MITSUBISHI MOTORS

Multi Use Tester III

MUT-III Owner's Manual

< Ver. 3.0 >

Heart-Beat Motors

MITSUBISHI MOTORS

Foreword

This manual explains MUT-III: functions, operating procedures, and other related information.
By reading this manual you will obtain a basic understanding of MUT-III and Vehicle Communication Interface (hereafter abbreviated as V.C.I.) functions and methods of operation. Because there are differences in MUT-III methods of operation due to the vehicle electronic control system, be sure to read this manual and Online Help prior to operation.
This manual was written based on the December 2004 version of the MUT-III system.
Please note that the information herein may not always agree with your version of the MUT-III system due to system specification changes and version upgrades.
Please take good care of this manual along with your MUT-III product.

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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.

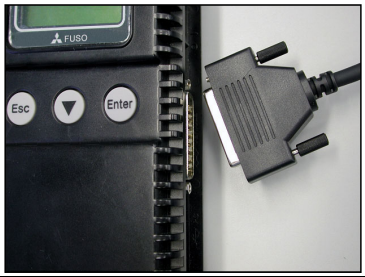
Unplug the power AC adapter from the outlet when the unit is not in use.

- 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

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 main 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.

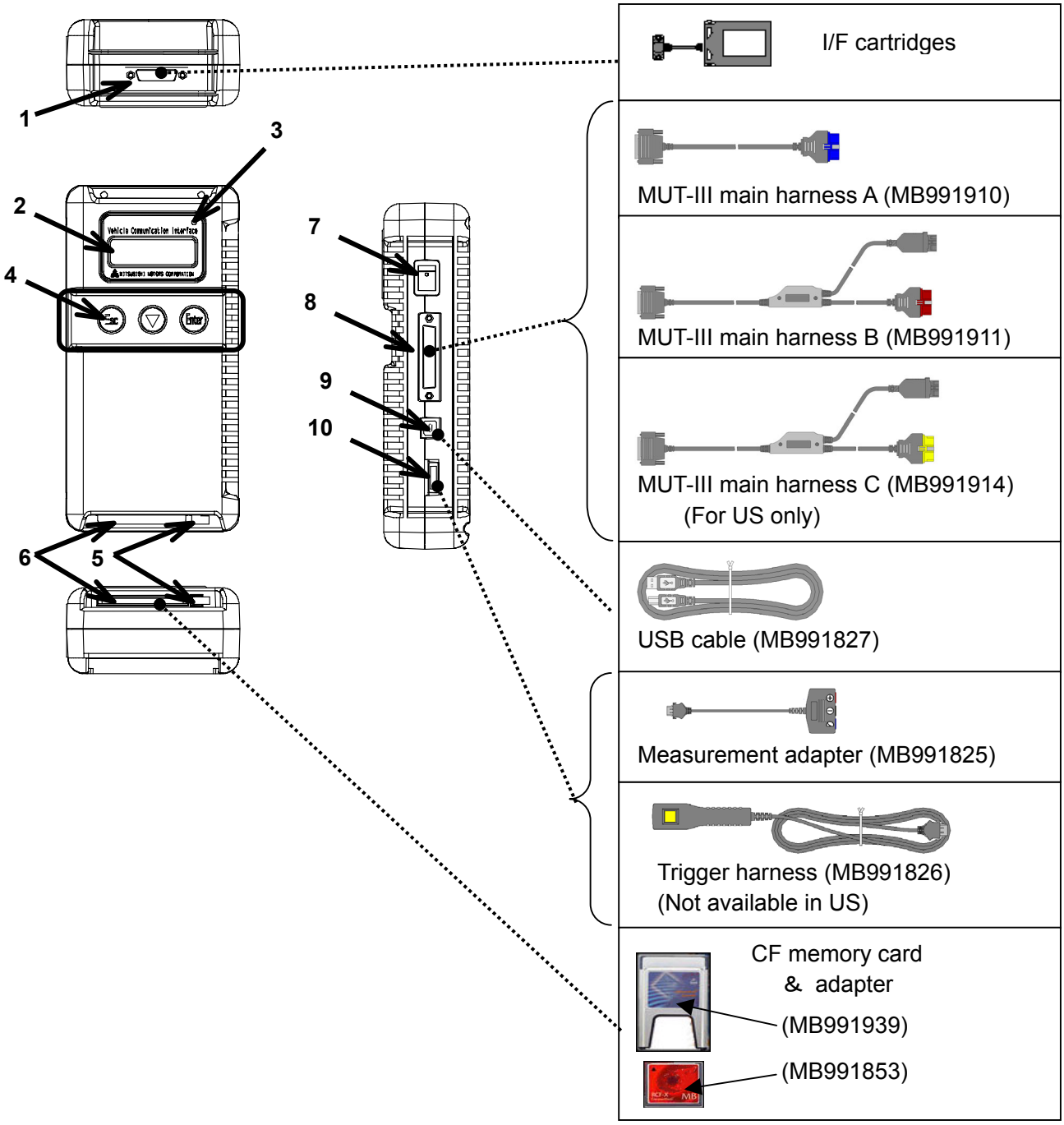
PC Usage Limitations

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 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. Outline Drawing and Component Names

The names of the V.C.I. components are indicated in the figure below.



<<Component Names>>

1. I/F cartridge terminal
2. LCD screen
3. Indicator lamp
4. Operation button
   (Used with V.C.I. functions)
5. Memory card removal lever
6. Memory card insertion port
7. Power switch
8. Main harness terminal
9. USB terminal
10. Trigger terminal

1-3. MUT-III Components Explanations

(1) Vehicle Communication Interface (V.C.I.) (MB991824)

A communication interface used to connect the vehicle ECUs and the PC.

1. When connected with the PC
   - Vehicle diagnosis (Interactive fault diagnosis)
   - SWS communication & CAN communication support
   - Drive recorder
   - ECU reprogramming
   - Volt, Ohm, measurement
   - Fuel pressure measurement (Not available in US)

2. When used with the V.C.I. unit (disconnected from PC)
   - Drive recorder
   - ECU reprogramming
   - Volt, Ohm measurement
   - Belt Tension measurement

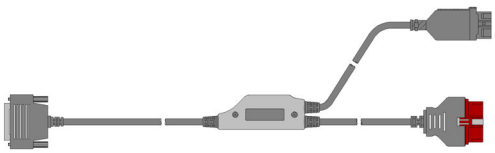
(2) Memory Card

Stores data for ECU reprogramming, drive recorder, etc. This is a standard, off-the-shelf memory card. The one provided (with reprogramming data) is a Compact Flash memory card (MB991853) inserted into the CF card adapter (MB991939).

(3) MUT-III Main Harness A (MB991910)

Used when connecting the V.C.I. with vehicles that have only one 16-pin diagnosis connector.

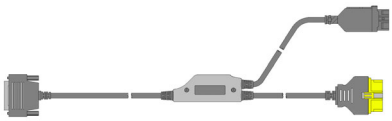
- Supports fault diagnosis and ECU updating on the above-described vehicles
- Supports the CAN communication system



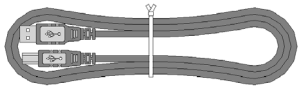
(4) MUT-III Main Harness B (MB991911)

Used to connecting V.C.I. with vehicles that have a 16-pin + 12-pin or 16-pin + 13-pin diagnosis connector.

-For models equipped with a 12-pin (or 12-pin + 12-pin) diagnosis connector, connect the MUT-II adapter harness (MB991498) to the end of this harness in the same as MUT-II, and power is supplied from the cigarette lighter socket.



(5) MUT-III Main Harness C (MB991914) (For US only)
Used when connecting the V.C.I. with vehicles that have the 420A engine and F4AC1 transaxle.

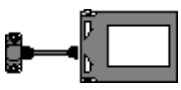


(6) USB Cable (MB991827)
Used to connect the PC to the V.C.I.

(7) Trigger Harness (MB991826) (Not available in US)
A harness with a trigger button used to manually insert a trigger point for data acquisition from the drive recorder function during data recording.

(8) Measurement Adapter (MB991825)
An adapter used to connect the V.C.I. and measurement probe for voltmeter and ohmmeter readings.
Or used when outputting Simulated Vehicle Speed with a vehicle whose diagnosis-connecter cannot receive vehicle speed signal.

(9) Measurement Test Leads (MB991499)
Test leads used for voltage and / or resistance measurement.
Test leads MB991499 acquire quality replacement test leads from Radio Shack or similar electronics stores.



(10) I/F Cartridge
Used to implement special functions that cannot be implemented with the V.C.I. unit alone. The following I/F cartridges used with MUT-II can be used with MUT-III as well:

- SWS I/F cartridge
- Daimler-Chrysler Corporate I/F cartridge

1-4. Harness Connection Method

Recommended harness connection sequence

[1] Start the PC.

[2] While the PC is starting, connect the USB cable to the V.C.I.

[3] After the PC boots to the MUT-III main screen, connect the USB cable to the PC.

Note: Disconnect the USB cable from the V.C.I. after the PC has shut down. However, if the USB cable is disconnected during use, a warning message indicating device disconnection such as that shown in Figure 1 appears. Close the message display by pressing the OK button.

[4] Select the appropriate MUT-III main harness. Connect it to the V.C.I.

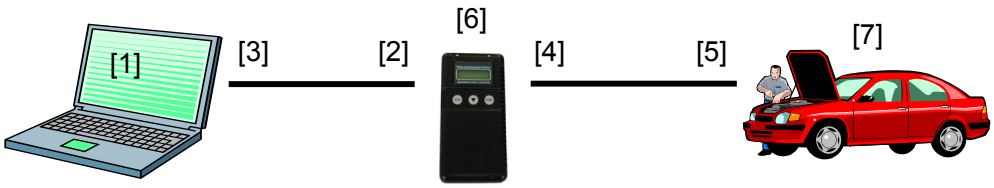
[5] Connect the MUT-III main harness to the vehicle diagnosis connector. See Figure 2.

Note: Disconnect the harnesses by performing the above steps in the reverse order.

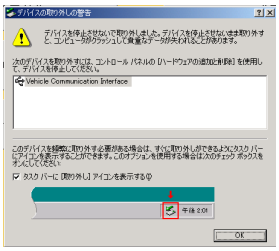
[6] Turn the V.C.I. power switch ON and verify that the indicator lamp located in the upper right area of the LCD screen is green.

[7] From the MUT-III system menu, turn the vehicle ignition switch ON and begin the diagnostic process.

Note: When the version of V.C.I. and the firmware version of V.C.I., which are, mismatch, the V.C.I. version upgrade process begins. This upgrade typically only occurs once per MUT-III system upgrade. Normal V.C.I. upgrades take about 1 minute. If a version upgrade error occurs, restart the V.C.I. by turning V.C.I. power OFF then, while pressing the Esc button, turn the V.C.I. power switch ON and begin the diagnostic process again.



<Fig. 1>

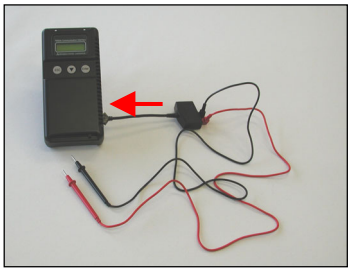


<Connecting the Trigger Harness>

Connect the trigger harness to the V.C.I. trigger terminal.
(Not available in US)

<Fig. 2>

<Connecting the Measurement Adapter and Measurement Probe >

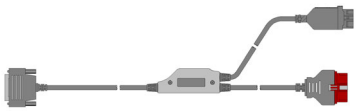
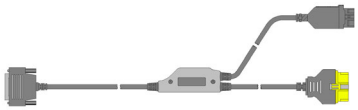


Connect the measurement adapter to the V.C.I. trigger terminal. Insert the measurement leads to the adapter. For best results, match the test lead colors with those on the adapter.

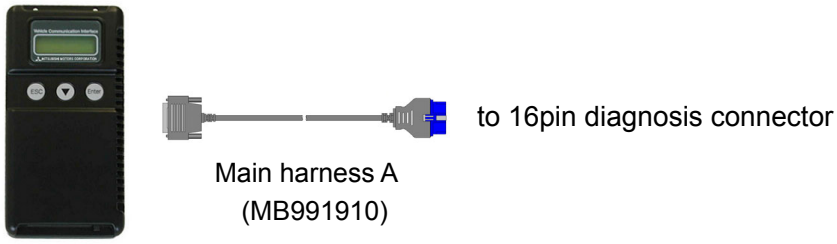
1-5. Combination Chart of Harness and Vehicle

Use of the MUT-III main harness A, B or C (US only) is determined by the type of diagnosis connector installed in the vehicle.
The main harness, indicated with “O”, is used in combination with another harness indicated with “●” depending on the vehicle and work to be performed. ECU update used below means ECU reprogramming.

