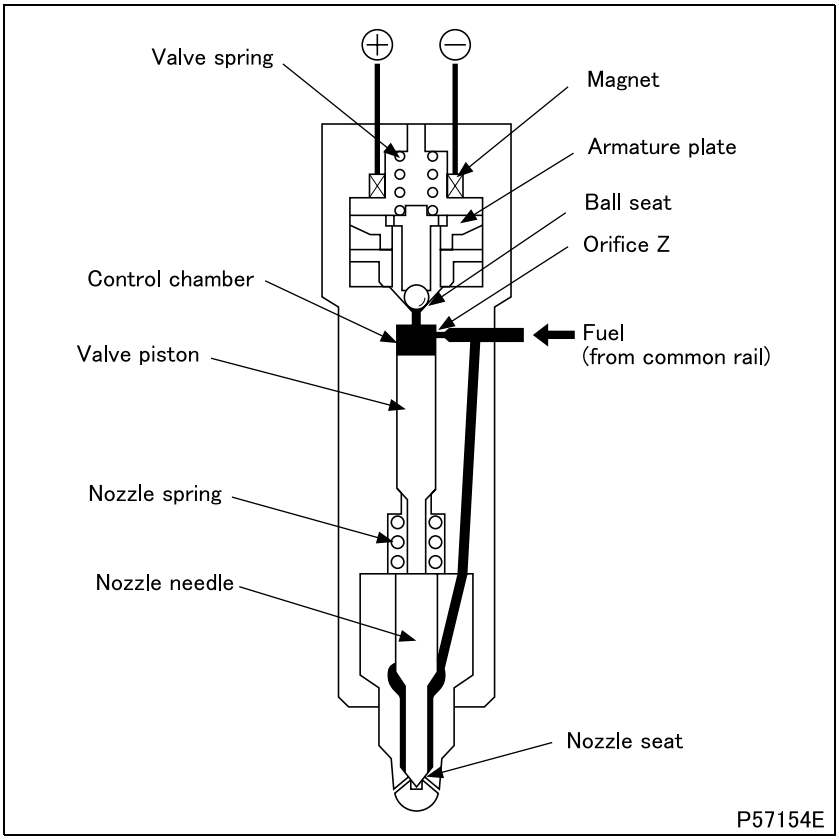
Flow limiter

- 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



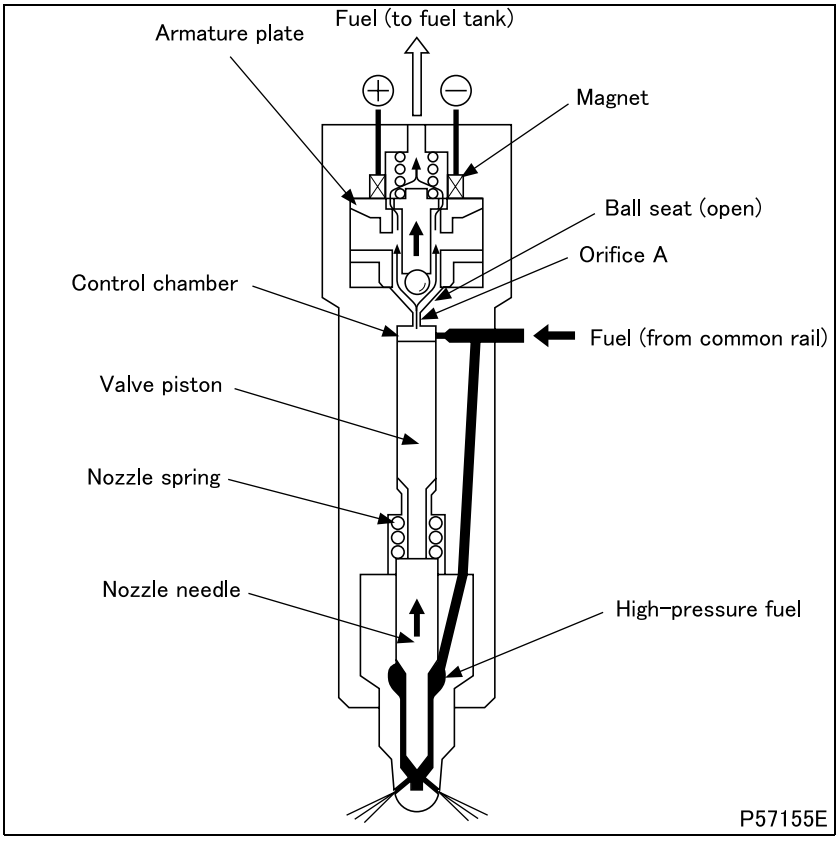
- In accordance with electrical signals from the engine electronic control unit, the injector supplies high-pressure fuel from the common rail to the relevant combustion chamber of the engine at the optimal timing and in the optimal quantity.
- The injector is divided into the control section and injector 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.



(1) Operation

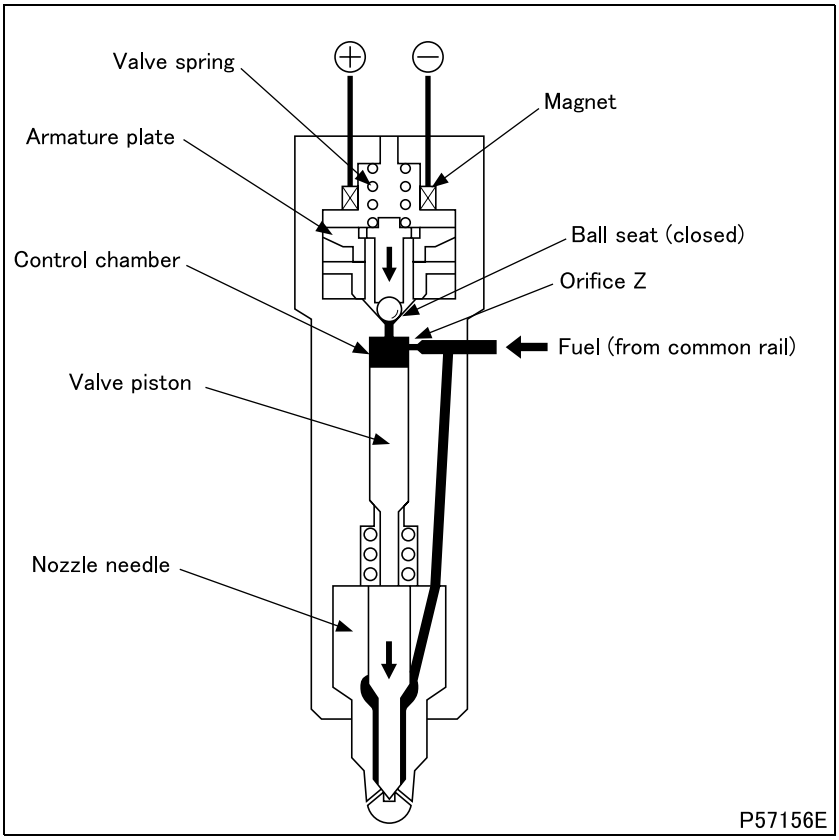
(1.1) Injection not taking place

- 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.

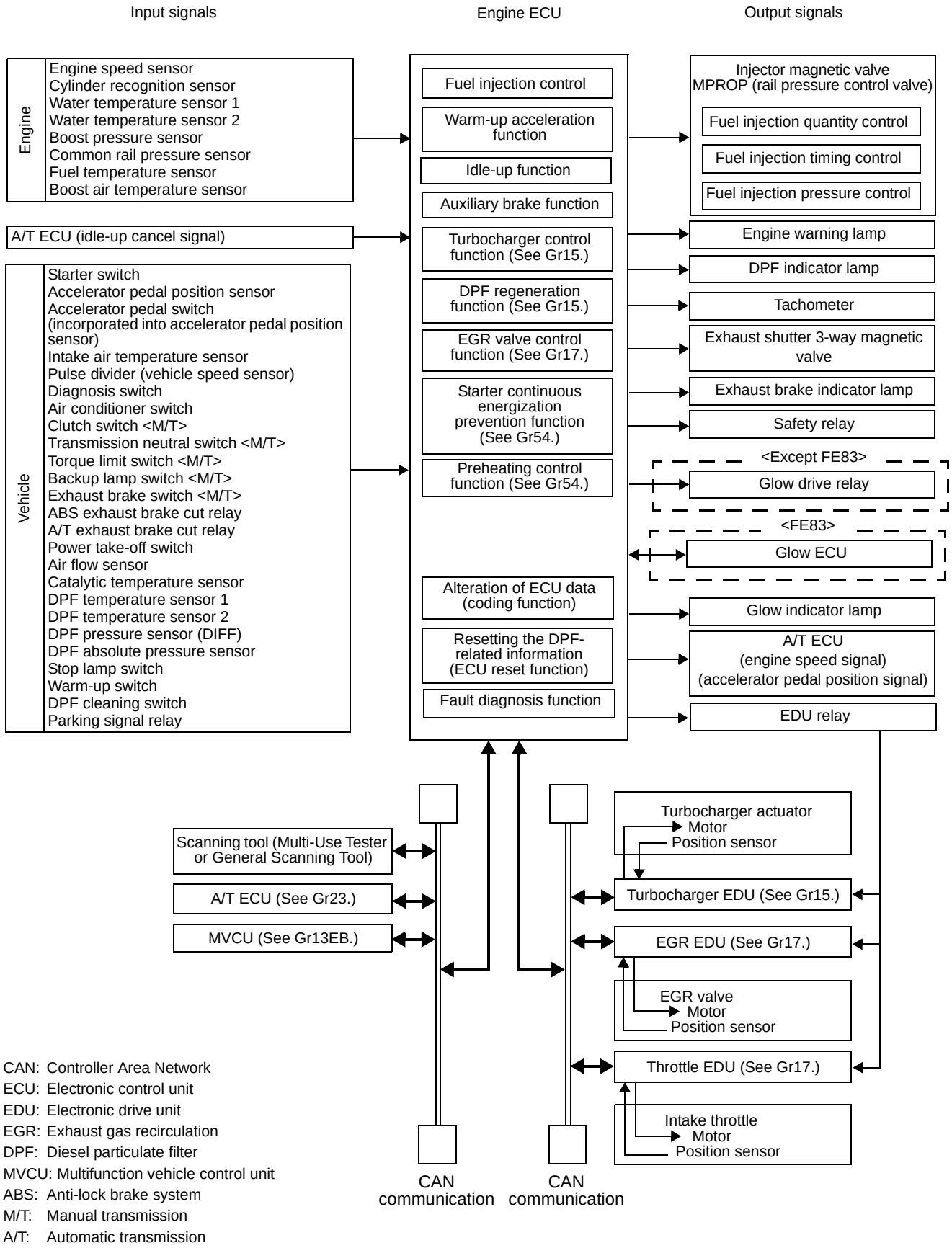


(1.3) End of injection

- 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.

2. Electronic Control System

2.1 System block diagram

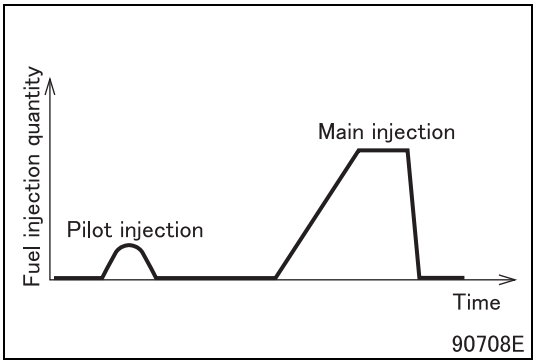


CAN: Controller Area Network
ECU: Electronic control unit
EDU: Electronic drive unit
EGR: Exhaust gas recirculation
DPF: Diesel particulate filter
MVCU: Multifunction vehicle control unit
ABS: Anti-lock brake system
M/T: Manual transmission
A/T: Automatic transmission

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	• Backup of coolant temperature • Sensing of coolant temperature for temperature gauge
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)
Warm-up switch	Warm-up acceleration
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 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

Part name		Main function/operation
Tachometer		Indicates engine speed (revolutions per minute)
Exhaust shutter 3-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

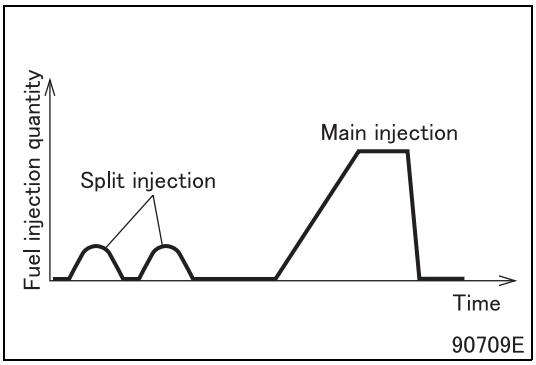
M E M O



2.2 Fuel injection rate control

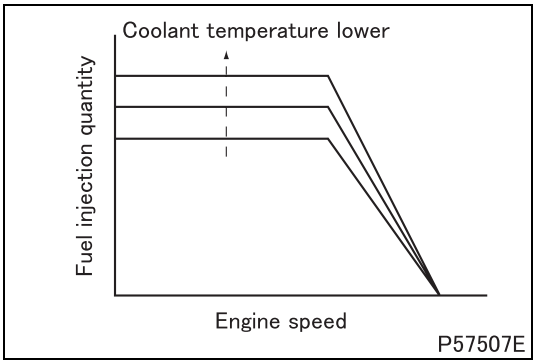
(1) Pilot injection

- 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

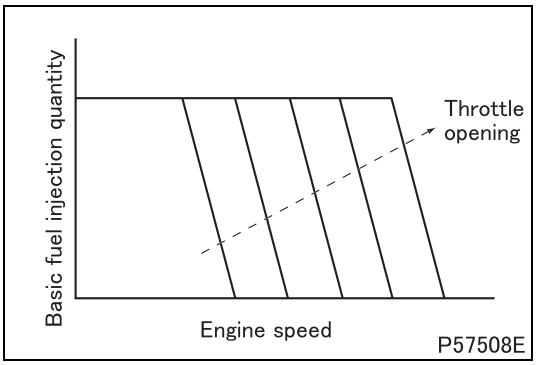
- Split injection entails the injection of an extremely small amount of fuel two or more times ahead of the main injection.
- Split injection increases the fuel's combustibility and thus enhances the engine's cold startability.



2.3 Fuel injection quantity control

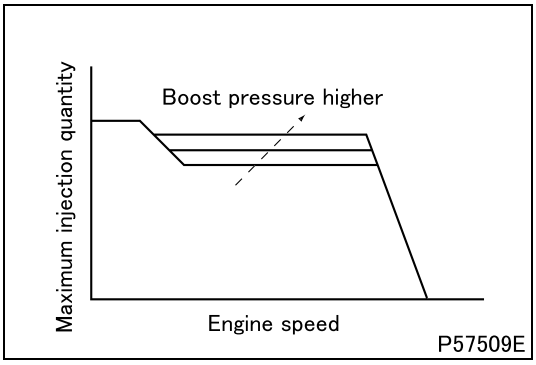
(1) Fuel injection quantity during engine startup

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



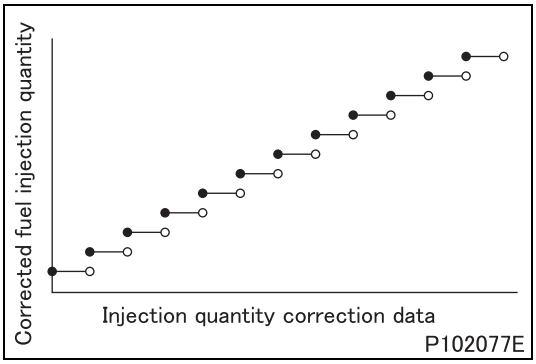
(2) Basic fuel injection quantity

- 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.

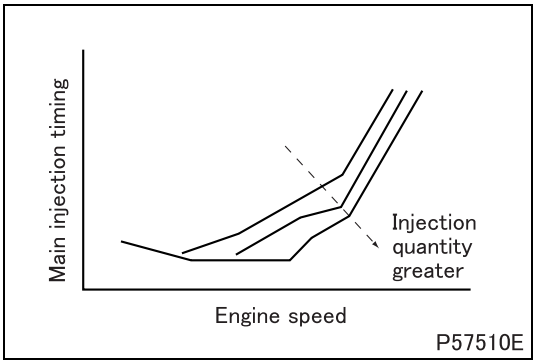


(4) Injection quantity correction

- 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.

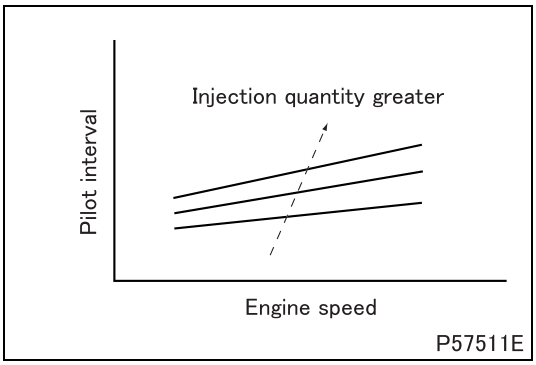
2.4 Fuel injection timing control

(1) Main injection timing



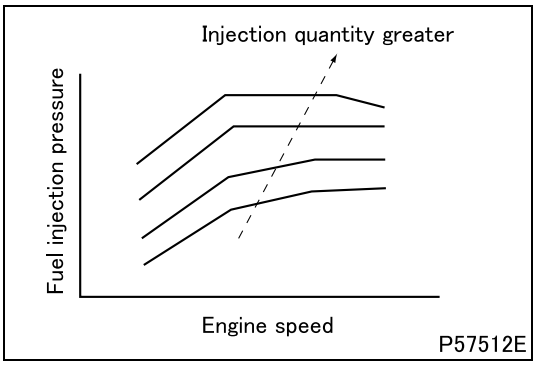
- The main injection timing is calculated from the fuel injection quantity and engine speed.

(2) Pilot injection timing (pilot interval)



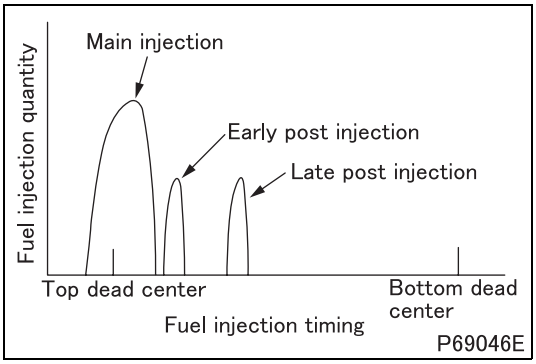
- The pilot interval is calculated from the fuel injection quantity and engine speed.

2.5 Fuel injection pressure control



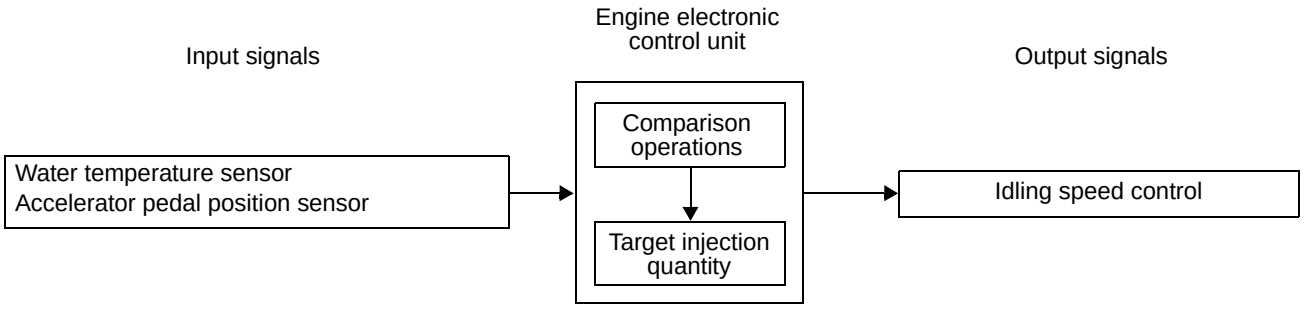
- The fuel injection pressure is calculated from the fuel injection quantity and engine speed.

2.6 Fuel injection control for DPF regeneration



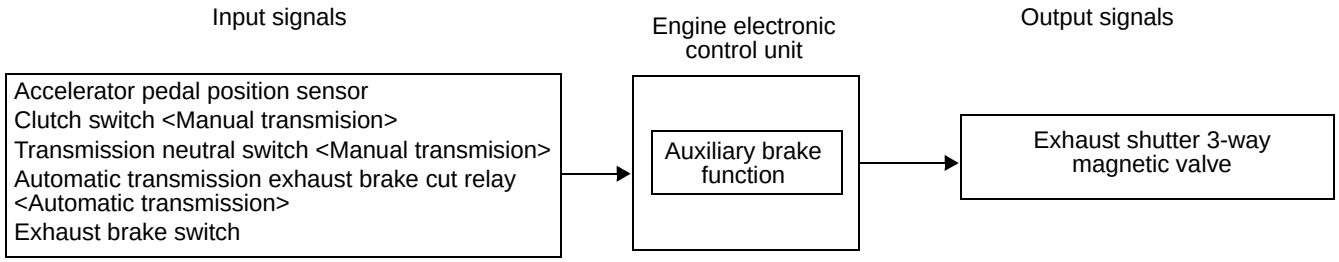
- Fuel injection control for diesel particular filter regeneration is performed in such a way, with early post injection and late post injection added after conventional fuel injection (main injection), exhaust gas temperature is increased to burn out particulate matter (PM) collected in the DPF.

2.7 Warm-up acceleration function



- The warm-up acceleration function accelerates engine warm-up by varying the engine's idling speed in accordance with the engine's coolant temperature.

2.8 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.

2.9 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.

2.10 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, contact your nearest STERLING TRUCKS dealer or STERLING TRUCKS CORPORATION.

2.11 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

2.12 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.

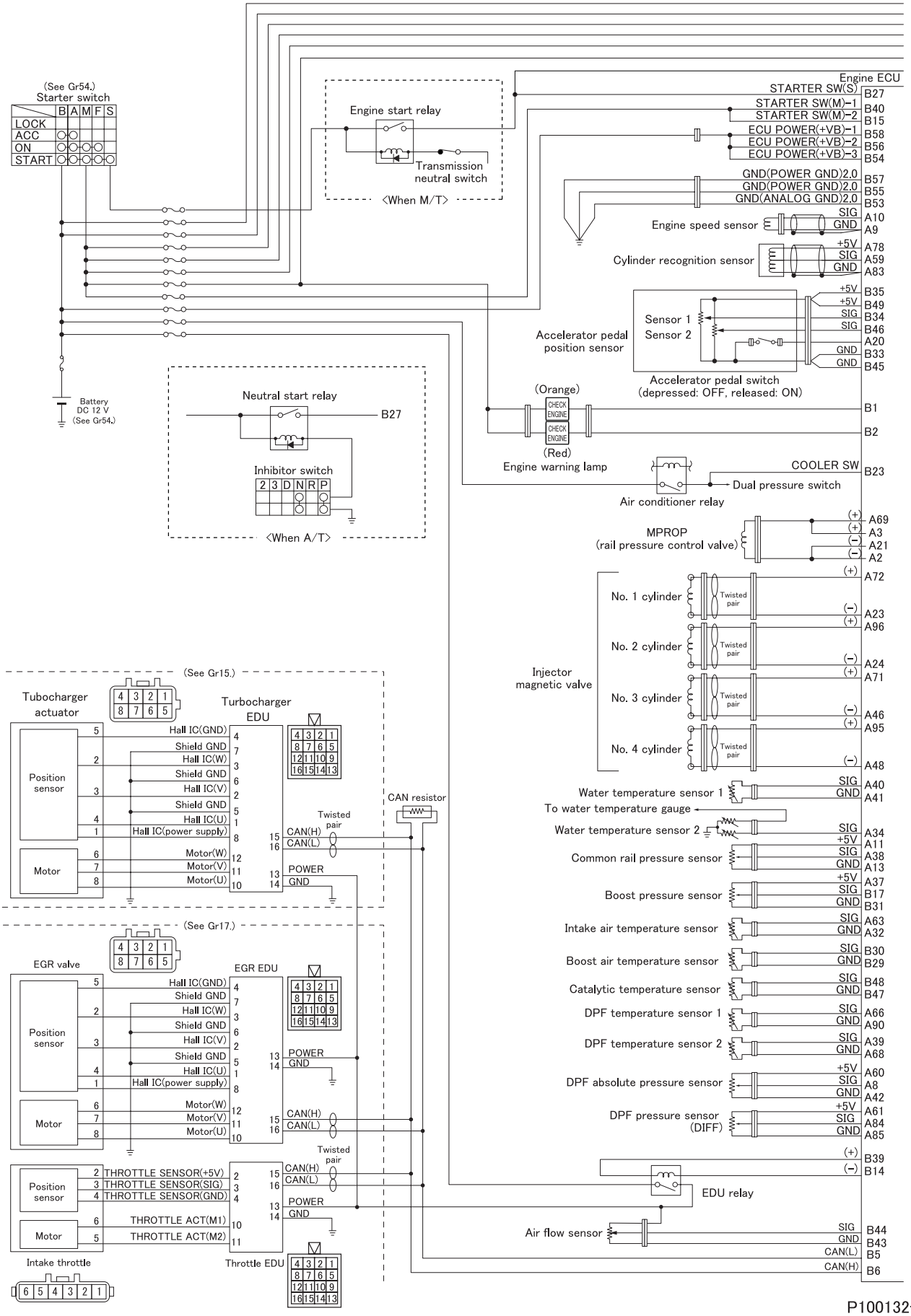
(2) Reading fault code

- 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.

3. Electronic Control Unit Connection Diagram



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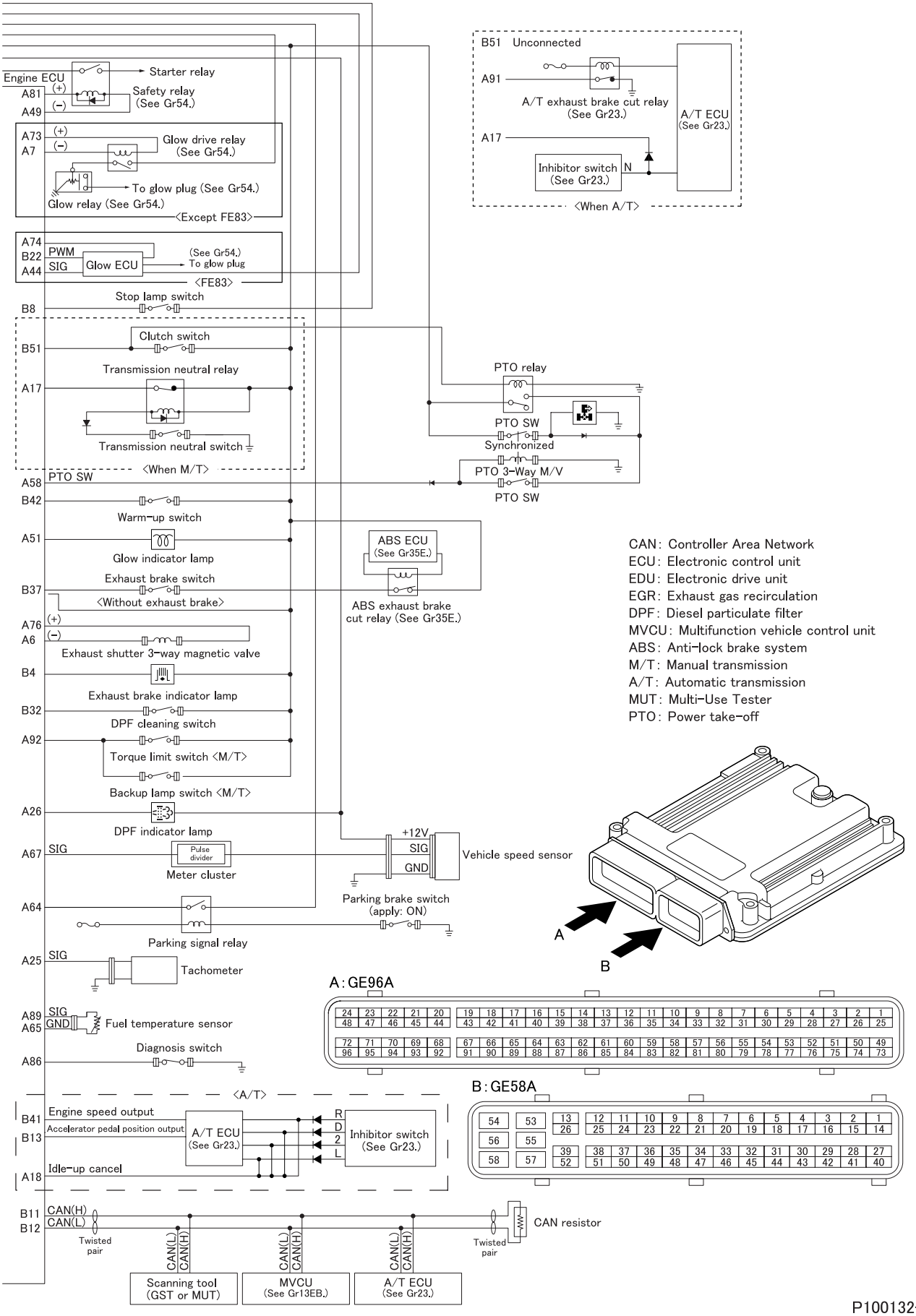
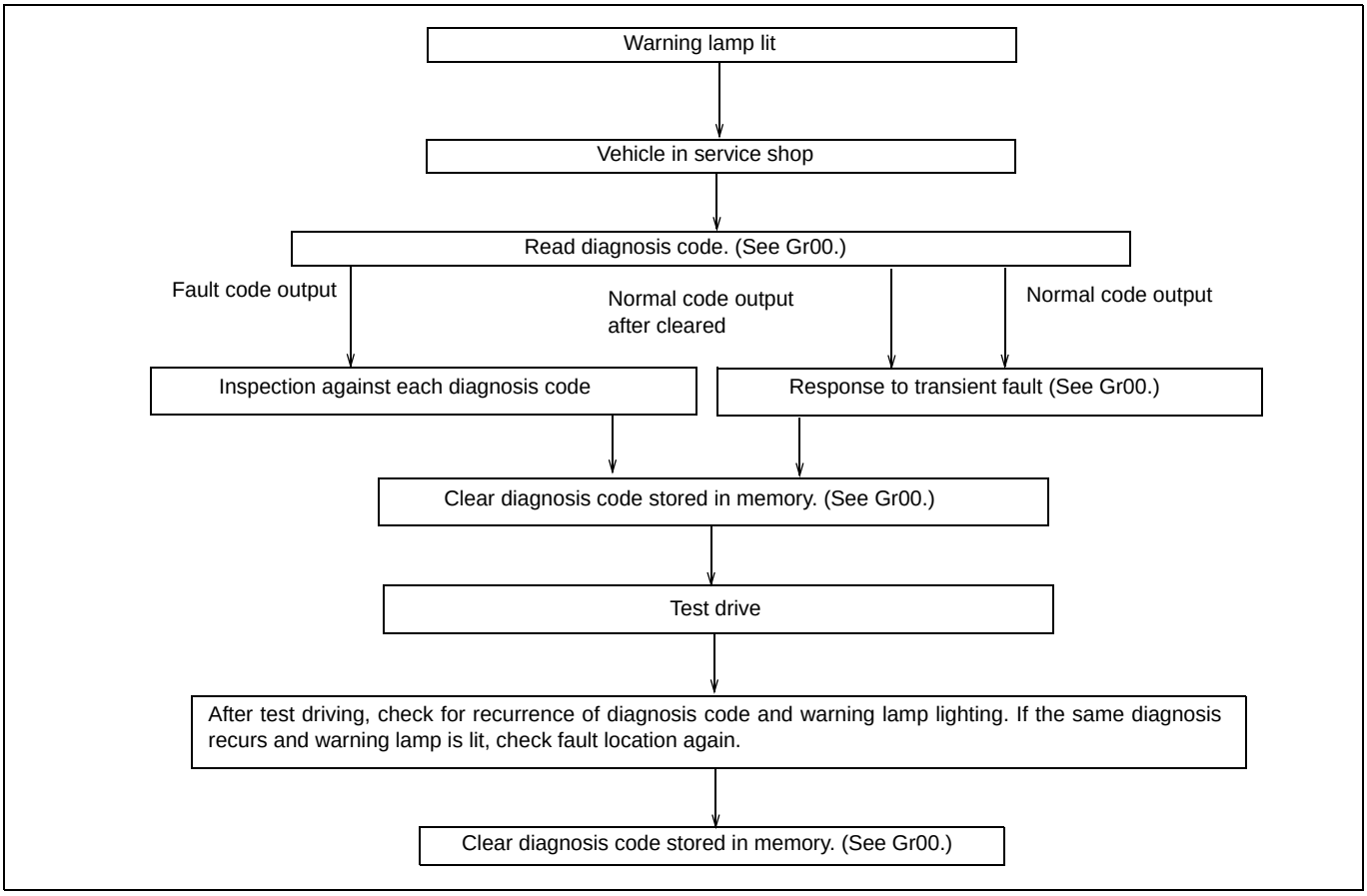

Engine ECU
A81
A49
Starter relay
Safety relay
(See Gr54.)
A73
A7
Glow drive relay
(See Gr54.)
To glow plug (See Gr54.)
Glow relay (See Gr54.)
<Except FE83>
A74
B22
A44
PWM
SIG
Glow ECU
(See Gr54.)
To glow plug
<FE83>
Stop lamp switch
B8
B51
Clutch switch
A17
Transmission neutral relay
Transmission neutral switch
<When M/T>
A58
PTO SW
B42
Warm-up switch
A51
Glow indicator lamp
B37
Exhaust brake switch
<Without exhaust brake>
A76
A6
Exhaust shutter 3-way magnetic valve
B4
Exhaust brake indicator lamp
B32
DPF cleaning switch
A92
Torque limit switch <M/T>
Backup lamp switch <M/T>
A26
DPF indicator lamp
A67
SIG
Pulse divider
Meter cluster
A64
Parking signal relay
A25
SIG
Tachometer
A89
A65
SIG
GND
Fuel temperature sensor
A86
Diagnosis switch
<A/T>
B41
B13
A18
Engine speed output
Accelerator pedal position output
Idle-up cancel
A/T ECU
(See Gr23.)
R
D
2
L
Inhibitor switch
(See Gr23.)
B11
B12
CAN(H)
CAN(L)
Twisted pair
CAN resistor
Scanning tool
(GST or MUT)
MVCU
(See Gr13EB.)
A/T ECU
(See Gr23.)
B51 Unconnected
A91
A/T exhaust brake cut relay
(See Gr23.)
A/T ECU
(See Gr23.)
A17
Inhibitor switch
(See Gr23.)
N
<When A/T>
PTO relay
PTO SW
Synchronized
PTO 3-Way M/V
PTO SW
ABS ECU
(See Gr35E.)
ABS exhaust brake
cut relay (See Gr35E.)
+12V
SIG
GND
Vehicle speed sensor
Parking brake switch
(apply: ON)
CAN: Controller Area Network
ECU: Electronic control unit
EDU: Electronic drive unit
EGR: Exhaust gas recirculation
DPF: Diesel particulate filter
MVCU: Multifunction vehicle control unit
ABS: Anti-lock brake system
M/T: Manual transmission
A/T: Automatic transmission
MUT: Multi-Use Tester
PTO: Power take-off
A
B
A: GE96A
B: GE58A

P100132-2E

TROUBLESHOOTING

1. Diagnosis Procedure

- Carry out system inspection in accordance with the flow chart given below.
- System inspection is roughly divided into two types as follows according to trouble symptom and diagnosis code.
  - Inspection against each diagnosis code stored in memory by the electronic control unit
  - Response to transient fault



2. Diagnostic Precautions

- Before measuring voltage, check the charge and specific gravity of the battery. If system inspection is performed with the battery uncharged or reduced in specific gravity, accurate measurements cannot be achieved.
- To avoid possible damage to electric parts, set the starter switch and lighting switch to LOCK or OFF before disconnecting and reconnecting battery terminals.
- Before disconnecting connectors, set the starter to LOCK or OFF, then allow at least 20 seconds. Voltage may remain in electric parts or connected circuit.
- When performing measurement with the tester, internal circuit and other electrical parts of the electronic control unit could be damaged by the test bar. To avoid it, handle the test bar carefully not to cause a short-circuit failure between connector terminals or between connector and body.
- Resistance is affected by temperature. Determine the necessity of resistance measurement by reference to given temperature specification as a guide. Otherwise, use normal temperature (10 to 35°C {50 to 95°F}) as the measuring condition.

NOTE

When installing the new electronic control unit by the replacement, the data must be stored in the electronic control unit. (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	O		Fuel system	IMD
P0003	63	Failure of MPROP (rail pressure control valve)	Low signal range check	O		Fuel system (Low)	IMD
P0004	63	Failure of MPROP (rail pressure control valve)	High signal range check	O		Fuel system (High)	IMD
*P0016	12, 14, 15	Both speed sensor (Engine speed sensor, Cylinder recognition sensor)	• Cam/crank signals present • Gap phase shift	O		Ne SNSR Offset/Backup Mode	IMD
P0045	51	Failure of turbocharger actuator	Circuit	O		VGT Acutuator (Open)	2DC
P0046	51	Failure of turbocharger actuator	Circuit	O		VGT Acutuator (Performance)	2DC
P0047	51	Failure of turbocharger actuator	Circuit	O		VGT Acutuator (Low)	2DC
P0069	19	Characteristic abnormality of atmospheric pressure sensor (built into engine electronic control unit)	Gain and offset drift	O		Boost Press SNSR (Correlation)	2DC
P0087	36	Abnormality of common rail pressure (comparison)	Rail pressure regulator adjustment	O		CRS (Too Low)	IMD
*P0088	23	Abnormality of common rail pressure (pressure: high)	Plausibility	O	O	CRS (Too High)	IMD
P0089	63	Failure of MPROP (rail pressure control valve)	Overload	O		MPROP (Over Load)	IMD
P0090	63	Failure of MPROP (rail pressure control valve)	MPROP (rail pressure control valve) open – circuit	O		MPROP (Open Circuit)	IMD
P0091	63	Failure of MPROP (rail pressure control valve)	MPROP (rail pressure control valve) short circuit	O		MPROP (Low)	IMD
P0092	63	Failure of MPROP (rail pressure control valve)	MPROP (rail pressure control valve) short circuit	O		MPROP (High)	IMD
P0093	22	Abnormality of common rail pressure (fuel leakage)	Fuel leakage		O	CRS (Fuel Leak)	IMD
P0097	9	Failure of boost air temperature sensor	Low signal range check	O		INT Air Temp SNSR2 (Low)	2DC

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		
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	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

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		
P0223	16	Failure of accelerator pedal position sensor 2	High signal range check	O		Accel Pedal Sensor 2	IMD
P0226	28	Failure of intake throttle	• Signal range check • Ref voltage	O		Throttle Valve Position	2DC
*P0234	32, 54	Overboost	Overboost	O	O	Over Boost	2DC IMD
P0236	32	Characteristic abnormality of boost pressure sensor	• Offset and gain drift (High) • Offset and gain drift (Low)	O		Boost Press SNSR (Plausi)	2DC
P0237	32	Failure of boost pressure sensor	Low signal range check	O		Boost Press SNSR (Low)	2DC
P0238	32	Failure of boost pressure sensor	High signal range check	O		Boost Press SNSR (High)	2DC
P0251	36	Valve opening of common rail safety valve (DBV)	Common rail pressure (maximum)		O	Common Rail Pressure Defect	IMD
P0253	22	Rail pressure is abnormal (to low) during opening of safety valve (DBV).	Common rail pressure (minimum)		O	Common Rail Pressure Defect	IMD
*P0254	23	Rail pressure is abnormal (to high) during opening of safety valve (DBV).	• Pressure shock • Not open • Common rail pressure (maximum)		O	Common Rail Pressure Defect	IMD
P0261	37	Failure of injector magnetic valve (No. 1 cylinder)	Injector short circuit (No. 1 cylinder)	O		Injector #1-A (Low)	IMD
P0262	37	Failure of injector magnetic valve (No. 1 cylinder)	Injector short circuit (No. 1 cylinder)	O		Injector #1-A (High)	IMD
▲P0263	53	Abnormality in cylinder balance correction	Cylinder balancing out of range	O		Injector #1-A (Plausibility)	2DC
P0264	8	Failure of injector magnetic valve (No. 2 cylinder)	Injector short circuit (No. 2 cylinder)	O		Injector #2-A (Low)	IMD
P0265	8	Failure of injector magnetic valve (No. 2 cylinder)	Injector short circuit (No. 2 cylinder)	O		Injector #2-A (High)	IMD
▲P0266	53	Abnormality in cylinder balance correction	• Cylinder balancing out of range • Sensor signal range check • Ref voltage	O		Injector #2-A (Plausibility)	2DC
P0267	38	Failure of injector magnetic valve (No. 3 cylinder)	Injector short circuit (No. 3 cylinder)	O		Injector #3-A (Low)	IMD
P0268	38	Failure of injector magnetic valve (No. 3 cylinder)	Injector short circuit (No. 3 cylinder)	O		Injector #3-A (High)	IMD
▲P0269	53	Abnormality in cylinder balance correction	Cylinder balancing out of range	O		Injector #3-A (Plausibility)	2DC
P0270	39	Failure of injector magnetic valve (No. 4 cylinder)	Injector short circuit (No. 4 cylinder)	O		Injector #4-A (Low)	IMD
P0271	39	Failure of injector magnetic valve (No. 4 cylinder)	Injector short circuit (No. 4 cylinder)	O		Injector #4-A (High)	IMD
▲P0272	53	Abnormality in cylinder balance correction	Cylinder balancing out of range	O		Injector #4-A (Plausibility)	2DC
▲P0299	32	Underboost	Underboost	O		Turbocharger (Underboost)	2DC
▲P0300	45	Cylinder misfire (multiple cylinders)	Misfire multiple cylinders	O		Multiple Cylinder Misfire	2DC

IMD: Immediate

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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	O		Cylinder 1 Misfire	2DC
▲P0302	45	Cylinder misfire (individual cylinders)	Misfire individual cylinder 2	O		Cylinder 2 Misfire	2DC
▲P0303	45	Cylinder misfire (individual cylinders)	Misfire individual cylinder 3	O		Cylinder 3 Misfire	2DC
▲P0304	45	Cylinder misfire (individual cylinders)	Misfire individual cylinder 4	O		Cylinder 4 Misfire	2DC
P0335	15	Failure of engine speed sensor	No pulse check	O		Engine Revolution SNSR	IMD
*P0339	15	Failure of engine speed sensor	Abnormality of pulse count	O	O	Engine Revolution SNSR (Plausi)	IMD
P0340	12	Failure of cylinder recognition sensor	No pulse check	O		Camshaft Position SNSR	IMD
P0344	12	Failure of cylinder recognition sensor	Abnormality of pulse count	O		Camshaft Position SNSR (Plausi)	IMD
▲P0381	26	Failure of preheating indicator lamp	• Short circuit battery • Short circuit ground • Open circuit • Overload	O		Glow Lamp	2DC
P0383	26	Failure of preheating control	Short circuit ground	O		Relay for Glow Relay	2DC
P0384	26	Failure of preheating control	Short circuit battery	O		Relay for Glow Relay	2DC
P0401	2	Insufficient air flow rate in exhaust gas recirculation system	• Exhaust gas recirculation system insufficient flow • Exhaust gas recirculation mass flow too low	O		EGR Flow (Insufficient)	2DC
P0402	2	Excessive air flow rate in exhaust gas recirculation system	• Exhaust gas recirculation system excessive flow • Exhaust gas recirculation mass flow too high	O		EGR Flow (Excessive)	2DC
P0403	2, 67	Failure of exhaust gas recirculation system	• Circuit • Plausibility	O		EGR1 (Actuator Circuit)	2DC
P0404	67	Failure of exhaust gas recirculation valve	• Circuit • Open valve	O		EGR System	2DC
P0409	67	Failure of exhaust gas recirculation valve	• Low signal range check • High signal range check	O		EGR1 (Position Sensor)	2DC
P0426	42	Characteristic abnormality of catalytic temperature sensor	Gain and offset drift	O		EXH Gas Temp SNSR1 (Plausibility)	2DC
P0427	42	Failure of catalytic temperature sensor	Low signal range check	O		EXH Gas Temp SNSR1 (Low)	2DC
P0428	42	Failure of catalytic temperature sensor	High signal range check	O		EXH Gas Temp SNSR1 (High)	2DC
P0470	92	Characteristic abnormality of DPF absolute pressure sensor and DPF pressure sensor (DIFF)	• Gain drift • Offset and gain drift	O		DPF Press SNSR (Plausi)	2DC
P0471	98	Failure of DPF absolute pressure sensor	Offset drift	O		DPF Press SNSR (Plausi)	2DC

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		
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 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 IMD
*P0563	33	Failure inside engine electronic control unit	High signal range check	O	O	Power Supply Voltage (High)	2DC IMD
P0600	64, 76	Abnormality of speed limitation device system	• Controller area network • Message timeout		O	CAN Communication	IMD
P0605	33	Failure inside engine electronic control unit	Electronic controll 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 controll 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	• Short circuit ground • Open circuit		O	Starter Safety Relay (Low)	IMD
P0617	48	Failure of safety relay	Short circuit battery		O	Starter Safety Relay (High)	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		
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)	• Short circuit battery • Short circuit ground • Open circuit • Overload	O		MIL	2DC
P0652	81	Sensor power supply abnormail	Low signal range check	O		Sensor Supply Voltage 2 (Low)	IMD
P0653	81	Sensor power supply abnormail	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	• Open circuit • Overload • GCU communication error	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

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		
▲■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	• Low signal range check • High signal range check		O	Exhaust Absolute Pressure (High)	IMD
P1411	88	Diesel particulate filter is overheated.	• Low signal range check • High signal range check • Plausibility		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.

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	• Short circuit battery • Short circuit ground • Open circuit • Overload	O		DPF Lamp Control Circuit (Low)	IMD
P2002	92	Diesel particulate filter clogged	Efficiency below threshold (leaking diesel particulate filter)	O		DPF MFF	2DC 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	• Intake throttle valve slow response/steady state position deviation • Circuit check	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)	• Low signal range check • High signal range check • Plausibility		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	• Turbocharger actuator slow response/steady state position deviation • Plausibility • Motor lock	O		VGT System	2DC
P2413	67, 95	Abnormality in exhaust gas recirculation valve position	• Exhaust gas recirculation valve slow response/ steady state position deviation • Plausibility	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)	• Dynamic check • Offset check	O	O	DPF Diff SNSR (Plausi) & MFF	2DC 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.

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 inout	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	• Low signal range check • High signal range check	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 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.)

[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.

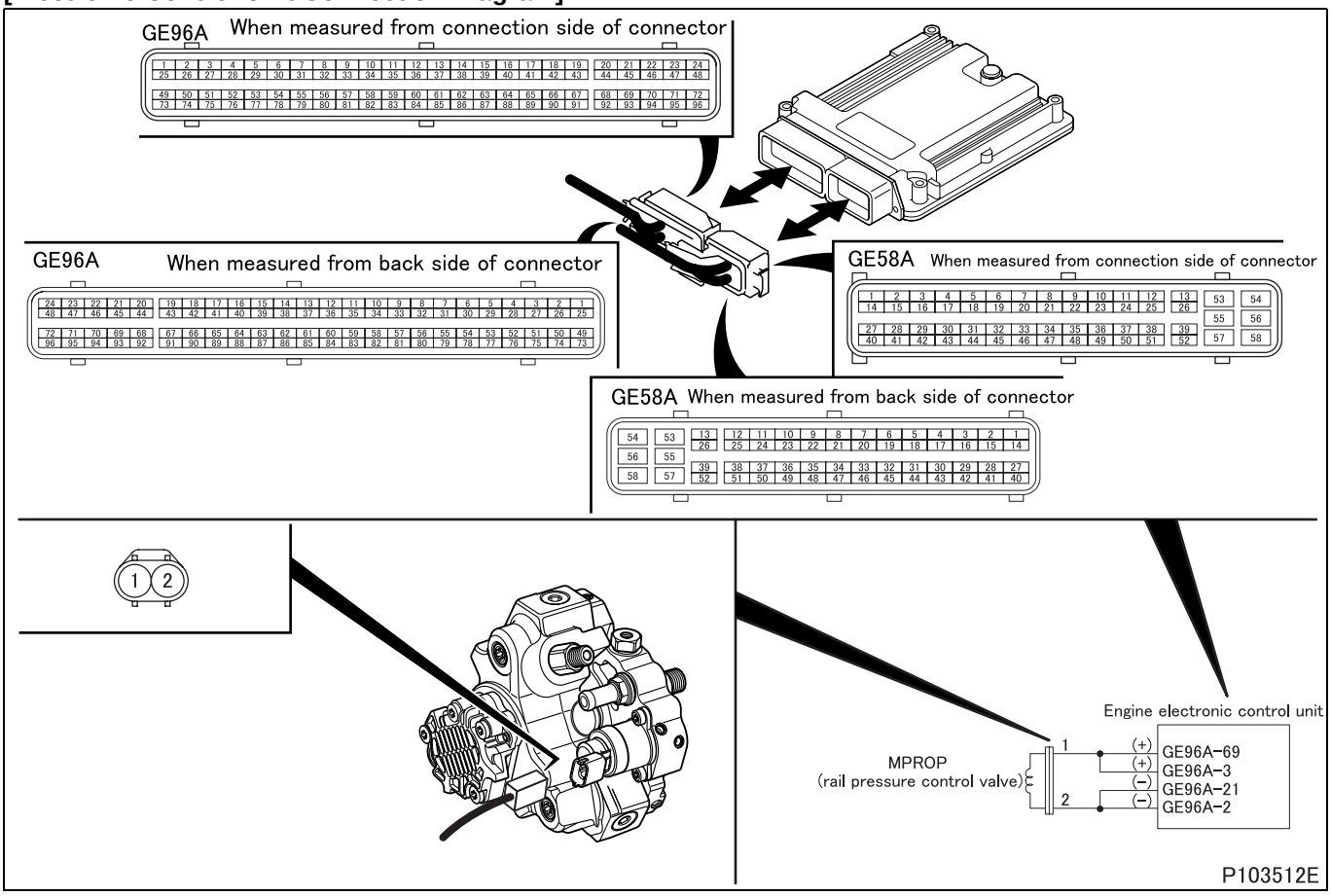
[Diagnostic requirement]
–

[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.

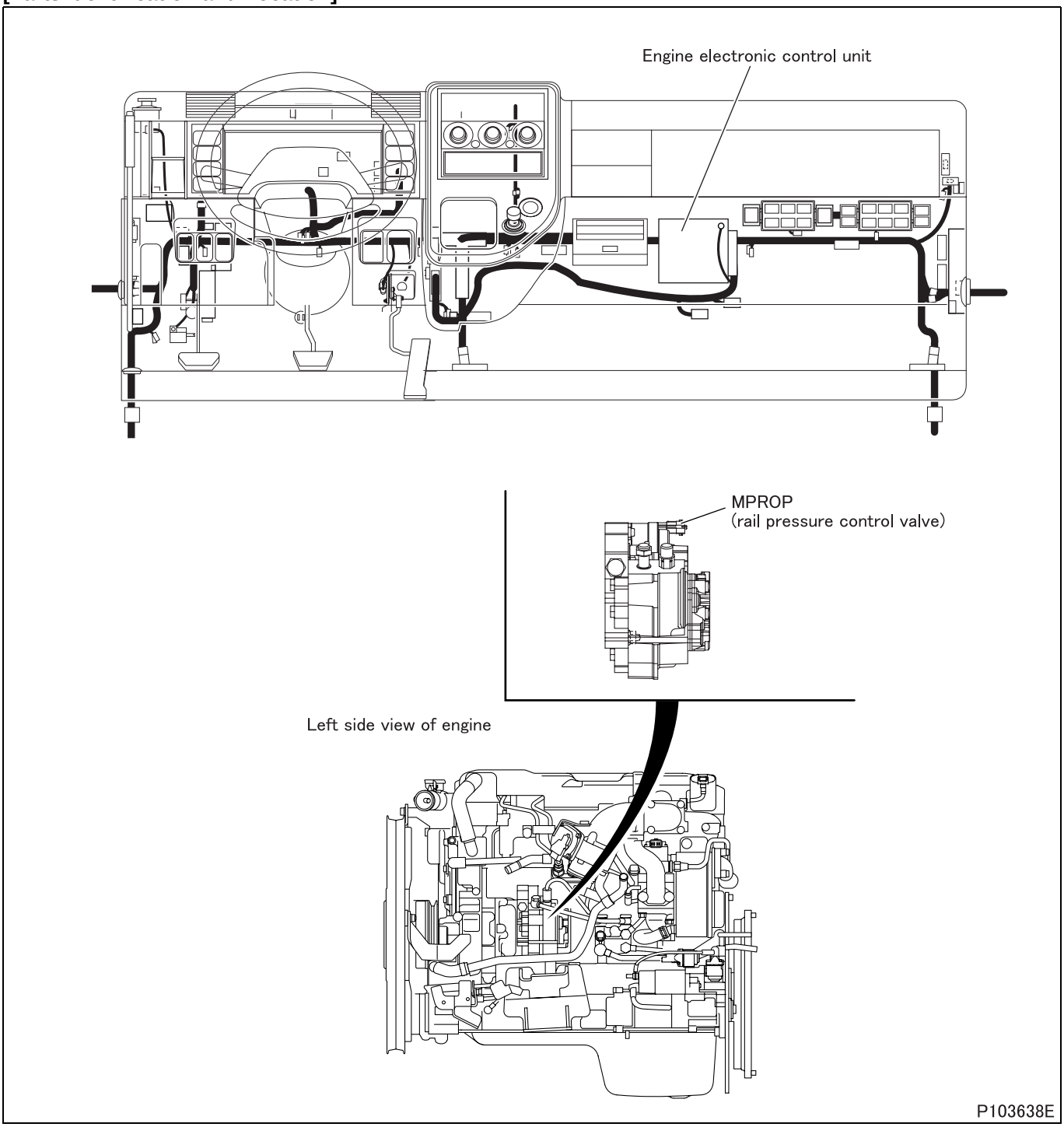
[Probable cause of trouble]
- Open-circuit of harness between electronic control unit and MPROP (rail pressure control valve)
- Malfunction of each connector
- Malfunction of MPROP (rail pressure control valve)
- Malfunction of electronic control unit

[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]



[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 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of supply pump
		NO	Modify connector.

[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.

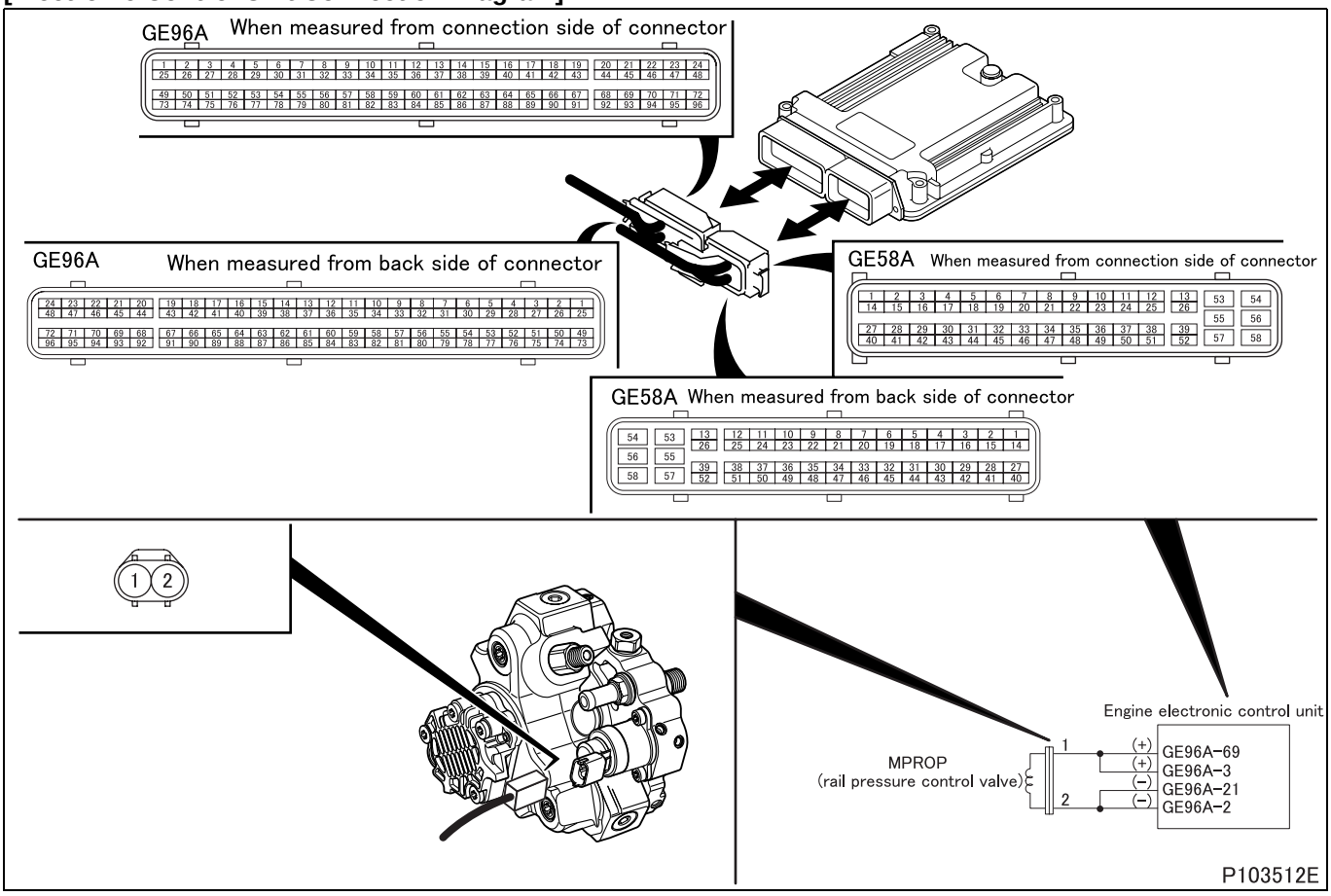
[Diagnostic requirement]
–

[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]



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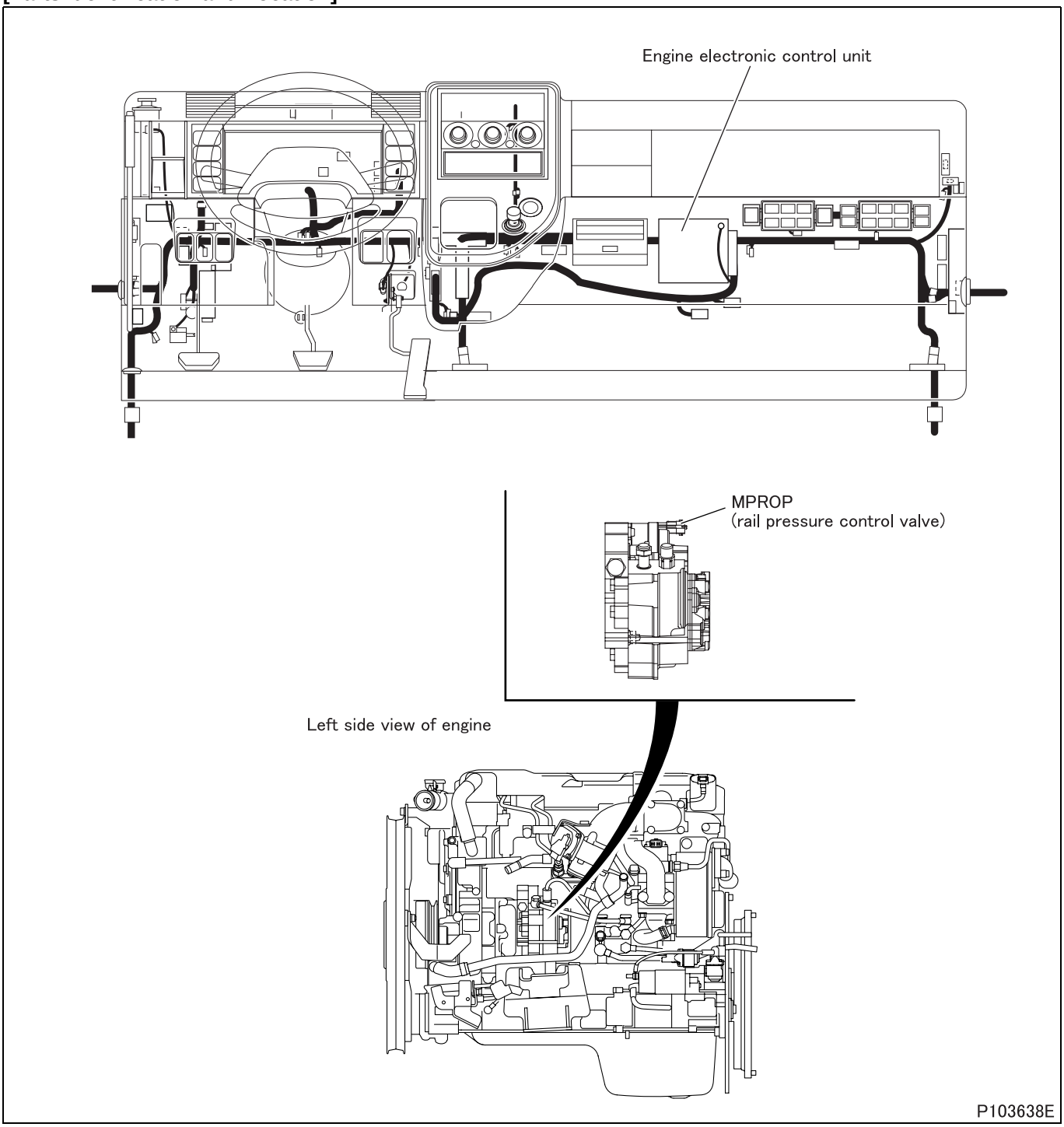


[Fault diagnosis]

- 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of supply pump
		NO	Modify connector.

[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.

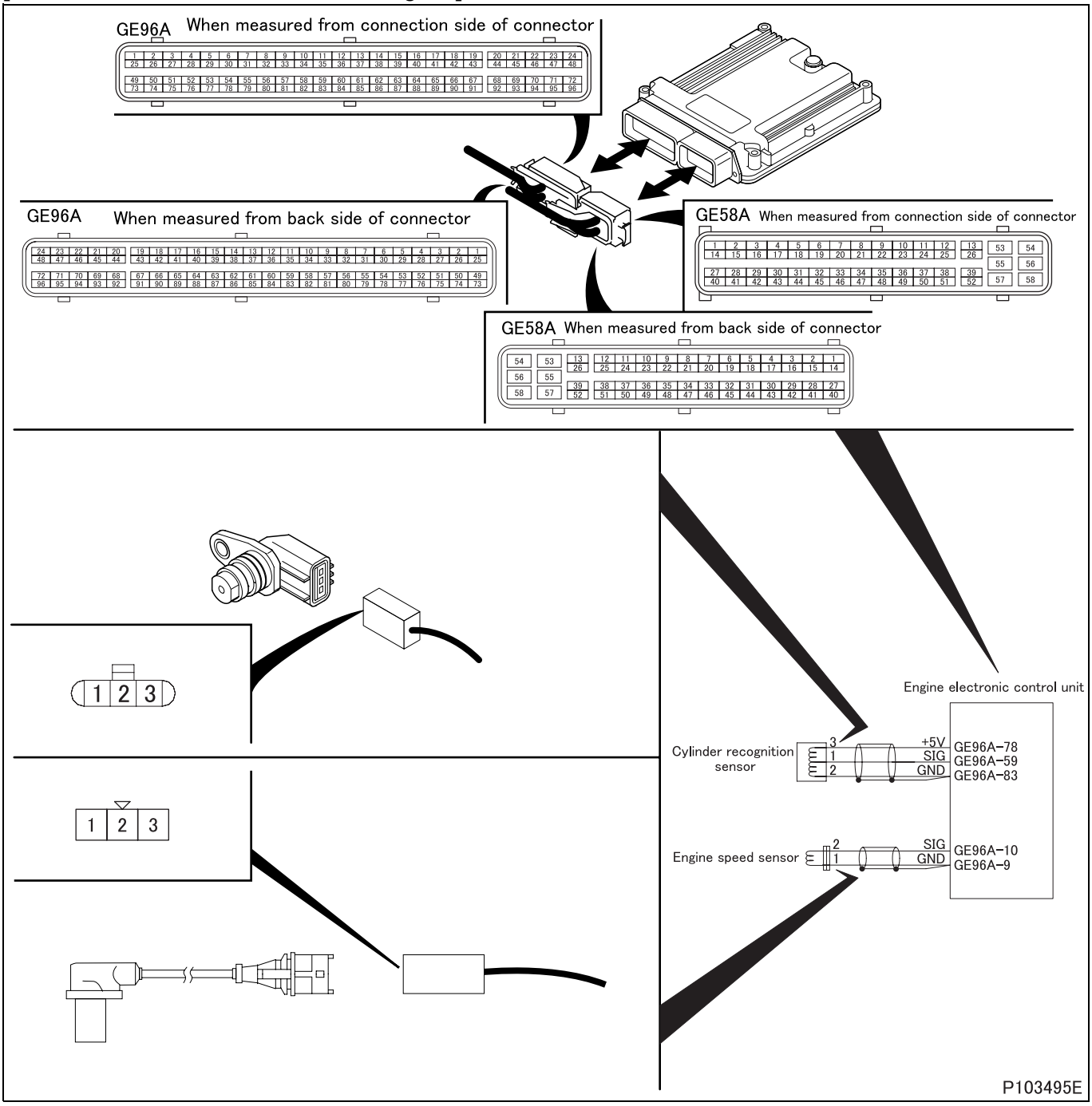
<Condition (2)>

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

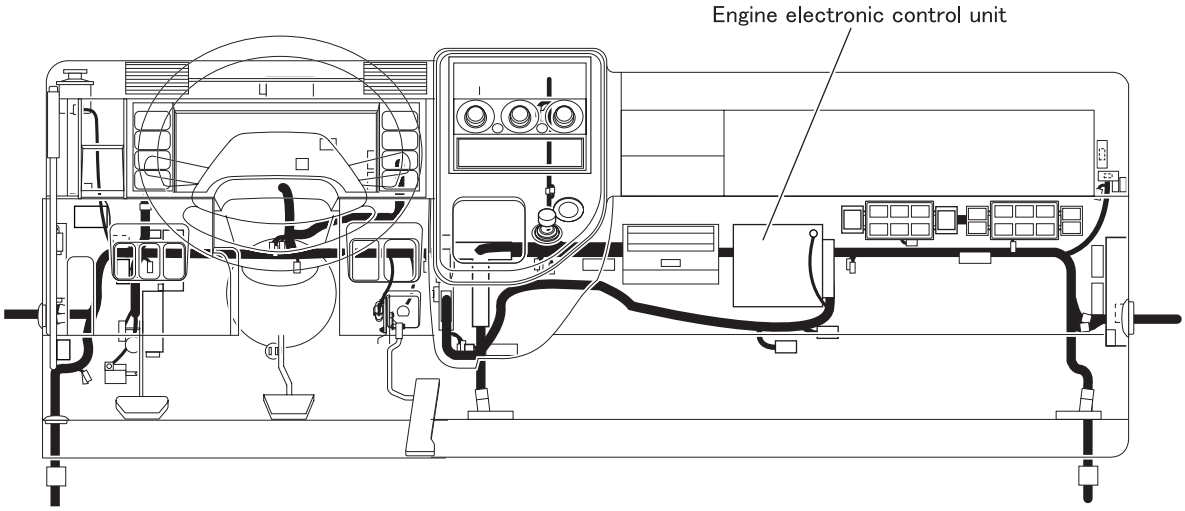
<Condition (3)>

- Diagnosis code is cleared simultaneously with recovery.

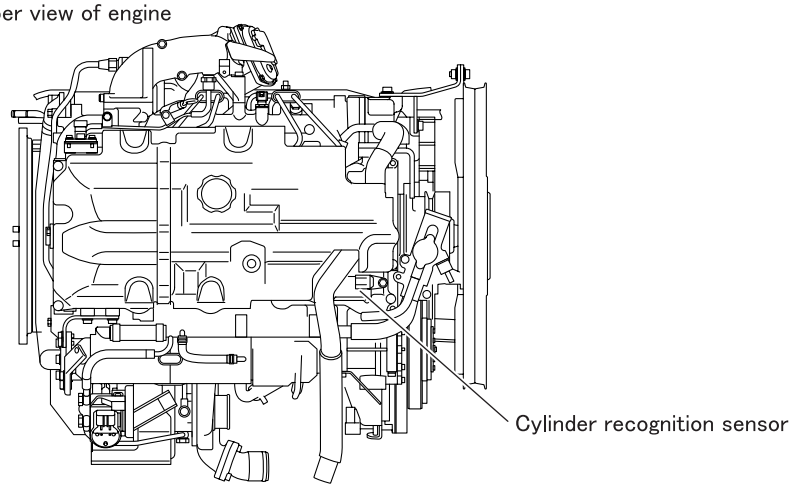
[Electronic Control Unit Connection Diagram]



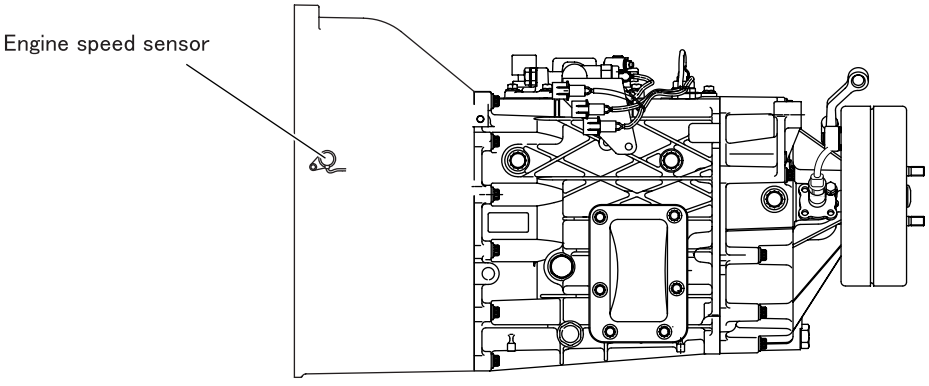
[Parts Identification and Location]



Upper view of engine



Left side view of transmission



P103623E

[Fault diagnosis]

- Perform checks in the sequence of the following steps.

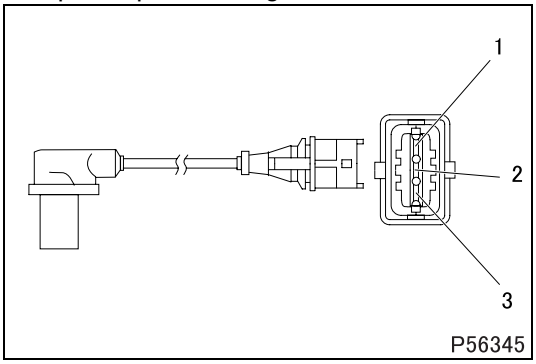
Step 1	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** • Measure item “Ne”. **<Multi-Use Tester used>** • Measure item No. 01 “Engine Revolution” of Service Data.
	Inspection condition		–
	Requirements		Same indication as tachometer is given.
	Inspection 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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>



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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 9.
		NO	Go to step 10.

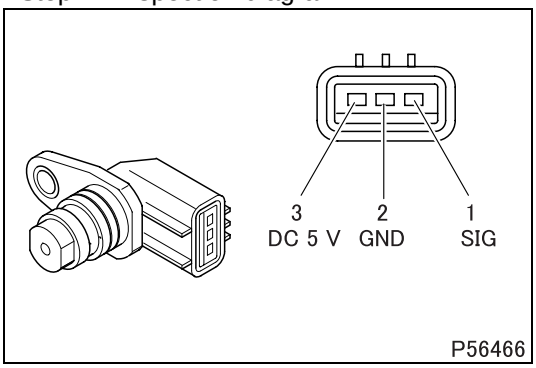
Step 9	Inspection items		Inspection by electronic control unit connector (ground) (cylinder recognition sensor)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 83 (+) and (GE58A) 53 (–).
	Inspection condition		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Remove connector and measure from harness side. • Starter switch: ON
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 15.
		NO	Go to step 14.

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		**<General Scanning Tool used>** • Measure item “Ne”. **<Multi-Use Tester used>** • 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.

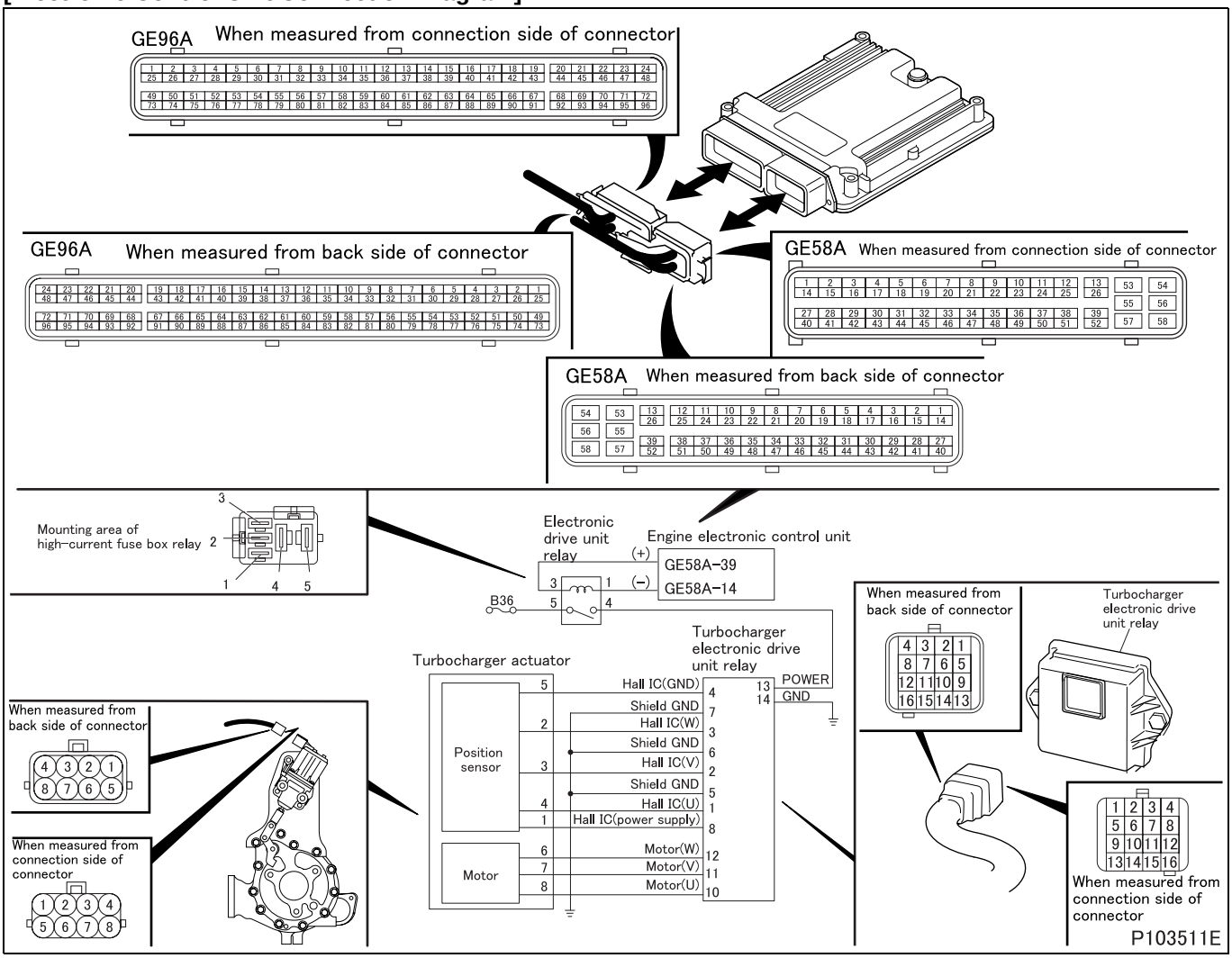
[Diagnostic requirement]
- Controller area network communication in order

[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.

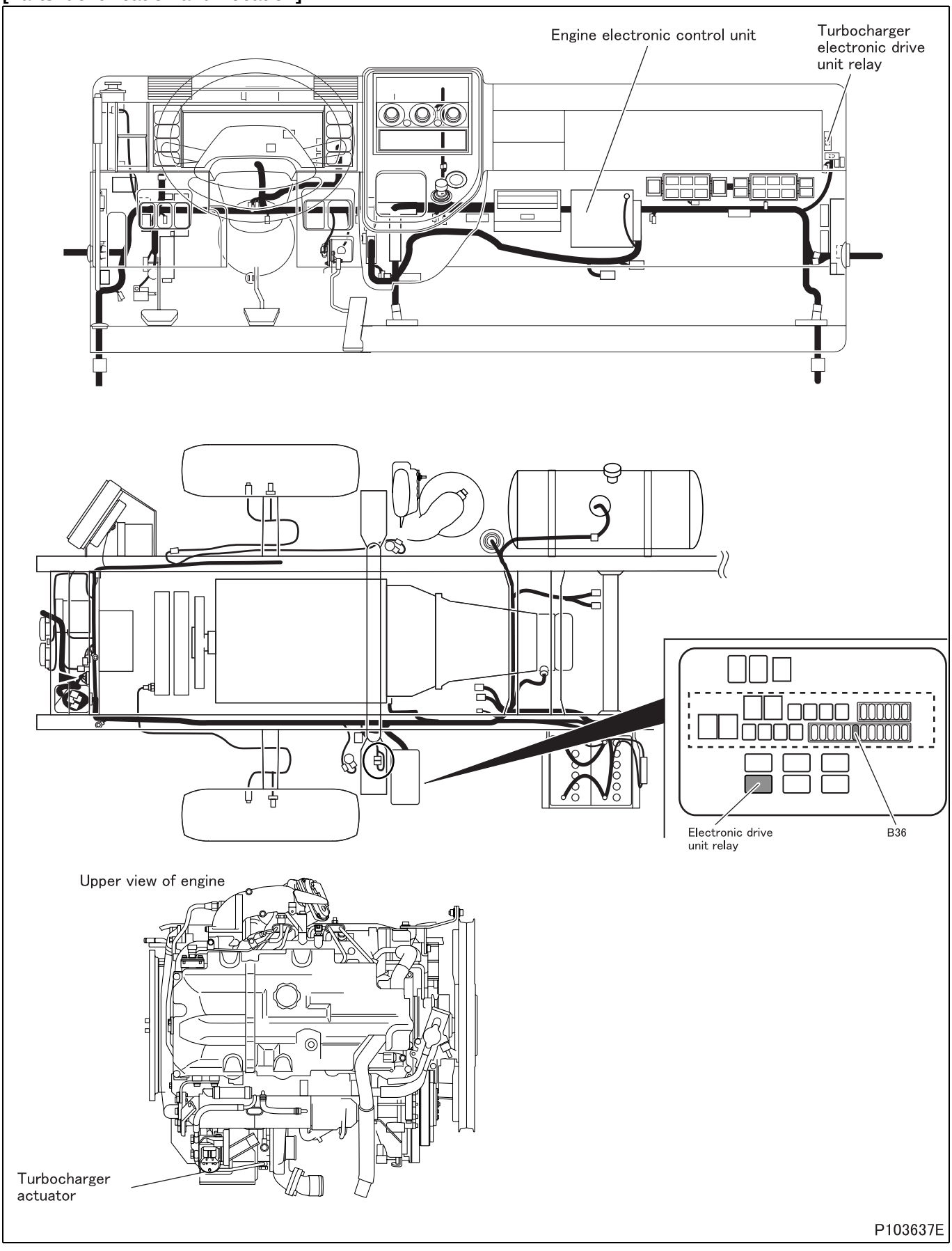
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic drive unit and turbocharger actuator
- Malfunction of each connector
- Malfunction of turbocharger motor (built in turbocharger actuator)
- Malfunction of turbocharger position sensor (built in turbocharger actuator)
- 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.)

[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 actuator test item No. A4 “VGT 1”
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral (parking satisfactory for automatic transmission) • Diagnosis switch: OFF (fuse removed)
	Requirements		Actual position matches with target value set by Multi-Use Tester. (check with service data “54: Target VGT Position, 55: Actual VGT Position”) **NOTE** • **Set turbocharger opening to the range of 20 to 80%.** • **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).**
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)”
	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		• Remove connector and measure from harness side. • Starter switch: ON • Perform actuator test item No. AF “EDU Relay”
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

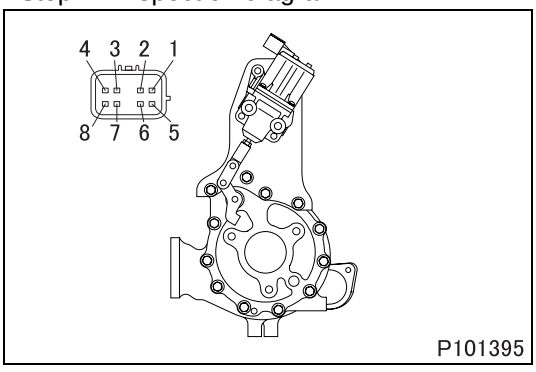
Step 9	Inspection items		Inspection of harness between electronic drive unit and ground
	Maintenance item		Check circuit between following electronic drive unit connector terminals • Electronic drive unit ground: terminal No. 14 - chassis ground • Sensor shield ground (U): terminal No. 5 - 14 • Sensor shield ground (V): terminal No. 6 - 14 • Sensor shield ground (W): terminal No. 7 - 14 • Sensor ground: terminal No. 4 - 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 10.
		NO	Modify harness.

Step 10	Inspection items		Inspection of electronic drive unit connector (motor)
	Maintenance item		Measure value of resistance between following connector terminals. • Between U - V: 10 - 11 • Between U - W: 10 - 12 • Between V - W: 11 - 12
	Inspection condition		–
	Requirements		2.1 ± 0.3 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 turbocharger actuator (motor)
	Maintenance item		Check circuit between following connector terminals. • Motor (U): electronic drive unit connector terminal No. 10 - turbocharger actuator connector terminal No. 8 • Motor (V): electronic drive unit connector terminal No. 11 - turbocharger actuator connector terminal No. 7 • Motor (W): electronic drive unit connector terminal No. 12 - turbocharger actuator connector 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 12.
		NO	Modify harness.

Step 12	Inspection items		Inspection of turbocharger actuator unit (motor)
	Maintenance item		Measure value of resistance between following turbocharger actuator connector terminals • Between U - V: 8 - 7 • Between U - W: 8 - 6 • Between V - W: 7 - 6
	Inspection condition		Keep turbocharger actuator installed on vehicle. Remove harness connector, and measure turbocharger actuator side.
	Requirements		2.1 ± 0.3 Ω
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 13.
		NO	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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 • U signal output: terminal 1 (+) - 4 (–) • V signal output: terminal 2 (+) - 4 (–) • W signal output: terminal 3 (+) - 4 (–)
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON • Perform actuator test item No. A4 “VGT 1”
	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. • Sensor (power supply): electronic drive unit connector terminal No. 8 - turbocharger actuator connector terminal No. 1 • Sensor (U): electronic drive unit connector terminal No. 1 - turbocharger actuator connector terminal No. 4 • Sensor (V): electronic drive unit connector terminal No. 2 - turbocharger actuator connector terminal No. 3 • Sensor (W): electronic drive unit connector terminal No. 3 - turbocharger actuator connector terminal No. 2 • Sensor (ground): electronic drive unit connector terminal No. 4 - turbocharger actuator 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	After replacement of turbocharger, go to step 16
		NO	Modify harness.

Step 16	Inspection items		Inspection by control data
	Maintenance item		Perform actuator test item No. A4 “VGT 1”
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral (parking satisfactory for automatic transmission) • Diagnosis switch: OFF (fuse removed)
	Requirements		Actual position matches with target value set by Multi-Use Tester. (check with service data “54: Target VGT Position, 55: Actual VGT Position”) **NOTE** • **Set turbocharger opening to the range of 20 to 80%.** • **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).**
	Inspection result (Is the judging standard satisfied?)	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.

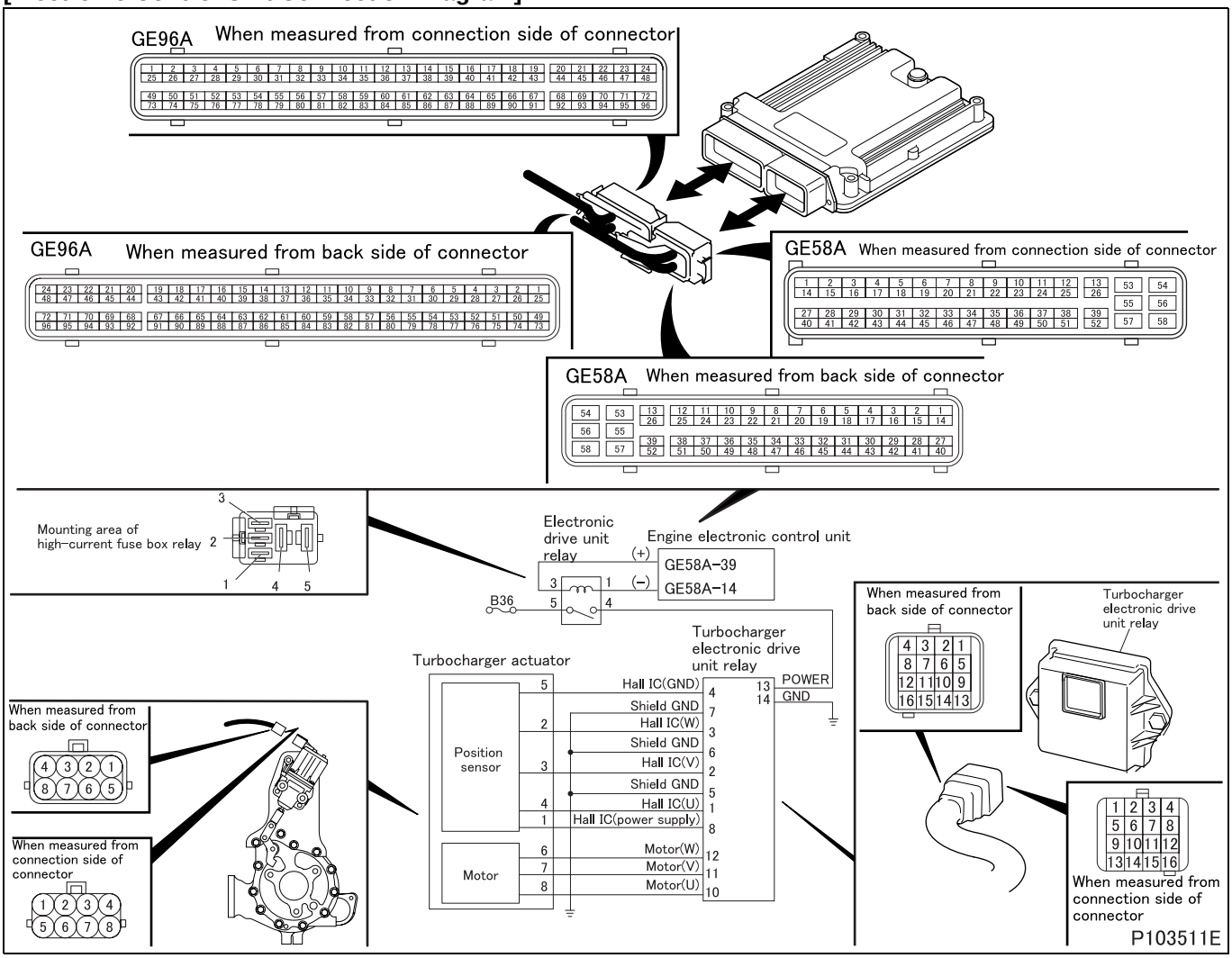
[Diagnostic requirement]
- Controller area network communication in order

[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.

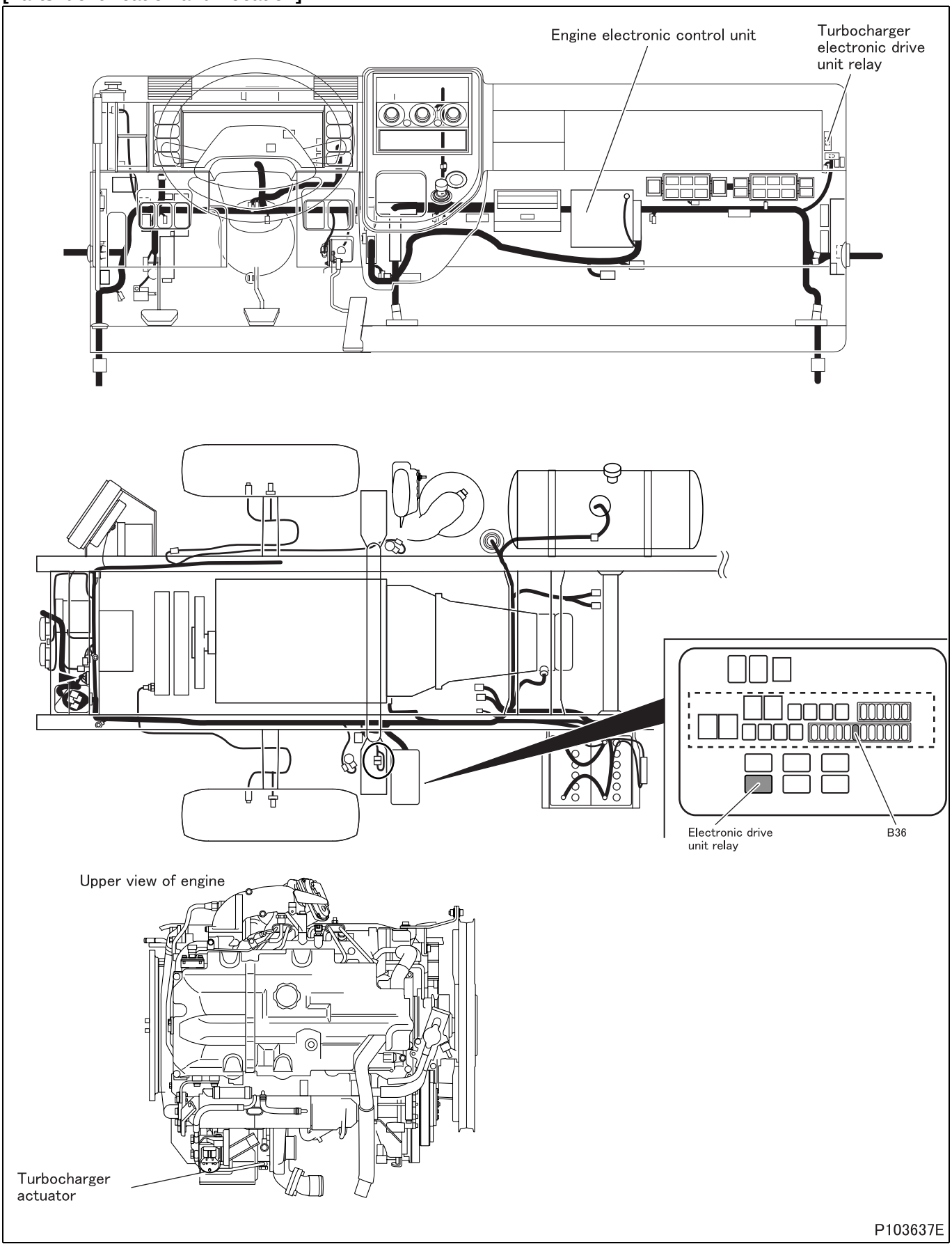
[Probable cause of trouble]
- Turbocharger actuator unit stuck
- Malfunction of electronic drive unit

[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.)

[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 actuator test item No. A4 “VGT 1”
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral (parking satisfactory for automatic transmission) • Diagnosis switch: OFF (fuse removed)
	Requirements		Actual position matches with target value set by Multi-Use Tester. (check with service data “54: Target VGT Position, 55: Actual VGT Position”) **NOTE** • **Set turbocharger opening to the range of 20 to 80%.** • **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).**
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)”
	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		• Remove connector and measure from harness side. • Starter switch: ON • Perform actuator test item No. AF “EDU Relay”
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

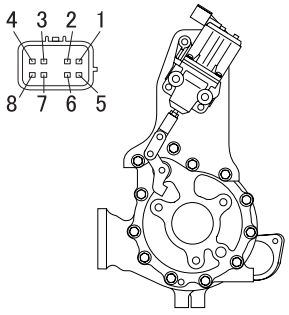
Step 9	Inspection items		Inspection of harness between electronic drive unit and ground
	Maintenance item		Check circuit between following electronic drive unit connector terminals • Electronic drive unit ground: terminal No. 14 - chassis ground • Sensor shield ground (U): terminal No. 5 - 14 • Sensor shield ground (V): terminal No. 6 - 14 • Sensor shield ground (W): terminal No. 7 - 14 • Sensor ground: terminal No. 4 - 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 10.
		NO	Modify harness.

Step 10	Inspection items		Inspection of electronic drive unit connector (motor)
	Maintenance item		Measure value of resistance between following connector terminals. • Between U - V: 10 - 11 • Between U - W: 10 - 12 • Between V - W: 11 - 12
	Inspection condition		–
	Requirements		2.1 ± 0.3 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 turbocharger actuator (motor)
	Maintenance item		Check circuit between following connector terminals. • Motor (U): electronic drive unit connector terminal No. 10 - turbocharger actuator connector terminal No. 8 • Motor (V): electronic drive unit connector terminal No. 11 - turbocharger actuator connector terminal No. 7 • Motor (W): electronic drive unit connector terminal No. 12 - turbocharger actuator connector 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 12.
		NO	Modify harness.

Step 12	Inspection items		Inspection of turbocharger actuator unit (motor)
	Maintenance item		Measure value of resistance between following turbocharger actuator connector terminals • Between U - V: 8 - 7 • Between U - W: 8 - 6 • Between V - W: 7 - 6
	Inspection condition		Keep turbocharger actuator installed on vehicle. Remove harness connector, and measure turbocharger actuator side.
	Requirements		2.1 ± 0.3 Ω
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 13.
		NO	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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 • U signal output: terminal 1 (+) - 4 (–) • V signal output: terminal 2 (+) - 4 (–) • W signal output: terminal 3 (+) - 4 (–)
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON • Perform Multi-Use Tester actuator test item No. A4 “VGT 1”
	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. • Sensor (power supply): electronic drive unit connector terminal No. 8 - turbocharger actuator connector terminal No. 1 • Sensor (U): electronic drive unit connector terminal No. 1 - turbocharger actuator connector terminal No. 4 • Sensor (V): electronic drive unit connector terminal No. 2 - turbocharger actuator connector terminal No. 3 • Sensor (W): electronic drive unit connector terminal No. 3 - turbocharger actuator connector terminal No. 2 • Sensor (ground): electronic drive unit connector terminal No. 4 - turbocharger actuator 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	After replacement of turbocharger, go to step 16
		NO	Modify harness.

Step 16	Inspection items		Inspection by control data
	Maintenance item		Perform actuator test item No. A4 “VGT 1”
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral (parking satisfactory for automatic transmission) • Diagnosis switch: OFF (fuse removed)
	Requirements		Actual position matches with target value set by Multi-Use Tester. (check with service data “54: Target VGT Position, 55: Actual VGT Position”) **NOTE** • **Set turbocharger opening to the range of 20 to 80%.** • **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).**
	Inspection result (Is the judging standard satisfied?)	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.

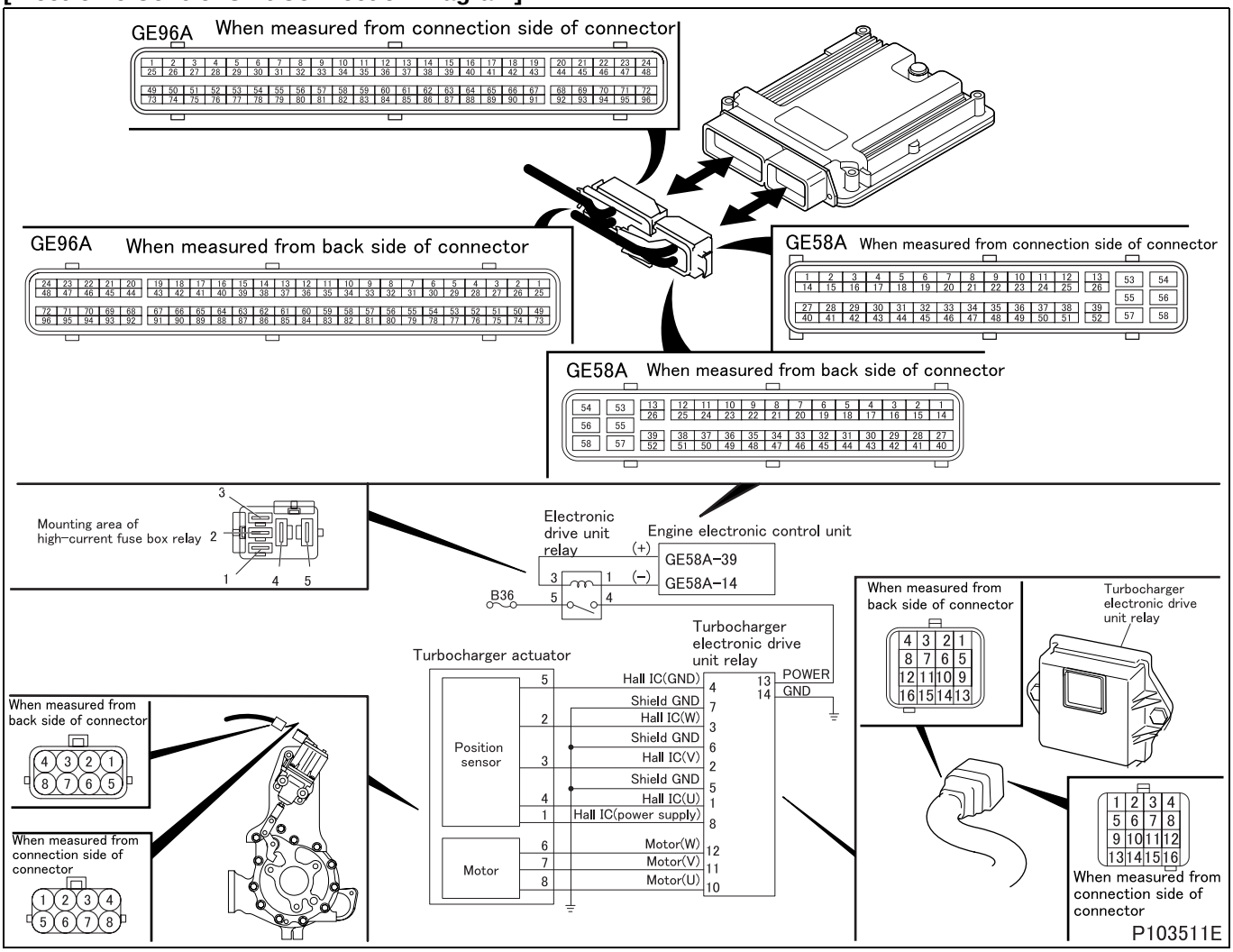
[Diagnostic requirement]
- Controller area network communication in order

[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.

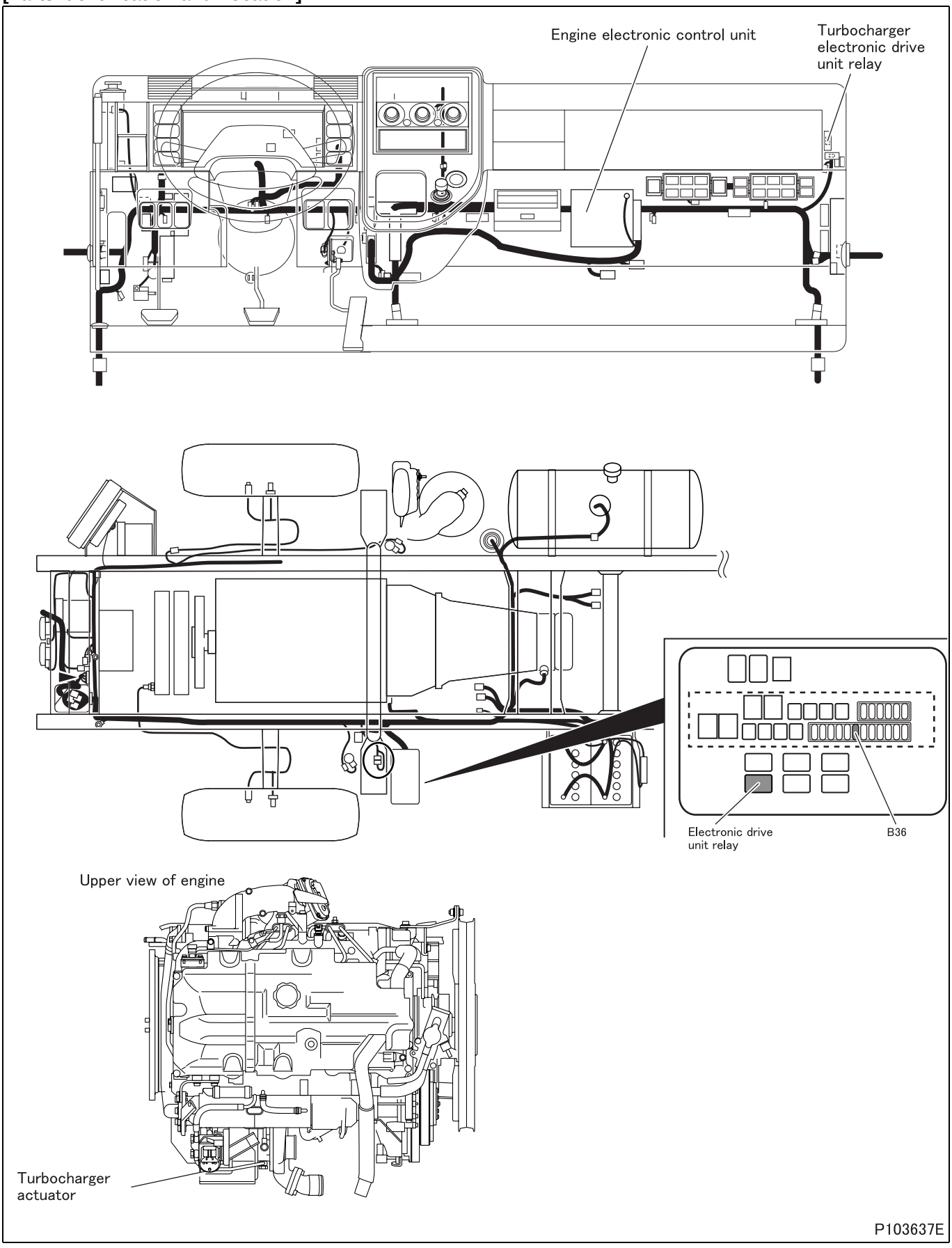
[Probable cause of trouble]
- Open-circuit or short-circuit harness between electronic drive unit and turbocharger actuator
- Malfunction of each connector
- Malfunction of turbocharger motor (built in turbocharger actuator)
- Malfunction of turbocharger position sensor (built in turbocharger actuator)
- 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.)

[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 actuator test item No. A4 “VGT 1”
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral (parking satisfactory for automatic transmission) • Diagnosis switch: OFF (fuse removed)
	Requirements		Actual position matches with target value set by Mult-Use Tester. (check with service data “54: Target VGT Position, 55: Actual VGT Position”) **NOTE** • **Set turbocharger opening to the range of 20 to 80%.** • **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).**
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)”
	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		• Remove connector and measure from harness side. • Starter switch: ON • Perform Multi-Use Tester actuator test item No. AF “EDU Relay”
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

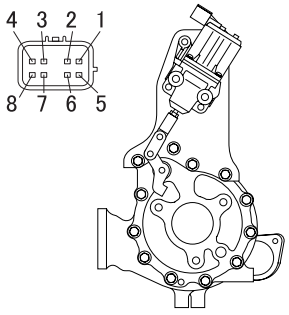
Step 9	Inspection items		Inspection of harness between electronic drive unit and ground
	Maintenance item		Check circuit between following electronic drive unit connector terminals • Electronic drive unit ground: terminal No. 14 - chassis ground • Sensor shield ground (U): terminal No. 5 - 14 • Sensor shield ground (V): terminal No. 6 - 14 • Sensor shield ground (W): terminal No. 7 - 14 • Sensor ground: terminal No. 4 - 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 10.
		NO	Modify harness.

Step 10	Inspection items		Inspection of electronic drive unit connector (motor)
	Maintenance item		Measure value of resistance between following connector terminals. • Between U - V: 10 - 11 • Between U - W: 10 - 12 • Between V - W: 11 - 12
	Inspection condition		–
	Requirements		2.1 ± 0.3 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 turbocharger actuator (motor)
	Maintenance item		Check circuit between following connector terminals. • Motor (U): electronic drive unit connector terminal No. 10 - turbocharger actuator connector terminal No. 8 • Motor (V): electronic drive unit connector terminal No. 11 - turbocharger actuator connector terminal No. 7 • Motor (W): electronic drive unit connector terminal No. 12 - turbocharger actuator connector 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 12.
		NO	Modify harness.

Step 12	Inspection items		Inspection of turbocharger actuator unit (motor)
	Maintenance item		Measure value of resistance between following turbocharger actuator connector terminals • Between U - V: 8 - 7 • Between U - W: 8 - 6 • Between V - W: 7 - 6
	Inspection condition		Keep turbocharger actuator installed on vehicle. Remove harness connector, and measure turbocharger actuator side.
	Requirements		2.1 ± 0.3 Ω
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 13.
		NO	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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 • U signal output: terminal 1 (+) - 4 (–) • V signal output: terminal 2 (+) - 4 (–) • W signal output: terminal 3 (+) - 4 (–)
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON • Perform actuator test item No. A4 “VGT 1”
	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. • Sensor (power supply): electronic drive unit connector terminal No. 8 - variable geometry turbocharger actuator connector terminal No. 1 • Sensor (U): electronic drive unit connector terminal No. 1 - turbocharger actuator connector terminal No. 4 • Sensor (V): electronic drive unit connector terminal No. 2 - turbocharger actuator connector terminal No. 3 • Sensor (W): electronic drive unit connector terminal No. 3 - turbocharger actuator connector terminal No. 2 • Sensor (ground): electronic drive unit connector terminal No. 4 - turbocharger actuator 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	After replacement of turbocharger, go to step 16
		NO	Modify harness.

Step 16	Inspection items		Inspection by control data
	Maintenance item		Perform actuator test item No. A4 “VGT 1”
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral (parking satisfactory for automatic transmission) • Diagnosis switch: OFF (fuse removed)
	Requirements		Actual position matches with target value set by Multi-Use Tester. (check with service data “54: Target VGT Position, 55: Actual VGT Position”) **NOTE** • **Set turbocharger opening to the range of 20 to 80%.** • **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).**
	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^2} 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.)

[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. • P0234 “Overboost” • P0236 “Boost Press SNSR (Plausi)” • P0237 “Boost Press SNSR (Low)” • P0238 “Boost Press SNSR (High)” • P0299 “Turbocharger (Underboost)” • P2228 “Atm Press SNSR (Low)” • P2229 “Atm Press SNSR (High)”
	Inspection condition		• Starter switch: ON • Engine: Idling
	Requirements		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		**<General Scanning Tool used>** • Measure item “Intake MAP”. **<Multi-Use Tester used>** • Measure item No. 20 “Atmospheric Pressure” of Service Data.
	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

[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.)

[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. • P0093 “CRS (Fuel Leak)” • P0148 “CRS (Fuel Delivery)” • P0191 “CRS Pressure SNSR (Plausibility)” • P0192 “CRS Pressure SNSR (Low)” • P0193 “CRS Pressure SNSR (High)” • P0201 “Injector M/V-Cylinder 1 (Load)” • P0202 “Injector M/V-Cylinder 2 (Load)” • P0203 “Injector M/V-Cylinder 3 (Load)” • P0204 “Injector M/V-Cylinder 4 (Load)” • P0261 “Injector #1-A (Low)” • P0262 “Injector #1-A (High)” • P0263 “Injector #1-A (Plausibility)” • P0264 “Injector #2-A (Low)” • P0265 “Injector #2-A (High)” • P0266 “Injector #2-A (Plausibility)” • P0267 “Injector #3-A (Low)” • P0268 “Injector #3-A (High)” • P0269 “Injector #3-A (Plausibility)” • P0270 “Injector #4-A (Low)” • P0271 “Injector #4-A (High)” • P0272 “Injector #4-A (Plausibility)” • P0562 “Power Supply Voltage (Low)” • P0563 “Power Supply Voltage (High)” • P0607 “ECU System” • P060B “A/D Converter” • P061B “ECU Performance (Calc)” • P061C “ECU Performance (Ne)”
	Inspection condition		• Starter switch: ON • Do not start engine.
	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

Step 11	Inspection items		Check inside of combustion chamber.
	Maintenance item		Check for fuel leak.
	Inspection condition		• After performing actuator test item No. B2 “Fuel Leak Check”, stop engine. • Remove glow plug, and check from glow plug mounting hole using bore scope.
	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^2} 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

[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.

<table>
<tr><td rowspan="7">Step 1</td><td colspan="2">Inspection items</td><td>Inspection by control data</td></tr>
<tr><td colspan="2">Maintenance item</td><td>Check if following diagnosis codes occur simultaneously.
• P0093 “CRS (Fuel Leak)”
• P0148 “CRS (Fuel Delivery)”
• P0191 “CRS Pressure SNSR (Plausibility)”
• P0192 “CRS Pressure SNSR (Low)”
• P0193 “CRS Pressure SNSR (High)”
• P0201 “Injector M/V-Cylinder 1 (Load)”
• P0202 “Injector M/V-Cylinder 2 (Load)”
• P0203 “Injector M/V-Cylinder 3 (Load)”
• P0204 “Injector M/V-Cylinder 4 (Load)”
• P0261 “Injector #1-A (Low)”
• P0262 “Injector #1-A (High)”
• P0263 “Injector #1-A (Plausibility)”
• P0264 “Injector #2-A (Low)”
• P0265 “Injector #2-A (High)”
• P0266 “Injector #2-A (Plausibility)”
• P0267 “Injector #3-A (Low)”
• P0268 “Injector #3-A (High)”
• P0269 “Injector #3-A (Plausibility)”
• P0270 “Injector #4-A (Low)”
• P0271 “Injector #4-A (High)”
• P0272 “Injector #4-A (Plausibility)”
• P0562 “Power Supply Voltage (Low)”
• P0563 “Power Supply Voltage (High)”
• P0607 “ECU System”
• P060B “A/D Converter”
• P061B “ECU Performance (Calc)”
• P061C “ECU Performance (Ne)”</td></tr>
<tr><td colspan="2">Inspection condition</td><td>• Starter switch: ON
• Do not start engine.</td></tr>
<tr><td colspan="2">Requirements</td><td>No codes occur.</td></tr>
<tr><td rowspan="2">Inspection result (Is the judging standard satisfied?)</td><td>YES</td><td>Replacement of supply pump</td></tr>
<tr><td>NO</td><td>Inspect diagnosis code that is occurring.</td></tr>
</table>

[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.

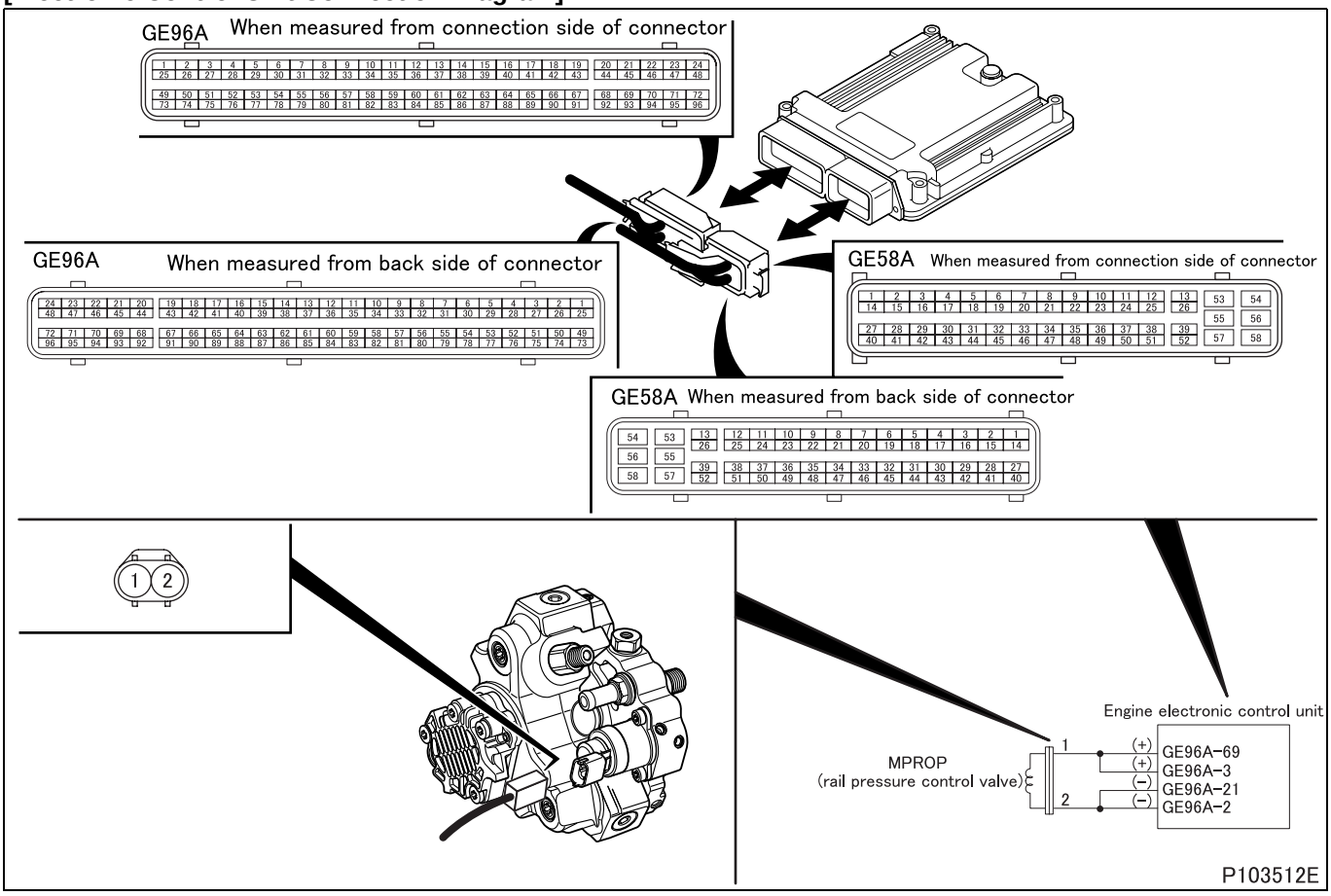
[Diagnostic requirement]
–

[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.

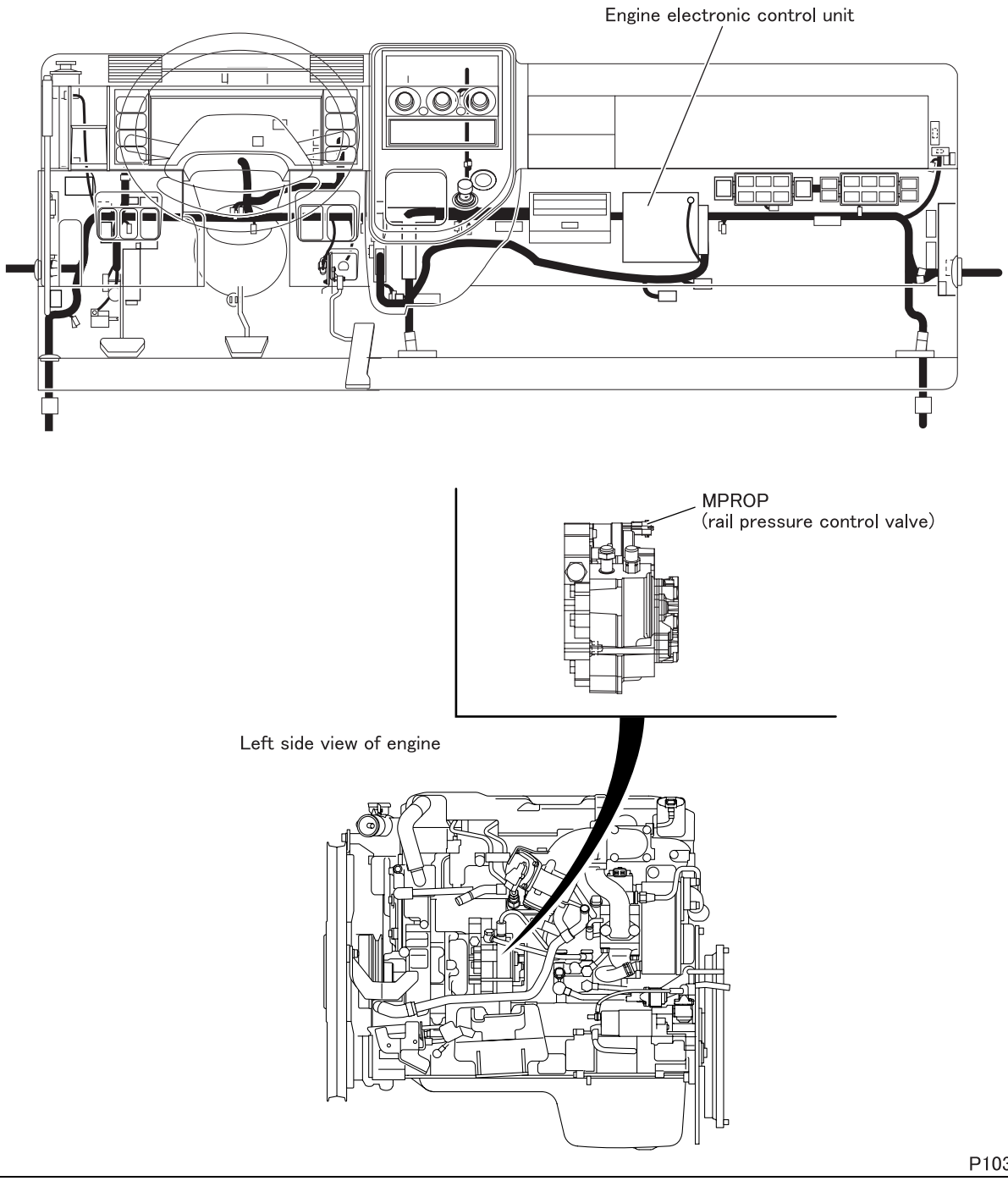
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and MPROP (rail pressure control valve)
- Malfunction of each connector
- Malfunction of MPROP (rail pressure control valve)
- Malfunction of electronic control unit

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[Fault diagnosis]

- Perform checks in the sequence of the following steps.

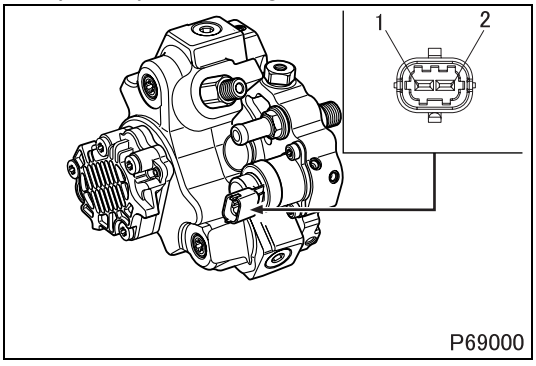
Step 1	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 3 or No. 69 and No. 2 or No. 21.
	Inspection condition		Disconnect electronic control unit and harness, and measure from connection side of harness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

Step 2	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 7.
		NO	Modify connector.

Step 3	Inspection items		Inspection of MPROP (rail pressure control valve) connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Modify connector.

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	Go to step 5.
		NO	Replacement of supply pump

<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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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

[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.

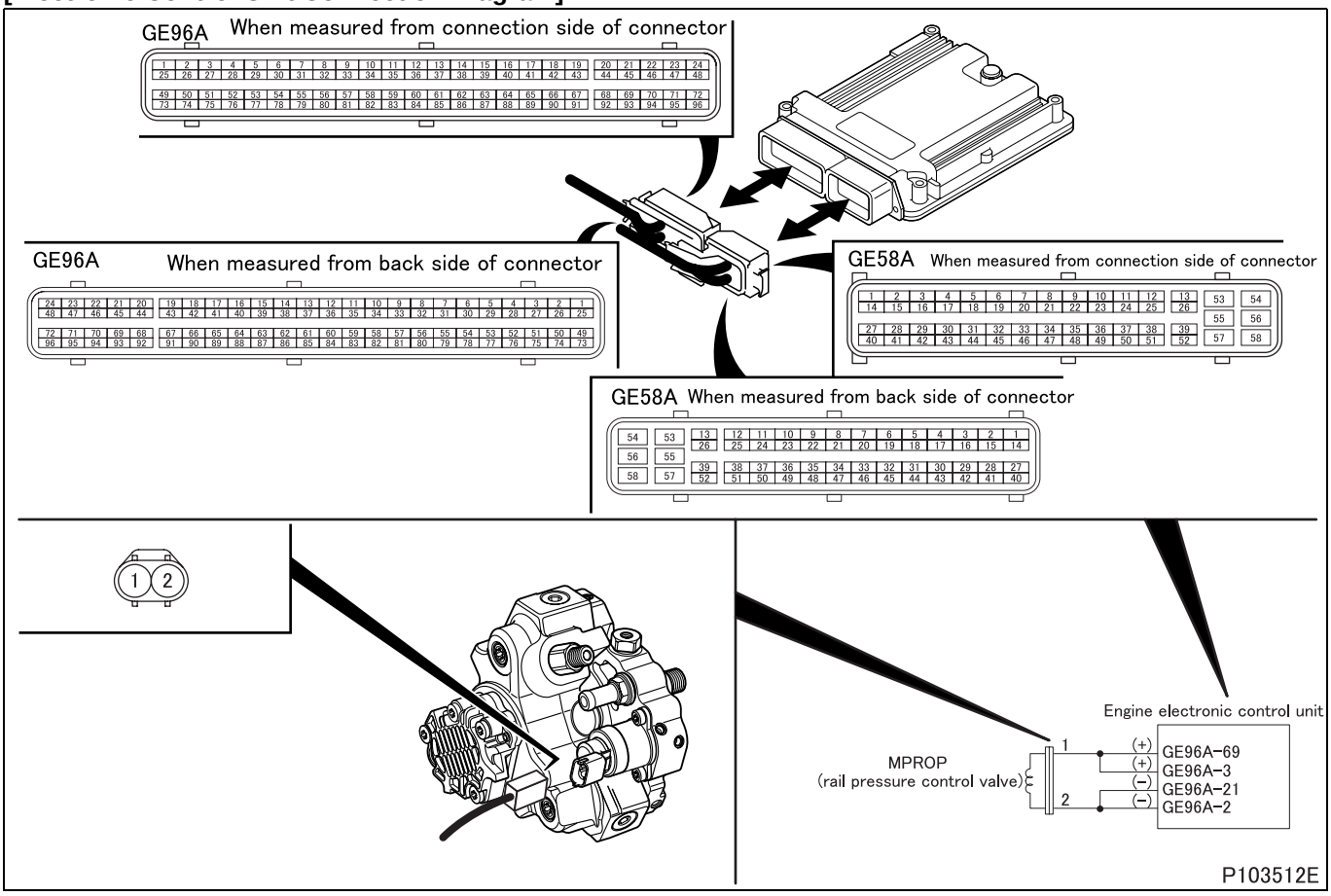
[Diagnostic requirement]
–

[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.

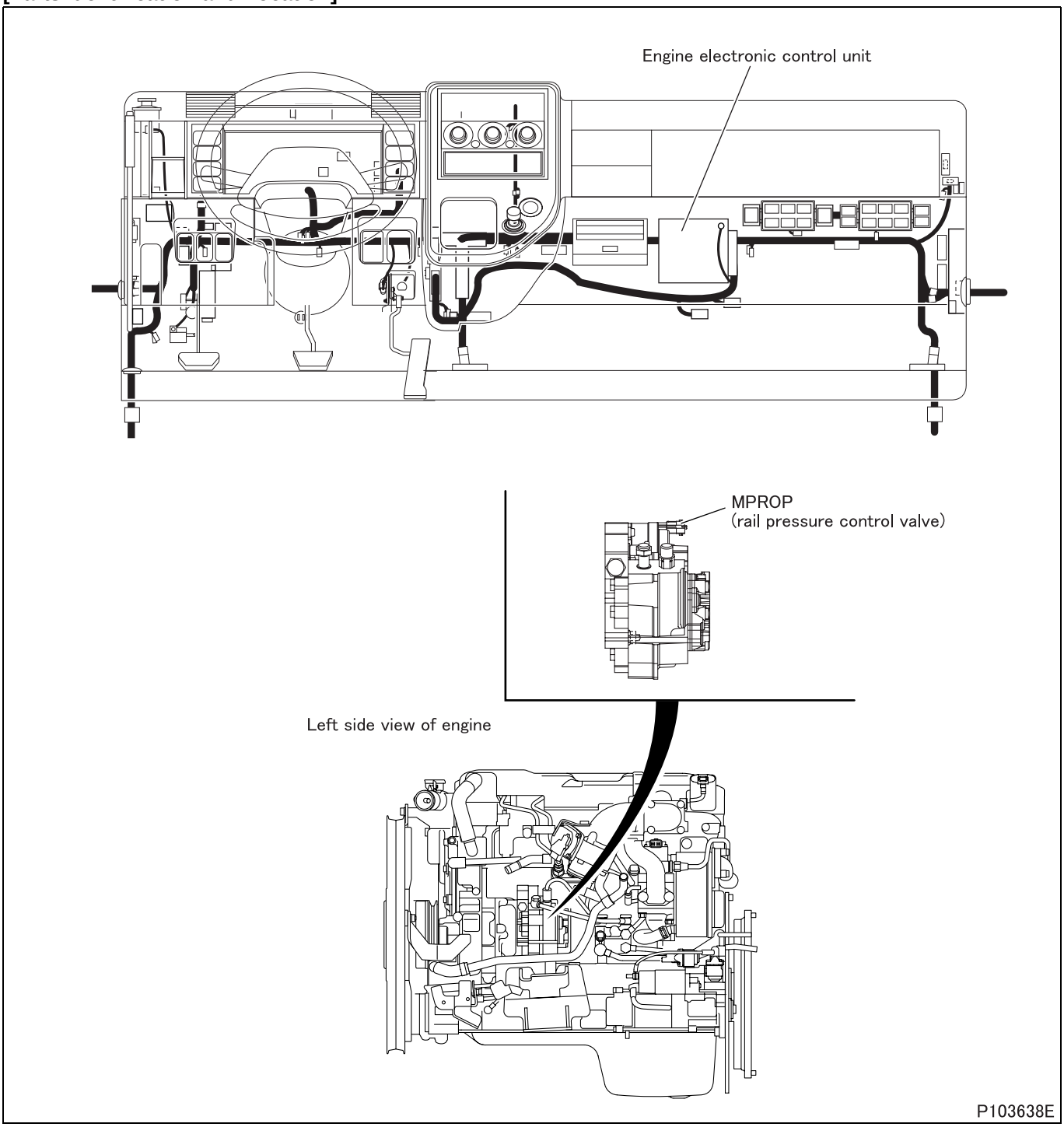
[Probable cause of trouble]
- Open-circuit of harness between electronic control unit and MPROP (rail pressure control valve)
- Malfunction of each connector
- Malfunction of MPROP (rail pressure control valve)
- Malfunction of electronic control unit

[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]



[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 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of supply pump
		NO	Modify connector.

[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.

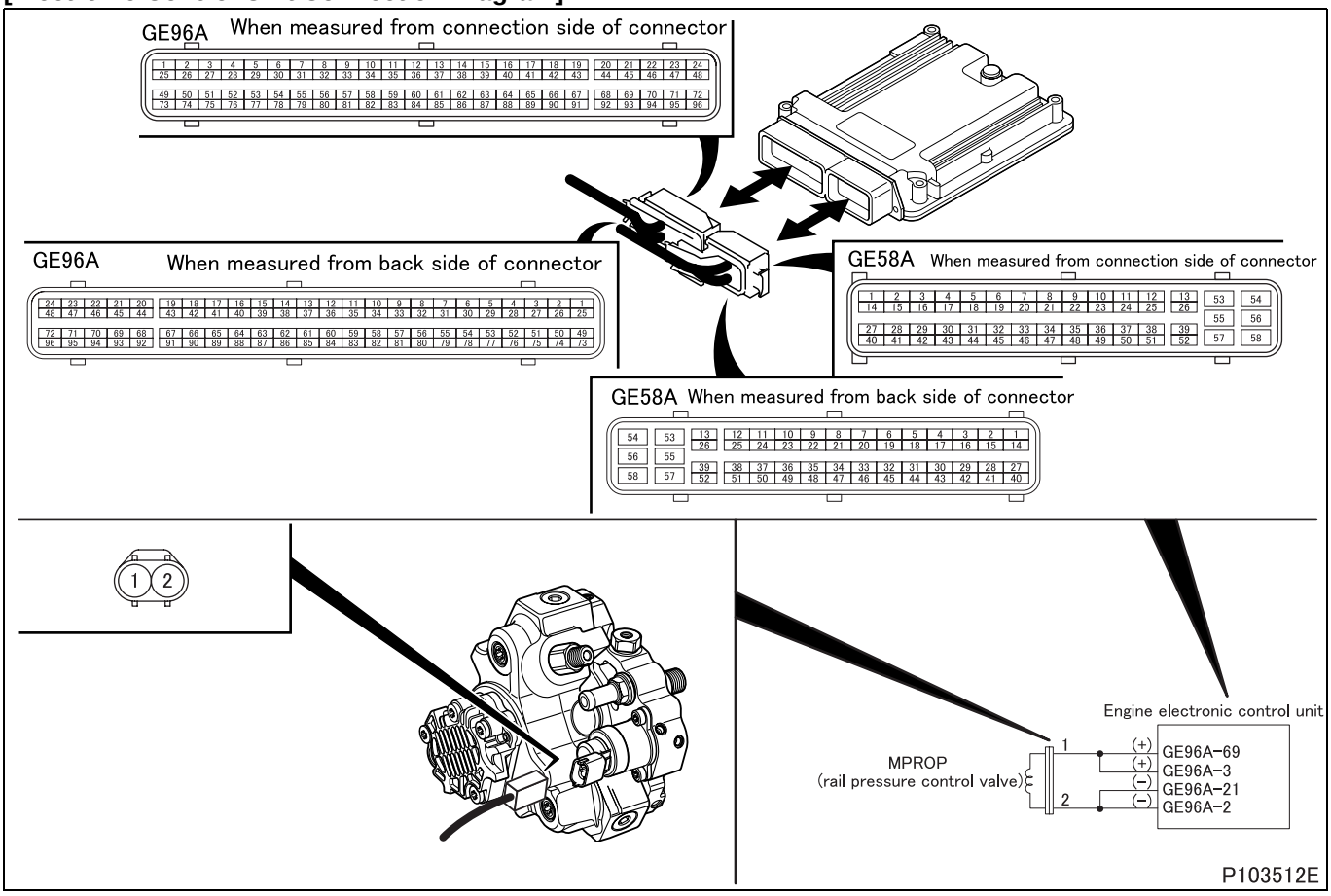
[Diagnostic requirement]
–

[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.

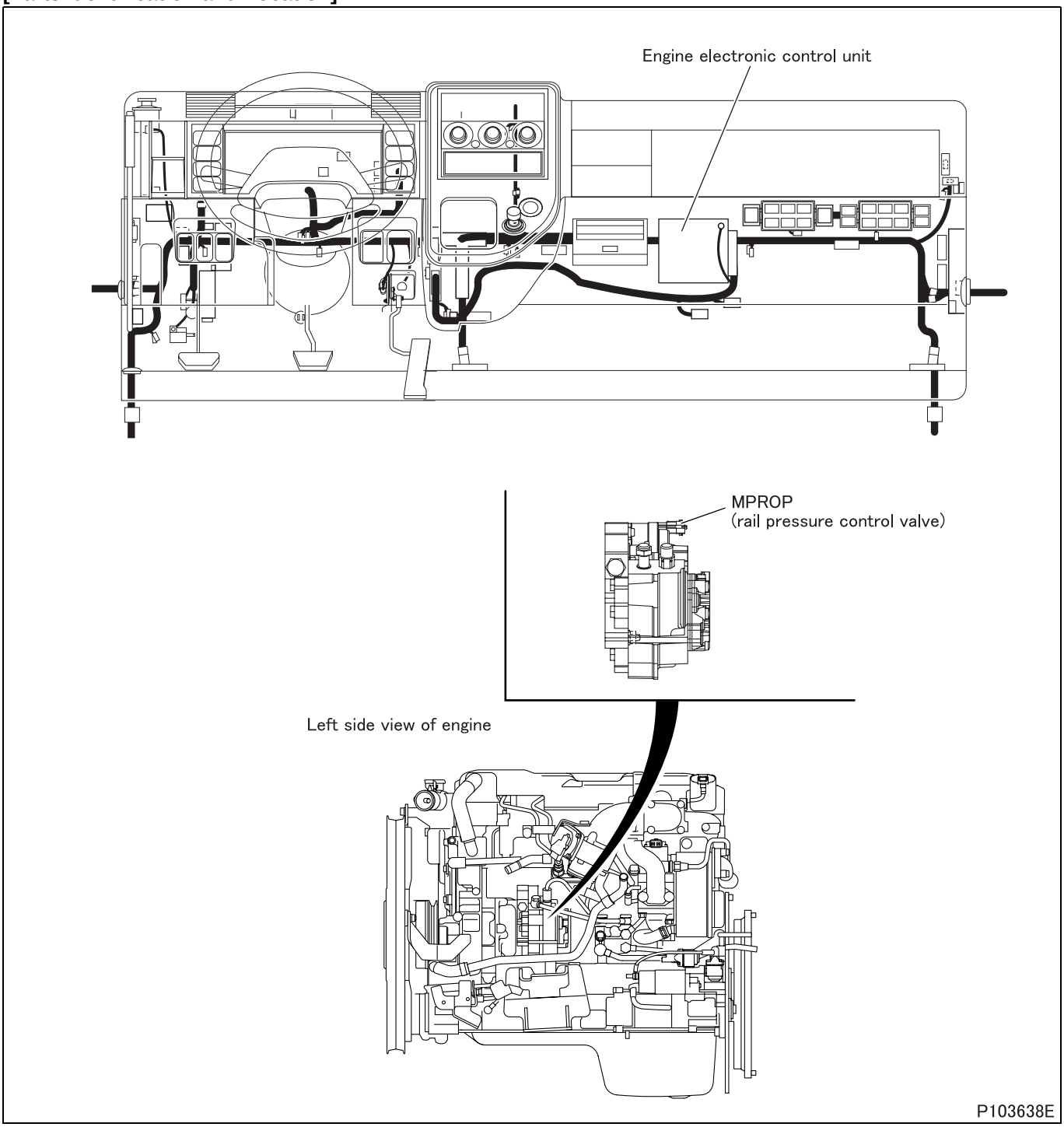
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and MPROP (rail pressure control valve)
- Malfunction of each connector
- Malfunction of MPROP (rail pressure control valve)
- Malfunction of electronic control unit

[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]



[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 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of supply pump
		NO	Modify connector.

[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.

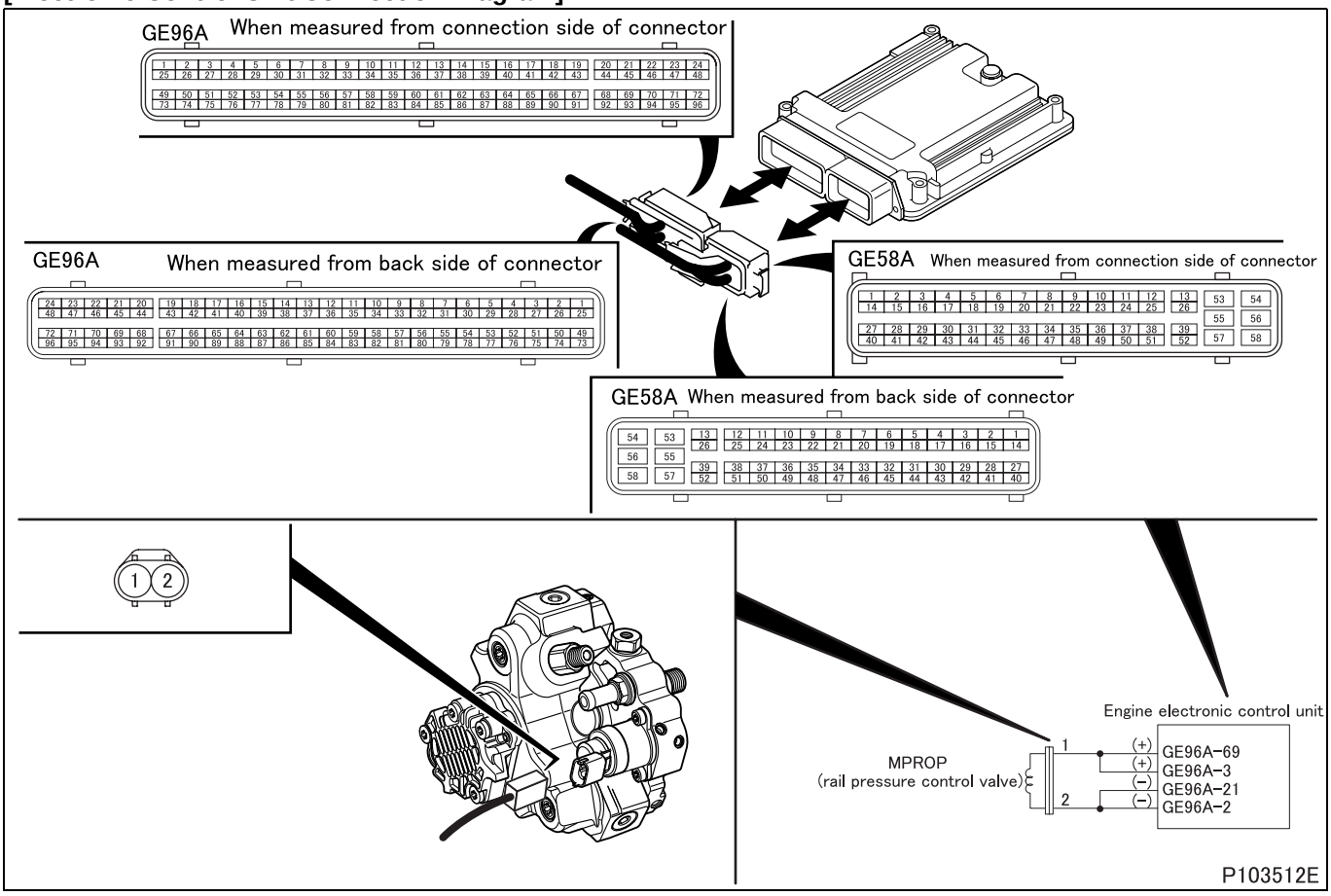
[Diagnostic requirement]
–

[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.

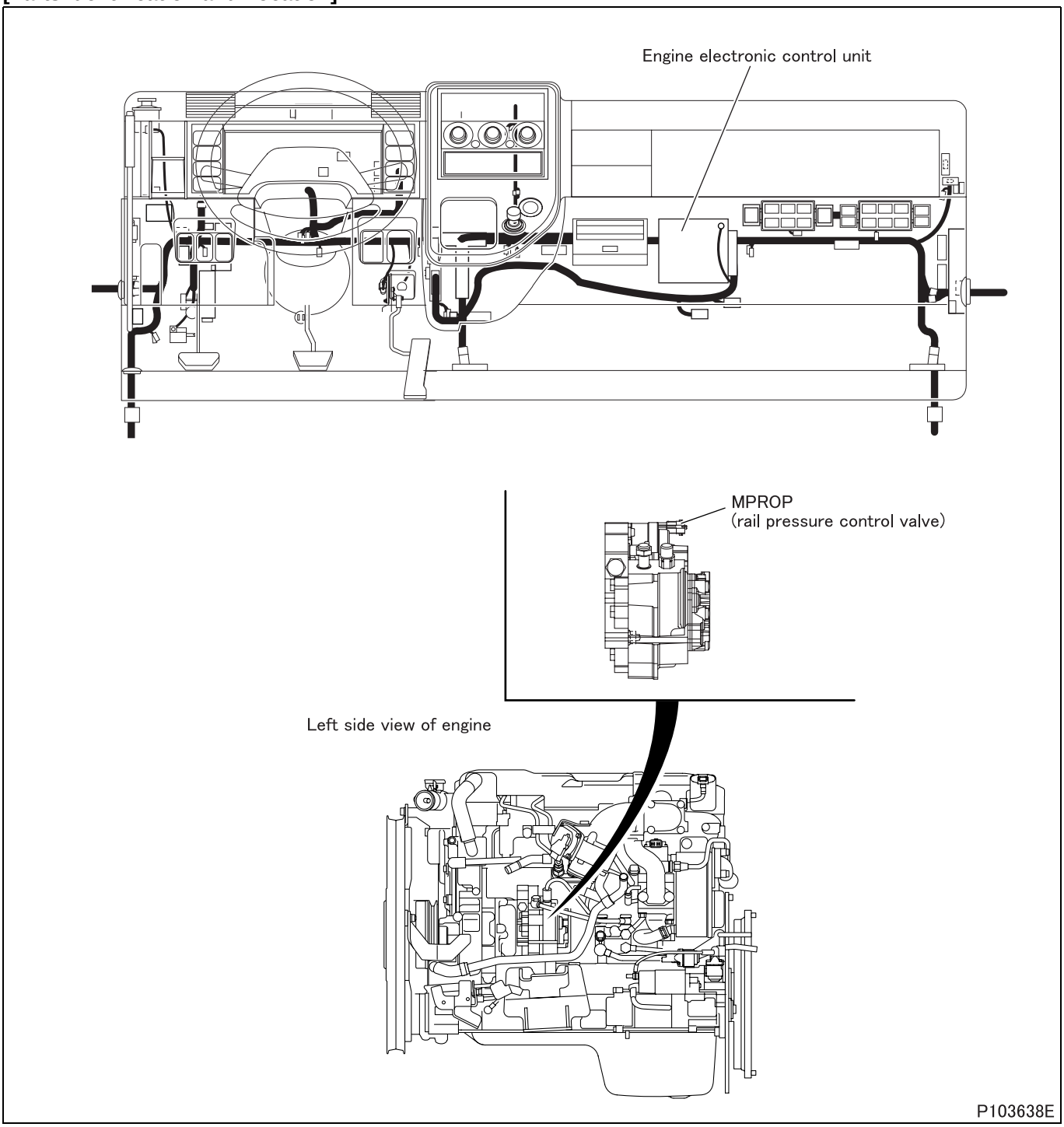
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and MPROP (rail pressure control valve)
- Malfunction of each connector
- Malfunction of MPROP (rail pressure control valve)
- Malfunction of electronic control unit

[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]



[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 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of supply pump
		NO	Modify connector.

[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		Check if following diagnosis codes occur simultaneously. • P0093 “CRS (Fuel Leak)” • P0148 “CRS (Fuel Delivery)” • P0191 “CRS Pressure SNSR (Plausibility)” • P0192 “CRS Pressure SNSR (Low)” • P0193 “CRS Pressure SNSR (High)” • P0201 “Injector M/V-Cylinder 1 (Load)” • P0202 “Injector M/V-Cylinder 2 (Load)” • P0203 “Injector M/V-Cylinder 3 (Load)” • P0204 “Injector M/V-Cylinder 4 (Load)” • P0261 “Injector #1-A (Low)” • P0262 “Injector #1-A (High)” • P0263 “Injector #1-A (Plausibility)” • P0264 “Injector #2-A (Low)” • P0265 “Injector #2-A (High)” • P0266 “Injector #2-A (Plausibility)” • P0267 “Injector #3-A (Low)” • P0268 “Injector #3-A (High)” • P0269 “Injector #3-A (Plausibility)” • P0270 “Injector #4-A (Low)” • P0271 “Injector #4-A (High)” • P0272 “Injector #4-A (Plausibility)” • P0562 “Power Supply Voltage (Low)” • P0563 “Power Supply Voltage (High)” • P0607 “ECU System” • P060B “A/D Converter” • P061B “ECU Performance (Calc)” • P061C “ECU Performance (Ne)”
	Inspection condition		• Starter switch: ON • Do not start engine.
	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.

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		• After performing actuator test item No. B2 “Fuel Leak Check”, stop engine. • Remove glow plug, and check from glow plug mounting hole using bore scope.
	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.

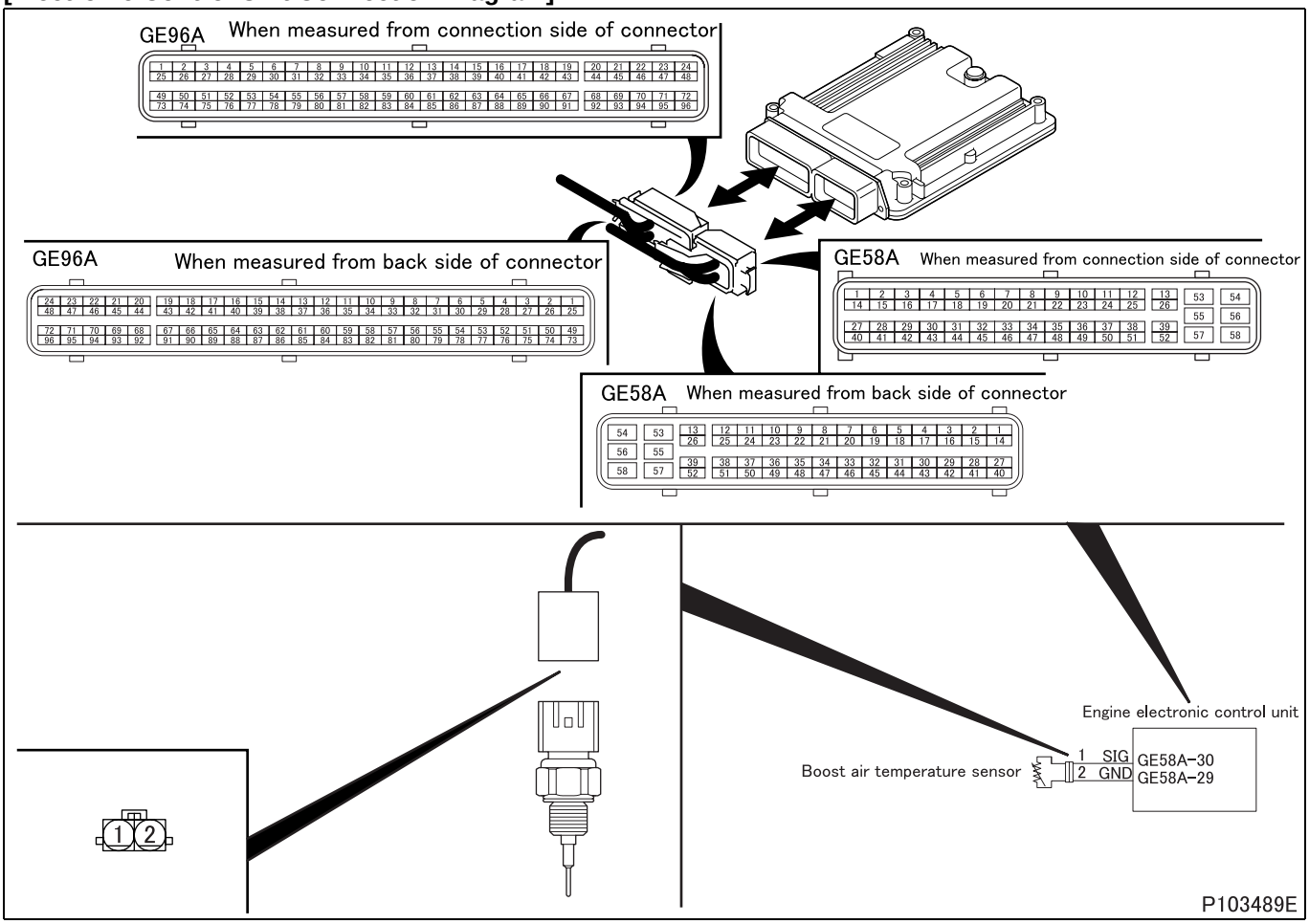
[Diagnostic requirement]
–

[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.

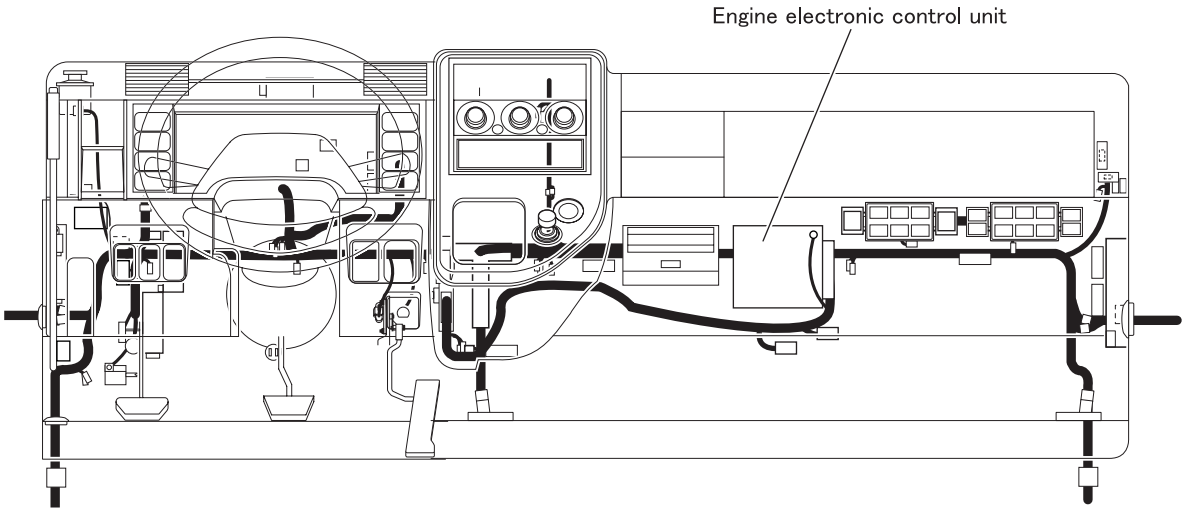
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and boost air temperature sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

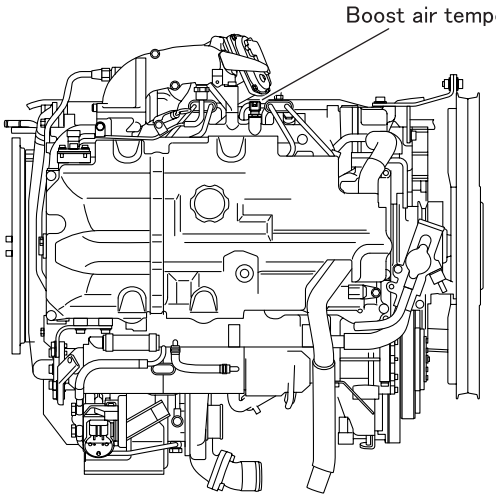
[Electronic Control Unit Connection Diagram]



[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		**<General Scanning Tool used>** • Measure item “Intake Air Temperature”. **<Multi-Use Tester used>** • Measure item No. 10 “Intake Air Temperature (EGR)” of Service Data.
	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.

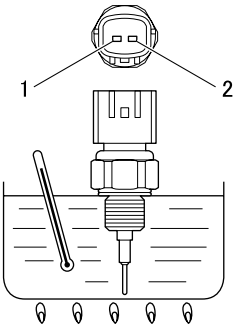
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE58A) terminal No. 29 and 30.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		• 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
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Put boost air temperature sensor in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 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
	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		**<General Scanning Tool used>** • Measure item “Intake Air Temperature”. **<Multi-Use Tester used>** • Measure item No. 10 “Intake Air Temperature (EGR)” of Service Data.
	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: 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°C {–34.6°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.

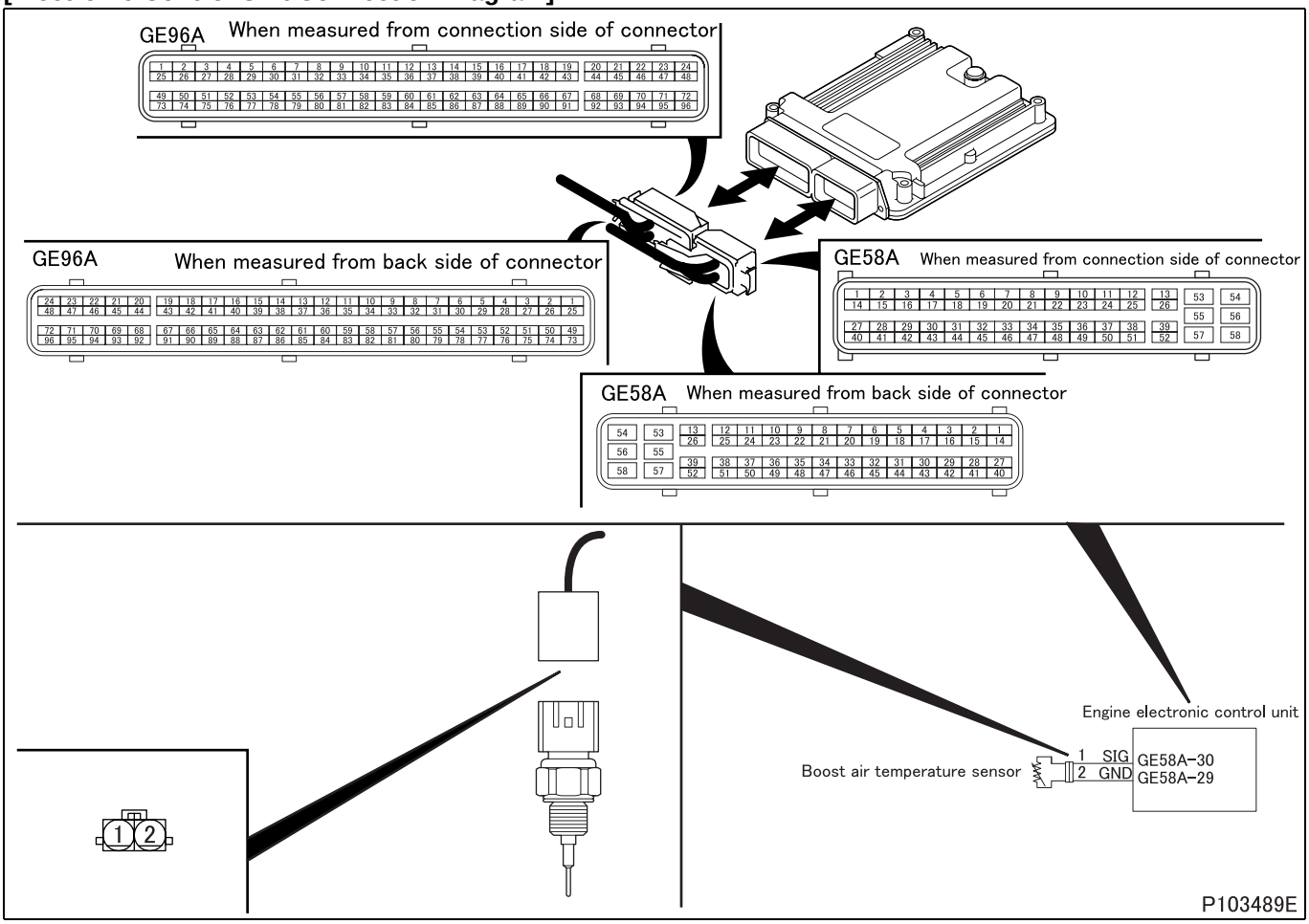
[Diagnostic requirement]
–

[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.

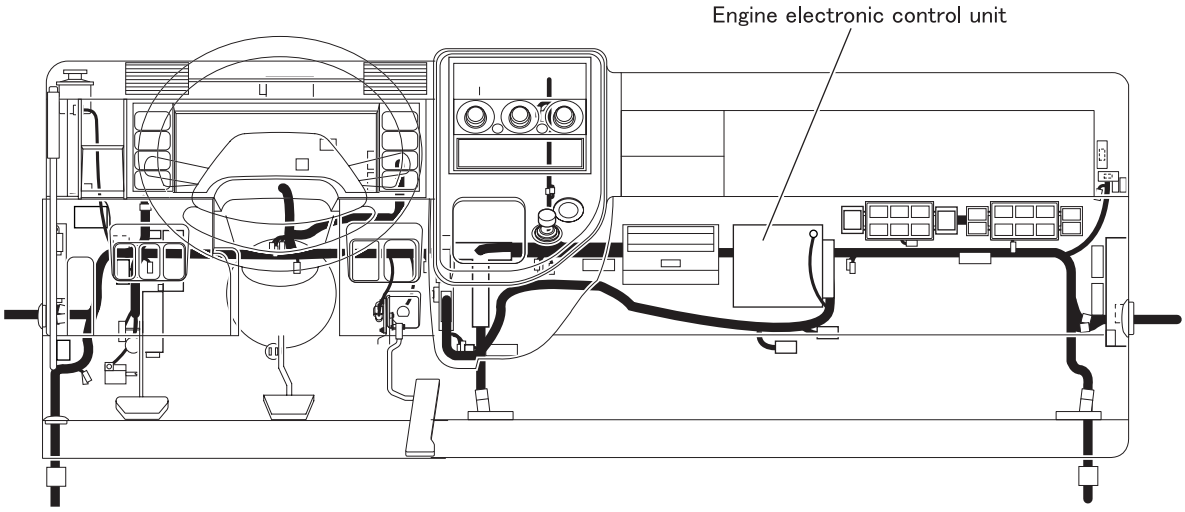
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and boost air temperature sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

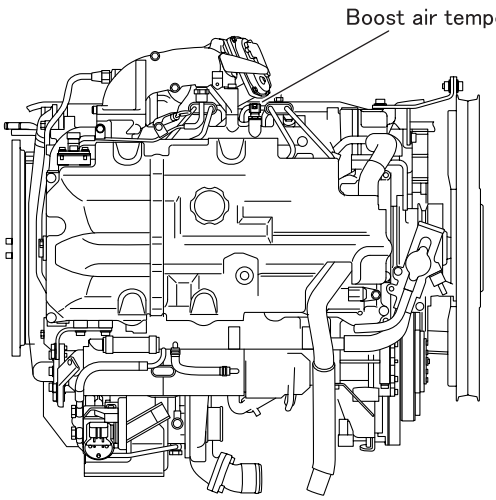
[Electronic Control Unit Connection Diagram]



[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		**<General Scanning Tool used>** • Measure item “Intake Air Temperature”. **<Multi-Use Tester used>** • Measure item No. 10 “Intake Air Temperature (EGR)” of Service Data.
	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.

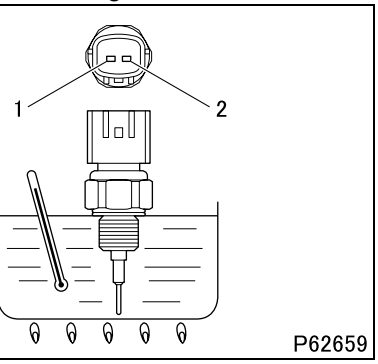
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE58A) terminal No. 29 and 30.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		• 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
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Put boost air temperature sensor in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 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
	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		**<General Scanning Tool used>** • Measure item “Intake Air Temperature”. **<Multi-Use Tester used>** • Measure item No. 10 “Intake Air Temperature (EGR)” of Service Data.
	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

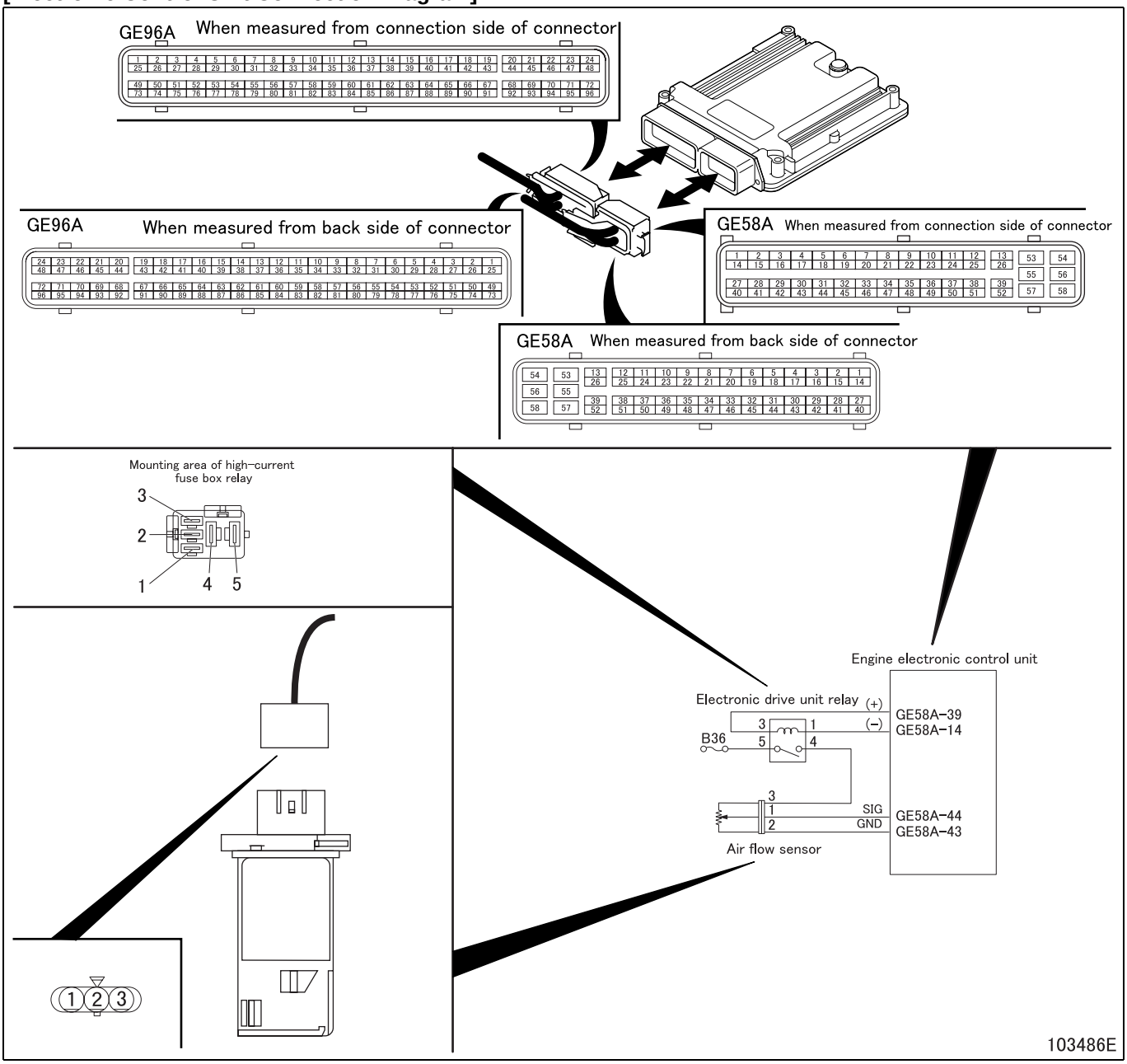
<When difference in intake air flow rate is abnormally low>
- Engine operating mode: normal (engine in operation)
- Engine speed: 1000 to 3000 rpm
- Fuel injection quantity: more than 12 mg/cyc
- Atmospheric pressure: above 828 mbar {12 psi}
- Boost pressure: less than 2500 mbar {36.25 psi}
- Intake throttle valve opening: more than 15°
- Exhaust gas recirculation λ 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.

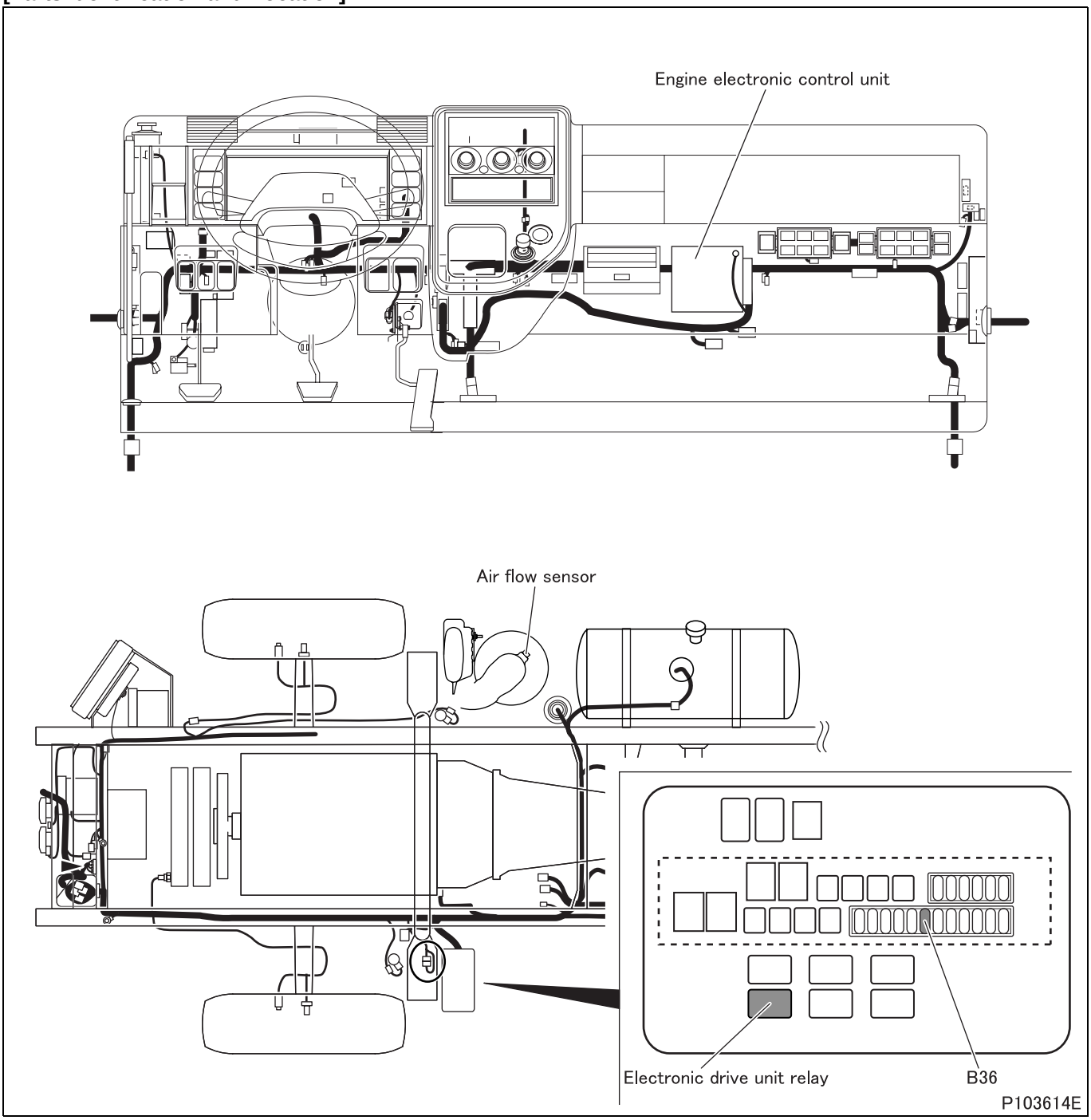
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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]



[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		• Perform actuator test item No. AF “EDU Relay” • Gradually press accelerator pedal.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Perform actuator test item No. AF “EDU Relay”
	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		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	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		• Perform actuator test item No. AF “EDU Relay” • Gradually press accelerator pedal.
	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.

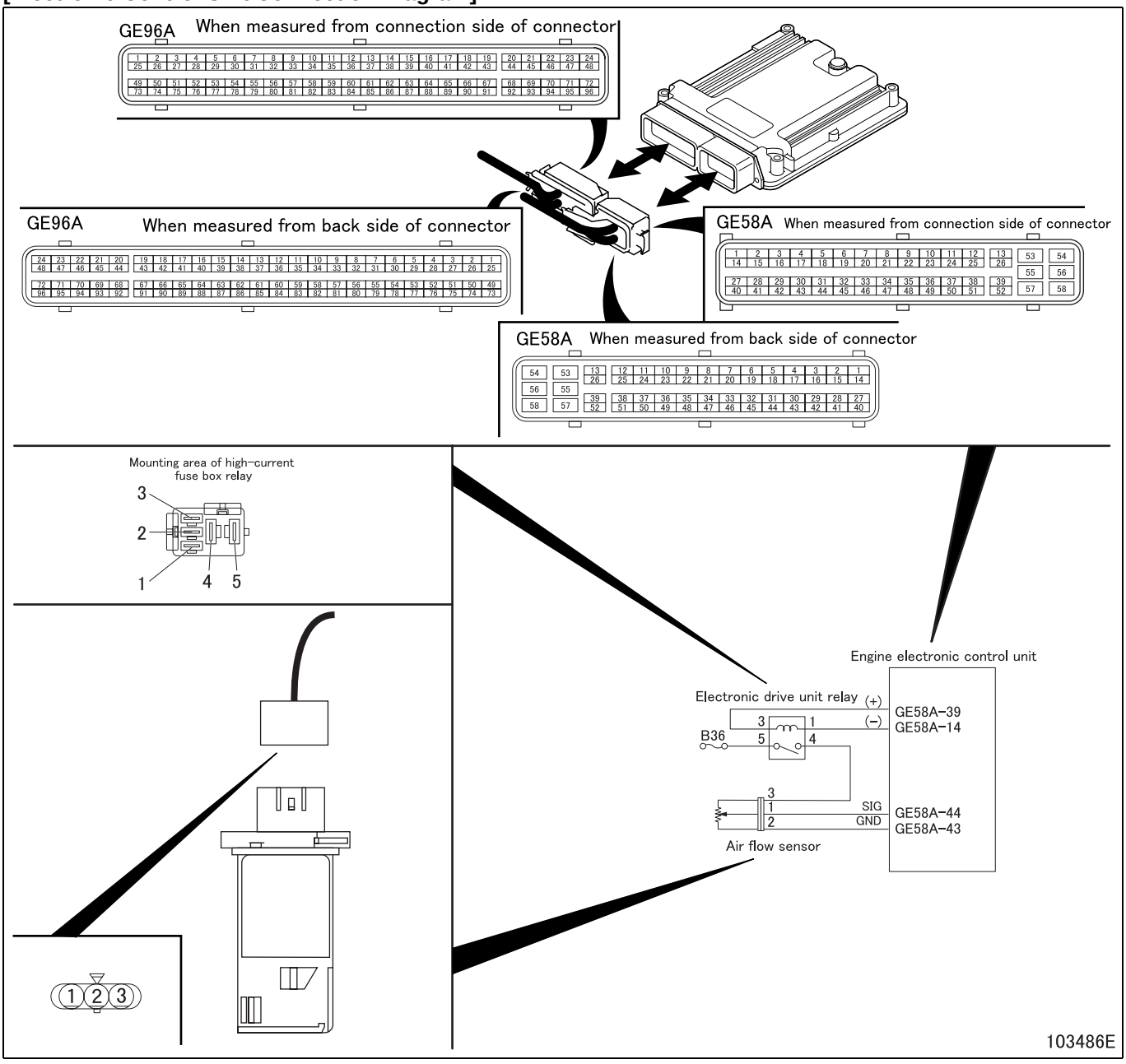
[Diagnostic requirement]
–

[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.

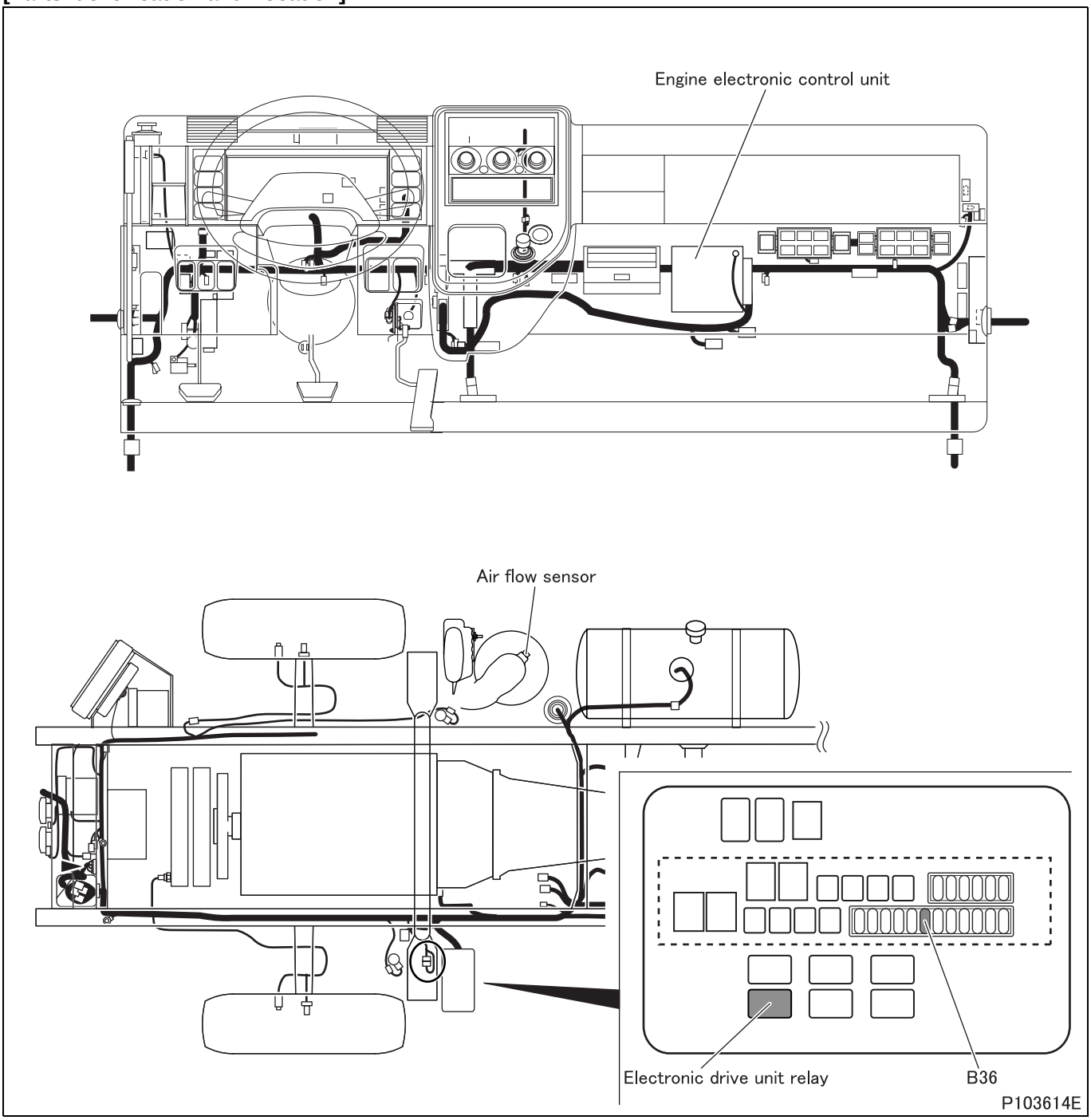
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and relay
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Open-circuit or short-circuit of harness between electronic drive unit and sensor
- Open-circuit or 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.)

[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. 60 “Air mass flow” of Service Data.
	Inspection condition		• Perform actuator test item No. AF “EDU Relay” • Gradually press accelerator pedal.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Perform actuator test item No. AF “EDU Relay”
	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		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	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		• Perform actuator test item No. AF “EDU Relay” • Gradually press accelerator pedal.
	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: 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.

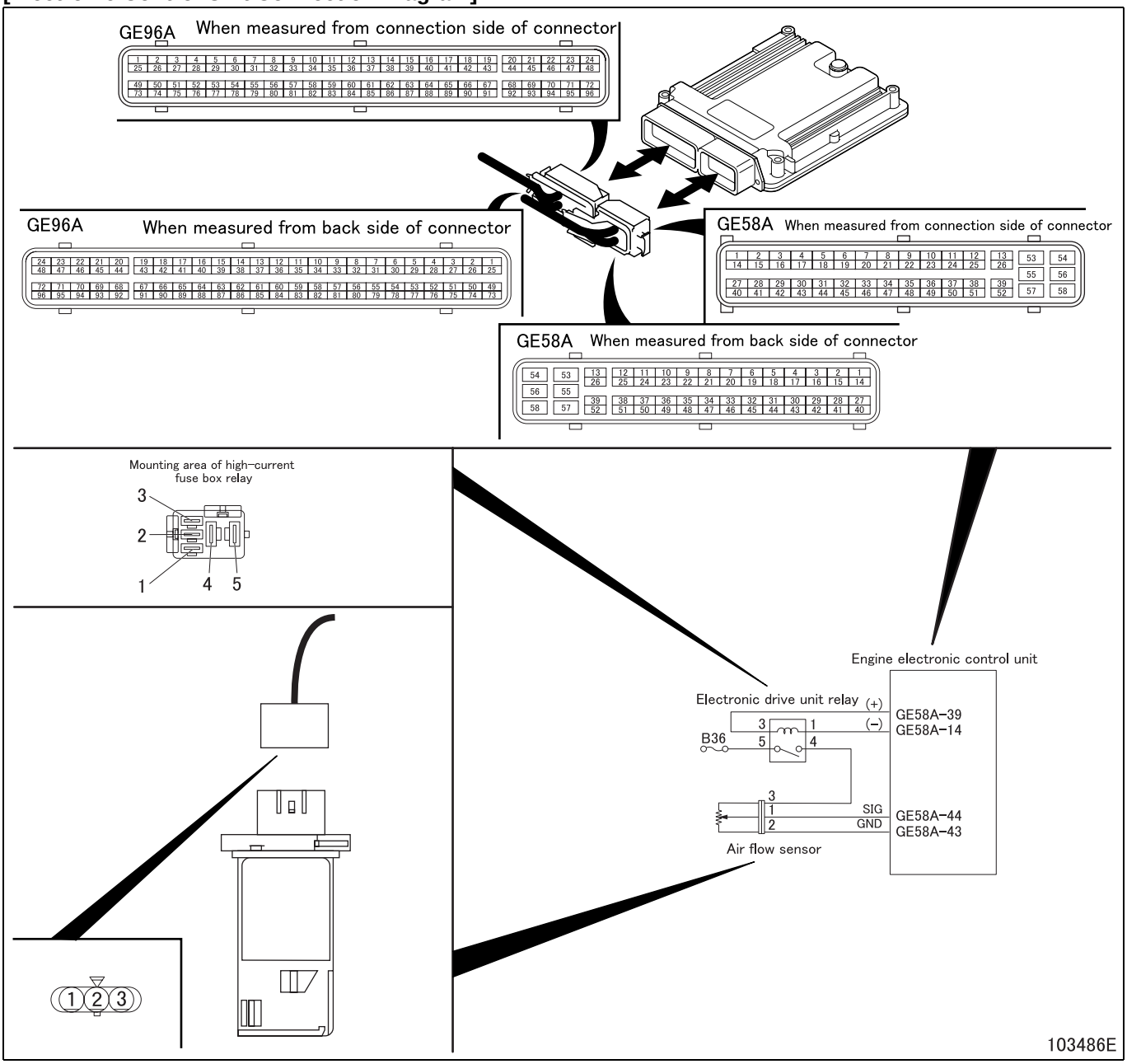
[Diagnostic requirement]
–

[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.

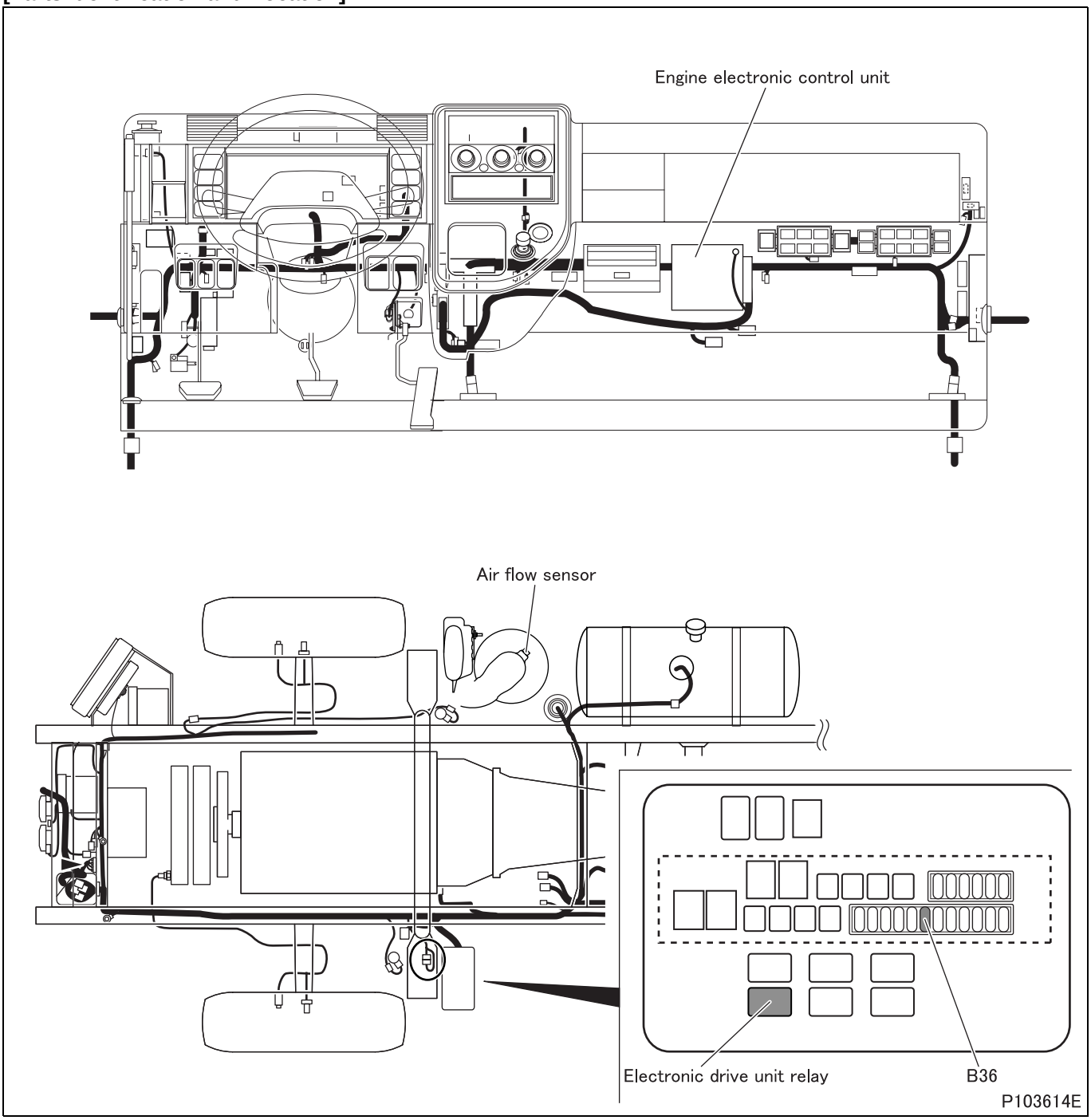
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and relay
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Open-circuit or short-circuit of harness between electronic drive unit and sensor
- Open-circuit or 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]



[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		• Perform actuator test item No. AF “EDU Relay” • Gradually press accelerator pedal.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Perform actuator test item No. AF “EDU Relay”
	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		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	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		• Perform actuator test item No. AF “EDU Relay” • Gradually press accelerator pedal.
	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.

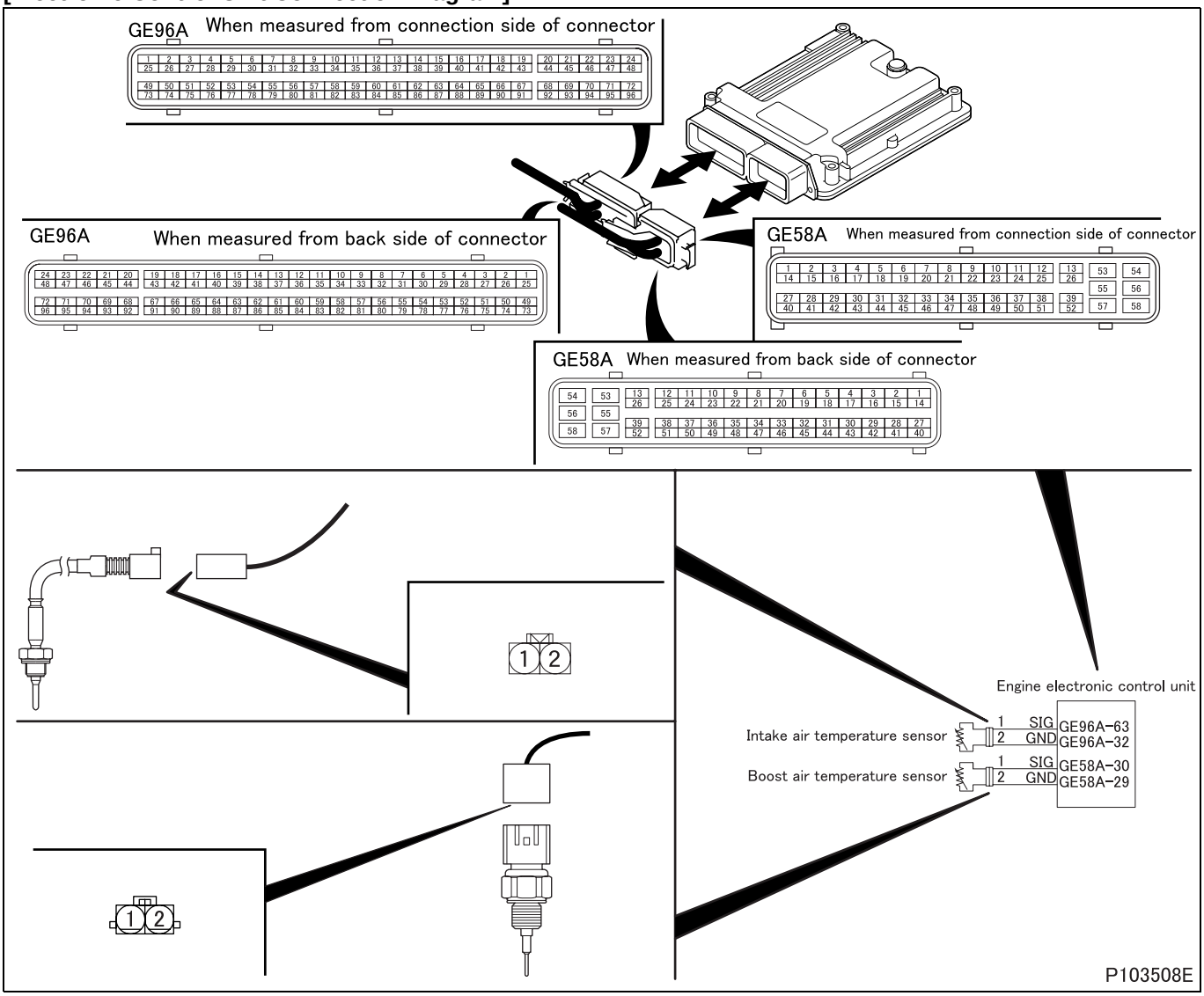
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Intake air flow rate is fixed at backup value.
- Related fault check is stopped.

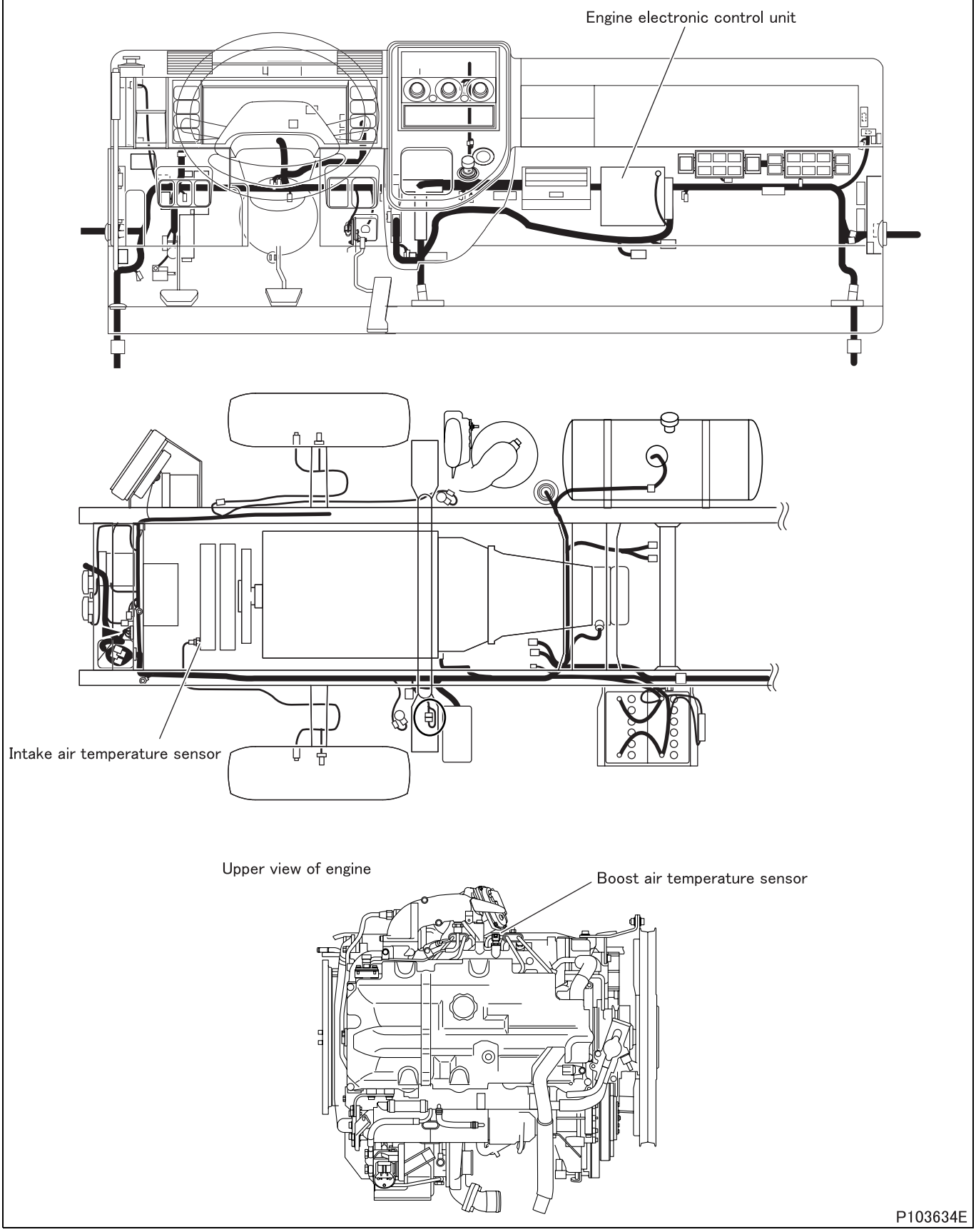
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and intake air temperature sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

[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		**<General Scanning Tool used>** • Measure item “Intake Air Temperature” . **<Multi-Use Tester used>** • Measure item No. 30 “Intake Air Temp. (upstream)” of Service Data.
	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.

