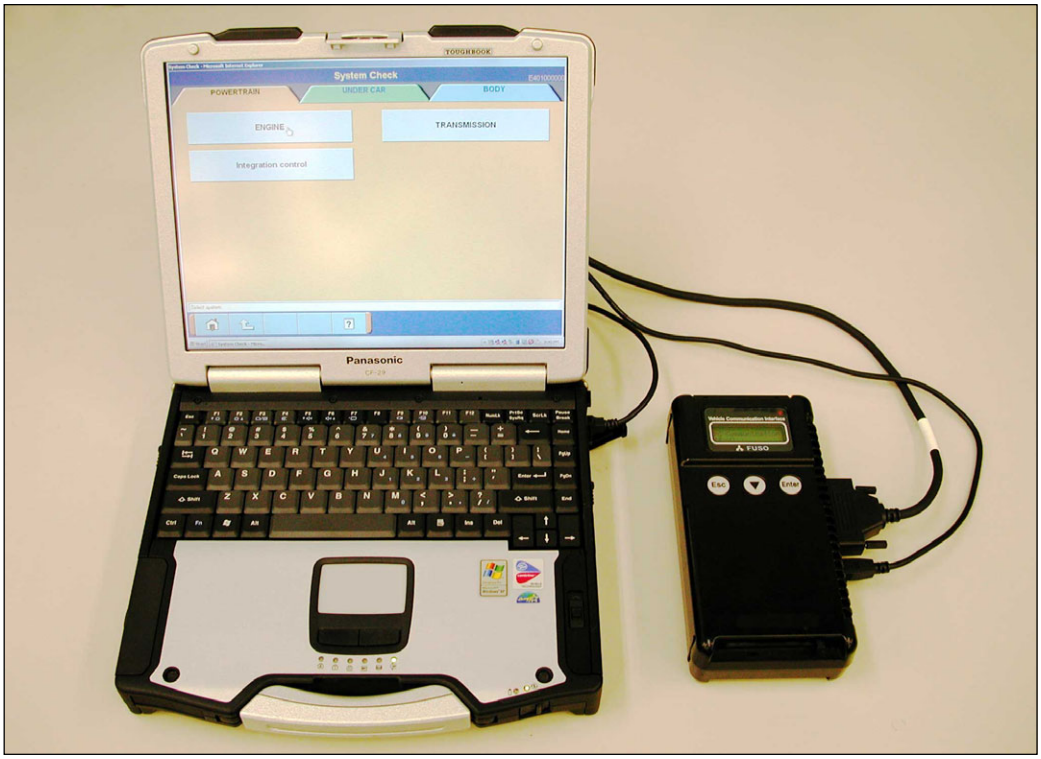
Multi Use Tester III

MUT-III Instruction Manual



FUSO

MUT-III Instruction Manual

Preface

This instruction manual provides information about MUT-III functions, operating procedures and other details.
An understanding of the functions and operating procedures for both the MUT-III system and the Vehicle Communication Interface (referred to as V.C.I. hereafter) will allow users to perform precise and efficient fault diagnosis for vehicle-mounted Electronic Control Units (referred to as ECU hereafter) that can be serviced with the MUT-III.
Please ensure that this instruction manual is read completely prior to using the MUT-III system, as the operating procedures may vary, depending upon the particular type of vehicle electronic control unit.
Please note that the information described within this manual may not be fully consistent with certain products, due to specification changes or version upgrades.

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For Your Safety

To ensure proper use of this product and prevent personal injury and property damage, various graphic displays are used in the user's manual. The graphic displays and respective meanings are described below.

Warning	Warning messages alert you to a procedure or practice which, if not followed correctly, could lead to death or serious injury.
Caution	Caution messages alert you to a procedure or practice which, if not followed correctly, could lead to serious injury and/or property damage.

Icon Examples	The symbol alerts you to a prohibited action. The symbol alerts you to an action that must be enforced.

Warning	
Drivers should not operate the unit while driving. • Operating the unit while driving may result in a traffic accident.	Do not plug in or unplug the power AC adapter with wet hands. • Doing so results in the risk of electric shock.
When using the cigarette lighter plug to supply power to the V.C.I. unit, be sure the power voltage supplied is DC32V or less. • Applying a voltage greater than DC32V results in the risk of fire. • MUT-III as provided to dealers includes 12V accessory / cigarette lighter plug adapter to power MUT-III during extended test drives.	Maximum voltage the V.C.I. can withstand is 40V. Do not use the V.C.I. on systems greater than the 32-volt system mentioned previously. • Violating this requirement results in the risk of a ground fault, damage and/or electric shock.

Warning

The V.C.I. screen is liquid crystal display or LCD. In the unlikely event that the display breaks due to impact, do not let your skin come in contact with the LCD fluid.
If your skin comes in contact with the LCD fluid, wash your skin thoroughly with water. If skin rash or abnormality occurs seek medical attention from a doctor.

Do not use the unit if the power AC adapter plug or cord is damaged or plugging into the outlet is loose.
Use under such conditions may result in electric shock, an electric short and/or fire.

Be sure to hold the harness connector when disconnecting from the vehicle. Do not disconnect the harness by pulling on the cord.
Pulling the cord rather than the connector may result in damage to the lead wire inside the cord, thereby causing a short and possibly starting a fire.

Unplug the power AC adapter from the outlet when the unit is not in use.
Failure to do so may result in injury, burns, electric shock caused by insulation deterioration, or fire due to a short circuit.

Warning

When the harness is connected to the V.C.I., be sure to check the top and bottom of the connector and connect the harness perpendicularly to the connector of the V.C.I.
Connecting at an angle may result in bending of the pins of the connector.
Check for the secure connection of the harness before tightening of the screw locks.
The bent pin may contact the connector case, thereby causing an electric short which leads to damage to the V.C.I.

Please Note

Do not expose the PC or V.C.I. to direct sunlight or high temperatures, or leave the unit in sun-heated cars. Such action may result in system failure.

Store the PC and V.C.I. in a dry environment at room temperatures.

Moving the PC and V.C.I. to a location with a very different temperature and humidity than that of the previous location may result in external or internal condensation. Caution is required.

Protect the PC and V.C.I. from exposure to elements such as rain, dirt, dust, food and liquids.

Be careful when handling the PC and V.C.I. Dropping the units may result in damage.

Do not expose either unit to engine oil, gasoline, antifreeze or battery acid. Also, do not clean the PC or V.C.I. case using solutions such as thinner or benzene. Doing so may result in deterioration of the case surface.

Prior to connecting the MUT-III main harness between the V.C.I. and vehicle, turn the IG switch to OFF.
Connecting the V.C.I. harness with the IG switch ON may damage the V.C.I. programming.

Use only the power AC adapter included with the PC (or approved replacement), power cigarette plug, other probes, main harness and other cables.
Use of unspecified parts may result in damage or malfunction due to excess voltage or insufficient contact.

The LCD display of this unit turns off when the supplied voltage is less the DC 8V. This is not an error. The power supplied should be from 8VDC to 32VDC.

Keep all V.C.I. connectors and openings away from dirt and static electricity. Exposure to dirt and static electricity may result in malfunction and damage.

Chapter 1 Product Overview

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1-1. Precautions

Service Work Precautions

- Be sure to follow all basic service work precautions when using MUT-III during vehicle inspection and service work.
- For detailed information regarding service work precautions, refer to the service instruction manual of each vehicle.

Work Precautions

- When performing vehicle inspection work at the work site with the engine running, either use an exhaust gas discharger or ventilate the area sufficiently.
- When working on a vehicle, be sure to apply the parking brake and set wheel chocks in place to prevent the car from moving.

Driving Precautions

- If you wish to use MUT-III while driving the target vehicle, first verify that all parts are properly assembled.
- While driving, always have an assistant operate MUT-III.
- Be sure that the MUT-III maintenance harness and other cables will not interfere with driving.
- Install and remove the PC and V.C.I. with the vehicle parked, IG switch OFF.

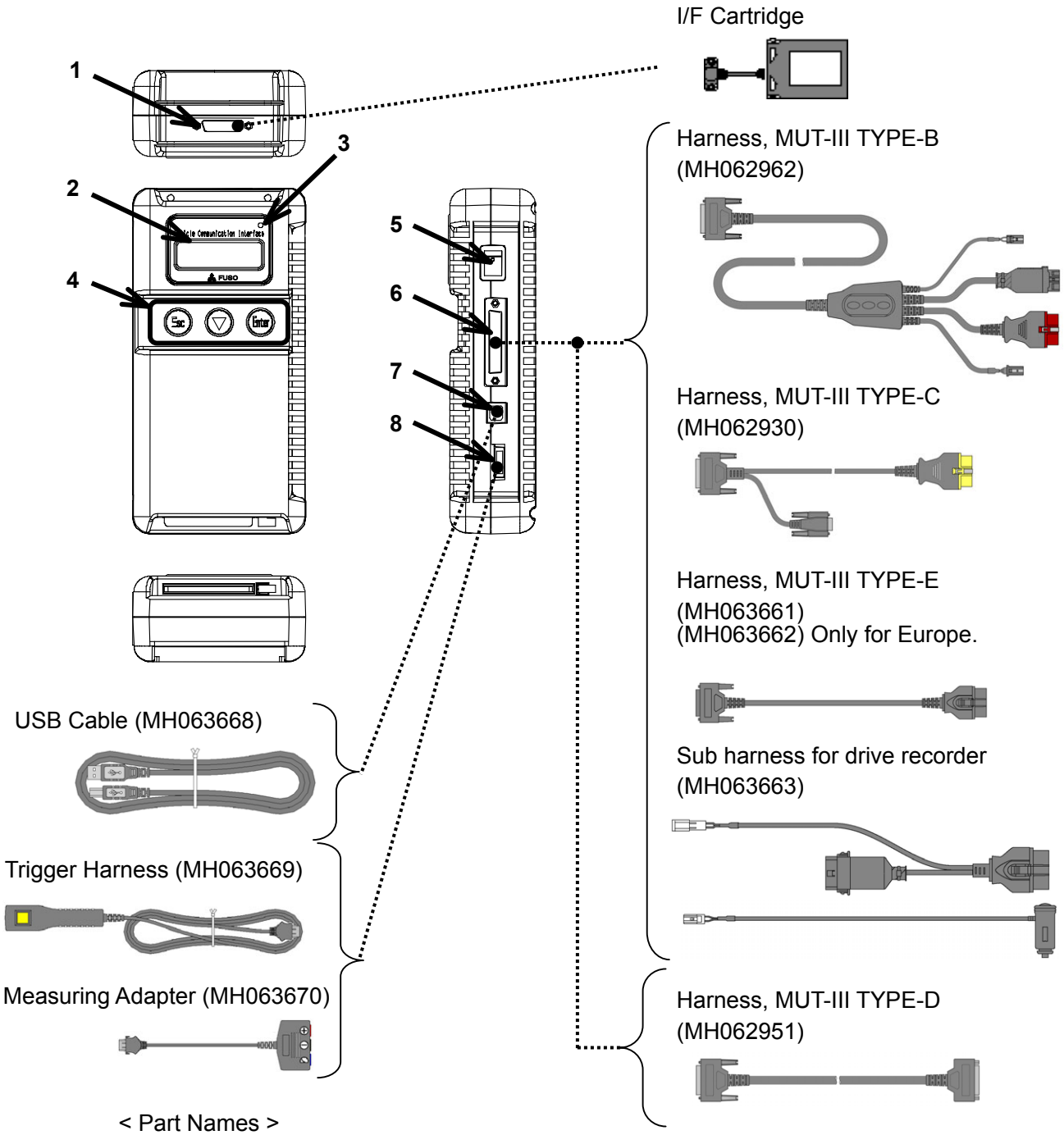
PC Usage Limitations

Do Not Install Software on the PC

- The MUT-III PC is a special service tool. Do not install any software other than MUT-III software provided by MMNA onto the unit. Installation of other software results in the risk of MUT-III system failure.
- Any unauthorized software will not be supported. Technical support for units with unauthorized software will be charged additional technical support fees to return the unit to its authorized state of operation.
- All unauthorized software will be erased with each new upgrade.

1-2. V.C.I. Exterior Diagram and Part Names

Part names for the main unit are shown in the figure below.



< Part Names >

1. I/F Cartridge Port
2. LCD Display Screen
3. Indicator Lamp
4. Control Buttons < Esc , ▼ , Enter >
   (Used for V.C.I. stand-alone functions)
5. Power Switch
6. Harness Port
7. USB Port
8. Trigger Port

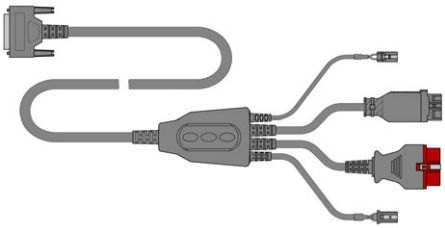
1-3. Description and Usage of MUT-III Components

(1) V.C.I. (MH062927)

Communications interface used for connecting the vehicle ECU to a PC

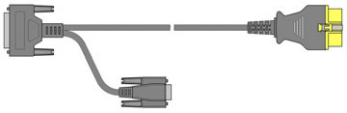
1. When Connected to PC
   - Provides ECU fault diagnosis (interactive fault diagnosis)
2. V.C.I. Stand-Alone Usage (usage while disconnected from PC)
   - Drive recorder

The V.C.I. can be utilized, without modification, for both 12V / 24V vehicles.



(2) Harness, MUT-III TYPE-B (MH062962)

This harness is used to connect the V.C.I. to a vehicle.
Power can be supplied to the V.C.I. via the cigarette lighter plug, depending upon the particular model of vehicle.
Refer to section 1-5 for connection of harness and vehicle combinations.



(3) Harness, MUT-III TYPE-C (MH062930)

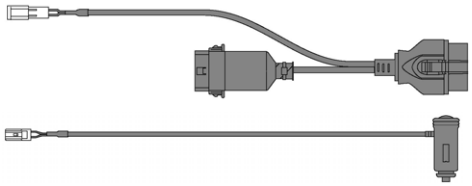
This harness is used for checking or data recording of the Air Suspension ECU, manufactured by WABCO.
This harness is used with Air Suspension I/F Cartridge.

(4) Harness, MUT-III TYPE-D (MH062951)

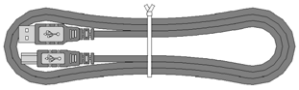
This harness is used as an extension for TYPE-B/TYPE-E harnesses.

(5) Harness, MUT-III TYPE-E
(MH063661)
(MH063662) Only for Europe.

This harness is used to connect the V.C.I. to a vehicle.
Refer to section 1-5 for connection of harness and vehicle combinations.
Please refer to the service guide for each vehicle.



(6) Sub harness for drive recorder (MH063663)
This Sub harness is used with the Harness, MUT-III TYPE-E (MH063661,MH063662) used for drive recorder function.

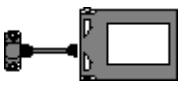


(7) USB Cable (MH063668)
This harness is used to connect the V.C.I. to a PC.

(8) Trigger Harness (MH063669)
The button on this harness is used to generate manual triggering for data acquisition during data recording, while using the drive recorder function.

(9) Measurement Adapter (MH063670)
This adapter is used to connect the V.C.I. to the measuring probes.

(10) Measuring Probes(MH063671)
The measuring probes are used with the voltmeter and ohmmeter.
Either MUT-II accessory probes (MB991499) or
off-the-shelf probes can be utilized.

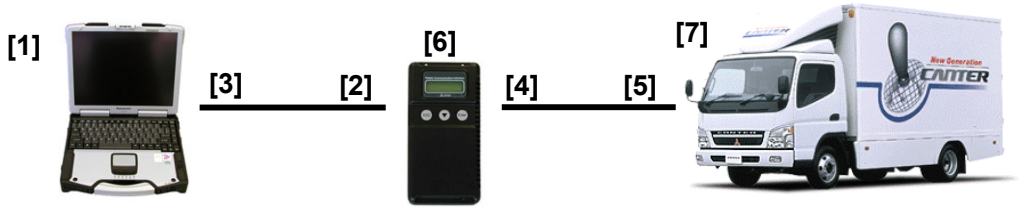


(11) I/F Cartridge
The I/F Cartridge is used to perform special functions that cannot be performed by the V.C.I. alone.
The following I/F Cartridges, which are from the MUT-II, can be utilized:
- Electronic Governor I/F Cartridge
- Air Suspension I/F Cartridge

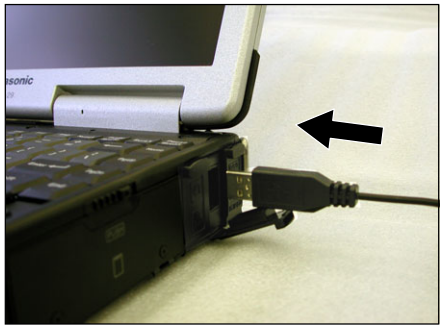
1-4. Harness Connection Procedures and Connection Order

To perform diagnostics, first connect the cabling by following the procedures described below.

[1] Restart the PC.
[2] Connect one end of the USB cable to the V.C.I.
[3] Connect the other end of the USB cable to the PC.
[4] Connect the MUT-IIIharness to the V.C.I.
[5] Connect the MUT-IIIharness to the vehicle's diagnostic connector.
* To disconnect the cabling, reverse the above procedures:
[6] Turn the V.C.I. power switch ON and check to ensure that the indicator lamp, located in the upper right corner of the LCD screen, illuminates in green.
[7] Start up the MUT-III system software on the PC and turn the vehicle ignition switch ON to begin performing diagnostics.
* If the version of the V.C.I. software installed in the PC is different from the version of the firmware within the V.C.I. itself, then a V.C.I. software version upgrade will be initiated. If a version upgrade error occurs, restart the V.C.I. while simultaneously depressing the Esc button on the V.C.I., in order to resume diagnostic testing.



<Connecting the USB Cable to the PC>

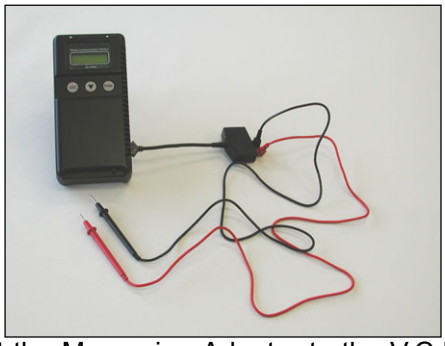


Open the lid covering the USB port, which is located on the Right side of the PC and indicated by the ⇐ symbol. Plug the USB connector into the port.

<Connecting the Trigger Harness>

Connect the trigger harness to the trigger port of the V.C.I.

<Connecting the Measuring Adapter and Probes>



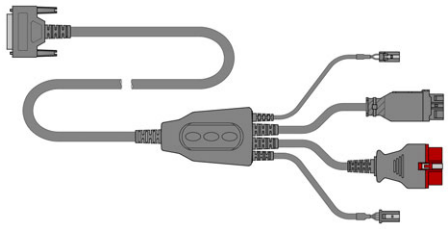
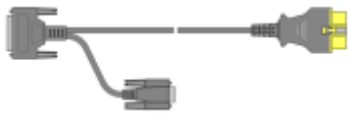
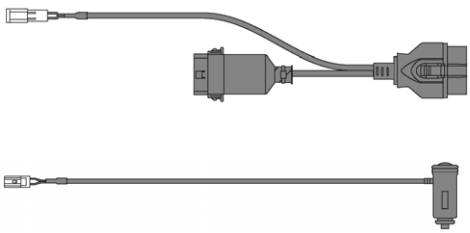
Connect the Measuring Adapter to the V.C.I. trigger port then connect the measuring probes to the adapter, matching the color of each probe plug to the appropriate color on the adapter jack.

1-5. Connection Harness and Vehicle Combinations

- Connect either a "TYPE-B" or “TYPE-C” or "TYPE-E " harness to the vehicle’s 16-pole / 12-pole connector and perform fault diagnosis.
- A "TYPE-D" harness can be utilized as an extension for "TYPE-B / TYPE-E" harnesses.
- Use a combination of harnesses, either a "TYPE-B" or “TYPE-C” or "TYPE-E " (O), and either a "TYPE-D" or “Drive recorder" (●), depending upon the performing operation.

Harness Name / Vehicle	01 TYPE-B	02 TYPE-C	03 TYPE-E	04 TYPE-D	05 Drive recorder
~EURO3, ~EPA04, ~Taiwan 3rd terms	O			●	
EURO4~, EPA07~, Taiwan 4th terms~, EURO3(Limited country*1)~			O	●	●
Equipped with Air Suspension manufactured by WABCO		O			

*1 : Thailand, Chile

Harness Name		Appearance
01	TYPE-B MH062962	
02	TYPE-C MH062930	
03	TYPE-E MH063661 MH063662(Only for Europe.)	
04	TYPE-D MH062951	
05	Drive recorder MH063663	

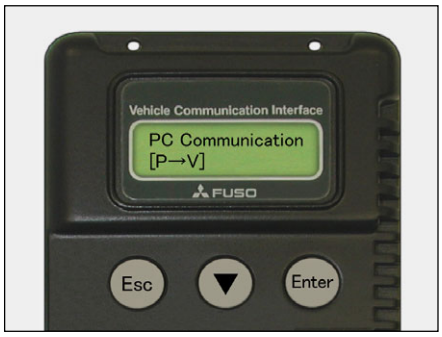
Chapter 2 MUT-III Functions

2-1. Basic Functions

- The MUT-III can be utilized for all types of vehicle electronic control units (incorporating the diagnostics function).
- The MUT-III reads each diagnostic code and displays it as a name.
- Using serial communications, the MUT-III reads the RAM data (data list) within the ECU that is required for servicing, thus enabling the display of both graphs and numeric values converted to physical quantities. (Only for ECUs that support serial communications.)
- The MUT-III can forcibly drive or forcibly stop the actuators required for servicing. (Only for ECUs that support serial communications.)
- Using its voltage measuring function, the MUT-III can measure DC voltage ranging from +/-40V.
- Using its resistance measuring function, the MUT-III can measure resistance ranging from 0 ~ 100kOhm.