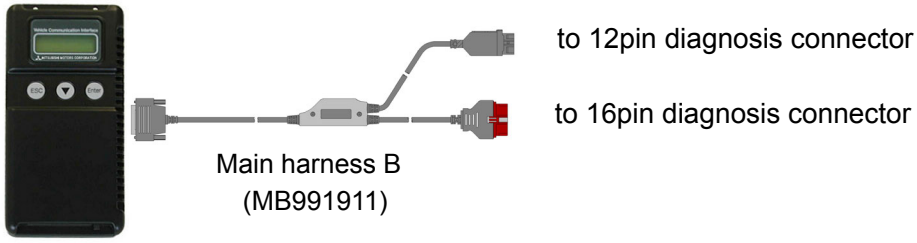
Vehicle Diagnosis Connector / Diagnostic Function \ Harness Name		01 MUT-III Main Harness A	02 MUT-III Main Harness B	03 MUT-III Main Harness C	04 Conventional Vehicle Inspection Adapter Harness	05 ECU Update Adapter Harness
16Pin	Fault diagnosis	O				
	ECU update	O				
16Pin&12Pin	Fault diagnosis		O			
	ECU update		O			
12Pin	Fault diagnosis		O		●	
	ECU update	-	-	-	-	-
16Pin&13Pin	Fault diagnosis		O			
	ECU update		O			●
Vehicle with 420A Engine and F4AC1 Transaxle	Fault diagnosis			O		
	ECU update	-	-	-		

Harness Name		Illustration
01	MUT-III Main Harness A MB991910	
02	MUT-III Main Harness B MB991911	
03	MUT-III Main Harness C MB991914 (For US only)	
04	Conventional Vehicle Inspection Adapter Harness (MUT-II adapter harness) MB991498	
05	ECU Update Adapter Harness MB991855	

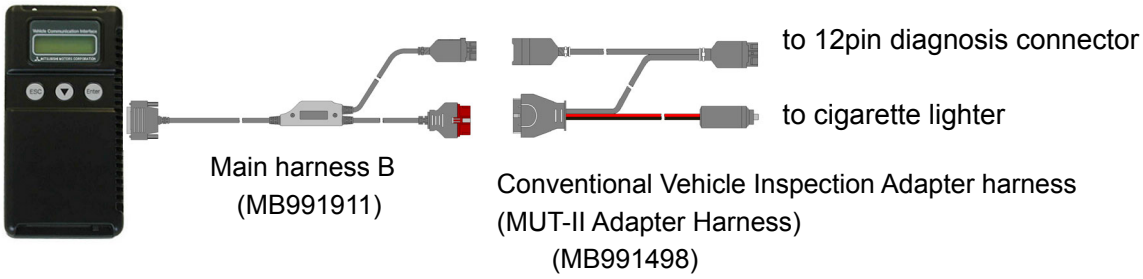
Vehicle diagnostic connector - 16pin type



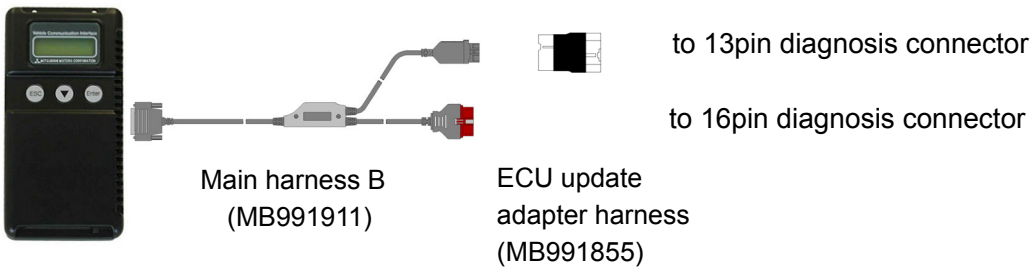
Vehicle diagnostic connector - 16pin type + 12 pin type



Vehicle diagnostic connector - 12pin type



Vehicle diagnostic connector - 16pin type + 13 pin type



Chapter 2 MUT-III Functions

2-1. Basic Functions

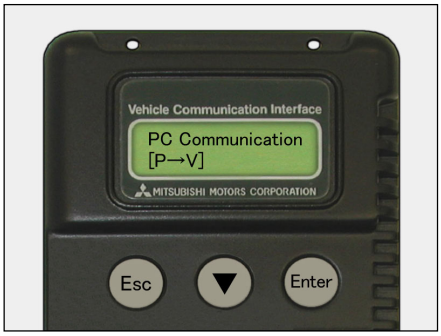
Can be used with all vehicle installed electronic control systems (with built-in diagnostic functions) from model year 1984.

Function	Synopsis
DTC readout	Reads various diagnostic codes and displays the codes by name and number.
Data List	Reads RAM data inside ECU and displays the data in digital and graphic form. (Available with ECUs that support serial communication only)
Actuator tests	Permits forced operation or shutdown of various types of actuators that is required for service. (Available with ECUs that support serial communication only)
Simulated vehicle speed	Outputs vehicle speed signal to appropriate ECUs facilitating diagnosis without travel.
Drive Recorder	Permits recording and displaying arbitrary service data that is determined for an arbitrarily specified time.
Voltmeter	Permits measurement of DC voltage within the range of 0- ±40V using the voltage measurement function.
Ohmmeter	Permits measurement of resistance within the range of 0-100KΩ using the resistance measurement function.
SWS Diagnosis	Permits SWS diagnosis using the SWS monitor kit (MB991806).
CAN Bus Diagnosis	Identifies CAN bus failures that occur in vehicle that is subject to the diagnosis and narrows down a cause.
ECU Reprogramming	Permits updating programs in ECU for system version upgrade.
Electronic service information	Displays with Service manual data. In addition, the system supports interactive fault diagnosis. The Interactive Diagnosis permits user to use both the scan tool viewing functions and service manual troubleshooting procedures. (Not available in US and Australia)
Tension meter	Permits measurement of belt tension using Belt tension meter set (MB991668).
Fuel pressure meter	Permits measurement of fuel pressure using a pressure gauge set (MB991637 / MB991981), and displays it on PC. (Not available in US)
Fuel consumption measurement	Permits more precise measurement of fuel consumption by measuring injection quantity of fuel injector.

2-2. V.C.I. Functions

<When V.C.I. and PC are connected>

2-2-1. Fault Diagnosis



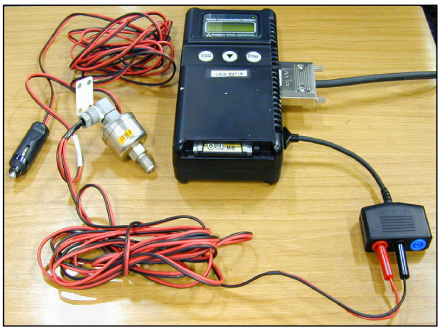
The system diagnoses faults by receiving instructions from the PC and communicating with the vehicle-installed ECU. When the system is connected to the PC, VCI keys are disabled.

[Start Screen]

*When the USB cable is connected to the system, the screen illustrated on the left appears.

The screen indicates the flow of signals between the PC (P) and V.C.I. (V) using “P → V” and “P ← V”.

2-2-2. Fuel Pressure measurement



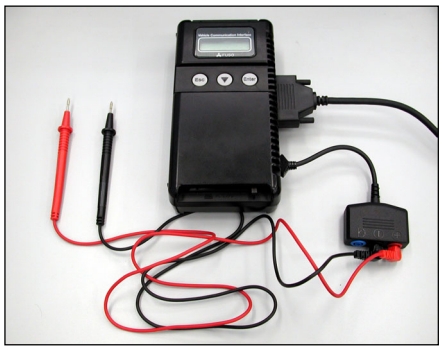
The system analyzes faults by measuring fuel pressure using the Pressure gauge set (MB991637 or MB991981).

{the pressure gauge for LP: MB991655 or MB991979
for HP: MB991708 or MB992007}

The V.C.I. reads the fuel pressure, which is converted into voltage value by the pressure gauge. Then the system converts it back to pressure value and displays it as text or graph on PC screen. (refer to 11-2-1.)

<With the V.C.I. only>

2-2-3. Measurement Function 1: Voltmeter / Ohmmeter



The system reads the voltage/resistance value from the trigger terminal and displays the value on the V.C.I. LCD screen.

1. Connect the measurement adapter to the V.C.I., connect the test leads to the adapter.
2. Connect the appropriate main harness to the V.C.I., and then to the vehicle diagnostic leak connector and turn the V.C.I. power switch ON.
3. Press ▼ button to select Voltmeter or Ohmmeter in the Main Menu (see the illustration on the left), and press the Enter button to begin measurement.

Note:

- Permits measurement of DC voltage within the range of 0-±40V.
- Permits measurement of resistance within the range of 0-100KΩ.
- Permits displaying the value as text or graph on PC screen by connecting the V.C.I. to PC. (refer to 11-2-2.)

Chapter 3 Operating MUT-III

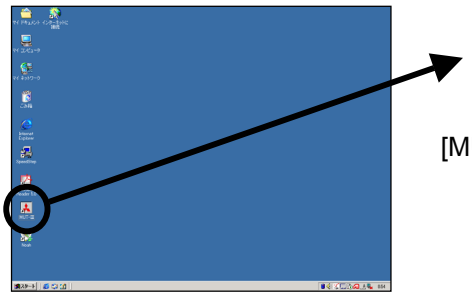
3-1. Starting and Shutting the MUT-III System

3-1-1. Starting the MUT-III System

[Starting the PC]

1. Please turn on the power of MUT-III PC. (Refer to the instructions of MUT-III PC for details.)

[To start up MUT-III System]



[MUT-III icon]

2. Double-click the MUT-III icon displayed on the desktop to start up the system.

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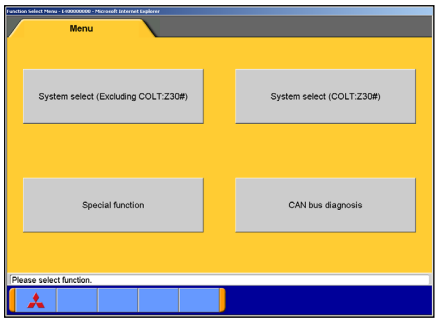
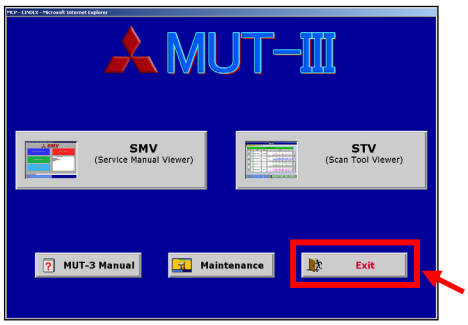
3-1-2. Shutting Down the MUT-III System

[Close the MUT-III System]

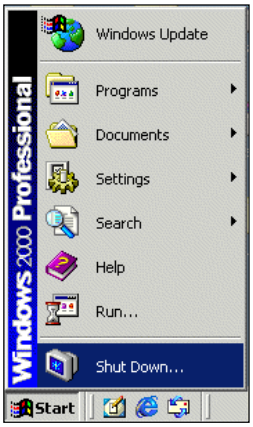


1. Press button on each diagnostic screen to return to the STV start menu screen (illustrated on the left).
   Then press button on this screen to go to the MUT-III Start screen.



2. Press **Exit** button displayed in the lower right portion of the screen. The MUT-III system will close.

[Shutting down the PC]

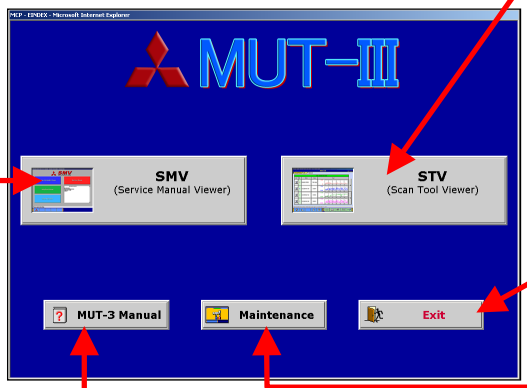


3. Click the Windows **Start** button (lower left portion of the screen), and select "*Shut Down*".

4. Select "*Shut down*" by pressing button, and press the **OK** button.

3-2. Screen Explanations

< MUT-III Start Screen >



Starts **"Scan Tool Viewer"** system.
This manual contains information for proper operation of this system.
Press this button first to start various interactive diagnoses.

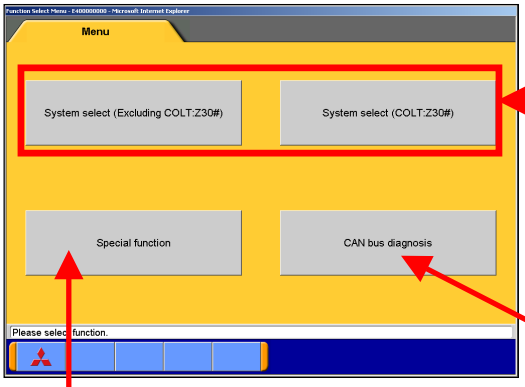
Exit the MUT-III system.
For detailed operation procedure (refer to 3-1-2.)