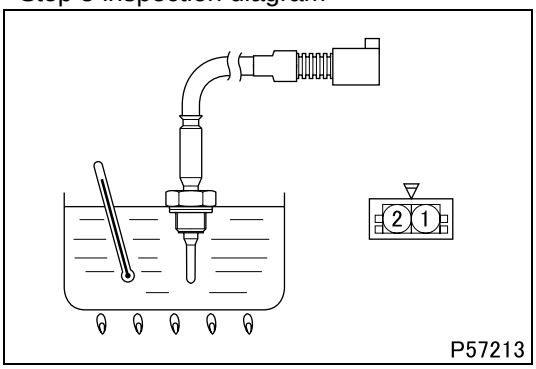
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 32 and 63.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		• 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
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Put intake air temperature sensor in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 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
	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		**<General Scanning Tool used>** • Measure item “Intake Air Temperature”. **<Multi-Use Tester used>** • Measure item No. 30 “Intake Air Temp. (upstream)” of Service Data.
	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: 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°C {–34.6°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.

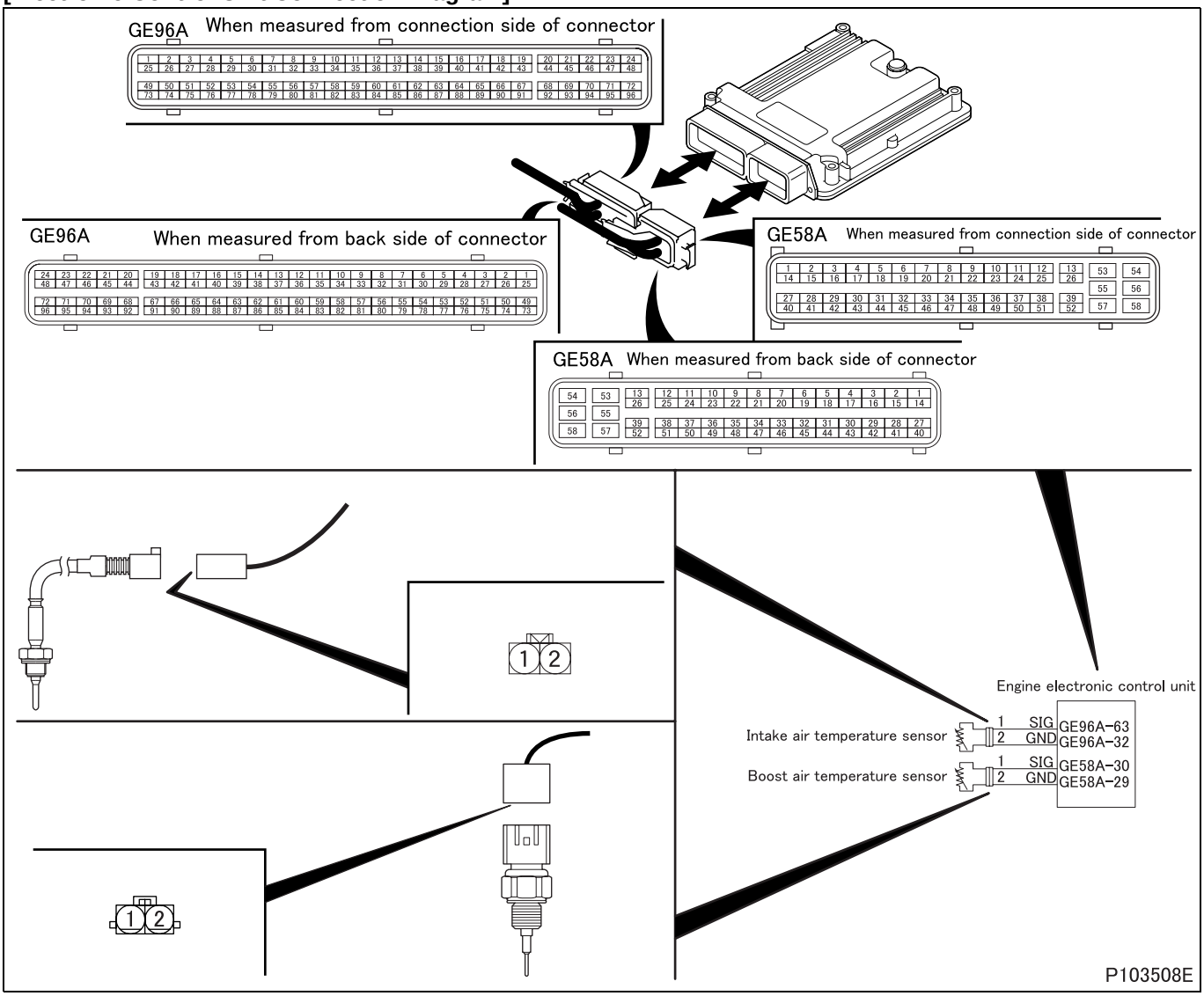
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Intake air flow rate is fixed at backup value.
- Related fault check is stopped.

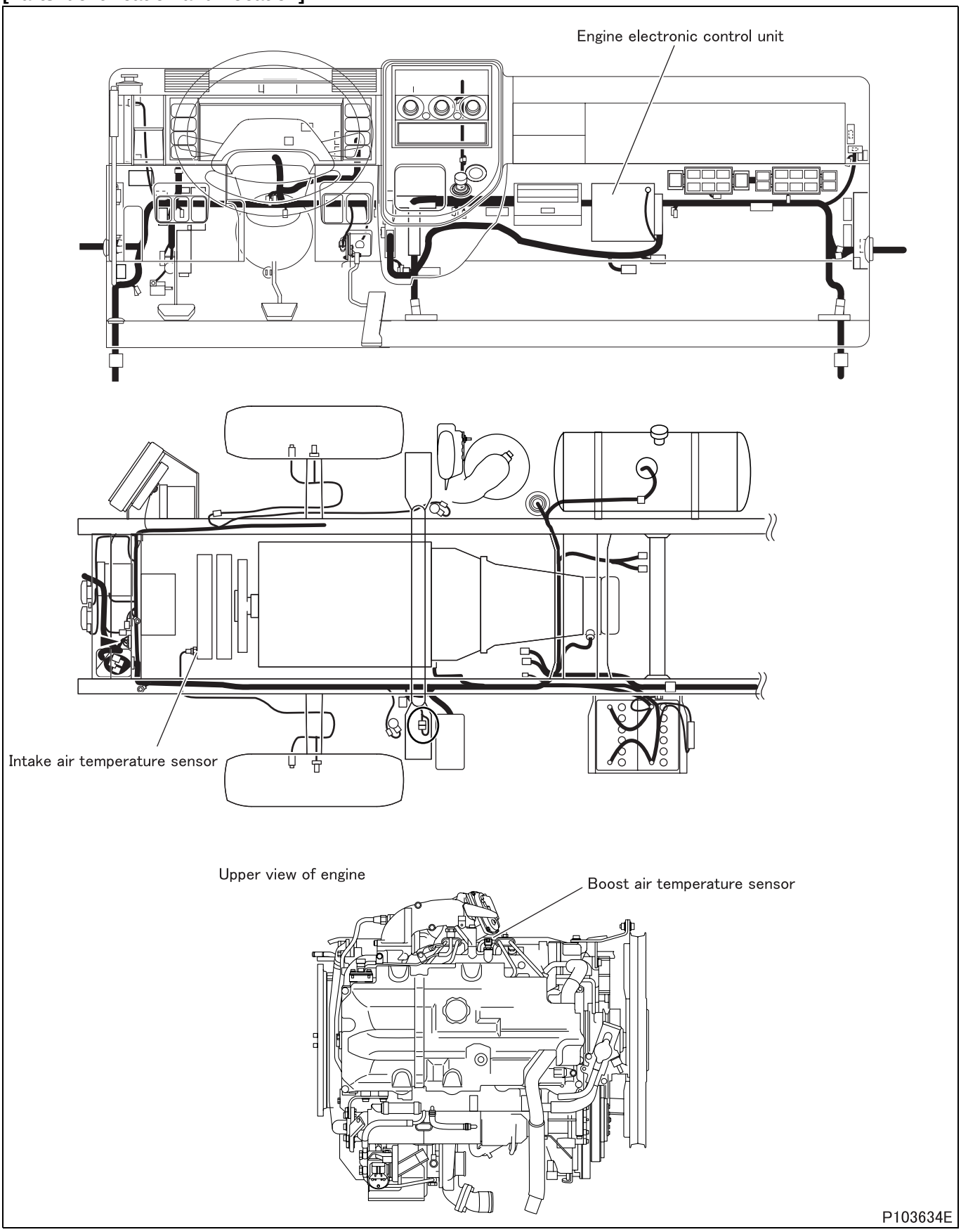
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and intake air temperature sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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]



[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		**<General Scanning Tool used>** • Measure item “Intake Air Temperature”. **<Multi-Use Tester used>** • Measure item No. 30 “Intake Air Temp. (upstream)” of Service Data.
	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.

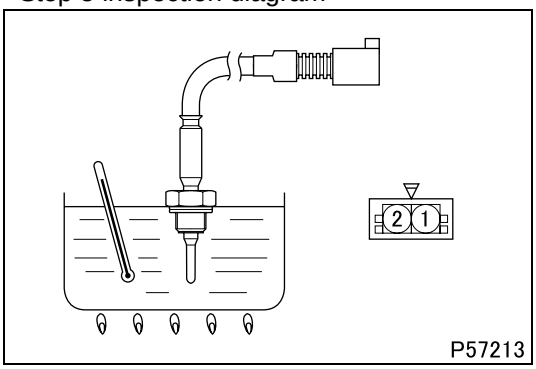
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 32 and 63.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		• 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
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Put intake air temperature sensor in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 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
	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		**<General Scanning Tool used>** • Measure item “Intake Air Temperature”. **<Multi-Use Tester used>** • Measure item No. 30 “Intake Air Temp. (upstream)” of Service Data.
	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.

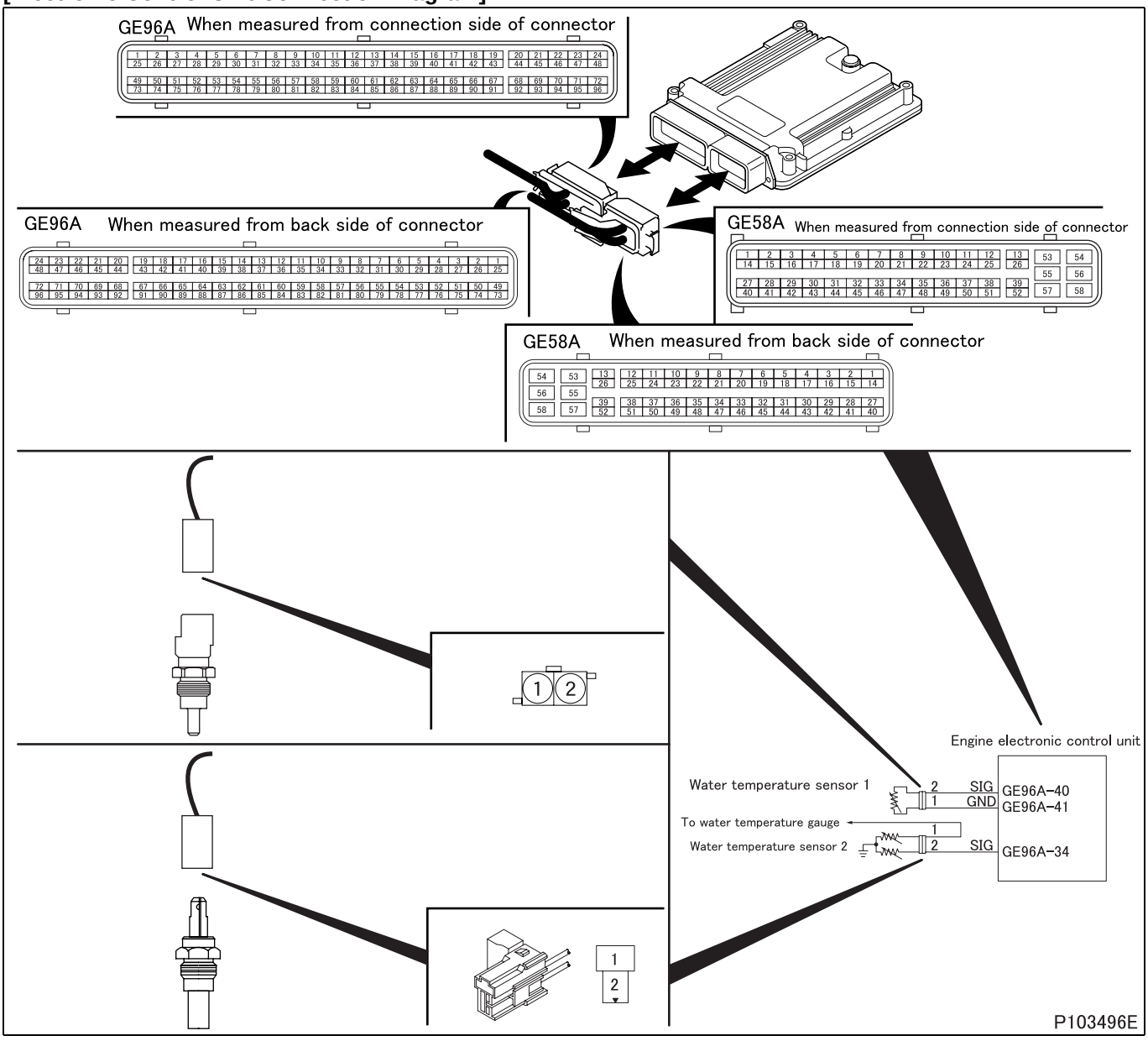
[Diagnostic requirement]
–

[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.

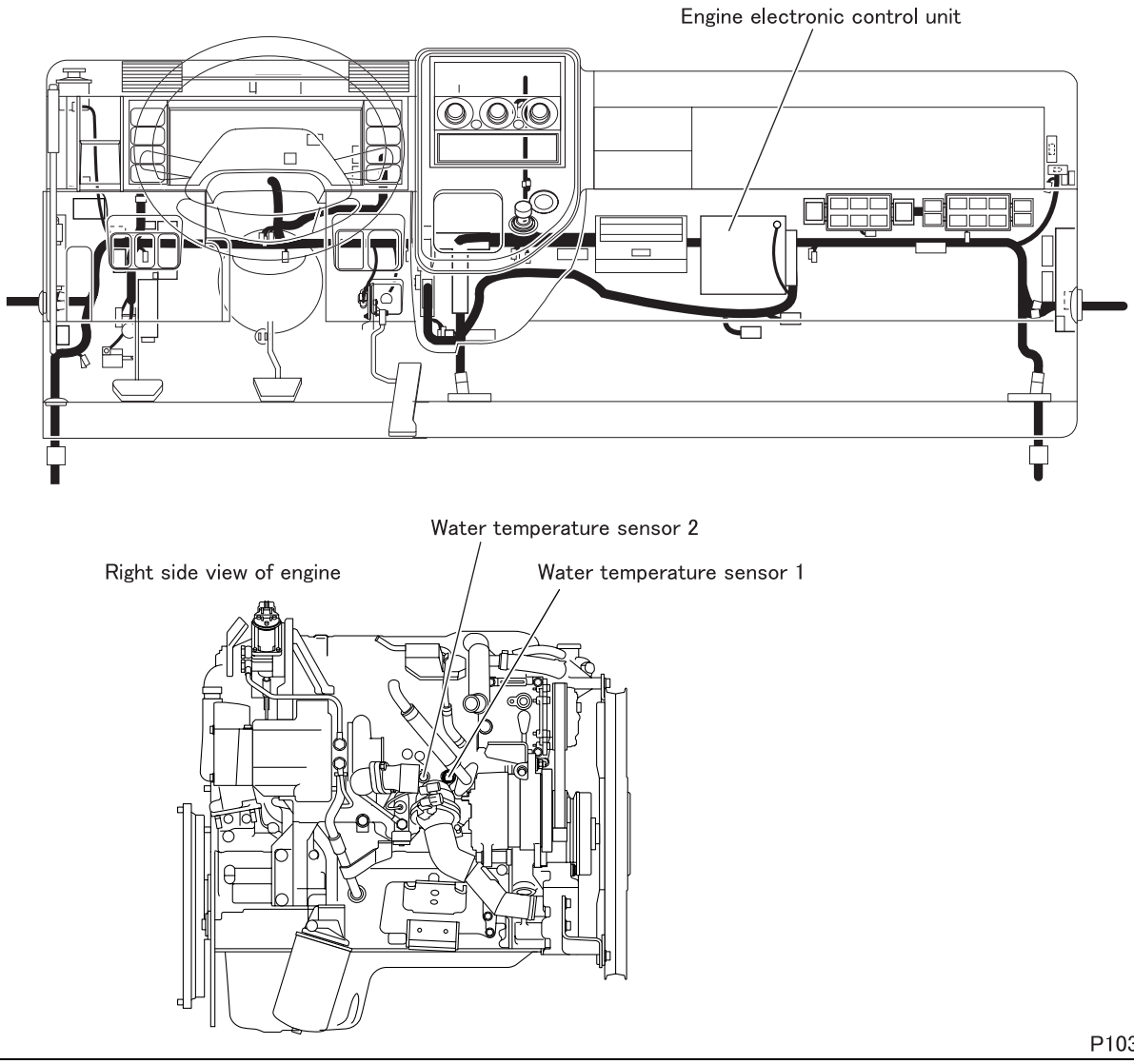
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and water temperature sensor 1
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

[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		**<General Scanning Tool used>** • Measure item “Engine Coolant Temperature”. **<Multi-Use Tester used>** • Measure item No. 31 “Water Temperature” of Service Data.
	Inspection condition		–
	Requirements		• When engine is cold: Temperature is equivalent to outside temperature. • While engine is warmed up: Temperature gradually increases. • When engine is stopped after warm-up: Temperature gradually declines.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 2.

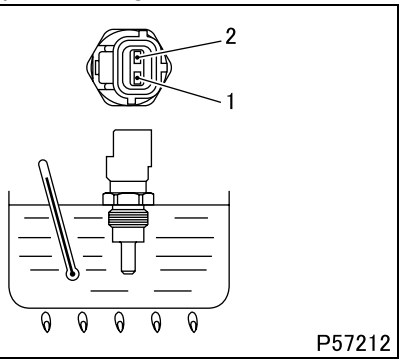
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminals No. 40 and No. 41.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		• 20°C {68°F}: 2.45 ± 0.14 kΩ • 80°C {176°F}: 0.32 kΩ (reference value) • 110°C {230°F}: 141.7 ± 2 kΩ
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Put water temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F}: 2.45 ± 0.14 kΩ • 80°C {176°F}: 0.32 kΩ (reference value) • 110°C {230°F}: 141.7 ± 2 kΩ
	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. 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?)	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?)	YES	Go to step 8.
		NO	Modify harness.

Step 8	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** • Measure item “Engine Coolant Temperature”. **<Multi-Use Tester used>** • Measure item No. 31 “Water Temperature” of Service Data.
	Inspection condition		–
	Requirements		• When engine is cold: Temperature is equivalent to outside temperature. • While engine is warmed up: Temperature gradually increases. • When engine is stopped after warm-up: Temperature gradually declines.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Replacement of electronic control unit

[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°C {–49°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.

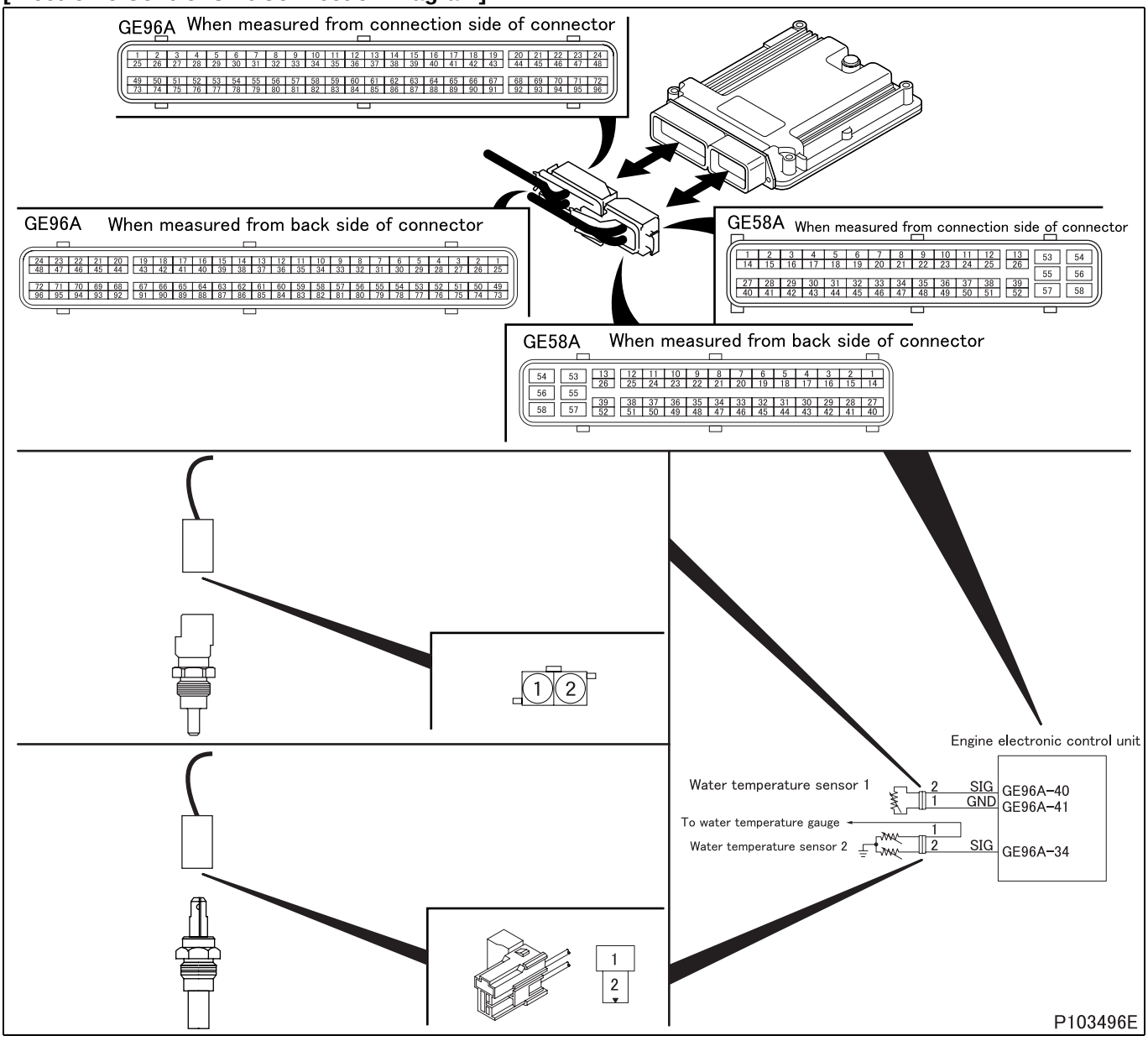
[Diagnostic requirement]
–

[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.

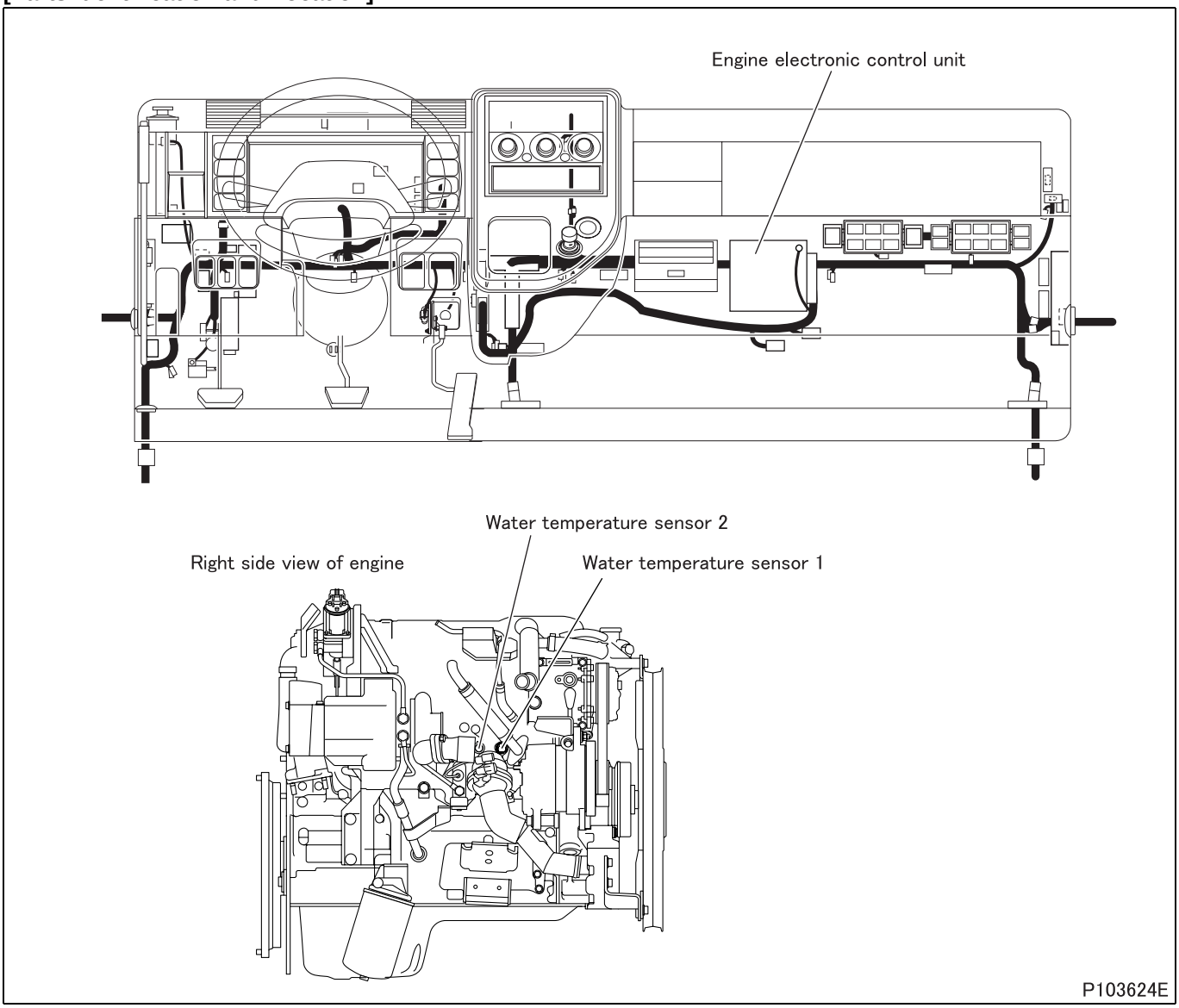
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and water temperature sensor 1
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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]



[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		**<General Scanning Tool used>** • Measure item “Engine Coolant Temperature”. **<Multi-Use Tester used>** • Measure item No. 31 “Water Temperature” of Service Data.
	Inspection condition		–
	Requirements		• When engine is cold: Temperature is equivalent to outside temperature. • While engine is warmed up: Temperature gradually increases. • When engine is stopped after warm-up: Temperature gradually declines.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 2.

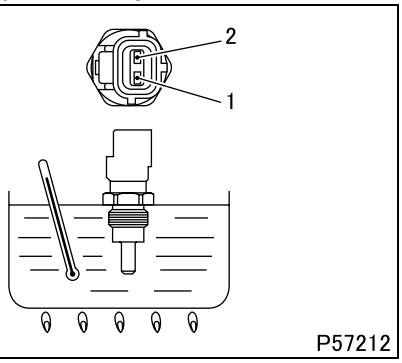
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminals No. 40 and No. 41.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		• 20°C {68°F}: 2.45 ± 0.14 kΩ • 80°C {176°F}: 0.32 kΩ (reference value) • 110°C {230°F}: 141.7 ± 2 kΩ
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Put water temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F}: 2.45 ± 0.14 kΩ • 80°C {176°F}: 0.32 kΩ (reference value) • 110°C {230°F}: 141.7 ± 2 kΩ
	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. 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?)	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?)	YES	Go to step 8.
		NO	Modify harness.

Step 8	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** • Measure item “Engine Coolant Temperature”. **<Multi-Use Tester used>** • Measure item No. 31 “Water Temperature” of Service Data.
	Inspection condition		–
	Requirements		• When engine is cold: Temperature is equivalent to outside temperature. • While engine is warmed up: Temperature gradually increases. • When engine is stopped after warm-up: Temperature gradually declines.
	Inspection result (Is the judging standard satisfied?)	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.

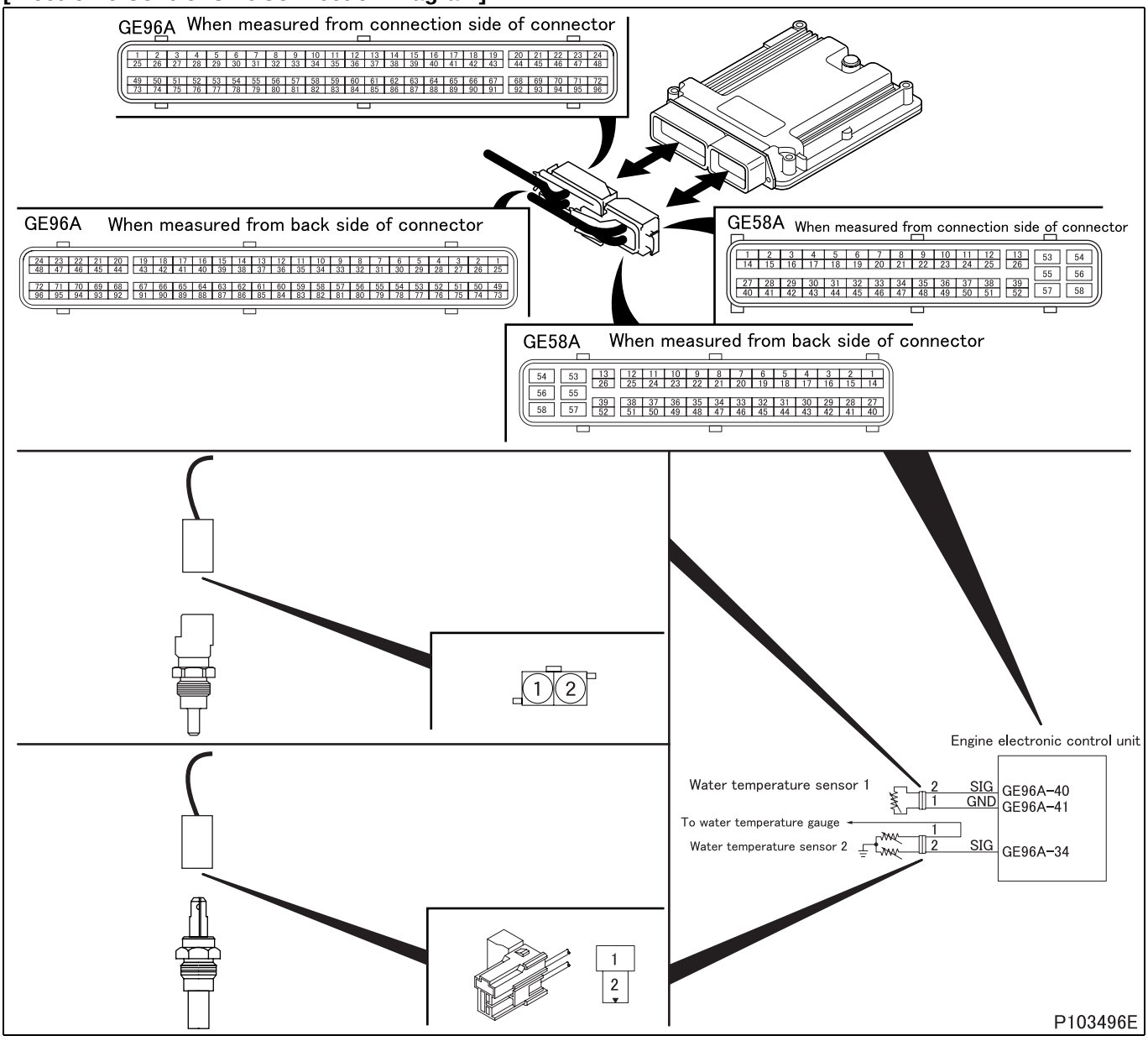
[Diagnostic requirement]
- Engine running time: 30 seconds

[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.

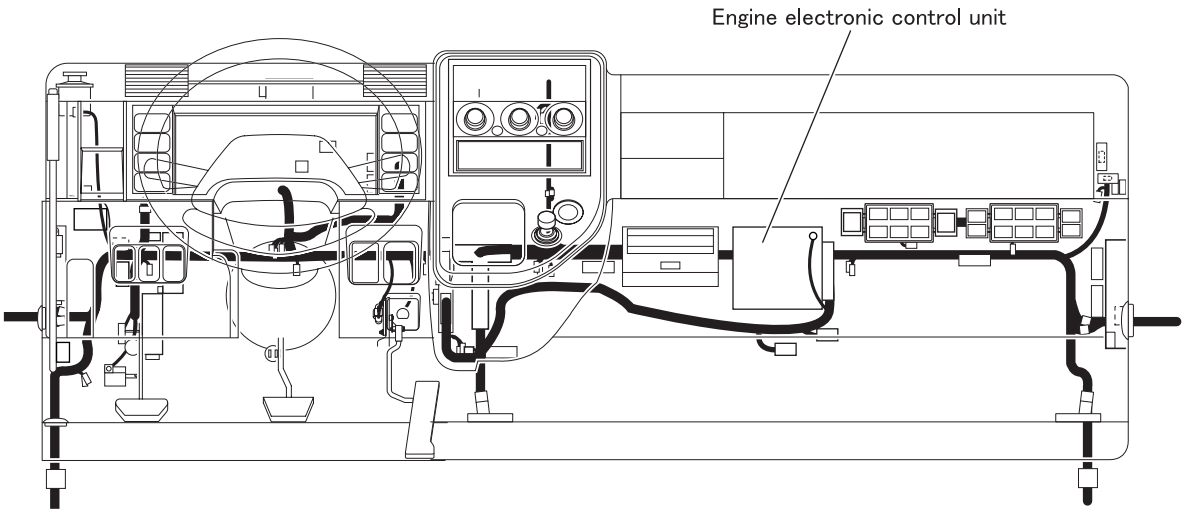
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

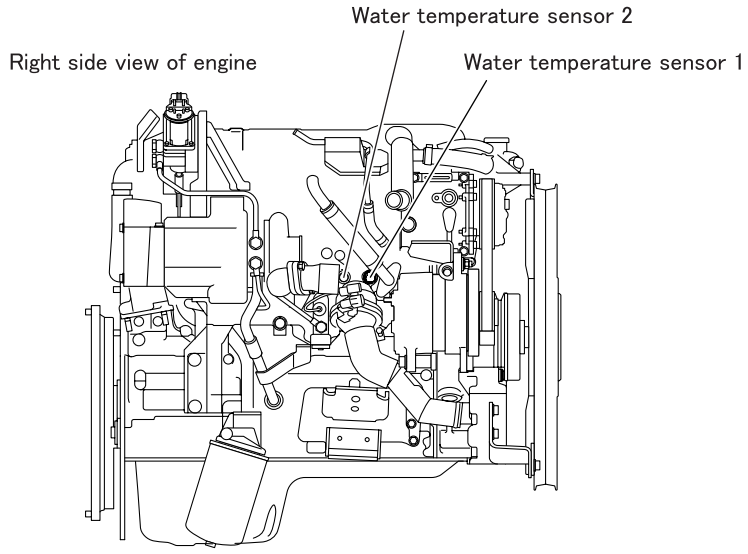
[Recoverability]
- Recovered if signal becomes normal with starter switch in ON position.
  (Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]





P103624E

[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 • Water temperature sensor 1: Item No. 31 “Water Temperature” • Water temperature sensor 2: Item No. 32 “Water Temperature 2”
	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.

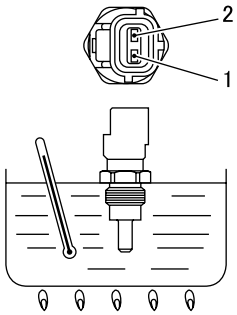
Step 2	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• 20°C {68°F}: 2.45 ± 0.14 kΩ • 80°C {176°F}: 0.32 kΩ (reference value) • 110°C {230°F}: 141.7 ± 2 kΩ
	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		• Put water temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F}: 2.45 ± 0.14 kΩ • 80°C {176°F}: 0.32 kΩ (reference value) • 110°C {230°F}: 141.7 ± 2 kΩ
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 6.
		NO	Replacement of sensor

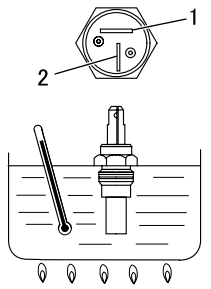
<Step 5 inspection diagram>



Step 6	Inspection items		Inspection 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		• –20°C {–4°F}: 24.8 ± 2.5 kΩ • 0°C {32°F}: 8.62 kΩ (reference value) • 20°C {68°F}: 3.25 ± 0.33 kΩ • 60°C {140°F}: 620 kΩ (reference value) • 80°C {176°F}: 300 kΩ (reference value)
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of electronic control unit
		NO	Go to step 7.

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		• Put water temperature sensor 2 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• –20°C {–4°F}: 24.8 ± 2.5 kΩ • 0°C {32°F}: 8.62 kΩ (reference value) • 20°C {68°F}: 3.25 ± 0.33 kΩ • 60°C {140°F}: 620 kΩ (reference value) • 80°C {176°F}: 300 kΩ (reference value)
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of electronic control unit
		NO	Replacement of sensor

<Step 7 inspection diagram>



P19463

[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.

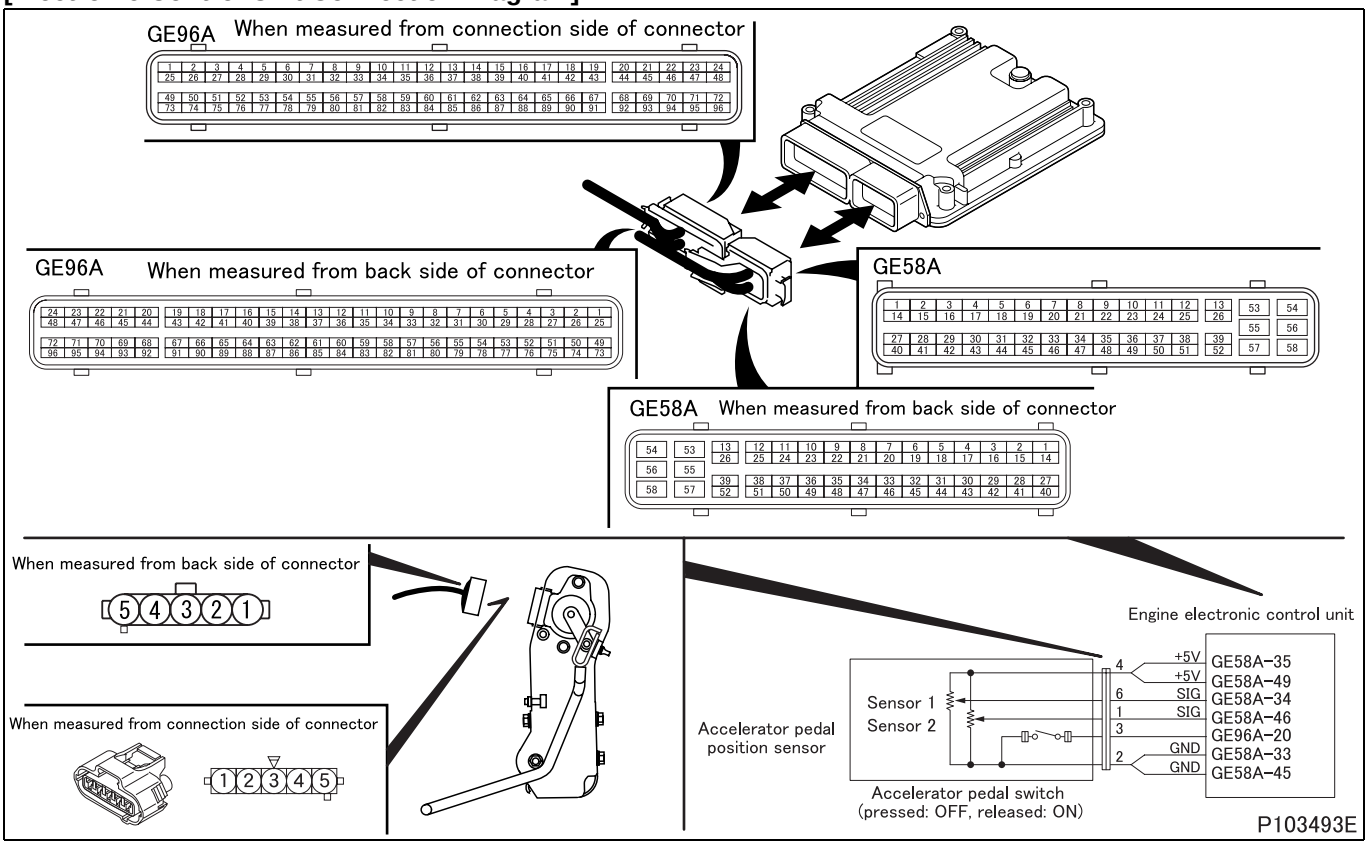
[Diagnostic requirement]
–

[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.

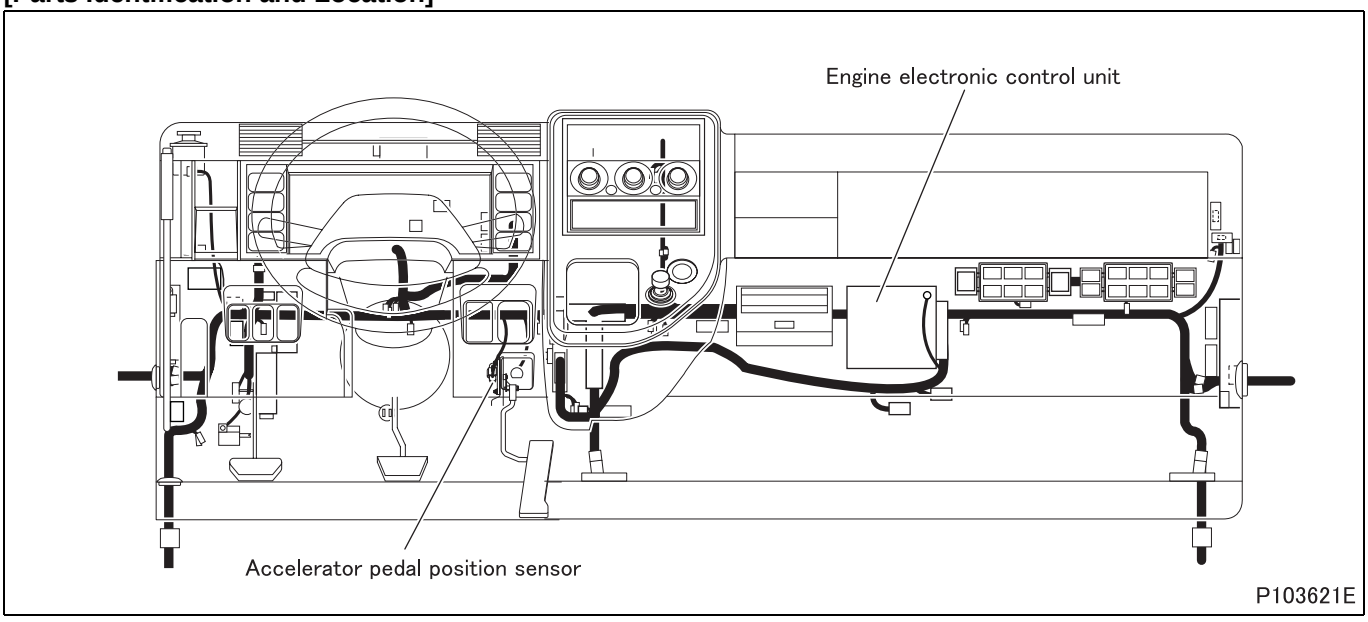
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

[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		**<General Scanning Tool used>** • Measure “Accelerator Pedal Position 1”. **<Multi-Use Tester used>** • Measure item No. 40 “Accelerator sensor voltage 1” of Service Data.
	Inspection condition		–
	Requirements		**<General Scanning Tool used>** • Accelerator pedal not pressed: 0% • Accelerator pedal pressed: 100% **<Multi-Use Tester used>** • Accelerator pedal not pressed: 0.85 ± 0.1 V • Accelerator pedal pressed: 4.15 ± 0.1 V
	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		• Starter switch: ON • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	Requirements		• Accelerator pedal not pressed: 0.85 ± 0.1 V • Accelerator pedal pressed: 4.15 ± 0.1 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 (GE58A) terminal No. 35 (+) and No. 33 (–).
	Inspection condition		• Starter switch: ON • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	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		• Starter switch: ON • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 12.
		NO	Modify connector.

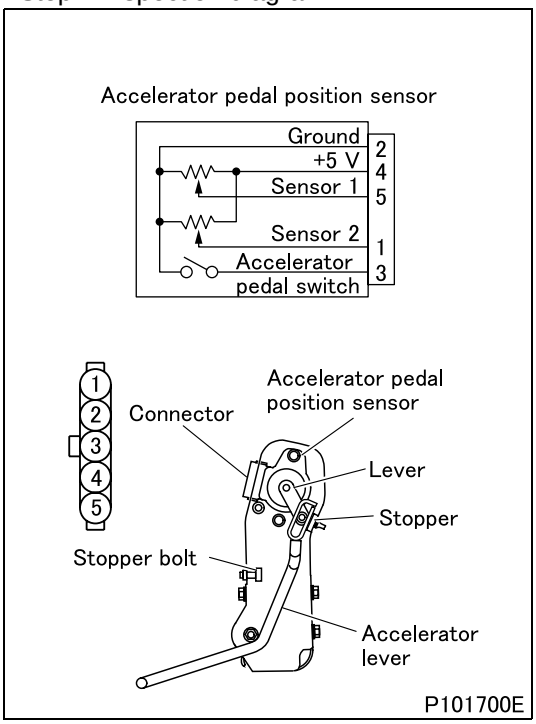
Step 6	Inspection items		Inspection of sensor connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 7.
		NO	Modify connector.

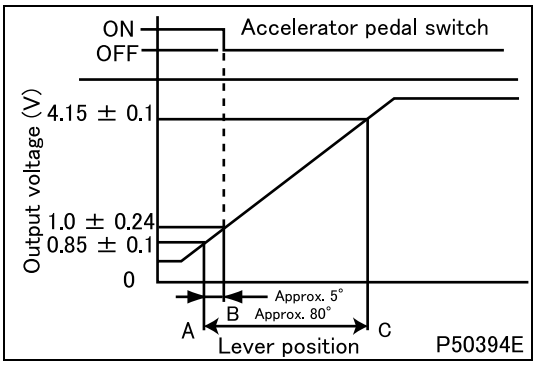
Step 7	Inspection items		Inspection of accelerator pedal position sensor 1 unit
	Maintenance item		Measure value of voltage between connector terminal No. 5 (+) and 2 (–).
	Inspection condition		Apply voltage DC 5 V across connector terminals No. 4 (+) and 2 (–).

	Requirements		• Idle position A: 0.85 ± 0.1 V
			• Accelerator switch operating position B: 1.0 ± 0.24 V
			• Full load position C: 4.15 ± 0.1 V
			  • A: When accelerator lever is in contact with stopper
			  • B: When accelerator pedal is pressed until there is no continuity between terminals 2 and 3.
			  • C: When 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 (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		• Starter switch: ON • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	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.

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		**<General Scanning Tool used>** • Measure item “Accelerator Pedal Position 1”. **<Multi-Use Tester used>** • Measure item No. 40 “Accelerator sensor voltage 1” of Service Data.
	Inspection condition		–
	Requirements		**<General Scanning Tool used>** • Accelerator pedal not pressed: 0% • Accelerator pedal pressed: 100% **<Multi-Use Tester used>** • Accelerator pedal not pressed: 0.85 ± 0.1 V • 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

[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.

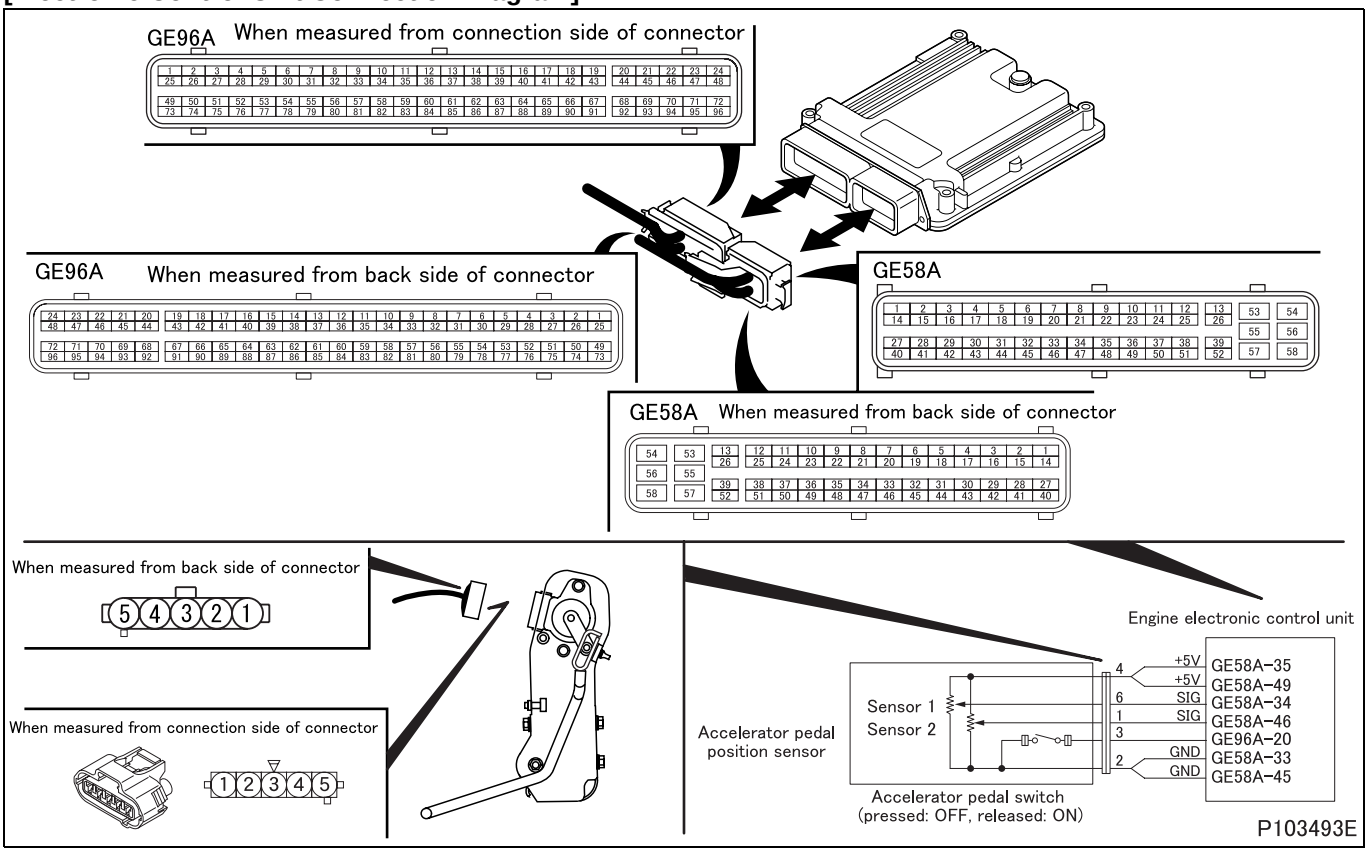
[Diagnostic requirement]
–

[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.

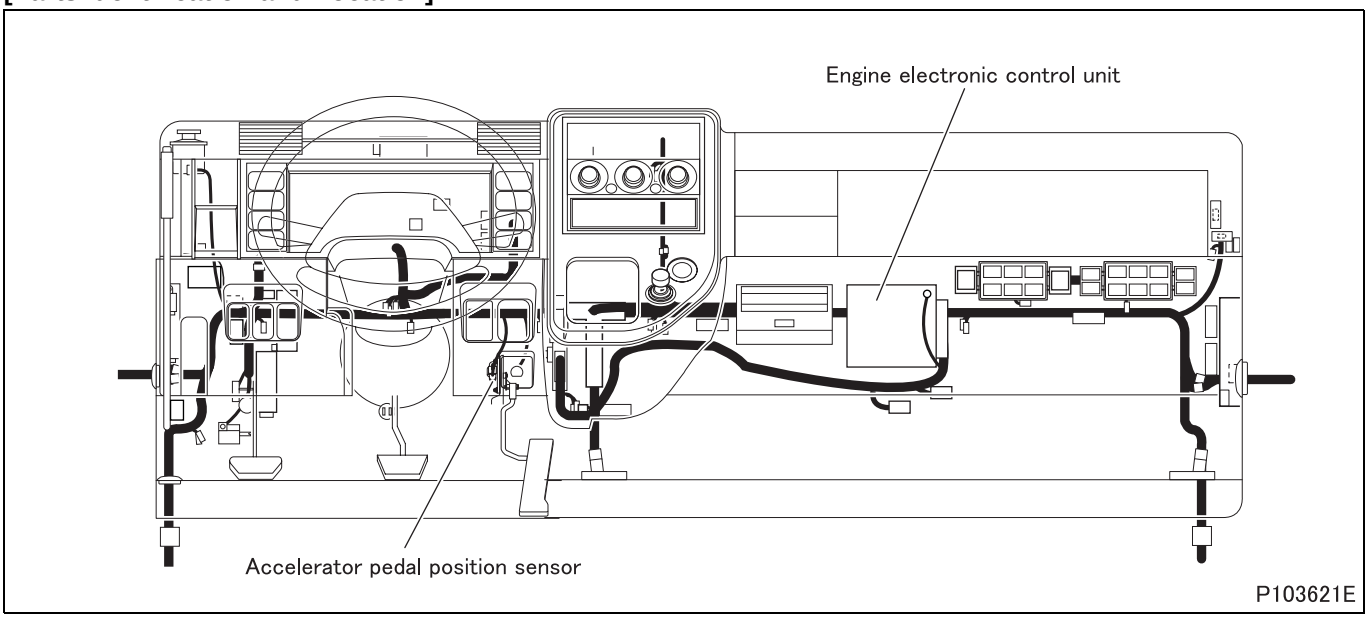
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

[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		**<General Scanning Tool used>** • Measure item “Accelerator Pedal Position 1”. **<Multi-Use Tester used>** • Measure item No. 40 “Accelerator sensor voltage 1” of Service Data.
	Inspection condition		–
	Requirements		**<General Scanning Tool used>** • Accelerator pedal not pressed: 0% • Accelerator pedal pressed: 100% **<Multi-Use Tester used>** • Accelerator pedal not pressed: 0.85 ± 0.1 V • Accelerator pedal pressed: 4.15 ± 0.1 V
	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		• Starter switch: ON • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	Requirements		• Accelerator pedal not pressed: 0.85 ± 0.1 V • Accelerator pedal pressed: 4.15 ± 0.1 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 (GE58A) terminal No. 35 (+) and No. 33 (–).
	Inspection condition		• Starter switch: ON • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	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		• Starter switch: ON • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 12.
		NO	Modify connector.

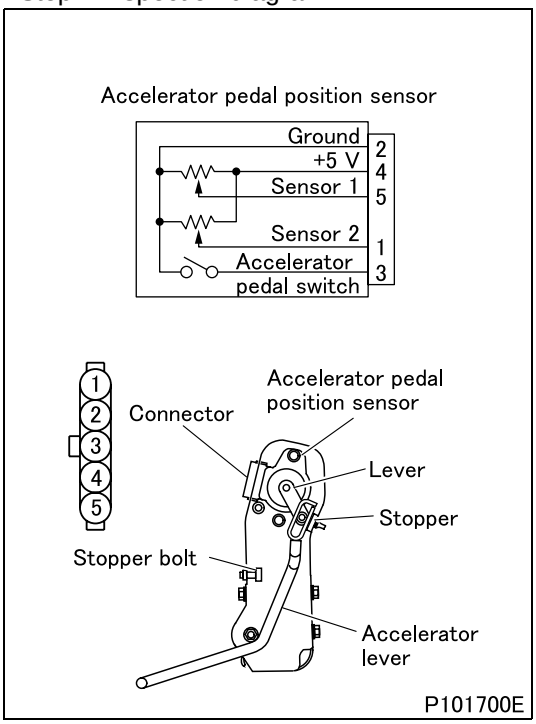
Step 6	Inspection items		Inspection of sensor connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 7.
		NO	Modify connector.

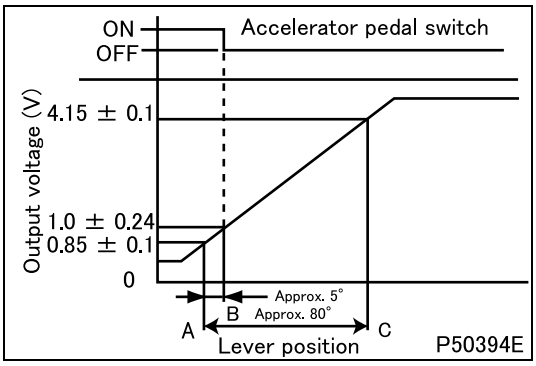
Step 7	Inspection items		Inspection of accelerator pedal position sensor 1 unit
	Maintenance item		Measure value of voltage between connector terminal No. 5 (+) and 2 (–).
	Inspection condition		Apply voltage DC 5 V across connector terminals No. 4 (+) and 2 (–).

	Requirements		• Idle position A: 0.85 ± 0.1 V
			• Accelerator switch operating position B: 1.0 ± 0.24 V
			• Full load position C: 4.15 ± 0.1 V
			  • A: When accelerator lever is in contact with stopper
			  • B: When accelerator pedal is pressed until there is no continuity between terminals 2 and 3.
			  • C: When 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 (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		• Starter switch: ON • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	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.

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		**<General Scanning Tool used>** • Measure item “Accelerator Pedal Position 1”. **<Multi-Use Tester used>** • Measure item No. 40 “Accelerator sensor voltage 1” of Service Data.
	Inspection condition		–
	Requirements		**<General Scanning Tool used>** • Accelerator pedal not pressed: 0% • Accelerator pedal pressed: 100% **<Multi-Use Tester used>** • Accelerator pedal not pressed: 0.85 ± 0.1 V • 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

[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.)

[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. • P0112 “INT Air Temp SNSR (Low)” • P0113 “INT Air Temp SNSR (High)” • P2199 “EGR Temp Sensor (Correlation)”
	Inspection condition		• Starter switch: ON • Do not start engine.
	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°C {19 to 113°F}
- Intake air temperature at engine start: above –7°C {19°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.)

[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. • P0117 “Water Temp SNSR (Low)” • P0118 “Water Temp SNSR (High)” • P011A “Water Temp SNSR”
	Inspection condition		• Starter switch: ON • Engine: started
	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.)

[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. • P0093 “CRS (Fuel Leak)” • P0148 “CRS (Fuel Delivery)” • P0191 “CRS Pressure SNSR (Plausibility)” • P0192 “CRS Pressure SNSR (Low)” • P0193 “CRS Pressure SNSR (High)” • P0201 “Injector M/V-Cylinder 1 (Load)” • P0202 “Injector M/V-Cylinder 2 (Load)” • P0203 “Injector M/V-Cylinder 3 (Load)” • P0204 “Injector M/V-Cylinder 4 (Load)” • P0261 “Injector #1-A (Low)” • P0262 “Injector #1-A (High)” • P0263 “Injector #1-A (Plausibility)” • P0264 “Injector #2-A (Low)” • P0265 “Injector #2-A (High)” • P0266 “Injector #2-A (Plausibility)” • P0267 “Injector #3-A (Low)” • P0268 “Injector #3-A (High)” • P0269 “Injector #3-A (Plausibility)” • P0270 “Injector #4-A (Low)” • P0271 “Injector #4-A (High)” • P0272 “Injector #4-A (Plausibility)” • P0562 “Power Supply Voltage (Low)” • P0563 “Power Supply Voltage (High)” • P0607 “ECU System” • P060B “A/D Converter” • P061B “ECU Performance (Calc)” • P061C “ECU Performance (Ne)”
	Inspection condition		• Starter switch: ON • Do not start engine
	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

Step 11	Inspection items		Check inside of combustion chamber.
	Maintenance item		Check for fuel leak.
	Inspection condition		• After performing actuator test item No. B2 “Fuel Leak Check”, stop engine. • Remove glow plug, and check from glow plug mounting hole using bore scope.
	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.

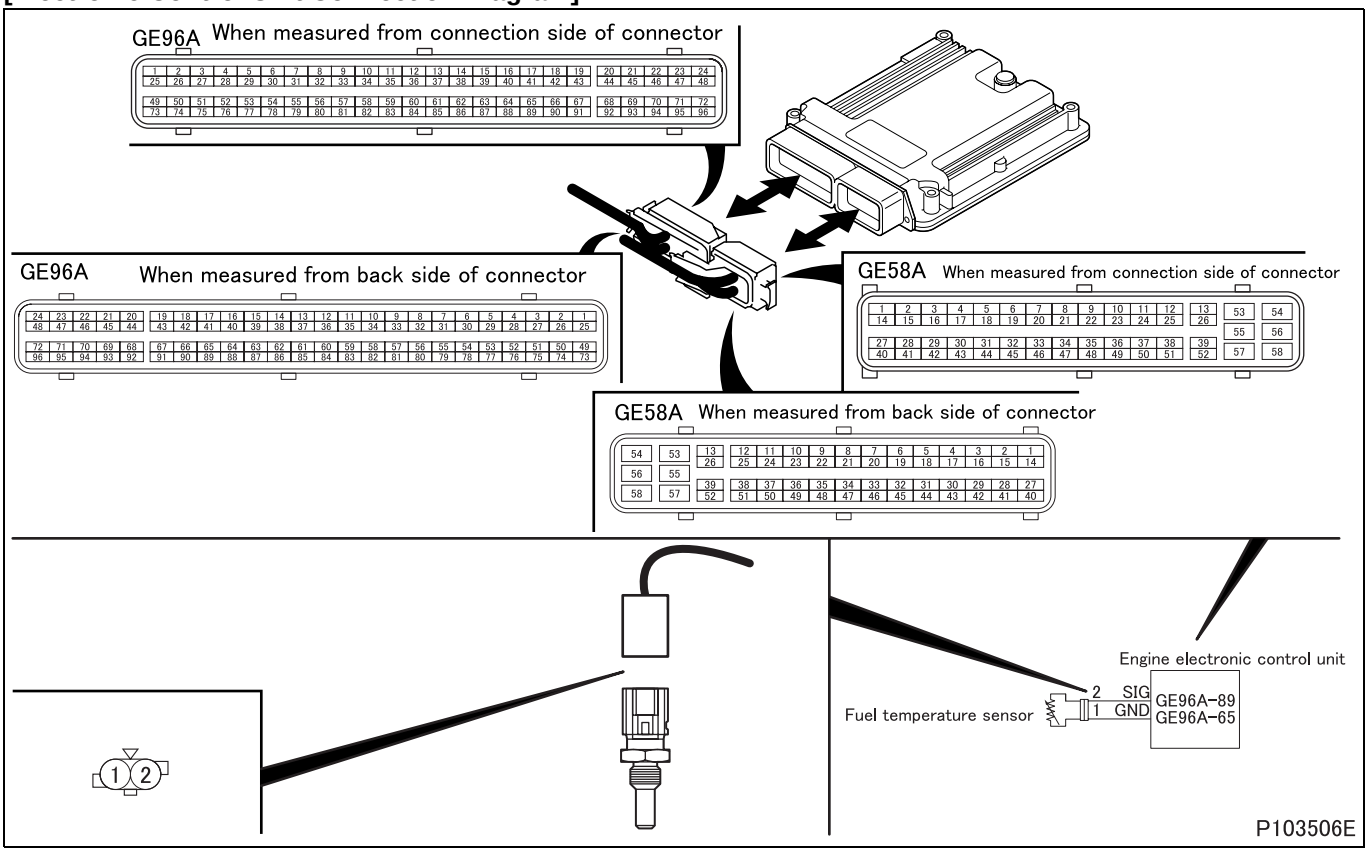
[Diagnostic requirement]
–

[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.

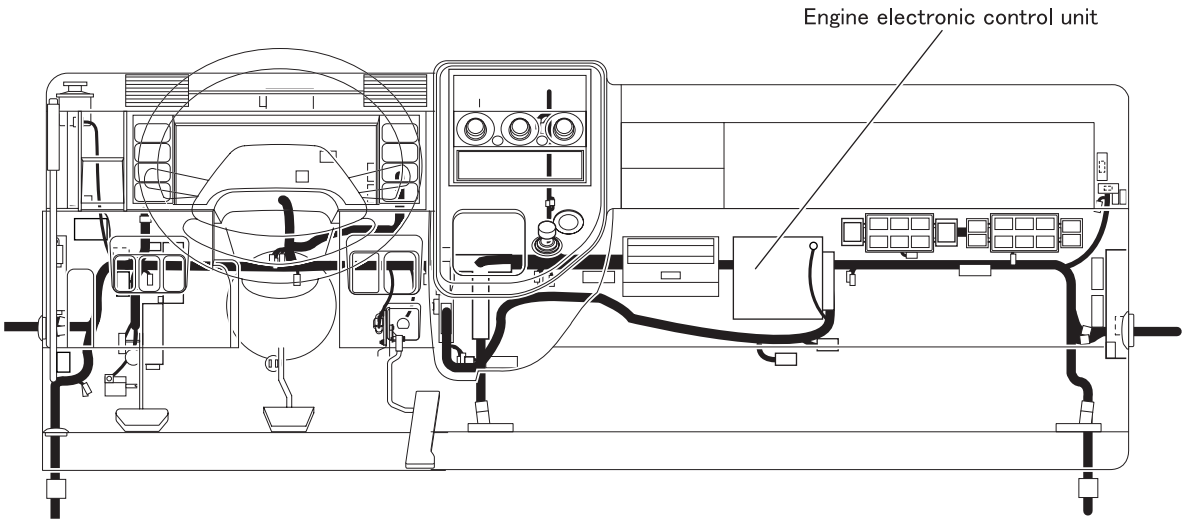
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and fuel temperature sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

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

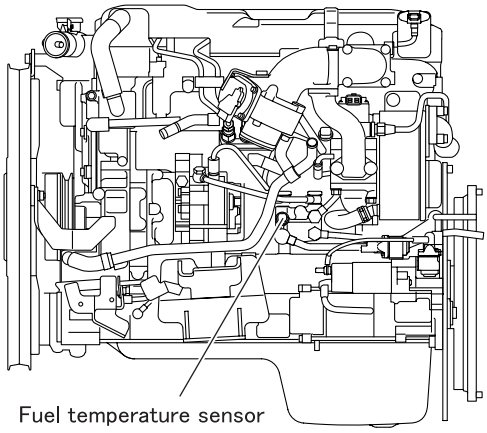
[Electronic Control Unit Connection Diagram]



[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		• When engine is cold: Temperature is equivalent to outside temperature. • While engine is warmed up: Temperature gradually increases. • When engine is stopped after warm-up: Temperature rise up just after engine stopped, then gradually decline.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 2.

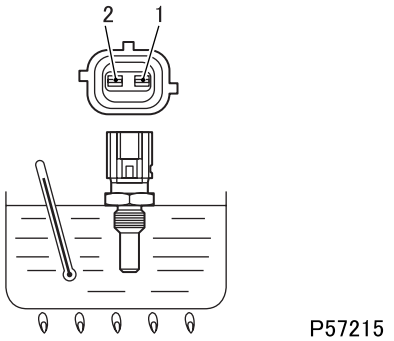
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 65 and 89.
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	Requirements		• 20°C {68°F}: 2.45 $^{+0.14}_{-0.13}$ kΩ • 80°C {176°F}: 0.318 ± 0.008 kΩ • 110°C {230°F}: 0.1417 ± 0.0018 kΩ
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• 20°C {68°F}: 2.45 $^{+0.14}_{-0.13}$ kΩ • 80°C {176°F}: 0.318 ± 0.008 kΩ • 110°C {230°F}: 0.1417 ± 0.0018 kΩ
	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		• When engine is cold: Temperature is equivalent to outside temperature. • While engine is warmed up: Temperature gradually increases. • When engine is stopped after warm-up: Temperature rise up just after engine stopped, then gradually decline.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Replacement of electronic control unit

[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.

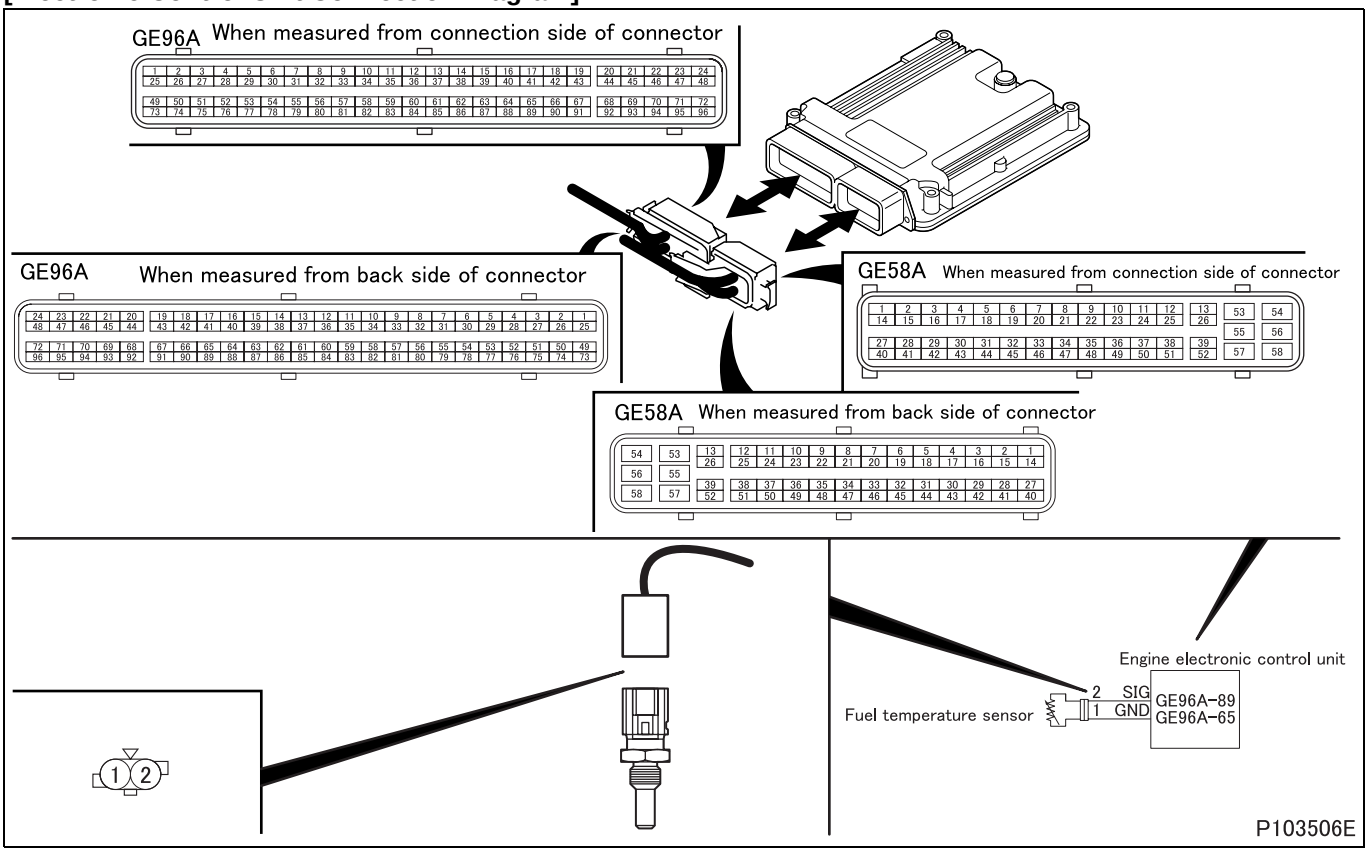
[Diagnostic requirement]
–

[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.

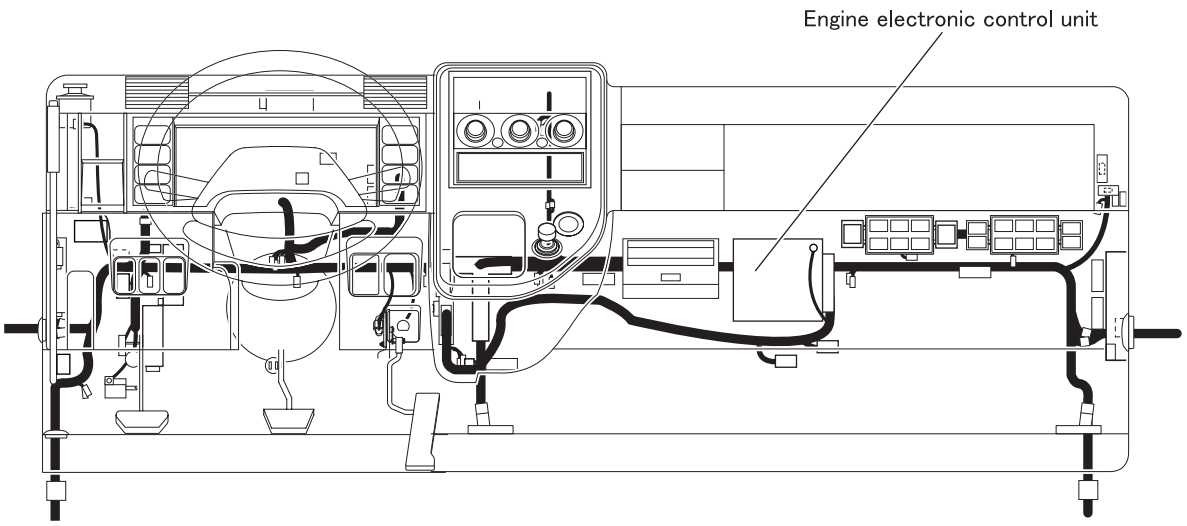
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and fuel temperature sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

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

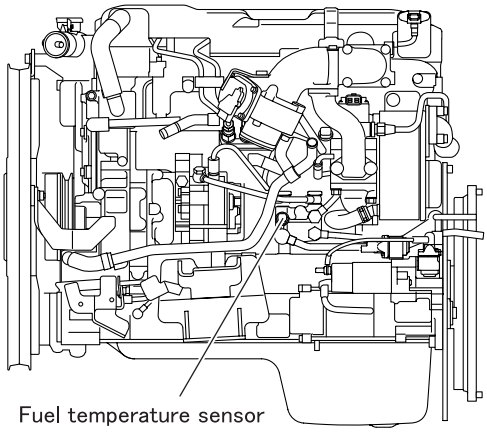
[Electronic Control Unit Connection Diagram]



[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		• When engine is cold: Temperature is equivalent to outside temperature. • While engine is warmed up: Temperature gradually increases. • When engine is stopped after warm-up: Temperature rise up just after engine stopped, then gradually decline.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 2.

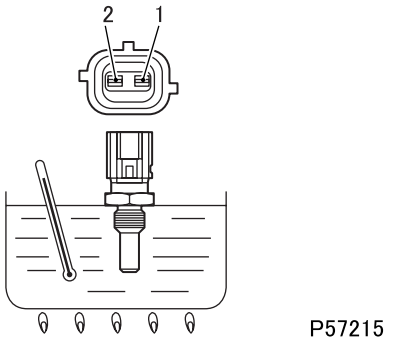
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 65 and 89.
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	Requirements		• 20°C {68°F}: 2.45 $^{+0.14}_{-0.13}$ kΩ • 80°C {176°F}: 0.318 ± 0.008 kΩ • 110°C {230°F}: 0.1417 ± 0.0018 kΩ
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• 20°C {68°F}: 2.45 $^{+0.14}_{-0.13}$ kΩ • 80°C {176°F}: 0.318 ± 0.008 kΩ • 110°C {230°F}: 0.1417 ± 0.0018 kΩ
	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		• When engine is cold: Temperature is equivalent to outside temperature. • While engine is warmed up: Temperature gradually increases. • When engine is stopped after warm-up: Temperature rise up just after engine stopped, then gradually decline.
	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.

[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.

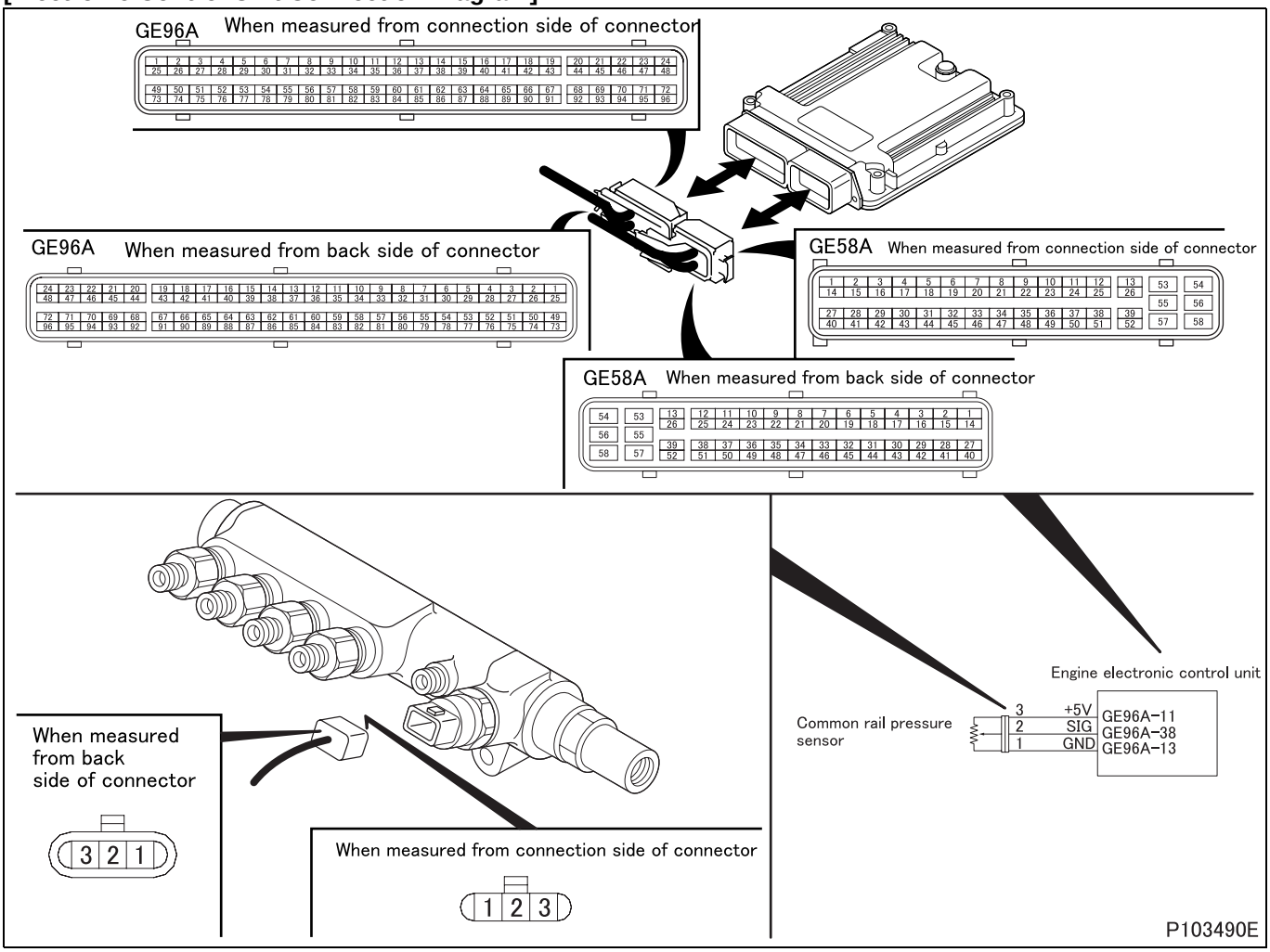
[Diagnostic requirement]
- Status of engine: stop to start
- Water temperature: above 0°C {32°F}
- Delay time after starter switch ON: more than 3.2 seconds

[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.

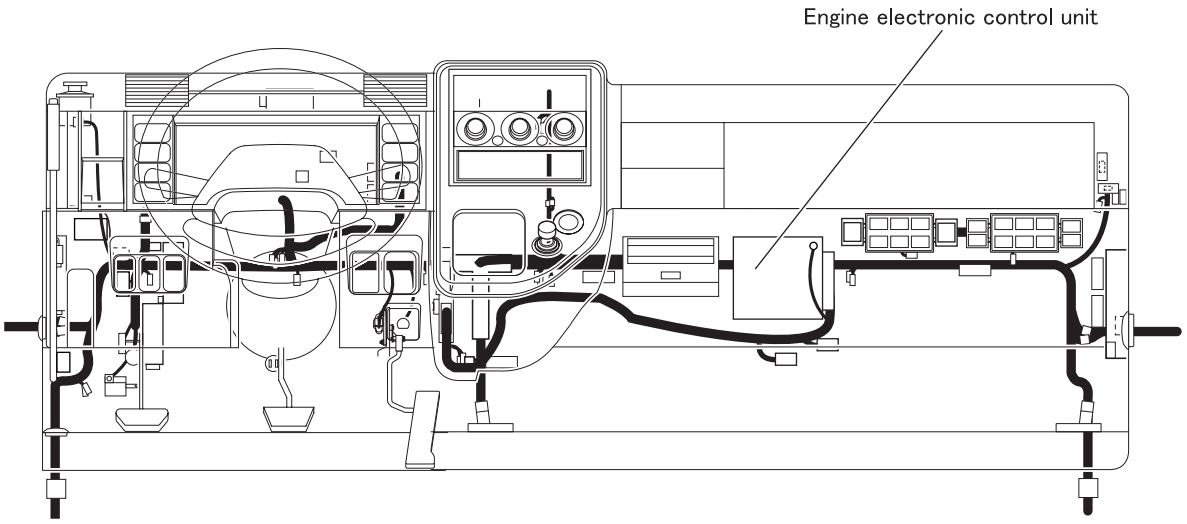
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

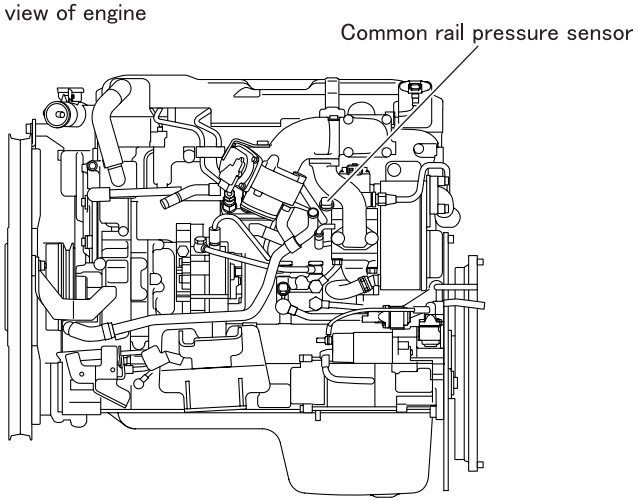
[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



Left side view of engine



P103618E

[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	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 2.

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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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. 11 (+) and 13 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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. 13 (+) and (GE58A) terminal No. 53 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 11.
		NO	Modify connector.

Step 6	Inspection items		Inspection of sensor connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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.

Step 11	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	Replacement of rail

[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.

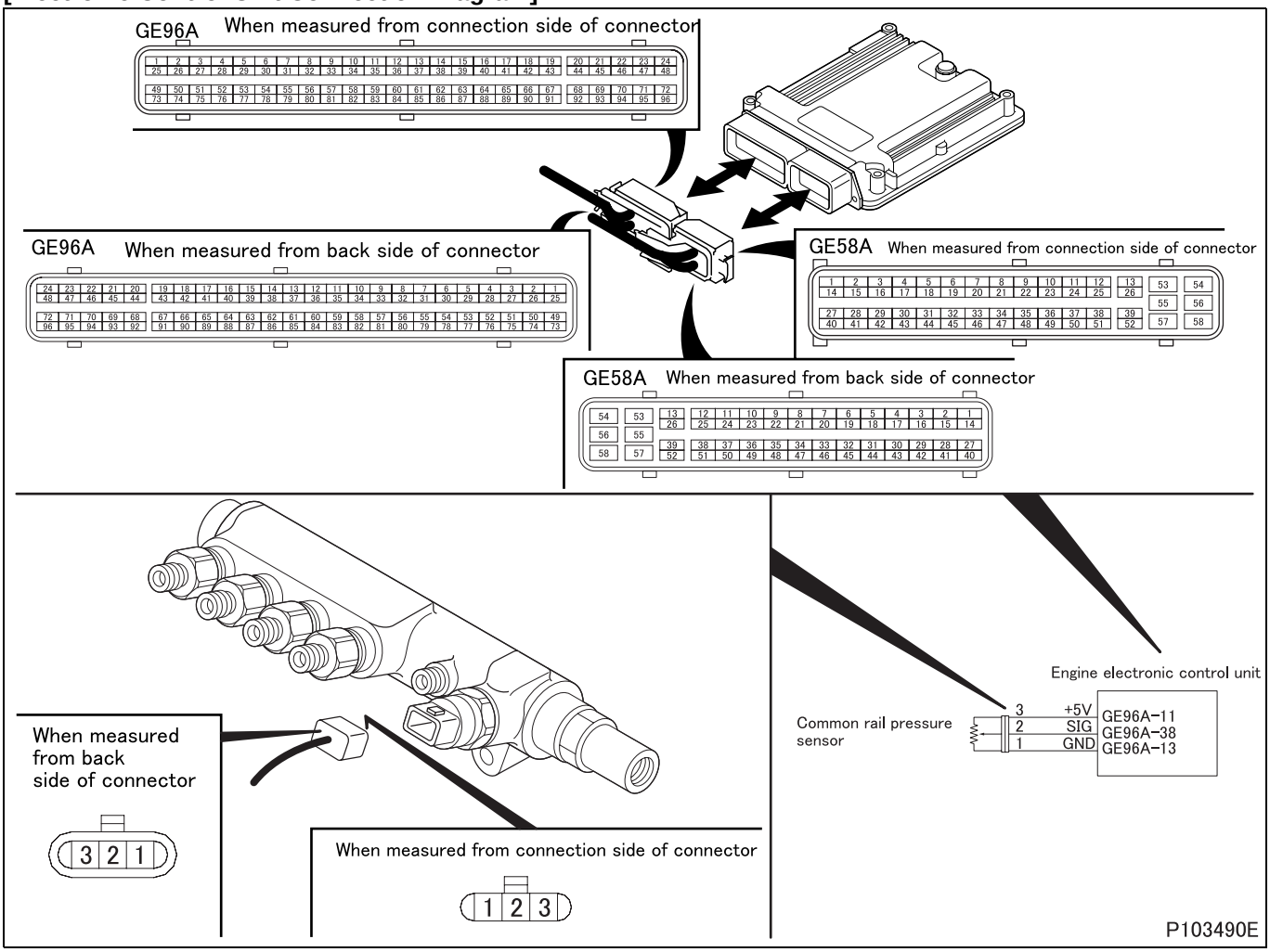
[Diagnostic requirement]
–

[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.

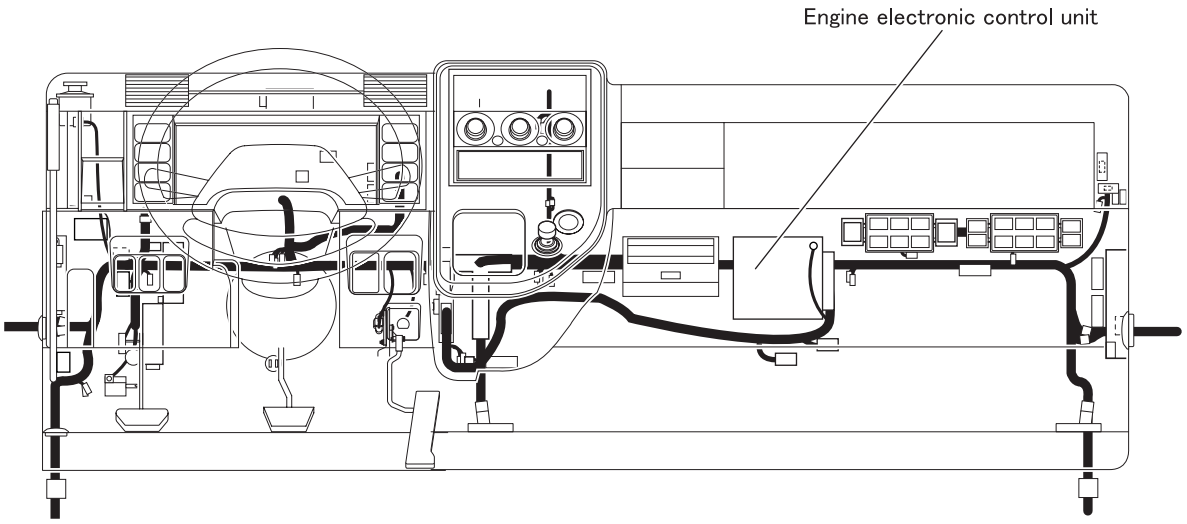
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

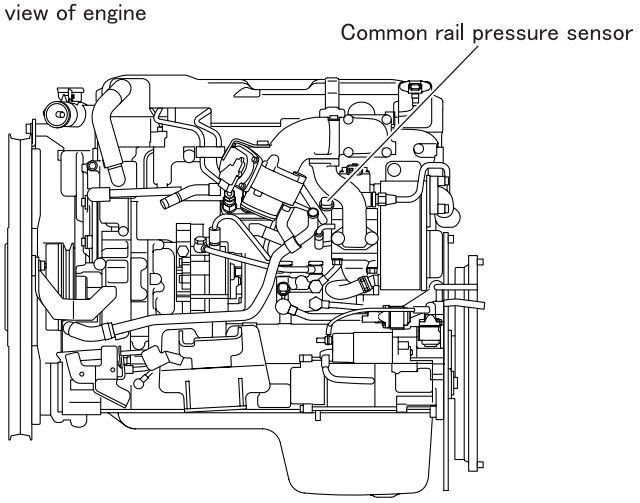
[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



Left side view of engine



P103618E

[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	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. 38 (+) and 13 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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. 11 (+) and 13 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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. 13 (+) and (GE58A) terminal No. 53 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 11.
		NO	Modify connector.

Step 6	Inspection items		Inspection of sensor connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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.

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.

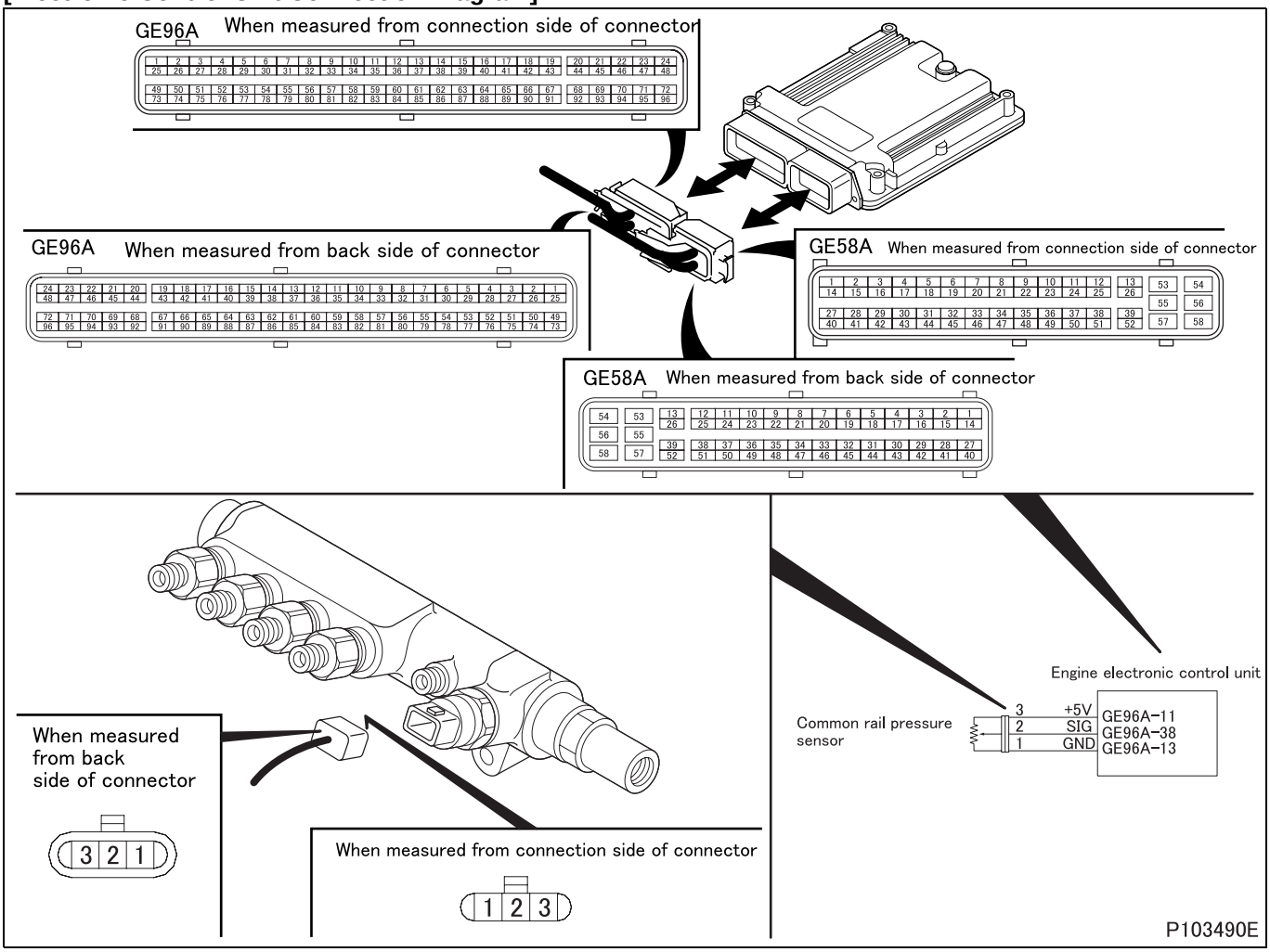
[Diagnostic requirement]
–

[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.

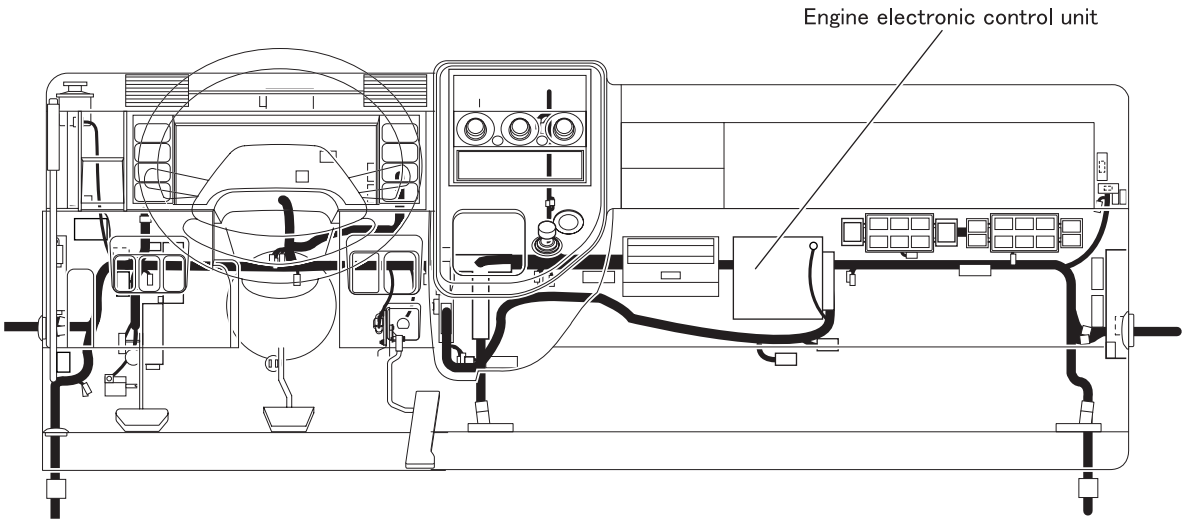
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

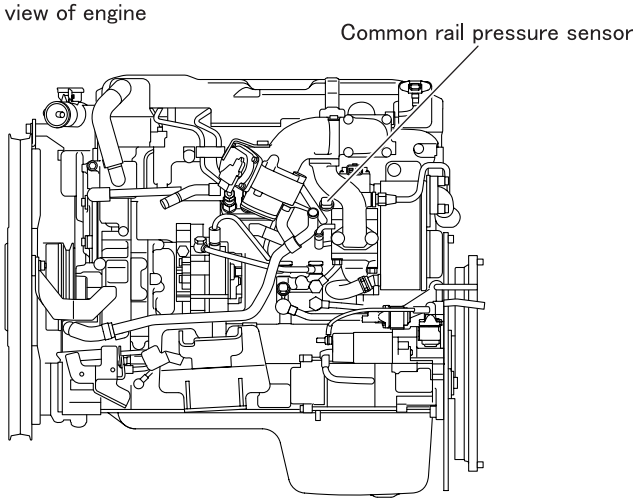
[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



Left side view of engine



P103618E

[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	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. 38 (+) and 13 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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. 11 (+) and 13 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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. 13 (+) and (GE58A) terminal No. 53 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 11.
		NO	Modify connector.

Step 6	Inspection items		Inspection of sensor connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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.

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]
–

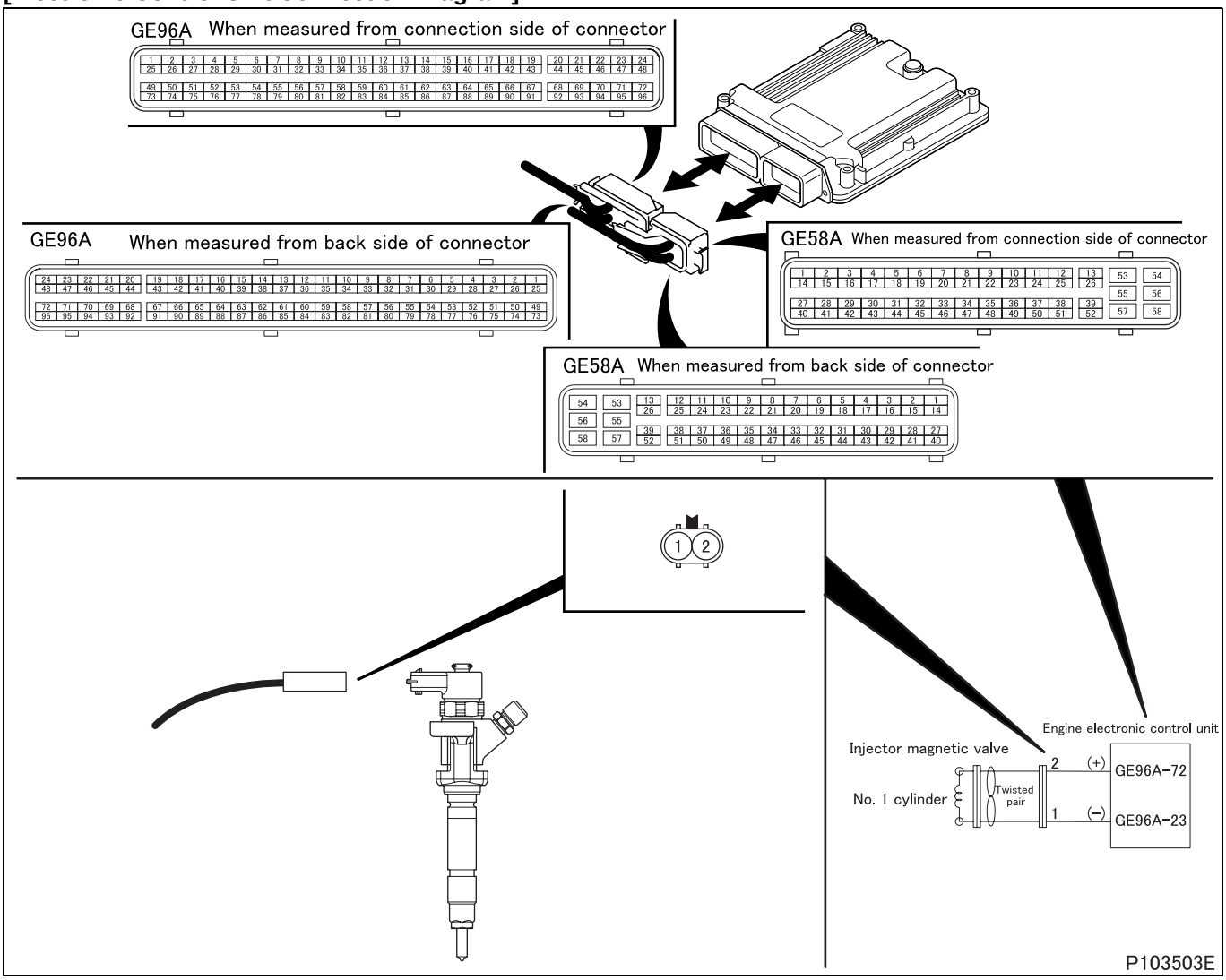
[Control effected by electronic control unit during fault]
Electronic control unit differs in the way of control by the diagnosis check item.
<Short-circuit>
- Injector magnetic valve (No. 1 and No. 4 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- 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.

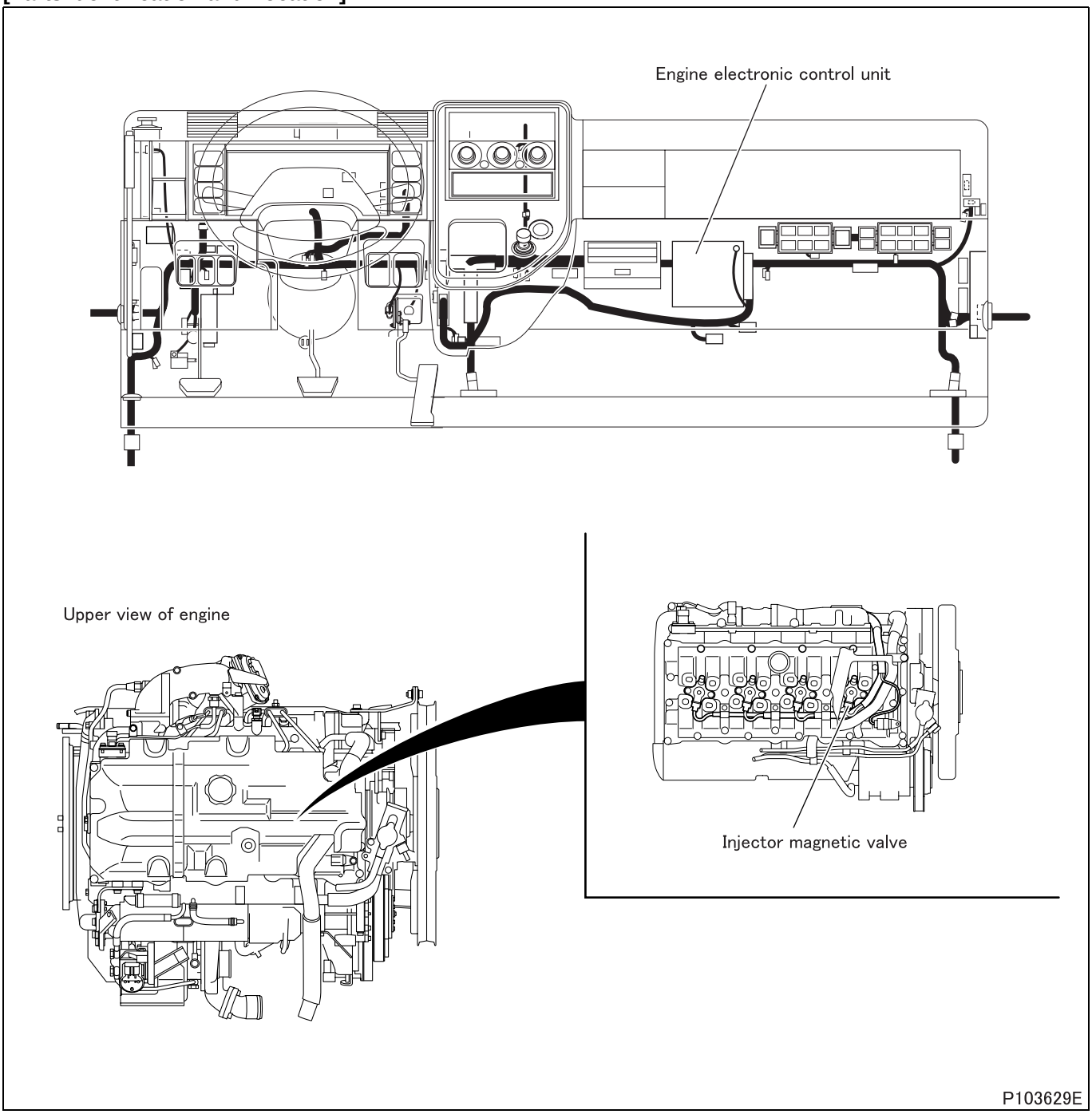
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

[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.)

[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 actuator test item No. BB “Injector Test 1”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

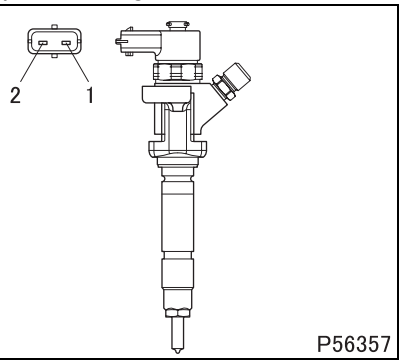
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 23 and 72.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		0.255 ± 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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

[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]
–

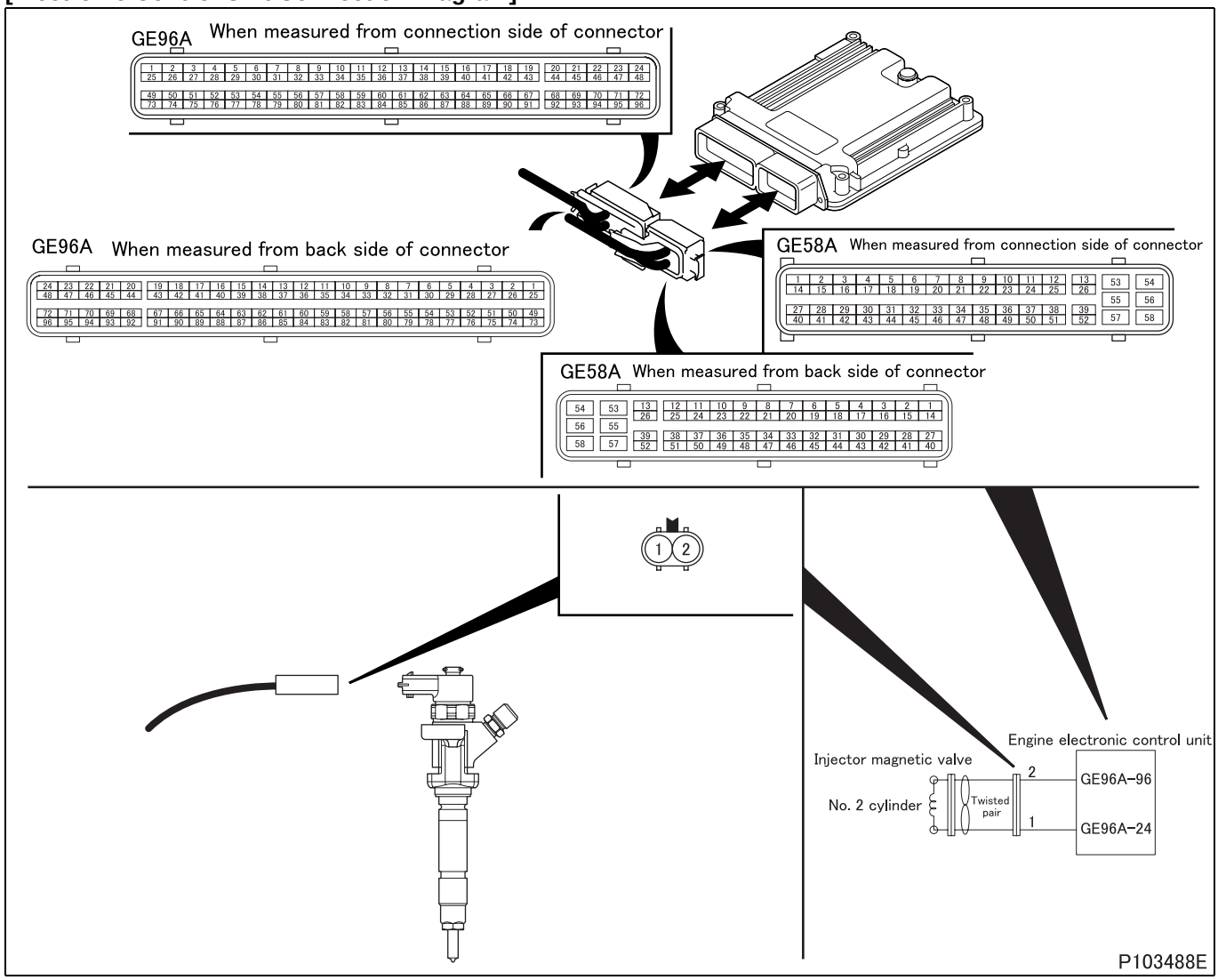
[Control effected by electronic control unit during fault]
Electronic control unit differs in the way of control by the diagnosis check item.
<Short-circuit>
- Injector magnetic valve (No. 2 and No. 3 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- 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]



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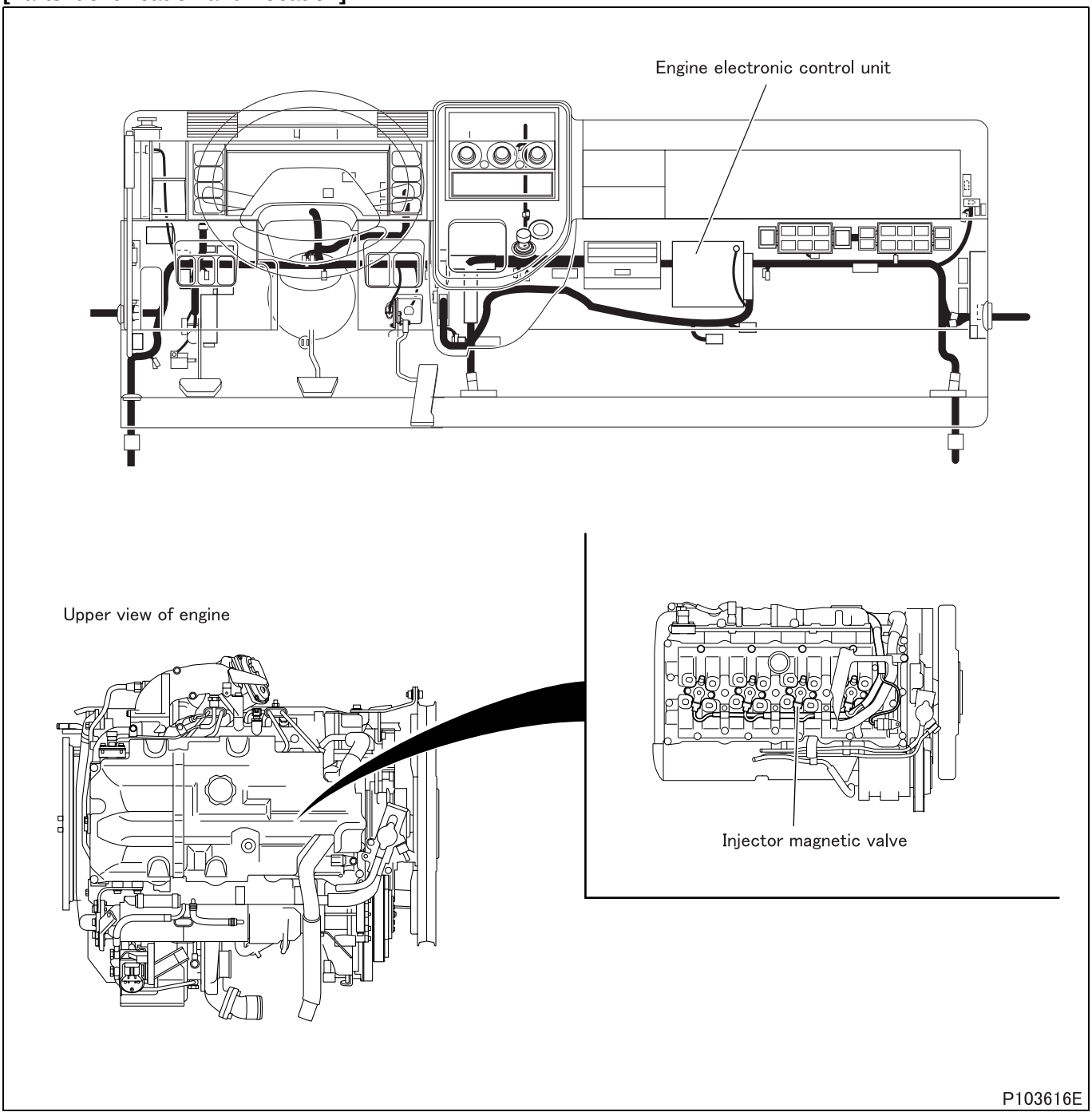


[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Perform actuator test item No. BD “Injector Test 3”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

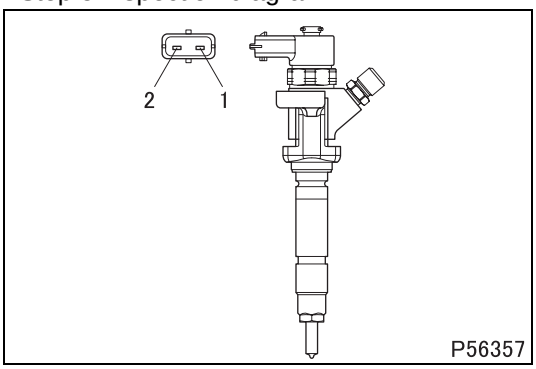
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 24 and 96.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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 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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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]
–

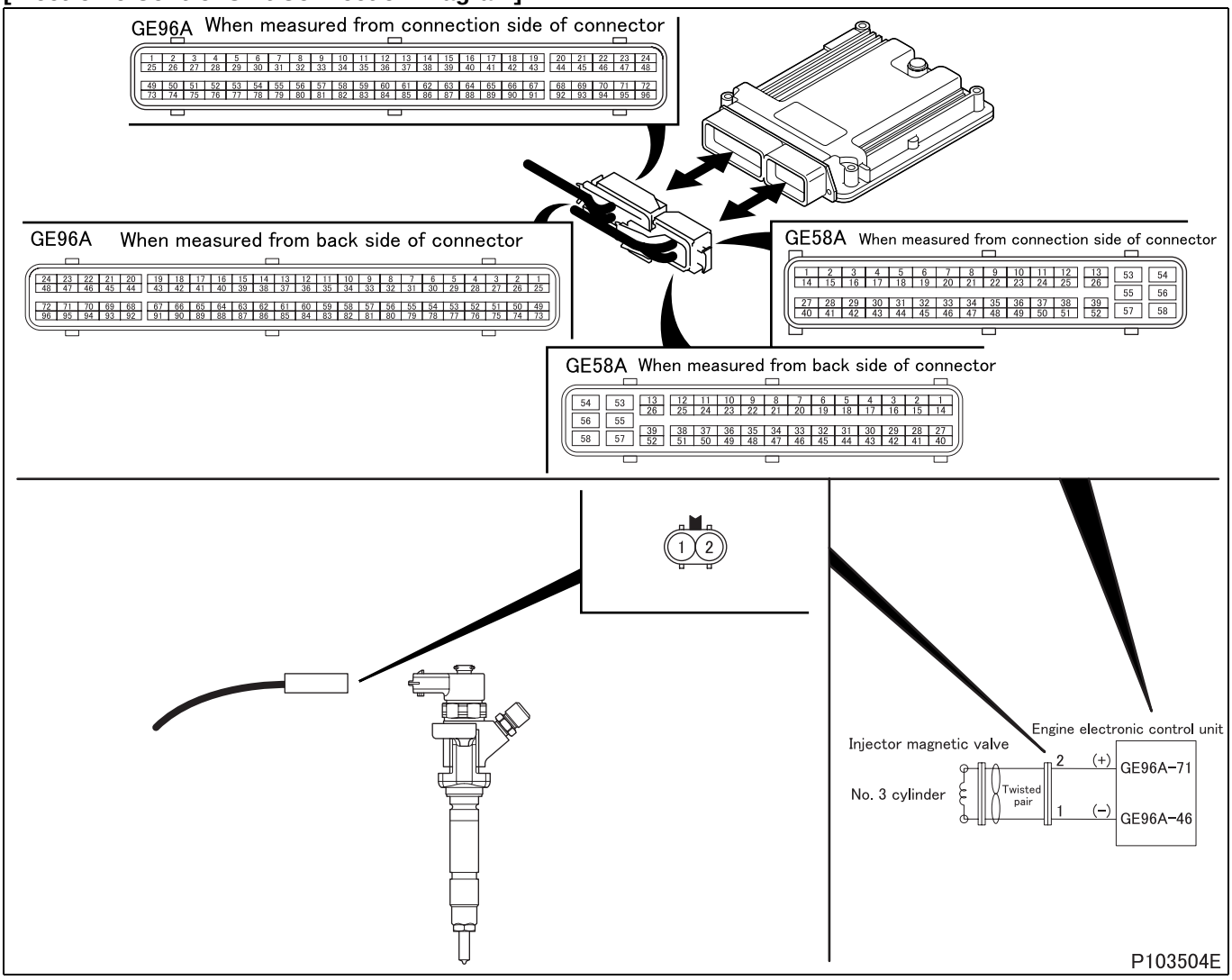
[Control effected by electronic control unit during fault]
Electronic control unit differs in the way of control by the diagnosis check item.
<Short-circuit>
- Injector magnetic valve (No. 2 and No. 3 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- 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.)

[Electronic Control Unit Connection Diagram]



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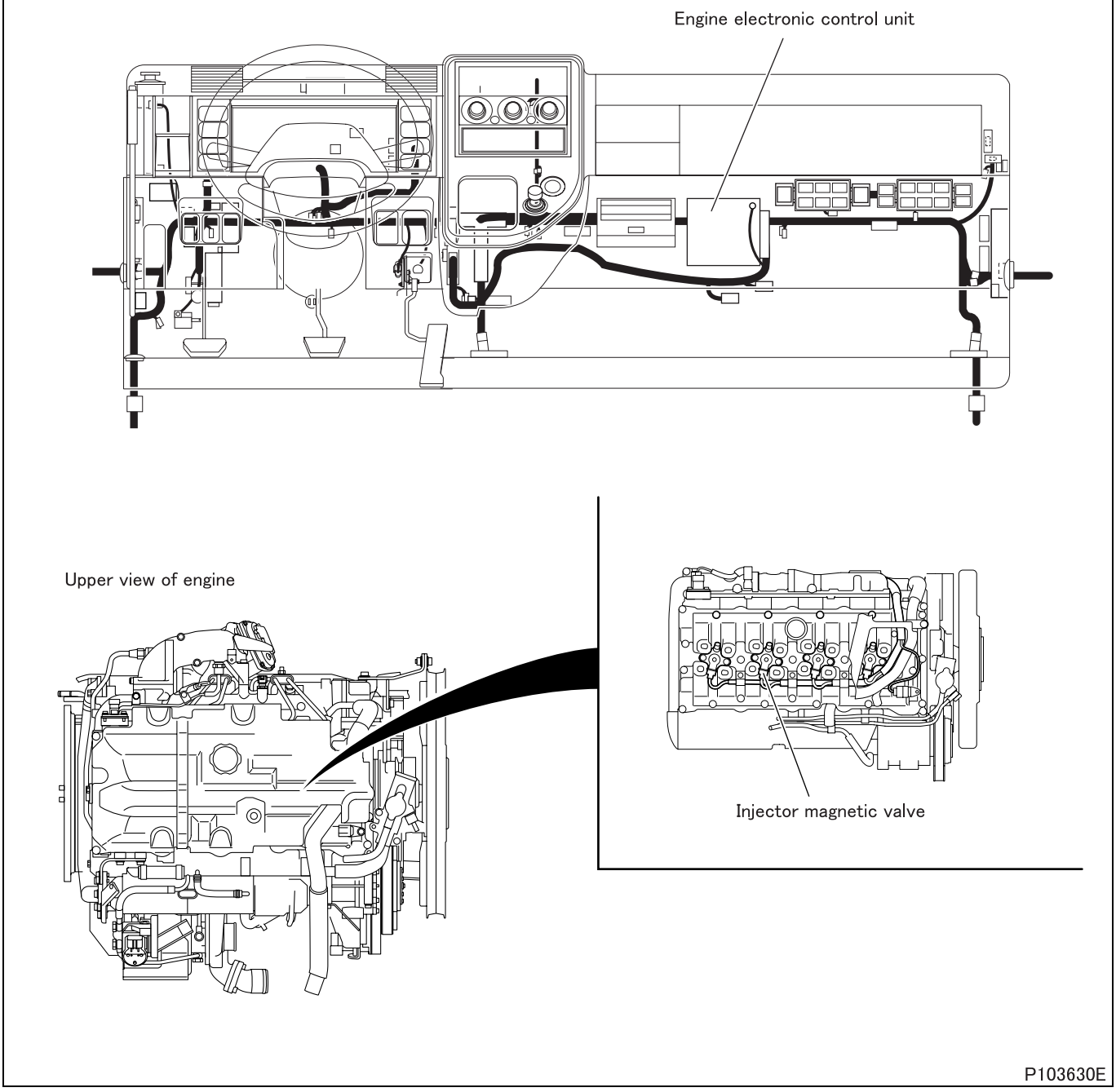


[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Perform actuator test item No. BE “Injector Test 4”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

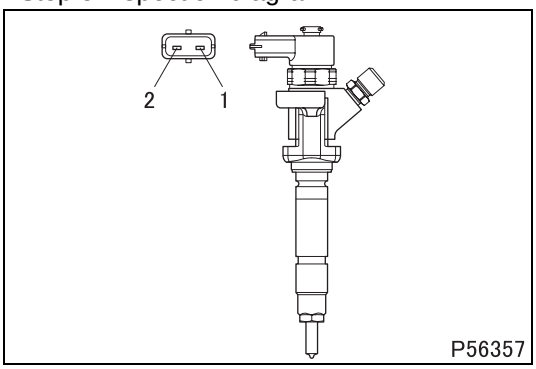
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 46 and 71.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		0.255 ± 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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

[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]
–

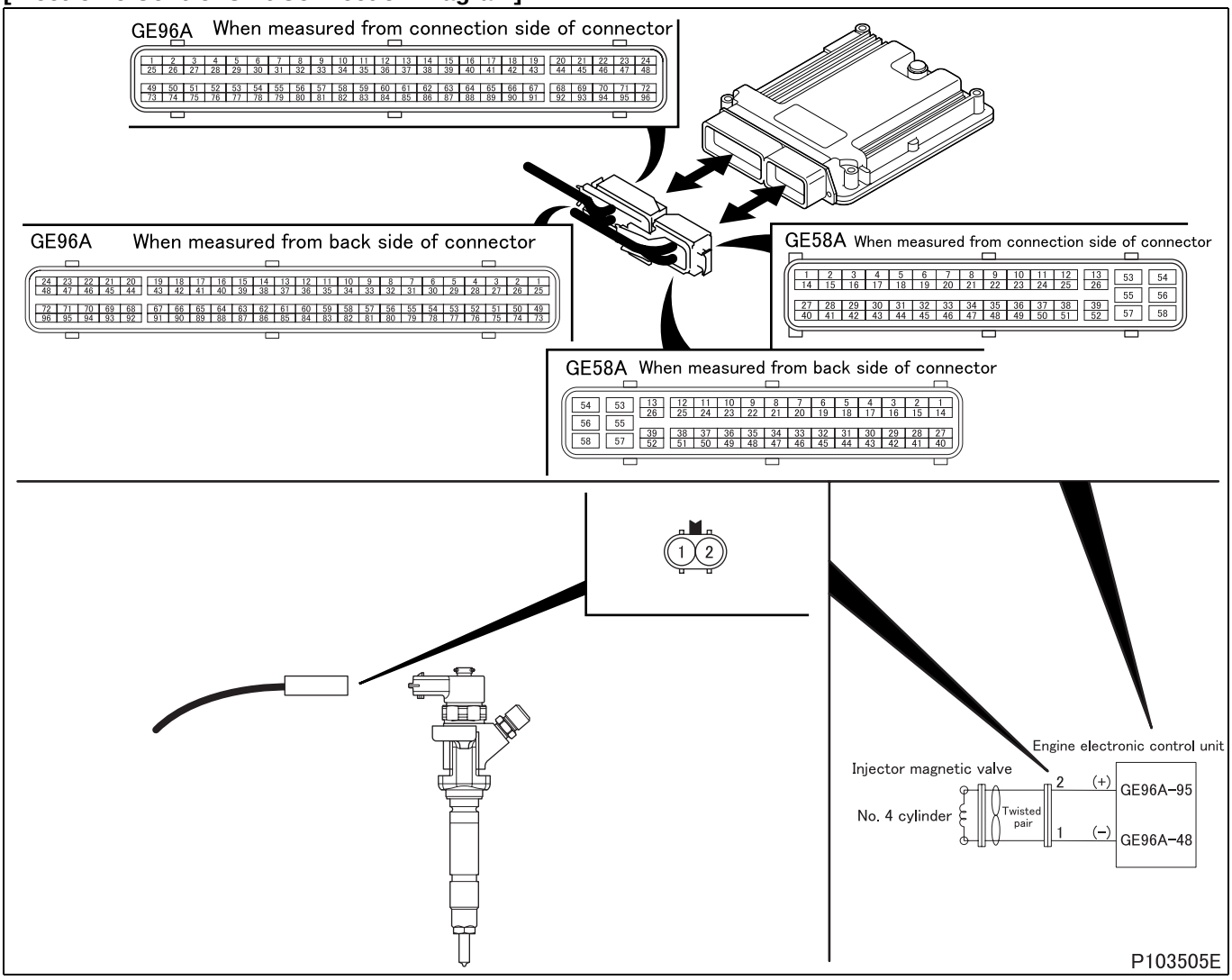
[Control effected by electronic control unit during fault]
Electronic control unit differs in the way of control by the diagnosis check item.
<Short-circuit>
- Injector magnetic valve (No. 1 and No. 4 cylinder) is stopped.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- 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.

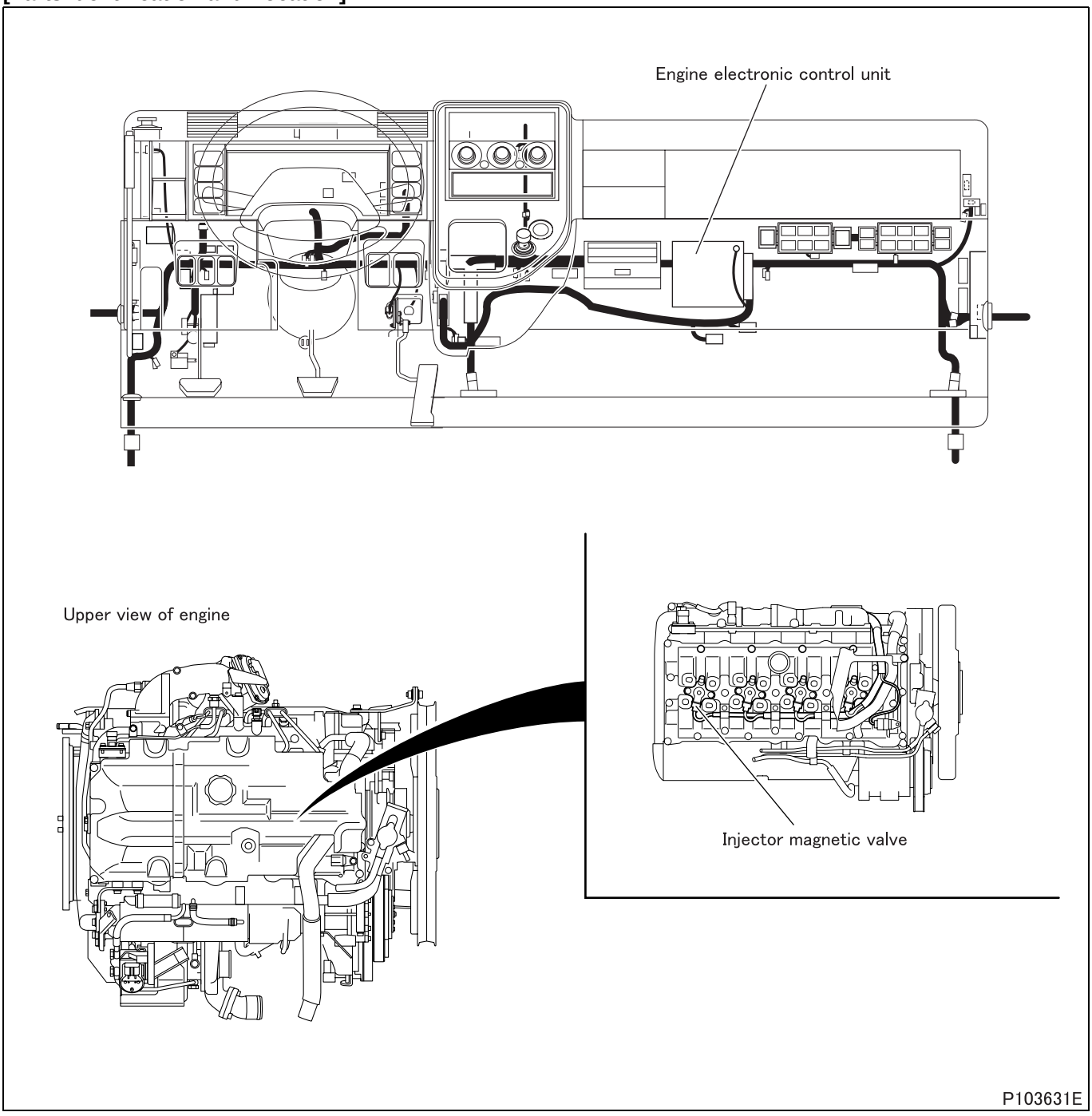
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

[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]



[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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

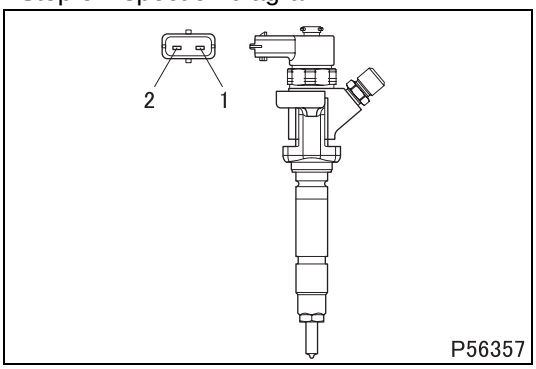
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 48 and 95.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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 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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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		• Starter switch: ON • Engine start (condition except in red zone)
	Requirements		Codes occur.
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of electronic control unit
		NO	–

[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.

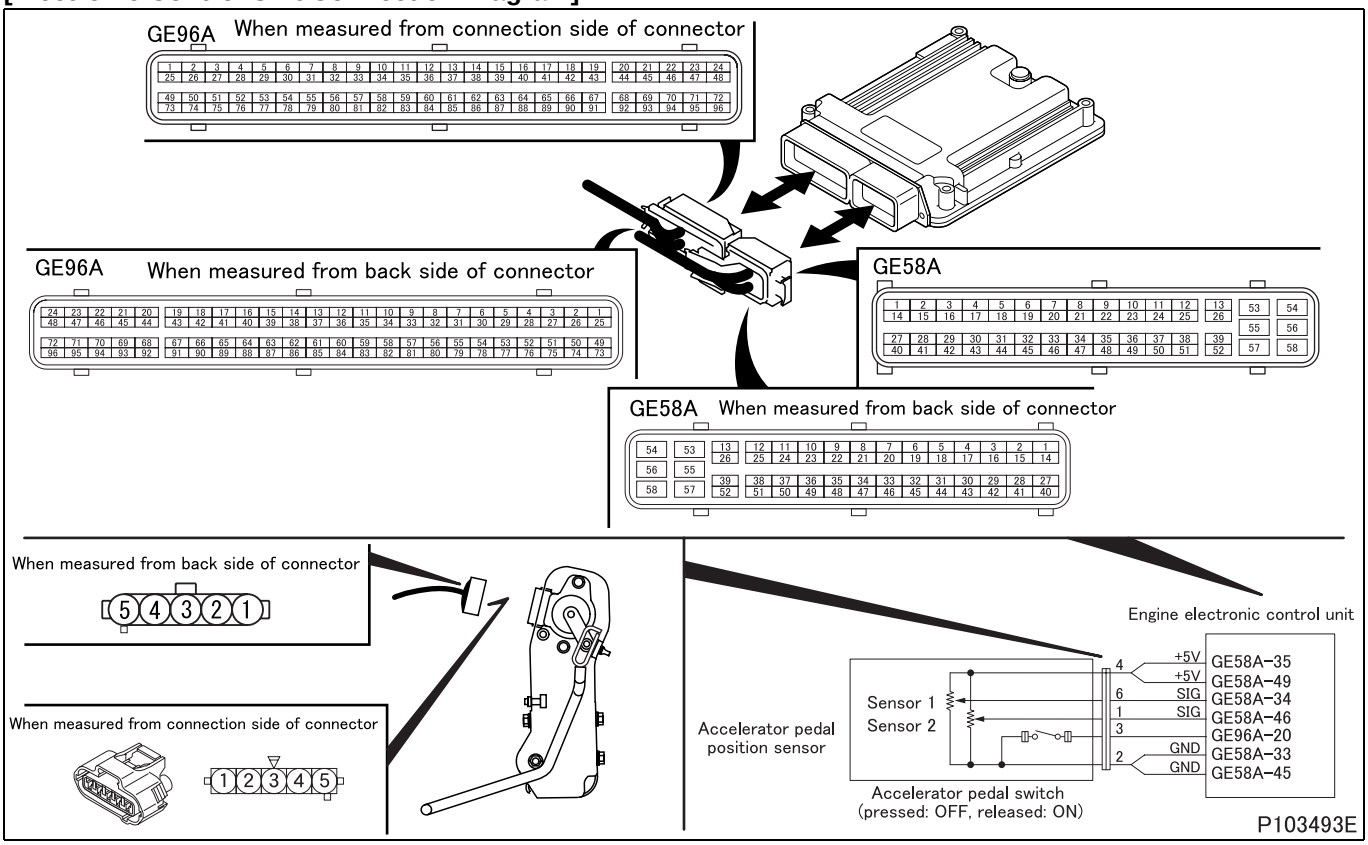
[Diagnostic requirement]
–

[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.

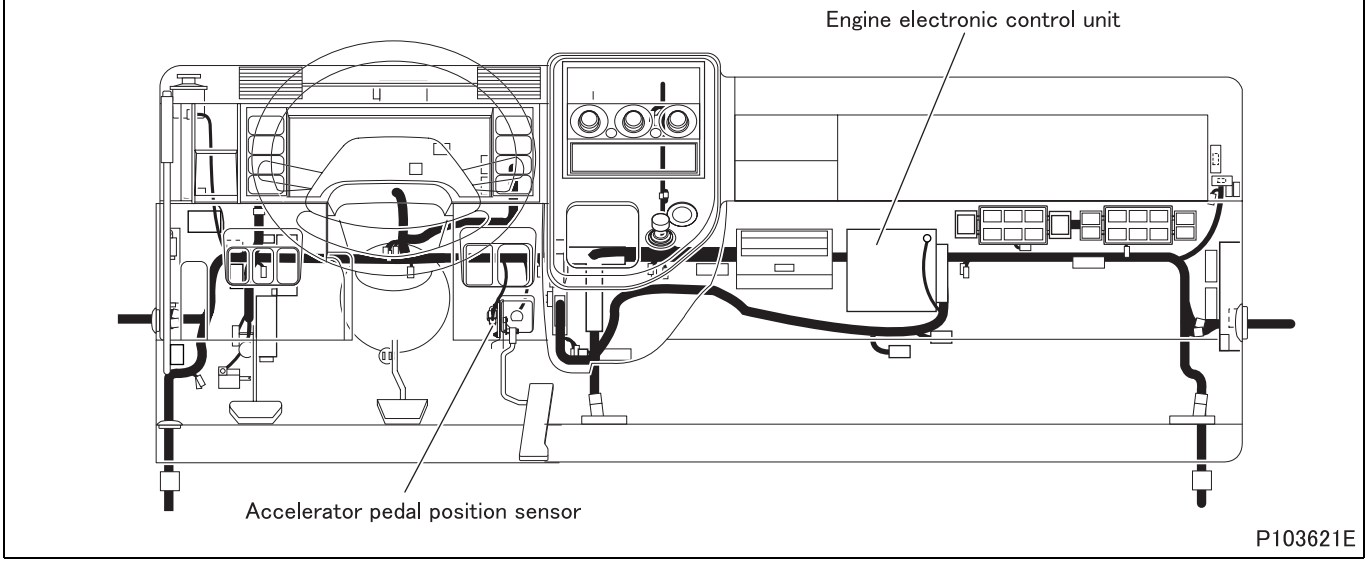
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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]



[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** • Measure item “Accelerator Pedal Position 2”. **<Multi-Use Tester used>** • Measure item No. 41 “Accelerator sensor voltage 2” of Service Data.
	Inspection condition		–
	Requirements		**<General Scanning Tool used>** • Accelerator pedal not pressed: 0% • Accelerator pedal pressed: 100% **<Multi-Use Tester used>** • Accelerator pedal not pressed: 0.85 ± 0.1 V • Accelerator pedal pressed: 4.15 ± 0.1 V
	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		• Starter switch: ON. • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	Requirements		• Accelerator pedal not pressed: 0.85 ± 0.1 V • Accelerator pedal pressed: 4.15 ± 0.1 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 (GE58A) terminal No. 49 (+) and No. 45 (–).
	Inspection condition		• Starter switch: ON • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	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		• Starter switch: ON • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 12.
		NO	Modify connector.

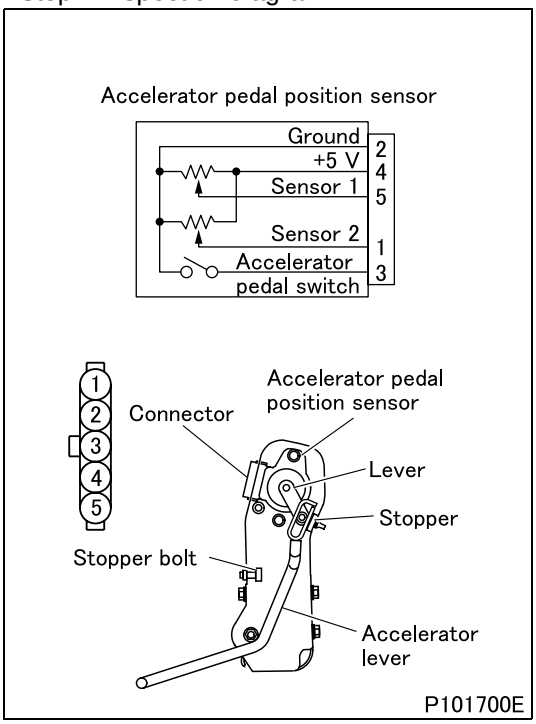
Step 6	Inspection items		Inspection of sensor connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 7.
		NO	Modify connector.

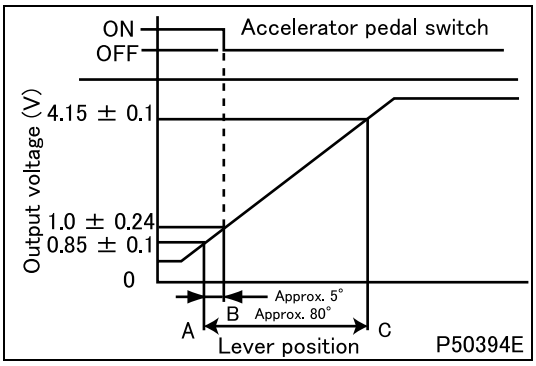
Step 7	Inspection items		Inspection of accelerator pedal position sensor 2 unit
	Maintenance item		Measure value of voltage between connector terminal No. 1 (+) and 2 (–).
	Inspection condition		Apply voltage DC 5 V across connector terminals No. 4 (+) and 2 (–).

	Requirements		• Idle position A: 0.85 ± 0.1 V
			• Accelerator switch operating position B: 1.0 ± 0.24 V
			• Full load position C: 4.15 ± 0.1 V
			  • A: When accelerator lever is in contact with stopper
			  • B: When accelerator pedal is pressed until there is no continuity between terminals 2 and 3.
			  • C: When 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 (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		• Starter switch: ON • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	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. 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.
		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		**<General Scanning Tool used>** • Measure item “Accelerator Pedal Position 2”. **<Multi-Use Tester used>** • Measure item No. 41 “Accelerator sensor voltage 2” of Service Data.
	Inspection condition		–
	Requirements		**<General Scanning Tool used>** • Accelerator pedal not pressed: 0% • Accelerator pedal pressed: 100% **<Multi-Use Tester used>** • Accelerator pedal not pressed: 0.85 ± 0.1 V • 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

[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.

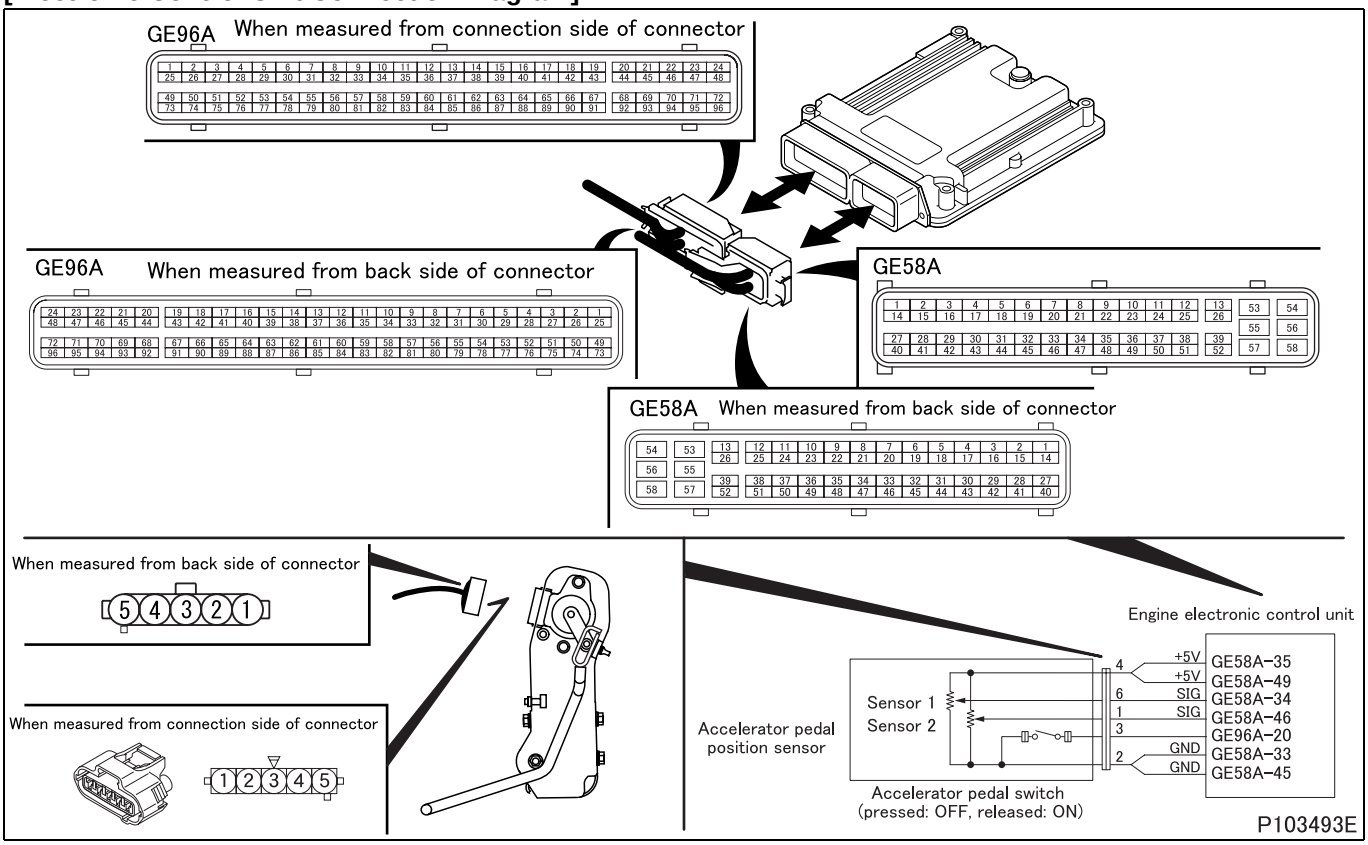
[Diagnostic requirement]
–

[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.

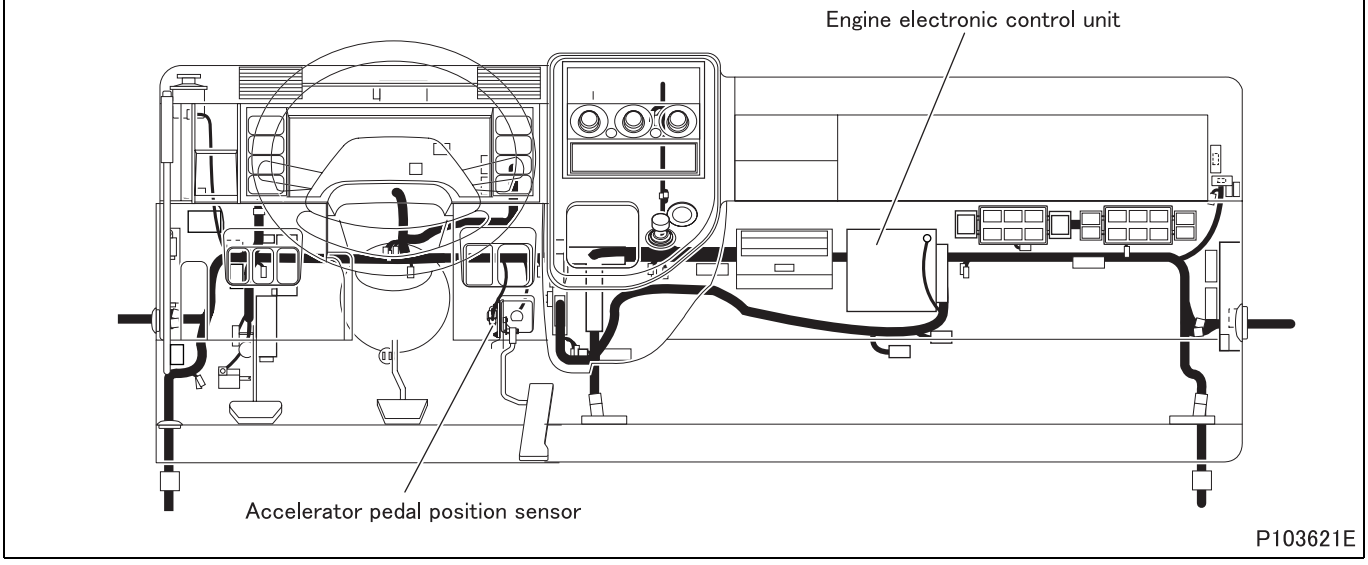
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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]



[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** • Measure item “Accelerator Pedal Position 2”. **<Multi-Use Tester used>** • Measure item No. 41 “Accelerator sensor voltage 2” of Service Data.
	Inspection condition		–
	Requirements		**<General Scanning Tool used>** • Accelerator pedal not pressed: 0% • Accelerator pedal pressed: 100% **<Multi-Use Tester used>** • Accelerator pedal not pressed: 0.85 ± 0.1 V • Accelerator pedal pressed: 4.15 ± 0.1 V
	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		• Starter switch: ON. • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	Requirements		• Accelerator pedal not pressed: 0.85 ± 0.1 V • Accelerator pedal pressed: 4.15 ± 0.1 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 (GE58A) terminal No. 49 (+) and No. 45 (–).
	Inspection condition		• Starter switch: ON • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	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		• Starter switch: ON • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 12.
		NO	Inspection of connector

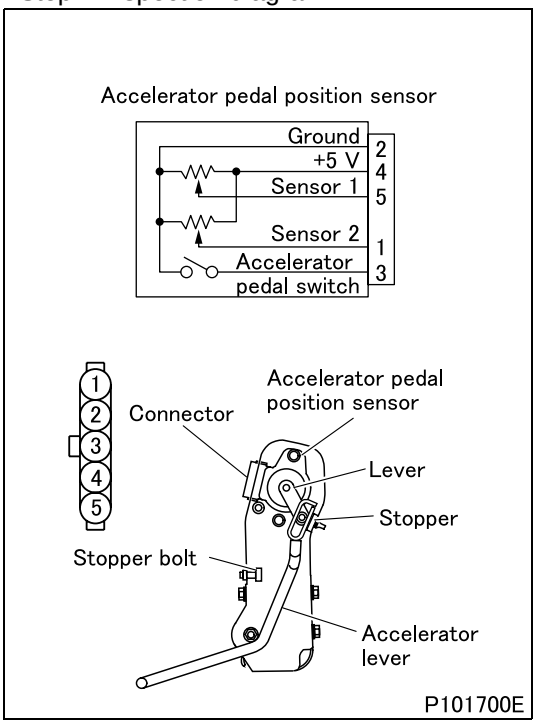
Step 6	Inspection items		Inspection of sensor connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 7.
		NO	Inspection of connector

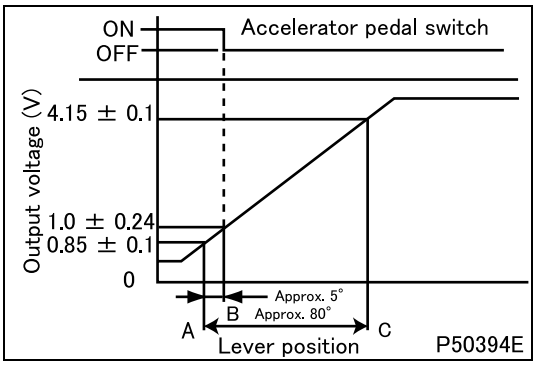
Step 7	Inspection items		Inspection of accelerator pedal position sensor 2 unit
	Maintenance item		Measure value of voltage between connector terminal No. 1 (+) and 2 (–).
	Inspection condition		Apply voltage DC 5 V across connector terminals No. 4 (+) and 2 (–).

	Requirements		• Idle position A: 0.85 ± 0.1 V
			• Accelerator switch operating position B: 1.0 ± 0.24 V
			• Full load position C: 4.15 ± 0.1 V
			  • A: When accelerator lever is in contact with stopper
			  • B: When accelerator pedal is pressed until there is no continuity between terminals 2 and 3.
			  • C: When 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 (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		• Starter switch: ON • Engine is stopped. • Measure from back side of connector of harness with each device connected to harness.
	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. 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.
		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		**<General Scanning Tool used>** • Measure item “Accelerator Pedal Position 2”. **<Multi-Use Tester used>** • Measure item No. 41 “Accelerator sensor voltage 2” of Service Data.
	Inspection condition		–
	Requirements		**<General Scanning Tool used>** • Accelerator pedal not pressed: 0% • Accelerator pedal pressed: 100% **<Multi-Use Tester used>** • Accelerator pedal not pressed: 0.85 ± 0.1 V • 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

[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.

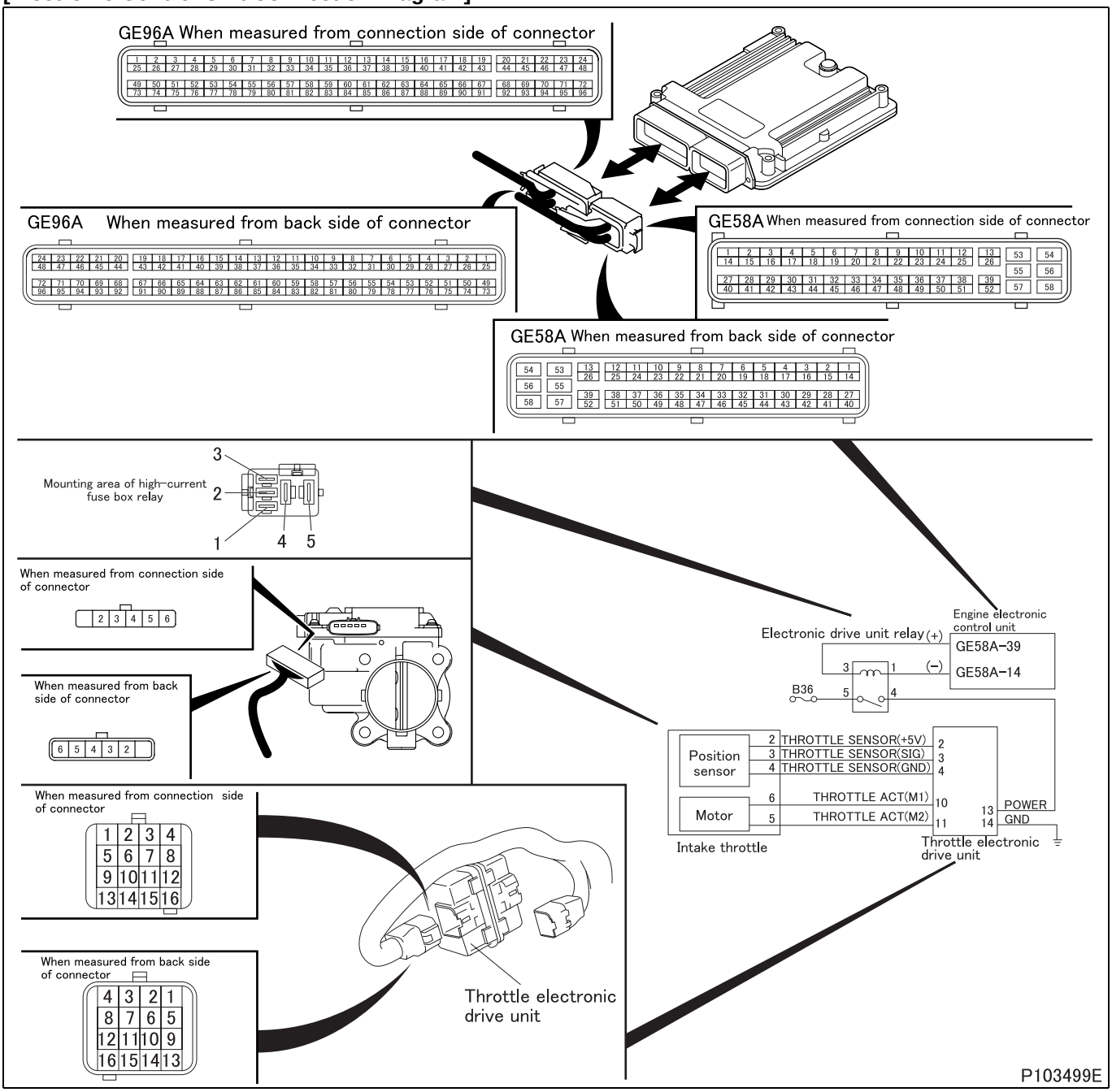
[Diagnostic requirement]
- Controller area network communication in order

[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.

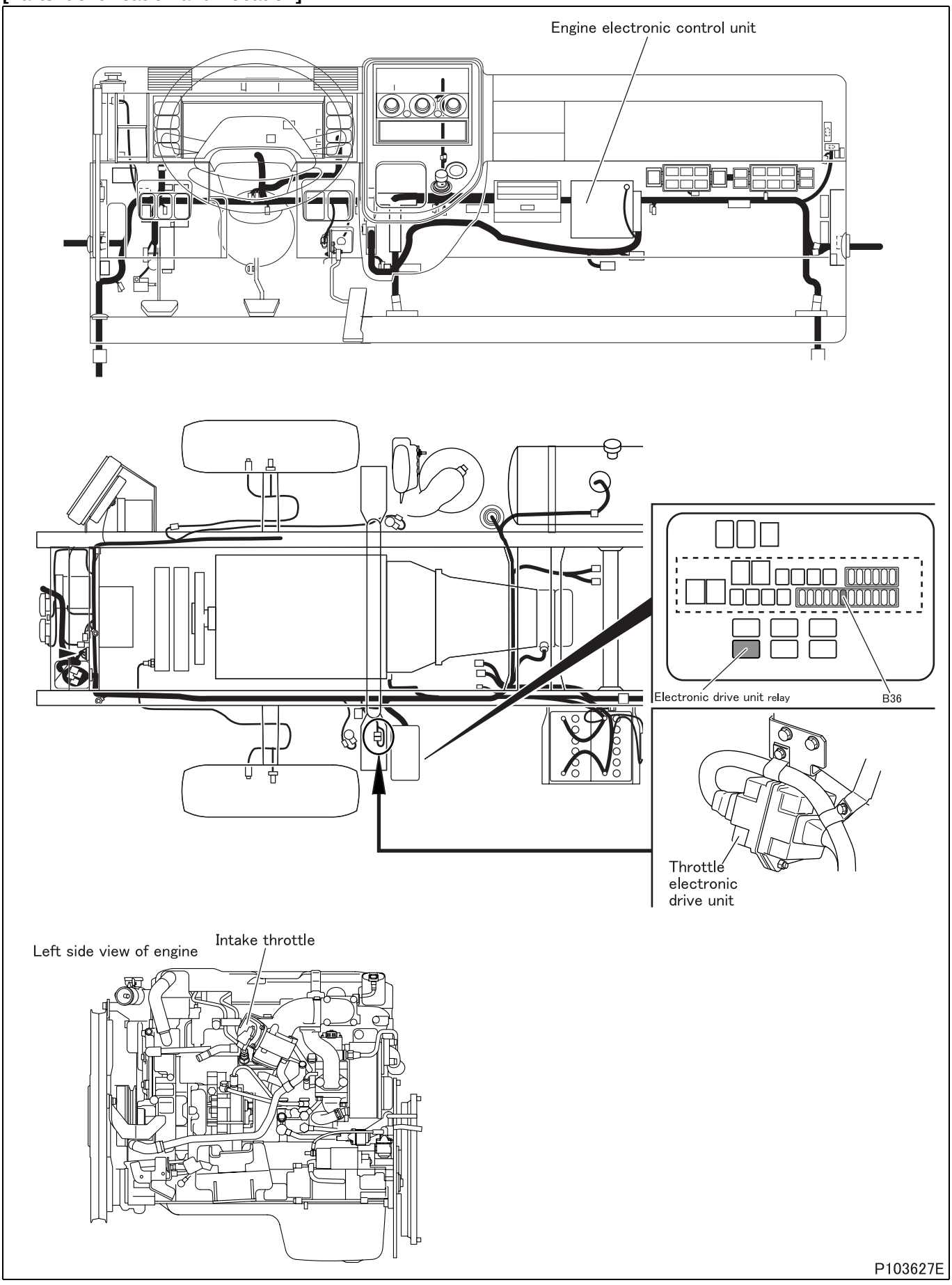
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic drive unit and throttle actuator
- Malfunction of each connector
- Malfunction of throttle motor (built in throttle actuator)
- Malfunction of throttle position sensor (built in throttle actuator)
- Malfunction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



[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. A3 “Intake Throttle 1”
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)”
	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		• Remove connector and measure from harness side. • Starter switch: ON • Perform actuator test item No. AF “EDU Relay”
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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 connecter 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.

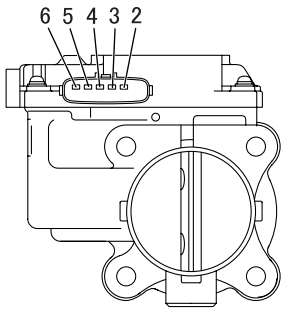
Step 9	Inspection items		Inspection of harness between electronic drive unit and ground
	Maintenance item		Check circuit between following electronic drive unit connector terminals • Electronic drive unit ground: terminal No. 14 - chassis ground • Sensor ground: terminal No. 4 - 14
	Inspection condition		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 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. • Motor (1) : electronic drive unit connector terminal No. 10 - throttle actuator connector terminal No. 6 • Motor (2) : electronic drive unit connector terminal No. 11 - throttle actuator 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 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		• Keep throttle actuator installed on vehicle. • Remove connector, and measure throttle actuator side.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON • Perform actuator test item No. A3 “Intake Throttle 1”
	Requirements		• Valve fully closed: 0.5 V • Valve fully opened: 4.375 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 16.
		NO	Go to step 15.back side

Step 15	Inspection items		Inspection of harness between electronic drive unit and throttle actuator (position sensor)
	Maintenance item		Check circuit between following connector terminals. • Sensor (power supply): electronic drive unit connector terminal No. 2 - throttle actuator connector terminal No. 2 • Sensor (signal): electronic drive unit connector terminal No. 3 - throttle actuator connector terminal No. 3 • Sensor (ground): electronic drive unit connector terminal No. 4 - throttle actuator 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	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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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

[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		Check if following diagnosis codes occur simultaneously. • P0045 “VGT Acutuator (Open)” • P0046 “VGT Acutuator (Performance)” • P0047 “VGT Acutuator (Low)” • P0069 “Boost Press SNSR (Correlation)” • P0236 “Boost Press SNSR (Plausi)” • P0237 “Boost Press SNSR (Low)” • P0238 “Boost Press SNSR (High)” • P0401 “EGR Flow (Insufficient)” • P0402 “EGR Flow (Excessive)” • P0403 “EGR1 (Acutuator Circuit)” • P0404 “EGR System” • P0409 “EGR1 (Position Sensor)” • P0562 “Power Supply Voltage (Low)” • P0563 “Power Supply Voltage (High)” • P0600 “CAN Communication” • P0607 “ECU System” • P060B “A/D Converter” • P061B “ECU Performance (Calc)” • P061C “ECU Performance (Ne)” • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)” • P2002 “DPF MFF” • P2228 “Atm Press SNSR (Low)” • P2229 “Atm Press SNSR (High)” • P2263 “VGT System” • P2413 “EGR System” • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (High) & MFF” • P2457 “EGR Cooler Performance”
	Inspection condition		Starter switch: ON Do not start engine.
	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		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	Clean or replace parts.
		NO	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	Replacement of turbocharger
		NO	Go to step 4.

Step 4	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** • Measure item “Intake MAP”. **<Multi-Use Tester used>** • Measure item No. 21 “Boost Pressure” of Service Data.
	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

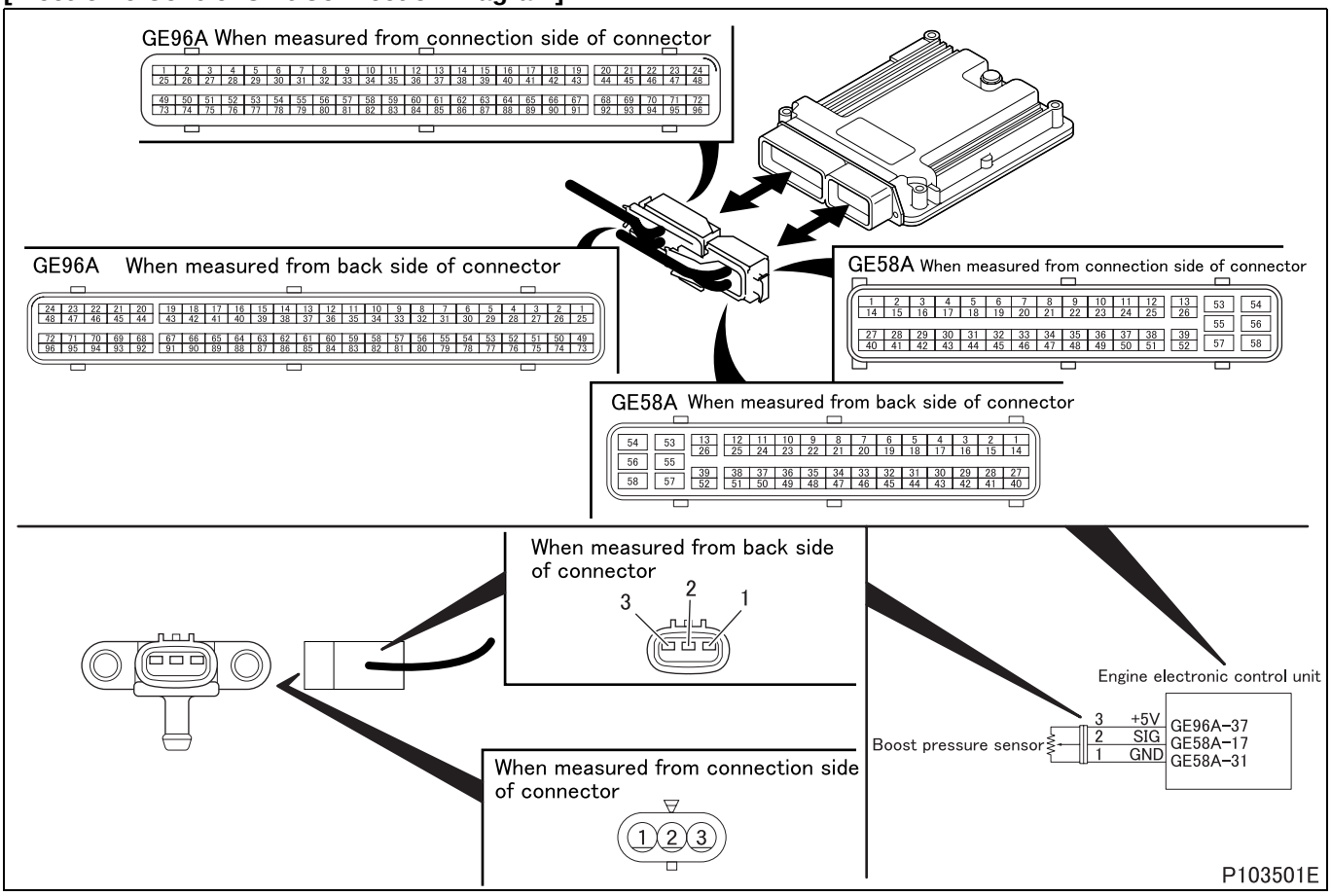
<Low speed operation>
- Engine operating mode: normal (engine in operation)
- Engine speed: more than 2100 rpm
- Fuel injection quantity: above 67 mg/cyc
- Intake throttle valve opening: more than 60%
- Turbocharger position: more than 40%
- Air flow sensor: in order
- Exhaust gas recirculation valve: 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.

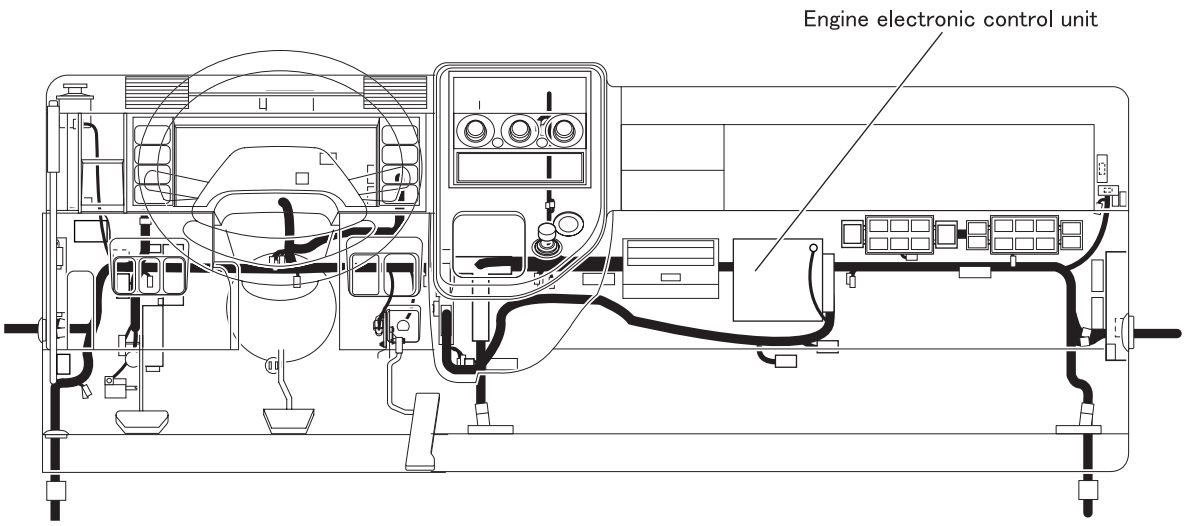
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

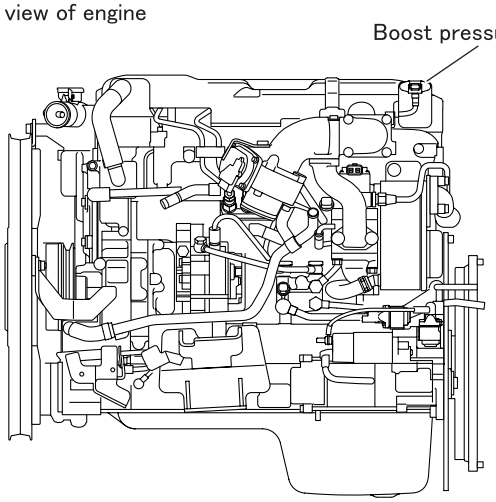
[Electronic Control Unit Connection Diagram]



[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		**<General Scanning Tool used>** • Measure item “Intake MAP”. **<Multi-Use Tester used>** • Measure item No. 21 “Boost Pressure” of Service Data.
	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		• Measure from back side of connector of harness with each device connected to harness. • Engine started
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Go to step 5.

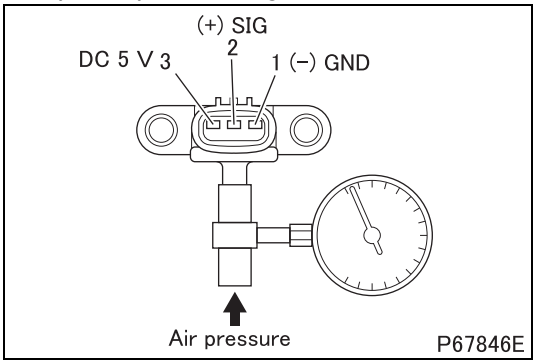
Step 4	Inspection items		Inspection by electronic control unit connector (ground)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 14 (+) and (GE58A) terminal No. 53 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• 99 kPa {14 psi, 1.0 kgf/cm^2}: Approx. 2.5 V • 232.3 kPa {34 psi, 2.4 kgf/cm^2}: Approx. 4.5 V
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		**<General Scanning Tool used>** • Measure item “Intake MAP”. **<Multi-Use Tester used>** • Measure item No. 21 “Boost Pressure” of Service Data.
	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

[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.

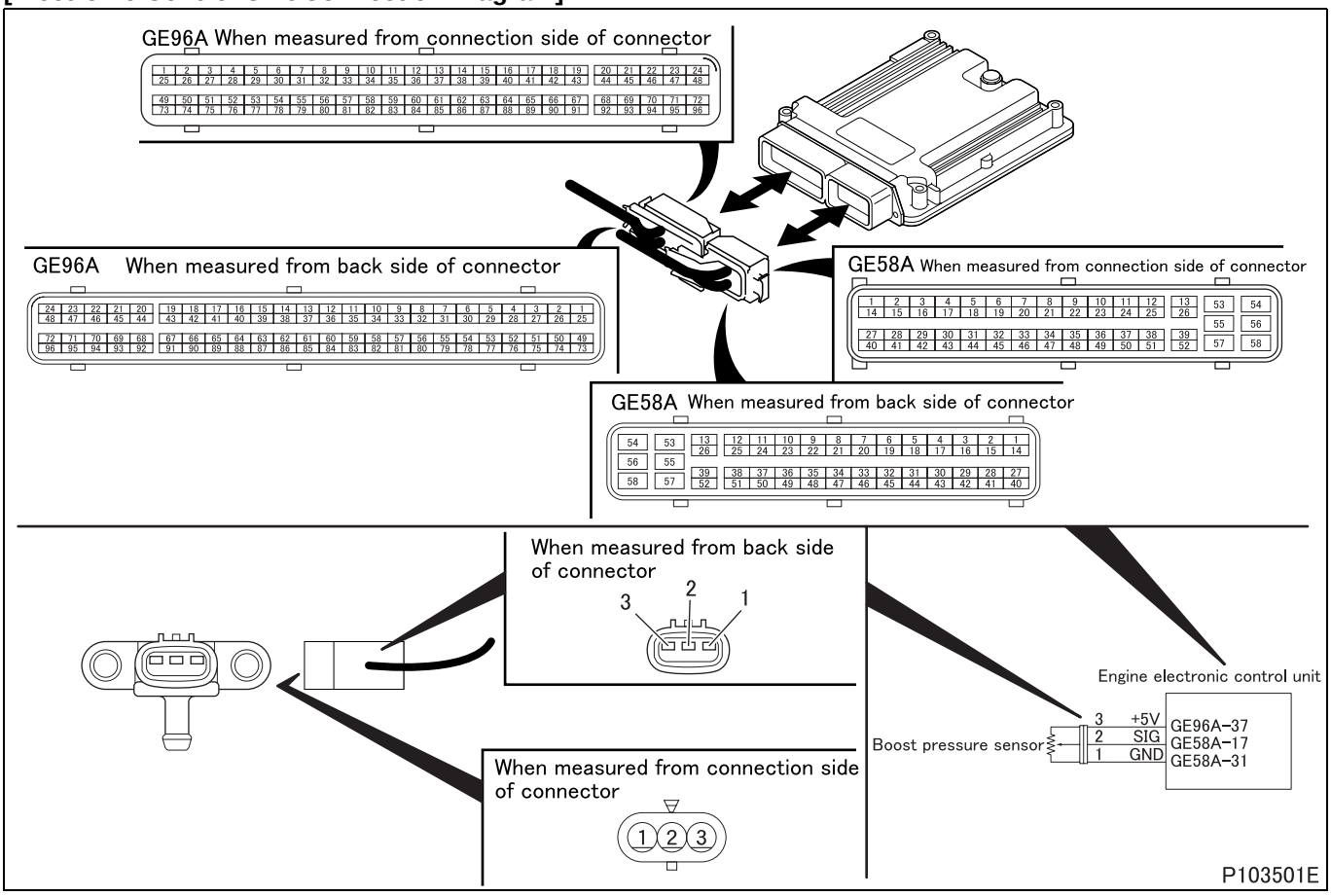
[Diagnostic requirement]
- Fault diagnosis starts when one of the following requirements are met (The diagnosis does not start when both requirements are simultaneously met.).
  - Engine speed: less than 500 rpm
  - Fuel injection quantity: below 5 mg/cyc

[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.

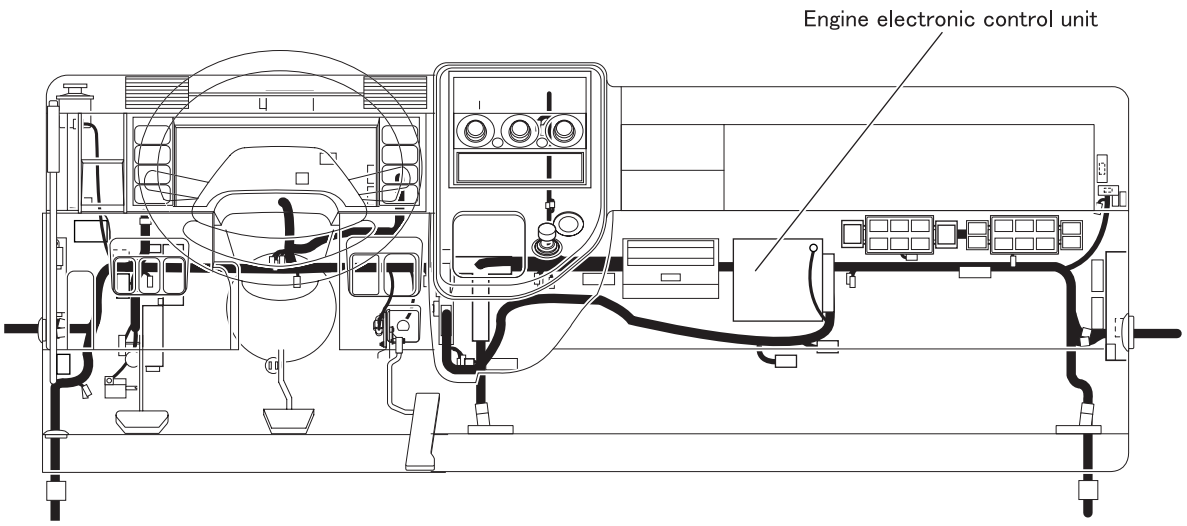
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

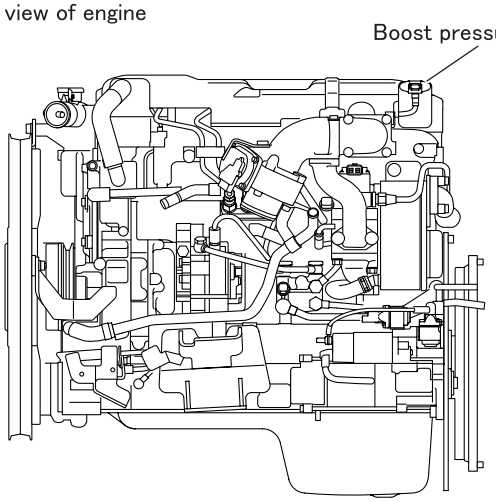
[Electronic Control Unit Connection Diagram]



[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		**<General Scanning Tool used>** • Measure item “Intake MAP”. **<Multi-Use Tester used>** • Measure item No. 21 “Boost Pressure” of Service Data.
	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		• Measure from back side of connector of harness with each device connected to harness. • Engine started
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Go to step 5.

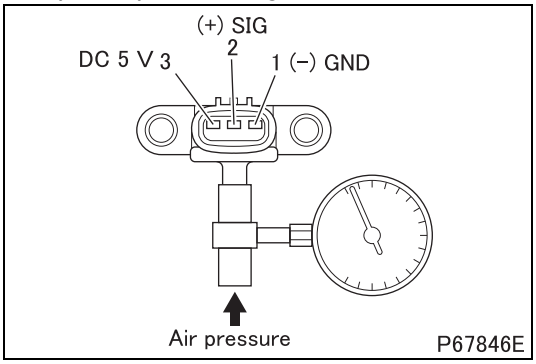
Step 4	Inspection items		Inspection by electronic control unit connector (ground)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 14 (+) and (GE58A) terminal No. 53 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• 99 kPa {14 psi, 1.0 kgf/cm^2}: Approx. 2.5 V • 232.3 kPa {34 psi, 2.4 kgf/cm^2}: Approx. 4.5 V
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		**<General Scanning Tool used>** • Measure item “Intake MAP”. **<Multi-Use Tester used>** • Measure item No. 21 “Boost Pressure” of Service Data.
	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

[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.

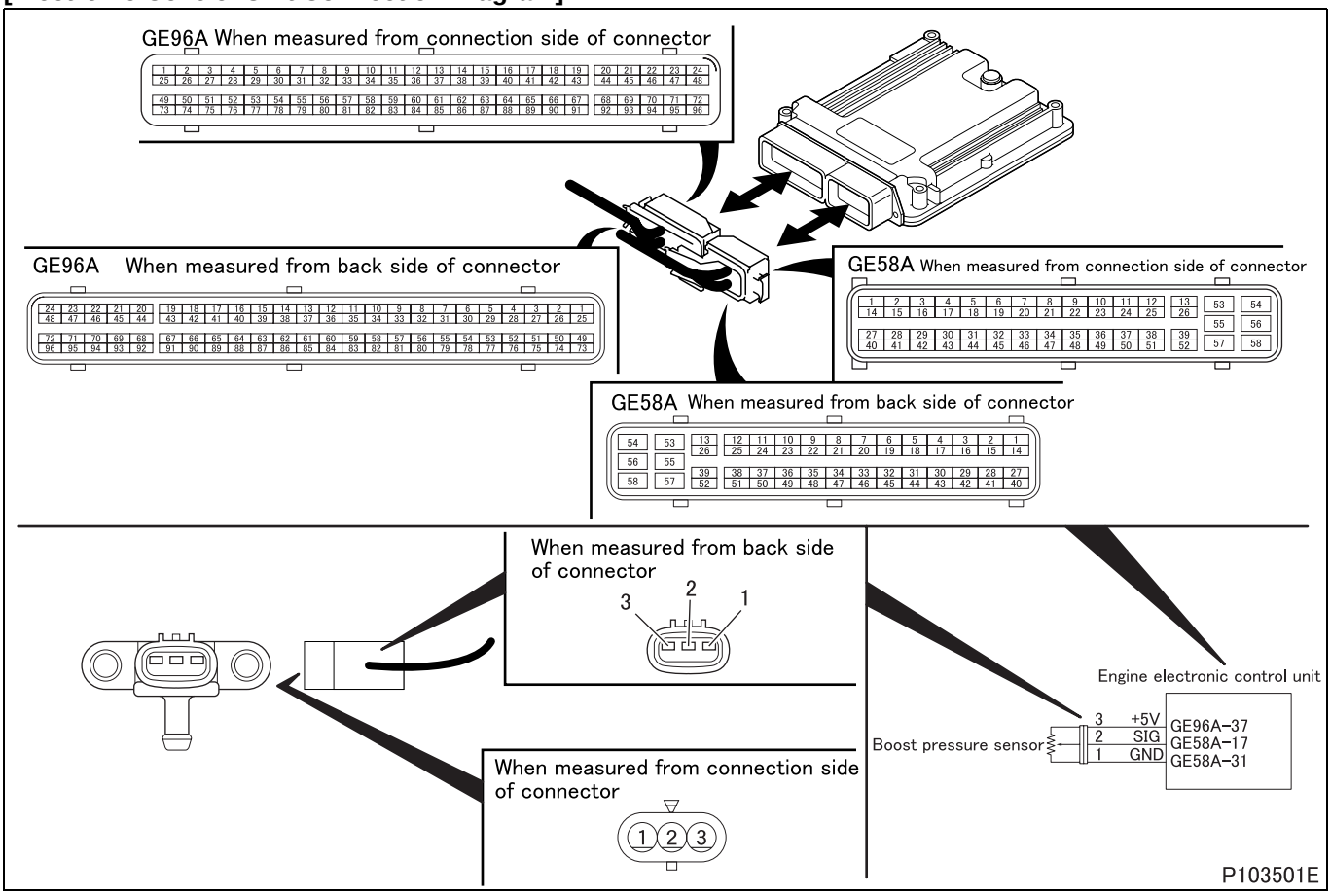
[Diagnostic requirement]
–

[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.

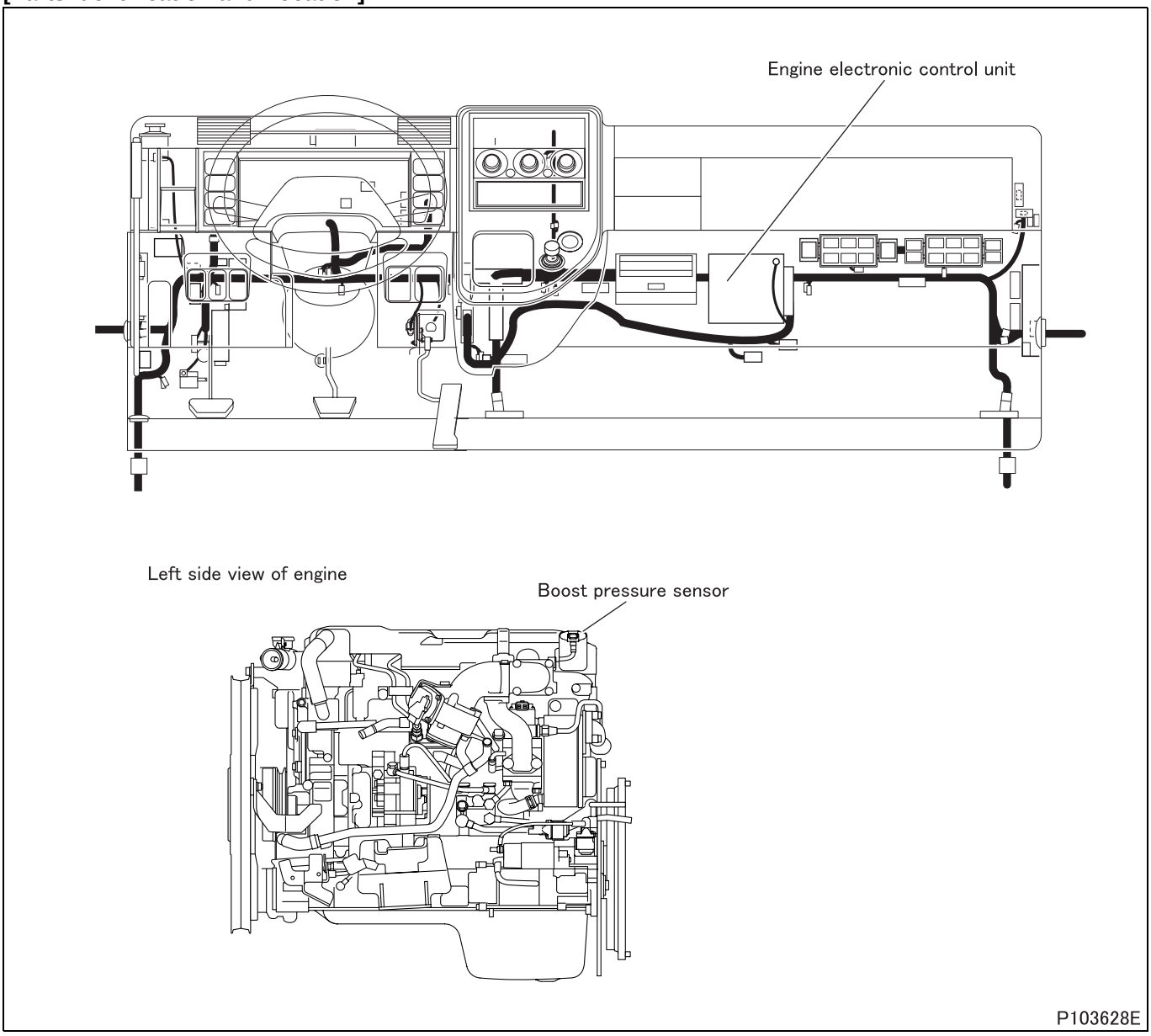
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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]



[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		**<General Scanning Tool used>** • Measure item “Intake MAP”. **<Multi-Use Tester used>** • Measure item No. 21 “Boost Pressure” of Service Data.
	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		• Measure from back side of connector of harness with each device connected to harness. • Engine started
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Go to step 5.

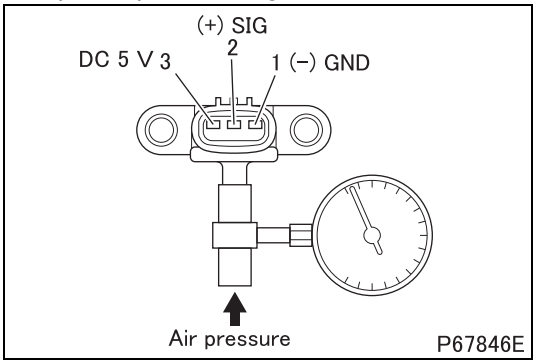
Step 4	Inspection items		Inspection by electronic control unit connector (ground)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 14 (+) and (GE58A) terminal No. 53 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• 99 kPa {14 psi, 1.0 kgf/cm^2}: Approx. 2.5 V • 232.3 kPa {34 psi, 2.4 kgf/cm^2}: Approx. 4.5 V
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		**<General Scanning Tool used>** • Measure item “Intake MAP”. **<Multi-Use Tester used>** • Measure item No. 21 “Boost Pressure” of Service Data.
	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

[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^2} once, then dropped and stabilized at a level near a safety valve (DBV) operating pressure of 80 MPa {11604 psi, 816 kgf/cm^2}.
  (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. • P0192 “CRS Pressure SNSR (Low)” • P0193 “CRS Pressure SNSR (High)” • P0201 “Injector M/V-Cylinder 1 (Load)” • P0202 “Injector M/V-Cylinder 2 (Load)” • P0203 “Injector M/V-Cylinder 3 (Load)” • P0204 “Injector M/V-Cylinder 4 (Load)” • P0253 “Common Rail Pressure Defect” • P0605 “ECU System (Hardware)” • P0607 “ECU System”
	Inspection condition		• Starter switch: ON • Engine: stopped
	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.