2-2. V.C.I. Function

<Using the V.C.I. with a PC>



2-2-1. Fault Diagnosis

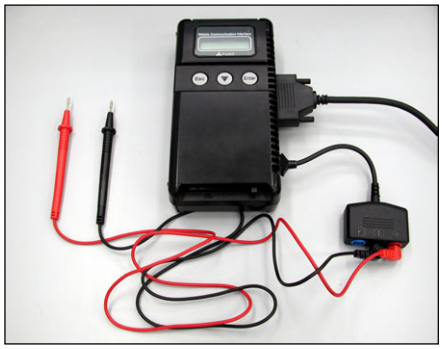
The V.C.I. can perform fault diagnosis by receiving commands from a PC and communicating with a vehicle ECU.

*The buttons on the V.C.I. will not function while it is connected to a PC.

[Start-up Screen]

- The screen to the left will be displayed when the USB cable is connected to the main unit.
  The direction of signal flow between the PC and the V.C.I. will be indicated by an arrow, such as [P->V] or [P<-V].

<Using the Stand-Alone V.C.I.>



2-2-2. Measurement Functions: Voltmeter / Ohmmeter

The V.C.I. can read voltage / resistance values that are applied to its trigger port, displaying these numeric values on its LCD screen.

(1) Connect the Measuring Adapter to the V.C.I. trigger port then connect the measuring probes (MB991499, etc.) to the adapter, matching the color of each probe plug to the appropriate color on the adapter jack.

(2) Connect the vehicle to the V.C.I. using the appropriate harness, then turn the V.C.I. power switches ON.

(3) Press the ▼ button to select either the Voltmeter or the Ohmmeter from the main menu (refer to the photo at left) then press the Enter button to perform the measurement.

<For Your Reference>

- DC voltages ranging from +/-40V can be measured.
- Resistance values ranging from 0 ~ 100kOhm can be measured.

Chapter 3 MUT-III Operating Procedures

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3-6. Removing a memory card from PC

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3-1. Start-Up Procedures for PC and MUT-III System

[PC Start-Up]

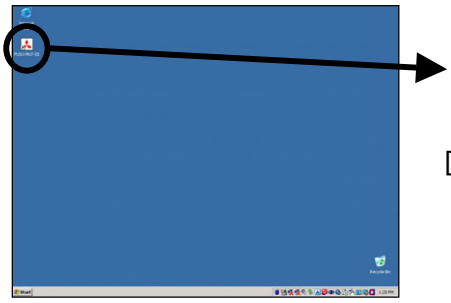
Power up the PC.
Wait for the Windows operating system to start up.

For more detailed PC operating instructions, please refer to the instruction manual included with the PC.

[Entering User Name / Password]

Once Windows is running, the logon dialogue will be displayed.
Enter both the user name and the password to logon as an administrator, then select the "OK" button.

[MUT-III Start-Up]



[Enlarged View of Icon]

Once the desktop screen is displayed, touch the "FUSO MUT-III" icon, which is located on the desktop, twice quickly.
This action will start MUT-III.

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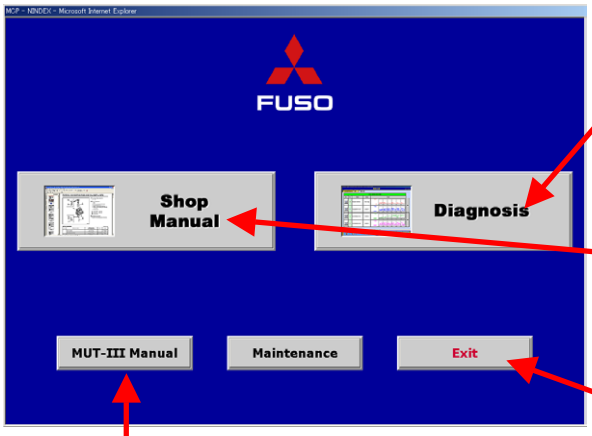
3-2. Description of Operating Screens

<Start-Up Screen>



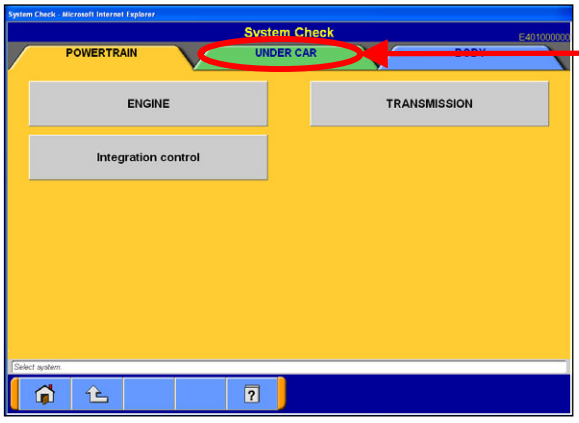
This button is used to activate the **Fault Diagnostics System.** Refer to section 3-4 for operating procedures.

Service Guide Display
Additional functions will be included later.

This button is used to shut down the **MUT-III System.**
Refer to section 3-5 for operating procedures.

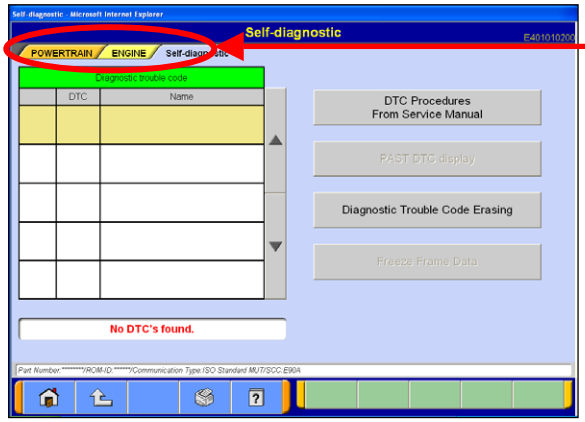
This button is used to view the **MUT-III Instruction Manual** on the PC.
Refer to section 3-4-3 for operating procedures.

<System Selection Screen>



On the system selection screen, different main item categories can be viewed by selecting the different tabs, located at the top of the screen.

<Diagnostic Screen>



This screen displays titles for 3 hierarchies, in order to allow the user to understand which operation is currently running in each system.
Selecting a different tab from the upper part of the screen will not change the title displayed.

3-3. Description of Buttons on the Operating Screens

The names and functions for the button icons are as follows:

Button Image		Button Name	Button Function
English	Except English		
		Main menu	Returns the screen to the main menu.
		Return Home	Returns the screen to the start screen.
		Return one level	Returns the screen to the upper layer screen.
		Print screen	Print the screen image.
		Help	Displays online help.
		OK or YES	Determines an outcome.
		Cancel	Cancels the operation or closes the screen.
		Select drive	Select drive
		Select folder	Select folder
		View vehicle information	Displays vehicle information.
		Select item	Select an item.
		Item group registration	Item group is registered.
		Item group clearance	Registered item group is cleared.
		Item sort	Sorts a chosen item.
		View text	Displays text.
		View graph1	Displays four items on four graphs.
		View graph2	Displays (overwrites) four items on one graph.
		Change time scale	Changes the graph display time scale.
		Change data scale	Changes the graph display time scale.
		File save	Sets extraction conditions and saves the extracted data in a file.
		Save to HDD	Save to Hard drive.
		Delete file	Deletes files.
		Alphanumeric input screen	Opens the alphanumeric input screen.
		Print of the data	Print of the data.
		Displays troubleshooting	Displays a troubleshooting

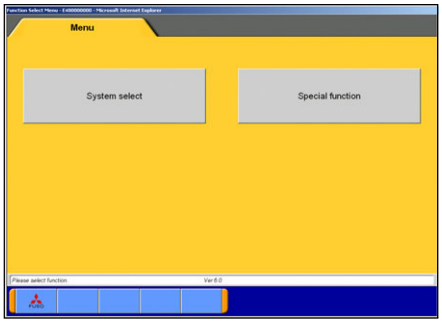
Description of Buttons on the Operating Screens

Button Image		Button Name	Button Function
English	Except English		
		1/3	Change of function button (1/3 display)
		View V.C.I. Regeneration data	Displays a list of V.C.I. Regeneration data.
		Data transfer	Transmits the data of the selected block to the PC.
		Open setting screen (PC)	Opens the setting screen used to record information on the PC.
		Open setting screen (V.C.I.)	Opens the setting screen used to record information on the V.C.I..
		Manual trigger	Generates a manual trigger.
		Trigger point data	Jumps to the trigger point.
		Data Retrieval	Opens the search condition settings screen.
		Data extraction settings	Opens the extraction condition (data) screen.
		Time setting	Opens the extraction condition (time) screen.
		Add	Adds items.
		Correlation chart	Opens the correlation chart settings screen.
		Distribution map	Opens the distribution chart settings screen.
		Pause	Pause
		Record finish	Record finish
		Trigger setting	Trigger setting
		Systems select	Systems select.
		Exhaust	Exhaust
		Air intake	Air intake
		4 button	Shows an enlarged view of the 4 buttons.
		Front/Rear change	Front/Rear change
		Esc	ESC Key function of V.C.I.
		Enter	Enter Key function of V.C.I.
		Down arrow	Down arrow Key function of V.C.I.
		Zero point calibration	Corrects the measurement function.

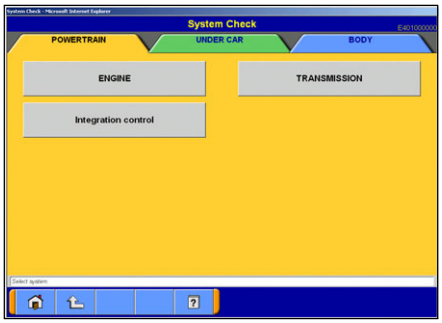
3-4. Operating Procedures for the MUT-III System

3-4-1. Selecting Desired Functions

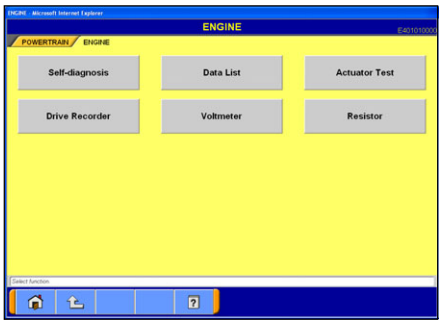
(1) Select the **Diagnosis** button, which is located on the right side of the screen.



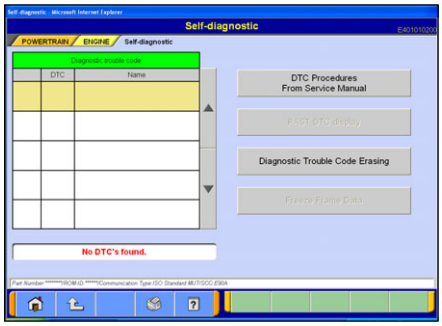
(2) Select the **System Select** button from the function selection menu.
Select the FUSO icon to return to the initial screen.



(3) From the system selection menu select the desired button to choose the particular system to be diagnosed.
Each system is classified into 3 groups, "POWERTRAIN", "UNDER CAR" and "BODY." To change the group, select the desired tab, located in the upper area of the screen.

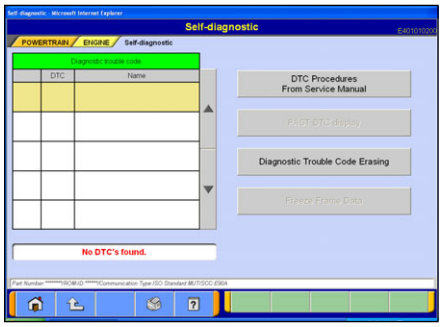


(4) If “ENGINE” is selected, the screen shown in the figure to the left will appear.
The functions available for diagnosis are then displayed as buttons.
<Note>
Certain diagnostic functions may not be available, even though the buttons are displayed, depending upon the particular ECU utilized in the vehicle to be diagnosed.

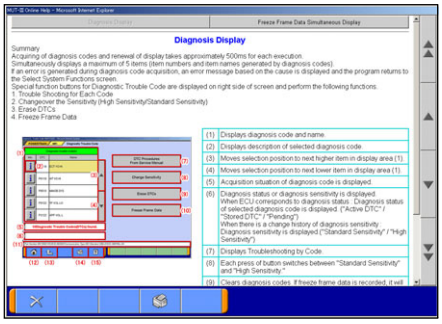


(5) If “Self-Diagnostic” is selected, the screen shown in the figure to the left will appear.
The Diagnostic Trouble Codes (DTCs) are acquired through automatic communication with the vehicle ECU.
For information about the Diagnostic Trouble Code function, refer to "4-1. Operating Procedures for Diagnostic Trouble Codes."

3-4-2. Help Screen Functions

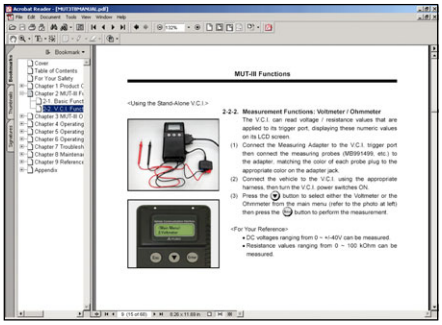


(1) The ? button is used to display the help screen that corresponds to the screen currently displayed.



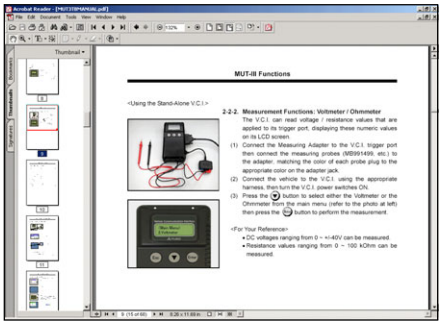
(2) This screen contains brief explanations for both the screen displays and the button functions, for use as a reference. Select the scroll buttons, located on the right hand side of the screen, to scroll the screen up or down.

3-4-3. Displaying the Instruction Manual



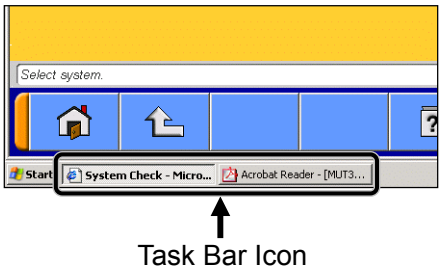
Select the **Instruction Manual (PDF)** button located at the bottom left of the screen shown in section 3-5-1.(1). If a “bookmarked tab” is selected, located on the left hand side of the screen, the screen shown in the figure to the left will appear. Selecting one of the bookmarked items will cause the screen to jump to the corresponding page. If the + symbol on the bookmark is selected, lower hierarchies will be displayed and made available for selection.

Select the ✕ button, located in the upper right corner of the screen, to close the instruction manual.



If the "Page" tab, located on the left hand side of the screen, is selected, a screen will appear that displays smaller thumbnail images of pages, as shown in the figure to the left. Among the page thumbnail images shown, the specific section currently being displayed appears bordered by a red frame.

Select the ✕ button, located in the upper right corner of the screen, to close the instruction manual.



Task Bar Icon

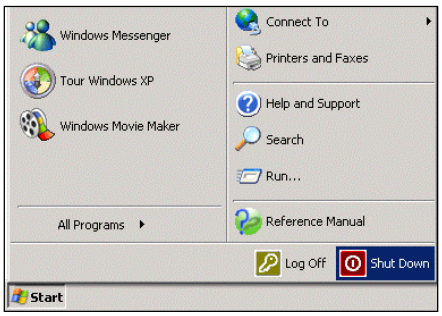
(3) While the instruction manual is open, the display can be switched between the MUT-III system and the instruction manual by selecting the task bar icon, located at the bottom of the screen.
This function facilitates MUT-III operation, as it allows the user to make simultaneous reference to the instruction manual.

3-5. Shutdown Procedures for the PC and MUT-III System

3-5-1. Shutdown Procedures for the MUT-III System

Return to the MUT-III start-up screen by selecting either the icon or the icon, then touch the **Exit** button, located in the bottom right corner of the screen.

3-5-2. Shutdown Procedures for the PC



(1) After confirming that MUT-III has been shut down, touch the [Start] button, located in the bottom left corner of the screen and select [Shut Down].

(2) Select [Shut down] by touching the button then select the **OK** button.

(3) After the PC has been shut down, the power indicator on PC will no longer be illuminated.

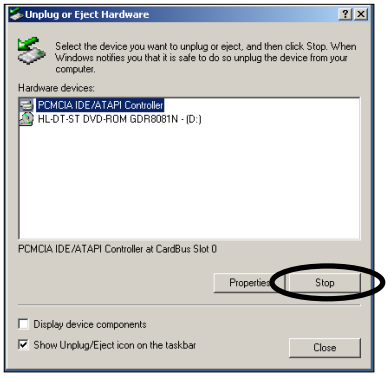
3-6. Removing a memory card from PC

3-6-1. Removal Procedures for a memory card from PC

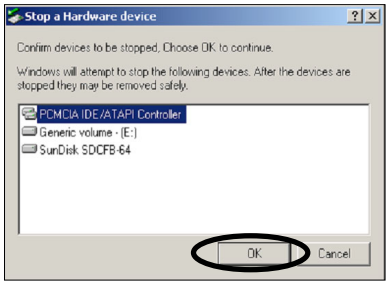
Before you remove the memory card, make sure to perform the following procedures to stop the memory card, if the data has been transferred between PC and memory card.

Double click here

(1) Before you remove the memory card, double-click the icon for removal of adaptor displayed on the bottom-right corner.



(2) Select [*PCMCIA IDE/ATAPI Controller]* or the other appropriate device, then press **Stop** button.



(3) Verify the contents of the selection, then press **OK** button.

(4) After displayed the message “The device can now be safely removed from the system”, push the lever on the side of PC m-card slot and remove the memory card.

Caution:

Do not remove the memory card away unless complete above method or turn off the PC.

Chapter 4 Operating Procedures for Diagnostic Functions

4-1. Operating Procedures for Diagnostic Trouble Codes (DTCs)

4-1-1. Reading Diagnostic Trouble Codes (DTCs) P.20

4-1-2. Displaying Prior Diagnostics....P.20

4-1-3. Deleting DTCs P.20

4-1-4. Displaying Freeze Frame Data....P.20

4-2. Operating Procedures for the Data List

4-2-1. Displaying the Data List....P.21

4-2-2. Saving and Regenerating the Data List....P.24

4-2-3. Displaying the Data List Saved Previously P.24

4-2-4. Group registration P.27

4-2-5. Other Functions....P.29

4-3. Operating Procedures for the Actuator Test

4-3-1. Operating Procedures for the Actuator Test P.31

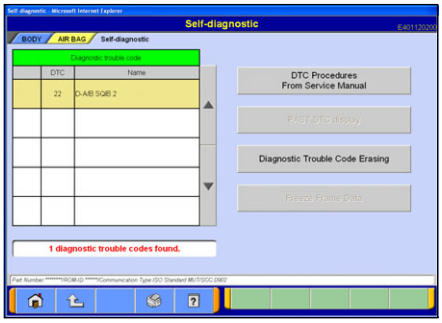
4-3-2. Simultaneously Displaying the Actuator Test and Data List....P.31

4-3-3. Displaying the Data List Saved Previously....P.34

4-3-4. Other Functions....P.34

4-1. Operating Procedures for Diagnostic Trouble Codes (DTCs)

4-1-1. Reading Diagnostic Trouble Codes (DTCs)



After the DTCs are read, the results are displayed.

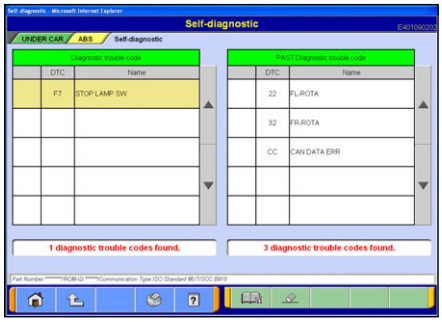
Select the **PAST DTC display** button to display the status (i.e., current or prior malfunctions) for the selected diagnostic items. -> Go to section 4-1-2.

Select the **Diagnostic Trouble Code Erasing** button to delete the DTCs.

-> go to section 4-1-3.

Select the **Freeze Frame Data** button to display the freeze frame data. -> Go to section 4-1-4.

4-1-2. Displaying PAST DTC display



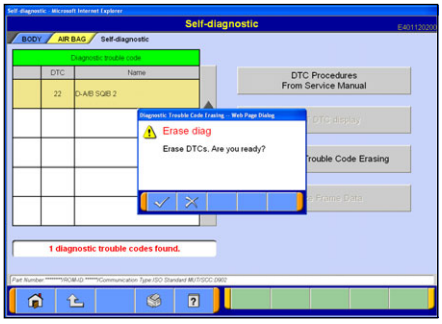
Both current and prior DTCs can be acquired and displayed simultaneously.

--- Select this button to return to section 4-1-1.

--- Select this button to display the service guide.

--- Select this button to delete DTCs (both current and prior).