To set option settings, e.g. displaying language. (refer to 3-4.)

Shows "MUT-III Owner's Manual". (refer to 3-5-2.)

Starts "**Service Manual Viewer**".
For detailed operation procedure, click the SMV MANUAL bookmark on the left screen of Adobe Reader.

< Start Menu Screen >



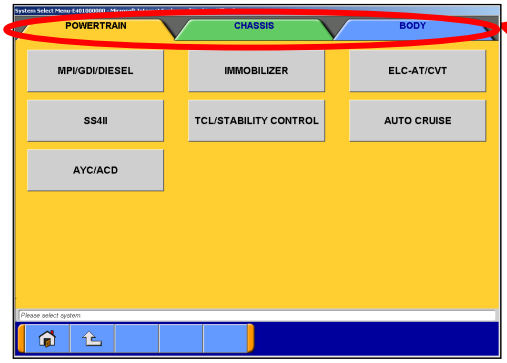
To diagnose vehicles by selecting each system (ECU).
e.g.
-Reading diagnostic code
-Actuator test -Drive recorder

For detailed operation procedure, refer to 3-3-1.

Starts the CAN bus diagnosis.
Refer to Chapter 9.

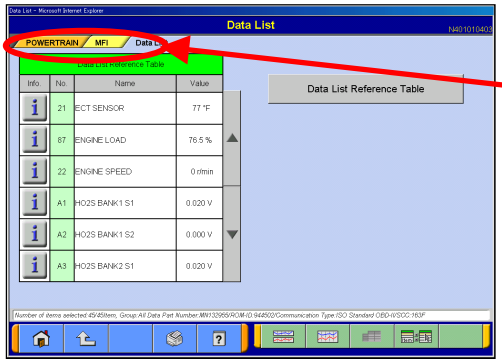
-Displaying saved data
(Drive recorder, SWS monitor)
-ECU reprogramming (Chapter 10)
-Measurement Function (Chapter 11)

<System Selection Screen>



The system selection screen allows you to switch between major system categories by selecting the tabs located on the upper part of the screen.

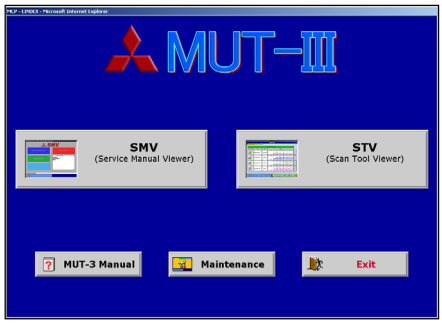
<Diagnostic Screen>



The diagnostic screen displays three titles in layer format, informing you what is being implemented on each system. The screen does not allow you to switch systems by selecting the upper title areas.

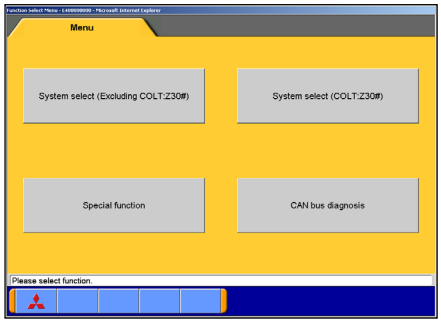
3-3. Basic Flow to Start Diagnosis

3-3-1. Basic Flow of System Select Diagnosis



(1) MUT-III Start Screen

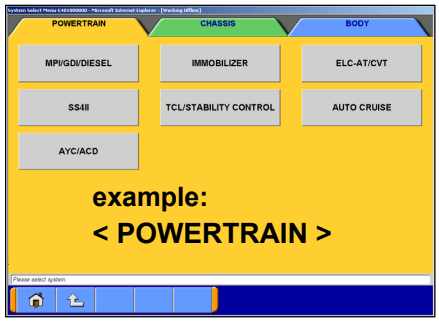
Select **STV (Scan Tool Viewer)** button from the MUT-III start screen.



(2) Start Menu Screen

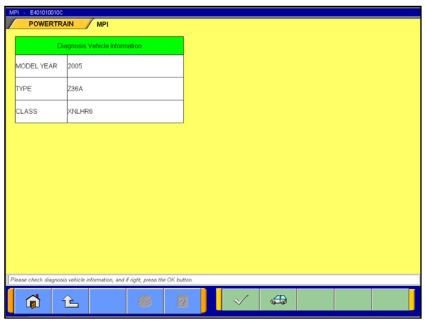
Select **System Select (Excluding COLT:Z30)** button on the Start Menu screen.

When you diagnose COLT:Z30# car,
select **System Select (COLT:Z30#)** button.



(3) System Selection Screen

Select a tab “Powertrain”, “Chassis” or “Body” in the upper area of the screen to switch the system major category.
And then select a button of the system that you want to diagnose.

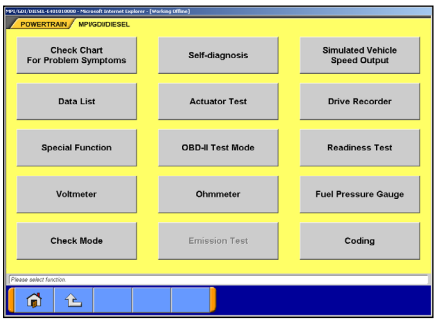


<u>When diagnosing COLT:Z30# car</u>

-The System selection screen is not same as above picture.
-After system selection, confirmation screen of the Diagnosis Vehicle Information appears.

1. Check the contents, and if they do not match to diagnosing vehicle, press button to set correct information. -- to 2
   --OK -- to (4)

2. Vehicle Information setting screen appears.
   Press an item button that you want to modify, and then its selection screen appears. Apply appropriate information.
   --OK -- back to 1
   --Deletes whole information
   --Displays history of vehicle information setting as open option.



[MPI/GDI/DIESEL 's Function Selection menu]

(4) Function Selection Screen

After System Selection, the Function Selection menu screen of the selected system appears.

In the picture on the left shows the screen appears when the MPI/GDI/DIESEL system (Powertrain group), which is a representative example, is selected. Details of each buttons are as follows.

Note:

As available functions differ between systems, there might be functions that will not appear when you select other system.

Check Chart For Problem Symptoms --To view the Symptom Chart of Service Manual.

Self-diagnosis --To read out or erase Diagnosis Trouble Codes from vehicle ECU. Also, you can read out the Freeze Frame data. (refer to 4-1.)

Simulated Vehicle Speed Output --To transmit simulated vehicle speed signal into the vehicle.

Data List -- To read the RAM data inside the ECU and displays the data in digital and graphic form. (refer to 4-2.)

Actuator Test --To control the ECU output device. (refer to 4-3.)

Drive Recorder --To record, display or analyze the ECU input / output signals which can be viewed using Data List function. (refer to Chapter 6)

Special Function --To execute special functions specific to the selected system. For detailed operation, please utilize each Online Help function.

OBD-II Test Mode --To read out "Monitoring test results" "Provisional DTC" and "ECU information", which are regarding Emission Related System, from ECU.

Readiness Test --To read out the result of Readiness Test from ECU.

Voltmeter -- To measure voltage value using MUT-III. (same operation as 11-2-2)

Ohmmeter -- To measure resistance value using MUT-III. (same operation as 11-2-2)

Fuel Pressure Gauge --To measure fuel pressure using a pressure gauge, and display the result on PC screen. (Not Available in US)

Check Mode --To shorten sampling time of communication by changing the communication method between MUT-III and ECU. This function is available in Data List, Drive Recorder and Actuator Test.

Emission Test --To test the Evaporative Emission Control System of the vehicle.

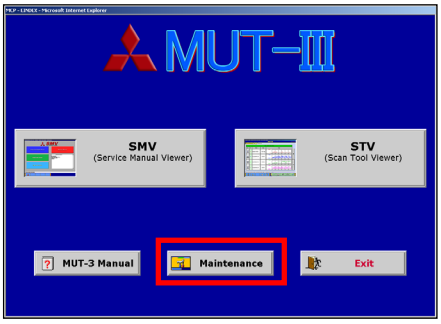
Coding -- To write the vehicle equipment specifications into ECU.

SWS monitor (appears when selecting **SWS** button in **BODY** group) (refer to Chapter 7)

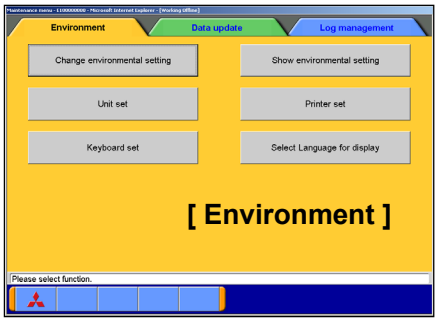
Pulse Check (appears when selecting **SWS** button in **BODY** group)
--To confirm existence of the signal pulse to operate remote system on SWS communication line.

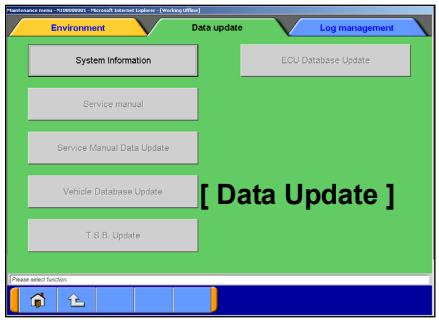
3-4. Option Settings

3-4-1. Edit Option Settings



(1) Select **Maintenance** button on the lower portion of the MUT-III Start Screen.





(2) Select a button corresponding to your purpose.

[Environment]

Change Environmental setting--To set the driver which the Service manual data should be installed.

Show environmental setting--To view the settings.

Unit set--To select US unit or metric unit, e.g. lbs : kg

Printer set--To set output conditions of the printer. (3-4-2.)

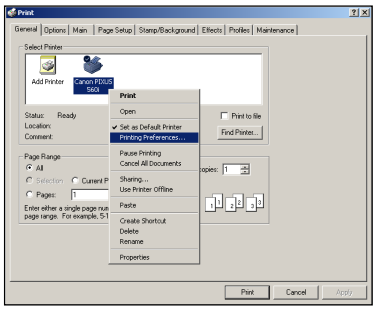
Keyboard set--To select row of keys: Alphabetical-order or QWERTY.

Select Language for display--To select a language displayed in whole MUT-III system and Service manual. (Service manual will not be displayed unless the selected language has been downloaded.)

[Data Update]

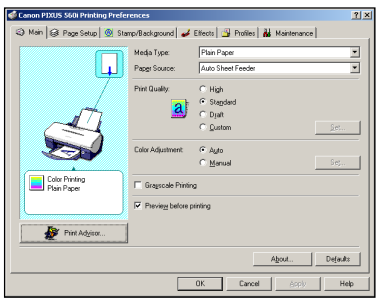
System Information--To view versions of installed software on the PC.

3-4-2. Set up Output conditions of Printer



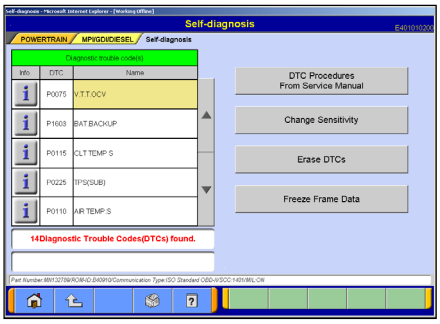
(1) When you select the **Printer set** button on 3-4-1(2), the "*Printer*" window illustrated on the left appears.
Select an appropriate printer icon and right-click it to open a pull-down menu; select "*Printing Preferences*…".

<Note>
-Set up conditions on this window will not be reflected.



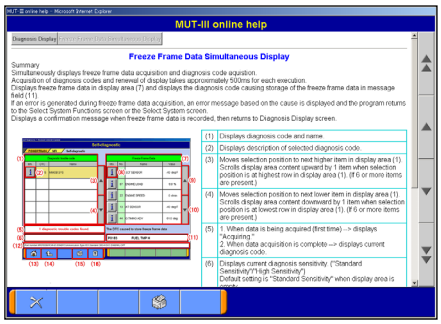
(2) The "*Printing Preferences*" window of the selected printer appears. Please set output conditions e.g. page setup, and press OK button.

3-5. Useful Functions



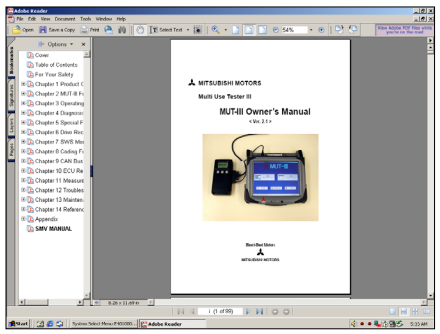
3-5-1. Online Help Function

(1) The [?] button on each screen is the online help button for that screen.