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). • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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		Rail pressure is increased for a certain period of time (6 seconds). • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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		Rail pressure is increased for a certain period of time (6 seconds). • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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		Rail pressure is increased for a certain period of time (6 seconds). • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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		Rail pressure is increased for a certain period of time (6 seconds). • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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		Check inside of combustion chamber.
	Maintenance item		Check for fuel leak.
	Inspection condition		• After performing actuator test item No. B2 “Fuel Leak Check”, stop engine. • Remove glow plug, and check from glow plug mounting hole using bore scope.
	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)

[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^2} 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. • P0251 “Common Rail Pressure Defect”
	Inspection condition		• Starter switch: ON • Engine: stopped
	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: 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^2} 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^2} 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^2} 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^2}>
–
<When common rail pressure exceeds 126 MPa {18277 psi, 1285 kgf/cm^2}>
- 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.

[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. • P0251 “Common Rail Pressure Defect”
	Inspection condition		• Starter switch: ON • Engine: stopped
	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.

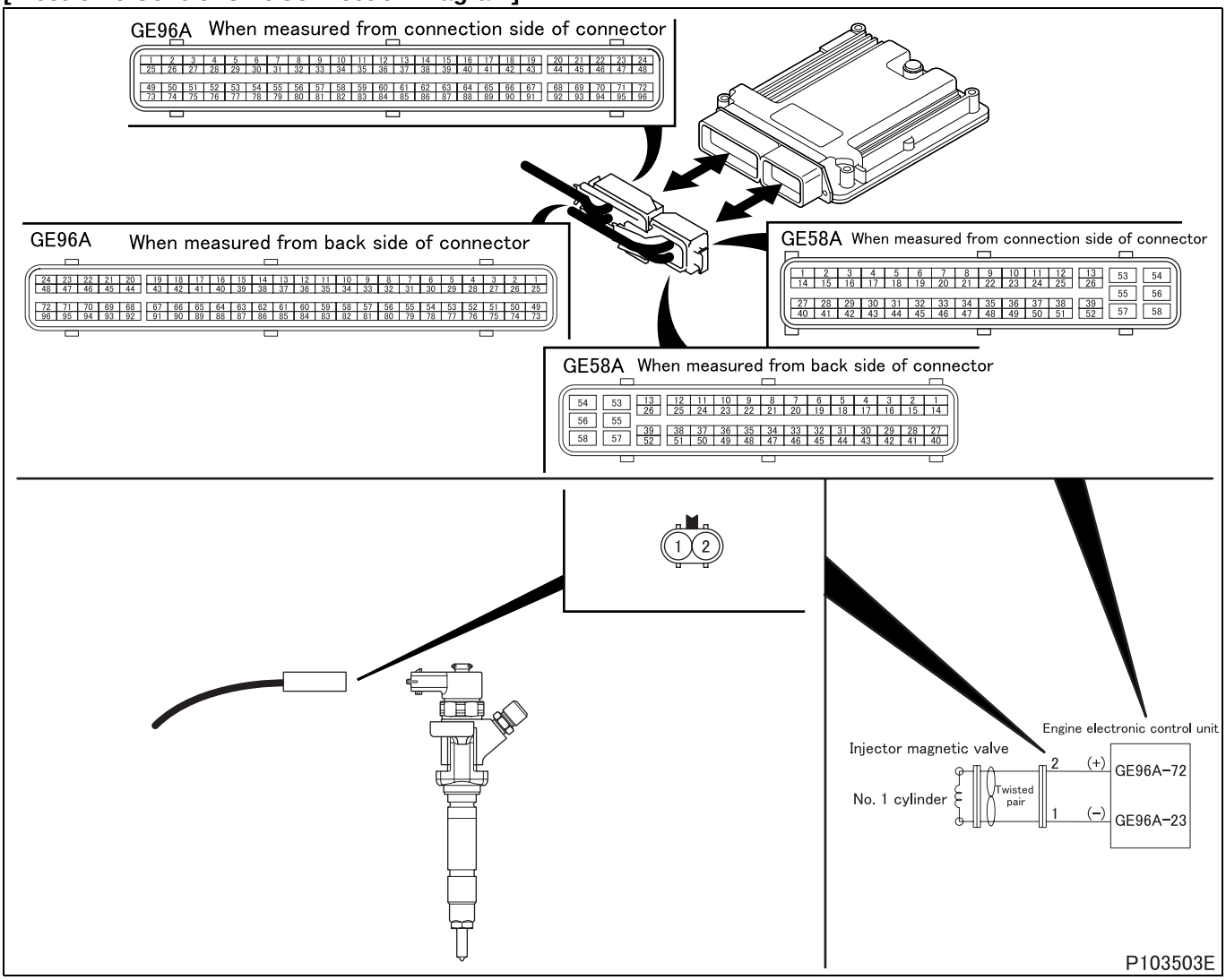
[Diagnostic requirement]
–

[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.

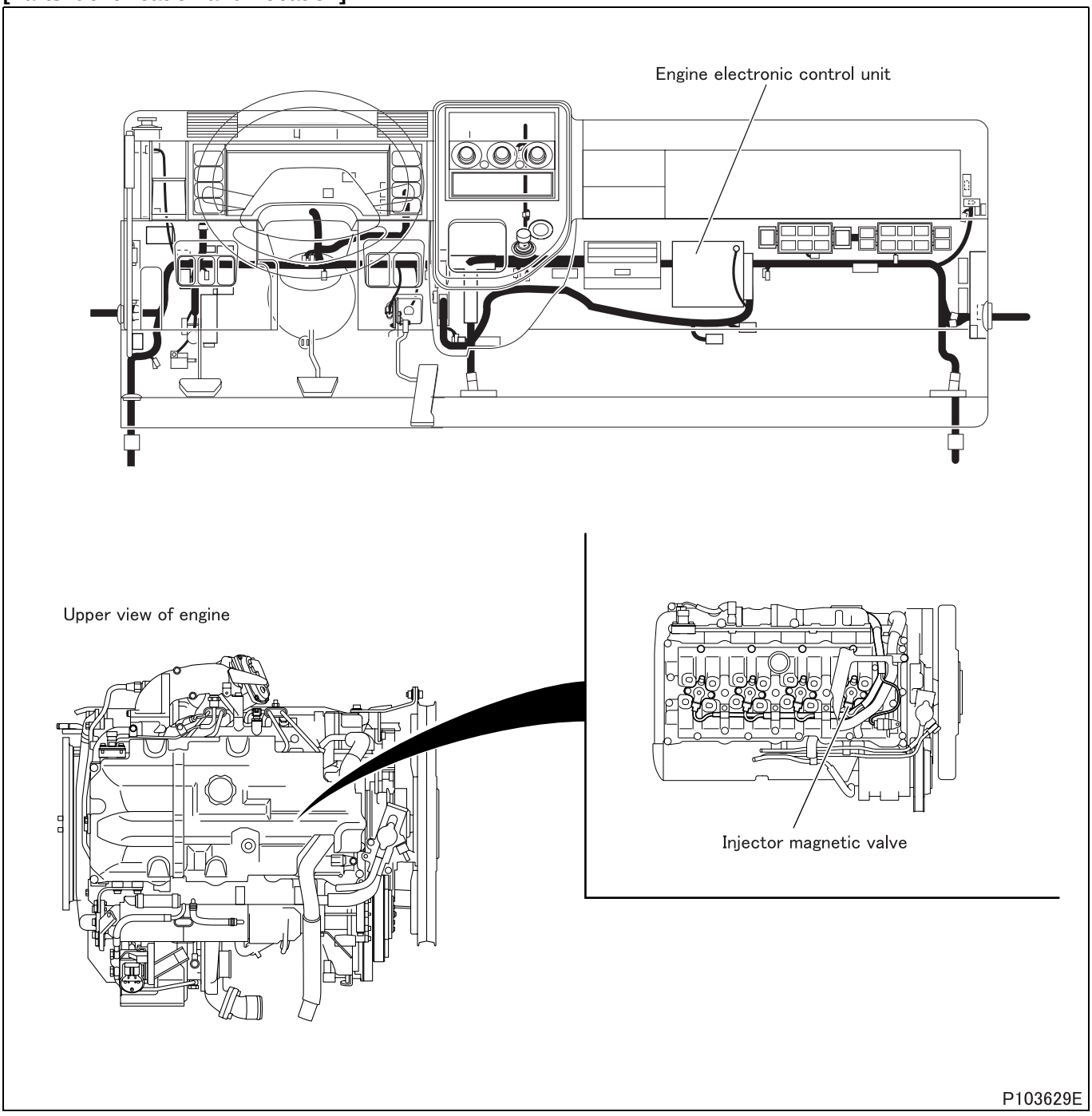
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

[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.)

[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 actuator test item No. BB “Injector Test 1”
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

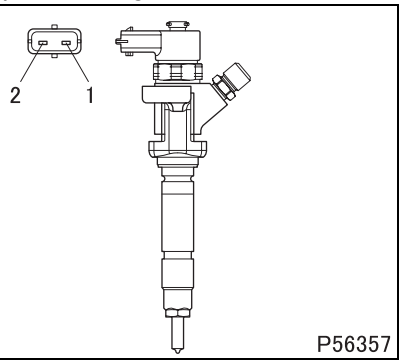
Step 2	Inspection items		Inspection by electronic drive unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 23 and 72.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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

[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.

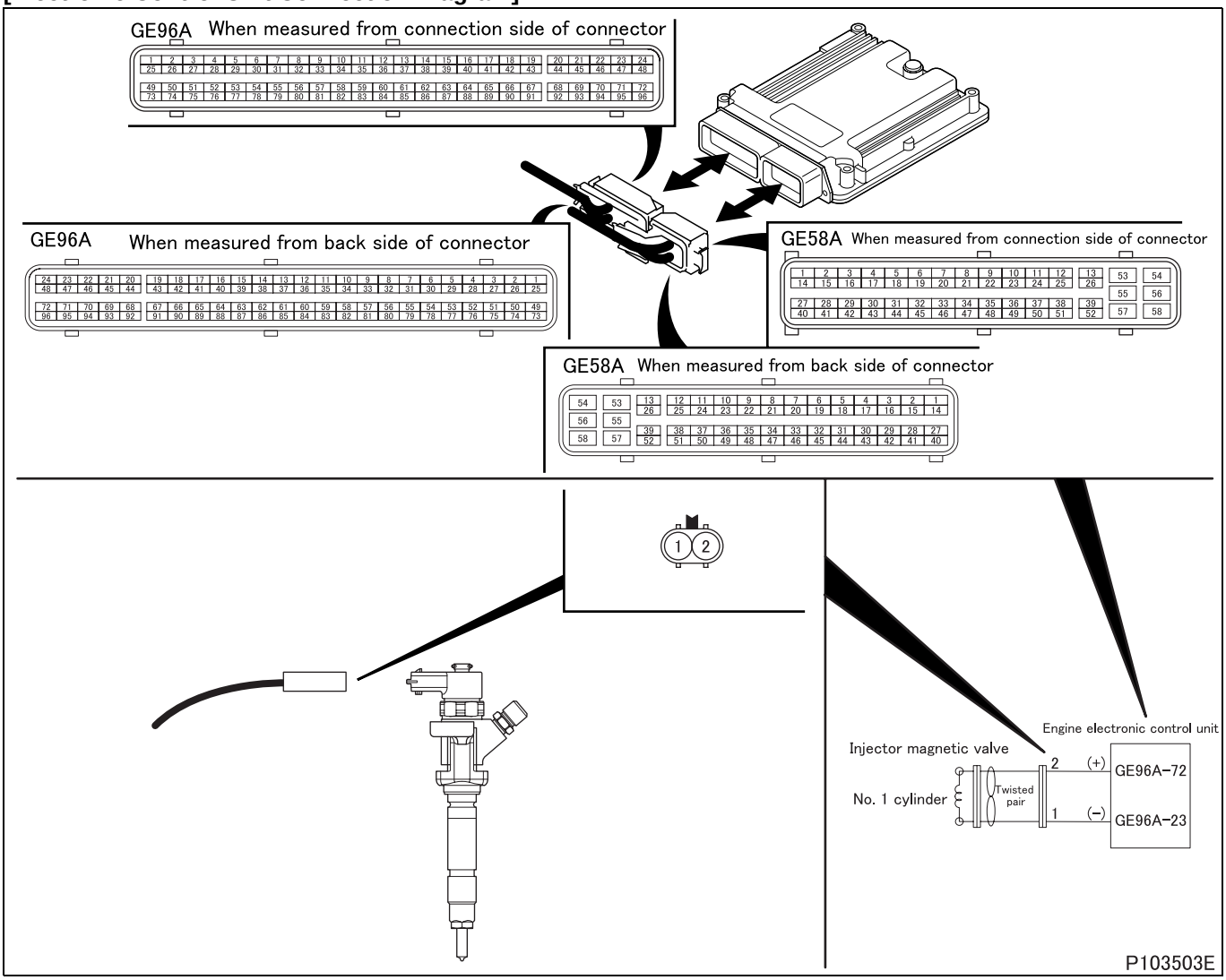
[Diagnostic requirement]
–

[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.

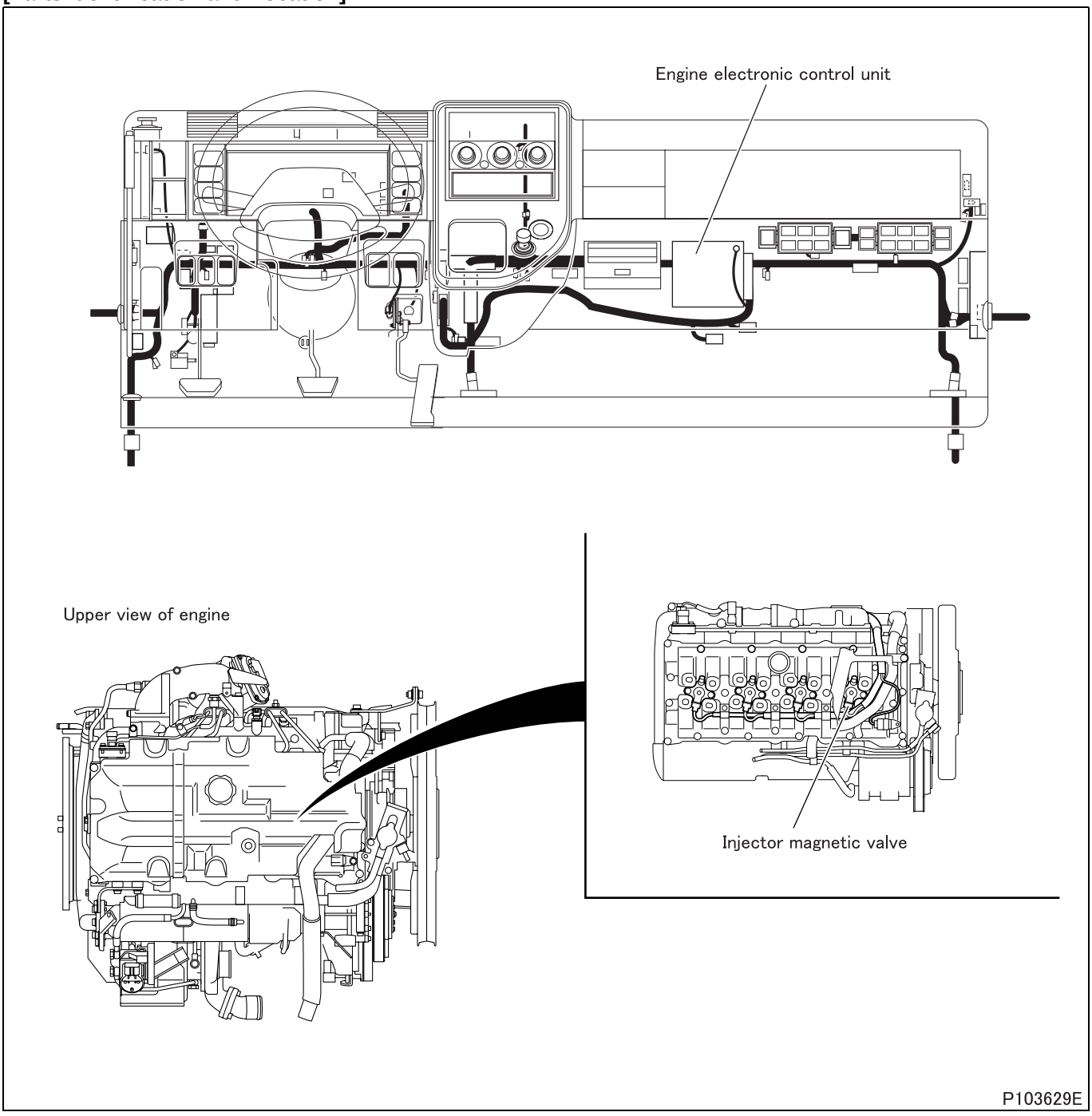
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

[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]



[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. BB “Injector Test 1”
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

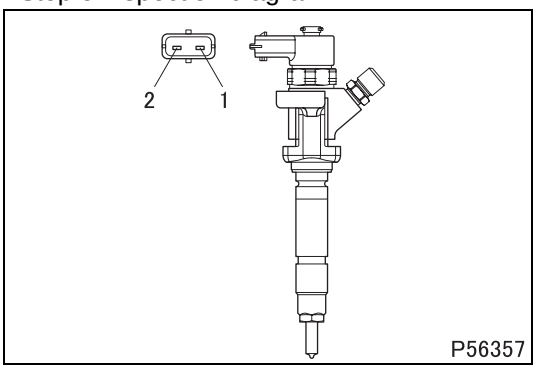
Step 2	Inspection items		Inspection by electronic drive unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 23 and 72.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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

[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.)

[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. • P0261 “Injector #1-A (Low)” • P0262 “Injector #1-A (High)” • P0264 “Injector #2-A (Low)” • P0265 “Injector #2-A (High)” • P0267 “Injector #3-A (Low)” • P0268 “Injector #3-A (High)” • P0270 “Injector #4-A (Low)” • P0271 “Injector #4-A (High)”
	Inspection condition		• Starter switch: ON • Engine: started
	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.

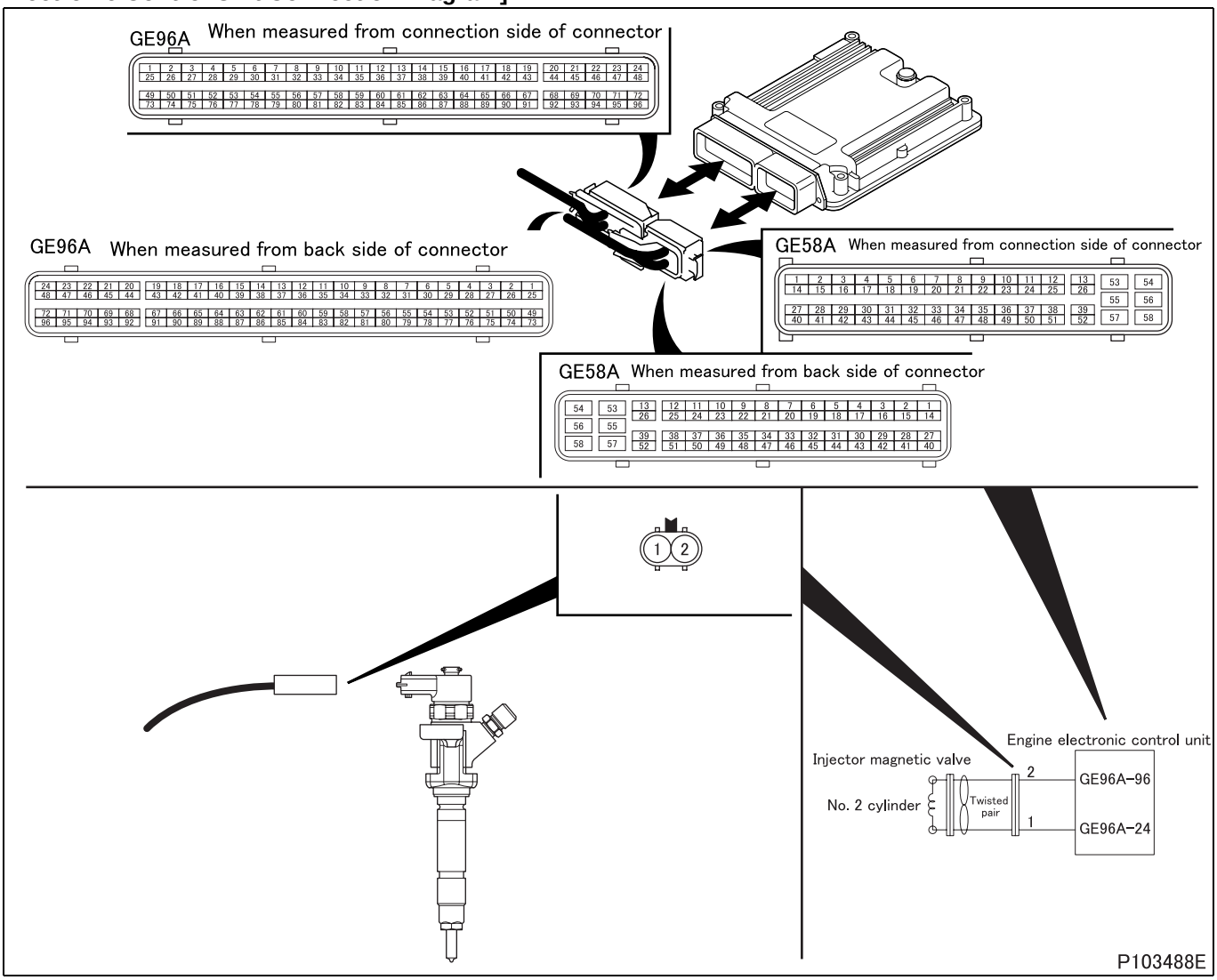
[Diagnostic requirement]
–

[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.

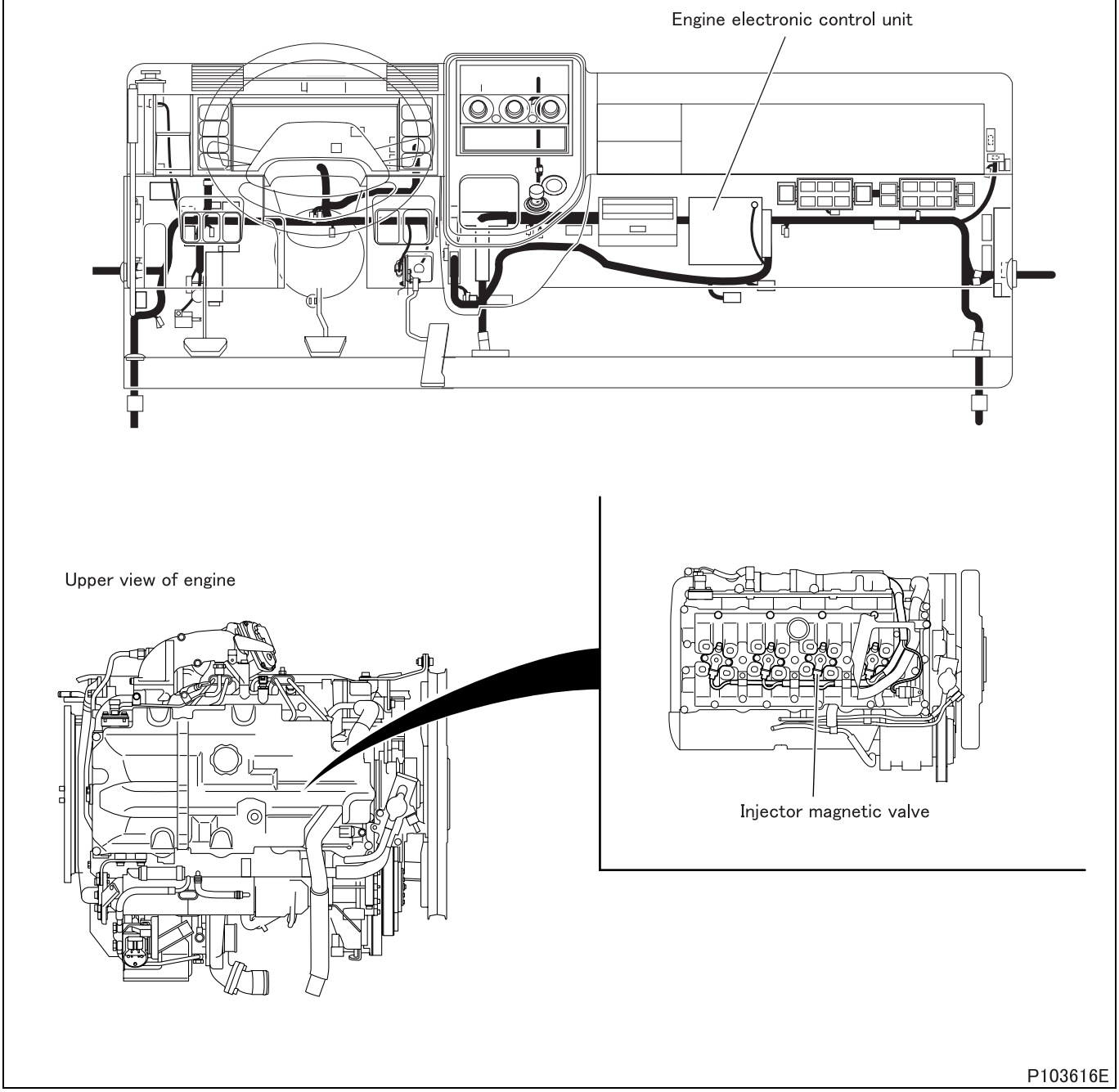
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

[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.)

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 actuator test item No. BD “Injector Test 3”
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

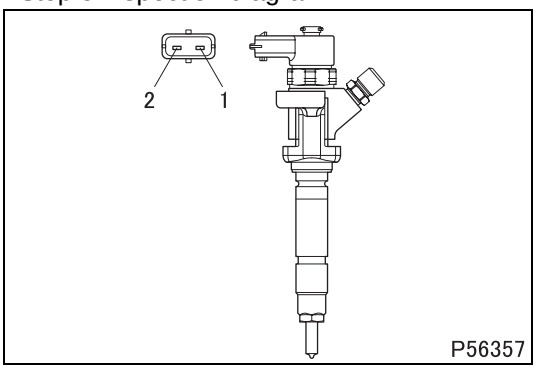
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 24 and 96.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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: 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.

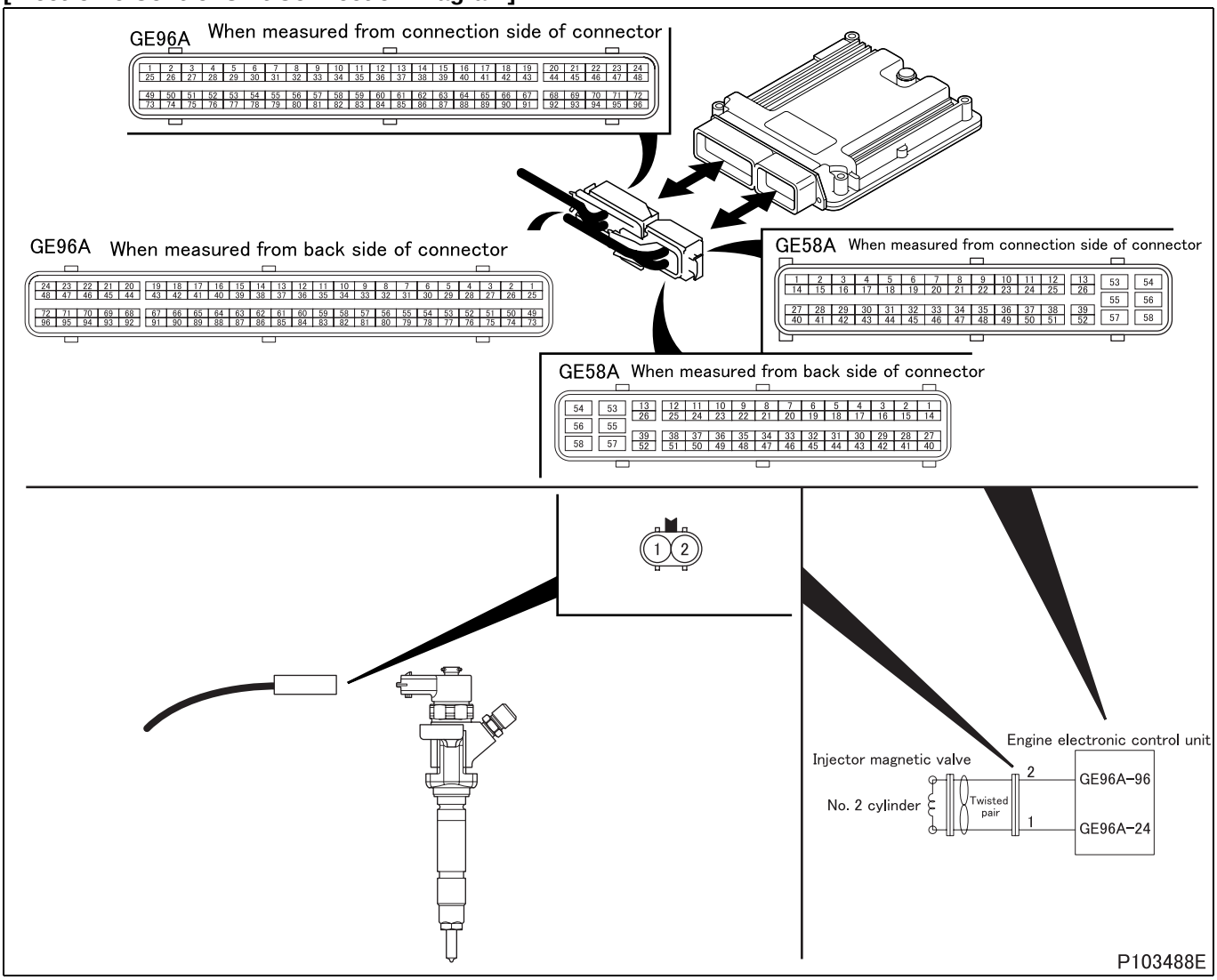
[Diagnostic requirement]
–

[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]



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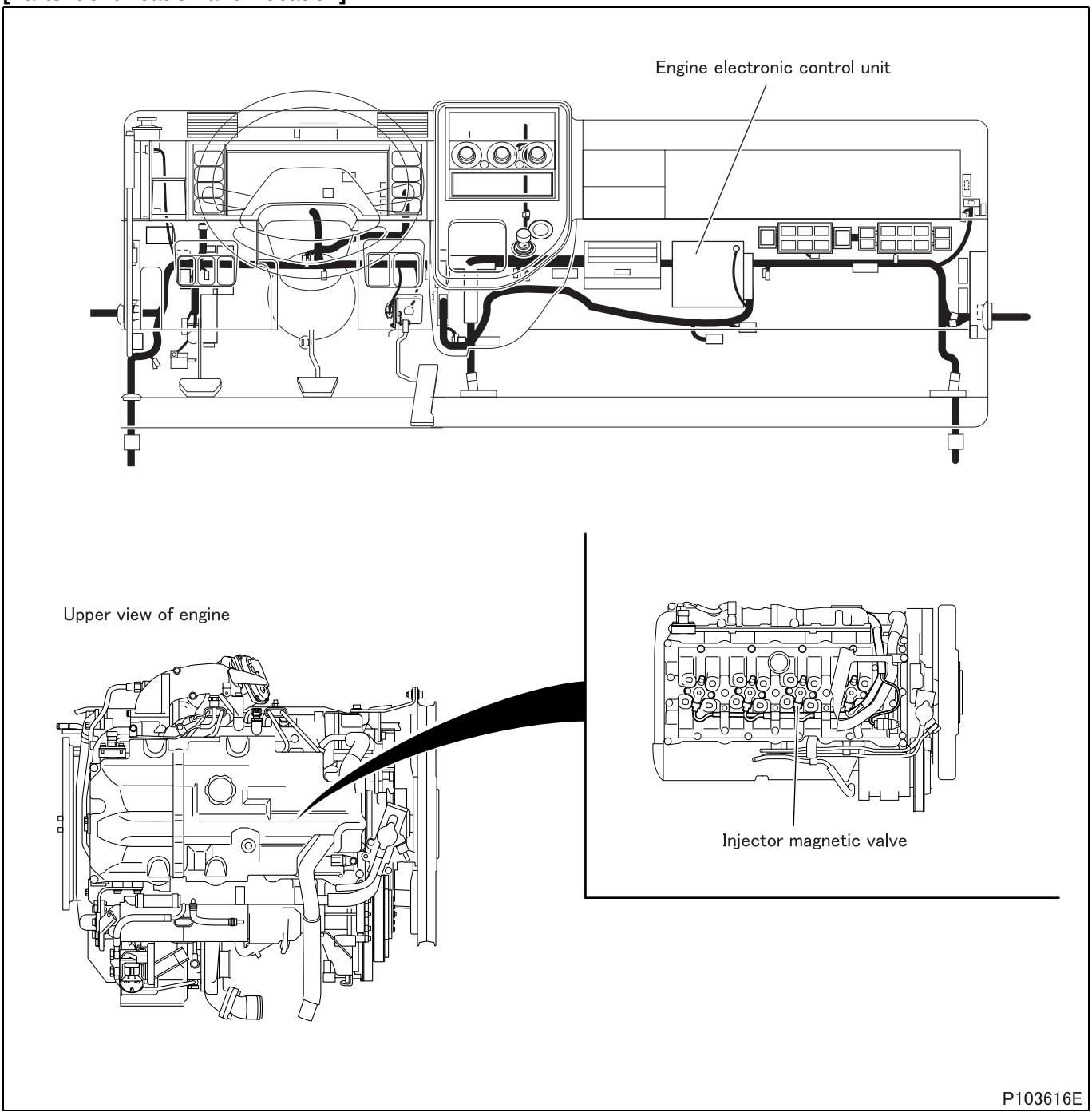


[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Perform actuator test item No. BD “Injector Test 3”
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

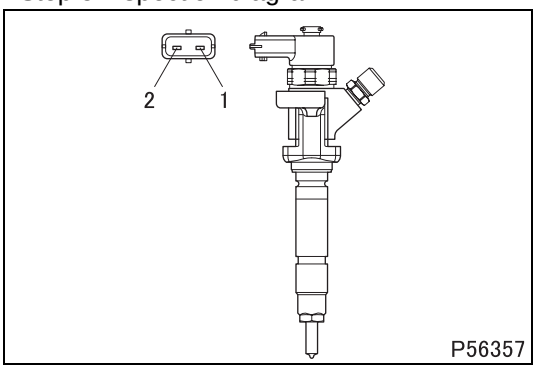
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 24 and 96.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.)

[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. • P0261 “Injector #1-A (Low)” • P0262 “Injector #1-A (High)” • P0264 “Injector #2-A (Low)” • P0265 “Injector #2-A (High)” • P0267 “Injector #3-A (Low)” • P0268 “Injector #3-A (High)” • P0270 “Injector #4-A (Low)” • P0271 “Injector #4-A (High)”
	Inspection condition		• Starter switch: ON • Engine: started
	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.

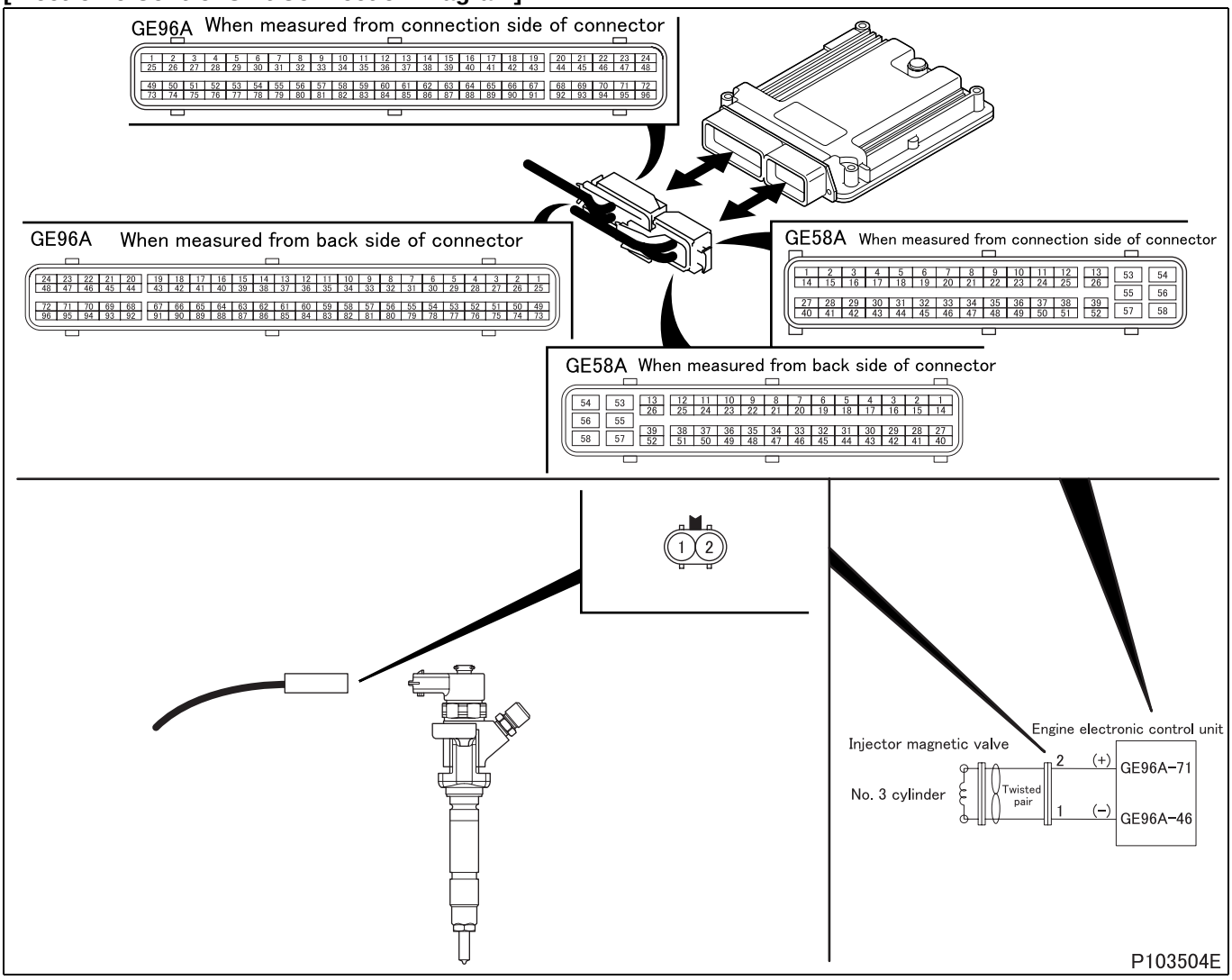
[Diagnostic requirement]
–

[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.

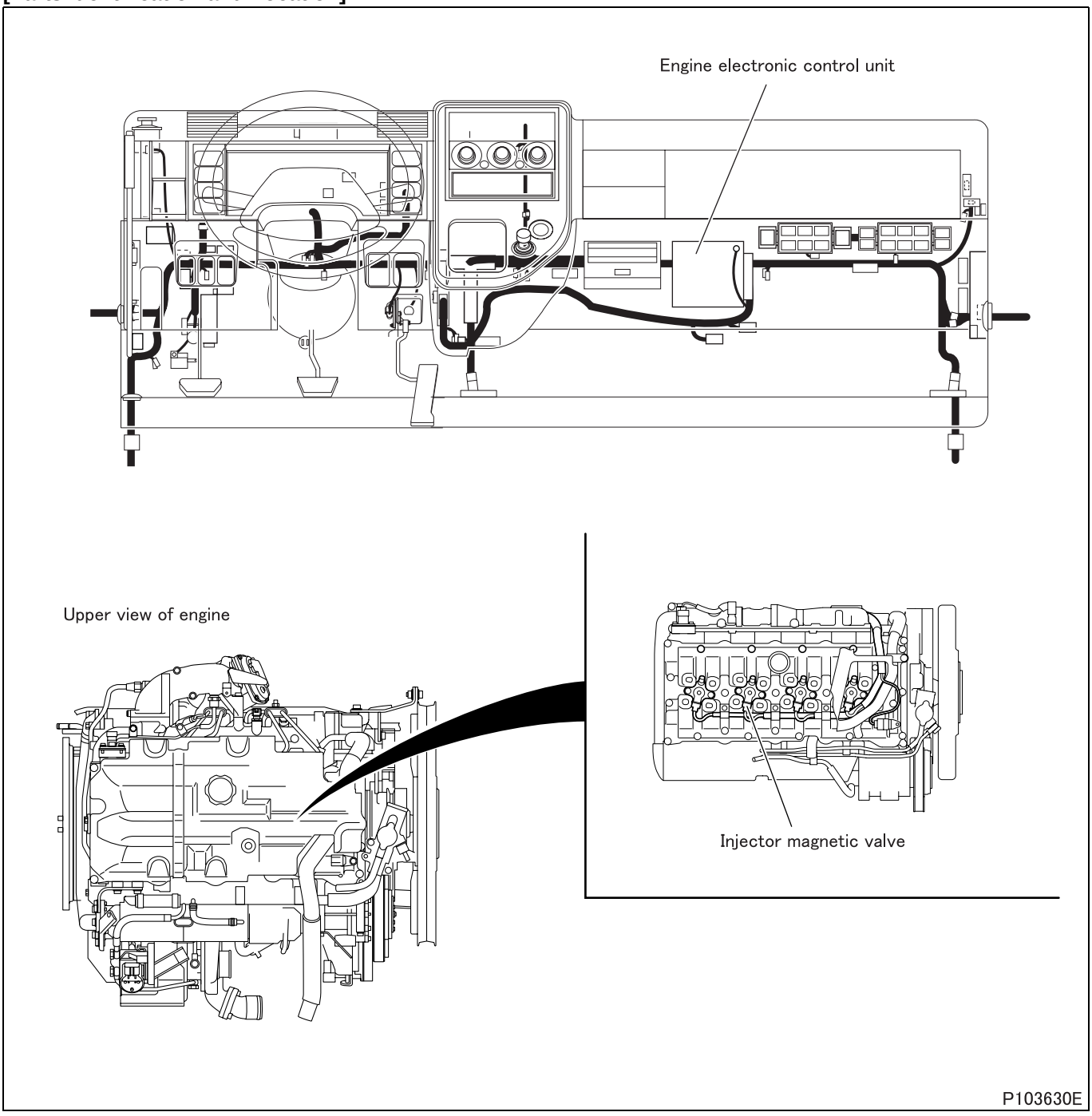
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

[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.)

[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 actuator test item No. BE “Injector Test 4”
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

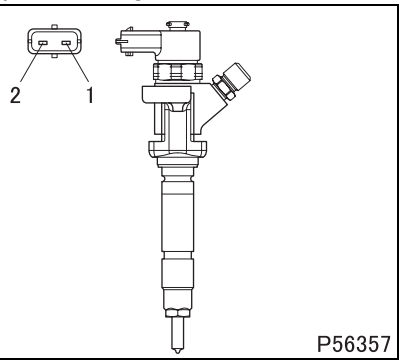
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 46 and 71.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		0.255 ± 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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: 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.

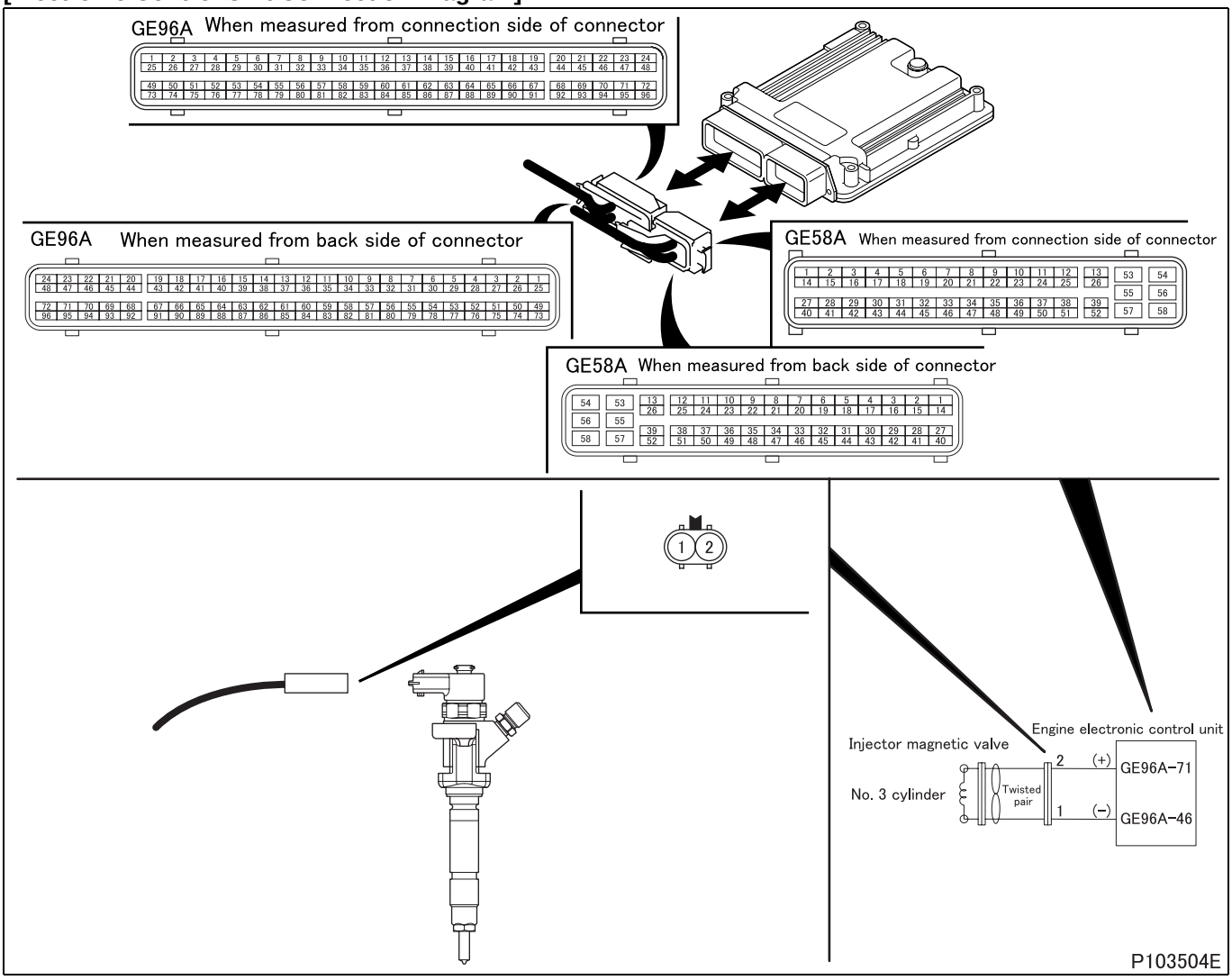
[Diagnostic requirement]
–

[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.

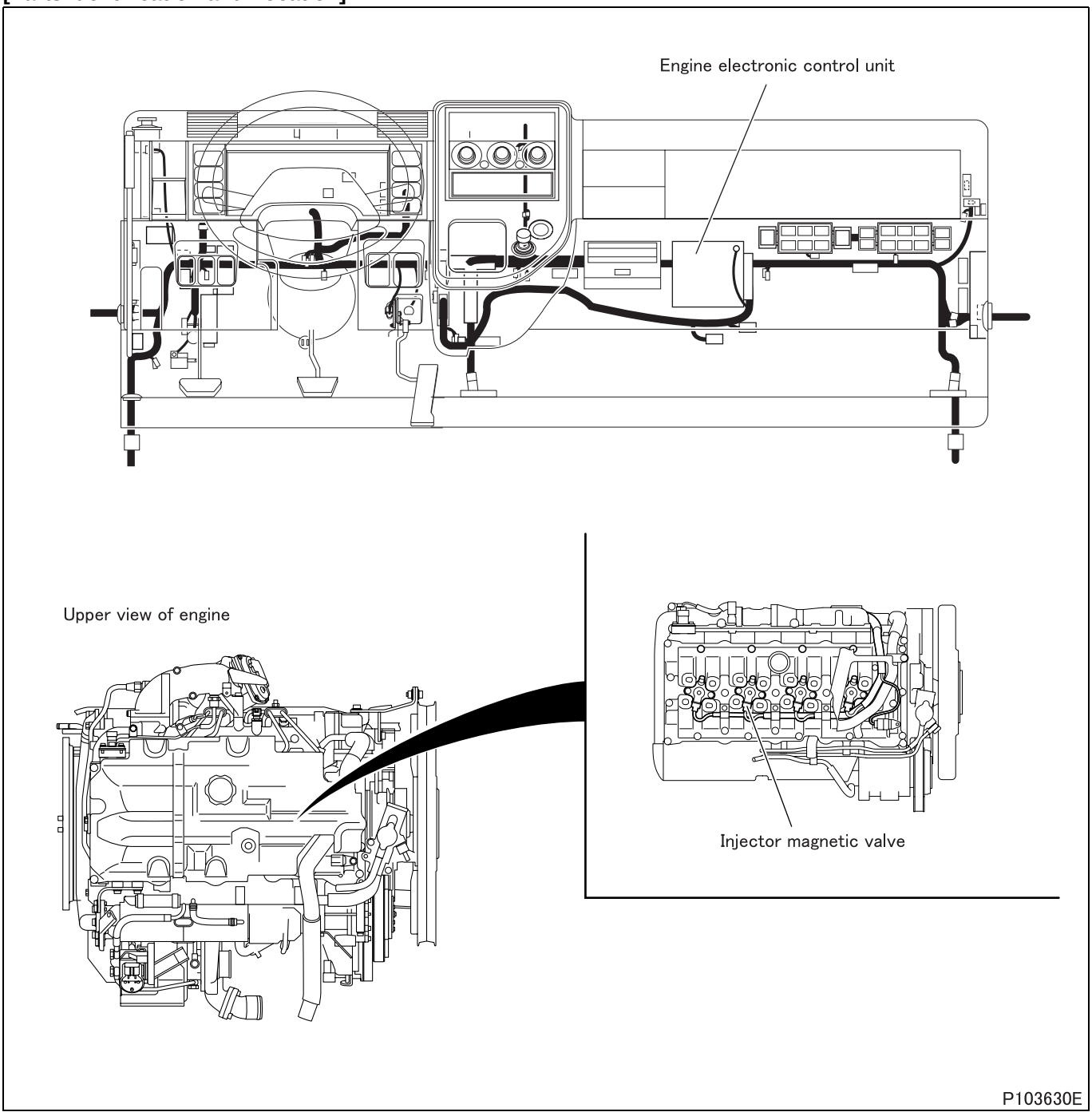
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

[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]



[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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

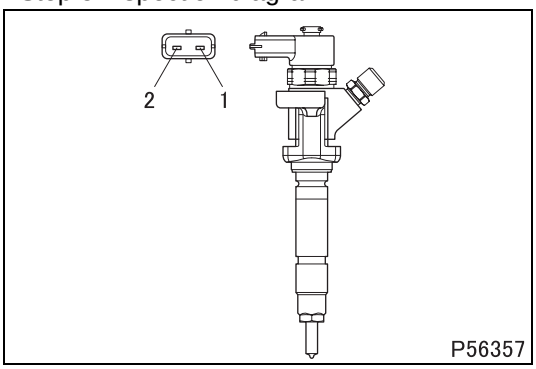
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 46 and 71.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		0.255 ± 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.)

[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. • P0261 “Injector #1-A (Low)” • P0262 “Injector #1-A (High)” • P0264 “Injector #2-A (Low)” • P0265 “Injector #2-A (High)” • P0267 “Injector #3-A (Low)” • P0268 “Injector #3-A (High)” • P0270 “Injector #4-A (Low)” • P0271 “Injector #4-A (High)”
	Inspection condition		• Starter switch: ON • Engine: started
	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.

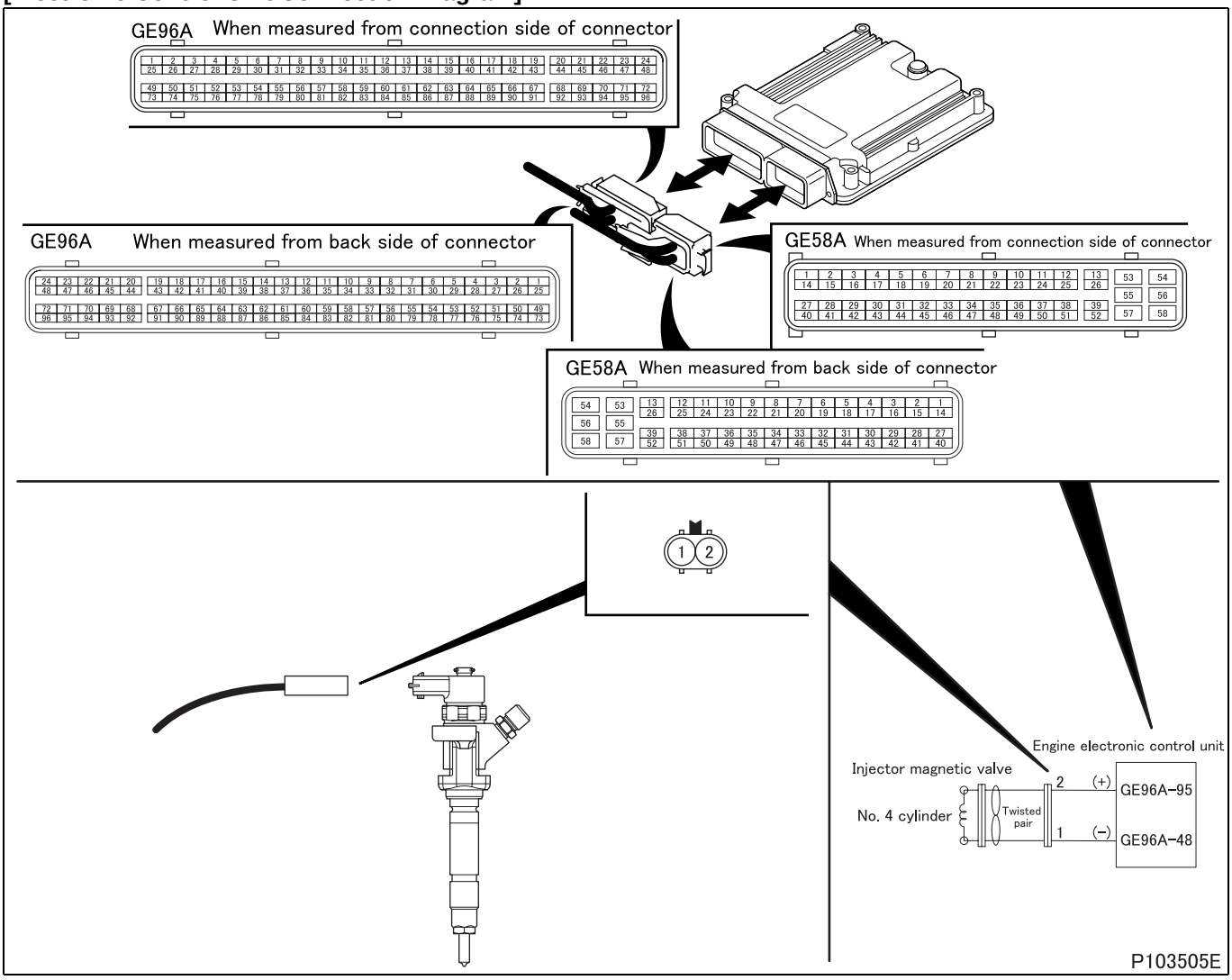
[Diagnostic requirement]
–

[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.

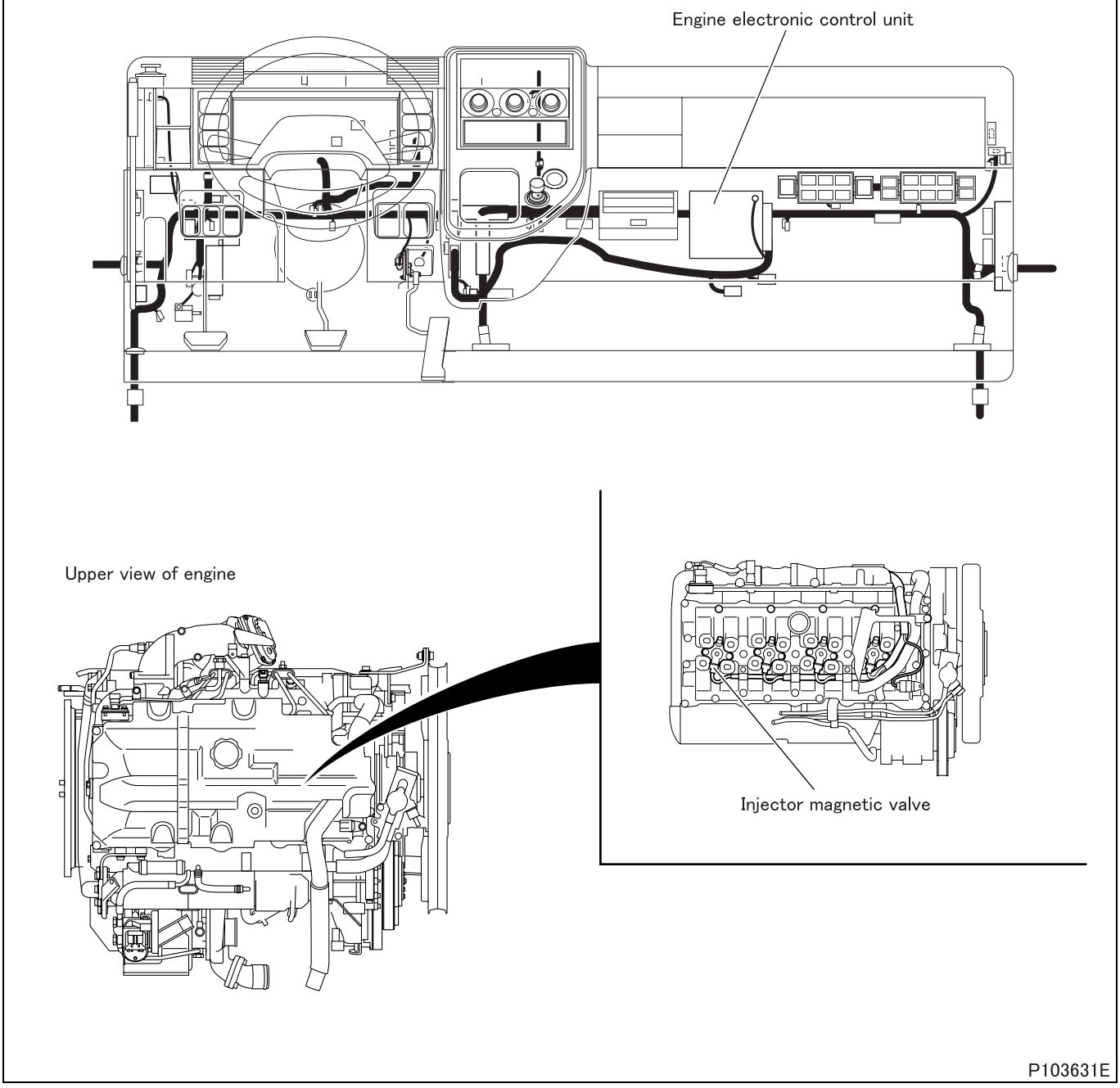
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

[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.)

[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 actuator test item No. BC “Injector Test 2”
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

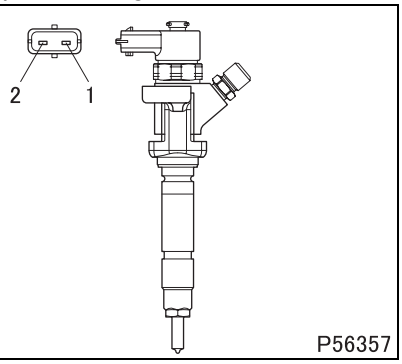
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 48 and 95.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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: 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.

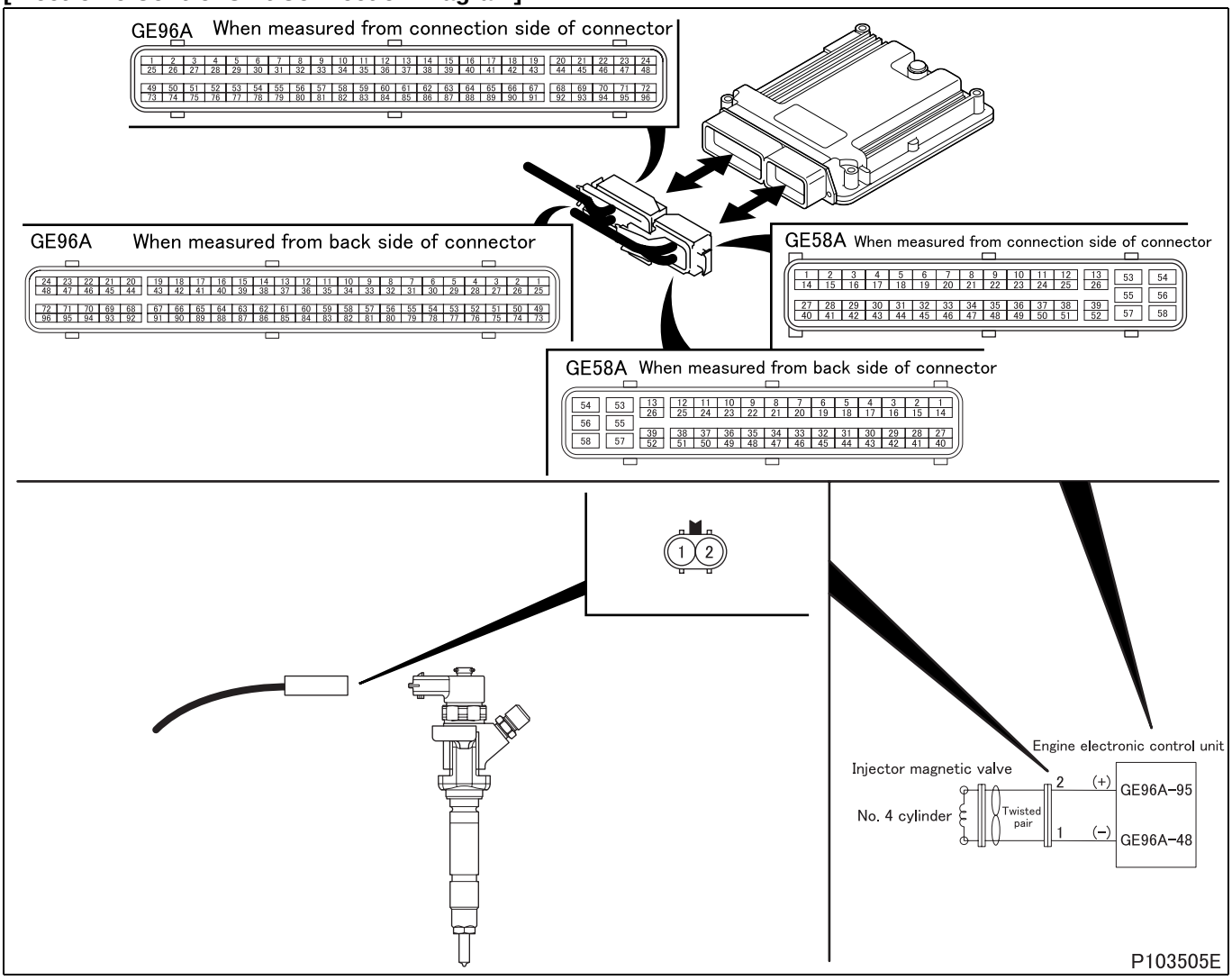
[Diagnostic requirement]
–

[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.

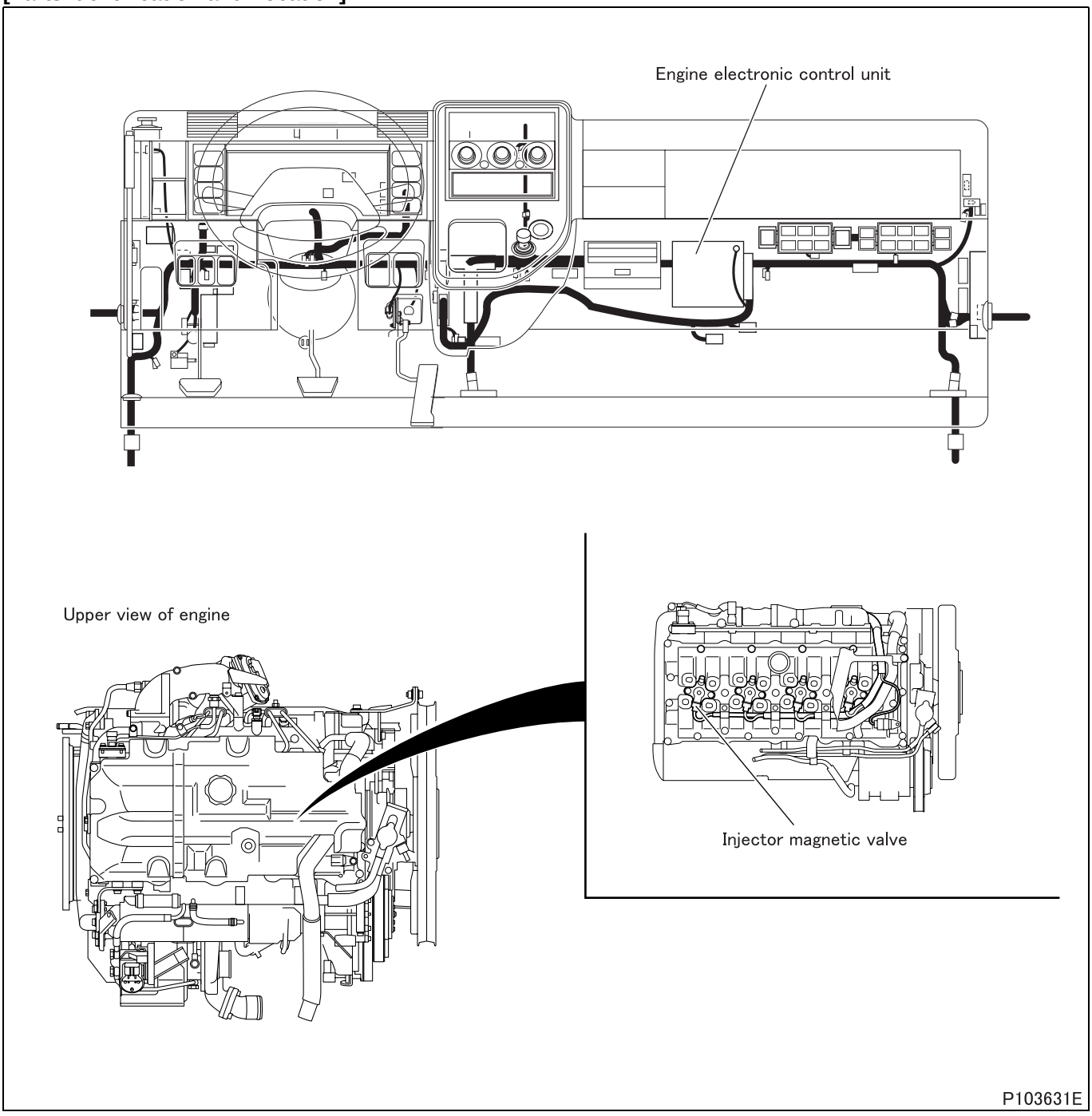
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

[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]



[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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

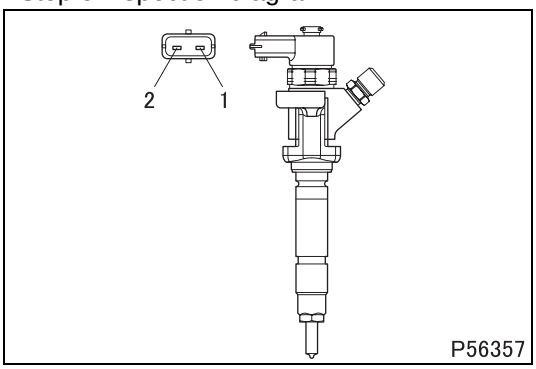
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 48 and 95.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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: 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.)

[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. • P0261 “Injector #1-A (Low)” • P0262 “Injector #1-A (High)” • P0264 “Injector #2-A (Low)” • P0265 “Injector #2-A (High)” • P0267 “Injector #3-A (Low)” • P0268 “Injector #3-A (High)” • P0270 “Injector #4-A (Low)” • P0271 “Injector #4-A (High)”
	Inspection condition		• Starter switch: ON • Engine: started
	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.)

[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. • P0045 “VGT Acutuator (Open)” • P0046 “VGT Acutuator (Performance)” • P0047 “VGT Acutuator (Low)” • P0069 “Boost Press SNSR (Correlation)” • P0237 “Boost Press SNSR (Low)” • P0238 “Boost Press SNSR (High)” • P0401 “EGR Flow (Insufficient)” • P0402 “EGR Flow (Excessive)” • P0403 “EGR1 (Acutuator Circuit)” • P0409 “EGR1 (Position Sensor)” • P0562 “Power Supply Voltage (Low)” • P0563 “Power Supply Voltage (High)” • P0600 “CAN Communication” • P0607 “ECU System” • P060B “A/D Converter” • P061B “ECU Performance (Calc)” • P061C “ECU Performance (Ne)” • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)” • P2002 “DPF MFF” • P2228 “Atm Press SNSR (Low)” • P2229 “Atm Press SNSR (High)” • P2263 “VGT System” • P2413 “EGR System” • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (High) & MFF” • P2457 “EGR Cooler Performance”
	Inspection condition		• Starter switch: ON • Do not start engine.
	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		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?)	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?)	YES	Replacement of turbocharger
		NO	Go to step 4.

Step 4	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** • Measure item “Intake MAP”. **<Multi-Use Tester used>** • Measure item No. 21 “Boost Pressure” of Service Data.
	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

[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.)

[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.)

[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.

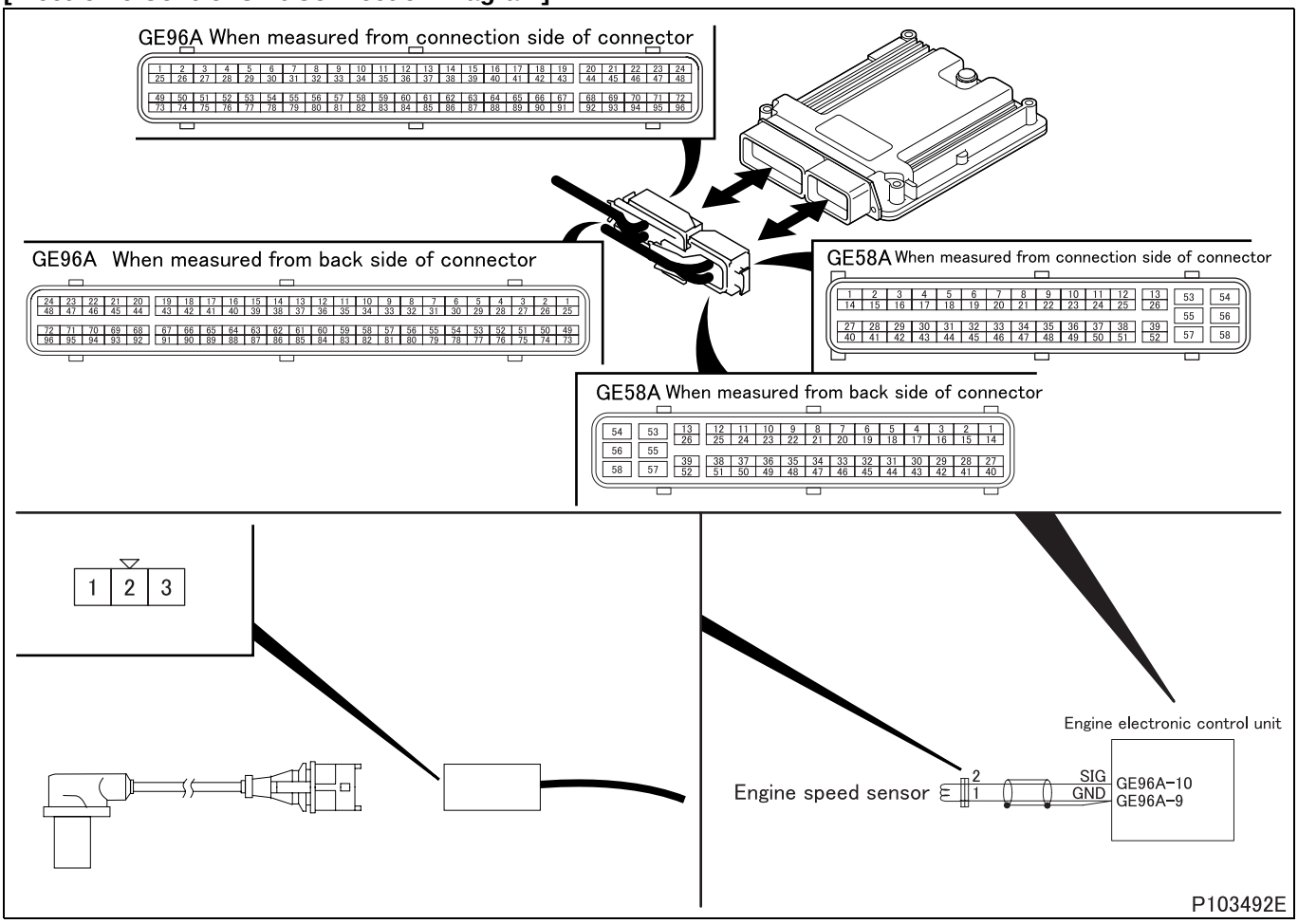
[Diagnostic requirement]
- Engine operating mode: normal (engine in operation)

[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.

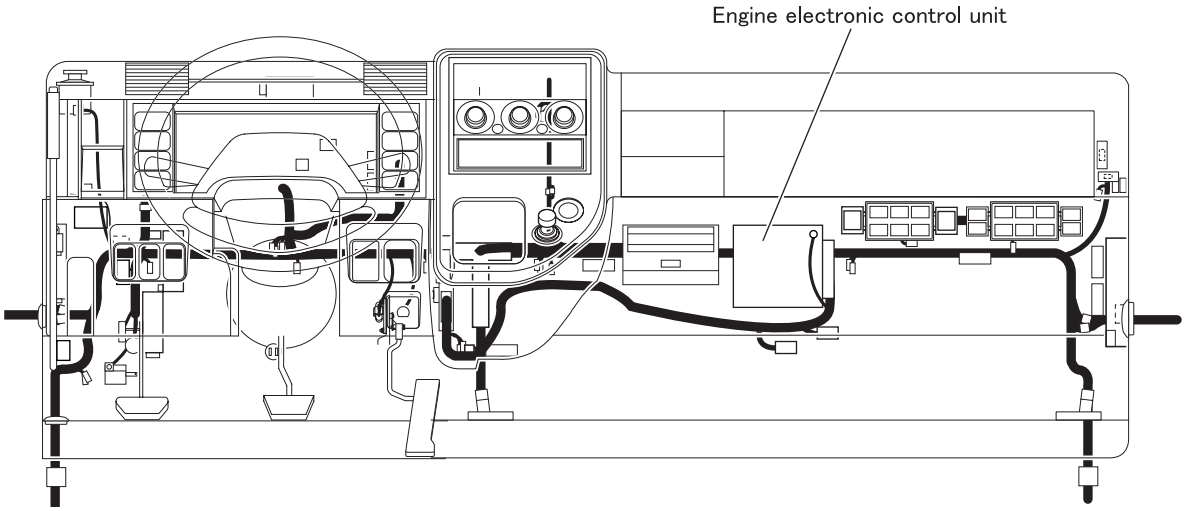
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and engine speed sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

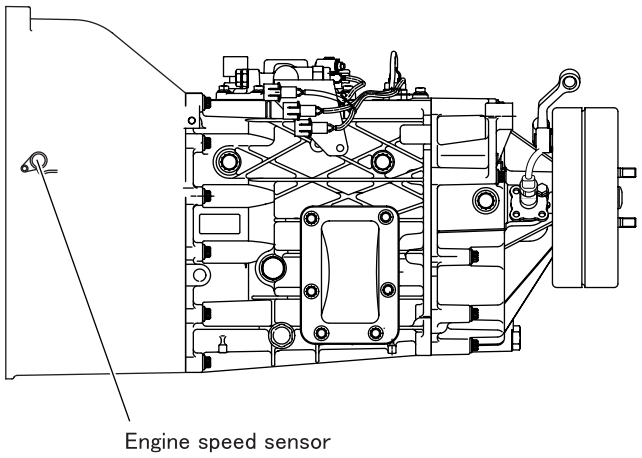
[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



Left side view of transmission



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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		**<General Scanning Tool used>** • Measure item “Ne” . **<Multi-Use Tester used>** • 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.

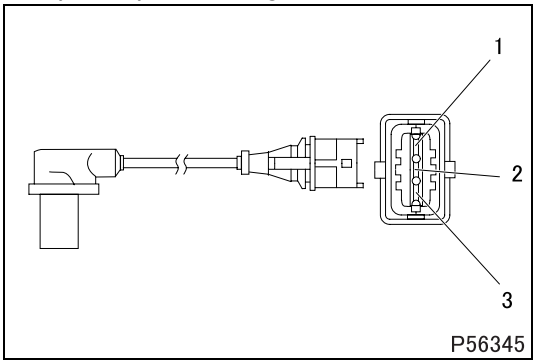
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 9 and 10.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		**<General Scanning Tool used>** • Measure item “Ne”. **<Multi-Use Tester used>** • 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: 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.

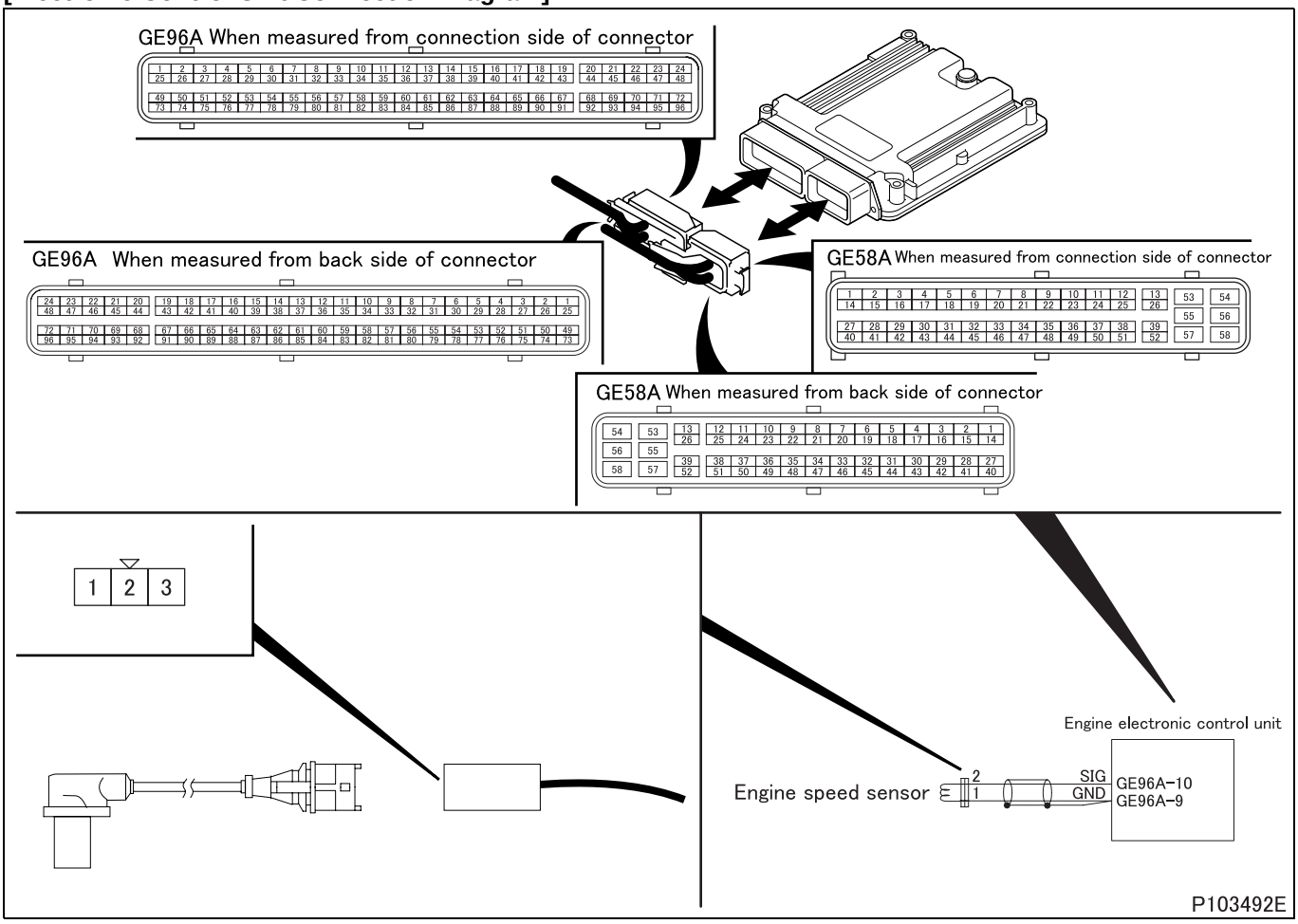
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and engine speed sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

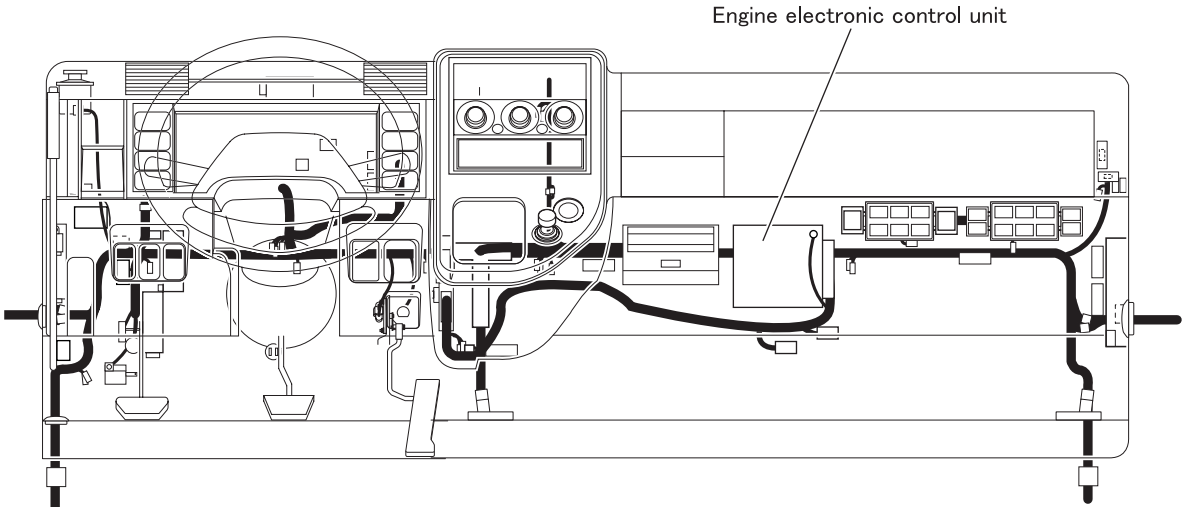
<Condition (1)>
- Lamp is extinguished and code is cleared at fourth diagnosis code display after recovery.

<Condition (2)>
- Lamp is extinguished and code is cleared simultaneously with recovery.

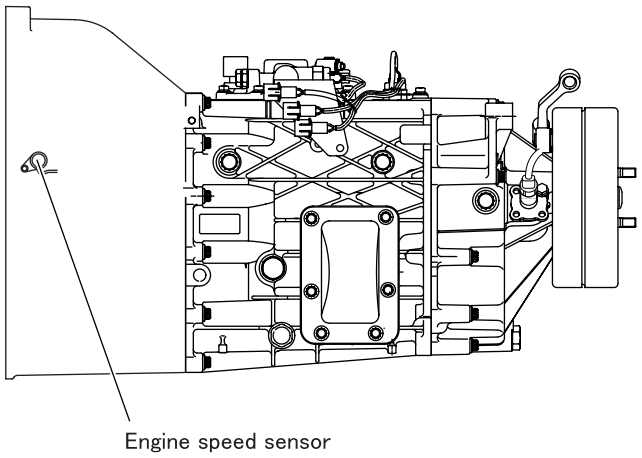
[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



Left side view of transmission



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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		**<General Scanning Tool used>** • Measure item “Ne”. **<Multi-Use Tester used>** • 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.

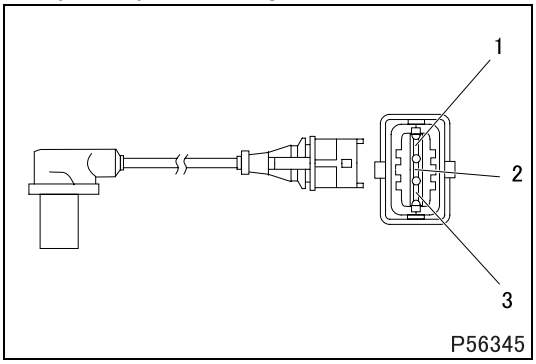
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 9 and 10.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		**<General Scanning Tool used>** • Measure item “Ne”. **<Multi-Use Tester used>** • 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.

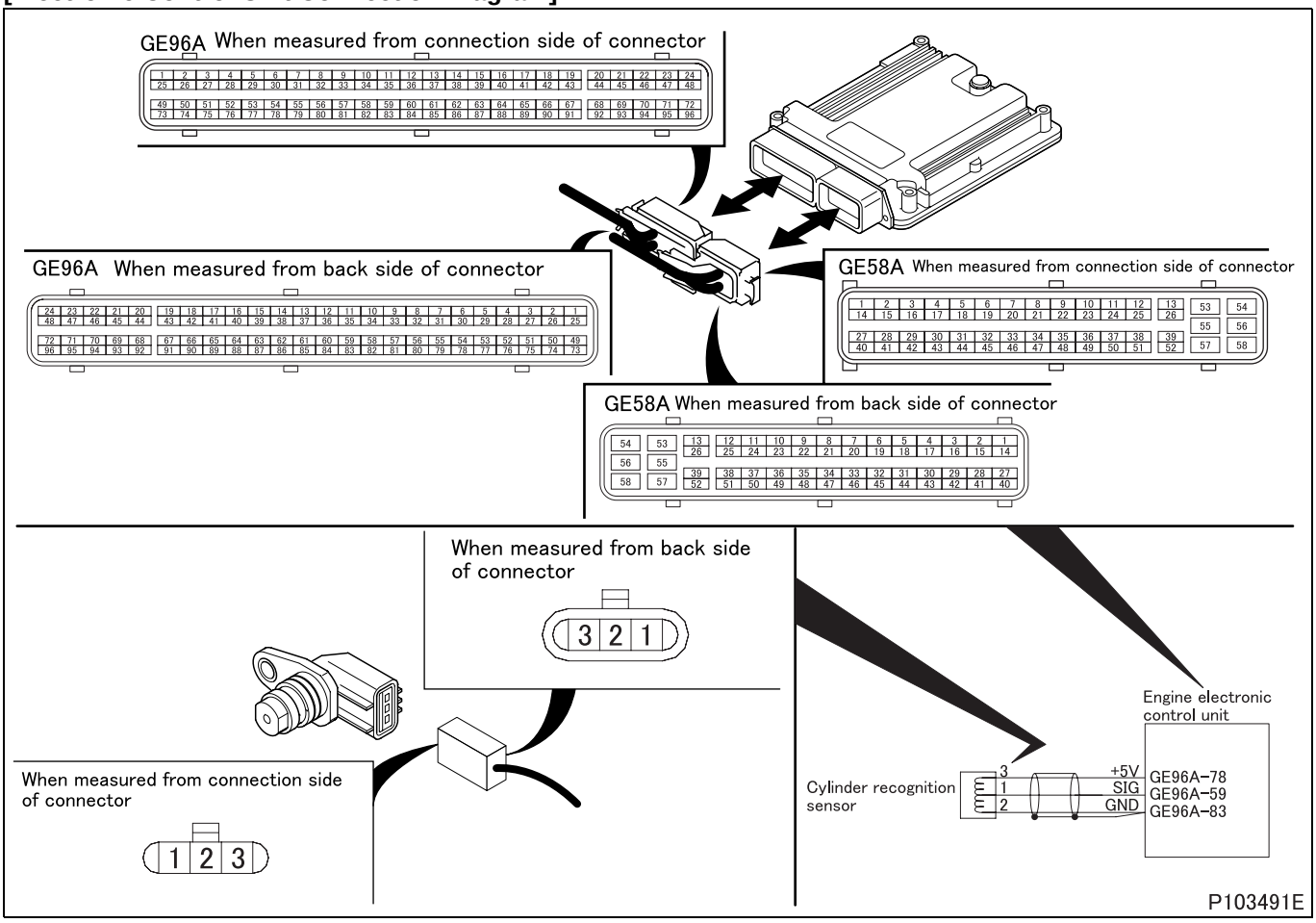
[Diagnostic requirement]
- Starter switch: ON
- Engine speed: more than 20 rpm

[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.

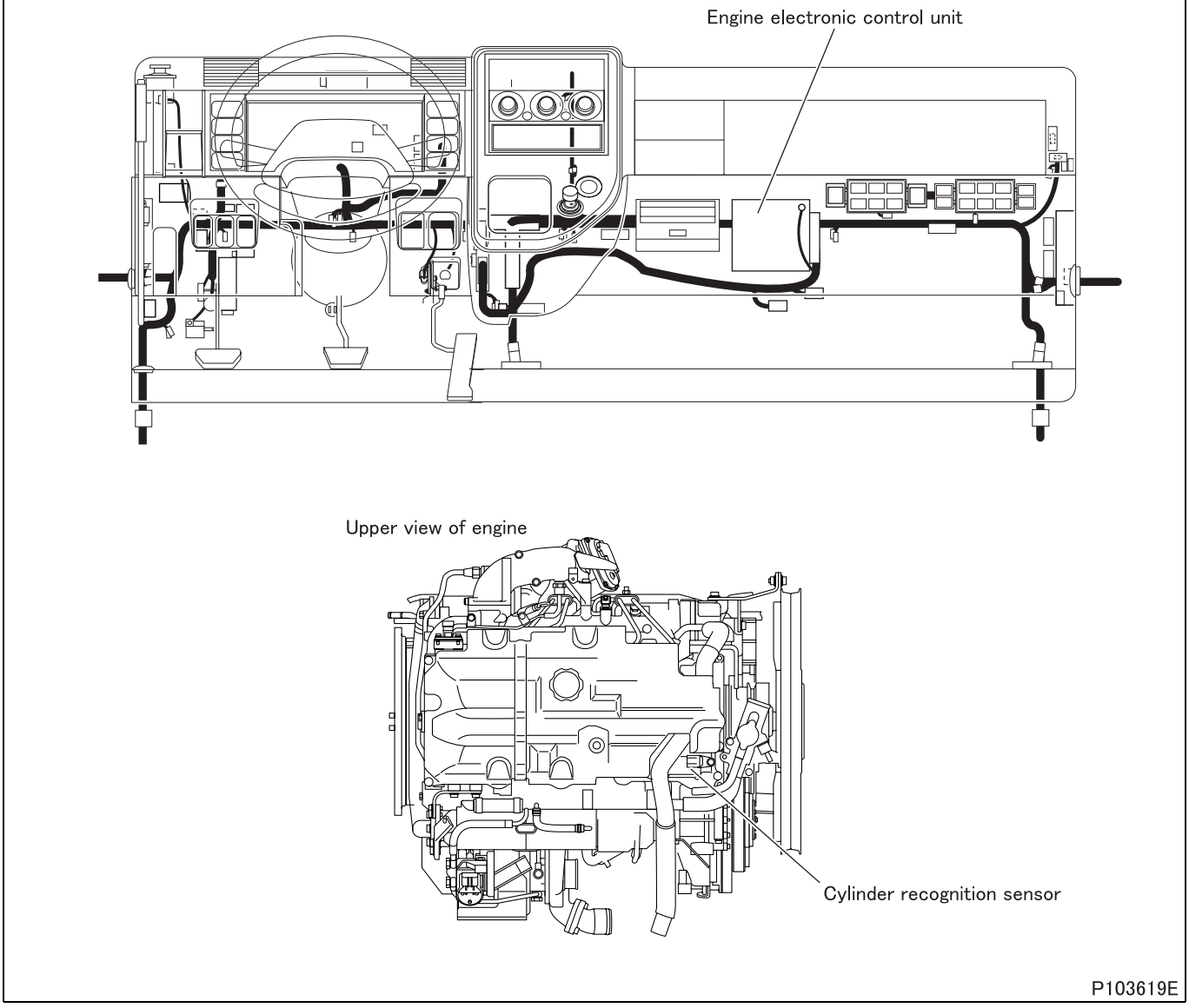
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and engine speed sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

[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		**<General Scanning Tool used>** • Measure item “Ne”. **<Multi-Use Tester used>** • 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 (signal)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 59 (+) and 83 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Go to step 5.

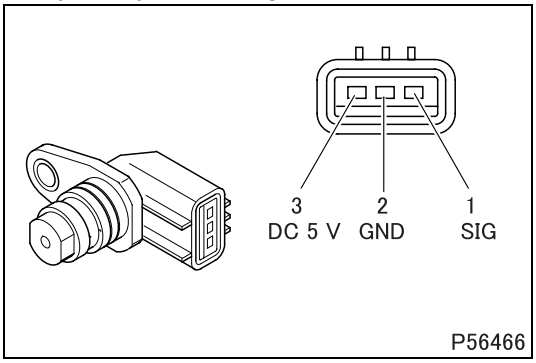
Step 4	Inspection items		Inspection by electronic control unit connector (ground)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 83 (+) and 53 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Remove connector and measure from harness side. • Starter switch: ON
	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.

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		**<General Scanning Tool used>** • Measure item “Ne”. **<Multi-Use Tester used>** • 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.

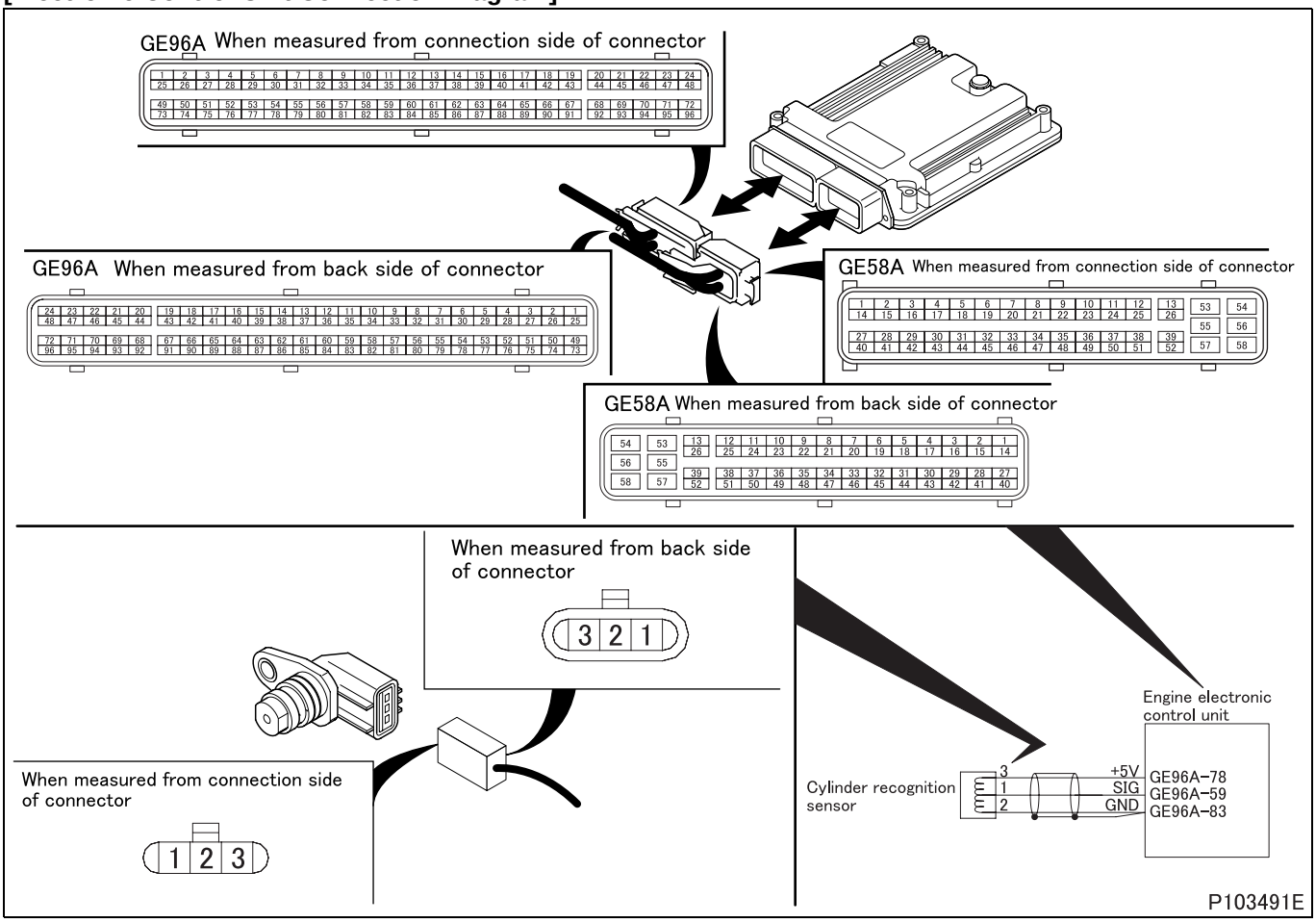
[Diagnostic requirement]
- Starter switch: ON
- Engine speed: more than 20 rpm

[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.

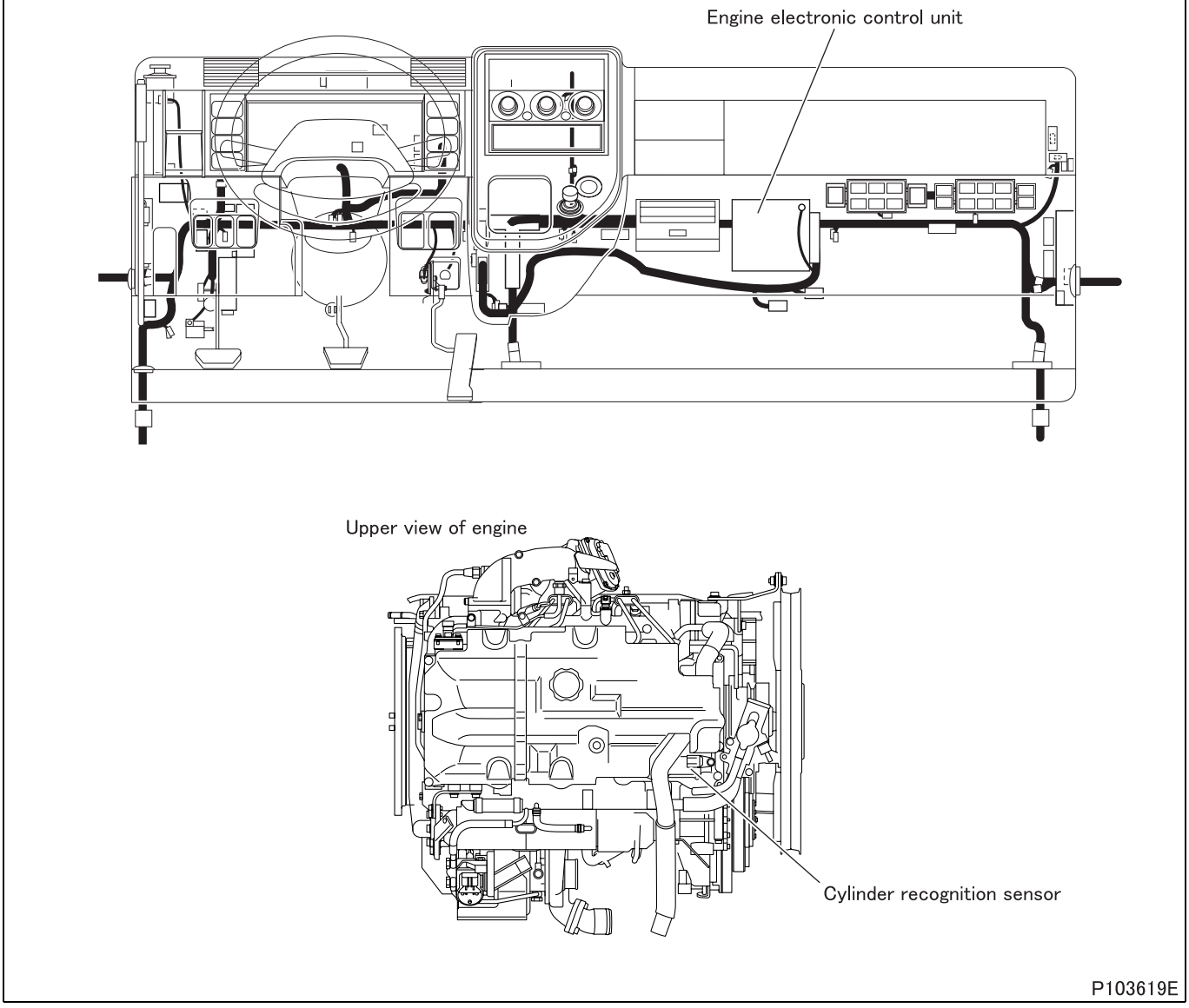
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

[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		**<General Scanning Tool used>** • Measure item “Ne”. **<Multi-Use Tester used>** • 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 (signal)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 59 (+) and 83 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Go to step 5.

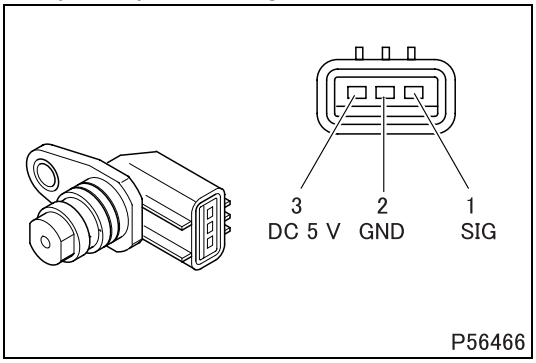
Step 4	Inspection items		Inspection by electronic control unit connector (ground)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 83 (+) and 53 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Remove connector and measure from harness side. • Starter switch: ON
	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.

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		**<General Scanning Tool used>** • Measure item “Ne”. **<Multi-Use Tester used>** • 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: 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.

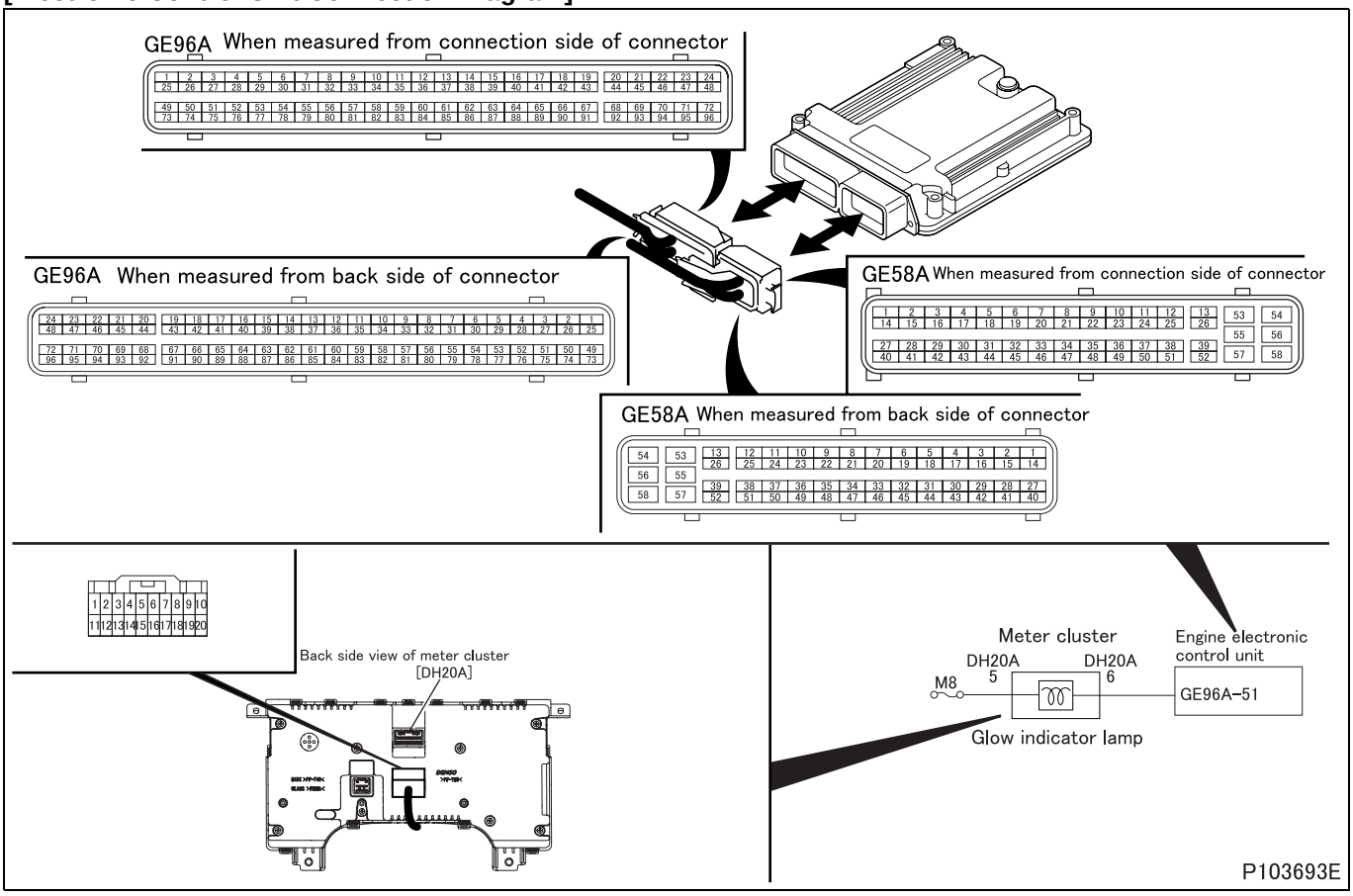
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Effects no special control.

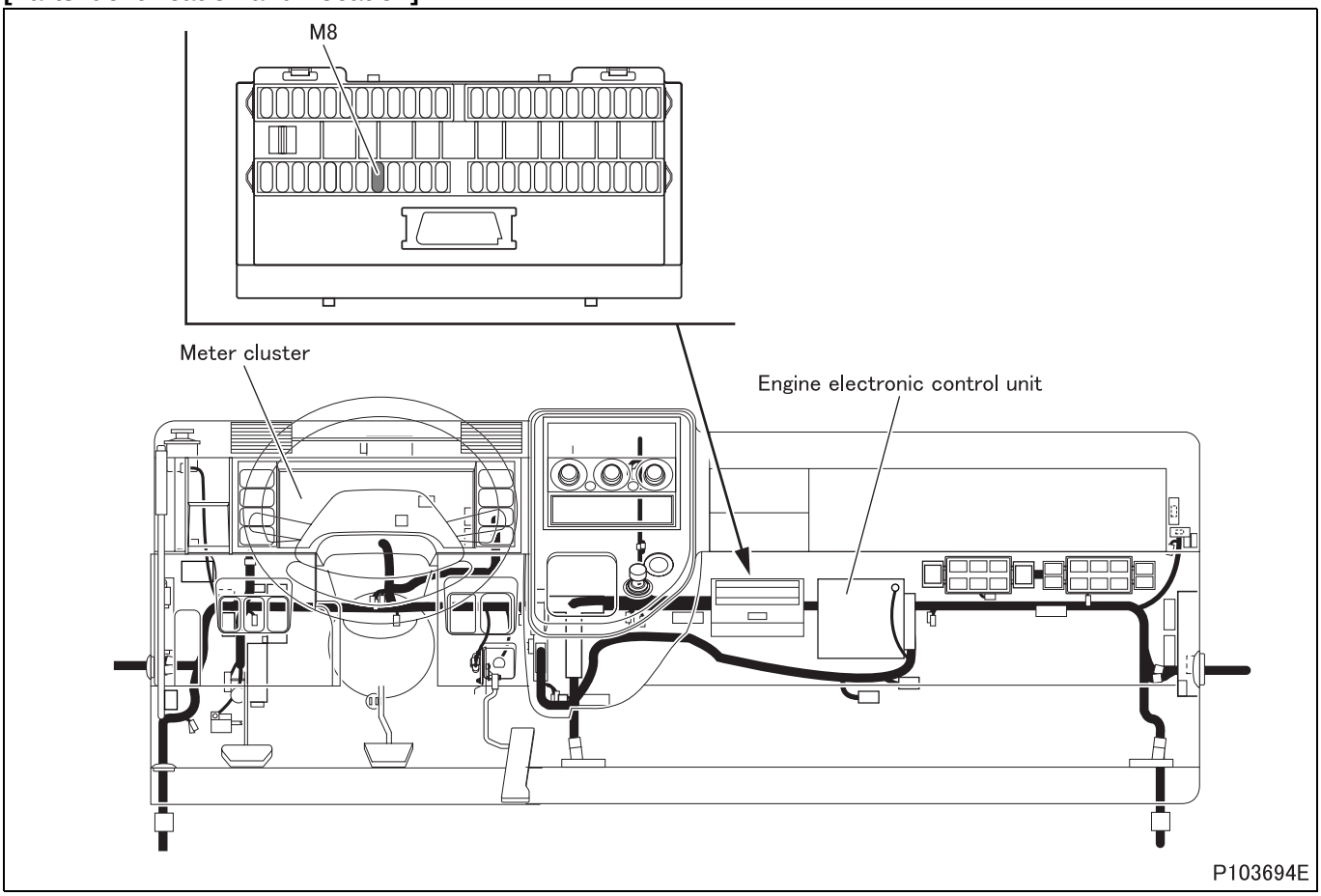
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and meter cluster (preheating indicator lamp)
- Malfunction of each connector
- Malfunction of meter cluster (preheating indicator lamp)
- Malfunction of electronic control unit

[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.)

[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.).
		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.
		NO	Go to step 4.

Step 3	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

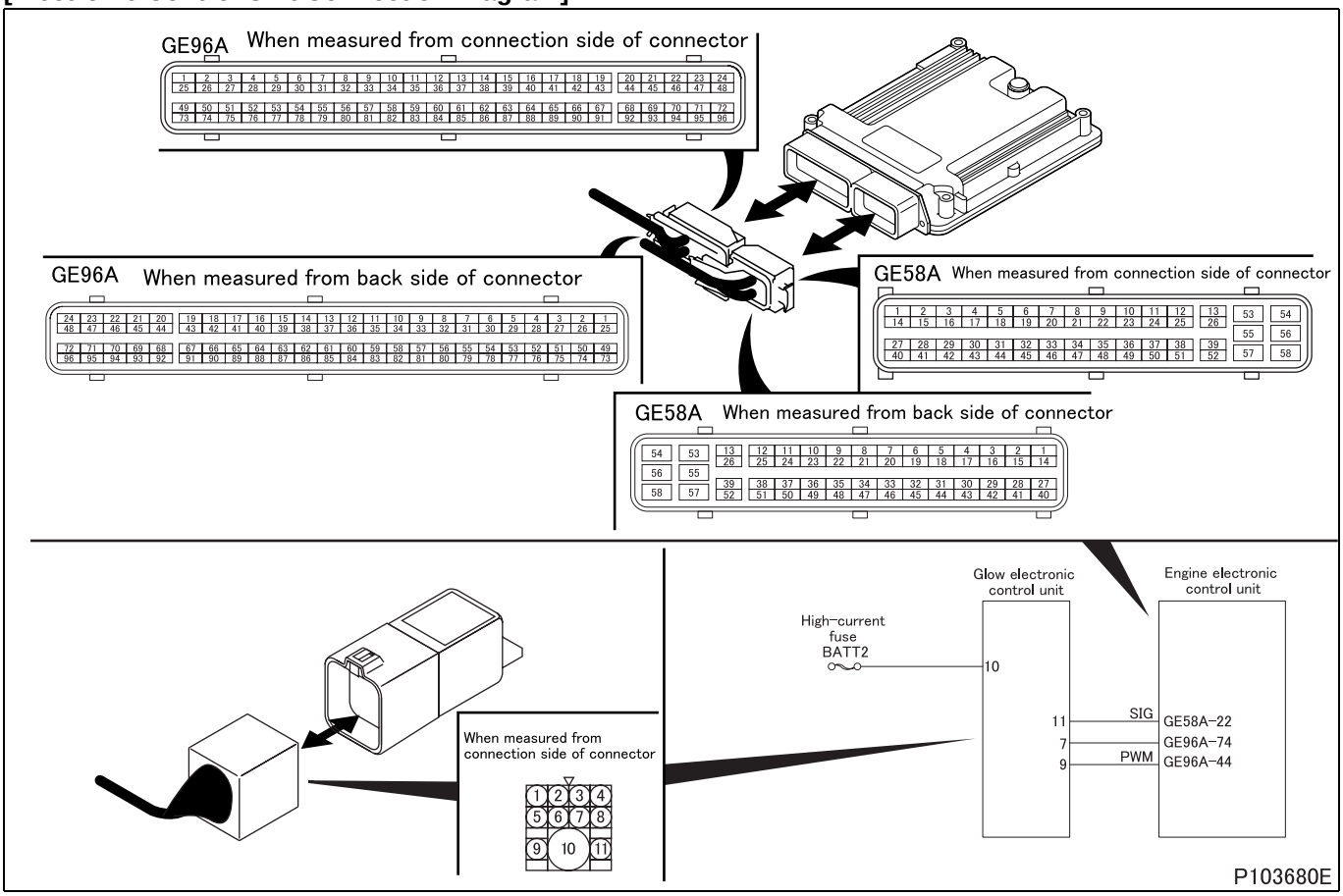
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Effects no special control.

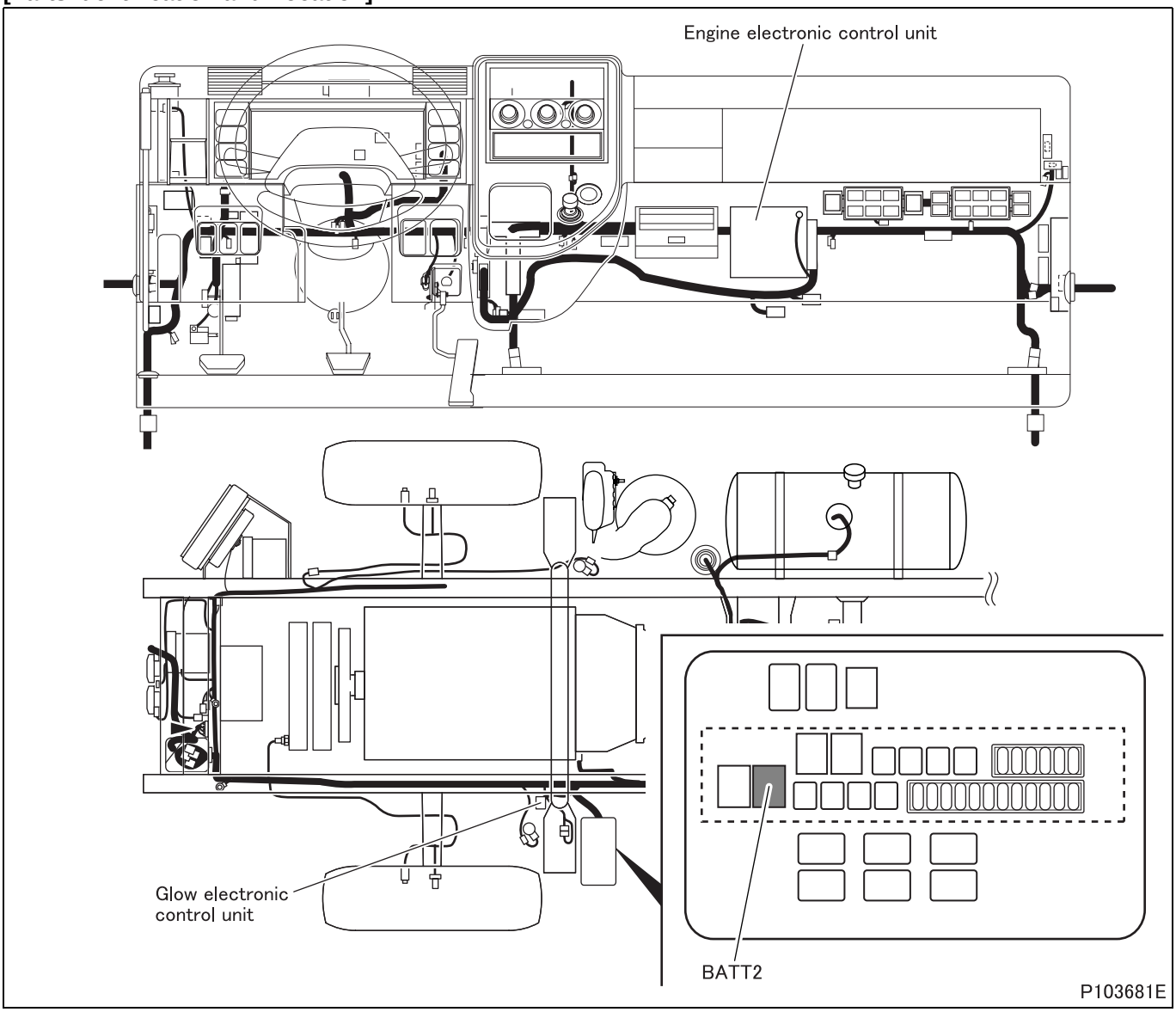
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and glow electronic control unit
- Malfunction of each connector
- Malfunction of glow electronic control unit
- Malfunction of electronic control unit

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[Fault diagnosis]

- Perform checks in the sequence of the following steps.

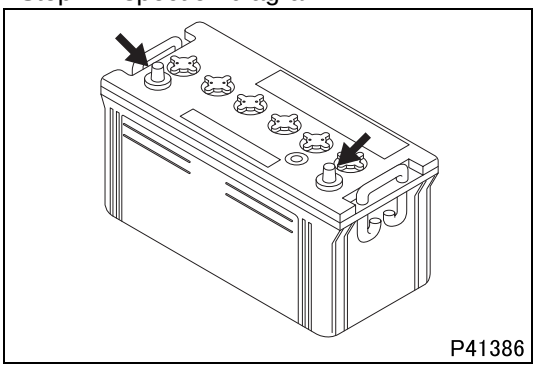
Step 1	Inspection items		Inspection by control data
	Maintenance item		Perform actuator test item No. B5 “GCU (GLOW PLUG)”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0MPH}) • Starter switch: ON • Engine: stopped
	Requirements		Power ON to glow plug
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 2.

Step 2	Inspection items		Inspection of 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	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?)	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?)	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		Check circuit between following connector terminals. • Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22 • Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74 • Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) 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 6.
		NO	Modify harness.

Step 6	Inspection items		Inspection of glow electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of engine electronic control unit
		NO	Modify connector.

<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.

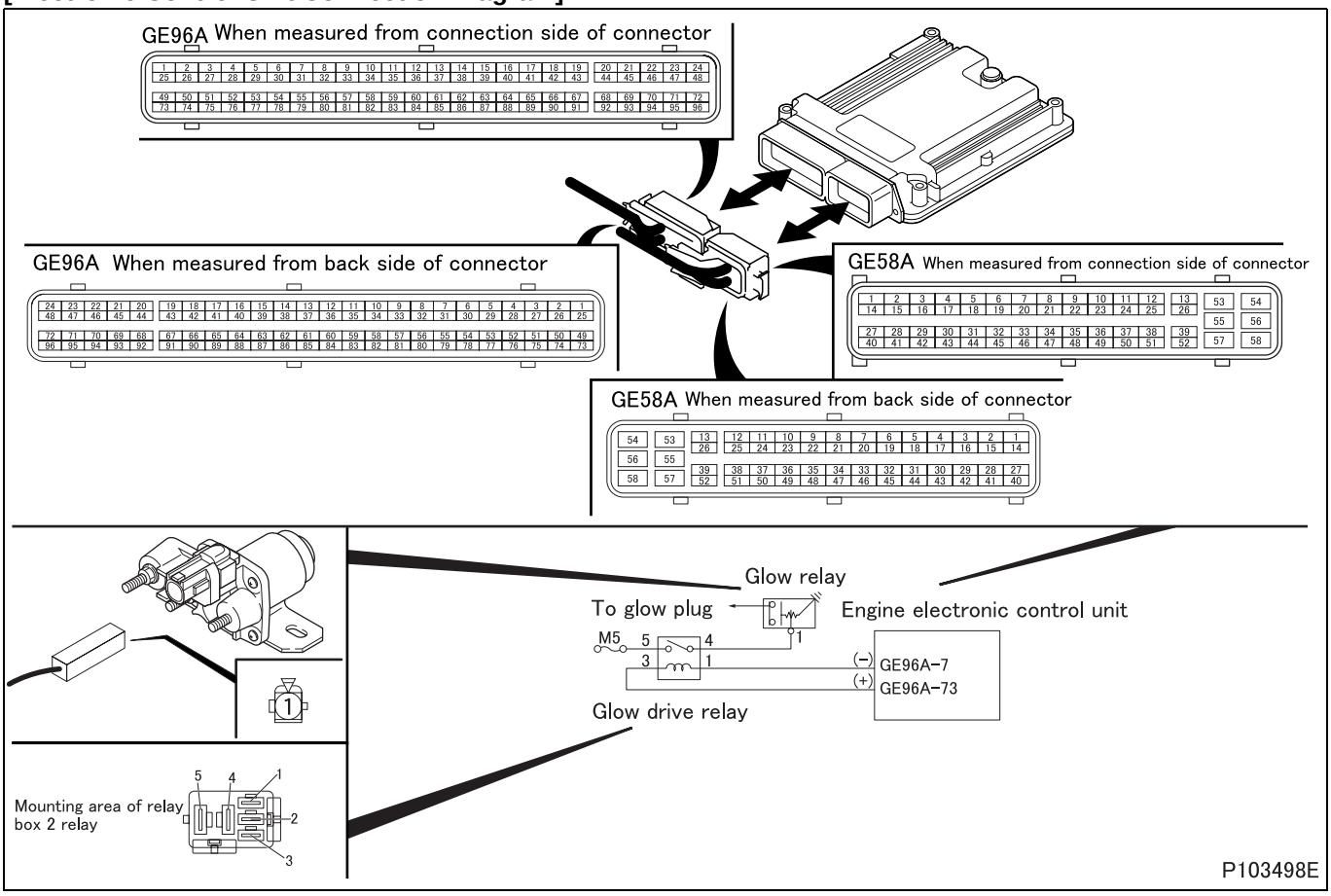
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Related fault check is stopped.

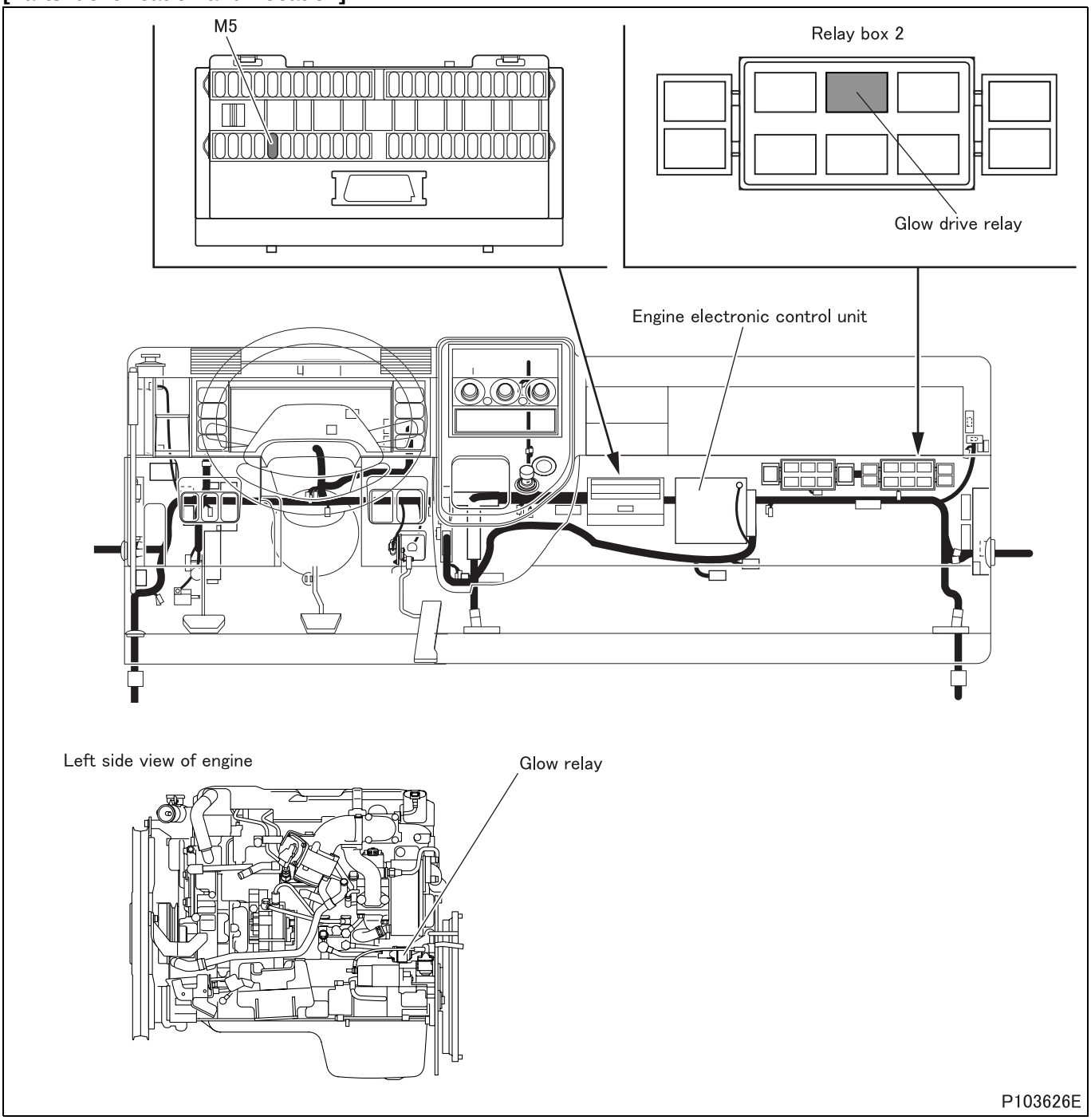
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and glow drive relay
- Malfunction of each connector
- Malfunction of glow drive relay
- Malfunction of electronic control unit

[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]



[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. 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.

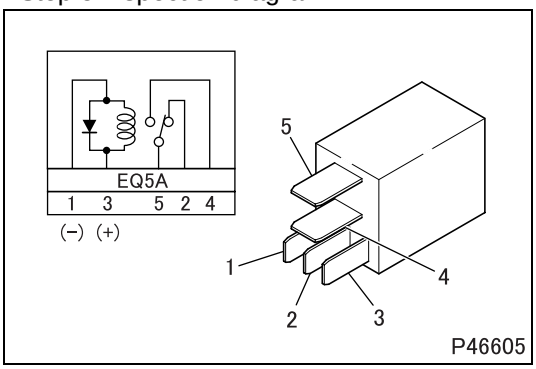
Step 2	Inspection items		Inspection of electronic control unit connector (power supply)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 73 (+) and 7 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Perform actuator test item No. AC “Relay for Glow Relay”
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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 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.

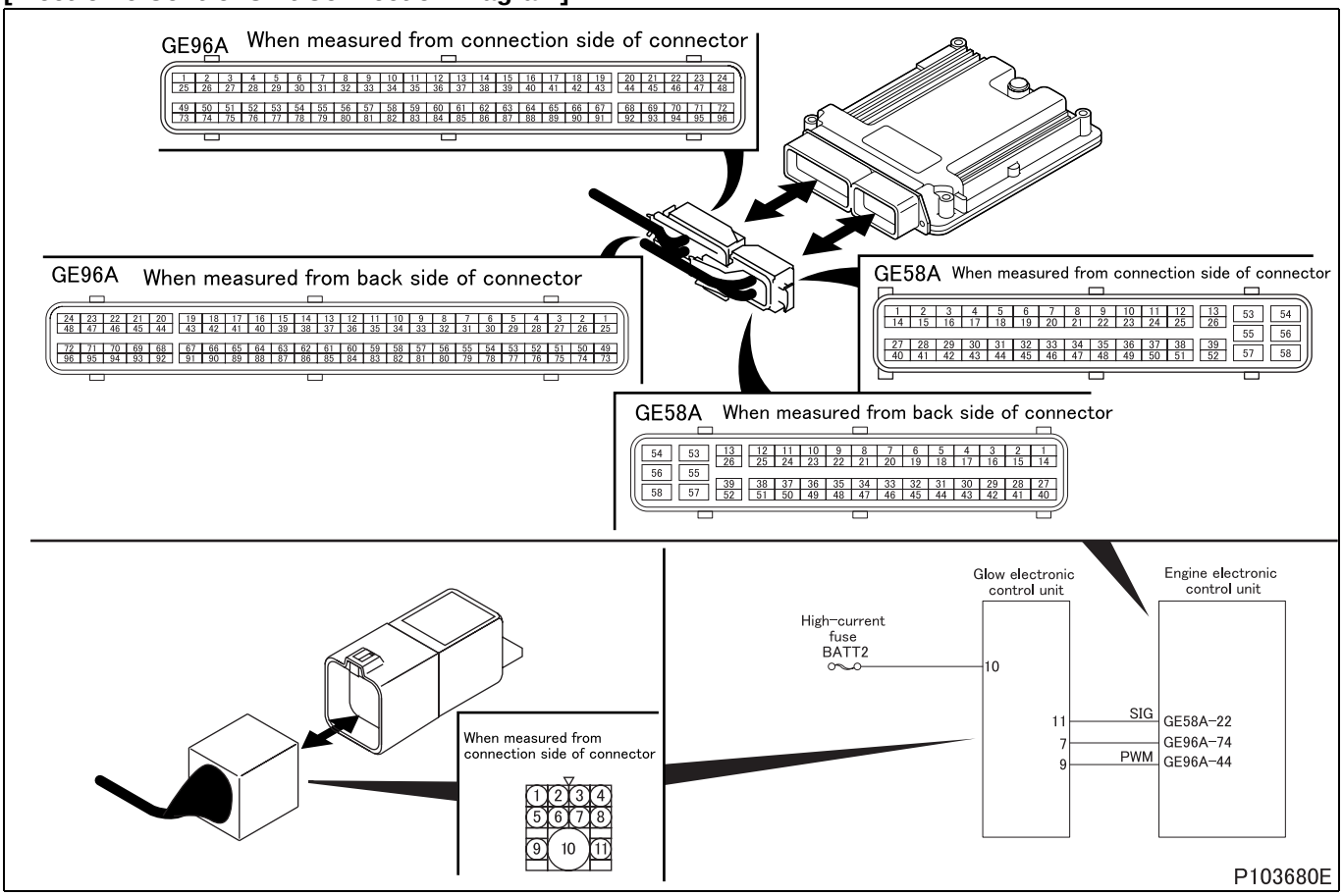
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Effects no special control.

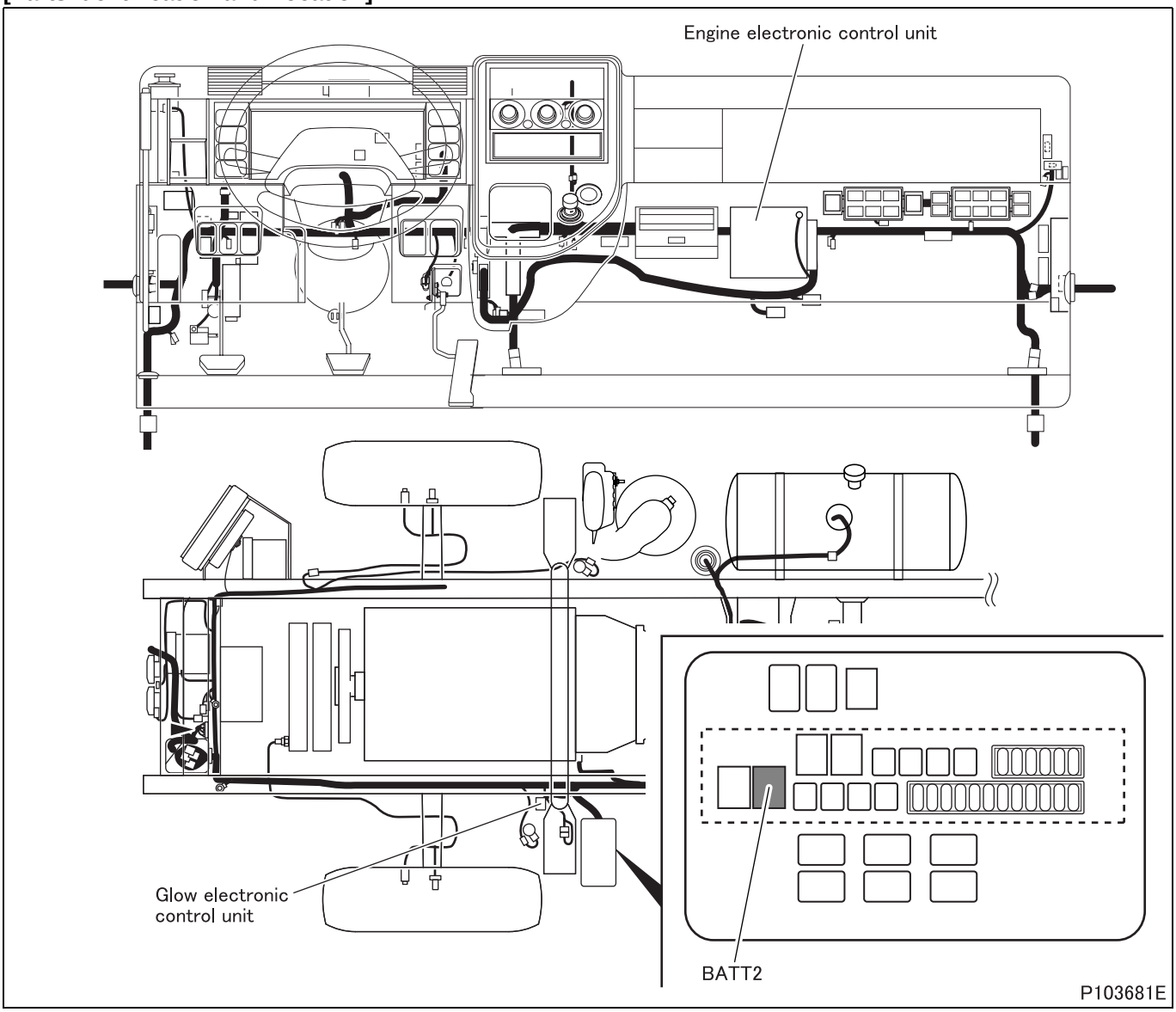
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and glow electronic control unit
- Malfunction of each connector
- Malfunction of glow electronic control unit
- Malfunction of electronic control unit

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[Fault diagnosis]

- Perform checks in the sequence of the following steps.

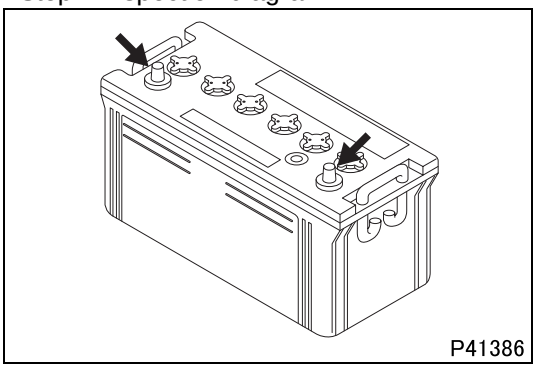
Step 1	Inspection items		Inspection by control data
	Maintenance item		Perform actuator test item No. B5 “GCU (GLOW PLUG)”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0MPH}) • Starter switch: ON • Engine: stopped
	Requirements		Power ON to glow plug
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 2.

Step 2	Inspection items		Inspection of 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	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?)	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?)	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		Check circuit between following connector terminals. • Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22 • Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74 • Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) 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 6.
		NO	Modify harness.

Step 6	Inspection items		Inspection of glow electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of engine electronic control unit
		NO	Modify connector.

<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.

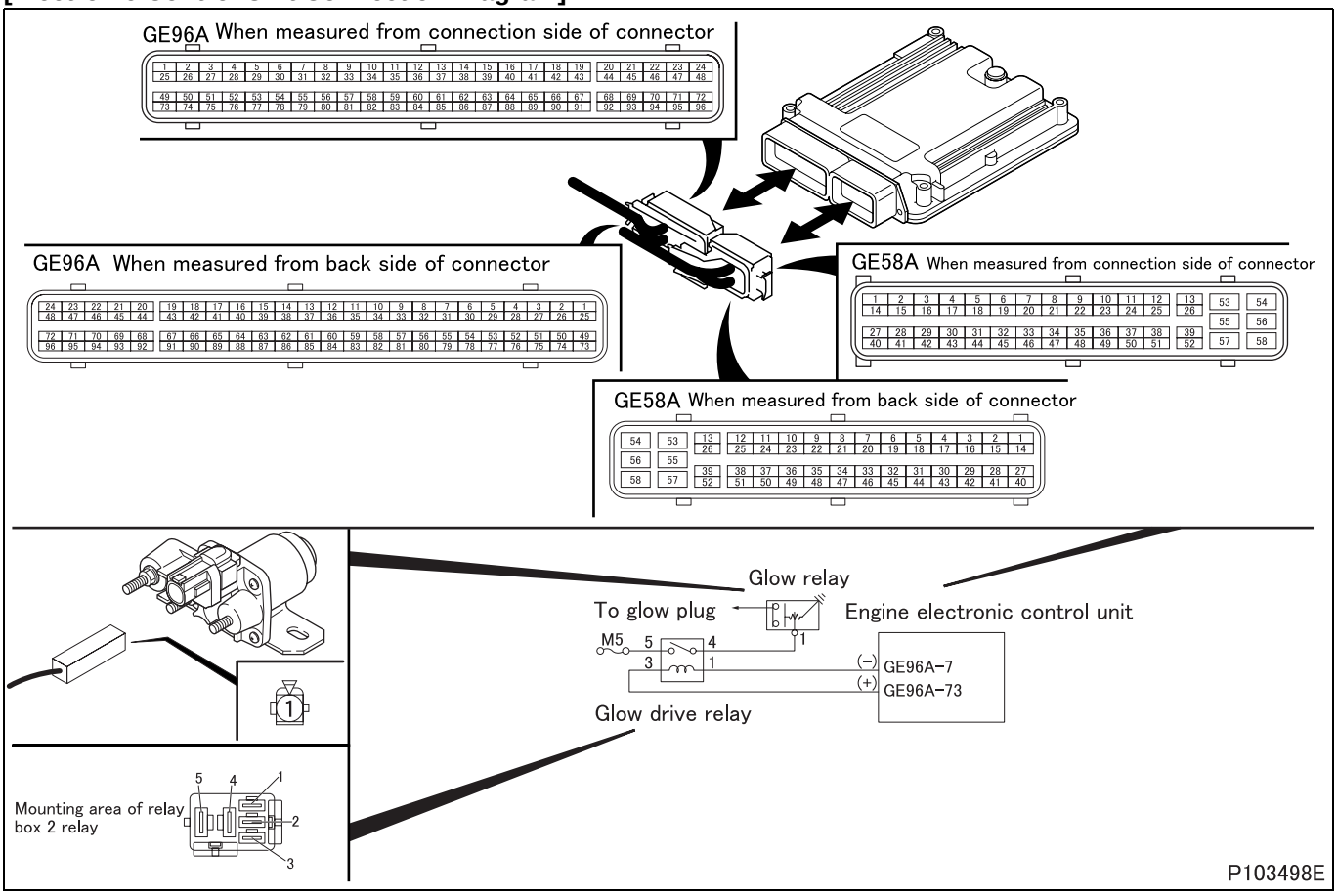
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Related fault check is stopped.

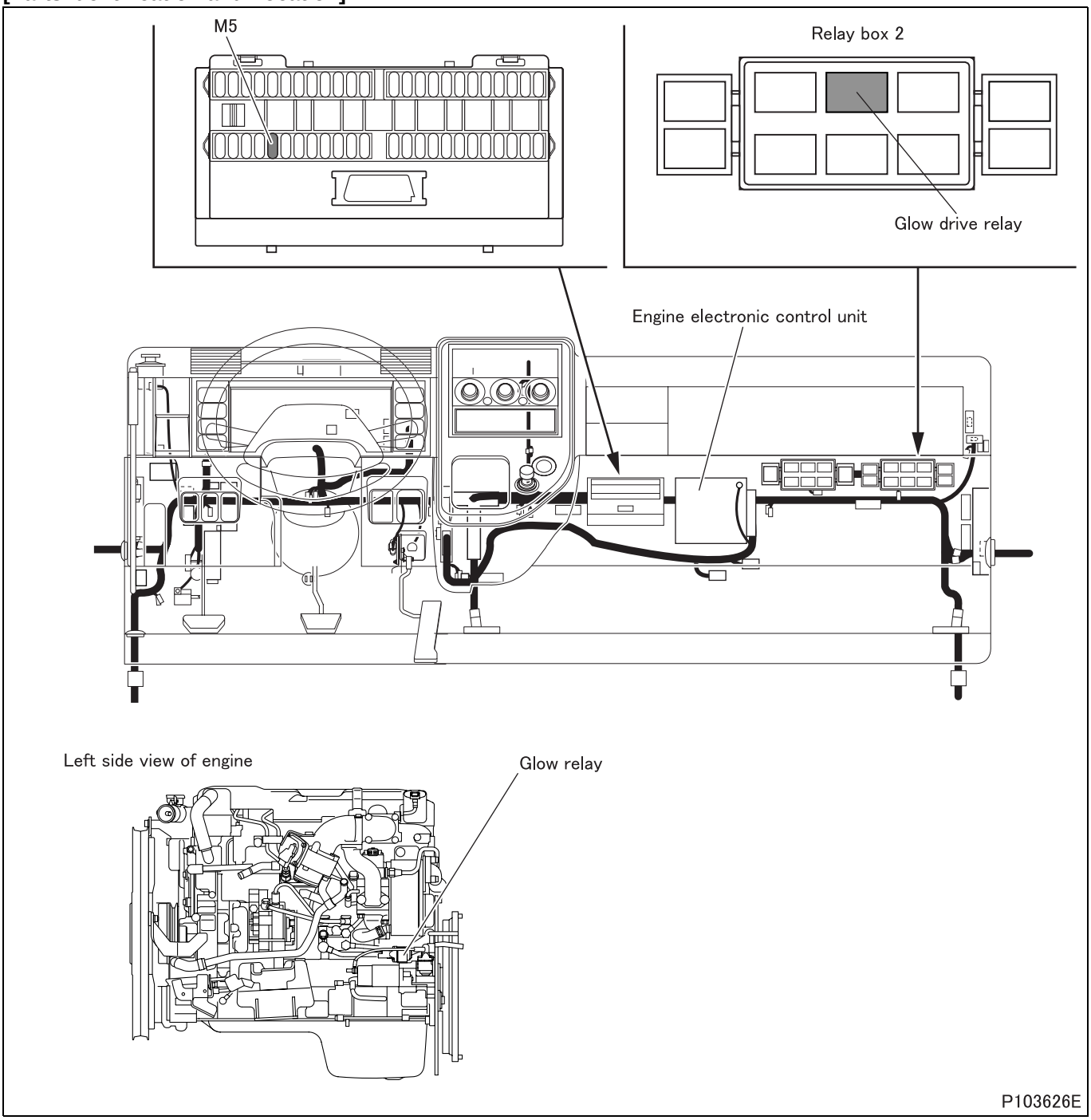
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and glow drive relay
- Malfunction of each connector
- Malfunction of glow drive relay
- Malfunction of electronic control unit

[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]



[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. 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.

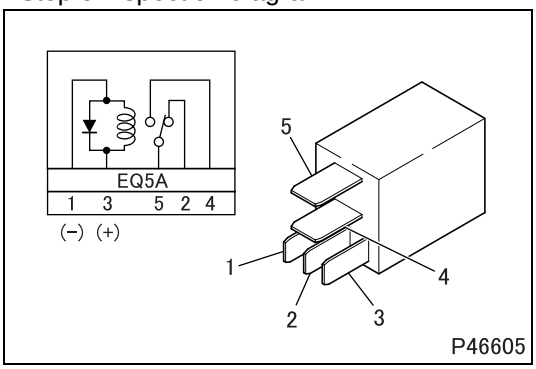
Step 2	Inspection items		Inspection of electronic control unit connector (power supply)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 73 (+) and 7 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Perform actuator test item No. AC “Relay for Glow Relay “
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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 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)>
- λ value computed by engine electronic control unit is compared with pre-mapped specified valve.

<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 λ value and computed λ 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

<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. • P0403 “EGR1 (Actuator Circuit)” • P0409 “EGR1 (Position Sensor)” • P0562 “Power Supply Voltage (Low)” • P0563 “Power Supply Voltage (High)” • P0600 “CAN Communication” • P0607 “ECU System” • P060B “A/D Converter” • P061B “ECU Performance (Calc)” • P061C “ECU Performance (Ne)” • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)” • P2413 “EGR System”
	Inspection condition		• Starter switch: ON • Do not start engine
	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: 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)>
- λ value computed by engine electronic control unit is compared with pre-mapped specified valve.

<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 λ value and computed λ 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

<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 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.)

[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. • P0403 “EGR1 (Actuator Circuit)” • P0409 “EGR1 (Position Sensor)” • P0562 “Power Supply Voltage (Low)” • P0563 “Power Supply Voltage (High)” • P0600 “CAN Communication” • P0607 “ECU System” • P060B “A/D Converter” • P061B “ECU Performance (Calc)” • P061C “ECU Performance (Ne)” • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)” • P2413 “EGR System”
	Inspection condition		• Starter switch: ON • Do not start engine
	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

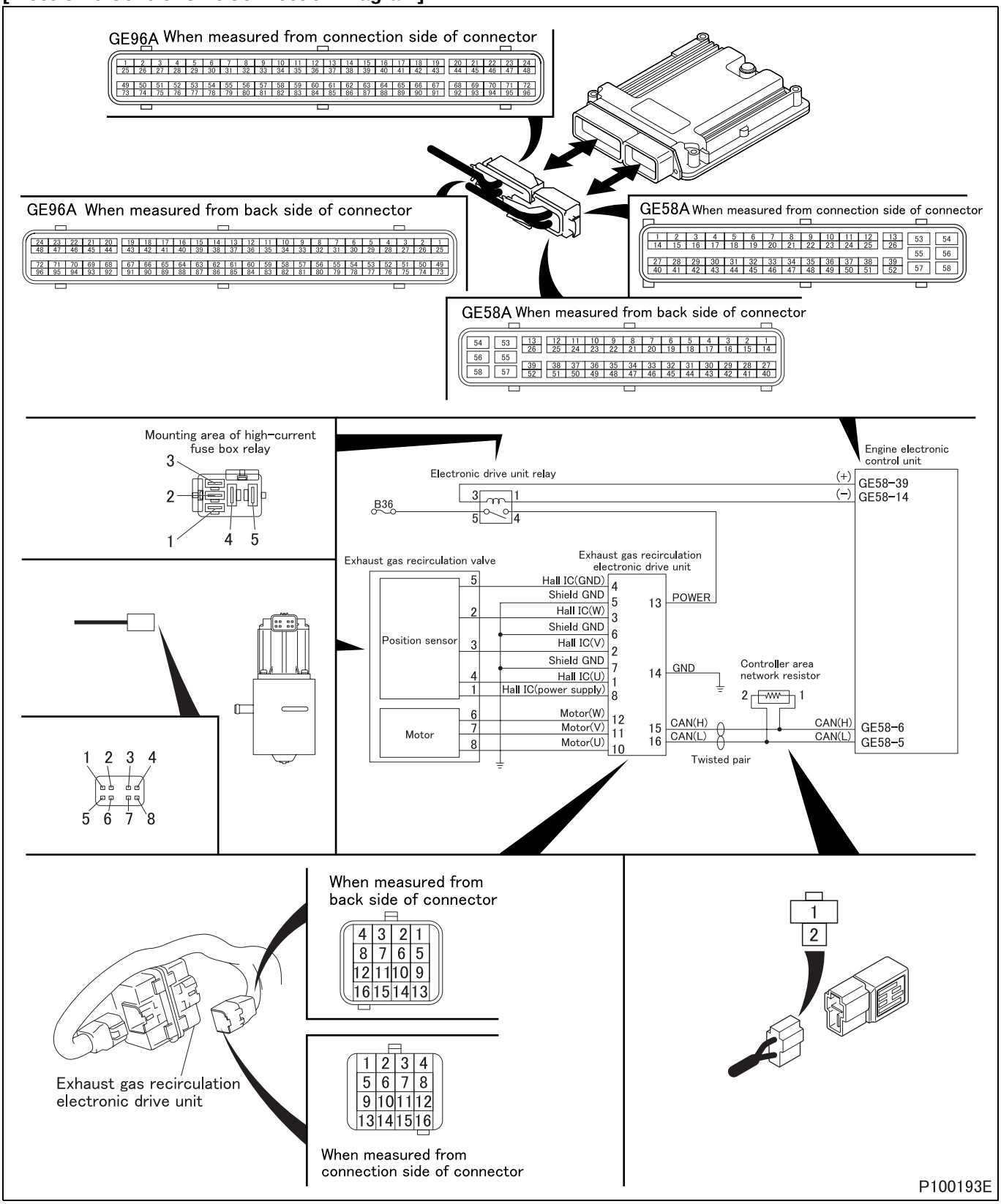
[Control effected by electronic control unit during fault]
Electronic control unit differs in the way of control by the diagnosis check item.
<Power supply circuit>
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped (manual 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.

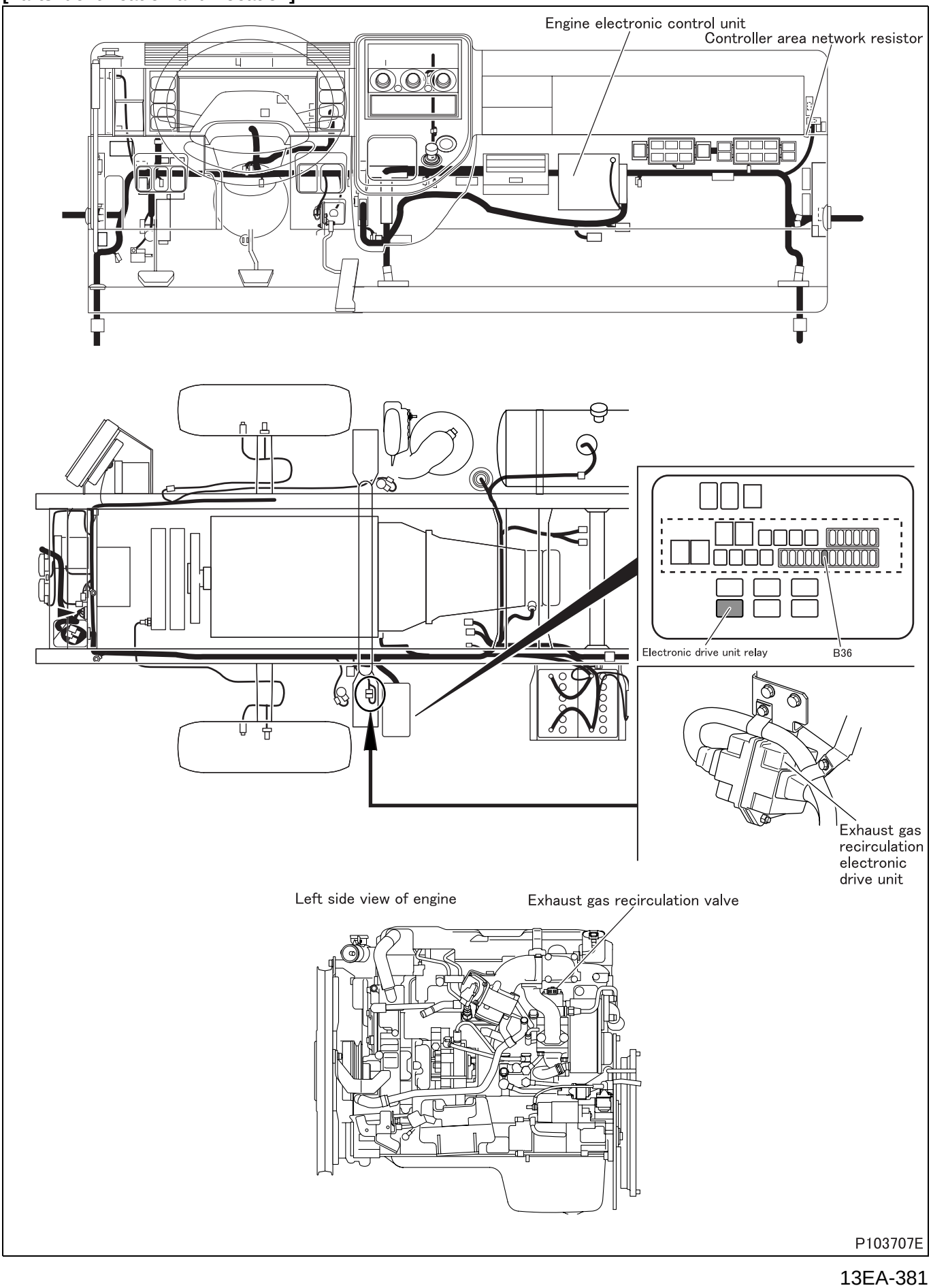
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic drive unit and exhaust gas recirculation valve
- Malfunction of each connector
- Malfunction of exhaust gas recirculation motor (built in exhaust gas recirculation valve)
- Malfunction of exhaust gas recirculation 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.)

[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 actuator test item No. A0 “EGR 1”
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral (parking satisfactory for automatic transmission) • Diagnosis switch: OFF (fuse removed)
	Requirements		Actual position matches with target value set by Multi-Use Tester. (check with service data “51: Actual EGR Valve Position”) **NOTE** • **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).**
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)”
	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		• Remove connector and measure from harness side. • Starter switch: ON • Perform actuator test item No. AF “EDU Relay”
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

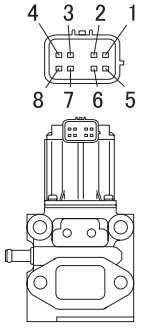
Step 9	Inspection items		Inspection of harness between electronic drive unit and ground
	Maintenance item		Check circuit between following electronic drive unit connector • Electronic drive unit ground: terminal No. 14 - chassis ground • Sensor shield ground (U): terminal No. 5 - 14 • Sensor shield ground (V): terminal No. 6 - 14 • Sensor shield ground (W): terminal No. 7 - 14 • Sensor ground: terminal No. 4 - 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 10.
		NO	Modify harness.

Step 10	Inspection items		Inspection of electronic drive unit connector (motor)
	Maintenance item		Measure value of resistance between following connector terminals. • Between U - V: 10 - 11 • Between U - W: 10 - 12 • Between V - W: 11 - 12
	Inspection condition		–
	Requirements		2.1 ± 0.3 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 exhaust gas recirculation valve (motor)
	Maintenance item		Check circuit between following connector terminals. • Motor (U): electronic drive unit connector terminal No. 10 - exhaust gas recirculation valve connector terminal No. 8 • Motor (V): electronic drive unit connector terminal No. 11 - exhaust gas recirculation valve connector terminal No. 7 • Motor (W): electronic drive unit connector terminal No. 12 - exhaust gas recirculation valve connector 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 12.
		NO	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 • Between U - V: 8 - 7 • Between U - W: 8 - 6 • Between V - W: 7 - 6
	Inspection condition		• Keep exhaust gas recirculation valve installed on vehicle. • Remove harness connector, and measure exhaust gas recirculation valve side.
	Requirements		2.1 ± 0.3 Ω
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 13.
		NO	Replacement of exhaust gas recirculation valve

<Step 12 inspection diagram>



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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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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 • U signal output: terminal 1 (+) - 4 (–) • V signal output: terminal 2 (+) - 4 (–) • W signal output: terminal 3 (+) - 4 (–)
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON • Perform actuator test item No. A0 “EGR 1”
	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. • Sensor (power supply): electronic drive unit connector terminal No. 8 - exhaust gas recirculation valve connector terminal No. 1 • Sensor (U): electronic drive unit connector terminal No. 1 - exhaust gas recirculation valve connector terminal No. 4 • Sensor (V): electronic drive unit connector terminal No. 2 - exhaust gas recirculation valve connector terminal No. 3 • Sensor (W): electronic drive unit connector terminal No. 3 - exhaust gas recirculation valve connector terminal No. 2 • Sensor (ground): electronic drive unit connector terminal No. 4 - exhaust gas recirculation valve 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	After replacement of exhaust gas recirculation valve, go to step 16
		NO	Modify harness.

Step 16	Inspection items		Inspection by control data
	Maintenance item		Perform actuator test item No. A0 “EGR 1” **NOTE** • **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).**
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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.)

[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. • P0403 “EGR1 (Actuator Circuit)” • P0404 “EGR System” • P0605 “ECU System (Hardware)” • P0607 “ECU System” • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)” • P1632 “CAN (EGR1 Time out)” • U0001 “High Speed CAN Communication” • U0002 “High Speed CAN Communication”
	Inspection condition		• Starter switch: ON • Engine: stopped
	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.

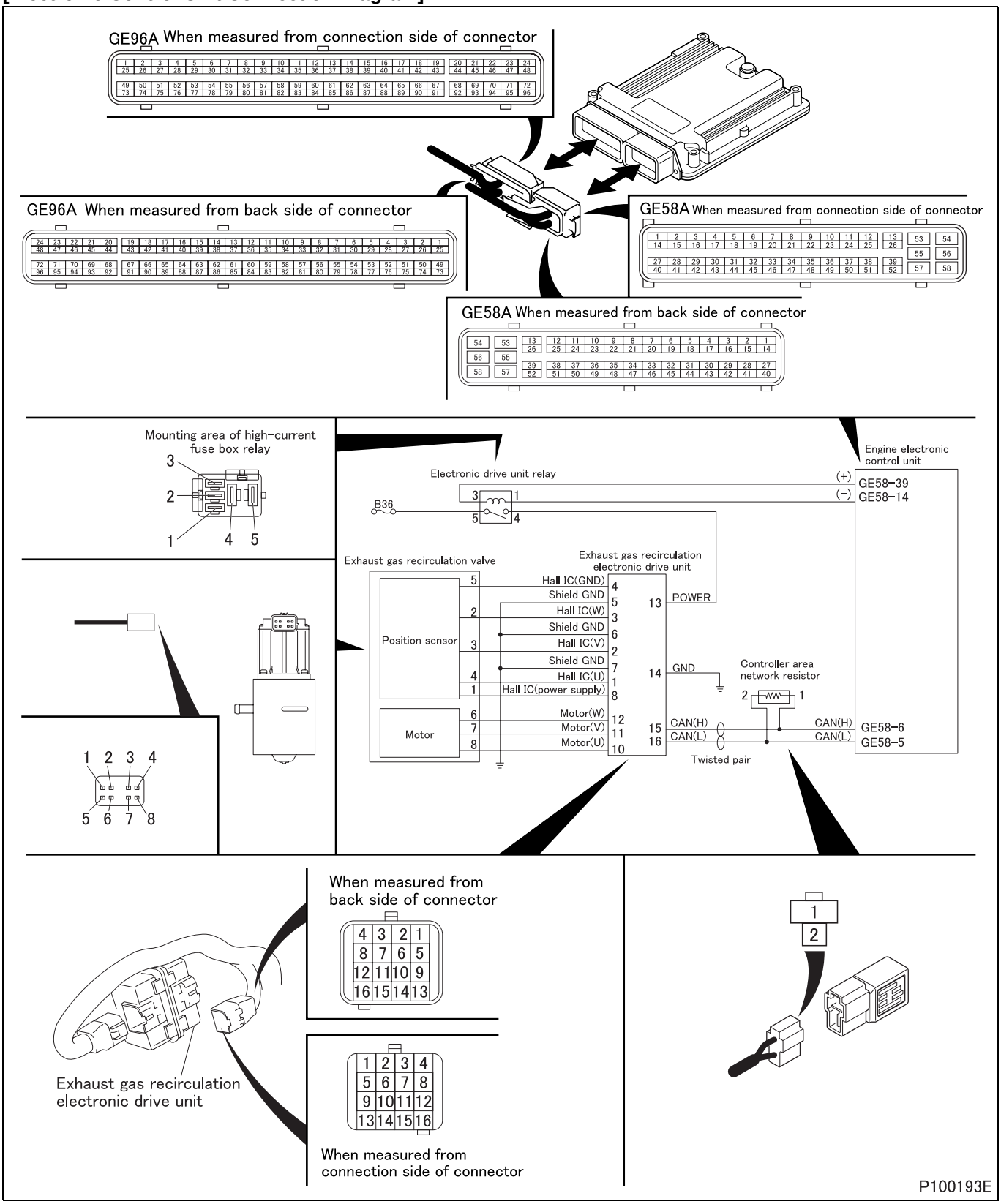
[Diagnostic requirement]
- Controller area network communication in order

[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.)

[Electronic Control Unit Connection Diagram]



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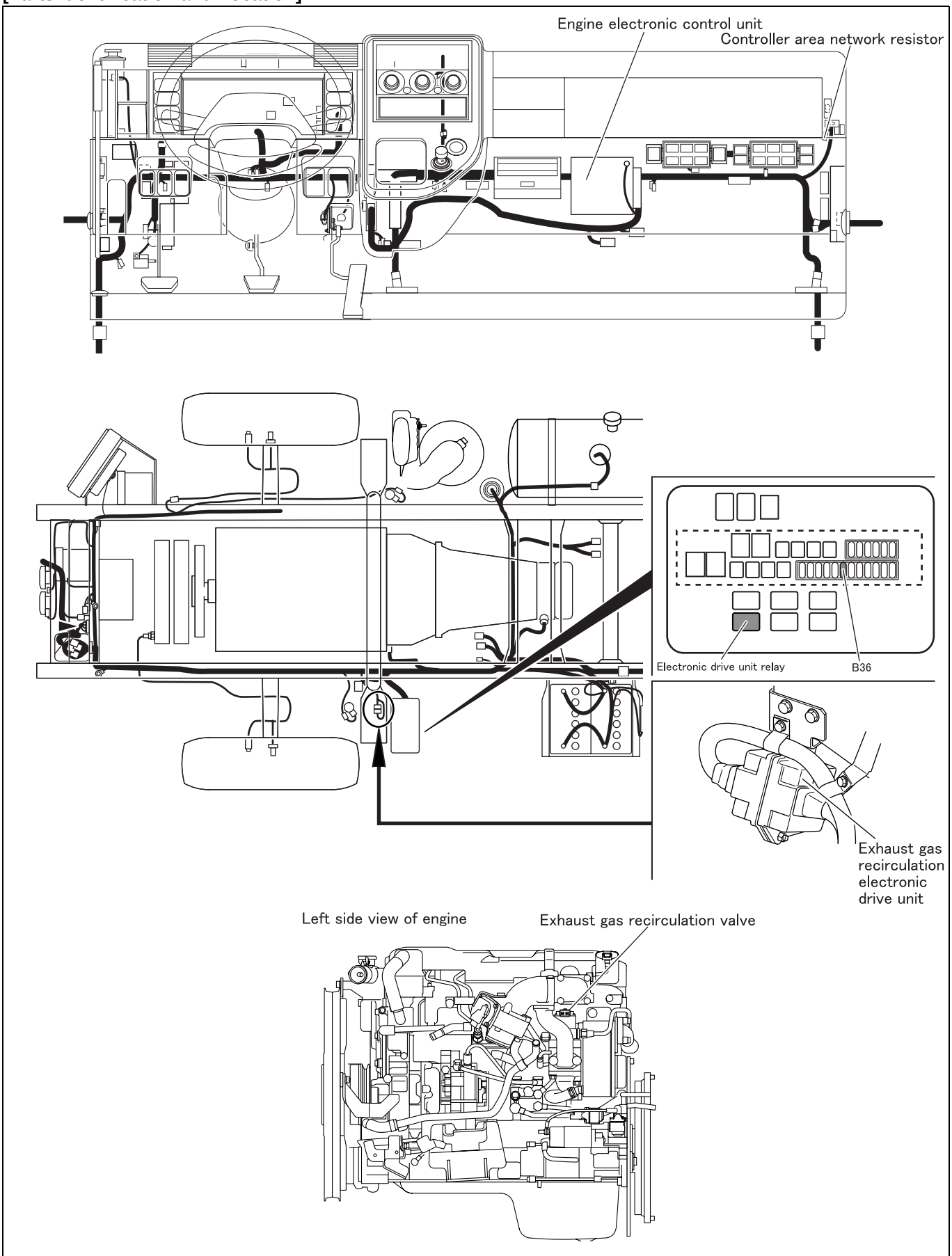

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[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Perform actuator test item No. A0 “EGR 1” **NOTE** • **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).**
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)”
	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		• Remove connector and measure from harness side. • Starter switch: ON • Perform actuator test item No. AF “EDU Relay”
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

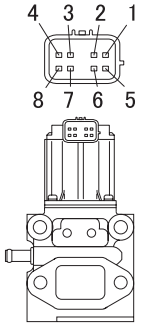
Step 9	Inspection items		Inspection of harness between electronic drive unit and ground
	Maintenance item		Check circuit between following electronic drive unit connector • Electronic drive unit ground: terminal No. 14 - chassis ground • Sensor shield ground (U): terminal No. 5 - 14 • Sensor shield ground (V): terminal No. 6 - 14 • Sensor shield ground (W): terminal No. 7 - 14 • Sensor ground: terminal No. 4 - 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 10.
		NO	Modify harness.

Step 10	Inspection items		Inspection of electronic drive unit connector (motor)
	Maintenance item		Measure value of resistance between following connector terminals. • Between U - V: 10 - 11 • Between U - W: 10 - 12 • Between V - W: 11 - 12
	Inspection condition		–
	Requirements		2.1 ± 0.3 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 exhaust gas recirculation valve (motor)
	Maintenance item		Check circuit between following connector terminals. • Motor (U): electronic drive unit connector terminal No. 10 - exhaust gas recirculation valve connector terminal No. 8 • Motor (V): electronic drive unit connector terminal No. 11 - exhaust gas recirculation valve connector terminal No. 7 • Motor (W): electronic drive unit connector terminal No. 12 - exhaust gas recirculation valve connector 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 12.
		NO	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 • Between U - V: 8 - 7 • Between U - W: 8 - 6 • Between V - W: 7 - 6
	Inspection condition		• Keep exhaust gas recirculation valve installed on vehicle. • Remove harness connector, and measure exhaust gas recirculation valve side.
	Requirements		2.1 ± 0.3 Ω
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 13.
		NO	Replacement of exhaust gas recirculation valve

<Step 12 inspection diagram>



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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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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 • U signal output: terminal 1 (+) - 4 (–) • V signal output: terminal 2 (+) - 4 (–) • W signal output: terminal 3 (+) - 4 (–)
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON • Perform Multi-Use Tester actuator test item No. A0 “EGR 1”
	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. • Sensor (power supply): electronic drive unit connector terminal No. 8 - exhaust gas recirculation valve connector terminal No. 1 • Sensor (U): electronic drive unit connector terminal No. 1 - exhaust gas recirculation valve connector terminal No. 4 • Sensor (V): electronic drive unit connector terminal No. 2 - exhaust gas recirculation valve connector terminal No. 3 • Sensor (W): electronic drive unit connector terminal No. 3 - exhaust gas recirculation valve connector terminal No. 2 • Sensor (ground): electronic drive unit connector terminal No. 4 - exhaust gas recirculation valve 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	After replacement of exhaust gas recirculation valve, go to step 16.
		NO	Modify harness.

Step 16	Inspection items		Inspection by control data
	Maintenance item		Perform actuator test item No. A0 “EGR 1” **NOTE** • **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).**
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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.)

[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.

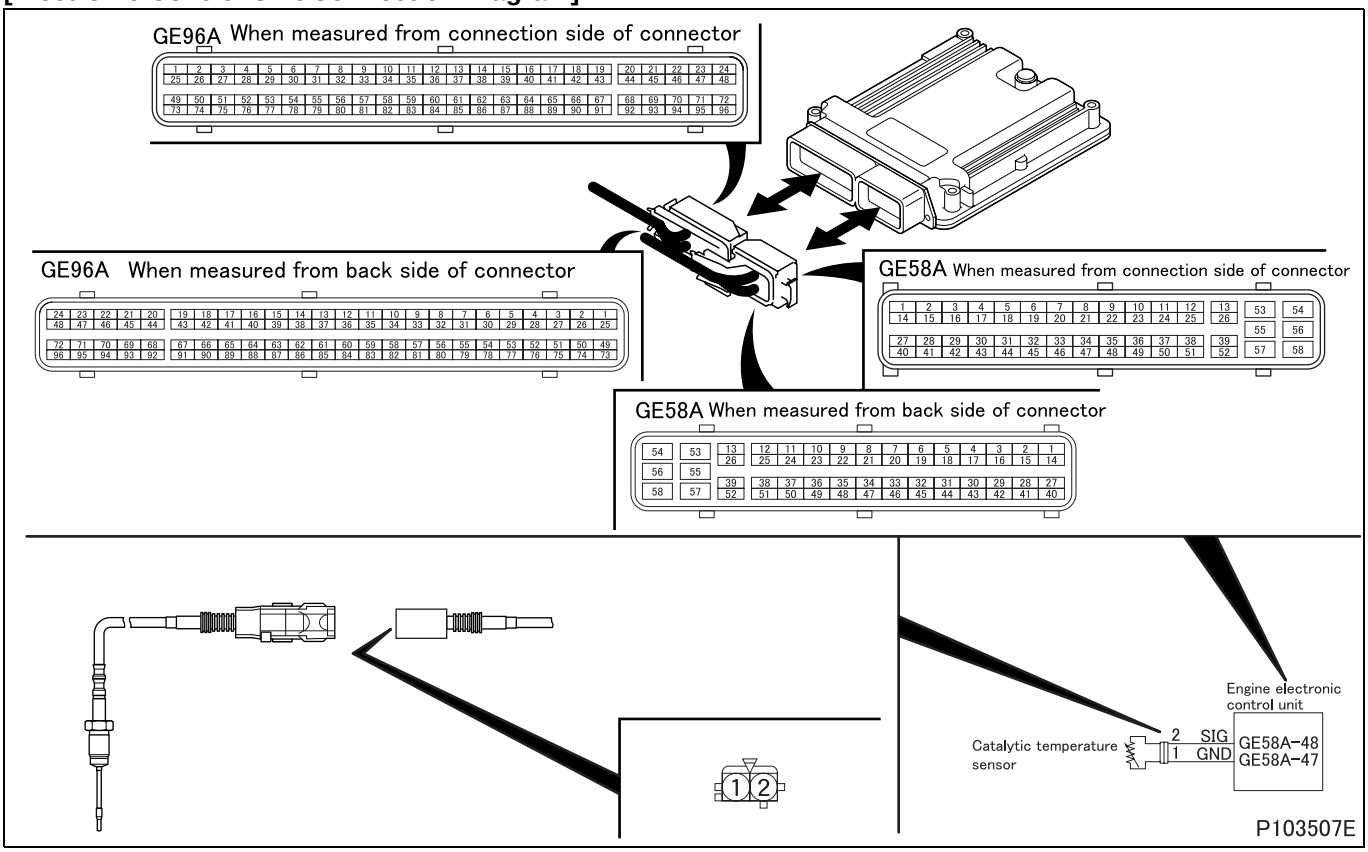
[Diagnostic requirement]
–

[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]



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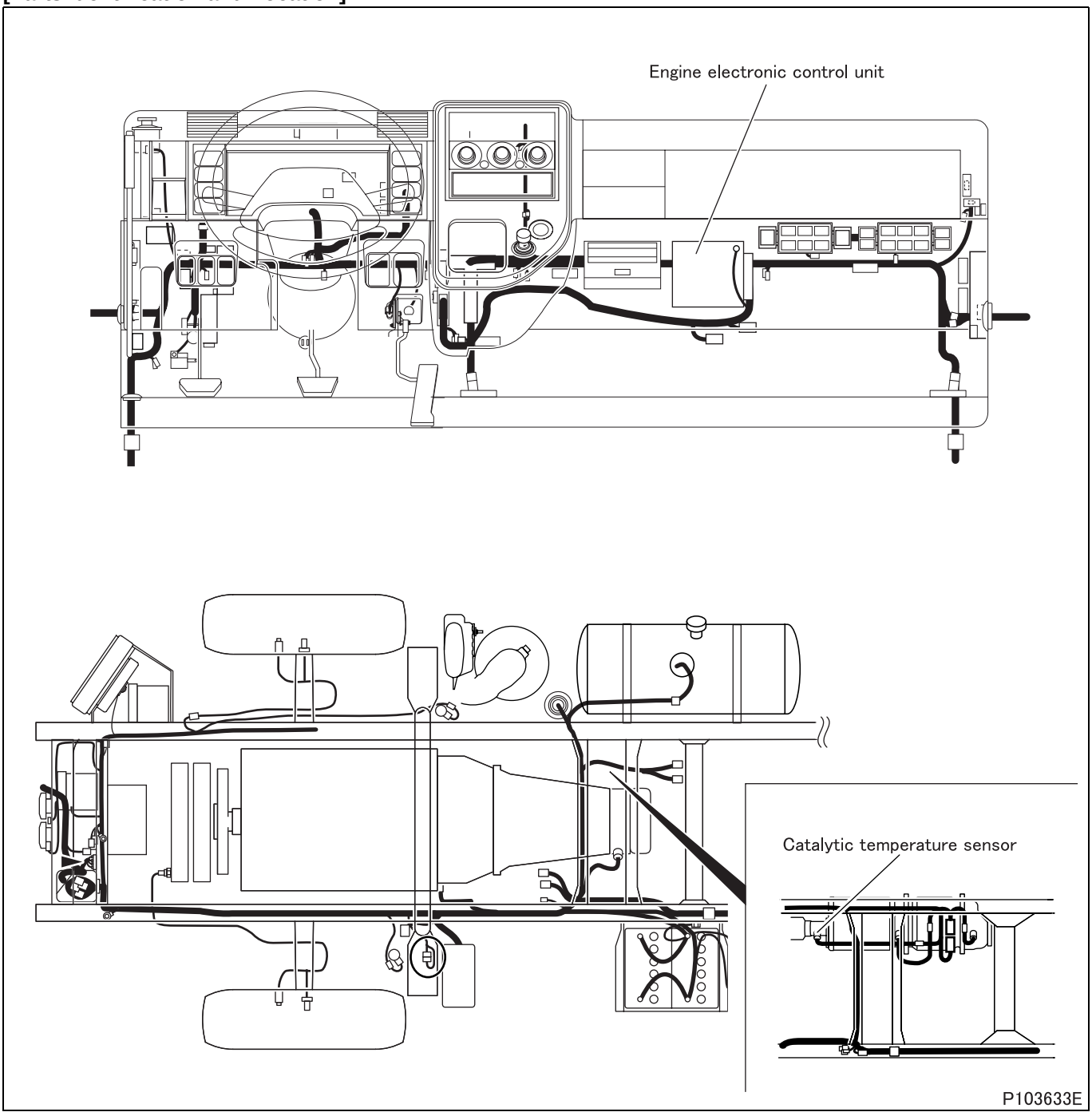


[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** • Measure item “OXI CAT Temperature”. **<Multi-Use Tester used>** • Measure item No. 24 “OXI CAT Temperature” 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	Go to step 2.

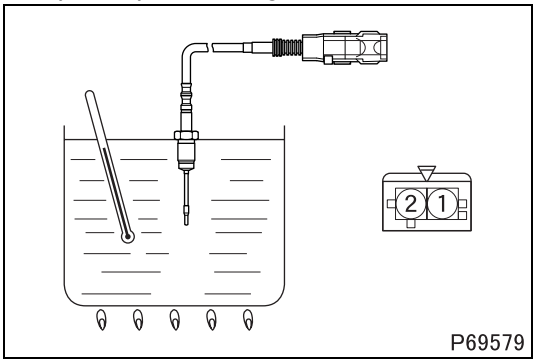
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE58A) terminal No. 48 and 47.
	Inspection condition		• Starter switch: OFF • Disconnect electronic control unit from harness and measure at vehicle-side connector half.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Put catalytic temperature sensor in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	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		**<General Scanning Tool used>** • Measure item “OXI CAT Temperature”. **<Multi-Use Tester used>** • Measure item No. 24 “OXI CAT Temperature” 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: 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.

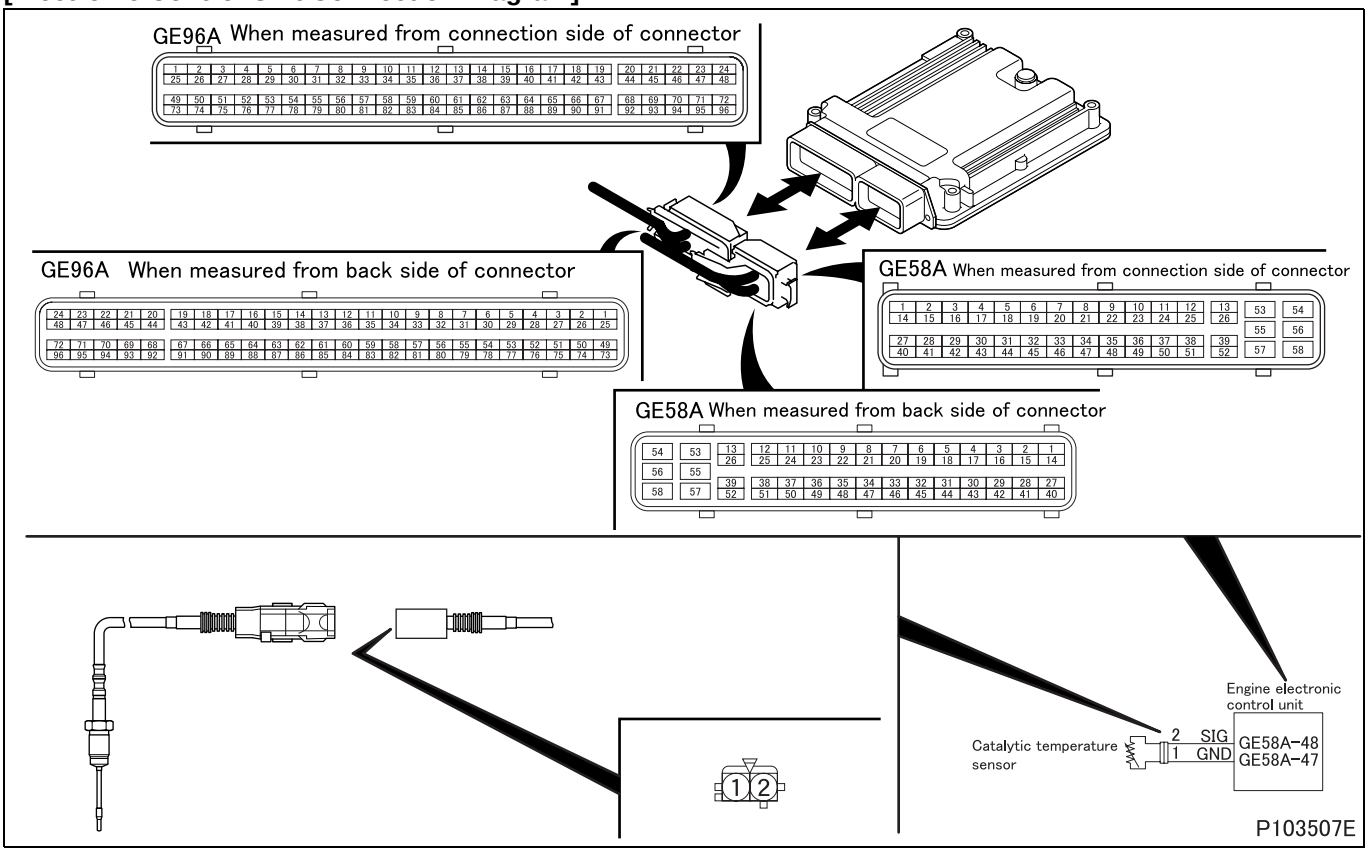
[Diagnostic requirement]
- Engine speed: 1000 to 5000 rpm
- Fuel injection quantity: 30 to 200 mg/cyc
- Water temperature: above –7°C {19°F}

[Control effected by electronic control unit during fault]
- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).
- Related fault check is stopped.

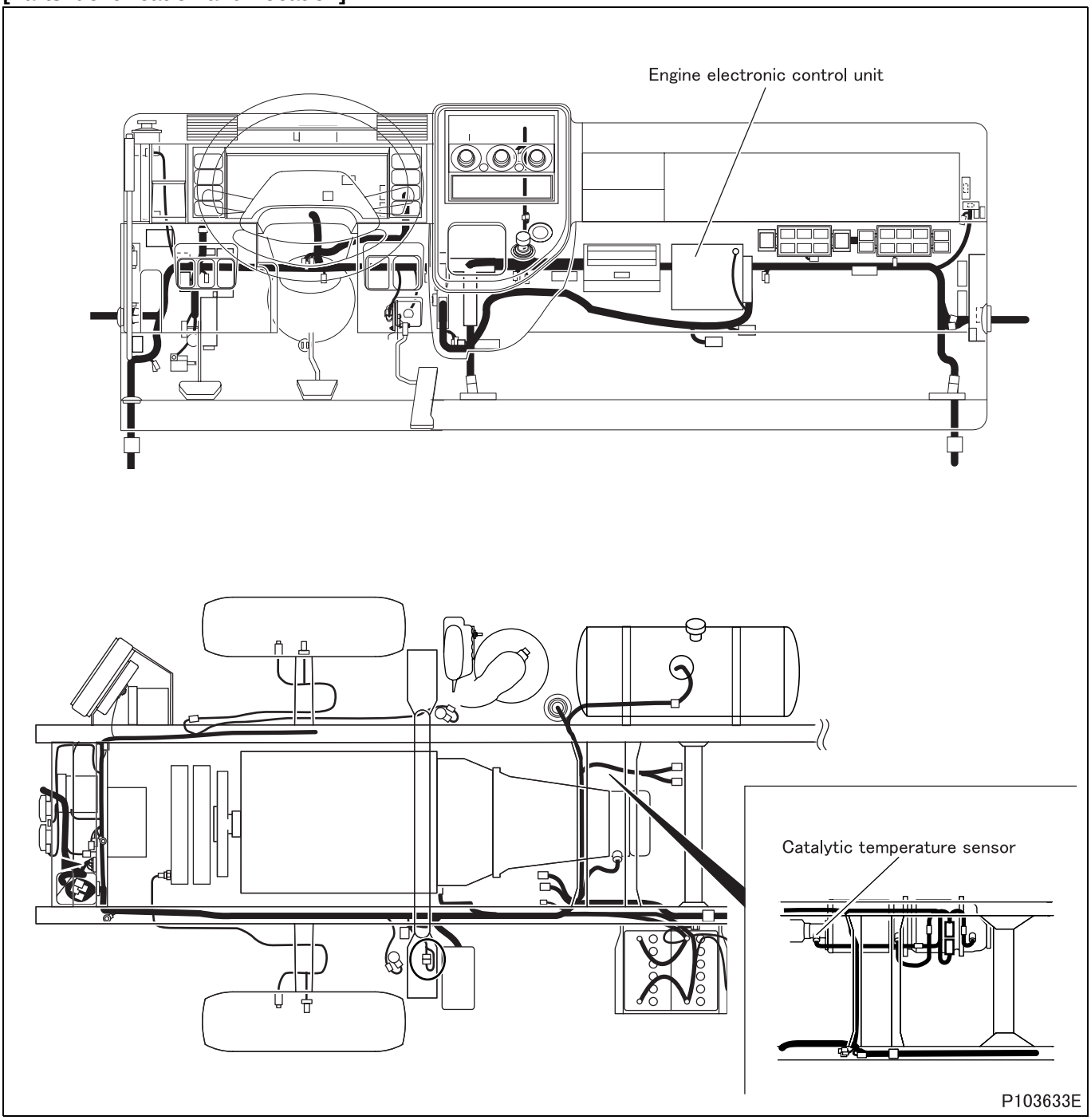
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit
- Malfunction of catalytic temperature sensor

[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.)

[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		**<General Scanning Tool used>** • Measure item “OXI CAT Temperature”. **<Multi-Use Tester used>** • Measure item No. 24 “OXI CAT Temperature” 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	Go to step 2.

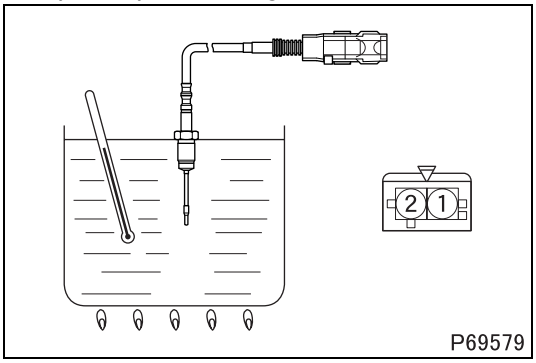
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE58A) terminal No. 48 and 47.
	Inspection condition		• Starter switch: OFF • Disconnect electronic control unit from harness and measure at vehicle-side connector half.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Put catalytic temperature sensor in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	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		**<General Scanning Tool used>** • Measure item “OXI CAT Temperature”. **<Multi-Use Tester used>** • Measure item No. 24 “OXI CAT Temperature” 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: 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^2} 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.