4-1-3. Diagnostic Trouble Code Erasing

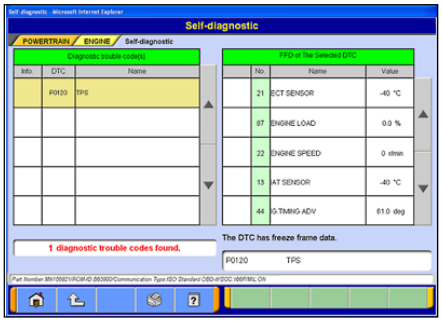


A dialogue requesting confirmation of DTC deletion will be displayed.

--- Select this button to delete the DTC that is currently displayed.

--- Select this button to cancel the delete operation and return to section 4-1-1.

4-1-4. Displaying Freeze Frame Data



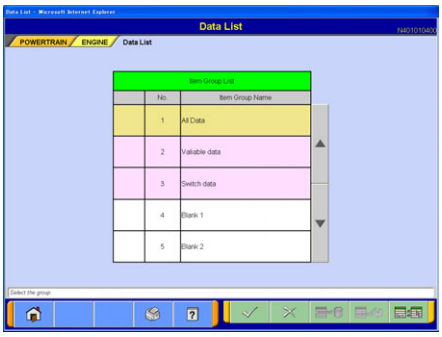
Both DTCs and Freeze Frame Data can be acquired and displayed simultaneously.

The DTCs that caused freeze frame data to be stored will be displayed.

--- Select this button to return to section 4-1-1.

4-2. Operating Procedures for the Data List

4-2-1. Displaying the Data List



(1) Select item group

Select the desired item group to be displayed.

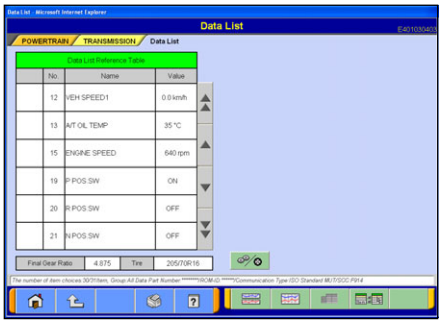
--- Text View: refer to section (2).

--- Screen will return to the calling screen.

--- Registered select group is cleared.

--- Group Registration: refer to section 4-2-4.(1).

--- Select display item: refer to section (5).



(2) Text View

When the number of items displayed must be reduced or when the order in which items are displayed must be changed, use the button to forward to the item selection screen: refer to section (4).

--- Graph View 1: refer to section (2).

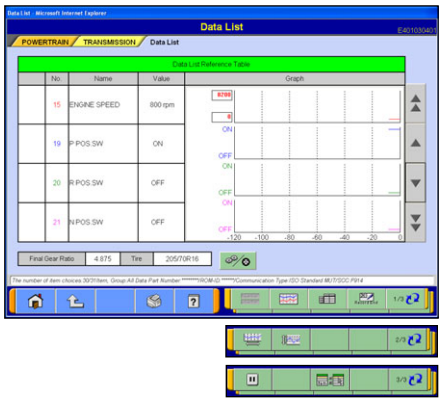
--- Graph View 2: refer to section (3)

--- Text View

--- Select this button to move forward to the display screen showing the final gear ratio setting and tire information refer to section 4-2-4.(4).

<Note>

The order in which items are displayed can be changed: refer to section 4-2-4.(1).



(3) Graph View 1

--- Graph View 1 (The graph height area will change in accordance with the number of items displayed. For example, if 3 items are displayed, the graph height area will be divided into 3.)

--- Graph View 2 (overlay graph view): refer to section (3).

--- Text View: refer to section (1).

--- Save and regenerate Data List: refer to section 4-2-2.(1).

--- Change time scale

--- Change data scale

--- Graph View pause / resume: refer to section 4-2-4.(3).

--- Select display item: refer to section (4).

--- Switch displays of individual function button (1/3 view)

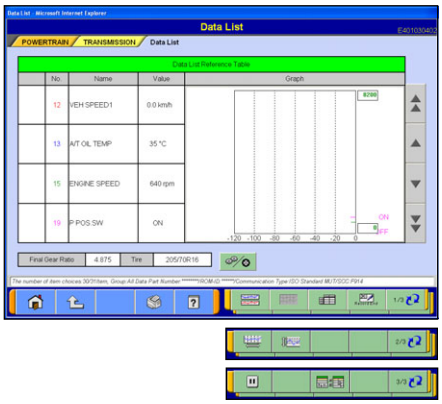
--- Switch displays of individual function button (2/3 view)

--- Switch displays of individual function button (3/3 view)

--- Select this button to move forward to the display screen showing the final gear ratio setting and tire information refer to section 4-2-4.(4).

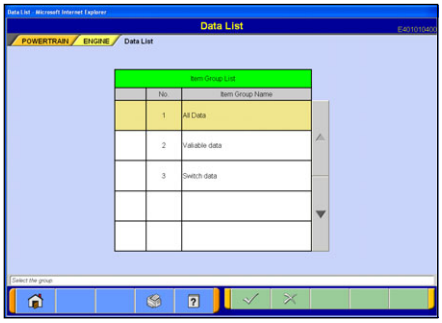
<Note>

- The order in which items are displayed can be changed: refer to section 4-2-4.(1).
- The data range can be changed to user-specified values: refer to section 4-2-4.(2).



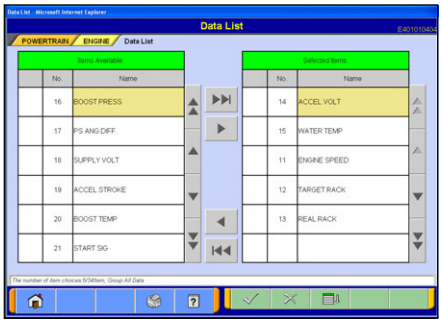
(4) Graph View 2

The buttons available for use with Graph View 2 are the same as those used for Graph View 1.



(5) Select Display Item Group

Select the group of items to be displayed and touch the button.



(6) Select Item

Items can be moved back and forth by using either the button or the button as necessary.

The item order can be changed by the following procedure: Temporarily return items that were once moved from the Selected Items to the Selectable Items list, back to the Selected Items list; change the position of the desired items; then move the items back to the Selectable Items list.

--- Touch this button to insert all the items from the Selectable Item list into the desired positions on the Selected Item list. Please note that voltage values cannot be moved.

--- Touch this button to insert the item currently chosen from the Selectable Item list into the desired position on the Selected Item list.

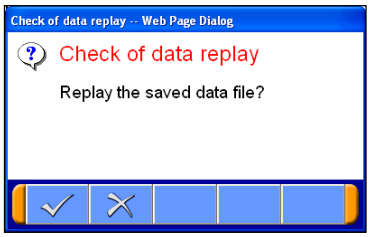
--- Touch this button to move the item currently chosen from the Selected Item list to the very bottom position on the Selectable Item list.

--- Touch this button to move all the items from the Selected Item list to the very bottom of the Selectable Item list.

--- Touch this button to change the order of items on both the Selectable Item list and the Selected Item list, in accordance with the specified default setting.

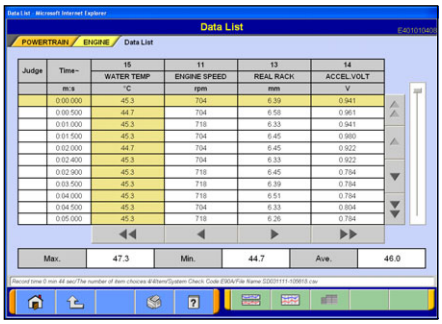
<Note>

In the event that no items are chosen as Selected Items, then all items will be displayed, except for voltage values.



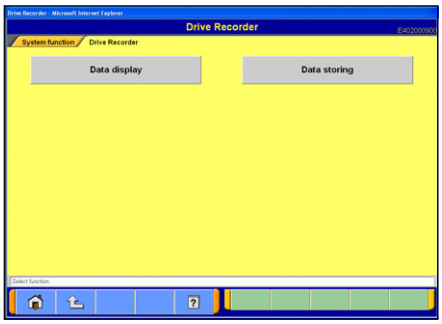
4-2-2. Saving and Regenerating the Data List

(1) If the Record End button is selected during the Data List graph operation, only the data for the items currently displayed in the graph will be saved.
A prompt will be displayed to confirm the regeneration of saved data.
--- OK: go to section (2).
--- Cancel: the data will not be regenerated and the screen will return to the Data List display.

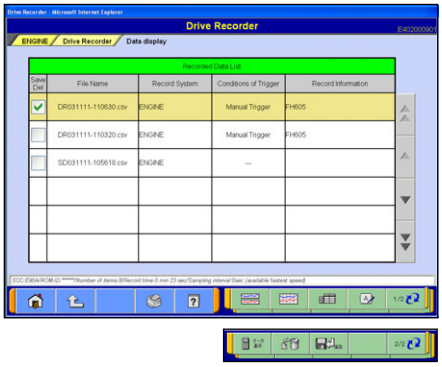


(2) Regenerating Saved Data
The data saved immediately after the recording will be displayed.
The display format can be changed by using the following buttons:
--- Graph View 1
--- Graph View 2 (overlay graph view)
--- Text View
<Note>
- The order in which items are displayed can be changed: refer to section 4-2-4.(1).
- The data range can be changed to user-specified values while the graph is displayed: refer to section 4-2-4.(2).

4-2-3. Displaying the Data List Saved Previously



(1) In order to display the previous Data List, select:
Special Function from the function selection menu screen, then select **Drive Recorder** -> **Display Data**.
For this operation, the V.C.I. does not need to be connected to the vehicle.



(2) Regenerated File List

Select the desired data to display from the regenerated file list, then touch the button to view the text data.

Also, press the and buttons to view the graph data.

--- Text View: go to section (3).

--- Graph View 1: go to section (4).

--- Graph View 2: go to section (5).

--- Edit Recording Information

--- Display V.C.I. Data

--- Delete Regenerated File

--- Save Regenerated File

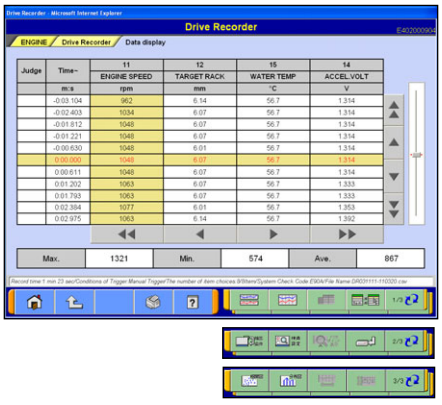
<Note>

The name of the file currently displayed is composed of SD (DR) + date + time. The time at which data was downloaded into the PC is used as a reference. The most recent data is displayed first.

DR : files saved via the Drive Recorder.

SD : files saved via the Data List.

(Including the Data List saved via the actuator test.)



(3) Text View

The data recorded via the Data List recording operation will be displayed as text.

--- Graph View 1: go to section (4).

--- Graph View 2: go to section (5).

--- Select Item

--- Set Data Extraction Condition

--- Set Data Searching Condition

--- Jump to Triggering Point

--- Save Regenerated File

--- Set Correlation Chart

--- Set Distribution Chart

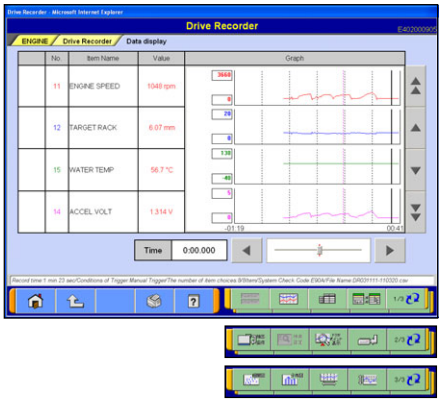
--- Switch displays of individual function button (1/3 view)

--- Switch displays of individual function button (2/3 view)

--- Switch displays of individual function button (3/3 view)

<Note>

The order in which items are displayed can be changed: refer to section 4-2-4.(1).



(4) Graph View 1

The data recorded via the Data List recording operation will be displayed in the form of a graph.

The points currently displayed are indicated by pink dotted lines. During recording, the section where Graph View is paused will be indicated by a solid black line.

--- Graph View 1 (The graph height area will change in accordance with the number of items displayed. For example, if 3 items are displayed, the graph height area will be divided into 3.)

--- Graph View 2: go to section (5).

--- Text View: go to section (3).

--- Select Item

--- Set Data Extraction Condition

--- Jump to Triggering Point

--- Save Regenerated File

--- Set Correlation Chart

--- Set Distribution Chart

--- Change Time Scale

--- Change Data Scale

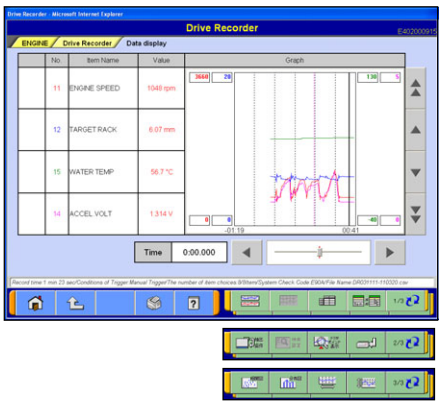
--- Switch displays of individual function button (1/3 view)

--- Switch displays of individual function button (2/3 view)

--- Switch displays of individual function button (3/3 view)

<Note>

- The order in which items are displayed can be changed: refer to section 4-2-4.(1).
- The data range can be changed to user-specified values: refer to section 4-2-4.(2).

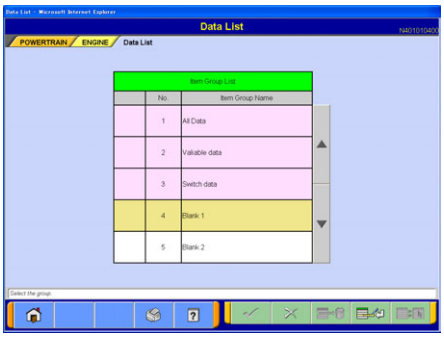


(5) Graph View 2

The buttons available for use with Graph View 2 are the same as those used for Graph View 1.

<Note>

For more information about handling the recorded data, please refer to section "5-3. Analyzing Recorded Data."



4-2-4. Group registration

(1) Group registration

Up to 5 new groups, which is the combination of user-specified items, can be registered.

Click button after selecting the line (No.4 – No.8) to be registered as group.

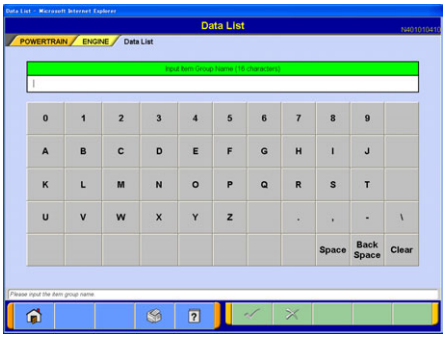
--- Registered group is cleared.

--- Group registration: go to section（2）へ

--- Select display item: refer to section 4-2-1.(6)

<Note>

- Registered contents can be corrected if you press the button after selecting the registered item group.
- Registered item group can be used for [Displaying the Data List Function], [the Actuator Test Function (simultaneously displaying the Data List)] and [Drive recorder Function (selecting the recorded item)].



(2) Input Item Group Name

Enter up to 16 characters of group name to be registered.

--- OK: go to section（3）.

--- Cancel: go to section（1）.

<Note>

As the PC keyboard is connected, the information may be entered either directly from the PC keyboard or from the keyboard shown on the screen.

(3) Selecting registered item

Pressing the ▶ button moves desired items to be registered as a group, to the Selected item list.

After you press the ✓ button, Item group is registered, then the screen returns to section（1）.

<Note>

Items can be moved back and forth by using either the ▶ button or the ◀ button as necessary.

▶▶| --- Touch this button to insert all the items from the Selectable Item list into the desired positions on the Selected Item list.

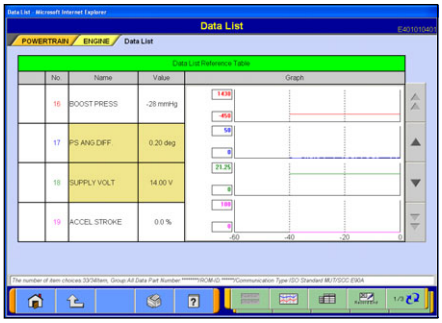
▶ --- Touch this button to insert the item currently chosen from the Selectable Item list into the desired position on the Selected Item list.

◀ --- Touch this button to move the item currently chosen from the Selected Item list to the very bottom position on the Selectable Item list.

|◀◀ --- Touch this button to move all the items from the Selected Item list to the very bottom of the Selectable Item list.

--- Touch this button to change the order of items on both the Selectable Item list and the Selected Item list, in accordance with the specified default setting.

4-2-5. Other Functions



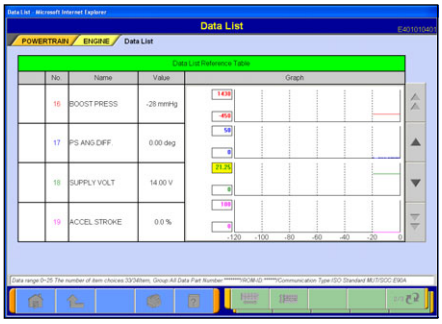
(1) Changing the Ordering of Items

The order in which items are displayed on the Data List screen can be changed. This function is available for Text View, Graph View 1 and Graph View 2.

The displayed item order can be changed while the Data List is continuously displayed. (Graph View will be reset.)

Keep one item fixed by touching the area indicated by the item names, then change the order of the other items by scrolling non-selected items that are not fixed, using the up and down scroll buttons. Touch the item again to cancel the selection.

This function cannot be utilized in Graph View during the selection of the data range display area, using the data range change function. (Functions such as: Select Item / Cancel / Scroll, cannot be utilized.)



(2) Changing the Data Range

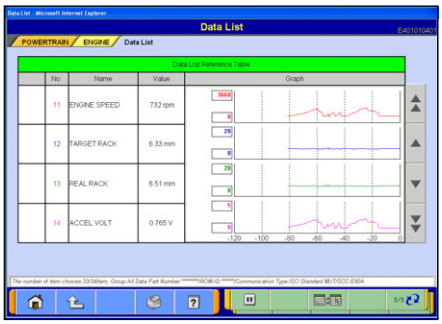
Select the item for which the data range must be changed by touching the screen.

Once the selected item becomes highlighted in yellow, numeric values can be entered.

Methods for entering values --- PC input or scroll button input

If a PC is used to enter values, enter user-specified values using the keyboard and either press the [Enter] key or touch the graph. This action will cancel the input state and will finalize the changed data range.

The ▲ and ▼ scroll buttons can also be used to change the data range. The ▲ button will make a full-scale +5% change toward the default data range and the ▼ button will make a change of -5%. Each time the values are changed, the data range change is finalized.

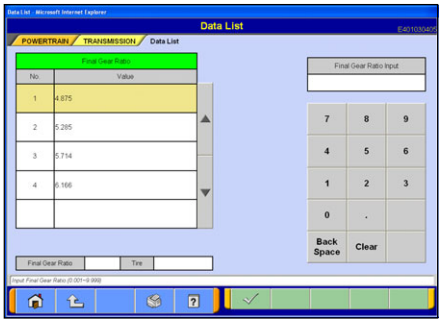


(3) Pausing for Graph View

If the ⏸ button is touched while the Data List is displayed as a graph, then Graph View will pause temporarily. If the ⏸ button is touched again, Graph View will resume.

The section where the Graph View was temporarily paused will be indicated on the graph by a solid black line.

While Graph View is paused, the data recording function will not operate.



(4) Setting the Final Gear Ratio and Displaying Tire Information.

Enter the final gear ratio.

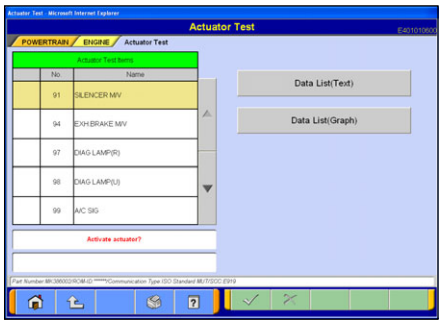
This screen is displayed only for certain vehicle models, when the system "transmission" has been selected.

Enter the final gear ratio using either the numeric buttons located on the right side of the screen, or using the keyboard.

After entering the final gear ratio, touch the button to finalize the entered values.

4-3. Operating Procedures for the Actuator Test

4-3-1. Operating Procedures for the Actuator Test



(1) Driving the Actuator

--- Touch this button to drive the actuator selected from the Actuator Test Ref.

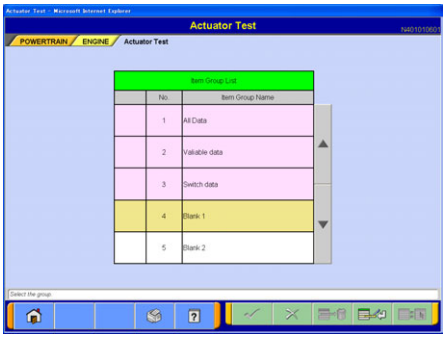
--- Touch this button to stop the actuator.

<Caution>

As this function forcibly drives or stops the actuator, always use additional care when performing these procedures and ensure that all safety measures are implemented.

In addition, check to ensure that all cabling and harnesses are connected properly, prior to performing this operation.

4-3-2. Simultaneously Displaying the Actuator Test and Data List



(1) Selecting item group

Touching the **Data List (Text)** button or the **Data List (Graph)** button on the screen shown in section 4-3-1.(1) will cause the item group selection screen to be displayed.

Selected the item group of the Data List to be displayed.