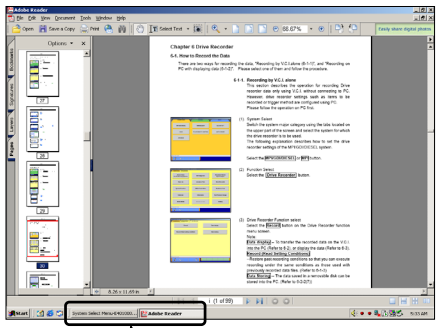


(2) The online help function allows you to view a general overview of each screen and refer to explanations of the various button functions. If you wish to move the screen up or down, select the applicable scroll button located on the right side of the screen.

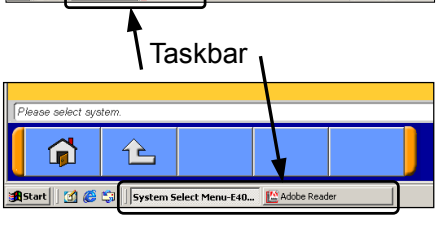
3-5-2. Display "MUT-III Owner's Manual"



(1) Press **MUT-3 Manual** button at the lower-left portion of the MUT-III Start Screen, then this Adobe Acrobat Reader "MUT-III Owner's Manual" starts.
Select "*Bookmarks*" tab at far left of the window.
-When you select a title on the left side, you can jump into the corresponding page.
-When you click [+], it turns to [−], and titles in lower layer are displayed.



(2) Select "*Pages*" tab at far left of the window, then miniature version of pages are displayed on the left. It shows currently displayed page with red frame so that you can see where the page is.



(3) Selecting MUT-III system or "*Adobe Reader*" appearing as buttons on the Taskbar switches between the system and the manual. You can hereby readily check this manual while operating MUT-III system.

Chapter 4 Diagnosis Function

4-1. Diagnostic Code

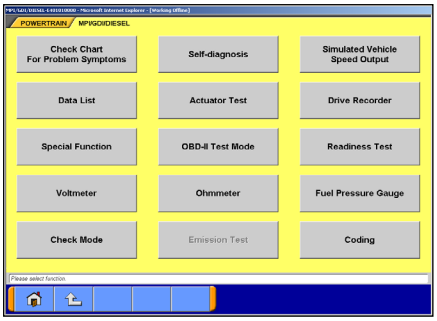
4-1-1. Reading and Erasing Diagnostic Code

(1) Select a tab in the upper area of the screen to switch the system major category, and select the button of the system you wish to diagnosis. In the explanation that follows, the method is explained using the MPI/GDI/DIESEL system of Powertrain group as a representative example.

Select **MPI/GDI/DIESEL** or **MPI/DIESEL** button.

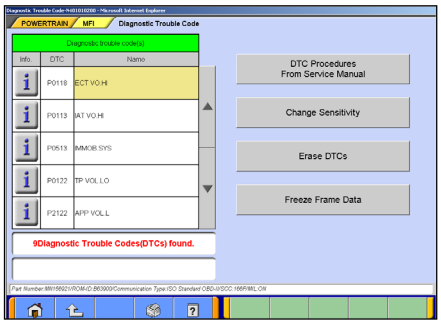
Note:

If the engine is OBD, a check code appears.



(2) Select **Self-diagnosis** button.

The system automatically communicates with the vehicle ECU and acquires the diagnostic code.



(3) The diagnostic code results appear.

DTC Procedures From Service Manual button switches the mode to interactive fault diagnosis mode.

(Not Available in US, Australia)

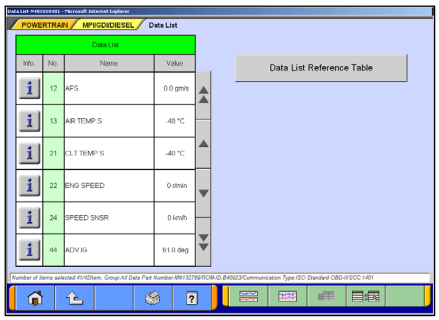
Change Sensitivity button allows you to increase the diagnostic code detection capability of the ECU or return the sensitivity level back to normal.

Erase DTCs button deletes the diagnostic code.

Freeze Frame Data button displays freeze frame data.

4-2. Data List (Service Data monitor)

4-2-1. Display of Data List



(1) Displaying Text style

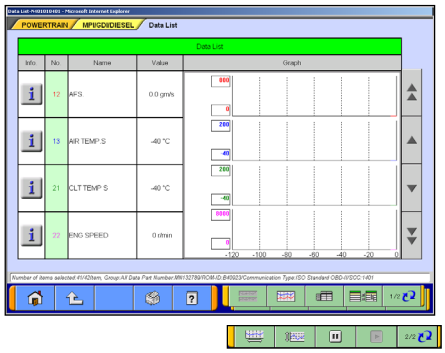
Select **Data List** button on screen of 4-1-1(2), and the left figure will be displayed.

-- Select item -- to 4-2-2(1).

-- 4items/4Graphs display -- to (2)

-- 4items/View Graph (overwrite) --to (3)

Data List Reference Table -- Displays “Data List Reference Table” of Service manual to view normal value.
(Not available in US and Australia)



(2) Displaying Graphs 1

The graph screen displays the data of 4items/4graphs.

-- 4items/4Graphs display

-- 4items/View Graph (overwrite)

-- View Text

-- View1/2

-- Change Time Scale

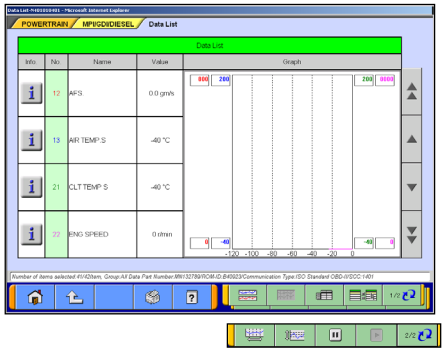
-- Change Data Scale

-- Pause -- to 4-2-2(2)

-- Start

-- View2/2

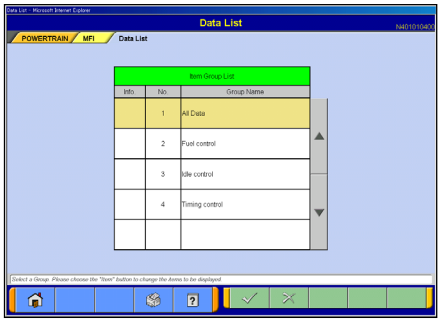
Note:
Record Data (button allows you to save the portion of Data List displayed on the graph)-- Refer to 4-2-2(2)



(3) Displaying Graphs 2

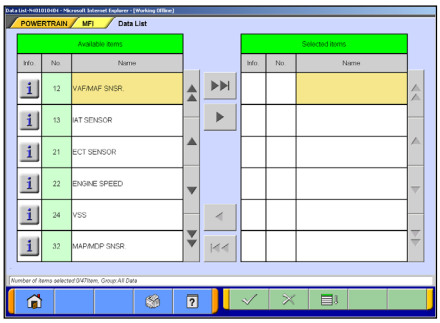
The data of displayed items are overlaid on a graph.
Available function buttons are the same as Graph 1.

4-2-2. Details of Data List Screen



(1) Displaying Item Selection

Select a group of the data to be displayed, and press ✓ button.



Item Select

By default, none of the items are selected.

Select an item that you wish to display, and apply the selection using ▶ or ▶▶| buttons.

When the selection has completed, press ✓ button.

▶▶| -- Inserts all the items from “Available item list” into the selection areas of “Selected item list.”

▶ -- Inserts the item selected in “Available item list” into the selection area of “Selected item list”.

◀ -- Inserts the item selected in “Selected item list” into the lowermost area of “Available item list”.

|◀◀ -- Inserts all the items from “Selected item list” into the lowermost areas of “Available item list.”

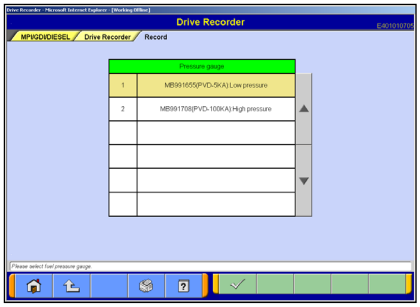
-- Changes the order in which the items are displayed in the “Selected item list” and the “Available item list,” in the sequence of default setting.

Note:

-When there is no selected item, all items are displayed.

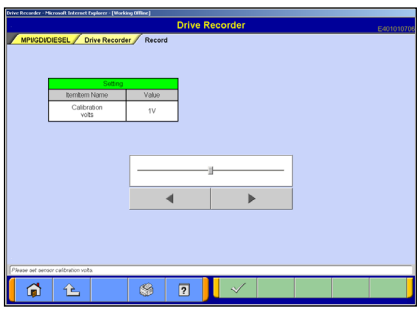
-The item number of Data List OBD basic items appears green.

-“Fuel pressure” and “Voltmeter” cannot be selected simultaneously.



<u>When you select the item “Fuel pressure”</u>

1. Pressure gauge list will be displayed after item selection. Select a type of pressure gauge used for fuel pressure measurement, and press ✓ button.



2. Set up the calibration voltage of the pressure gauge, and press ✓ button.

   Note:

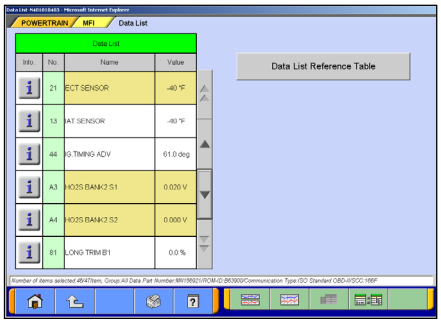
   For details on how to measure calibration voltage, refer to 11-2-1(1).

(2) Record Data

1. Graph data can be paused by pressing button, and the data is saved on the PC automatically.
   -- OK -- to 2
   --Cancel (not save the data and back to the pause screen. Pressing button starts data list again.)

2. The data has saved.
   The file name of the recorded data is set as SD + YearMonthDay + Time (military time including seconds), using the PC time as standard.
   -- OK

Note:
For details on how to view the saved data, refer to 6-2-2(3).



(3) Changing Item Display Order

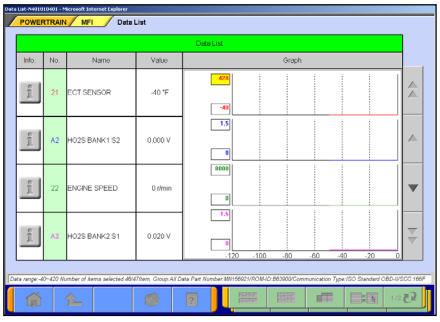
-On the data list display screen, you can change the display order of the items. The change is possible for both text display and graph display.

-The display order change can be performed with the data list displayed continuously. (The graph display is reset.)

-Selecting the name display area of an item fixes the item.. Then over-scrolling only the items not selected using the vertical scroll keys changes the order.

-The selection can be released by selecting the item again.

-The function is not activated while a data range display area is selected. (Selection, release, and scroll functions of item are not available.)



(4) Data Range Change

-Select a data range display area on the graph.

-When the color of the selected area turns into yellow, you can enter values.

Entering method: Use PC keyboard or scroll keys.

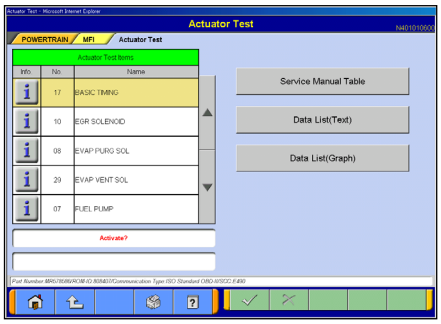
-When use PC keyboard, enter a value, and then press the [Enter] key or release the selection of the data range display area to determine the data range change.

-When the scroll keys, and , on the screen are used for the data range change, pressing the key each time changes the data range setting by +5 % of full scale and the . key changes it by –5 %. The change is determined at each key pressing.

4-3. Actuator Test

4-3-1. Actuator Test
4-3-2. Actuator Test (In case diagnosing COLT:Z30#)

4-3-1. Actuator Test

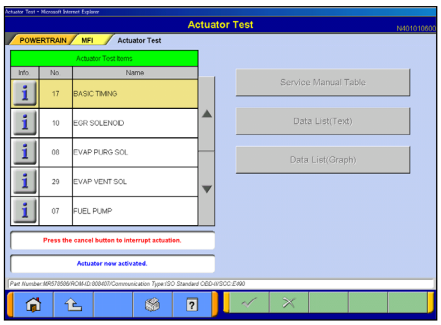


(1) Select **Actuator Test** button on screen of 4-1-1.(2), and the screen illustrated on the left appears.
Select a test item and press ✓ button to activate actuator.