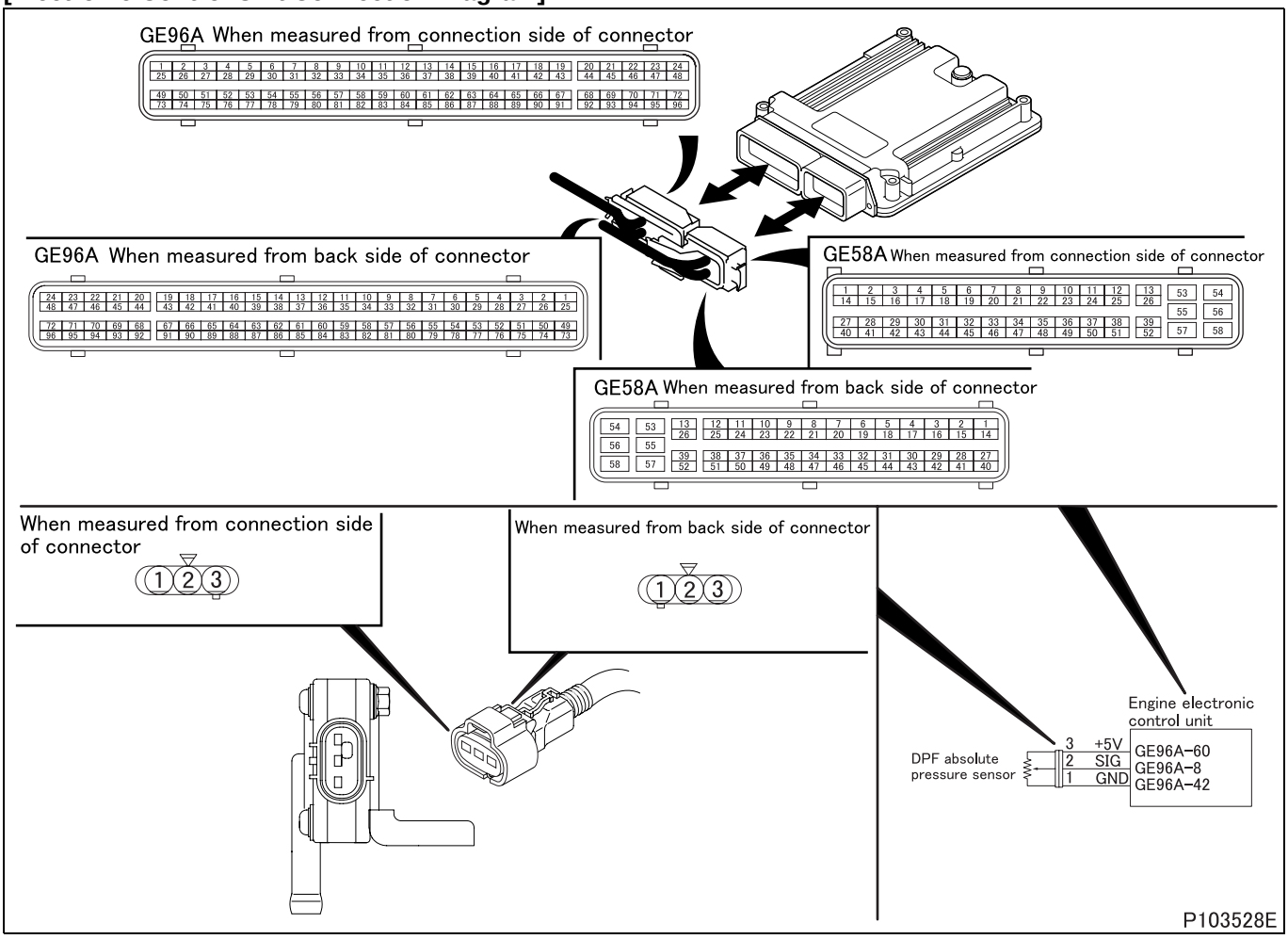
[Diagnostic requirement]
- Engine status: after-run

[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

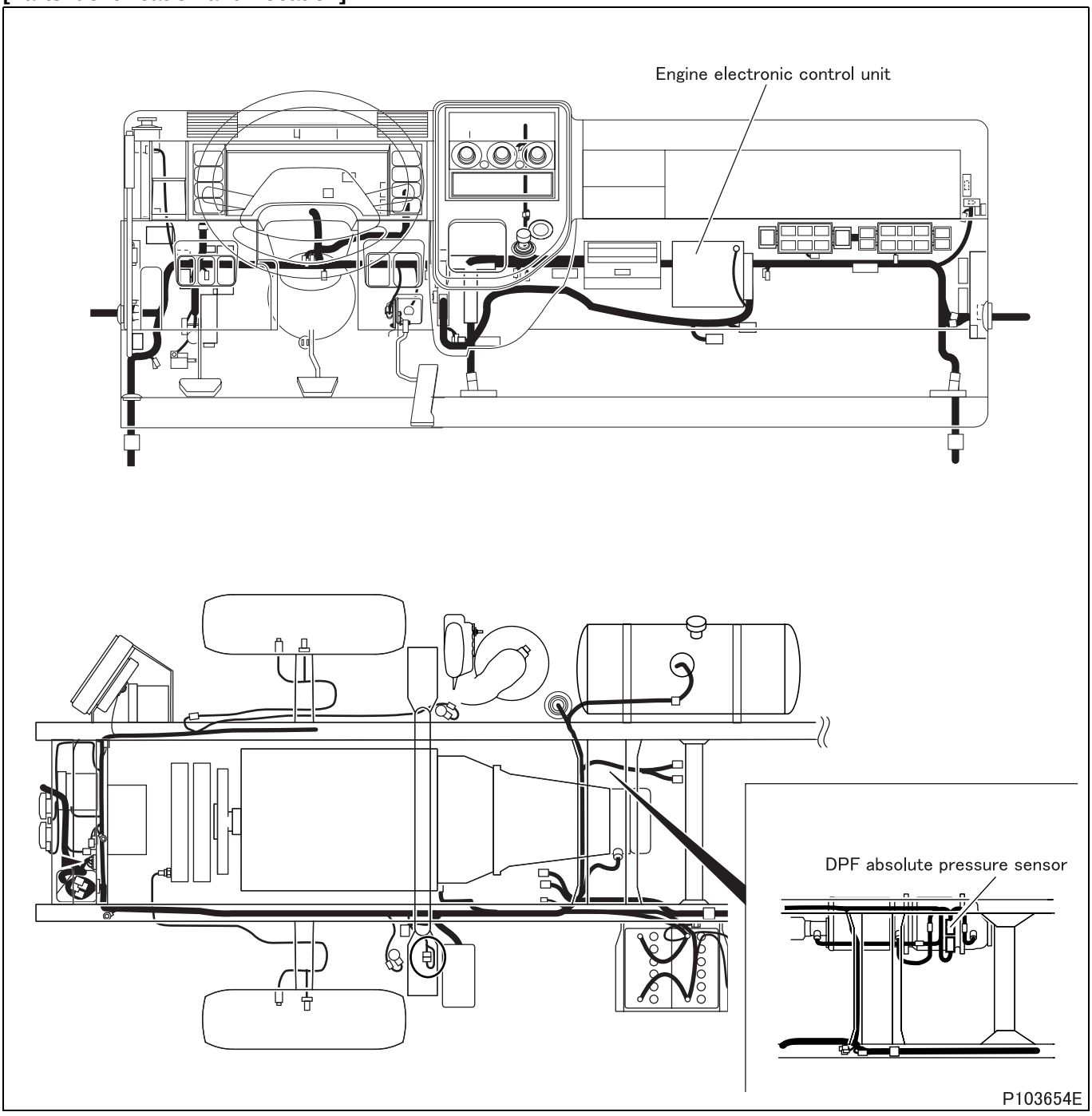
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- High pressure side (upper stream) pressure hose slipped off or clogged
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

[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		Check if following diagnosis codes occur simultaneously. • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (High) & MFF”
	Inspection condition		Starter switch: ON Engine: stopped
	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		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^2}
	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. 8 (+) and 42 (–).
	Inspection condition		• Starter switch: ON • Engine: stopped • Measure from back side of connector of harness with each device connected to harness.
	Requirements		1.875 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. 60 (+) and 42 (–).
	Inspection condition		• Starter switch: ON • Engine: stopped • Measure from back side of connector of harness with each device connected to harness.
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Go to step 6.

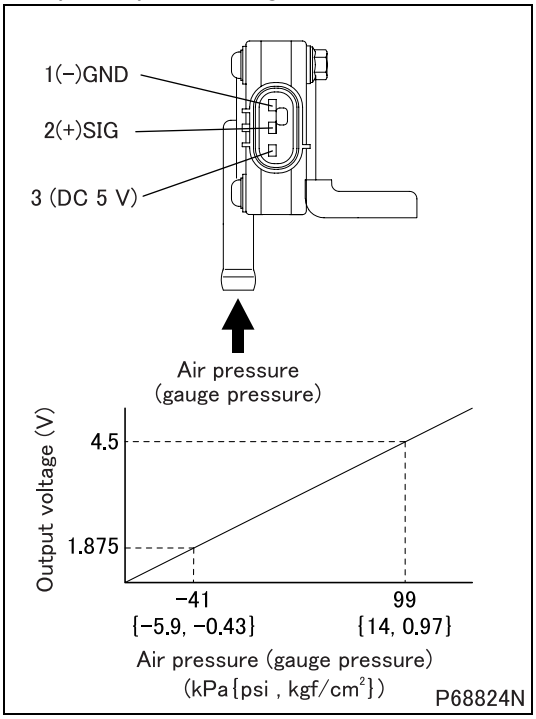
Step 5	Inspection items		Inspection by electronic control unit connector (ground)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 42 (+) and (GE58A) terminal No. 53 (–).
	Inspection condition		• Starter switch: ON • Engine: stopped • Measure from back side of connector of harness with each device connected to harness.
	Requirements		0 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 7.
		NO	Go to step 6.

Step 6	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Apply voltage DC 5 V across connector terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 41 ± 3.2 kPa {5.9 ± 0.5 psi, 0.43 ± 0.03 kgf/cm^2}: 1.875 V • 99 ± 3.2 kPa {14 ± 0.5 psi, 1.0 ± 0.03 kgf/cm^2}: 4.5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 9.
		NO	Replacement of sensor

<Step 8 inspection diagram>



Step 9	Inspection items		Inspection by sensor connector
	Maintenance item		Measure value of voltage between terminal No. 3 (+) and 1 (–)
	Inspection condition		• Starter switch: ON • Engine: stopped • Measure from back side of connector of harness with each device connected to harness.
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	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?)	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?)	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?)	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^2}
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		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^2} 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.

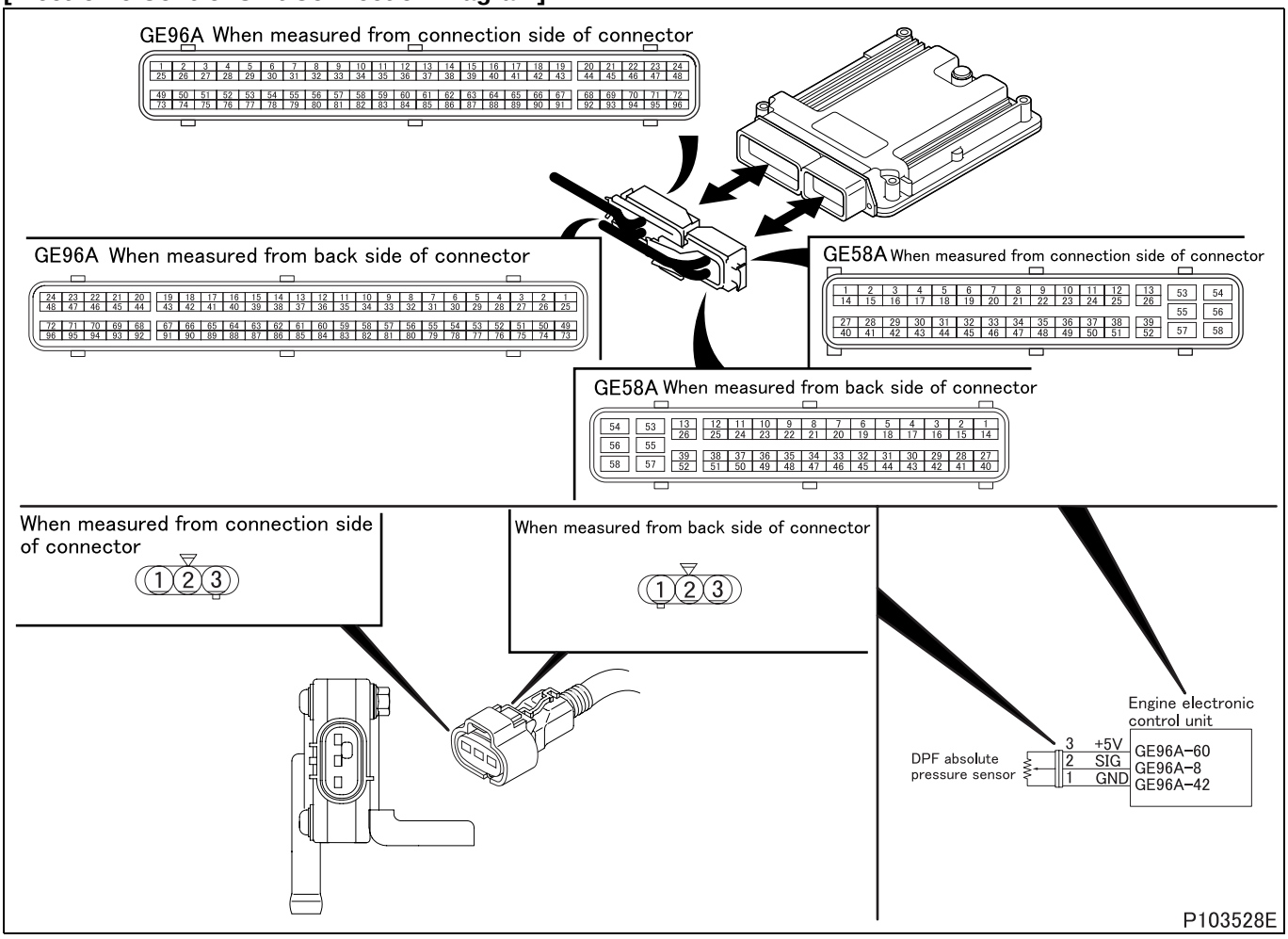
[Diagnostic requirement]
–

[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.

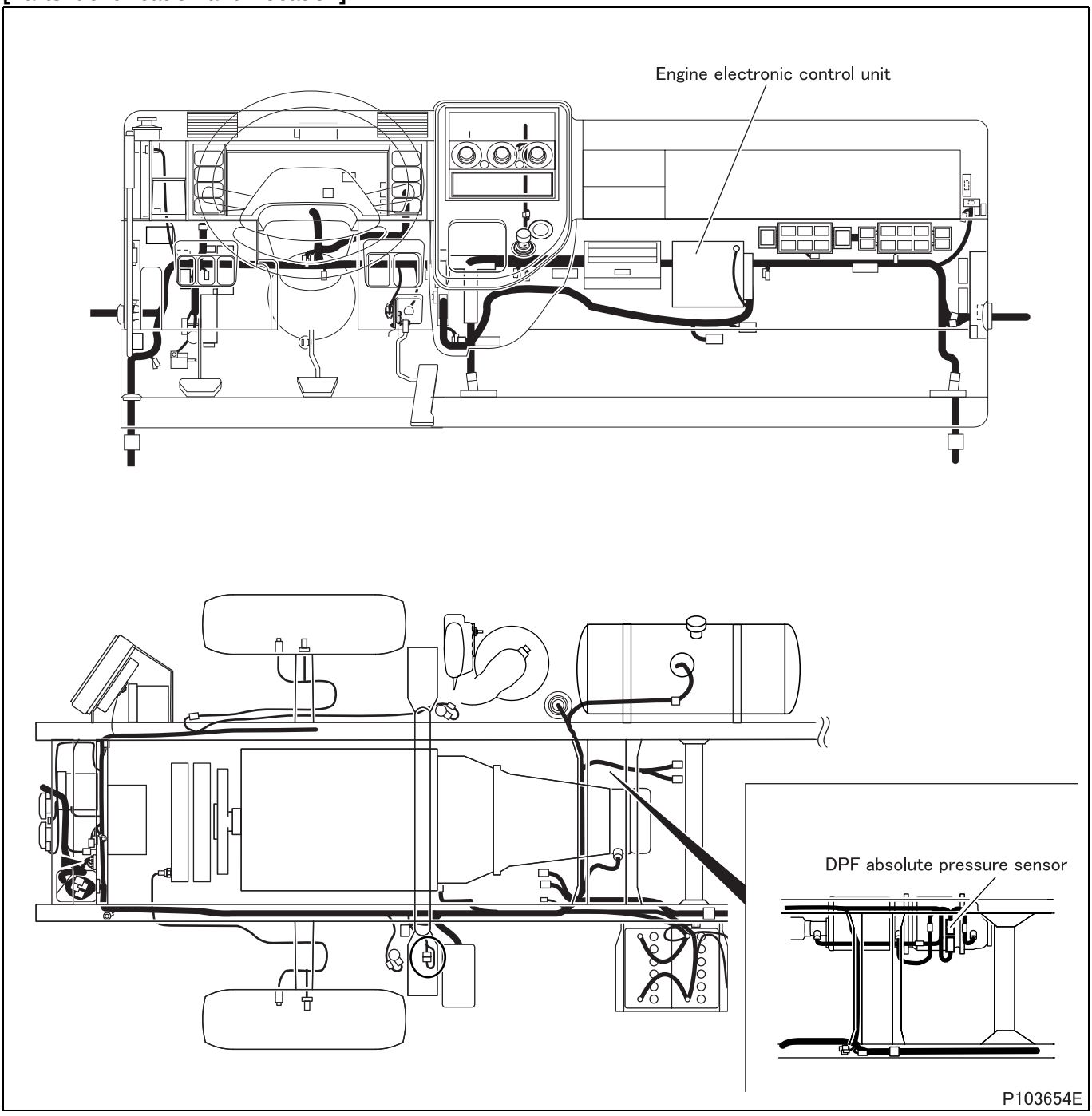
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

[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		Check if following diagnosis codes occur simultaneously. • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (High) & MFF”
	Inspection condition		Starter switch: ON Engine: stopped
	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		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^2}
	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. 8 (+) and 42 (–).
	Inspection condition		• Starter switch: ON • Engine: stopped • Measure from back side of connector of harness with each device connected to harness.
	Requirements		1.875 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. 60 (+) and 42 (–).
	Inspection condition		• Starter switch: ON • Engine: stopped • Measure from back side of connector of harness with each device connected to harness.
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Go to step 6.

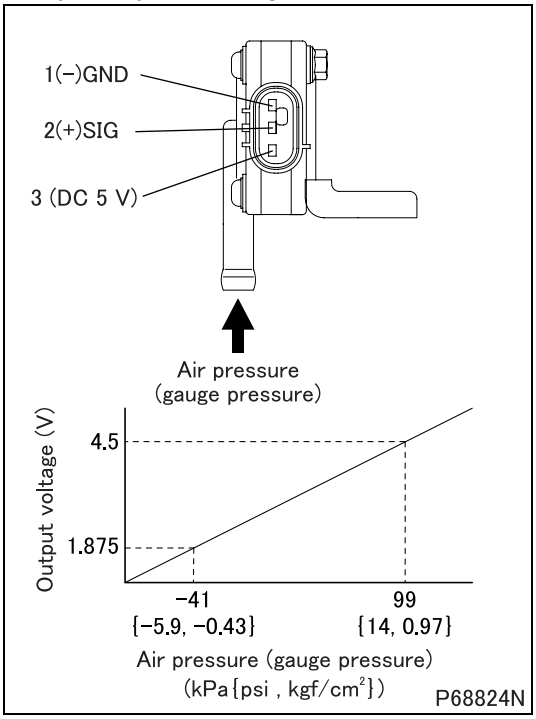
Step 5	Inspection items		Inspection by electronic control unit connector (ground)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 42 (+) and (GE58A) terminal No. 53 (–).
	Inspection condition		• Starter switch: ON • Engine: stopped • Measure from back side of connector of harness with each device connected to harness.
	Requirements		0 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 7.
		NO	Go to step 6.

Step 6	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Apply voltage DC 5 V across connector terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 41 ± 3.2 kPa {5.9 ± 0.5 psi, 0.43 ± 0.03 kgf/cm^2}: 1.875 V • 99 ± 3.2 kPa {14 ± 0.5 psi, 1.0 ± 0.03 kgf/cm^2}: 4.5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 9.
		NO	Replacement of sensor

<Step 8 inspection diagram>



Step 9	Inspection items		Inspection by sensor connector
	Maintenance item		Measure value of voltage between terminal No. 3 (+) and 1 (–).
	Inspection condition		• Starter switch: ON • Engine: stopped • Measure from back side of connector of harness with each device connected to harness.
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	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?)	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?)	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?)	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^2}
	Inspection result (Is the judging standard satisfied?)	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^2} 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.

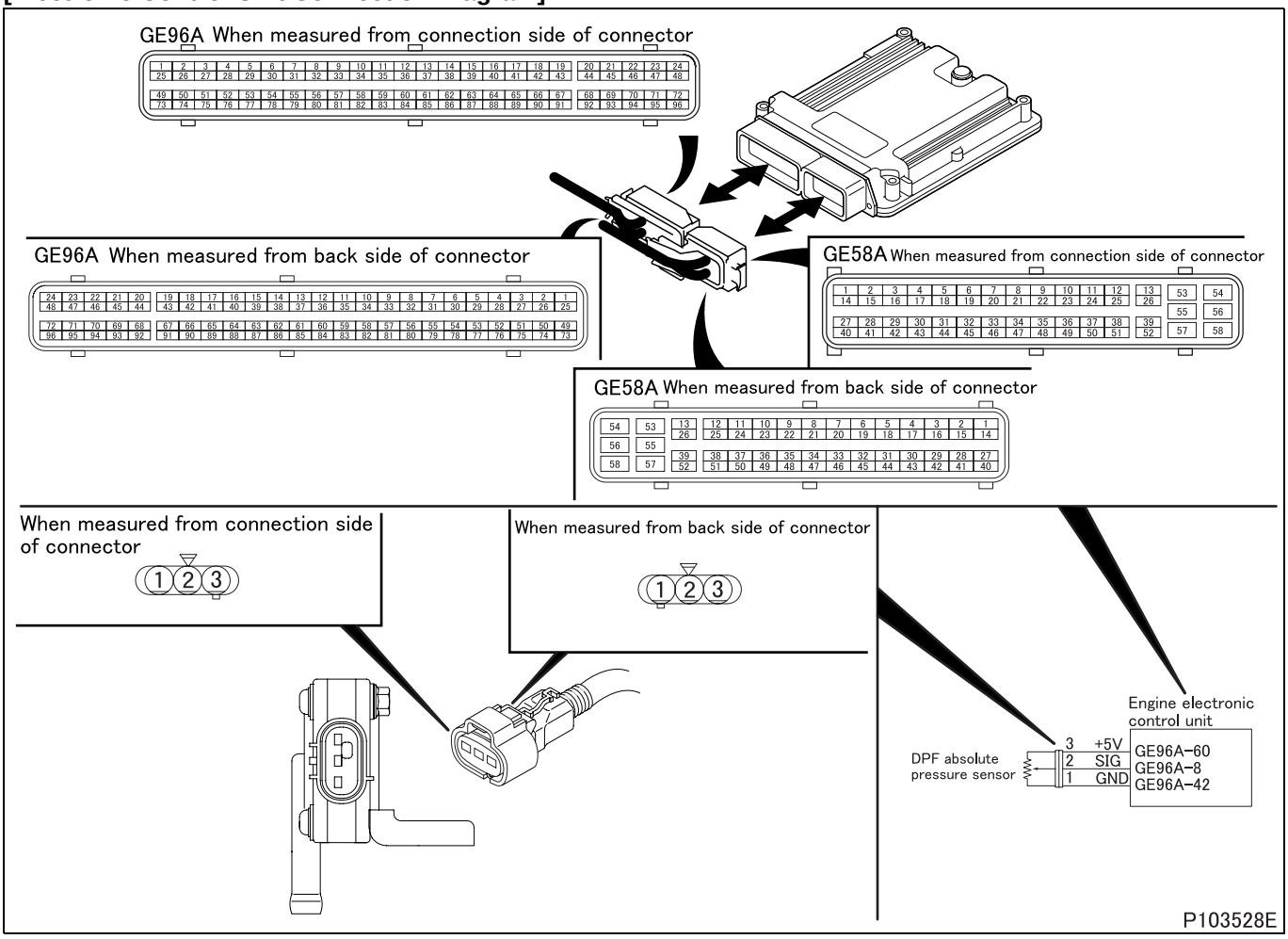
[Diagnostic requirement]
–

[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.

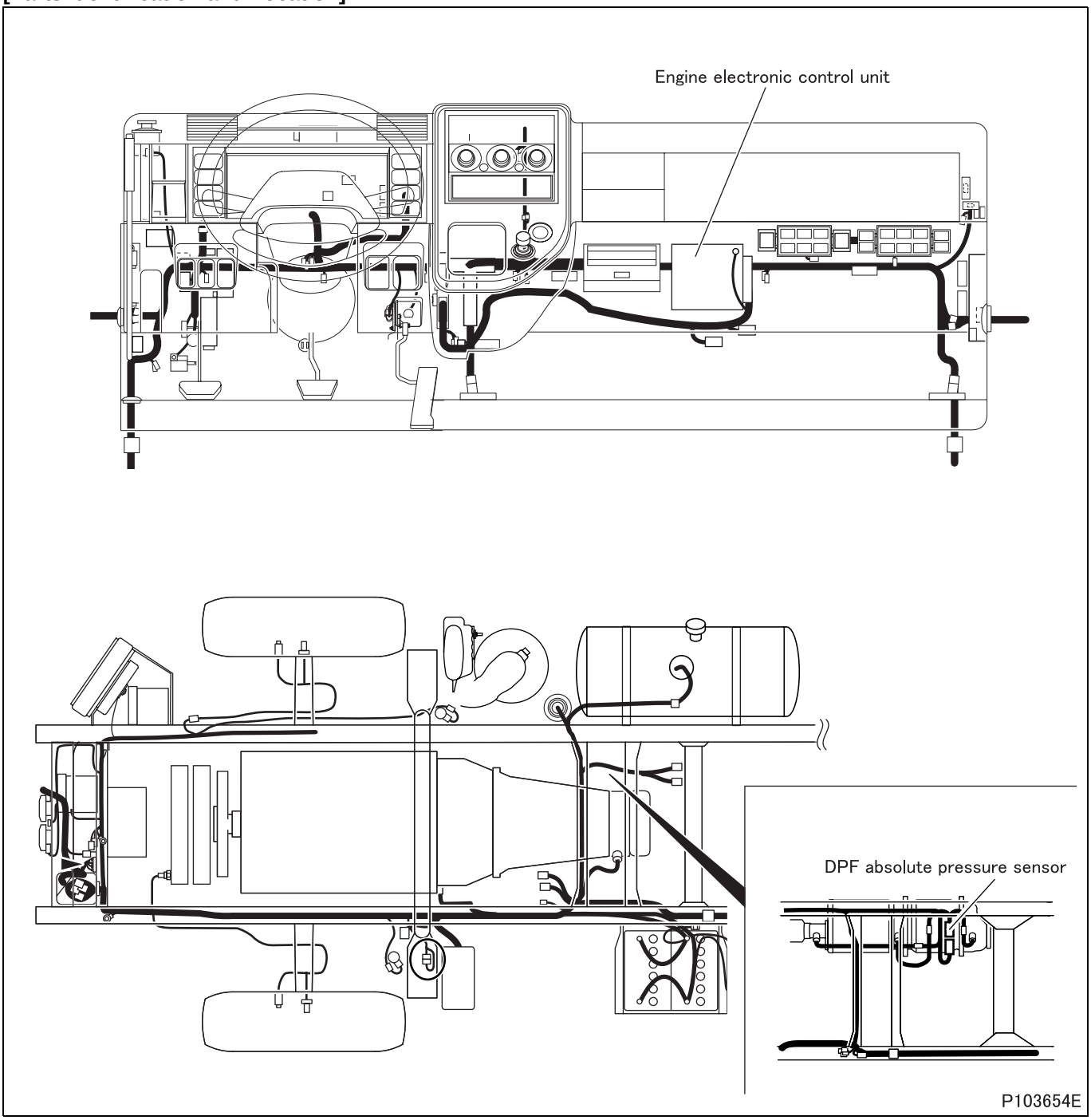
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

[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		Check if following diagnosis codes occur simultaneously. • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (High) & MFF”
	Inspection condition		Starter switch: ON Engine: stopped
	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		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^2}
	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. 8 (+) and 42 (–).
	Inspection condition		• Starter switch: ON • Engine: stopped • Measure from back side of connector of harness with each device connected to harness.
	Requirements		1.875 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. 60 (+) and 42 (–).
	Inspection condition		• Starter switch: ON • Engine: stopped • Measure from back side of connector of harness with each device connected to harness.
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Go to step 6.

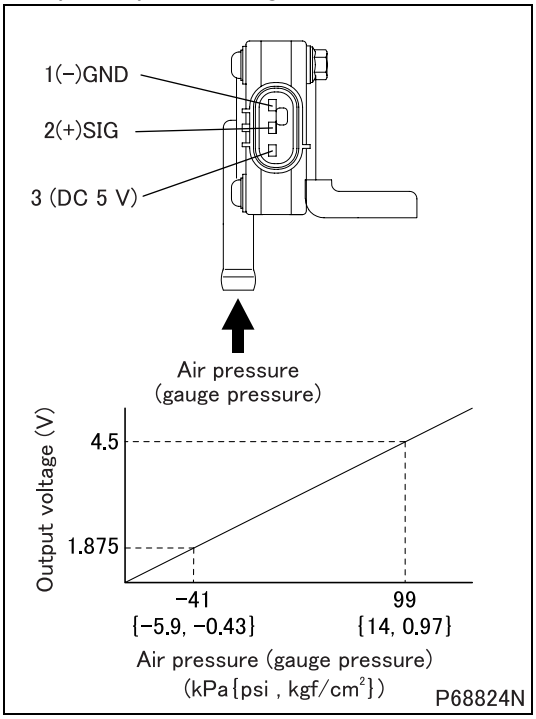
Step 5	Inspection items		Inspection by electronic control unit connector (ground)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 42 (+) and (GE58A) terminal No. 53 (–).
	Inspection condition		• Starter switch: ON • Engine: stopped • Measure from back side of connector of harness with each device connected to harness.
	Requirements		0 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 7.
		NO	Go to step 6.

Step 6	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Apply voltage DC 5 V across connector terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 41 ± 3.2 kPa {5.9 ± 0.5 psi, 0.43 ± 0.03 kgf/cm^2}: 1.875 V • 99 ± 3.2 kPa {14 ± 0.5 psi, 1.0 ± 0.03 kgf/cm^2}: 4.5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 9.
		NO	Replacement of sensor

<Step 8 inspection diagram>



Step 9	Inspection items		Inspection by sensor connector
	Maintenance item		Measure value of voltage between terminal No. 3 (+) and 1 (–).
	Inspection condition		• Starter switch: ON • Engine: stopped • Measure from back side of connector of harness with each device connected to harness.
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	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?)	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?)	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?)	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^2}
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		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.

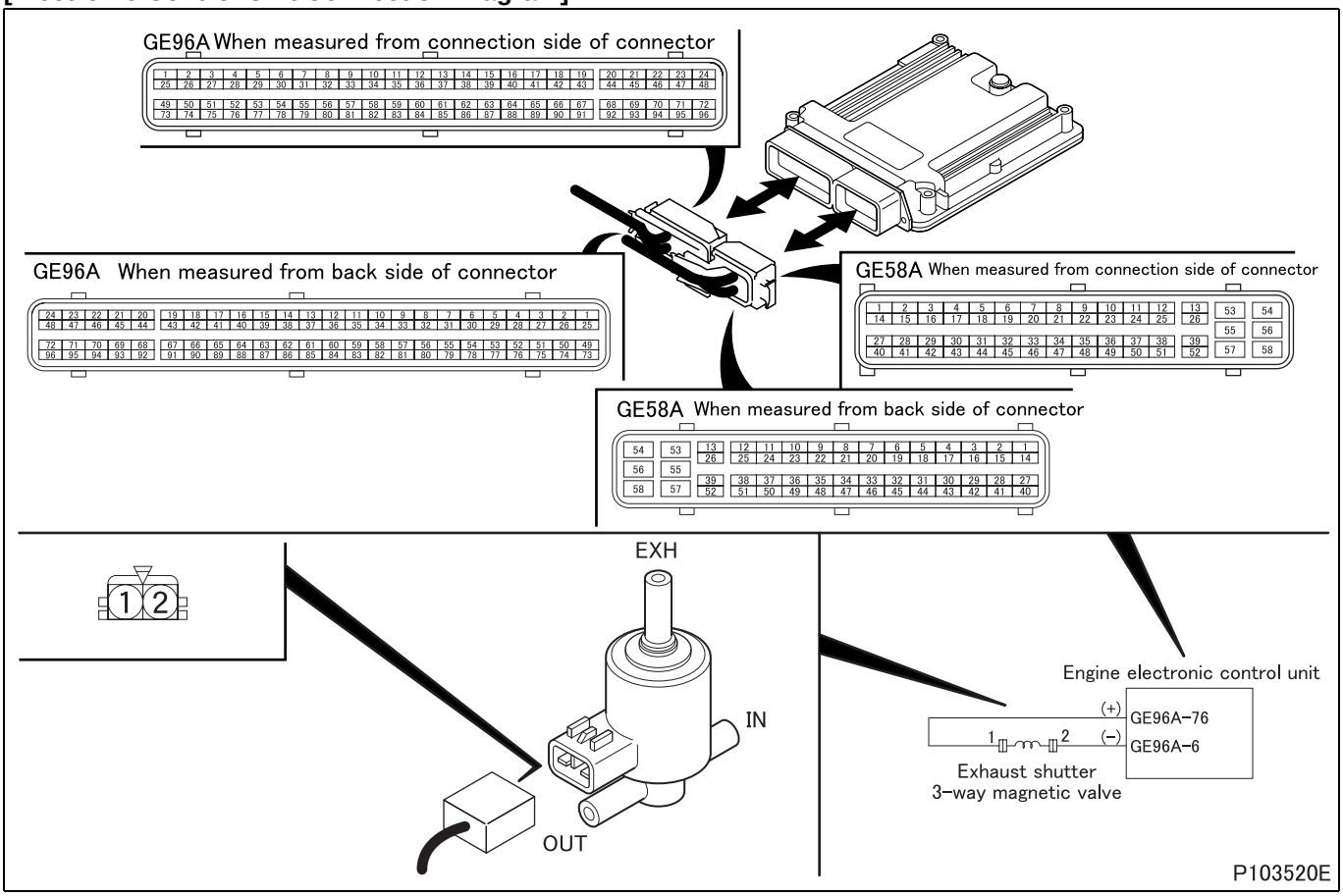
[Diagnostic requirement]
- Engine operating mode: normal (engine in operation)
- Engine speed: 1250 to 2750 rpm
- Accelerator pedal position: less than 2%
- Water temperature: 64 to 100°C {147 to 212°F}
- Intake air temperature: –7 to 60°C {19 to 140°F}
- Boost pressure: more than 750 rpm
- Exhaust gas 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 3-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.

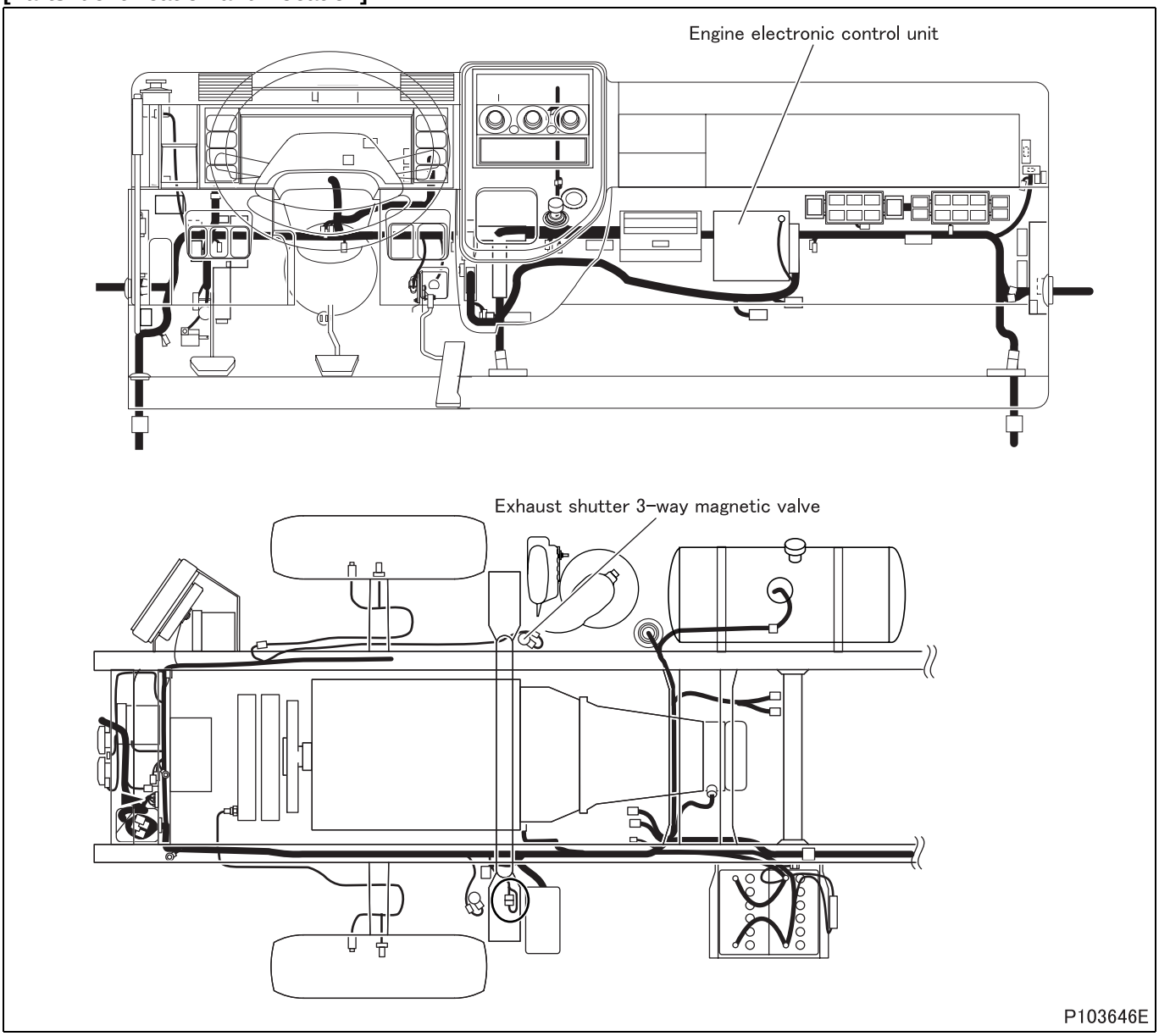
[Probable cause of trouble]
- Short-circuit of harness between electronic control unit and exhaust shutter 3-way magnetic valve
- Malfunction of each connector
- Malfunction of exhaust shutter 3-way magnetic valve
- Malfunction of electronic control unit
- Malfunction of exhaust shutter unit

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[Fault diagnosis]

- Perform checks in the sequence of the following steps.

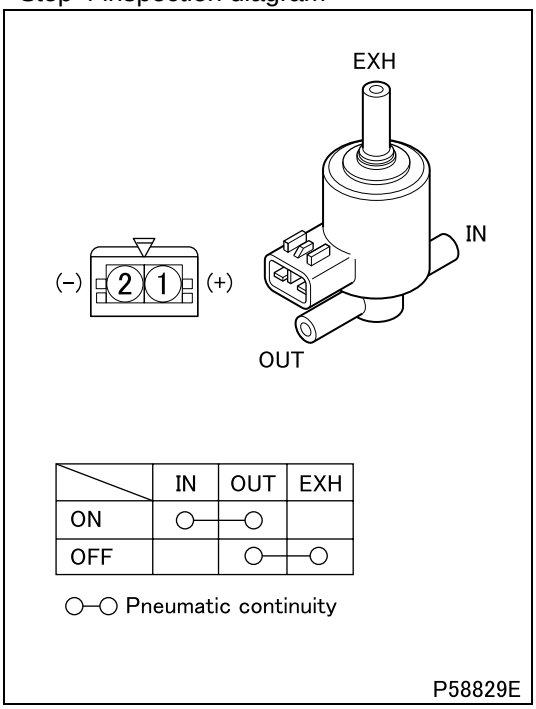
Step 1	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 6 and 76.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		NO	Modify connector.

Step 3	Inspection items		Inspection of exhaust shutter 3-way magnetic valve connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Modify connector.

Step 4	Inspection items		Inspection of exhaust shutter 3-way magnetic valve unit
	Maintenance item		Measure minimum operating voltage when 3-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	Go to step 5.
		NO	Replacement of 3-way magnetic valve

<Step 4 inspection diagram>



Step 5	Inspection items		Inspection of harness between exhaust shutter 3-way magnetic valve and electronic control unit (power supply)
	Maintenance item		Check circuit between exhaust shutter 3-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	Go to step 6.
		NO	Modify harness.

Step 6	Inspection items		Inspection of harness between exhaust shutter 3-way magnetic valve and electronic control unit (power supply)
	Maintenance item		Check circuit between exhaust shutter 3-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	Go to step 7.
		NO	Modify harness.

Step 7	Inspection items		Inspection of harness between exhaust shutter 3-way magnetic valve and electronic control unit (ground)
	Maintenance item		Check circuit between exhaust shutter 3-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.

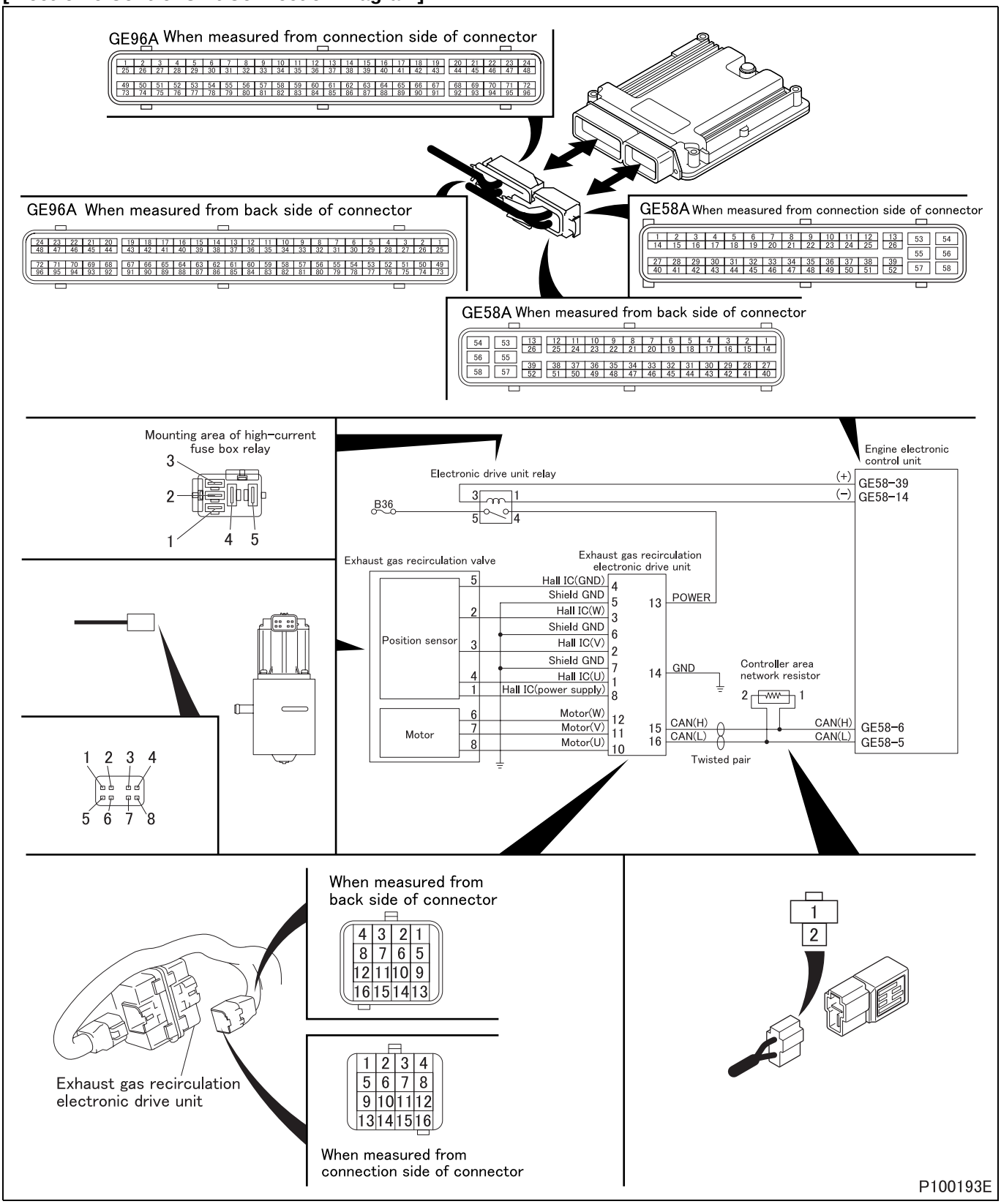
[Diagnostic requirement]
- Controller area network communication in order

[Control effected by electronic control unit during fault]
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Related fault check is stopped.

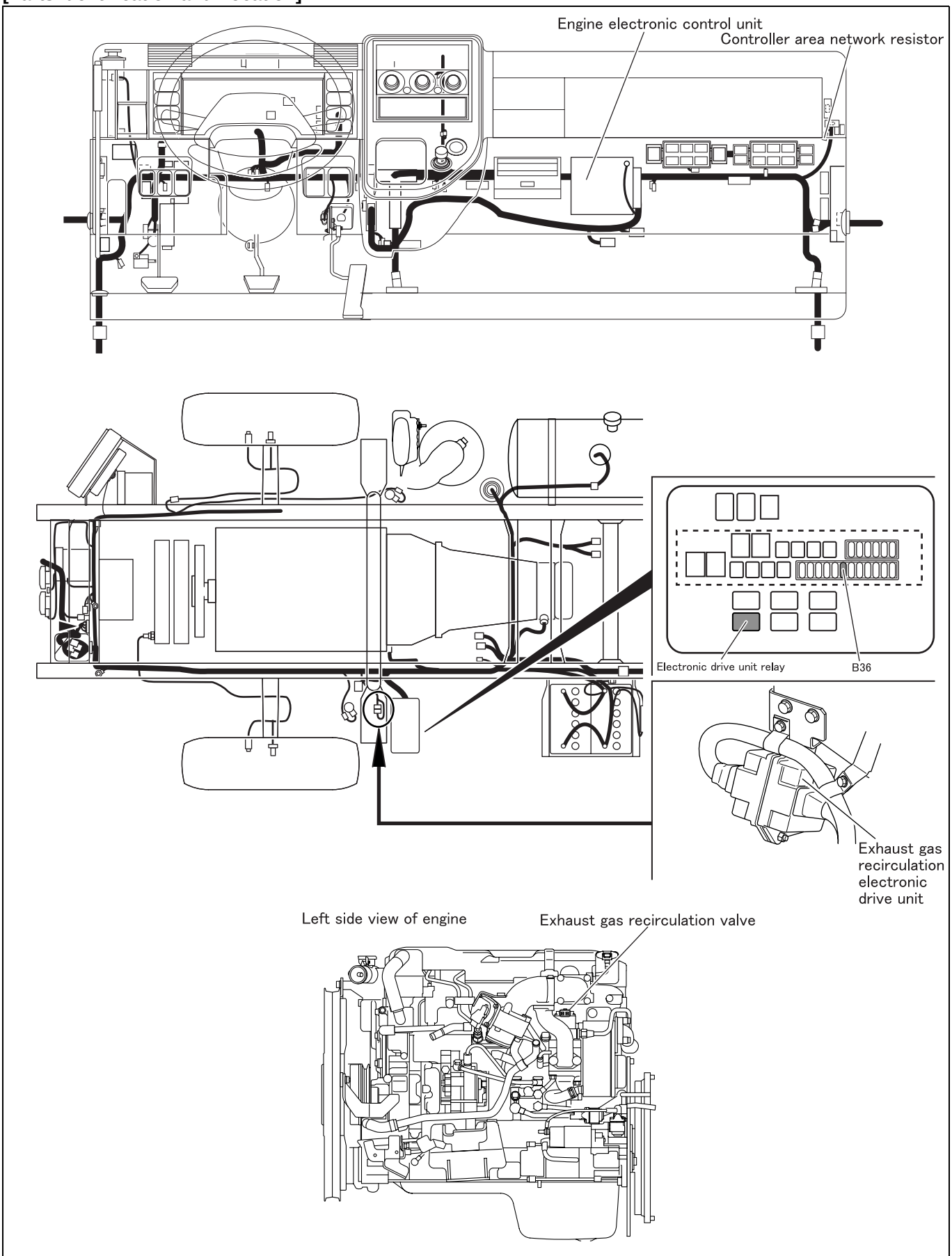
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic drive unit and battery
- Malfunction of each connector
- Malfunction of battery
- Malfunction of electronic drive unit relay
- Malfunction of electronic drive unit

[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.)

[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		Check if following diagnosis codes occur simultaneously. • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)” • P0688 “EDU Relay (Over Load)”
	Inspection condition		• Starter switch: ON • Engine: stopped
	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		Inspection of electronic drive unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		NO	Modify connector.

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		• Starter switch: ON • Engine: stopped • Remove connector and measure from harness side. • Perform actuator test item No. AF “EDU Relay”
	Requirements		Same as battery voltage.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 4.

Step 4	Inspection items		Inspection of relay connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Modify connector.

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	Go to step 6.
		NO	Modify harness.

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: 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.

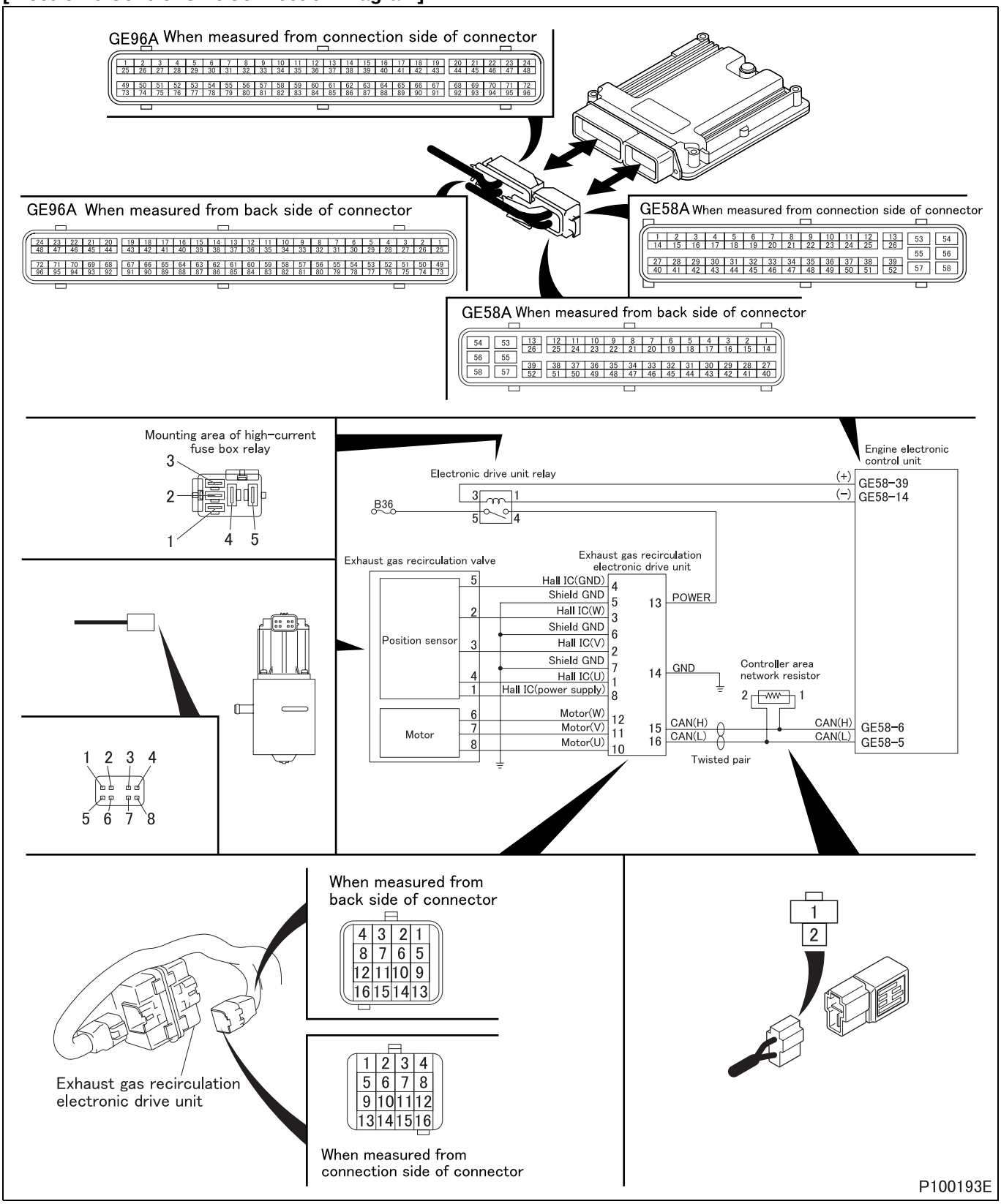
[Diagnostic requirement]
- Controller area network communication in order

[Control effected by electronic control unit during fault]
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Related fault check is stopped.

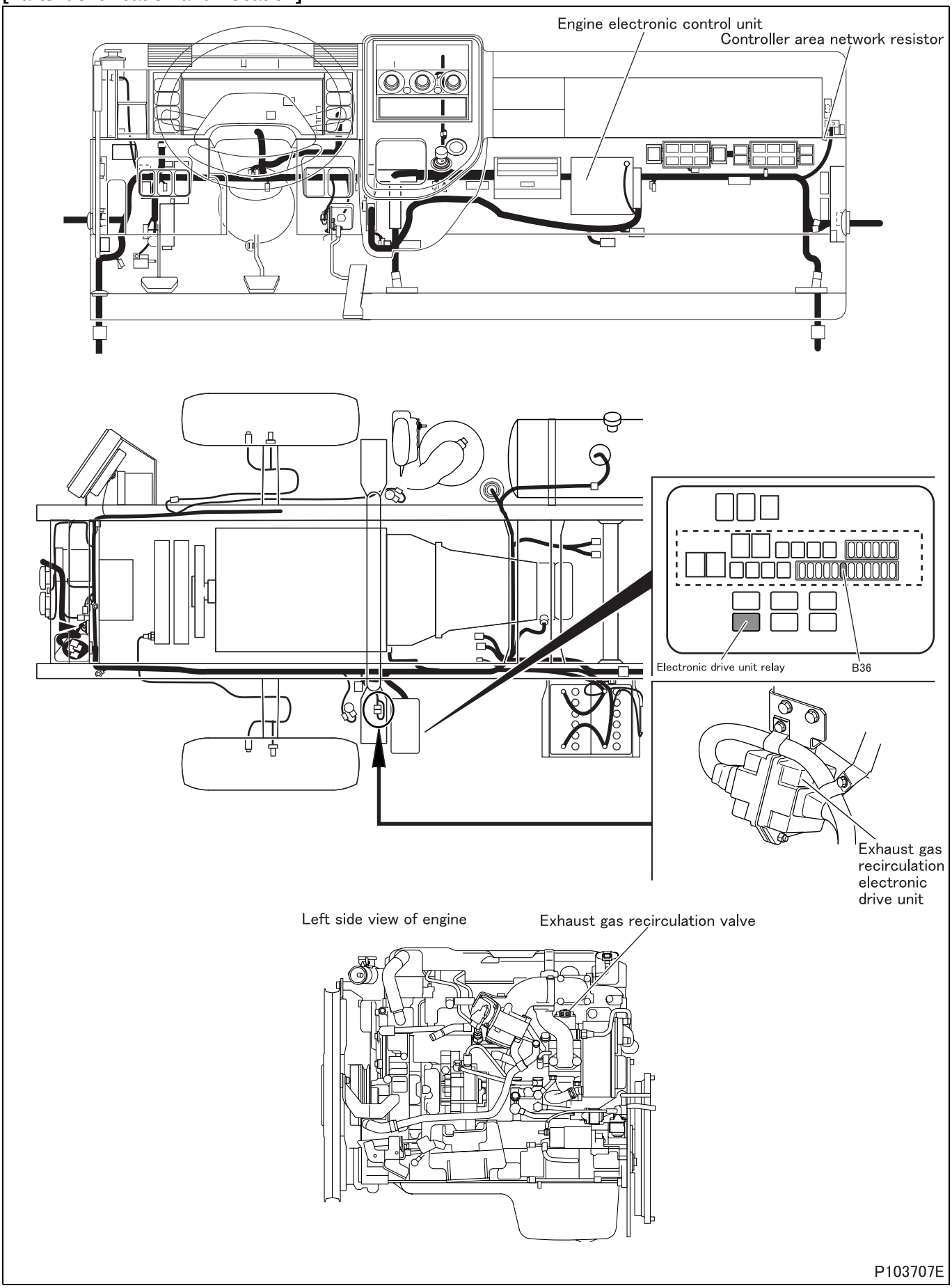
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic drive unit and battery
- Malfunction of each connector
- Malfunction of battery
- Malfunction of electronic drive unit relay
- Malfunction of electronic drive unit

[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]



[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		Check if following diagnosis codes occur simultaneously. • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)” • P0688 “EDU Relay (Over Load)”
	Inspection condition		• Starter switch: ON • Engine: stopped
	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		Inspection of electronic drive unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		NO	Modify connector.

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		• Starter switch: ON • Engine: stopped • Remove connector and measure from harness side. • Perform actuator test item No. AF “EDU Relay”
	Requirements		Same as battery voltage.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 4.

Step 4	Inspection items		Inspection of relay connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Modify connector.

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	Go to step 6.
		NO	Modify harness.

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.

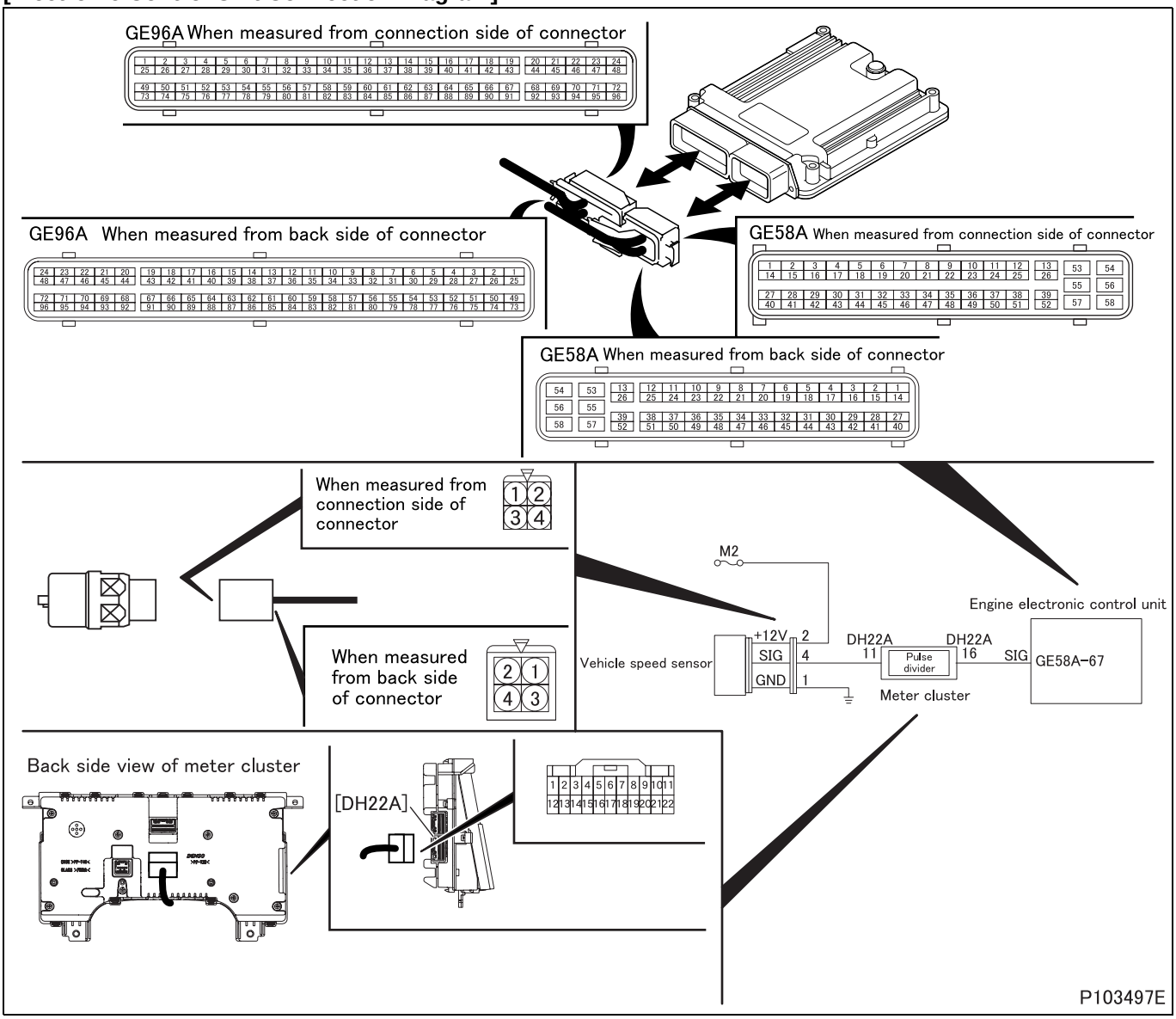
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and pulse divider (built in meter cluster)
- Malfunction of each connector
- Malfunction of pulse divider (built in meter cluster)
- Malfunction of electronic control unit

[Recoverability]
- Recovered if signal becomes normal with starter switch in ON position.
  (Timing of warning lamp/diagnosis code OFF depends on condition.)

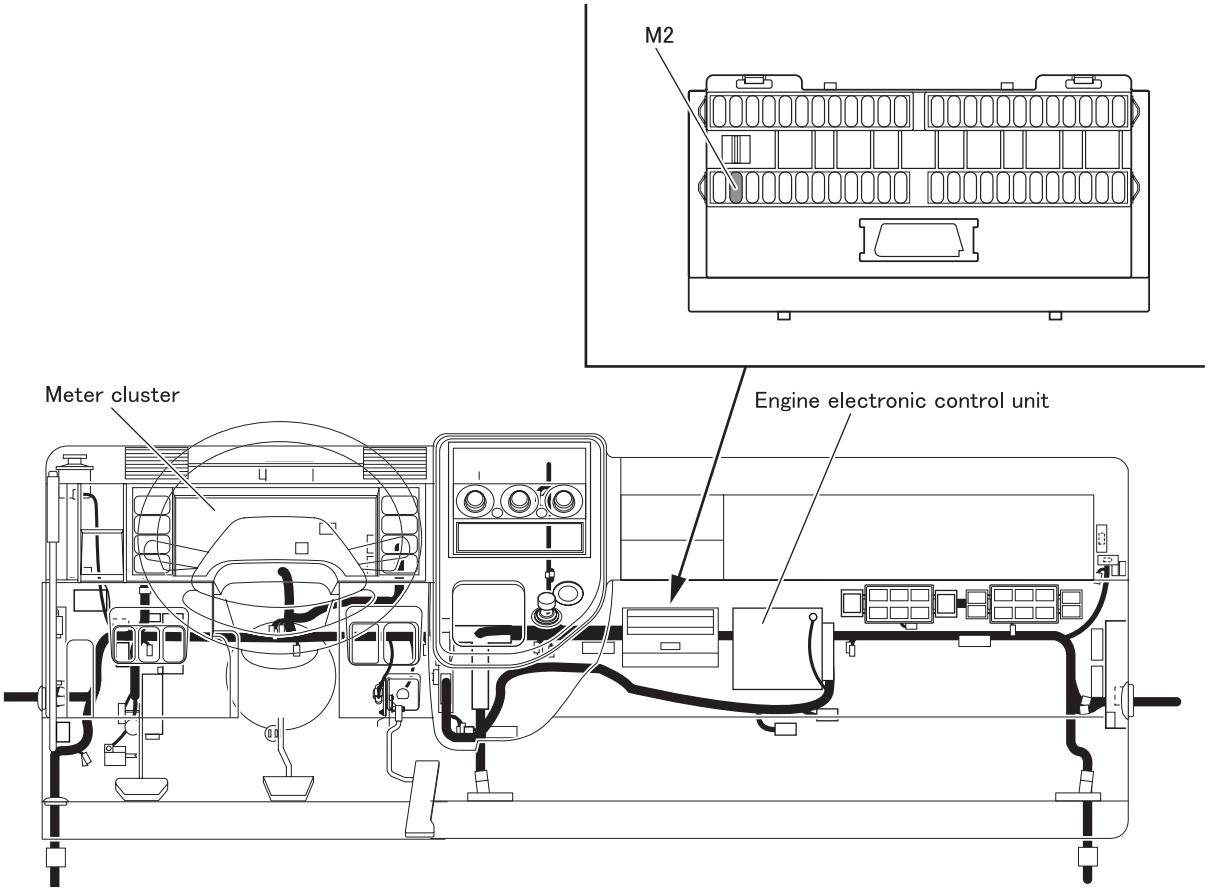
<Condition (1)>
- Lamp is extinguished and code is cleared at fourth diagnosis code display after recovery.

<Condition (2)>
- Lamp is extinguished and code is cleared simultaneously with recovery.

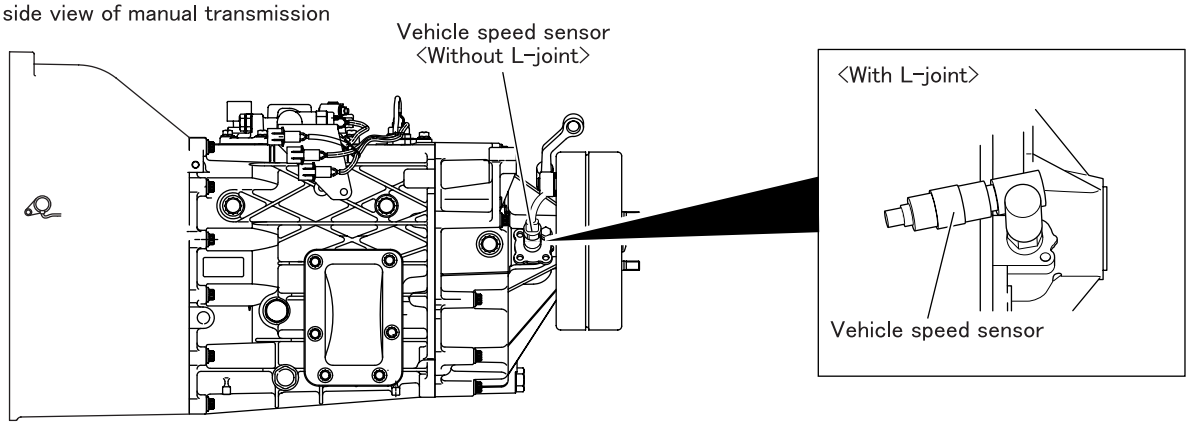
[Electronic Control Unit Connection Diagram]



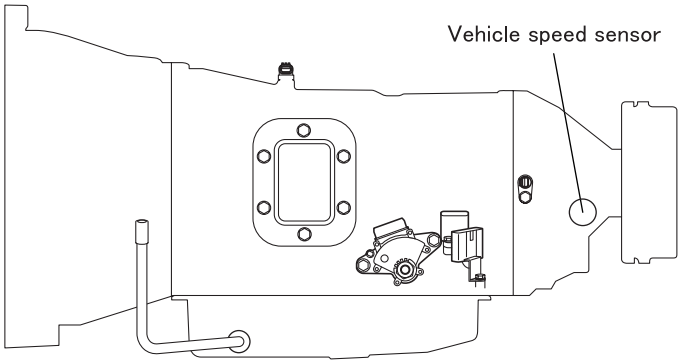
[Parts Identification and Location]



Left side view of manual transmission



Left side view of automatic transmission



P103625E

[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** • Measure item “Vehicle Speed Sensor”. **<Multi-Use Tester used>** • Measure item No. 90 “Vehicle Speed” of Service Data.
	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.

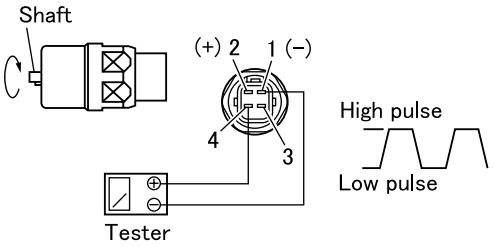
Step 2	Inspection items		Inspection by electronic control unit connector (signal)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 67 (+) and chassis ground.
	Inspection condition		• Starter switch: ON • Engine: stopped • Measure from back side of connector of harness with each device connected to harness. • Remove sensor and slowly turn sensor shaft.
	Requirements		• Low pulse: 0.5 V or less • High pulse: 8 ± 1 V
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Low pulse: 0.5 V or less • High pulse: 8 ± 1 V
	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.

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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON • Remove sensor and slowly turn sensor shaft.
	Requirements		• Low pulse: 0.5 V or less • High pulse: 8 ± 1 V
	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		**<General Scanning Tool used>** • Measure item “Vehicle Speed Sensor”. **<Multi-Use Tester used>** • Measure item No. 90 “Vehicle Speed” of Service Data.
	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.

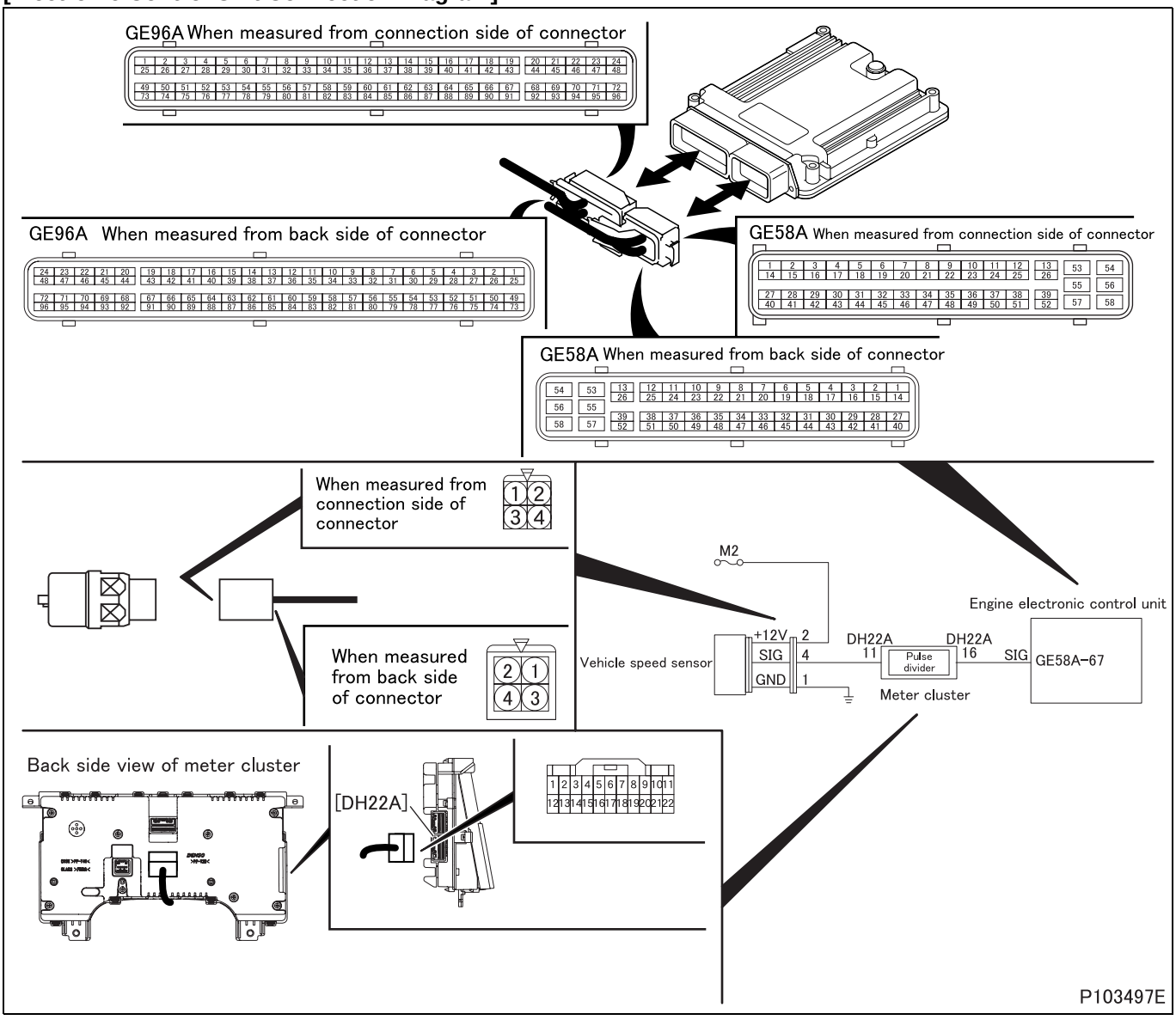
[Diagnostic requirement]
- Engine speed: more than 2000 rpm
- Fuel injection quantity: above 50 mg/cyc
- Time till above conditions were met: more than 2 seconds
- Battery voltage: in order
- MPROP (rail pressure control valve): in order

[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.

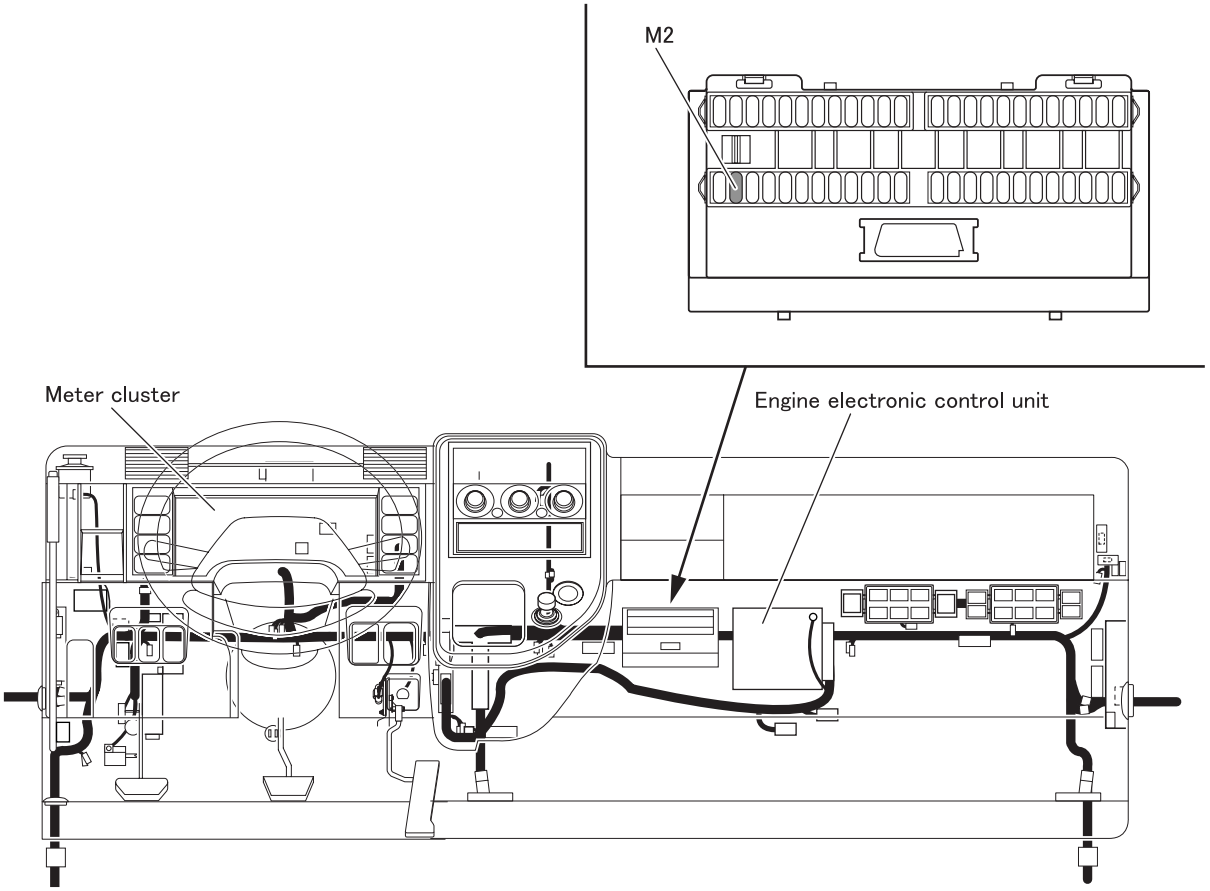
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and pulse divider (built in meter cluster)
- Malfunction of each connector
- Malfunction of pulse divider (built in meter cluster)
- Malfunction of electronic control unit

[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.)

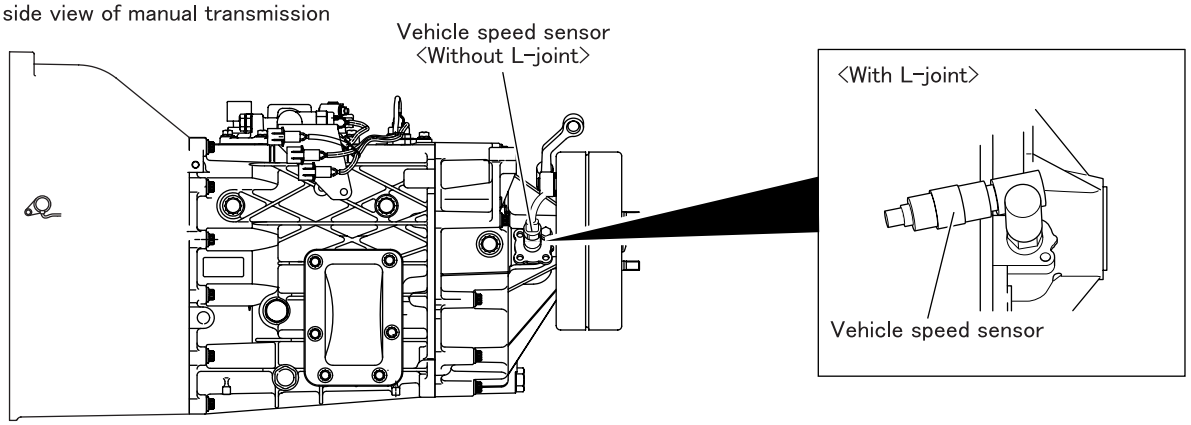
[Electronic Control Unit Connection Diagram]



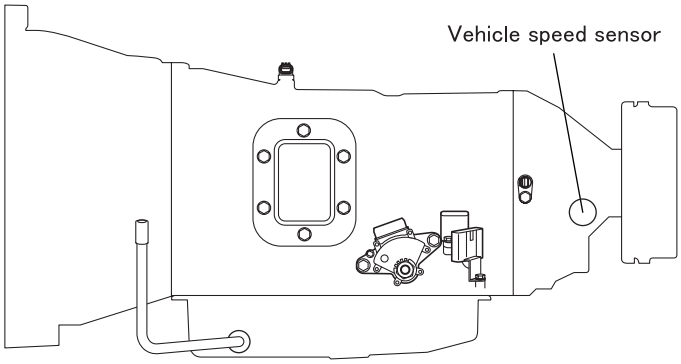
[Parts Identification and Location]



Left side view of manual transmission



Left side view of automatic transmission



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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		**<General Scanning Tool used>** • Measure item “Vehicle Speed Sensor”. **<Multi-Use Tester used>** • Measure item No. 90 “Vehicle Speed” of Service Data.
	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.

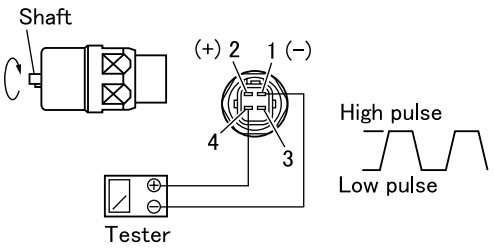
Step 2	Inspection items		Inspection by electronic control unit connector (signal)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 67 (+) and chassis ground.
	Inspection condition		• Starter switch: ON • Engine: stopped • Measure from back side of connector of harness with each device connected to harness. • Remove sensor and slowly turn sensor shaft.
	Requirements		• Low pulse: 0.5 V or less • High pulse: 8 ± 1 V
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Low pulse: 0.5 V or less • High pulse: 8 ± 1 V
	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.

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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON • Remove sensor and slowly turn sensor shaft.
	Requirements		• Low pulse: 0.5 V or less • High pulse: 8 ± 1 V
	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		**<General Scanning Tool used>** • Measure item “Vehicle Speed Sensor”. **<Multi-Use Tester used>** • Measure item No. 90 “Vehicle Speed” of Service Data.
	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.

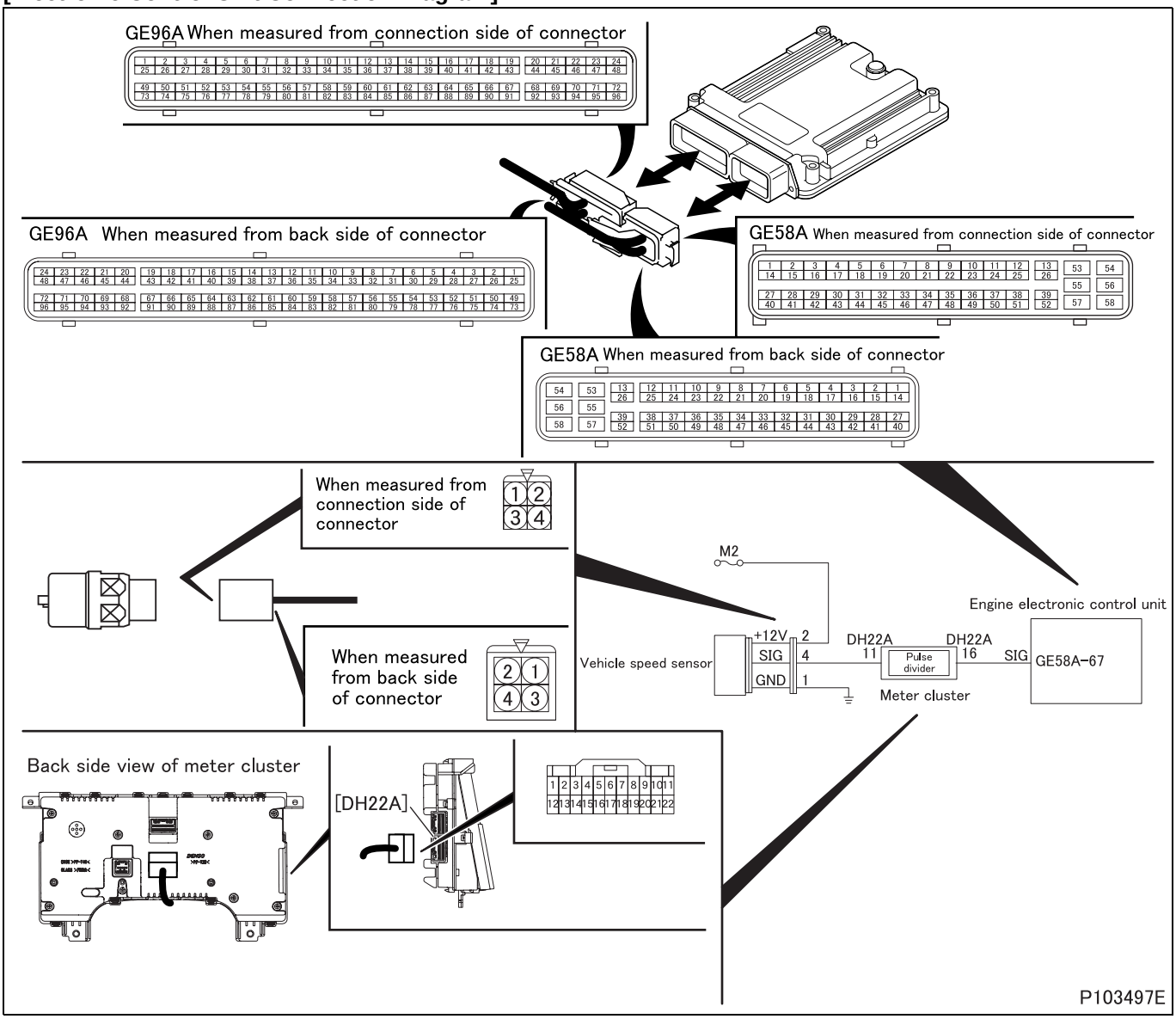
[Diagnostic requirement]
- Engine speed: 600 to 1500 rpm
- Fuel injection quantity: above 35 mg/cyc
- Time till above conditions were met: more than 2 seconds
- Battery voltage: in order
- MPROP (rail pressure control valve): in order

[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.

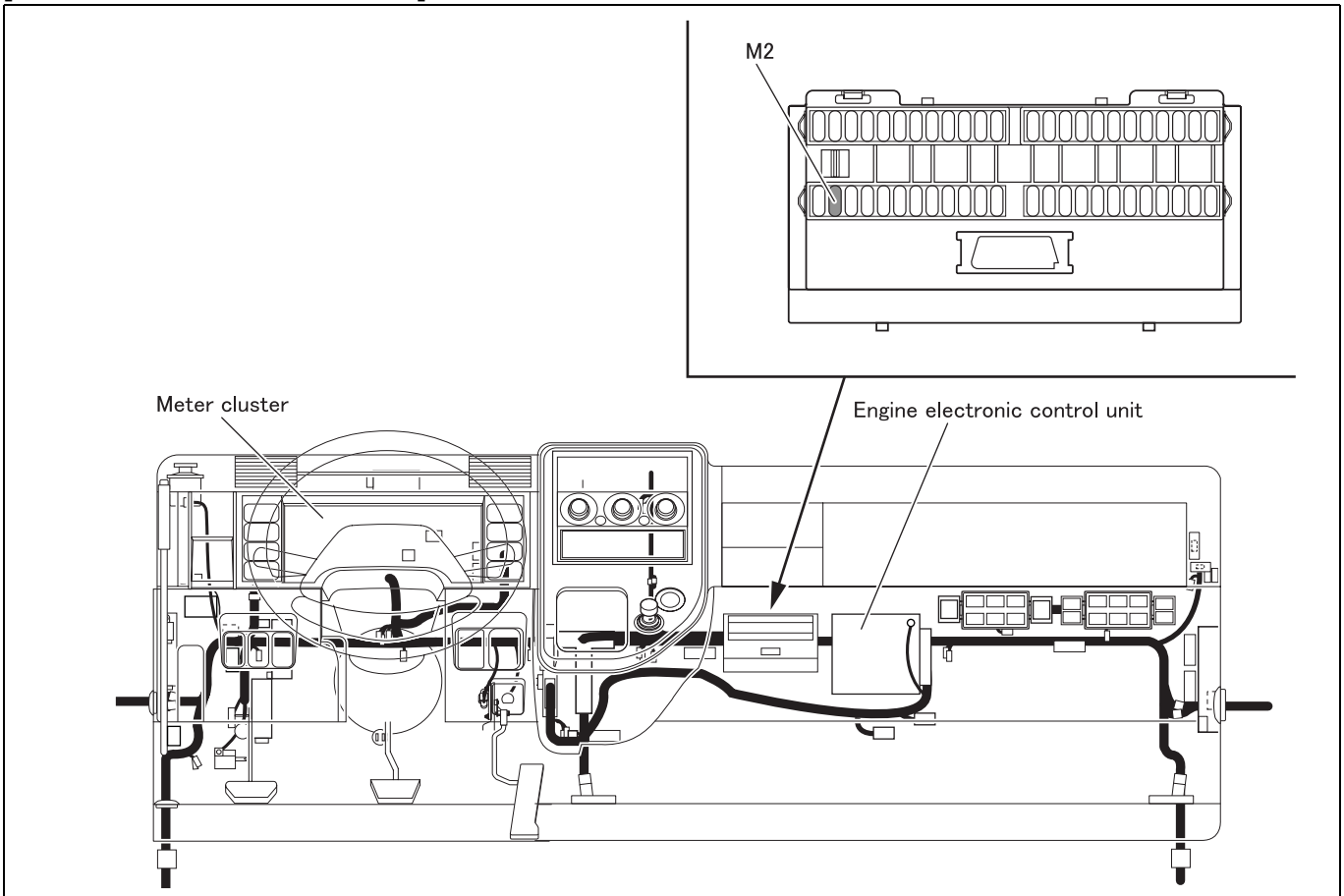
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and pulse divider (built in meter cluster)
- Malfunction of each connector
- Malfunction of pulse divider (built in meter cluster)
- Malfunction of electronic control unit

[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.)

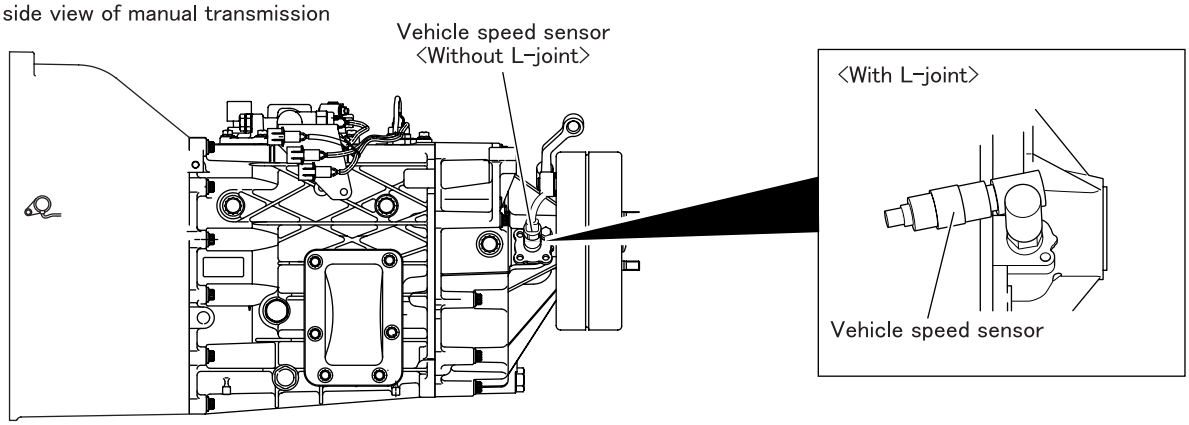
[Electronic Control Unit Connection Diagram]



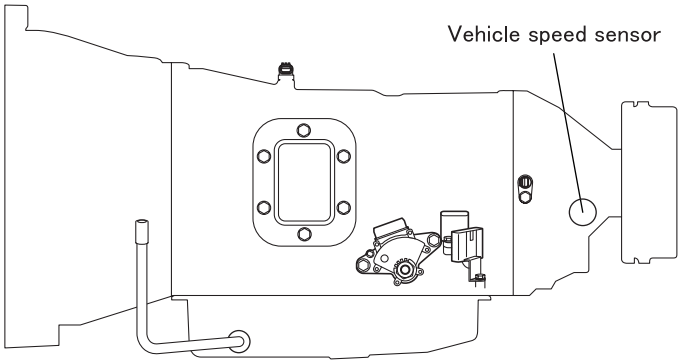
[Parts Identification and Location]



Left side view of manual transmission



Left side view of automatic transmission



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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		**<General Scanning Tool used>** • Measure item “Vehicle Speed Sensor”. **<Multi-Use Tester used>** • Measure item No. 90 “Vehicle Speed” of Service Data.
	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.

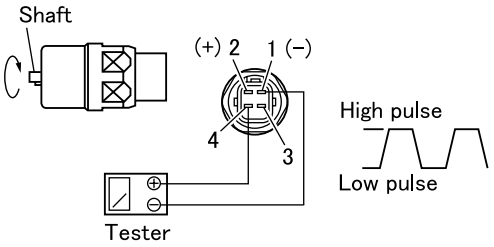
Step 2	Inspection items		Inspection by electronic control unit connector (signal)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 67 (+) and chassis ground.
	Inspection condition		• Starter switch: ON • Engine: stopped • Measure from back side of connector of harness with each device connected to harness. • Remove sensor and slowly turn sensor shaft.
	Requirements		• Low pulse: 0.5 V or less • High pulse: 8 ± 1 V
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Low pulse: 0.5 V or less • High pulse: 8 ± 1 V
	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.

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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON • Remove sensor and slowly turn sensor shaft.
	Requirements		• Low pulse: 0.5 V or less • High pulse: 8 ± 1 V
	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		**<General Scanning Tool used>** • Measure item “Vehicle Speed Sensor”. **<Multi-Use Tester used>** • Measure item No. 90 “Vehicle Speed” of Service Data.
	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.)

[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.)

[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.

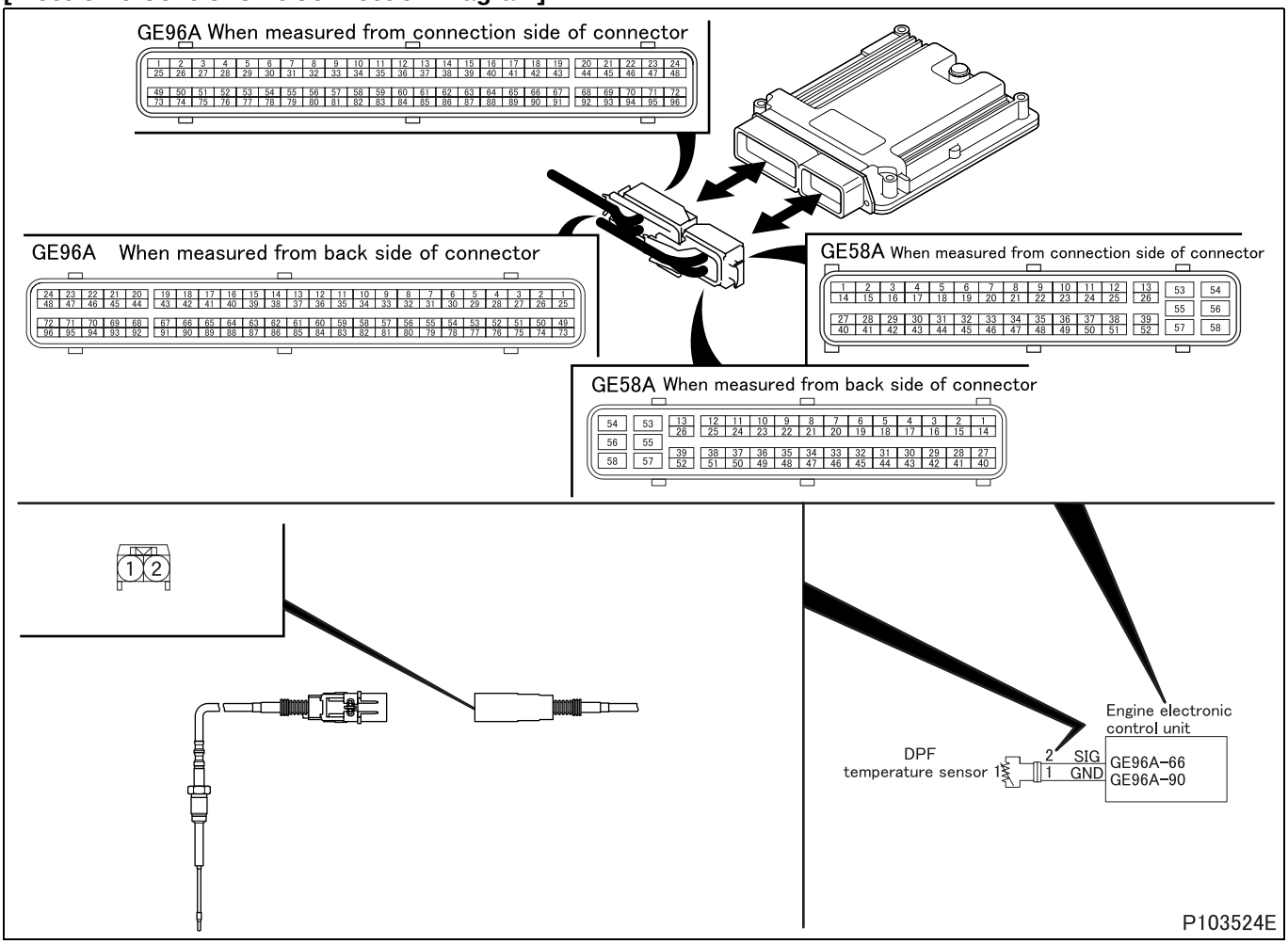
[Diagnostic requirement]
–

[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.

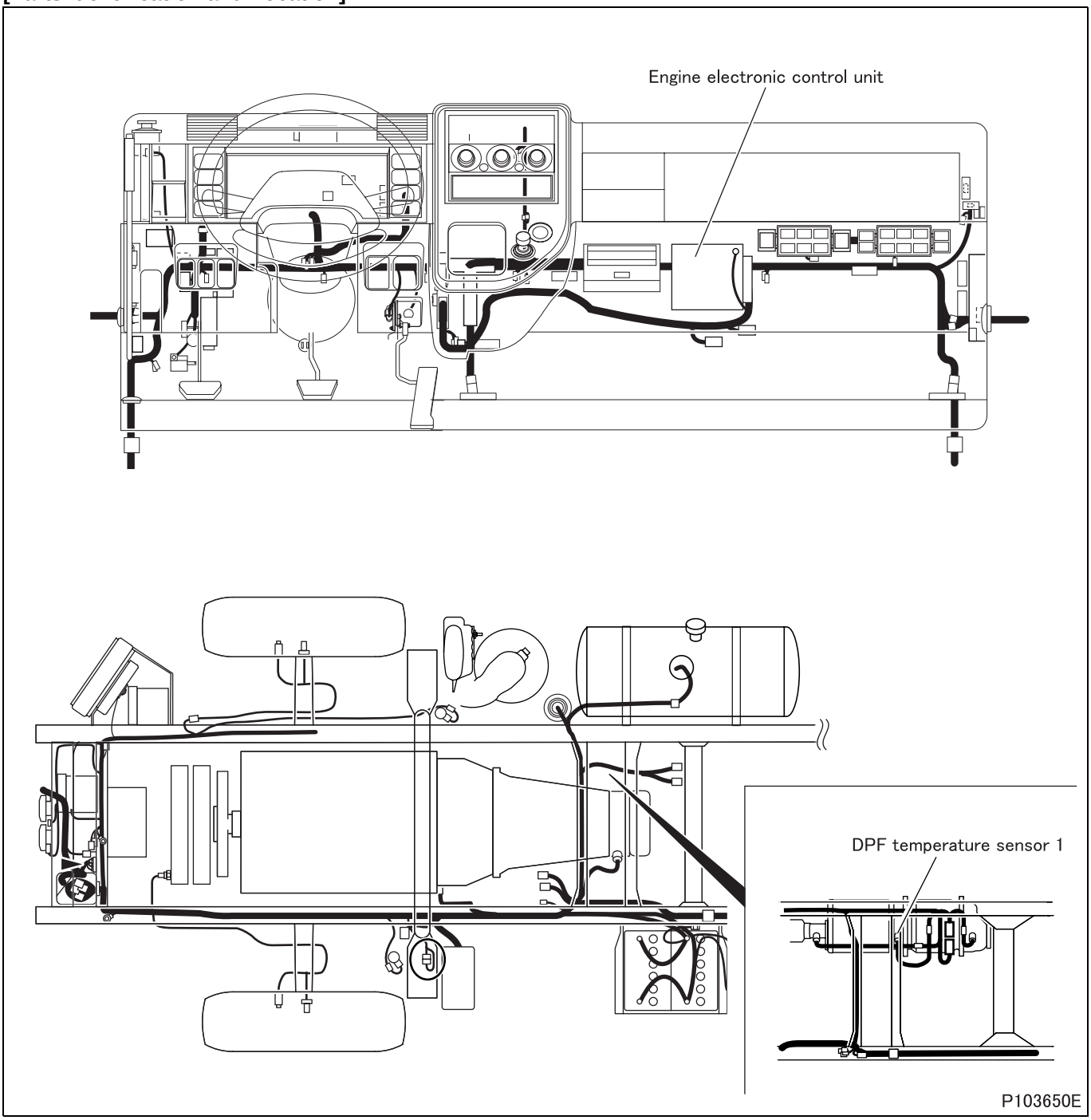
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit
- Malfunction of DPF temperature sensor 1

[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]



[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. 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	Go to step 2.

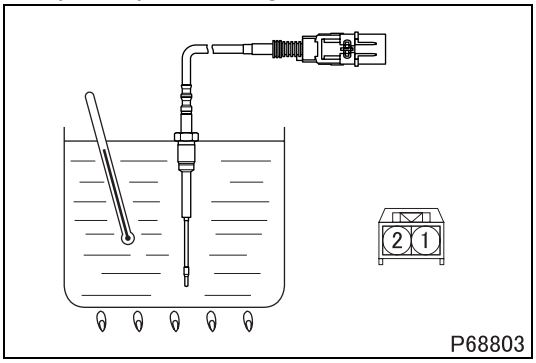
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 66 and 90.
	Inspection condition		• Starter switch: OFF • Disconnect electronic control unit from harness and measure at vehicle-side connector half.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.58 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		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		• Put DPF temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F}: 241.8 kΩ • 50°C {122°F}: 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F}: 33.58 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F}: 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F}: 6.896 $^{+2.064}_{-1.252}$ kΩ
	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.

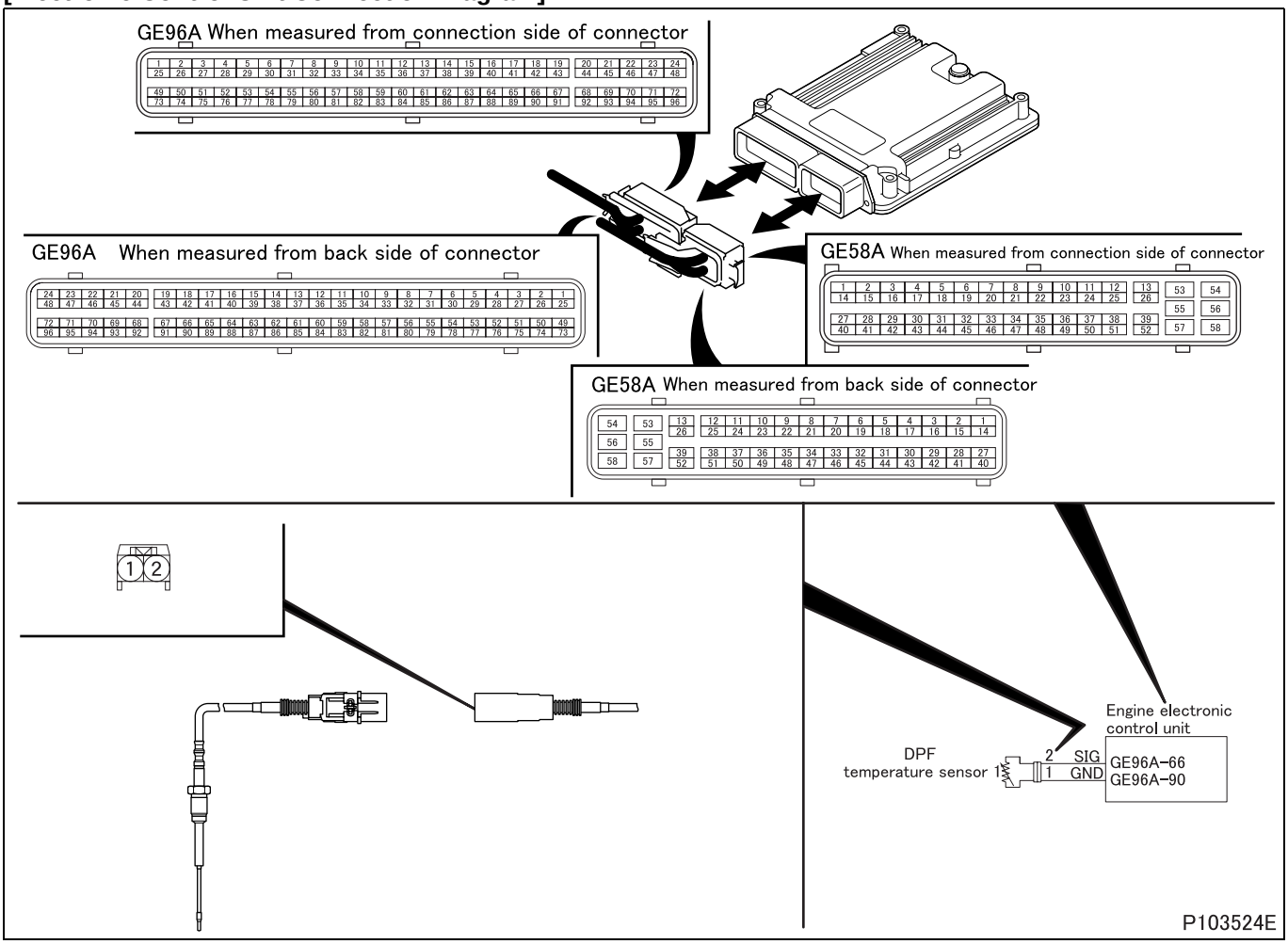
[Diagnostic requirement]
- Engine speed: 1200 to 5000 rpm
- Fuel injection quantity: 32 to 200 mg/cyc
- Water temperature: above –7°C {19°F}

[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.

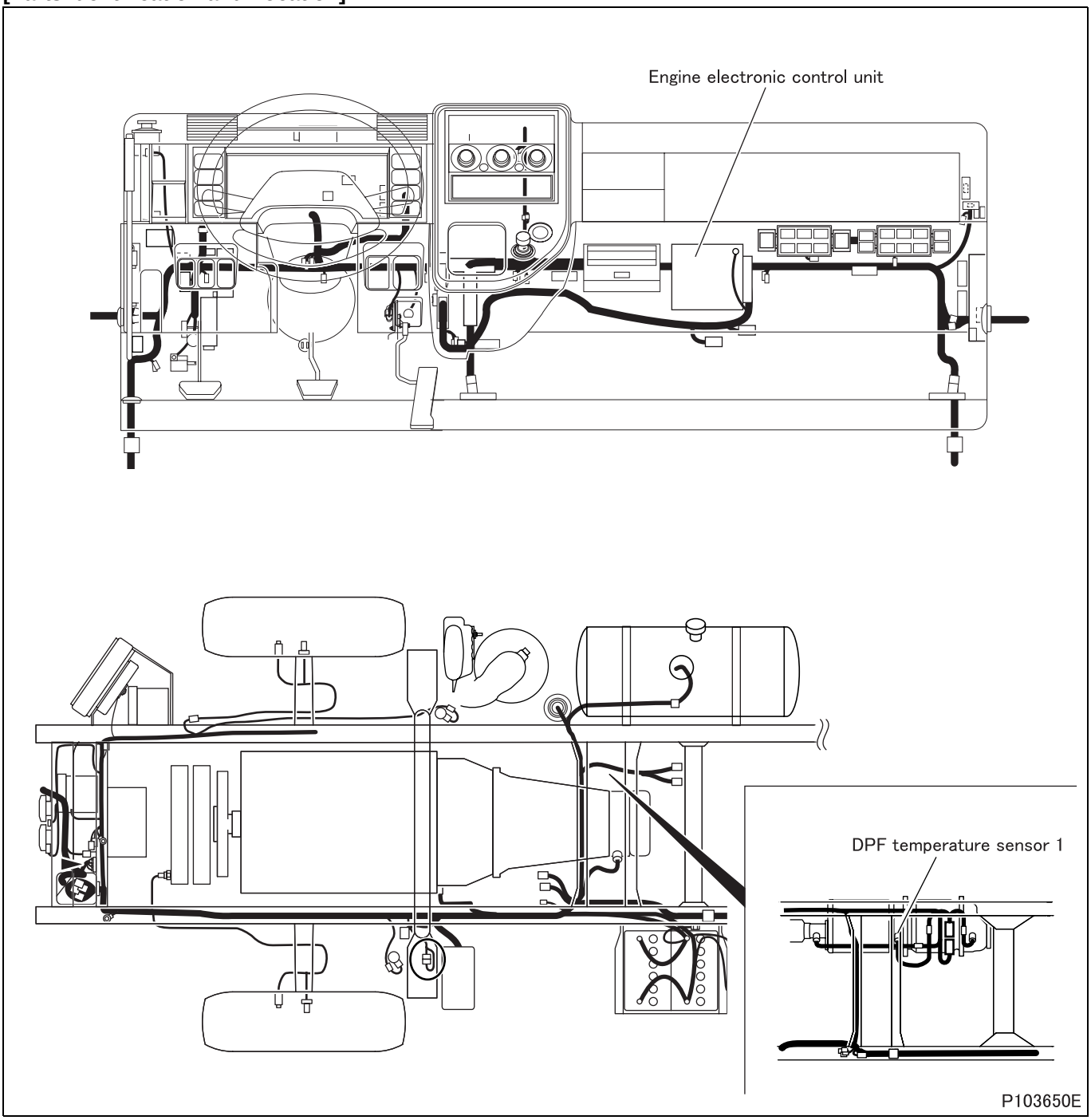
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit
- Malfunction of DPF temperature sensor 1

[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.)

[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. 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	Go to step 2.

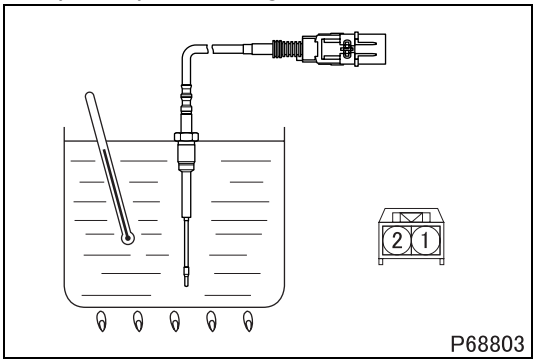
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 66 and 90.
	Inspection condition		• Starter switch: OFF • Disconnect electronic control unit from harness and measure at vehicle-side connector half.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.58 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		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		• Put DPF temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F}: 241.8 kΩ • 50°C {122°F}: 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F}: 33.58 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F}: 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F}: 6.896 $^{+2.064}_{-1.252}$ kΩ
	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: 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.

[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.

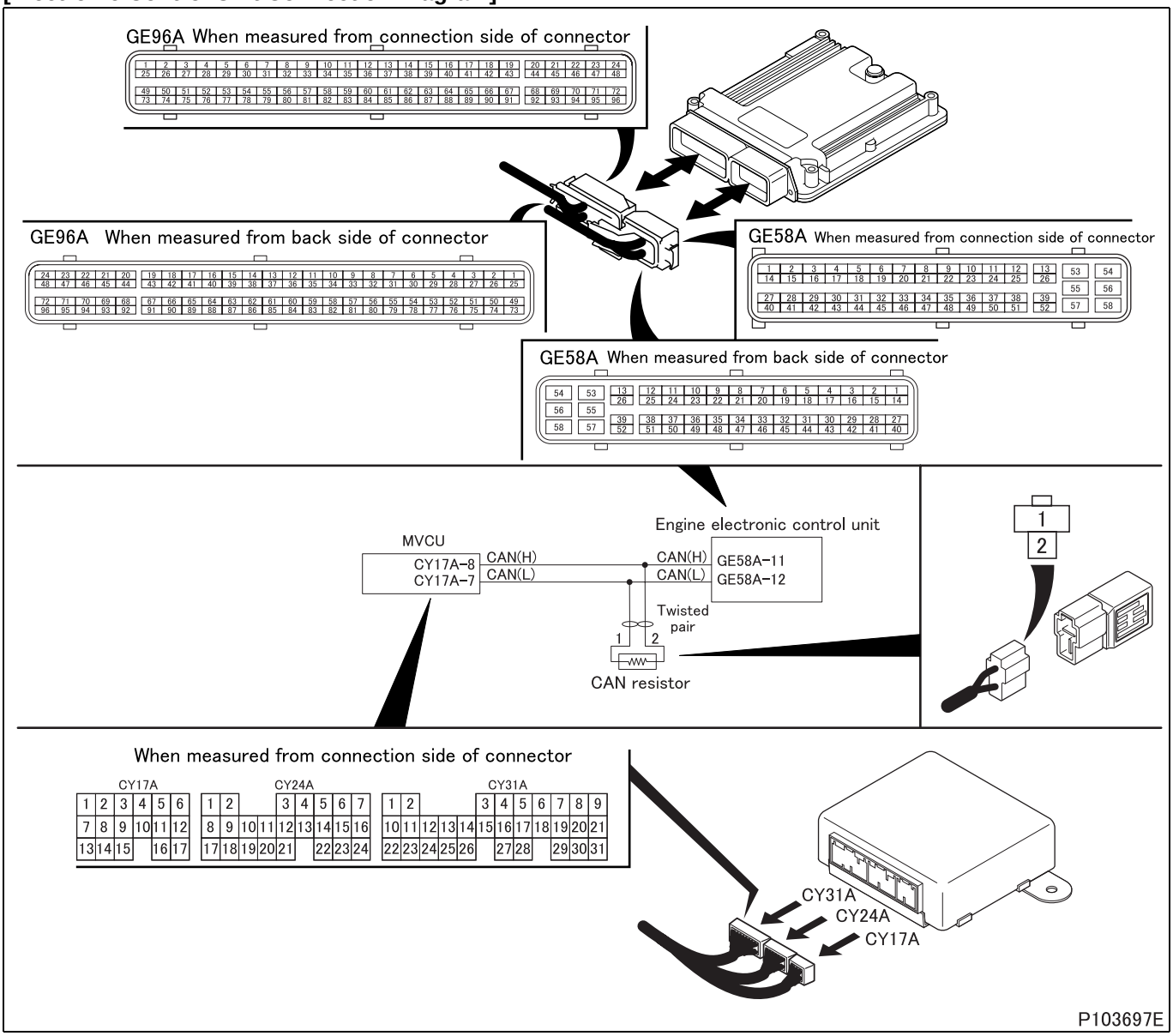
[Diagnostic requirement]
- Controller area network communication in order

[Control effected by electronic control unit during fault]
- Speed limitation device control is stopped.

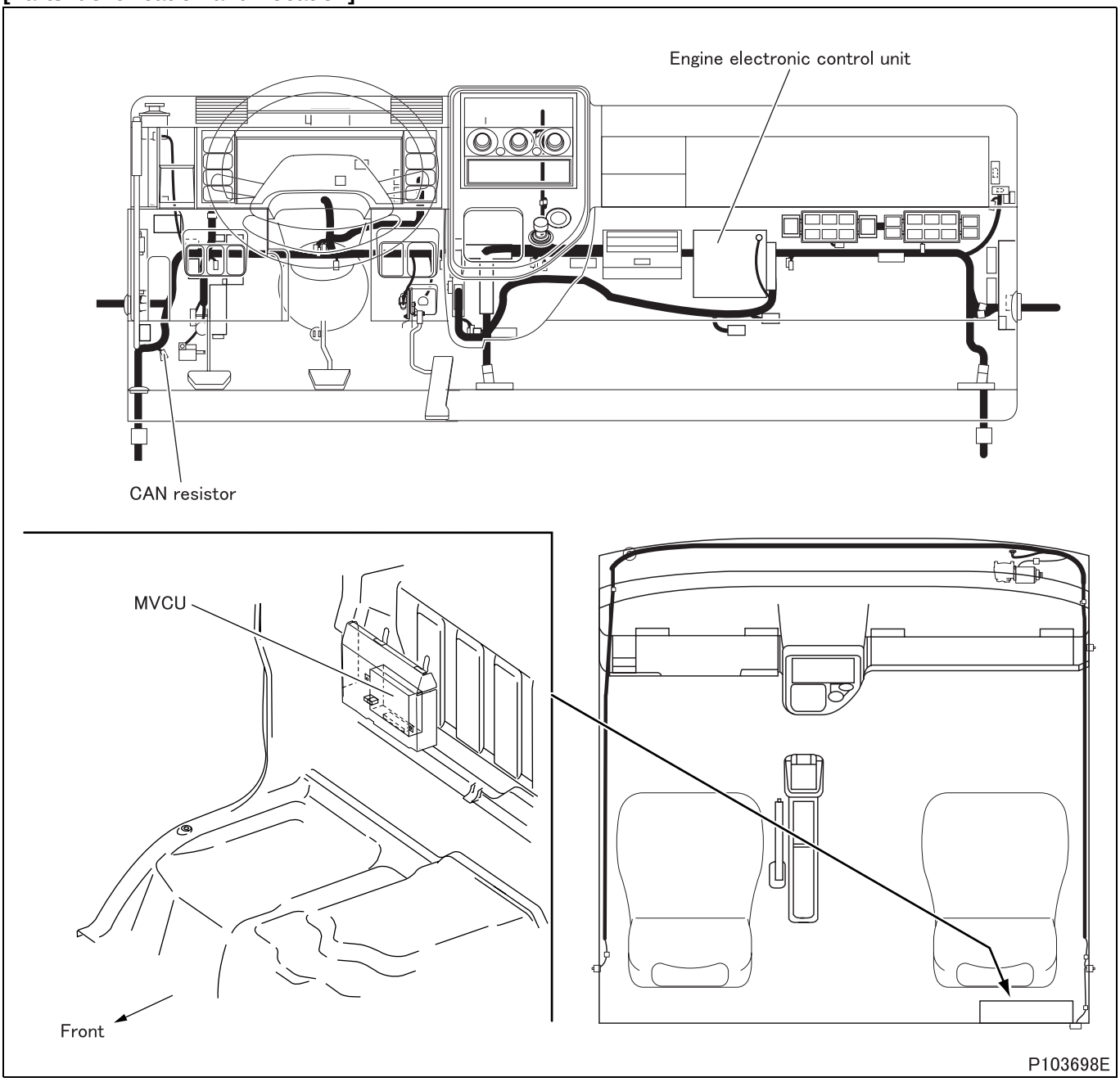
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and multifunction vehicle control unit
- Malfunction of each connector
- Malfunction of electronic control unit
- Malfunction of multifunction vehicle control unit

[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]



[Parts Identification and Location]



[Fault diagnosis]

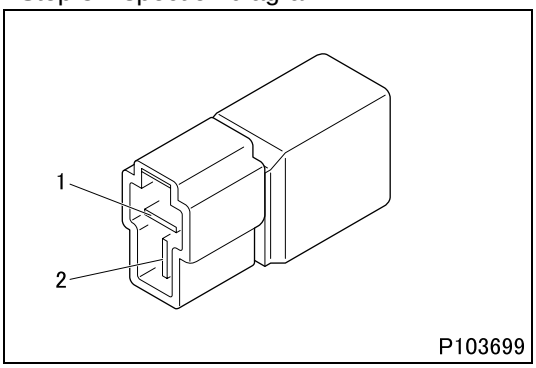
- Perform checks in the sequence of the following steps.

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	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		Remove connector and measure resistance.
	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 electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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 EEPOM (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.)

[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.)

[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, contact your nearest STERLING TRUCKS dealer or STERLING TRUCKS CORPORATION.)

[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.

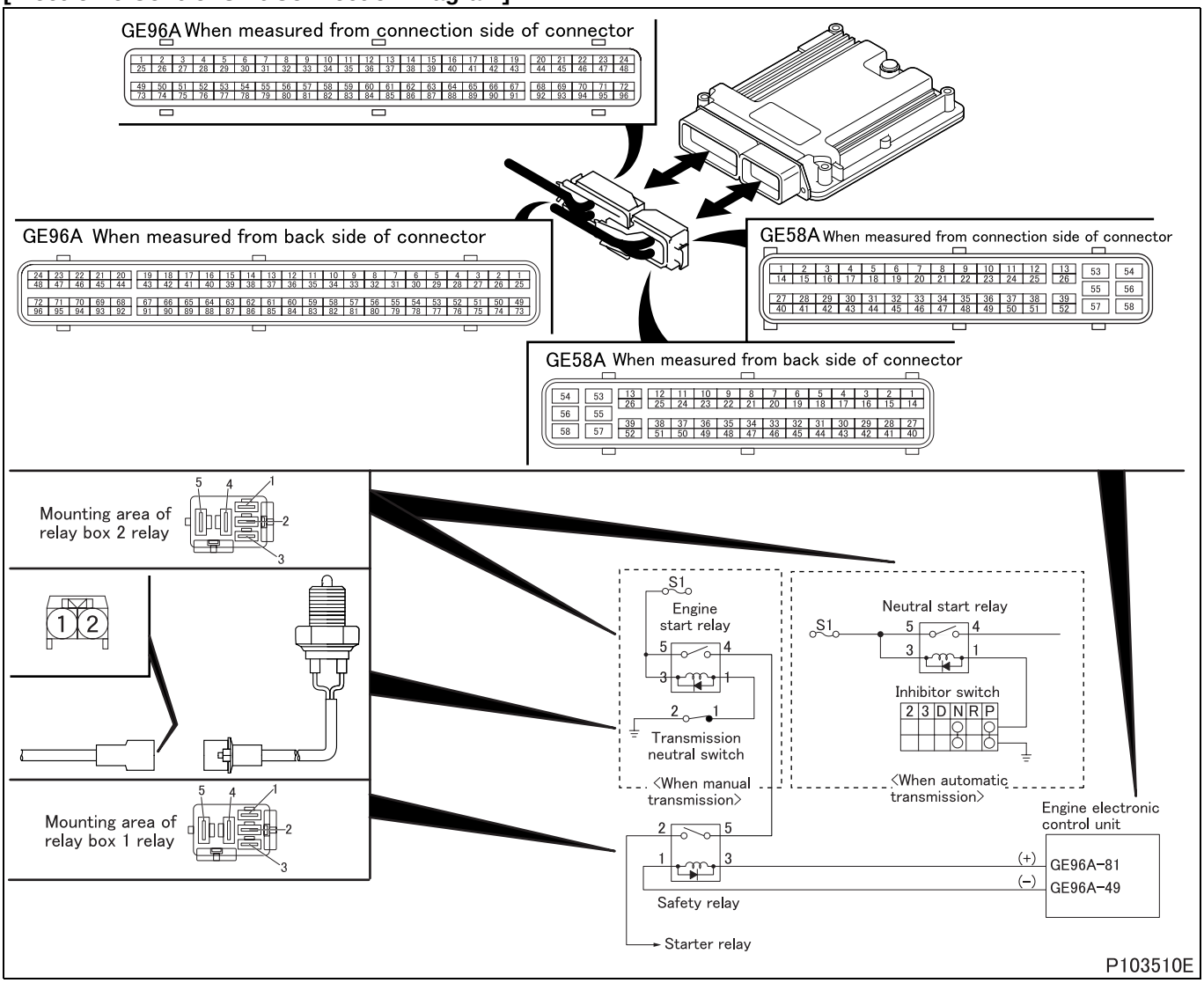
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Effects no special control.

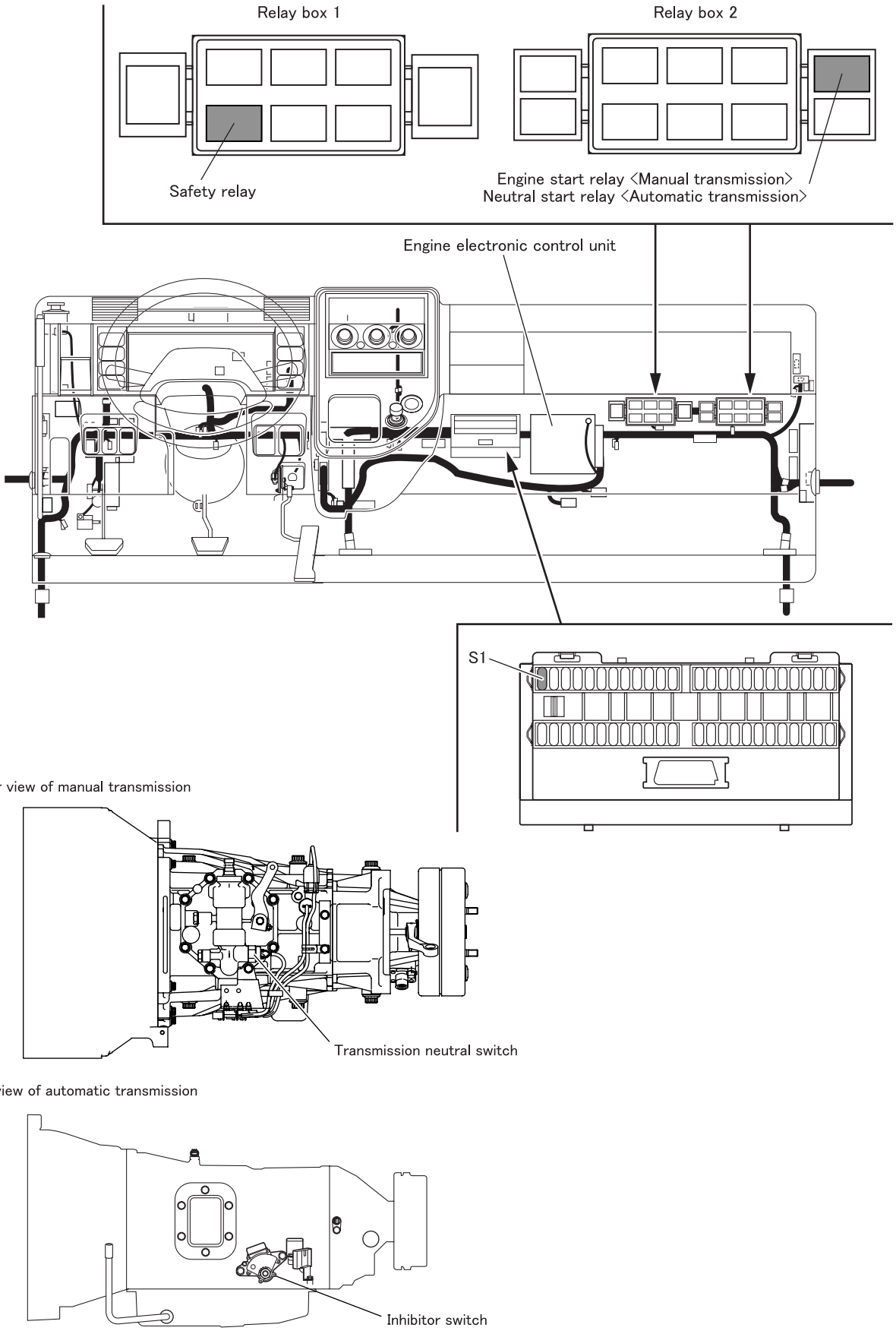
[Probable cause of trouble]
- Short-circuited harness between electronic control unit and safety relay
- Malfunction of each connector
- Malfunction of safety relay
- Malfunction of electronic control unit

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



P103636E

[Fault diagnosis]

- Perform checks in the sequence of the following steps.

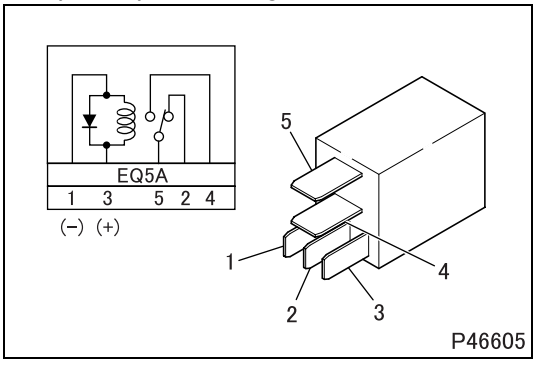
Step 1	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Check circuit between connector (GE96A) terminal No. 81 (+) and No. 49 (–).
	Inspection condition		Measure from back side of connector of harness with each device connected to harness.
	Requirements		There is continuity.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 2.
		NO	Go to step 3.

Step 2	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 7.
		NO	Modify connector.

Step 3	Inspection items		Inspection of relay connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Modify connector.

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	Go to step 5.
		NO	Replacement of relay

<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

[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.

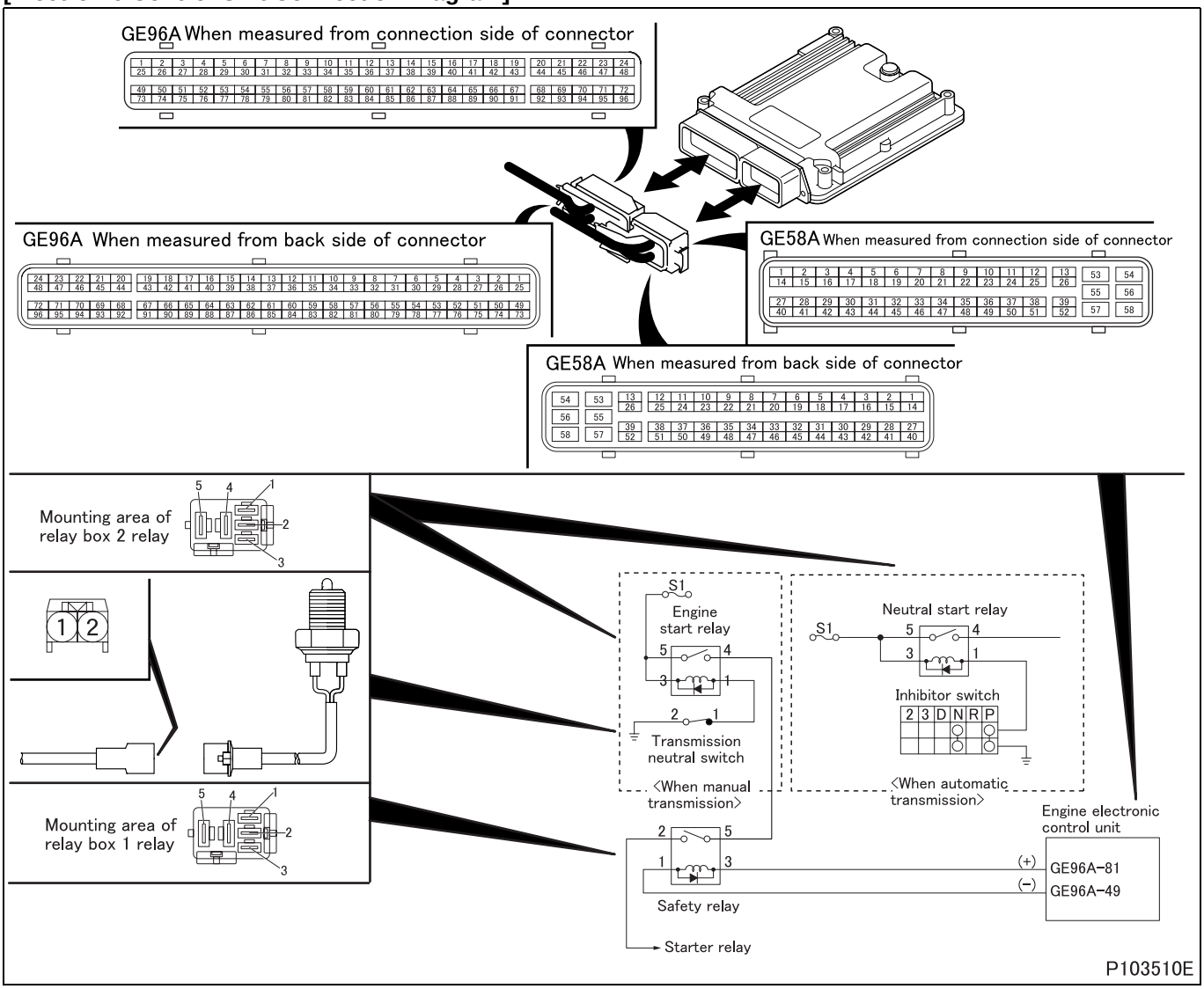
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Effects no special control.

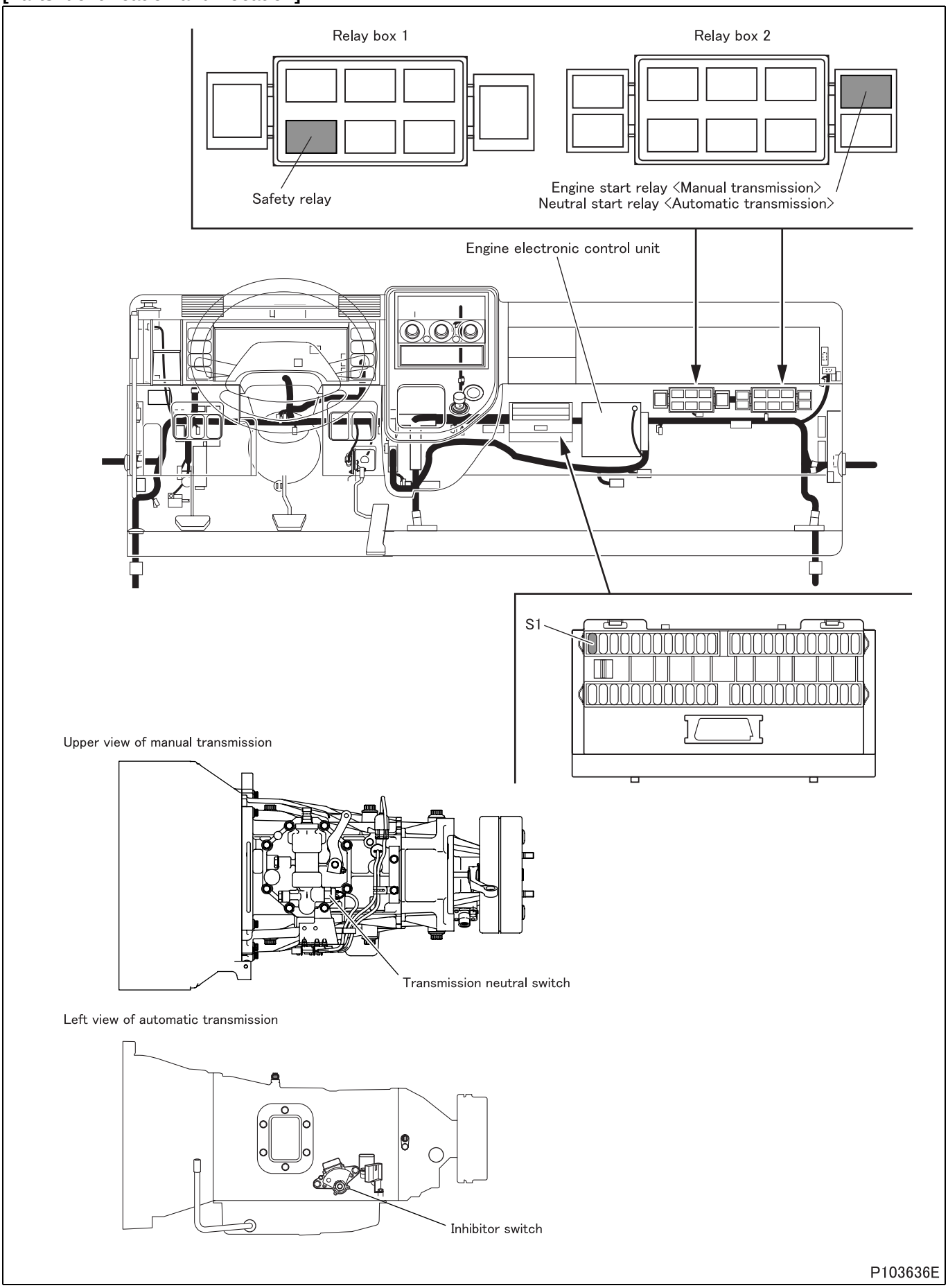
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and safety relay
- Malfunction of each connector
- Malfunction of safety relay
- Malfunction of electronic control unit

[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]



[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.

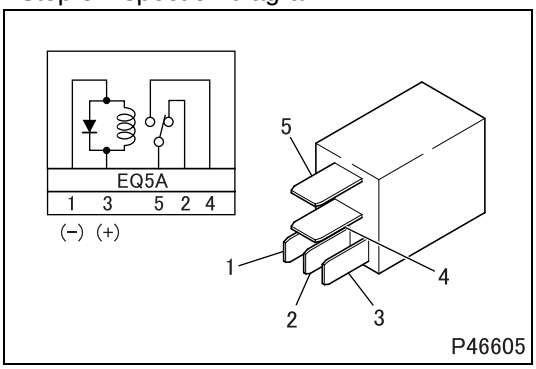
Step 2	Inspection items		Inspection by electronic control unit connector (power supply)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 81 (+) and 49 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Perform actuator test item No. AE “Starter Safety Relay”
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. 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.

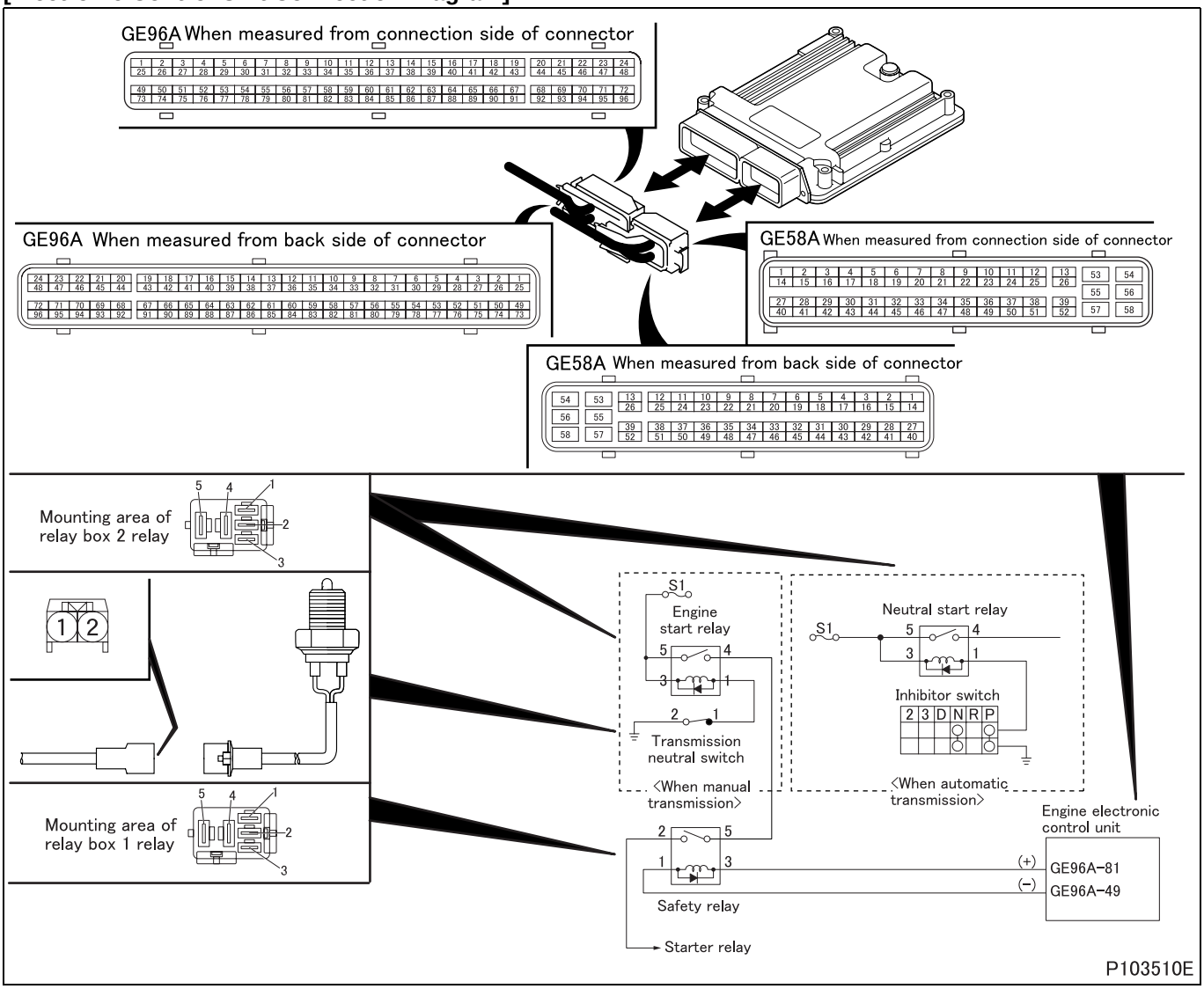
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Effects no special control.

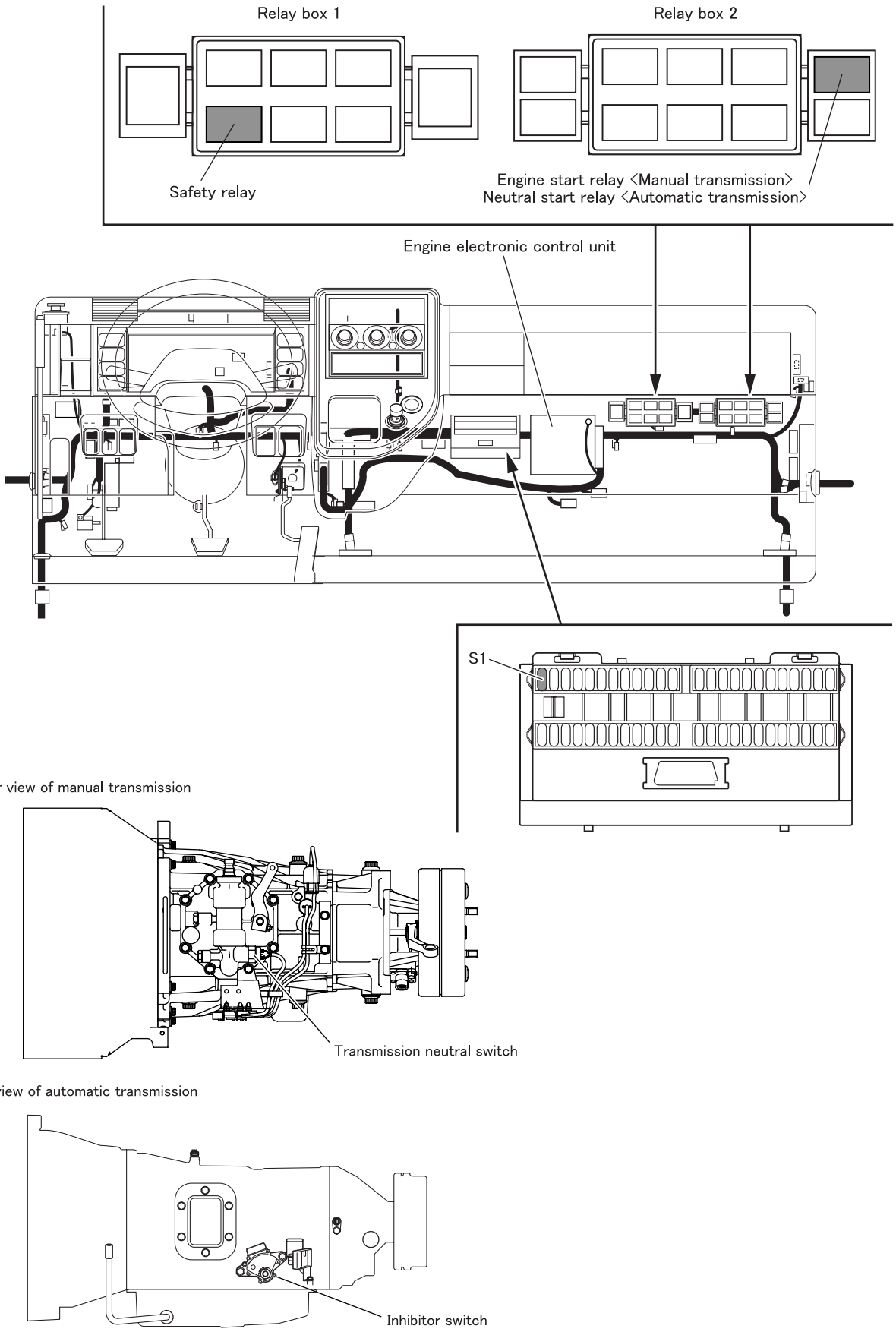
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and relay
- Malfunction of each connector
- Malfunction of safety relay
- Malfunction of electronic control unit

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



P103636E

[Fault diagnosis]

- Perform checks in the sequence of the following steps.

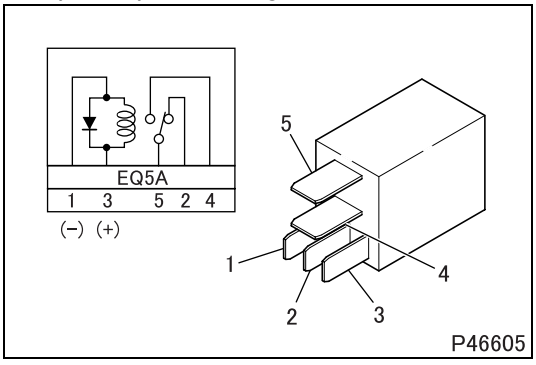
Step 1	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 49 and 81.
	Inspection condition		–
	Requirements		343 Ω or more
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 8.
		NO	Go to step 2.

Step 2	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		NO	Modify connector.

Step 3	Inspection items		Inspection of relay connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Modify connector.

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	Go to step 5.
		NO	Replacement of relay

<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

[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.)

[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.

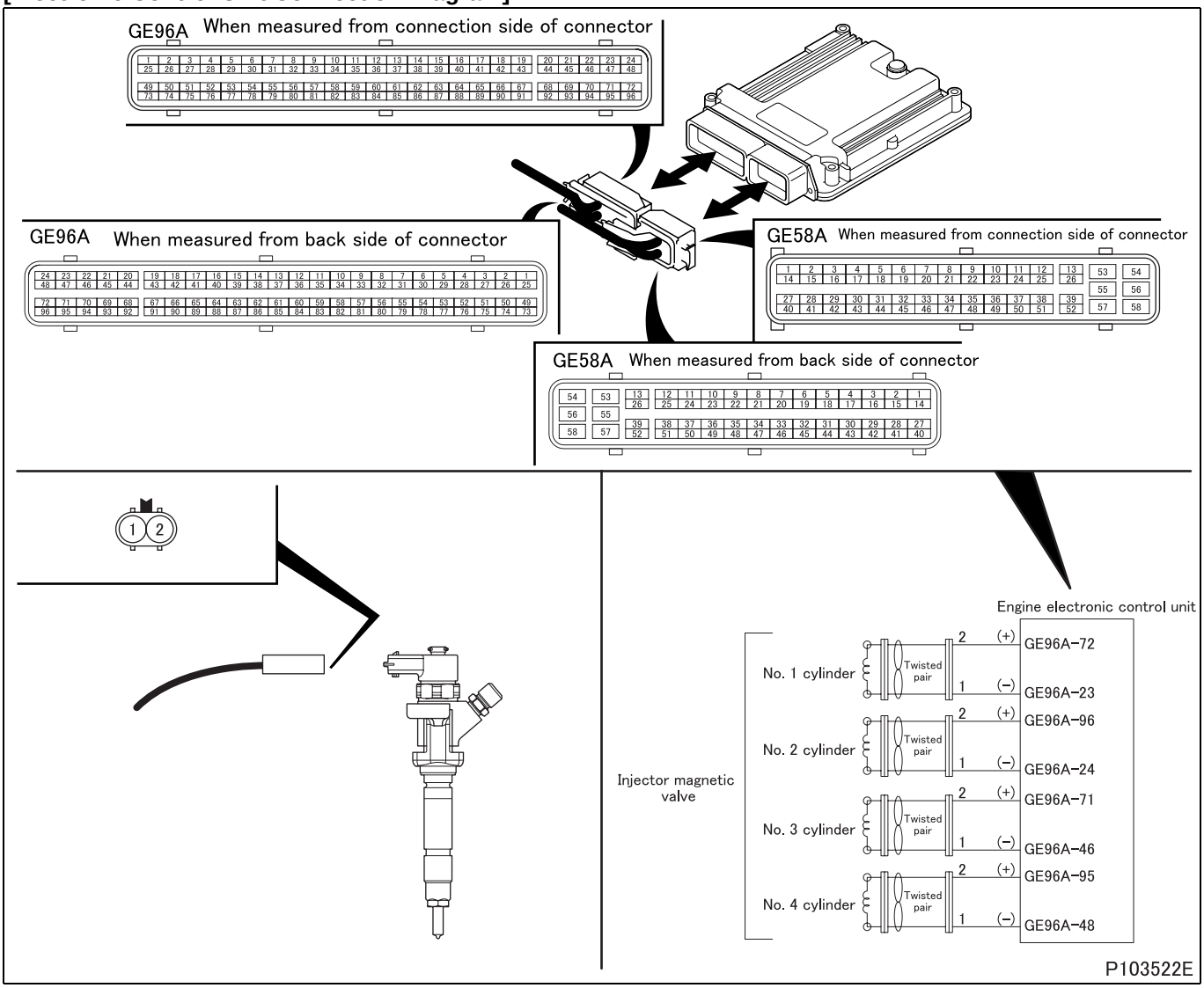
[Diagnostic requirement]
–

[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.

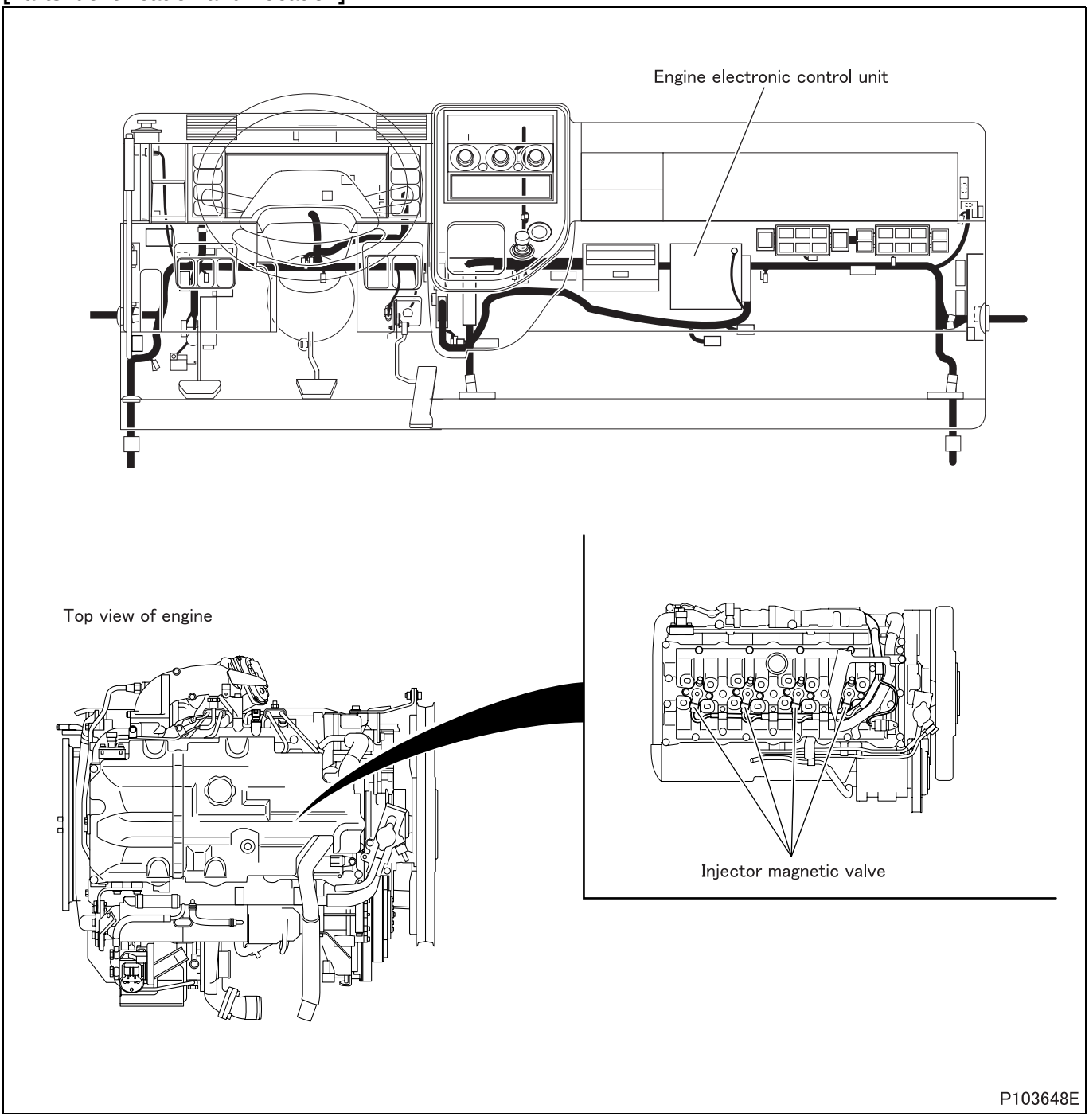
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valves
- Malfunction of each connector
- Malfunction of injector magnetic valves
- Malfunction of electronic control unit

[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]



[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 the following actuator tests. • Injector magnetic valve (No. 1 cylinder): Perform item No. BB “Injector Test 1”. • Injector magnetic valve (No. 3 cylinder): Perform item No. BE “Injector Test 4”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

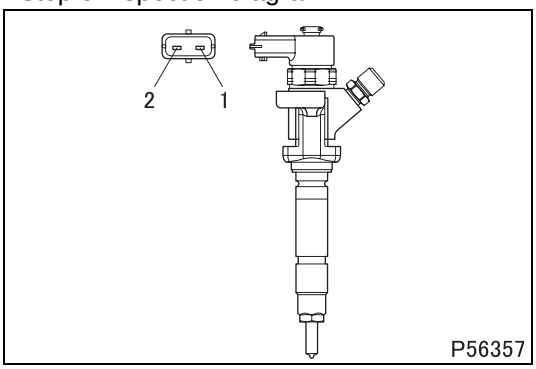
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between following connector (GE96A) terminals. • Injector magnetic valve (No. 1 cylinder): 72 (+) and 23 (–) • Injector magnetic valve (No. 3 cylinder): 71 (+) and 46 (–)
	Inspection 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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 following connector terminals. • Injector magnetic valve (No. 1 cylinder): magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 72 • Injector magnetic valve (No. 3 cylinder): 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 following connector terminals. • Injector magnetic valve (No. 1 cylinder): magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 23 • Injector magnetic valve (No. 3 cylinder): 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 the following actuator tests. • Injector magnetic valve (No. 1 cylinder): Perform item No. BB “Injector Test 1”. • Injector magnetic valve (No. 3 cylinder): Perform item No. BE “Injector Test 4”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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

[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.

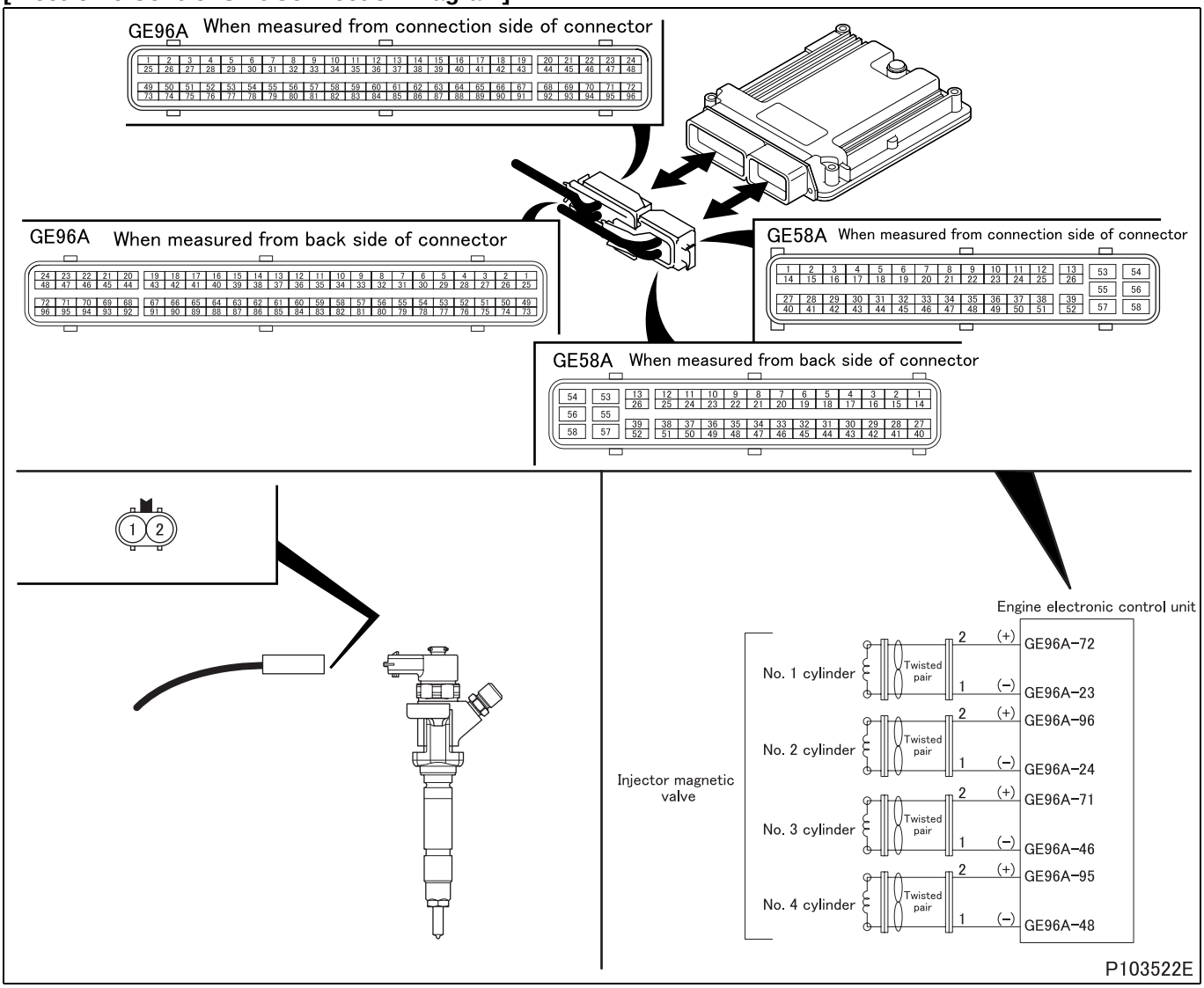
[Diagnostic requirement]
–

[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.

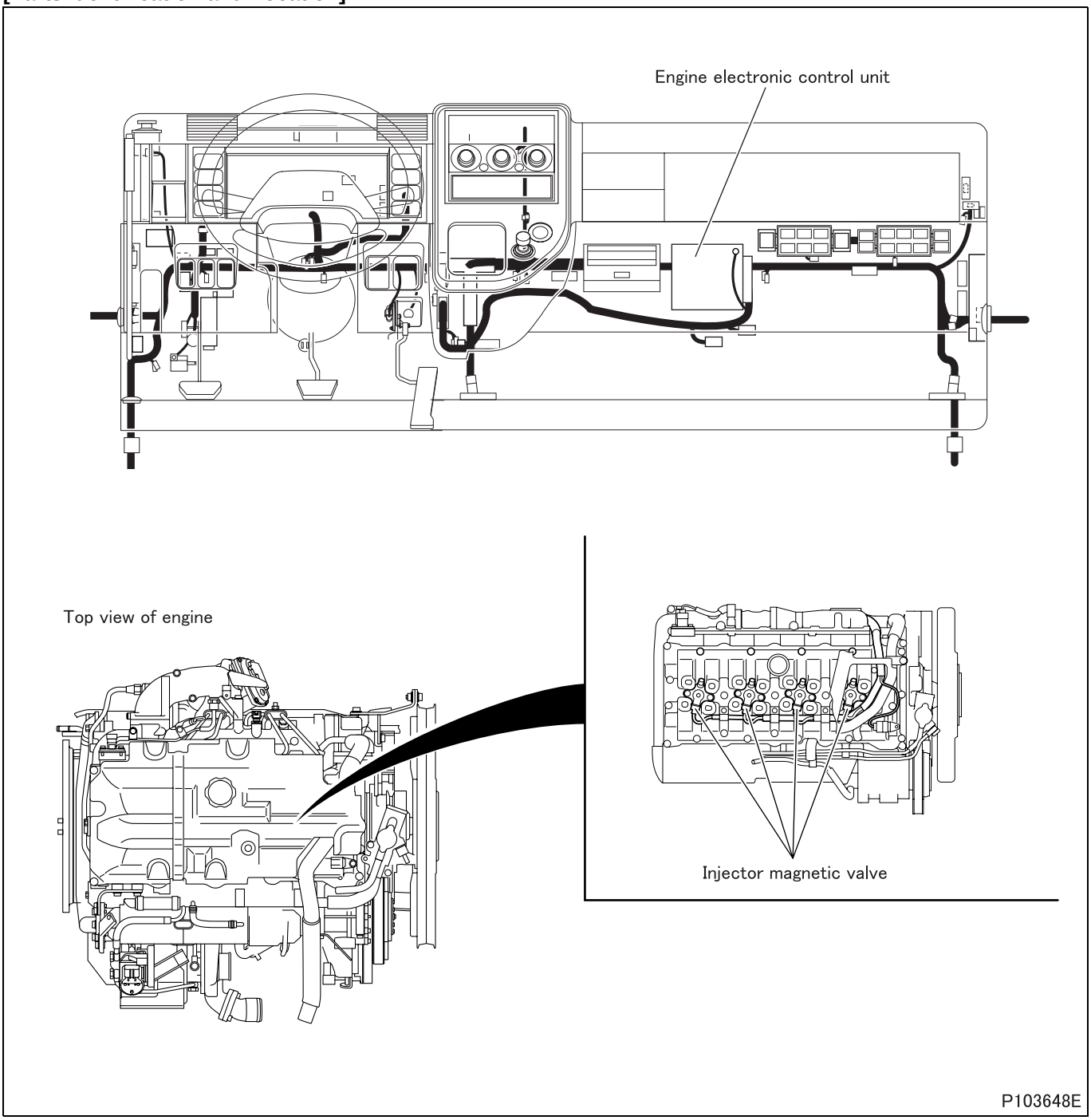
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valves
- Malfunction of each connector
- Malfunction of injector magnetic valves
- Malfunction of electronic control unit

[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]



[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 the following actuator tests. • Injector magnetic valve (No. 2 cylinder): Perform item No. BD “Injector Test 3”. • Injector magnetic valve (No. 4 cylinder): Perform item No. BC “Injector Test 2”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

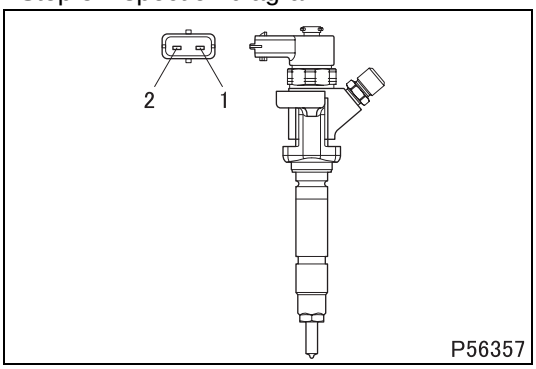
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between following connector (GE96A) terminals. • Injector magnetic valve (No. 2 cylinder): 96 (+) and 24 (–) • Injector magnetic valve (No. 4 cylinder): 95 (+) and 48 (–)
	Inspection 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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 following connector terminals. • Injector magnetic valve (No. 2 cylinder): magnetic valve connector terminal No. 2 and electronic control unit connector (GE96A) terminal No. 96 • Injector magnetic valve (No. 4 cylinder): 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 following connector terminals. • Injector magnetic valve (No. 2 cylinder): magnetic valve connector terminal No. 1 and electronic control unit connector (GE96A) terminal No. 24 • Injector magnetic valve (No. 4 cylinder): 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 the following actuator tests. • Injector magnetic valve (No. 2 cylinder): Perform item No. BD “Injector Test 3”. • Injector magnetic valve (No. 4 cylinder): Perform item No. BC “Injector Test 2”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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

[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.

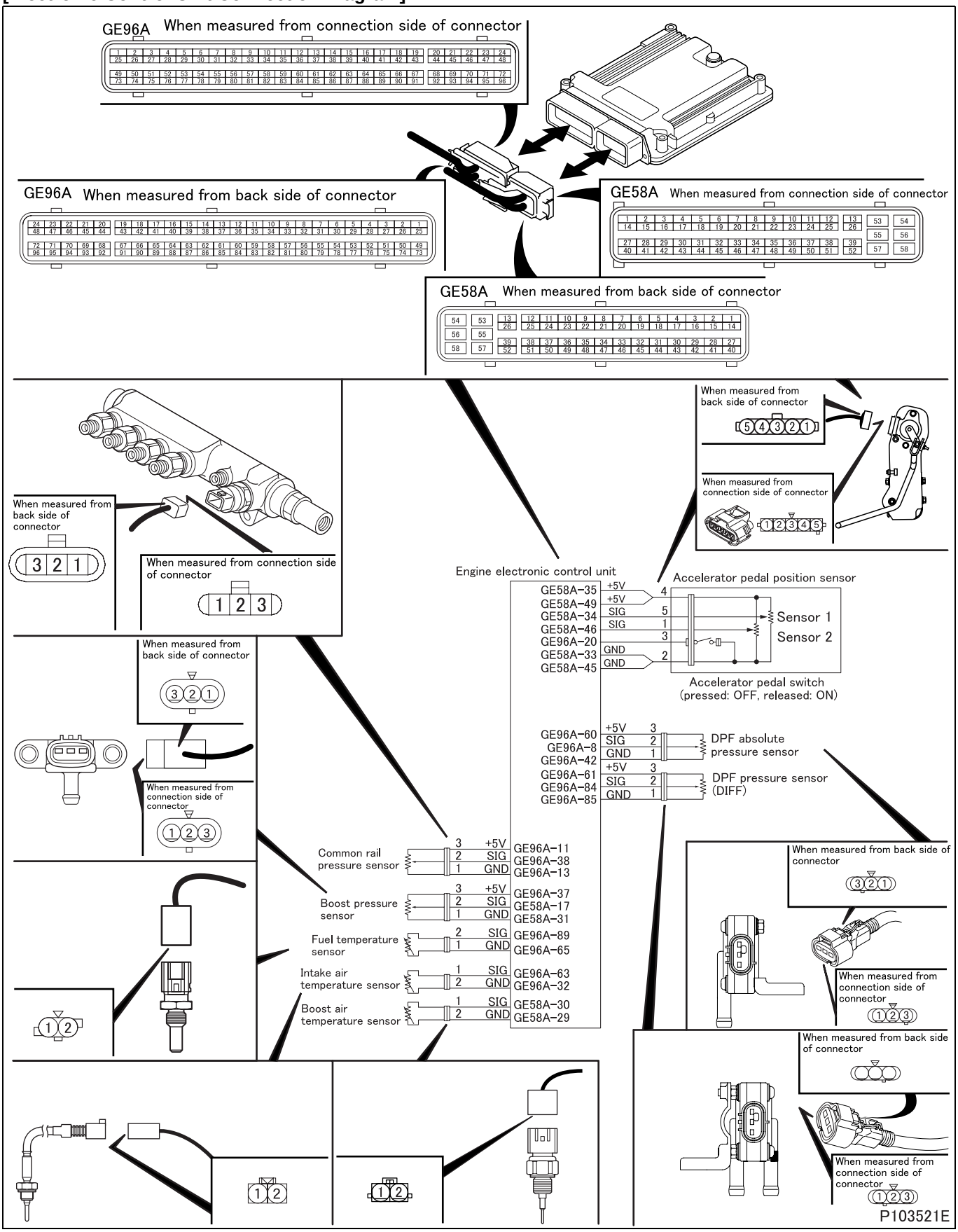
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Related fault check is stopped.

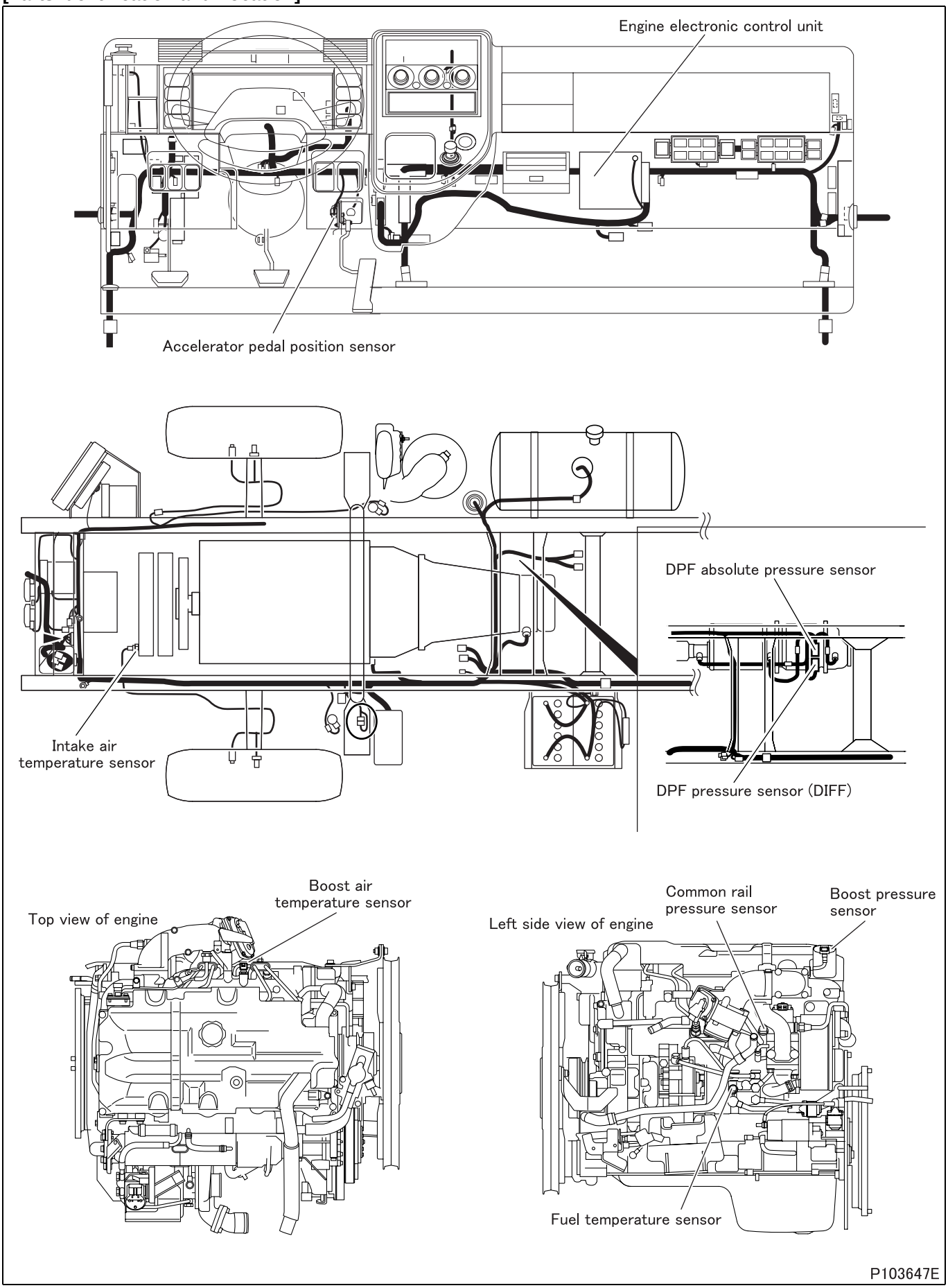
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and each sensor
- Malfunction of each connector
- Malfunction of each sensor
- Malfunction of electronic control unit

[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]



[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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

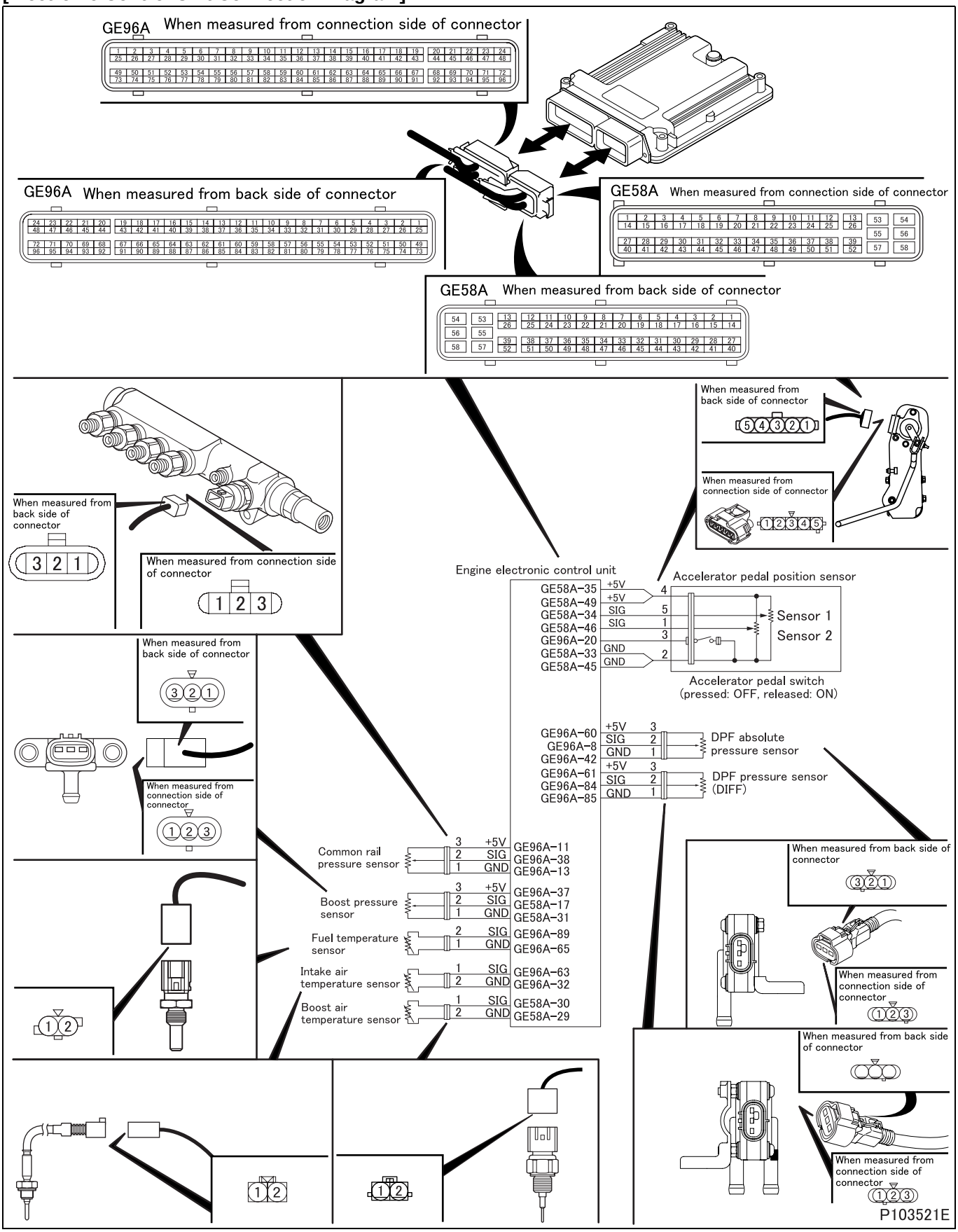
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Related fault check is stopped.

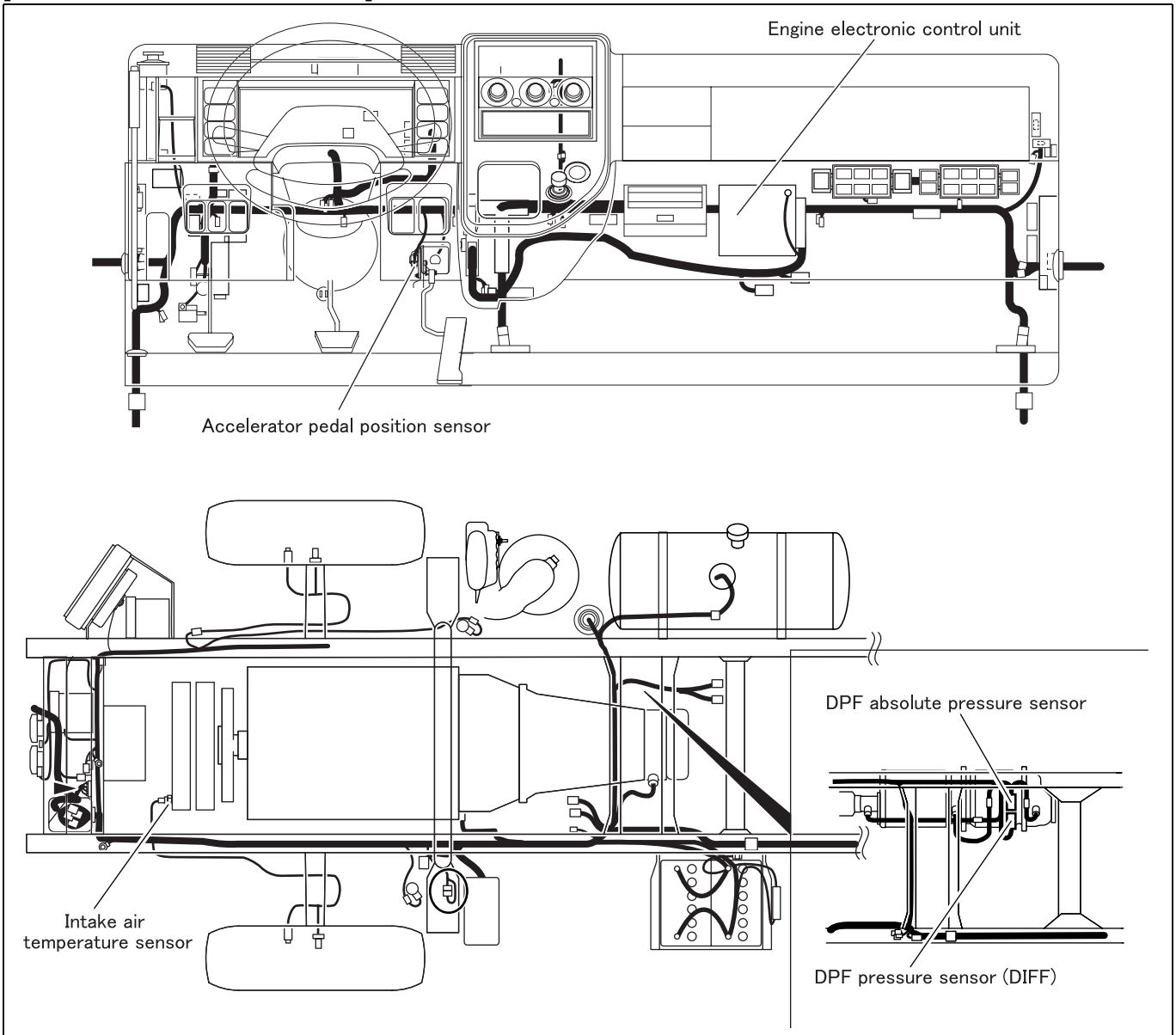
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and each sensor
- Malfunction of each connector
- Malfunction of each sensor
- Malfunction of electronic control unit

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



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[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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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: 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.

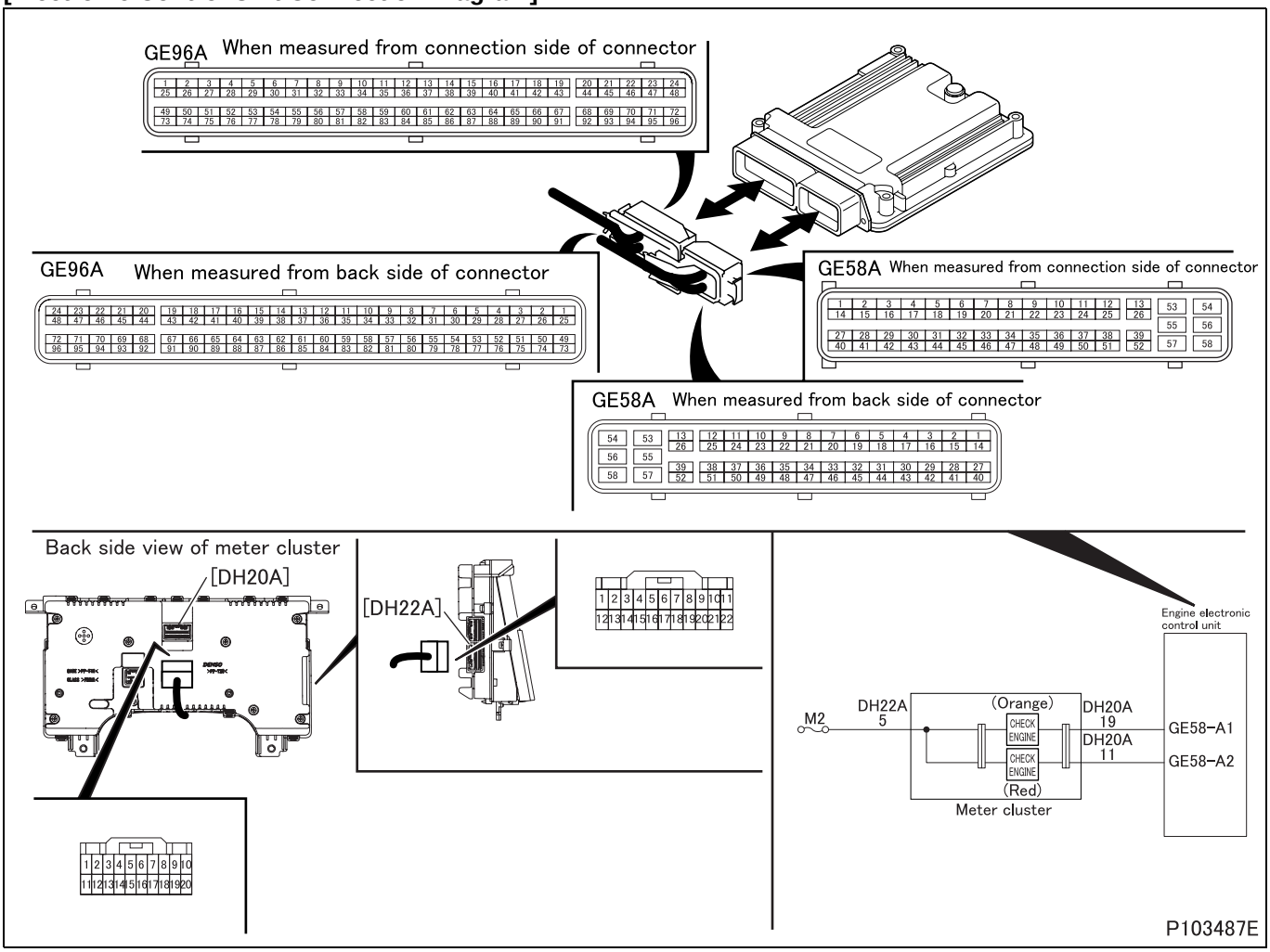
[Diagnostic requirement]
–

[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]



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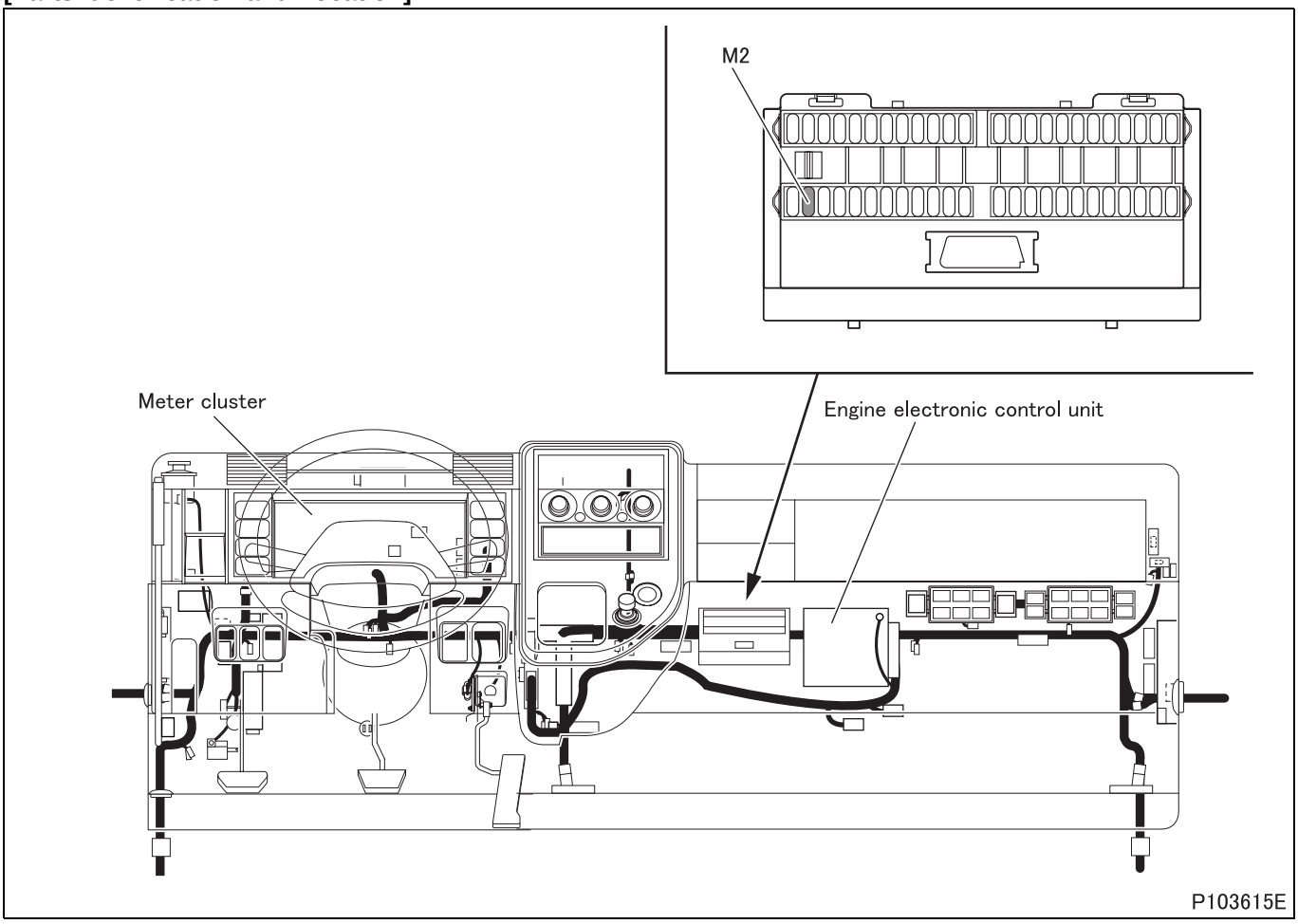


[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

Step 6	Inspection items		Inspection of meter cluster
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

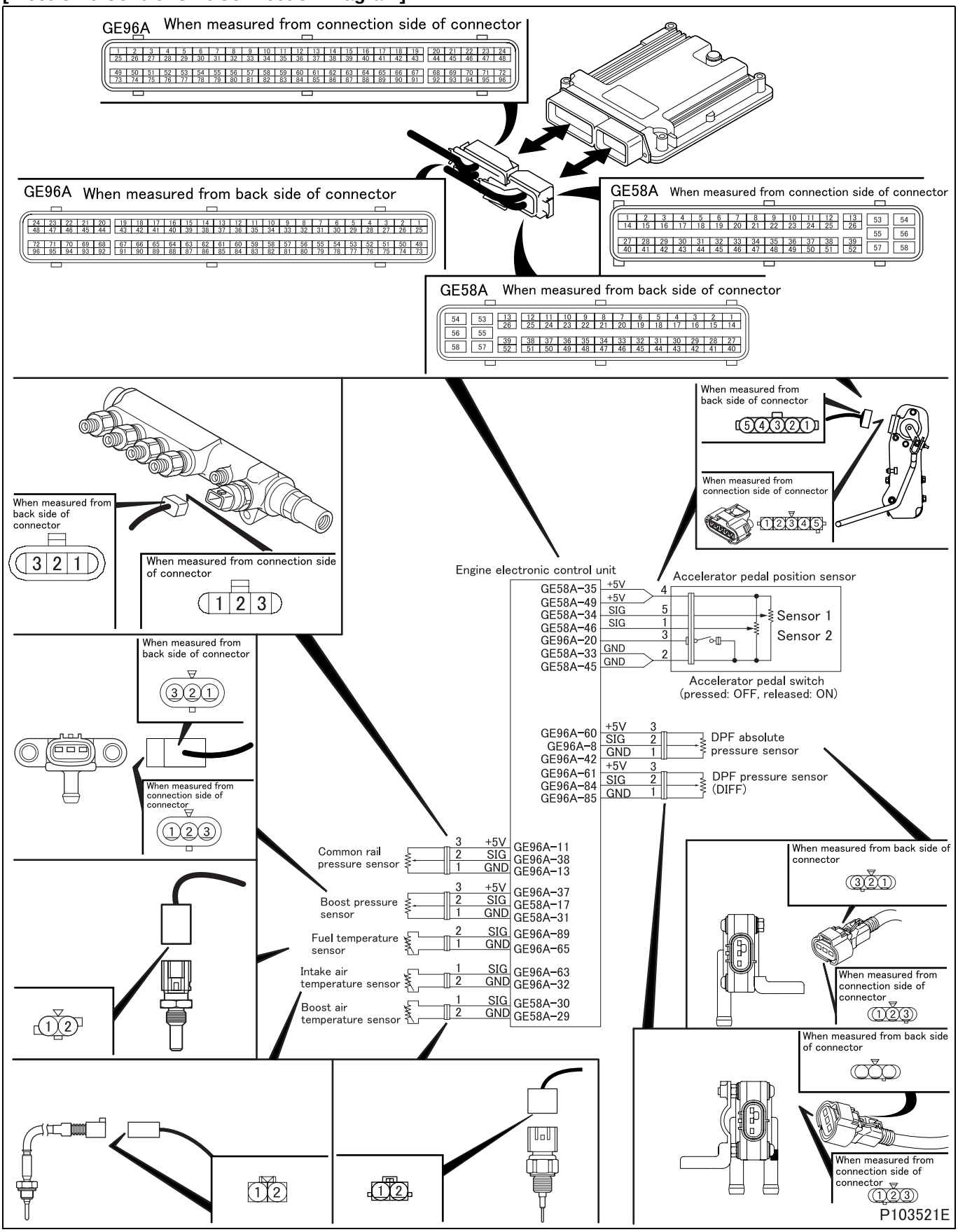
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Related fault check is stopped.

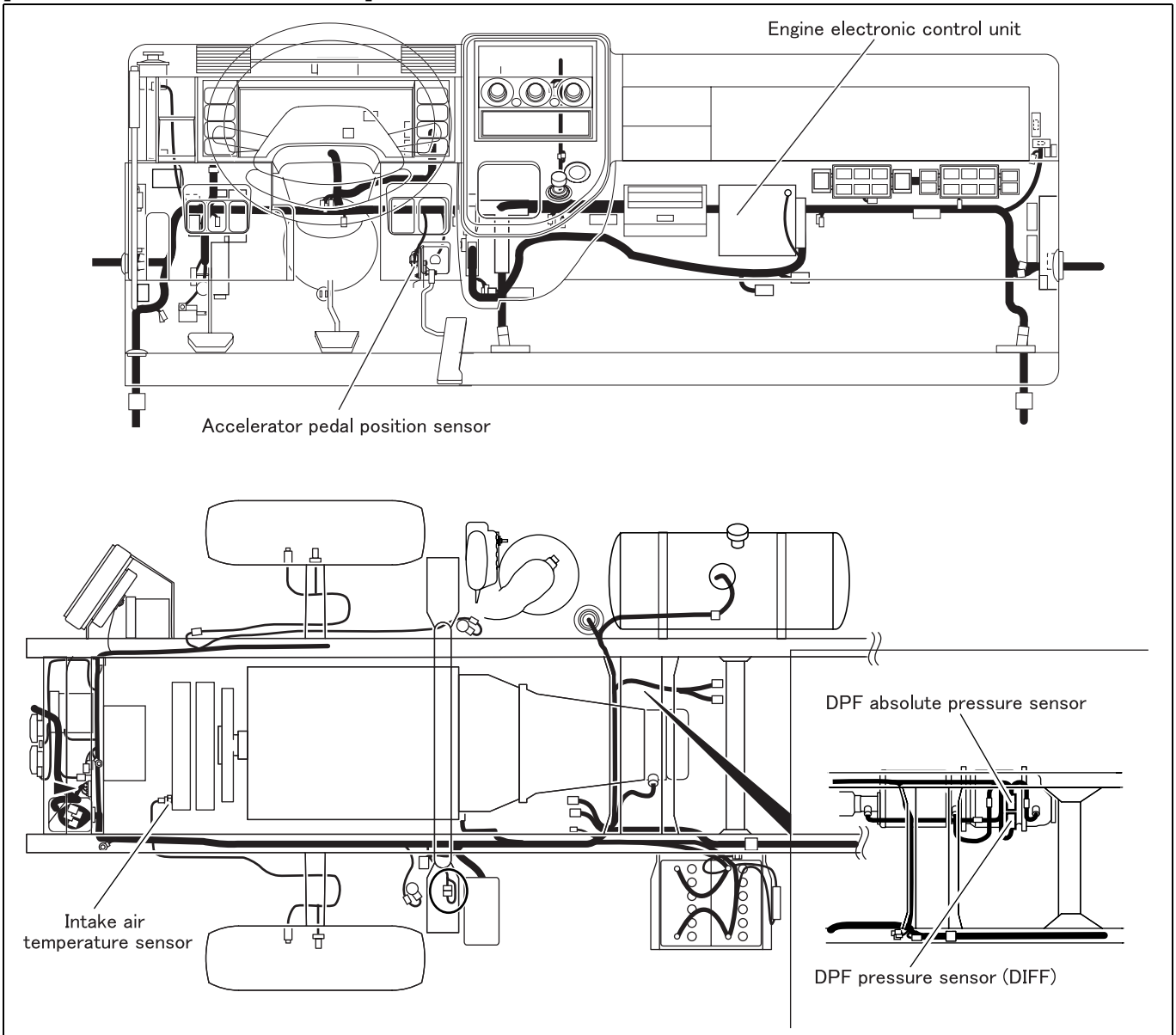
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and each sensor
- Malfunction of each connector
- Malfunction of each sensor
- Malfunction of electronic control unit

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



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[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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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: 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.