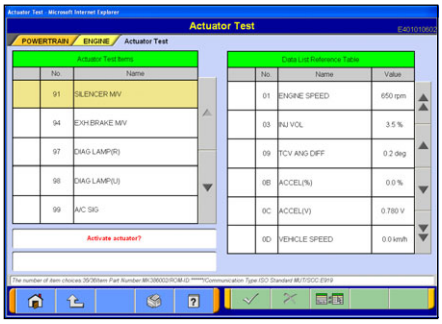
--- OK : go to section (2)/(3)

--- Cancel : go to section 4-3-1.(1)

--- Registered group is cleared.

--- Group registration:
refer to section P.26 [4-2-4.(1) Group registration]

--- Selecting item group to be displayed. :
go to section (5)



(2) Simultaneous Display with Data List (Text View)

Touching the **Data List (Text View)** button on the screen shown in section 4-3-1.(1) will cause both the Actuator Test Ref screen and the Data List Text View screen to be displayed simultaneously.

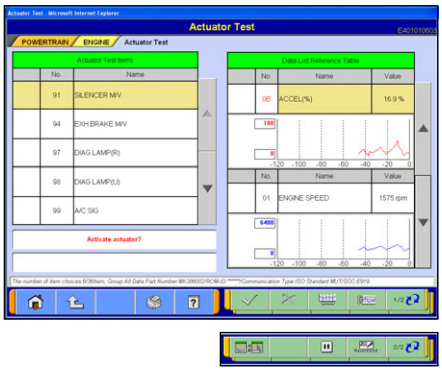
--- Touch this button to drive the actuator selected from the Actuator Test Ref.

--- Touch this button to stop the actuator.

--- Touch this button to select the item to be displayed from the Data List: go to section (4).

<Note>

The order in which Data List items are displayed can be changed: refer to section 4-3-4.(1).



(3) Simultaneous Display with Data List (Graph View)

Touching the **Data List (Graph View)** button on the screen shown in section 4-3-1.(1) will cause both the Actuator Test Ref screen and the Data List Graph View screen to be displayed simultaneously.

--- Touch this button to drive the actuator selected from the Actuator Test List.

--- Touch this button to stop the actuator.

--- Change time scale

--- Change data scale

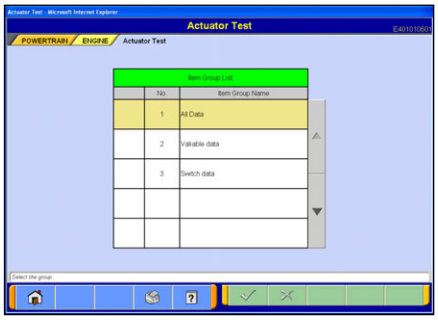
--- Touch this button to select the item to be displayed from the Data List: go to section (4).

--- Graph View Pause: refer to section 4-3-4.(3).

--- Save Data List: touch this button once to save the data list currently displayed. No dialogue boxes or messages will be displayed to confirm the save operation.

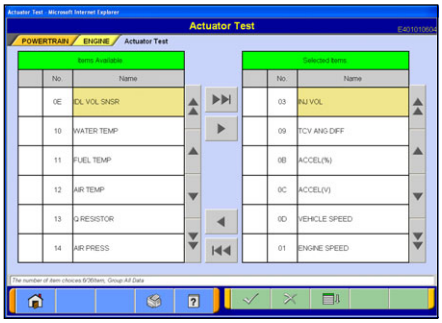
<Note>

- The order in which items are displayed can be changed: refer to section 4-3-4.(1).
- The data range can be changed to user-specified values: refer to section 4-3-4.(2).
- The item names selected from the Actuator Test Ref are recorded as recording information for the file in which the Data List has been saved.



(4) Select Display Item Group

Select the group of items to be displayed from the Data List and touch the button. -> go to section (5).



(5) Select Item

Items can be moved back and forth by using either the ▶ button or the ◀ button as necessary.

The item order can be changed by the following procedure: Temporarily return items that were once moved from the Selected Items to the Selectable Items list, back to the Selected Items list; change the position of the desired items; then move the items back to the Selectable Items list.

▶▶| --- Touch this button to insert all the items from the Selectable Item list into the desired positions on the Selected Item list. Please note that voltage values cannot be moved.

▶ --- Touch this button to insert the item currently chosen from the Selectable Item list into the desired position on the Selected Item list.

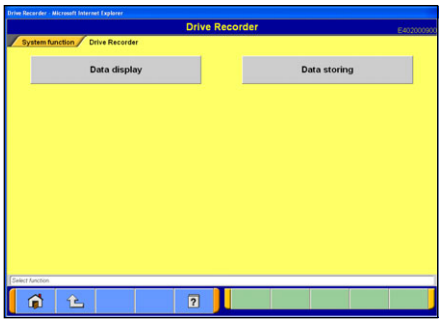
◀ --- Touch this button to move the item currently chosen from the Selected Item list to the very bottom position on the Selectable Item list.

|◀◀ --- Touch this button to move all the items from the Selected Item list to the very bottom of the Selectable Item list.

--- Touch this button to change the order of items on both the Selectable Item list and the Selected Item list, in accordance with the specified default setting.

<Note>

In the event that no items are chosen as Selected Items, then all items will be displayed, except for voltage values.

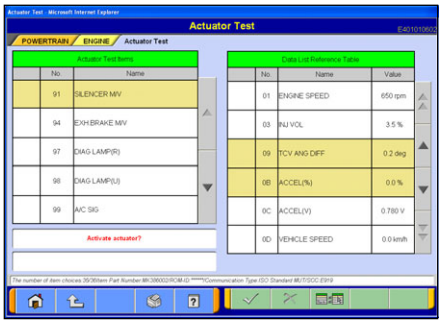


4-3-3. Displaying the Data List Saved Previously

In order to display the previous Data List, select: **Special Function** from the function selection menu screen, then select **Drive Recorder** -> **Display Data**.

<Note>
For the procedure used to display the saved Data List, refer to "4-2-3. Displaying the Data List Saved Previously."

4-3-4. Other Functions



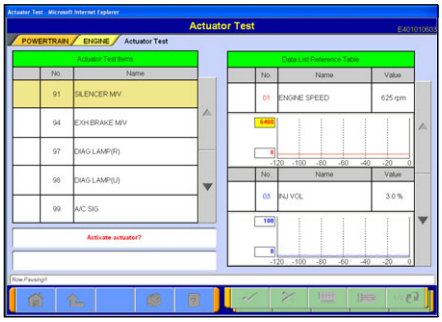
(1) Changing the Ordering of Items

The order in which items are displayed on the Data List screen can be changed. This function is available for Text View and Graph View.

The displayed item order can be changed while the Data List is continuously displayed. (Graph View will be reset.)

Keep one item fixed by touching the area indicated by the item names, then change the order of the other items by scrolling non-selected items that are not fixed, using the up and down scroll buttons. Touch the item again to cancel the selection.

This function cannot be utilized in Graph View during the selection of the data range display area, using the data range change function. (Functions such as: Select Item / Cancel / Scroll, cannot be utilized.)



(2) Changing the Data Range

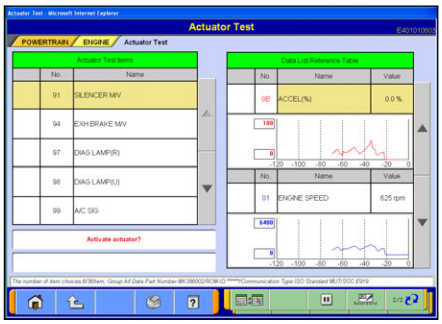
Select the item for which the data range must be changed by touching the screen.

Once the selected item becomes highlighted in yellow, numeric values can be entered.

Methods for entering values : PC input or scroll button input

If a PC is used to enter values, enter user-specified values using the keyboard and either press the [Enter] key or touch the graph. This action will cancel the input state and will finalize the changed data range.

The ▲ and ▼ scroll buttons can also be used to change the data range. The ▲ button will make a full-scale +5% change toward the default data range and the ▼ button will make a change of -5%. Each time the values are changed, the data range change is finalized.



(3) Pausing for Graph View

If the button is touched while the Data List is displayed as a graph, then Graph View will pause temporarily. If the button is touched again, Graph View will resume.

The section where the Graph View was temporarily paused will be indicated on the graph by a solid black line.

While Graph View is paused, the data recording function will not operate.

Chapter 5 Operating Procedures for the Drive Recorder

There are 2 methods used for recording data with the drive recorder:
[1] Method in which data recording is performed using a stand-alone V.C.I..
[2] Method in which data recording is performed using a PC, displaying data.

The sampling rates / times for each of the above methods are shown in the table below.
The most appropriate recording method can be selected to suit the particular application.

	[1] Recording Using a Stand-Alone V.C.I.	[2] Recording onto a PC
Sampling Rate	Fast	Slow
Sampling Time	Short	Long

5-1. Recording with the Drive Recorder

5-1-1. Recording with the Stand-Alone V.C.I. P.37

5-1-2. Recording with the PC.....P.42

5-1-3. Recording by Using the Previous Settings P.48

5-1-4. Group registration P.49

5-2. Handling the Recorded Data

5-2-1. Transferring Recorded Data from the V.C.I. to the PC P.51

5-2-2. Regenerating the Recorded Data P.52

5-2-3. Deleting / Saving the Recorded Data.....P.53

5-2-4. Loading Recorded Data P.54

5-3. Analyzing Recorded Data

5-3-1. Regenerating Recorded Data.....P.55

5-3-2. Extracting / Searching the Recorded Data P.58

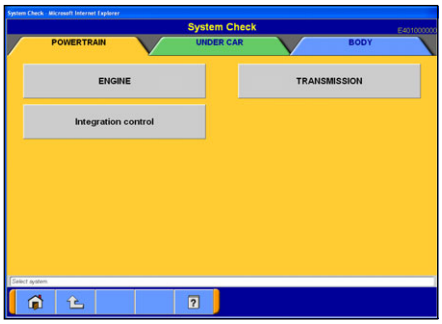
5-3-3. Displaying the Correlation Chart / Distribution Chart P.59

5-3-4. Item Order Change Function.....P.61

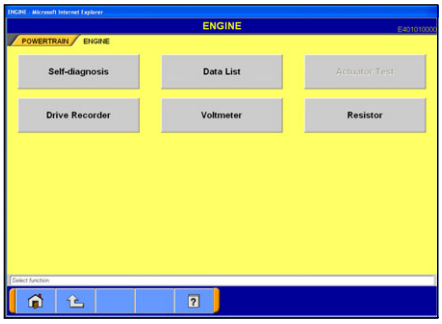
5-3-5. Data Range Change Function P.61

5-1. Recording with the Drive Recorder

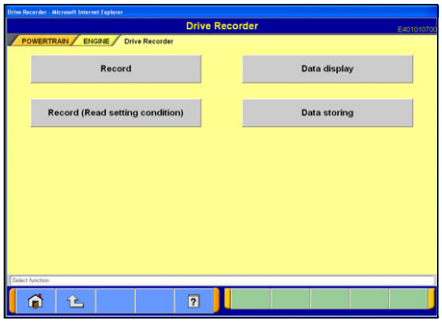
5-1-1. Recording with the Stand-Alone V.C.I..



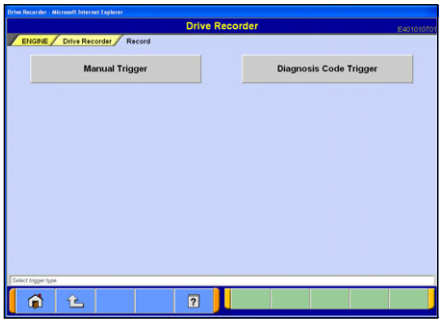
(1) Select the recording settings using the stand-alone V.C.I.
Use the PC to select the drive recorder settings, such as the items to be recorded and the triggering method.
Change the main category by selecting the tab located on the upper side of the screen and selects the system on which drive recording will be performed.
The procedures used for setting up the Drive Recorder for the engine system are explained in this section.
Select the **ENGINE** button.



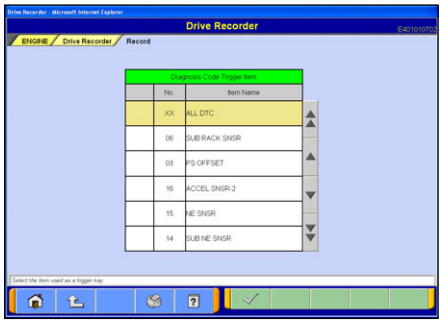
(2) Select Function
Select the **Drive Recorder** button.



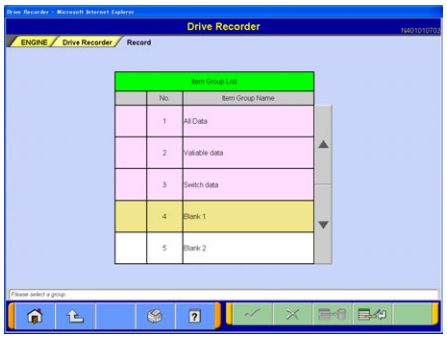
(3) Select Drive Recorder Function
Select the **Record** button from the Drive Recorder menu screen.



(4) Select Triggering Method
Select the triggering method.
Manual Trigger --- Touch this button for manual triggering. -> go to section (6).
Diagnosis Code Trigger --- Touch this button for triggering upon the occurrence of user-specified DTCs. -> go to section (5).



(5) Select Diag. Trigger
Select the item to be used as a trigger key and touch the button.



(6) Item Group Selection

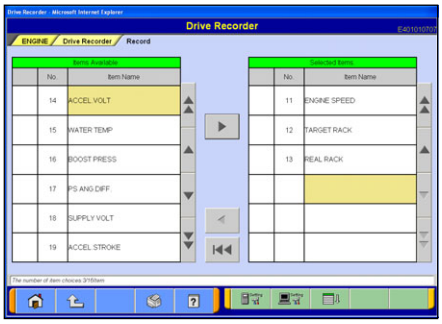
Select the Group for Recording Items.

--- OK : go to section (7)

--- Screen will return to the calling screen.

--- Registered group is cleared.

--- Group registration : refer to 5-1-4.(1).



(7) Select Recording Items

The Display Item list for the Data List will be displayed.

Select the items to be recorded.

--- Touch this button to insert the item currently chosen from the Selectable Item list into the desired position on the Selected Item list.

--- Touch this button to move the item currently chosen from the Selected Item list to the very bottom position on the Selectable Item list.

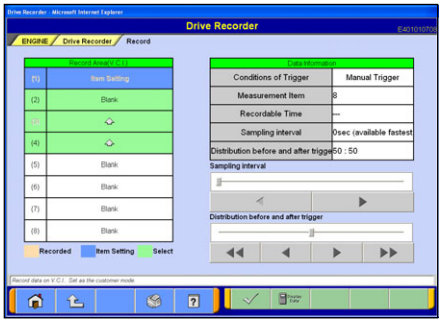
--- Touch this button to move all the items from the Recording Selection Item list to the very bottom of the Selectable Item list. (The selected position and items are fixed.)

--- V.C.I. Settings -> go to section (8).

--- Sort: Touch this button to change the order of items on both the Selectable Item list and the Recording Selection Item list, in accordance with the specified default setting.

<Note>

A maximum of 16 items can be chosen as Recording Selection Items.



(8) V.C.I. Recording Settings

Click the recording area on the V.C.I. to select it. Use the ◀◀ ◀ ▶ ▶▶ buttons to select the sampling interval and the percentage distribution before and after triggering.

--- OK: go to section (10).

Display Data --- Data display: go to section (9).

<Note>

8 recording areas can be selected. Also, contiguous areas can be selected.

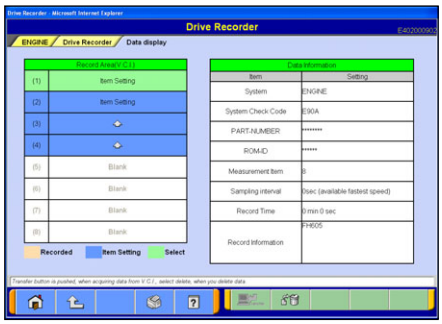
Selected recording areas will be displayed in green.

If the V.C.I. does not have any space for recording areas, touch the Display Data button. Delete the recorded data from the V.C.I. display screen.

The sampling interval indicates the time interval between each recorded data sample of an item. Sampling interval settings can be selected from: 0 sec (fastest) / 1 sec / 10 sec / 1 min.

When any sampling interval setting is selected, other than the fastest interval, the available recording time will be displayed. Please note that this available time is only an estimate obtained by calculation, thus may differ from the actual amount of recording time available.

The triggering distribution ranges from 0:100 ~ 100:0 in increments of 1%.

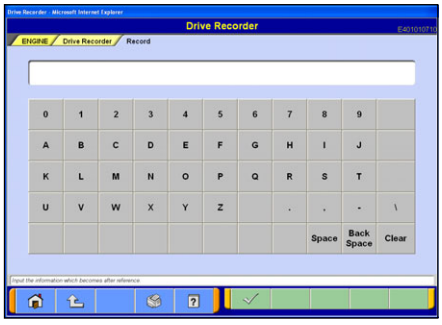


(9) Display V.C.I. Data

The settings will be displayed for each item, for data recorded in the selected V.C.I. recording areas.

--- Touch this button to delete V.C.I. recording data: the selected V.C.I. recording data will be deleted.

--- Touch this button to return to the settings screen: go to section (8).



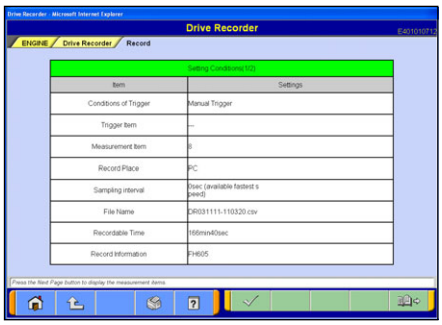
(10) Enter Recording Information

Enter up to 50 characters of recording information (memo), which can be used as a reference after recording.

--- OK

<Note>

- Reference information, such as vehicle model name and diagnostic system name, should be entered.
- As the PC keyboard is connected, the information may be entered either directly from the PC keyboard or from the keyboard shown on the screen.

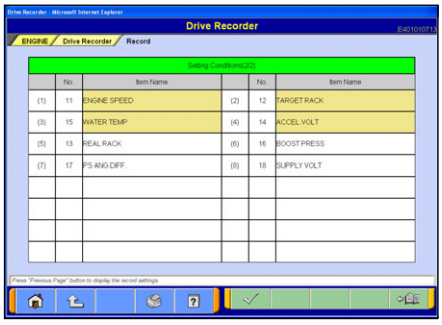


(11) Recording Settings List

Recording settings can be confirmed with this function.

Touch the button to confirm the items to be measured on the Recording Item list screen. -> go to section (12).

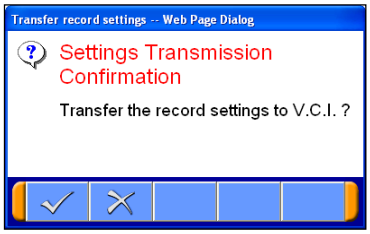
--- OK : go to section (13).



(12) Recording Item List

Touch the button to display the settings for data recording. -> go to section (11).

--- OK : go to section (13).

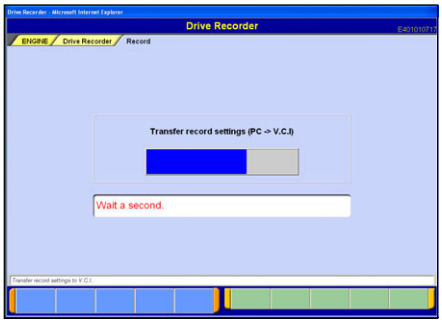


(13) Confirm Transfer

A message will be displayed requesting confirmation to transfer settings.

--- OK : go to section (14).

--- Cancel : go to sections (11) / (12).



(14) Transfer Settings

Settings are now being transferred to the V.C.I. Please wait for a moment until the transfer has completed.

Upon transfer completion, a dialogue box will appear, that states "Transfer of Settings Completed."

<Note>

If recording operations must be performed immediately after the transfer of setting has completed, unplug the USB cable while keeping the V.C.I. switch in the ON position.

If only the settings operations must be performed and if recording operations are to be performed later, then first turn the V.C.I. switch off, then unplug the USB cable.

(15) When Performing Manual Triggering

Connect the trigger harness to the V.C.I. trigger port, as necessary.

In the event that manual triggering must be generated during the recording operation, either press the button on the trigger harness or press the Enter button on the V.C.I.

(16) Start Recording

Upon the start of recording, the V.C.I screen will appear as shown to the left. If the ignition switch is not ON, perform one of the following operations to initialize communications: turn the ignition switch ON or turn the V.C.I. power switch ON after starting the vehicle engine. The recording operation will then start after communication initialization.

<Note>

The [numeric value] shown on the V.C.I.'s LCD screen displays the number of the recording area for the Drive Recorder within the V.C.I.

(17) Triggering

Manual triggering can be initiated by pressing either the button located on the trigger harness, or the Enter button. Once triggering has occurred, the letter "T" will be displayed on the screen. Data produced subsequent to triggering will be recorded.

When using Diag. Trigger, triggering will be initiated automatically upon the occurrence of specified DTCs.

(18) End Recording

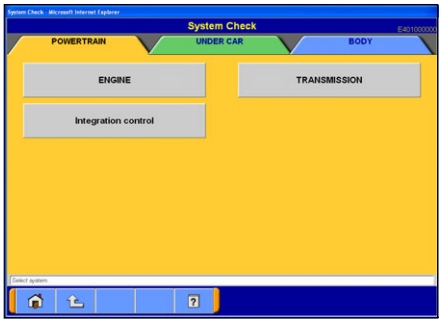
Regardless of the triggering method, whenever the recording operation must be stopped, data recording can be stopped by pressing the V.C.I.'s Esc button.