Service Manual Table --Displays “Actuator test Reference Table” of Service Manual. (Not Available in US, Australia)

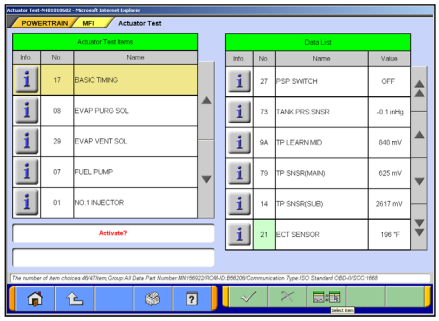
Data List(Text) --Data List simultaneous display (Text) –to(3)

Data List(Graph) --Data List simultaneous display (Graphs) –to(4)

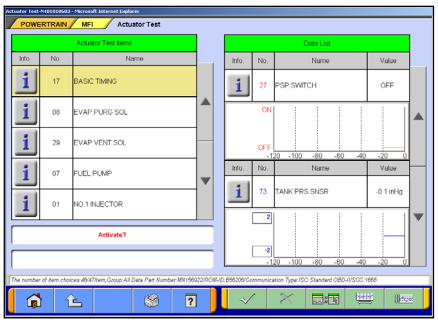


(2) Actuator Test Executing
If you want to interrupt Actuator Test, press ✕ button.

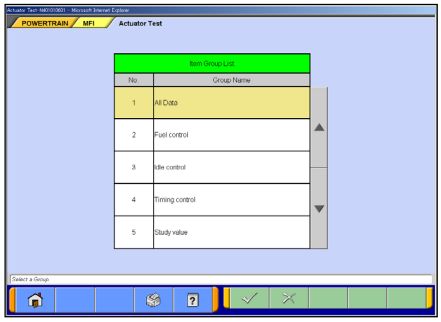
When completes the test, a massage appears.
Press ✓ button and go back to (1).



(3) Data List simultaneous display (Display Text)
Refer to (1)(2).
--Select items for Data list display -- to (5)



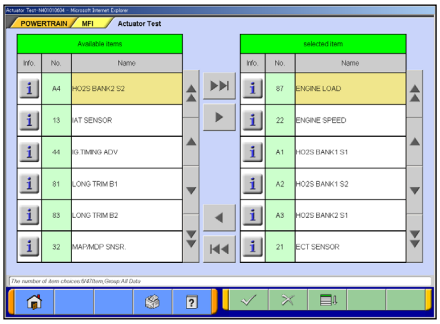
(4) Data List simultaneous display (Display Graphs)
Refer to (1)(2).
--Select items for Data list display -- to (5)
--Change Time Scale
--Change Data Scale



(5) Display item selection

1. Display item group selection

Select the group of the item, which performs Data List display and press ✓ button.



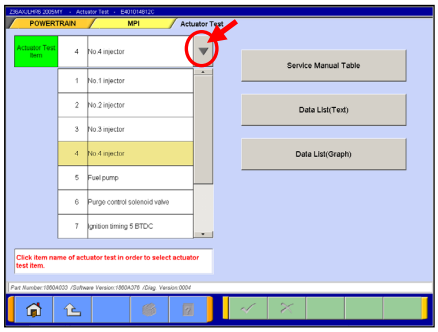
2. Item selection

For details regarding how to select item, refer to Section 4-2-2.(1).

✓ -- OK--back to (3) or (4)

4-3-2. Actuator Test (in case diagnosing COLT:Z30#)

When you diagnosing COLT:Z30# car and have selected **System Select (COLT:Z30#)** button on the Start Menu screen, operations of Actuator Test are different from 4-3-1.



(1) Select **Actuator Test** button on screen of 4-1-1(2). Press ▼ button located next to item name, and select a test item from the pull-down menu.

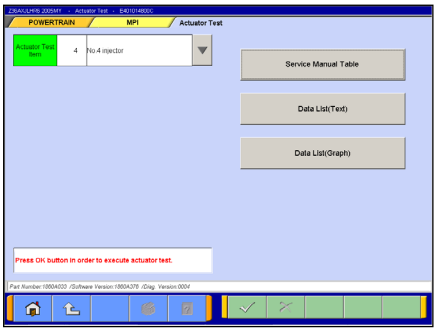
-When the selected item has no parameters -- to (2)

-When the selected item has parameters -- to (3)

Service Manual Table --Displays “Actuator Test Reference Table” of Service manual.

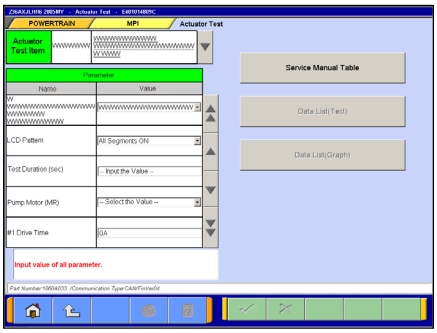
Data List(Text) --Data List simultaneous display (Text) -- to (6)

Data List(Graph) --Data List simultaneous display (Graphs) -- to (7)



In case selected item has no parameter

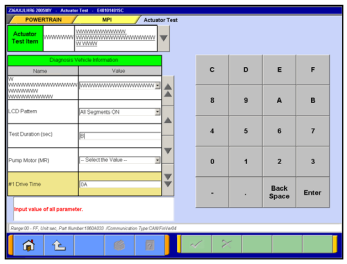
(2) Press ✓ button to execute Actuator Test. -- to (4)

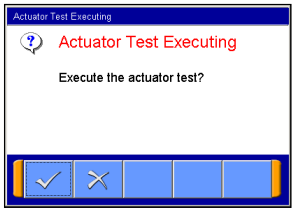


In case selected item has parameters

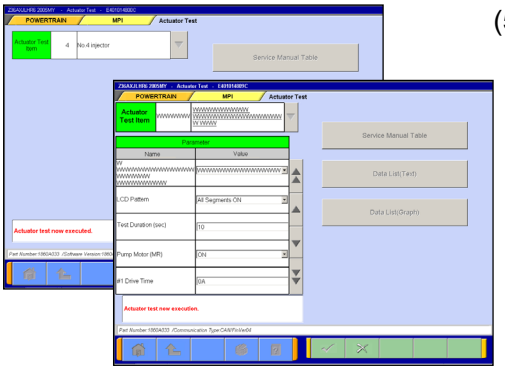
(3) The test item that you have selected need to be set some parameters. After completes the parameter setting, press button to execute the Actuator Test. -- to (4)

"--Select the Value--" : Select the value from the pull-down.
"--Input the Value--" : Input the value using hexadecimal keys appeared by clicking the input box.



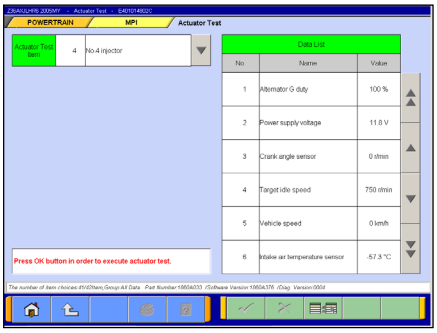


(4) Confirmation of executing test
Press button

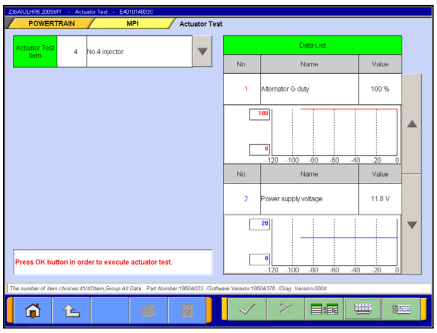


(5) Actuator Test Executing
If you want to interrupt the Actuator Test, press button.

When completes the test, a massage appears.
Press button. -- go back to (2) or (3).



(6) Data List simultaneous display (Display Text)
Refer to (1)-(5).
--Select items for Data list display



(7) Data List simultaneous display (Display Graphs)
Refer to (1)-(5).

--Select items for Data list display

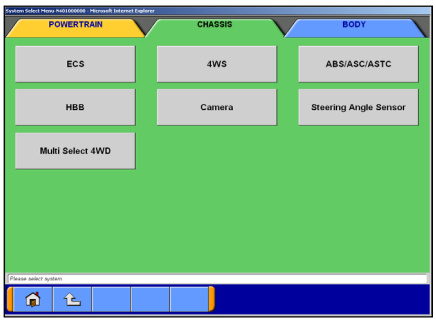
--Change Time Scale

--Change Data Scale

Chapter 5 Special Function (Calibration & Setting)

5-1. Steering Angle Sensor Calibration

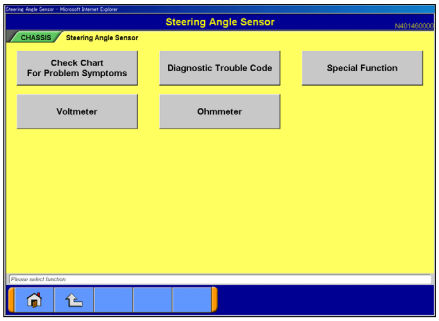
5-1-1. Steering Angle Sensor Calibration



(1) System Select

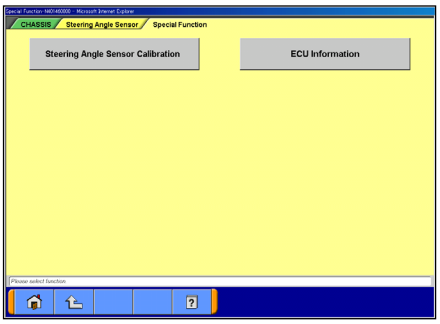
Select the **CHASSIS** group using the tabs that appear on the upper part of the screen.

Select **Steering Angle Sensor** button from the System Select Menu.



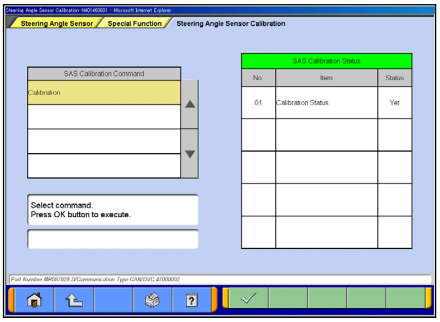
(2) Function Select

Select **Special Function** button.



(3) Function Select

Select **Steering Angle Sensor Calibration** button.



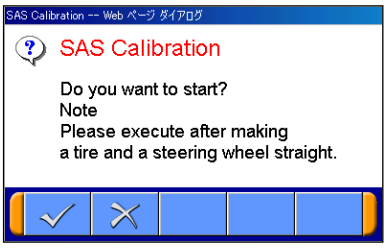
(4) Steering Angle Sensor Calibration

Select a command item and press the ✓ button to execute.

Note:

When the display is “Yet” as the result of status, it is to (5).

When the display is “Done” as the result of status, it is to (7).



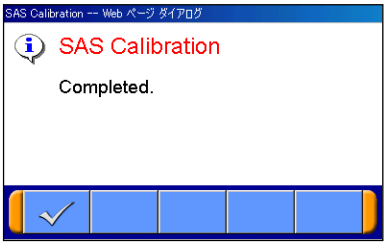
(5) Study Confirmation

--Start --to (6).

--Cancel --to (4).

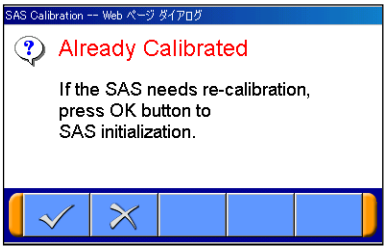
Note:

Please execute after making a tire and a steering wheel straight.



(6) Study Completed

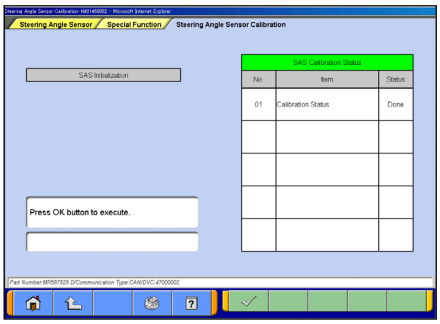
--OK --to (4).



(7) Re-calibration

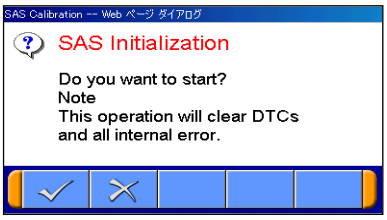
If the SAS needs re-calibration, press the button to execute SAS initialization.

--Cancel --to (4).



(8) Initialization.

Press the button to execute.



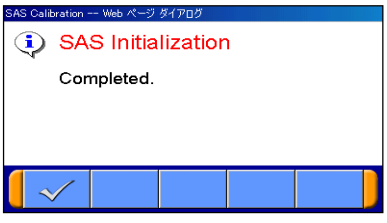
(9) Clear DTCs Confirmation

--Start --to (10).

--Cancel --to (8).

Note:

This operation will clear DTCs and all internal error.