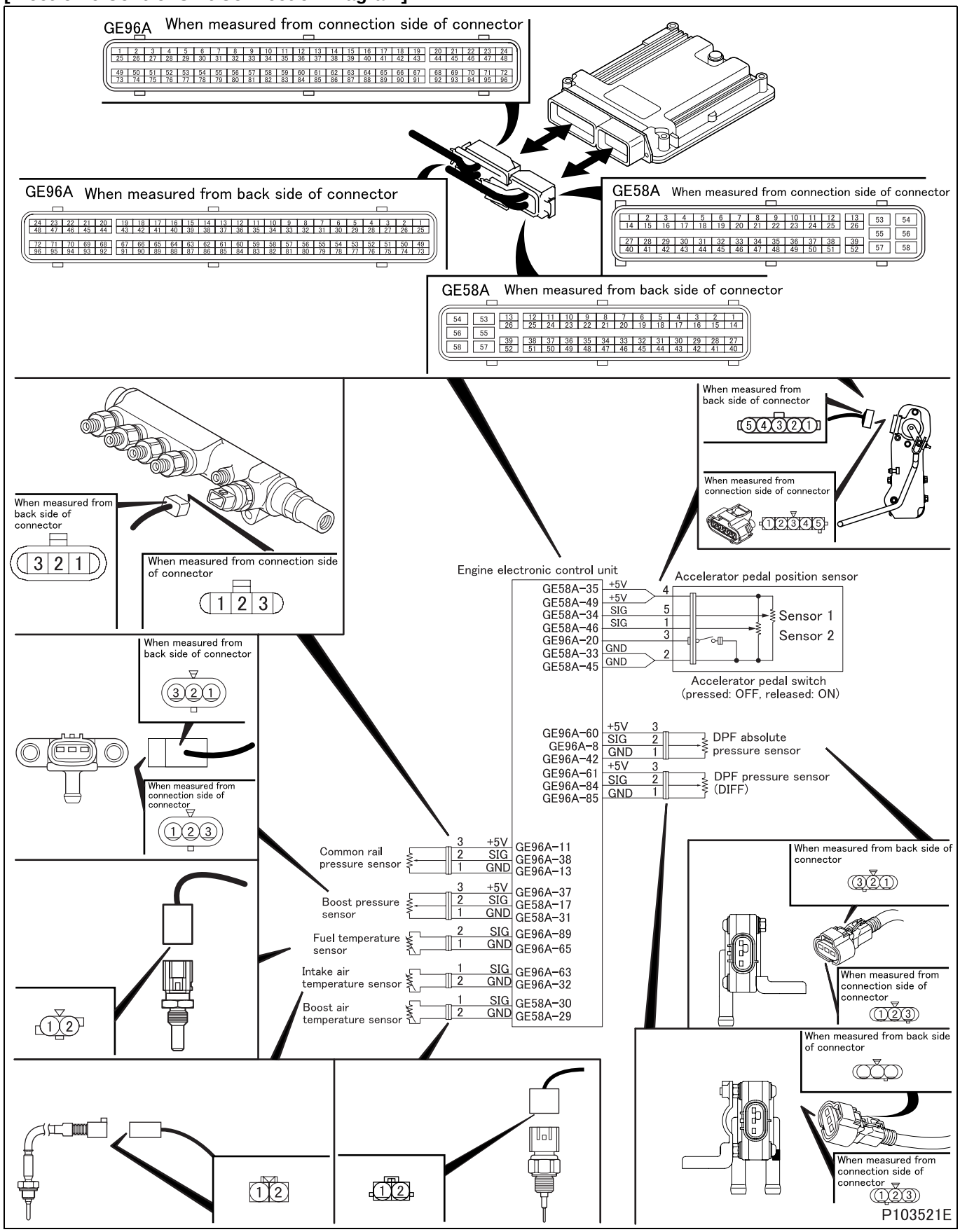
[Diagnostic requirement]
–

[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]



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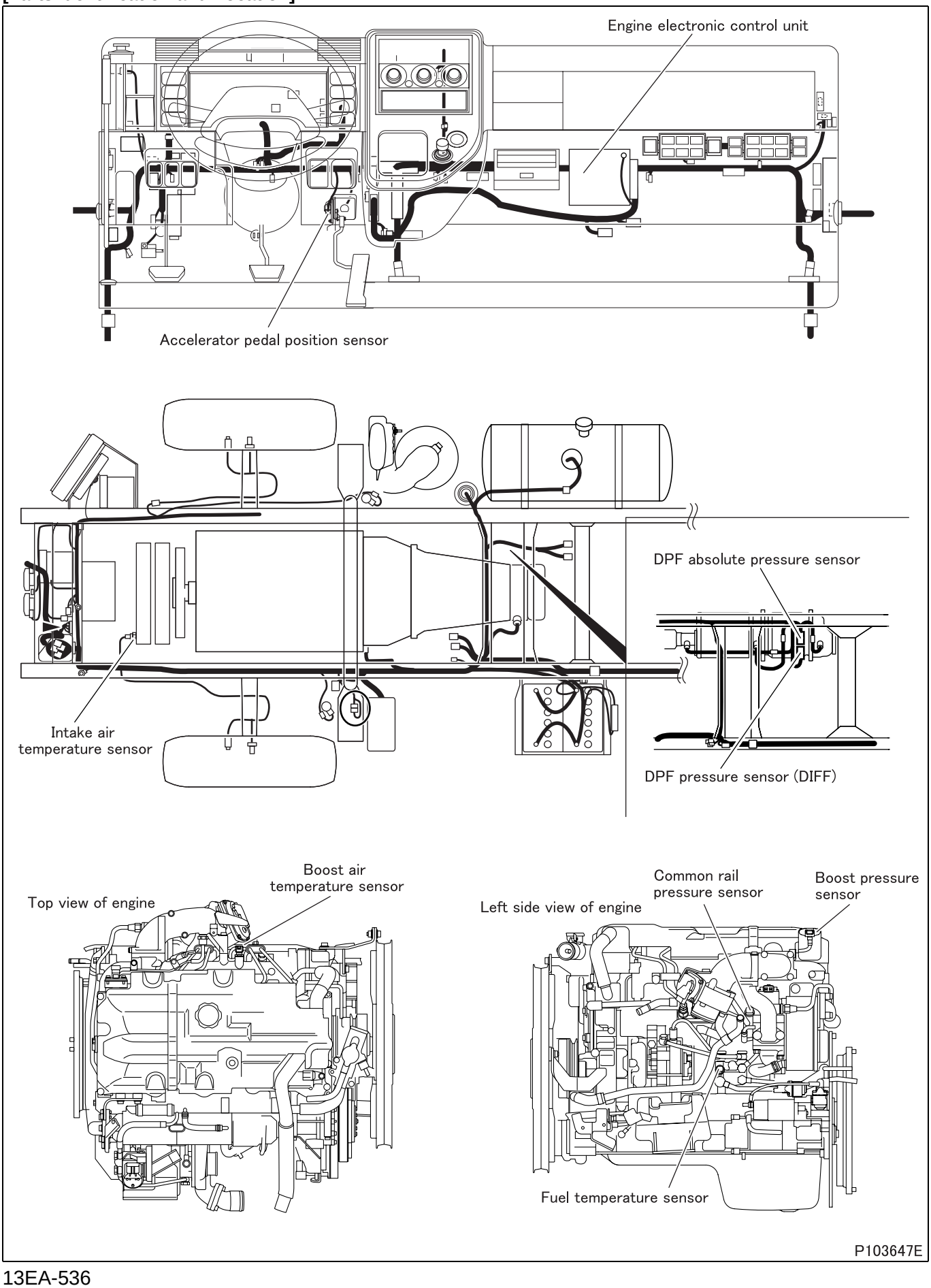


[Fault diagnosis]

- 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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 3-way magnetic valve circuit is monitored for fault.

[Code generation condition]
- Exhaust shutter 3-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.

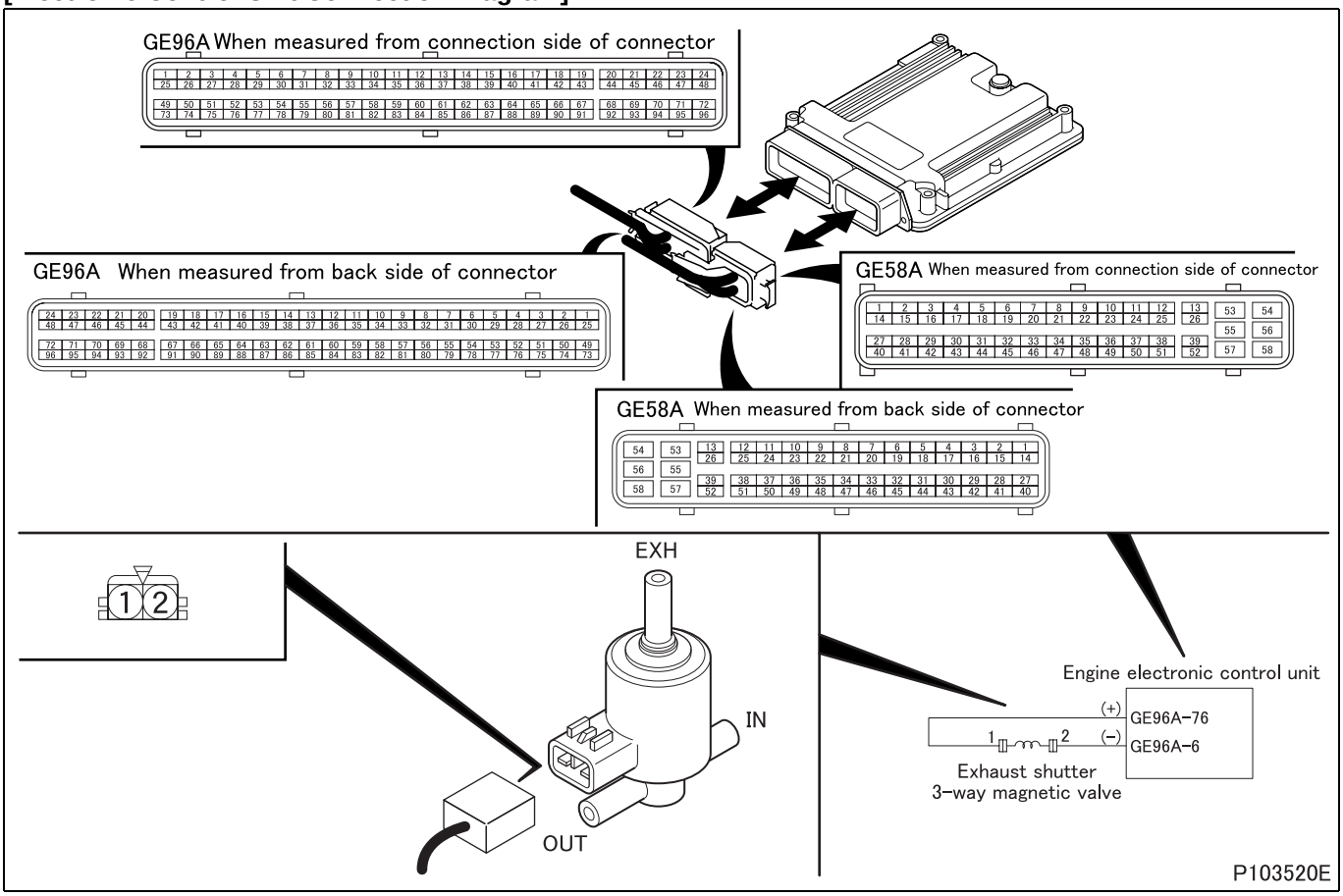
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Exhaust shutter 3-way magnetic valve is turned off.

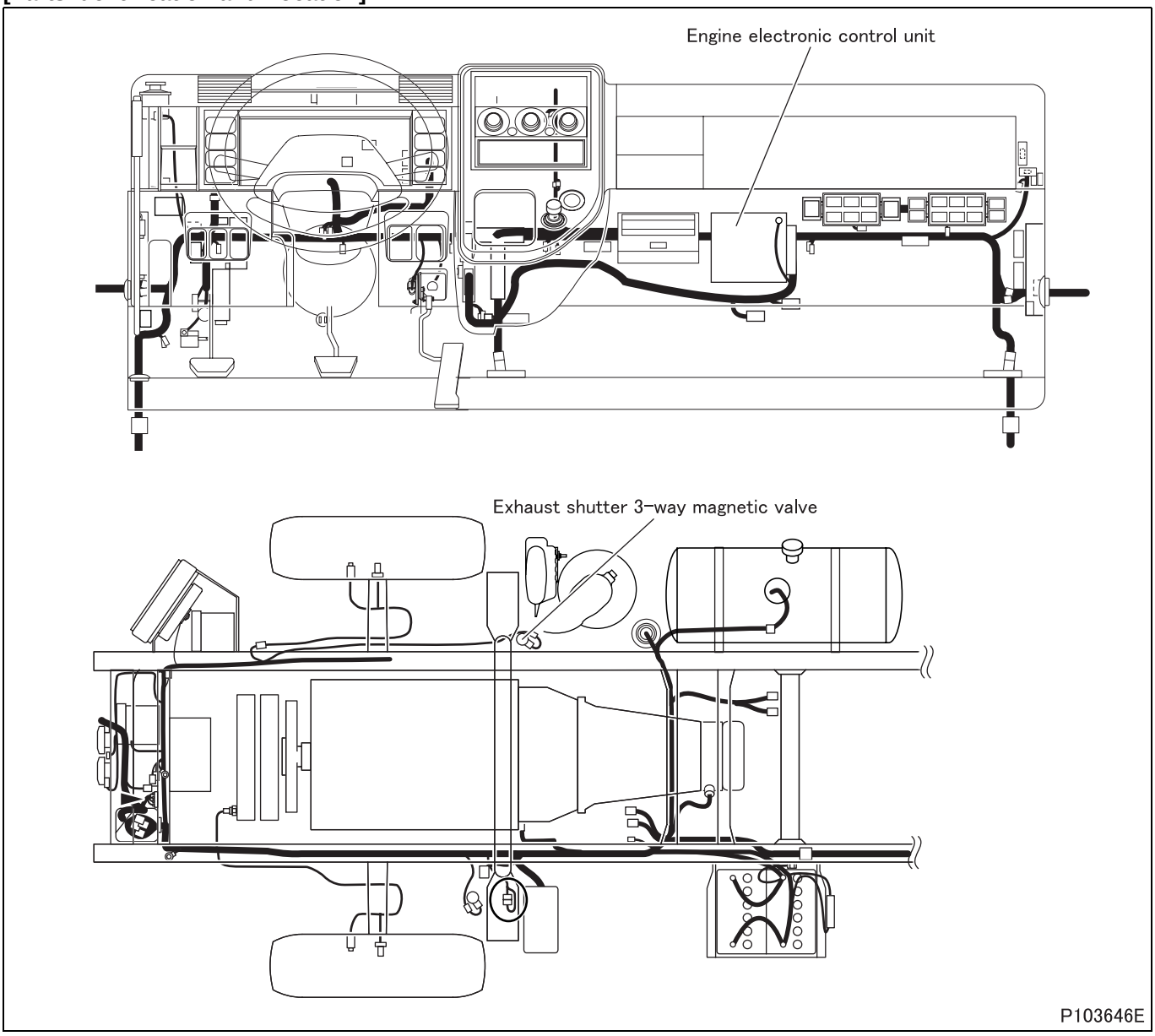
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and exhaust shutter 3-way magnetic valve
- Malfunction of each connector
- Malfunction of exhaust shutter 3-way magnetic valve
- Malfunction of electronic control unit

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[Fault diagnosis]

- Perform checks in the sequence of the following steps.

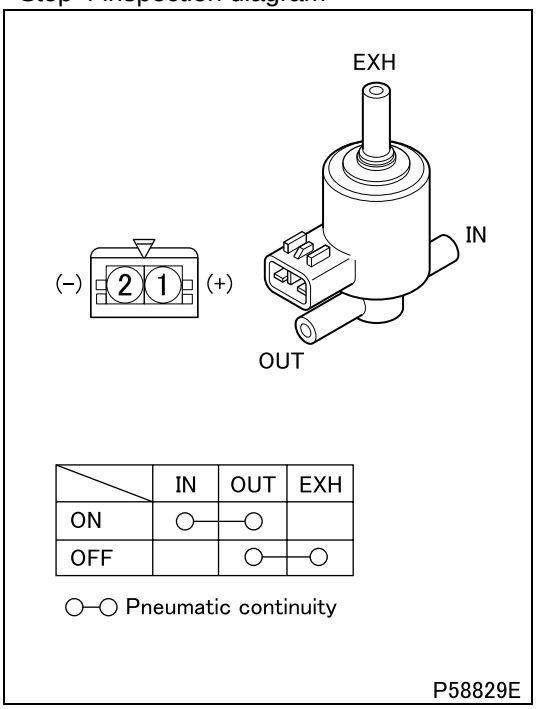
Step 1	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 6 and 76.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		NO	Modify connector.

Step 3	Inspection items		Inspection of 3-way magnetic valve connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Modify connector.

Step 4	Inspection items		Inspection of 3-way magnetic valve unit
	Maintenance item		Measure minimum operating voltage when 3-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	Go to step 5.
		NO	Replacement of 3-way magnetic valve

<Step 4 inspection diagram>



Step 5	Inspection items		Inspection of harness between exhaust shutter 3-way magnetic valve and electronic control unit (power supply)
	Maintenance item		Check circuit between exhaust shutter 3-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	Go to step 6.
		NO	Modify harness.

Step 6	Inspection items		Inspection of harness between exhaust shutter 3-way magnetic valve and electronic control unit (power supply)
	Maintenance item		Check circuit between exhaust shutter 3-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	Go to step 7.
		NO	Modify harness.

Step 7	Inspection items		Inspection of harness between exhaust shutter 3-way magnetic valve and electronic control unit (ground)
	Maintenance item		Check circuit between exhaust shutter 3-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		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: 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.

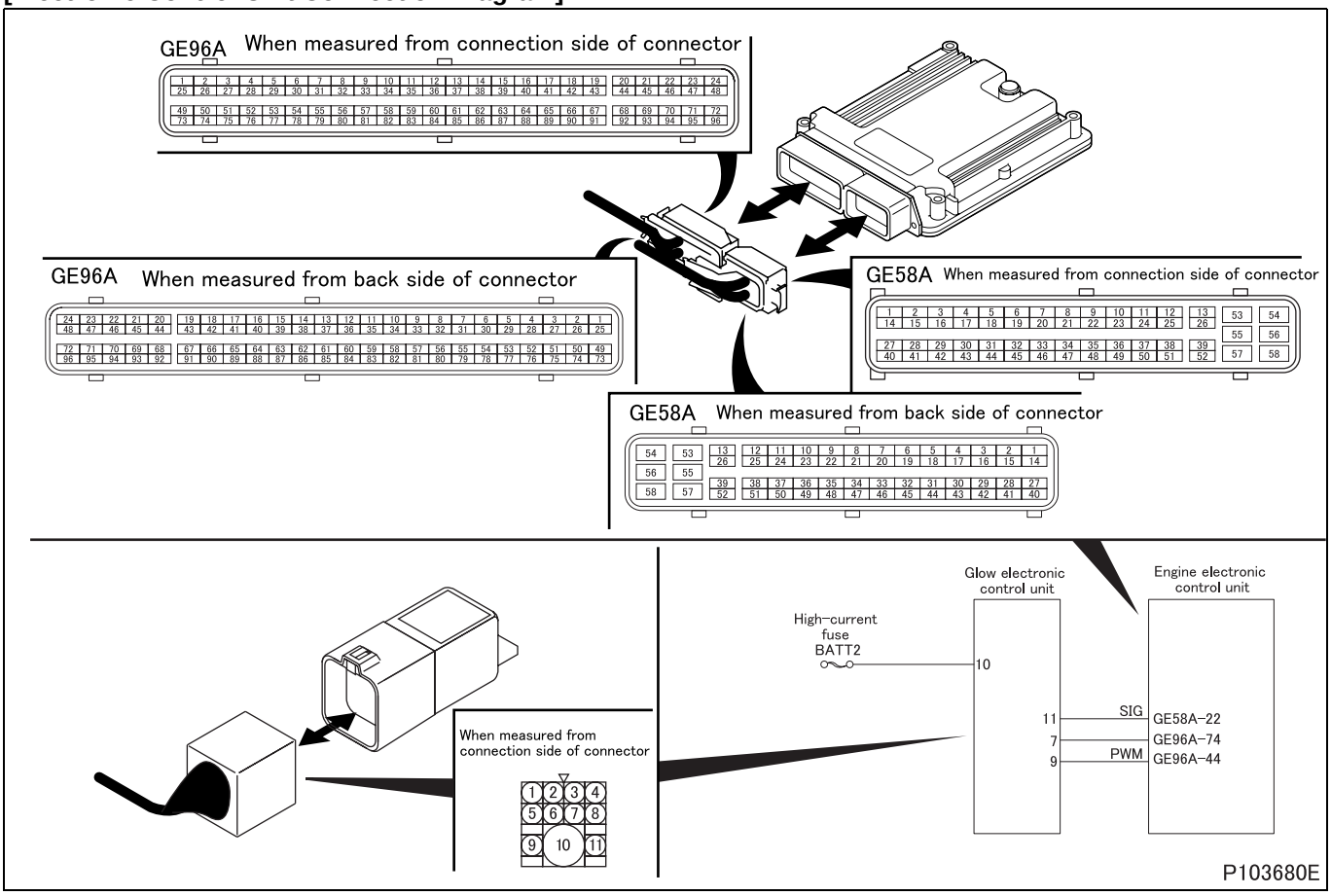
[Control effected by electronic control unit during fault]
Electronic control unit varies in the way of control by the status of warning lamp.
<Warning lamp (orange) lit>
- Effects no special control.

<Warning lamp extinguished (diagnosis code only)>
- Related fault check is stopped.

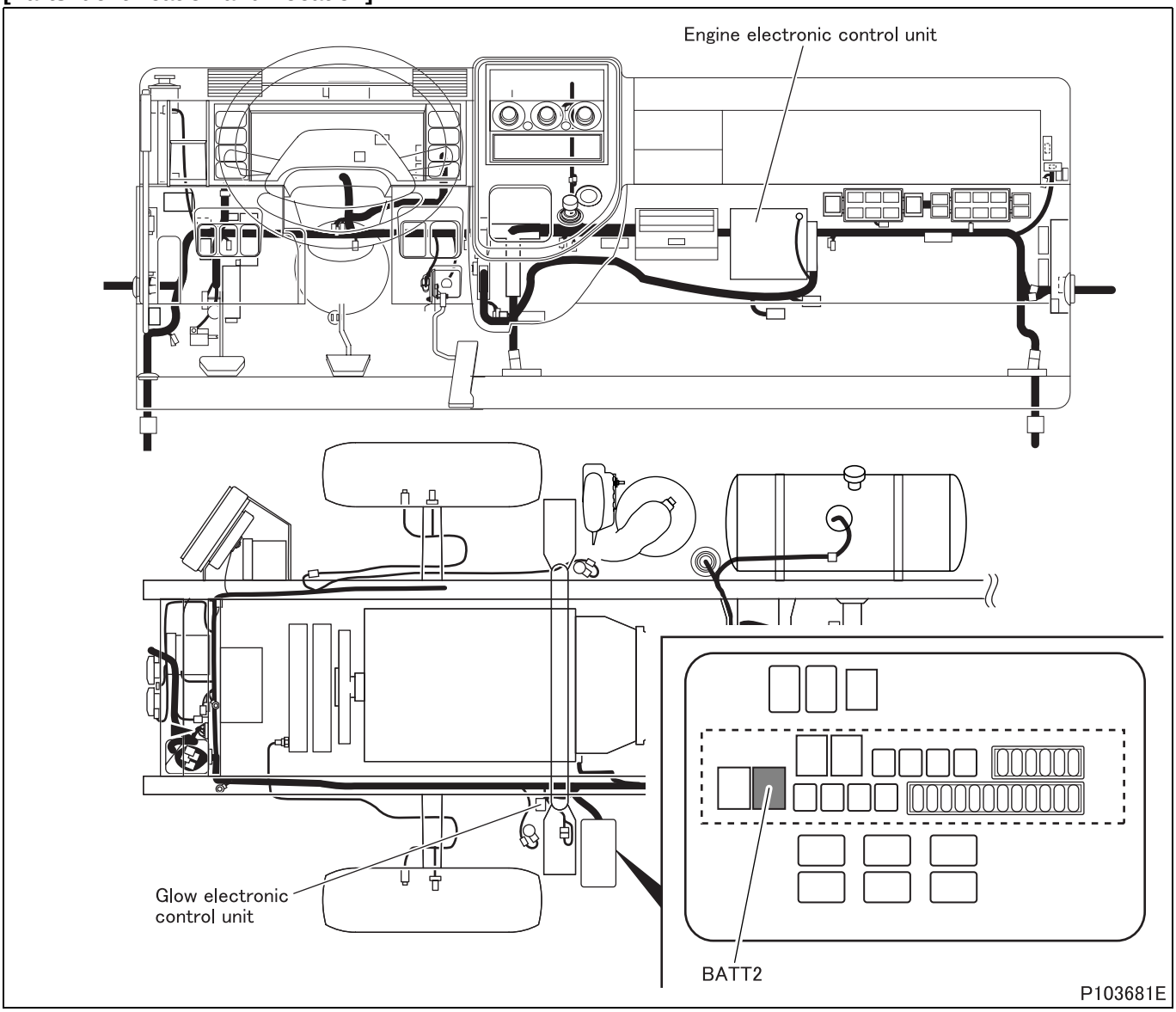
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between glow electronic control unit and high-current fuse (BATT2)
- Blown high-current fuse (BATT2)
- Malfunction of each connector
- Malfunction of glow electronic control unit

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[Fault diagnosis]

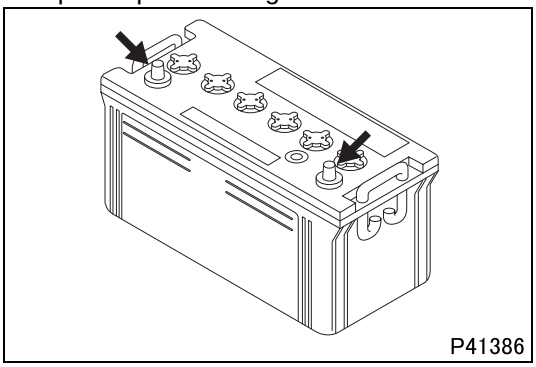
- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection 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	Go to step 2.
		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	Go to step 3.
		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	Go to step 4.
		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. • Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22 • Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74 • Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) 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 5.
		NO	Modify harness.

Step 5	Inspection items		Inspection of glow electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of engine electronic control unit
		NO	Modify connector.

[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.

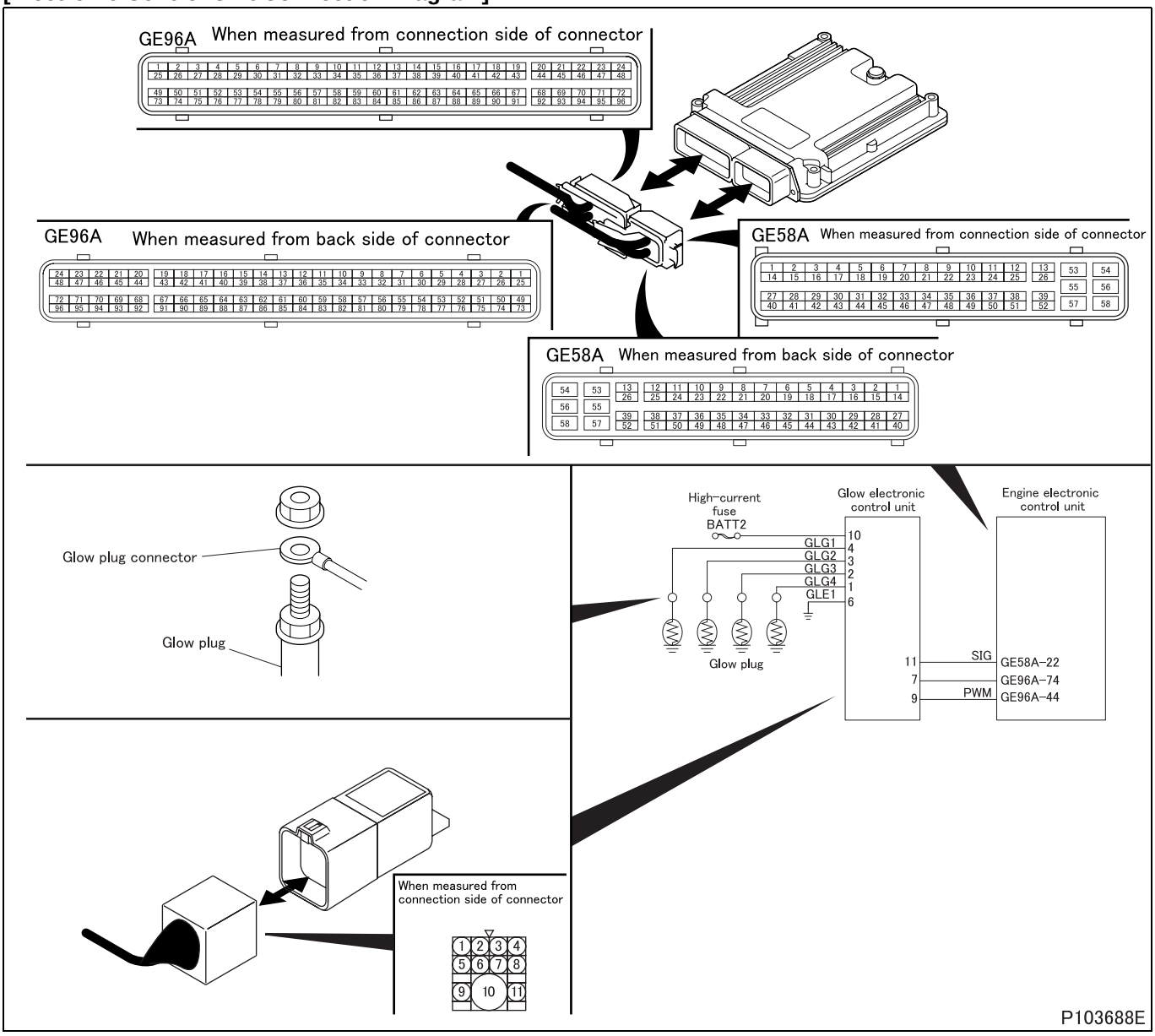
[Diagnostic requirement]
- Glow electronic control unit operating voltage: higher than 8 V

[Control effected by electronic control unit during fault]
- Effects no special control.

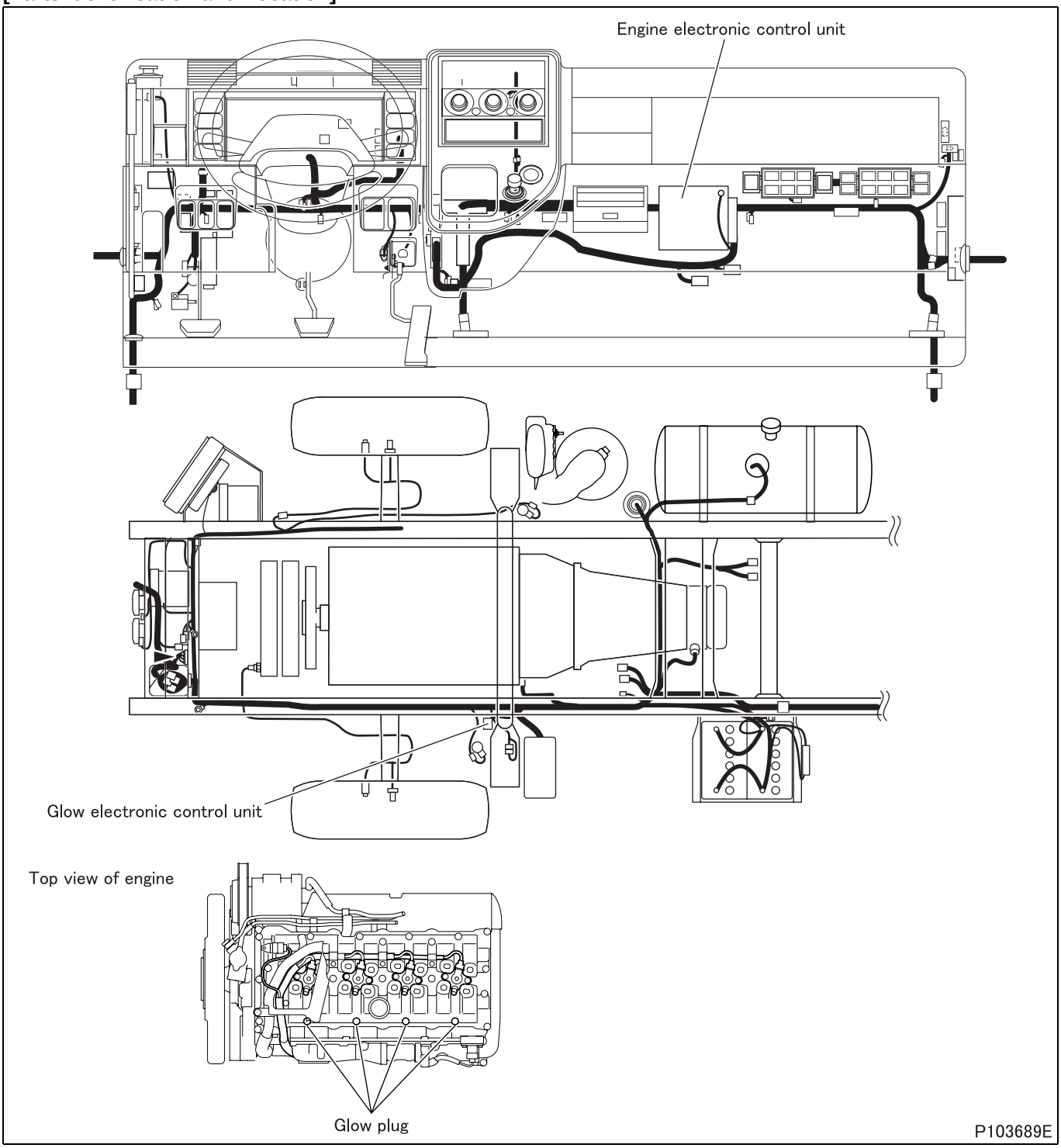
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between glow electronic control unit and glow plug
- Malfunction of each connector
- Malfunction of glow plug
- Malfunction of glow electronic control unit

[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]



[Parts Identification and Location]



[Fault diagnosis]

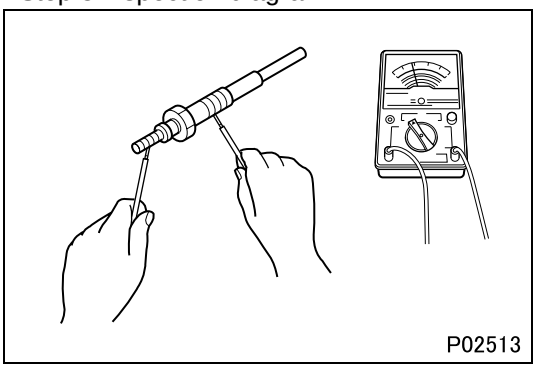
- Perform checks in the sequence of the following steps.

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. 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. • Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22 • Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74 • Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) 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 5.
		NO	Modify harness.

Step 5	Inspection items		Inspection of glow electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

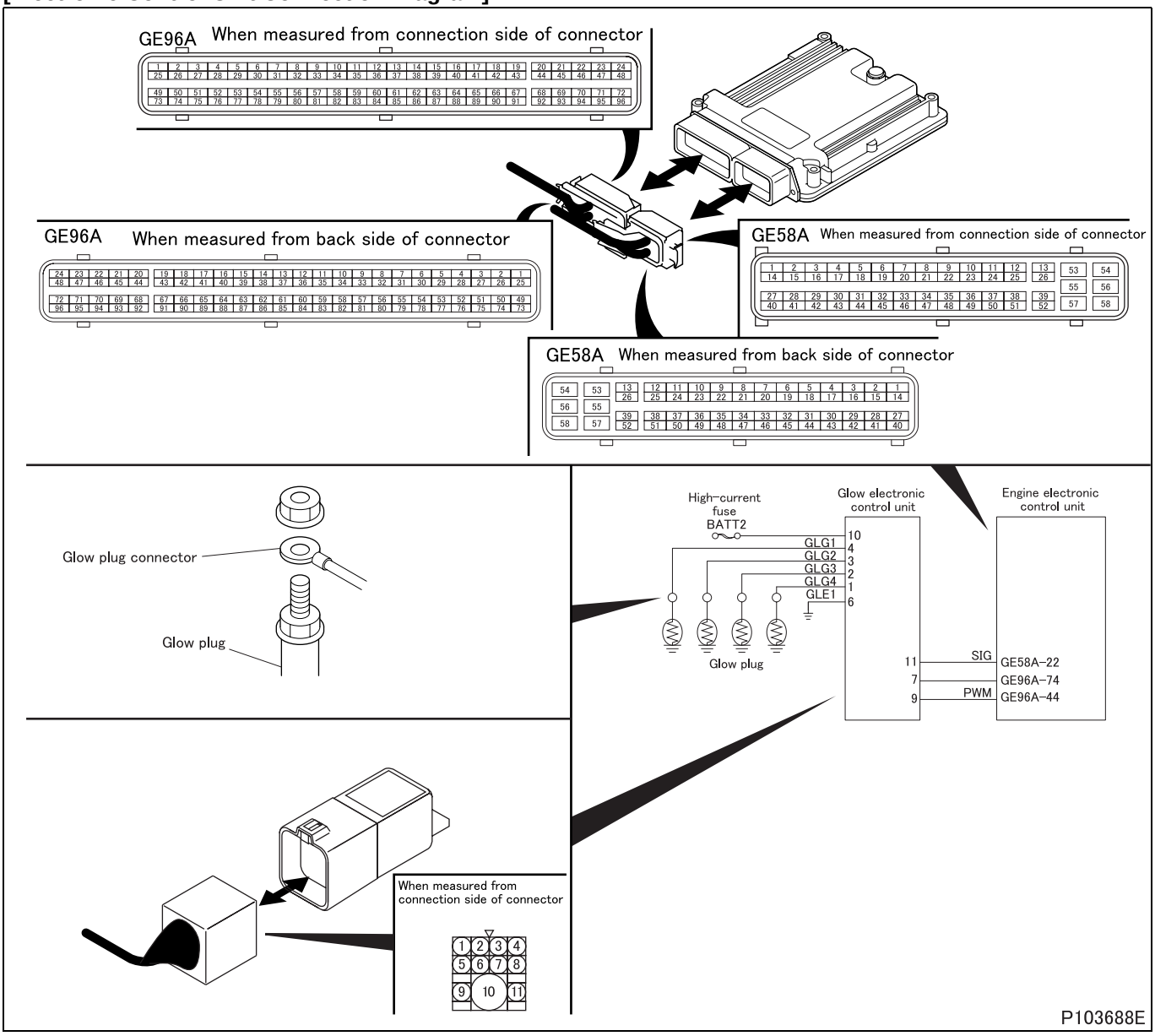
[Diagnostic requirement]
- Glow electronic control unit operating voltage: higher than 8 V

[Control effected by electronic control unit during fault]
- Effects no special control.

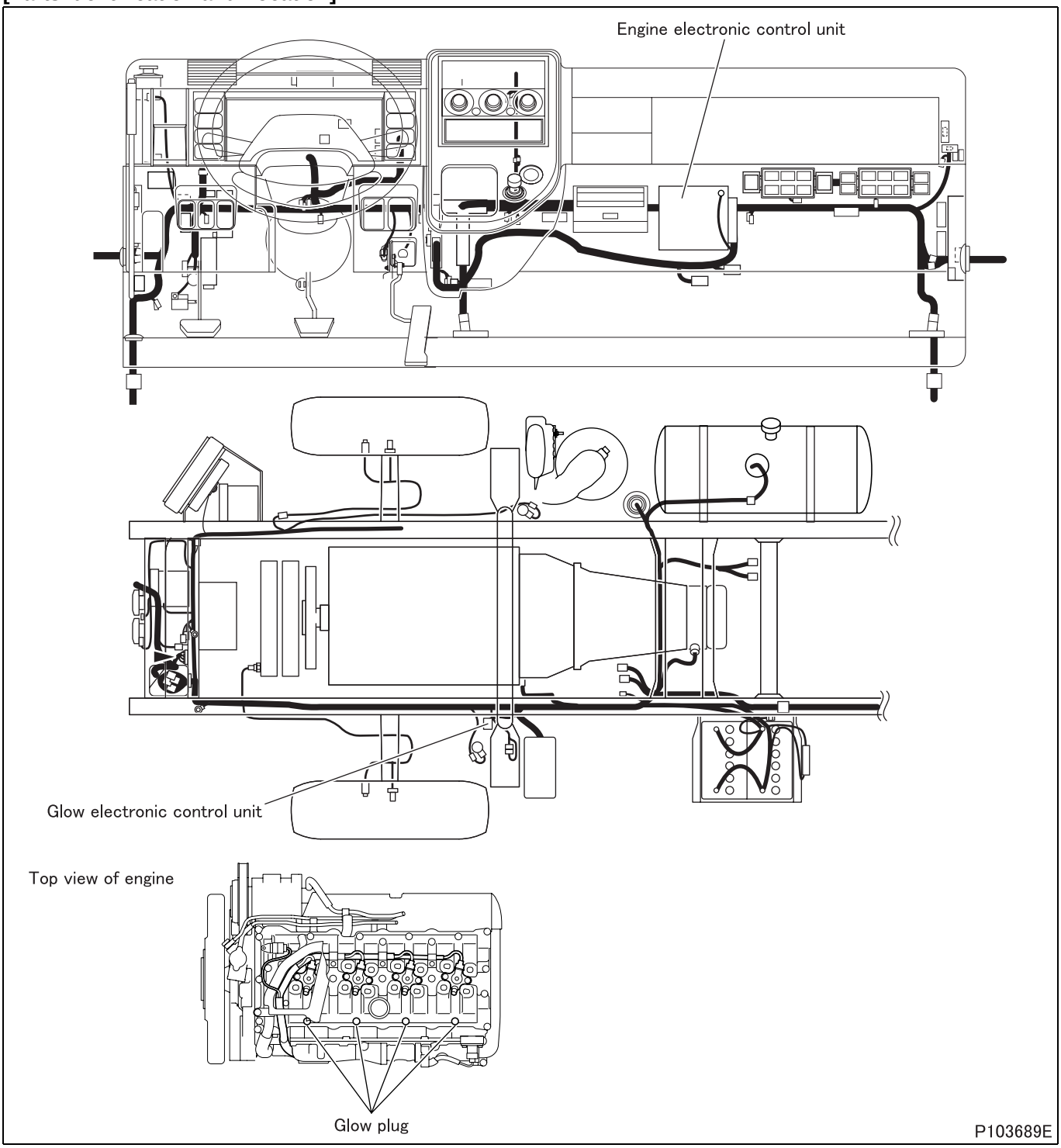
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between glow electronic control unit and glow plug
- Malfunction of each connector
- Malfunction of glow plug
- Malfunction of glow electronic control unit

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[Fault diagnosis]

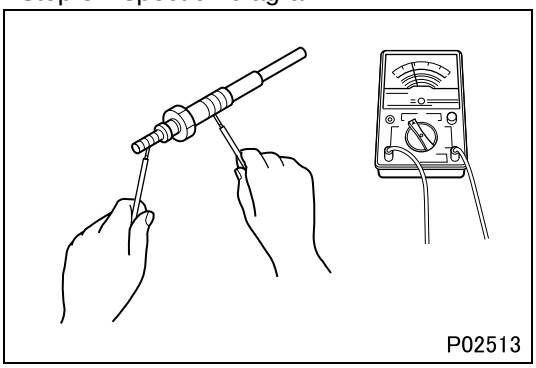
- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection 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 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. • Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22 • Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74 • Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) 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 5.
		NO	Modify harness.

Step 5	Inspection items		Inspection of glow electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of engine electronic control unit
		NO	Modify connector.

[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.

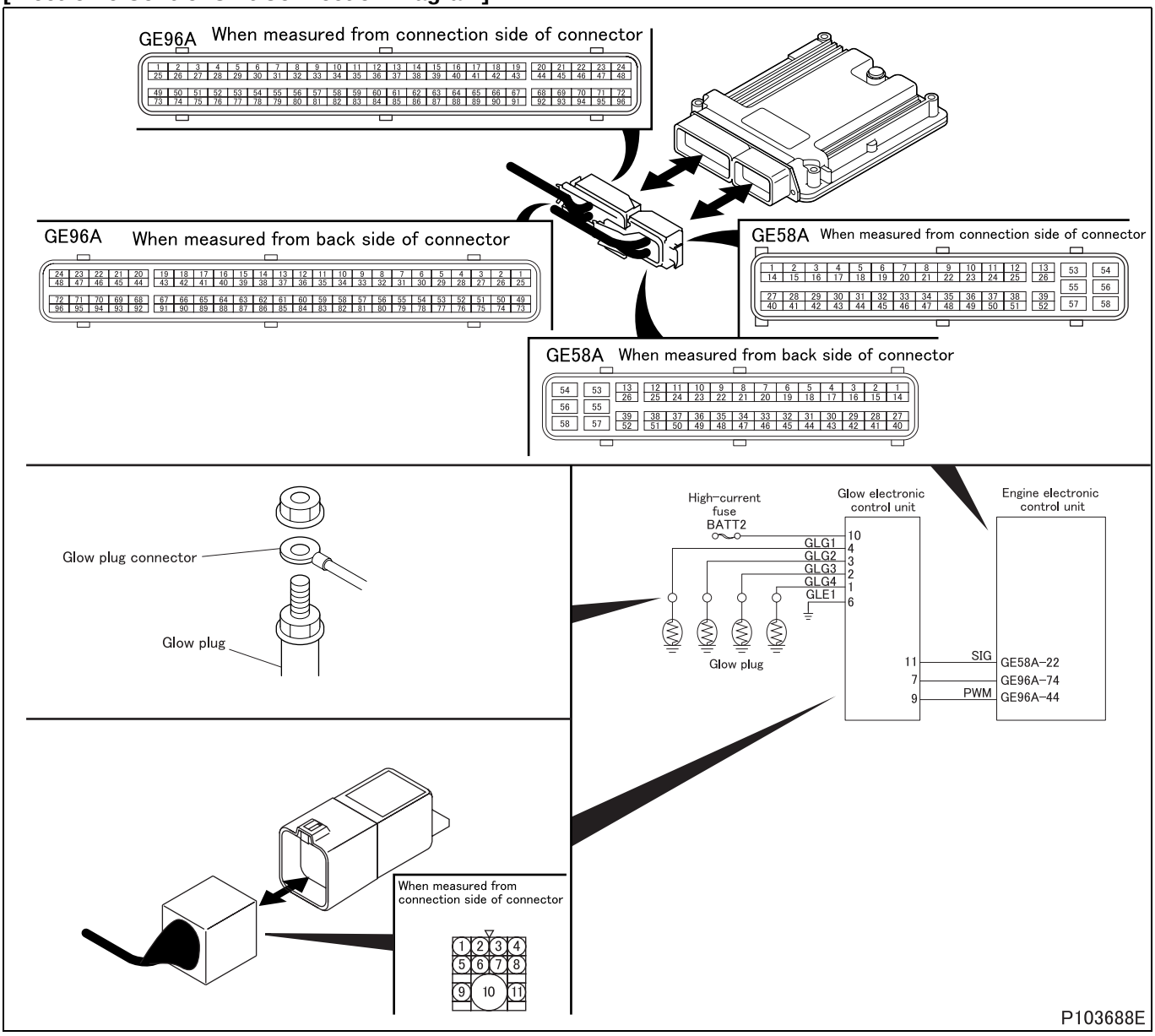
[Diagnostic requirement]
- Glow electronic control unit operating voltage: higher than 8 V

[Control effected by electronic control unit during fault]
- Effects no special control.

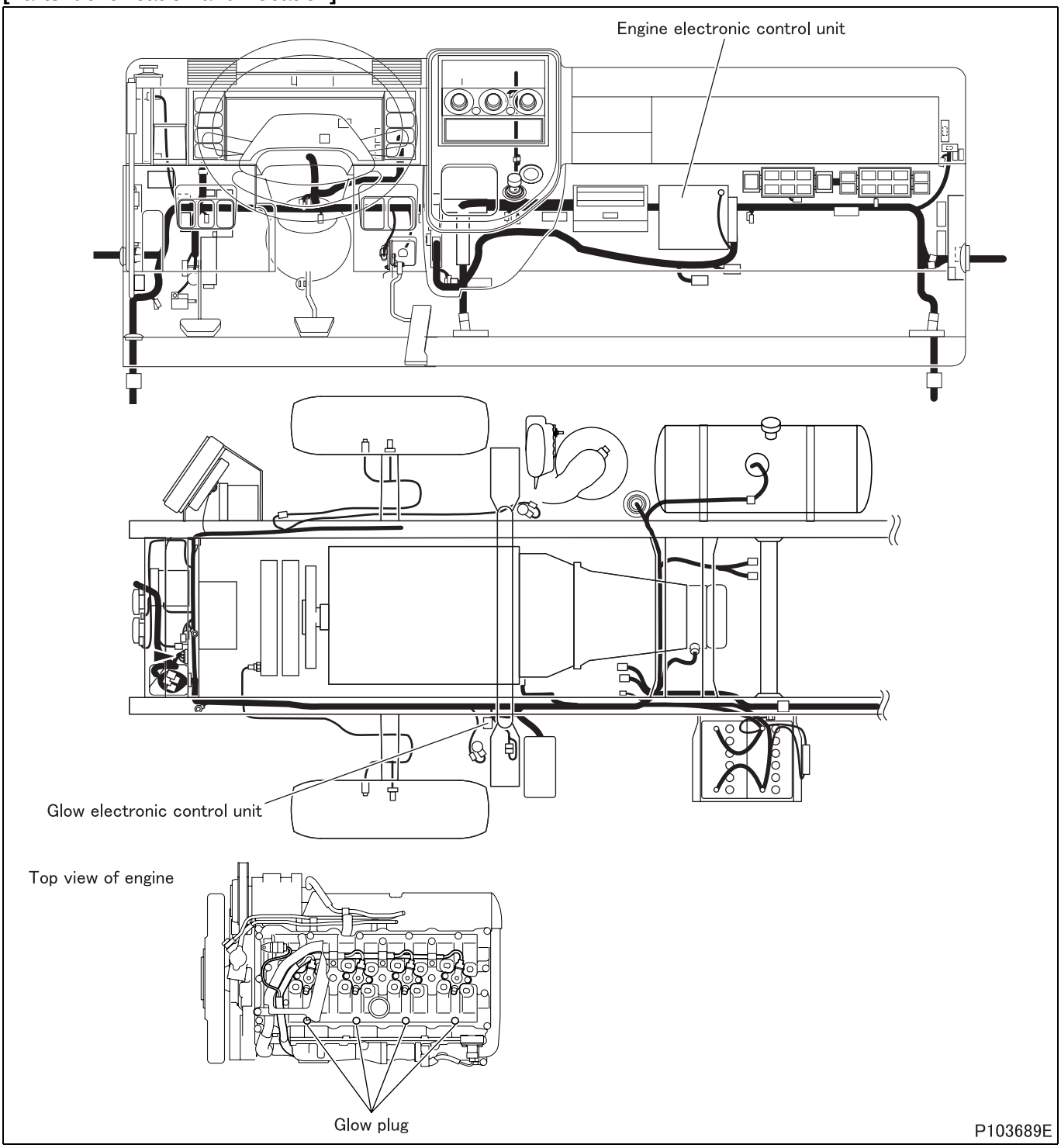
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between glow electronic control unit and glow plug
- Malfunction of each connector
- Malfunction of glow plug
- Malfunction of glow electronic control unit

[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]



[Parts Identification and Location]



[Fault diagnosis]

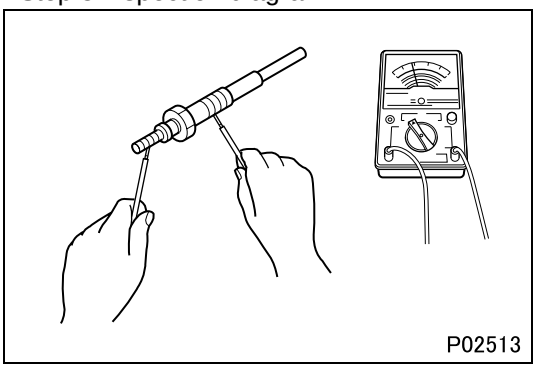
- Perform checks in the sequence of the following steps.

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. • Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22 • Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74 • Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) 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 5.
		NO	Modify harness.

Step 5	Inspection items		Inspection of glow electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

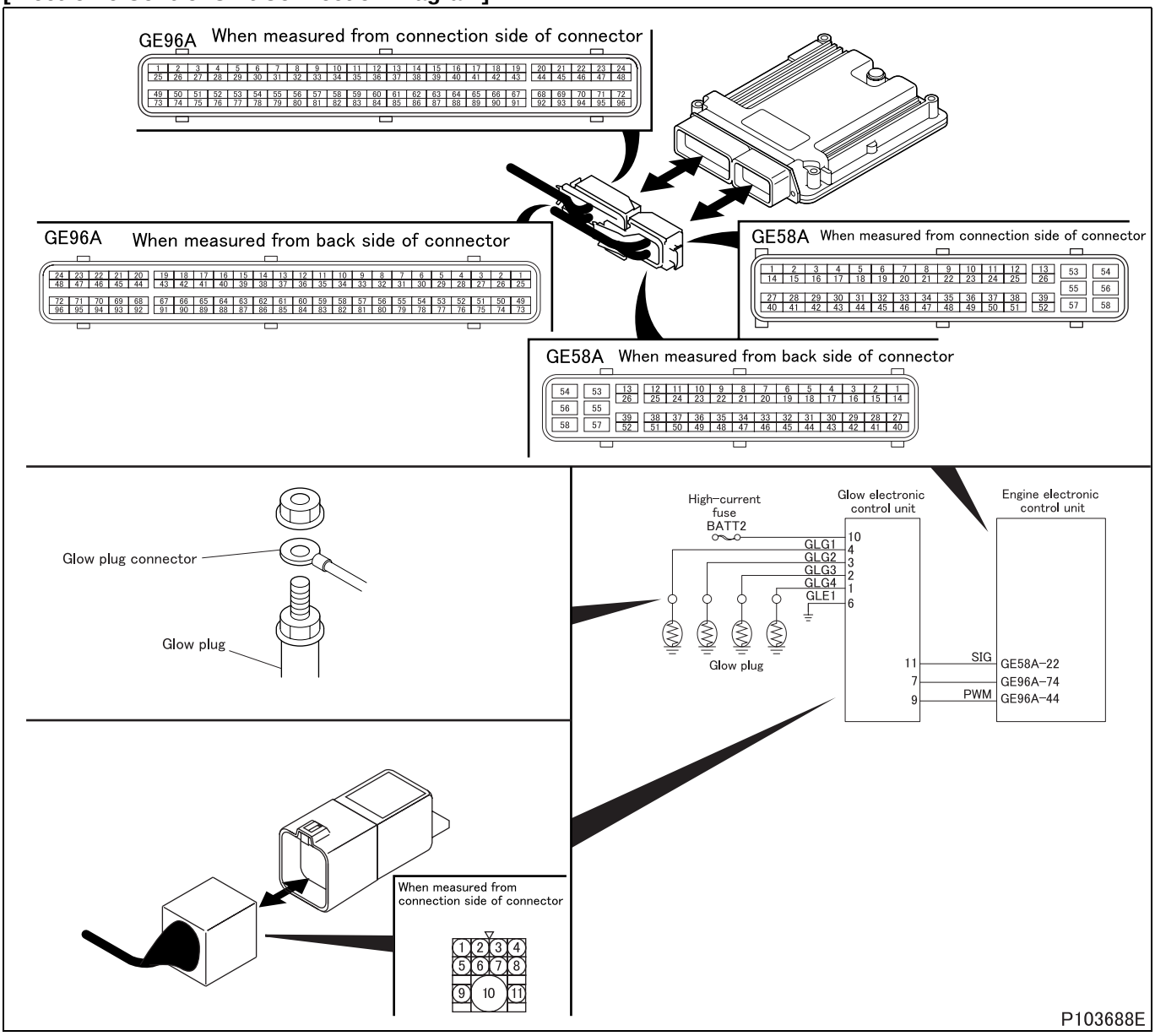
[Diagnostic requirement]
- Glow electronic control unit operating voltage: higher than 8 V

[Control effected by electronic control unit during fault]
- Effects no special control.

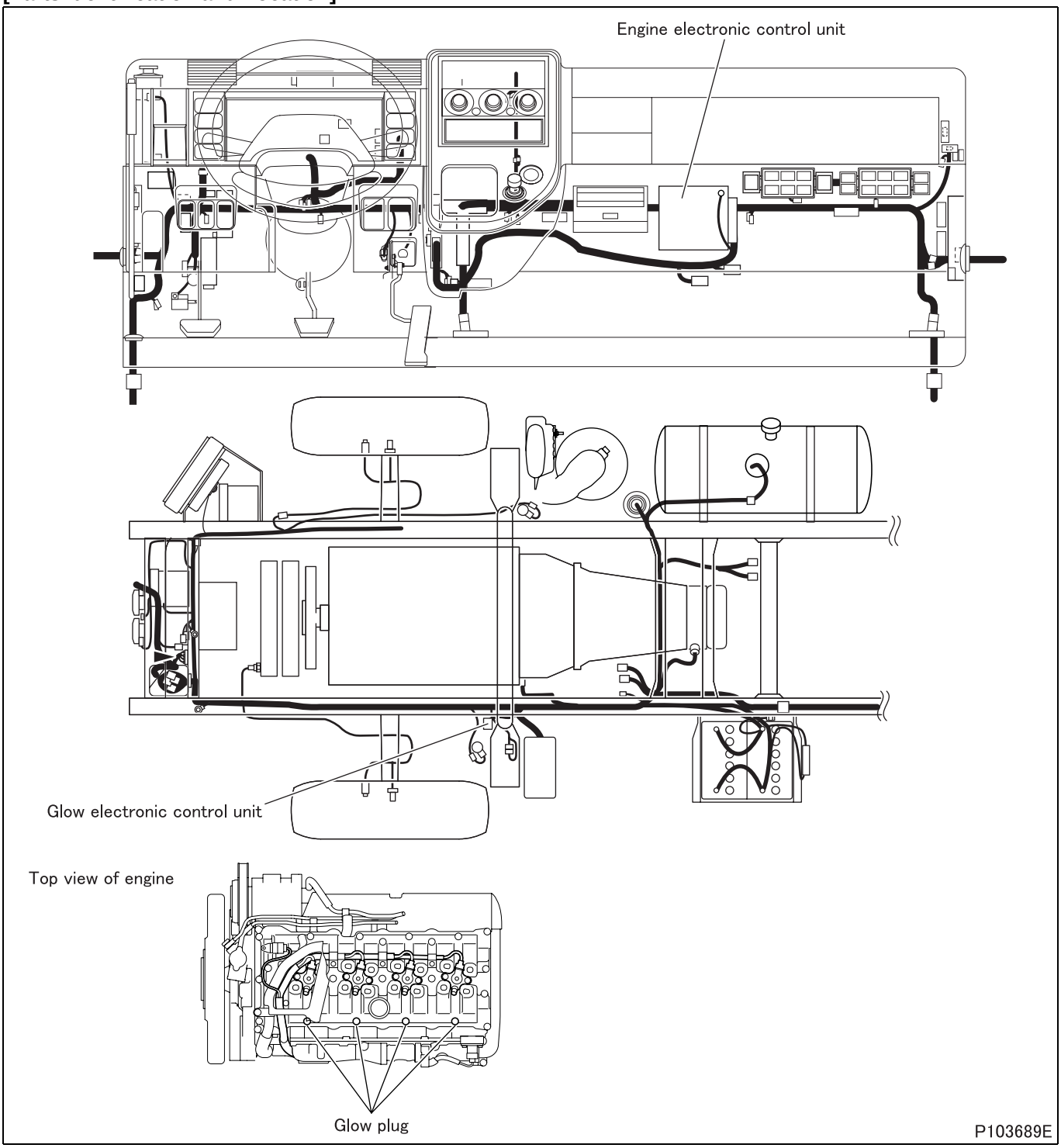
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between glow electronic control unit and glow plug
- Malfunction of each connector
- Malfunction of glow plug
- Malfunction of glow electronic control unit

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[Fault diagnosis]

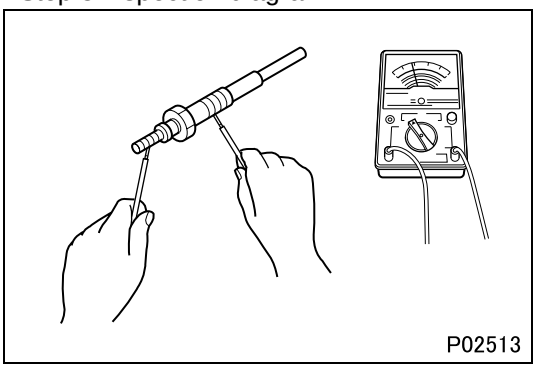
- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection 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 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. • Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22 • Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74 • Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) 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 5.
		NO	Modify harness.

Step 5	Inspection items		Inspection of glow electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of engine electronic control unit
		NO	Modify connector.

[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.

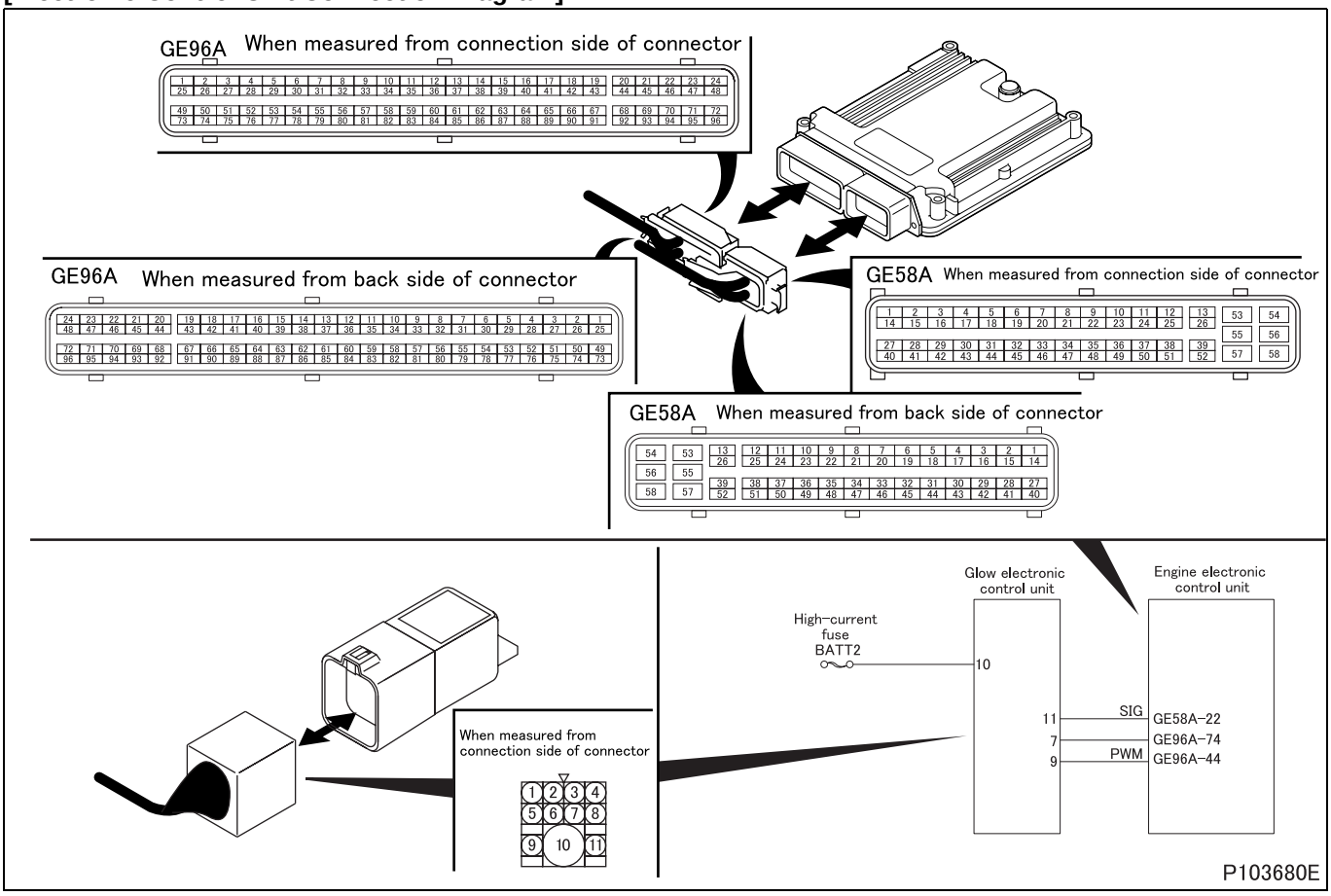
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Effects no special control.

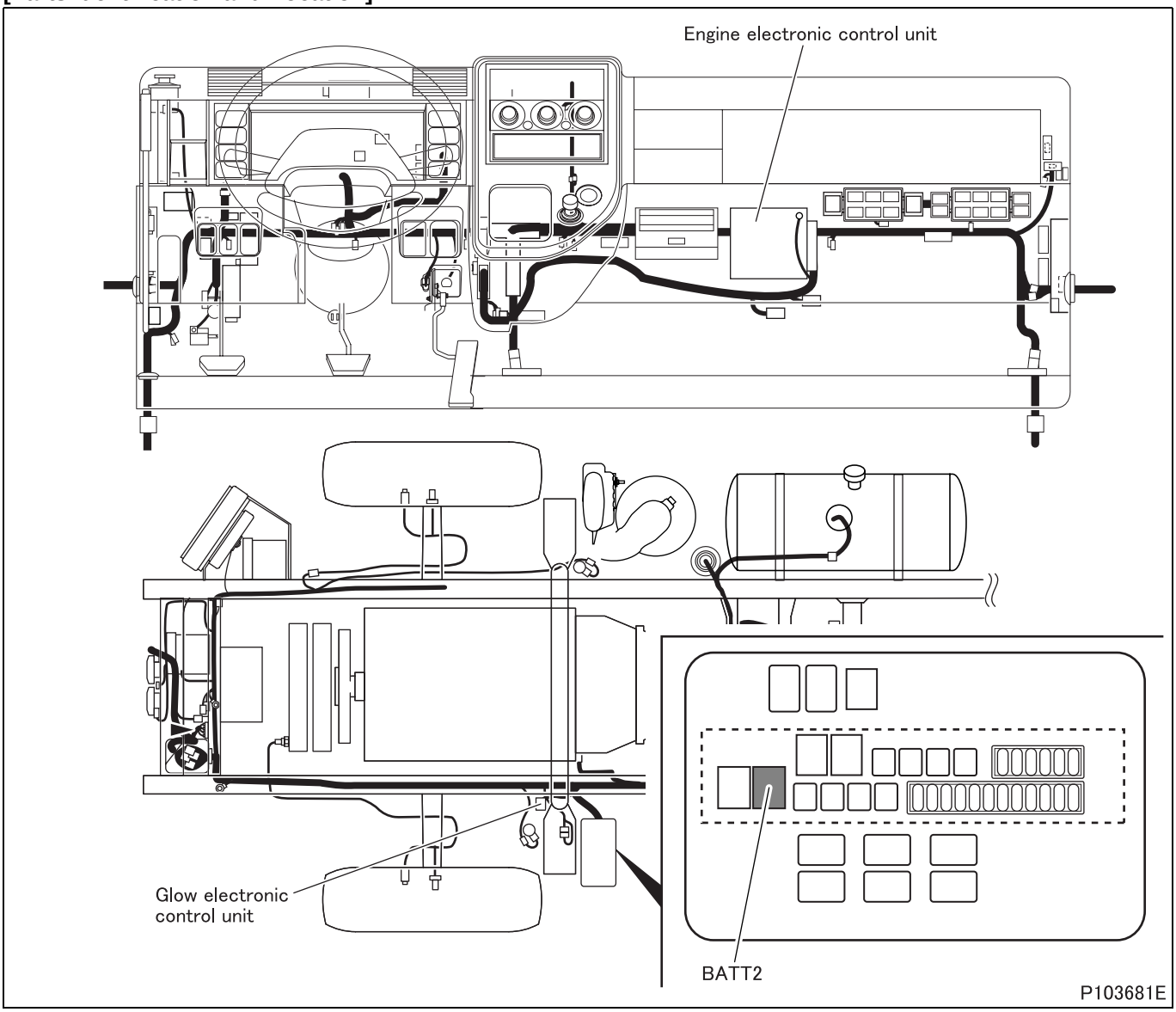
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between glow electronic control unit and engine electronic control unit
- Malfunction of each connector
- Malfunction of glow electronic control unit
- Malfunction of engine electronic control unit

[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]



[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. • Fault information circuit: glow electronic control unit terminal No. 11 - engine electronic control unit (GE58A) terminal No. 22 • Power supply circuit: glow electronic control unit terminal No. 7 - engine electronic control unit (GE96A) terminal No. 74 • Operating signal circuit: glow electronic control unit terminal No. 9 - engine electronic control unit (GE96A) 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 2.
		NO	Modify harness.

Step 2	Inspection items		Inspection of glow electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of engine electronic control unit
		NO	Modify connector.

[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.

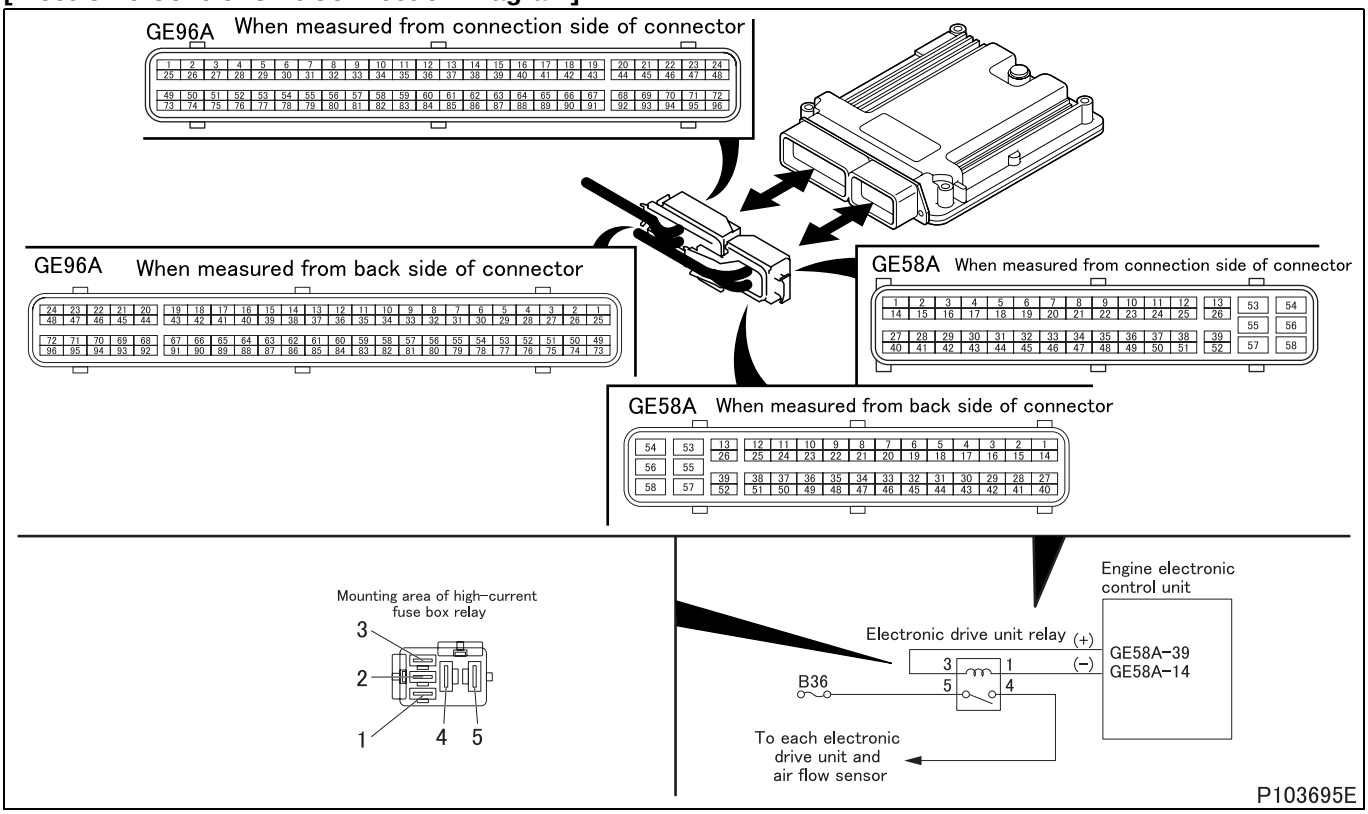
[Diagnostic requirement]
–

[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.

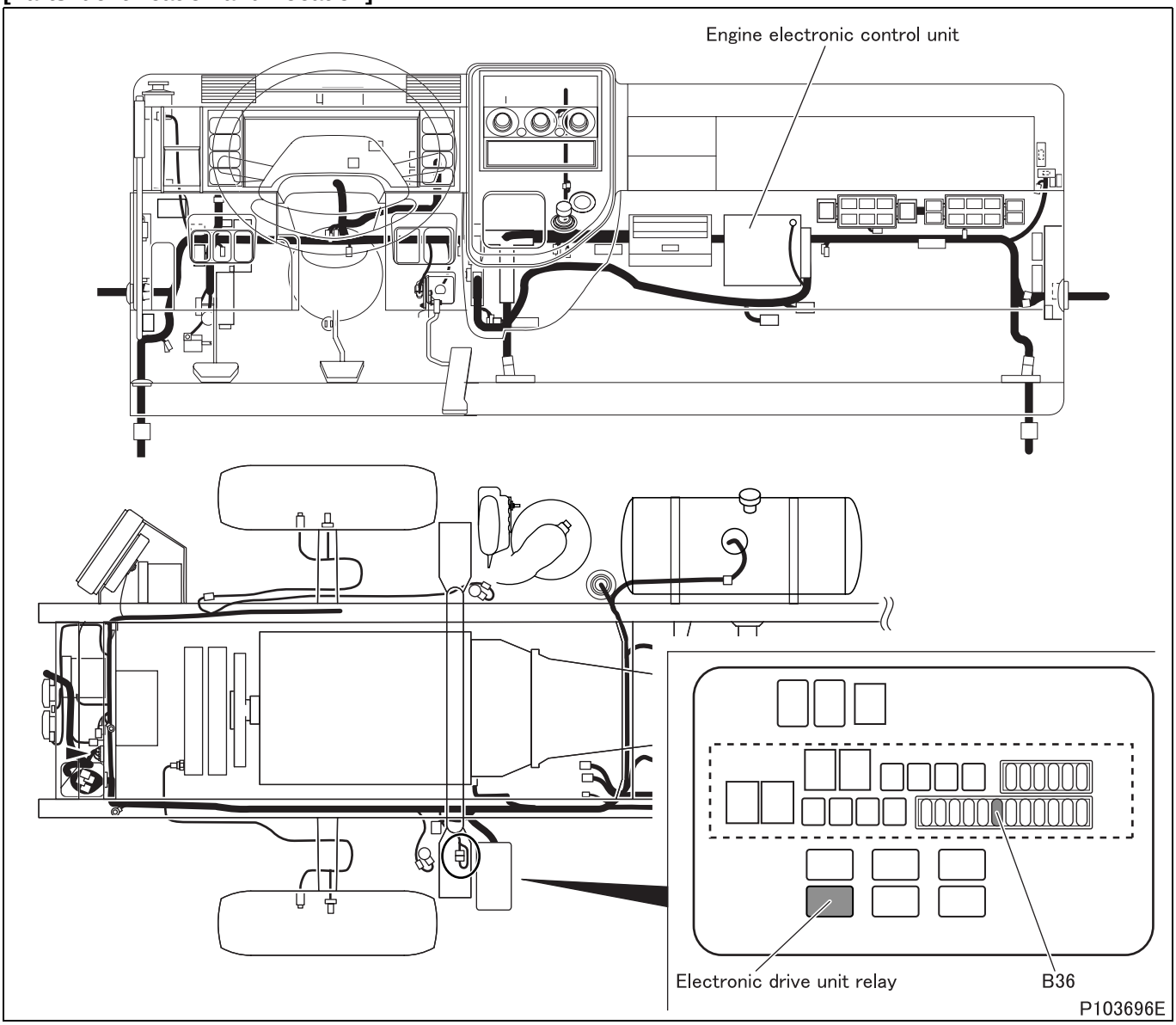
[Probable cause of trouble]
- Open-circuit of harness between electronic control unit and electronic drive unit relay
- Malfunction of each connector
- Malfunction of electronic drive unit relay
- Malfunction of electronic control unit

[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]



[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.

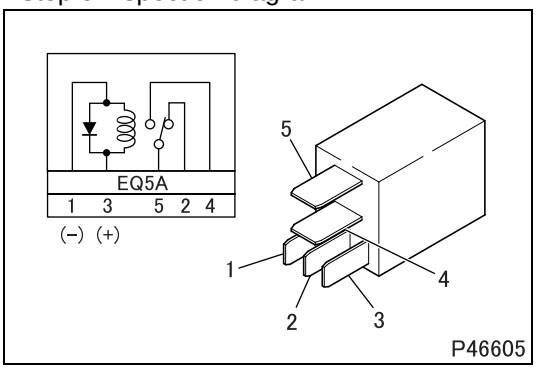
Step 2	Inspection items		Inspection by electronic control unit connector (power supply)
	Maintenance item		Measure value of voltage between connector (GE58A) terminal No. 39 (+) and No. 14 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Perform actuator test item No. AF “EDU Relay”.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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

[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.

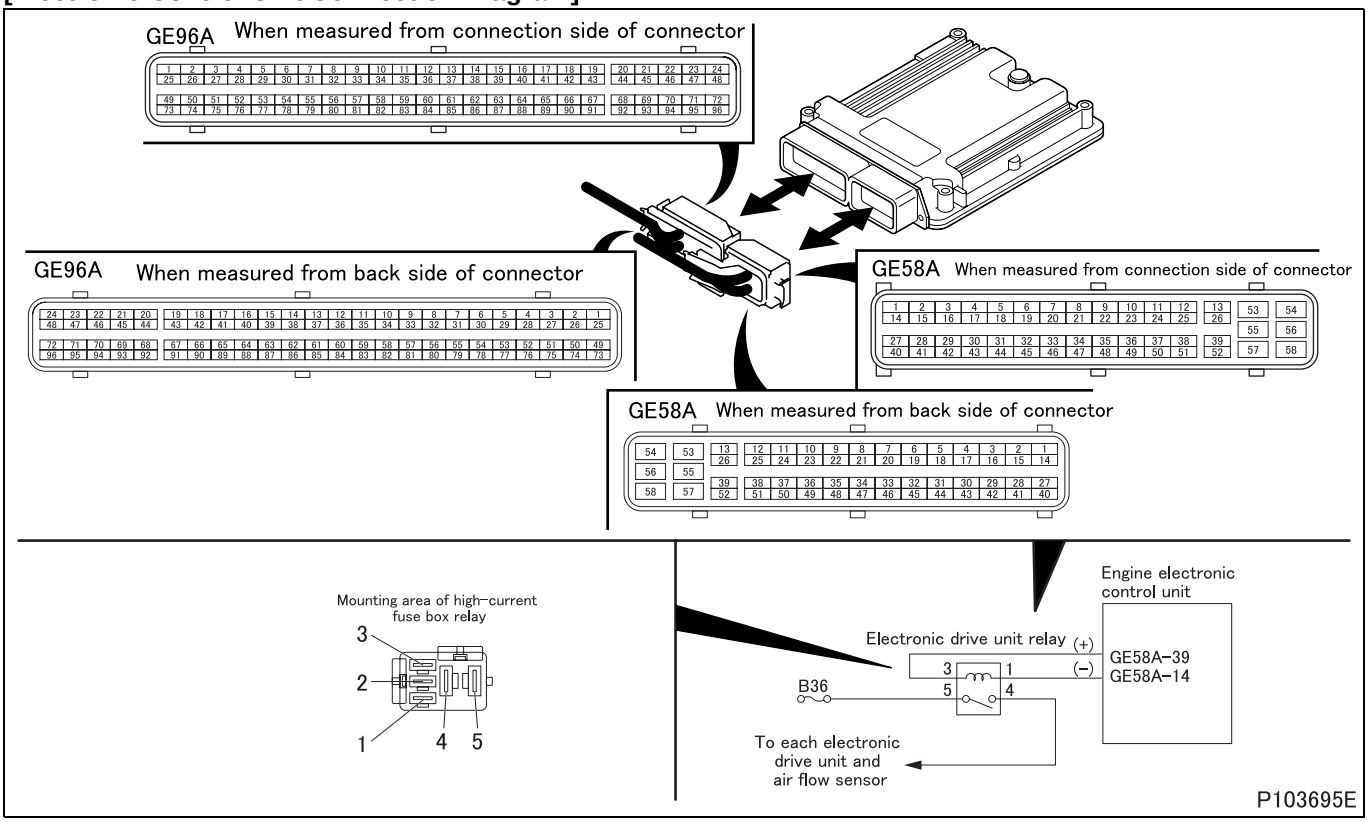
[Diagnostic requirement]
- After-run executed
- Electronic drive unit relay request signal: OFF

[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.

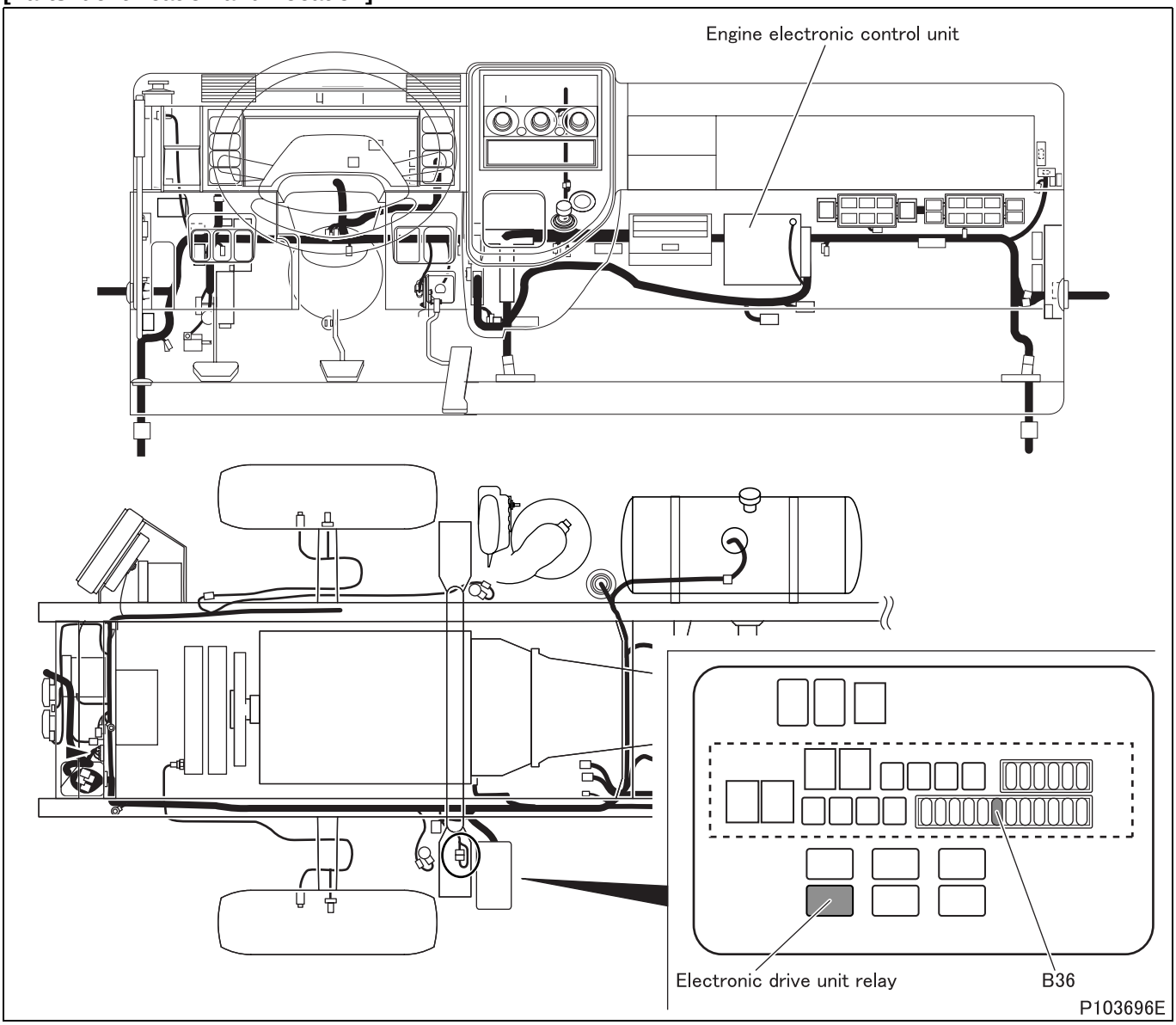
[Probable cause of trouble]
- Short-circuit of harness between electronic control unit and electronic drive unit relay
- Malfunction of each connector
- Malfunction of electronic drive unit relay
- Malfunction of electronic control unit

[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.)

[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 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.

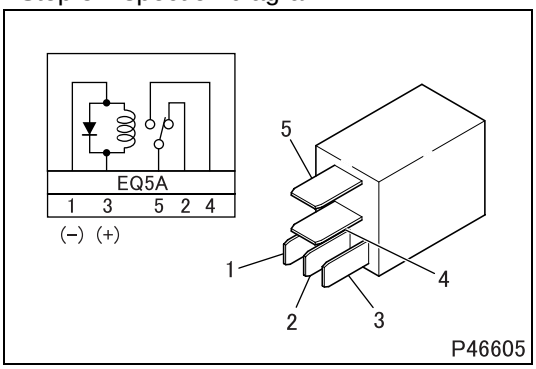
Step 2	Inspection items		Inspection by electronic control unit connector (power supply)
	Maintenance item		Measure value of voltage between connector (GE58A) terminal No. 39 (+) and No. 14 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Perform actuator test item No. AF “EDU Relay”.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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

[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.

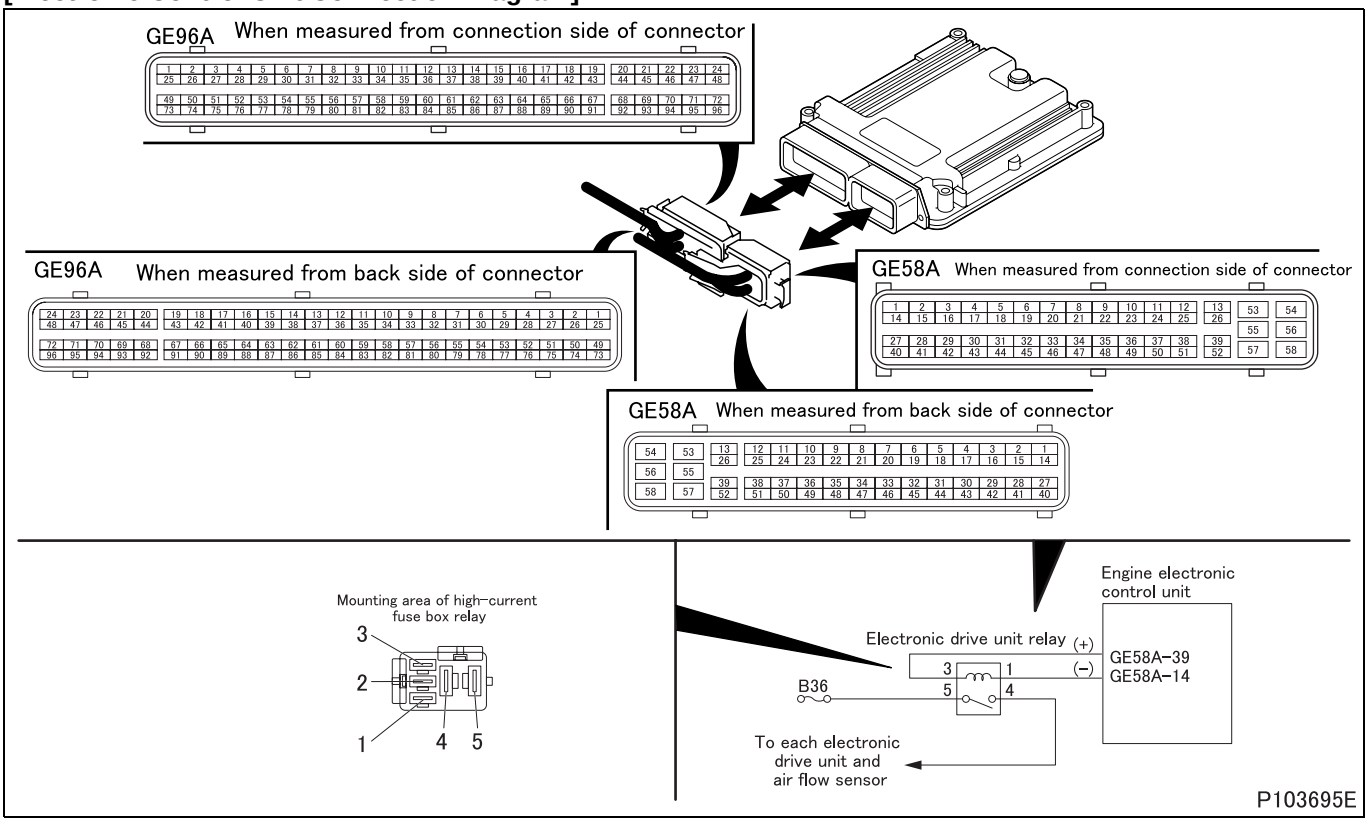
[Diagnostic requirement]
- Electronic drive unit relay is on.
- Electronic drive unit relay request signal: ON

[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.

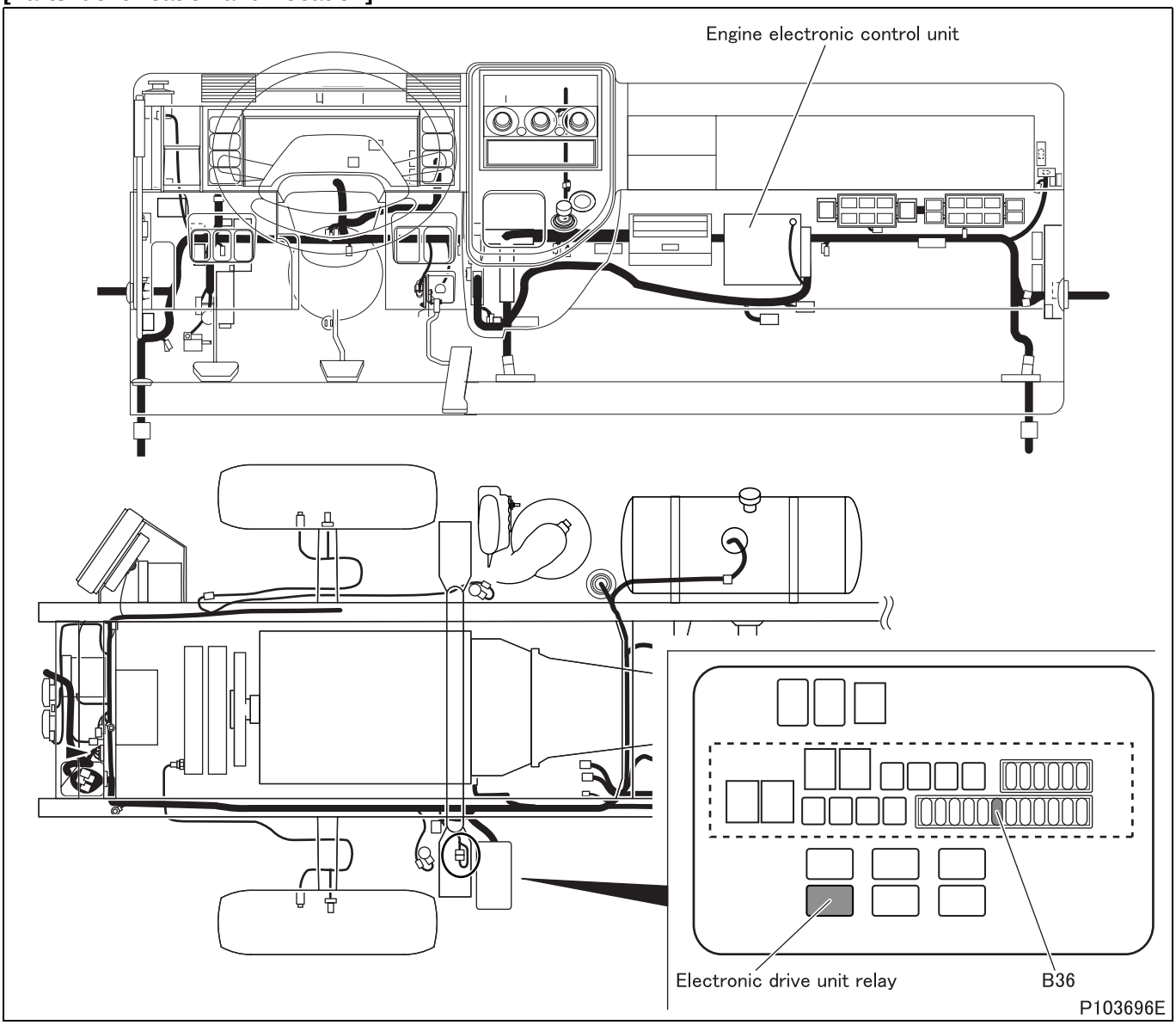
[Probable cause of trouble]
- Short-circuit of harness between electronic control unit and electronic drive unit relay
- Malfunction of each connector
- Malfunction of electronic drive unit relay
- Malfunction of electronic control unit

[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]



[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.

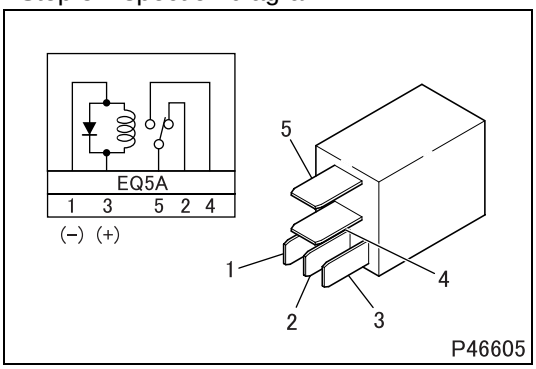
Step 2	Inspection items		Inspection by electronic control unit connector (power supply)
	Maintenance item		Measure value of voltage between connector (GE58A) terminal No. 39 (+) and No. 14 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Perform actuator test item No. AF “EDU Relay”.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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

[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.

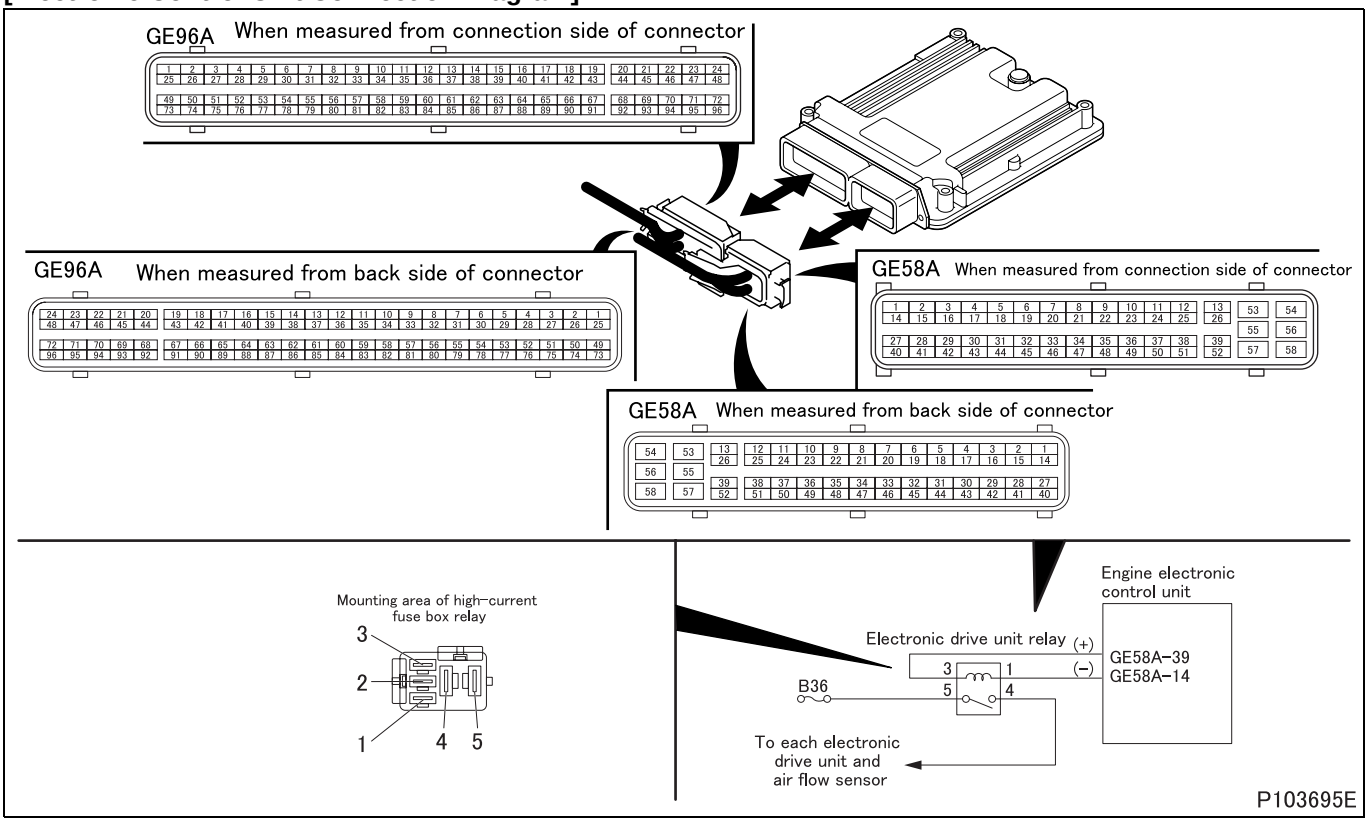
[Diagnostic requirement]
- Electronic drive unit relay is on.
- Electronic drive unit relay request signal: ON

[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.

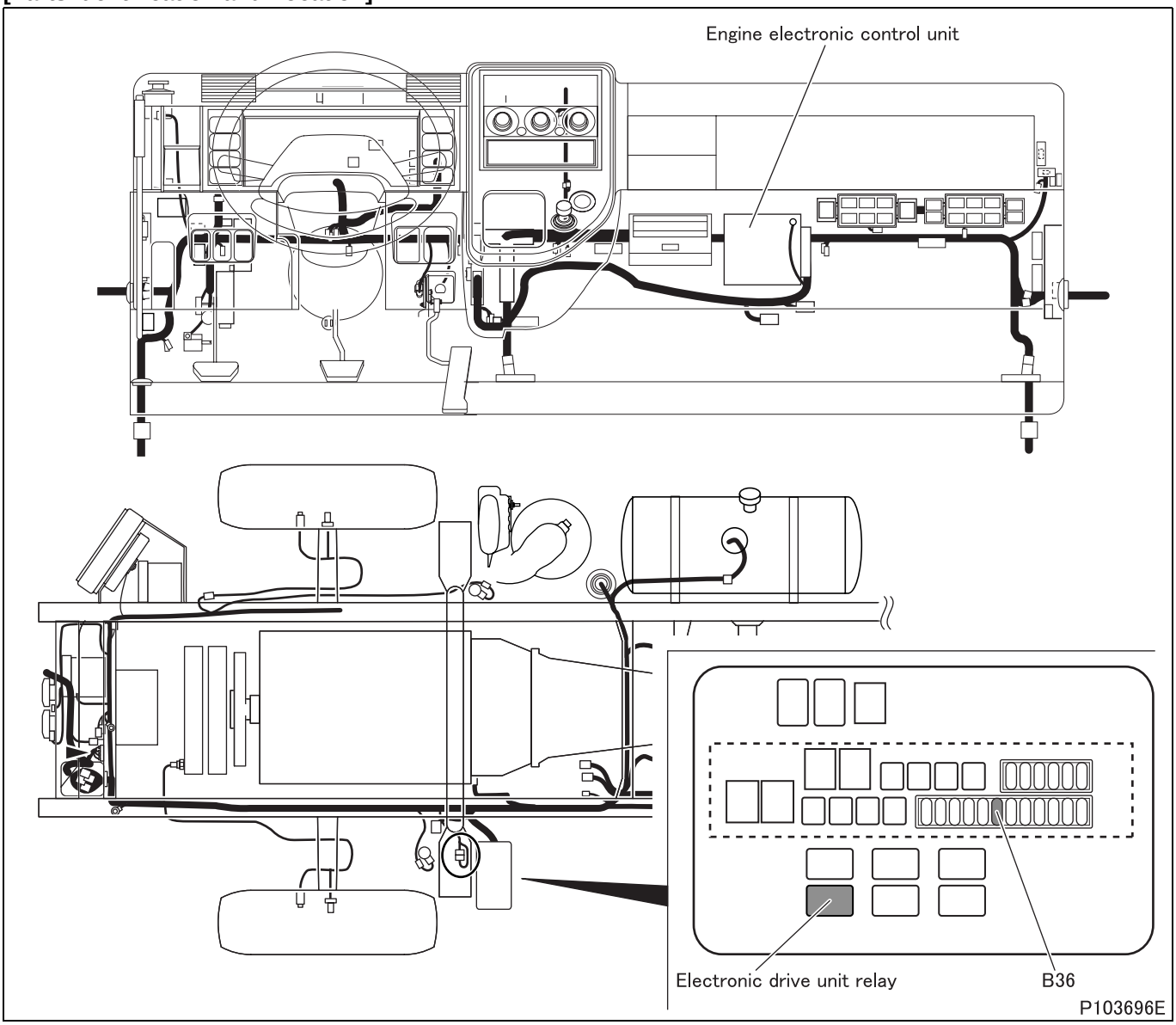
[Probable cause of trouble]
- Short-circuit of harness between electronic control unit and electronic drive unit
- Malfunction of each connector
- Malfunction of electronic drive unit relay
- Malfunction of electronic control unit

[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.)

[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 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.

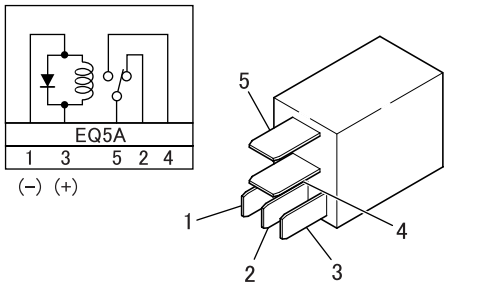
Step 2	Inspection items		Inspection by electronic control unit connector (power supply)
	Maintenance item		Measure value of voltage between connector (GE58A) terminal No. 39 (+) and No. 14 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Perform actuator test item No. AF “EDU Relay”.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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

[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.

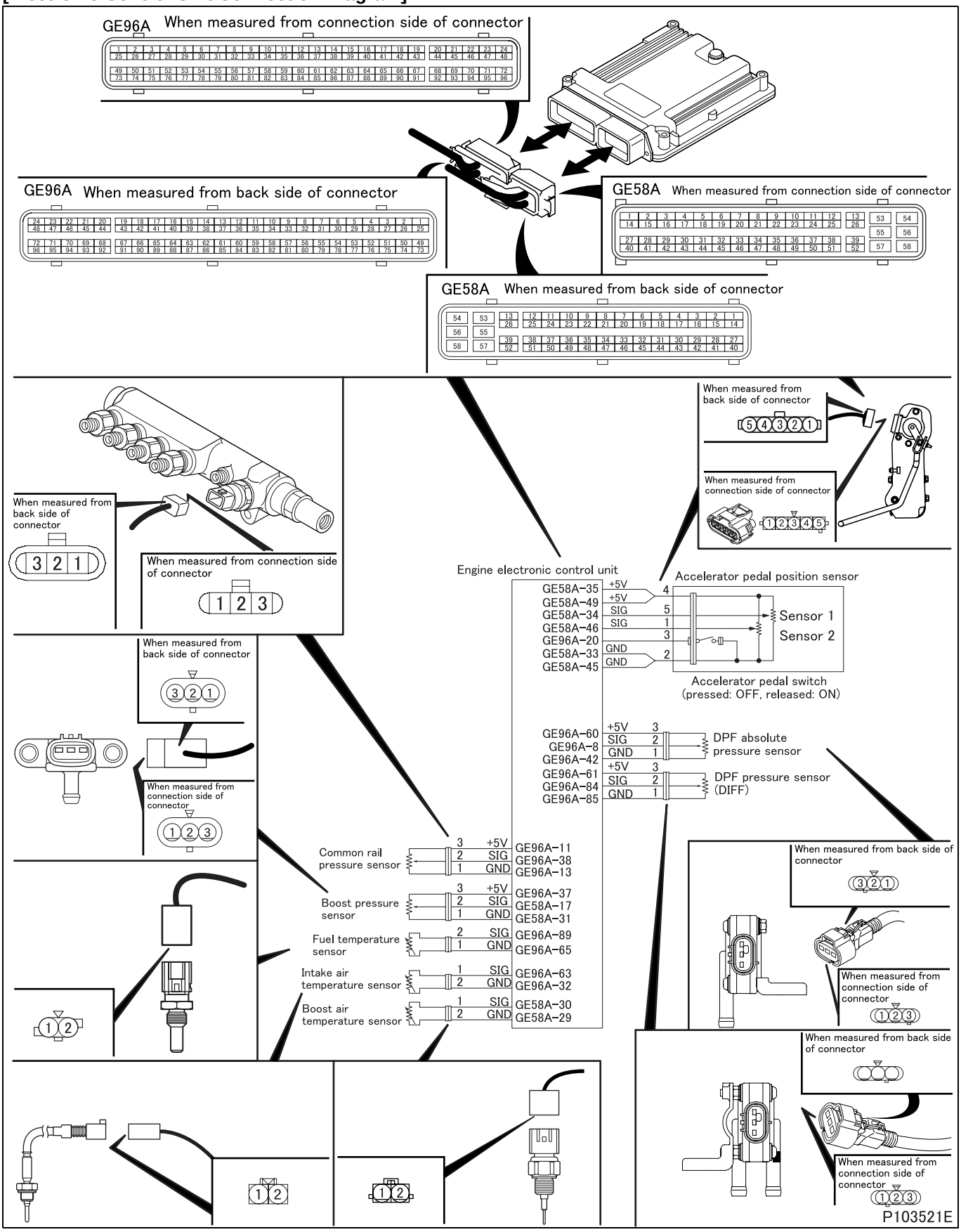
[Diagnostic requirement]
–

[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]



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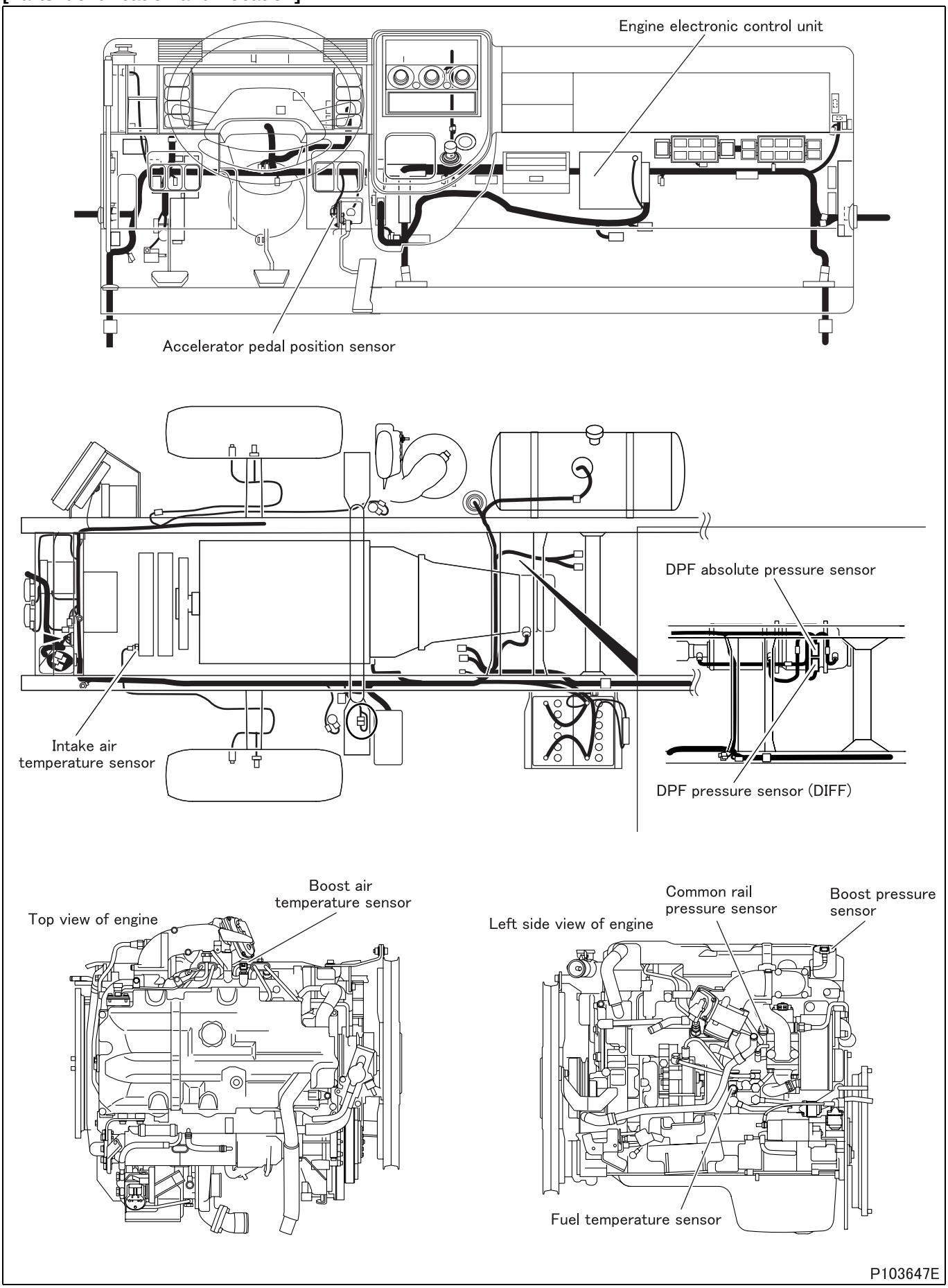


[Fault diagnosis]

- 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

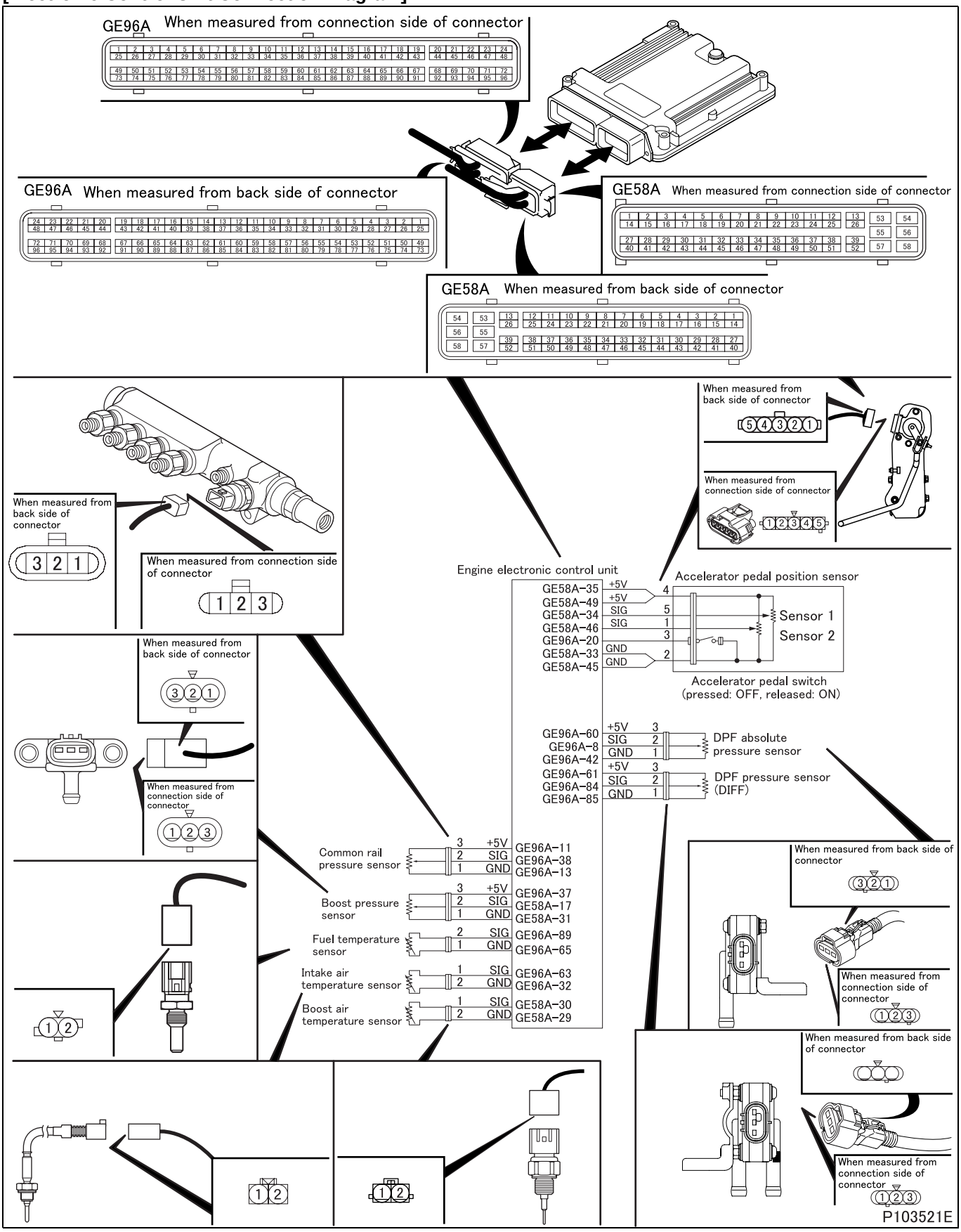
[Diagnostic requirement]
–

[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.)

[Electronic Control Unit Connection Diagram]



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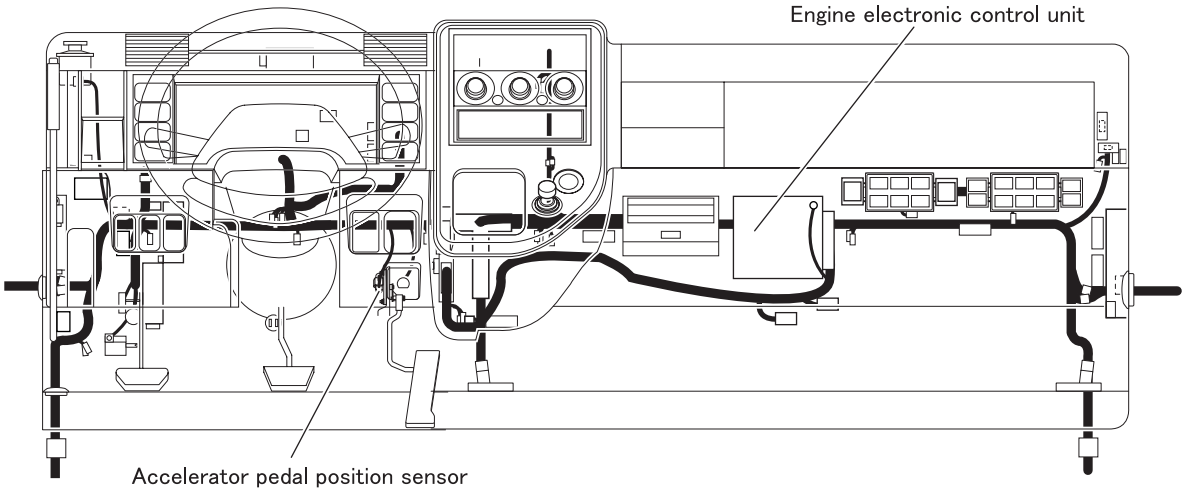
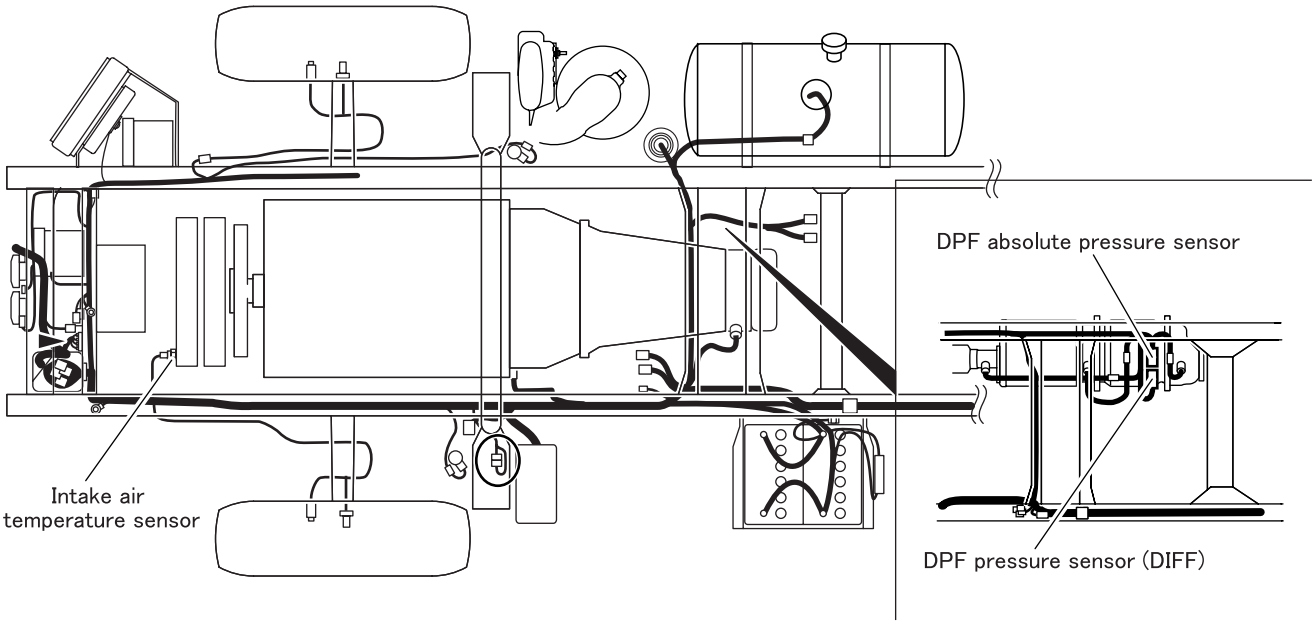
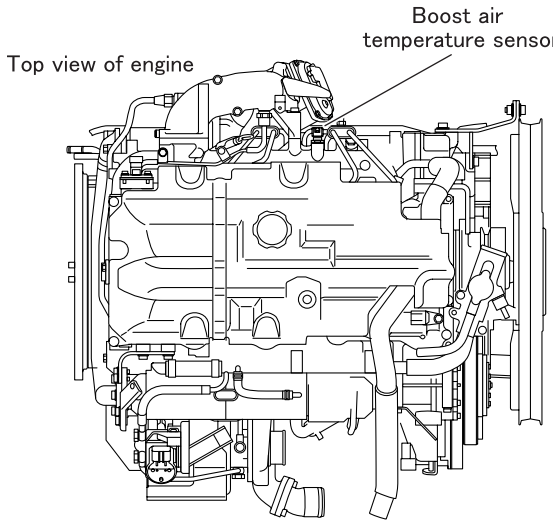
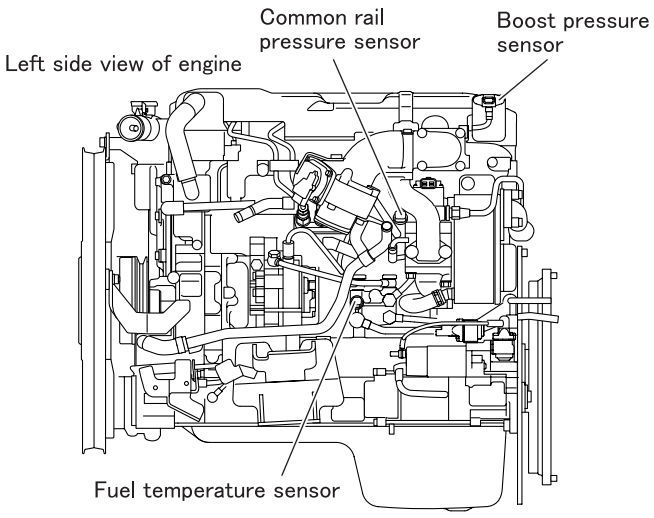








P103647E

[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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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: 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, contact your nearest STERLING TRUCKS dealer or STERLING TRUCKS CORPORATION.)

[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: 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, contact your nearest STERLING TRUCKS dealer or STERLING TRUCKS CORPORATION.)

[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.

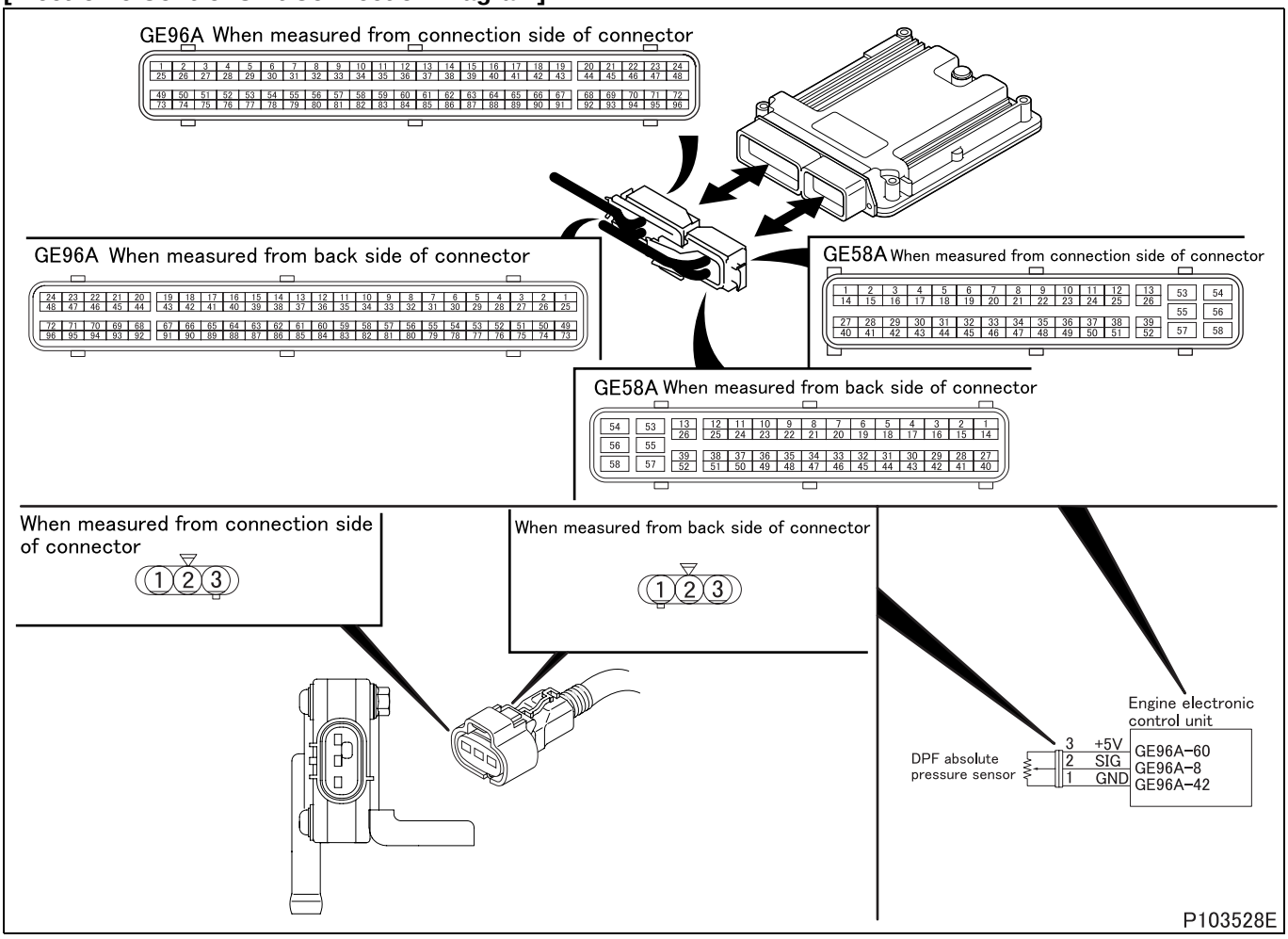
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Engine torque is limited.
- Exhaust gas recirculation control is stopeed.
- Throttle control disabled.
- Diesel particulate filter regeneration is stopped.
- Particulate matter deposit computation is stopped.

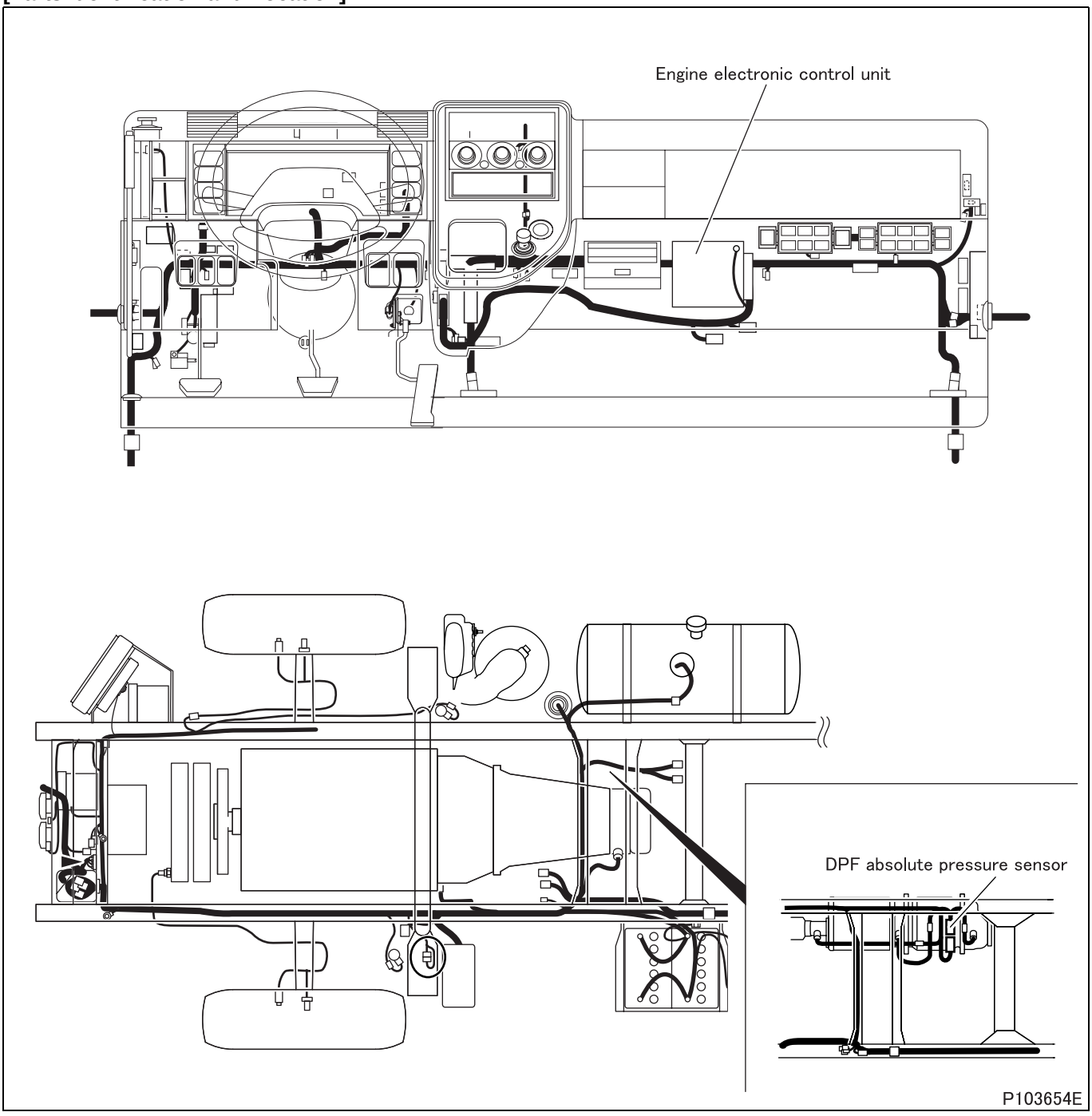
[Probable cause of trouble]
- Excessive smoke emission (due to malfunction of engine proper, common rail or exhaust gas recirculation system)
- Malfunction of diesel particulate filter regeneration control
- Excessive particuler matter (PM) deposit
- Malfunction of DPF absolute pressure sensor.
- Malfunction 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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



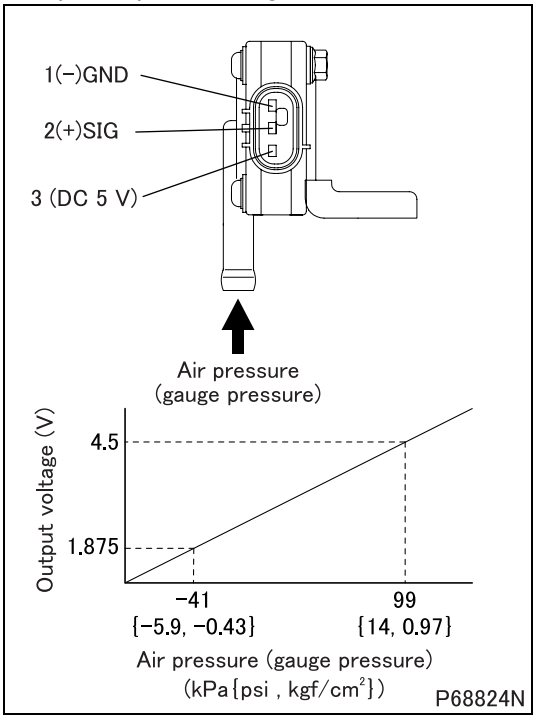
[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Check if following diagnosis codes occur simultaneously. • P0045 “VGT Actuator (Open)” • P0046 “VGT Actuator (Performance)” • P0047 “VGT Actuator (Low)” • P0102 “Airflow sensor (Low)” • P0103 “Airflow sensor (High)” • P0426 ”EXH Gas Temp SNSR1 (Plausibility)” • P0427 ”EXH Gas Temp SNSR1 (Low)” • P0428 ”EXH Gas Temp SNSR1 (High)” • P0545 ”DPF Temp SNSR (upstream) Low” • P0546 ”DPF Temp SNSR (upstream) High” • P1430 “DPF Regeneration Switch” • P1660 “DPF Lamp Control Circuit (Low)” • P2031 “Exhaust Gas Temp” • P2032 “Exhaust Gas Temp (Low)” • P2033 “Exhaust Gas Temp (High)” • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (HIgh) & MFF”
	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 occuring, go to step 2.
		NO	Go to step 2.

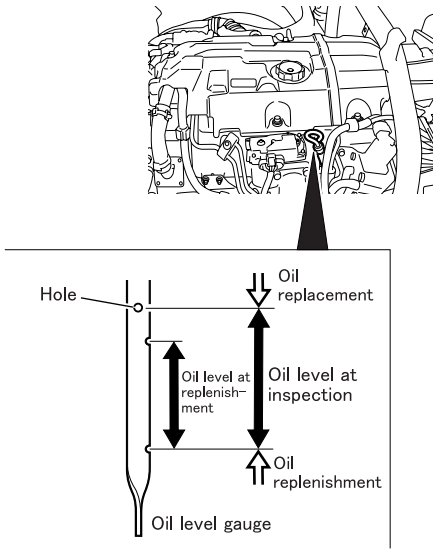
Step 2	Inspection items		Inspection of DPF absolute pressure sensor unit
	Maintenance item		Measure value of voltage between terminal No. 2 (+) and 1 (–).
	Inspection condition		• Apply voltage DC 5 V across connector terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 41 ± 3.2 kPa {5.9 ± 0.5 psi, 0.43 ± 0.03 kgf/cm^2}: 1.875 V • 99 ± 3.2 kPa {14 ± 0.5 psi, 1.0 ± 0.03 kgf/cm^2}: 4.5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		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>



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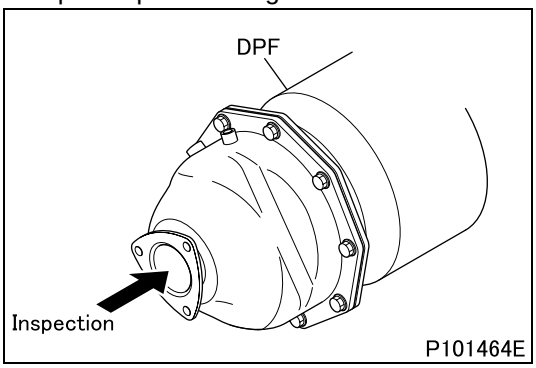
Step 4	Inspection items		Inspection of pressure hose
	Maintenance item		Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks.
	Inspection condition		–
	Requirements		Nothing abnormal detected
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	After correction and replacement of hose, go to step 5.

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		Perform the following preparatory works. • Place the transmission in neutral. (place the automatic transmission in P range) • Turn the steering wheel in neutral position and securely apply the parking brake. • Turn off air conditioner not to increase the engine speed. • Check diagnosis code of each electronic control system. If any fault exists, rectify it. • Resetting the DPF-related information (perform “History reset” of Multi-Use Tester) (See Gr15 “Resetting the DPF-related Information”.) • 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”)
	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.

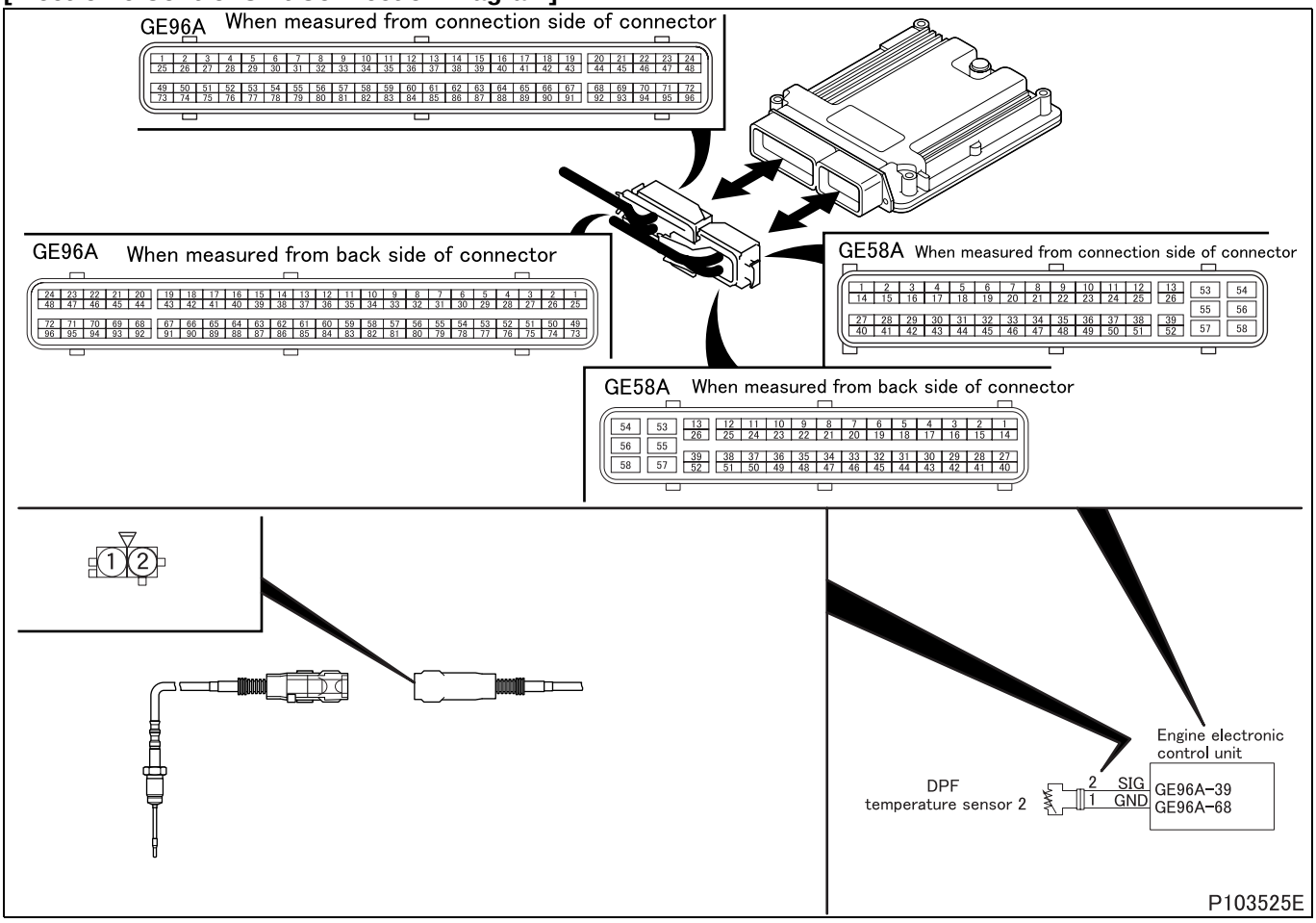
[Diagnostic requirement]
–

[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.

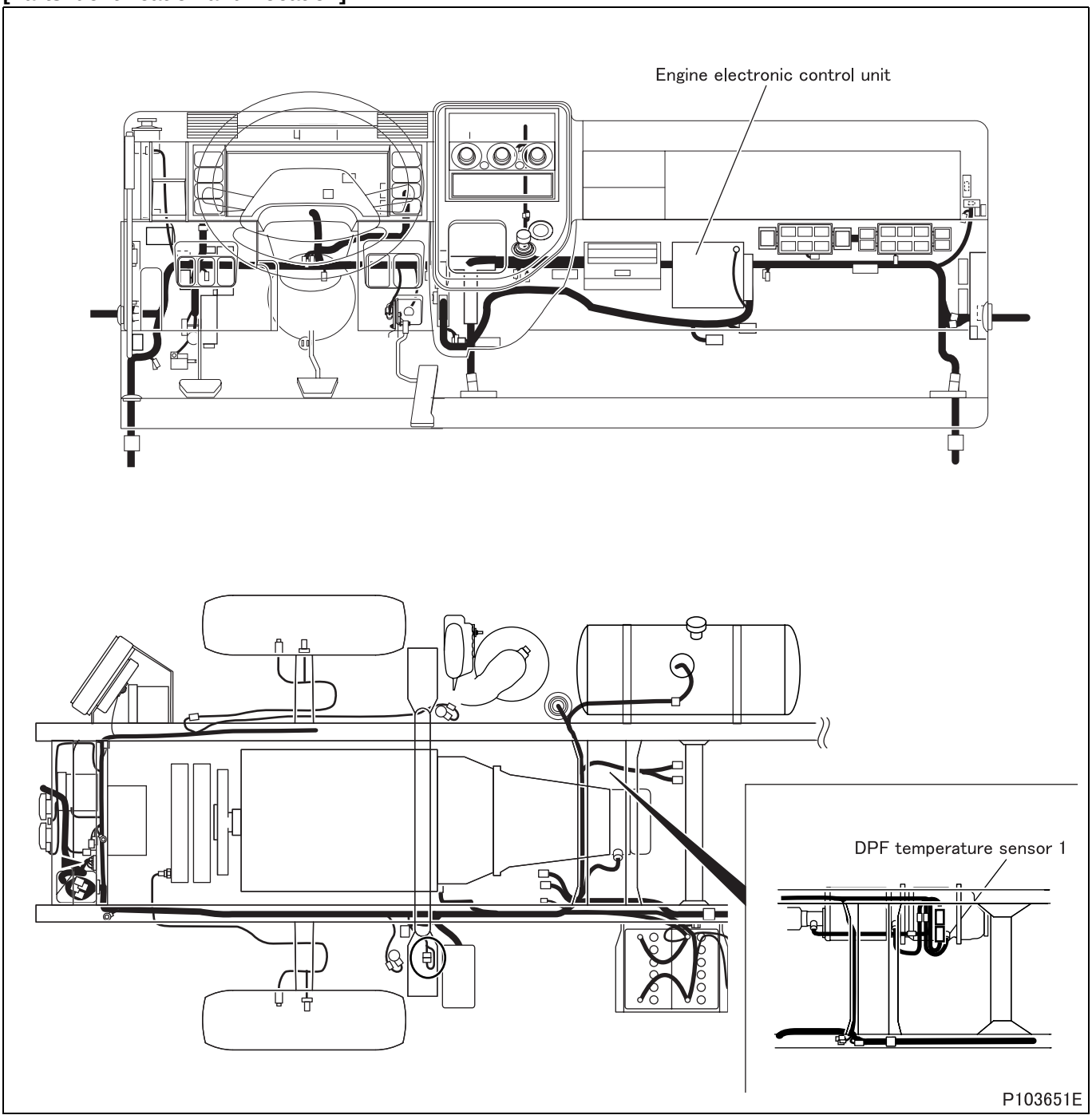
[Probable cause of trouble]
- Excessive smoke emission (due to malfunction of engine proper, common rail or exhaust gas recirculation system)
- Malfunction of diesel particulate filter regeneration control
- Excessive particulate matter (PM) deposit
- Malfunction of engine electronic control unit

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



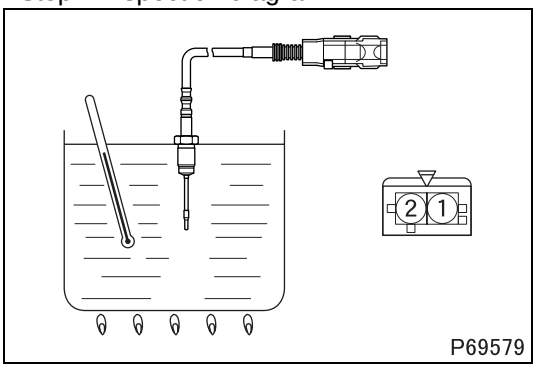
[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Check if following diagnosis codes occur simultaneously. • P0045 “VGT Actuator (Open)” • P0046 “VGT Actuator (Performance)” • P0047 “VGT Actuator (Low)” • P0102 “Airflow Sensor (Low)” • P0103 “Airflow Sensor (High)” • P0426 “EXH Gas Temp SNSR1 (Plausibility)” • P0427 “EXH Gas Temp SNSR1 (Low)” • P0428 “EXH Gas Temp SNSR1 (High)” • P0545 “DPF Temp SNSR (upstream) Low” • P0546 “DPF Temp SNSR (upstream) High” • P1430 “DPF Regeneration Switch” • P1660 “DPF Lamp Control Circuit (Low)” • P2031 “Exhaust Gas Temp” • P2032 “Exhaust Gas Temp (Low)” • P2033 “Exhaust Gas Temp (High)” • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (High) & MFF”
	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 code that is occurring, go to step 2.
		NO	Go to step 2.

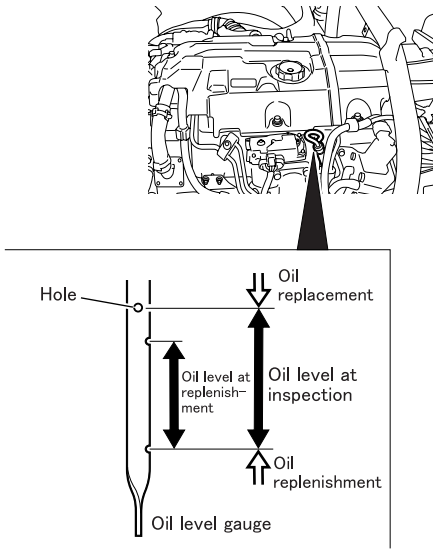
Step 2	Inspection items		Inspection of DPF temperature sensor 2 unit
	Maintenance item		Measure value of resistance between terminal No. 1 and 2.
	Inspection condition		• Put DPF temperature sensor 2 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	Inspection result (Is the judging standard satisfied?)	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>



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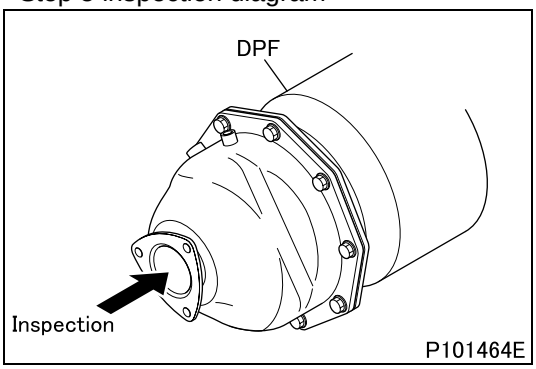
Step 4	Inspection items		Inspection of pressure hose
	Maintenance item		Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks.
	Inspection condition		–
	Requirements		Nothing abnormal detected
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	After correction and replacement of hose, go to step 5.

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		Perform following preparatory works. • Place the transmission in neutral. (place the automatic transmission in P range) • Turn the steering wheel in neutral position and securely apply the parking brake. • Turn off air conditioner not to increase the engine speed. • Check diagnosis code of each electronic control system. If any fault exists, rectify it. • Resetting the DPF-related information (perform “History reset” of Multi-Use Tester) (See Gr15 “Resetting the DPF-related information”.) • 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”)
	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.

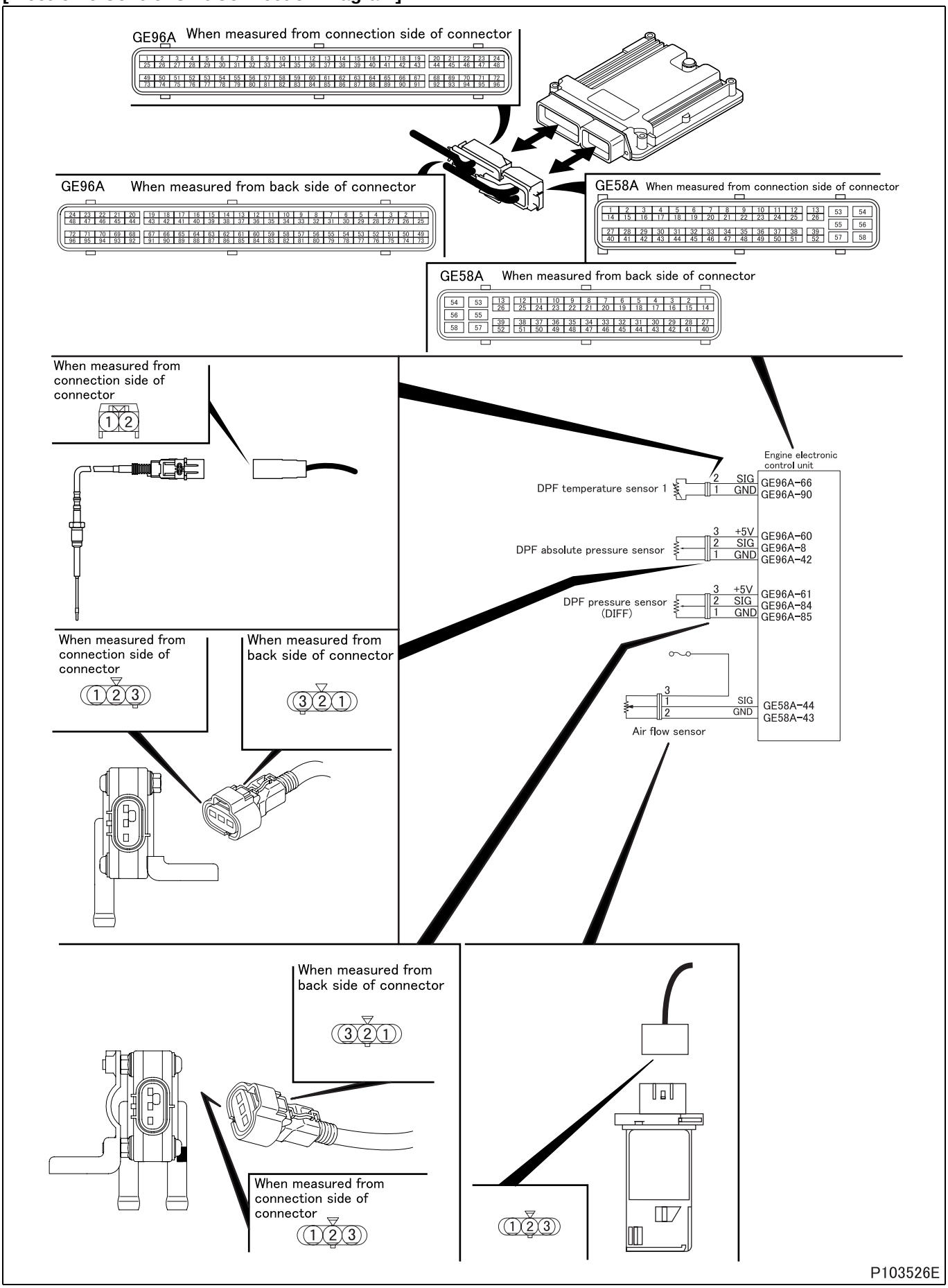
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Diesel particulate filter regeneration is stopped (manual regeneration is feasible)

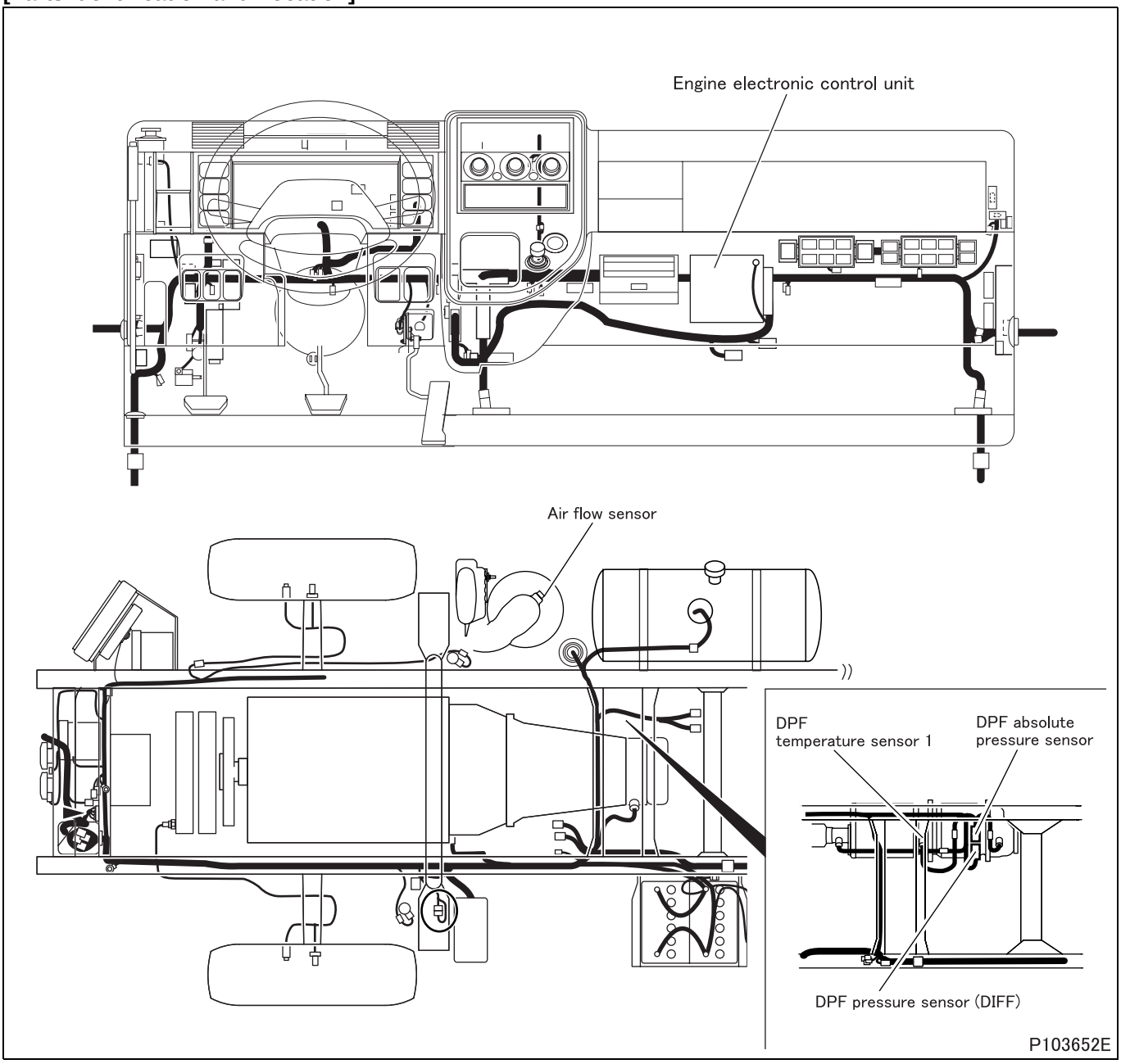
[Probable cause of trouble]
- Malfunction of diesel particulate filter regeneration control
- Malfunction of DPF temperature sensor 1
- Malfunction of engine electronic control unit
- Malfunction of common rail
- Malfunction of diesel particulate filter (front oxidation catalyst)

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



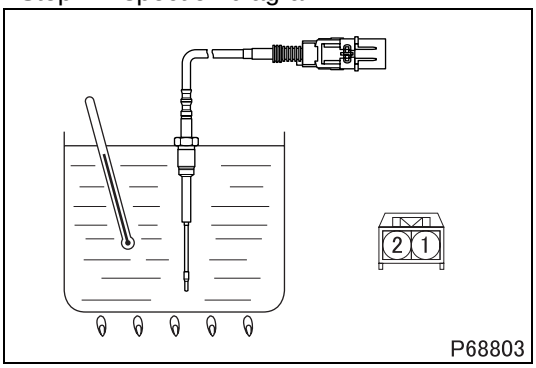
[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Check if following diagnosis codes occur simultaneously. • P0045 “VGT Actuator (Open)” • P0046 “VGT Actuator (Performance)” • P0047 “VGT Actuator (Low)” • P0102 “Airflow Sensor (Low)” • P0103 “Airflow Sensor (High)” • P0426 “EXH Gas Temp SNSR1 (Plausibility)” • P0427 “EXH Gas Temp SNSR1 (Low)” • P0428 “EXH Gas Temp SNSR1 (High)” • P0545 “DPF Temp SNSR (upstream) Low” • P0546 “DPF Temp SNSR (upstream) High” • P1430 “DPF Regeneration Switch” • P1660 “DPF Lamp Control Circuit (Low)” • P2031 “Exhaust Gas Temp” • P2032 “Exhaust Gas Temp (Low)” • P2033 “Exhaust Gas Temp (High)” • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (High) & MFF”
	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 code that is occurring, go to step 2.
		NO	Go to step 2.

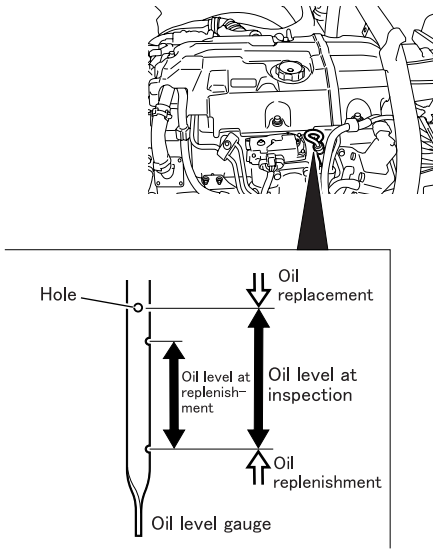
Step 2	Inspection items		Inspection of DPF temperature sensor 1 unit
	Maintenance item		Measure value of resistance between terminal No. 1 and 2.
	Inspection condition		• Put DPF temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	Inspection result (Is the judging standard satisfied?)	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>



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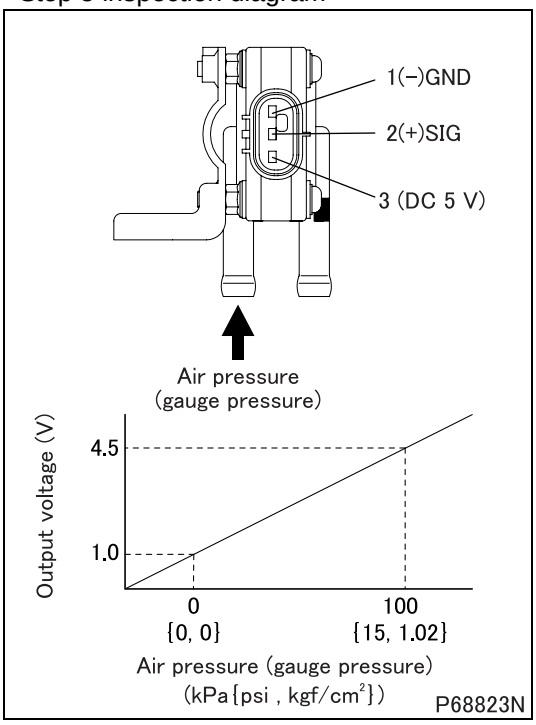
Step 4	Inspection items		Inspection of pressure hose
	Maintenance item		Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks.
	Inspection condition		–
	Requirements		Nothing abnormal detected
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Correction and replacement of hose

Step 5	Inspection items		Inspection of sensor unit
	Maintenance item		Measure value of voltage between connector terminal No. 2 (+) and 1 (–).
	Inspection condition		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	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		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	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: 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.

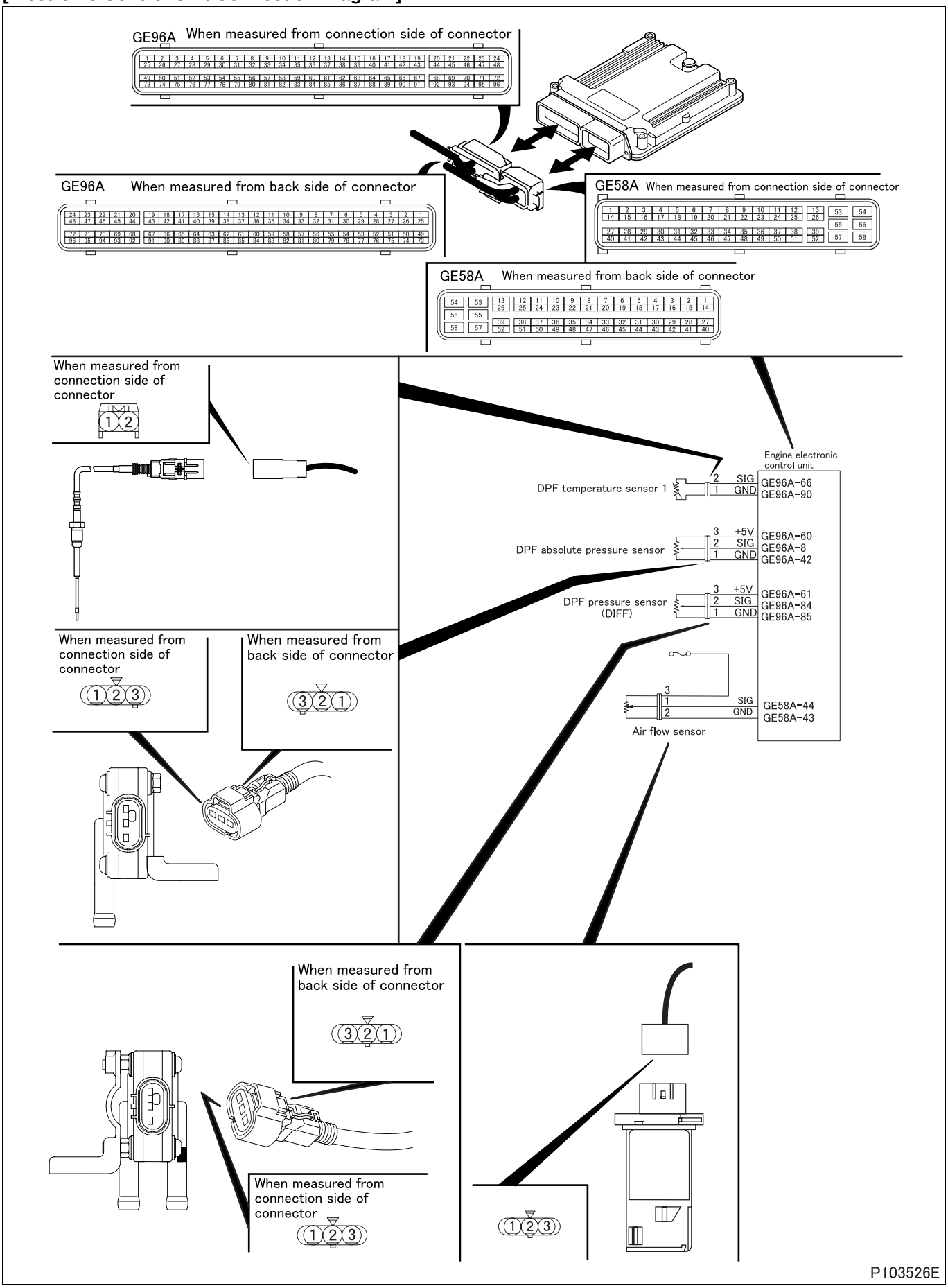
[Diagnostic requirement]
–

[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]



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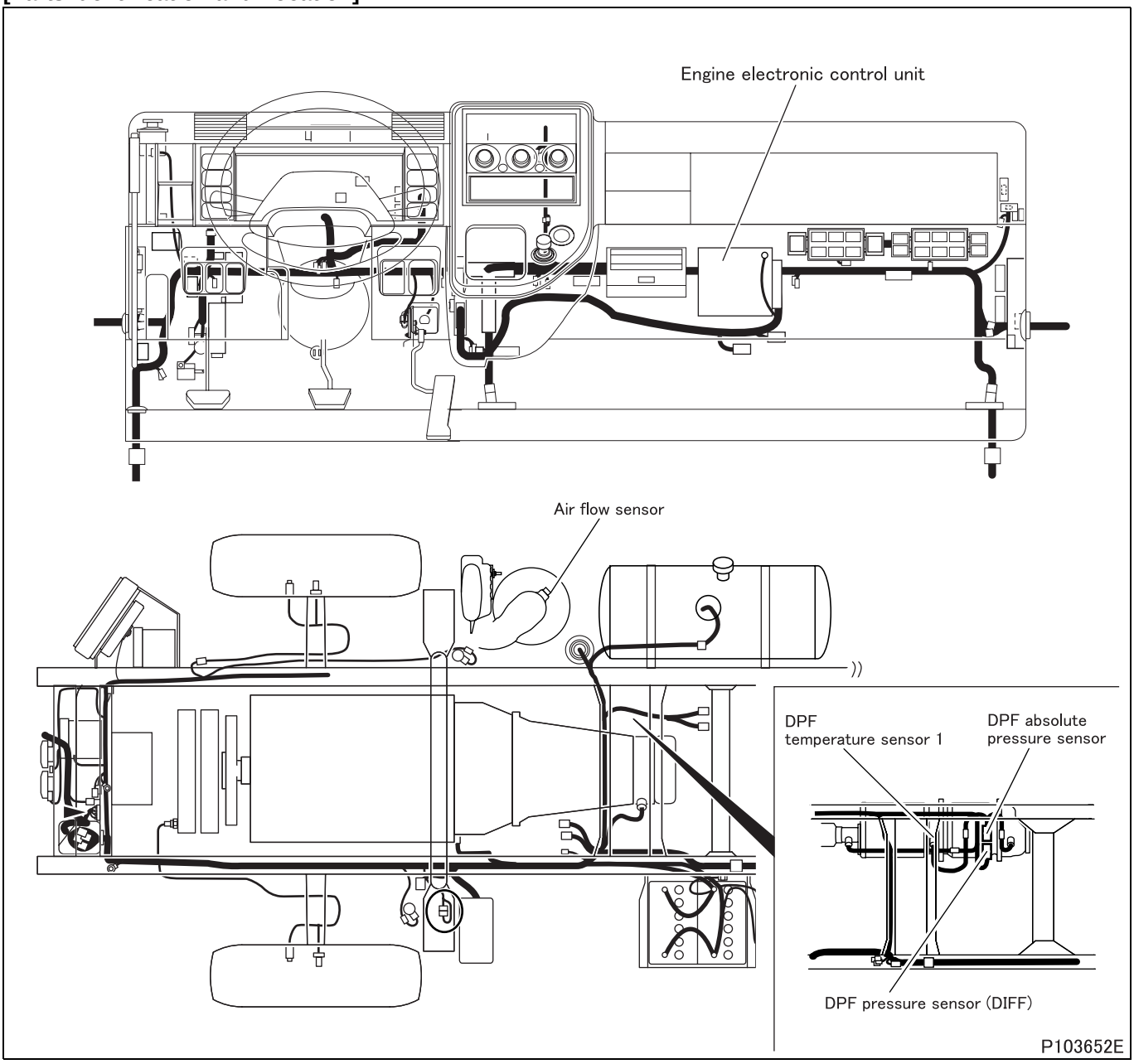
[Parts Identification and Location]



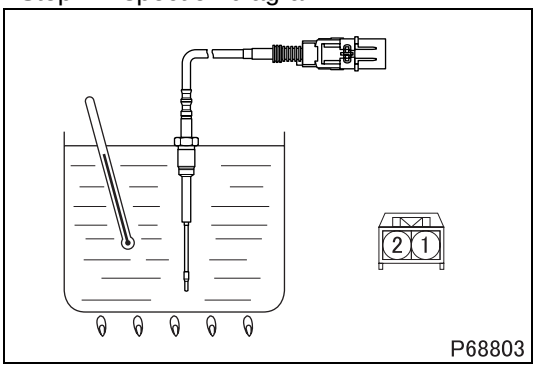
[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Check if following diagnosis codes occur simultaneously. • P0045 “VGT Actuator (Open)” • P0046 “VGT Actuator (Performance)” • P0047 “VGT Actuator (Low)” • P0102 “Airflow Sensor (Low)” • P0103 “Airflow Sensor (High)” • P0426 “EXH Gas Temp SNSR1 (Plausibility)” • P0427 “EXH Gas Temp SNSR1 (Low)” • P0428 “EXH Gas Temp SNSR1 (High)” • P0545 “DPF Temp SNSR (upstream) Low” • P0546 “DPF Temp SNSR (upstream) High” • P1430 “DPF Regeneration Switch” • P1660 “DPF Lamp Control Circuit (Low)” • P2031 “Exhaust Gas Temp” • P2032 “Exhaust Gas Temp (Low)” • P2033 “Exhaust Gas Temp (High)” • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (High) & MFF”
	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 code that is occurring, go to step 2.
		NO	Go to step 2.

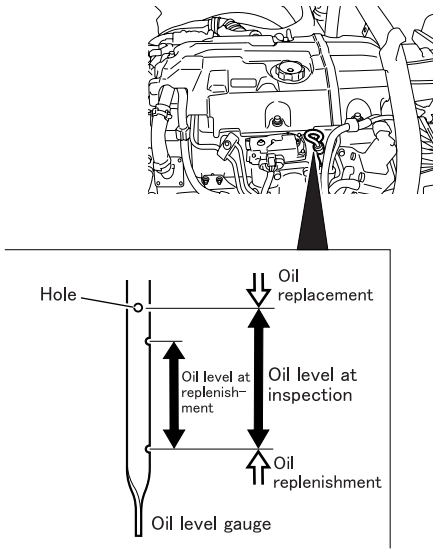
Step 2	Inspection items		Inspection of DPF temperature sensor 1 unit
	Maintenance item		Measure value of resistance between terminal No. 1 and 2.
	Inspection condition		• Put DPF temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	Inspection result (Is the judging standard satisfied?)	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>



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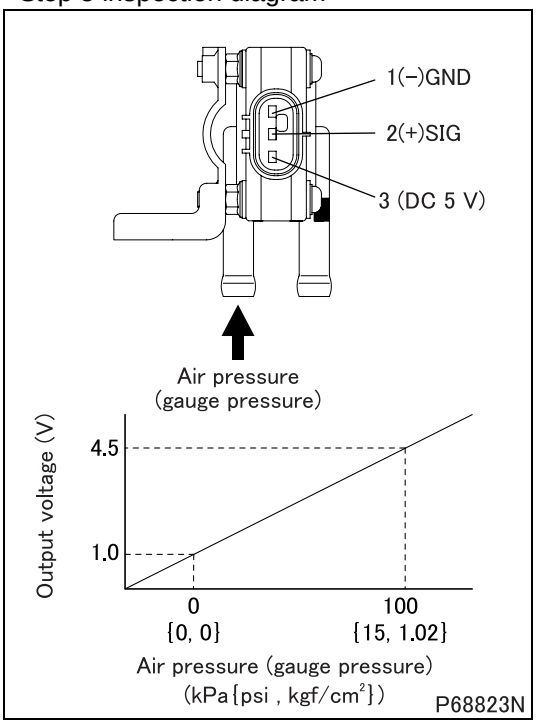
Step 4	Inspection items		Inspection of pressure hose
	Maintenance item		Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks.
	Inspection condition		–
	Requirements		Nothing abnormal detected
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Correction and replacement of hose

Step 5	Inspection items		Inspection of sensor unit
	Maintenance item		Measure value of voltage between connector terminal No. 2 (+) and 1 (–).
	Inspection condition		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	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		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	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: 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.

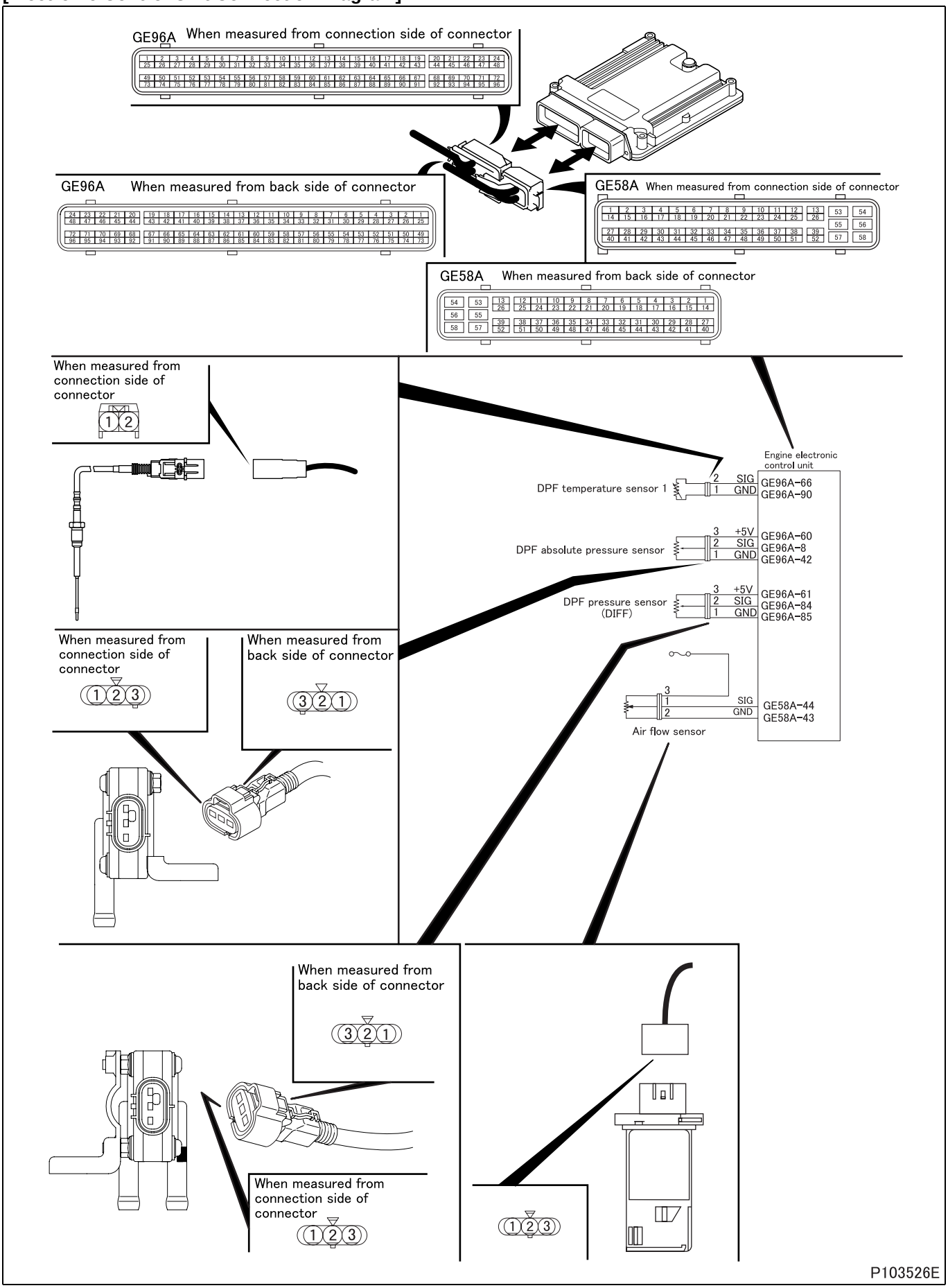
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Diesel particulate filter regeneration is stopped (manual regeneration is feasible).

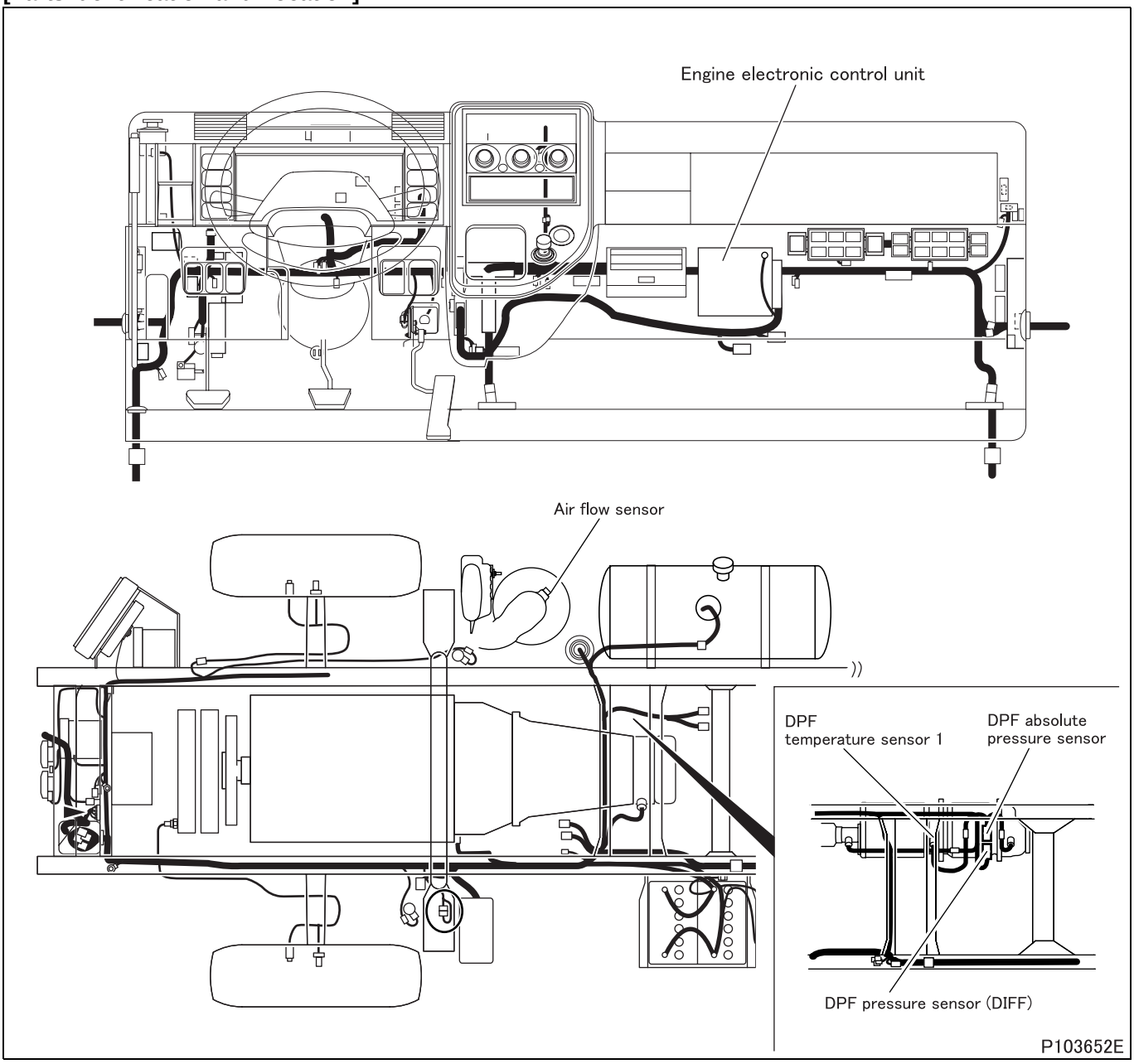
[Probable cause of trouble]
- Malfunction of diesel particulate filter regeneration control
- Malfunction of DPF temperature sensor 1
- Malfunction of engine electronic control unit
- Malfunction of common rail
- Malfunction of diesel particulate filter (front oxidation catalyst)

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



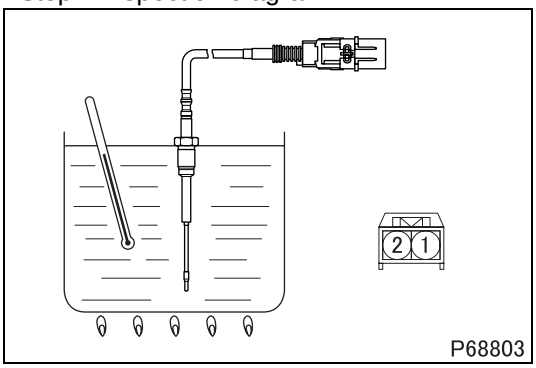
[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Check if following diagnosis codes occur simultaneously. • P0045 “VGT Actuator (Open)” • P0046 “VGT Actuator (Performance)” • P0047 “VGT Actuator (Low)” • P0102 “Airflow Sensor (Low)” • P0103 “Airflow Sensor (High)” • P0426 “EXH Gas Temp SNSR1 (Plausibility)” • P0427 “EXH Gas Temp SNSR1 (Low)” • P0428 “EXH Gas Temp SNSR1 (High)” • P0545 “DPF Temp SNSR (upstream) Low” • P0546 “DPF Temp SNSR (upstream) High” • P1430 “DPF Regeneration Switch” • P1660 “DPF Lamp Control Circuit (Low)” • P2031 “Exhaust Gas Temp” • P2032 “Exhaust Gas Temp (Low)” • P2033 “Exhaust Gas Temp (High)” • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (High) & MFF”
	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 code that is occurring, go to step 2.
		NO	Go to step 2.

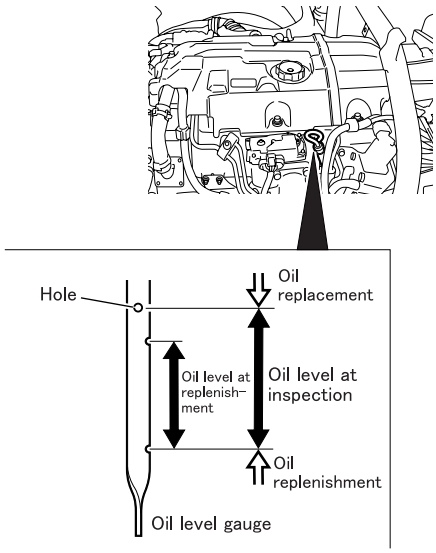
Step 2	Inspection items		Inspection of DPF temperature sensor 1 unit
	Maintenance item		Measure value of resistance between terminal No. 1 and 2.
	Inspection condition		• Put DPF temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	Inspection result (Is the judging standard satisfied?)	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>



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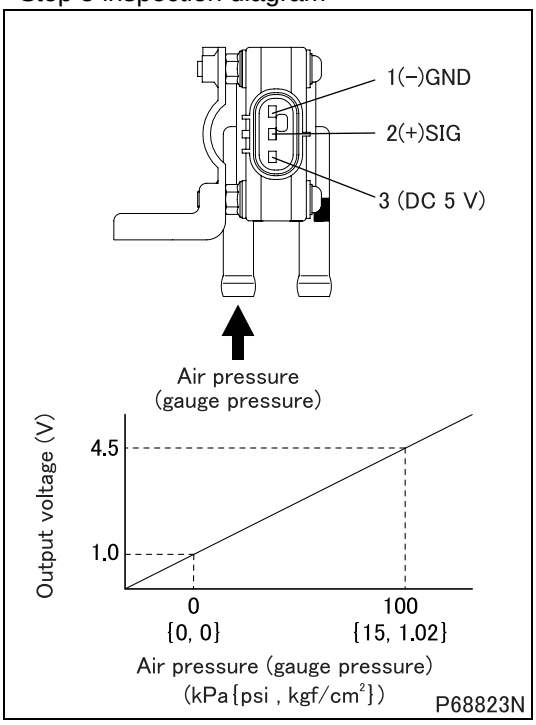
Step 4	Inspection items		Inspection of pressure hose
	Maintenance item		Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks.
	Inspection condition		–
	Requirements		Nothing abnormal detected
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Correction and replacement of hose

Step 5	Inspection items		Inspection of sensor unit
	Maintenance item		Measure value of voltage between connector terminal No. 2 (+) and 1 (–).
	Inspection condition		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	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		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	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: 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.

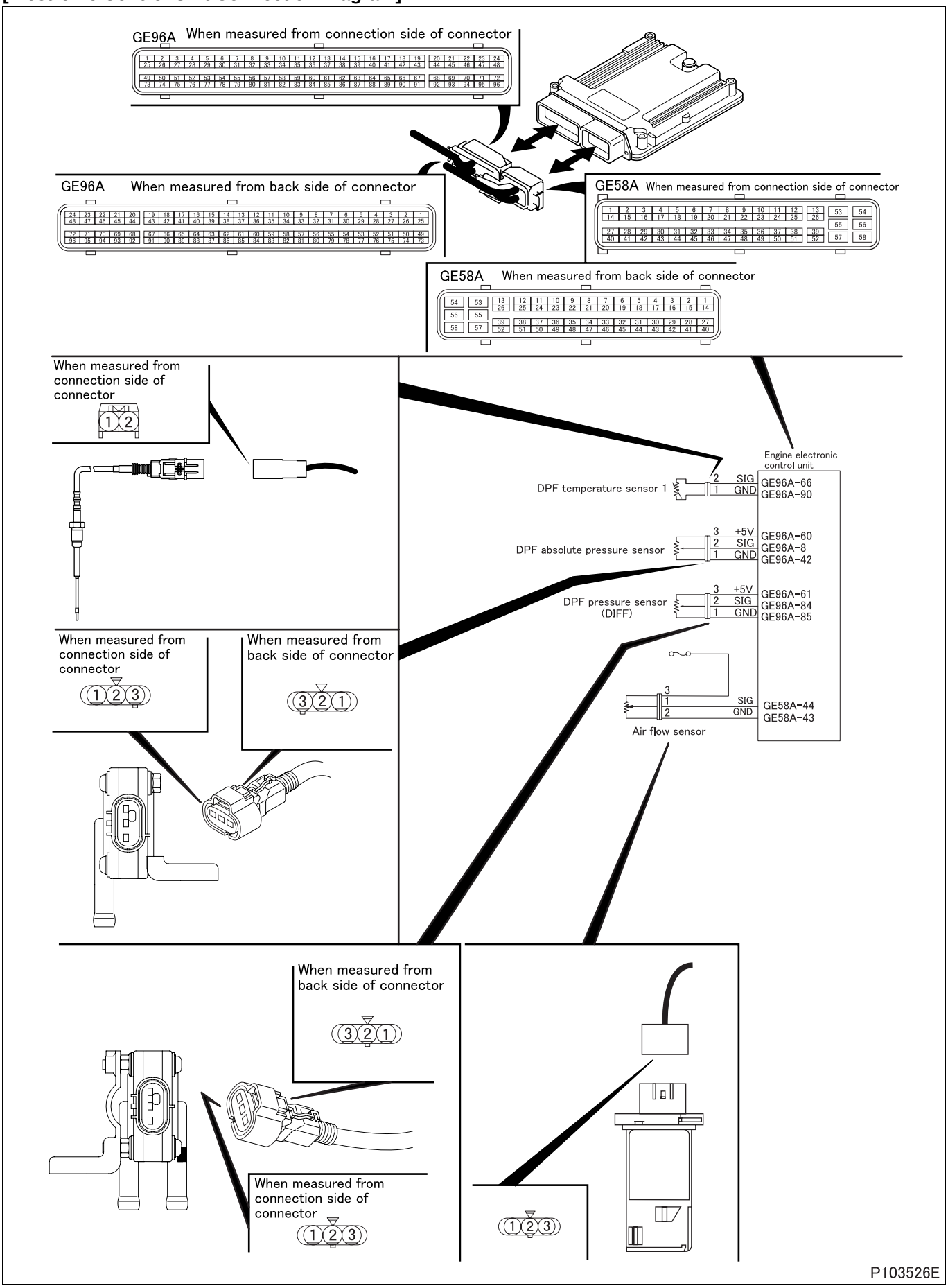
[Diagnostic requirement]
–

[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]



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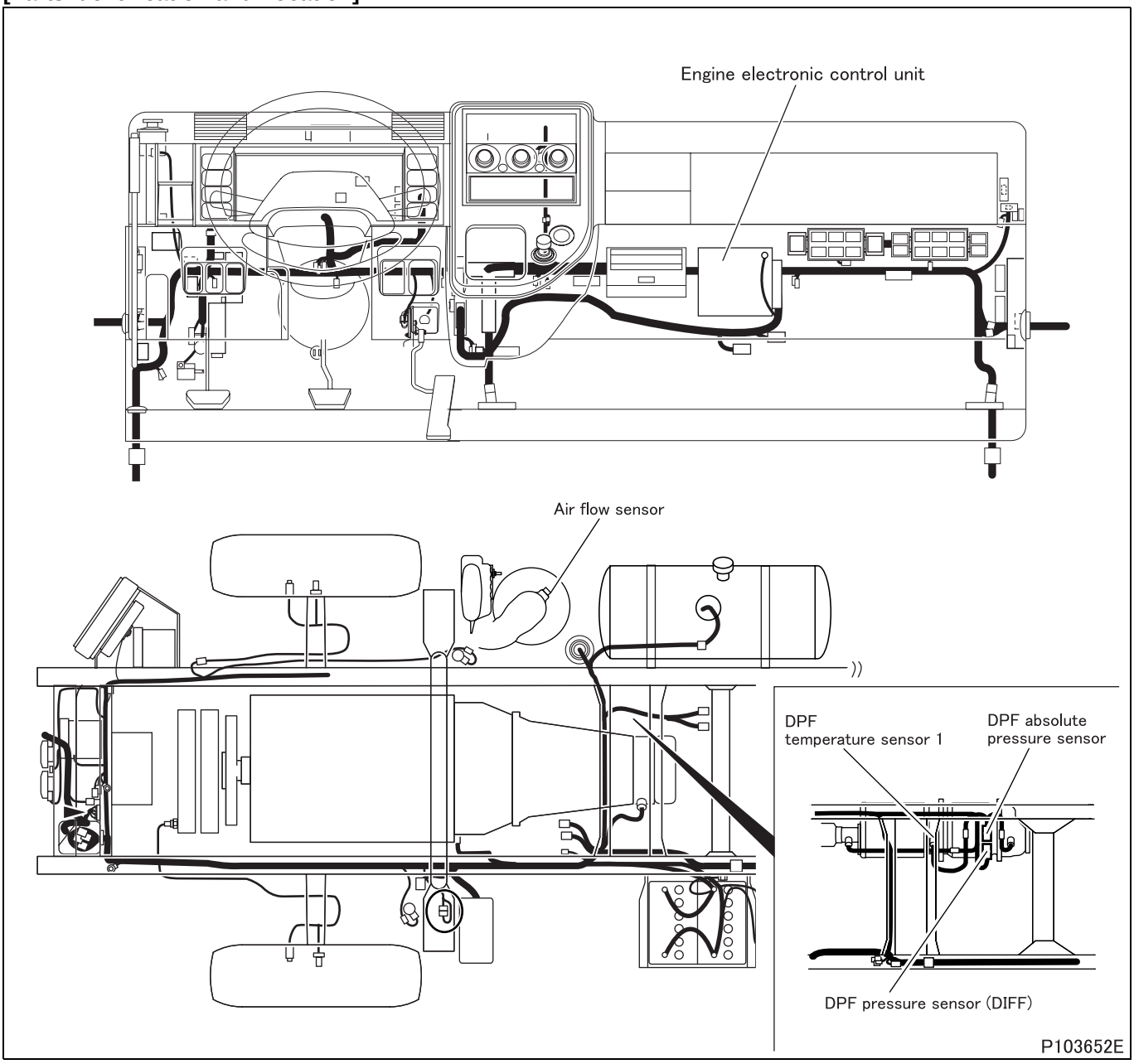
[Parts Identification and Location]



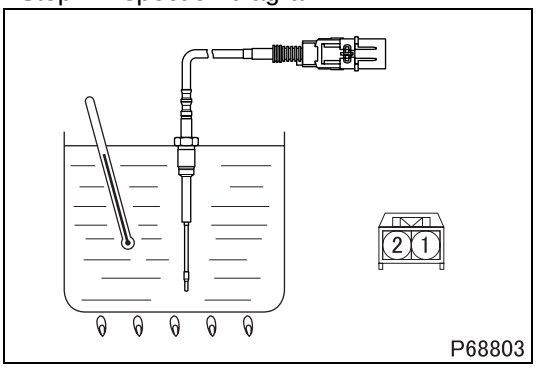
[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Check if following diagnosis codes occur simultaneously. • P0045 “VGT Actuator (Open)” • P0046 “VGT Actuator (Performance)” • P0047 “VGT Actuator (Low)” • P0102 “Airflow Sensor (Low)” • P0103 “Airflow Sensor (High)” • P0426 “EXH Gas Temp SNSR1 (Plausibility)” • P0427 “EXH Gas Temp SNSR1 (Low)” • P0428 “EXH Gas Temp SNSR1 (High)” • P0545 “DPF Temp SNSR (upstream) Low” • P0546 “DPF Temp SNSR (upstream) High” • P1430 “DPF Regeneration Switch” • P1660 “DPF Lamp Control Circuit (Low)” • P2031 “Exhaust Gas Temp” • P2032 “Exhaust Gas Temp (Low)” • P2033 “Exhaust Gas Temp (High)” • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (High) & MFF”
	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 code that is occurring, go to step 2.
		NO	Go to step 2.