After recording, both the vehicle harness and the trigger harness can be detached after the V.C.I. has been turned OFF.

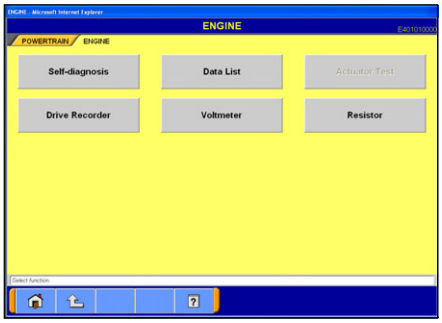
If triggering is not initiated, data will not be recorded.

(19) For confirmation of recorded data, please refer to "5-2-1. Transferring Recorded Data from the V.C.I. to the PC."

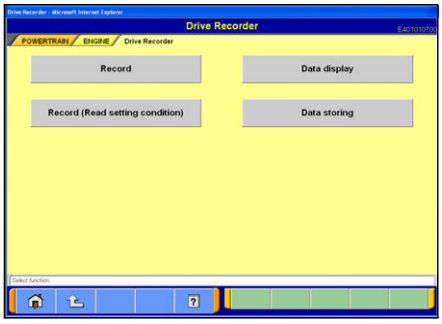
5-1-2. Recording with the PC



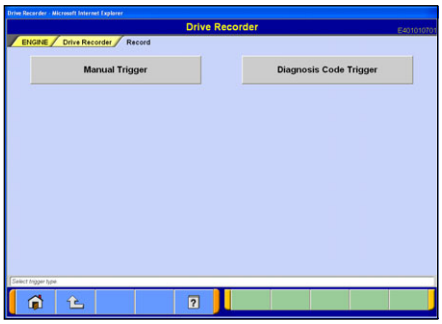
(1) The PC can be used to select the recording settings.
Use the PC to select the drive recorder settings, such as the items to be recorded and the triggering method.
Change the main category by selecting the tab located on the upper side of the screen and selects the system for which drive recording will be performed.
The procedures used for setting up the Drive Recorder for the engine system are explained in this section.
Select the **ENGINE** button.



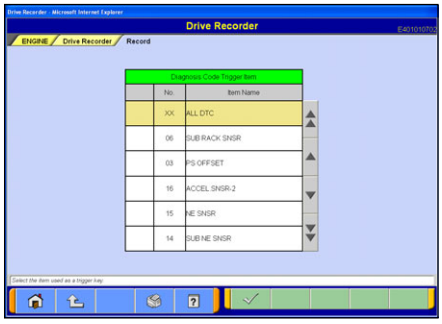
(2) Select Function
Select the **Drive Recorder** button.



(3) Select Drive Recorder Function
Select the **Record** button from the Drive Recorder menu screen.

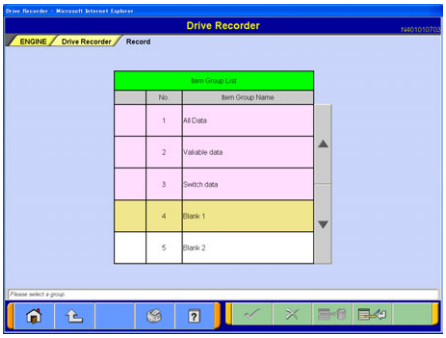


(4) Select Triggering Method
Select the triggering method.
Manual Trigger --- Touch this button for manual triggering. -> go to section (6).
Diagnosis Code Trigger --- Touch this button for triggering upon the occurrence of user-specified DTCs. -> go to section (5).



(5) Select Diag. Trigger

Select the item to be used as a trigger key and touch the button. -> go to section (6).



(6) Item Group Selection

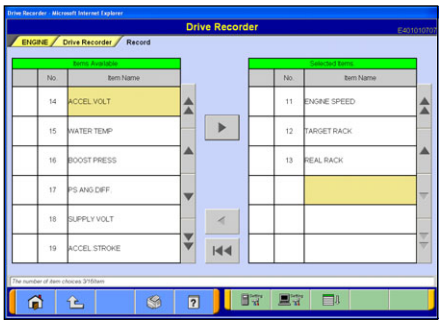
Select the Group for Recording Items.

--- OK : go to section (7)

--- Screen will return to the calling screen.

--- Registered group is cleared

--- Group registration : refer to 5-1-4.(1).



(7) Select Recording Items

The Display Item list for the Data List will be displayed.

Select the items to be recorded.

--- Touch this button to insert the item currently chosen from the Selectable Item list into the desired position on the Selected Item list.

--- Touch this button to move the item currently chosen from the Selected Item list to the very bottom position on the Selectable Item list.

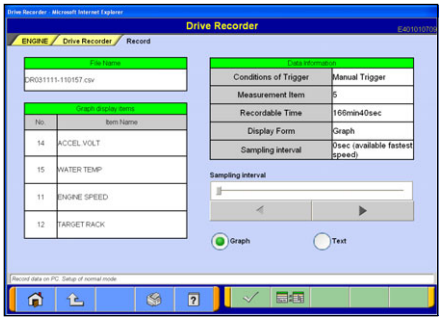
--- Touch this button to move all the items from the Recording Selection Item list to the very bottom of the Selectable Item list. (The selected position and items are fixed.)

--- PC Settings -> go to section (8).

--- Sort: Touch this button to change the order of items on both the Selectable Item list and the Recording Selection Item list, in accordance with the specified default setting.

<Note>

A maximum of 16 items can be chosen as Recording Selection Items.



(8) PC Recording Settings

"Normal Mode" is used as the setting for PC recording.

The display format setting used during the recording operation is the data display format.

Set the sampling interval using the buttons.

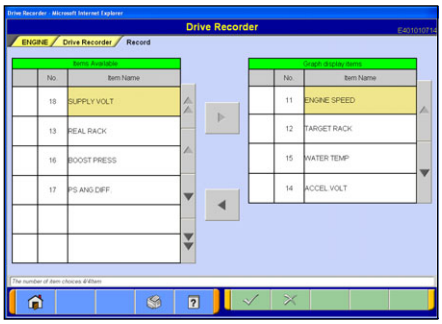
Graph --- Select the display format during the recording operation (either Graph View or Text View) by marking the appropriate selection ( ).

--- OK -> go to section (10).

--- Select Graph View item -> go to section (9). (Only when Graph View has been selected as the display format.)

<Note>

- The sampling interval indicates the time interval between each recorded data sample of an item. Sampling interval settings can be selected from: 0 sec (fastest) / 1 sec / 10 sec / 1 min.
- When any sampling interval setting is selected, other than the fastest interval, the available recording time will be displayed. Please note that this available time is only an estimate obtained by calculation, thus may differ from the actual amount of recording time available.
- The Graph View item list will be displayed when "Graph View" is selected as the display format for the recording operation.
- The name of the file currently displayed is composed of DR + date + time. The time at which data was downloaded into the PC is used as a reference.
- DR: files saved via the Drive Recorder.



(9) Select Graph View Display Item

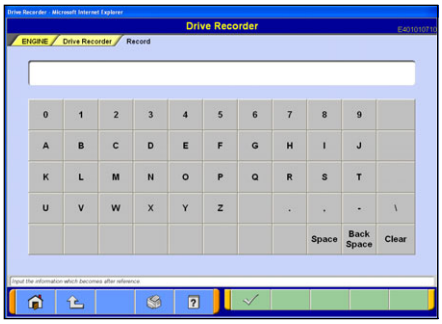
Select the desired item to display as a graph from among the selectable items.

Only the items selected will be displayed as graphs. Although other items will not be displayed, the data has been recorded.

--- Touch this button to insert the item currently chosen from the Selectable Item list into the desired position on the Graph View Item list.

--- Touch this button to move the item currently chosen from the Graph View Item list to the very bottom position on the Selectable Item list. (The selected position and items are fixed.)

--- OK -> go to section (8).



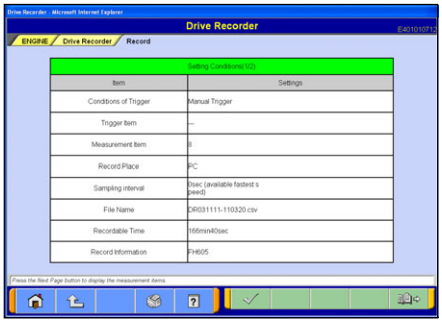
(10) Enter Recording Information

Enter up to 50 characters of recording information (memo), which can be used as a reference after recording.

--- OK -> go to section (11).

<Note>

- Reference information, such as vehicle model name and diagnostic system name, should be entered.
- As the PC keyboard is connected, the information may be entered either directly from the PC keyboard or from the keyboard shown on the screen.

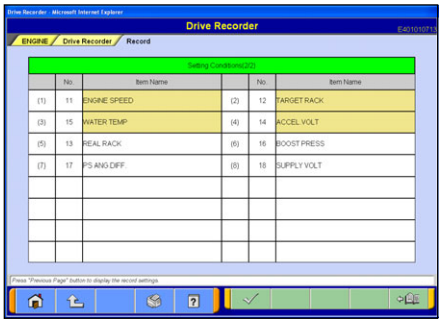


(11) Recording Settings List

Recording settings can be confirmed with this function.

Touch the button to confirm the items to be measured on the Recording Item list screen. -> go to section (12).

--- OK -> go to sections (13) / (14).



(12) Recording Item List

The row items to be displayed in graph format during the recording operation will appear with the background highlighted in yellow, under the [Item Name] column. (Only when Graph View has been selected as the display format for the PC Recording Settings operation.)

Touch the button to display the settings for data recording. -> go to section (11).

--- OK -> go to sections (13) / (14).

(13) Recording Screen (If Text View is Selected)

If Text View is selected, on the screen shown in section (8), data will be acquired / displayed as text and will be simultaneously saved in a file.

16 text items can be displayed simultaneously.

--- Touch this button to end data recording: go to section (15).

If 0 points of data are recorded: go to section (16).

--- Touch this button for manual triggering (Note that if Diag. Trigger has been selected as the triggering method, this operation will not function.)

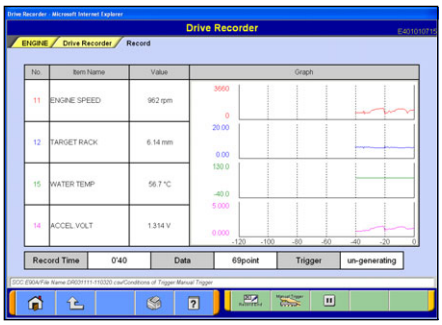
--- Touch this button to pause the Data List display. To resume display, touch this button again.

The data recording operation will continue, even if Data List display is paused.

<Note>

- Even if triggering occurs, the recording operation will continue until the

button is touched.
- Once the recording screen is displayed, the amount of available PC hard disc space will be checked. If 100 MB or less space is available, a message will be displayed and the recording operation will be canceled.
- Once 20,000 data points have been recorded, a message will be displayed and the recording operation will end. (If the sampling interval is 1 second, then 1 data point will be recorded each second. Therefore, when converted to time, approximately 5.5 hours are required to record 20,000 data points. If the sampling interval is 10 seconds, the time conversion will be approximately 55 hours. If the sampling interval is 1 minute, the time conversion will be approximately 333 hours.)
- In the event that an error occurs during the data recording operation, all data recorded up until the time of the error will be saved.



(14) Recording Screen (When Graph View is Selected)

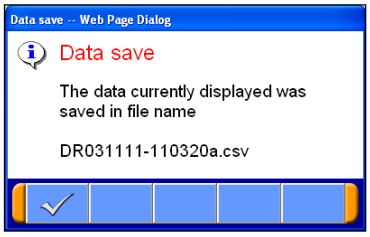
4 items are displayed simultaneously as graphs. Items that are not displayed on the screen are also recorded.

The buttons available for use with this function are the same as those used for Text View.

<Note>

The occurrence of triggering is indicated by a solid red line.

If the pause button is touched, a solid black line will be displayed on the graph.



(15) Save Recorded Data

If the Record End button is touched, in the procedures described in either section (13) or (14), data will be saved and a dialogue will appear to confirm the completion of the data save operation.

Once data has been saved, the display will return to the Drive Recorder menu screen.

--- OK -> go to section (3).

(16) No Recorded Data

If no recorded data is present, a dialogue will appear to confirm whether the recording operation should be ended.

--- OK

Go to the fault diagnosis menu (once the button is selected).

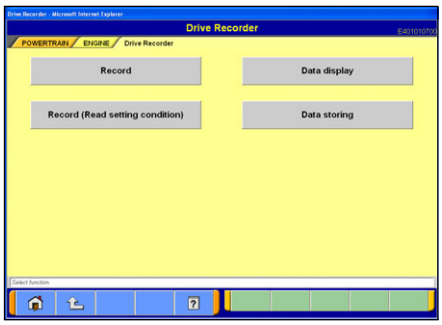
Go to either section (13) or (14) (once the button is selected).

Go to section (3) (once the Record End button is selected).

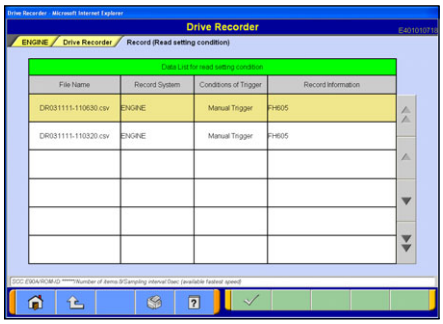
--- Touch this button to cancel: return to either section (13) or (14) and resume the recording operation.

(16) For the procedure used to confirm the data after the recording operation, refer to "5-2-2. Regenerating the Recorded Data."

5-1-3. Recording by Using the Previous Settings



(1) The previous recording settings can be restored to re-record data under the same conditions as those used for the previous data file.
Select the
Record (Read Setting Condition) button from the Drive Recorder menu screen.

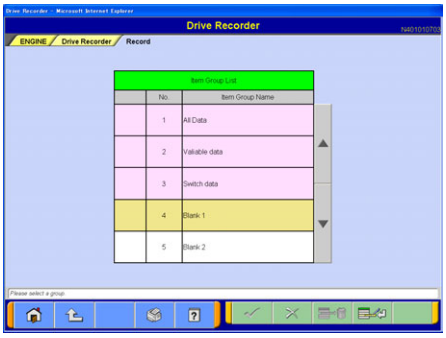


(2) Select the data for which settings must be restored, from the Setting Conditions File list.
After displaying the Setting Conditions File list, the recording conditions can be reset.

--- OK
When displaying the data recorded with the stand-alone V.C.I.:
-> go to section 5-1-1.(7).
When displaying data recorded with the PC.
-> go to section 5-1-2.(7).

--- Touch this button to return 1 level: go to section (1).

5-1-4. Group registration



(1) Group registration

Up to 5 new groups, which is the combination of user-specified items, can be registered.

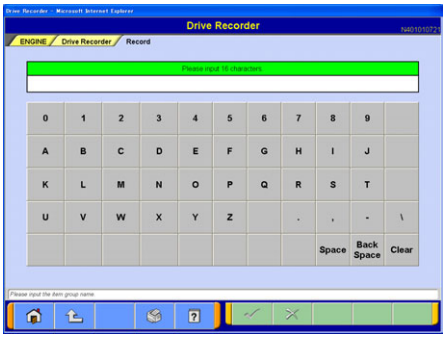
Click button after select the line (No.4 – No.8) to be registered as group.

--- Registered group is cleared.

--- Group registration: go to section（2）へ

<Note>

- Registered contents can be corrected if you press the button after selecting the registered item group.
- Registered item group can be used for [Displaying the Data List Function], [the Actuator Test Function(simultaneously displaying the Data List)] and [Drive recorder Function (selecting the recorded item)].



(2) Input Item Group Name

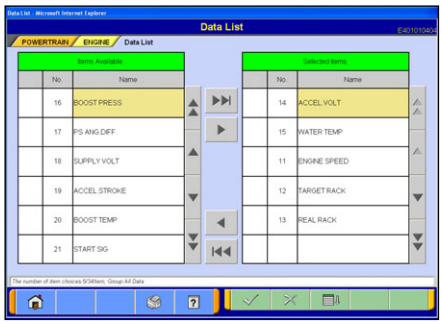
Enter up to 16 characters of group name to be registered.

--- OK: go to section（3）.

--- Cancel: go to section（1）.

<Note>

As the PC keyboard is connected, the information may be entered either directly from the PC keyboard or from the keyboard shown on the screen.



(3) Selecting registered item

Pressing the ▶ button moves desired items to be registered as a group, to the Selected item list.

After you press the ✓ button, Item group is registered, then the screen returns to section（1）.

<Note>

Items can be moved back and forth by using either the ▶ button or the ◀ button as necessary.

▶▶| --- Touch this button to insert all the items from the Selectable Item list into the desired positions on the Selected Item list.

▶ --- Touch this button to insert the item currently chosen from the Selectable Item list into the desired position on the Selected Item list.

◀ --- Touch this button to move the item currently chosen from the Selected Item list to the very bottom position on the Selectable Item list.

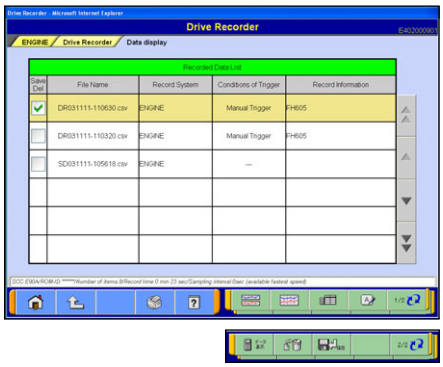
|◀◀ --- Touch this button to move all the items from the Selected Item list to the very bottom of the Selectable Item list.

--- Touch this button to change the order of items on both the Selectable Item list and the Selected Item list, in accordance with the specified default setting.

5-2. Handling the Recorded Data

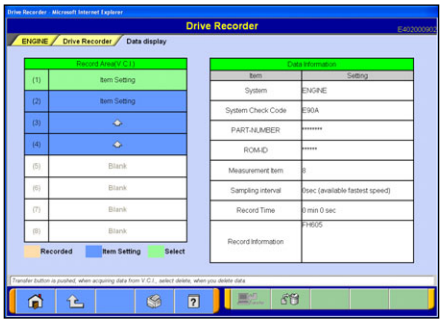
5-2-1. Transferring Recorded Data from the V.C.I. to the PC

(1) Data recorded in the V.C.I. can be transferred to the PC.
Connect the V.C.I. to the PC using the USB cable.
Select **Data Display** from the Drive Recorder menu.
When transferring V.C.I. data by selecting the Drive Recorder from within the **Special Function** menu, it is not necessary to connect the V.C.I. to the vehicle.



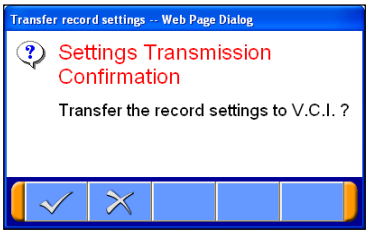
(2) Regenerated File List
Select the Display V.C.I. Data button

from the function buttons on the Regenerated File List.

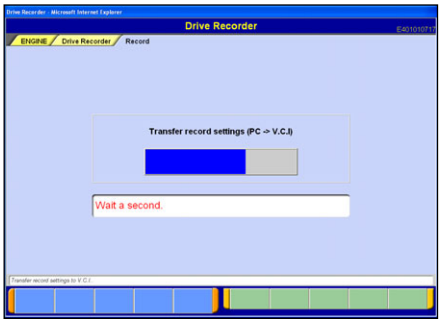


(3) Display V.C.I. Data
The conditions of the V.C.I. recording areas can be displayed. Drive Recorder data recorded in the V.C.I. can be transferred to the PC. As well, the data within the V.C.I. can be deleted.
Touch the

button after selecting the data to be transferred.
Touch the button to delete the data.



(4) Confirm V.C.I. Data Transfer
--- OK: go to section (5).
--- Cancel: go to section (3).



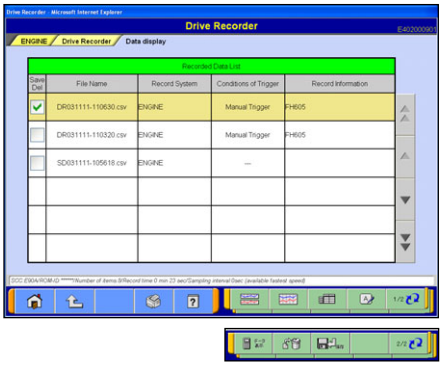
(5) V.C.I. Data Transfer Status
Data is now being transferred from the V.C.I. to the PC.
Please wait for a moment.
Upon completion of data transfer, a message will be displayed requesting confirmation to delete the data in the V.C.I..
Follow the instructions.
After data has been transferred, the screen will return to section (3).

5-2-2. Regenerating the Recorded Data

(1) Select Drive Recorder Function

To display recorded data after recording using the Drive Recorder, select the **Data Display** button.

When displaying recorded data by selecting the Drive Recorder from within the **Special Function** menu, it is not necessary to connect the V.C.I. to the vehicle.



(2) Regenerated File List

Select the desired data to display from the regenerated file list, then touch the button to view the text data.

Also, touch the and buttons to view the graph data.

The background color of the selected file row will change.

<Note>

The name of the file currently displayed is composed of DR (SD) + date + time. The time at which data was downloaded into the PC is used as a reference. The most recent data is displayed first.