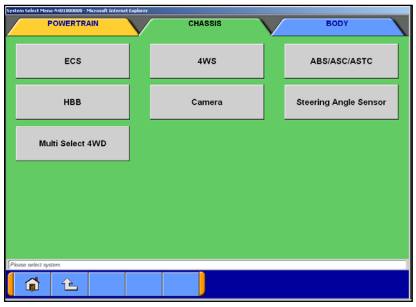


(10) Clear Completed

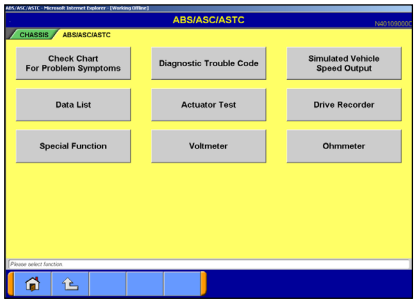
--OK --to (4).

5-2. Lateral G sensor Calibration

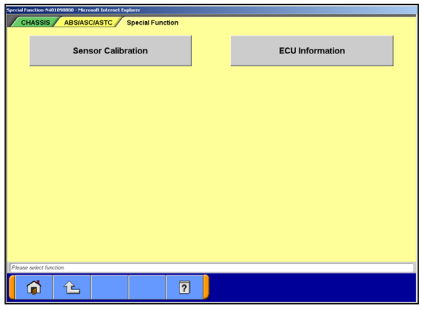
5-2-1. Lateral G sensor Calibration



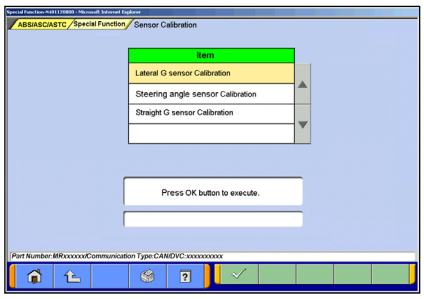
(1) System Select
Select the **CHASSIS** group using the tabs that appear on the upper part of the screen.
Select **ABS/ASC/ASTC** button from the System Select Menu.



(2) Function Select
Select **Special Function** button.

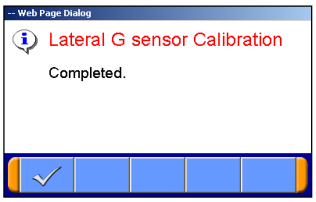


(3) Function Select
Select **Sensor Calibration** button.



(4) Execute Screen
Press the ✓ button to execute.

(5) Execute Confirmation
✓ --Start
✗ --Cancel --to (4).



(6) Lateral G sensor Calibration Completed
✓ --to (4).

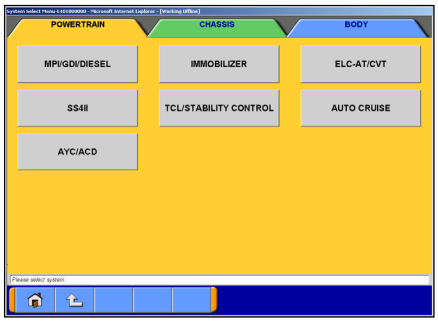
Chapter 6 Drive Recorder

6-1. How to Record the Data

There are two ways for recording the data, “Recording by V.C.I.alone (6-1-1)”, and “Recording on PC with displaying data (6-1-2)”. Please select one of them and follow the procedure.

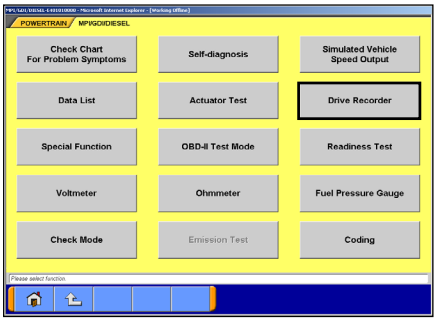
6-1-1. Recording by V.C.I. alone

This section describes the operation for recording data using only V.C.I. without connecting to PC. However, drive recorder settings such as items to be recorded or trigger method are configured using PC.
Please connect V.C.I. into PC and vehicle, and start performing the following steps using PC.

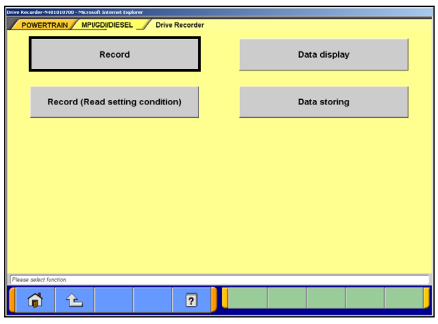


(1) System Select
Switch the system major category using the tabs located on the upper part of the screen and select the system for which the drive recorder is to be used.
The following explanation describes how to set the drive recorder settings of the MPI/GDI/DIESEL system.

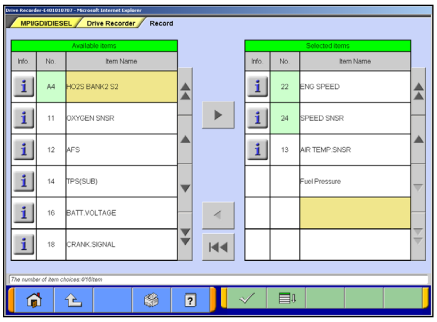
Select **MPI/GDI/DIESEL** or **MPI/DIESEL** button.



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



(3) Drive Recorder Function select
Select **Record** button on the Drive Recorder function menu screen.
Note:
Data display-- To transfer the recorded data on the V.C.I. into the PC (Refer to 6-2), or display the data (Refer to 6-3).
Record (Read Setting Conditions)
--Restore past recording conditions so that you can execute recording under the same conditions as those used with previously recorded data files. (Refer to 6-1-3)
Data Storing -- The data saved in a removable disk can be stored into the PC. (Refer to 6-2-2(7))



(4) Item Select

Select an item you wish to record and apply the selection using ▶ button.

When the selection has completed, press ✓ button.

▶ -- Inserts the item selected in "*Available items* list" into the selected area of "*Selected items* list".

◀ -- Inserts the item selected in "*Selected items* list" into the lowermost area of "*Available items* list".

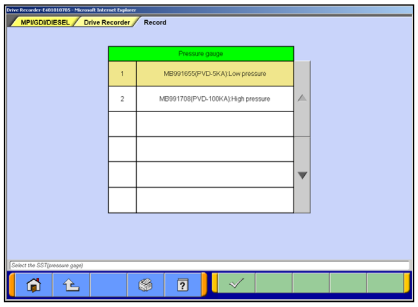
⏮ -- Inserts all the items from "*Selected items* list" into the lowermost areas of "*Available item* list".

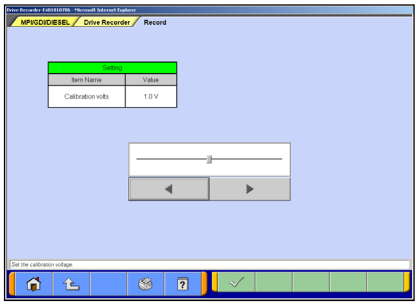
-- Changes the order in which the items are displayed in "*Selected items* list" and "*Available items* list", in the sequence of default setting.

Note:

-A maximum of 16 items can be recorded.

-"Fuel pressure" and "Voltmeter" cannot be selected simultaneously.



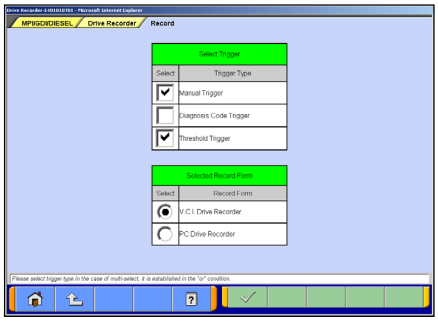


<u>When you select the item "Fuel pressure"</u>

1. Pressure gauge list is displayed after the item selection. Select a type of pressure gauge used for fuel pressure measurement, and press ✓ button.

2. Set up the calibration voltage of the pressure gauge, and press ✓ button.

   Note:
   For details on how to measure calibration voltage, refer to 11-2-1(1).



(5) Trigger method / Recording style Select

-Select trigger method and put ✔ mark. (Multiple selection)

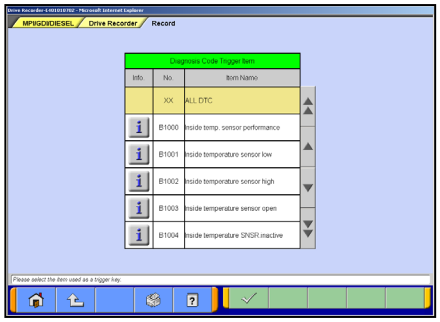
-Put the ◉ mark on "<u>VCI Drive recorder</u>".

When completes the selection, press ✓ button.

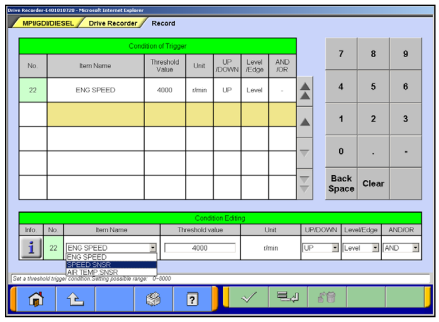
"**Manual Trigger**" --Allows you to set the trigger manually. --to (8)

"**Diagnosis Code Trigger**" --Applies the trigger when the specified diagnostic code is generated. -- to (6)

"**Threshold Trigger**"--Applies the trigger when the condition meets the set threshold. -- to(7)



(6) When "**Diagnosis Code Trigger**" is selected in (5), the left screen appears.
Select an item to be the trigger, and press the button.
--to (8). (If Threshold Trigger is selected as well, go to (7))

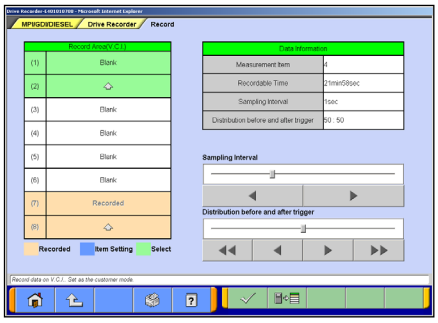


(7) When "**Threshold Trigger**" is selected in (5), the left screen appears.

- Select an item and edit conditions in *Condition Editing* table appearing at the bottom of the screen, first.

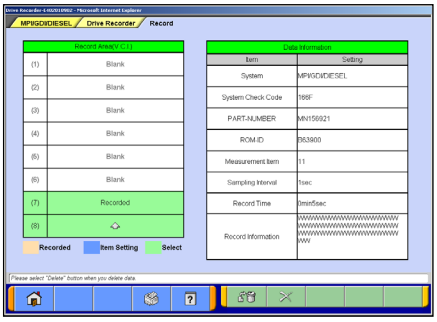
Condition Editing table
"UP/DOWN": Threshold or higher / Threshold or lower
"Level/Edge": Matching data / Data as of the time when it turns to be matching from not matching.
"AND/OR": Data matching with both of this condition and the other one upper row on *Condition of Trigger* table / Data matching with either of this condition or the other one upper row on *Condition of Trigger* table.

- Then, press the Add button to set the condition into selected area of *Condition of Trigger* table.
(*Condition of Trigger* table can include up to 8 conditions.)
- When completed the setting, press the button.



(8) Select the V.C.I. recording area.
The sampling interval and rate distributions (before and after the trigger) are set using the buttons.
---OK to (10)
---V.C.I. data display to (9)

Note:
-You can select from eight recording areas.
-It is possible to set consecutive areas as well.
-The sampling interval time indicates the data-recording interval for one item. A setting of 0 seconds results in the fastest sampling interval.
-When a sampling interval other than the fastest interval is selected, the amount of time in which recording is possible appears. This time is a calculated estimated time and may differ from the actual amount.

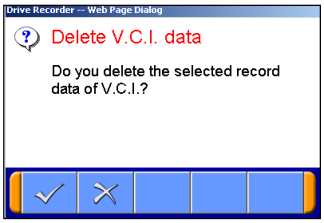


(9) View V.C.I. Regeneration Data

1. For the data recorded in the selected V.C.I. recording area, the settings of the items are displayed.

   -- Deletes data recorded in the V.C.I.
   Select a data you wish to delete, and press this button -- to 2

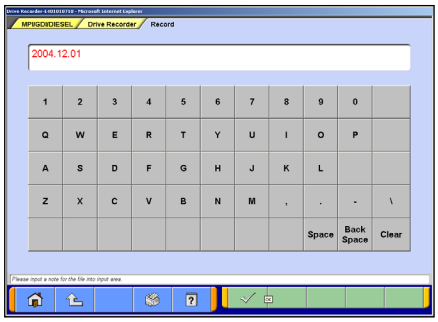
   -- Cancel -- to (8)



2. Delete Confirmation

   --OK

   --Cancel

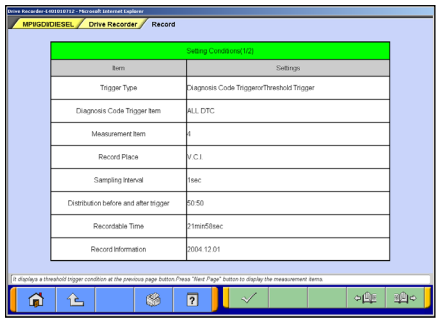


(10) Enter the record information (memo)

Enter the reference information, such as the vehicle model and diagnosed system name.