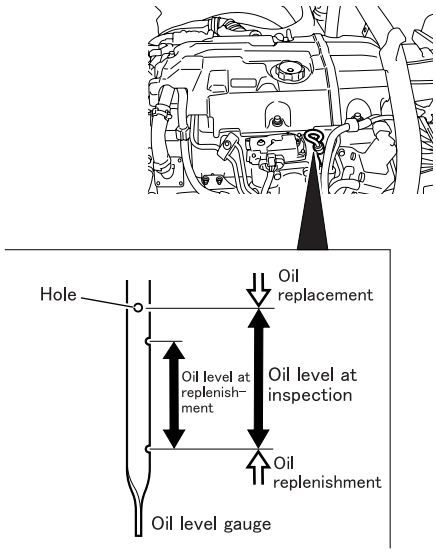
Step 2	Inspection items		Inspection of DPF temperature sensor 1 unit
	Maintenance item		Measure value of resistance between terminal No. 1 and 2.
	Inspection condition		• Put DPF temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	Inspection result (Is the judging standard satisfied?)	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>



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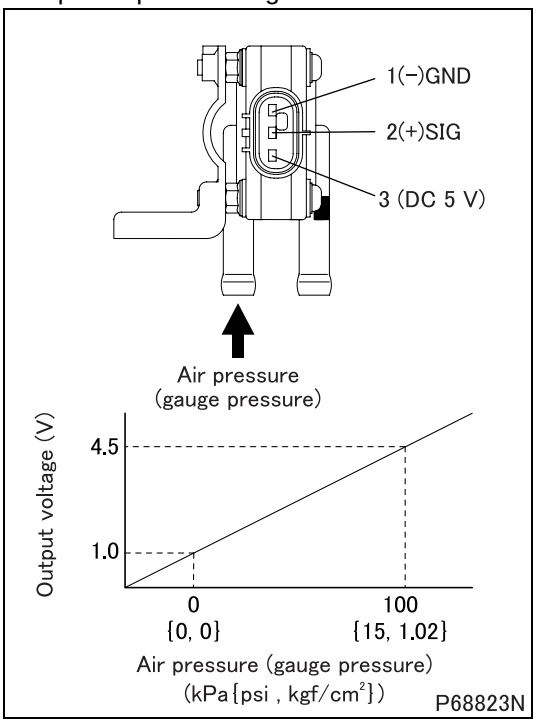
Step 4	Inspection items		Inspection of pressure hose
	Maintenance item		Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks.
	Inspection condition		–
	Requirements		Nothing abnormal detected
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Correction and replacement of hose

Step 5	Inspection items		Inspection of sensor unit
	Maintenance item		Measure value of voltage between connector terminal No. 2 (+) and 1 (–).
	Inspection condition		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	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		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	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: 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 particular 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.

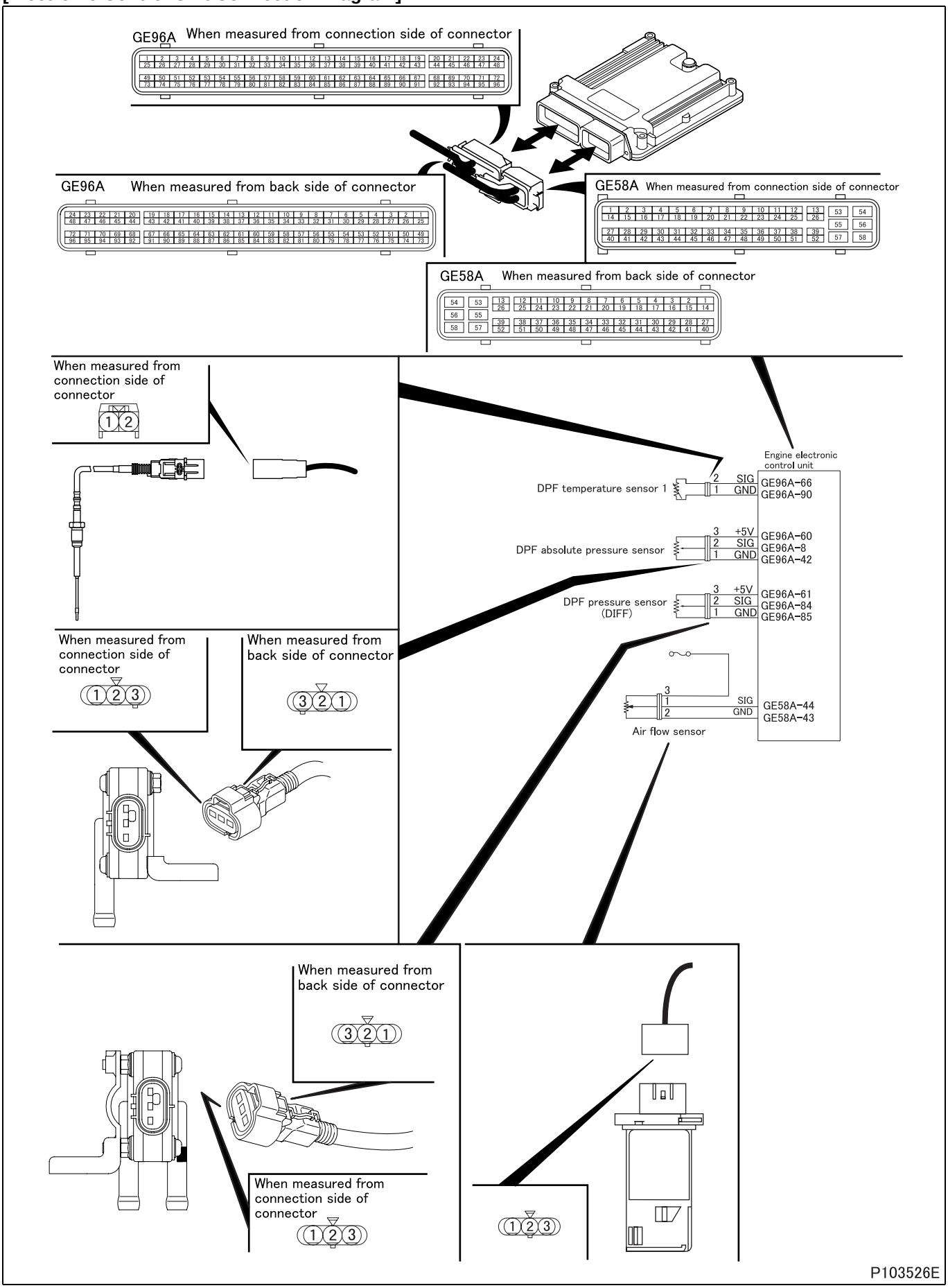
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Diesel particulate filter regeneration is stopped.

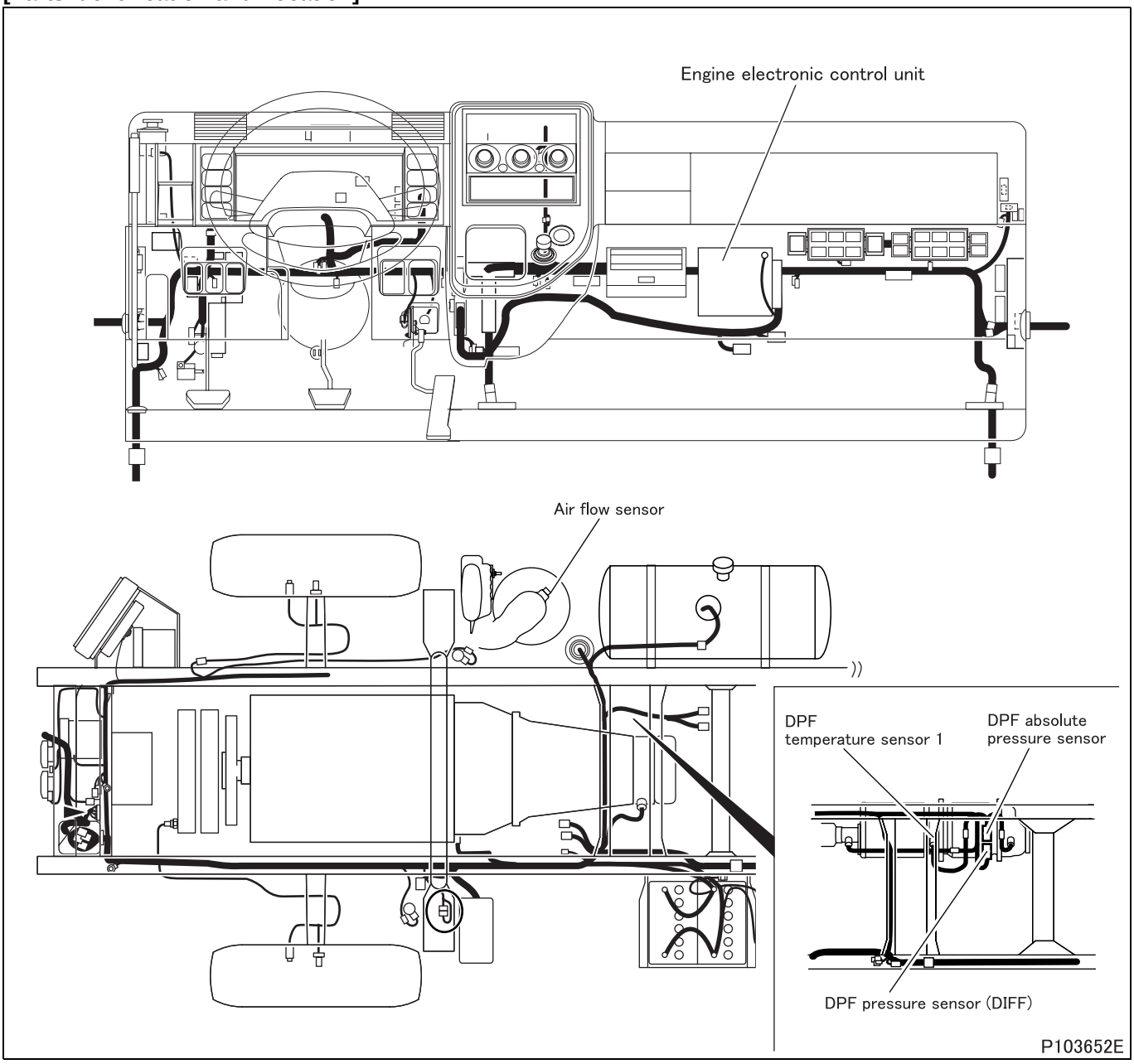
[Probable cause of trouble]
- Malfunction of diesel particulate filter regeneration control
- Malfunction of DPF temperature sensor 1
- Malfunction of engine electronic control unit
- Malfunction of common rail
- Malfunction of diesel particulate filter (front oxidation catalyst)

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



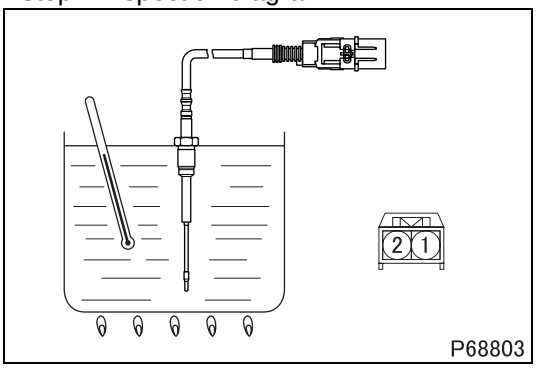
[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Check if following diagnosis codes occur simultaneously. • P0045 “VGT Actuator (Open)” • P0046 “VGT Actuator (Performance)” • P0047 “VGT Actuator (Low)” • P0102 “Airflow Sensor (Low)” • P0103 “Airflow Sensor (High)” • P0426 “EXH Gas Temp SNSR1 (Plausibility)” • P0427 “EXH Gas Temp SNSR1 (Low)” • P0428 “EXH Gas Temp SNSR1 (High)” • P0545 “DPF Temp SNSR (upstream) Low” • P0546 “DPF Temp SNSR (upstream) High” • P1430 “DPF Regeneration Switch” • P1660 “DPF Lamp Control Circuit (Low)” • P2031 “Exhaust Gas Temp” • P2032 “Exhaust Gas Temp (Low)” • P2033 “Exhaust Gas Temp (High)” • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (High) & MFF”
	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 and go to step 2.
		NO	Go to step 2.

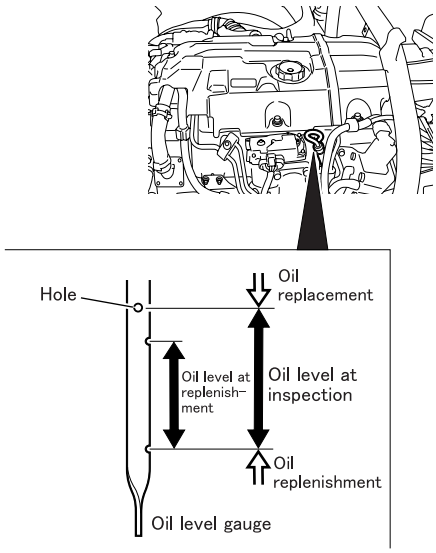
Step 2	Inspection items		Inspection of DPF temperature sensor 1 unit
	Maintenance item		Measure value of resistance between connector terminal No.1 and 2.
	Inspection condition		• Put DPF temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	Inspection result (Is the judging standard satisfied?)	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>



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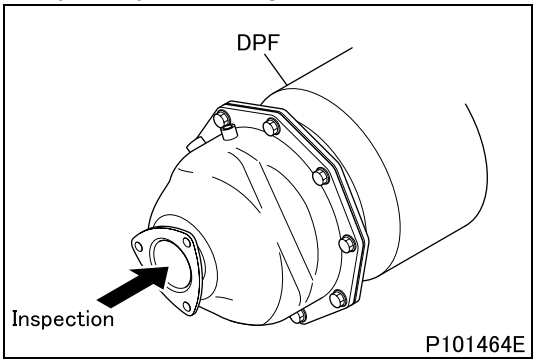
Step 4	Inspection items		Inspection of pressure hose
	Maintenance item		Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks.
	Inspection condition		–
	Requirements		Nothing abnormal detected
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	After correction and replacement of hose, go to step 5.

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.

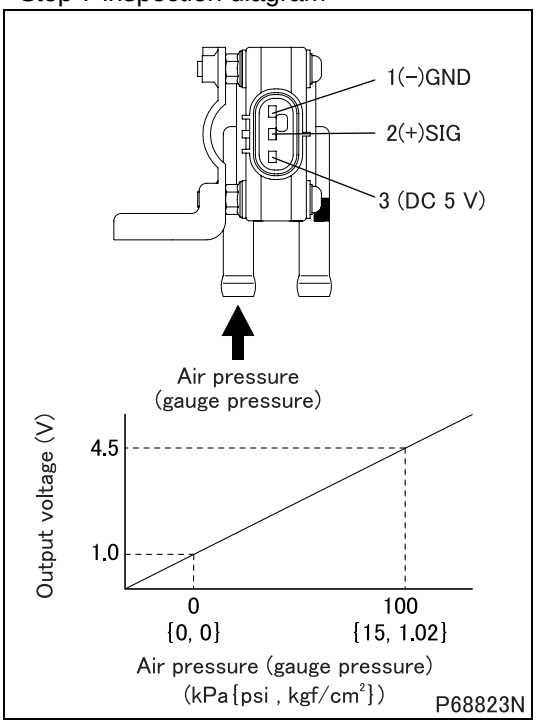
<Step 5 inspection diagram>



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		Perform the following preparatory works. • Place the transmission in neutral (place the automatic transmission in P range). • Turn the steering wheel in neutral position and securely apply the parking brake. • Turn off air conditioner not to increase the engine speed. • Check diagnosis code of each electronic control system. If any fault exists, rectify it. • Resetting the DPF-related information (perform “History reset” of Multi-Use Tester) (See Gr15 “Resetting the DPF-related Information”.) • 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”).
	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

Step 7	Inspection items		Inspection of sensor unit
	Maintenance item		Measure value of voltage between connector terminal No. 2 (+) and 1 (–).
	Inspection condition		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	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 sensor unit
	Maintenance item		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	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: 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 particular 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.

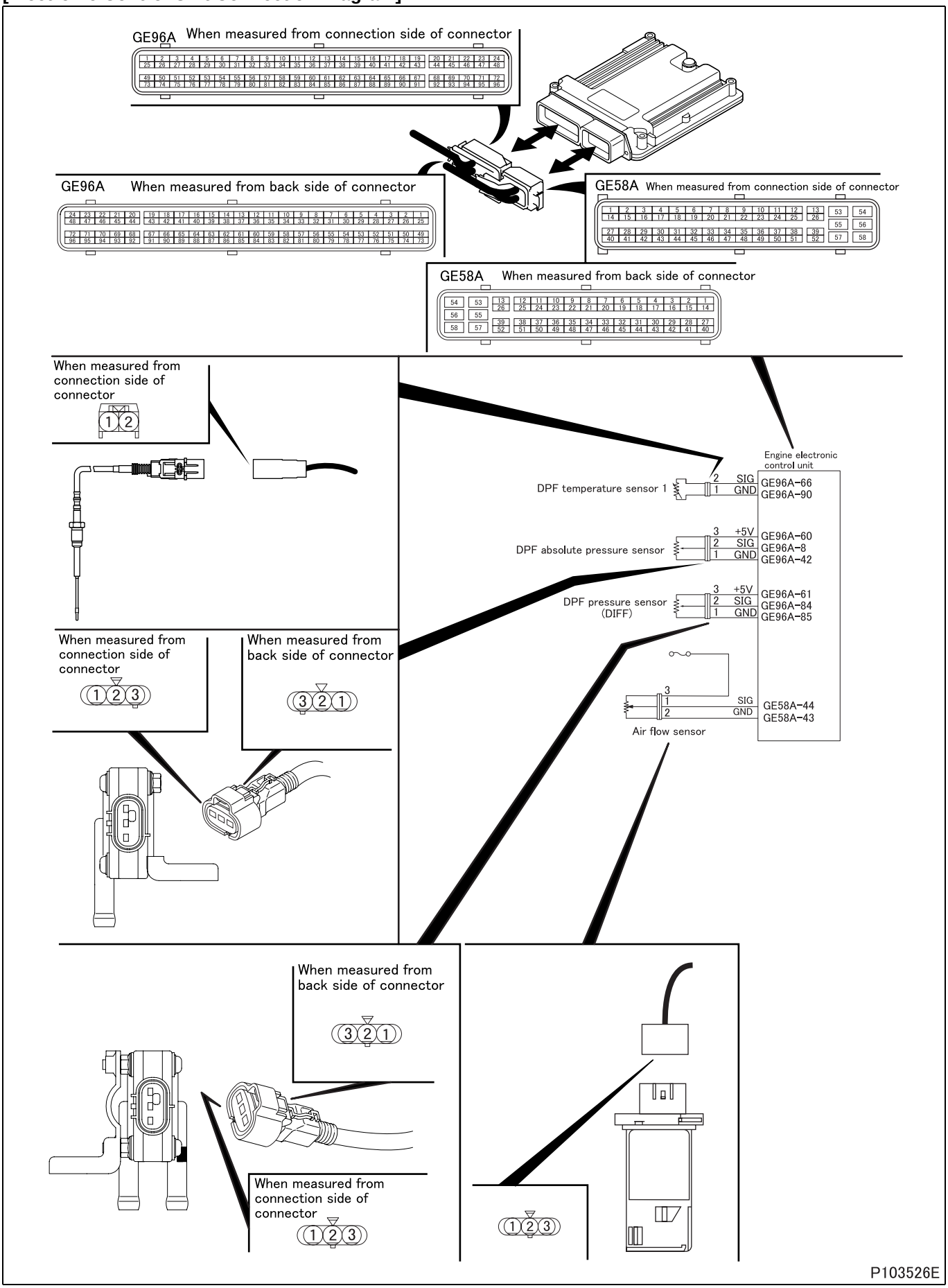
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Diesel particulate filter regeneration is stopped.

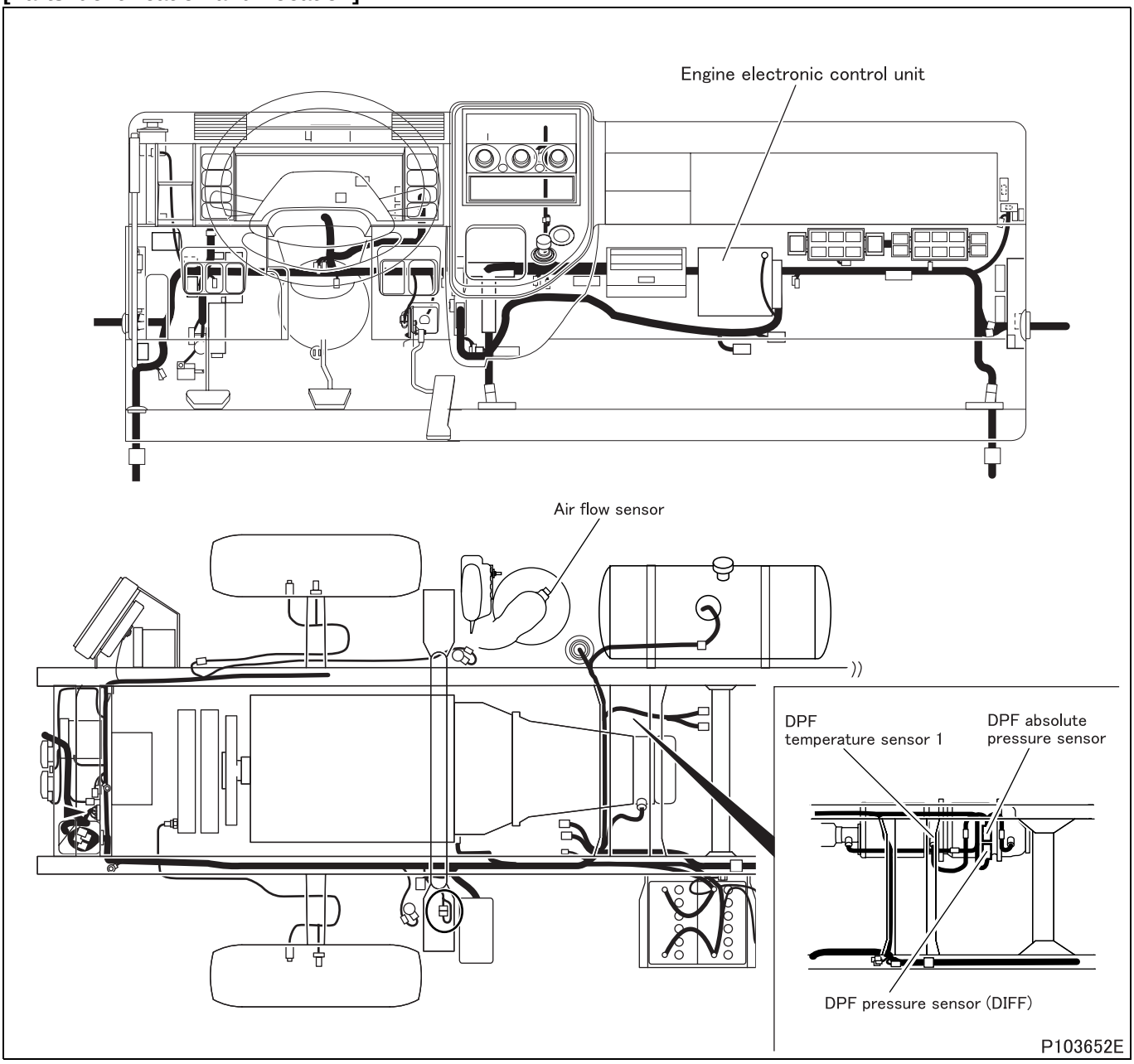
[Probable cause of trouble]
- Malfunction of diesel particulate filter regeneration control
- Malfunction of DPF temperature sensor 1
- Malfunction of engine electronic control unit
- Malfunction of common rail
- Malfunction of diesel particulate filter (front oxidation catalyst)

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



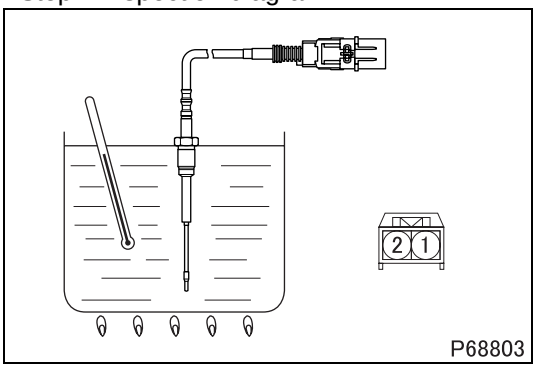
[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Check if following diagnosis codes occur simultaneously. • P0045 “VGT Actuator (Open)” • P0046 “VGT Actuator (Performance)” • P0047 “VGT Actuator (Low)” • P0102 “Airflow Sensor (Low)” • P0103 “Airflow Sensor (High)” • P0426 “EXH Gas Temp SNSR1 (Plausibility)” • P0427 “EXH Gas Temp SNSR1 (Low)” • P0428 “EXH Gas Temp SNSR1 (High)” • P0545 “DPF Temp SNSR (upstream) Low” • P0546 “DPF Temp SNSR (upstream) High” • P1430 “DPF Regeneration Switch” • P1660 “DPF Lamp Control Circuit (Low)” • P2031 “Exhaust Gas Temp” • P2032 “Exhaust Gas Temp (Low)” • P2033 “Exhaust Gas Temp (High)” • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (High) & MFF”
	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 and go to step 2.
		NO	Go to step 2.

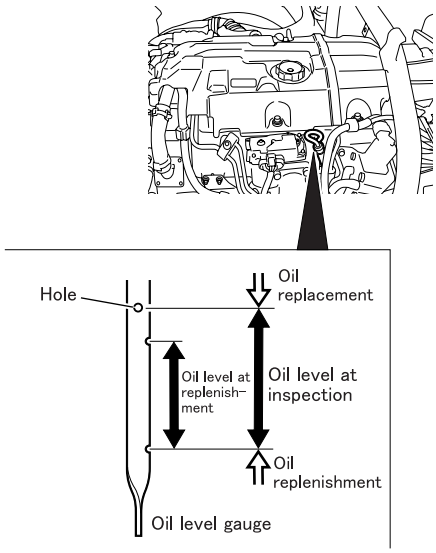
Step 2	Inspection items		Inspection of DPF temperature sensor 1 unit
	Maintenance item		Measure value of resistance between connector terminal No. 1 and 2.
	Inspection condition		• Put DPF temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	Inspection result (Is the judging standard satisfied?)	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>



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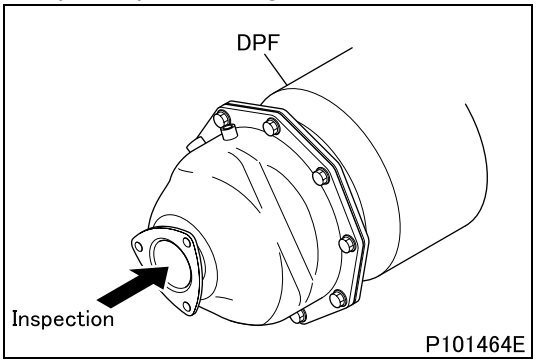
Step 4	Inspection items		Inspection of pressure hose
	Maintenance item		Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks.
	Inspection condition		–
	Requirements		Nothing abnormal detected
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	After correction and replacement of hose, go to step 5.

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.

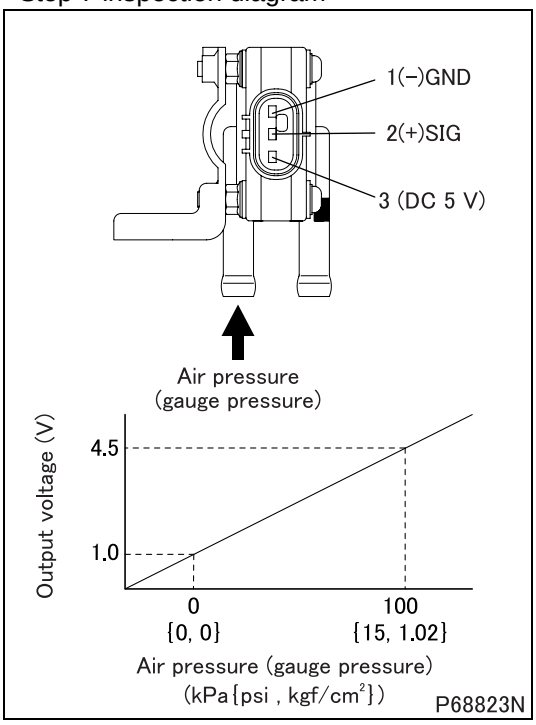
<Step 5 inspection diagram>



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		Perform the following preparatory works. • Place the transmission in neutral (place the automatic transmission in P range). • Turn the steering wheel in neutral position and securely apply the parking brake. • Turn off air conditioner not to increase the engine speed. • Check diagnosis code of each electronic control system. If any fault exists, rectify it. • Resetting the DPF-related information (perform “History reset” of Multi-Use Tester) (See Gr15 “Resetting the DPF-related Information”.) • 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”).
	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

Step 7	Inspection items		Inspection of sensor unit
	Maintenance item		Measure value of voltage between connector terminal No. 2 (+) and 1 (–).
	Inspection condition		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	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 sensor unit
	Maintenance item		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	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: 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 particular 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.

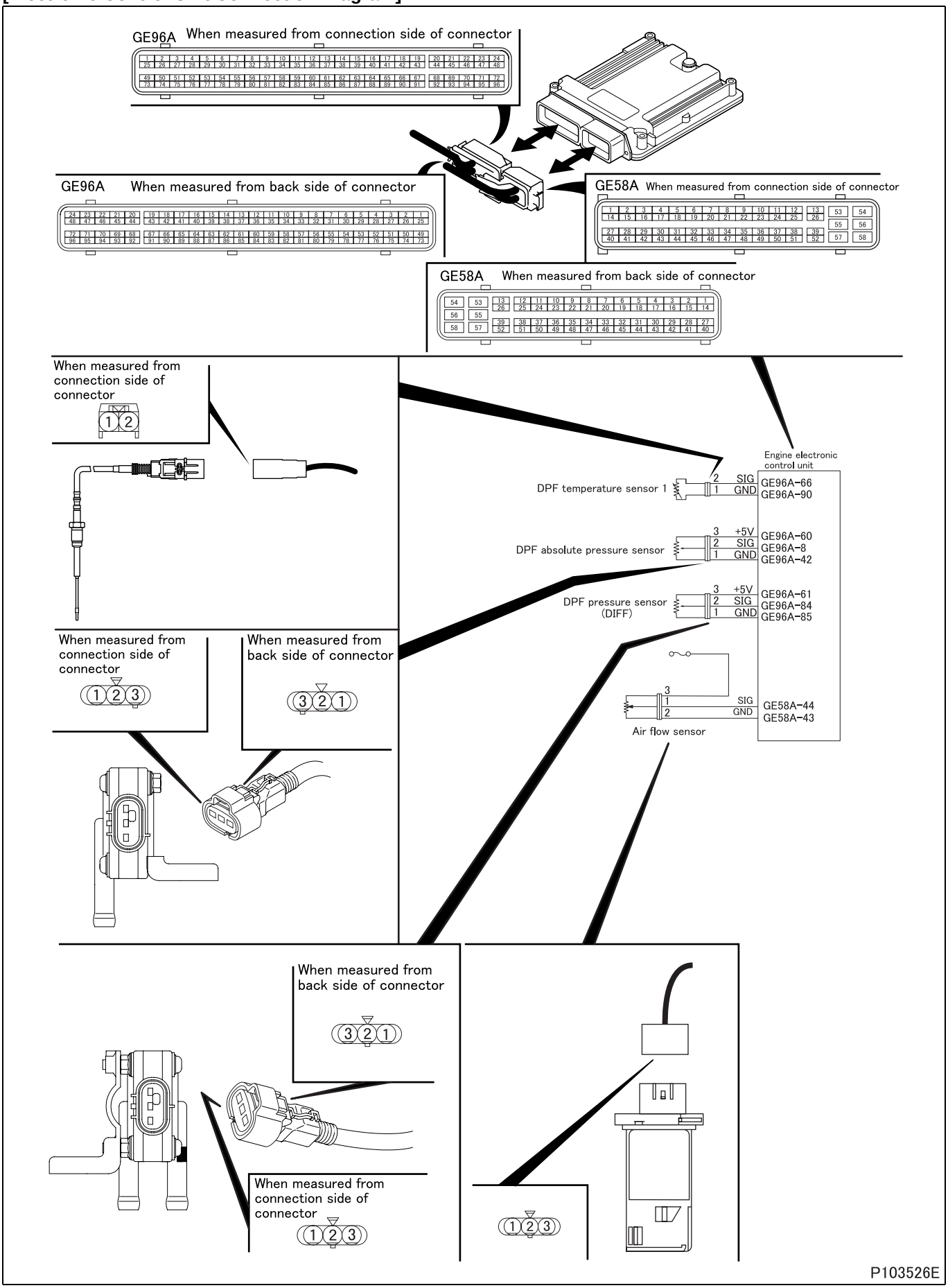
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Diesel particulate filter regeneration is stopped.

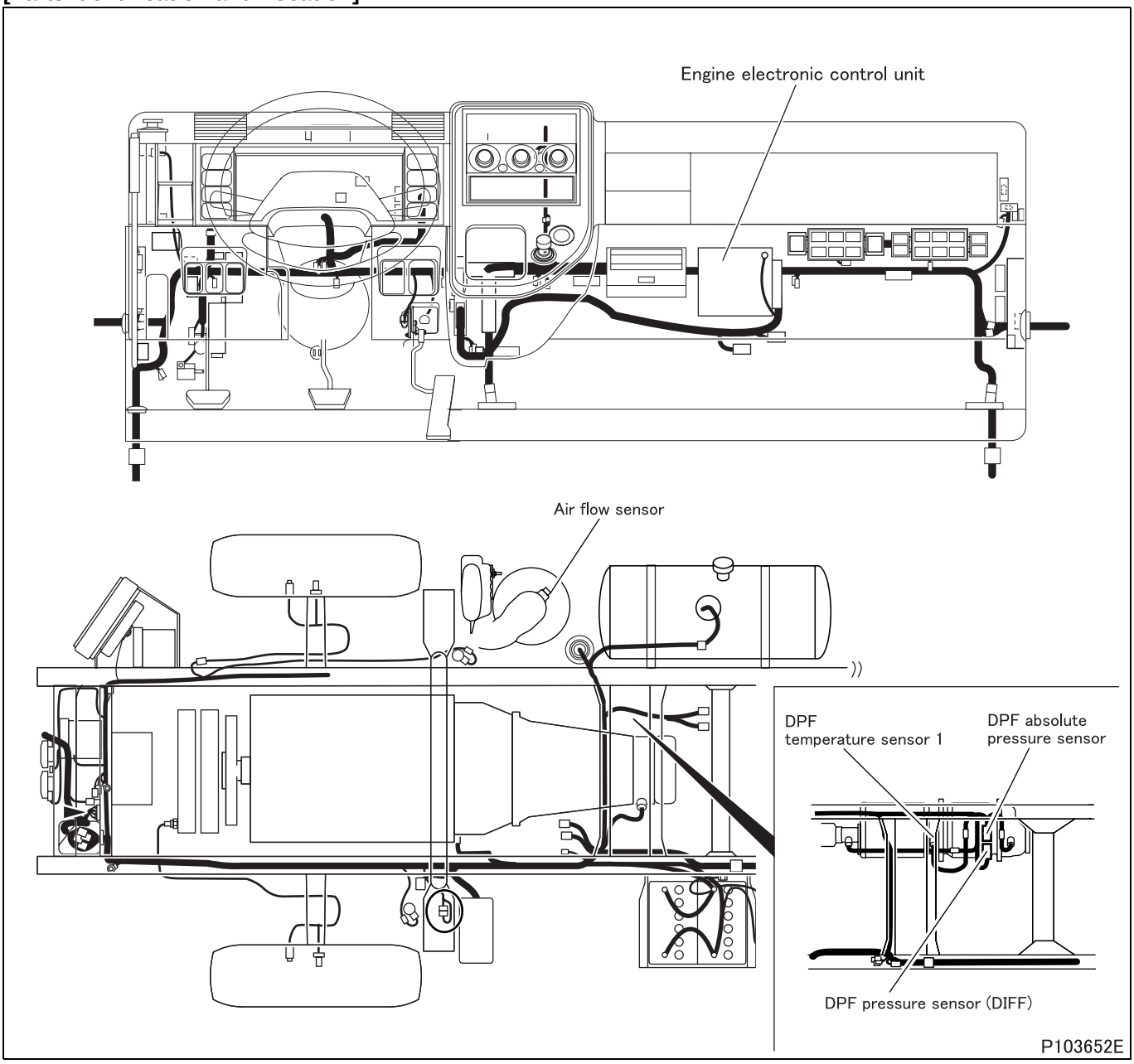
[Probable cause of trouble]
- Malfunction of diesel particulate filter regeneration control
- Malfunction of DPF temperature sensor 1
- Malfunction of engine electronic control unit
- Malfunction of common rail
- Malfunction of diesel particulate filter (front oxidation catalyst)

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



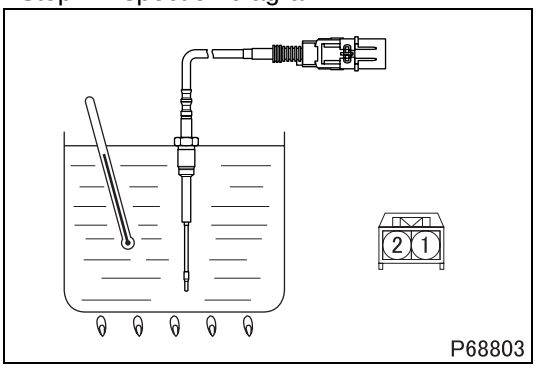
[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Check if following diagnosis codes occur simultaneously. • P0045 “VGT Actuator (Open)” • P0046 “VGT Actuator (Performance)” • P0047 “VGT Actuator (Low)” • P0102 “Airflow Sensor (Low)” • P0103 “Airflow Sensor (High)” • P0426 “EXH Gas Temp SNSR1 (Plausibility)” • P0427 “EXH Gas Temp SNSR1 (Low)” • P0428 “EXH Gas Temp SNSR1 (High)” • P0545 “DPF Temp SNSR (upstream) Low” • P0546 “DPF Temp SNSR (upstream) High” • P1430 “DPF Regeneration Switch” • P1660 “DPF Lamp Control Circuit (Low)” • P2031 “Exhaust Gas Temp” • P2032 “Exhaust Gas Temp (Low)” • P2033 “Exhaust Gas Temp (High)” • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (High) & MFF”
	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 and go to step 2.
		NO	Go to step 2.

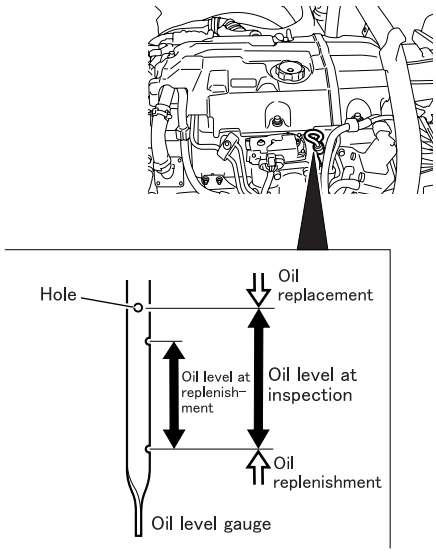
Step 2	Inspection items		Inspection of DPF temperature sensor 1 unit
	Maintenance item		Measure value of resistance between connector terminal No. 1 and 2.
	Inspection condition		• Put DPF temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	Inspection result (Is the judging standard satisfied?)	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>



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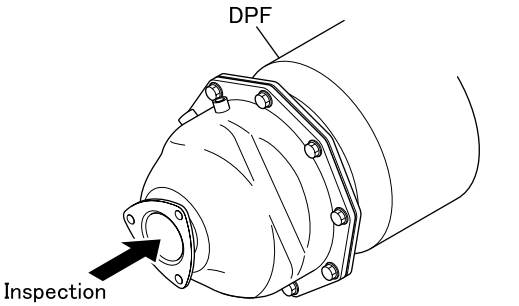
Step 4	Inspection items		Inspection of pressure hose
	Maintenance item		Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks.
	Inspection condition		–
	Requirements		Nothing abnormal detected
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	After correction and replacement of hose, go to step 5.

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.

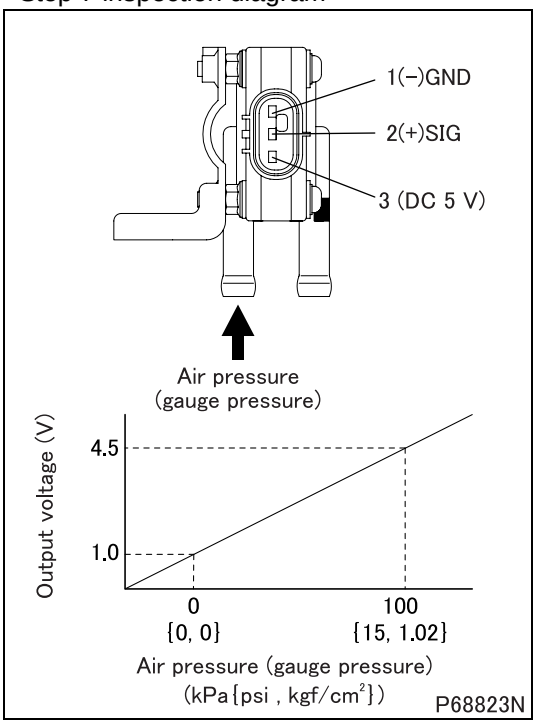
<Step 5 inspection diagram>



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		Perform the following preparatory works. • Place the transmission in neutral (place the automatic transmission in P range). • Turn the steering wheel in neutral position and securely apply the parking brake. • Turn off air conditioner not to increase the engine speed. • Check diagnosis code of each electronic control system. If any fault exists, rectify it. • Resetting the DPF-related information (perform “History reset” of Multi-Use Tester) (See Gr15 “Resetting the DPF-related Information”.) • 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”).
	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

Step 7	Inspection items		Inspection of sensor unit
	Maintenance item		Measure value of voltage between connector terminal No. 2 (+) and 1 (–).
	Inspection condition		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	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 sensor unit
	Maintenance item		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	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: 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.

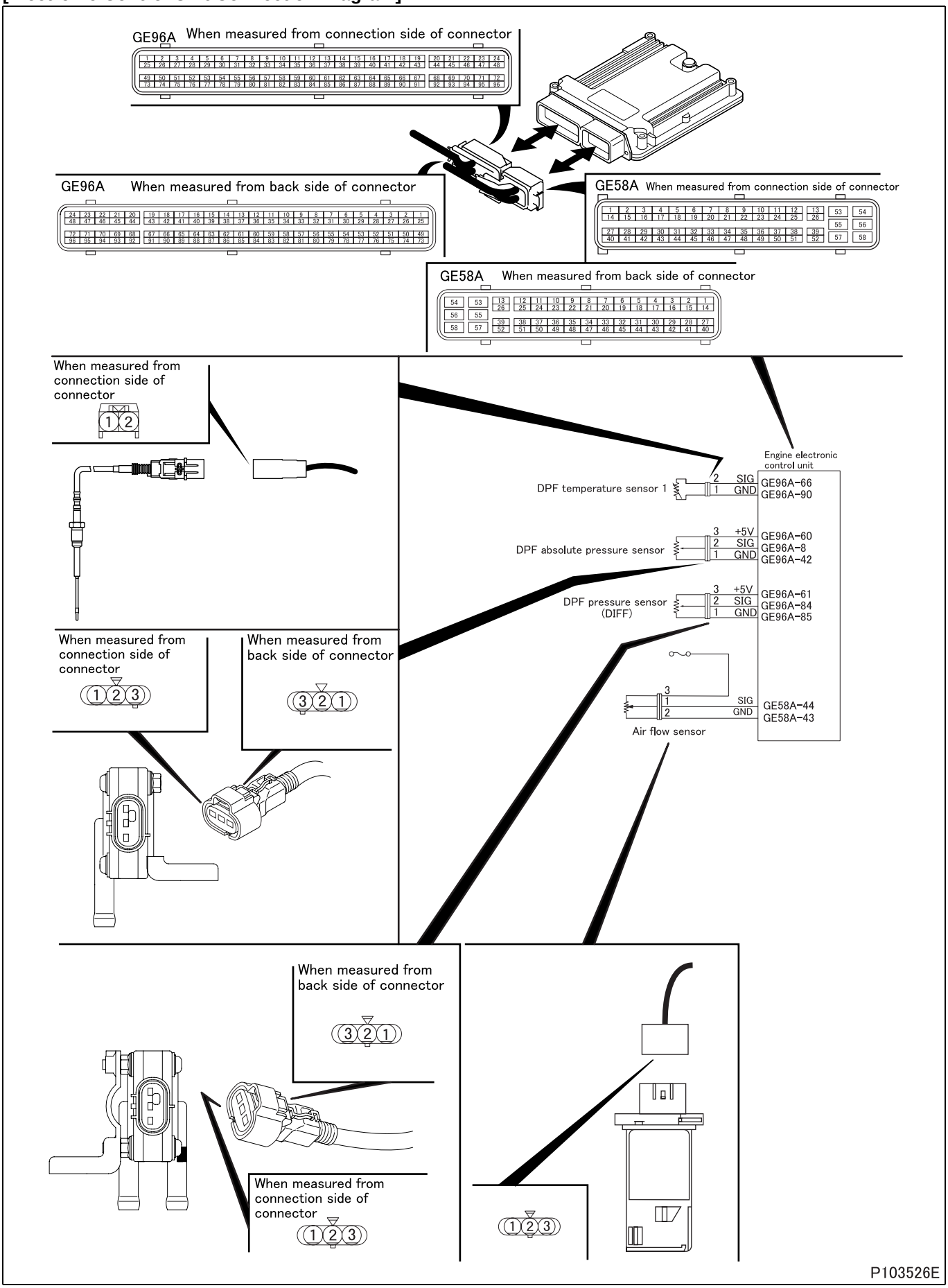
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Diesel particulate filter regeneration is stopped.

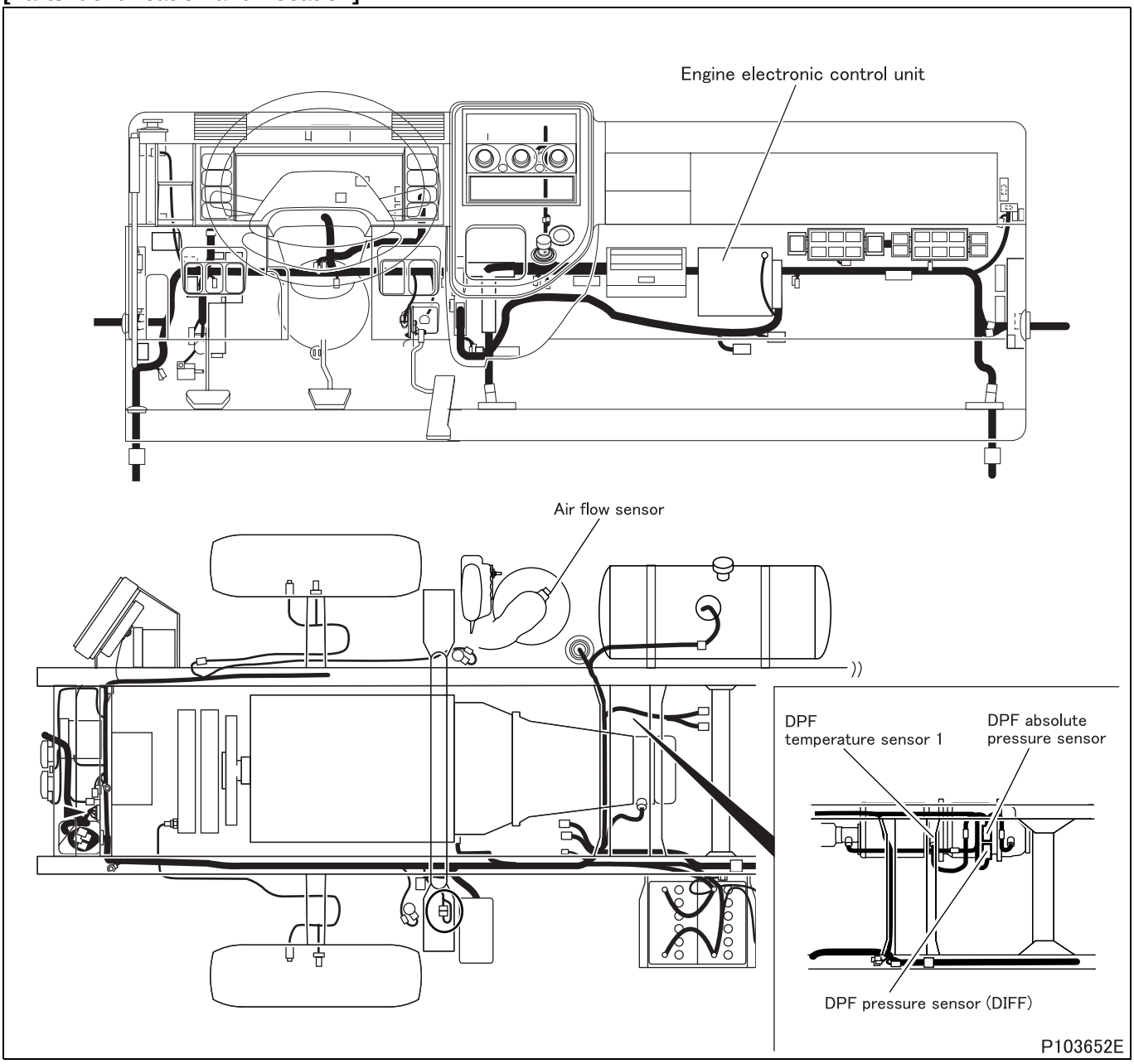
[Probable cause of trouble]
- Malfunction of diesel particulate filter regeneration control
- Malfunction of DPF temperature sensor 1
- Malfunction of engine electronic control unit
- Malfunction of common rail
- Malfunction of diesel particulate filter (front oxidation catalyst)

[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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



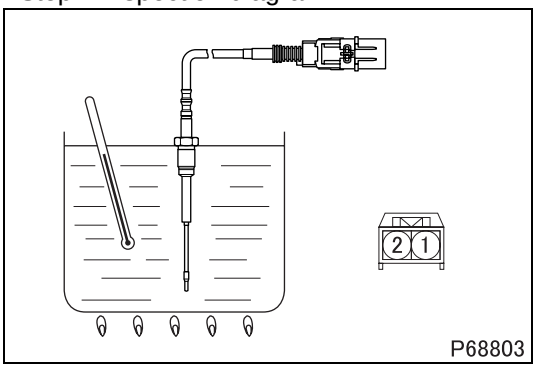
[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Check if following diagnosis codes occur simultaneously. • P0045 “VGT Actuator (Open)” • P0046 “VGT Actuator (Performance)” • P0047 “VGT Actuator (Low)” • P0102 “Airflow Sensor (Low)” • P0103 “Airflow Sensor (High)” • P0426 “EXH Gas Temp SNSR1 (Plausibility)” • P0427 “EXH Gas Temp SNSR1 (Low)” • P0428 “EXH Gas Temp SNSR1 (High)” • P0545 “DPF Temp SNSR (upstream) Low” • P0546 “DPF Temp SNSR (upstream) High” • P1430 “DPF Regeneration Switch” • P1660 “DPF Lamp Control Circuit (Low)” • P2031 “Exhaust Gas Temp” • P2032 “Exhaust Gas Temp (Low)” • P2033 “Exhaust Gas Temp (High)” • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (High) & MFF”
	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 and go to step 2.
		NO	Go to step 2.

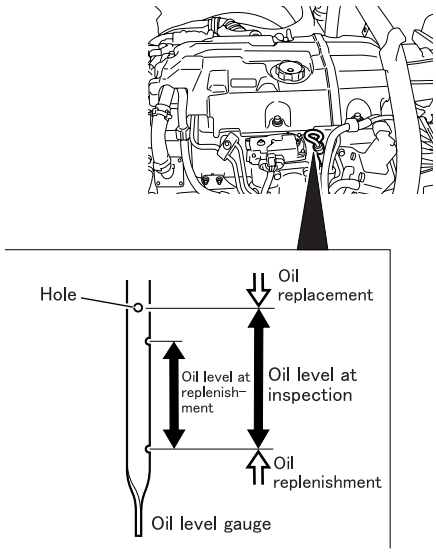
Step 2	Inspection items		Inspection of DPF temperature sensor 1 unit
	Maintenance item		Measure value of resistance between connector terminal No. 1 and 2.
	Inspection condition		• Put DPF temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	Inspection result (Is the judging standard satisfied?)	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>

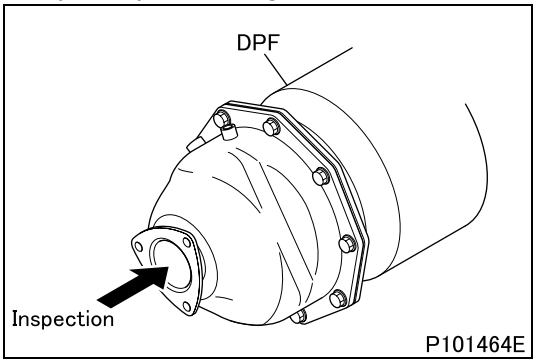


P103677E

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.

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.

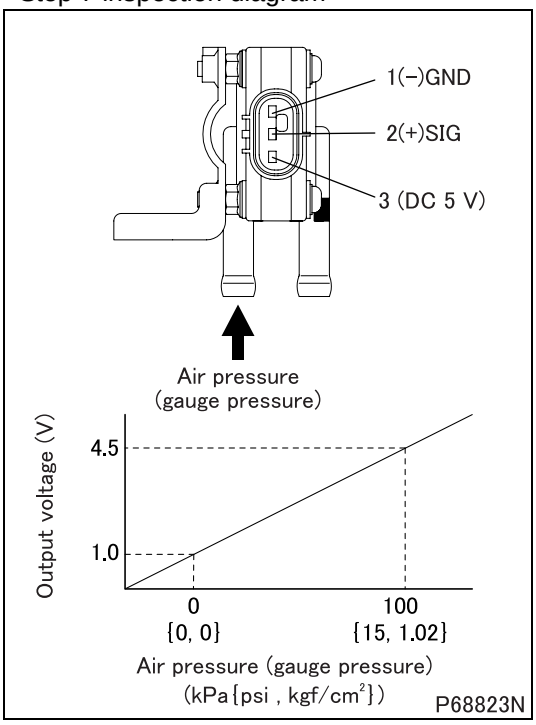
<Step 5 inspection diagram>



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		Perform the following preparatory works. • Place the transmission in neutral (place the automatic transmission in P range). • Turn the steering wheel in neutral position and securely apply the parking brake. • Turn off air conditioner not to increase the engine speed. • Check diagnosis code of each electronic control system. If any fault exists, rectify it. • Resetting the DPF-related information (perform “History reset” of Multi-Use Tester) (See Gr15 “Resetting the DPF-related Information”.) • 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”).
	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

Step 7	Inspection items		Inspection of sensor unit
	Maintenance item		Measure value of voltage between connector terminal No. 2 (+) and 1 (–).
	Inspection condition		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	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 sensor unit
	Maintenance item		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	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.

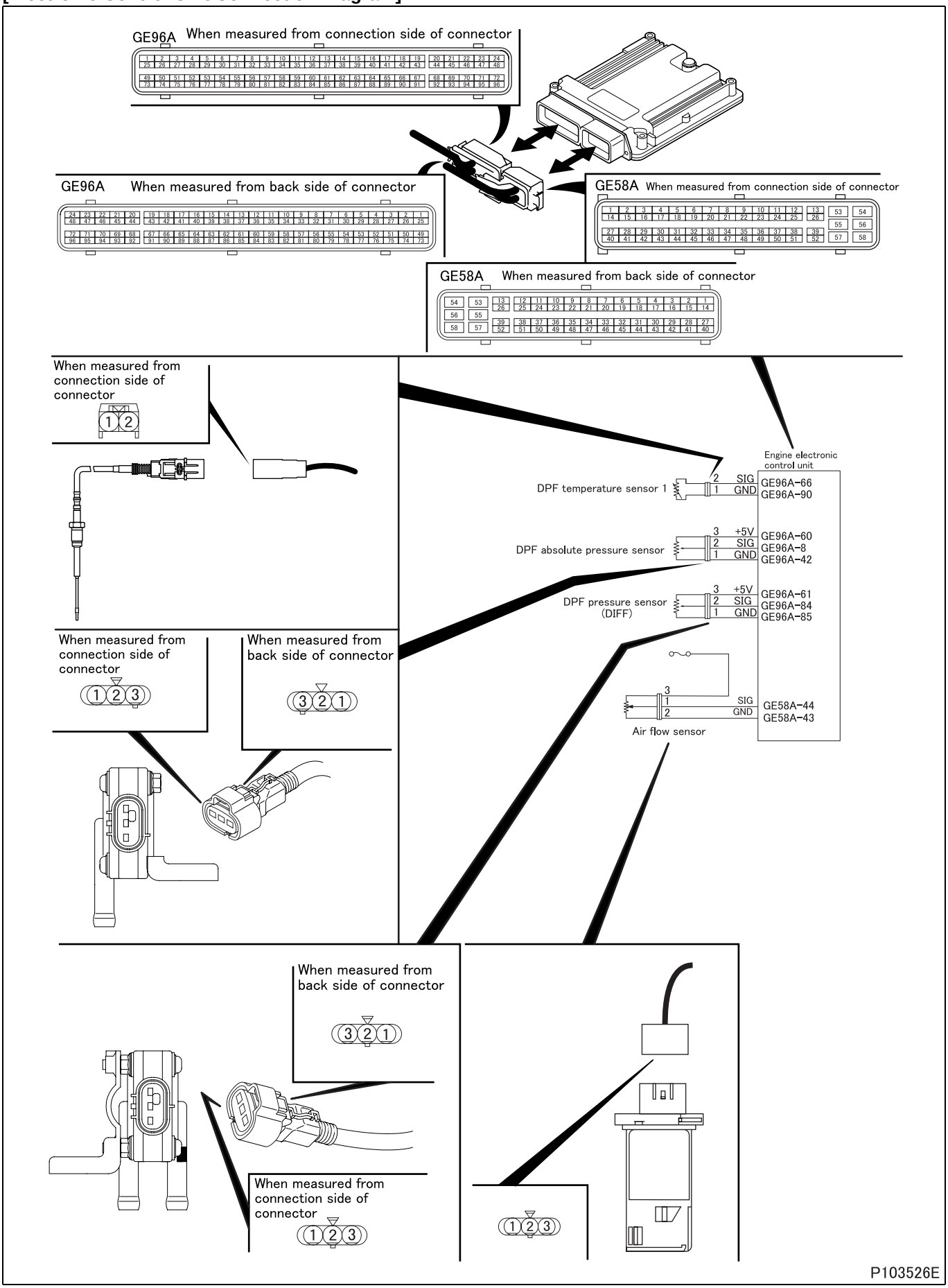
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Engine torque is limited.
- Auto cruise control stopped
- Traction control is stopped <Automatic transmission>

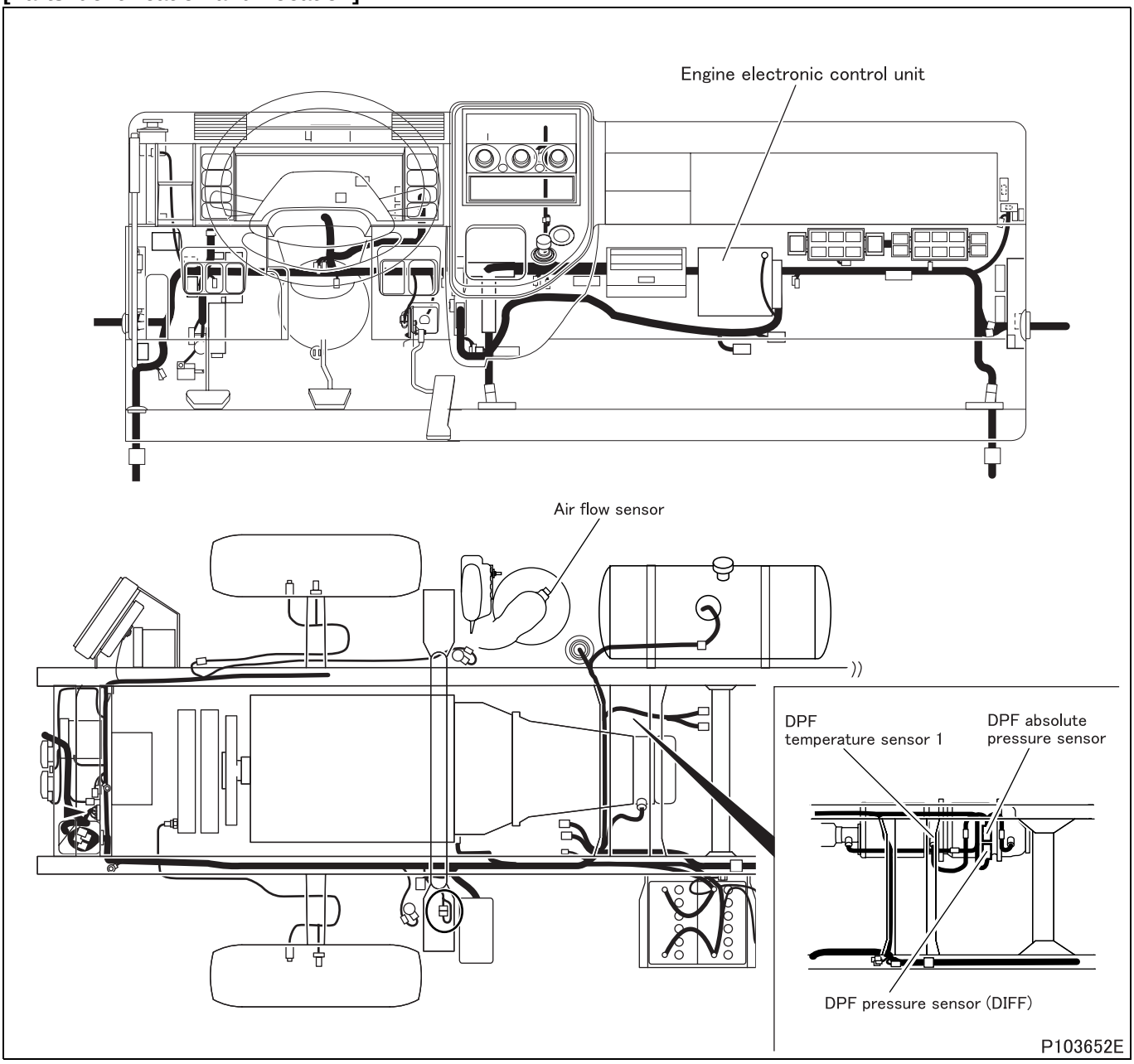
[Probable cause of trouble]
- Failure of diesel particulate filter indicator lamp
- Failure of diesel particulate filter cleaning switch
- Manual diesel particulate filter regeneration is not performed.
- Excessive smoke emission (due to malfunction of engine proper, common rail or exhaust gas recirculation 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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]

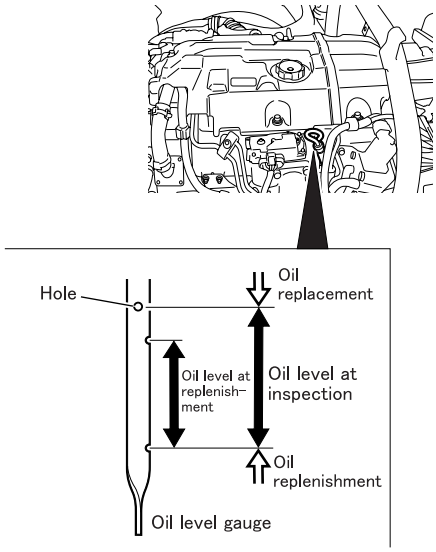


[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection 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 2.
		NO	After replacement of oil, go to step 2

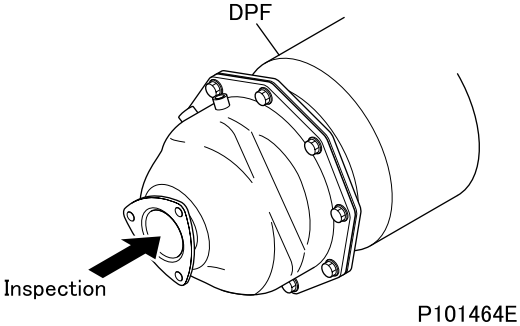
<Step 1 inspection diagram>



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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Engine: idling • Place the transmission in neutral. (place the automatic transmission in P range) • Parking brake: vehicle parked (parking brake switch: ON) • After engine warm-up
	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		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		Perform the following preparatory works. • Place the transmission in neutral. (place the automatic transmission in P range) • Turn the steering wheel in neutral position and securely apply the parking brake. • Turn off air conditioner not to increase the engine speed. • Check diagnosis code of each electronic control system. If any fault exists, rectify it. • Resetting the DPF-related information (perform “History reset” of Multi-Use Tester) (See Gr15 “Resetting the DPF-related information”.) • 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”)
	Requirements		This diagnosis code does not occur again.
	Inspection result (Is the judging standard satisfied?)	YES	End of inspection
		NO	Go to step 5.

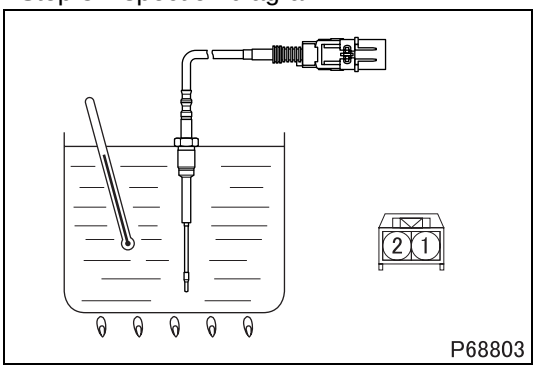
Step 5	Inspection items		Inspection by control data
	Maintenance item		Measure item No. B8 “DPF Indicator Lamp” of Service Data.
	Inspection condition		Perform Multi-Use Tester actuator test item No. A6 “DPF Lamp”.
	Requirements		Diesel particulate filter indicator lamp illuminates (automatic reset after 15 seconds)
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 6.
		NO	Replacement of engine electronic control unit

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.

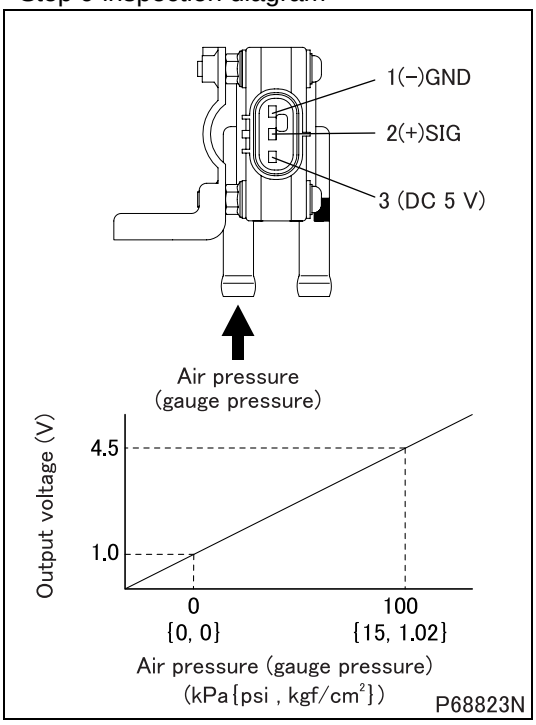
Step 8	Inspection items		Inspection of DPF temperature sensor 1 unit
	Maintenance item		Measure value of resistance between connector terminal No. 1 and 2.
	Inspection condition		• Put DPF temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	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		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 10.
		NO	Replacement of DPF pressure sensor (DIFF)

<Step 9 inspection diagram>



Step 10	Inspection items		Inspection of air flow sensor unit
	Maintenance item		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	Inspection condition		–
	Requirements		10% or less
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 11.
		NO	Replacement of air flow sensor

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?)	YES	• Inspection of exhaust gas recirculation system (exhaust gas recirculation pipe, exhaust gas recirculation cooler, exhaust gas recirculation valve) • Inspection of engine
		NO	Replacement of injector

[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.

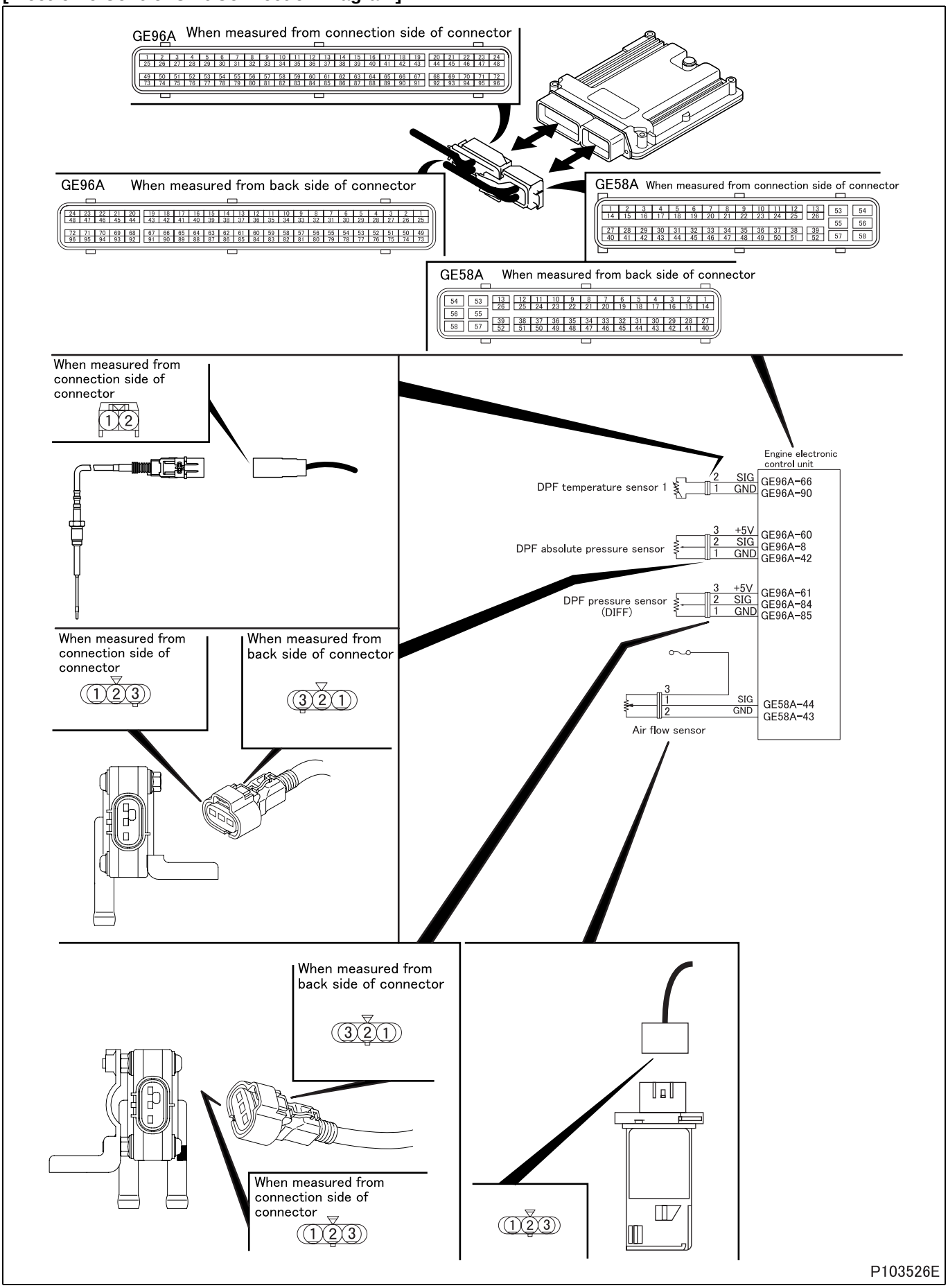
[Diagnostic requirement]
–

[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.

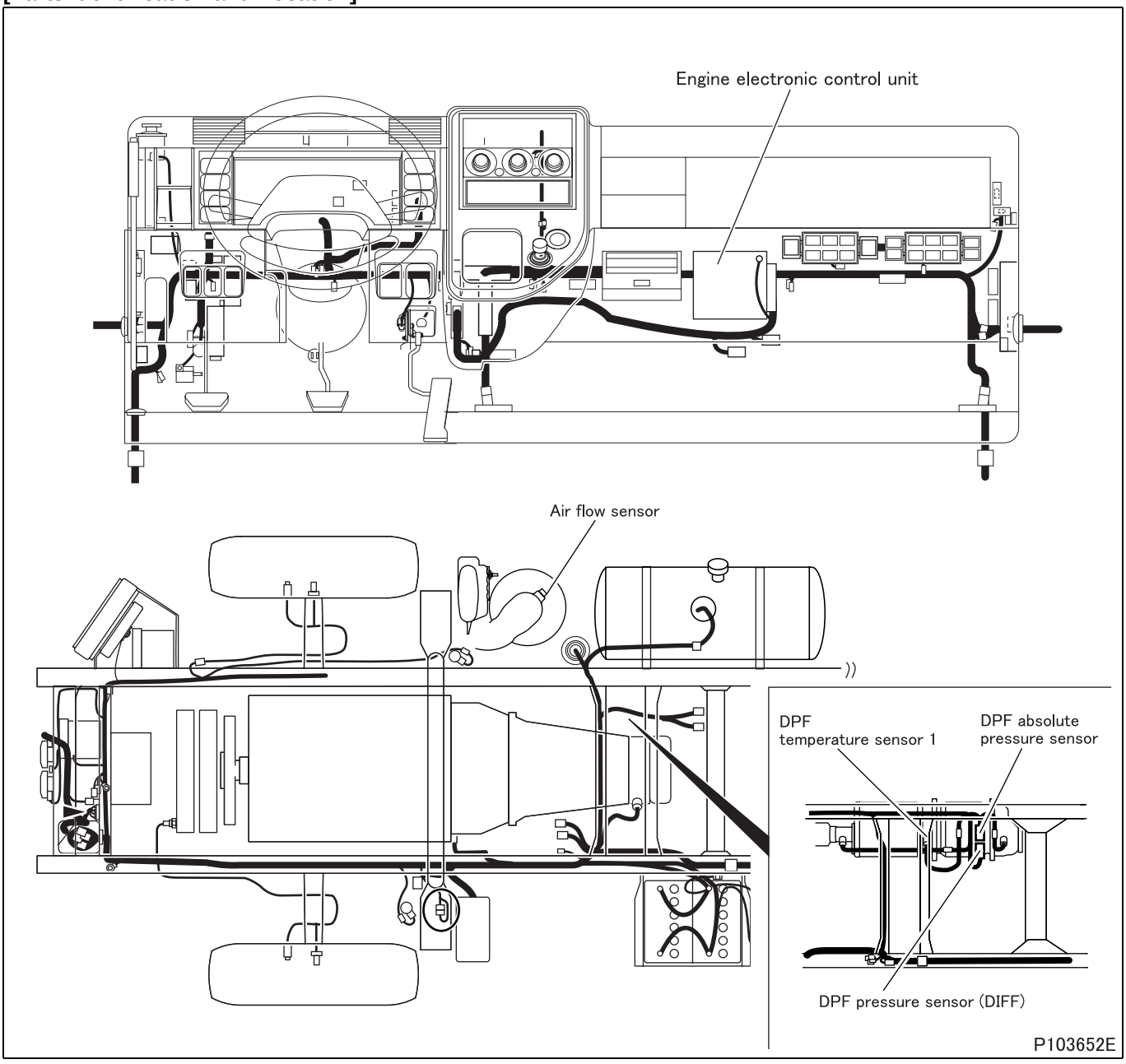
[Probable cause of trouble]
- Failure of diesel particulate filter indicator lamp
- Failure of diesel particulate filter cleaning switch
- Manual diesel particulate filter regeneration is not performed.
- Excessive smoke emission (due to malfunction of engine proper, common rail or exhaust gas recirculation 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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]

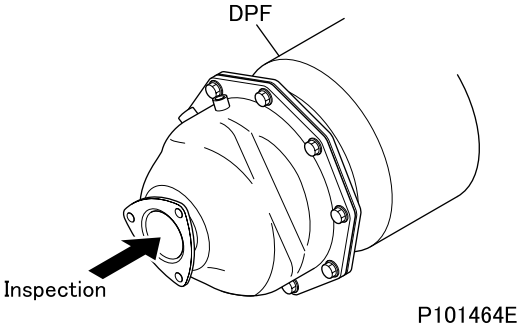


[Fault diagnosis]

- 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	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		Perform the following preparatory works. • Place the transmission in neutral. (place the automatic transmission in P range) • Turn the steering wheel in neutral position and securely apply the parking brake. • Turn off air conditioner not to increase the engine speed. • Check diagnosis code of each electronic control system. If any fault exists, rectify it. • Resetting the DPF-related information (perform “History reset” of Multi-Use Tester) (See Gr15 “Resetting the DPF-related information”.) • 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”)
	Requirements		This diagnosis code does not occur again.
	Inspection result (Is the judging standard satisfied?)	YES	End of inspection
		NO	Go to step 3.

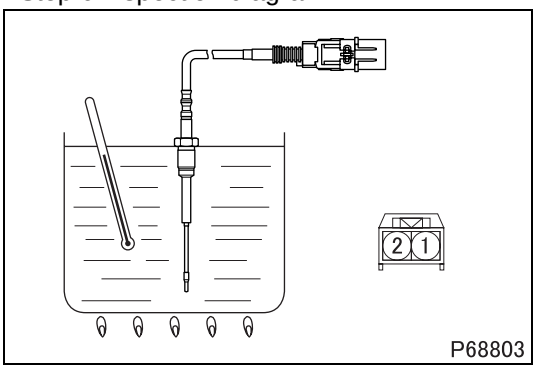
Step 3	Inspection items		Inspection by control data
	Maintenance item		Measure item No. B8 “DPF Indicator Lamp” of Service Data.
	Inspection condition		Perform Multi-Use Tester actuator test item No. A6 “DPF Lamp”.
	Requirements		Diesel particulate filter indicator lamp illuminates (automatic reset after 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.

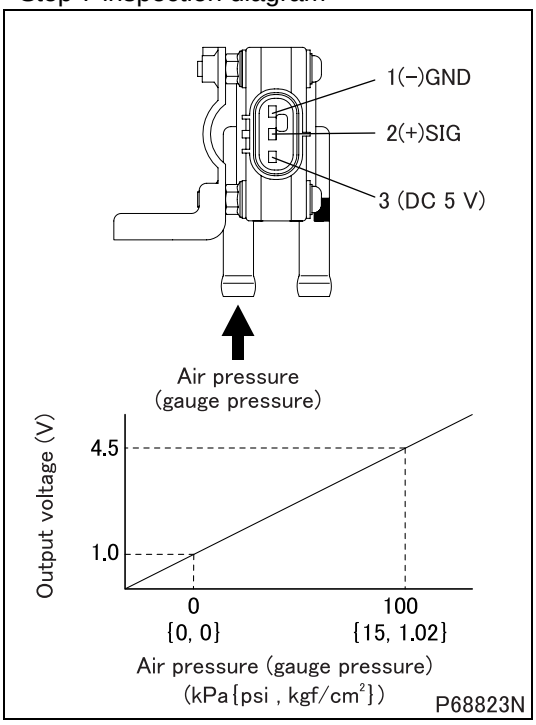
Step 6	Inspection items		Inspection of DPF temperature sensor 1 unit
	Maintenance item		Measure value of resistance between connector terminal No. 1 and 2.
	Inspection condition		• Put DPF temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 7.
		NO	Cleaning of sensor

<Step 6 inspection diagram>



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		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	Inspection result (Is the judging standard satisfied?)	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		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	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	• Inspection of exhaust gas recirculation system (exhaust gas recirculation pipe, exhaust gas recirculation cooler, exhaust gas recirculation valve) • Inspection of engine
		NO	Replacement of injector

[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.

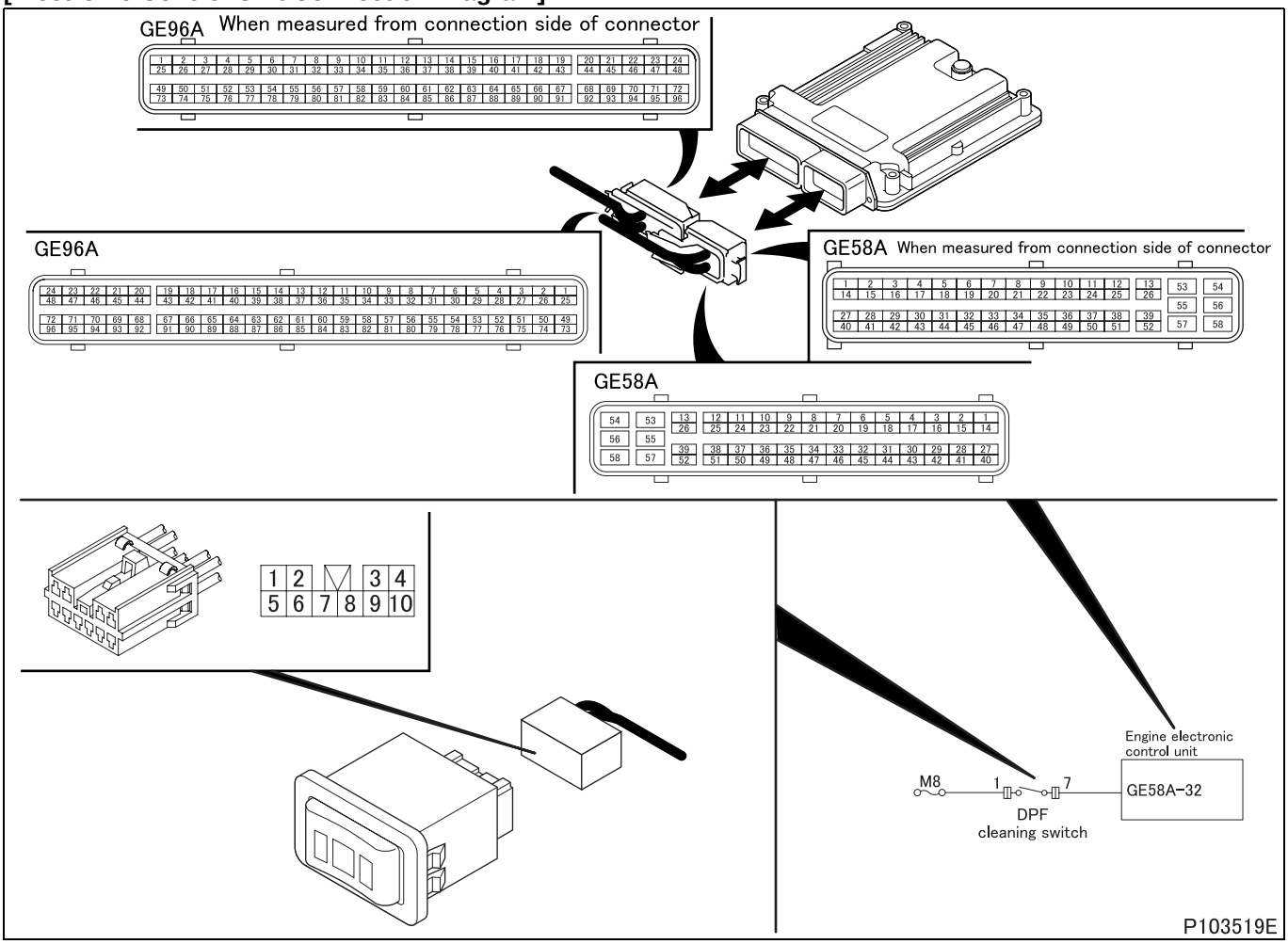
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Effects no special control.

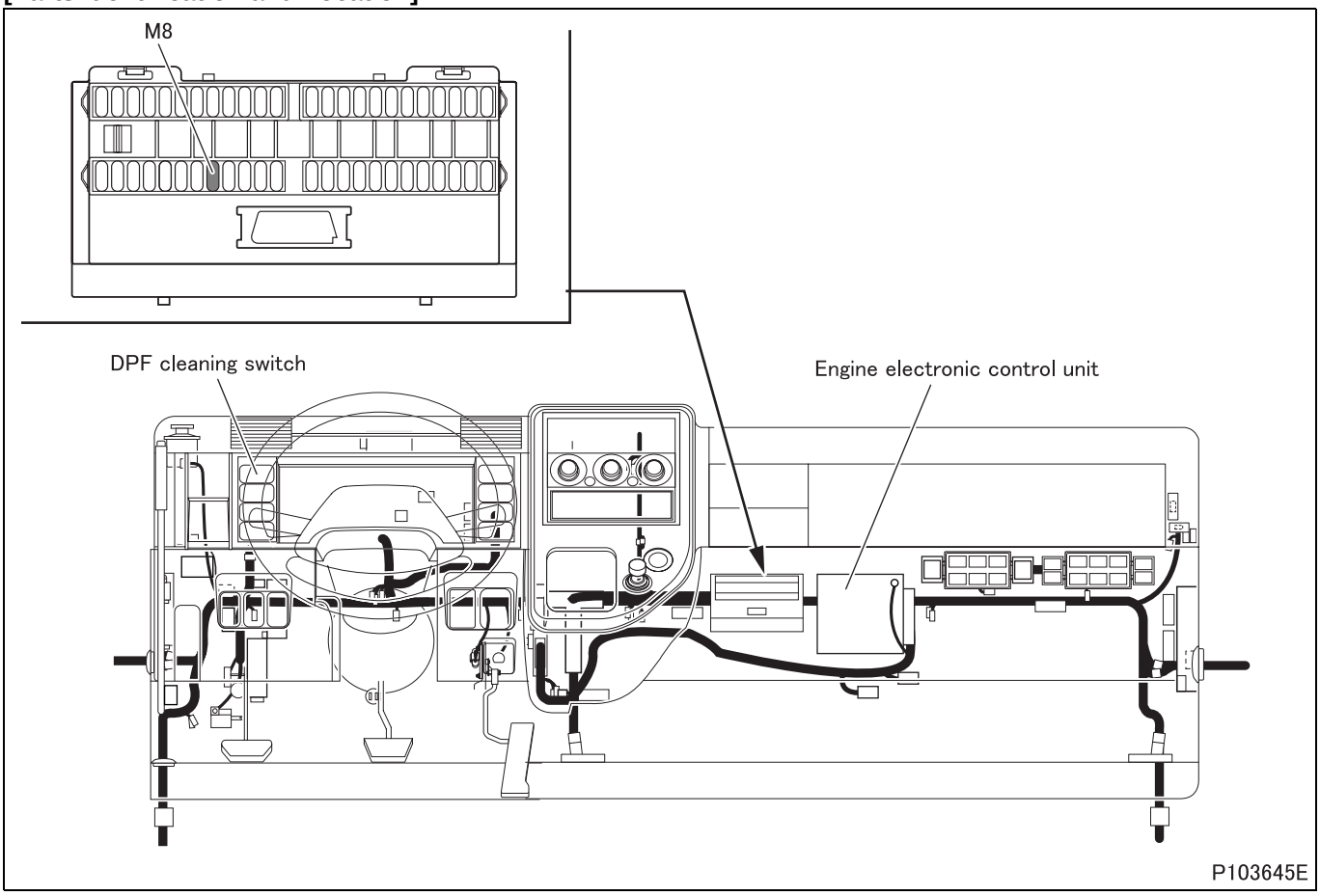
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and switch
- Malfunction of each connector
- Malfunction of switch
- Malfunction of engine electronic control unit

[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]



[Parts Identification and Location]



[Fault diagnosis]

- Perform checks in the sequence of the following steps.

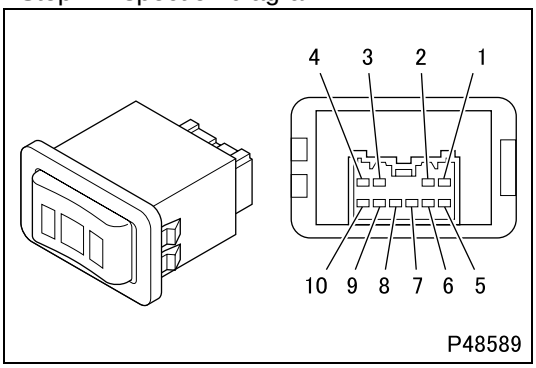
Step 1	Inspection items		Inspection by control data
	Maintenance item		Measure item No. A4 “DPF SW” of Service Data.
	Inspection condition		–
	Requirements		Press diesel particulate filter cleaning switch and check that “DPF SW” display switches from OFF to ON.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 2.

Step 2	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		NO	Modify connector.

Step 3	Inspection items		Inspection of diesel particulate filter cleaning switch connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Modify connector.

Step 4	Inspection items		Inspection of diesel particulate filter cleaning switch unit
	Maintenance item		• Switch: Check continuity between connector terminal No. 1 and 8. • Switch ON: Check continuity between connector terminal No. 1 and 7.
	Inspection condition		Disconnect connector and measure switch side.
	Requirements		There is continuity.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Replacement of switch

<Step 4 inspection diagram>



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^3/h
  - Exhaust gas recirculation valve position: more than 8 mm {0.3 in.}
- Exhaust volume-flow rate: 500 to 900 m^3/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

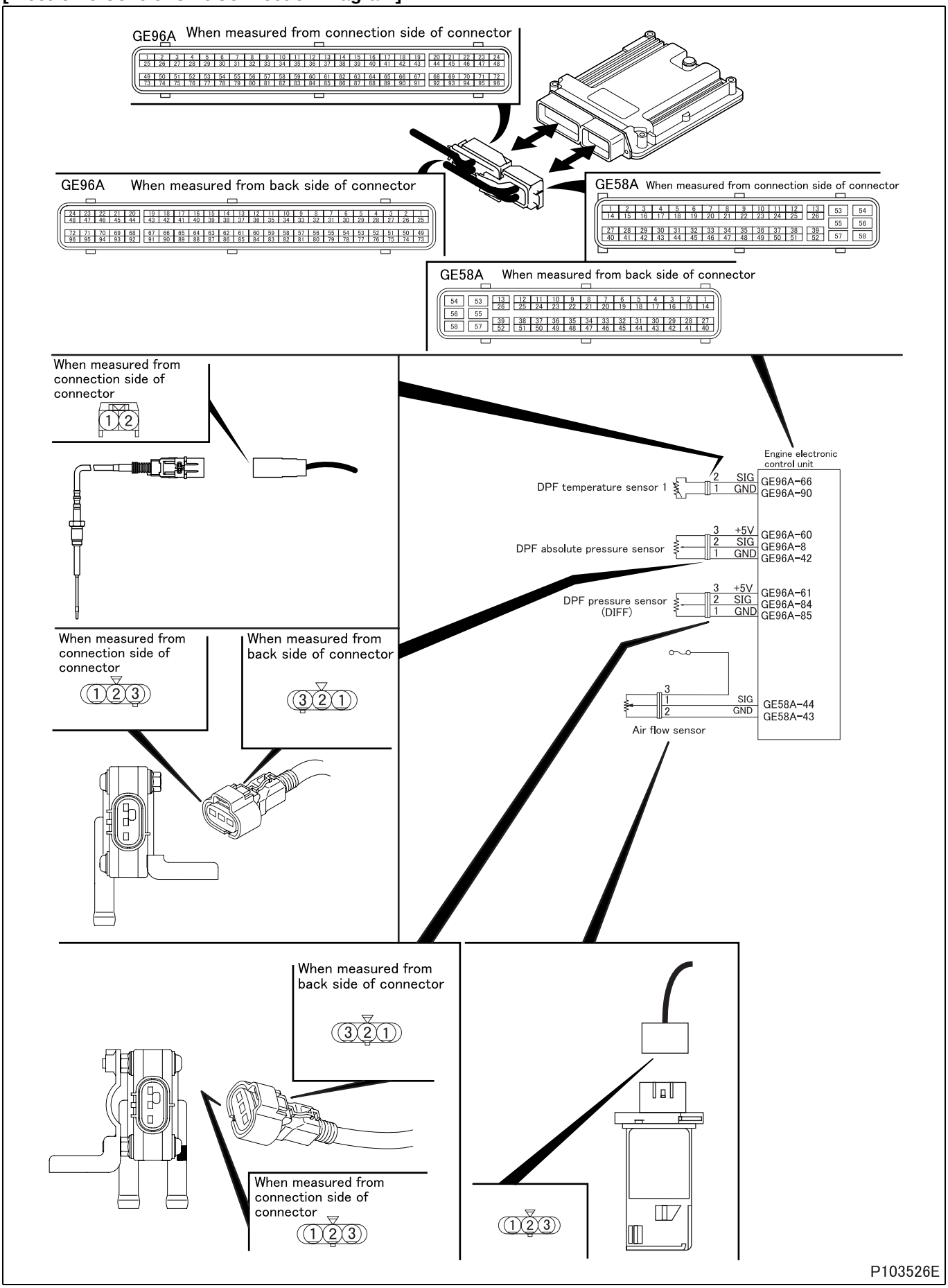
[Control effected by electronic control unit during fault]
Electronic control unit differs in the way of control by the engine model.
<Except FE83>
- Engine torque is limited.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- 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]
- 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)

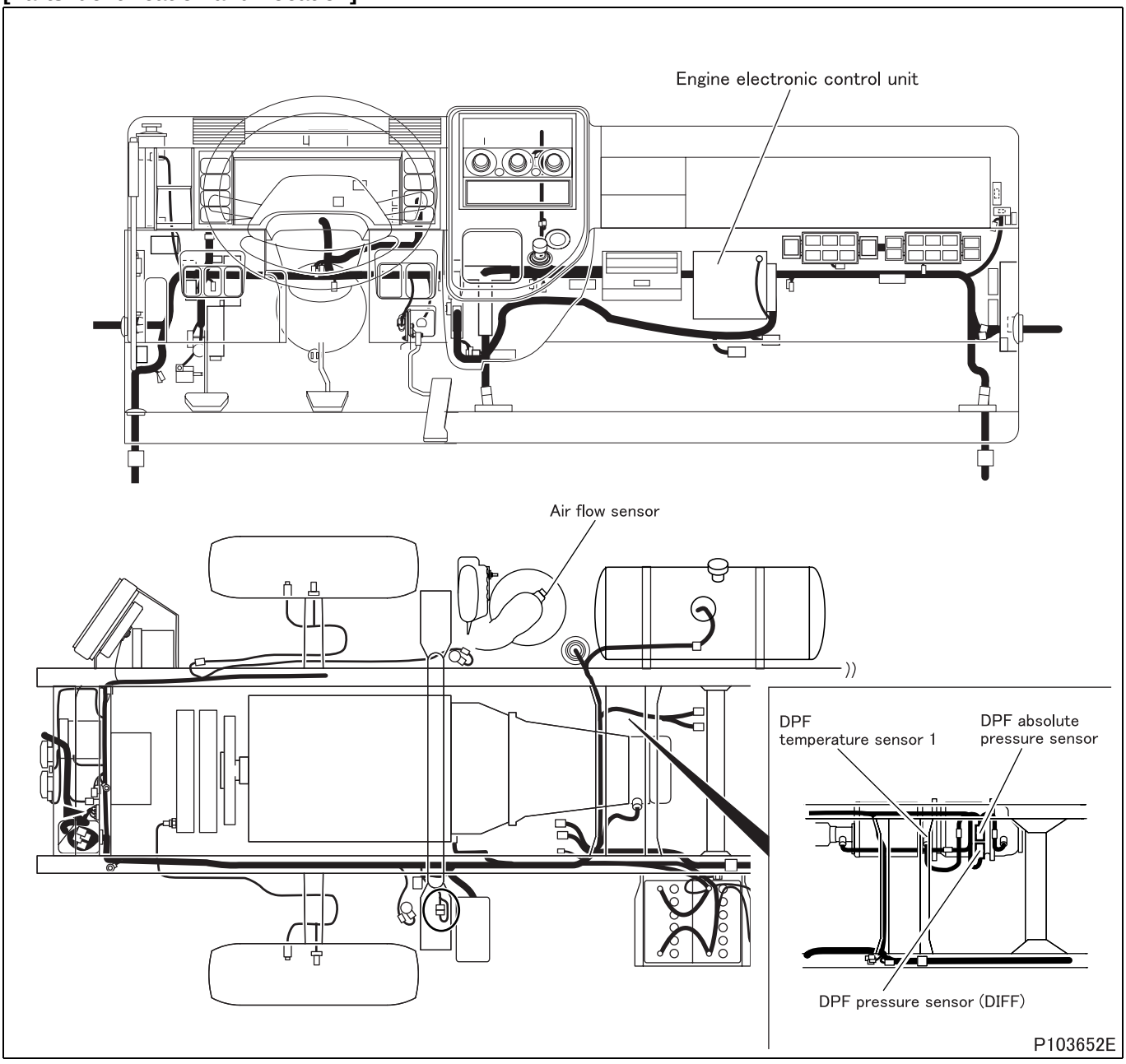
[Recoverability]
- Recovered if signal becomes normal with starter switch in ON position.
  (Warning lamp is extinguished and diagnosis code is cleared at fourth display of diagnosis code after recovery.)

[Electronic Control Unit Connection Diagram]



P103526E

[Parts Identification and Location]

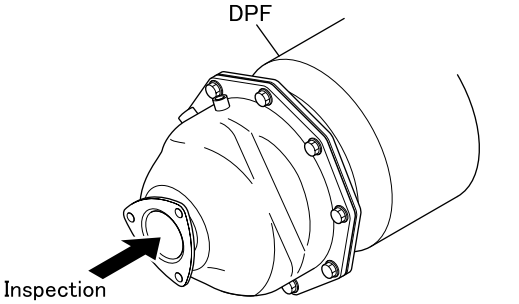


[Fault diagnosis]

- 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	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		Perform the following preparatory works. • Place the transmission in neutral. (place the automatic transmission in P range) • Turn the steering wheel in neutral position and securely apply the parking brake. • Turn off air conditioner not to increase the engine speed. • Check diagnosis code of each electronic control system. If any fault exists, rectify it. • Resetting the DPF-related information (perform “History reset” of Multi-Use Tester) (See Gr15 “Resetting the DPF-related information”.) • 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”)
	Requirements		This diagnosis code does not occur again.
	Inspection result (Is the judging standard satisfied?)	YES	End of inspection
		NO	Go to step 3.

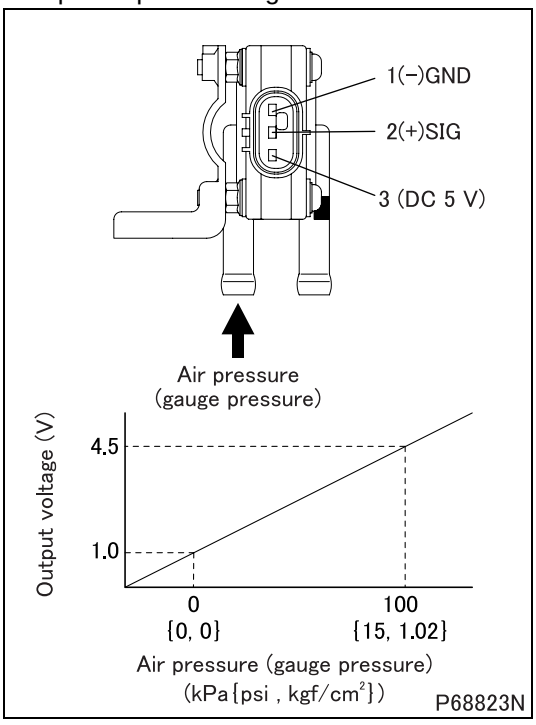
Step 3	Inspection items		Inspection by control data
	Maintenance item		Measure item No. B8 “DPF Indicator Lamp” of Service Data.
	Inspection condition		Perform Multi-Use Tester actuator test item No. A6 “DPF Lamp”.
	Requirements		Diesel particulate filter indicator lamp illuminates (automatic reset after 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 pressure sensor (DIFF)
	Maintenance item		Measure value of voltage between connector terminal No. 2 (+) and 1 (–).
	Inspection condition		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	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		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	Inspection condition		–
	Requirements		10% or less
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 8.
		NO	Replacement of air flow sensor

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?)	YES	• Inspection of exhaust gas recirculation system (exhaust gas recirculation pipe, exhaust gas recirculation cooler, exhaust gas recirculation valve) • Inspection of engine
		NO	Replacement of injector

[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. • P1412 “DPF Temp Abnormal1 (Auto)(Low)” • P1413 “DPF Temp Abnormal2 (Auto)(Low)” • P1414 “DPF Temp Abnormal3 (Auto)(High)”
	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. • P1416 “DPF Temp Abnormal1 (Auto)(Low)” • P1417 “DPF Temp Abnormal2 (Auto)(Low)” • P1418 “DPF Temp Abnormal3 (Auto)(High)”
	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: 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.

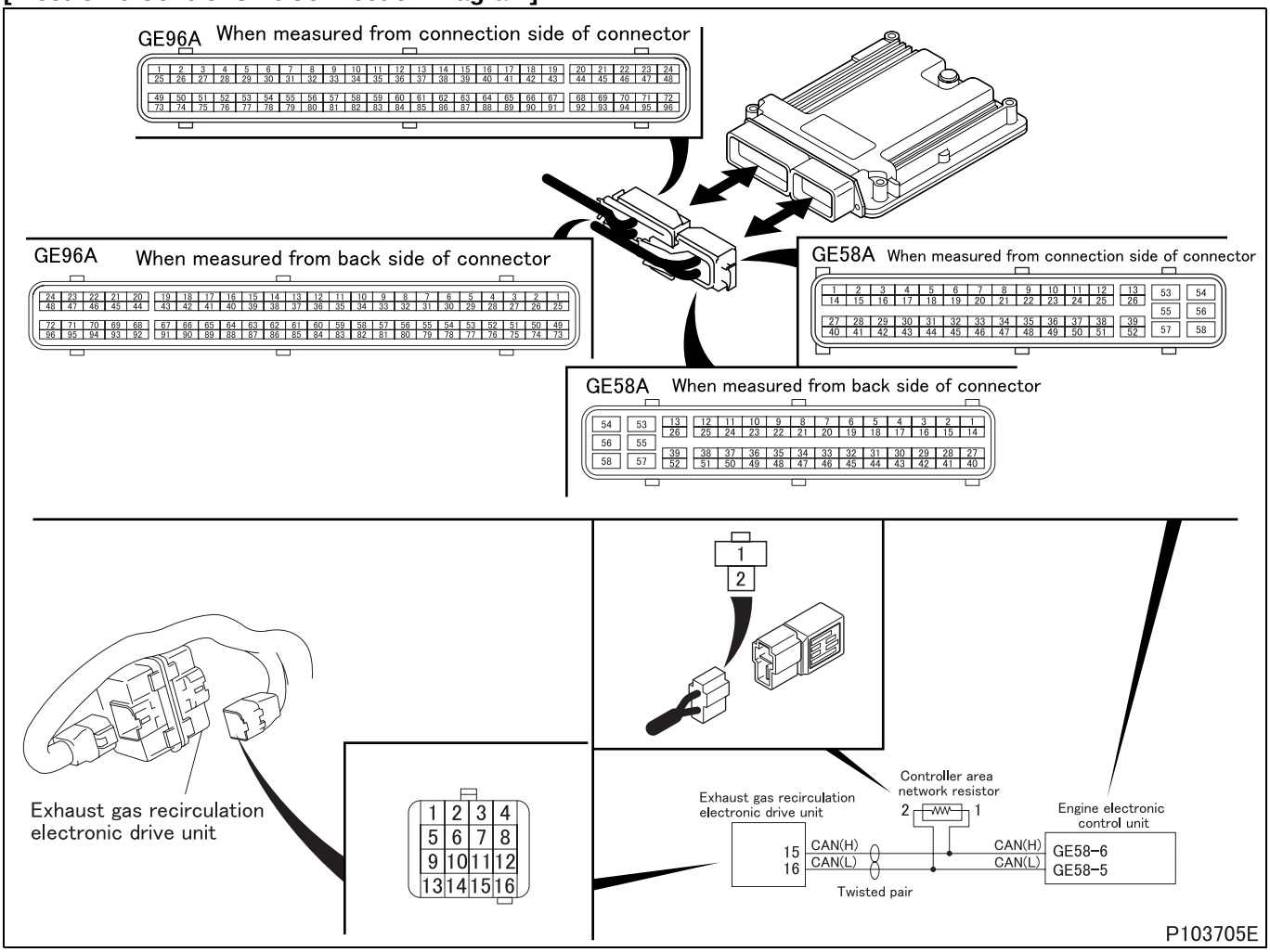
[Diagnostic requirement]
–

[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.

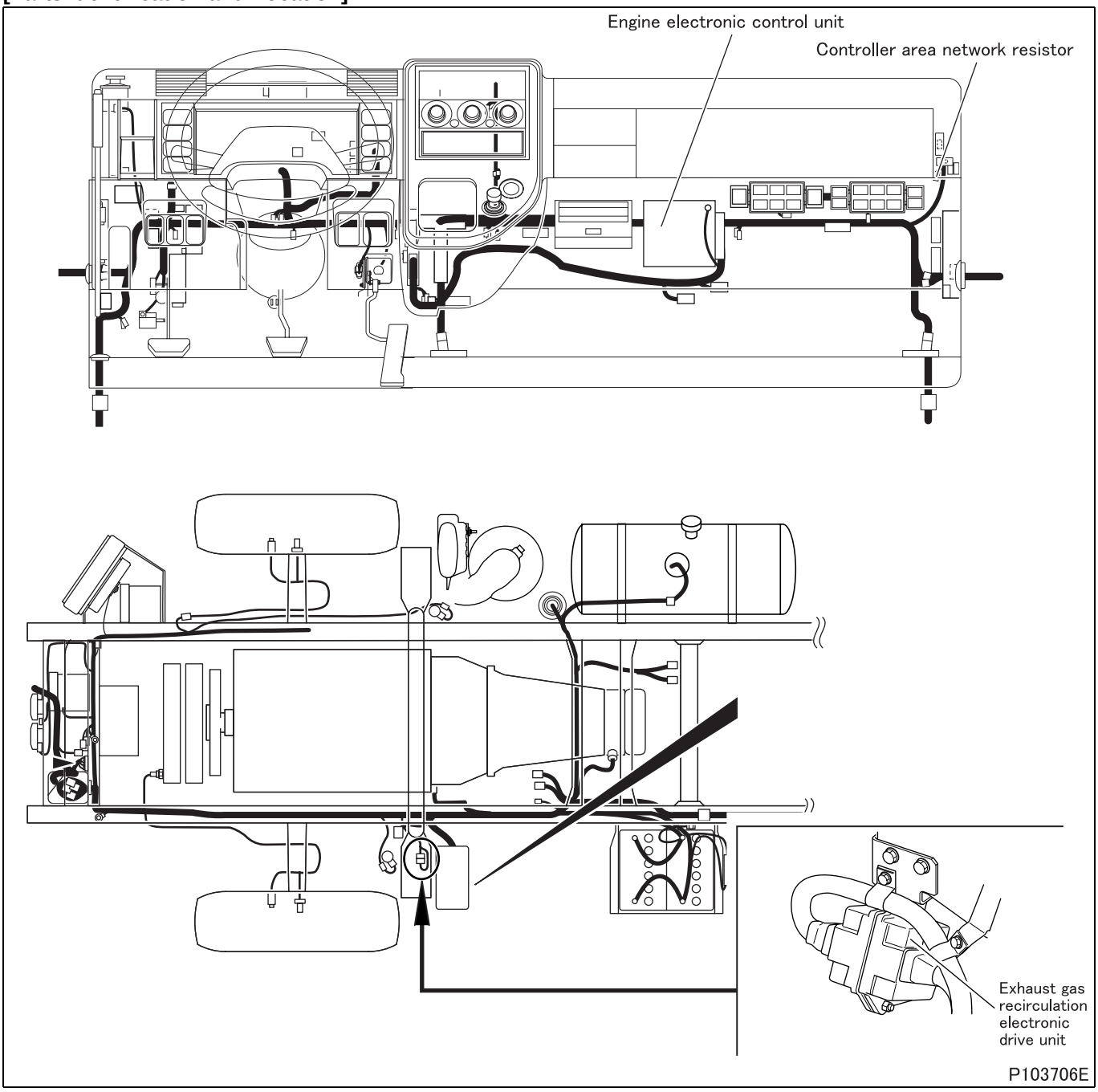
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between engine electronic control unit and exhaust gas recirculation electronic drive unit
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of exhaust gas recirculation electronic drive 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]



[Parts Identification and Location]



[Fault diagnosis]

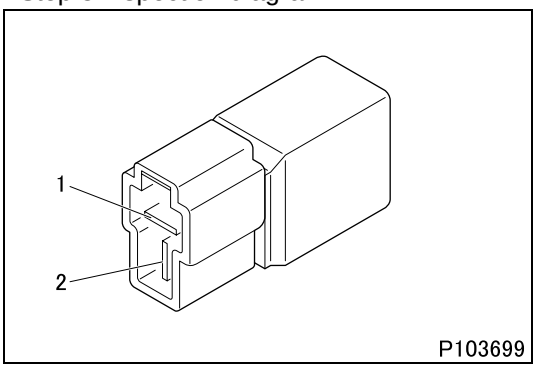
- Perform checks in the sequence of the following steps.

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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

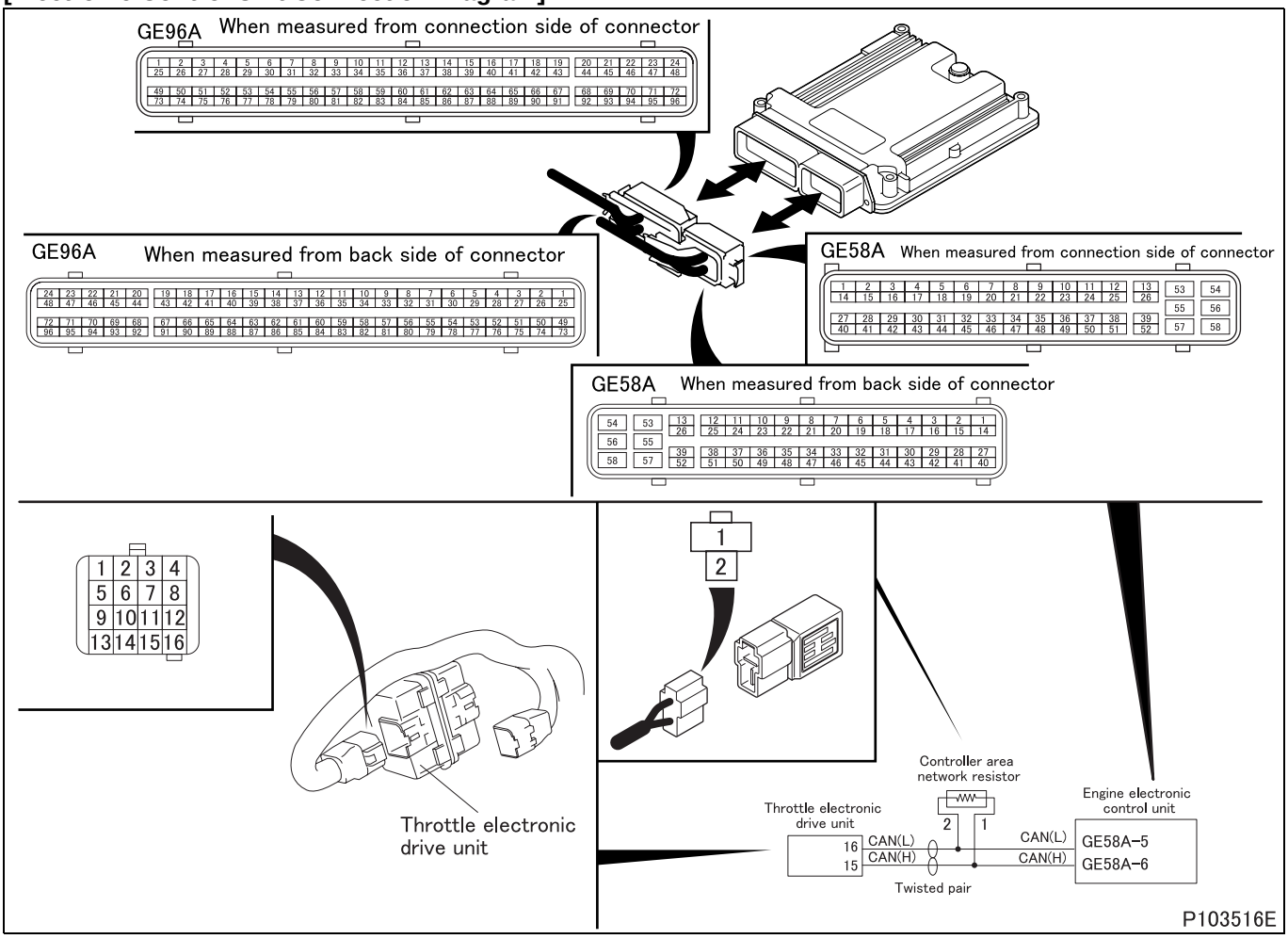
[Diagnostic requirement]
–

[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.

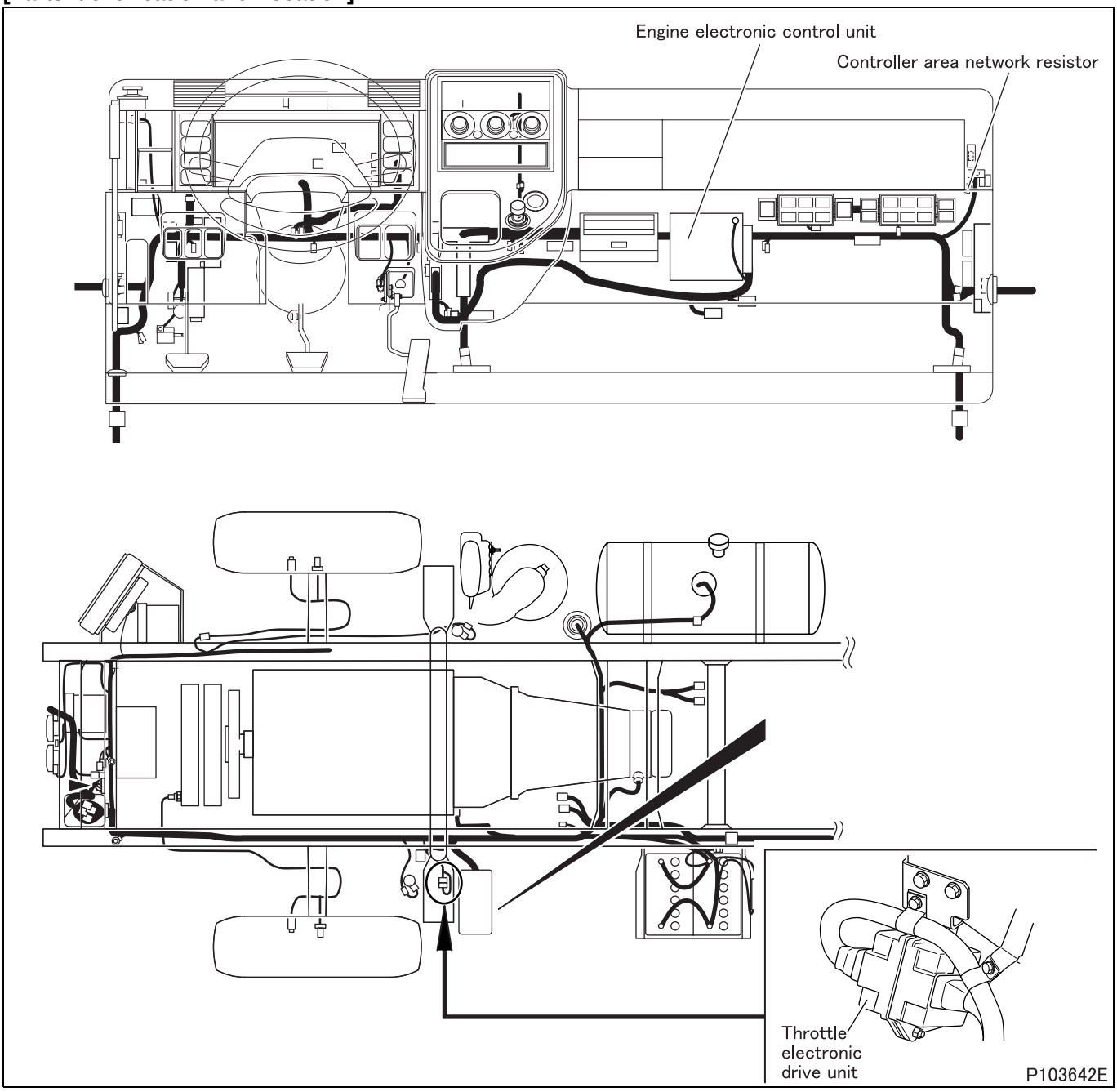
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between engine electronic control unit and throttle electronic drive unit
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of throttle electronic drive unit
- Malfunction of controller 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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[Fault diagnosis]

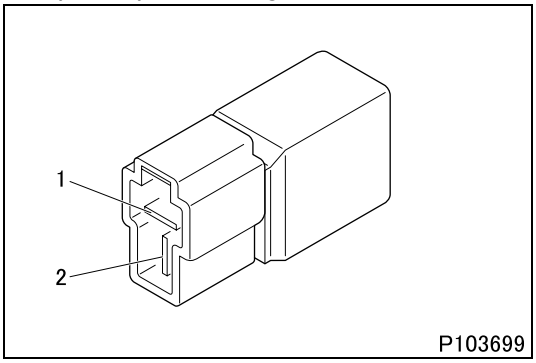
- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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: 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.

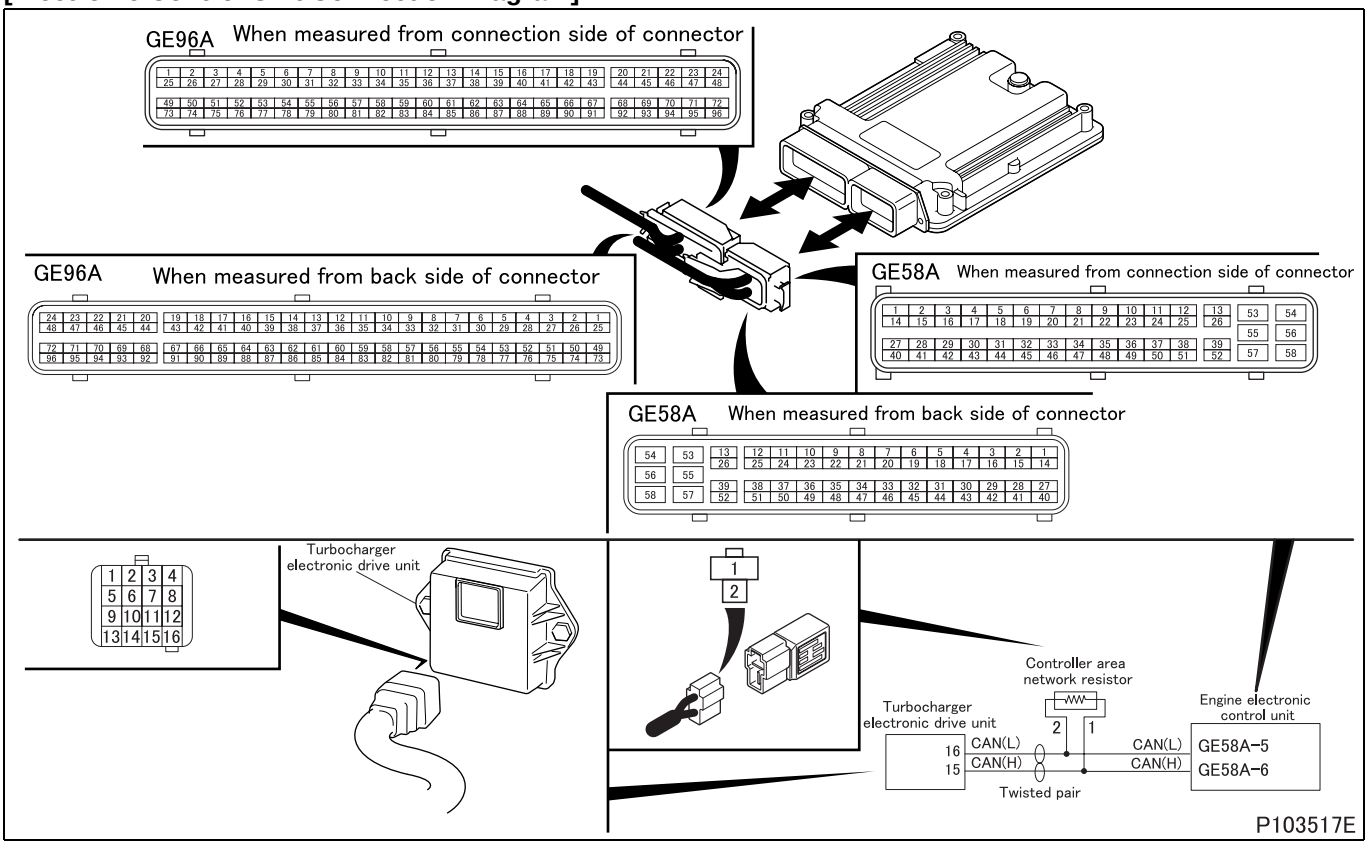
[Diagnostic requirement]
–

[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.

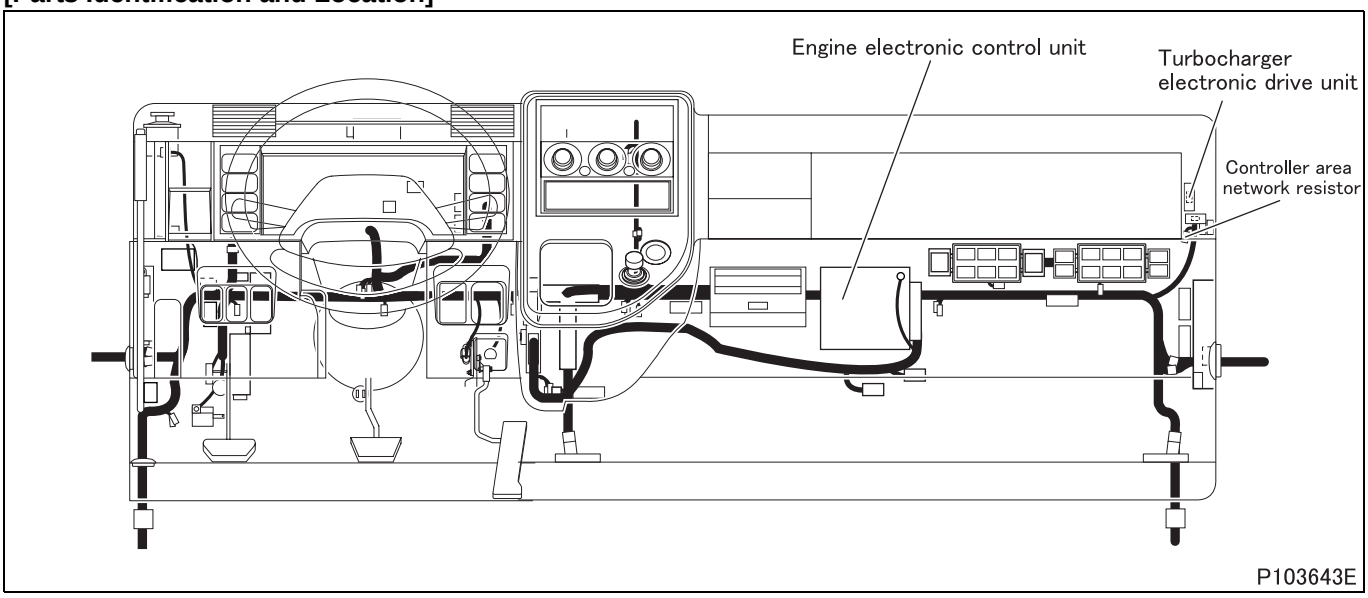
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between engine electronic control unit and turbocharger electronic drive unit
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of turbocharger electronic drive unit
- Malfunction of controller 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]



[Fault diagnosis]

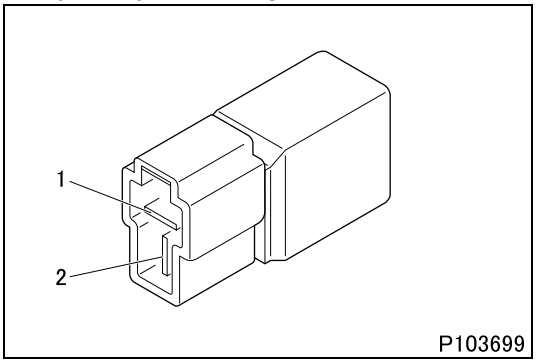
- Perform checks in the sequence of the following steps.

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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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: 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.

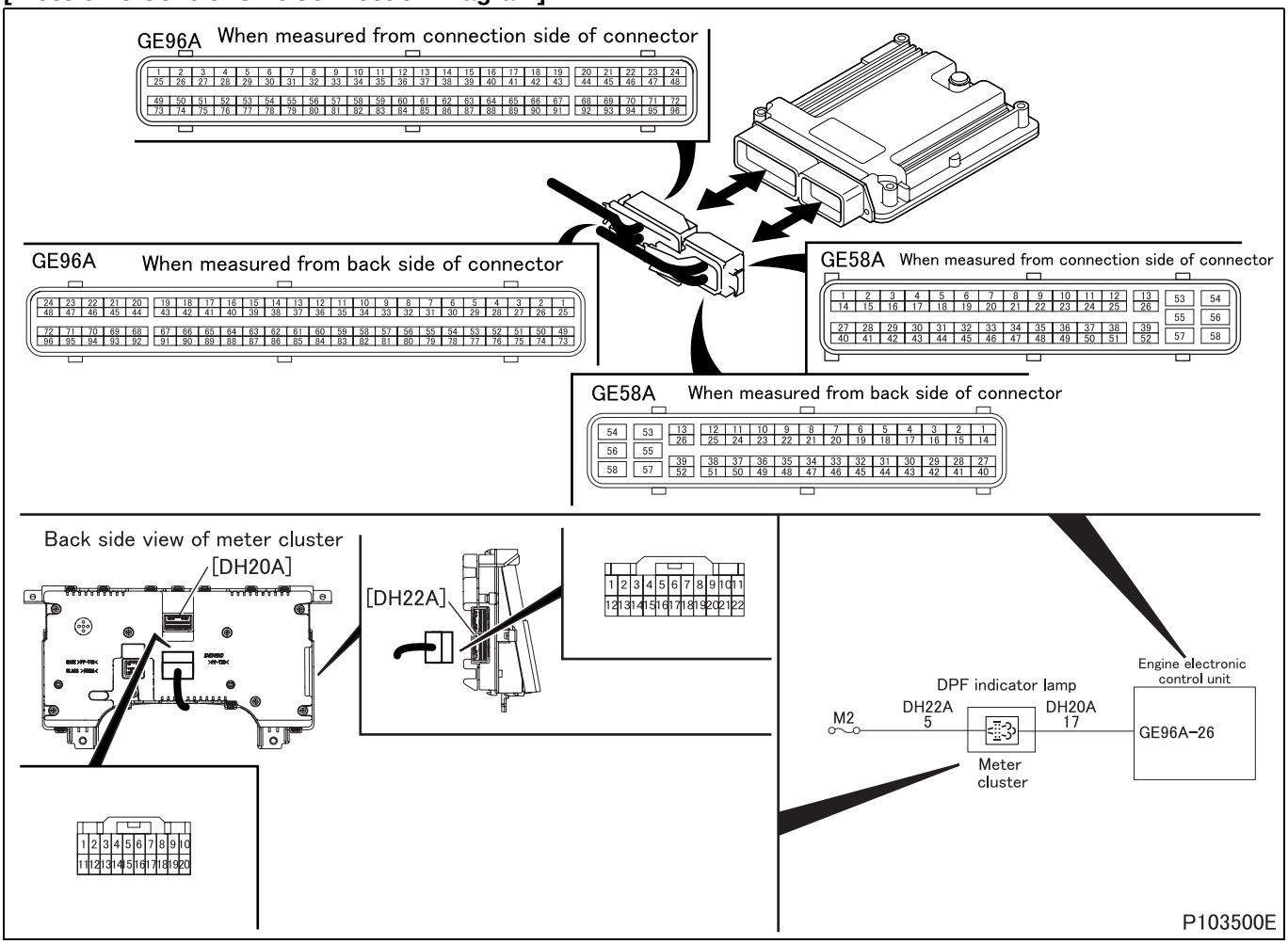
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Effects no special control.

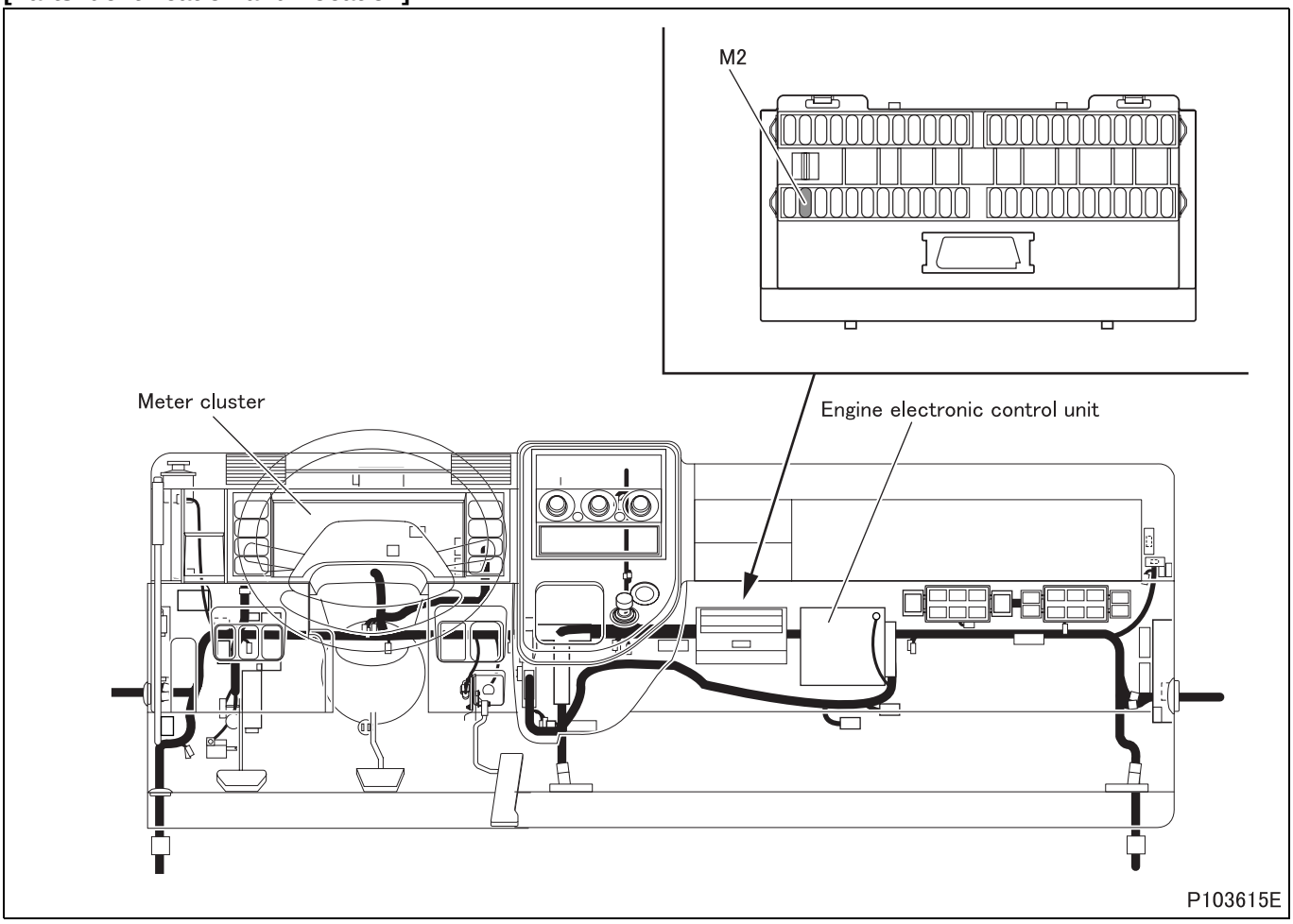
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and diesel particulate filter indicator lamp
- Malfunction of each connector
- Malfunction of diesel particulate filter indicator lamp
- Malfunction of electronic control unit

[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]



[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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of meter cluster or lamp
		NO	Modify connector.

[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^3/h
  - Exhaust gas recirculation valve position: more than 8 mm {0.3 in.}
- Exhaust volume-flow rate: 500 to 900 m^3/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

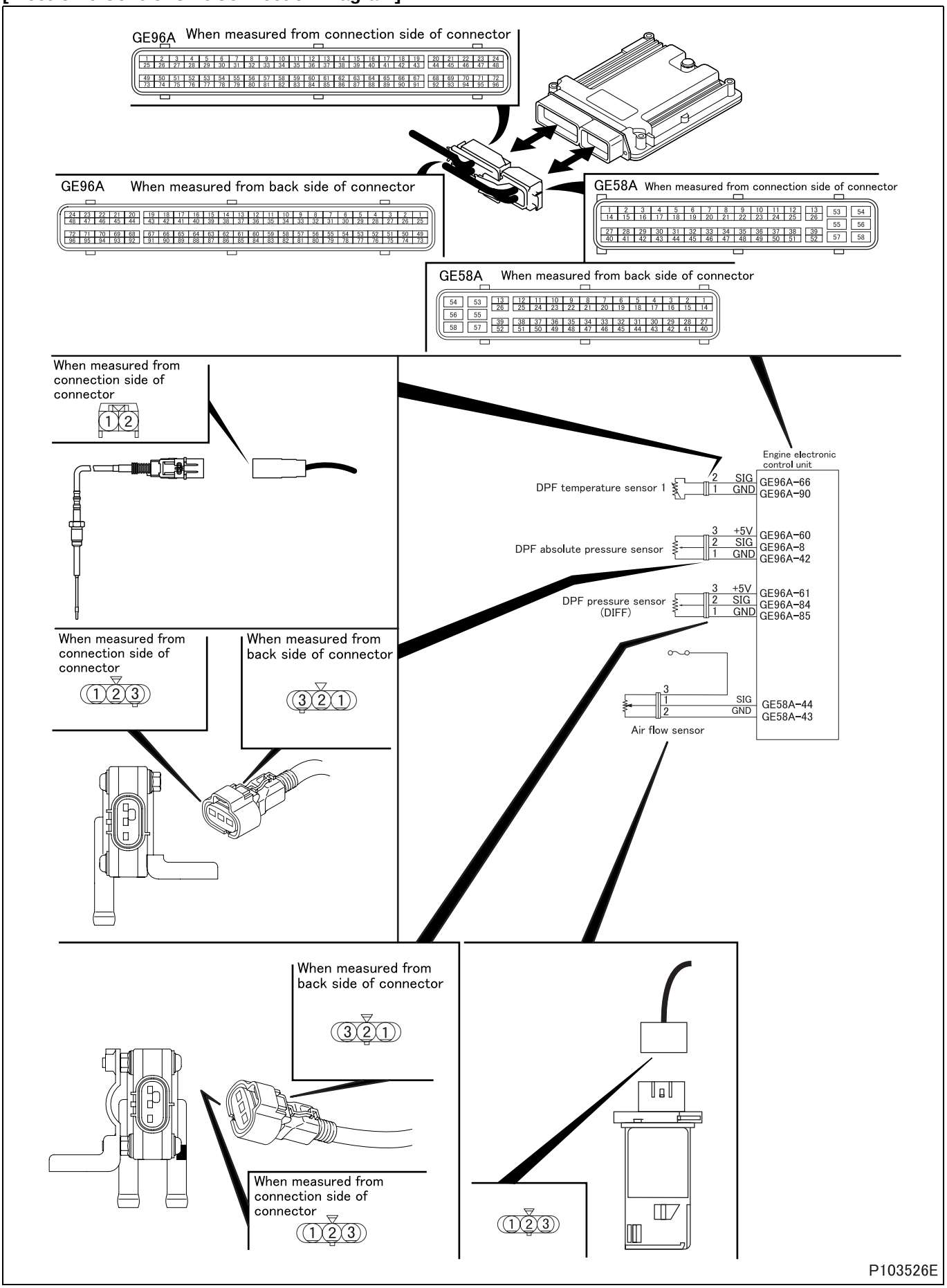
[Control effected by electronic control unit during fault]
Electronic control unit differs in the way of control by the engine model.
<Except FE83>
- Engine torque is limited.
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Diesel particulate filter regeneration is stopped.
- 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.)

[Electronic Control Unit Connection Diagram]



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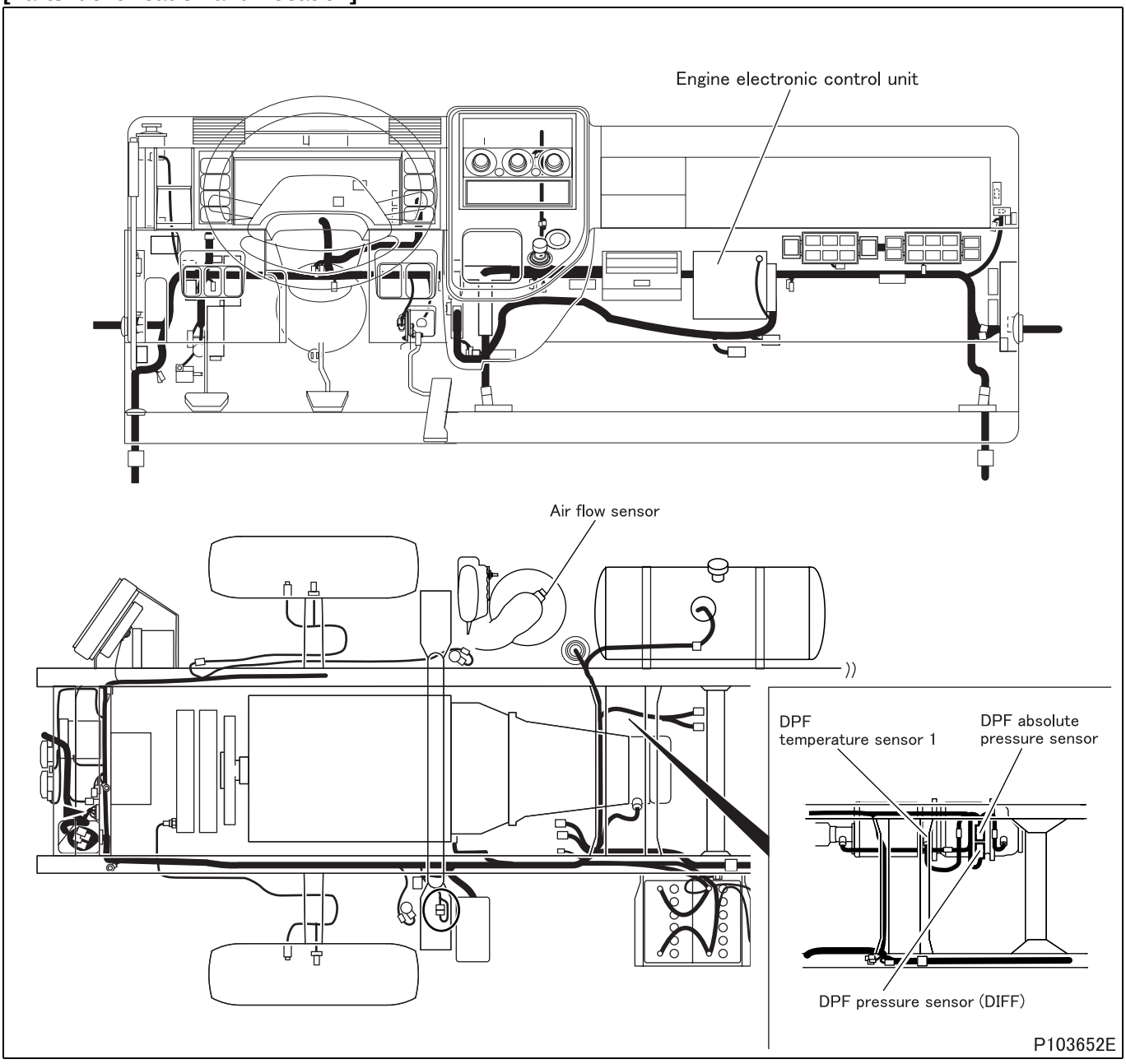
[Parts Identification and Location]

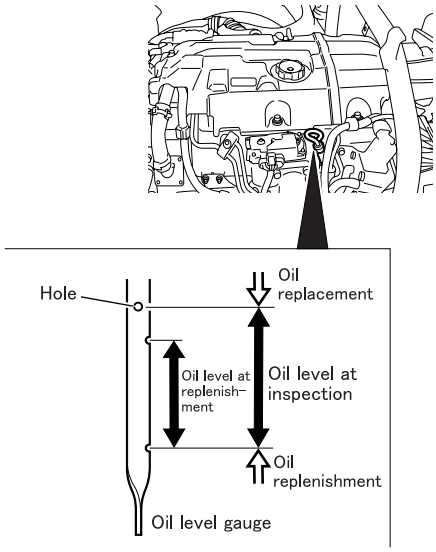


[Fault diagnosis]

- 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	Go to step 2.
		NO	After replacement of oil, go to step 2

<Step 1 inspection diagram>



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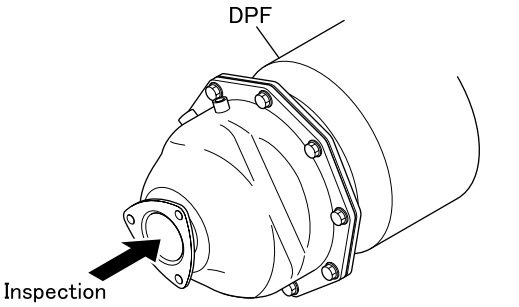
Step 2	Inspection items		Inspection by manual diesel particulate filter regeneration
	Maintenance item		Perform Multi-Use Tester actuator test item No. A5 “DPF Regeneration (Manual)”, and clean ceramic diesel particulate filter.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Engine: idling • Place the transmission in neutral. (place the automatic transmission in P range) • Parking brake: vehicle parked (parking brake switch: ON) • After engine warm-up
	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		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		Perform the following preparatory works. • Place the transmission in neutral. (place the automatic transmission in P range) • Turn the steering wheel in neutral position and securely apply the parking brake. • Turn off air conditioner not to increase the engine speed. • Check diagnosis code of each electronic control system. If any fault exists, rectify it. • Resetting the DPF-related information (perform “History reset” of Multi-Use Tester) (See Gr15 “Resetting the DPF-related information”.) • 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”)
	Requirements		This diagnosis code does not occur again.
	Inspection result (Is the judging standard satisfied?)	YES	End of inspection
		NO	Go to step 5.

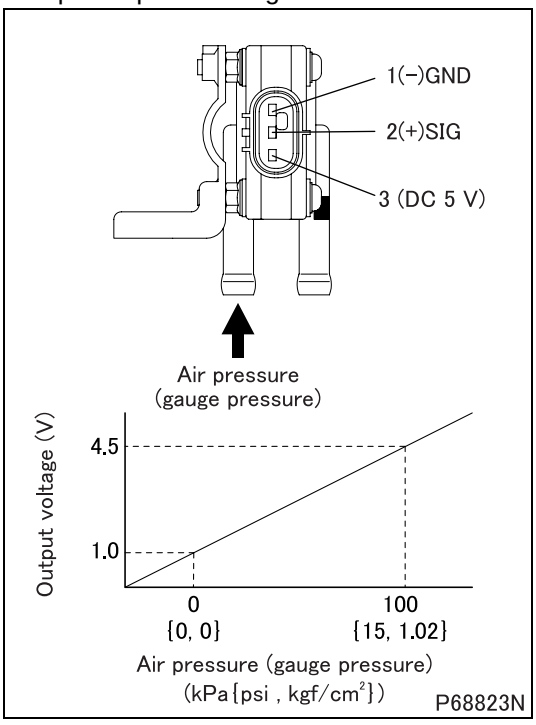
Step 5	Inspection items		Inspection by control data
	Maintenance item		Measure item No. B8 “DPF Indicator Lamp” of Service Data.
	Inspection condition		Perform Multi-Use Tester actuator test item No. A6 “DPF Lamp”.
	Requirements		Diesel particulate filter indicator lamp illuminates (automatic reset after 15 seconds)
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 6.
		NO	Replacement of engine electronic control unit

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		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2} : 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2} : 4.5 V
	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		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	Inspection condition		–
	Requirements		10% or less
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 10.
		NO	Replacement of air flow sensor

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	• Inspection of exhaust gas recirculation system (exhaust gas recirculation pipe, exhaust gas recirculation cooler, exhaust gas recirculation valve) • Inspection of engine
		NO	Replacement of injector

[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.

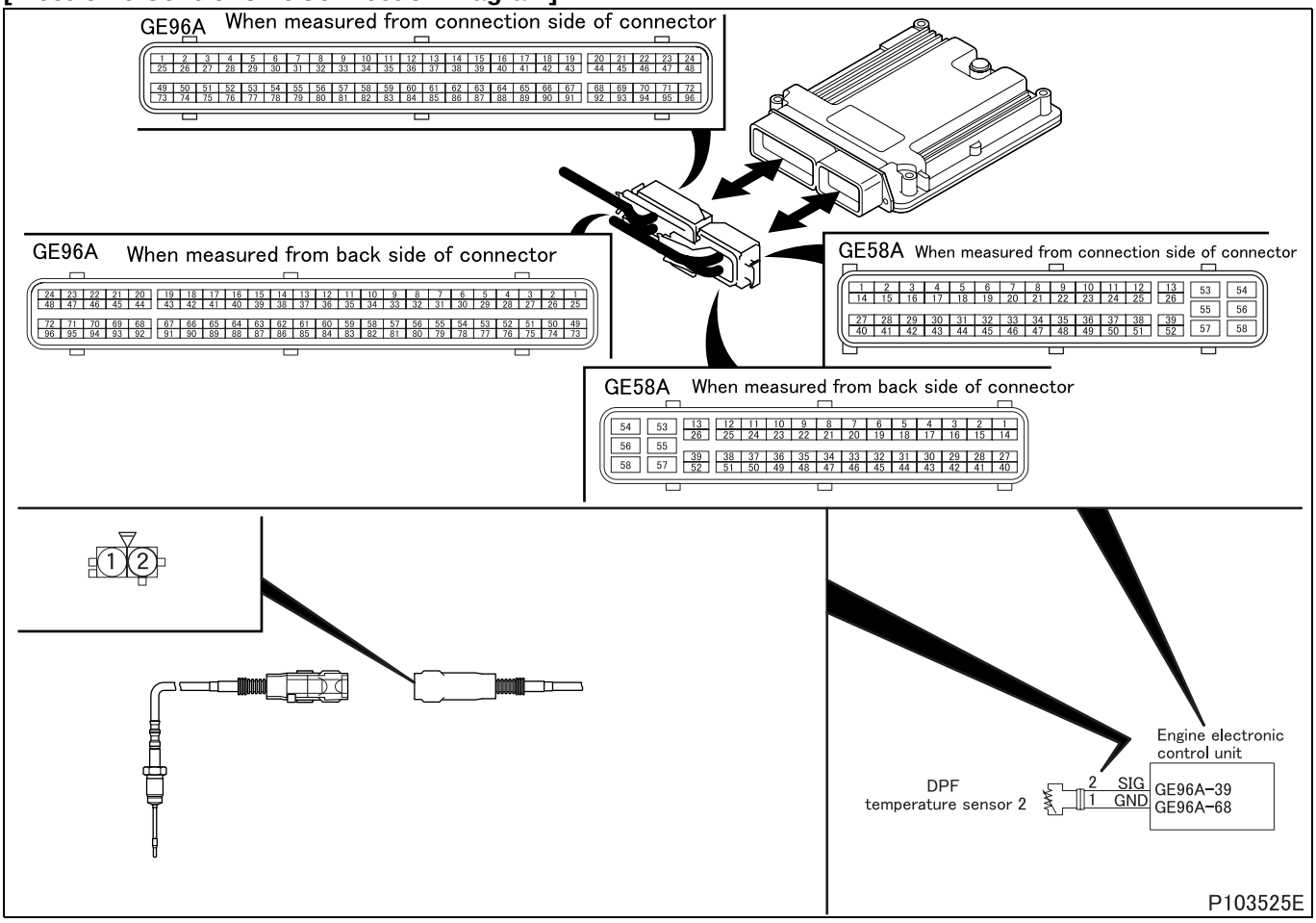
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Pressure after ceramic diesel particulate filter is fixed at backup value.
- Related fault check is stopped.

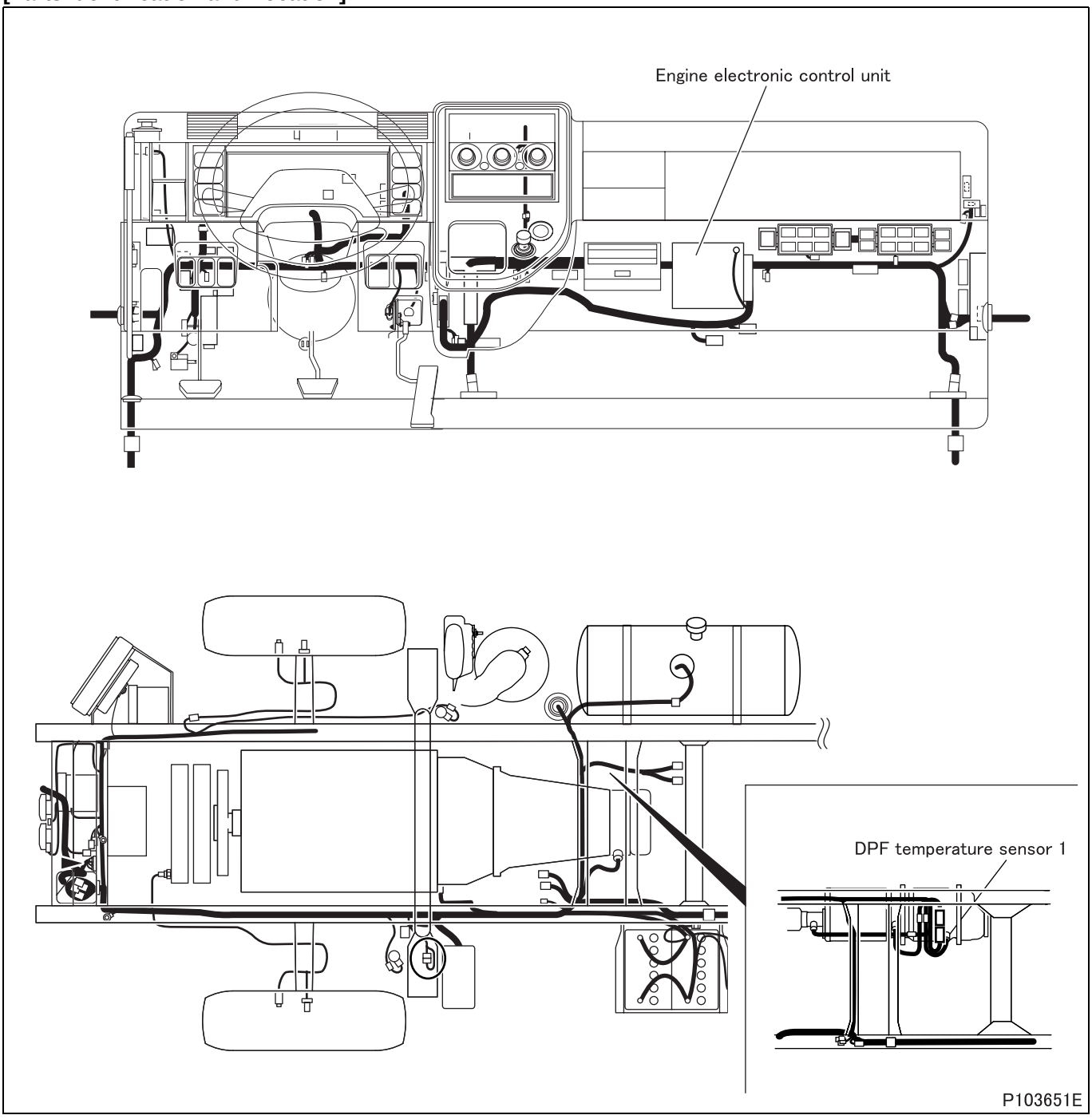
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of DPF temperature sensor 2
- Malfunction of electronic control unit

[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.)

[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. 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	Go to step 2.

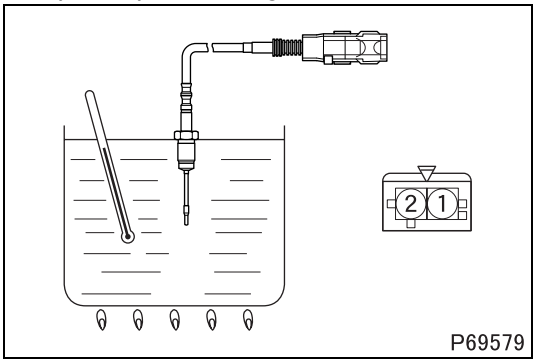
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 39 and 68.
	Inspection condition		• Starter switch: OFF • Disconnect electronic control unit from harness and measure at vehicle side connector.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.58 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		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		• Put DPF temperature sensor 2 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.58 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	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: 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.

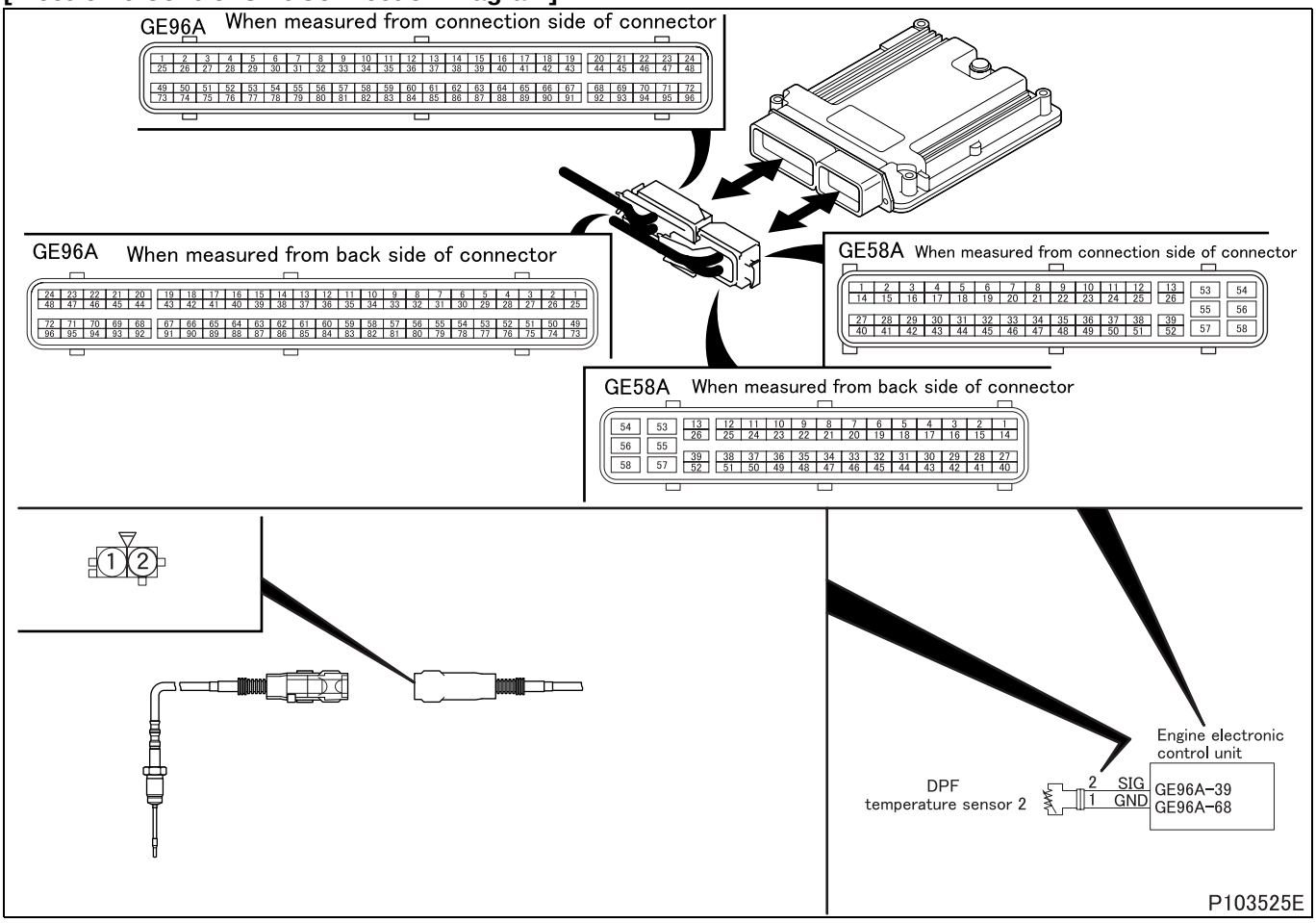
[Diagnostic requirement]
- Engine speed: 1400 to 5000 rpm
- Fuel injection quantity: 35 to 200 mg/cyc
- Water temperature: above 35°C {95°F}

[Control effected by electronic control unit during fault]
- Pressure after ceramic diesel particulate filter is fixed at backup value.
- Related fault check is stopped.

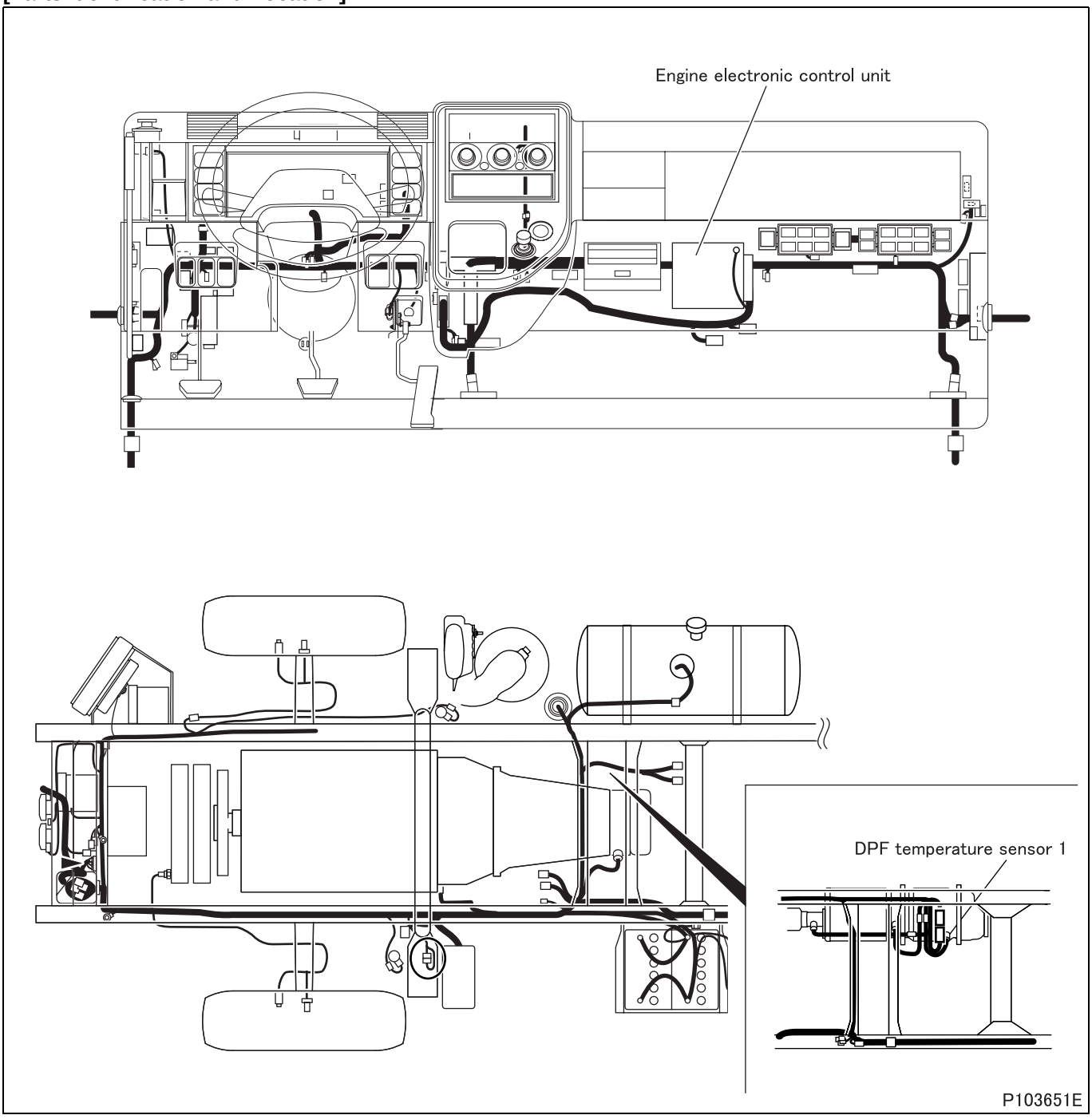
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of DPF temperature sensor 2
- Malfunction of electronic control unit

[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]



[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. 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	Go to step 2.

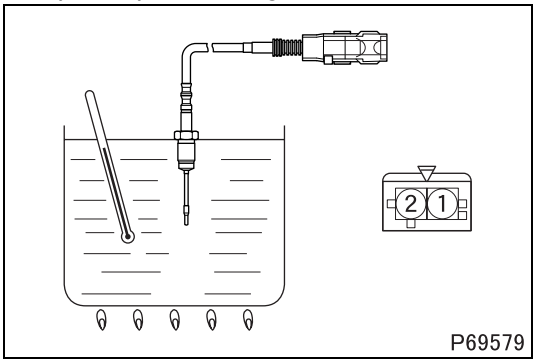
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 39 and 68.
	Inspection condition		• Starter switch: OFF • Disconnect electronic control unit from harness and measure at vehicle side connector.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.58 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		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		• Put DPF temperature sensor 2 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.58 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	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.)

[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.

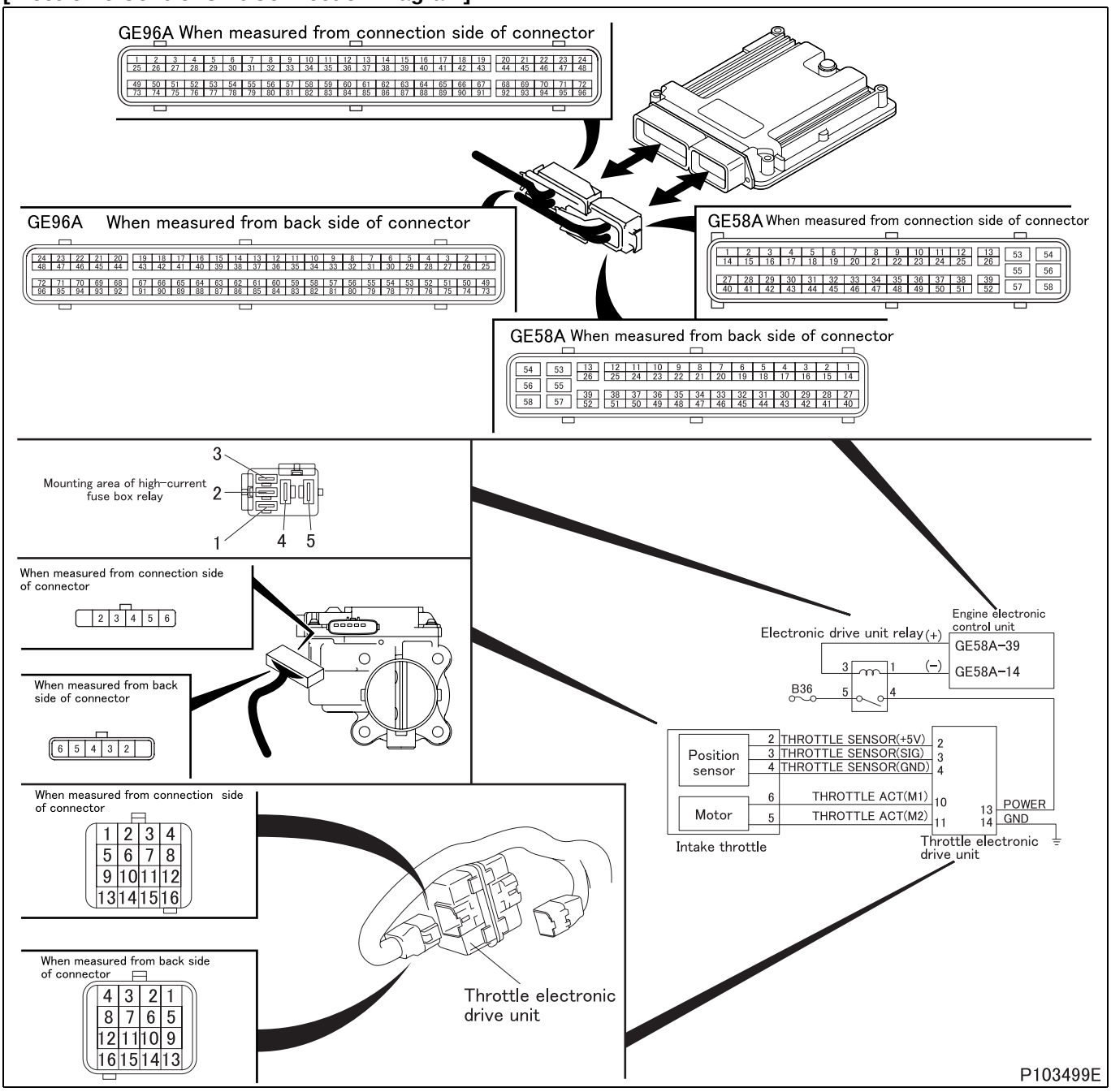
[Diagnostic requirement]
- Controller area network communication in order

[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.

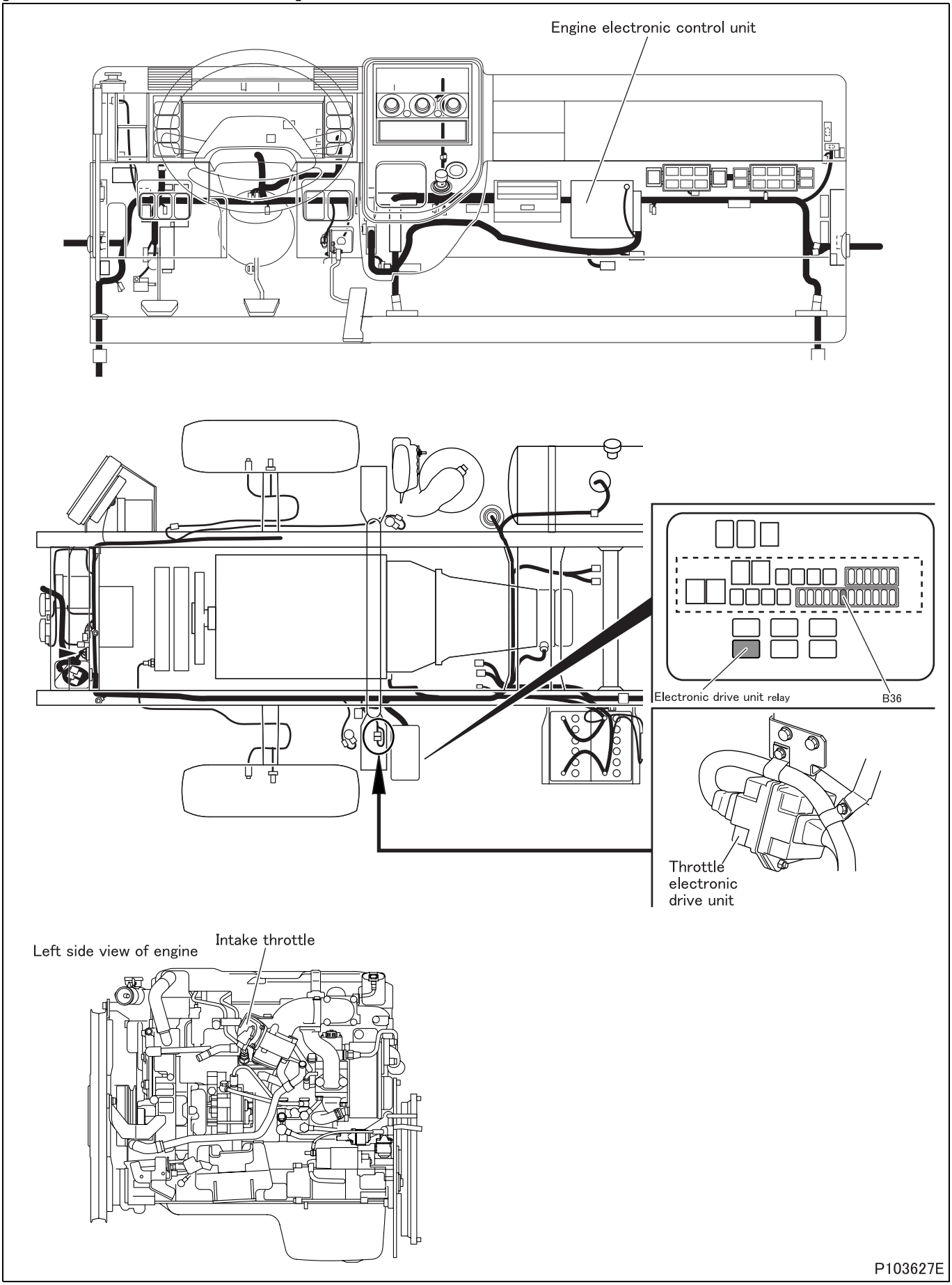
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic drive unit and throttle actuator
- Malfunction of each connector
- Malfunction of throttle motor (built in throttle actuator)
- Malfunction of throttle position sensor (built in throttle actuator)
- Malfunction 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.)

[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 actuator test item No. A3 “Intake Throttle 1”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)”
	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		• Disconnect connector and measure from harness side. • Starter switch: ON • Perform actuator test item No. AF “EDU Relay”.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

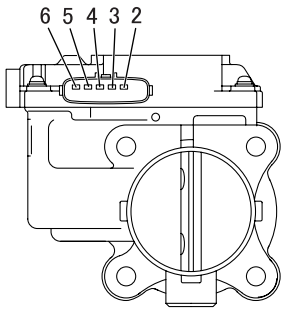
Step 9	Inspection items		Inspection of harness between electronic drive unit and ground
	Maintenance item		Check circuit between following electronic drive unit connector terminals. • Electronic drive unit ground: terminal No. 14 - chassis ground • Sensor ground: terminal No. 4 and 14
	Inspection condition		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 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. • Motor (1): electronic drive unit connector terminal No. 10 - throttle actuator connector terminal No. 6 • Motor (2): electronic drive unit connector terminal No. 11 - throttle actuator 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 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		• Keep throttle actuator installed on vehicle. • Disconnect connector and measure throttle actuator side.
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON • Perform actuator test item No. A3 “Intake Throttle 1”.
	Requirements		• Valve fully closed: 0.5 V • Valve fully opened: 4.375 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 throttle actuator (position sensor)
	Maintenance item		Check circuit between following connector terminals. • Sensor (power supply): electronic drive unit connector terminal No. 2 - throttle actuator connector terminal No. 2 • Sensor (signal): electronic drive unit connector terminal No. 3 - throttle actuator connector terminal No. 3 • Sensor (ground): electronic drive unit connector terminal No. 4 - throttle actuator 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	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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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: 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.

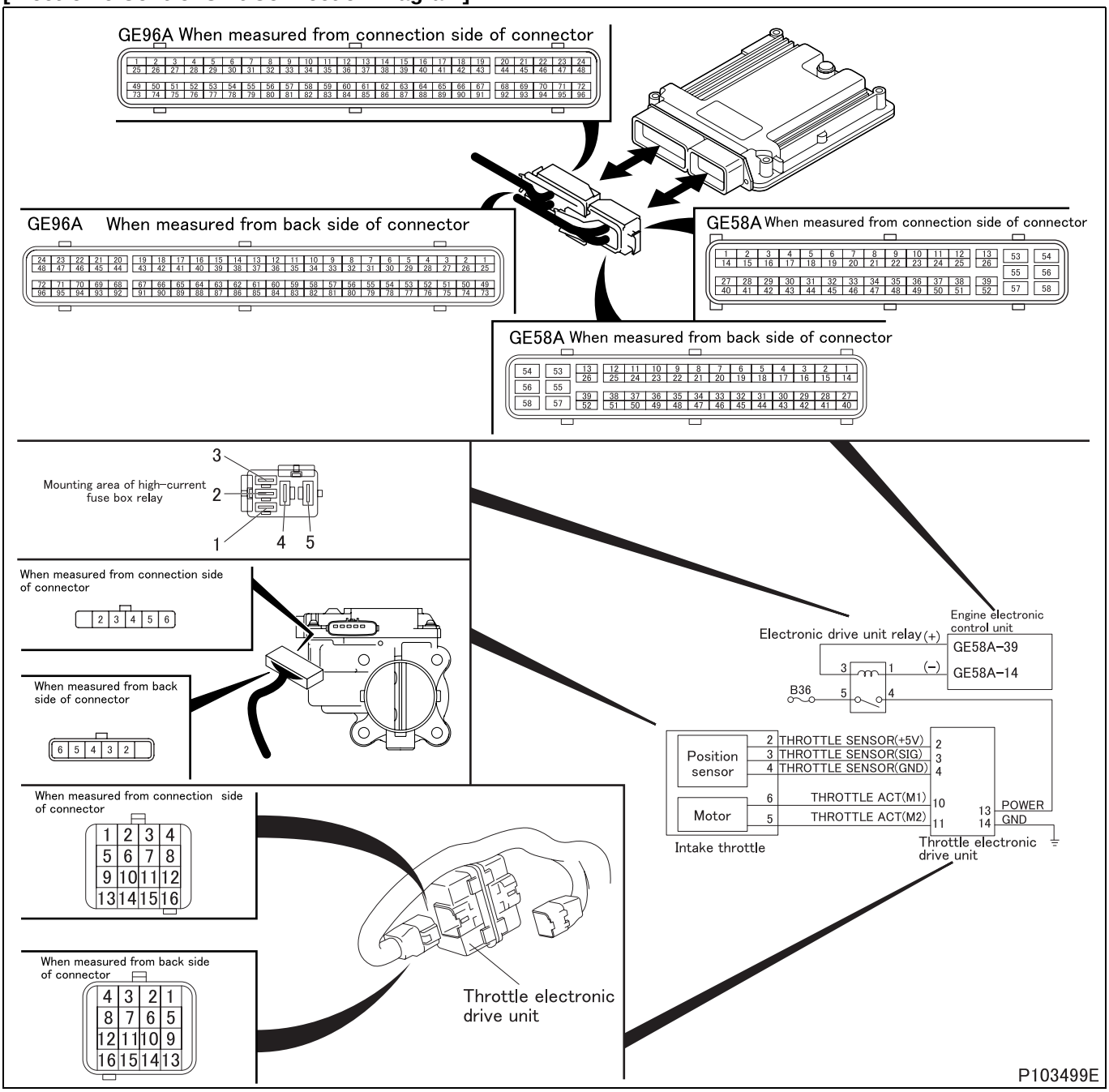
[Diagnostic requirement]
- Battery voltage: in order
- Exhaust gas recirculation valve: in order
- Electronic drive unit controller area network: in order

[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.

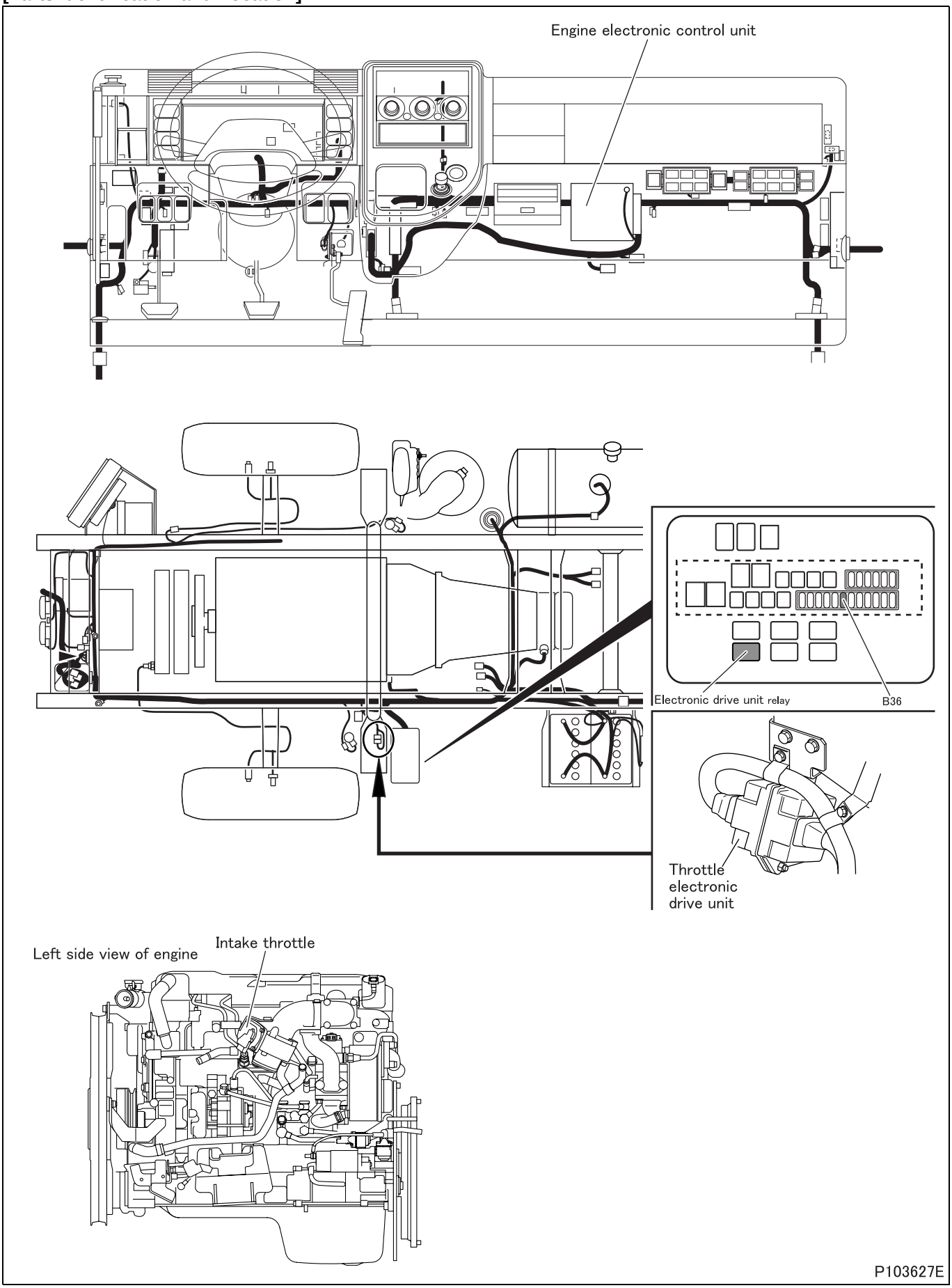
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic drive unit and throttle actuator
- Malfunction of each connector
- Malfunction of throttle motor (built in throttle actuator)
- Malfunction of throttle position sensor (built in throttle actuator)
- Malfunction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



[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. A3 “Intake Throttle 1”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)”
	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		• Disconnect connector and measure from harness side. • Starter switch: ON • Perform actuator test item No. AF “EDU Relay”.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

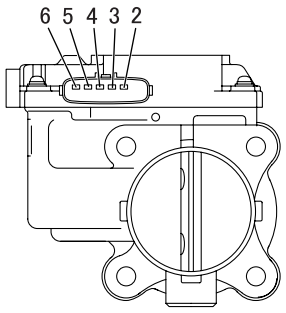
Step 9	Inspection items		Inspection of harness between electronic drive unit and ground
	Maintenance item		Check circuit between following electronic drive unit connector terminals. • Electronic drive unit ground: terminal No. 14 - chassis ground • Sensor ground: terminal No. 4 and 14
	Inspection condition		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 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. • Motor (1): electronic drive unit connector terminal No. 10 - throttle actuator connector terminal No. 6 • Motor (2): electronic drive unit connector terminal No. 11 - throttle actuator 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 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		• Keep throttle actuator installed on vehicle. • Disconnect connector and measure throttle actuator side.
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON • Perform actuator test item No. A3 “Intake Throttle 1”.
	Requirements		• Valve fully closed: 0.5 V • Valve fully opened: 4.375 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 throttle actuator (position sensor)
	Maintenance item		Check circuit between following connector terminals. • Sensor (power supply): electronic drive unit connector terminal No. 2 - throttle actuator connector terminal No. 2 • Sensor (signal): electronic drive unit connector terminal No. 3 - throttle actuator connector terminal No. 3 • Sensor (ground): electronic drive unit connector terminal No. 4 - throttle actuator 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	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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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.

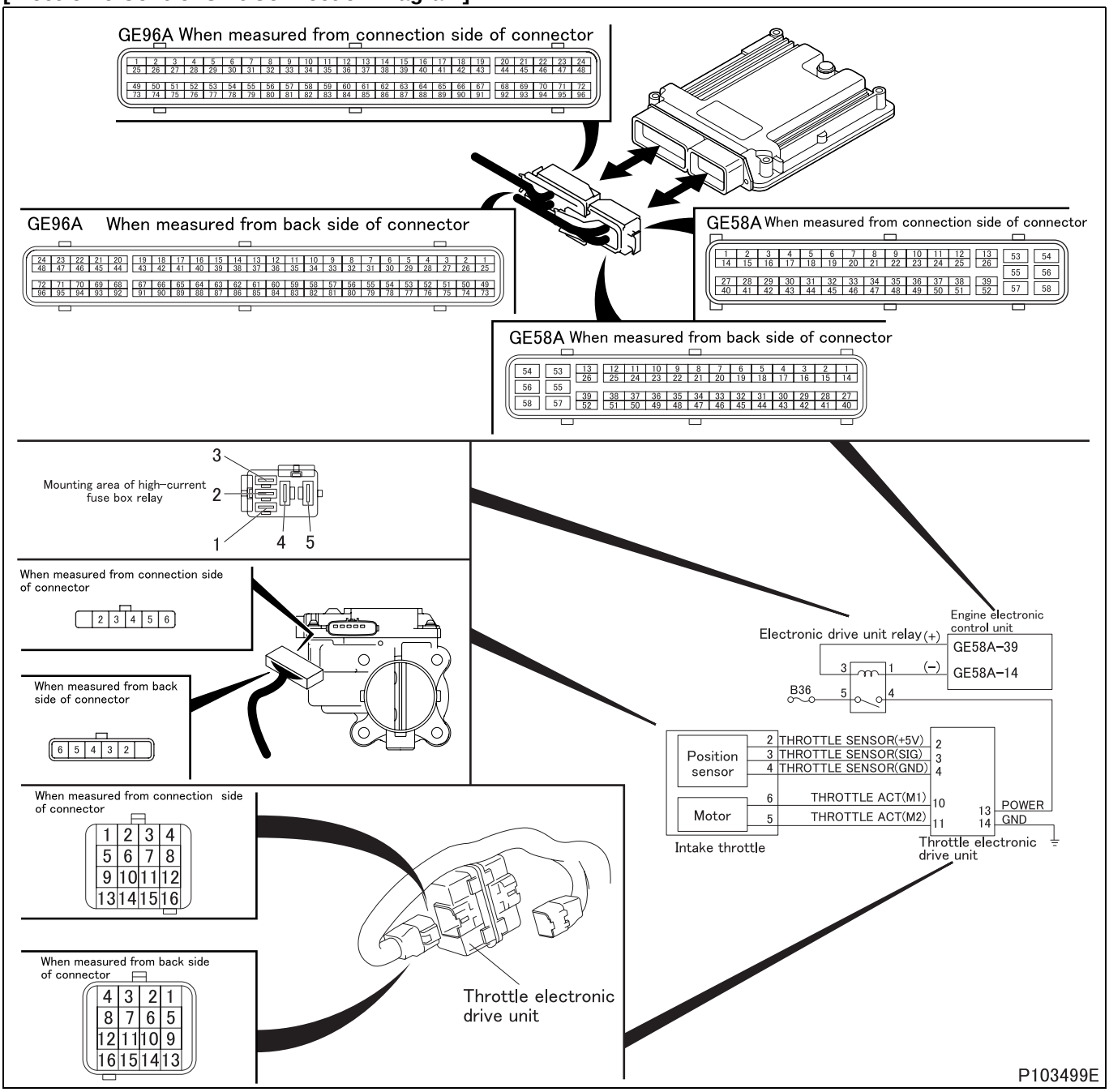
[Diagnostic requirement]
- Controller area network communication in order

[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.

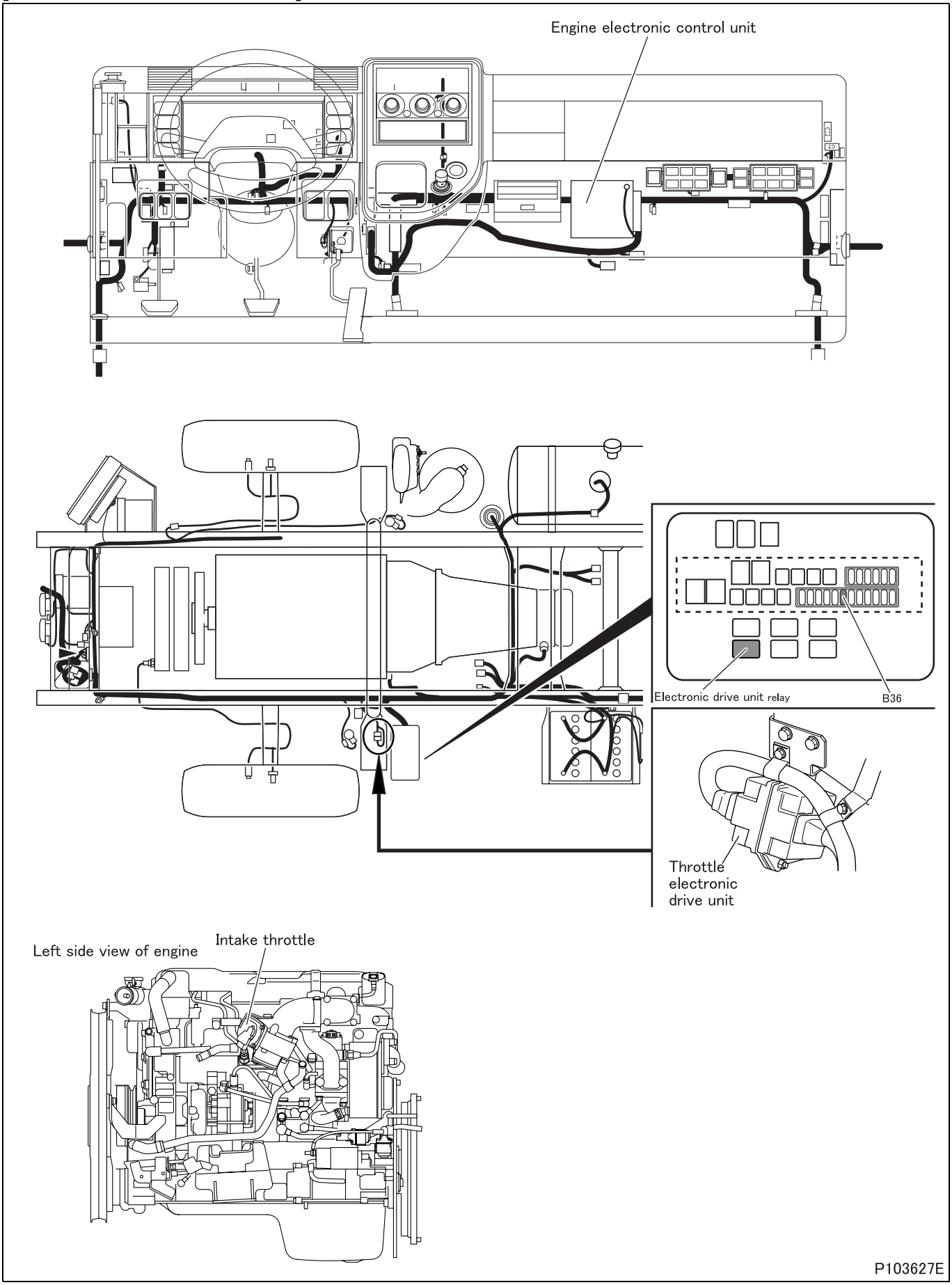
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic drive unit and throttle actuator
- Malfunction of each connector
- Malfunction of throttle motor (built in throttle actuator)
- Malfunction of throttle position sensor (built in throttle actuator)
- Malfunction 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.)