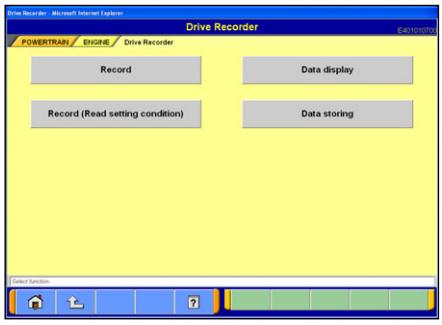
DR: files saved via the Drive Recorder.

SD: files saved via the Data List.

(Including the Data List saved via the actuator test.)

(3) For more information about the procedure used to check regenerated files, please refer to "5-3. Analyzing Recorded Data."

5-2-3. Deleting / Saving the Recorded Data

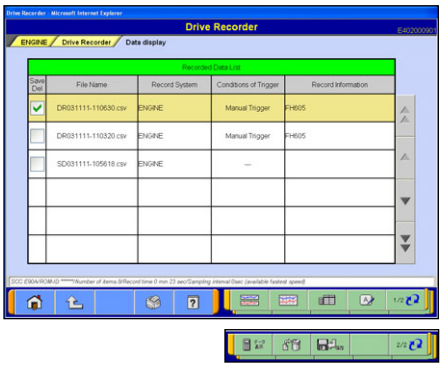


(1) Select Drive Recorder Function

Select the **Data Display** button.

When displaying the recorded data by selecting the Drive Recorder from within the **Special Function** menu, it is not necessary to connect the V.C.I. to the vehicle.

In order to save the data, insert removable media into the PC.



(2) Deleting Regenerated Files

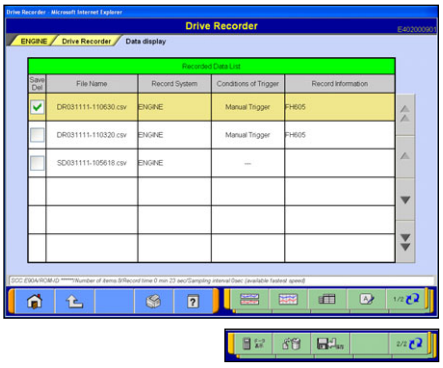
Mark the check box, then touch the button to delete the data. (Multiple files can be marked.)

<Note>

Move the curser onto the check box and click. This action will cause the ✔ mark to appear. (To select)

The ✔ mark will disappear if the check box is clicked again. (To cancel)

A confirmation dialogue will be displayed after the delete button is touched. Follow the instructions.



(3) Saving Regenerated Data

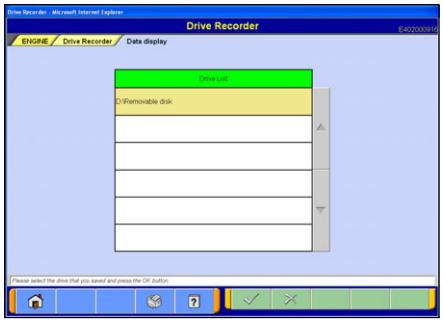
Mark the check box beside the file to be saved then touch the button. (Multiple files can be marked.)

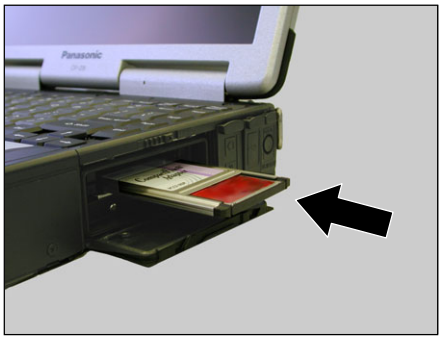
<Note>

Move the curser onto the check box and click. This action will cause the ✔ mark to appear. (To select)

The ✔ mark will disappear if the check box is clicked again. (To cancel)

If removable media is not present in the PC, files will not be saved.





(4) Select the Save Drive for Regenerated Files

The drive selection screen will be displayed. Select the save destination drive.

Touch the button to save the file to the removable media.

<Note>

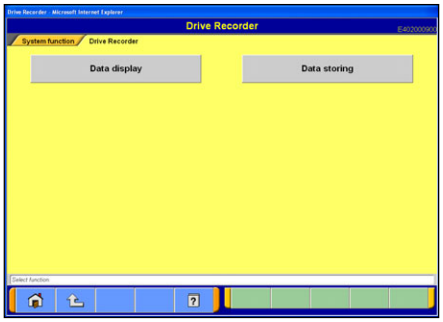
Prior to saving data, insert a PC memory card or other type of removable media, into the PC. If using a PC memory card, first open the card slot cover, which is located on the side of the PC, then insert the card.

Please note that PC memory cards are not provided with the product and must be obtained separately.

Caution

Never remove the PC memory card while data is being saved, as the data may become corrupted.

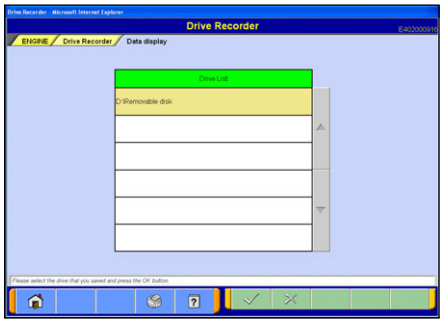
5-2-4. Loading Recorded Data



(1) Regenerated files that have been saved on removable media can be loaded into the PC.

After selecting the **Special Function** button from the function selection menu screen, select the **Drive Recorder** button to display the screen shown to the left.

Select the **Data Storing** button.



(2) Load Data

Data recorded on removable media can be loaded into the PC.

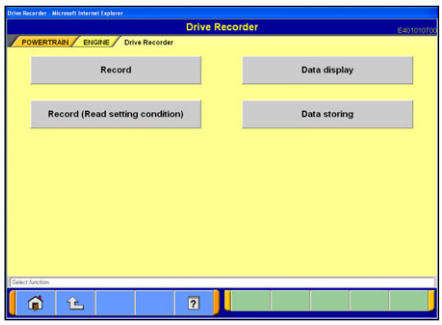
Select the removable media that holds the saved data and touch the button.

<Note>

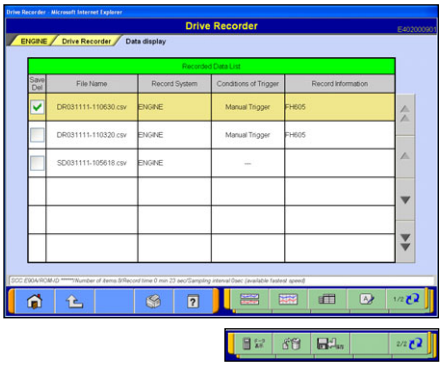
If the removable media has not been inserted into the PC, an error message will be displayed.

5-3. Analyzing Recorded Data

5-3-1. Regenerating Recorded Data



(1) Select the **Data Display** button from the Drive Recorder function menu. To display data without connecting the V.C.I. to the vehicle, select **Special Function** from the function selection menu screen, then select **Drive Recorder**.



(2) Regenerated File List

Select the desired data to display from the regenerated file list, then touch the button to view the text data.

Also, touch the and buttons to view the graph data.

--- Text View: go to section (3).

--- Graph View 1: go to section (4).

--- Graph View 2: go to section (5).

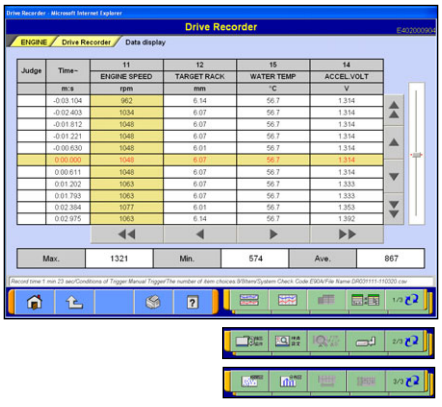
<Note>

The name of the file currently displayed is composed of DR (SD) + date + time. The time at which data was downloaded into the PC is used as a reference. The most recent data is displayed first.

DR: files saved via the Drive Recorder.

SD: files saved via the Data List.

(Including the Data List saved via the actuator test.)



(3) Text View

The data recorded via the Drive Recorder recording operation will be displayed as text.

Triggering points are displayed in red font.

--- Graph View 1: go to section (4).

--- Graph View 2: go to section (5).

--- Select Item: go to section (7).

--- Set Data Extraction Condition: go to section 5-3-2.(1).

--- Set Data Searching Condition: go to section 5-3-2.(3).

--- Jump to Triggering Point

--- Save Regenerated File: go to section (6).

--- Set Correlation Chart: go to section 5-3-3.(1).

--- Set Distribution Chart: go to section 5-3-3.(2).

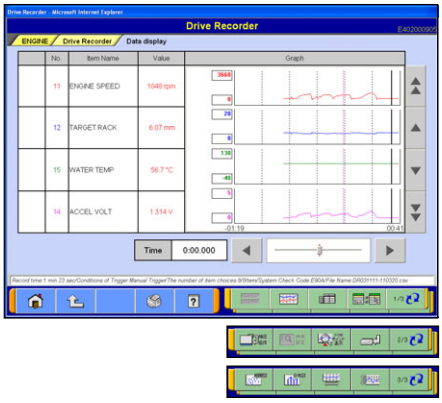
--- Switch displays of individual function button (1/3 view)

--- Switch displays of individual function button (2/3 view)

--- Switch displays of individual function button (3/3 view)

<Note>

The order in which items are displayed can be changed (refer to section 5-3-4).



(4) Graph View 1

The data recorded via the Drive Recorder recording operation will be displayed in the form of a graph.

The points currently displayed are indicated by pink dotted lines. Trigger points are indicated by solid red lines.

During recording, the section where Graph View is paused will be indicated by a solid black line. The section where Graph View has resumed will be indicated by a solid gray line.

--- Graph View 1 (The graph height area will change in accordance with the number of items displayed. For example, if 3 items are displayed, the graph height area will be divided into 3.)

--- Graph View 2: go to section (5).

--- Text View: go to section (3).

--- Select Item: go to section (7).

--- Set Data Extraction Condition: go to section 5-3-2. (1).

--- Jump to Triggering Point

--- Save Regenerated File: go to section (6).

--- Set Correlation Chart: go to section 5-3-3.(1).

--- Set Distribution Chart: go to section 5-3-3.(2).

--- Change Time Scale

--- Change Data Scale

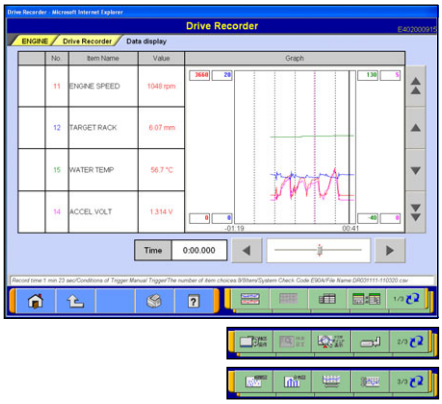
--- Switch displays of individual function button (1/3 view)

--- Switch displays of individual function button (2/3 view)

--- Switch displays of individual function button (3/3 view)

<Note>

- The order in which items are displayed can be changed (refer to section 5-3-4).
- The data range can be changed to user-specified values (refer to section 5-3-5).



(5) Graph View 2

The buttons available for use with Graph View 2 are the same as those used for Graph View 1.

(6) Save Regenerated File

Recorded data that is currently displayed will be saved in the PC.

Data that has been reduced via extraction can also be saved.

File names will consist of the original data file name + a letter (a, b, ~ z).

(7) Select Display Item

Items to be displayed can be selected using this function.

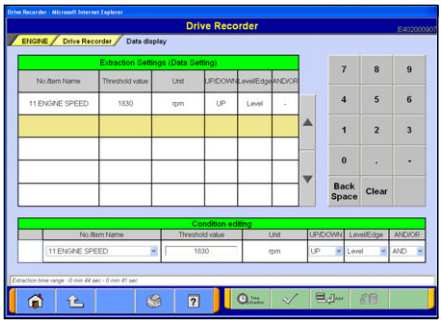
Items can be selected by moving them back and forth using either the ▶ button or the ◀ button.

The item order can be changed by the following procedure: Temporarily return items that were once moved from the Selected Items to the Selectable Items list, back to the Selected Items list; change the position of the desired items; then move the items back to the Selectable Items list;

- ▶▶| --- Touch this button to insert all the items from the Selectable Item list into the desired positions on the Selected Item list.
- ▶ --- Touch this button to insert the item currently chosen from the Selectable Item list into the desired position on the Selected Item list.
- ◀ --- Touch this button to move the item currently chosen from the Selected Item list to the very bottom position on the Selectable Item list.
- |◀◀ --- Touch this button to move all the items from the Selected Item list to the very bottom of the Selectable Item list.
- --- Touch this button to change the order of items on both the Selectable Item list and the Selected Item list, in accordance with the specified default setting.

5-3-2. Extracting / Searching the Recorded Data

Recorded data can be extracted and searched under user-specified conditions. Data can also be reduced and marked for reference. The time range or threshold value of items can be specified as data extraction / search conditions.



(1) Set Data Extraction Condition

Edit the item conditions, under the Edit Conditions column, then touch the Add button to add the item to the extraction conditions. Up to 8 conditions can be specified for data extraction.

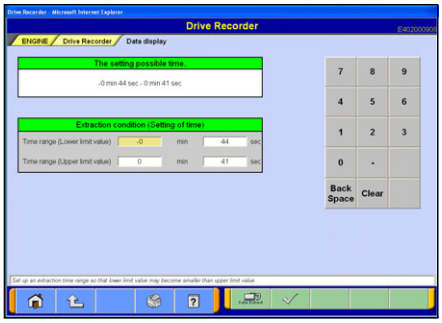
After specifying the extraction conditions, touch the button and only data that matches the specified extraction conditions will be displayed.

Time Extraction --- Set Time Extraction Conditions -> go to section (2).

--- Touch this button to delete the selected extraction conditions.

<Note>

Numeric values can be entered using either the keyboard or the buttons located on the right side of the screen.

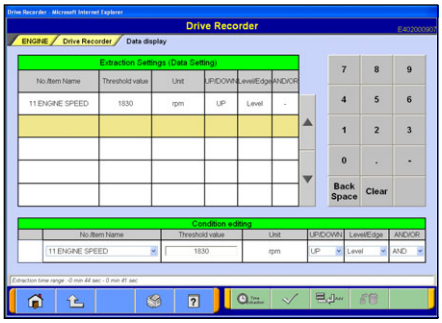


(2) Set Time Extraction Conditions

After setting the upper and lower time range limits for the desired data, touch the button and only data that matches the specified extraction conditions will be displayed.

<Note>

When both the data extraction conditions and the time extraction conditions have been specified, data will be extracted via AND processing.



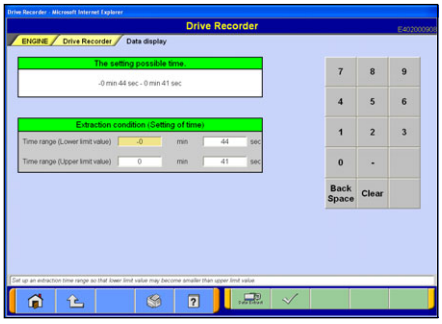
(3) Set Data Searching Condition (Only for Text View Screen)

Edit the item conditions, under the Edit Conditions column, and then touch the Add button to add the item to the search conditions. Up to 8 conditions can be specified for data searching.

After specifying the search conditions, touch the button. The * symbol will then be displayed in the confirmation column, directly beside data that matches the search conditions, on the text display screen shown in section 5-3-1.(3).

Time Extraction --- Set Time Searching Condition -> go to section (4).

--- Touch this button to delete the selected search conditions.



(4) Set Time Searching Condition

After setting the time range for the desired data to search, ouch the ✓ button. The * symbol will then be displayed in the confirmation column, directly beside data that matches the search conditions, on the text display screen shown in section 5-3-1.(3).

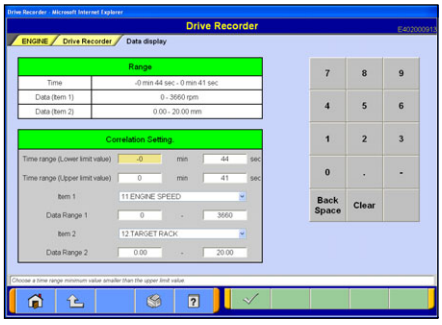
<Note>

When both the Data Searching Conditions and the Time Searching Conditions have been specified, data will be searched via AND processing.

<Information About Setting the Conditions>

- Item Name: use to select the items for which conditions are to be specified.
- Threshold Value: a value that can be used as a standard.
- UP: specification of a condition that has a value greater than the threshold value.
- DOWN: specification of a condition that has a value less than the threshold value.
- Level: all data that matches the specified conditions.
- Edge: data that is at the point where its status changes, from not matching the specified conditions, to matching the specified conditions.

5-3-3. Displaying the Correlation Chart / Distribution Chart



(1) Set Correlation Chart

Touch the ✓ button to display the correlation chart, after first specifying the time range for the subject data, as well as the item names and display ranges for each data group.

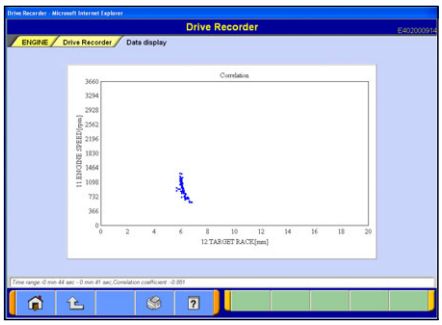
Analog data and voltage data can be plotted on the correlation chart.

Subject item 1 will be plotted on the vertical axis of the correlation chart and subject item 2 will be plotted on the horizontal axis of the correlation chart.

- Time Range: time range for the data to be plotted.
- Subject Item 1: item plotted on the vertical chart axis.
- Data Range 1: range of data for the item plotted on the vertical axis.
- Subject Item 2: item plotted on the horizontal chart axis.
- Data Range 2: range of data for the item plotted on the horizontal axis.

<Note>

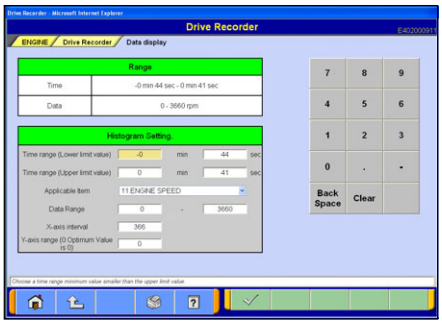
Numeric values can be entered using either the keyboard or the buttons located on the right side of the screen.



(2) Correlation Chart

Recorded data is displayed in the form of a correlation chart under the specified conditions.

--- Touch this button to return to the Set Correlation Chart screen: go to section (1).



(3) Set Distribution Chart

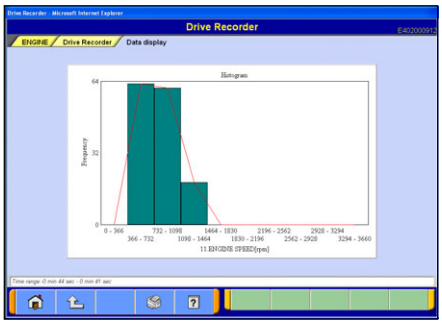
Touch the button to display the distribution chart, after first specifying the time range for the subject data, as well as the item names, data range, division width and frequency range.

Analog data and voltage data can be plotted on the distribution chart.

- Time Range: time range for the data to be plotted.
- Subject Items: items plotted.
- Data Range: range of data for the items plotted.
- Data Division Width: width of data divisions.
- Frequency Range: maximum frequency for the Y-axis (if "0" set to the optimum value to display the maximum frequency for each division width).

<Note>

Numeric values can be entered using either the keyboard or the buttons located on the right side of the screen.



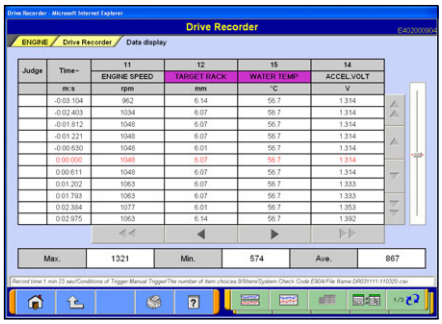
(4) Distribution Chart

Recorded data is displayed in the form of a distribution chart under the specified conditions.

--- Touch this button to return to the Set Distribution Chart screen: go to section (3).

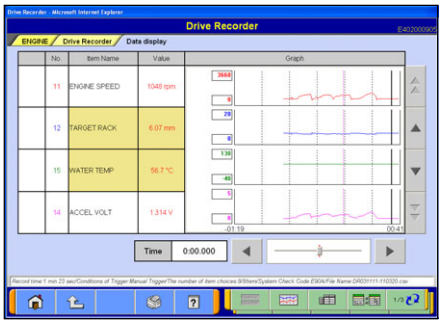
5-3-4. Item Order Change Function

The order in which items are displayed on the Text View screen and on Graph View 1 and 2 screens, can be changed.



(1) Changing the Ordering of Items on the Text View Screen

Select the names of items that are to remain fixed, by clicking on them (multiple items can be selected). Use the ◀ ▶ buttons to scroll the non-selected items, changing their order, while the selected items remain fixed. Touch the items again to cancel their selection.



(2) Changing the Ordering of Items on the Graph View 1 and 2 Screens

Select the item names that are to remain fixed (multiple items can be selected). Use the ▲ ▼ buttons to scroll the non-selected items, changing their order, while the selected items remain fixed. Touch the items again to cancel their selection.