--OK -- to (11)

Note:
-Because the unit is linked with the PC keyboard, you can enter the information either directly using the PC keyboard or by using the screen keyboard.



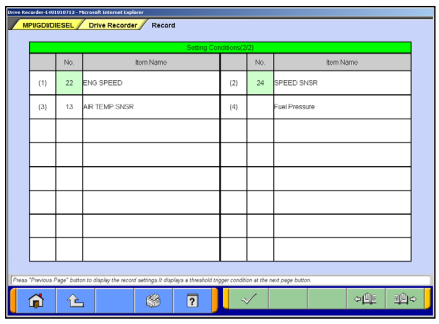
(11) The contents check of setting (1/3)

The list of recording setting appears.

--To check set items

--To check threshold trigger conditions (if selected)

Press button transmits the settings to the V.C.I.-- To (14)



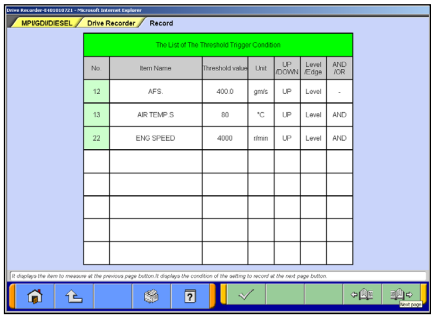
(12) The contents check of setting (2/3)

The list of recording items appears.

--To check threshold trigger conditions (if selected)

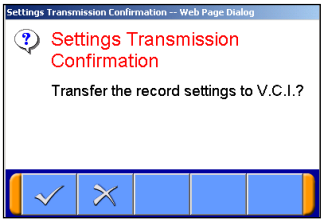
--To check recording setting

Press button transmits the settings to the V.C.I.-- To (14)

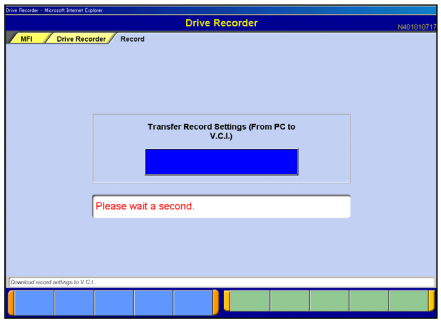


(13) The contents check of setting (3/3) (Only if selected in (7))
The list of Threshold conditions appears.
--To check recording setting
--To check set items

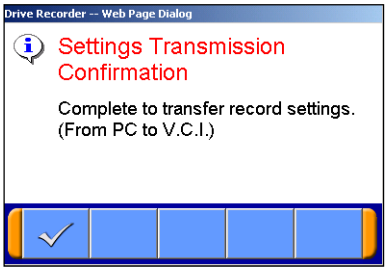
Press button transmits the settings to the V.C.I.-- To (14)



(14) Transmit Confirmation
By pressing button on screen (11)/(12)/(13), the record settings are transmitted to V.C.I..
Press button.



(15) Once the settings have been transmitted from the PC to the V.C.I., a message appears indicating that the settings have been transmitted. Please wait a second.



(16) Press button.
Note:
If you wish to start recording immediately, disconnect the USB cable while leaving the V.C.I. switch ON. (Disconnecting the USB cable starts to record the data on V.C.I.) -- to (17)
If you wish to just set the settings and later start recording, turn the V.C.I. switch OFF and then disconnect the USB cable.

(17) Recording
When you record with a manual trigger, connect the trigger harness to the V.C.I. trigger terminal as necessary.
Note:
-When the USB cable is connected, the VCI communicates with the PC, thereby prohibiting drive recorder startup. Do not connect the USB cable.

(18) Starting Recording

To start recording, turn off the engine first, and then turn the ignition switch ON or start the engine and turn the V.C.I. power switch ON. Recording begins after communication initialization.

Note:

-The number in parenthesis on the V.C.I. LCD screen indicates the recording area of the V.C.I. drive recorder.

(19) Trigger

With a manual trigger, pressing the V.C.I. Enter key activates the trigger, displaying “T” on the screen. Once the trigger has been activated, the data after the time of the trigger are recorded.

With a diagnostic trigger, the trigger is automatically activated when the specified diagnostic code is generated.

(20) Ending Recording

If you wish to end recording, regardless of whether or not the trigger has already been generated, press the V.C.I. ESC key.

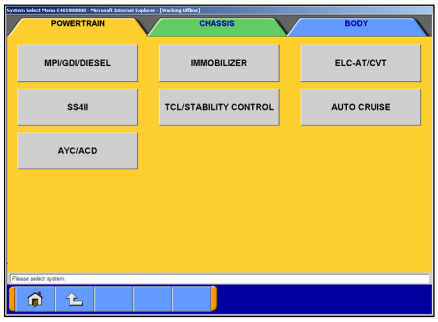
Once the button has been pressed you can disconnect the vehicle harness and trigger harness.

(21) When you check the data recorded in V.C.I.,

continue to 6-2-1.

6-1-2. Recording on PC with displaying data

This section describes the operation for saving the data at a file on PC with displaying it as the set up record conditions.

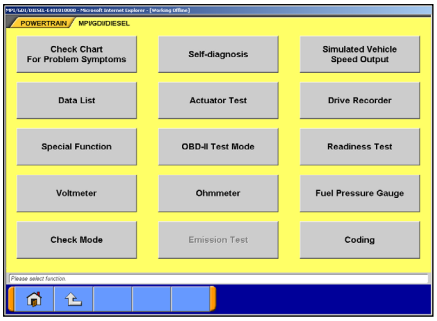


(1) System Select

Switch the system major category using the tabs located on the upper part of the screen and select the system for which the drive recorder is to be used.

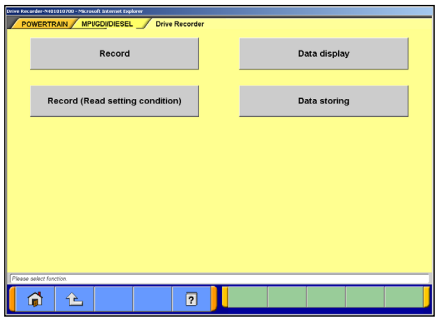
The following explanation describes how to set the drive recorder settings of the MPI/GDI/DIESEL system.

Select **MPI/GDI/DIESEL** or **MPI/DIESEL** button.



(2) Selection of function.

Select **Drive Recorder** button.



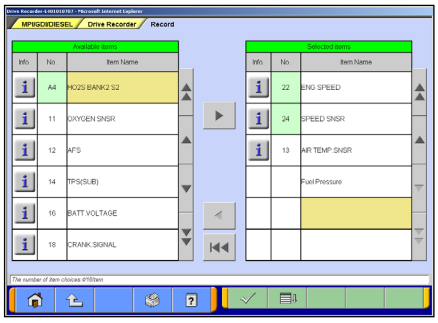
(3) Select **Record** button on the Drive Recorder function menu screen.

Note:

Data display -- Displays the recorded data. (Refer to 6-3) or edit the data (Refer to 6-2-2)

Record (Read Setting Conditions) -- Allows you to restore past recording conditions so that you can execute recording under the same conditions as those used with previously recorded data files. (Refer to 6-1-3)

Data Storing -- The data saved in a removable disk can be stored into the PC. (Refer to 6-2-2(7))



(4) Item Select

Select an item you wish to record and apply the selection using ▶ button.

When the selection has completed, press the ✓ button.

▶ -- Inserts the item selected in "*Available items* list" into the selected area of "*Selected items* list".

◀ -- Inserts the item selected in "*Selected items* list" into the lowermost area of "*Available items* list".

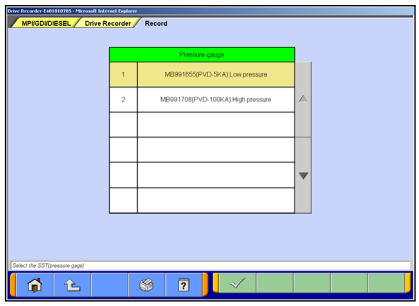
⏮ -- Inserts all the items from "*Selected items* list" into the lowermost areas of "*Available item*s list".

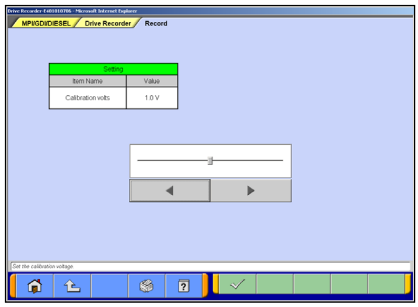
-- Changes the order in which the items are displayed in "*Selected items* list" and "*Available items* list", in the sequence of default setting.

Note:

-A maximum of 16 items can be recorded.

-"Fuel pressure" and "Voltmeter" cannot be selected simultaneously.



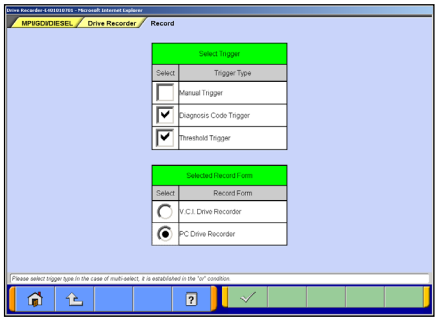


<u>When you select the item "Fuel pressure"</u>

1. Pressure gauge list is displayed after the item selection. Select a type of pressure gauge used for fuel pressure measurement, and press ✓ button.

2. Set up calibration voltage of the pressure gauge, and press ✓ button.

   Note:
   For details on how to measure calibration voltage, refer to 11-2-1(1).



(5) Trigger method / Recording style Select

-Select trigger method, and put ✔ mark. (Multiple selection)

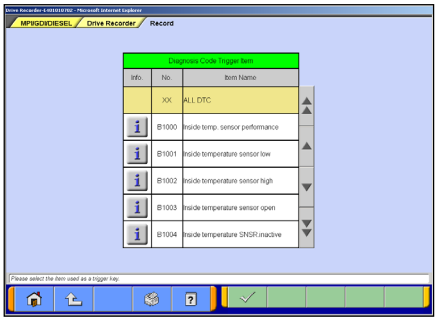
-Put the ◉ mark on "<u>PC Drive recorder</u>".

When completed the selection, press ✓ button.

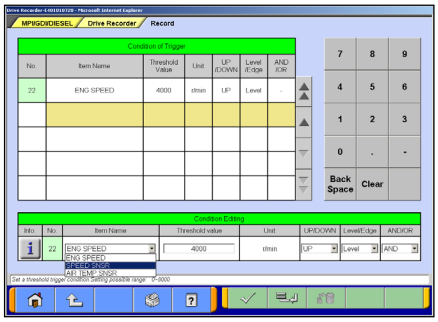
"**Manual Trigger**" -- Allows you to set the trigger manually. --to (8)

"**Diagnosis Code Trigger**" -- Applies the trigger when the specified diagnostic code is generated. -- to (6)

"**Threshold Trigger**" -- Applies the trigger when condition meets the set threshold. -- to(7)

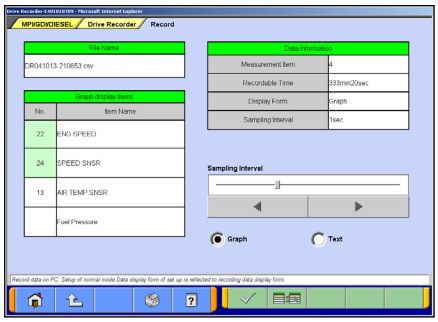


(6) When “**Diagnosis Code Trigger**” is selected in (5), the left screen appears.
Select an item to be the trigger, and press button.
--to (8). (If Threshold Trigger is selected as well, go to (7))

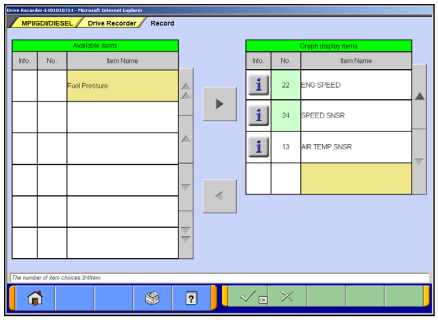


(7) When “**Threshold Trigger**” is selected in (5), the left screen appears.

- Select an item and edit conditions in *Condition Editing* table appearing at the bottom of the screen. (refer to 6-1-1(7))
- Then, press the button to set the condition into selected are of *Condition of Trigger* table.
(Extraction Setting Table can include up to 8 conditions.)
- When completed the setting, press the button.