[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 actuator test item No. A3 “Intake Throttle 1”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)”
	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		• Disconnect connector and measure from harness side. • Starter switch: ON • Perform actuator test item No. AF “EDU Relay”.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

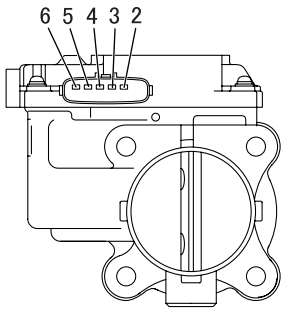
Step 9	Inspection items		Inspection of harness between electronic drive unit and ground
	Maintenance item		Check circuit between following electronic drive unit connector terminals. • Electronic drive unit ground: terminal No. 14 - chassis ground • Sensor ground: terminal No. 4 and 14
	Inspection condition		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 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. • Motor (1): electronic drive unit connector terminal No. 10 - throttle actuator connector terminal No. 6 • Motor (2): electronic drive unit connector terminal No. 11 - throttle actuator 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 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		• Keep throttle actuator installed on vehicle. • Disconnect connector and measure throttle actuator side.
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON • Perform actuator test item No. A3 “Intake Throttle 1”.
	Requirements		• Valve fully closed: 0.5 V • Valve fully opened: 4.375 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 throttle actuator (position sensor)
	Maintenance item		Check circuit between following connector terminals. • Sensor (power supply): electronic drive unit connector terminal No. 2 - throttle actuator connector terminal No. 2 • Sensor (signal): electronic drive unit connector terminal No. 3 - throttle actuator connector terminal No. 3 • Sensor (ground): electronic drive unit connector terminal No. 4 - throttle actuator 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	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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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: 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.

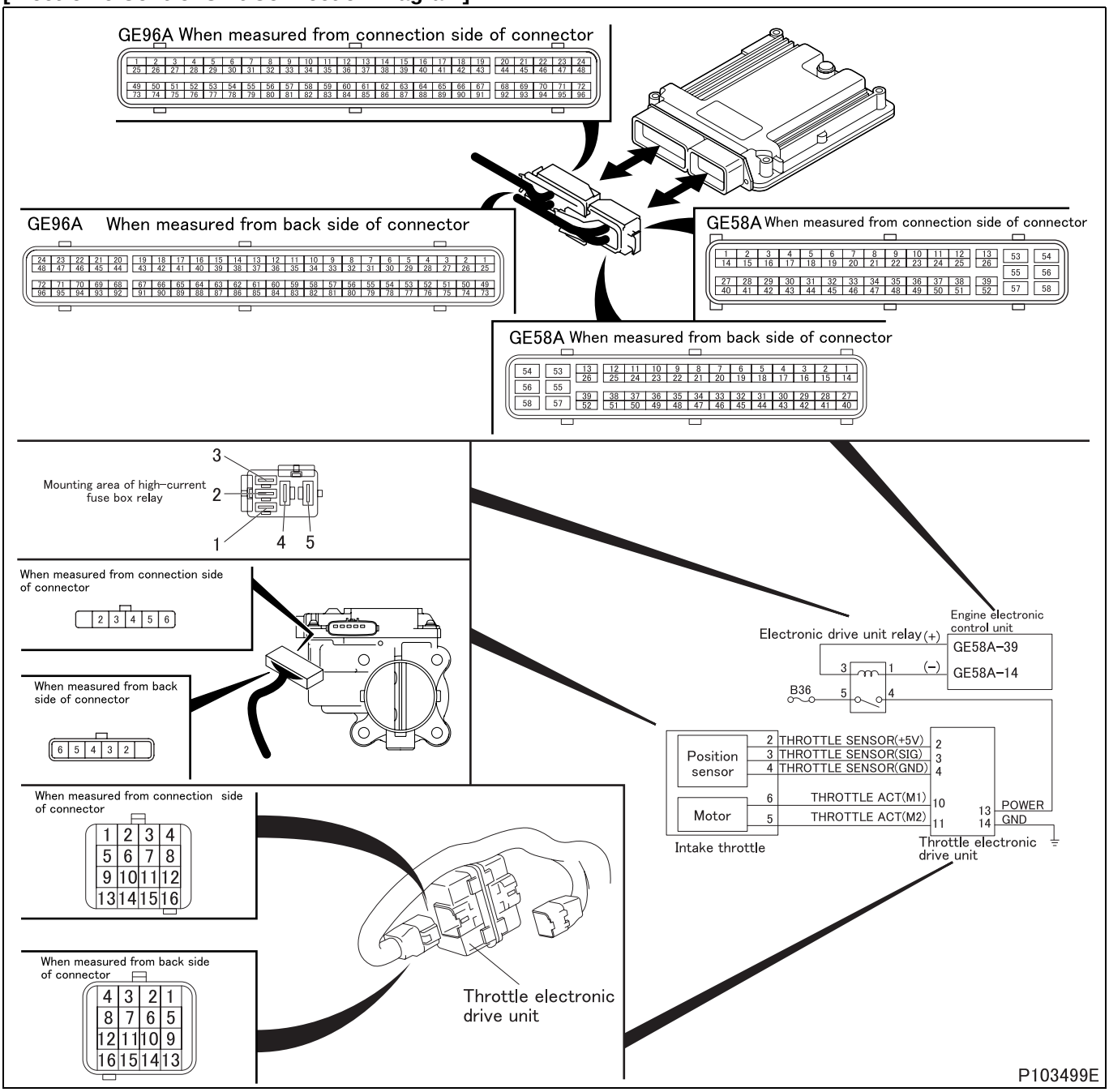
[Diagnostic requirement]
- Controller area network communication in order

[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.

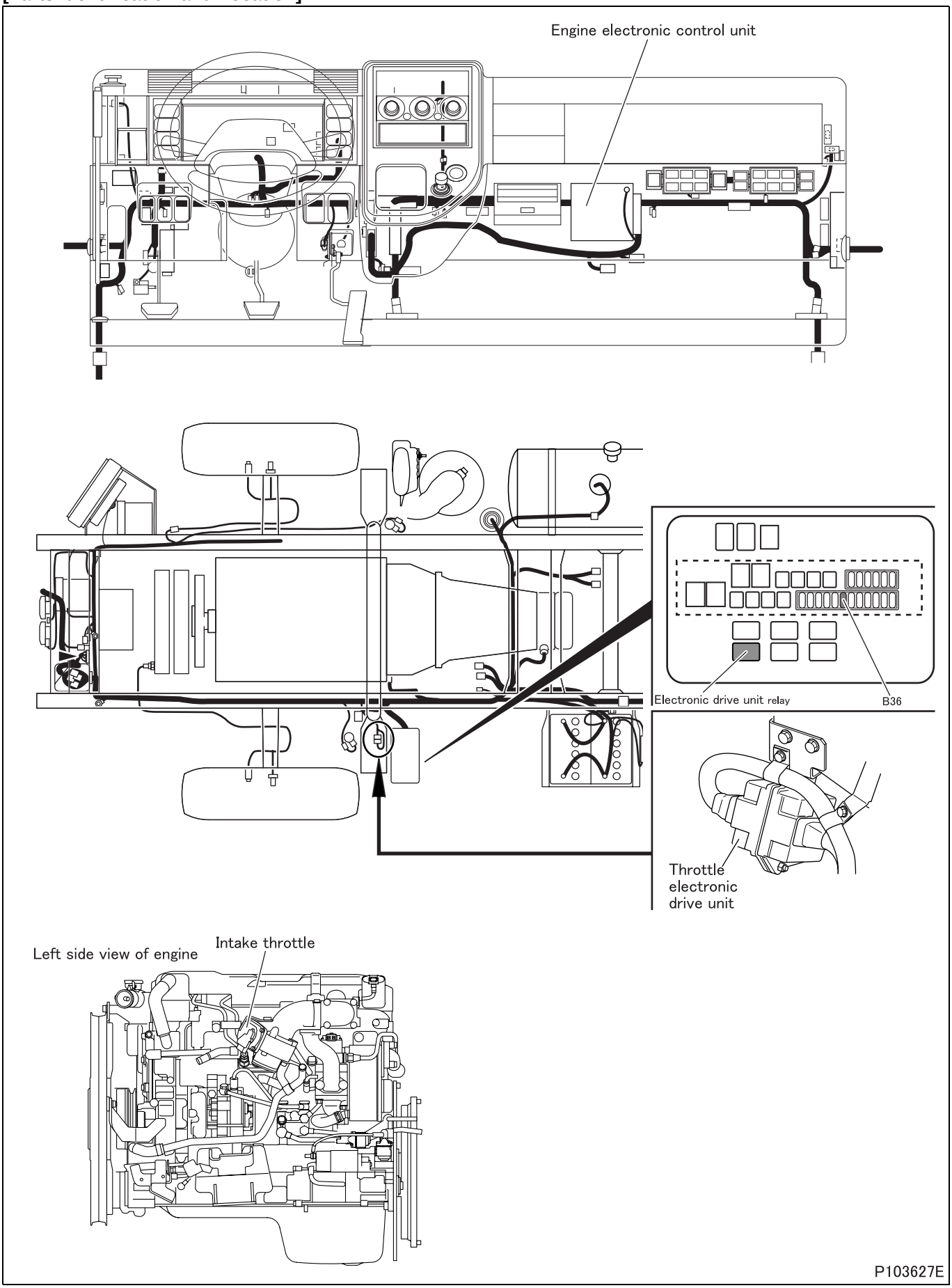
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic drive unit and throttle actuator
- Malfunction of each connector
- Malfunction of throttle motor (built in throttle actuator)
- Malfunction of throttle position sensor (built in throttle actuator)
- Malfunction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



[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. A3 “Intake Throttle 1”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)”
	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		• Disconnect connector and measure from harness side. • Starter switch: ON • Perform actuator test item No. AF “EDU Relay”.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

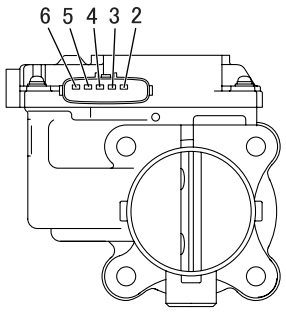
Step 9	Inspection items		Inspection of harness between electronic drive unit and ground
	Maintenance item		Check circuit between following electronic drive unit connector terminals. • Electronic drive unit ground: terminal No. 14 - chassis ground • Sensor ground: terminal No. 4 and 14
	Inspection condition		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 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. • Motor (1): electronic drive unit connector terminal No. 10 - throttle actuator connector terminal No. 6 • Motor (2): electronic drive unit connector terminal No. 11 - throttle actuator 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 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		• Keep throttle actuator installed on vehicle. • Disconnect connector and measure throttle actuator side.
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON • Perform actuator test item No. A3 “Intake Throttle 1”.
	Requirements		• Valve fully closed: 0.5 V • Valve fully opened: 4.375 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 throttle actuator (position sensor)
	Maintenance item		Check circuit between following connector terminals. • Sensor (power supply): electronic drive unit connector terminal No. 2 - throttle actuator connector terminal No. 2 • Sensor (signal): electronic drive unit connector terminal No. 3 - throttle actuator connector terminal No. 3 • Sensor (ground): electronic drive unit connector terminal No. 4 - throttle actuator 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	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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral • Diagnosis switch: OFF (fuse removed)
	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.

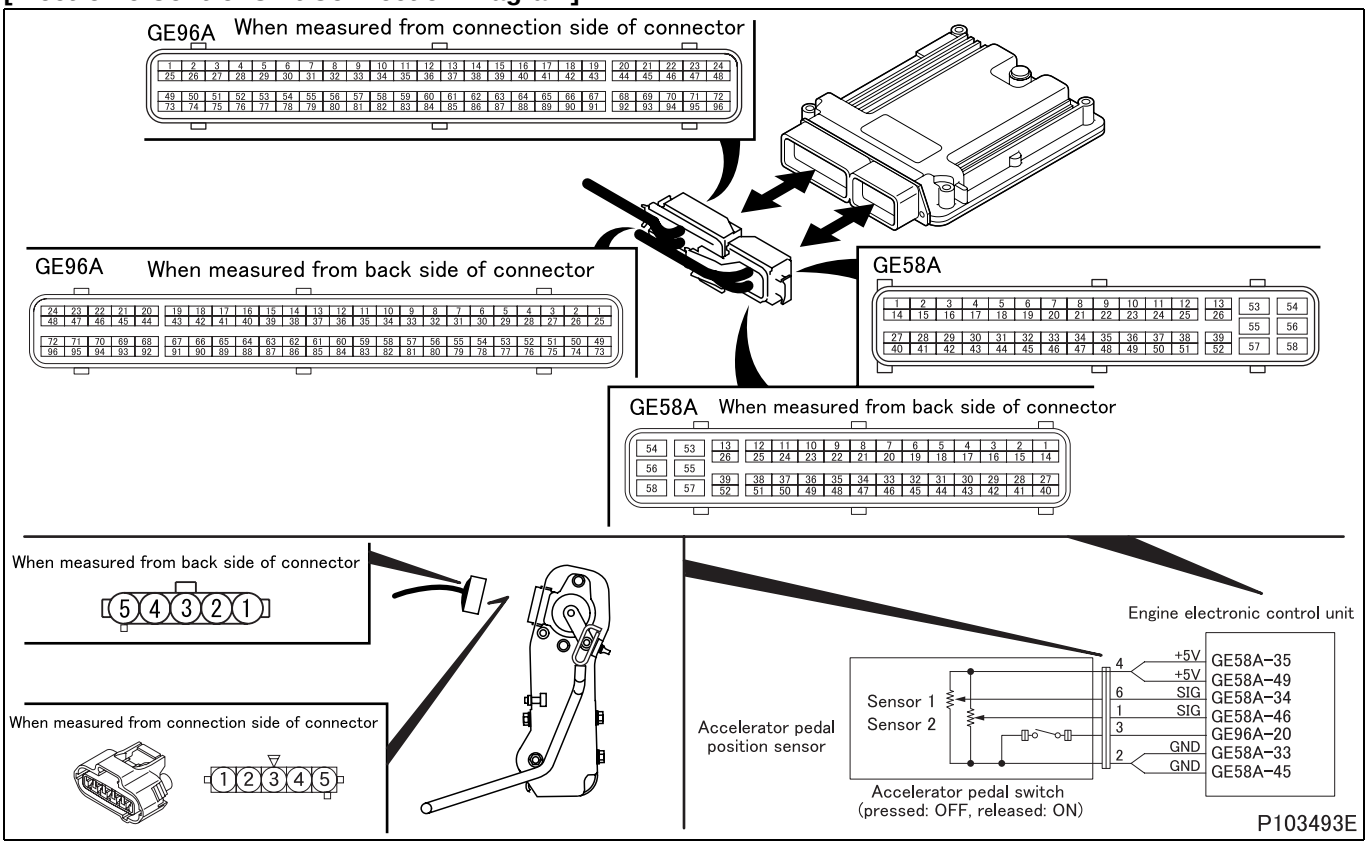
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Effects no special control.

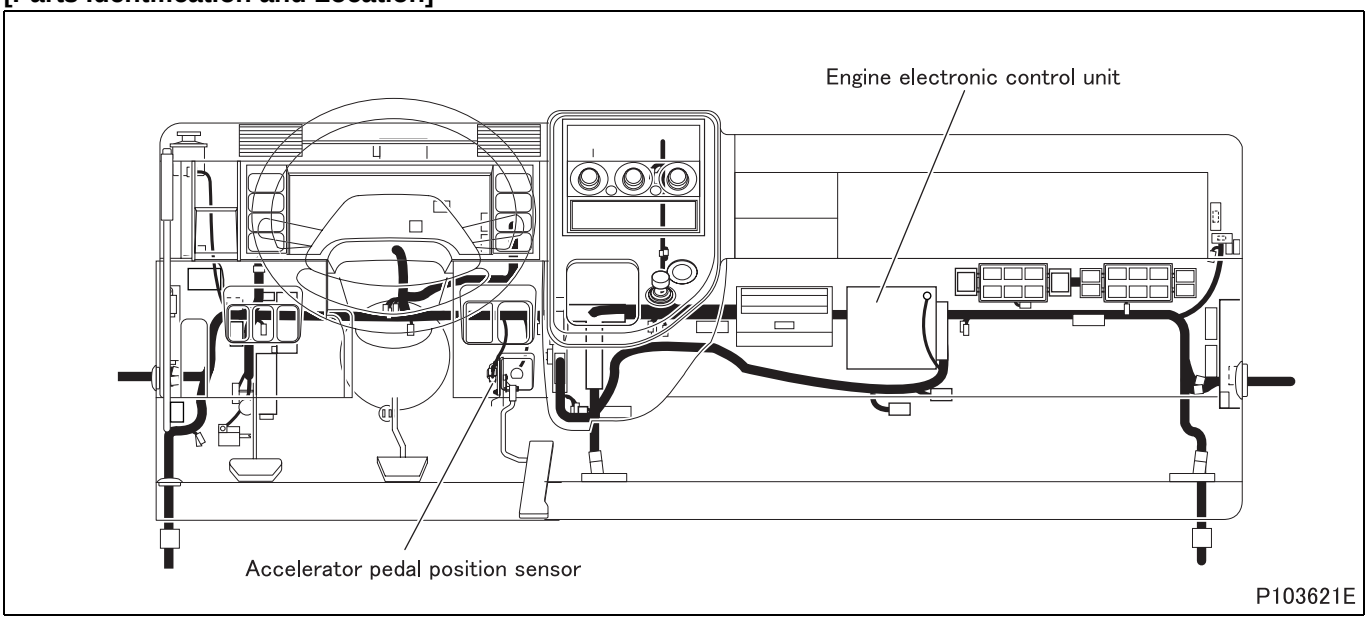
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and accelerator pedal position sensor (switch)
- Malfunction of each connector
- Malfunction of accelerator pedal position sensor (switch)
- Malfunction of electronic control unit

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

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[Fault diagnosis]

- Perform checks in the sequence of the following steps.

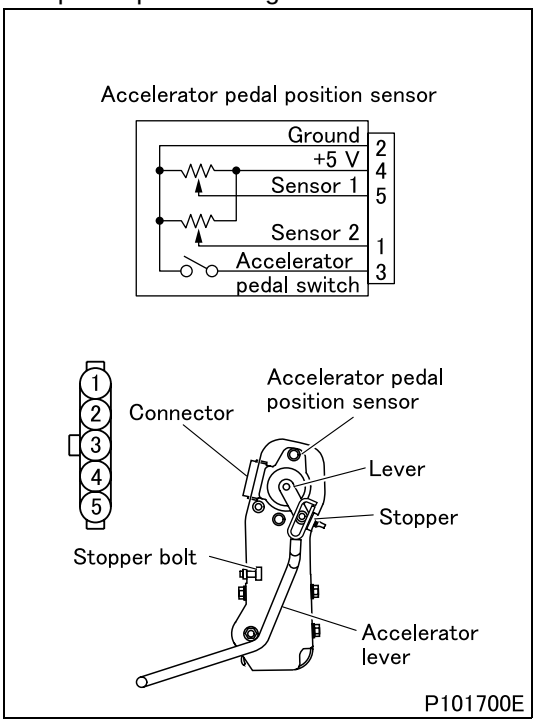
Step 1	Inspection items		Inspection by control data
	Maintenance item		Measure item No. A2 “Accel SW” of Service Data.
	Inspection condition		–
	Requirements		• Accelerator pedal released: ON • Accelerator pedal pressed: OFF
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 2.

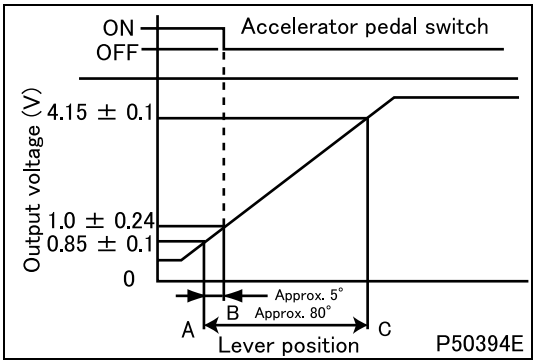
Step 2	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Modify connector.

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		• Accelerator pedal released: There is continuity. • Accelerator pedal pressed: There is no continuity.
	Inspection result (Is the judging standard satisfied?)	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?)	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		• Accelerator pedal released: ON • Accelerator pedal pressed: OFF
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Replacement of electronic control unit

[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.

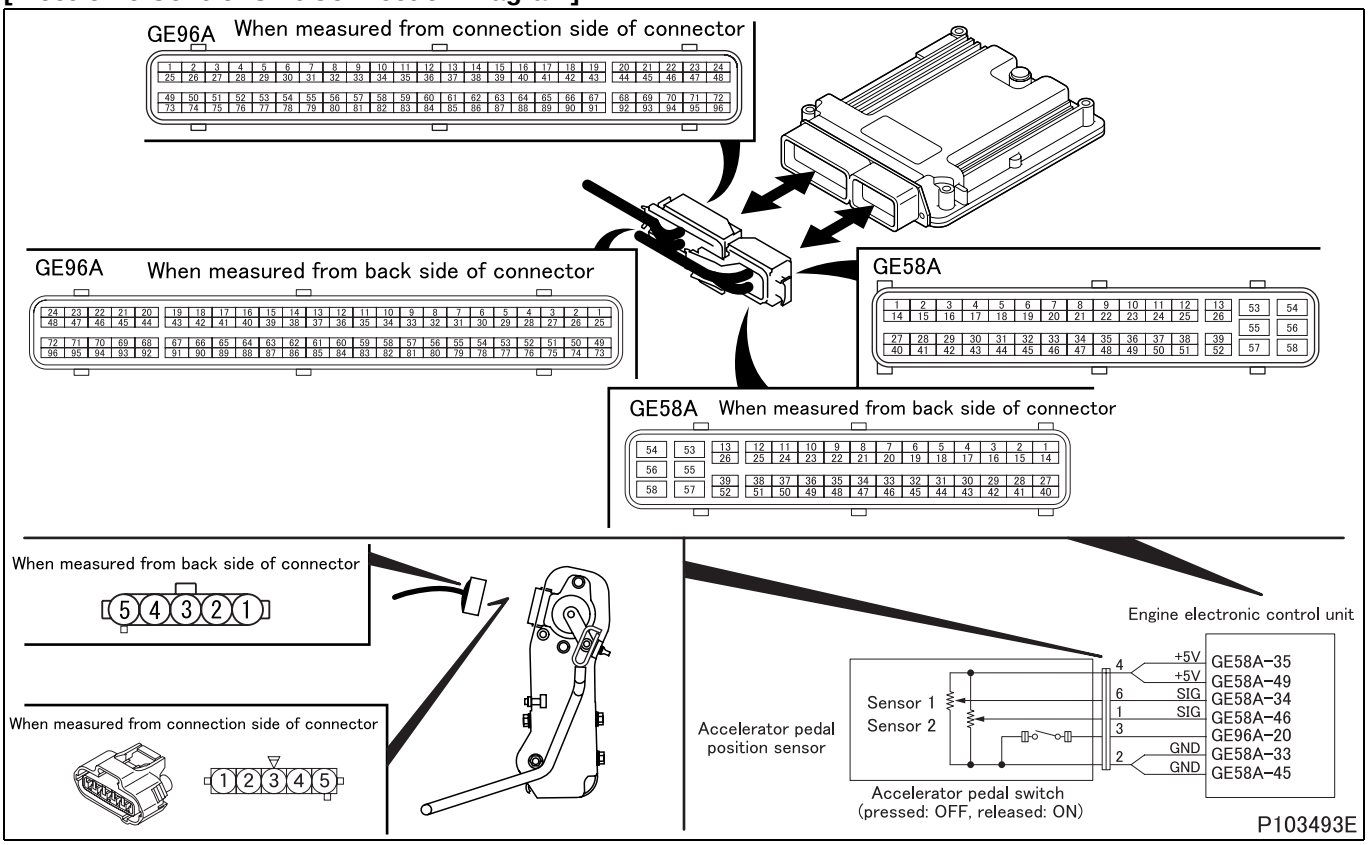
<Accelerator pedal position sensor 2>
- Accelerator pedal position sensor 1 is computed with accelerator pedal position sensor 2 only.
- In-use performance counter is stopped.
- Related fault check is stopped.

<Accelerator pedal position sensors 1 and 2>
- Related fault check is stopped.

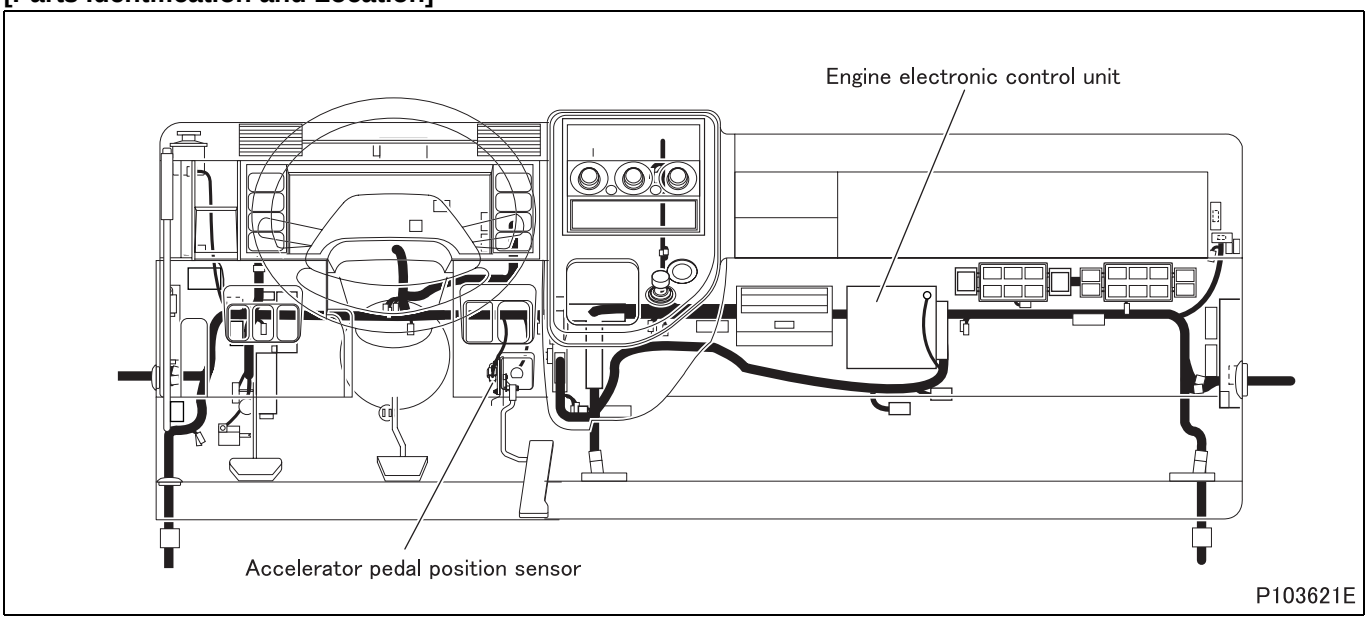
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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]



[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** Measurement of following service data • Sensor 1: Item “Accelerator Pedal Position 1” • Sensor 2: Item “Accelerator Pedal Position 2” **<Multi-Use Tester used>** Measurement of following service data • Sensor 1: Item No. 40 “Accelerator sensor voltage 1”. • Sensor 2: Item No. 41 “Accelerator sensor voltage 2”.
	Inspection condition		–
	Requirements		**<General Scanning Tool used>** • Accelerator pedal released: 0% • Accelerator pedal pressed: 100% **<Multi-Use Tester used>** • Accelerator pedal released: 0.85 ± 0.1 V • Accelerator pedal pressed: 4.15 ± 0.1 V
	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 • Sensor 1: 34 (+) - 33 (–) • Sensor 2: 46 (+) - 45 (–)
	Inspection condition		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	Requirements		• Accelerator pedal released: 0.85 ± 0.1 V • Accelerator pedal pressed: 4.15 ± 0.1 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 values of voltage between following connector (GE58A) terminals • Sensor 1: 35 (+) - 33 (–) • Sensor 2: 49 (+) - 45 (–)
	Inspection condition		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Go to step 5.

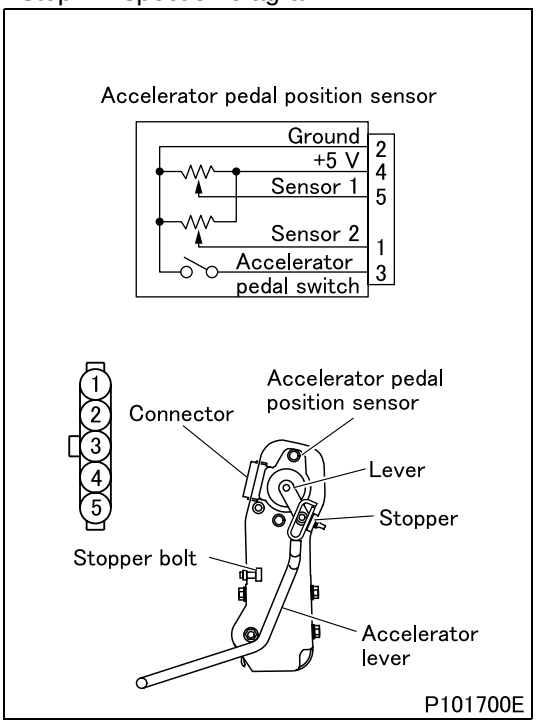
Step 4	Inspection items		Inspection by electronic control unit connector (ground)
	Maintenance item		Measure values of voltage between following connector (GE58A) terminals • Sensor 1: 33 (+) - 53 (–) • Sensor 2: 45 (+) - 53 (–)
	Inspection condition		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	Requirements		0 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 6.
		NO	Go to step 5.

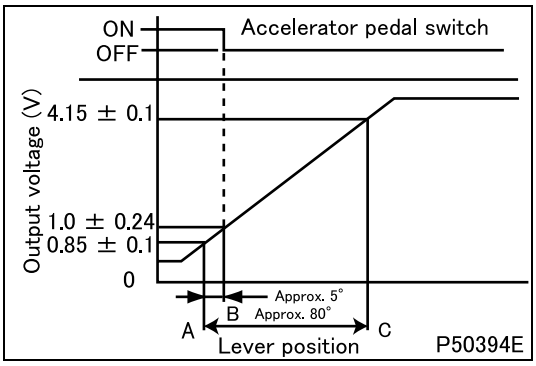
Step 5	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. • Sensor 1: 5 (+) - 2 (–) • Sensor 2: 1 (+) - 2 (–)
	Inspection condition		Apply voltage DC 5 V across terminals No. 4 (+) and 2 (–).
	Requirements		• Idling position A: 0.85 ± 0.1 V • Accelerator switch operating position B: 1.0 ± 0.24 V • Full-load position C: 4.15 ± 0.1 V A: When accelerator lever is in contact with stopper B: When accelerator pedal is pressed until there is no continuity between terminals 2 and 3. 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

<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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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. • Sensor 1: sensor connector terminal No. 4 - electronic control unit connector (GE58A) terminal No. 35 • 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. • Sensor 1: sensor connector terminal No. 2 - electronic control unit connector (GE58A) terminal No. 33 • 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. • Sensor 1: sensor connector terminal No. 5 - electronic control unit connector (GE58A) terminal No. 34 • 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		**<General Scanning Tool used>** Measurement of following service data • Sensor 1: Item “Accelerator Pedal Position 1” • Sensor 2: Item “Accelerator Pedal Position 2” **<Multi-Use Tester used>** Measurement of following service data • Sensor 1: Item No. 40 “Accelerator sensor voltage 1”. • Sensor 2: Item No. 41 “Accelerator sensor voltage 2”.
	Inspection condition		–
	Requirements		**<General Scanning Tool used>** • Accelerator pedal released: 0% • Accelerator pedal pressed: 100% **<Multi-Use Tester used>** • Accelerator pedal released: 0.85 ± 0.1 V • 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

[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.

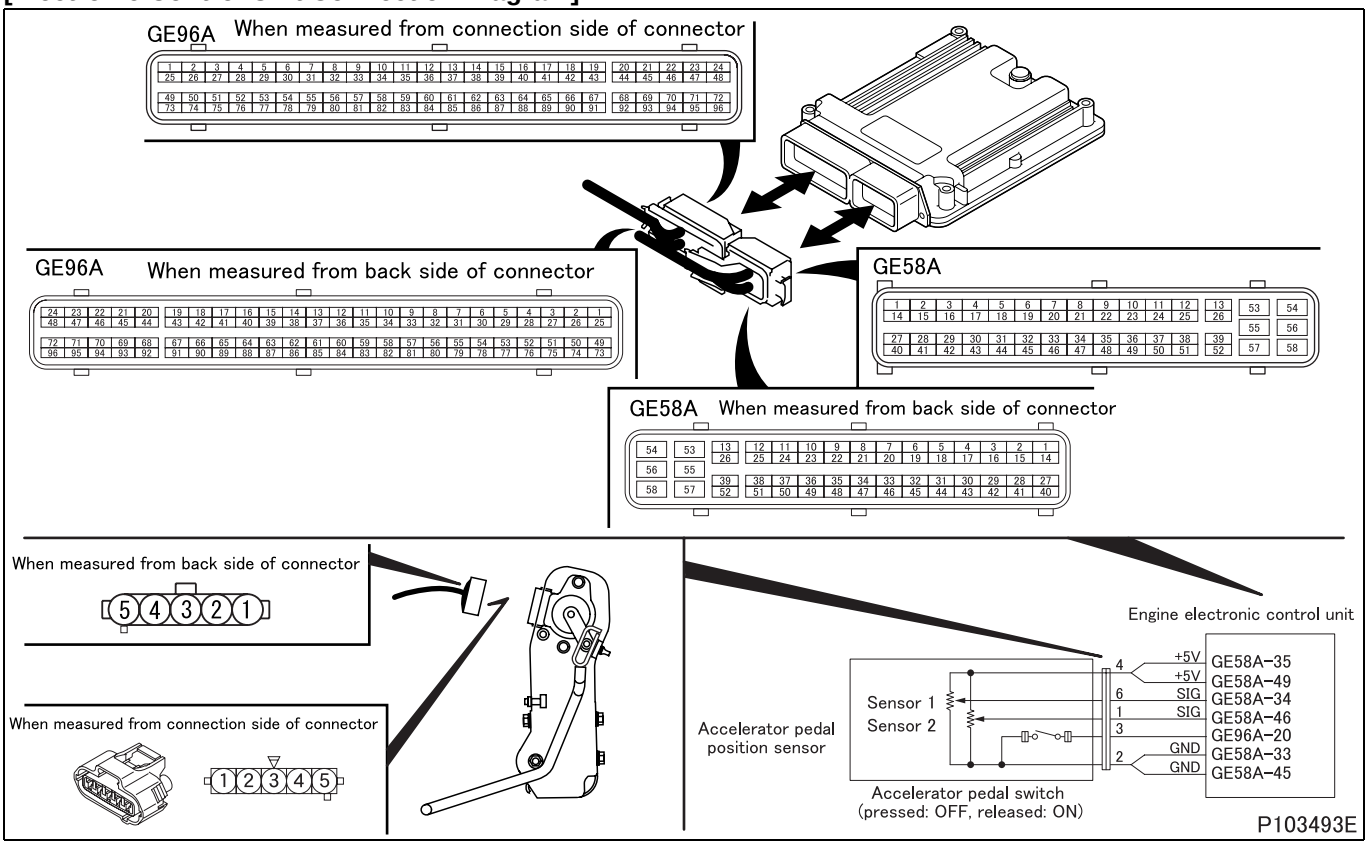
[Diagnostic requirement]
–

[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]



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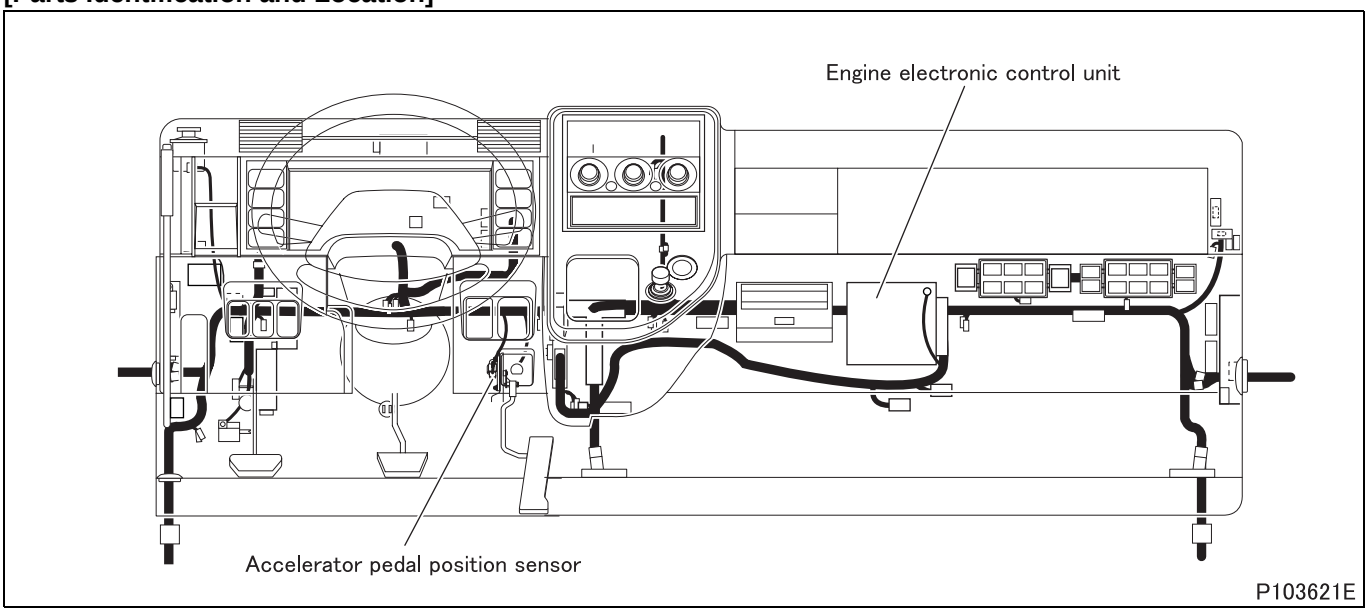


[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** Measurement of following service data • Sensor 1: Item “Accelerator Pedal Position 1” • Sensor 2: Item “Accelerator Pedal Position 2” **<Multi-Use Tester used>** Measurement of following service data • Sensor 1: Item No. 40 “Accelerator sensor voltage 1”. • Sensor 2: Item No. 41 “Accelerator sensor voltage 2”.
	Inspection condition		–
	Requirements		**<General Scanning Tool used>** • Accelerator pedal released: 0% • Accelerator pedal pressed: 100% **<Multi-Use Tester used>** • Accelerator pedal released: 0.85 ± 0.1 V • Accelerator pedal pressed: 4.15 ± 0.1 V
	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 • Sensor 1: 34 (+) - 33 (–) • Sensor 2: 46 (+) - 45 (–)
	Inspection condition		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	Requirements		• Accelerator pedal released: 0.85 ± 0.1 V • Accelerator pedal pressed: 4.15 ± 0.1 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 values of voltage between following connector (GE58A) terminals • Sensor 1: 35 (+) - 33 (–) • Sensor 2: 49 (+) - 45 (–)
	Inspection condition		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Go to step 5.

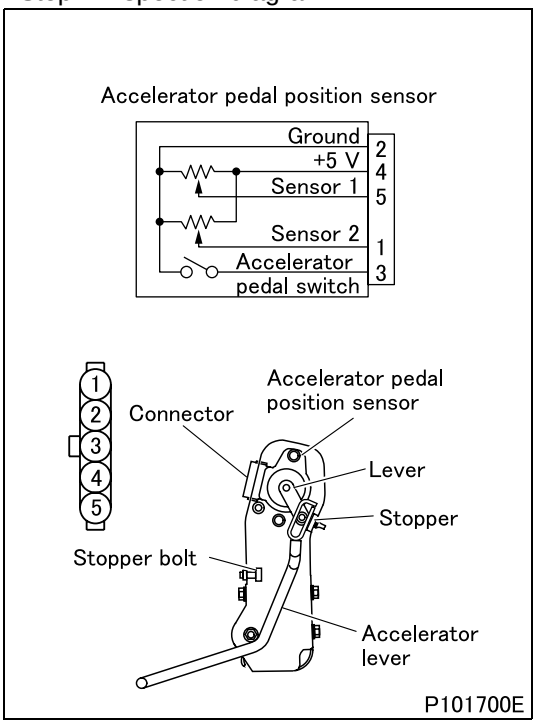
Step 4	Inspection items		Inspection by electronic control unit connector (ground)
	Maintenance item		Measure values of voltage between following connector (GE58A) terminals • Sensor 1: 33 (+) - 53 (–) • Sensor 2: 45 (+) - 53 (–)
	Inspection condition		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	Requirements		0 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 6.
		NO	Go to step 5.

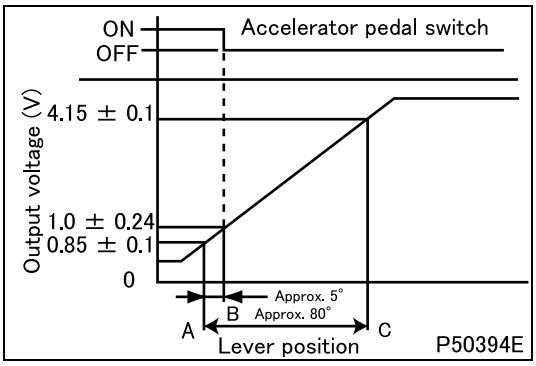
Step 5	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. • Sensor 1: 5 (+) - 2 (–) • Sensor 2: 1 (+) - 2 (–)
	Inspection condition		Apply voltage DC 5 V across terminals No. 4 (+) and 2 (–).
	Requirements		• Idling position A: 0.85 ± 0.1 V • Accelerator switch operating position B: 1.0 ± 0.24 V • Full-load position C: 4.15 ± 0.1 V A: When accelerator lever is in contact with stopper B: When accelerator pedal is pressed until there is no continuity between terminals 2 and 3. 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

<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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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. • Sensor 1: sensor connector terminal No. 4 - electronic control unit connector (GE58A) terminal No. 35 • 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. • Sensor 1: sensor connector terminal No. 2 - electronic control unit connector (GE58A) terminal No. 33 • 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. • Sensor 1: sensor connector terminal No. 5 - electronic control unit connector (GE58A) terminal No. 34 • 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		**<General Scanning Tool used>** Measurement of following service data • Sensor 1: Item “Accelerator Pedal Position 1” • Sensor 2: Item “Accelerator Pedal Position 2” **<Multi-Use Tester used>** Measurement of following service data • Sensor 1: Item No. 40 “Accelerator sensor voltage 1”. • Sensor 2: Item No. 41 “Accelerator sensor voltage 2”.
	Inspection condition		–
	Requirements		**<General Scanning Tool used>** • Accelerator pedal released: 0% • Accelerator pedal pressed: 100% **<Multi-Use Tester used>** • Accelerator pedal released: 0.85 ± 0.1 V • 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

[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.

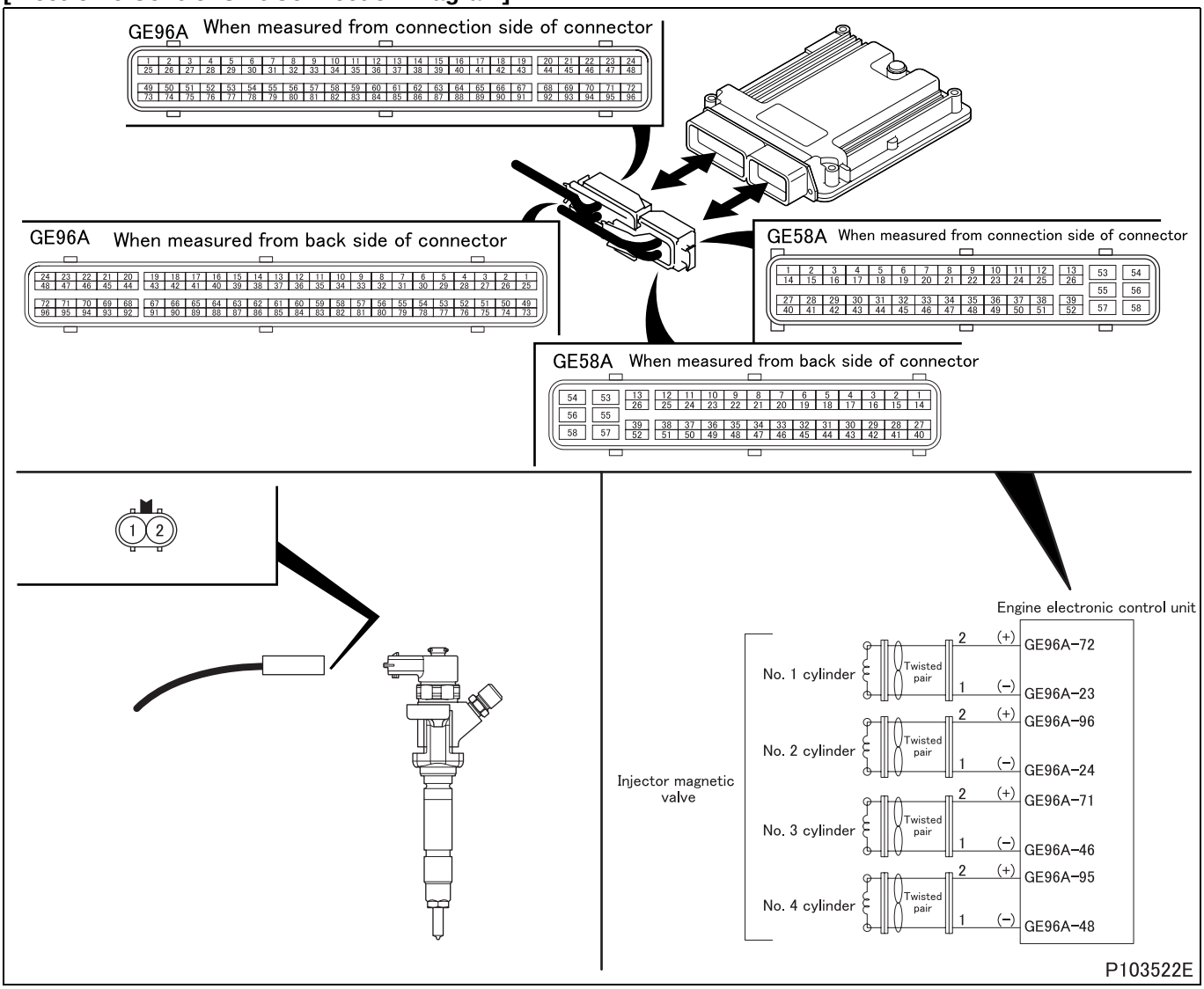
[Diagnostic requirement]
–

[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.

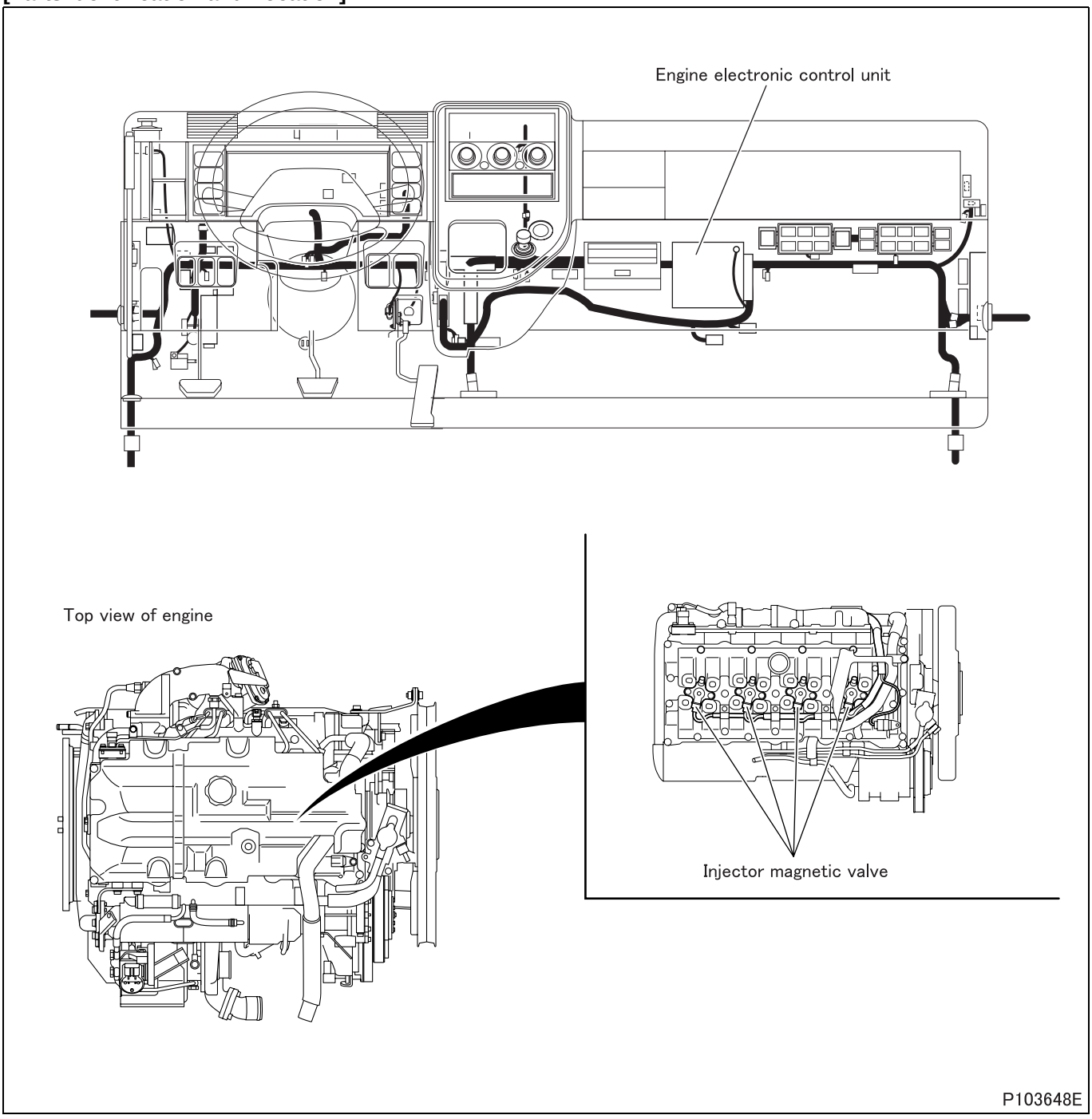
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

[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]



[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. • Injector magnetic valve (No. 1 cylinder): Perform item No. BB “Injector Test 1”. • Injector magnetic valve (No. 4 cylinder): Perform item No. BC “Injector Test 2”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

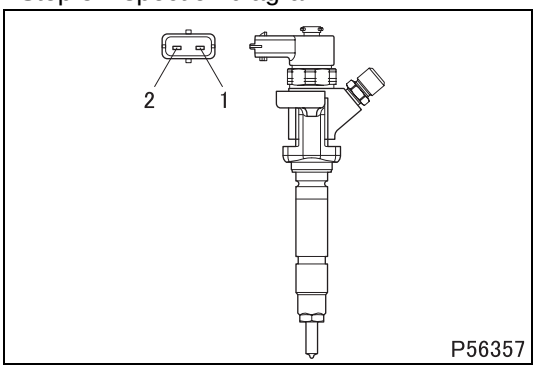
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure values of resistance between following connector (GE96A) terminals • Injector magnetic valve (No. 1 cylinder): 72 (+) - 23 (–) • Injector magnetic valve (No. 3 cylinder): 71 (+) - 46 (–)
	Inspection condition		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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 following connector terminals. • Injector magnetic valve (No. 1 cylinder): magnetic valve terminal No. 2 - electronic control unit (GE96A) terminal No. 72 • Injector magnetic valve (No. 3 cylinder): magnetic valve terminal No. 2 - electronic control unit (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 following connector terminals. • Injector magnetic valve (No. 1 cylinder): magnetic valve terminal No. 1 - electronic control unit (GE96A) terminal No. 23 • Injector magnetic valve (No. 3 cylinder): magnetic valve terminal No. 1 - electronic control unit (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 following actuator test. • Injector magnetic valve (No. 1 cylinder): Perform item No. BB “Injector Test 1”. • Injector magnetic valve (No. 4 cylinder): Perform item No. BC “Injector Test 2”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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

[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.

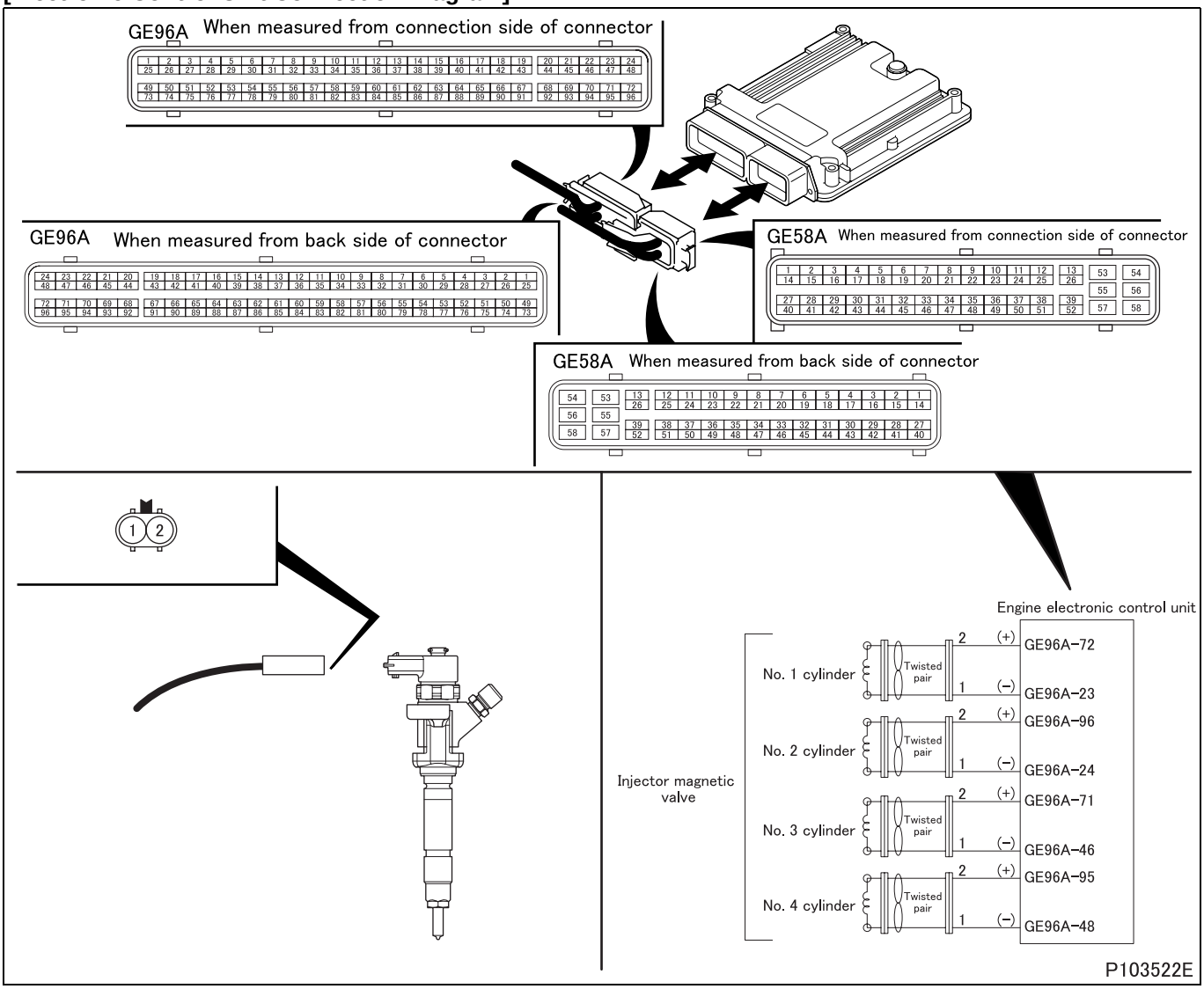
[Diagnostic requirement]
–

[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]



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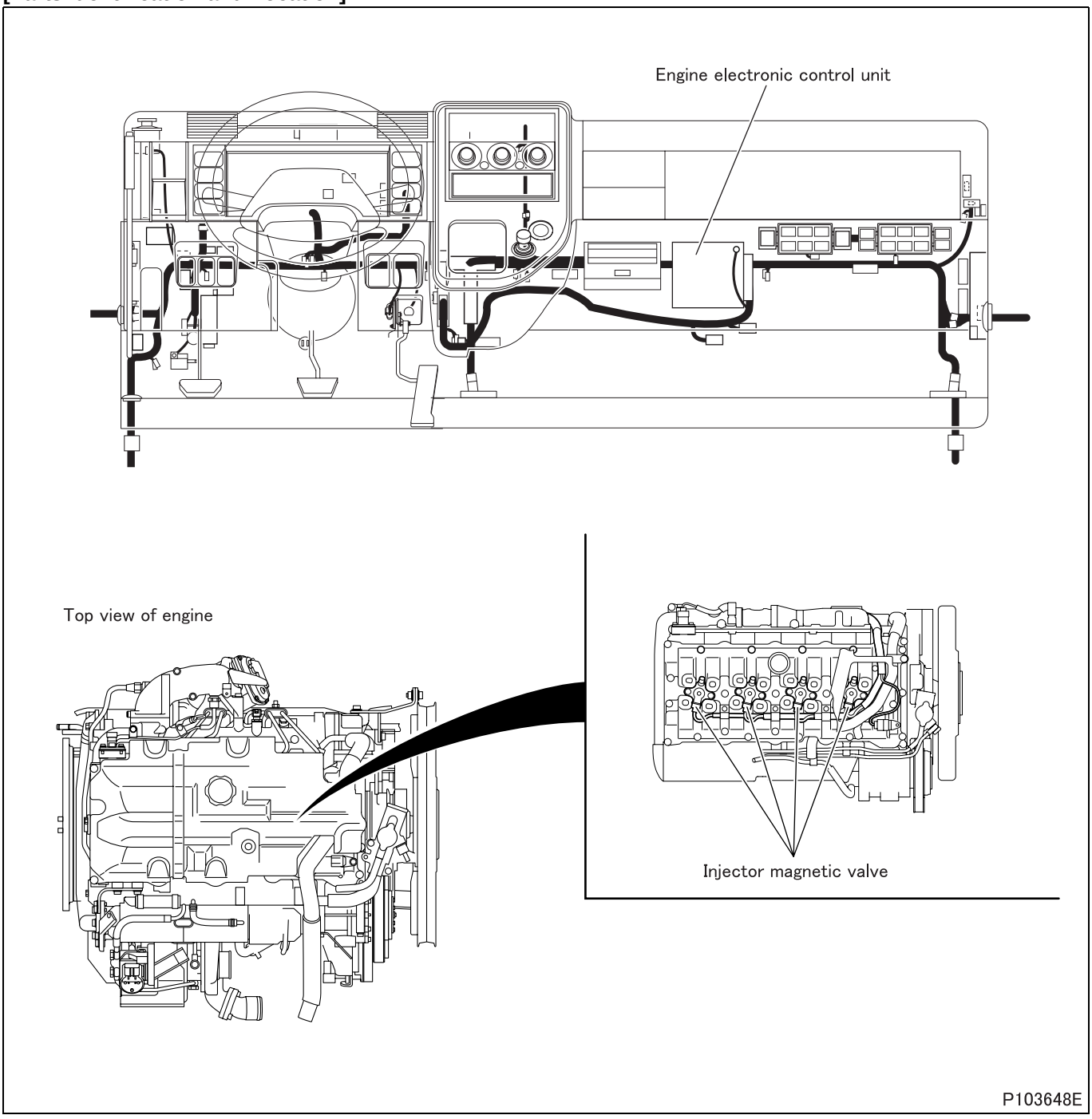


[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Perform following actuator test. • Injector magnetic valve (No. 1 cylinder): Perform item No. BB “Injector Test 1”. • Injector magnetic valve (No. 4 cylinder): Perform item No. BC “Injector Test 2”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

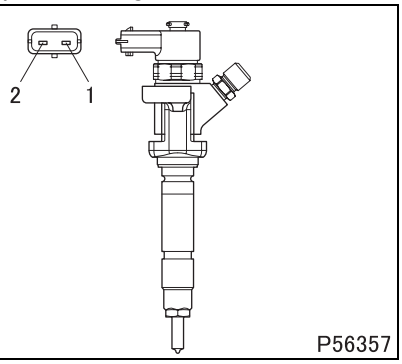
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure values of resistance between following connector (GE96A) terminals • Injector magnetic valve (No. 1 cylinder): 72 (+) - 23 (–) • Injector magnetic valve (No. 3 cylinder): 71 (+) - 46 (–)
	Inspection condition		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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 following connector terminals. • Injector magnetic valve (No. 1 cylinder): magnetic valve terminal No. 2 - electronic control unit (GE96A) terminal No. 72 • Injector magnetic valve (No. 3 cylinder): magnetic valve terminal No. 2 - electronic control unit (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 following connector terminals. • Injector magnetic valve (No. 1 cylinder): magnetic valve terminal No. 1 - electronic control unit (GE96A) terminal No. 23 • Injector magnetic valve (No. 3 cylinder): magnetic valve terminal No. 1 - electronic control unit (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 following actuator test. • Injector magnetic valve (No. 1 cylinder): Perform item No. BB “Injector Test 1”. • Injector magnetic valve (No. 4 cylinder): Perform item No. BC “Injector Test 2”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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

[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.

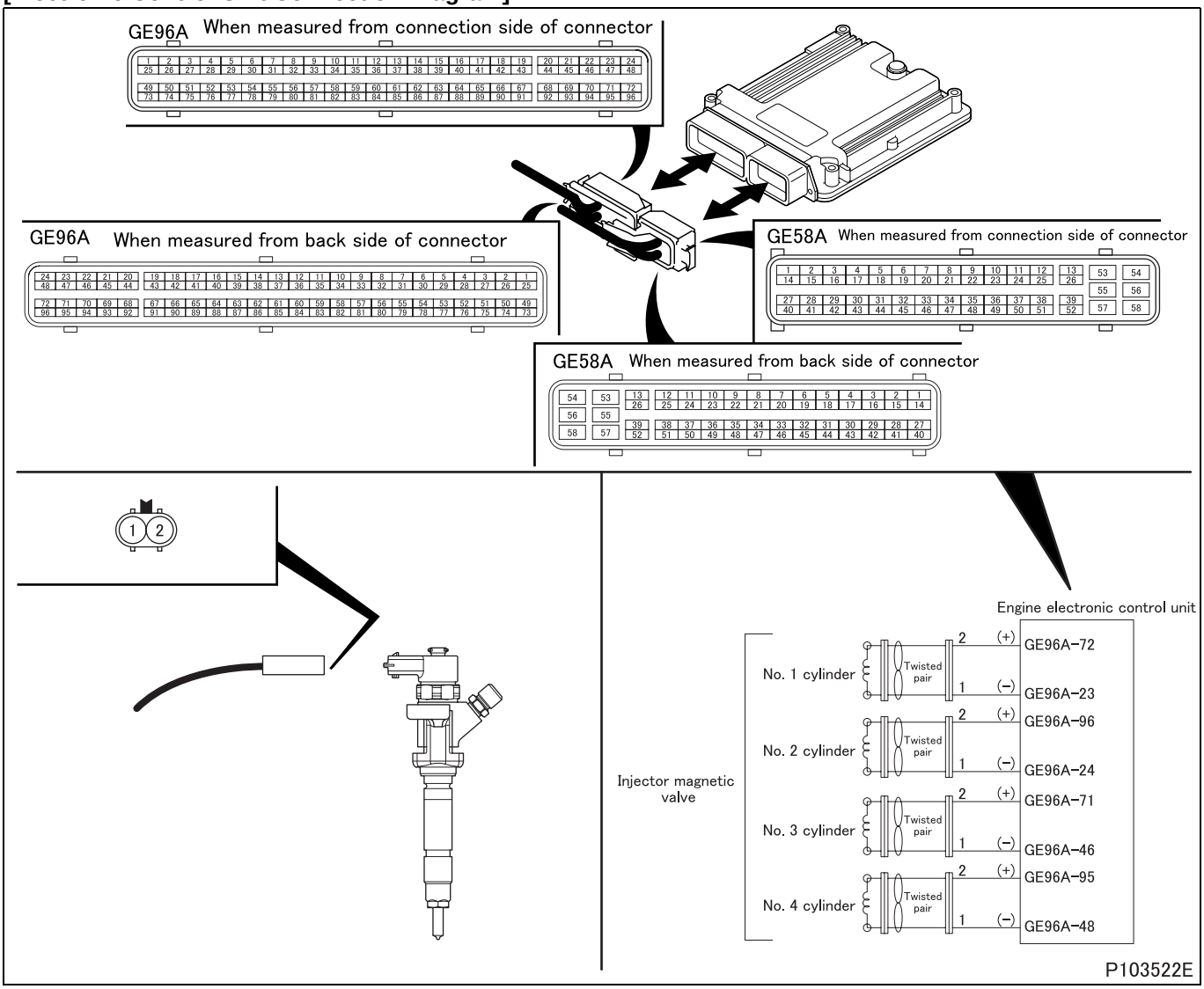
[Diagnostic requirement]
–

[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.

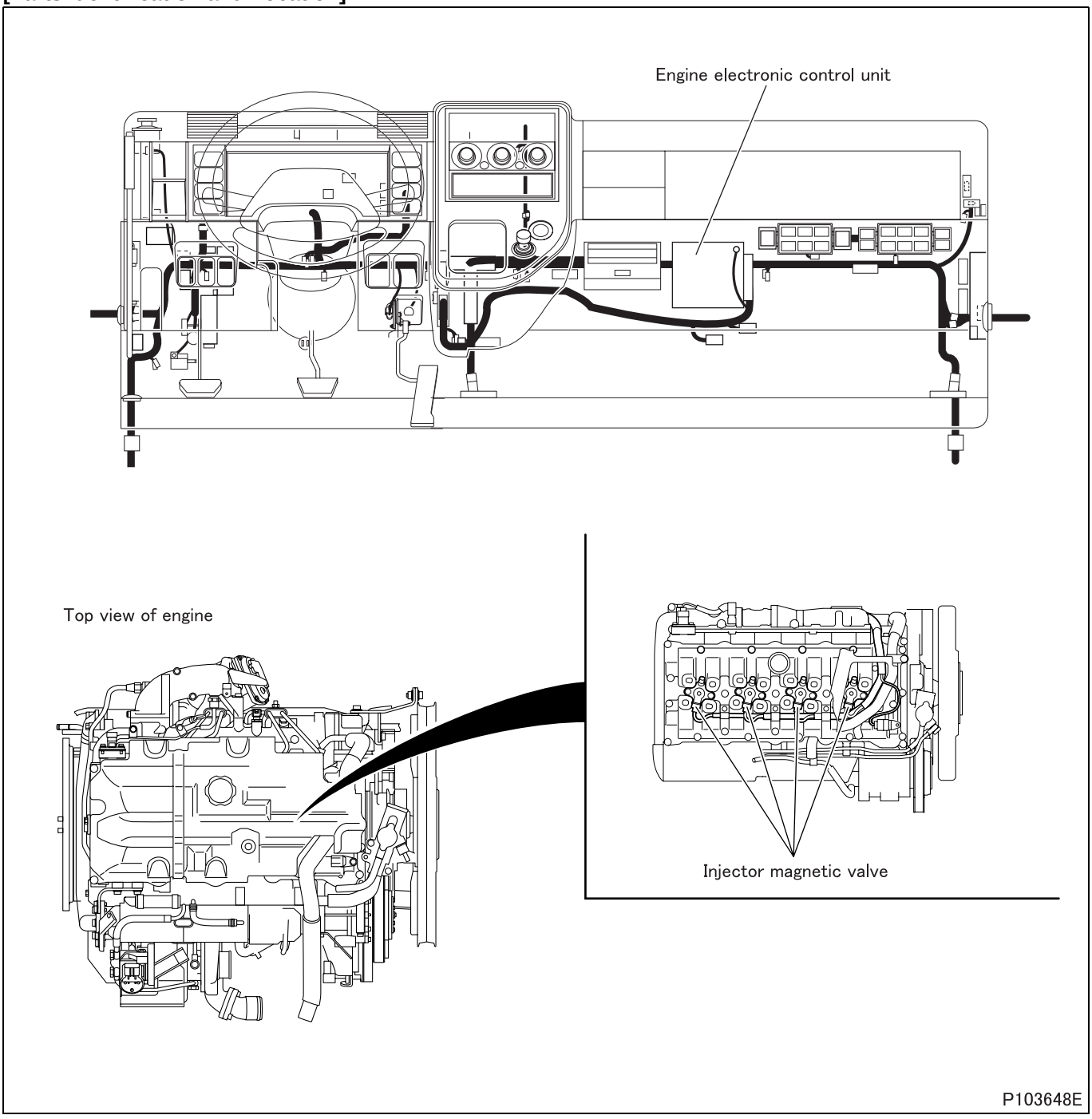
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

[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]



[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. • Injector magnetic valve (No. 2 cylinder): Perform item No. BD “Injector Test 3”. • Injector magnetic valve (No. 4 cylinder): Perform item No. BC “Injector Test 2”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

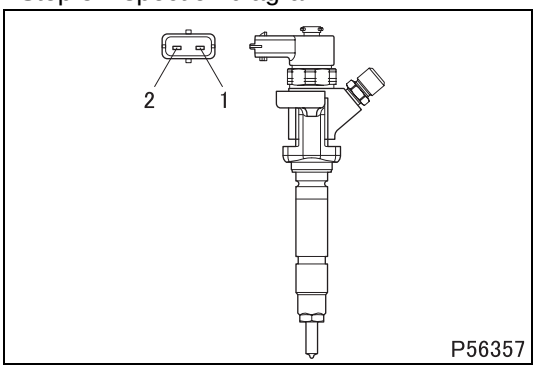
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure values of resistance between following connector (GE96A) terminals • Injector magnetic valve (No. 2 cylinder): 96 (+) - 24 (–) • Injector magnetic valve (No. 4 cylinder): 95 (+) - 48 (–)
	Inspection condition		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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 following connector terminals. • Injector magnetic valve (No. 2 cylinder): magnetic valve terminal No. 2 - electronic control unit (GE96A) terminal No. 96 • Injector magnetic valve (No. 4 cylinder): magnetic valve terminal No. 2 - electronic control unit (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 following connector terminals. • Injector magnetic valve (No. 2 cylinder): magnetic valve terminal No. 1 - electronic control unit (GE96A) terminal No. 24 • Injector magnetic valve (No. 4 cylinder): magnetic valve terminal No. 1 - electronic control unit (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 following actuator test. • Injector magnetic valve (No. 2 cylinder): Perform item No. BD “Injector Test 3”. • Injector magnetic valve (No. 4 cylinder): Perform item No. BC “Injector Test 2”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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

[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.

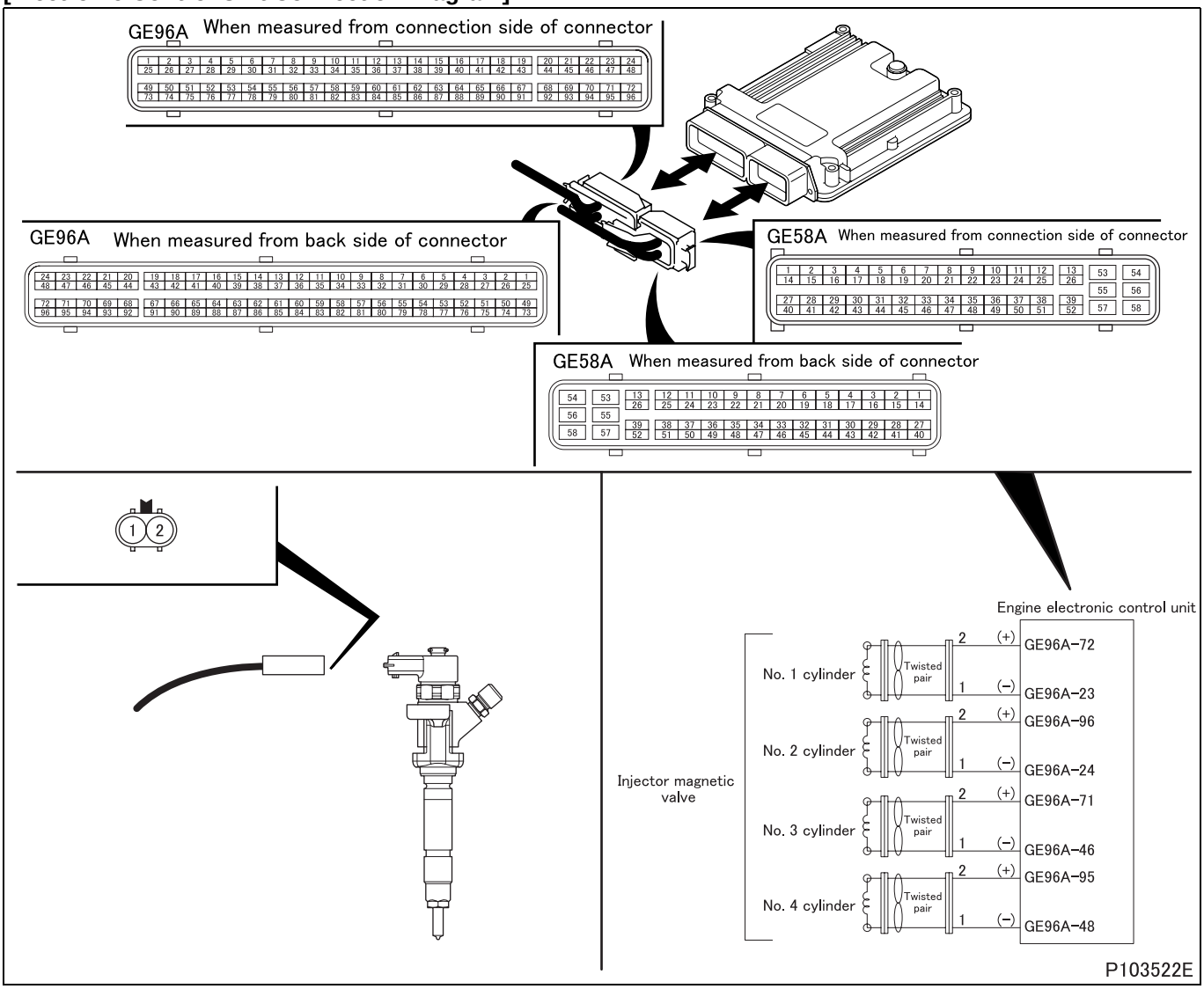
[Diagnostic requirement]
–

[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.

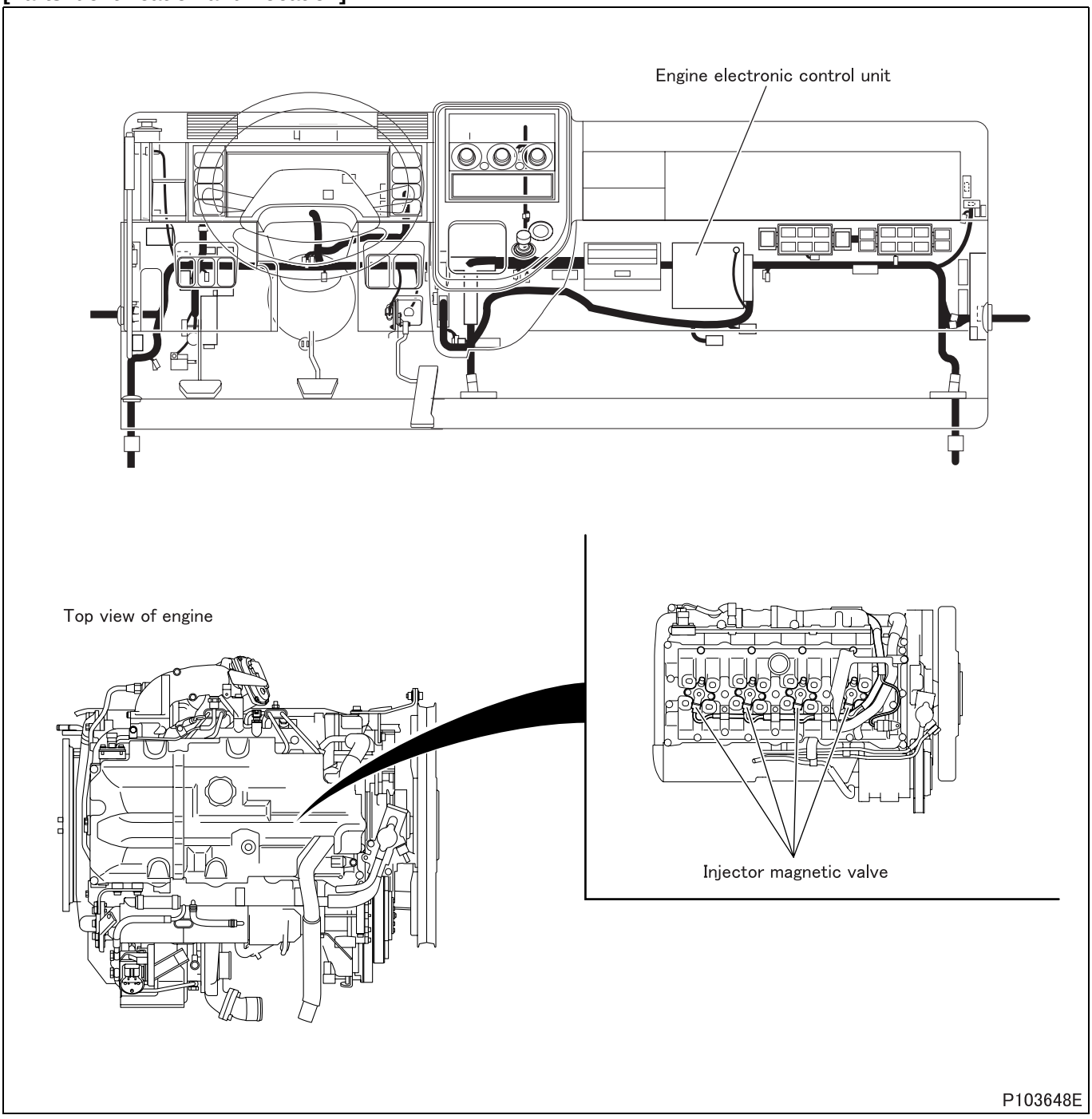
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and injector magnetic valve
- Malfunction of each connector
- Malfunction of injector magnetic valve
- Malfunction of electronic control unit

[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]



[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. • Injector magnetic valve (No. 2 cylinder): Perform item No. BD “Injector Test 3”. • Injector magnetic valve (No. 4 cylinder): Perform item No. BC “Injector Test 2”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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.

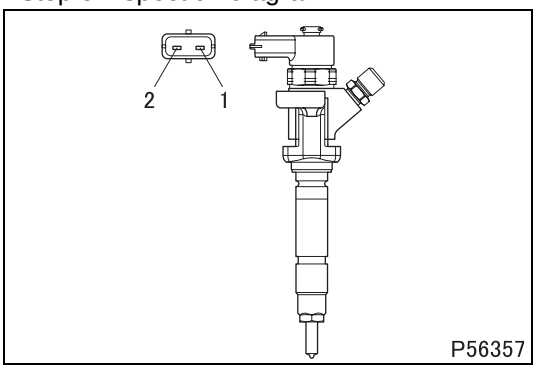
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure values of resistance between following connector (GE96A) terminals • Injector magnetic valve (No. 2 cylinder): 96 (+) - 24 (–) • Injector magnetic valve (No. 4 cylinder): 95 (+) - 48 (–)
	Inspection condition		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • Connection to terminal is appropriate.
	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 following connector terminals. • Injector magnetic valve (No. 2 cylinder): magnetic valve terminal No. 2 - electronic control unit (GE96A) terminal No. 96 • Injector magnetic valve (No. 4 cylinder): magnetic valve terminal No. 2 - electronic control unit (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 following connector terminals. • Injector magnetic valve (No. 2 cylinder): magnetic valve terminal No. 1 - electronic control unit (GE96A) terminal No. 24 • Injector magnetic valve (No. 4 cylinder): magnetic valve terminal No. 1 - electronic control unit (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 following actuator test. • Injector magnetic valve (No. 2 cylinder): Perform item No. BD “Injector Test 3”. • Injector magnetic valve (No. 4 cylinder): Perform item No. BC “Injector Test 2”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.
	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

[Fault code]
Diagnosis code: P2169/Flash code: 93
[Monitor]
Failure of exhaust shutter 3-way magnetic valve
[Fault (outline)]
Open circuit
[Diagnosis check]
- Exhaust shutter 3-way magnetic valve circuit is monitored for fault.

[Code generation condition]
- Exhaust shutter 3-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.

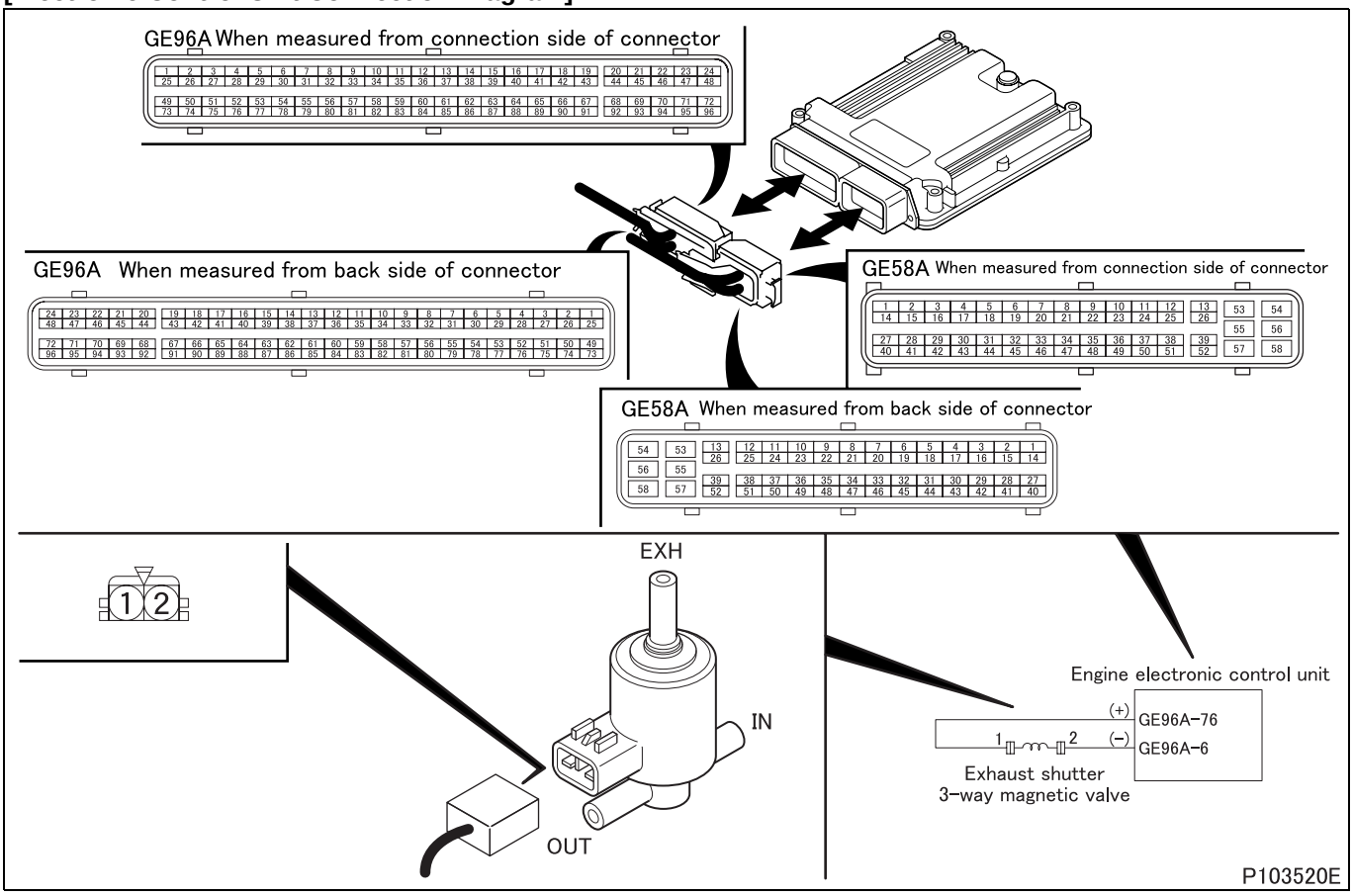
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Auxiliary brake control is stopped.
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

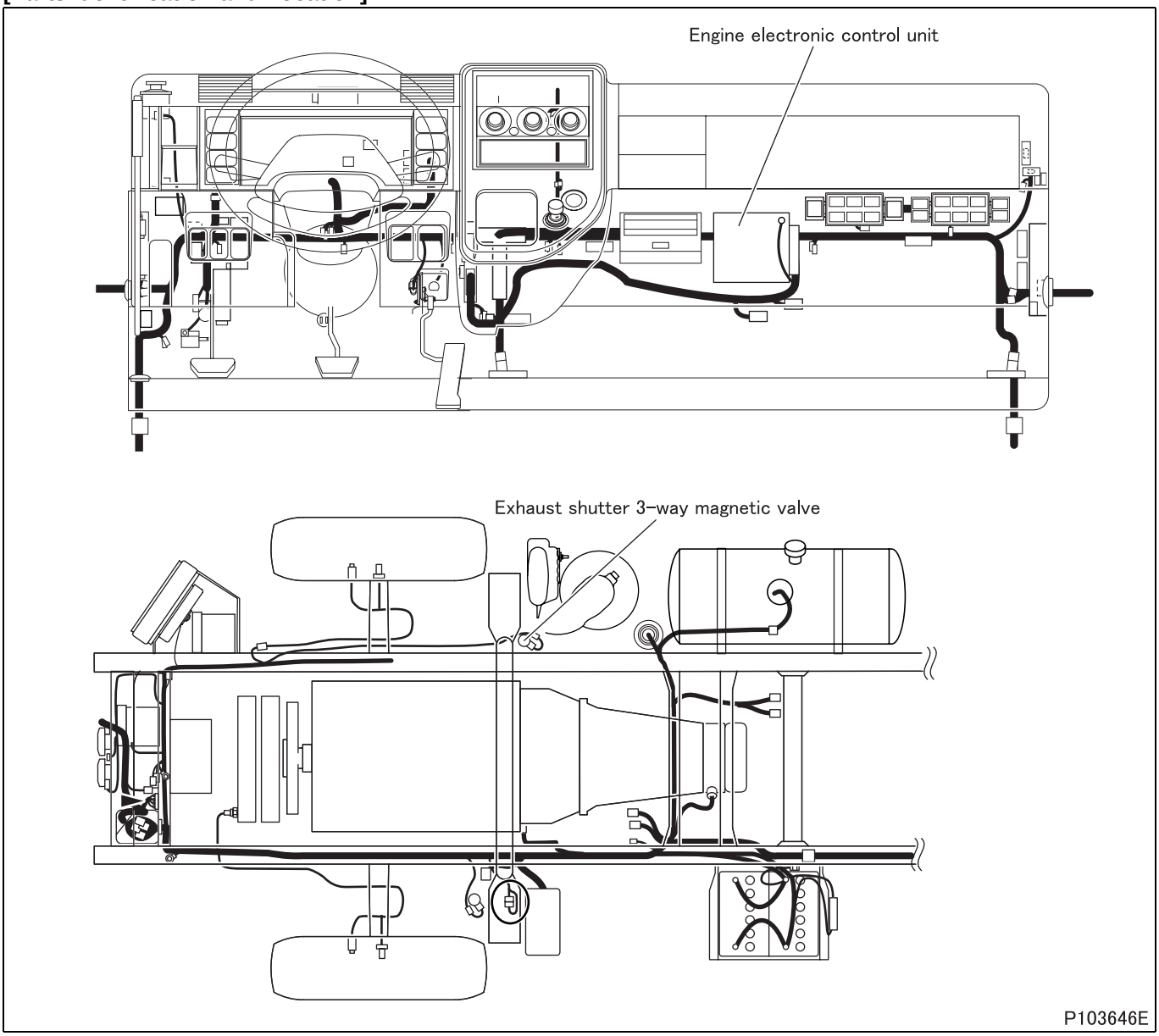
[Probable cause of trouble]
- Open-circuit of harness between electronic control unit and exhaust shutter 3-way magnetic valve
- Malfunction of each connector
- Malfunction of exhaust shutter 3-way magnetic valve
- Malfunction of electronic control unit

[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]



[Parts Identification and Location]



[Fault diagnosis]

- Perform checks in the sequence of the following steps.

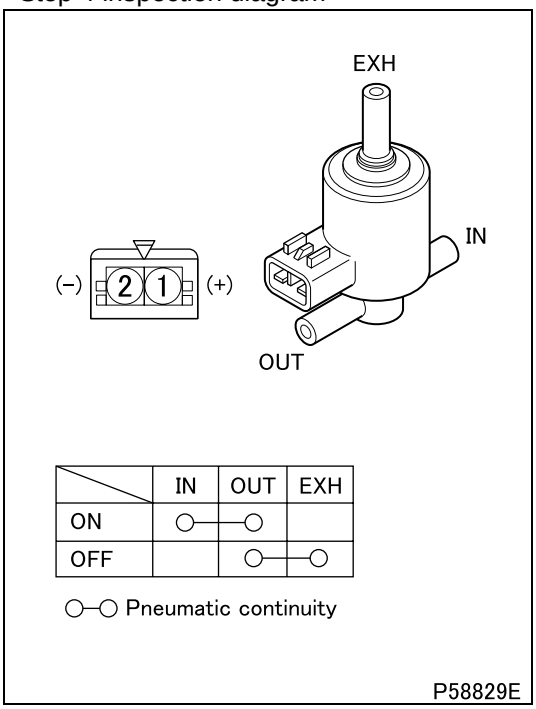
Step 1	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 6 and 76.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		NO	Modify connector.

Step 3	Inspection items		Inspection of 3-way magnetic valve connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Modify connector.

Step 4	Inspection items		Inspection of 3-way magnetic valve unit
	Maintenance item		Measure minimum operating voltage when 3-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	Go to step 5.
		NO	Replacement of 3-way magnetic valve

<Step 4 inspection diagram>



Step 5	Inspection items		Inspection of harness between exhaust shutter 3-way magnetic valve and electronic control unit (power supply)
	Maintenance item		Check circuit between exhaust shutter 3-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	Go to step 6.
		NO	Modify harness.

Step 6	Inspection items		Inspection of harness between exhaust shutter 3-way magnetic valve and electronic control unit (power supply)
	Maintenance item		Check circuit between exhaust shutter 3-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	Go to step 7.
		NO	Modify harness.

Step 7	Inspection items		Inspection of harness between exhaust shutter 3-way magnetic valve and electronic control unit (ground)
	Maintenance item		Check circuit between exhaust shutter 3-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		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: P2170/Flash code: 93
[Monitor]
Failure of exhaust shutter 3-way magnetic valve
[Fault (outline)]
Short circuit ground
[Diagnosis check]
- Exhaust shutter 3-way magnetic valve circuit is monitored for fault.

[Code generation condition]
- Exhaust shutter 3-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.

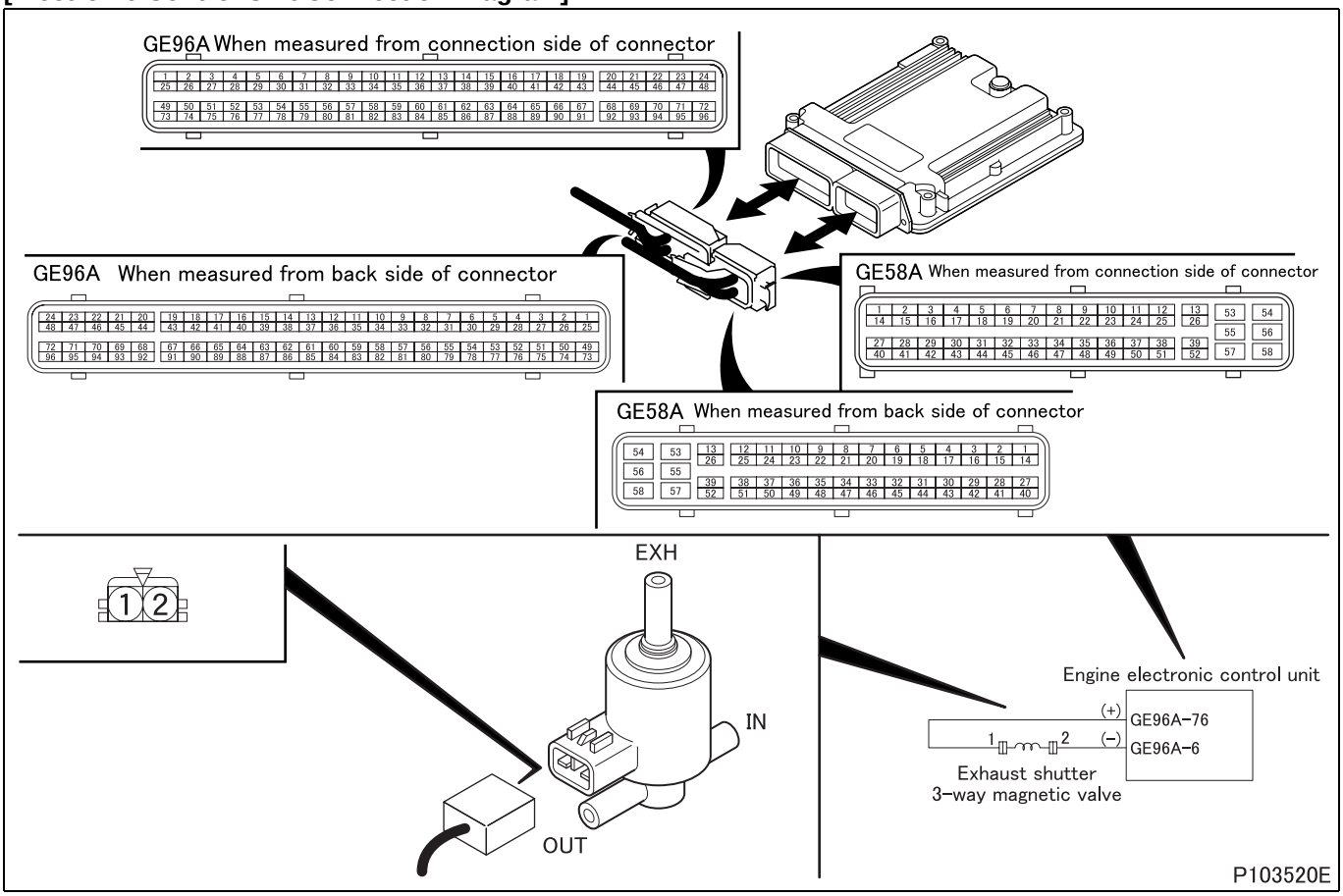
[Diagnostic requirement]
–

[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 3-way magnetic valve
- Malfunction of each connector
- Malfunction of exhaust shutter 3-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]



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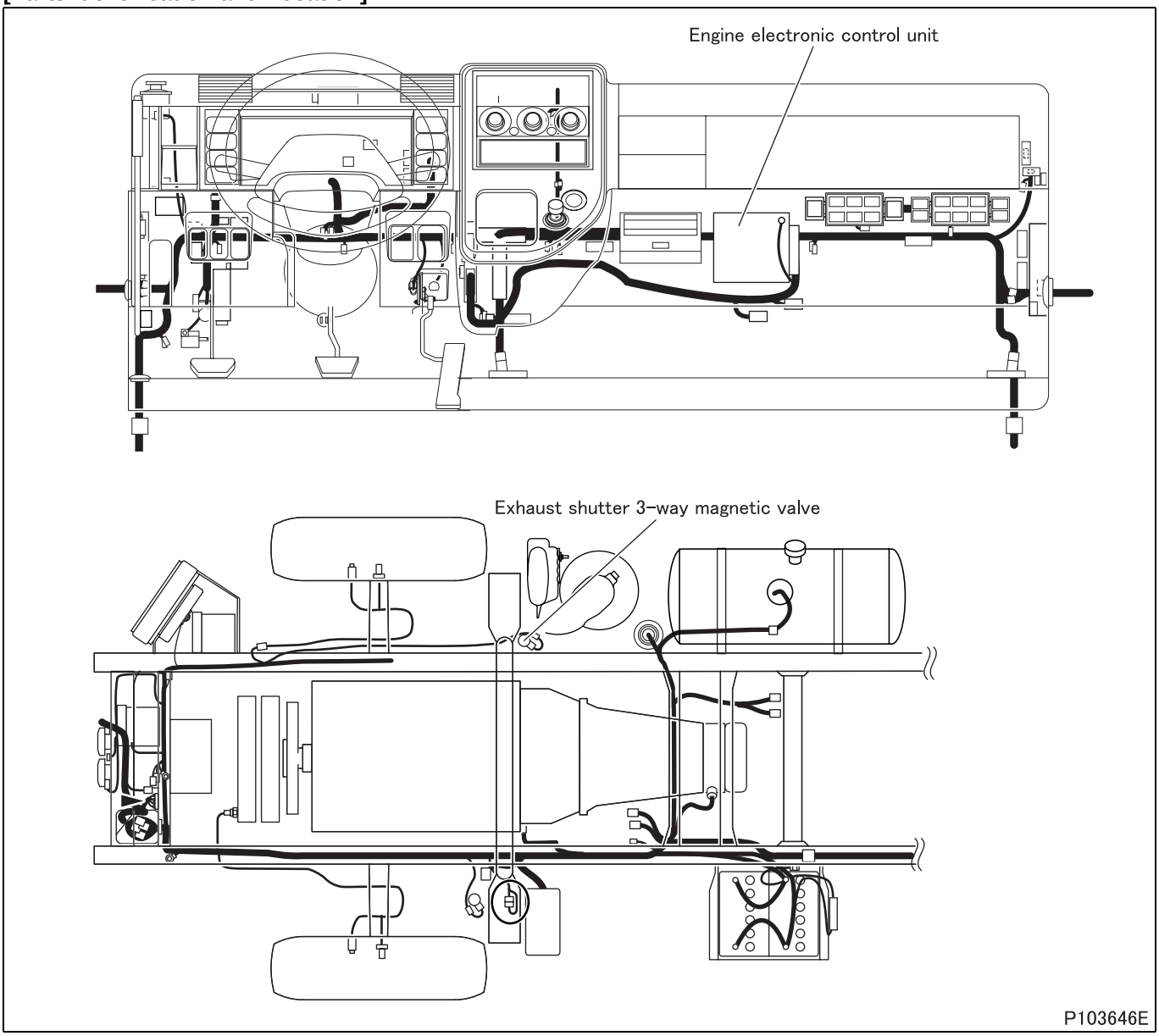


[Fault diagnosis]

- Perform checks in the sequence of the following steps.

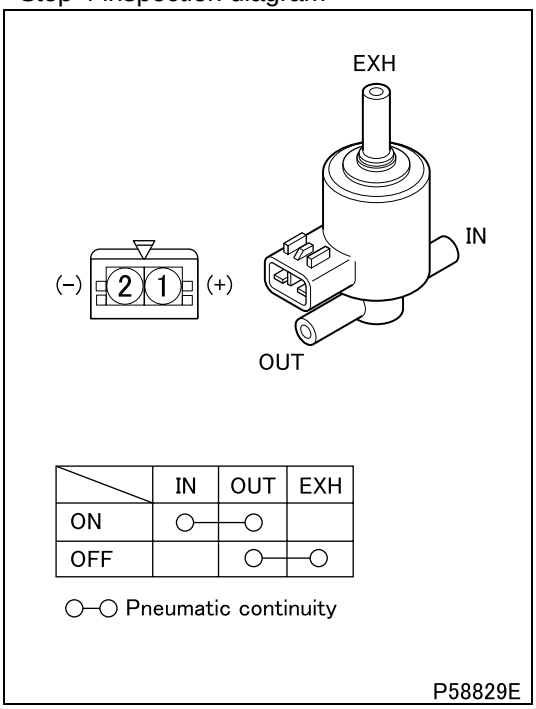
Step 1	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 6 and 76.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		NO	Modify connector.

Step 3	Inspection items		Inspection of 3-way magnetic valve connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Modify connector.

Step 4	Inspection items		Inspection of 3-way magnetic valve unit
	Maintenance item		Measure minimum operating voltage when 3-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	Go to step 5.
		NO	Replacement of 3-way magnetic valve

<Step 4 inspection diagram>



Step 5	Inspection items		Inspection of harness between exhaust shutter 3-way magnetic valve and electronic control unit (power supply)
	Maintenance item		Check circuit between exhaust shutter 3-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	Go to step 6.
		NO	Modify harness.

Step 6	Inspection items		Inspection of harness between exhaust shutter 3-way magnetic valve and electronic control unit (power supply)
	Maintenance item		Check circuit between exhaust shutter 3-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	Go to step 7.
		NO	Modify harness.

Step 7	Inspection items		Inspection of harness between exhaust shutter 3-way magnetic valve and electronic control unit (ground)
	Maintenance item		Check circuit between exhaust shutter 3-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		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: P2171/Flash code: 93
[Monitor]
Failure of exhaust shutter 3-way magnetic valve
[Fault (outline)]
Short circuit battery
[Diagnosis check]
- Exhaust shutter 3-way magnetic valve circuit is monitored for fault.

[Code generation condition]
- Exhaust shutter 3-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.

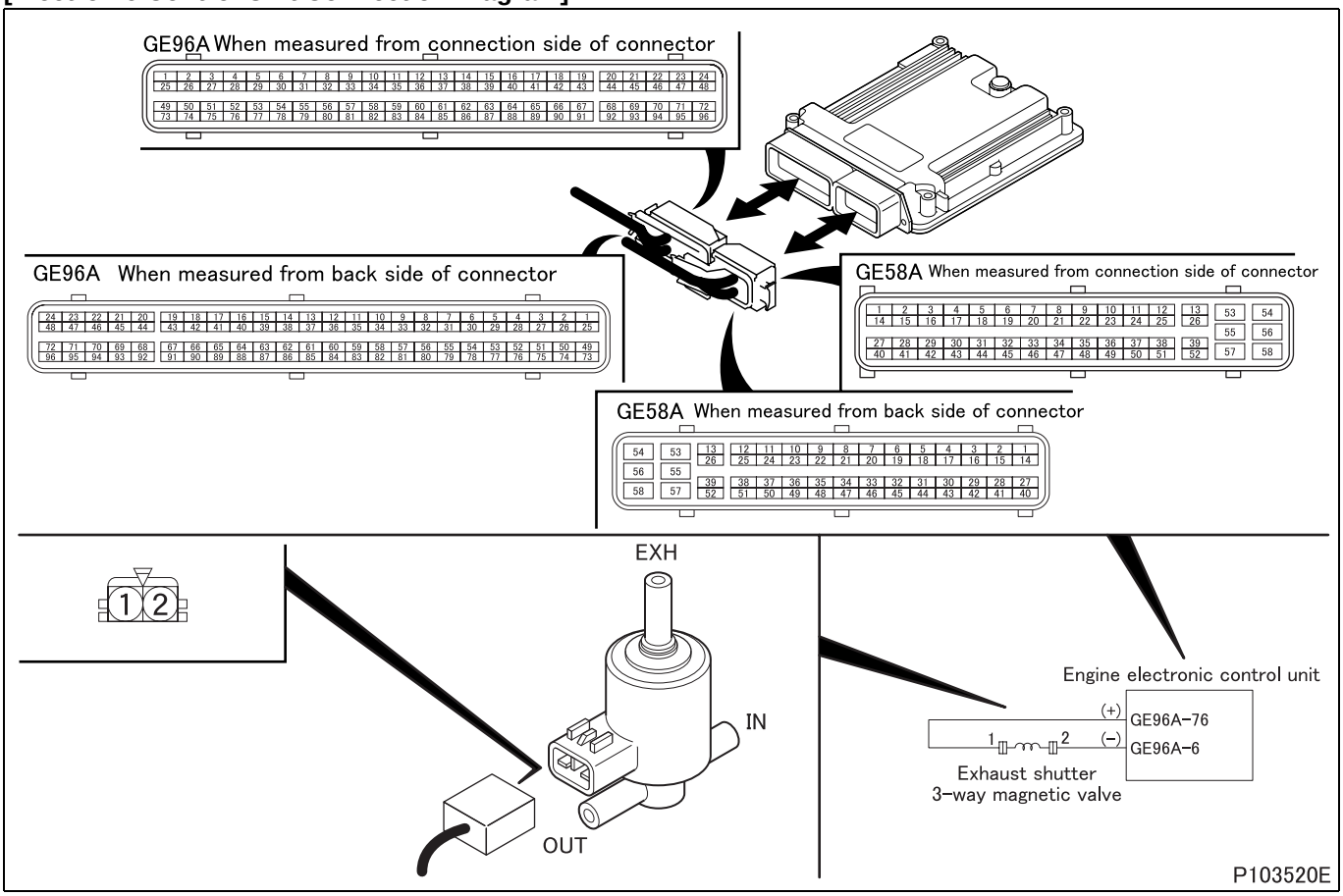
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Auxiliary brake control is stopped.
- Diesel particulate filter regeneration is stopped.
- Related fault check is stopped.

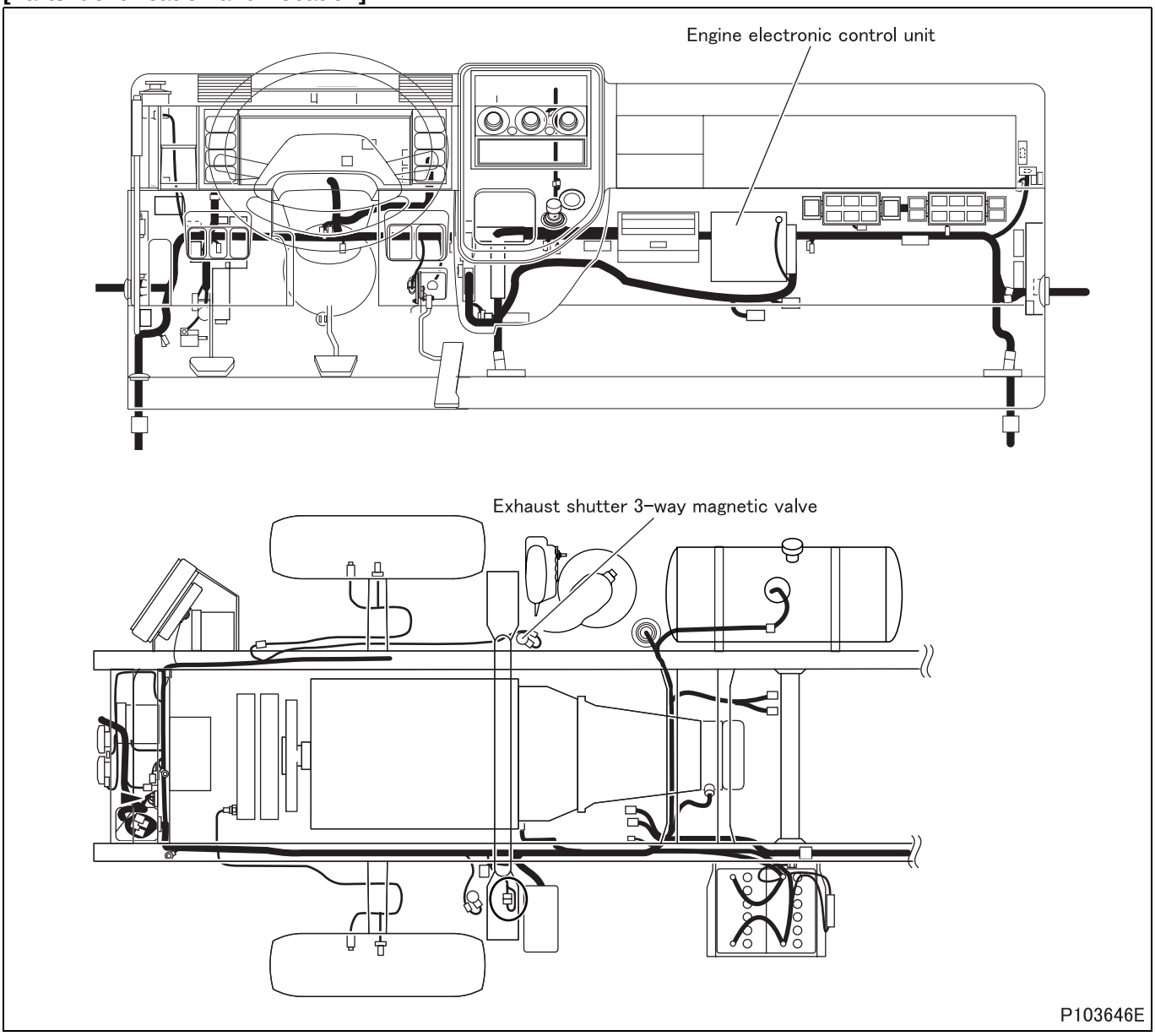
[Probable cause of trouble]
- Short-circuit of harness between electronic control unit and exhaust shutter 3-way magnetic valve
- Malfunction of each connector
- Malfunction of exhaust shutter 3-way magnetic valve
- Malfunction of electronic control unit

[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]



[Parts Identification and Location]



[Fault diagnosis]

- Perform checks in the sequence of the following steps.

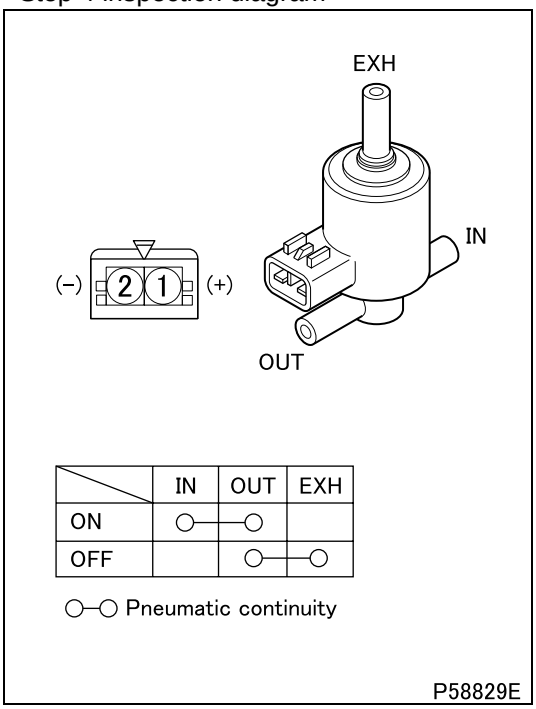
Step 1	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 6 and 76.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		NO	Modify connector.

Step 3	Inspection items		Inspection of 3-way magnetic valve connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Modify connector.

Step 4	Inspection items		Inspection of 3-way magnetic valve unit
	Maintenance item		Measure minimum operating voltage when 3-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	Go to step 5.
		NO	Replacement of 3-way magnetic valve

<Step 4 inspection diagram>



Step 5	Inspection items		Inspection of harness between exhaust shutter 3-way magnetic valve and electronic control unit (power supply)
	Maintenance item		Check circuit between exhaust shutter 3-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	Go to step 6.
		NO	Modify harness.

Step 6	Inspection items		Inspection of harness between exhaust shutter 3-way magnetic valve and electronic control unit (power supply)
	Maintenance item		Check circuit between exhaust shutter 3-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	Go to step 7.
		NO	Modify harness.

Step 7	Inspection items		Inspection of harness between exhaust shutter 3-way magnetic valve and electronic control unit (ground)
	Maintenance item		Check circuit between exhaust shutter 3-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		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: 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.

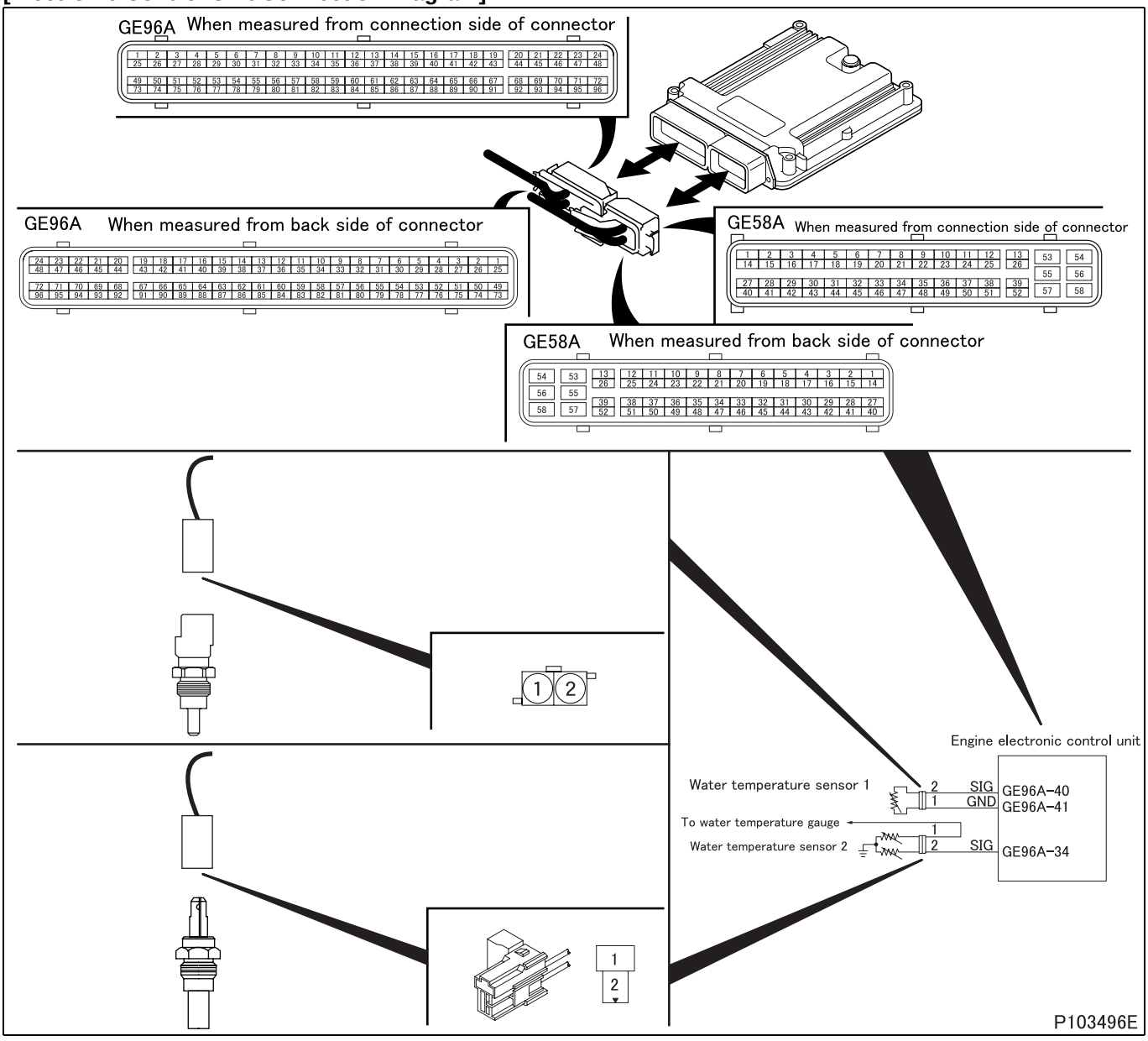
[Diagnostic requirement]
–

[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]



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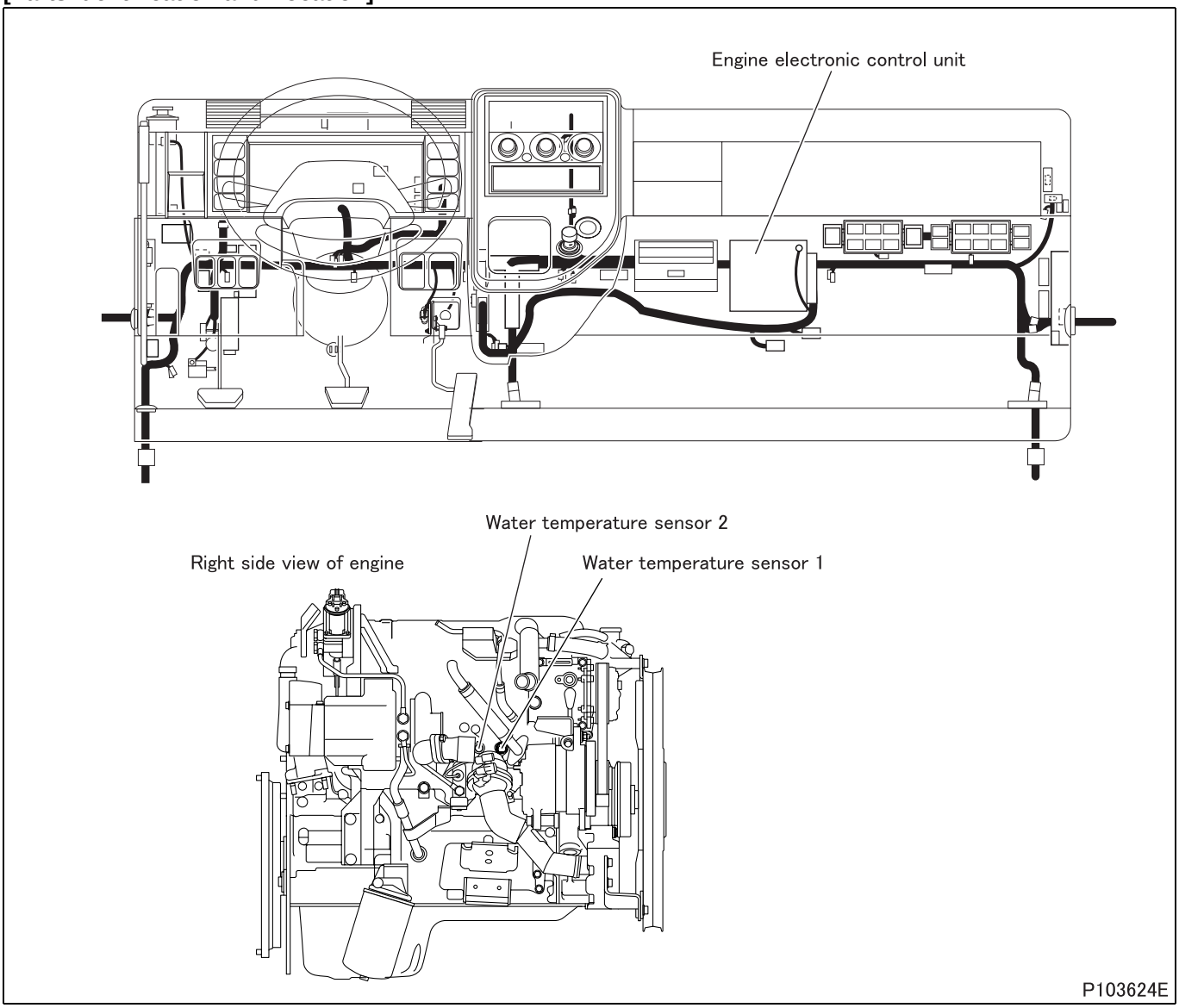


[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** • Measurement of item “Engine Coolant Temperature”. **<Multi-Use Tester used>** • Measure item No. 32 “Water Temperature 2” of Service Data.
	Inspection condition		–
	Requirements		• Cold engine: Equivalent to outside air temperature • During warm-up: Temperature gradually increased. • When engine is stopped after warm-up: Temperature gradually declines.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 2.

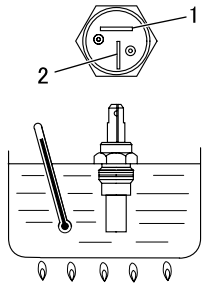
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 34 and ground.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		• –20°C {–4°F} : 24.8 ± 2.5 kΩ • 0°C {32°F} : 8.62 kΩ (reference value) • 20°C {68°F} : 3.25 ± 0.33 kΩ • 60°C {140°F} : 620 Ω (reference value) • 80°C {176°F} : 300 Ω (reference value)
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Put water temperature sensor 2 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• –20°C {–4°F} : 24.8 ± 2.5 kΩ • 0°C {32°F} : 8.62 kΩ (reference value) • 20°C {68°F} : 3.25 ± 0.33 kΩ • 60°C {140°F} : 620 Ω (reference value) • 80°C {176°F} : 300 Ω (reference value)
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 6
		NO	Replacement of sensor

<Step 5 inspection diagram>



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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		**<General Scanning Tool used>** • Measurement of item “Engine Coolant Temperature”. **<Multi-Use Tester used>** • Measure item No. 32 “Water Temperature 2” of Service Data.
	Inspection condition		–
	Requirements		• Cold engine: Equivalent to outside air temperature • During warm-up: Temperature gradually increased. • When engine is stopped after warm-up: Temperature gradually declines.
	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°C {–34.6°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.

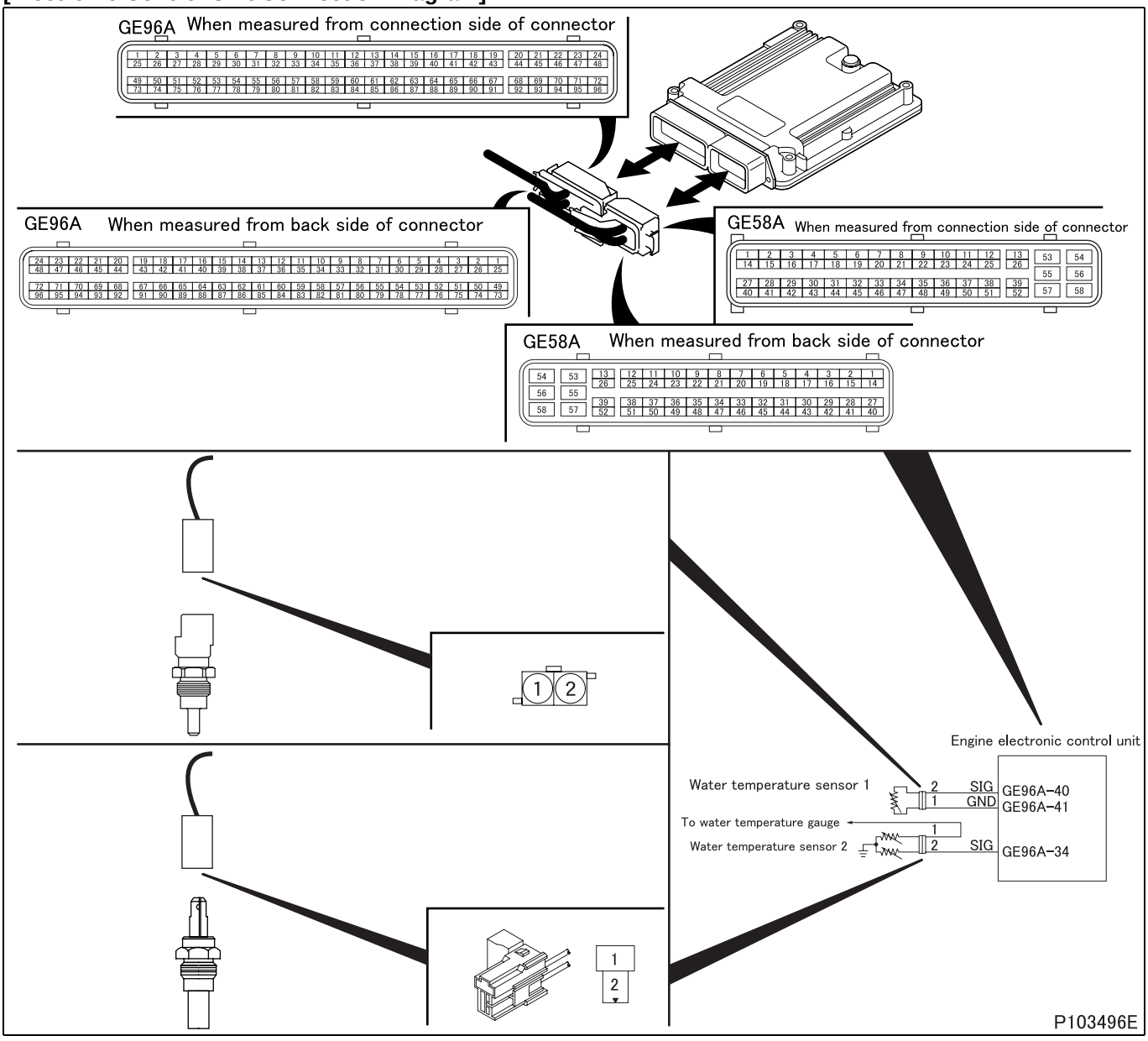
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Related fault check is stopped.

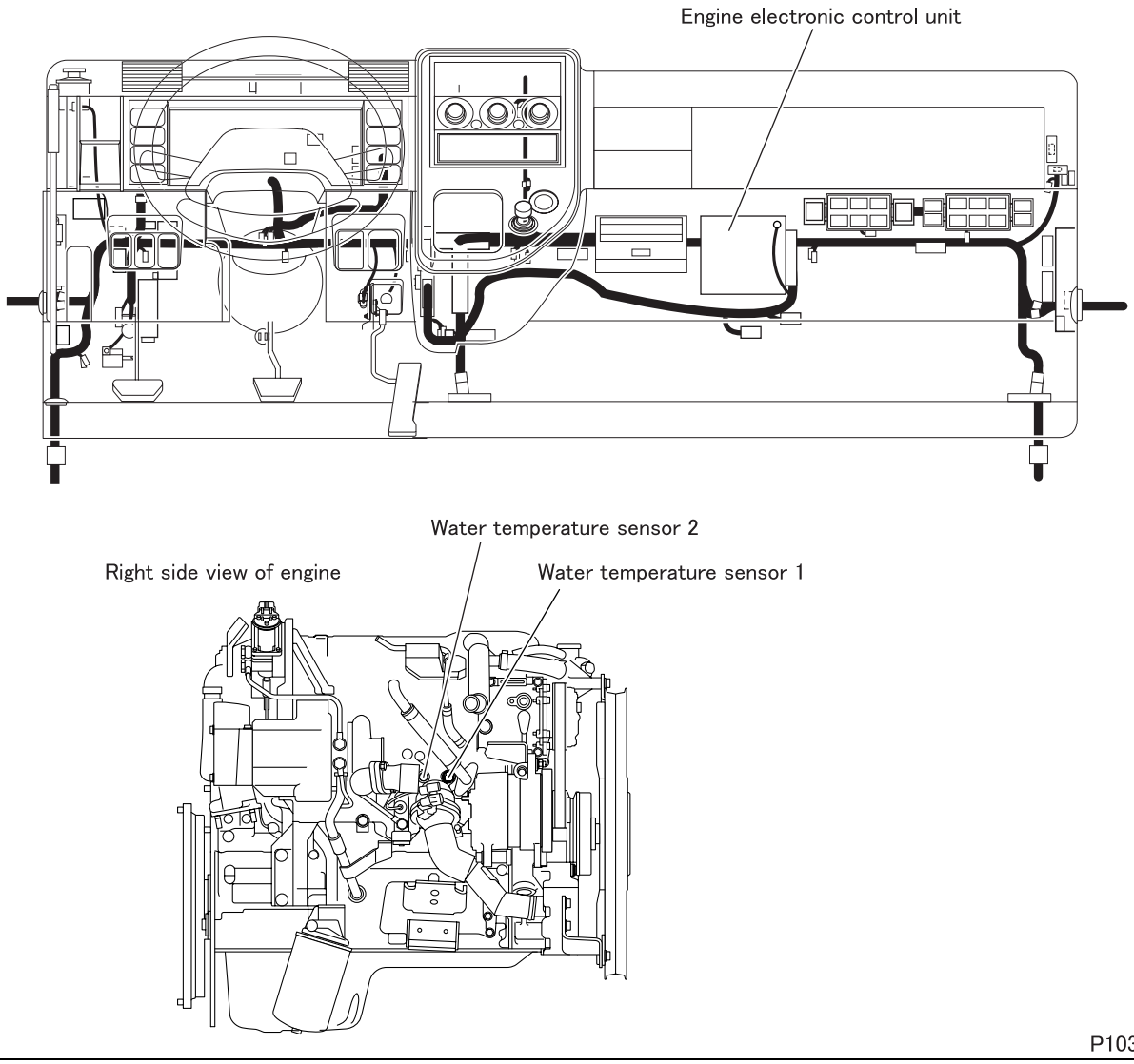
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and water temperature sensor 2
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

[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		**<General Scanning Tool used>** • Measurement of item “Engine Coolant Temperature”. **<Multi-Use Tester used>** • Measure item No. 32 “Water Temperature 2” of Service Data.
	Inspection condition		–
	Requirements		• Cold engine: Equivalent to outside air temperature • During warm-up: Temperature gradually increased. • When engine is stopped after warm-up: Temperature gradually declines.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 2.

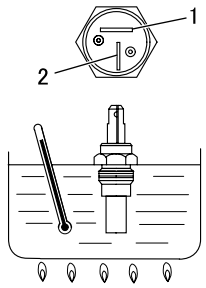
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE96A) terminal No. 34 and ground.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		• –20°C {–4°F}: 24.8 ± 2.5 kΩ • 0°C {32°F}: 8.62 kΩ (reference value) • 20°C {68°F}: 3.25 ± 0.33 kΩ • 60°C {140°F}: 620 Ω (reference value) • 80°C {176°F}: 300 Ω (reference value)
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Put water temperature sensor 2 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• –20°C {–4°F}: 24.8 ± 2.5 kΩ • 0°C {32°F}: 8.62 kΩ (reference value) • 20°C {68°F}: 3.25 ± 0.33 kΩ • 60°C {140°F}: 620 Ω (reference value) • 80°C {176°F}: 300 Ω (reference value)
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 6.
		NO	Replacement of sensor

<Step 5 inspection diagram>



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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		**<General Scanning Tool used>** • Measurement of item “Engine Coolant Temperature”. **<Multi-Use Tester used>** • Measure item No. 32 “Water Temperature 2” of Service Data.
	Inspection condition		–
	Requirements		**<General Scanning Tool used>** • During warm-up: Value of resistance gradually declines. • When engine is stopped after warm-up: Value of resistance gradually increased. **<Multi-Use Tester used>** • Cold engine: Equivalent to outside air temperature • During warm-up: Temperature gradually increased. • When engine is stopped after warm-up: Temperature gradually declines.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Replacement of electronic control unit

[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.)

[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.

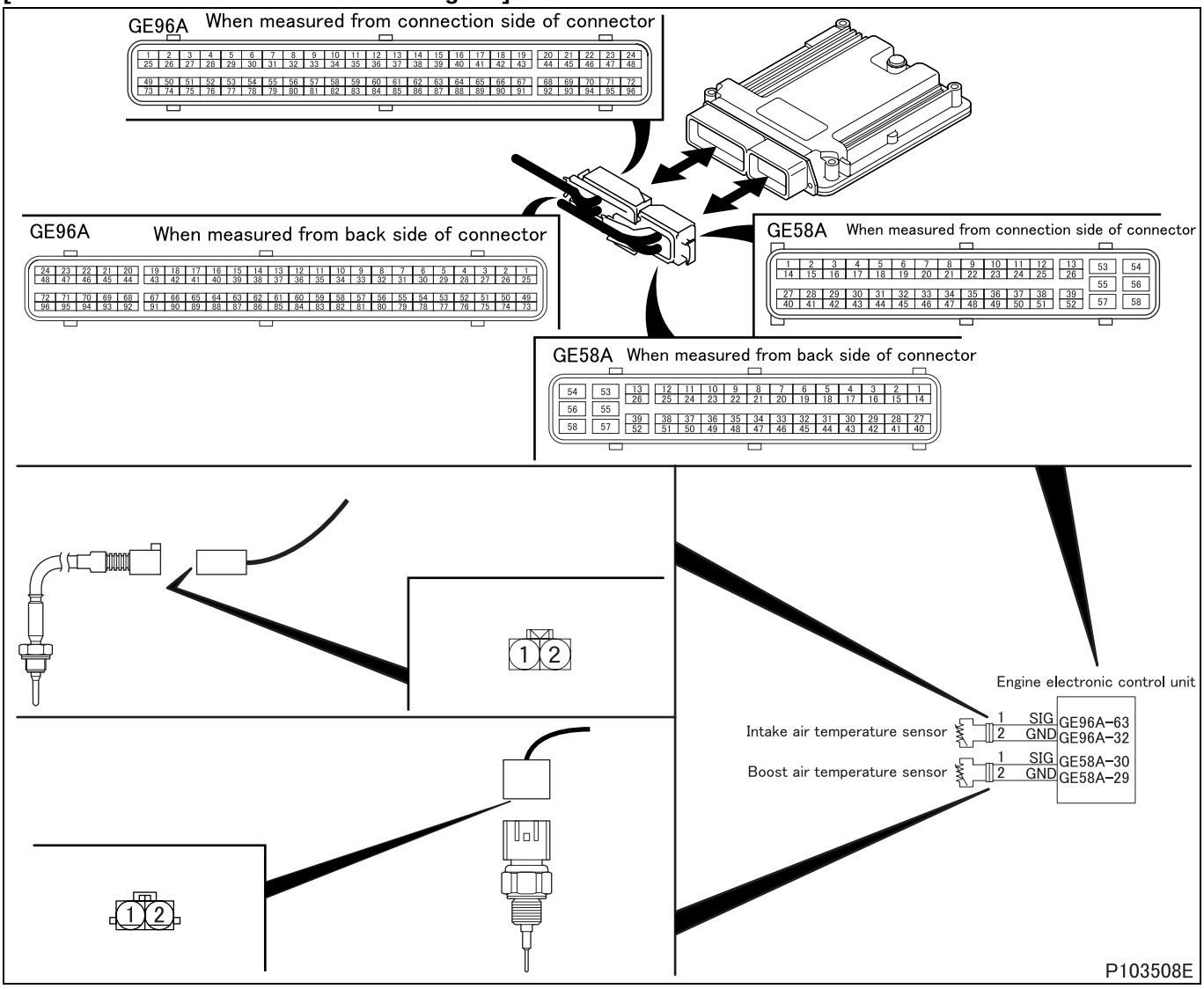
[Control effected by electronic control unit during fault]
- Intake air temperature is fixed at backup value.
- Related fault check is stopped.

[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

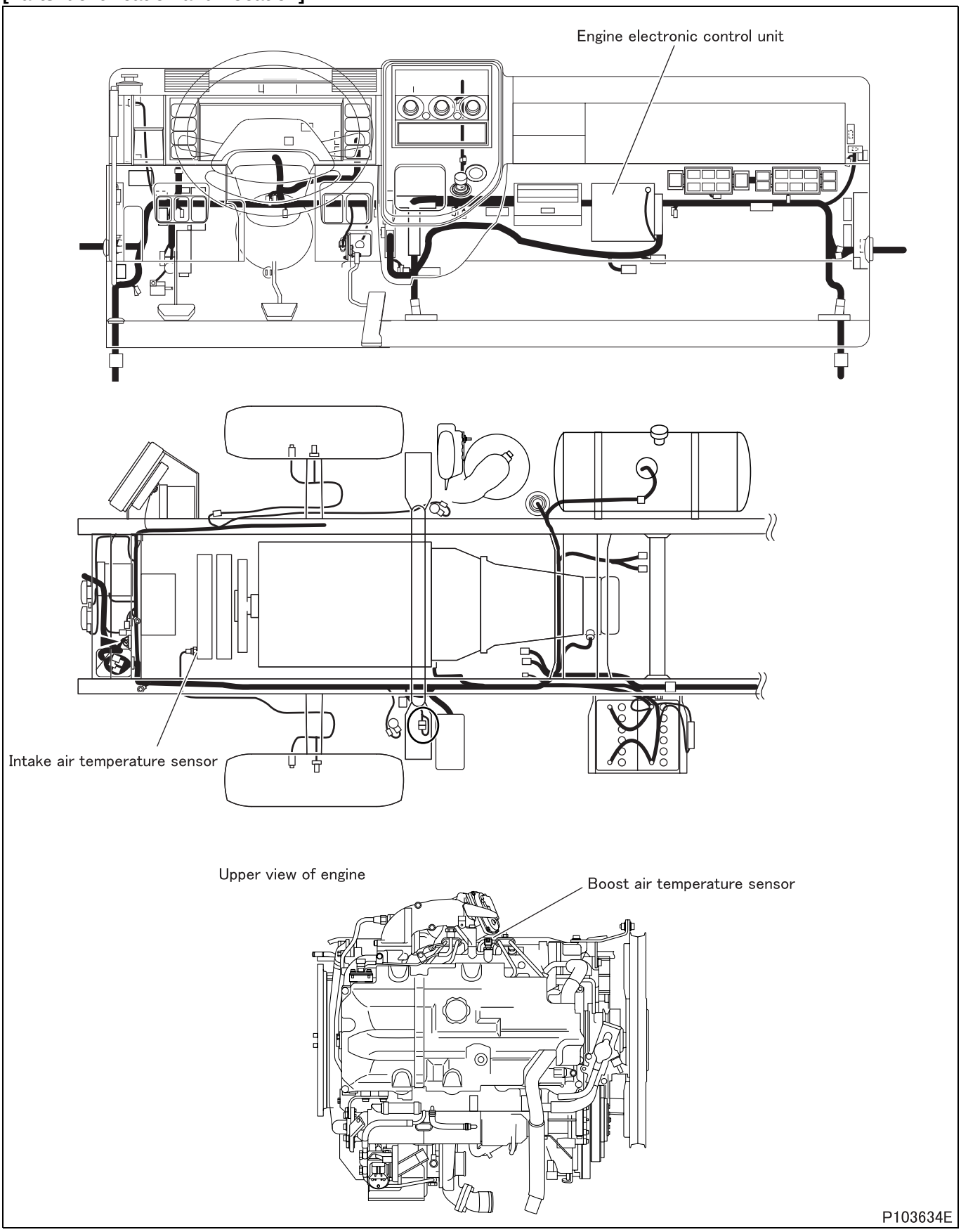
[Recoverability]

- 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]



[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		**<General Scanning Tool used>** • Measure item “Intake Air Temperature”. **<Multi-Use Tester used>** • Measure item No. 10 “Intake Air Temperature (EGR)” of Service Data.
	Inspection condition		–
	Requirements		Cold engine: Equivalent to outside air temperature
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Go to step 2.

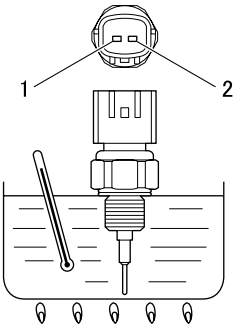
Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GE58A) terminal No. 29 and 30.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		• 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
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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 No. 2.
	Inspection condition		• Put boost air temperature sensor in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 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
	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		**<General Scanning Tool used>** • Measure item “Intake Air Temperature”. **<Multi-Use Tester used>** • Measure item No. 10 “Intake Air Temperature (EGR)” of Service Data.
	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		**<General Scanning Tool used>** • Measure item “Barometric Pressure”. **<Multi-Use Tester used>** • 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^2})
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Replacement of electronic control unit

[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		**<General Scanning Tool used>** • Measure item “Barometric Pressure”. **<Multi-Use Tester used>** • 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^2})
	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

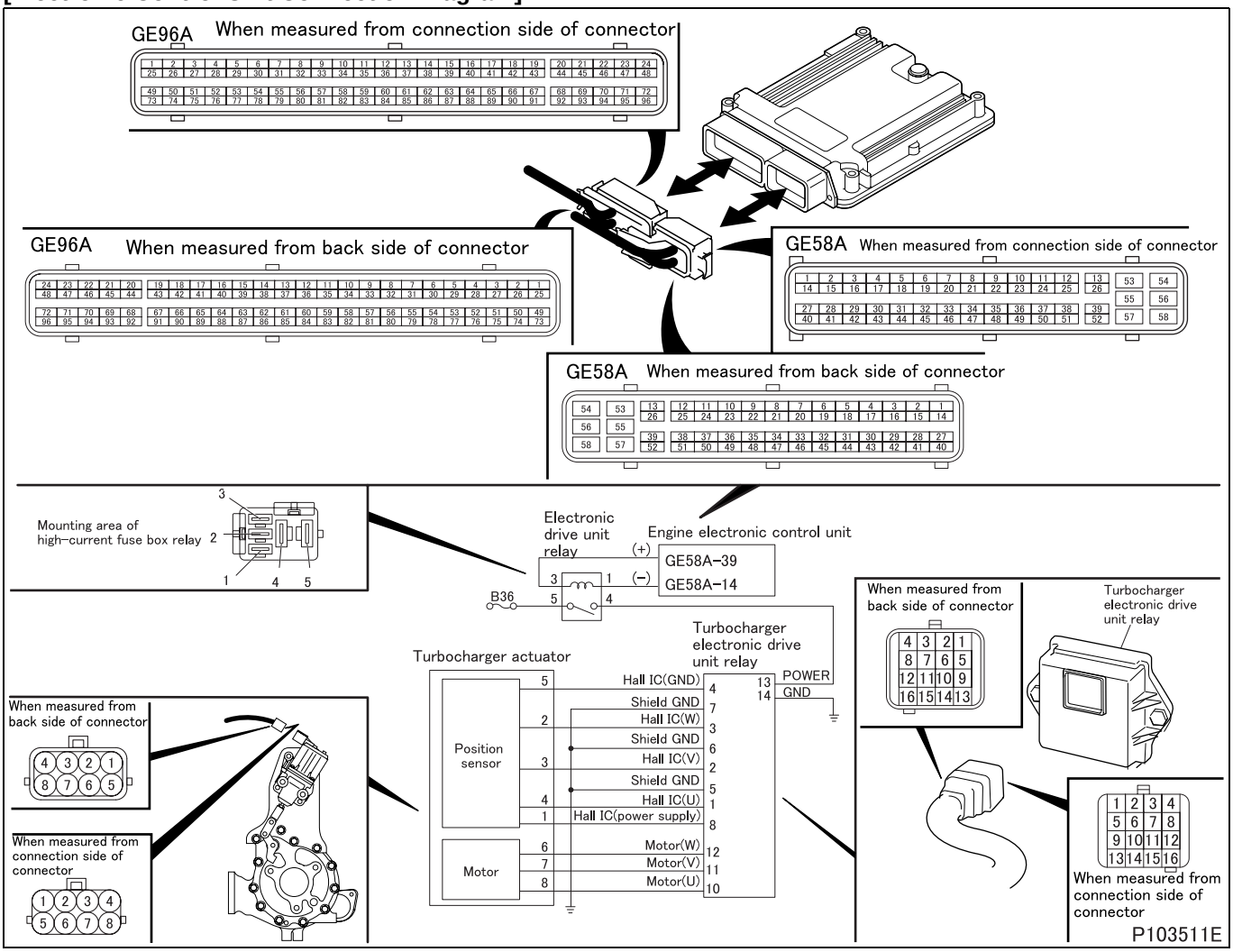
[Control effected by electronic control unit during fault]
Electronic control unit differs in the way of control by the diagnosis check item.
<Deviation in position, wiping (sliding)>
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Turbocharger control is stopped.
- Diesel 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.

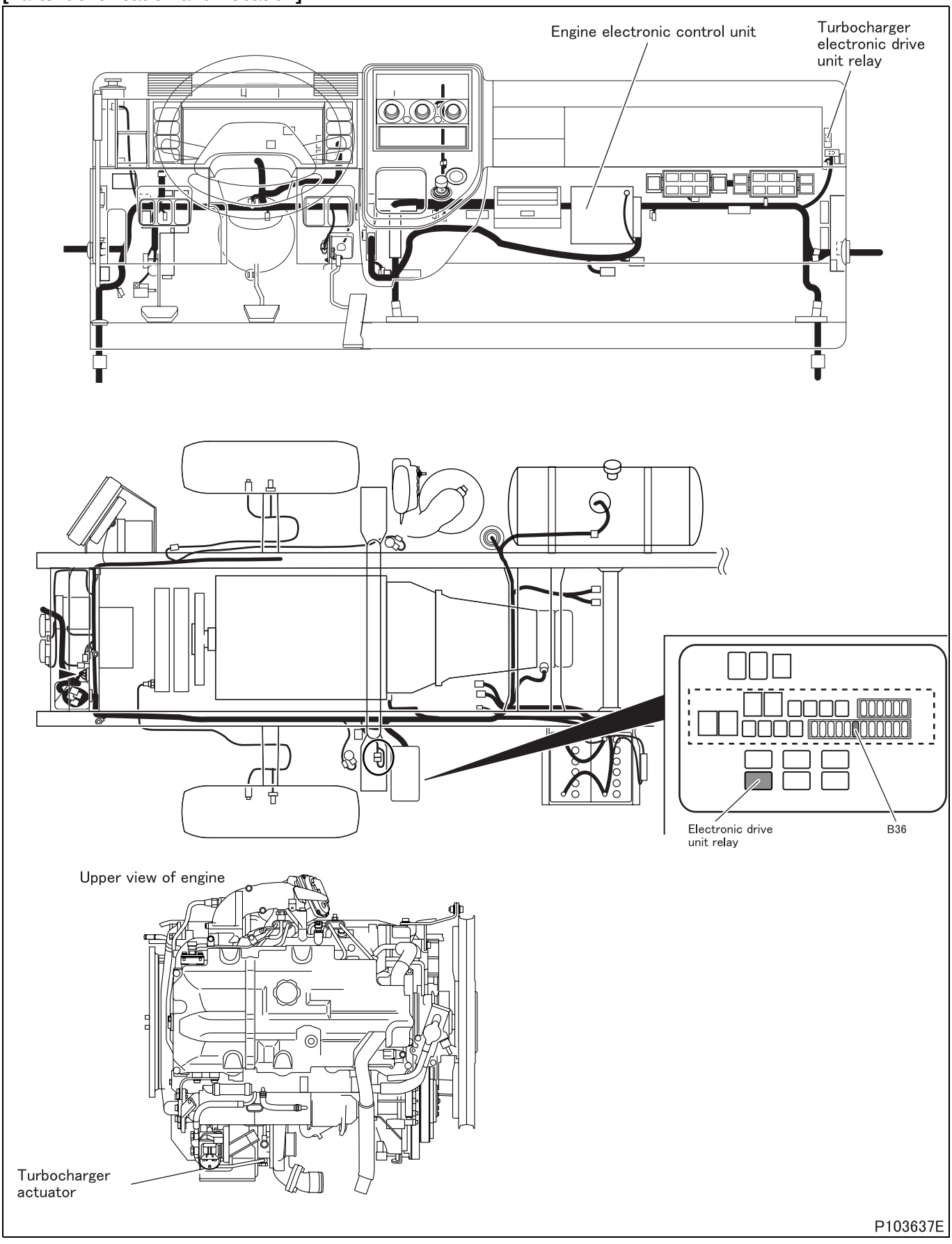
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic drive unit and turbocharger actuator
- Malfunction of each connector
- Malfunction of turbocharger motor (built in turbocharger actuator)
- Malfunction of turbocharger position sensor (built in turbocharger actuator)
- 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.)

[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 actuator test item No. A4 “VGT 1”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral (parking satisfactory for automatic transmission) • Diagnosis switch: OFF (fuse removed)
	Requirements		Actual position matches with target value set by Multi-Use Tester (check with service data “54: Target VGT Position, 55: Actual VGT Position”). **NOTE** • **Set turbocharger opening to the range of 20 to 80%.** • **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).**
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)”
	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		• Disconnect connector and measure from harness side. • Starter switch: ON • Perform actuator test item No. AF “EDU Relay”.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

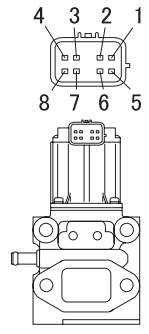
Step 9	Inspection items		Inspection of harness between electronic drive unit and ground
	Maintenance item		Check circuit between following electronic drive unit connector terminals. • Electronic drive unit ground: terminal No. 14 - chassis ground • Sensor shield ground (U): terminal No. 5 - 14 • Sensor shield ground (V): terminal No. 6 - 14 • Sensor shield ground (W): terminal No. 7 - 14 • Sensor ground: terminal No. 4 - 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 10.
		NO	Modify harness.

Step 10	Inspection items		Inspection of electronic drive unit connector (motor)
	Maintenance item		Measure value of resistance between following connector terminals • Between U - V: 10 - 11 • Between U - W: 10 - 12 • Between V - W: 11 - 12
	Inspection condition		–
	Requirements		2.1 ± 0.3 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 turbocharger actuator (motor)
	Maintenance item		Check circuit between following connector terminals. • Motor (U): electronic drive unit connector terminal No. 10 - turbocharger actuator connector No. 8 • Motor (V): electronic drive unit connector terminal No. 11 - turbocharger actuator connector No. 7 • Motor (W): electronic drive unit connector terminal No. 12 - turbocharger actuator connector 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 12.
		NO	Modify harness.

Step 12	Inspection items		Inspection of turbocharger actuator unit (motor)
	Maintenance item		Measure value of resistance between following turbocharger actuator connector terminals • Between U - V: 8 - 7 • Between U - W: 8 - 6 • Between V - W: 7 - 6
	Inspection condition		• Keep turbocharger actuator installed on vehicle. • Remove harness connector and measure turbocharger actuator side.
	Requirements		2.1 ± 0.3 Ω
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 13.
		NO	Replacement of turbocharger actuator

<Step 12 inspection diagram>



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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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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. • U signal output: terminal 1 (+) - 4 (–) • V signal output: terminal 2 (+) - 4 (–) • W signal output: terminal 3 (+) - 4 (–)
	Inspection condition		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON • Perform actuator test item No. A4 “VGT 1”.
	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. • Sensor (power supply): electronic drive unit connector terminal No. 8 - turbocharger actuator connector No. 1 • Sensor (U): electronic drive unit connector terminal No. 1 - turbocharger actuator connector No. 4 • Sensor (V): electronic drive unit connector terminal No. 2 - turbocharger actuator connector No. 3 • Sensor (W): electronic drive unit connector terminal No. 3 - turbocharger actuator connector No. 2 • Sensor (ground): electronic drive unit connector terminal No. 4 - turbocharger actuator connector 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	After replacement of turbocharger, go to step 16.
		NO	Modify harness.

Step 16	Inspection items		Inspection by control data
	Maintenance item		Perform actuator test item No. A4 “VGT 1”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral (parking satisfactory for automatic transmission) • Diagnosis switch: OFF (fuse removed)
	Requirements		Actual position matches with target value set by Multi-Use Tester (check with service data “54: Target VGT Position, 55: Actual VGT Position”). **NOTE** • **Set turbocharger opening to the range of 20 to 80%.** • **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).**
	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

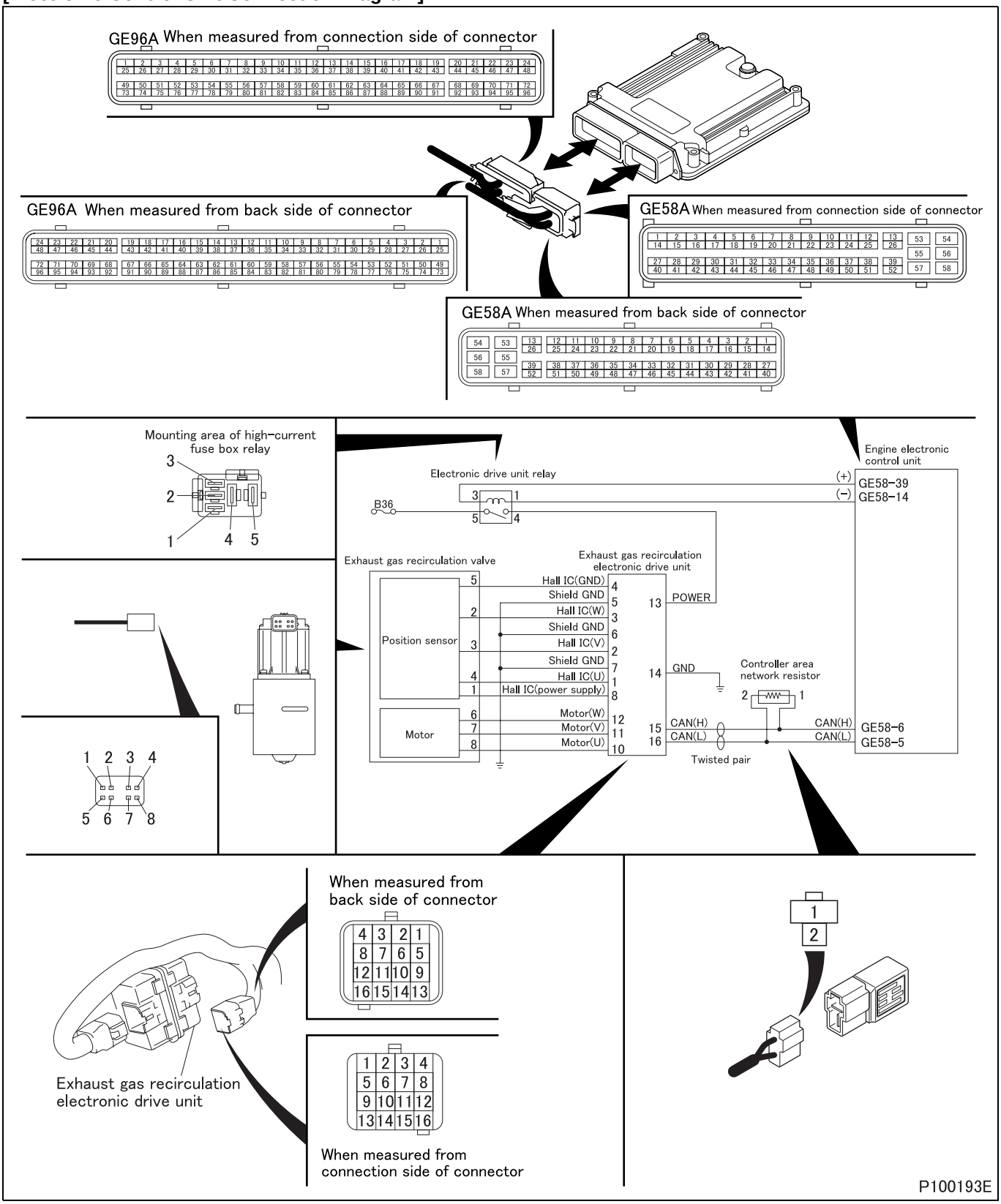
[Control effected by electronic control unit during fault]
Electronic control unit differs in the way of control by the diagnosis check item.
<Deviation in position>
- Exhaust gas recirculation control is stopped.
- Throttle controls disabled
- Turbocharger control is stopped.
- Diesel particulate filter 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.

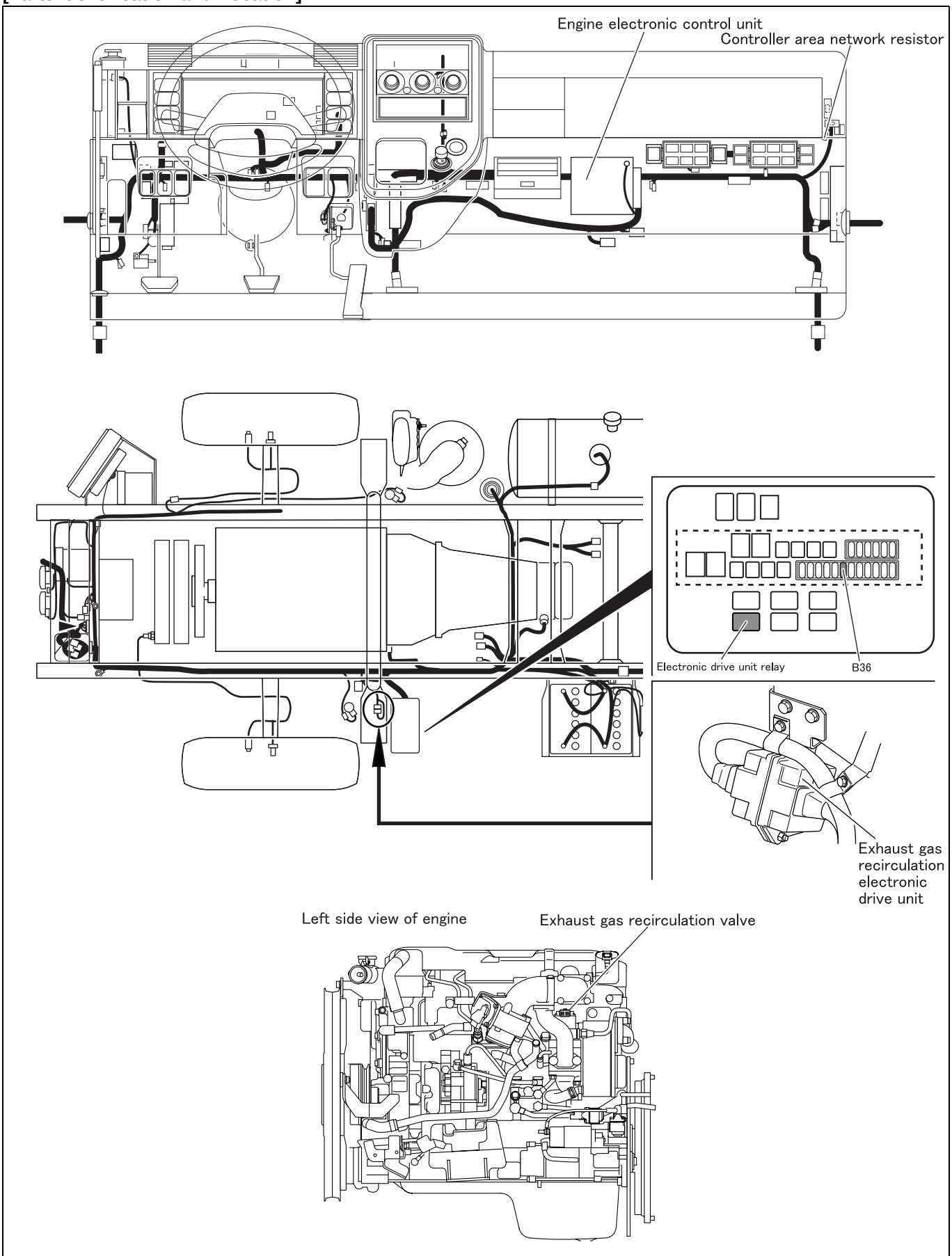
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic drive unit and exhaust gas recirculation valve
- Malfunction of each connector
- Malfunction of exhaust gas recirculation motor (built in exhaust gas recirculation valve)
- Malfunction of exhaust gas recirculation 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.)

[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 actuator test item No. A0 “EGR 1”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral (parking satisfactory for automatic transmission) • Diagnosis switch: OFF (fuse removed)
	Requirements		Actual position matches with target value set by Multi-Use Tester (check with service data “51: Actual EGR Valve Position”). **NOTE** • **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).**
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)”
	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		• Disconnect connector and measure from harness side. • Starter switch: ON • Perform actuator test item No. AF “EDU Relay”.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

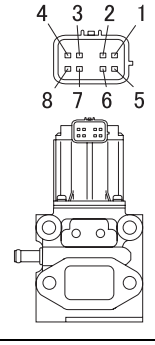
Step 9	Inspection items		Inspection of harness between electronic drive unit and ground
	Maintenance item		Check circuit between following electronic drive unit connector terminals. • Electronic drive unit ground: terminal No. 14 - chassis ground • Sensor shield ground (U): terminal No. 5 - 14 • Sensor shield ground (V): terminal No. 6 - 14 • Sensor shield ground (W): terminal No. 7 - 14 • Sensor ground: terminal No. 4 - 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 10.
		NO	Modify harness.

Step 10	Inspection items		Inspection of electronic drive unit connector (motor)
	Maintenance item		Measure value of resistance between following connector terminals • Between U - V: 10 - 11 • Between U - W: 10 - 12 • Between V - W: 11 - 12
	Inspection condition		–
	Requirements		2.1 ± 0.3 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 turbocharger actuator (motor)
	Maintenance item		Check circuit between following connector terminals. • Motor (U): electronic drive unit connector terminal No. 10 - turbocharger actuator connector No. 8 • Motor (V): electronic drive unit connector terminal No. 11 - turbocharger actuator connector No. 7 • Motor (W): electronic drive unit connector terminal No. 12 - turbocharger actuator connector 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 12.
		NO	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 • Between U - V: 8 - 7 • Between U - W: 8 - 6 • Between V - W: 7 - 6
	Inspection condition		• Keep exhaust gas recirculation valve installed on vehicle. • Remove harness connector and measure exhaust gas recirculation valve side.
	Requirements		2.1 ± 0.3 Ω
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 13.
		NO	Replacement of turbocharger actuator

<Step 12 inspection diagram>



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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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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. • U signal output: terminal 1 (+) - 4 (–) • V signal output: terminal 2 (+) - 4 (–) • W signal output: terminal 3 (+) - 4 (–)
	Inspection condition		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON • Perform actuator test item No. A0 “EGR 1”.
	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. • Sensor (power supply): electronic drive unit connector terminal No. 8 - exhaust gas recirculation valve connector No. 1 • Sensor (U): electronic drive unit connector terminal No. 1 - exhaust gas recirculation valve connector No. 4 • Sensor (V): electronic drive unit connector terminal No. 2 - exhaust gas recirculation valve connector No. 3 • Sensor (W): electronic drive unit connector terminal No. 3 - exhaust gas recirculation valve connector No. 2 • Sensor (ground): electronic drive unit connector terminal No. 4 - exhaust gas recirculation valve connector 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	After replacement of exhaust gas recirculation, go to step 16.
		NO	Modify harness.

Step 16	Inspection items		Inspection by control data
	Maintenance item		• Perform actuator test item No. A0 “EGR 1”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral (parking satisfactory for automatic transmission) • Diagnosis switch: OFF (fuse removed)
	Requirements		Actual position matches with target value set by Multi-Use Tester (check with service data “51: Actual EGR Valve Position”). **NOTE** • **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).**
	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

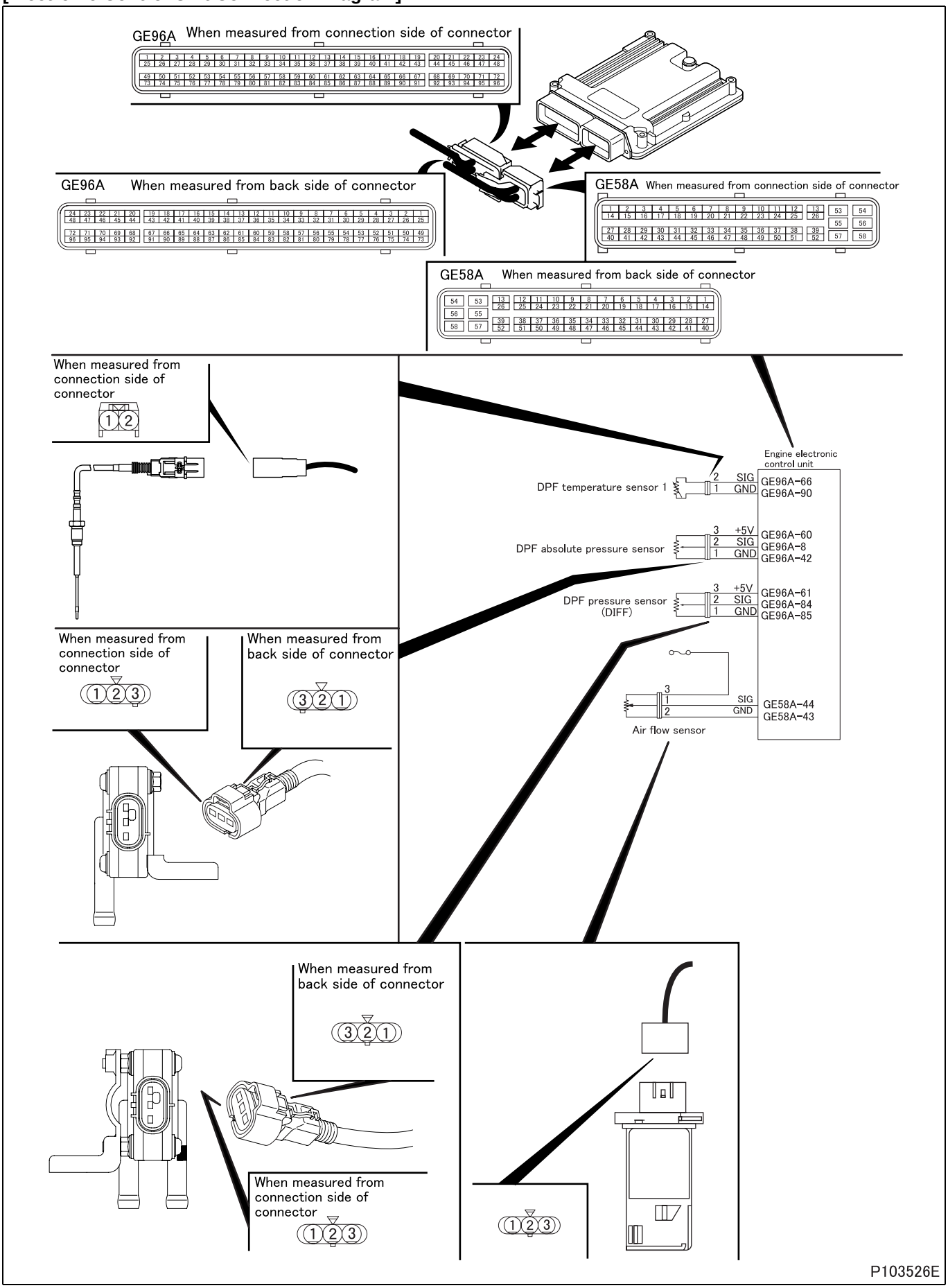
[Control effected by electronic control unit during fault]
- Diesel particulate filter regeneration is stopped.

[Probable cause of trouble]
- Deterioration of diesel particulate filter (front oxidation catalyst)

[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]



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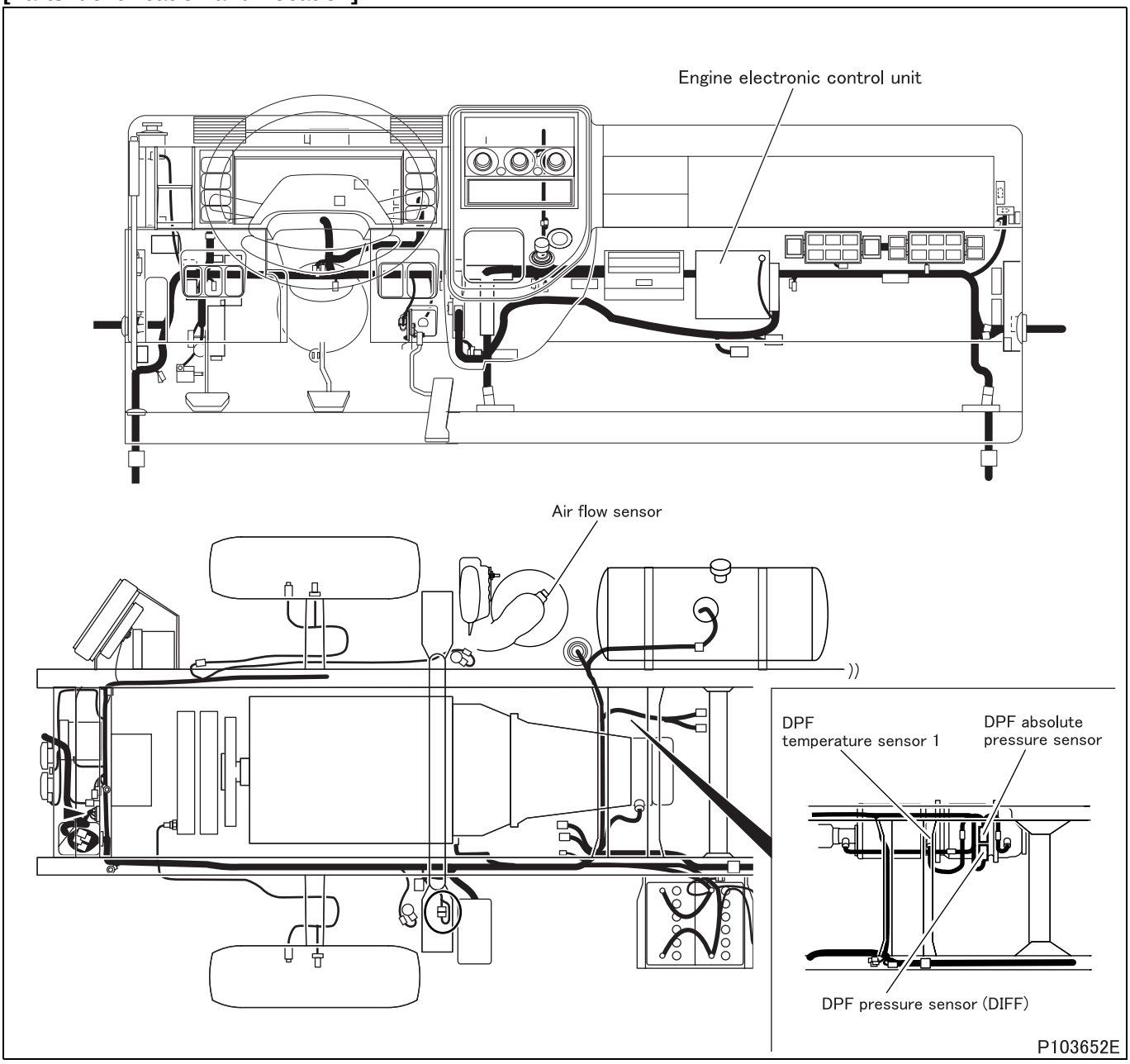
[Parts Identification and Location]



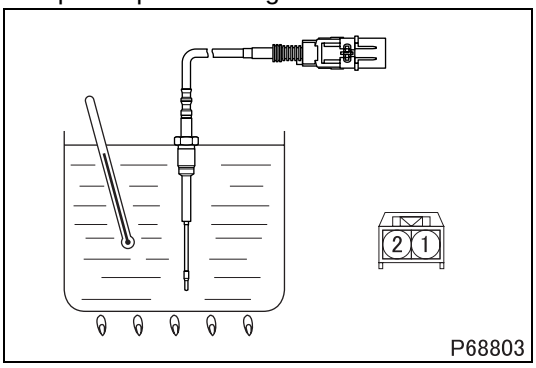
[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		Check if following diagnosis codes occur simultaneously. • P0045 “VGT Actuator (Open)” • P0046 “VGT Actuator (Performance)” • P0047 “VGT Actuator (Low)” • P0102 “Airflow Sensor (Low)” • P0103 “Airflow Sensor (High)” • P0426 “EXH Gas Temp SNSR1 (Plausibility)” • P0427 “EXH Gas Temp SNSR1 (Low)” • P0428 “EXH Gas Temp SNSR1 (High)” • P0545 “DPF Temp SNSR (upstream) Low” • P0546 “DPF Temp SNSR (upstream) High” • P1430 “DPF Regeneration Switch” • P1660 “DPF Lamp Control Circuit (Low)” • P2031 “Exhaust Gas Temp” • P2032 “Exhaust Gas Temp (Low)” • P2033 “Exhaust Gas Temp (High)” • P2453 “DPF Diff SNSR (Plausi) & MFF” • P2454 “DPF Diff SNSR (Low) & MFF” • P2455 “DPF Diff SNSR (High) & MFF”
	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 and go to step 2.
		NO	Go to step 2.

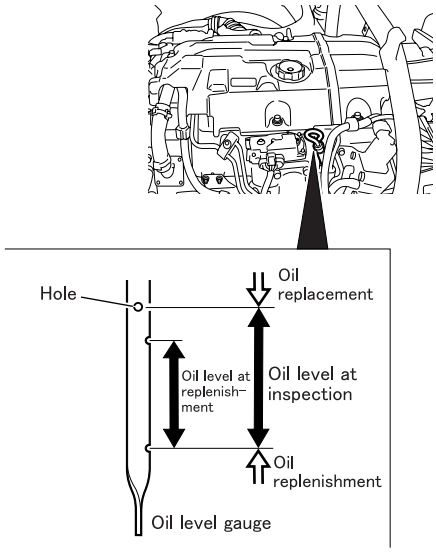
Step 2	Inspection items		Inspection of DPF temperature sensor 1 unit
	Maintenance item		Measure value of resistance between connector terminal No. 1 and 2.
	Inspection condition		• Put DPF temperature sensor 1 in container filled with engine oil. • Heat the oil to each of the specified temperatures. Stir the oil well while doing so.
	Requirements		• 20°C {68°F}: 241.8 kΩ • 50°C {122°F}: 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F}: 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F}: 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F}: 6.896 $^{+2.064}_{-1.252}$ kΩ
	Inspection result (Is the judging standard satisfied?)	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>



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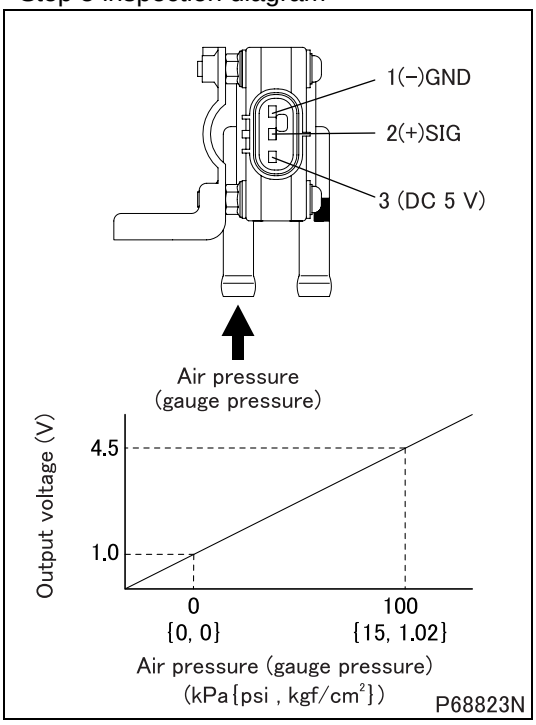
Step 4	Inspection items		Inspection of pressure hose
	Maintenance item		Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks.
	Inspection condition		–
	Requirements		Nothing abnormal detected
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	After correction and replacement of hose, go to step 5.

Step 5	Inspection items		Inspection of sensor unit
	Maintenance item		Measure value of voltage between connector terminal No. 2 (+) and 1 (–).
	Inspection condition		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	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		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	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^3/h/s or less than –200 m^3/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

[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.)

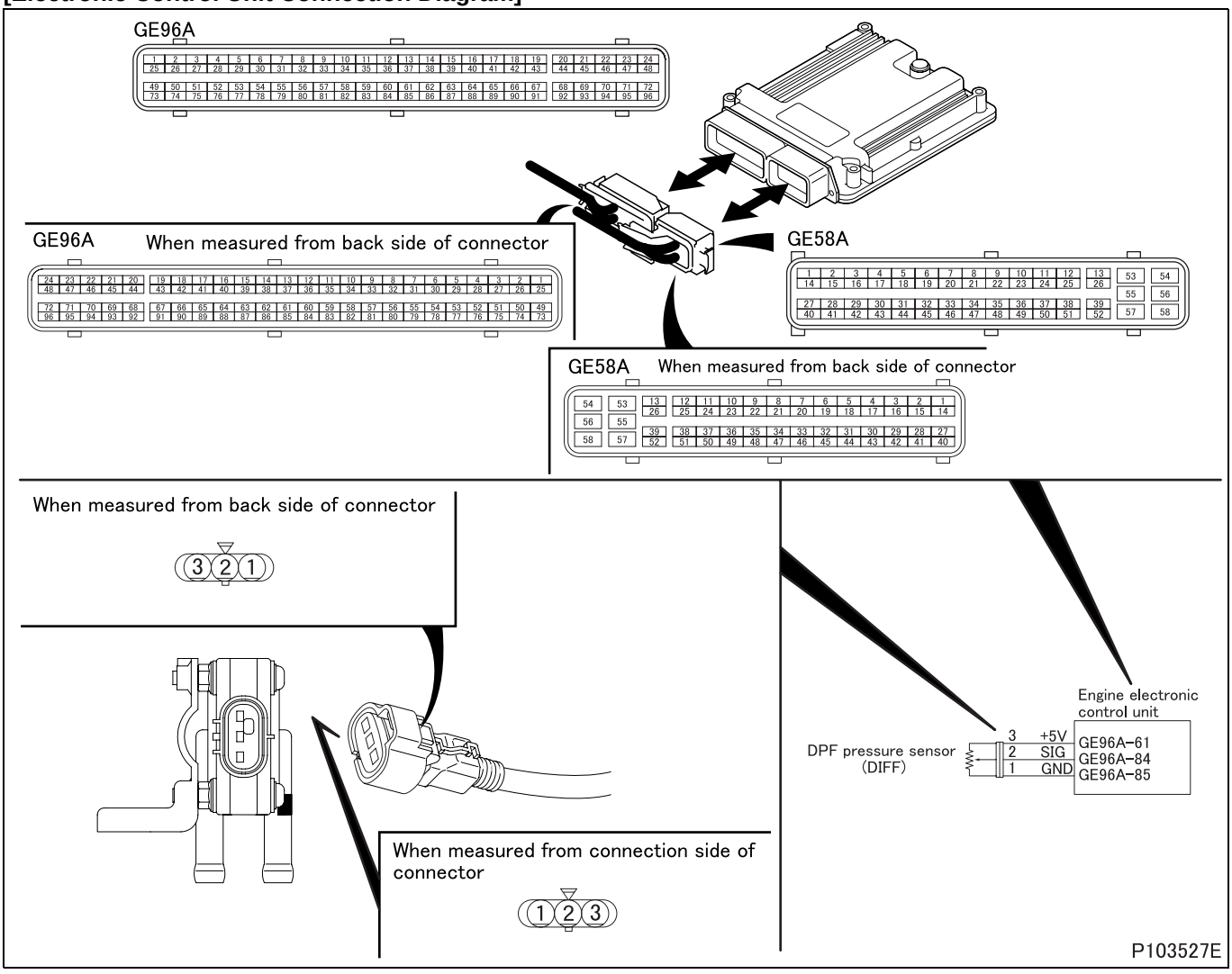
<Initial>

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

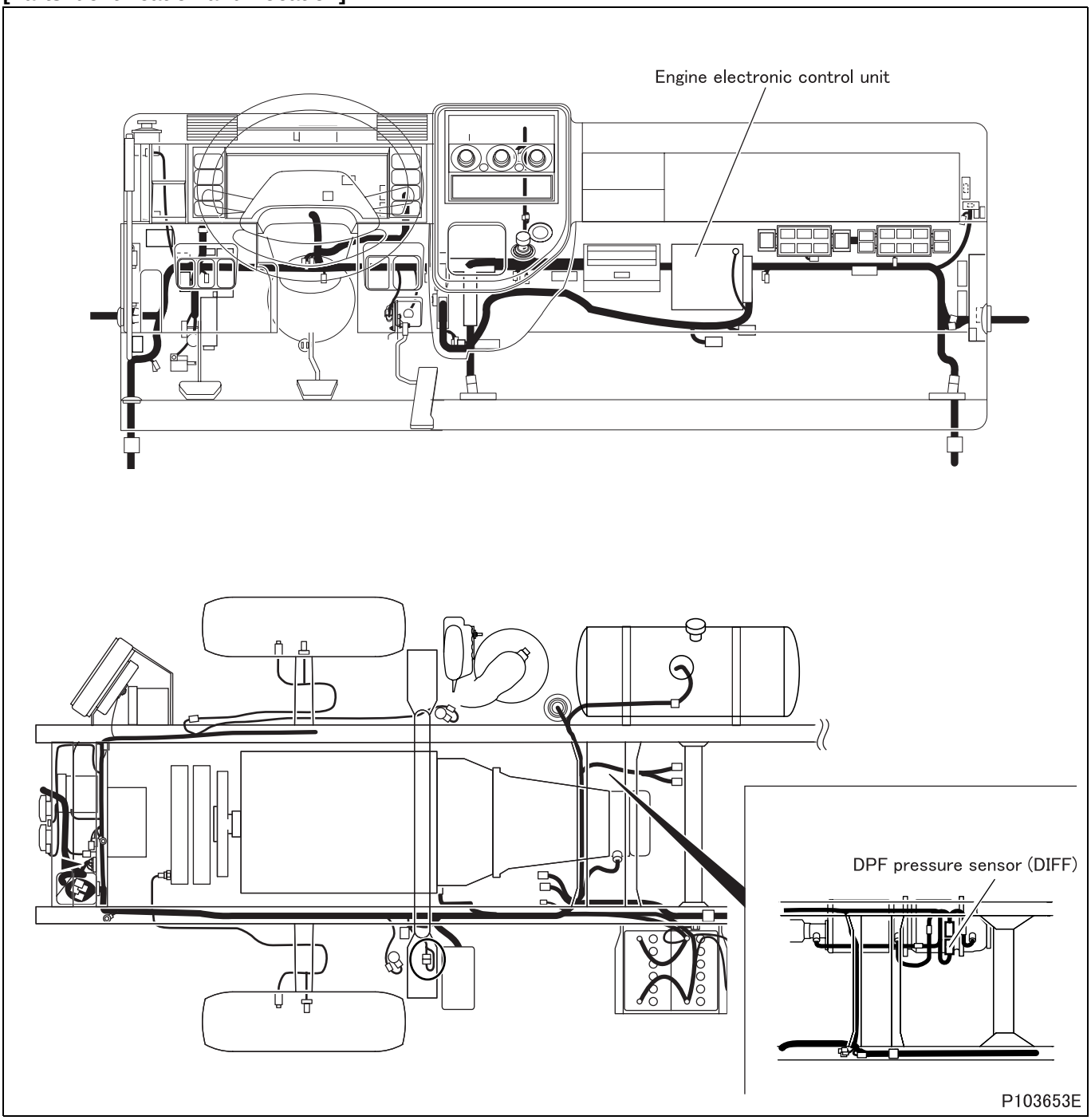
<During vehicle operation>

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

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[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^2}
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Go to step 5.

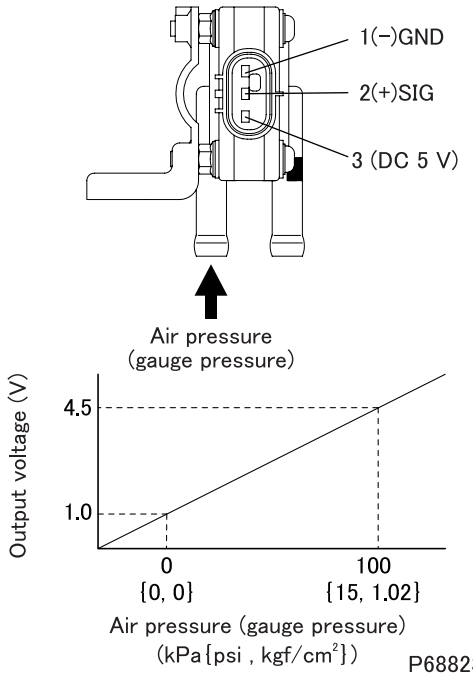
Step 4	Inspection items		Inspection by electronic control unit connector (ground)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 85 (+) and (GE58A) terminal No. 53 (–).
	Inspection condition		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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. 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^2}
	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.

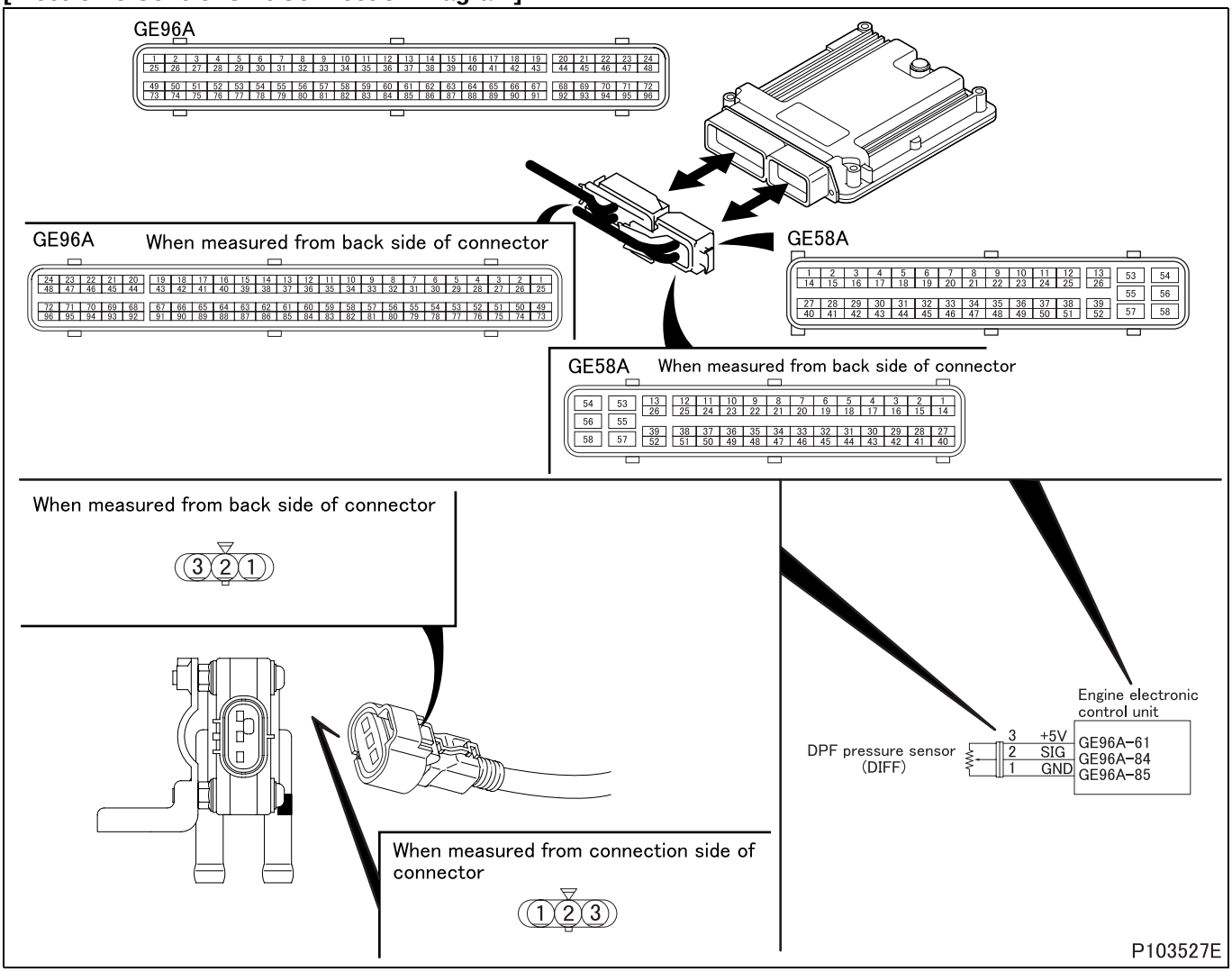
[Diagnostic requirement]
–

[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.