5-3-5. Data Range Change Function

Select the item for which the data range must be changed by touching the screen.

Once the selected item becomes highlighted in yellow, numeric values can be entered.

Methods for entering values: PC input or scroll button input.

If a PC is used to enter values, enter user-specified values using the keyboard and either press the [Enter] button or touch the graph. This action will cancel the input state and will finalize the changed data range.

The ▲ and ▼ scroll buttons can also be used to change the data range. The ▲ button will make a full-scale +5% change toward the default data range and the ▼ button will make a change of -5%. Each time the values are changed, the data range change is finalized.

Chapter 6 Operating Procedures for Measurement Functions

6-1. Operating Procedures for Measurement Functions

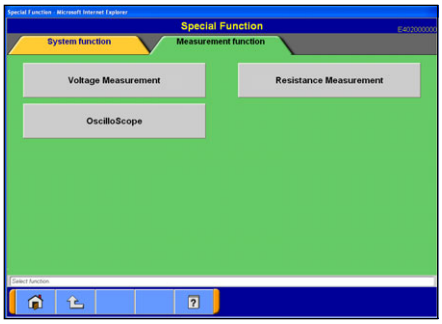
6-1-1. Measurement Function Menu.....P.63

6-1-2. Voltmeter P.63

6-1-3. Ohmmeter P.63

6-1. Operating Procedures for Measurement Functions

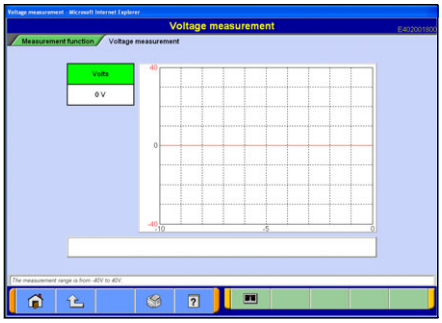
6-1-1. Measurement Function Menu



Select the **Special Function** button from the function selection menu to enter special function mode.
Switch to the **Measurement Functions** menu, using the tab located at the top of the screen.

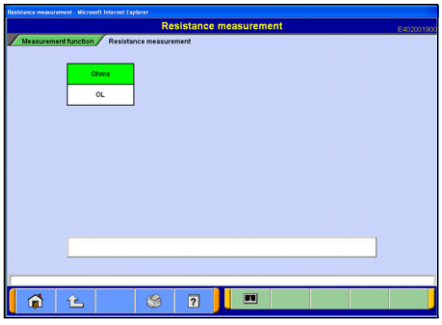
<Note>
For the method used to connect the measuring probes, refer to section "2-2-2. Measurement Functions".

6-1-2. Voltmeter



Select the **Voltmeter** button from the menu screen shown in section 6-1-1.
The voltage is read from the trigger port, by using the measuring probes. The numeric values are displayed on the PC screen.
Prior to measurement, perform zero point calibration by touching the button while the probes are short-circuited.
<Note>
DC voltages ranging from +/-40V can be measured.

6-1-3. Ohmmeter



Select the **Ohmmeter** button from the menu screen shown in section 6-1-1.
The resistance is read from the trigger port, by using the measuring probes. The numeric values are displayed on the PC screen.
Prior to measurement, perform zero point calibration by touching the while the probes are short-circuited.
<Note>
Resistance values ranging from 0 ~ 100kOhm can be measured.

Chapter 7 Other functions

7-1. Operating Procedures for V.C.I. Stand-alone Diagnosis

7-1-1. Transfer function of the database for V.C.I. stand-alone diagnosis P.66

7-1-2. Reading DTCs by V.C.I. stand-alone.....P.67

7-1-3. Error and Troubleshooting of V.C.I. Stand-alone Diagnosis P.69

<Note>

V.C.I. Stand-alone Diagnosis can read out DTCs by using the Program/Data stored in the internal memory of VCI, without connecting PC.

7-2. Operating Procedures for Engine VIN Writing

7-2-1. Coding Menu P.70

7-2-2. VIN Writing P.70

7-2-3. Displaying of VIN information P.70

7-3. Operating Procedures for Immobilizer Registration

7-3-1. Registration menu P.71

7-3-2. The 1st key Registration.....P.71

7-3-3. VIN Registration P.72

7-3-4. Additional key Registration.....P.72

7-3-5. Erasing Registered key P.73

7-4. Operating Procedures for Pulse Converter

7-4-1. Pulse Converter menu.....P.74

7-4-2. Parameter Setting P.74

7-4-3. Parameter Display.....P.74

7-4-4. System Information P.75

7-5. Operating Procedures for OBD-II Test Mode

7-5-1. OBD-II Test Mode menu P.76

7-5-2. Diagnostic Trouble Code(Mode$03).....P.76

7-5-3. On-Board Test Result(Mode$06).....P.77

7-5-4. Pending DTCs(Mode$07).....P.77

7-5-5. Vehicle Information(Mode$09) P.78

7-5-6. Readiness Tests P.78

7-5-7. Monitor System P.78

7-6. Operating Procedures for Air Suspension Calibration

7-6-1. Calibration Menu P.79

7-6-2. Height Sensor Calibration P.79

7-6-3. Pressure Sensor Calibration P.81

7-6-4. Calibration Data.....P.81

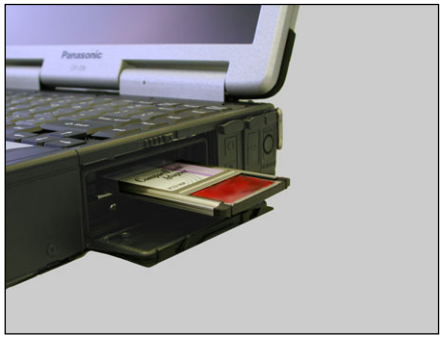
7-7. Operating Procedures for Language Switching

7-7-1. Language Switching P.82

7-1 Operating Procedures for V.C.I. Stand-alone Diagnosis

7-1-1. Transfer function of the database for V.C.I. Stand-alone diagnosis

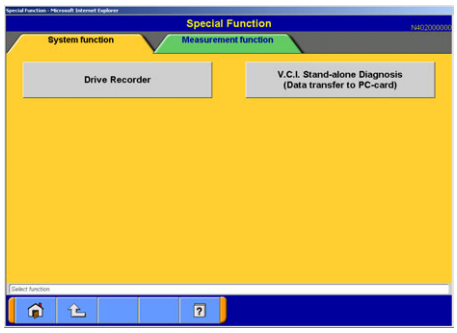
(1) Insert the memory card into the card adaptor, and then insert them into m-card slot on PC.



(2) Select function

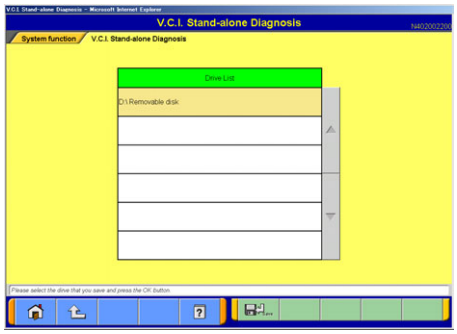
Select the **Special Function** button from the function selection menu to enter special function mode.

Select the **V.C.I. Stand-alone Diagnosis** button



(3) Select removable media

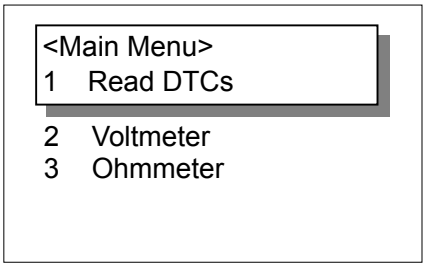
--- The Database, which is only for V.C.I. Stand-alone diagnosis, is transferred to the selected removable media(removable disk drive).



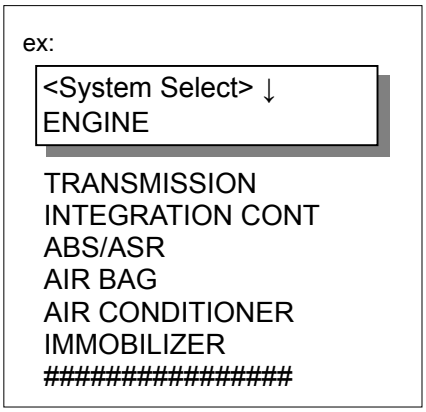
Database Transfer procedure written above has completed, remove the memory card from PC after stopping memory card by the procedures refer to [3-6].

(4) Insert the memory card, which is storing V.C.I. stand-alone diagnosis data, into the card adaptor, then insert them into V.C.I. main unit.

7-1-2. Reading Diagnostic Trouble Codes (DTCs)



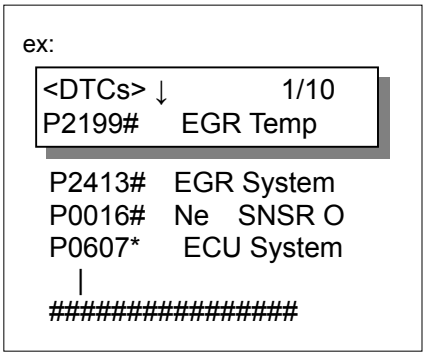
(1) Connect the V.C.I and the diagnosing vehicle with an appropriate main harness (TYPE-B/TYPE-E) securely, turn the V.C.I. power ON, and the V.C.I. LCD screen displays the Main Menu as illustrated on the left.
Confirm that "**1. Read DTCs**" is displayed, then press Enter (Enter) button.
<Note>
- If the V.C.I. is set on Drive Recorder mode, the LCD displays Drive Recorder menu screen (refer to 5-1-1(16)) Please press Esc (Esc)button twice in quick succession to cancel the Drive recorder mode.
- Necessary program/data for V.C.I. stand-alone diagnosis has been transferred automatically into the memory card.



(2) System Select
Press ▼ button to browse the list until the LCD displays the system you want to diagnose, then press Enter (Enter) button.

The display scrolls in the direction of the arrow displayed on the first line. To switch the direction, press Esc (Esc) button once.

<Note>
If you press Esc (Esc) button twice in quick succession, the screen goes back to the Main Menu (1).
The scrollable last line is displayed as「###############」.



(3) DTCs Display
The DTCs that have been read from ECU are displayed.
- The number shown on the right edge of first line is indicating [The number of reading order / Total number of detected DTCs].
- Press ▼ button to display the next DTC.

The display scrolls in the direction of the arrow displayed on the first line. To switch the direction, press Esc (Esc) button once. (When having only one DTC, the arrow is not displayed on the first line.) To switch the direction, press (Esc) button once.

- V.C.I. is constantly reading DTCs in order from Active to Stored and updating the screen.
- If the system supports status recognition, current status of each DTC is expressed by the following symbols, which appears after code.

Active	: [ ] (blank)
Stored	: [*]

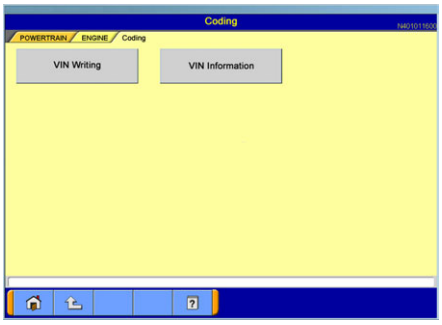
<Note>
If you press Esc (Esc) button twice in quick succession, the screen goes back to the Main Menu (1).

The scrollable last line is displayed as「###############」.

7-1-3. Error and Troubleshooting of V.C.I. Stand-alone Diagnosis

No.	Error Message / Symptom	Cause	Remedy
1	< Init. Error > System not Supported or System not exist > Out of target for V.C.I. Stand-alone diagnosis.(unregistered)	> The systems you selected are out of target for the V.C.I. Stand-alone diagnosis. > The selecting systems do not exist.	1. Use the PC to make a diagnosis because the systems you selected are not supported for the V.C.I. Stand-alone diagnosis. 2. Confirm that if the system you selected exists or not.
2	<Comm. Error> Retry ? > Error has happened during communication between V.C.I. and ECU	> Communication line between V.C.I. and ECU got disconnected or loosed connection from any cause > ECU power OFF	1. Verify that the IG switch is turned ON. 2. Check if the communication wire between V.C.I. and ECU is disconnected or not. 3. Pressing the V.C.I. “Enter” key proceeds on the diagnosis.

7-2 Operating Procedures for the Engine VIN Writing



7-2-1. Coding Menu

Select the **Coding** button from the Engine system.
The Coding menu is displayed.

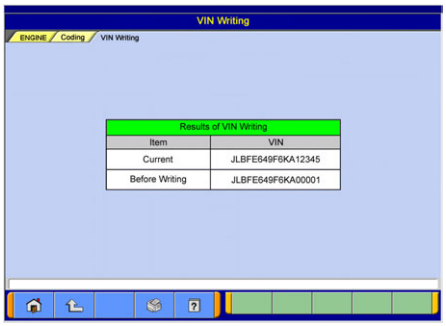
VIN Writing Start VIN Writing : go to section 7-2-2.

VIN Information Display VIN Information : go to section 7-2-3.

7-2-2. VIN Writing

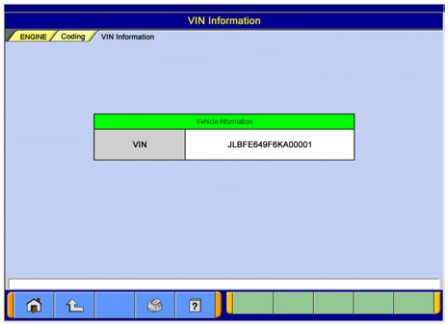
(1) The VIN that has been read from ECU is displayed on [Current VIN].
Input the desired VIN to be written into [New VIN].
--- Performing VIN Writing : go to section (2).

(2) The result screen of VIN Writing is displayed.

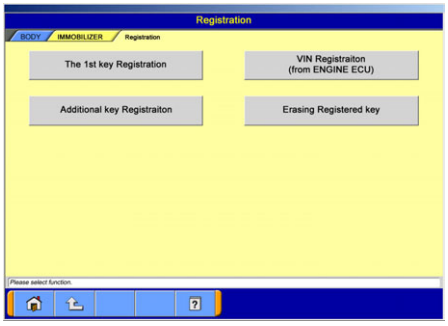


7-2-3. Displaying VIN information

VIN information that has read from ECU is displayed.



7-3 Operating Procedures for Immobilizer Registration



7-3-1. Registration menu

Select **Registration** button from the IMMOBILIZER system. Registration menu is displayed.

The 1st key Registration

Register the key information for the IMMOBILIZER system with no registered keys is registered.

→ go to section 7-3-2.

VIN Registration

Send the VIN from Engine system and store the information on the IMMOBILIZER system.

→ go to section 7-3-3.

Additional key Registration

Add and register the information for new key to the IMMOBILIZER system.

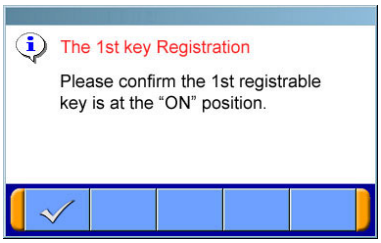
→ go to section 7-3-4.

Erasing Registered key

The key information registered on the IMMOBILIZER system is erased. Except the Master key information with key-on currently.

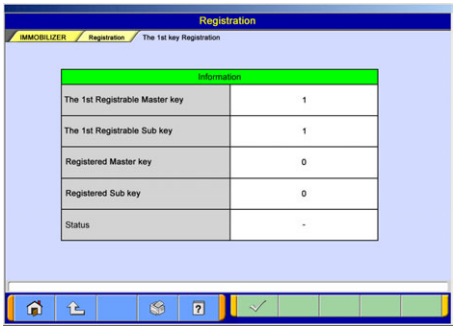
→ go to section 7-3-5.

7-3-2. The 1st key Registration



(1) The confirming screen if the 1st registrable key is at the “ON” position is displayed.

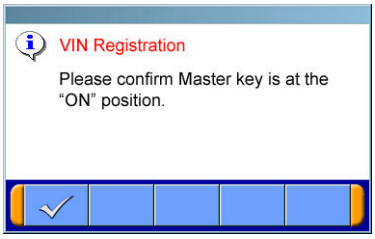
--- OK : go to section (2).



(2) The screen of the 1st key registration is displayed. Register both Master key and Sub key.

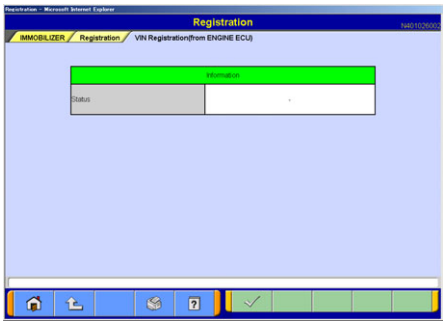
 --- The 1st key registration

7-3-3. VIN Registration



(1) The confirming screen if Master key is at the “ON” position is displayed.

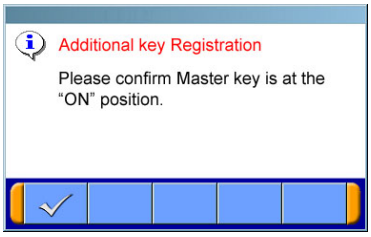
--- OK : go to section (2).



(2) VIN Registration screen is displayed.

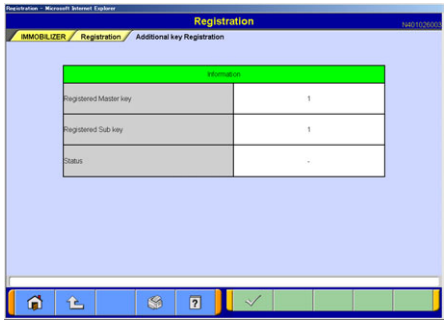
--- Performing VIN registration.

7-3-4. Additional key Registration



(1) The confirming screen if Master key is at the “ON” position is displayed.

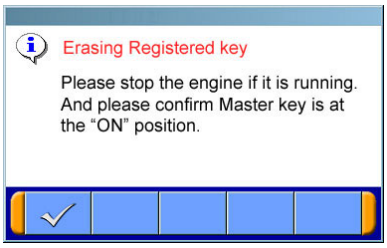
--- OK : go to section (2).



(2) Additional key Registration screen is displayed.
Register either Master key or Sub key.

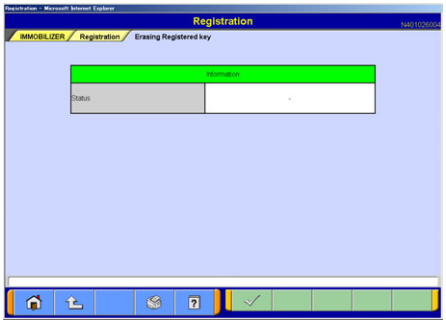
--- Performing Additional key Registration

7-3-5. Erasing Registered key



(1) The confirming screen if Master key is at the “ON” position is displayed.

--- OK : go to section (2).

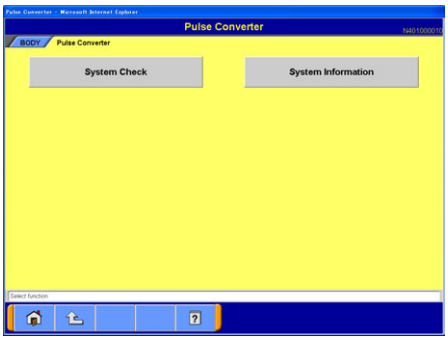


(2) The Erasing Registered key screen is displayed.
The registered key is erased except the key being at the “ON” position currently.

--- Performing Erasing Registered key.

7-4 Operating Procedures for Pulse Converter

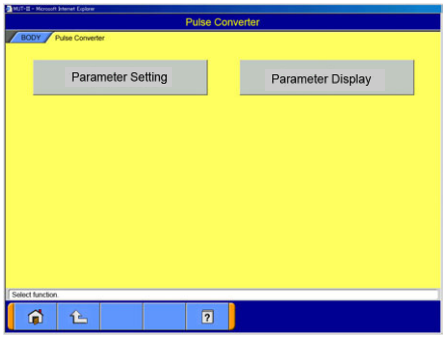
7-4-1. Pulse Converter menu



(1) Change the screen to **BODY** by selecting its tab located on the upper side of the screen.
Select **Pulse Converter** button from the BODY-related menu.

System Check
Change and display the parameter value of Pulse Converter.
→ go to section (2)

System Information
Display the system information.
→ go to section 7-4-4.

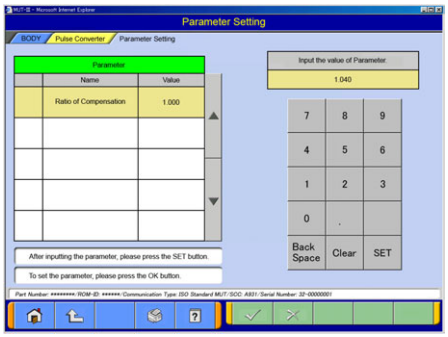


(2) The function selection screen of Pulse Converter is displayed.

Parameter Setting
Change the parameter value of Pulse Converter.
→ go to section 7-4-2.

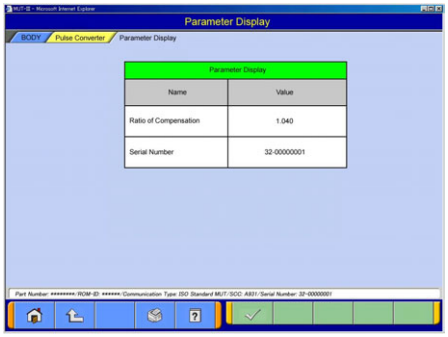
Parameter Display
Display the parameter registered on Pulse Converter.
→ go to section 7-4-3.

7-4-2. Parameter Setting

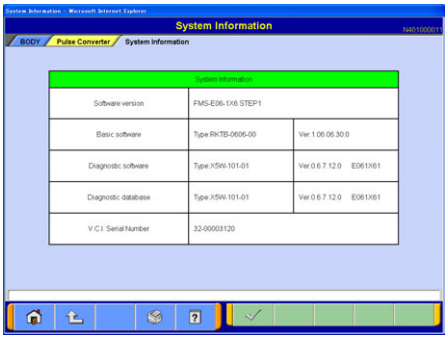


The parameter value that Pulse Converter recognizes is displayed.
((*.***) is displayed as the numeric value being out of the setting ranges.)
Insert the value by the numeric keypad.
As pressing the **SET** button, the value is registered.
Press the ✓ button to perform Parameter setting.
✓ --- Performing Parameter setting
✗ --- Cancel: go to section 7-4-1(2).

7-4-3. Parameter Display



The parameter registered on Pulse Converter is displayed.
✓ --- Return to the function selection screen
→go to section 7-4-1(2).



7-4-4. System Information

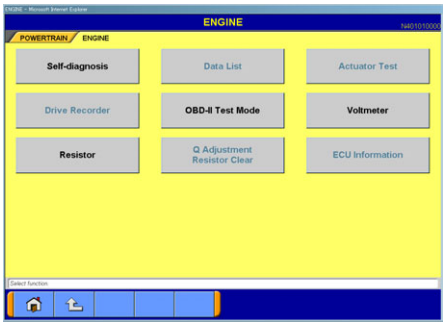
Select the **System Information** button from Pulse Converter menu screen.

System information screen displays [Software Version], [Basic Software], [Software for Fault Diagnostics System], [Database for Fault Diagnostics System] and [VCI Serial Number] of current MUT-3 system installed on PC.

Return to Pulse Converter menu screen
→go to section 7-4-1(1).

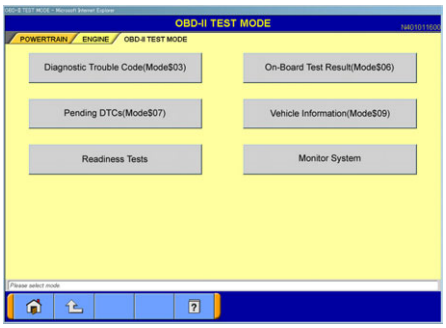
7-5 Operating Procedures for the OBD-II Test Mode menu

7-5-1. OBD-II Test Mode menu



(1) Change the screen to **POEWERTRAIN** by selecting its tab located on the upper side of system selection menu screen.
Select **ENGINE** from the POWERTRAIN-related menu.

Select the **OBD-II Test Mode** button from the function selection screen of **ENGINE**.



(2) Function selection screen of ODB-II Test Mode is displayed.

Diagnostic Trouble Code(Mode$03)
Diagnostic Trouble Code displaying screen is displayed.
→ go to section 7-5-2.

On-Board Test Result(Mode$06)
Monitor System selection screen is displayed.
→ go to section 7-5-3.

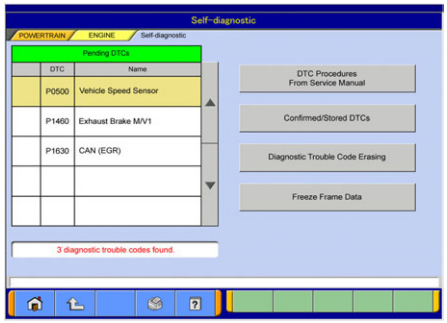
Pending DTCs(Mode$07)
Pending DTCs displaying screen is displayed.
→ go to section 7-5-4.

Vehicle Information(Mode$09)
Vehicle Information selection screen is displayed.
→ go to section 7-5-5.

Readiness Tests
Readiness Test result displaying screen is displayed.
→ go to section 7-5-6.

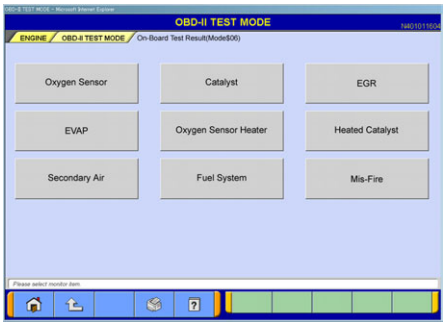
Monitor System
Monitor System displaying screen is displayed.
→ go to section 7-5-7.

7-5-2. Diagnostic Trouble Code(Mode$03)

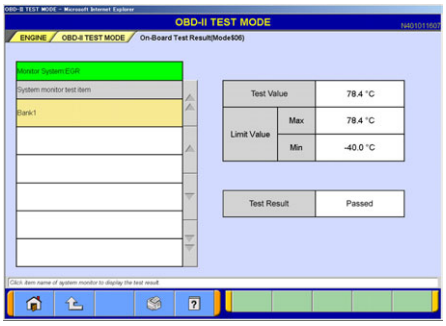


Self-diagnostic displaying screen is displayed.
Usable buttons are the same as ones on section 4-1-1.

7-5-3. On-Board Test Result(Mode$06)

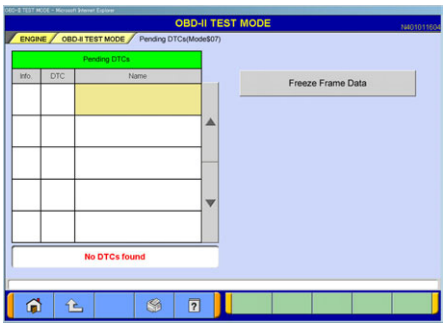


(1) Select the desired Monitor System to be displayed.
→ go to section (2).

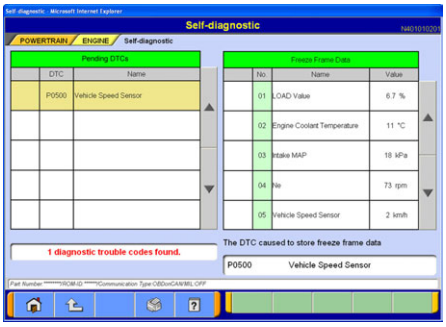


(2) The result of On-Board Test is displayed.

7-5-4. Pending DTCs(Mode$07)

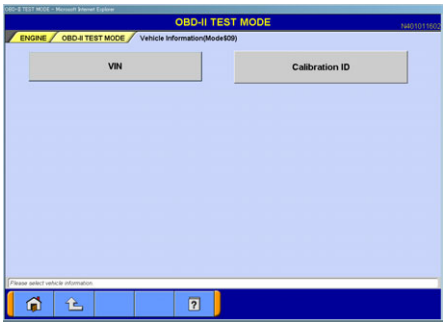


(1) Pending DTCs are displayed.
Freeze Frame Data
Freeze Frame Data screen is displayed.
→ go to section (2).

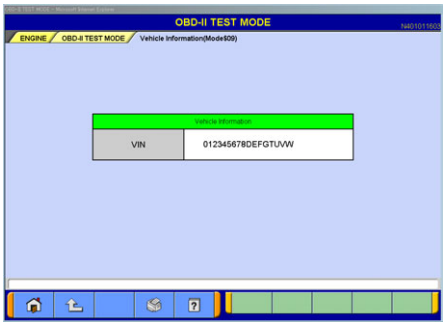


(2) Freeze Frame Data is displayed.

7-5-5. Vehicle Information(Mode$09)

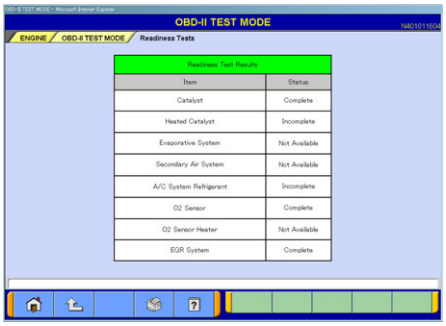


(1) Select the desired VIN to be displayed.
→ go to section (2).



(2) Selected VIN is displayed.

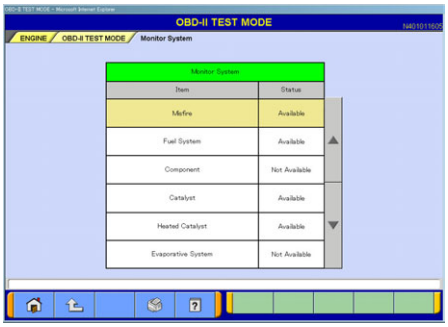
7-5-6. Readiness Tests



Readiness Test results are displayed.

- Not Available : Monitor not supported.
- Complete : Monitor complete.
- Incomplete : Monitor not complete.

7-5-7. Monitor System



The corresponding state of Monitor System is displayed.

- Available : Monitor supported.
- Not Available : Monitor not supported.

7-6. Operating Procedures for Air Suspension Calibration

7-6-1. Calibration Menu

Select the **Calibration** button from Suspension System.
Air Suspension calibration menu is displayed.

Height Sensor

Height sensor calibration is performed.
→ go to section 7-6-2.

Pressure Sensor

Pressure sensor calibration is performed.
→ go to section 7-6-3.

Calibration Data

Calibration data list is displayed.
→ go to section 7-6-4.

7-6-2. Height Sensor Calibration

(1) Set the Normal Level

Car height on each of the front / rear can be adjusted.
For the adjustment method, please refer to the service guide for each vehicle.

--- greatly down
--- small down
--- greatly up
--- small up
--- Go to the Upper level set screen, after the adjustment state is set.
--- Cancel : go to section 7-6-1.
--- Enlarged view of the 4 buttons : go to section (5).
--- The operate mode display: go to section (4).

For ensuring safety, the declining operation is stopped automatically, by the consecutive operation in a given time. (It stops after 3 Seconds for Front, 10 Seconds for Rear.)
Press the button again if you continue declining operation.

(2) Set the Upper Level

Car height on each of the front / rear can be adjusted.
For the adjustment method, please refer to the service guide for each vehicle.

--- greatly up
--- small up
--- greatly down
--- small down
--- Go to the Lower level set screen, after the adjustment state is set.
--- Enlarged view of the 4 buttons : go to section (5).
--- The operate mode display : go to section (4).

For ensuring safety, the declining operation is stopped automatically by the consecutive operation in a given time (It stops after 3 Seconds for Front, 10 Seconds for Rear.).
Press the button again if you continue declining operation.

(3) Set the Lower Level

Car height on each of the front / rear can be adjusted.

For the adjustment method, please refer to the service guide for each vehicle.

--- greatly down --- small down

--- greatly up --- small up

--- Height sensor calibration will be complete, after the adjustment state is set.

--- Enlarged view of the 4 buttons : go to section (5).

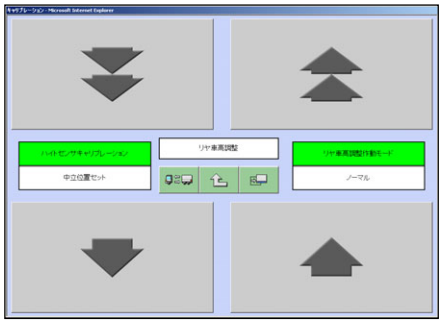
--- The operate mode display : go to section (4).

For ensuring safety, the declining operation is stopped automatically by the consecutive operation in a given time. (It stops after 3 Seconds for Front, 10 Seconds for Rear.) Press the button again if you continue declining operation.

(4) Select the operate mode

--- Setting

--- Return to the previous screen



(5) The button display can be enlarged in order that the up-and-down setting of car height is performed easier without looking at a screen.

--- Front / Rear change

--- Return to the previous screen

--- The operate mode display: go to section (4).

This screen is for operating up-and-down setting of car height, so the adjustment state cannot be fixed here.

Return to the previous screen by the button, and fix the adjustment state by the button.

7-6-3. Pressure Sensor Calibration

(1) Go on to the Pressure Sensor Calibration, after height sensor calibration ends.

--- Exhaust

--- Air Intake

--- Ending Calibration

--- Cancel

--- Operate mode display : go to section (2).

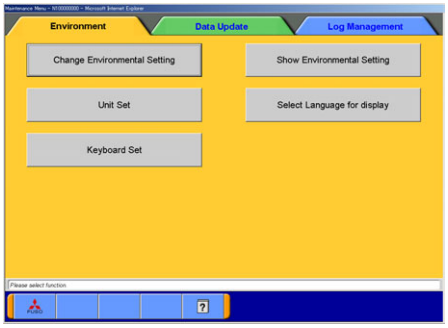
(2) Select the operate mode.

7-6-4. Calibration Data

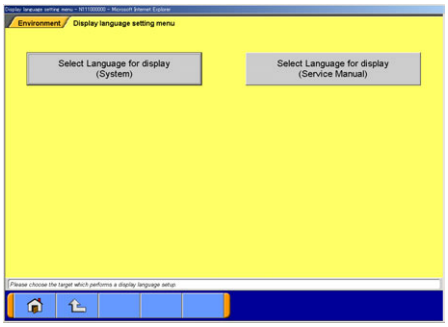
Calibration data list is displayed.

7-7 Operating Procedures for Language Switching

7-7-1. Language Switching



(1) Select the **Maintenance** button from the Start-UP Screen. Change the screen to the **Environment** by selecting its tab located on the upper side of Maintenance screen, and select the **Select Language for Display** button from Environment-related menu.



(2) Display language setting menu

Select Language for Display(System)

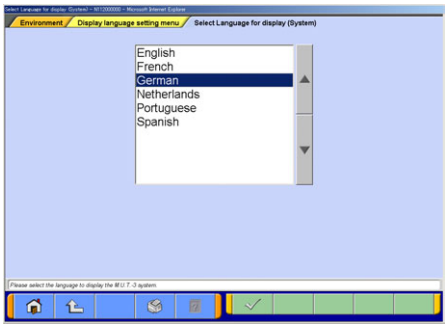
Language switching for Display(System) is performed.

→ go to section (3).

Select Language for Display(Service manual)

Language switching for Display(Service manual) is performed.

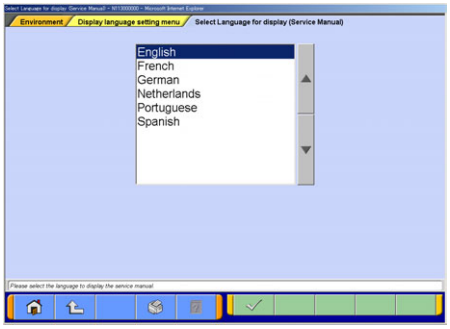
→ go to section (4).



(3) Select Language for Display(System)

Select the desired Language to be used for Display(System).

--- Setting the selected Language to be used for Display(System).



(4) Select Language for Display(Service manual)

Select the desired Language to be used for Display(Service manual).

--- Setting the selected Language to be used for Display(Service manual)

Chapter 8 Troubleshooting Measures

8-1. Troubleshooting Measures Classified by Symptom

This section describes the primary causes of error messages and provides measures to address each trouble symptom.

[Note]

- The error messages described within this section may be displayed at the same time as other screens.
- When inspecting circuits, please refer to the electrical wiring diagram that corresponds to the particular vehicle model.
- Communication lines vary, depending upon the particular systems and communication methods.
- For details about diagnostic connector port configuration, please refer to the electrical wiring diagram that corresponds to the particular vehicle model.

Remedy No.	Error Message / Symptom	Cause	Remedy
1	The following message is displayed: "No CD-ROM or wrong CD-ROM in drive."	There is no CD-ROM in the drive, or the wrong CD-ROM has been inserted.	Check the CD-ROM that has been inserted. If the error message stills appears, even though the proper CD-ROM has been inserted, request an inspection.
2	Although the V.C.I. is connected to the vehicle and the switch has been turned ON, the V.C.I. does not power up. (i.e., the V.C.I. indicator lamp does not illuminate in green.)	Vehicle power is not being supplied. •V.C.I. switch is turned OFF. •Low battery voltage. •Vehicle harness is not connected or is broken. •Hardware malfunction.	1. Check to see if the V.C.I. switch is turned ON. 2. Check the battery voltage. 3. Check the quality of the cable connections. 4. Check whether any wires are broken in the harness. (Try connecting using another harness.) 5. If the situation is not remedied after implementing the above solutions 1~4, then a hardware malfunction has probably occurred. Request an inspection of the hardware, as well as the harness.
3	The V.C.I. does not power up when connected to the PC under the following conditions: the V.C.I. is not connected to the vehicle; and the V.C.I. switch is turned OFF. (i.e., the V.C.I. indicator lamp does not illuminate in red.)	Power is not being supplied to the PC. •PC is not powered up. •USB cable is not connected or is broken. •Hardware malfunction (PC, V.C.I.)	1. Check to ensure that the PC is powered up. 2. Check to ensure that the PC and V.C.I. are connected directly together. (A USB hub should not be utilized.) 3. Check the quality of the cable connections. 4. Check whether any wires are broken in the cable. (Try connecting using another cable.) 5. If the situation is not remedied after implementing the above solutions 1~4, then a hardware malfunction has probably occurred. Request an inspection of the hardware, as well as the cable.
4	As soon as the V.C.I. powers up, the screen displays "Maintenance Mode."	The basic V.C.I. application has not yet loaded.	1. Power down, then power up the V.C.I. again. 2. Start up the MUT-III diagnostic application on the PC. Perform a diagnosis to see if the application will download via the V.C.I. auto upgrade function. 3. After downloading has completed, power up the V.C.I. again. If either the V.C.I. <Main Menu> or "PC Communication" does not appear, then request an inspection.
5	As soon as the V.C.I. powers up, the screen displays "ECU Reprogramming."	The basic V.C.I. application has not yet loaded.	1. Connect the V.C.I. to the PC, while pressing the [Esc] button. (Powers up) 2. Check to ensure that the V.C.I. displays "Maintenance Mode," then start up the MUT-III diagnostic application on the PC. Perform a diagnosis to see if the application will download via the V.C.I. auto upgrade function. 3. After downloading has completed, power up the V.C.I. again. If either the V.C.I. <Main Menu> or "PC Communication" does not appear, then request an inspection.

Chapter 9 Reference

9-1. V.C.I. Electrical Properties

<Power Requirements>

- Rated Voltage DC 12V, 24V
- Ground Polarity (-)
- Guaranteed Operating Voltage Range DC 8.0~32.0V
- Power Supply Reverse Voltage DC -40V (1 min.)
- Stand-alone Power Consumption (Max.) 1A (Only Within Guaranteed Operating Voltage Range)

* The above values do not apply under special operating conditions, such as if an upgraded control port or other component is short-circuited to GND, as well as under conditions outside of the guaranteed operating voltage range.
Current consumption is 420mA or less when the unit is used at the rated power supply.

Appendix

<Glossary>

(The terms below are defined in alphabetical order.)

C

CAN --- Abbreviation for the term Controller Area Network. A system that facilitates data sharing among controllers, through communication.
Each command (signal) can only be processed via a communication line.

D

Data Transfer --- The transfer of data that has been saved in a certain memory area, to another area in memory.
When using MUT-III, the term “data transfer” refers to the transfer of data saved in the memory area of the V.C.I., to the PC.

Default --- The initial settings or configuration for a system; in other words, a pre-specified configuration for certain settings.

Diagnosis --- A self-diagnostic function (Diagnosis). In the "Diagnosis" system, a computer (ECU) monitors the signals that are input from various sensors and switches. In the event of an error or malfunction in signal inputs, details of the error and the data at the time of malfunction are recorded by the computer.

Directory --- A structure created to organize and manage data files. A directory can be referred to as a folder. Information about each file is compiled within the directory.

E

ECU --- Abbreviation for the term Electronic Control Unit. A control device for an electronic control system.

I

I/F Cartridge --- An I/F cartridge is used when a particular situation cannot be handled solely by MUT-III, such as for unusual ECU communication methods, or for the expansion of MUT-IIIfunctionality. The Electronic Governor I/F cartridge used with the MUT-II, as well as several varieties of Air Suspension I/F cartridges, can be utilized interchangeably, without modification.

M

Memory Card --- A form of removable media used for data storage.
MUT-III utilizes flash memory, which enables data content to be changed via electrical charge and allows content to be preserved even when powered down. This feature allows the unit to retain operational data

O

Online Help --- Also referred to as Online Manual. The operating manual is converted to data (files) for the Online Help function, allowing users to view brief explanations on the screen, while the application is running. For the operation currently being performed, Online Help provides explanations of the operating procedures, processes and methods used for each function.

R

RAM --- Abbreviation for the term Random Access Memory. A memory device that permits both read and write data operations. Data stored in RAM is erased when the power is turned off.

ROM --- Abbreviation for the term Read Only Memory. A read-only memory device. Data stored in ROM will remain, even when the power is turned off.

S

Serial Communication --- A method of communication in which bits of digital data are transmitted, one after the other, using a communication line.
When using MUT, this type of communication method is called "Serial Communication" in order to provide contrast with the alternate method, called "Pattern Diagnosis," particularly when DTCs are read from the ECU via communications.

Slide Bar --- A data entry method in which values are entered by moving a sliding bar.

SWS --- Abbreviation for the term Smart Wiring System. A single-harness wiring system that performs centralized coordination of multiple electrical signals, in order to minimize the number of harnesses utilized. SWS is an upgraded version of a multiplex transmission system that enables the usage of lightweight harnesses and facilitates multi-functional operations for electrical devices.

V

V.C.I. --- Abbreviation for the term Vehicle Communication Interface. A communication interface device used to connect a vehicle ECU to a PC.