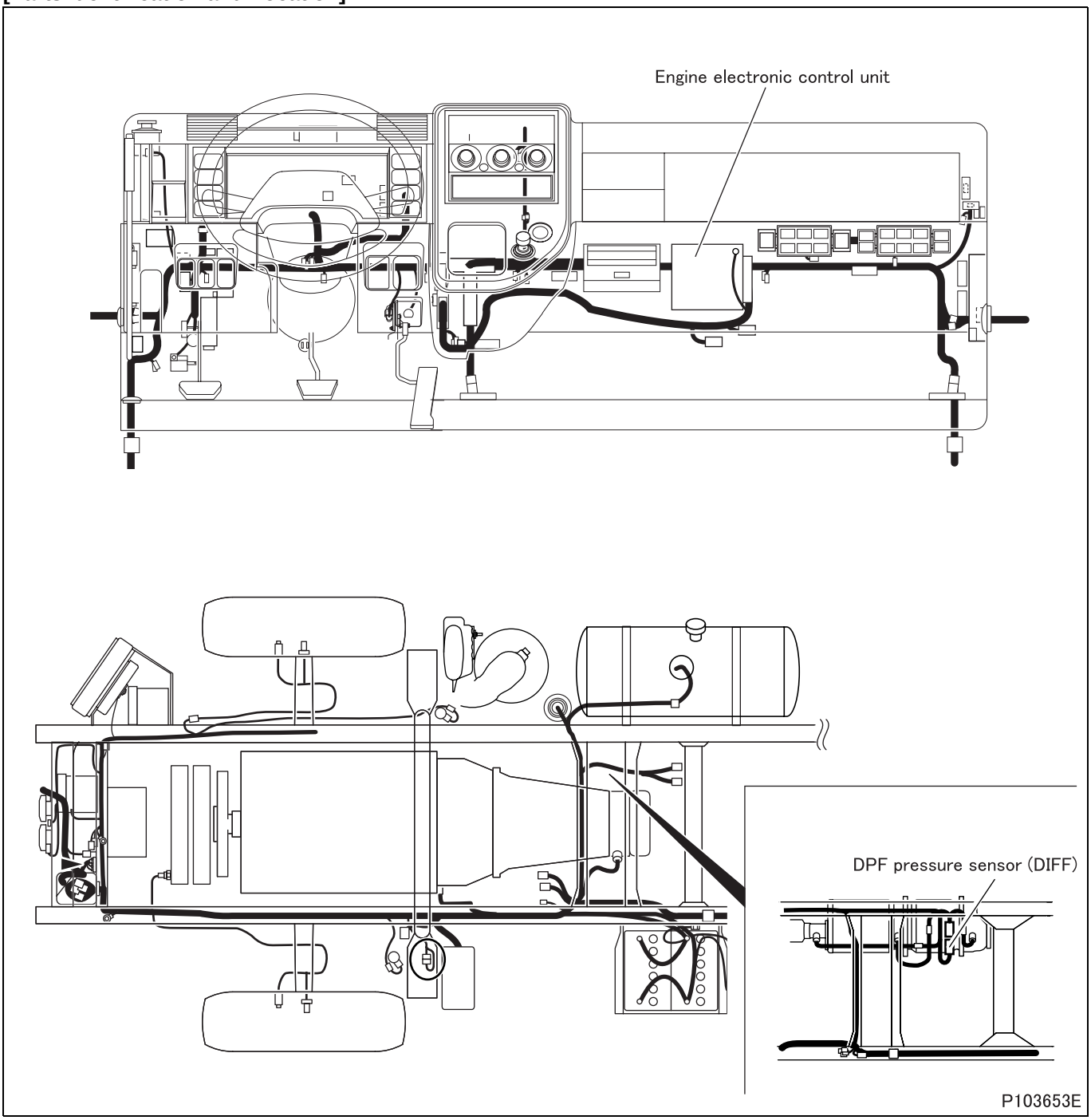
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

[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		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^2}
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Go to step 5.

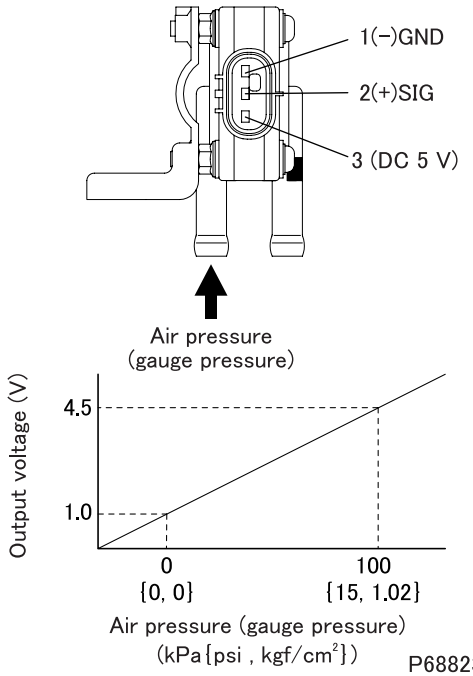
Step 4	Inspection items		Inspection by electronic control unit connector (ground)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 85 (+) and (GE58A) terminal No. 53 (–).
	Inspection condition		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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. 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^2}
	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.

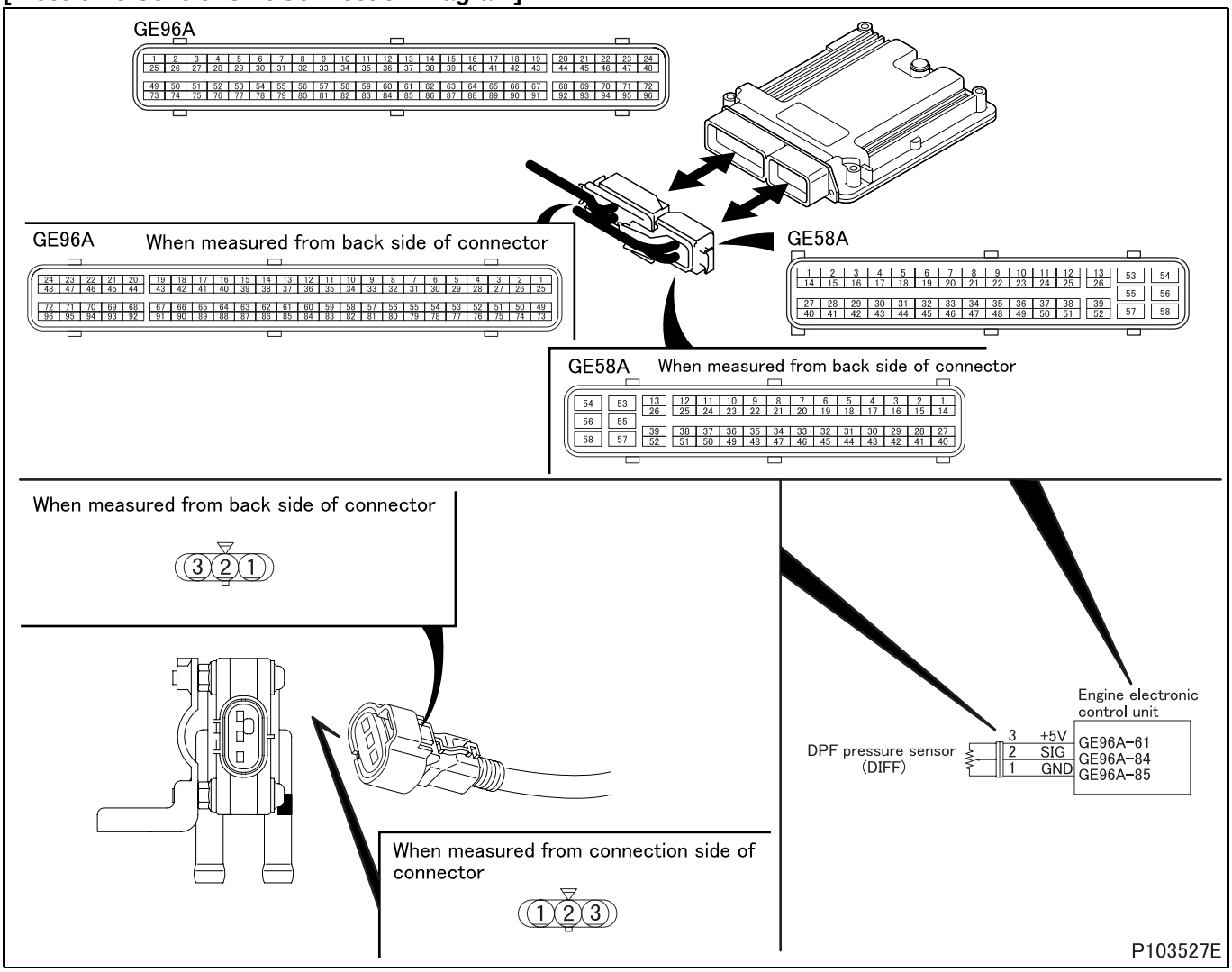
[Diagnostic requirement]
–

[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.

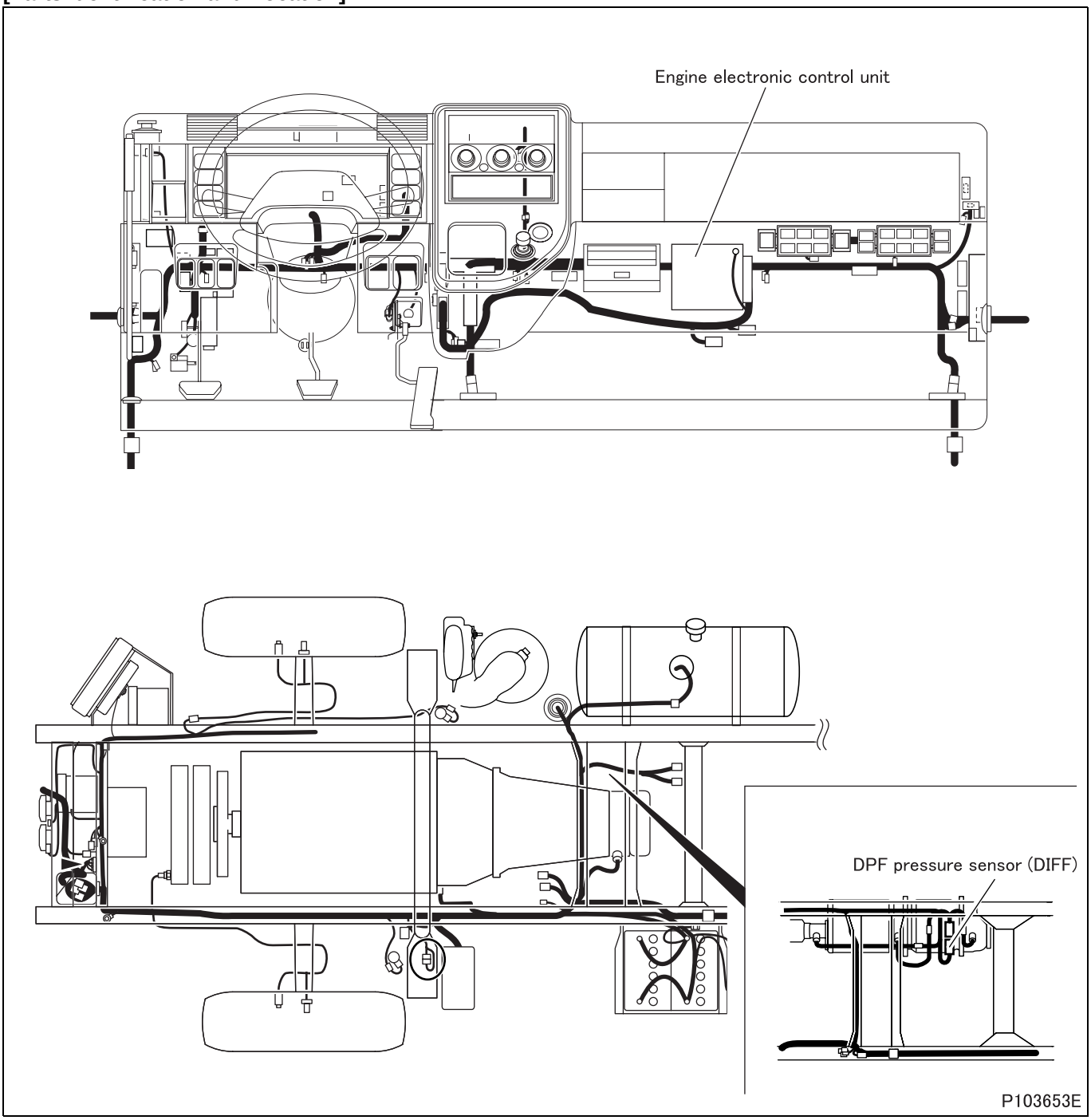
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and sensor
- Malfunction of each connector
- Malfunction of sensor
- Malfunction of electronic control unit

[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.)

[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		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^2}
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Go to step 5.

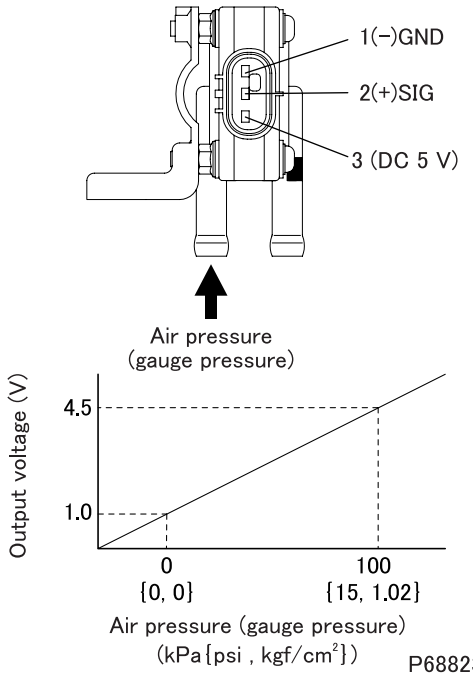
Step 4	Inspection items		Inspection by electronic control unit connector (ground)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 85 (+) and (GE58A) terminal No. 53 (–).
	Inspection condition		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	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		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	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. 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^2}
	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)

[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. • P0403 “EGR1 (Actuator Circuit)” • P0409 “EGR1 (Position Sensor)” • P0562 “Power Supply Voltage (Low)” • P0563 “Power Supply Voltage (High)” • P0600 “CAN Communication” • P0607 “ECU System” • P060B “A/D Converter” • P061B “ECU Performance (Calc)” • P061C “ECU Performance (Ne)” • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)” • P2413 “EGR System”
	Inspection condition		• Starter switch: ON • Do not start engine
	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.

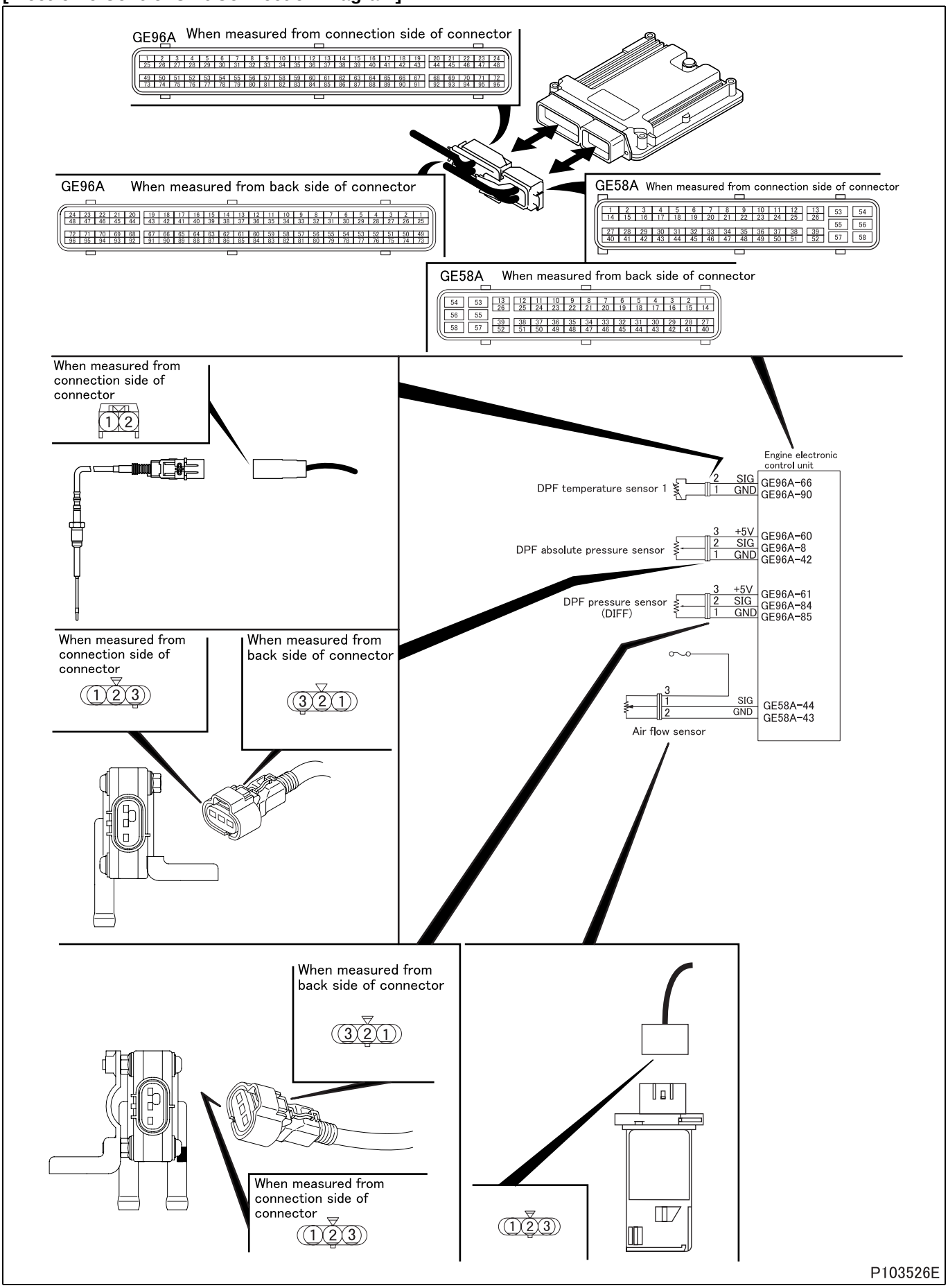
[Diagnostic requirement]
- Diesel particulate filter regeneration control: active

[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.

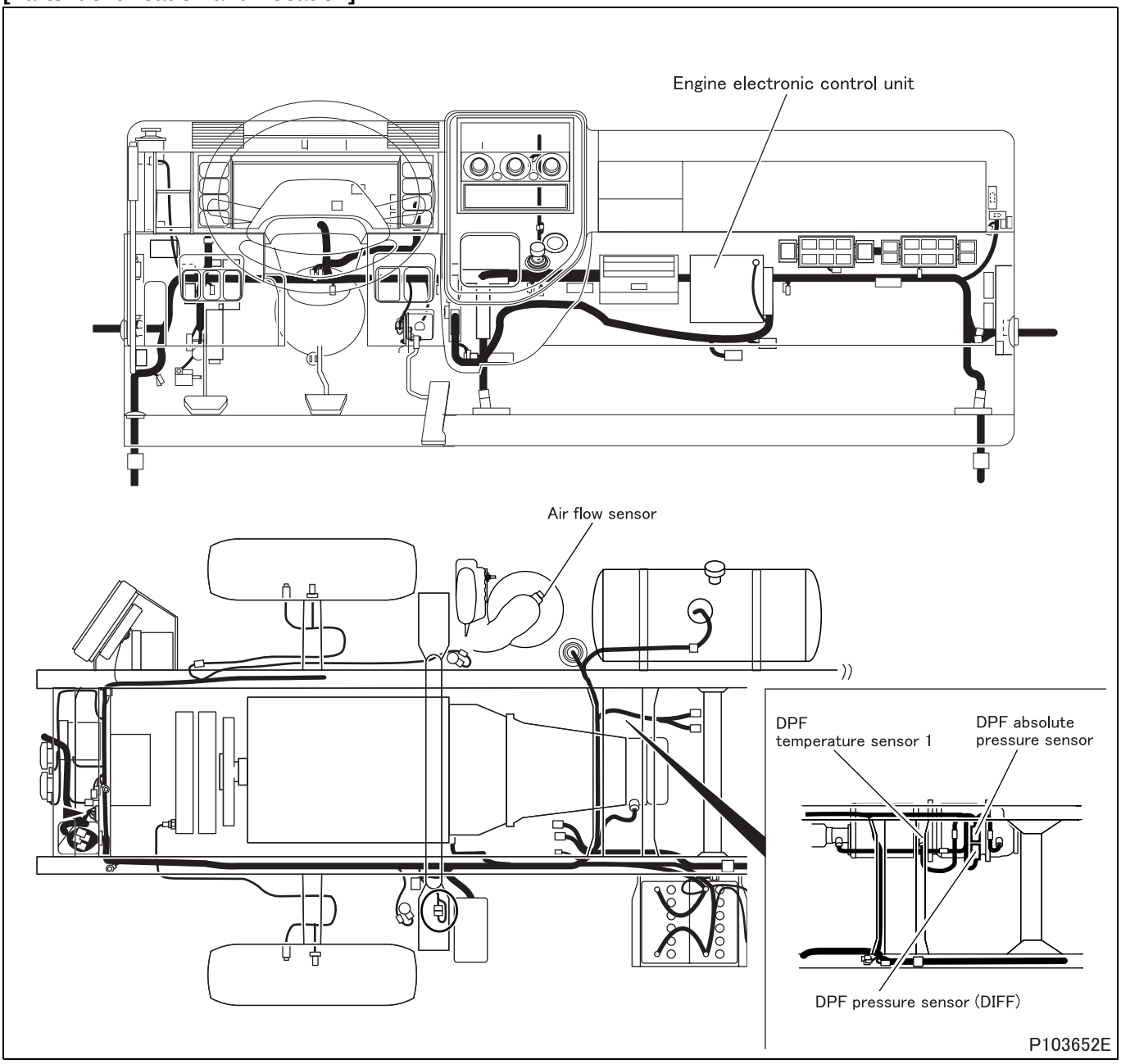
[Probable cause of trouble]
- Failure of diesel particulate filter indicator lamp
- Failure of diesel particulate filter cleaning switch
- Manual diesel particulate filter regeneration is not performed.
- Excessive smoke emission (due to malfunction of engine proper, common rail or exhaust gas recirculation 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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]

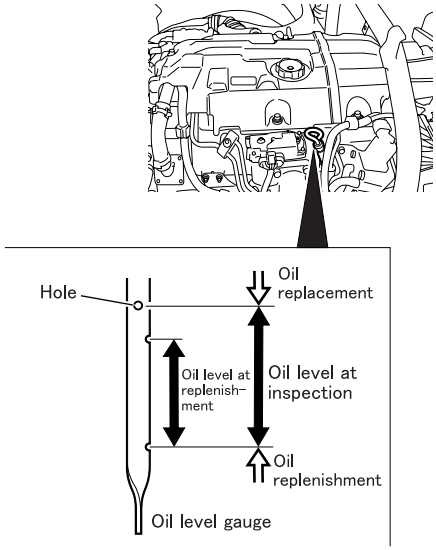


[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection 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 2.
		NO	After replacement of oil, go to step 2.

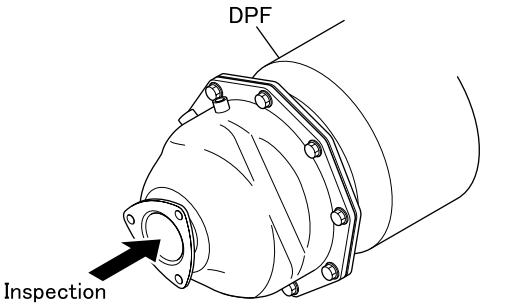
<Step 1 inspection diagram>



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		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Engine: Idling • Place the transmission in neutral. (place the automatic transmission in P range) • Parking brake: vehicle parked (parking brake switch: ON) • After engine warm-up
	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		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		Perform the following preparatory works. • Place the transmission in neutral. (place the automatic transmission in P range) • Turn the steering wheel in neutral position and securely apply the parking brake. • Turn off air conditioner not to increase the engine speed. • Check diagnosis code of each electronic control system. If any fault exists, rectify it. • Resetting the DPF-related information (perform “History reset” of Multi-Use Tester) (See Gr15 “Resetting the DPF-related information”.) • 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”)
	Requirements		This diagnosis code does not occur again.
	Inspection result (Is the judging standard satisfied?)	YES	End of inspection
		NO	Go to step 5.

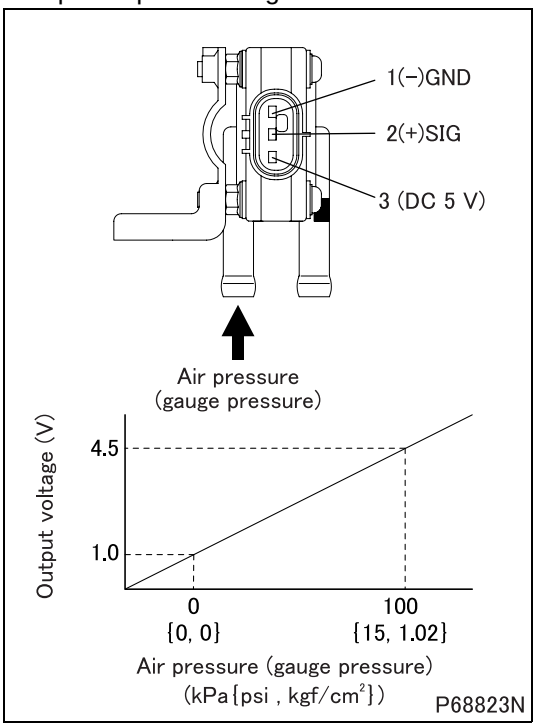
Step 5	Inspection items		Inspection by control data
	Maintenance item		Measure item No. B8 “DPF Indicator Lamp” of Service Data.
	Inspection condition		Perform Multi-Use Tester actuator test item No. A6 “DPF Lamp”.
	Requirements		Diesel particulate filter indicator lamp illuminates (automatic reset after 15 seconds)
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 6.
		NO	Replacement of engine electronic control unit

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		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	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		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. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “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) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	Inspection condition		–
	Requirements		10% or less
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 10.
		NO	Replacement of air flow sensor

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	• Inspection of exhaust gas recirculation system (exhaust gas recirculation pipe, exhaust gas recirculation cooler, exhaust gas recirculation valve) • Inspection of engine
		NO	Replacement of injector

[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.

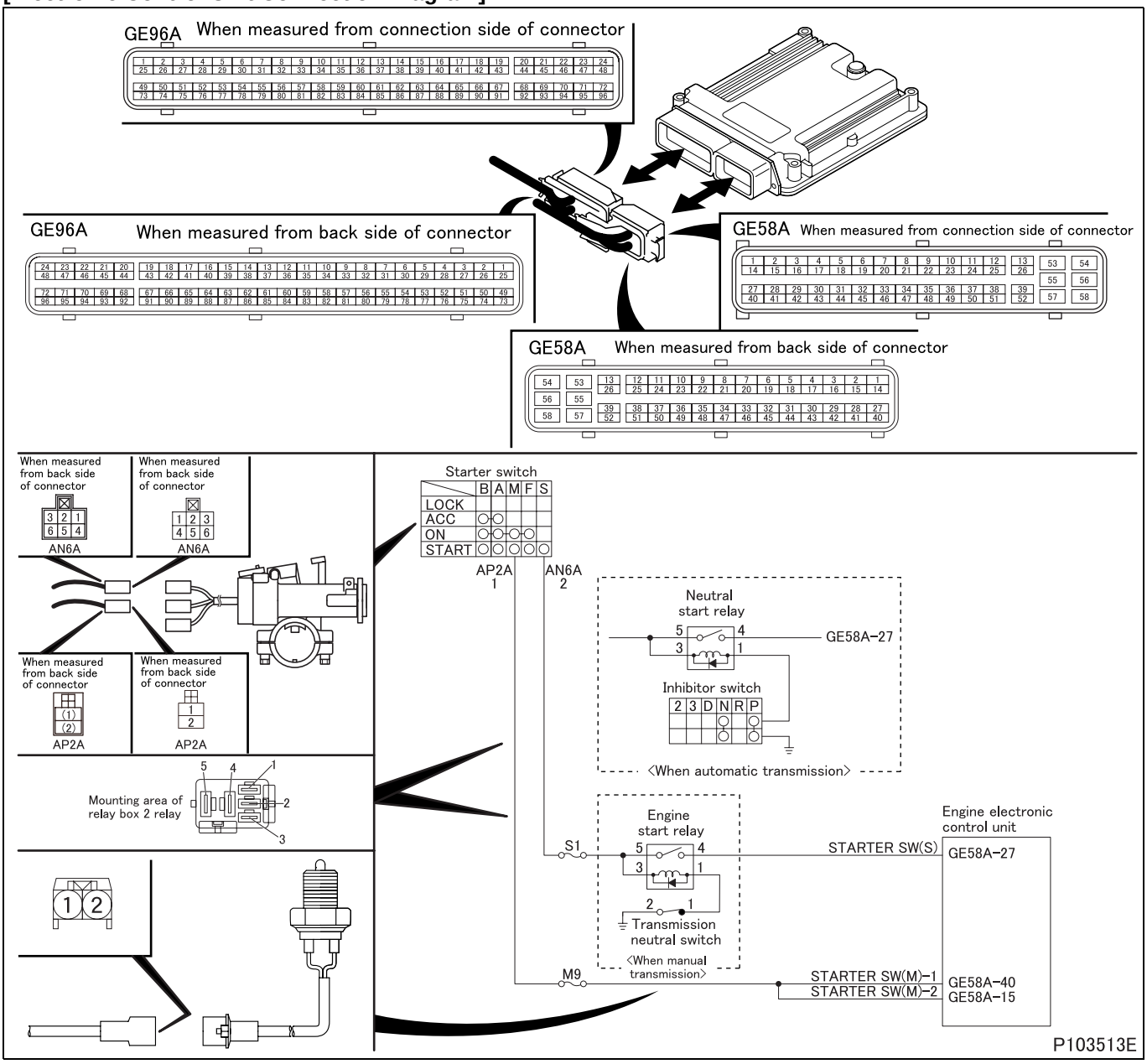
[Diagnostic requirement]
- Engine operating mode: starting
- Previous engine operation mode: OFF
- Speed increase from engine speed sensor: more than 100 rpm
- Speed increase from cylinder recognition sensor: more than 100 rpm
- Vehicle speed: less than 1 km/h {0.62 MPH}
- Vehicle speed sensor: in order

[Control effected by electronic control unit during fault]
- Related fault check is stopped.

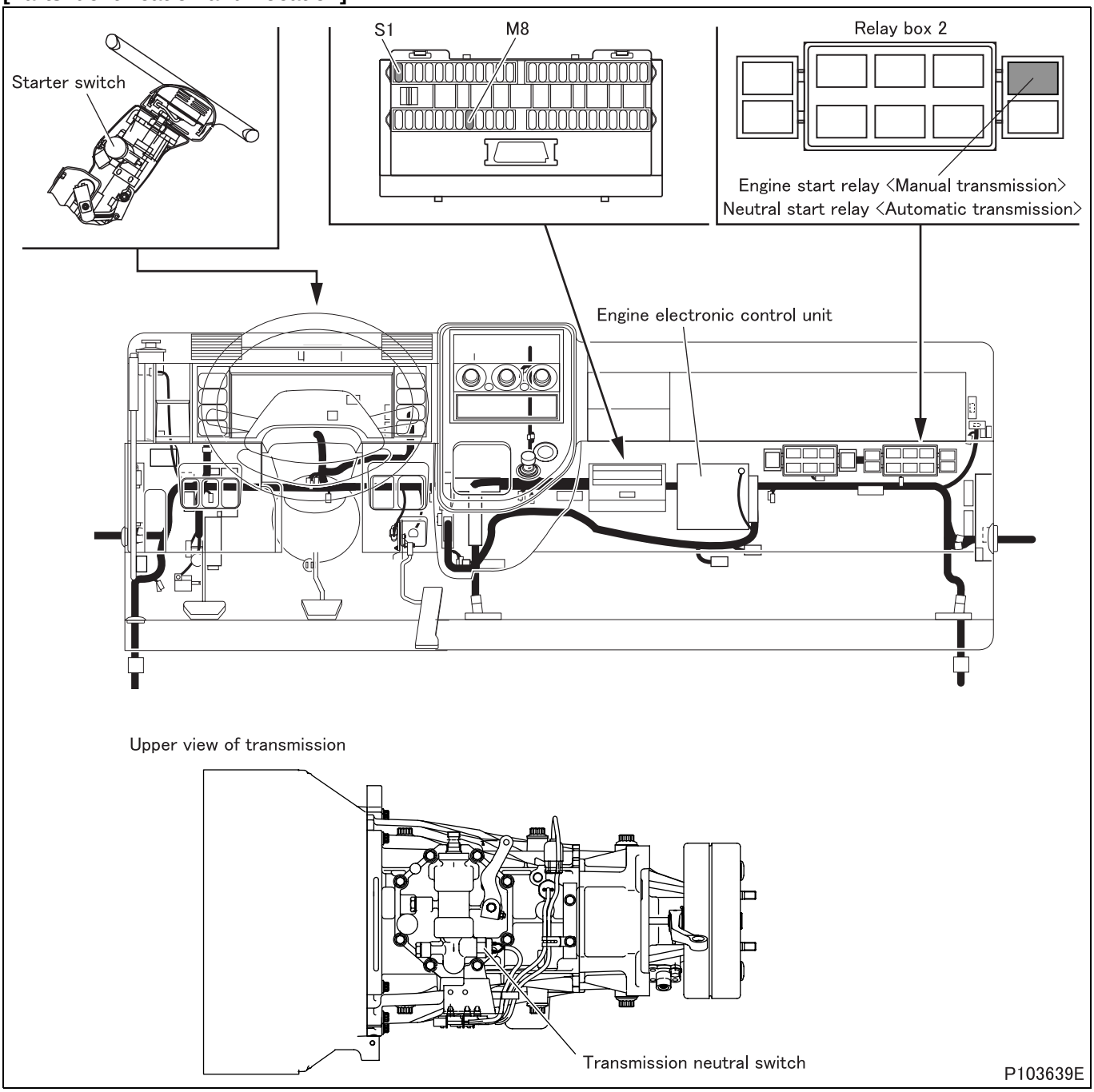
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and starter switch
- Malfunction of each connector
- Malfunction of starter switch
- Malfunction of engine start relay <Manual transmission>
- Malfunction of neutral start relay <Automatic transmission>
- 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]



[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		**<General Scanning Tool used>** • Measure value of voltage between electronic control unit connector (GE58A) terminal No. 27 (+) and ground (–). **<Multi-Use Tester used>** • Measure item No. A0 “Starter SW (S)” of Service Data.
	Inspection condition		• Transmission: neutral or P range • Starter switch: start
	Requirements		**<General Scanning Tool used>** • Same as battery voltage. **<Multi-Use Tester used>** • Displayed as “ON”.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 2.

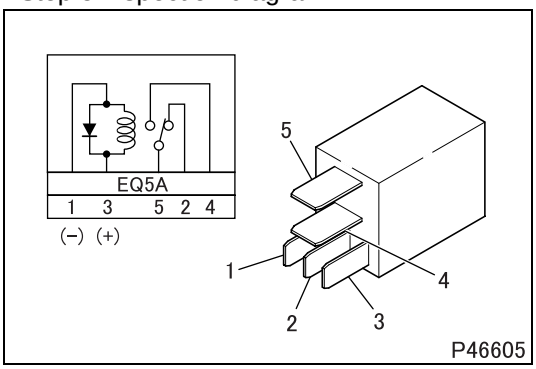
Step 2	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		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		• Transmission: neutral or P range • Starter switch: start
	Requirements		Same as battery voltage.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 9.
		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	Go to step 5.
		NO	• Replacement of transmission neutral switch <Manual transmission> • Replacement of inhibitor switch <Automatic transmission>

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>

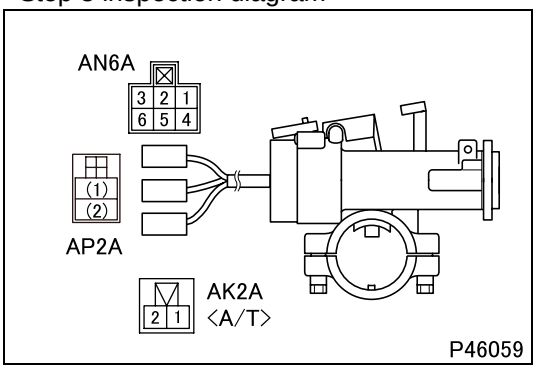


Step 6	Inspection items		Inspection of harness between starter switch and relay
	Maintenance item		Check circuit between starter switch connector (AN6A) terminal No. 2 and relay connector terminal No. 5 and 3.
	Inspection condition		Disconnect each device from harness and measure from connection side 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		• LOCK: There is no continuity. • ACC: There is continuity between [2] and (3) • ON: There is continuity between [1], [2], (3) and (4) • START: There is continuity between [1], [2], (2), (3) and (4) • Terminal No. with [ ] shows connector terminal of AP2A and Terminal No. with ( ) shows connector terminal of AN6A.
	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.

[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.

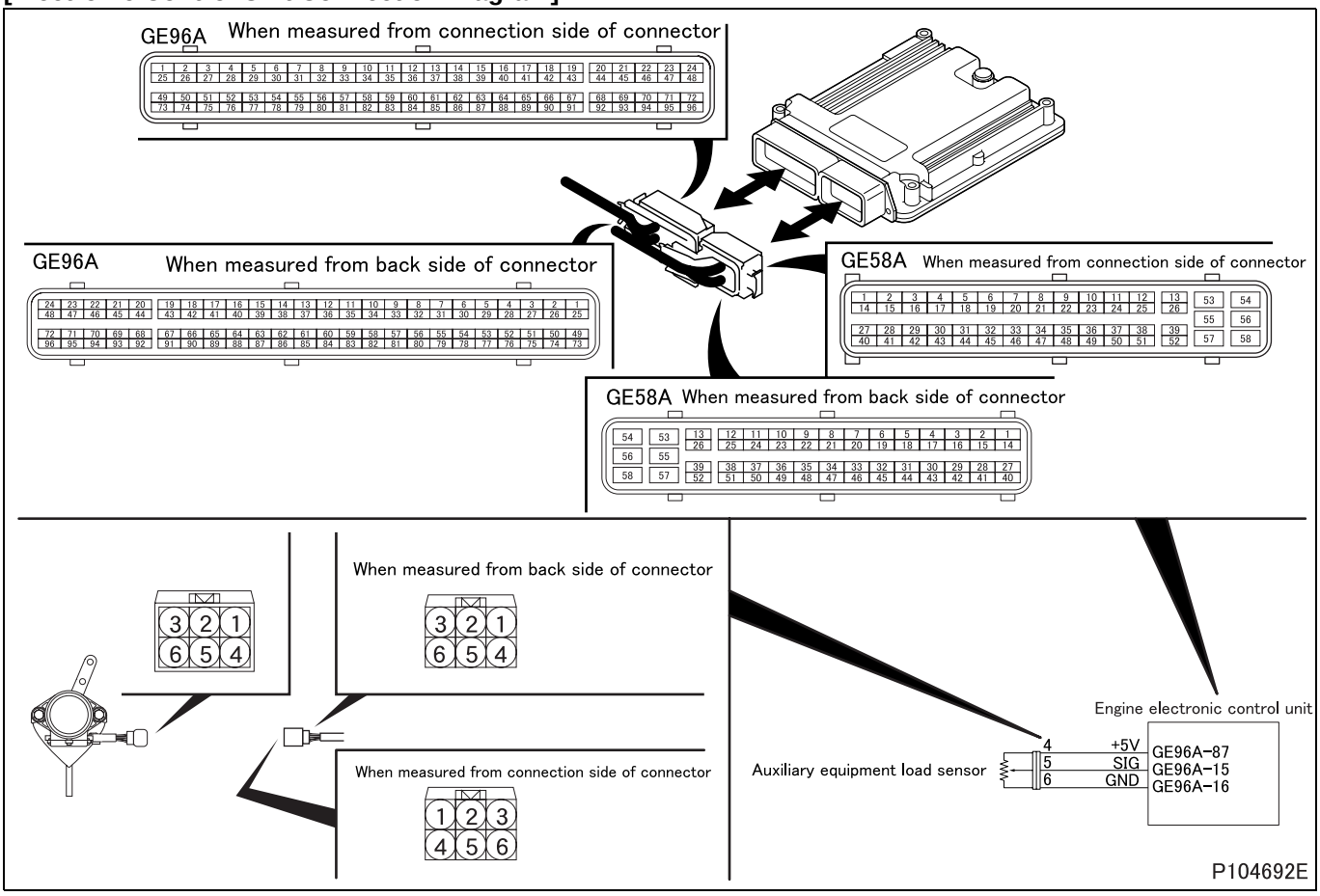
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Power take-off accelerator pedal position is fixed at backup value.

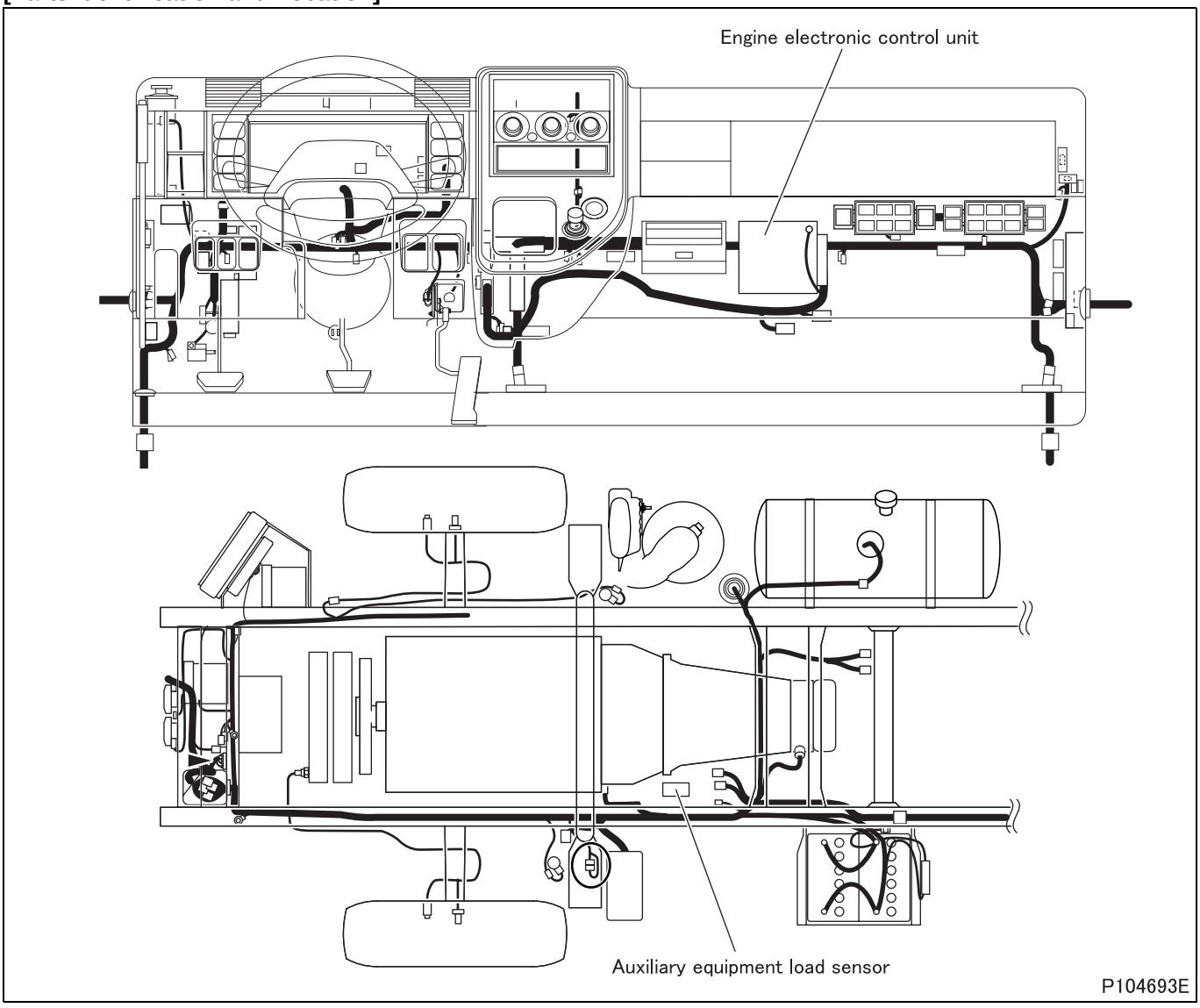
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and auxiliary equipment sensor
- Malfunction of each connector
- Malfunction of auxiliary equipment sensor
- Malfunction of electronic control unit

[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]



[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		Measurement of item No. 84 “PTO Accel Sensor Voltage” of Service Data.
	Inspection condition		–
	Requirements		• Idling position: 0.85 ± 0.1 V • Full-load position: 3.0 ± 0.1 V
	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		• Starter switch: ON (Do not start engine) • Measure from back side of harness connector with each device connected to harness.
	Requirements		• Idling position: 0.85 ± 0.1 V • Full-load position: 3.0 ± 0.1 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. 87 (+) and 16 (–).
	Inspection condition		• Starter switch: ON (Do not start engine) • Measure from back side of harness connector with each device connected to harness.
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Go to step 5.

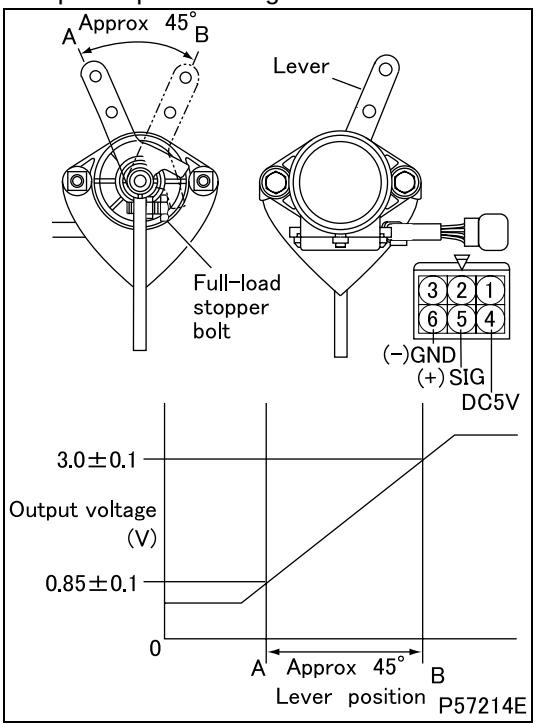
Step 4	Inspection items		Inspection by electronic control unit connector (ground)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 16 (+) and (GE58A) terminal No. 53 (–).
	Inspection condition		• Starter switch: ON (Do not start engine) • Measure from back side of harness connector with each device connected to harness.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Idling position: 0.85 ± 0.1 V • Full-load position: 3.0 ± 0.1 V
	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		• Starter switch: ON (Do not start engine) • Measure from back side of harness connector with each device connected to harness.
	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		• Idling position: 0.85 ± 0.1 V • Full-load position: 3.0 ± 0.1 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Replacement of electronic control unit

[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.

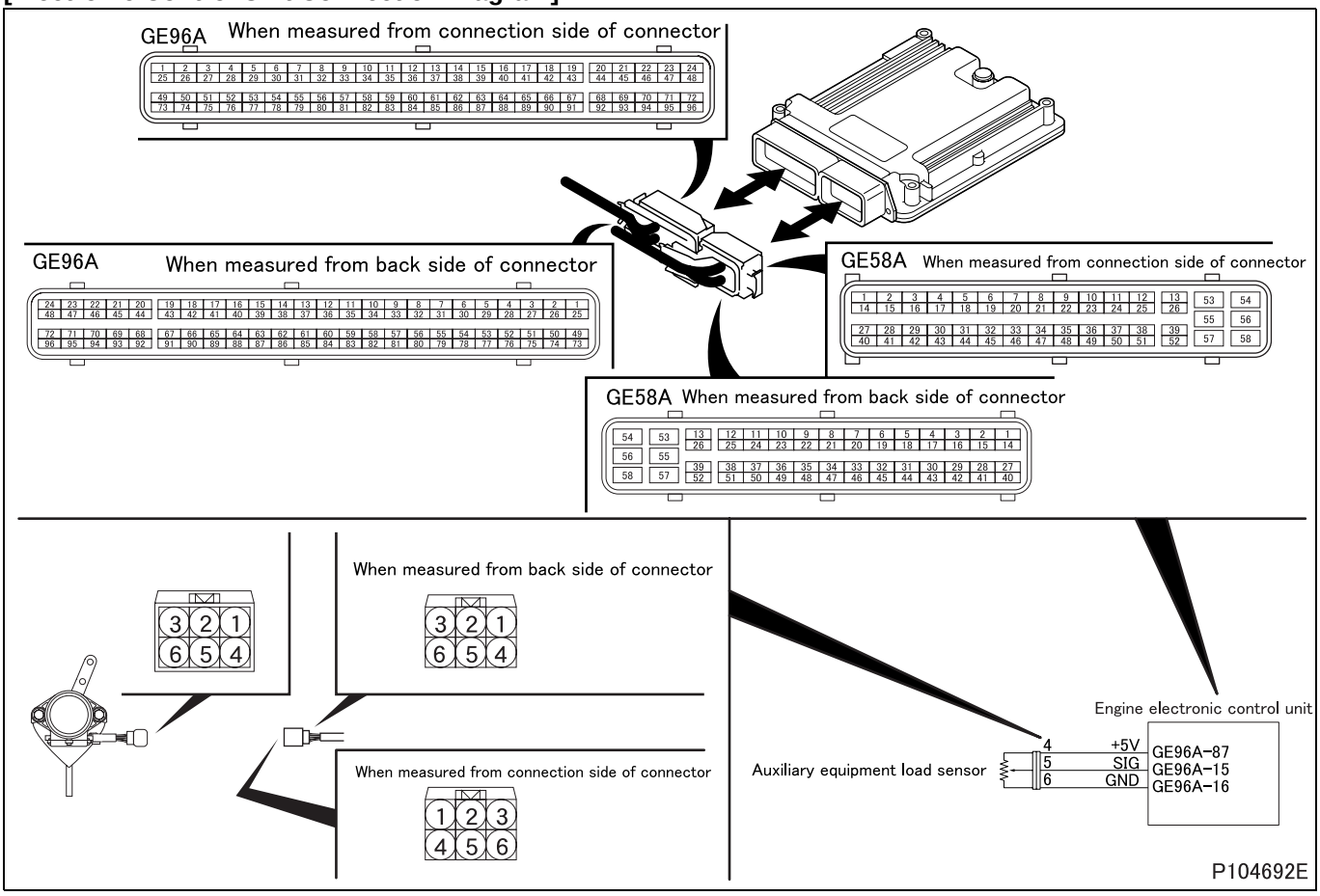
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Power take-off accelerator pedal position is fixed at backup value.

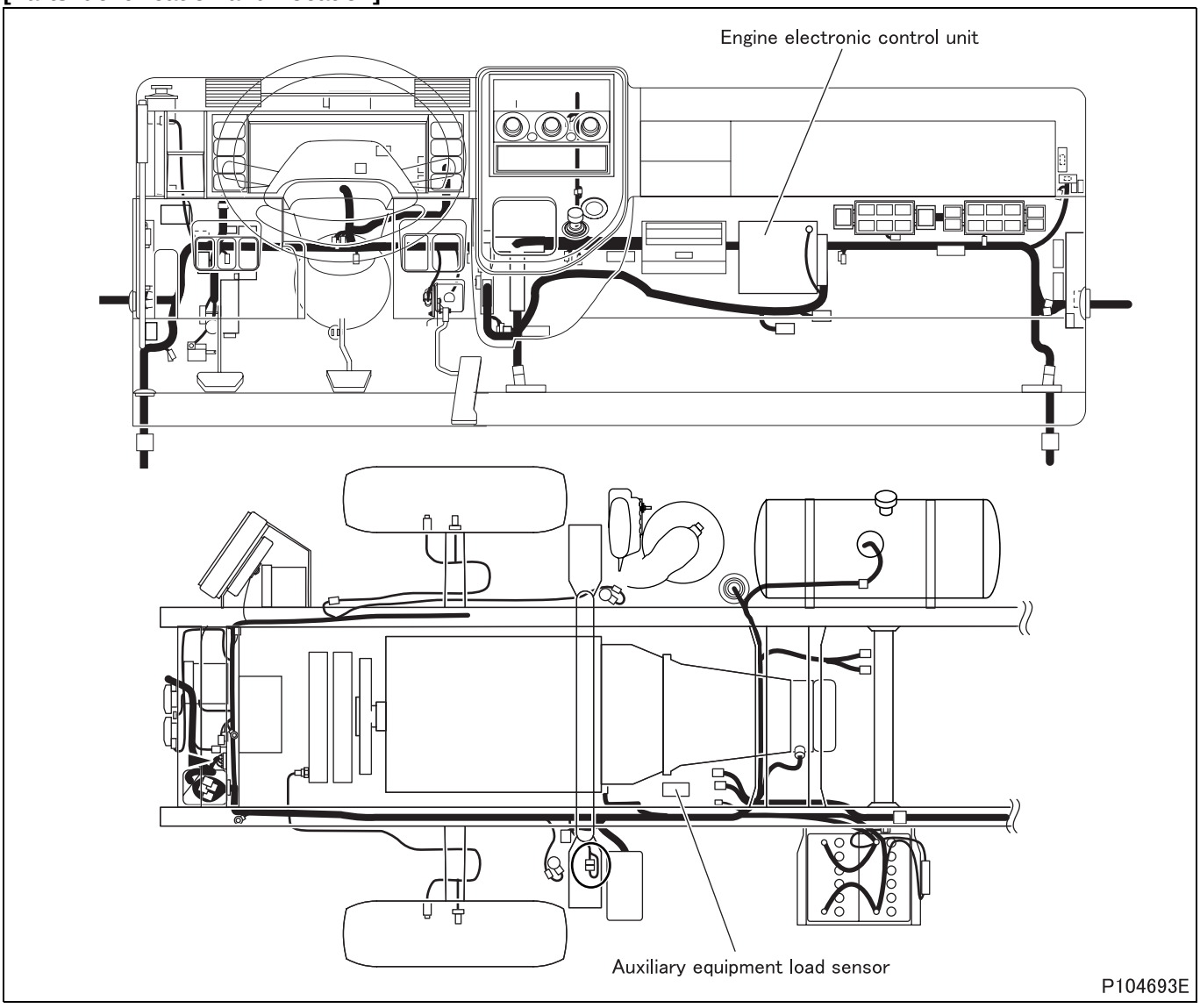
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic control unit and auxiliary equipment sensor
- Malfunction of each connector
- Malfunction of auxiliary equipment sensor
- Malfunction of electronic control unit

[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]



[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		Measurement of item No. 84 “PTO Accel Sensor Voltage” of Service Data.
	Inspection condition		–
	Requirements		• Idling position: 0.85 ± 0.1 V • Full-load position: 3.0 ± 0.1 V
	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		• Starter switch: ON (Do not start engine) • Measure from back side of harness connector with each device connected to harness.
	Requirements		• Idling position: 0.85 ± 0.1 V • Full-load position: 3.0 ± 0.1 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. 87 (+) and 16 (–).
	Inspection condition		• Starter switch: ON (Do not start engine) • Measure from back side of harness connector with each device connected to harness.
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Go to step 5.

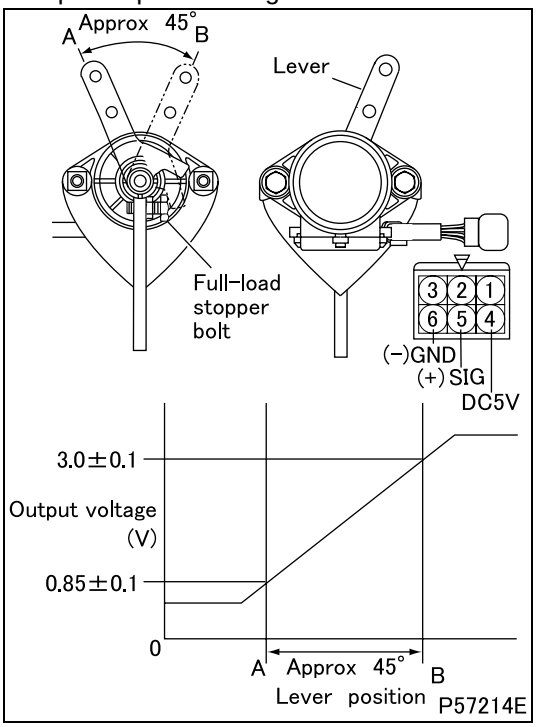
Step 4	Inspection items		Inspection by electronic control unit connector (ground)
	Maintenance item		Measure value of voltage between connector (GE96A) terminal No. 16 (+) and (GE58A) terminal No. 53 (–).
	Inspection condition		• Starter switch: ON (Do not start engine) • Measure from back side of harness connector with each device connected to harness.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Idling position: 0.85 ± 0.1 V • Full-load position: 3.0 ± 0.1 V
	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		• Starter switch: ON (Do not start engine) • Measure from back side of harness connector with each device connected to harness.
	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		• Idling position: 0.85 ± 0.1 V • Full-load position: 3.0 ± 0.1 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Replacement of electronic control unit

[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.

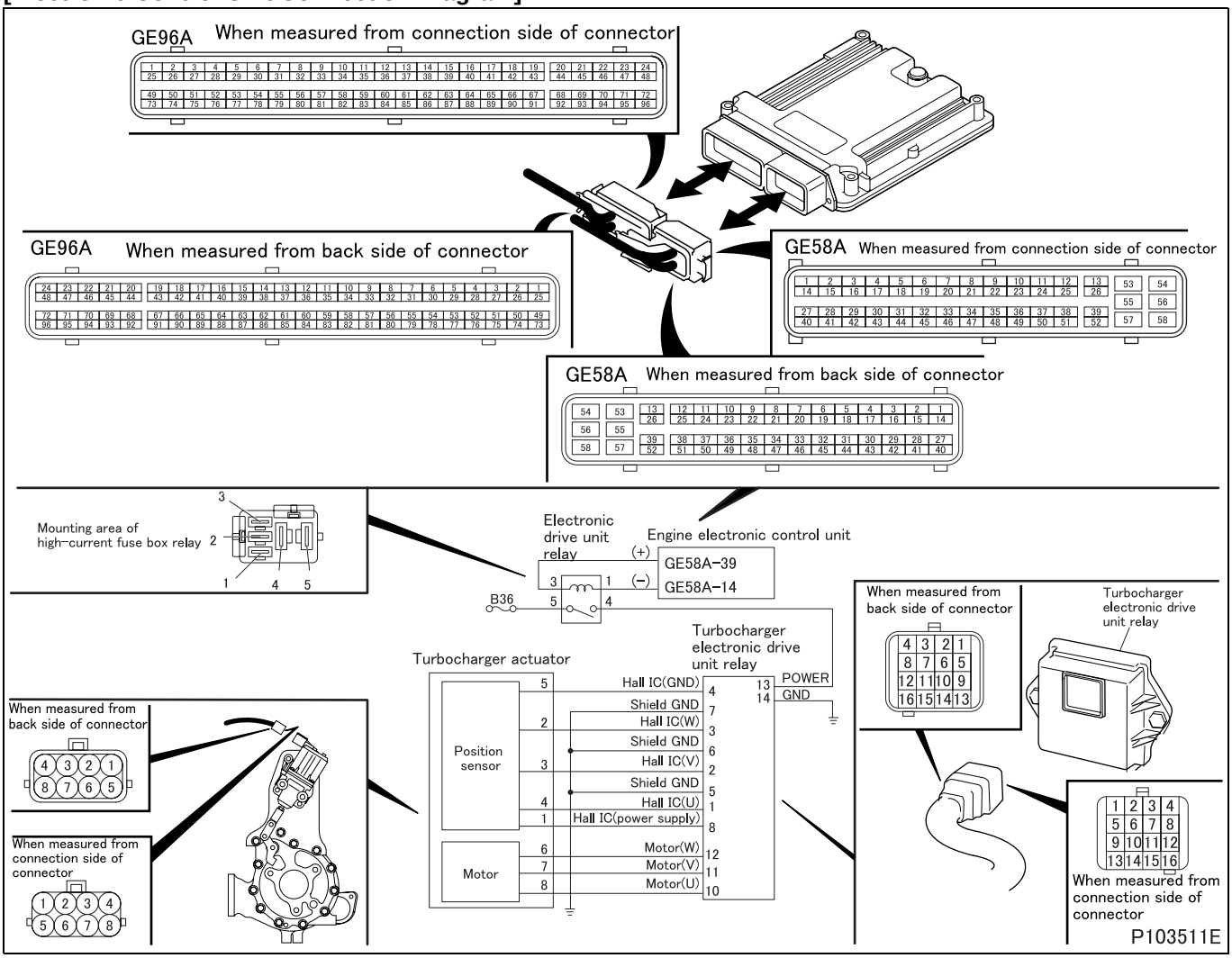
[Diagnostic requirement]
- Controller area network communication in order

[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.

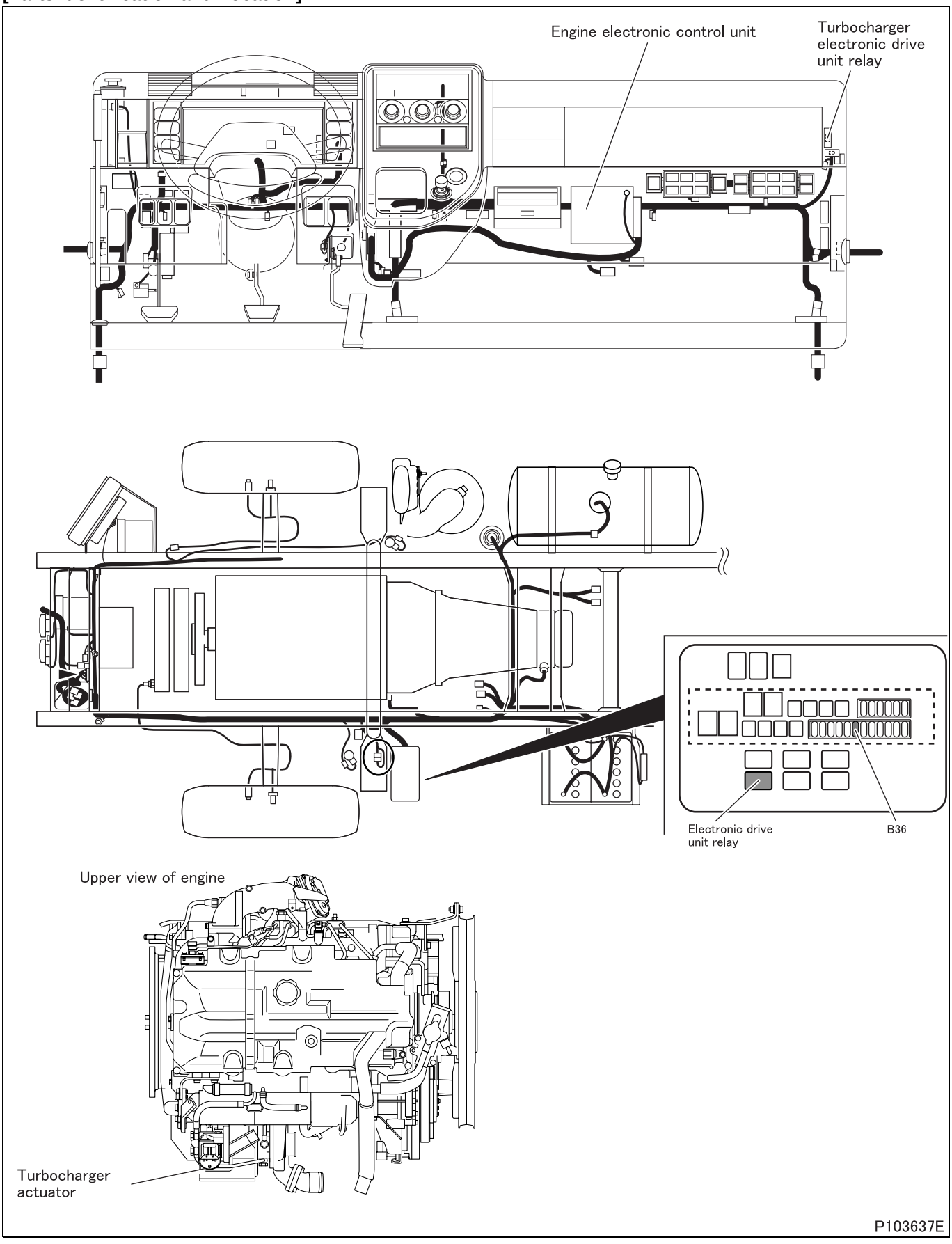
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between electronic drive unit and turbocharger actuator
- Malfunction of each connector
- Malfunction of turbocharger motor (built in turbocharger actuator)
- Malfunction of turbocharger position sensor (built in turbocharger actuator)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



[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		Check if following diagnosis codes occur simultaneously. • P0685 “EDU Relay (Open)” • P0686 “EDU Relay (Low)” • P0687 “EDU Relay (High)” • P0688 “EDU Relay (Over Load)”
	Inspection condition		• Starter switch: ON • Engine: stopped
	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		Inspection of electronic drive unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		NO	Modify connector.

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		• Starter switch: ON • Engine: stopped • Disconnect connector and measure from harness side. • Perform actuator test item No. AF “EDU Relay”.
	Requirements		Same as battery voltage.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 4.

Step 4	Inspection items		Inspection of relay connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Modify connector.

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	Go to step 6.
		NO	Modify harness.

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.)

[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. • P0093 “CRS (Fuel Leak)” • P0148 “CRS (Fuel Delivery)” • P0191 “CRS Pressure SNSR (Plausibility)” • P0192 “CRS Pressure SNSR (Low)” • P0193 “CRS Pressure SNSR (High)” • P0201 “Injector M/V-Cylinder 1 (Load)” • P0202 “Injector M/V-Cylinder 2 (Load)” • P0203 “Injector M/V-Cylinder 3 (Load)” • P0204 “Injector M/V-Cylinder 4 (Load)” • P0261 “Injector #1-A (Low)” • P0262 “Injector #1-A (High)” • P0263 “Injector #1-A (Plausibility)” • P0264 “Injector #2-A (Low)” • P0265 “Injector #2-A (High)” • P0266 “Injector #2-A (Plausibility)” • P0267 “Injector #3-A (Low)” • P0268 “Injector #3-A (High)” • P0269 “Injector #3-A (Plausibility)” • P0270 “Injector #4-A (Low)” • P0271 “Injector #4-A (High)” • P0272 “Injector #4-A (Plausibility)” • P0562 “Power Supply Voltage (Low)” • P0563 “Power Supply Voltage (High)” • P0607 “ECU System” • P060B “A/D Converter” • P061B “ECU Performance (Calc)” • P061C “ECU Performance (Ne)”
	Inspection condition		• Starter switch: ON • Do not start engine
	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

Step 11	Inspection items		Inside inspection of combustion chamber
	Maintenance item		Check for fuel leak.
	Inspection condition		• After performing actuator test item No. B2 “Fuel Leak Check”, stop engine. • Remove glow plug, and check from glow plug mounting hole using bore scope.
	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.

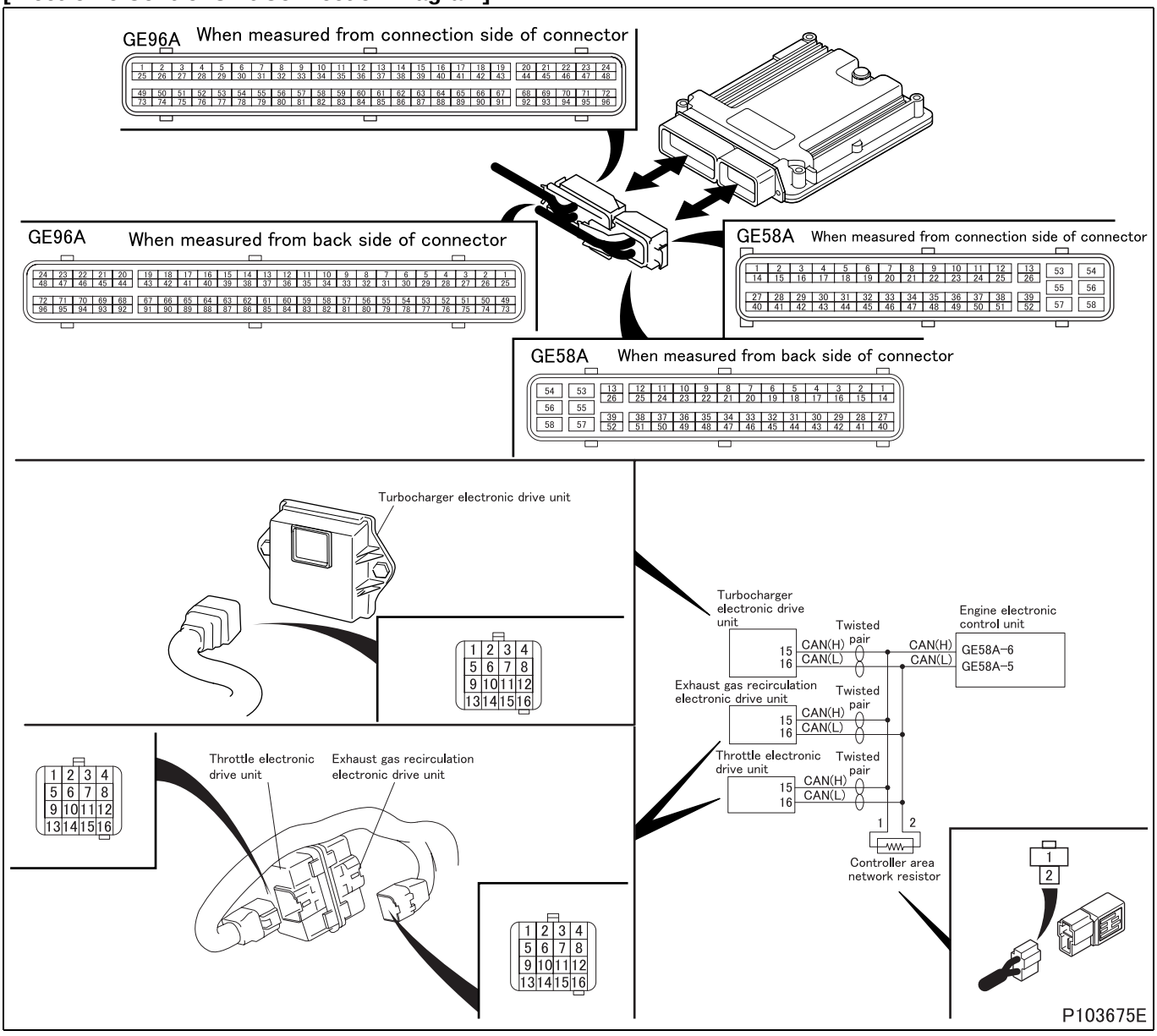
[Diagnostic requirement]
- When engine is in normal condition during period from after-run to start.

[Control effected by electronic control unit during fault]
- Related fault check is stopped.

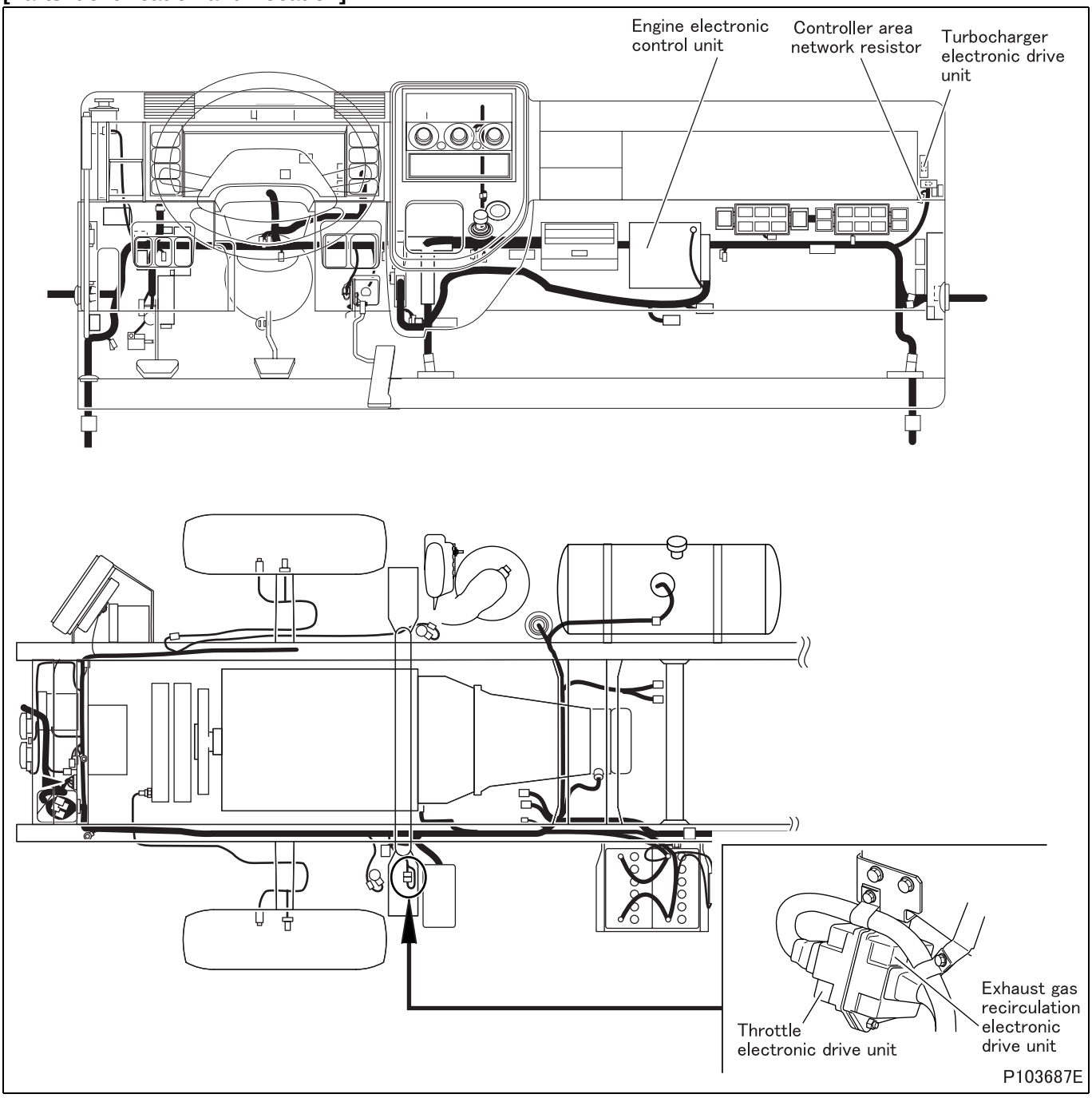
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between engine electronic control unit and each electronic drive unit (turbocharger, exhaust gas recirculation, throttle)
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of each electronic 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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[Fault diagnosis]

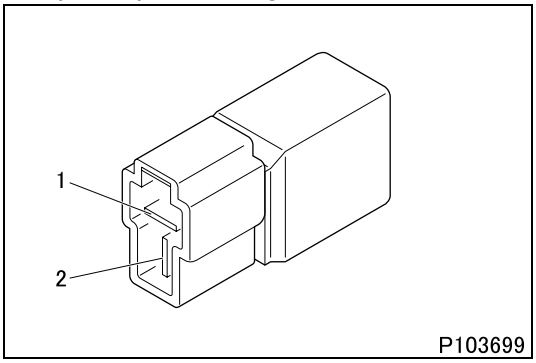
- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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: 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.

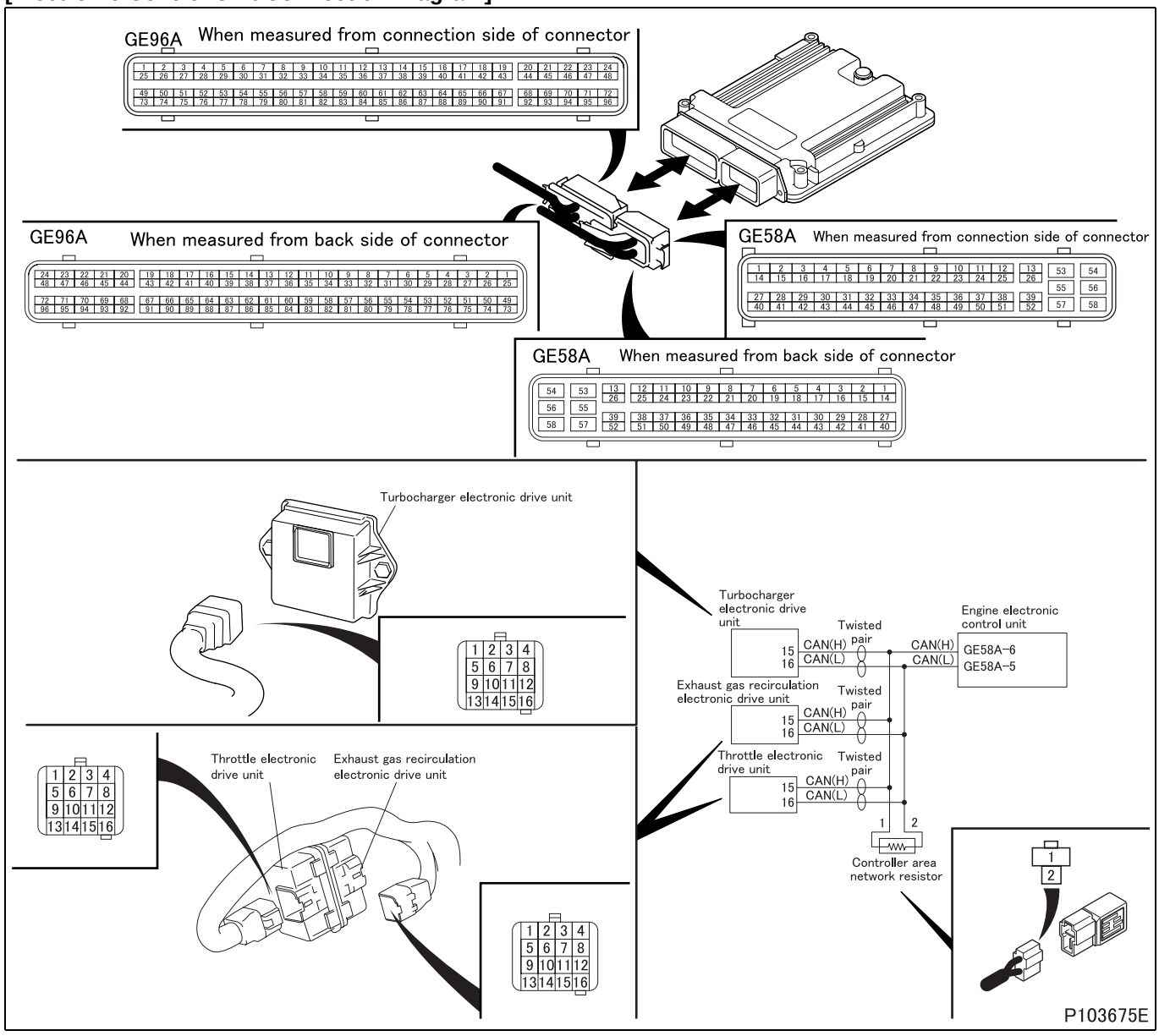
[Diagnostic requirement]
–

[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.

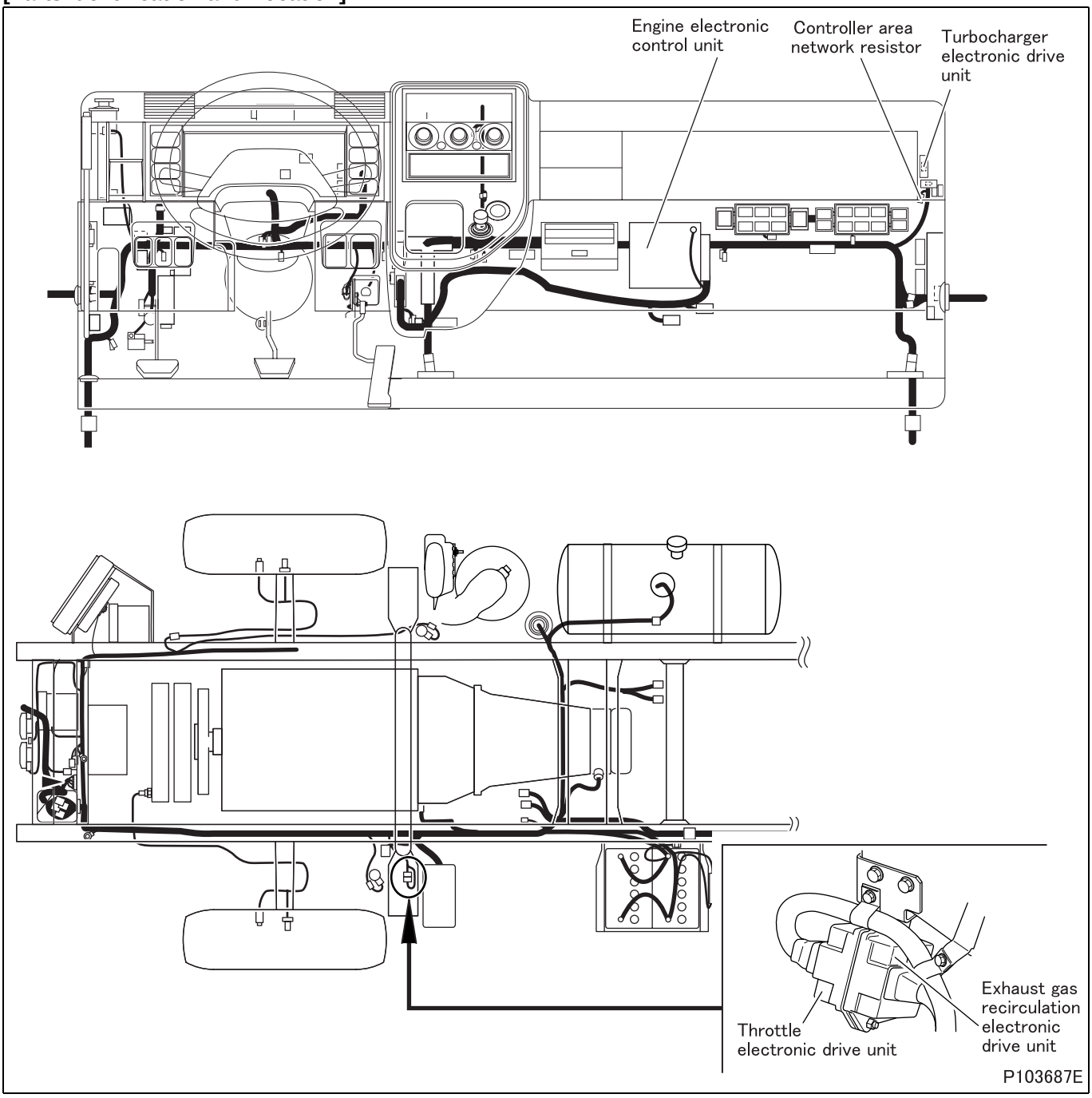
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between engine electronic control unit and each electronic drive unit (turbocharger, exhaust gas recirculation, throttle)
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of each electronic 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]



[Parts Identification and Location]



[Fault diagnosis]

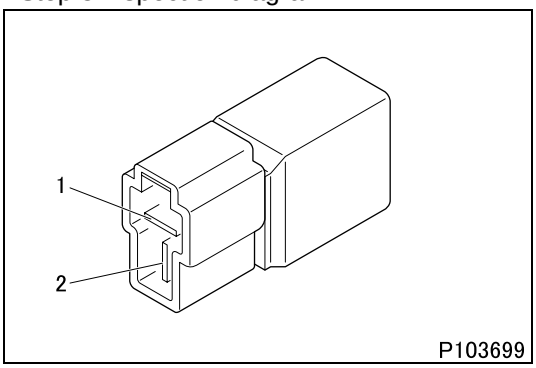
- Perform checks in the sequence of the following steps.

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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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. 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

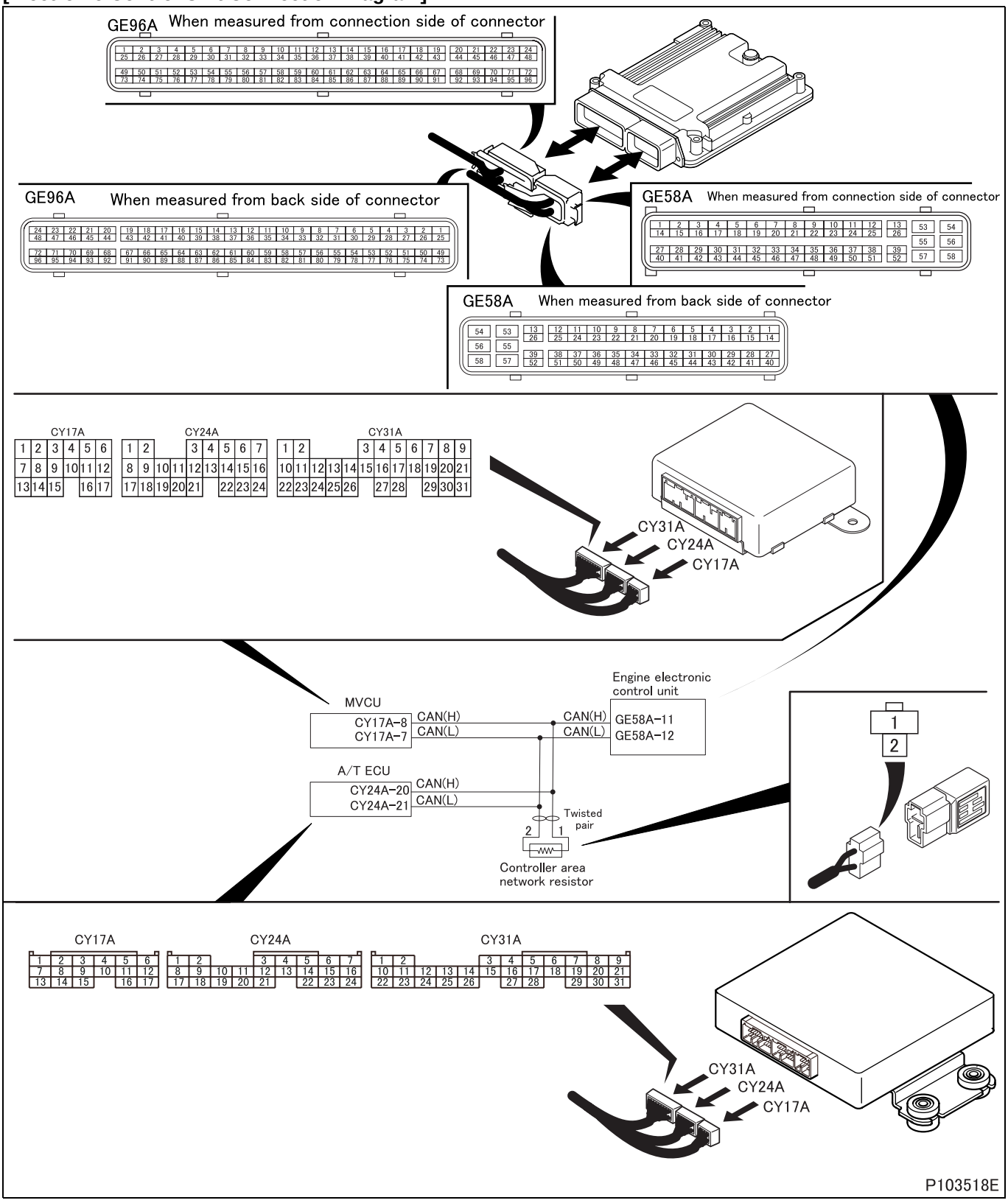
[Diagnostic requirement]
- When engine is in normal condition during period from after-run to start.

[Control effected by electronic control unit during fault]
- Effects no special control.

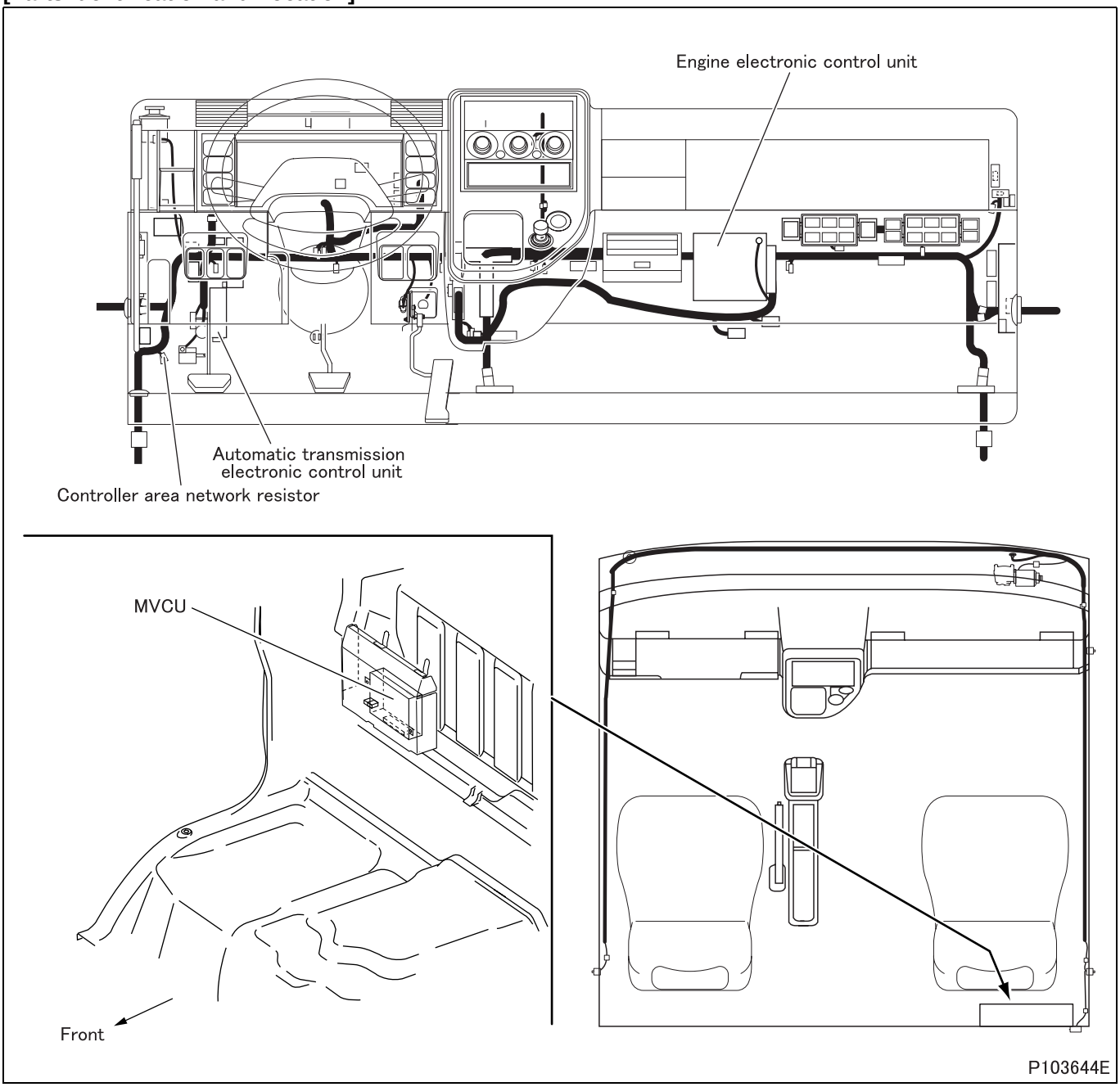
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between engine electronic control unit and each electronic control unit (automatic transmission, multifunction vehicle control unit)
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of 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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[Fault diagnosis]

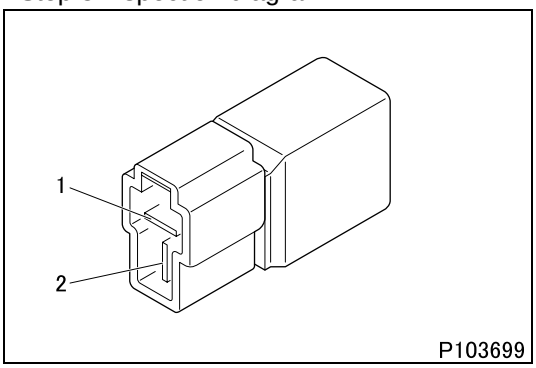
- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 10.
		NO	Modify connector.

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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

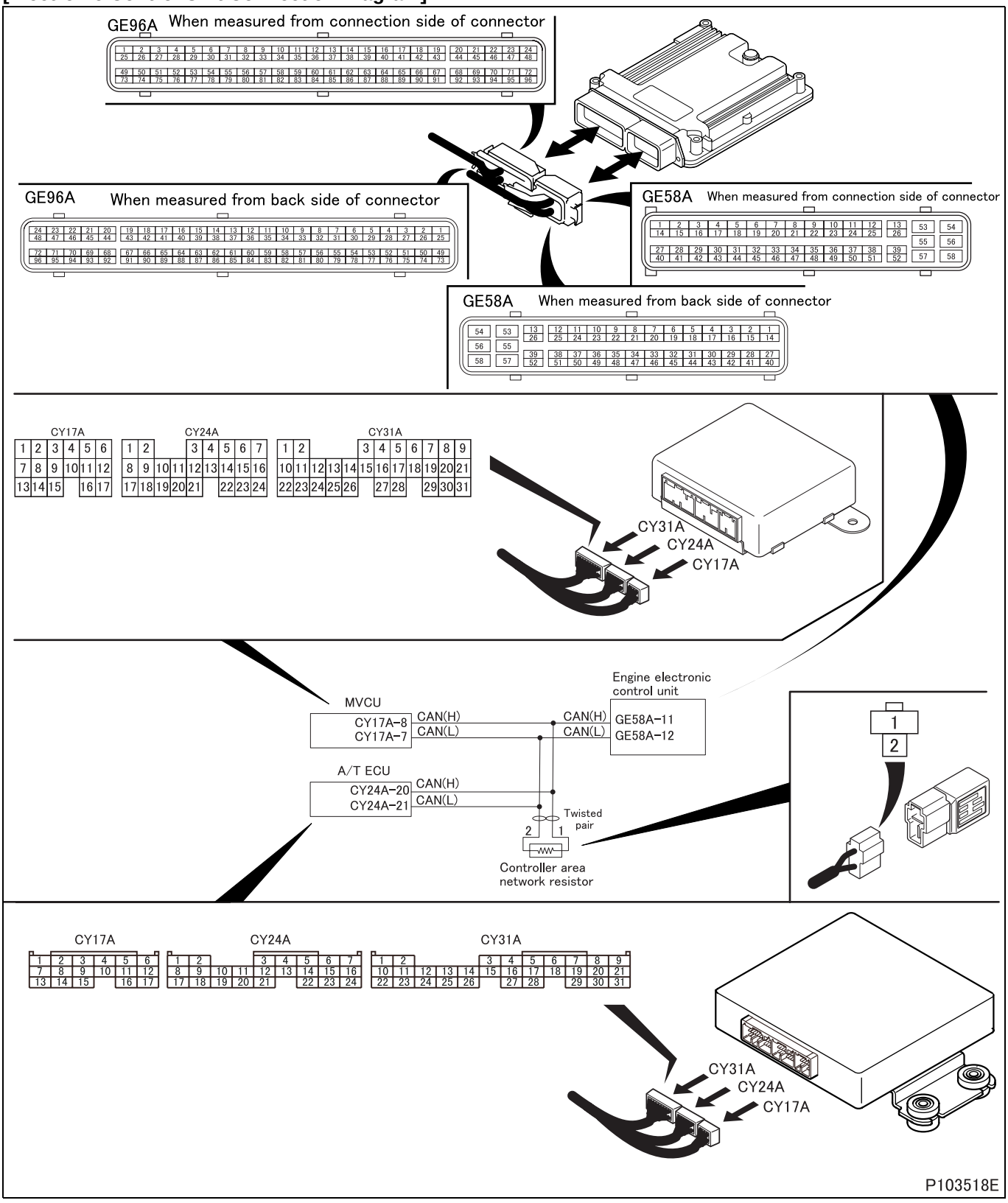
[Diagnostic requirement]
–

[Control effected by electronic control unit during fault]
- Auto cruise control stopped
- Speed limitation device control is stopped.
- Traction control is stopped. <Automatic transmission>

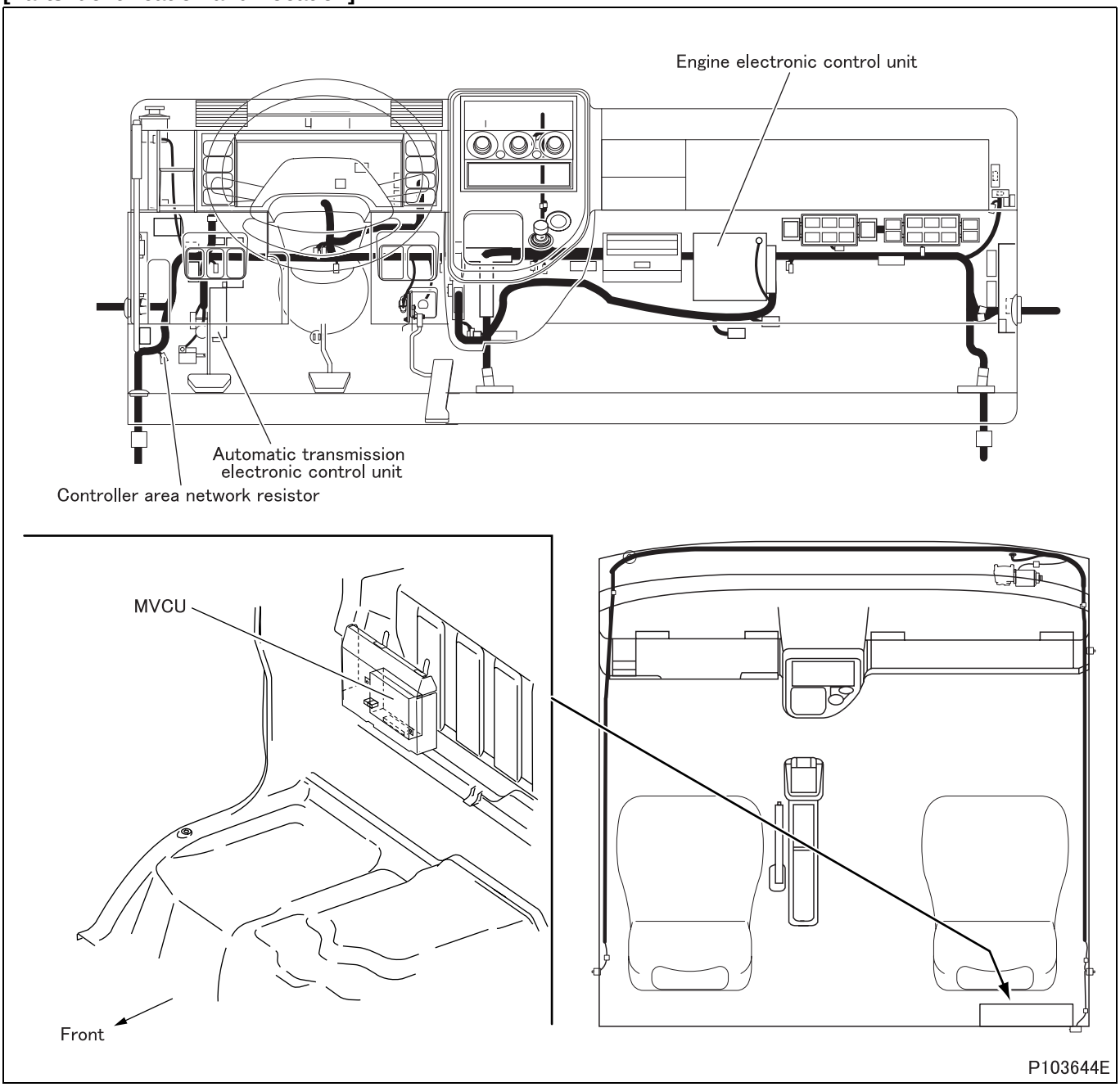
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between engine electronic control unit and each electronic control unit (automatic transmission, multifunction vehicle control unit)
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of 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.)

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[Fault diagnosis]

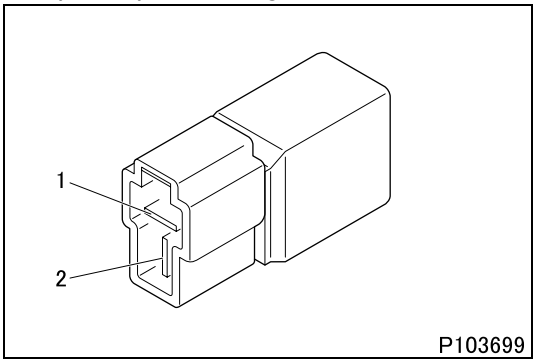
- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 10.
		NO	Modify connector.

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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

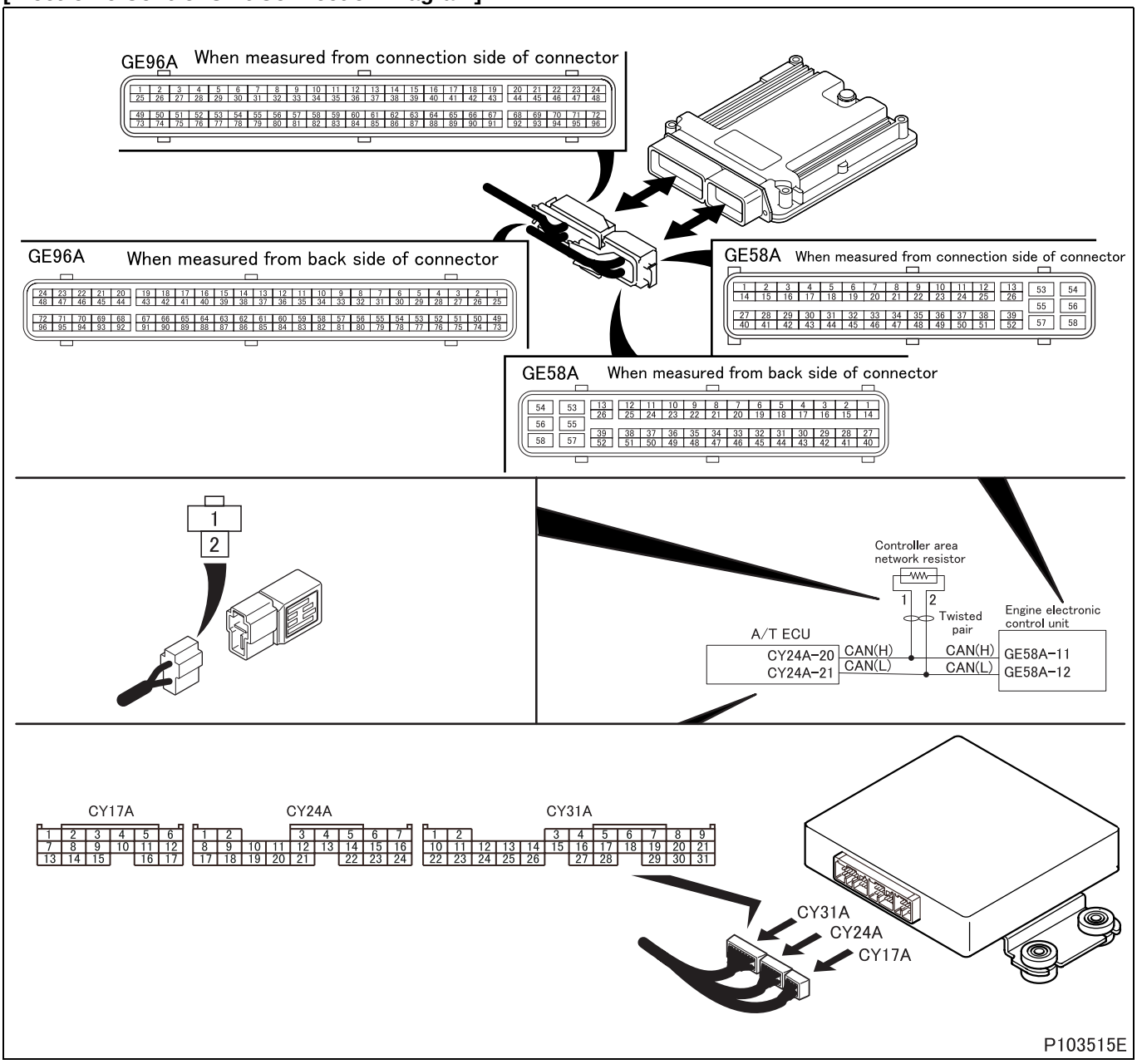
[Probable cause of trouble]
- Open-circuit or short-circuit of harness between engine electronic control unit and automatic transmission electronic control unit
- Malfunction of each connector
- Malfunction of engine electronic control unit
- Malfunction of automatic transmission electronic control unit

[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.)

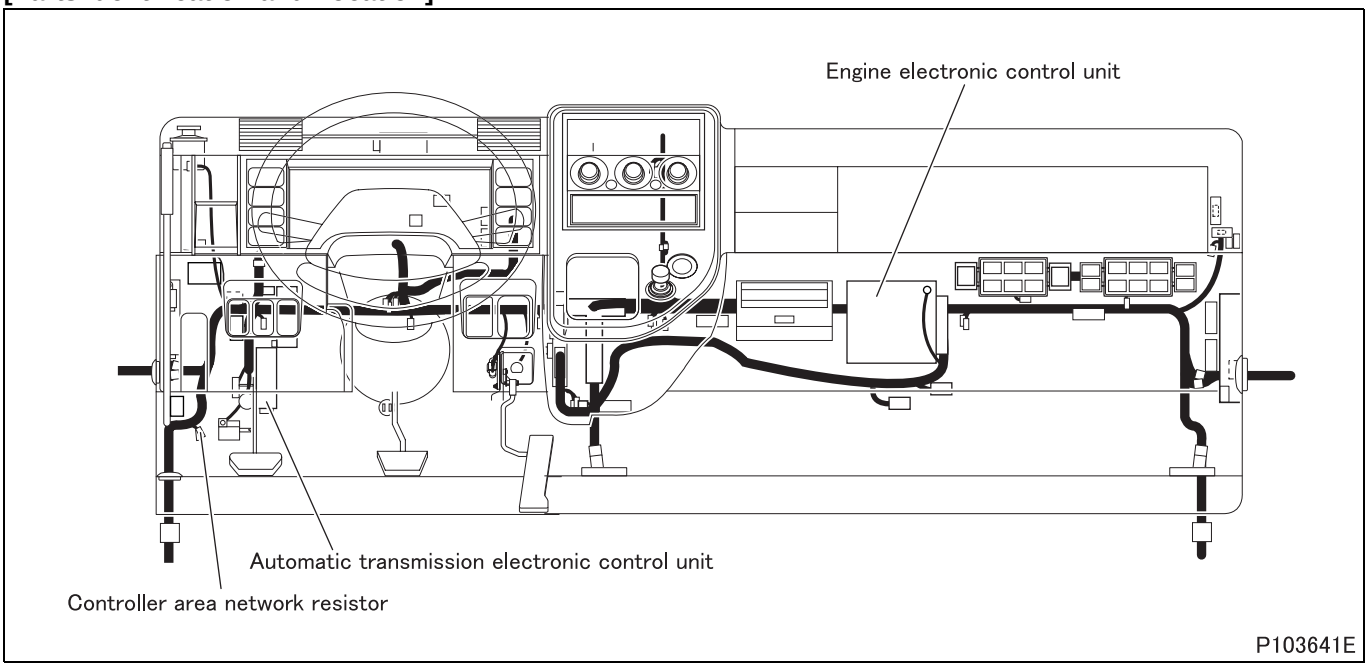
<Condition (1)>
- Code is cleared simultaneously with recovery.

<Condition (2)>
- Lamp is extinguished and code is cleared at fourth diagnosis code display after recovery.

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[Fault diagnosis]

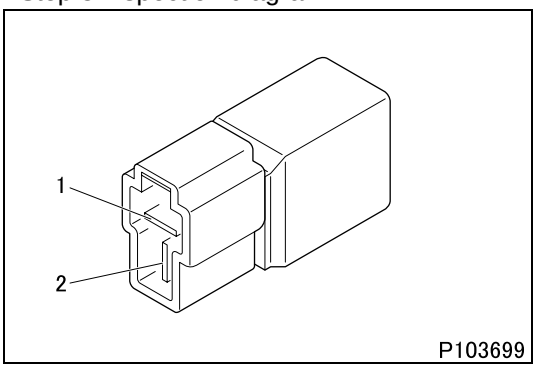
- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by 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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	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.

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/ 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/ 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

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> Normally <Automatic transmission> Change lever in N position	OFF
			[Actuator test] B4: Idle Up Canel 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 • Accelerator and clutch pedals are pressed • Transmission in neutral position • Anti-lock brake system in operation	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 (Do not start engine)	ON
			No error after engine startup	OFF
			[Actuator test] B0: MIL	
B7	Diagnosis Lamp	ON/OFF	Starter switch ON (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	

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
$22	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
$21	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
$09	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 $E1: Boost

Test ID	Description of test data	Description of test limit	Conversion factor
$23	Boost pressure	Malfunction criteria for turbocharger actuator deviation	0.001 kPa per bit

Monitor ID $E2: DPF

Test ID	Description of test data	Description of test limit	Conversion factor
$24	Filter pressure drop	Malfunction criteria for soot and ash loadings	0.001 kPa per bit

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 NOTE: 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. [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral or P range • Diagnosis switch: OFF (fuse removed)	Check that exhaust gas recirculation valve opening changes. [Service data] 51: Actual EGR Valve Position
A3	Intake Throttle 1	Intake throttle valve opening maintained as commanded by Multi-Use Tester [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral or P range • Diagnosis switch: OFF (fuse removed)	Check that throttle valve opening changes. [Service data] 53: Actual Intake Throttle Position
A4	VGT 1	Turbocharger opening maintained as commanded by Multi-Use Tester NOTE: • Set turbocharger opening to the range of 20 to 80%. • 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. [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral or P range • Diagnosis switch: OFF (fuse removed)	Check that turbine vane opening changes. Used for boost pressure measurement/adjustment (See Gr15.) [Service data] 54: Target VGT Position 55: Actual VGT Position
A5	DPF Regeneration (Manual)	Request is output for manual diesel particulate filter regeneration [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Engine: Idling • Parking brake: Vehicle parked (parking brake switch: ON) • After engine warm-up	• Check that diesel particulate filter indicator lamp flickers • Manual diesel particulate filter regeneration started with diesel particulate filter cleaning switch ON and engine speed increased. [Service data] A4: DPF SW
A6	DPF Lamp	Diesel particulate filter indicator lamp turned ON/OFF [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON • Engine: Idling • Transmission: neutral or P range	Check that indicator lamp is turned on and off [Service data] 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 NOTE: • Set turbocharger opening to the range of 20 to 80%. • 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. [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON (engine started) • Transmission: neutral or P range • Diagnosis switch: OFF (fuse removed) • 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).	Check that exhaust gas recirculation, intake throttle and turbine vane valve openings change. Used for boost pressure measurement/adjustment (See Gr15.) [Service data] 51: Actual EGR Valve Position 53: Actual Intake Throttle Position 55: Actual VGT Position
AA	Auxiliary Brake M/V 1	Exhaust shutter 3-way magnetic valve driving signal [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON • Engine: stopped	Magnetic valve operating sound [Service data] B0: Auxiliary Brake M/V 1
AB	Auxiliary Brake Indicator Lamp	Exhaust brake indicator lamp driving signal [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON • Engine: stopped	Check that indicator lamp is turned on and off [Service data] B1: Auxiliary Brake Indicator Lamp
AC	Relay for Glow Relay	ON/OFF switchover of glow drive relay [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON • Engine: stopped	Relay operating sound [Service data] B2: Glow Relay
AD	Glow Indicator Lamp	Preheating indicator lamp driving signal [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON • Engine: stopped	Check that indicator lamp is turned on and off [Service data] B3: Glow Indicator Lamp
AE	Starter Safety Relay	ON/OFF switchover of starter continuous power-on preventive relay (safety relay) [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON • Engine: stopped	Relay operating sound [Service data] 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). [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON • Engine: stopped	Relay operating sound [Service data] B5: EDU Power Relay
B0	MIL	Engine warning lamp (orange) driving signal [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Transmission: neutral or P range • Engine: stopped	Check that warning lamp (orange) is turned on and off [Service data] B6: MIL
B1	Diagnosis Lamp	Engine warning lamp (red) driving signal [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Transmission: neutral or P range • Engine: stopped	Check that warning lamp (red) is turned on and off [Service data] B7: Diagnosis Lamp

No.	Item	Description	Check method
B2	Fuel Leak Check	Rail pressure is increased for a certain period of time (6 seconds). [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Transmission: neutral or P range • Diagnosis switch: OFF (fuse removed)	Check for leakage from fuel system.
B3	Air Conditioner SW	ON/OFF switchover of air conditioner operation (idle up control) is performed. [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Transmission: neutral or P range • Engine: Idling	Check that engine speed increases and decreases. [Service data] AA: AC SW
B4	Idle Up Cancel SW	ON/OFF switchover of idle up inhibited status [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Transmission: neutral or P range	Check that idling speed remains low. [Service data] A9: Idle Up Cancel SW
B5	GCU (GLOW PLUG)	ON/OFF switchover of the glow plugs [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Starter switch: ON • Engine: stopped	Check to see that the glow plugs are energized.
BB	Injector Test 1	Selected injector magnetic valve is forced to stop. [Can be executed under following conditions] • Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Engine speed: 1500 rpm or less • Transmission: neutral • The current diagnosis code does not occur.	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, contact your nearest STERLING TRUCKS dealer or STERLING TRUCKS CORPORATION.

Disposition of equipment \ 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
Engine electronic control unit	Replaced with new unit	O	O	O	O	O	O	
	Relocated from other vehicle	O	O	O	O	O	O	
	Erasure of diagnosis codes							No action is required.
Replacement of injector			O					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						O		

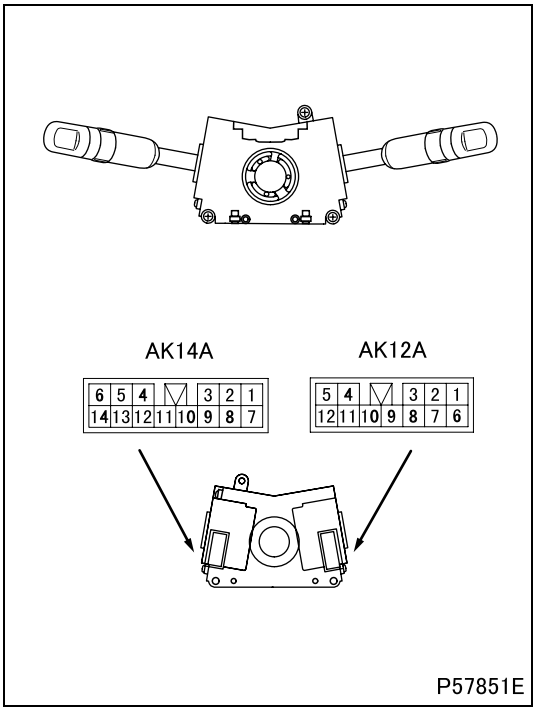
O : Denotes the necessity of data being updated or registered.

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

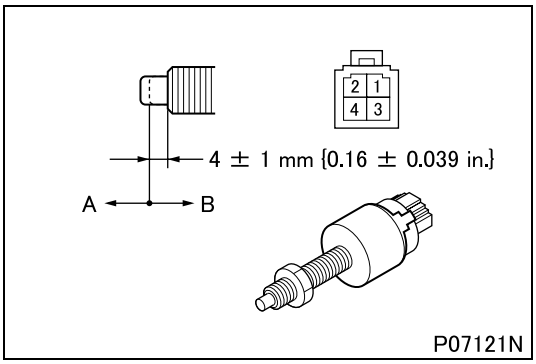


#001 Inspection of combination switch

AK14A connector connection table

Switch position		Terminals with continuity
Exhaust brake switch	OFF	–
	ON	8 - 9

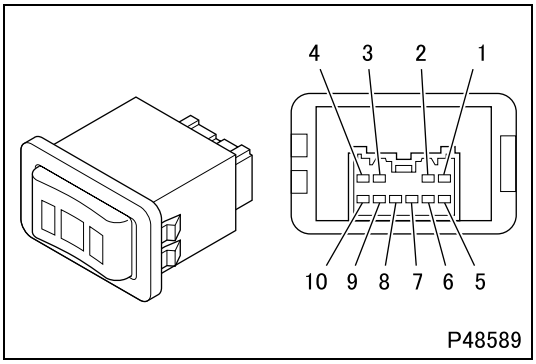
- For other inspections than shown above, see Electrical.
- If there is any abnormality, replace the switch.



#031 Inspection of clutch switch

Switch position	Terminals with continuity
A	1 - 4
B	2 - 3

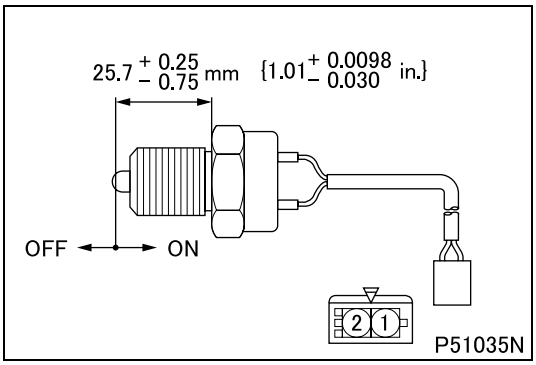
- If there is any abnormality, replace the switch.



#089 Inspection of DPF cleaning switch

Switch position	Terminals with continuity	Night lighting
–	1 - 8	(+) 6 - 2 (–)
ON	1 - 7	

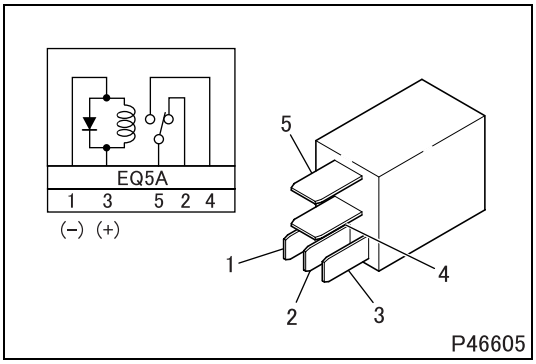
- If there is any abnormality, replace the switch.



#163 Inspection of torque limit switch

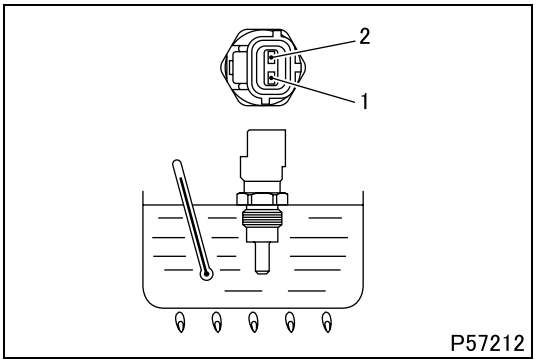
Switch position	Terminals with continuity
OFF	–
ON	1 - 2

- 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.



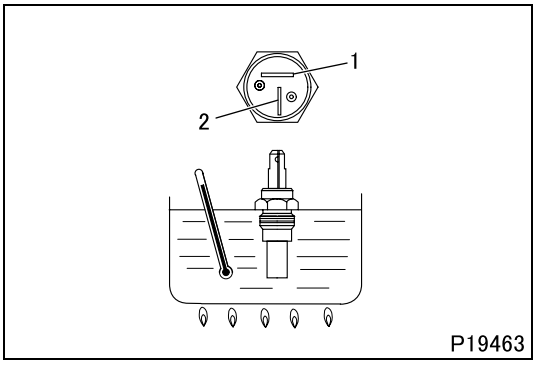
#262 Inspection of water temperature sensor

<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 (reference value)
	110°C {230°F}	147.1 ± 2 Ω

- If the measurement is out of specification, replace the sensor.

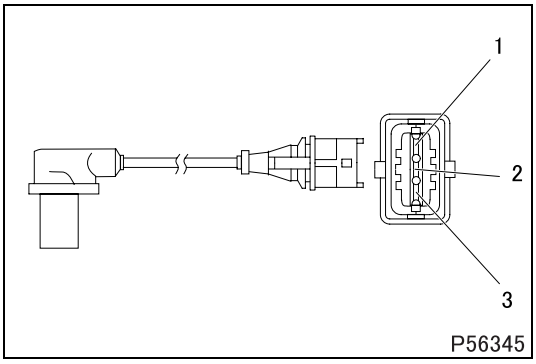


<Water temperature sensor 2>

- 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.

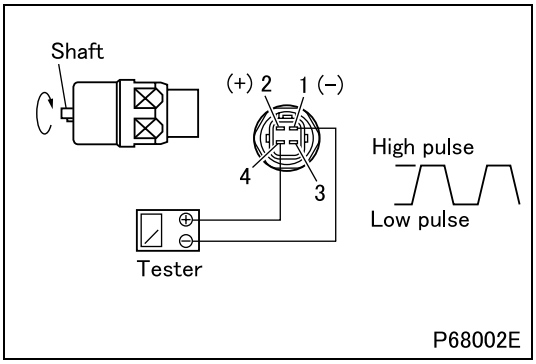


#263 Inspection of engine speed sensor

- 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.

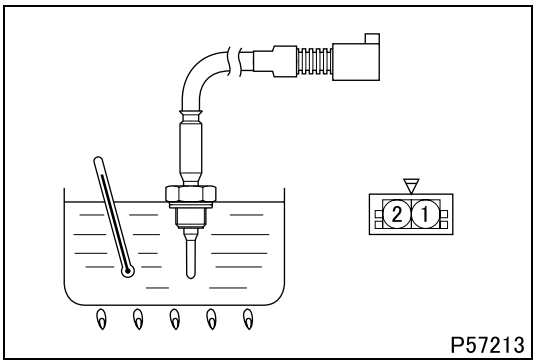


#265 Inspection of vehicle speed sensor

- 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 ± 1 V

- If any measurement is out of specification, replace the sensor.



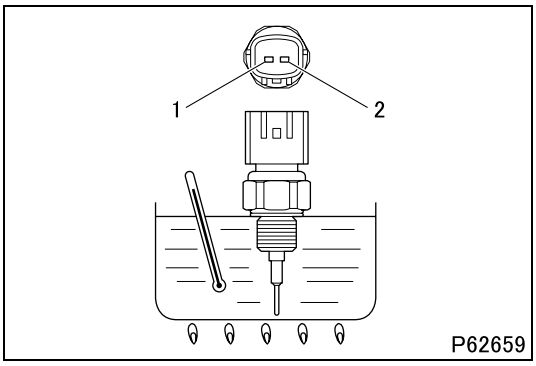
#305 Inspection of air temperature sensor

<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

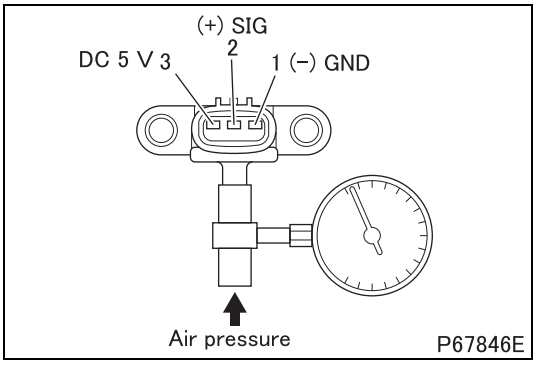
- Remove the existing sensor mounted on the vehicle and install a new sensor in its place.
- Press the accelerator pedal from the idling position all the way down to the stopper bolt. (The engine is running at maximum speed under no load.)
- From “Service Data”, measure intake air flow rate at the same 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

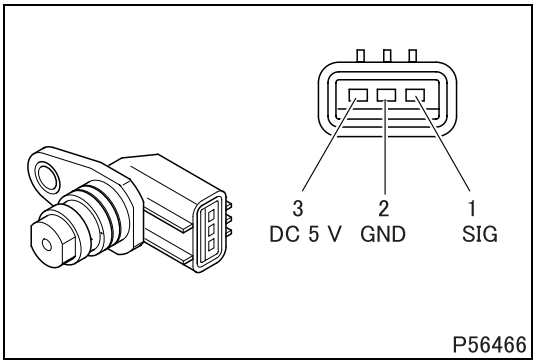
- Apply DC 5 V to terminals 3 and 1.
- Apply air pressure. Gradually increase it and, while doing so, measure the output voltage occurring at terminals 2 and 1.

	Air pressure (gauge reading)	Voltage
Standard value	232.2 kPa {34 psi, 2.3 kg/cm^2}	Approx. 3.2 V
	99 kPa {14 psi, 1.0 kg/cm^2}	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.

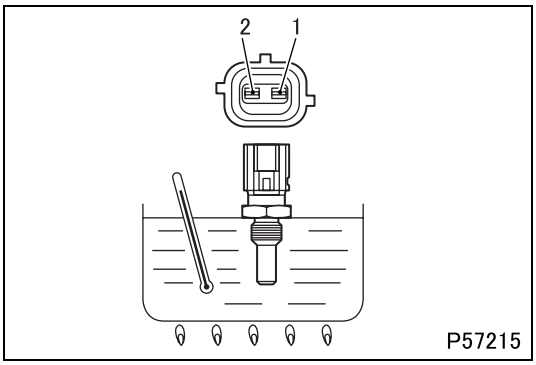


#320 Inspection of cylinder recognition sensor

- Measure the resistance between terminals 2 and 3.

Standard value	200 to 1800 Ω

- If the measurement is out of specification, replace the sensor.

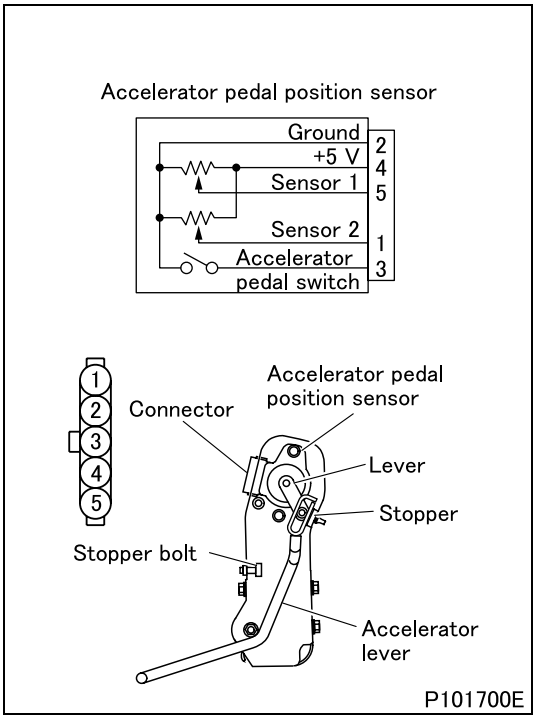


#323 Inspection of fuel temperature sensor

- Measure the resistance between terminals 1 and 2.

Standard value	20°C {68°F}	2.45 $^{+0.14}_{-0.13}$ kΩ
	80°C {176°F}	0.318 ± 0.01 kΩ
	110°C {230°F}	0.1417 ± 0.0018 kΩ

- If any measurement is out of specification, replace the sensor.



#324 Inspection of accelerator pedal position sensor

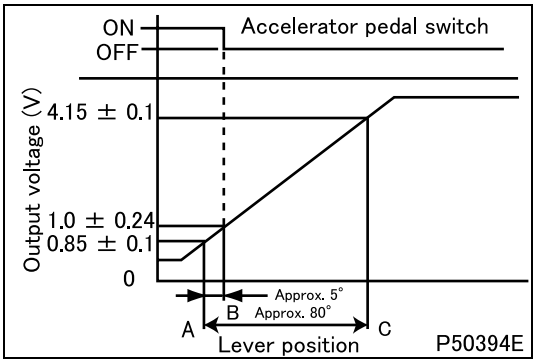
[Inspection]

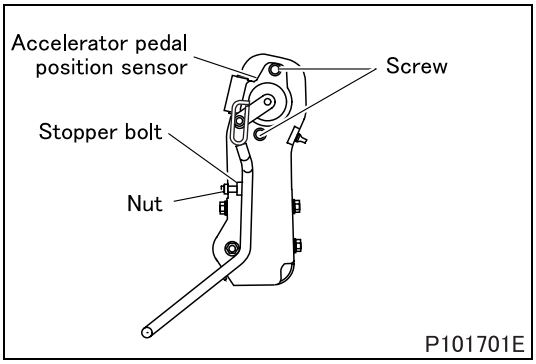
- Apply DC 5 V to terminals 4 and 2 of the accelerator pedal position sensor.
- Measure the output voltage at terminals 2 and 5 (sensor 1) and the output voltage at terminals 1 and 2 (sensor 2) with the accelerator lever in each specified position.

	Accelerator lever position	Output voltage
Standard value	Idling position A	0.85 ± 0.1 V
	Accelerator pedal switch operating position B	1.0 ± 0.24 V
	Full load position C	4.15 ± 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

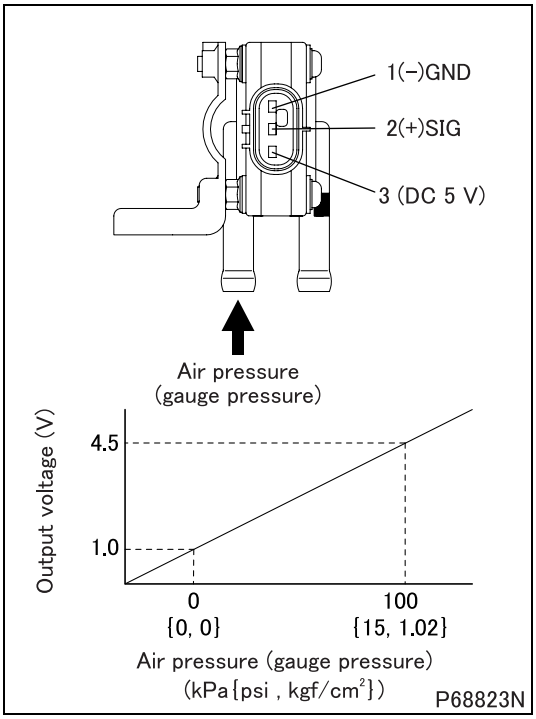
- If any output voltage is out of specification, make an adjustment.
- If any output voltage is still out of specification when you have made an adjustment, replace the sensor.





[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.



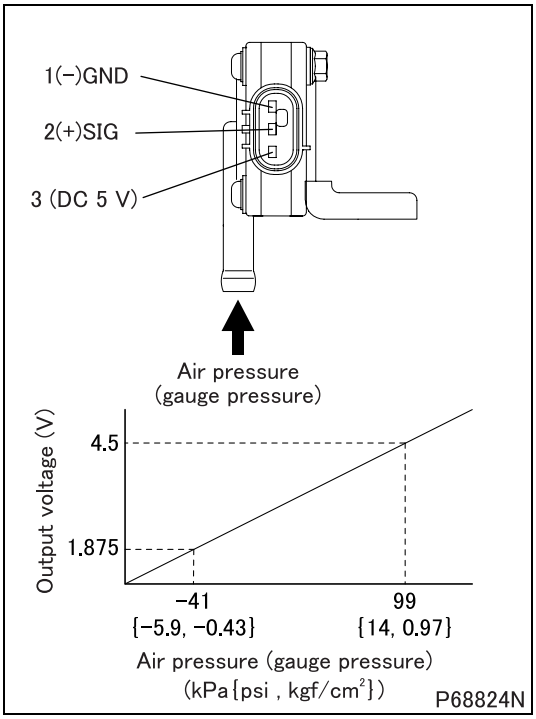
#334 Inspection of DPF pressure sensor

<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^2}	1 V
	100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}	4.5 V

- If the measurement is out of specification, replace the sensor.

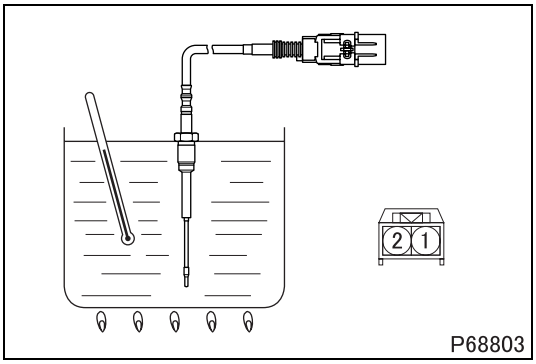


<DPF absolute pressure sensor>

- 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^2}	1.875 V
	99 ± 3.2 kPa {14 ± 0.5 psi, 1.0 ± 0.03 kgf/cm^2}	4.5 V

- If the measurement is out of specification, replace the sensor.



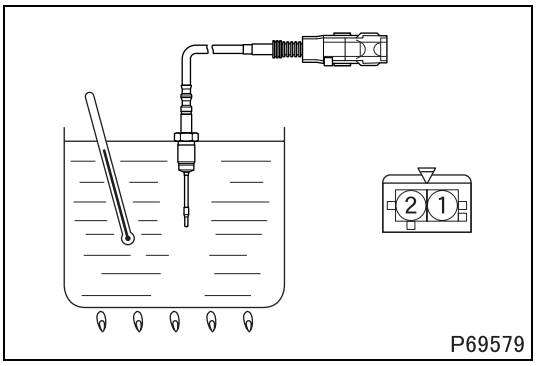
#336 DPF temperature sensor

<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}	$106.2^{+74.3}_{-41.8}$ kΩ
	100°C {212°F}	$33.56^{+17.60}_{-10.60}$ kΩ
	150°C {302°F}	$13.90^{+5.36}_{-3.60}$ kΩ
	200°C {392°F}	$6.896^{+2.064}_{-1.252}$ kΩ

- If the measurement is out of specification, replace the sensor.

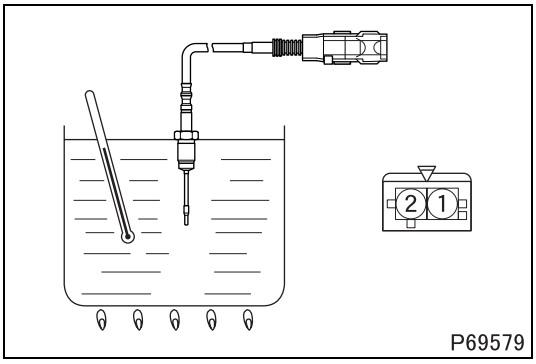


<DPF temperature sensor 2>

- 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}	$106.2^{+74.3}_{-41.8}$ kΩ
	100°C {212°F}	$33.56^{+17.60}_{-10.60}$ kΩ
	150°C {302°F}	$13.90^{+5.36}_{-3.60}$ kΩ
	200°C {392°F}	$6.896^{+2.064}_{-1.252}$ kΩ

- If the measurement is out of specification, replace the sensor.

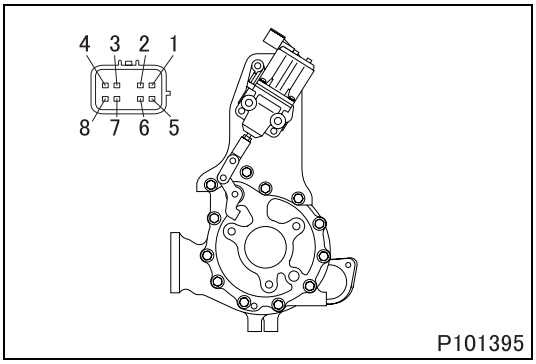


#338 Inspection of catalytic temperature sensor

- 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}	$106.2^{+74.3}_{-41.8}$ kΩ
	100°C {212°F}	$33.56^{+17.60}_{-10.60}$ kΩ
	150°C {302°F}	$13.90^{+5.36}_{-3.60}$ kΩ
	200°C {392°F}	$6.896^{+2.064}_{-1.252}$ kΩ

- If the measurement is out of specification, replace the sensor.



#514 Inspection of turbocharger actuator

- Perform the following checks. If there is any abnormality, replace the turbocharger actuator.

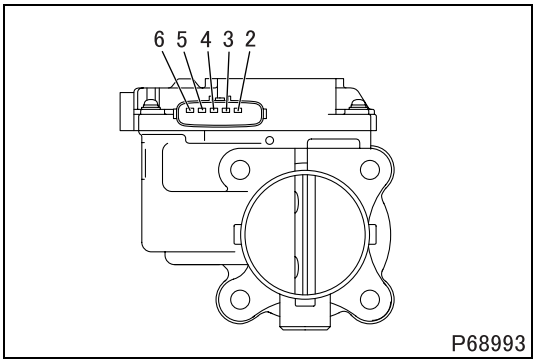
(1) Coil resistance of motor

- 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.



#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.

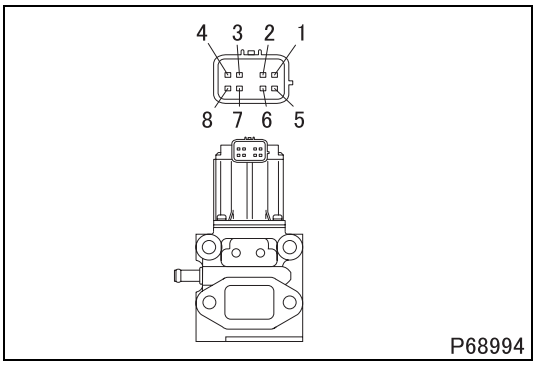
Standard value	0.3 to 80 Ω

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.



#530 Inspection of EGR valve

- Perform the following checks. If there is any abnormality, replace the EGR valve.

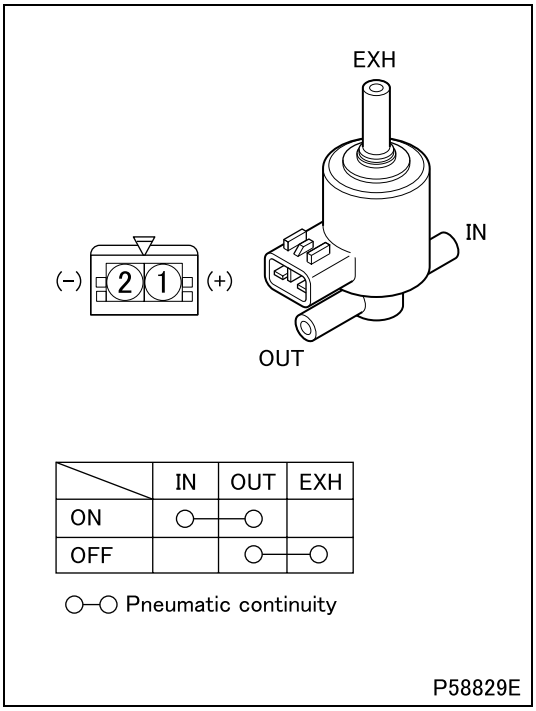
(1) Coil resistance of motor

- 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.



#565 Inspection of exhaust shutter 3-way magnetic valve

- Perform the following checks. If there is any abnormality, replace the exhaust shutter 3-way magnetic valve.

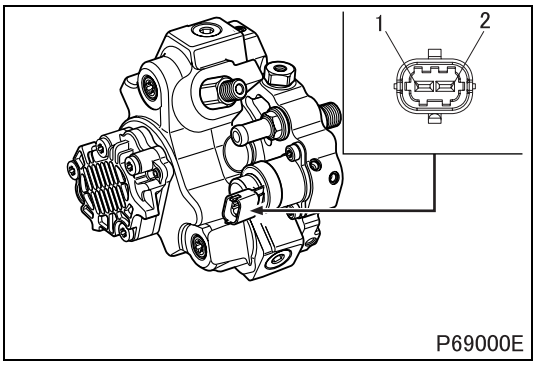
(1) Check of operation

- Gradually increase from zero the voltage applied to terminals 1 and 2.
- Observe the voltage when the exhaust shutter 3-way magenetic 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^2}

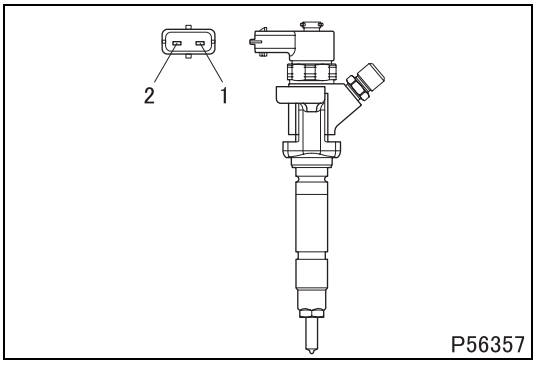


#574 Inspection of MPROP
(rail pressure control valve)

- 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.

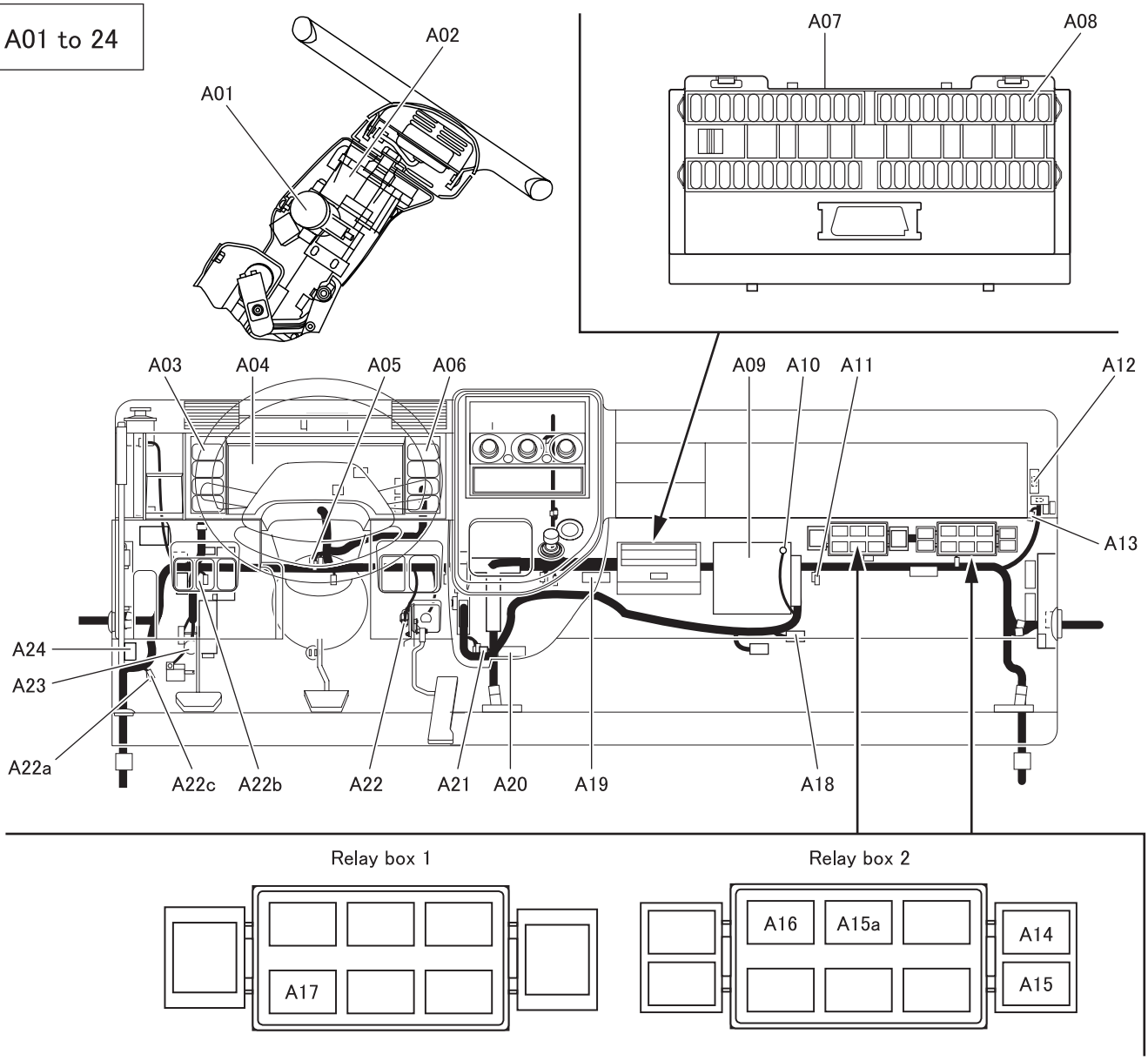
Standard value (at 20°C {68°F})	0.255 ± 0.04 Ω

- 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, contact your nearest STERLING TRUCKS dealer or STERLING TRUCKS CORPORATION.

M E M O

INSTALLED LOCATIONS OF PARTS

A01 to 24



A01 Starter switch
A02 Combination switch
A03 DPF cleaning switch
A04 Meter cluster
A05 Diode
A06 Warm-up switch
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 Multi-Use Tester 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

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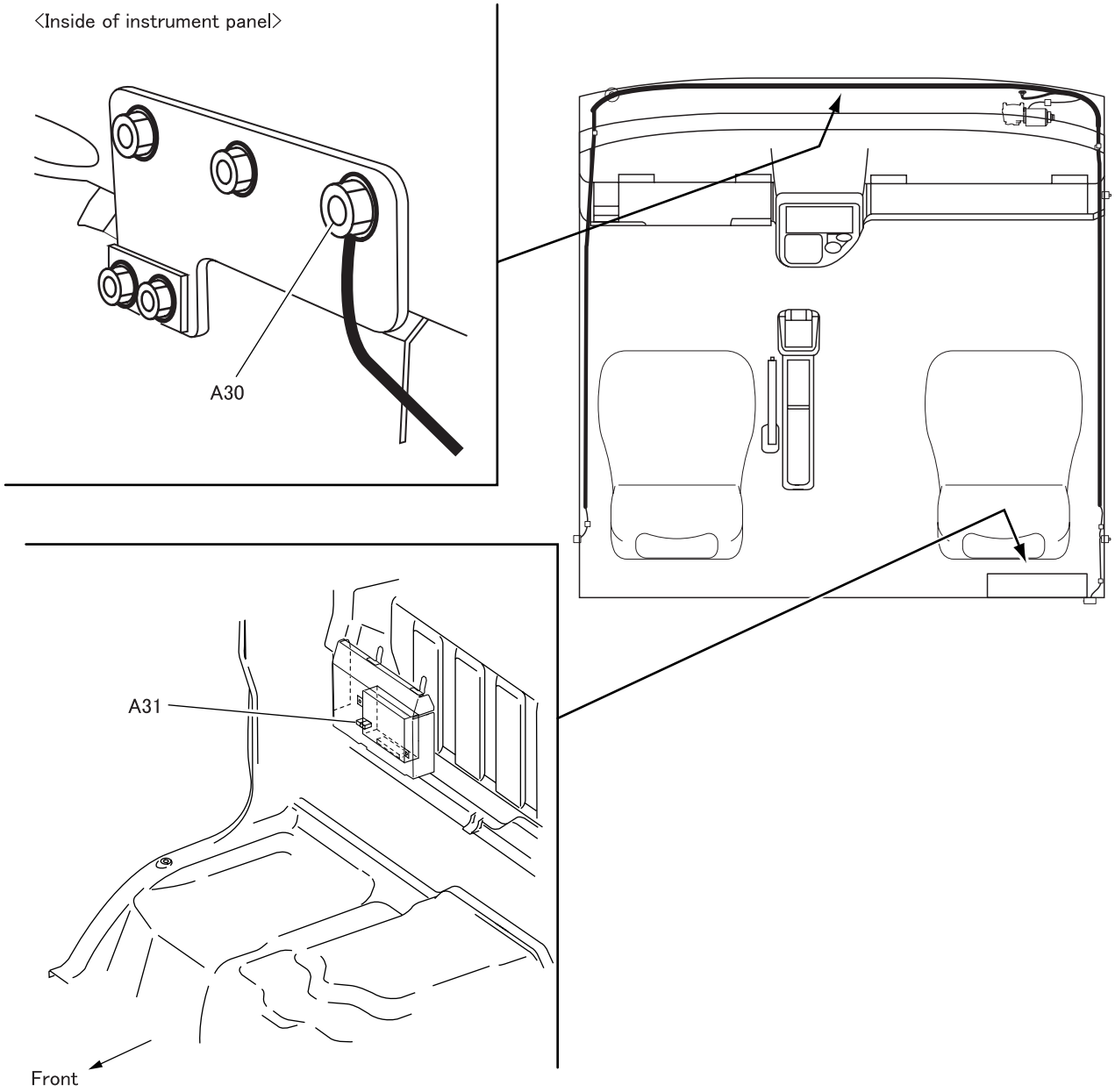
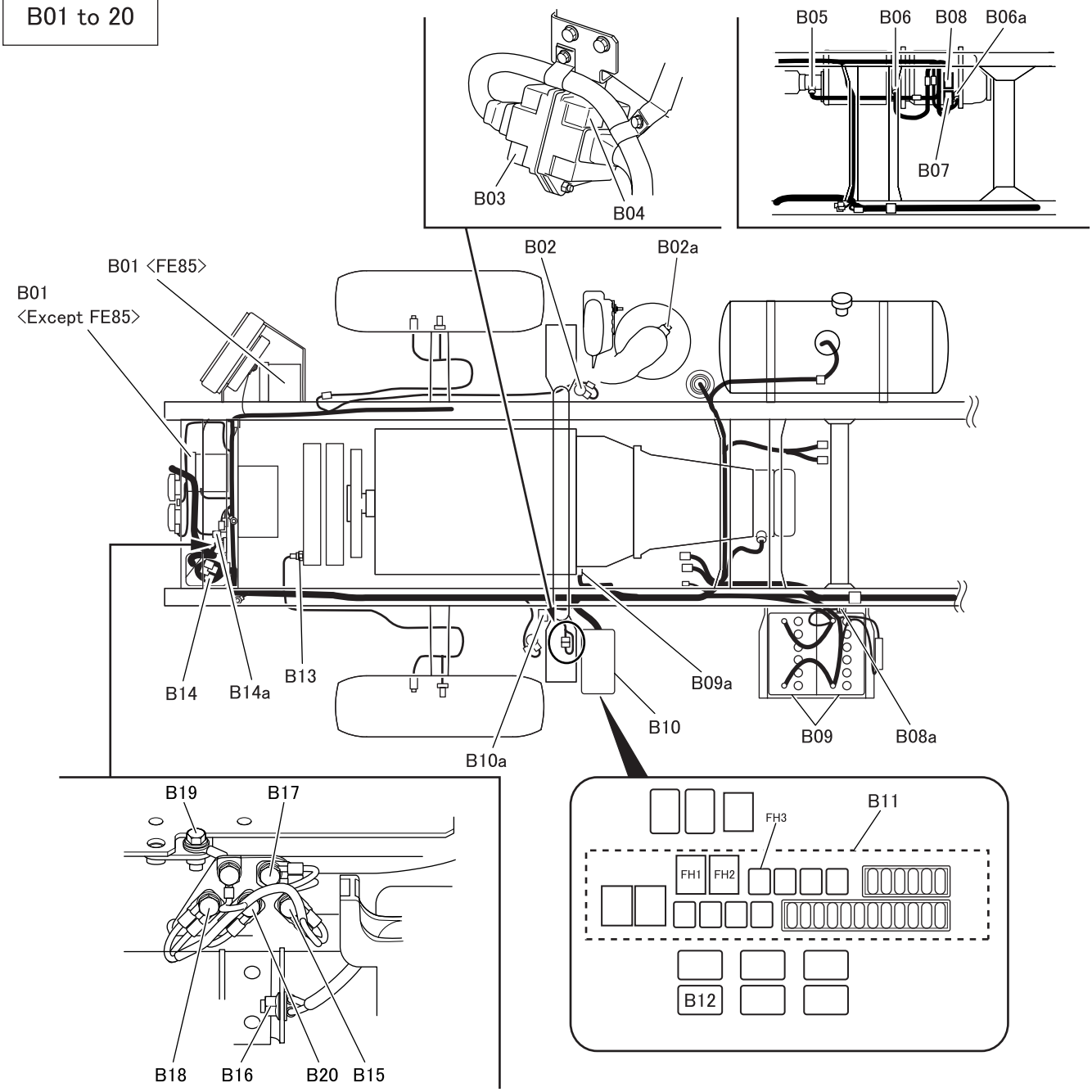
A30-31



A30 Ground
A31 Controller area network resistor

INSTALLED LOCATIONS OF PARTS

B01 to 20



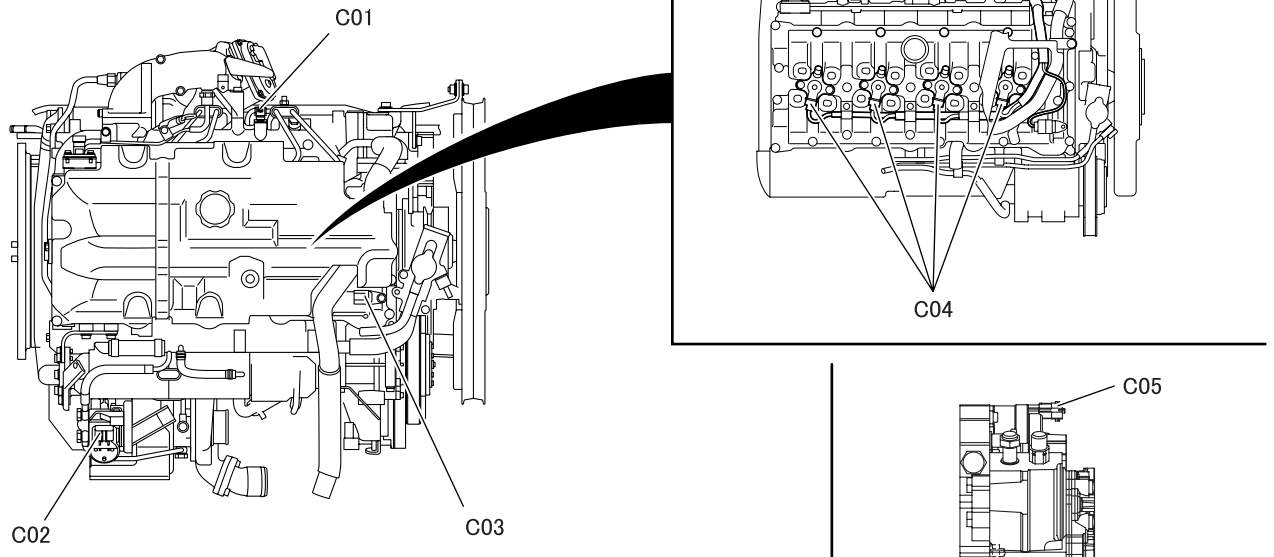
B01 Hydraulic unit
B02 Exhaust shutter 3-way magnetic valve
B02a Air flow sensor
B03 Throttle EDU
B04 EGR EDU
B05 Catalytic temperature sensor
B06 DPF temperature sensor 1
B06a DPF temperature sensor 2
B07 DPF pressure sensor (DIFF)
B08 DPF absolute pressure sensor
B08a Ground
B09 Battery
B09a Ground
B10 High-current fuse box
B10a Glow ECU <FE83>
B11 High-current fuse, fuse
B12 EDU relay
B13 Intake air temperature sensor
B14 Connection of chassis harness and cab harness or engine harness
B14a Connection of cab harness and engine harness
B15 Ground
B16 Ground
B17 Ground
B18 Ground
B19 Ground
B20 Ground

ECU : Electronic control unit
EDU : Electronic drive unit
EGR : Exhaust gas recirculation
DPF : Diesel particulate filter

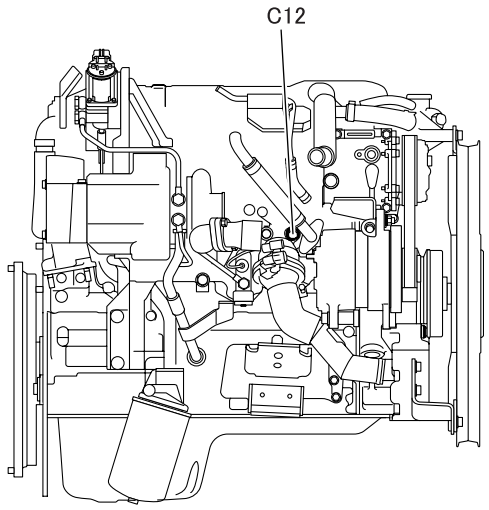
L02383

C01 to 12

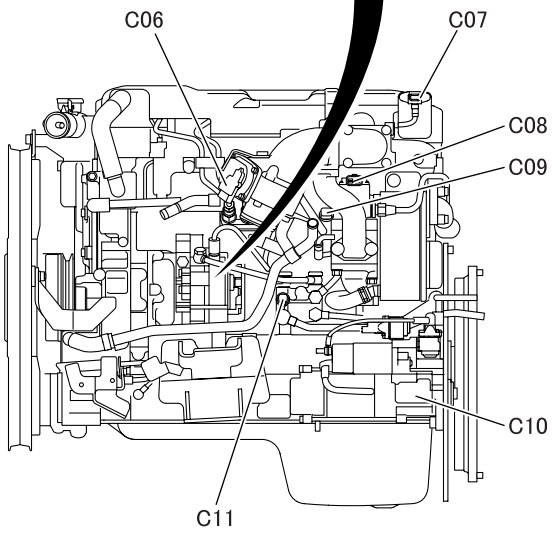
Upper view



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
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

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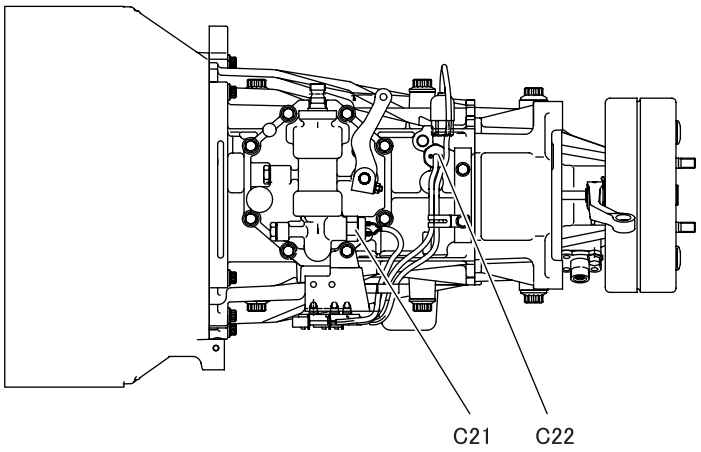
INSTALLED LOCATIONS OF PARTS

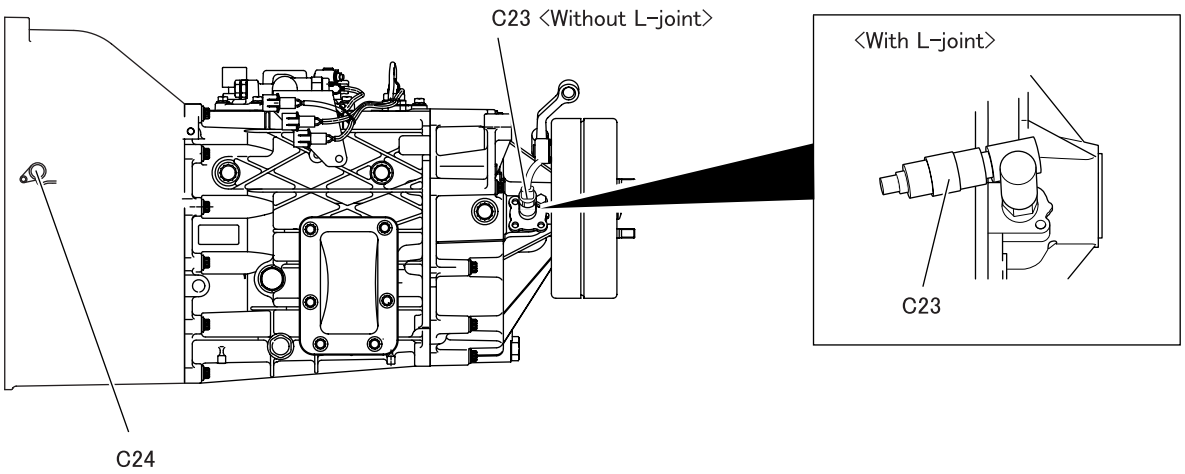
C21 to 24

<Manual transmission>

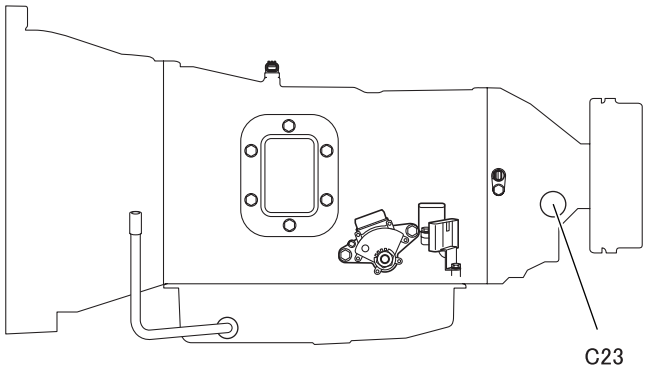
Upper view



Left side view



<Automatic transmission>

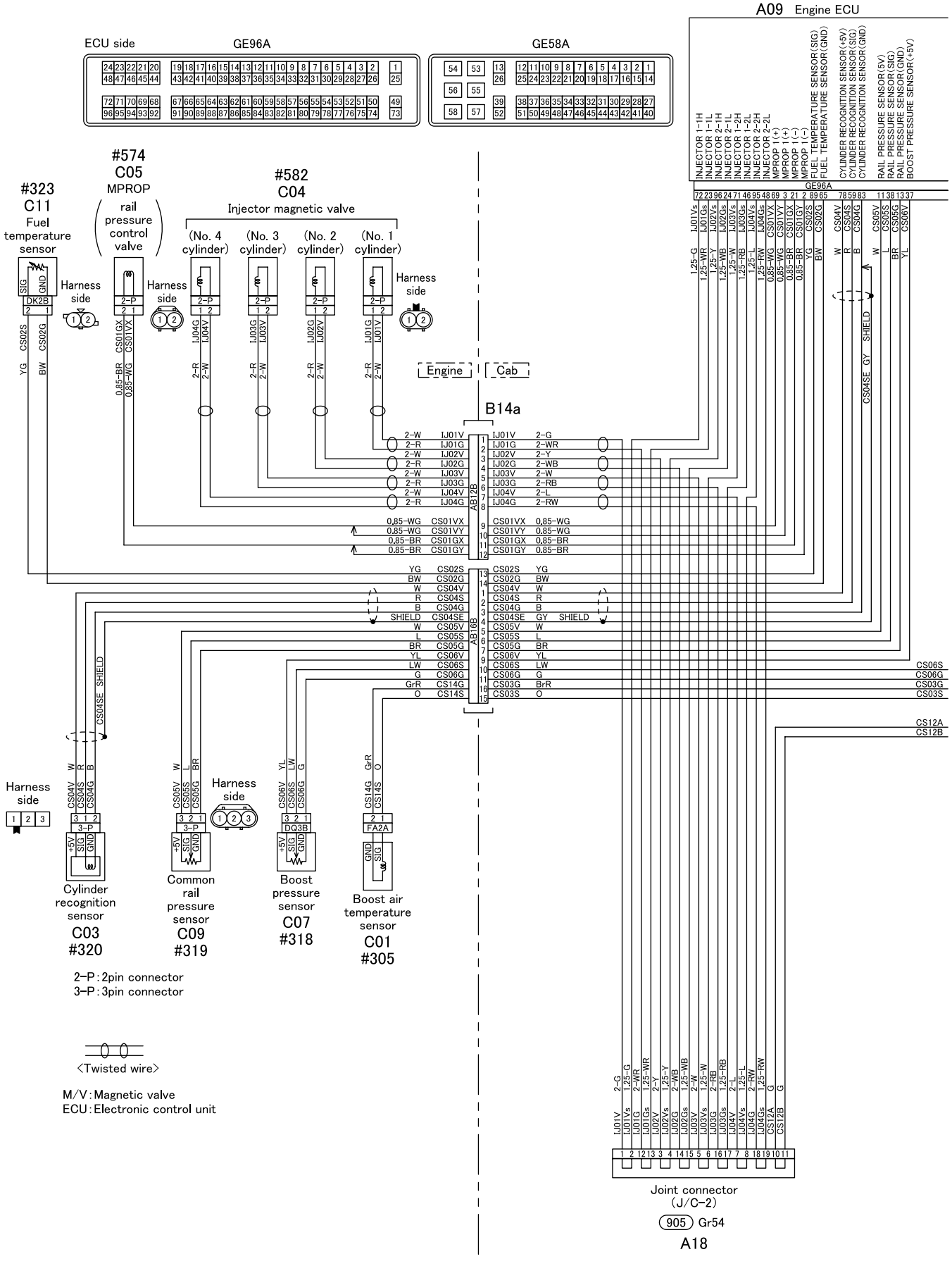


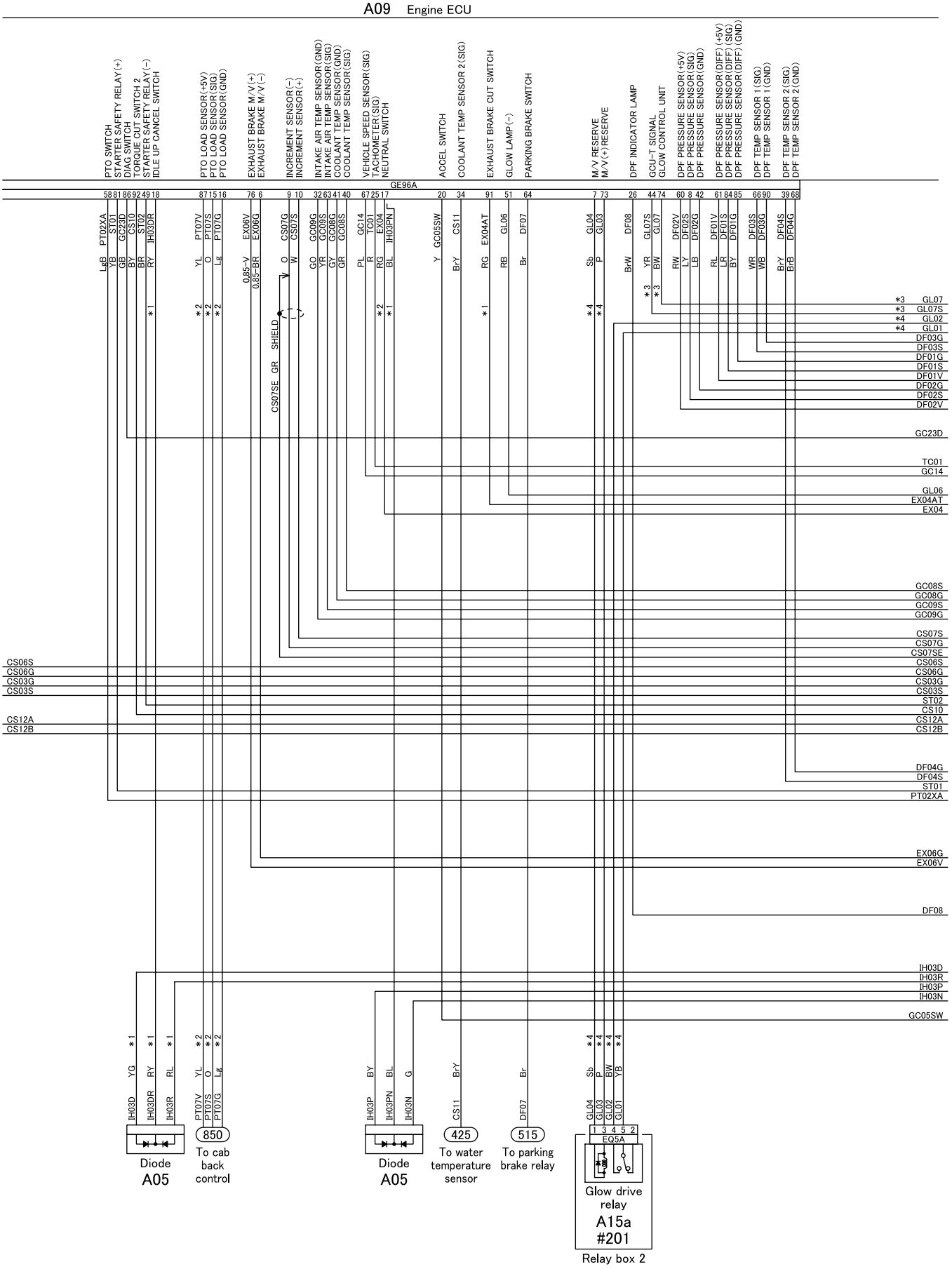
C21 Transmission neutral switch
C22 Torque limit switch
C23 Vehicle speed sensor
C24 Engine speed sensor

L02385

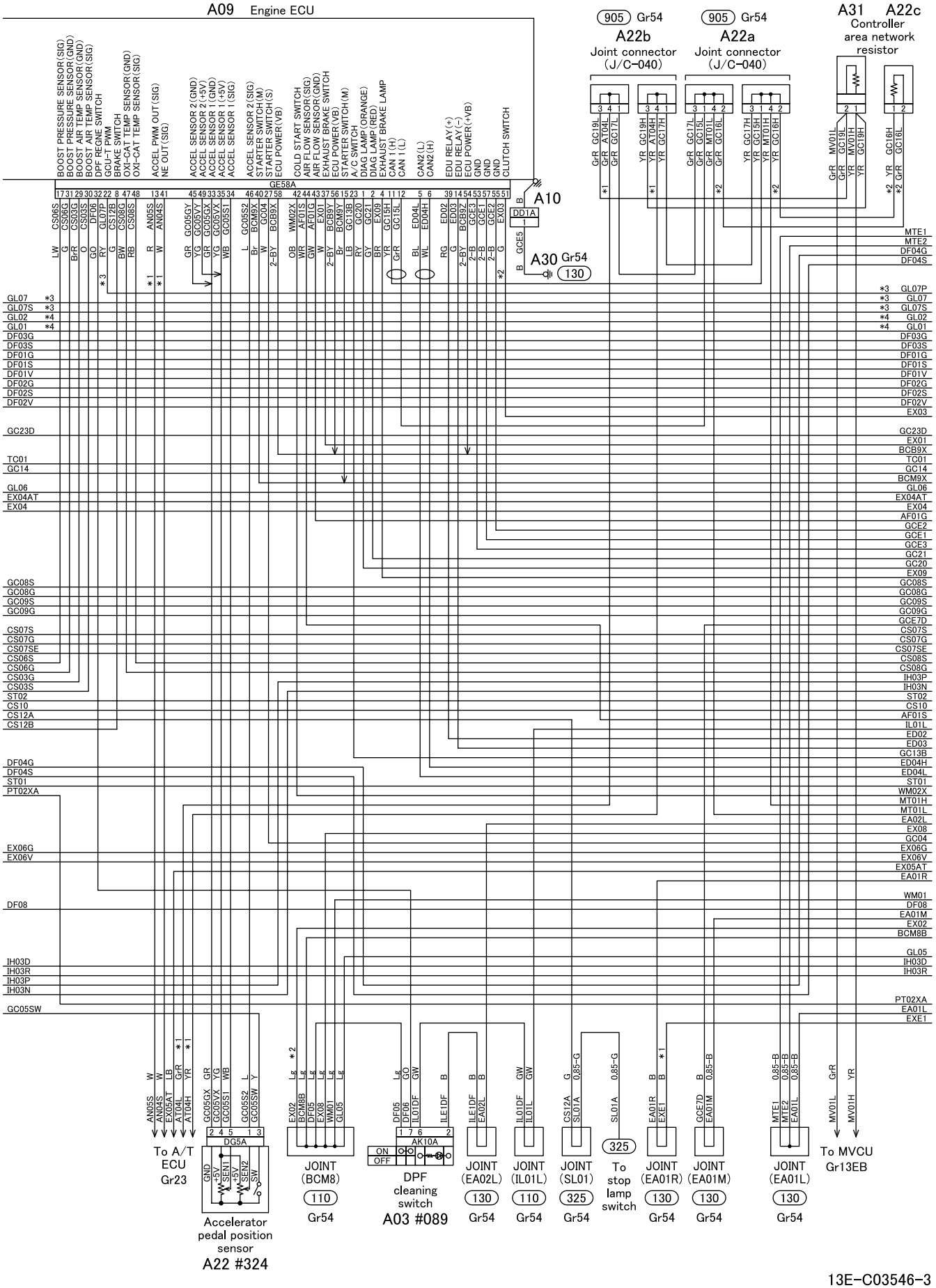
M E M O

ELECTRIC CIRCUIT DIAGRAM

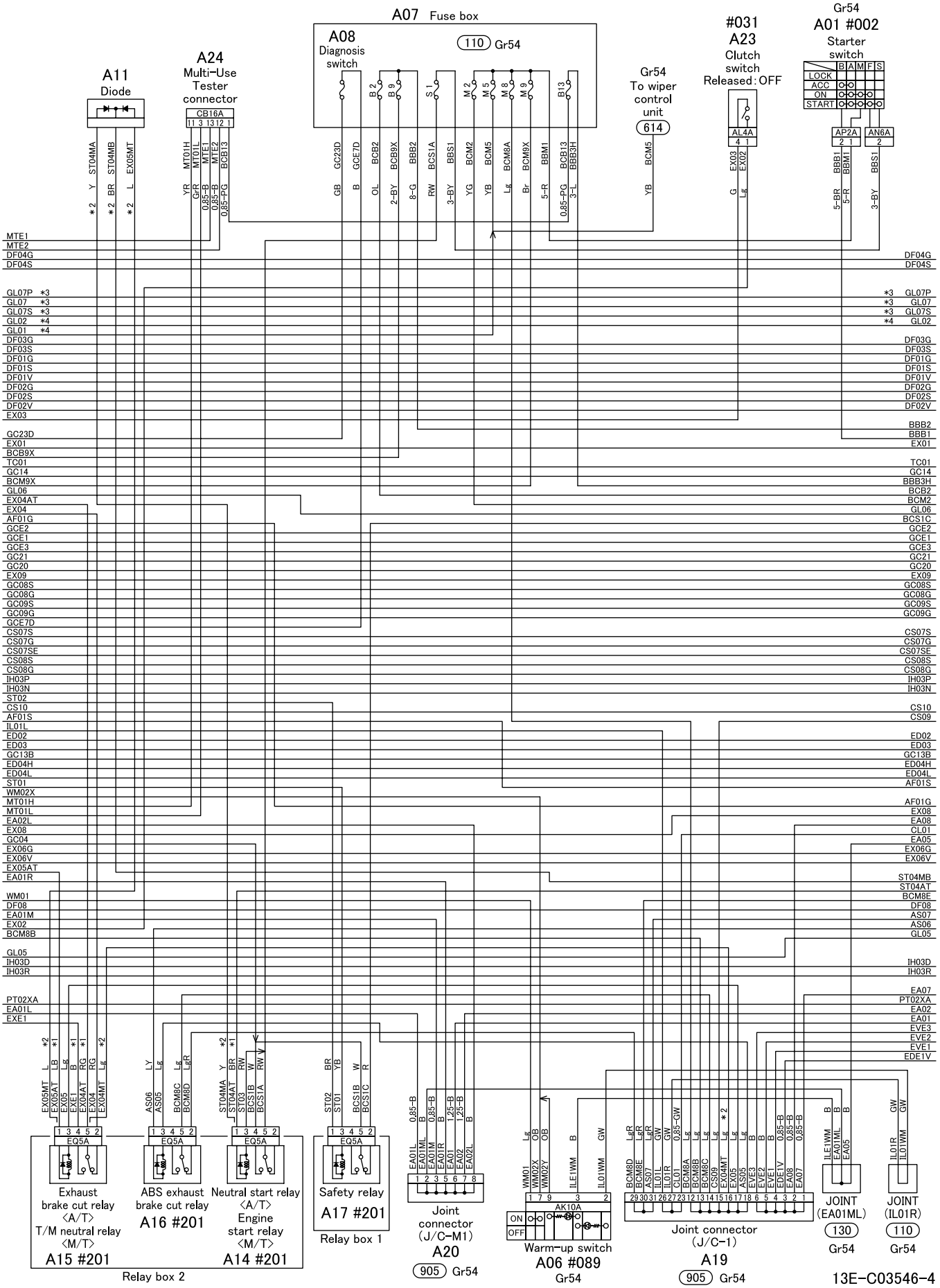



A09 Engine ECU
GE96A
PTO SWITCH
STARTER SAFETY RELAY(+)
DIAG SWITCH
TORQUE CUT SWITCH 2
STARTER SAFETY RELAY(-)
IDLE UP CANCEL SWITCH
PTO LOAD SENSOR(+5V)
PTO LOAD SENSOR(SIG)
PTO LOAD SENSOR(GND)
EXHAUST BRAKE M/V(+)
EXHAUST BRAKE M/V(-)
INCREMENT SENSOR(-)
INCREMENT SENSOR(+)
INTAKE AIR TEMP SENSOR(GND)
INTAKE AIR TEMP SENSOR(SIG)
COOLANT TEMP SENSOR(GND)
COOLANT TEMP SENSOR(SIG)
VEHICLE SPEED SENSOR(SIG)
TACHOMETER(SIG)
NEUTRAL SWITCH
ACCEL SWITCH
COOLANT TEMP SENSOR 2(SIG)
EXHAUST BRAKE CUT SWITCH
GLOW LAMP(-)
PARKING BRAKE SWITCH
M/V RESERVE
M/V(+)RESERVE
DPF INDICATOR LAMP
GCU-T SIGNAL
GLOW CONTROL UNIT
DPF PRESSURE SENSOR(+5V)
DPF PRESSURE SENSOR(SIG)
DPF PRESSURE SENSOR(GND)
DPF PRESSURE SENSOR(DIFF)(+5V)
DPF PRESSURE SENSOR(DIFF)(SIG)
DPF PRESSURE SENSOR(DIFF)(GND)
DPF TEMP SENSOR 1(SIG)
DPF TEMP SENSOR 1(GND)
DPF TEMP SENSOR 2(SIG)
DPF TEMP SENSOR 2(GND)
Diode A05
To cab back control
Diode A05
To water temperature sensor
To parking brake relay
Glow drive relay A15a #201
Relay box 2

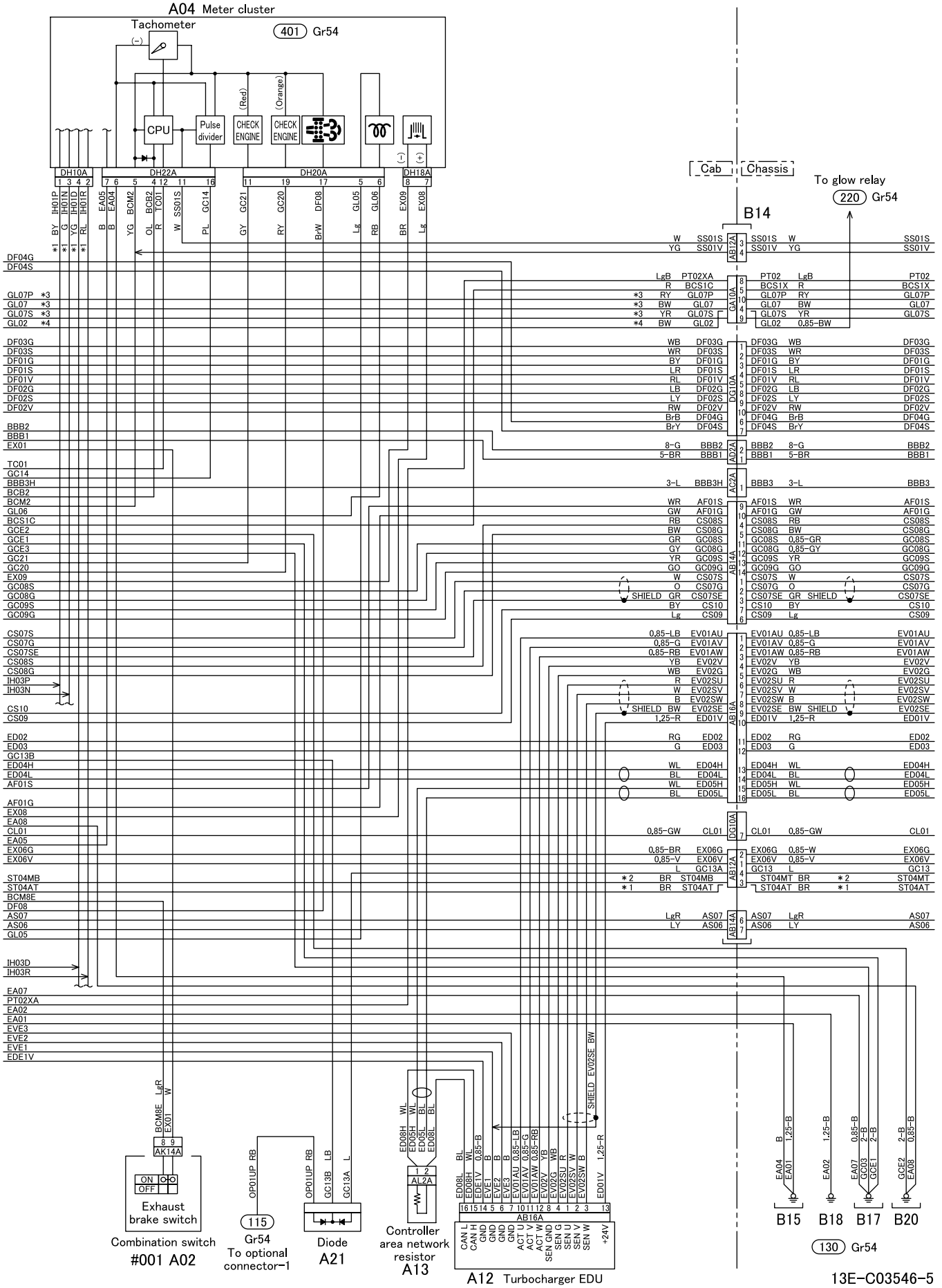
ELECTRIC CIRCUIT DIAGRAM

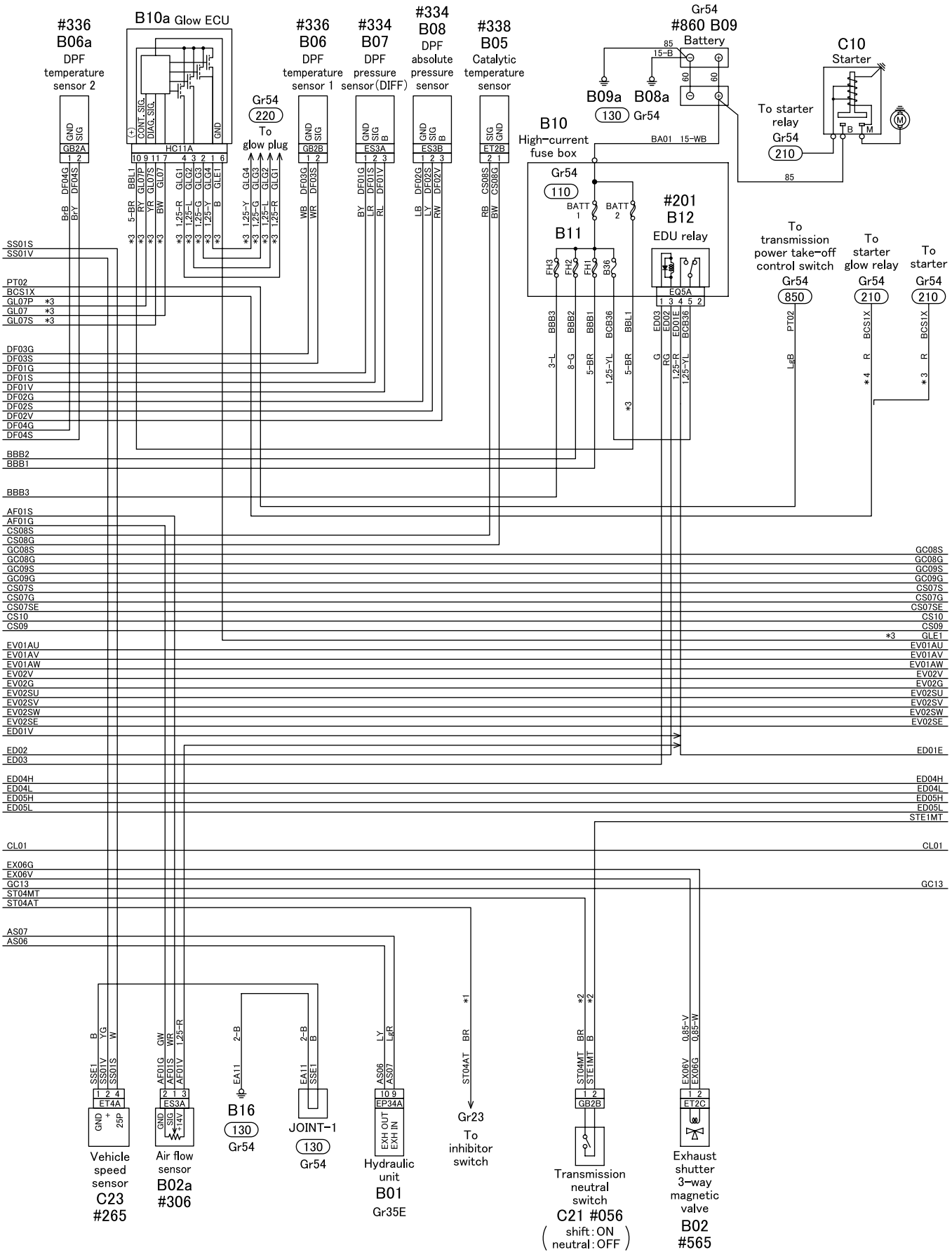


13E-C03546-3

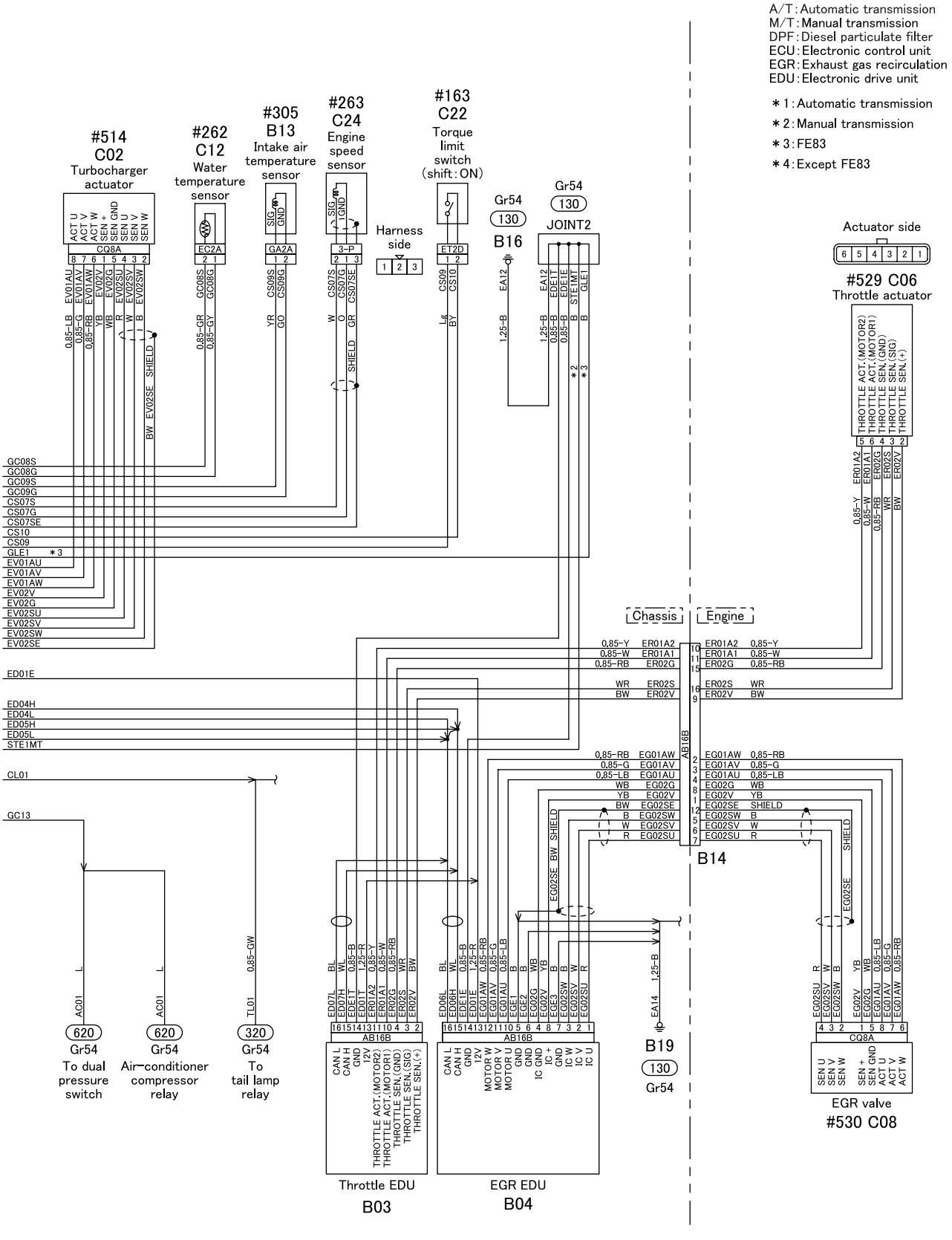

A07 Fuse box
A08 Diagnosis switch
110 Gr54
A11 Diode
A24 Multi-Use Tester connector
CB16A
Gr54 To wiper control unit
614
#031 A23 Clutch switch Released : OFF
AL4A
Gr54 A01 #002 Starter switch
LOCK
ACC
ON
START
AP2A
AN6A
A15 #201 Exhaust brake cut relay <A/T> T/M neutral relay <M/T>
A16 #201 ABS exhaust brake cut relay
A14 #201 Neutral start relay <A/T> Engine start relay <M/T>
Relay box 2
A17 #201 Safety relay
Relay box 1
A20 Joint connector (J/C-M1)
905 Gr54
A06 #089 Warm-up switch
AK10A
Gr54
A19 Joint connector (J/C-1)
905 Gr54
JOINT (EA01ML)
130 Gr54
JOINT (IL01R)
110 Gr54
13E-C03546-4

ELECTRIC CIRCUIT DIAGRAM




#336
B06a
DPF
temperature
sensor 2
B10a Glow ECU
#336
B06
DPF
temperature
sensor 1
#334
B07
DPF
pressure
sensor(DIFF)
#334
B08
DPF
absolute
pressure
sensor
#338
B05
Catalytic
temperature
sensor
Gr54
#860 B09
Battery
C10
Starter
B09a
B08a
Gr54
220
To
glow plug
B10
High-current
fuse box
Gr54
110
B11
#201
B12
EDU relay
To starter
relay
Gr54
210
To
transmission
power take-off
control switch
Gr54
850
To
starter glow relay
Gr54
210
To
starter
Gr54
210
Vehicle
speed
sensor
C23
#265
Air flow
sensor
B02a
#306
B16
Gr54
130
JOINT-1
Gr54
130
Hydraulic
unit
B01
Gr35E
Gr23
To
inhibitor
switch
Transmission
neutral
switch
C21 #056
shift : ON
neutral : OFF
Exhaust
shutter
3-way
magnetic
valve
B02
#565

ELECTRIC CIRCUIT DIAGRAM



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