(8) PC Drive recorder setup
Please check the contents of the record setting and set up the sampling interval with button.
To select a display format for recording (either graph display or text display), enter a check mark "".
--OK -- to (10)
--Displaying item select (‘Graph’ selected only)--to (9)
Note:
-The sampling interval time indicates the data-recording interval for one item. A setting of “0 sec” (fastest) results in the fastest sampling interval.
-Recordable time computes the number of the maximum record points as 20000 points, and is displayed. This is the prediction time on calculation and differs from actually recordable time.
-The configuration of the displayed file names is DR+ Year MonthDay + Time (military time including seconds), using the PC time.
<DR: The file saved by the drive recorder is meant>
-The setting value of a sampling interval can be chosen from 0sec(fastest)/1sec/10sec/1min.



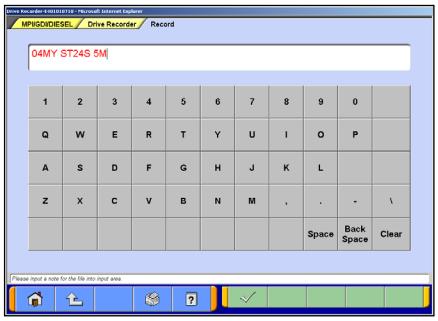
(9) Graph display item selection

Select the items you wish to display on the graph.

Selected 4items are displayed during the recording.

The items not selected are not displayed on graph but the data are recorded.

-- OK to (8)



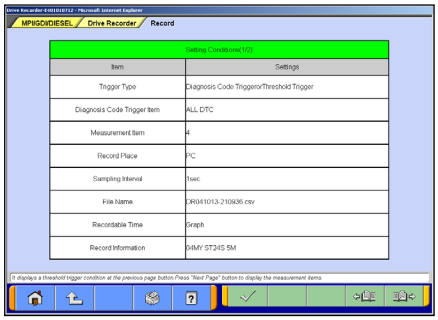
(10) Enter the record information (memo).

Enter the reference information, such as the vehicle model and diagnosed system name.

--OK to (11)

Note:

Because the unit is linked with the PC keyboard, you can enter the information either directly using the PC keyboard or by using the screen keyboard.



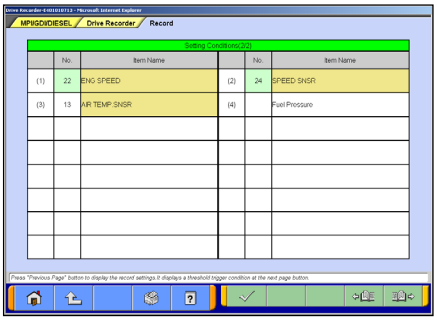
(11) The contents check of setting (1/3)

The list of recording settings appears.

--To check set items

--To check threshold trigger conditions (if selected)

Pressing starts recording – go to (14)



(12) The contents check of setting (2/3)

The list of set recording items appears.

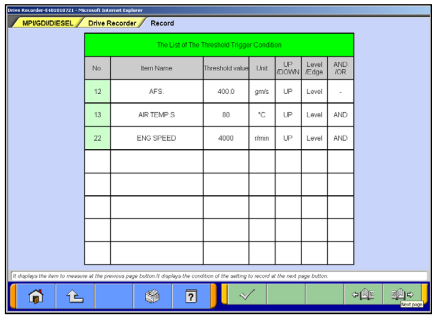
--To check threshold trigger conditions (if selected)

--To check recording setting

Pressing starts recording – go to (14)

Note:

When “Graph” is selected in (8), the background color of the name column of the item, which is to be displayed in graph during the recording, changes into yellow.



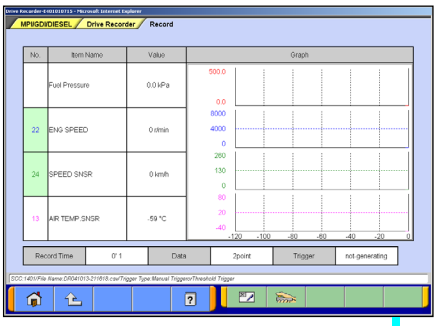
(13) The contents check of setting (3/3) (Only if selected in (7))

The list of threshold trigger conditions appears.

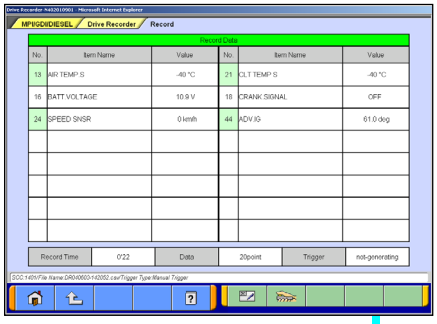
--To check recording setting

--To check set items

Pressing starts recording – go to (14)



(a). Recording screen [graph]



(b). Recording screen [text]

(14) Recording Data

[Graph]

It saves at the file, expressing data as the set-up record conditions. The four items chosen on (9) are indicated by graph as the left screen (a).

[Text]

When the “text” was chosen on (8) and a drive recorder is set up, it saves at a file, acquiring and expressing data as the set-up record conditions. (see the left screen (b))

--Data record end --to (16)

When neither Diagnosis Code Trigger nor a Manual Trigger is generated during data record, let the point at the time of a record start be time 0:00.0.

--Manual Trigger occurs

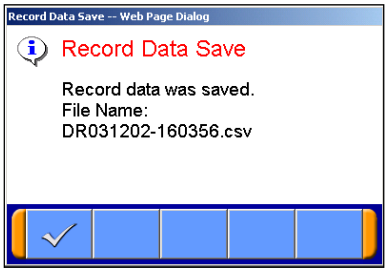
However, when Diagnosis Code Trigger is chosen as trigger conditions, suppose that it is invalid.

Note:

-Record is continued until record end button is pushed, even if trigger occurs.

-The availability of the hard disk of the PC is checked after record screen display and before record start. When the availability is 100MB or less, the message is displayed and record is stopped.

-When the number of record data reaches to 20000 points, the message is displayed and record is completed.



(15) Save record data

On the screens of (14), pressing the

button ends the data acquisition and saves it, and then displays a dialog indicating completion of the record data saving.

-- OK --To Drive Recorder function select menu screen (Refer to (3)).

Note:

*In the case that there is no record data, a dialog is displayed confirming whether to stop the recording.

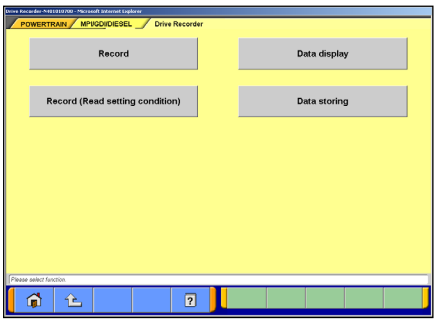
-- OK -- To the drive recorder function select menu

-- Cancel --To (14) to start recording again.

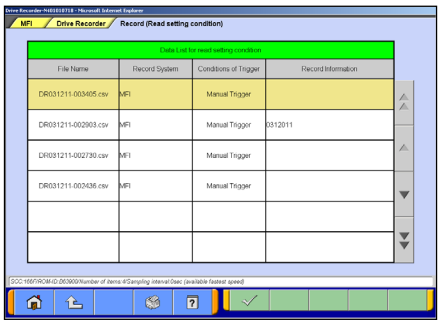
(16) When you check the recorded data, **continue to 6-2-2.**

6-1-3. Reuse past setting condition

Record (Read Setting Conditions) button allows you to restore past recording conditions so that you can execute recording under the same conditions as those used with previously recorded data files.



(1) Select **Record (Read Setting Conditions)** button on the screen illustrated in 6-1-1(3).

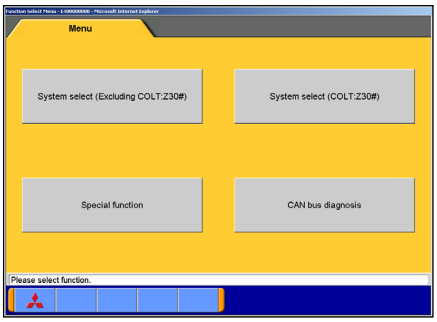


(2) Select the data you wish to restore, and press button.
The data was recorded using V.C.I.: To 6-1-1(8)
The data was recorded using PC : To 6-1-2(8)

6-2. Recorded Data Handling

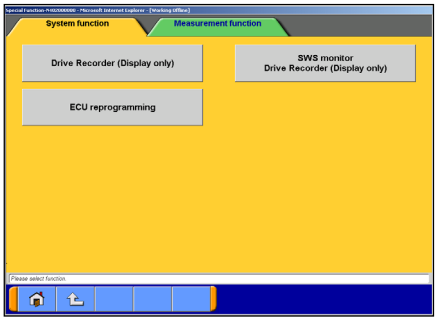
6-2-1. Transmit data on V.C.I. to PC

To view the data recorded on V.C.I., you need to transfer it from V.C.I. to PC first. Connect V.C.I. and PC using a USB cable and operate following procedures.

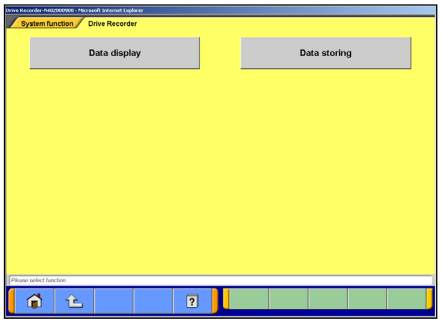


(1) You can transfer the data using only V.C.I. and PC, without connecting to the vehicle. Select **Special Function** button on the Start menu screen.--to (2)

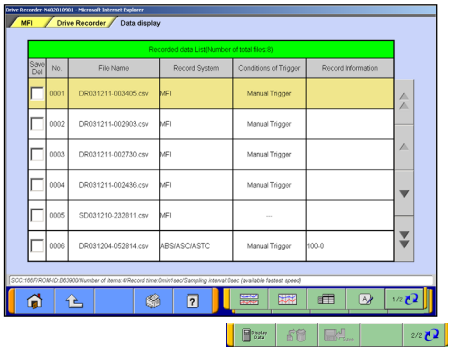
Or, if the V.C.I. is already connected to the vehicle, you can select **Data display** from the menu screen of the recorded system to regenerate the data. (Refer to 6-1-1(3)) --to (4)



(2) Select the **System Functions** tab on the upper part of the screen, and then select **Drive Recorder (Display only)** button.

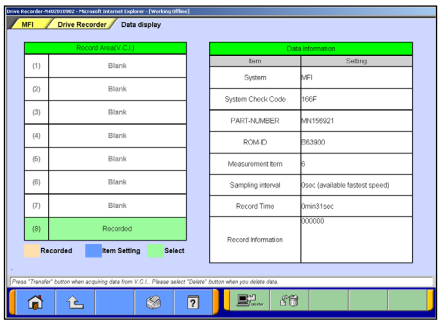


(3) Select **Data display** button.



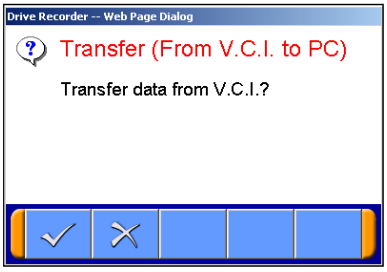
(4) File List

Press 1/2 button to view 2/2, and press the Display Data button.

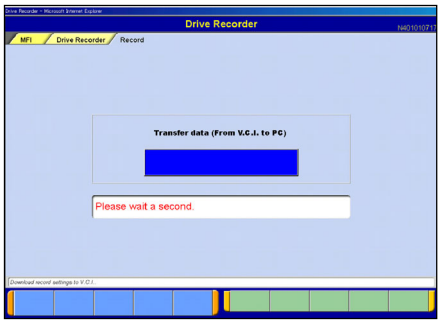


(5) Displaying V.C.I. Data
The status of V.C.I. recording area is displayed.
Select the data to be transferred into PC, and press .
--to (6)

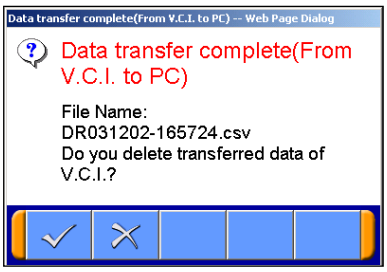
When you wish to delete a data, select it and press .
--to (9)



(6) Transfer Confirmation
Press the button.

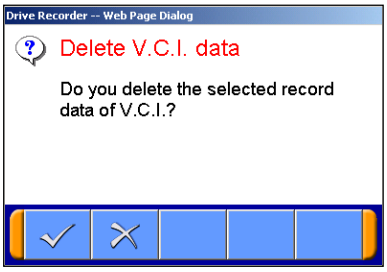


(7) The data is being transferred from V.C.I. to PC.
Please wait for a while.



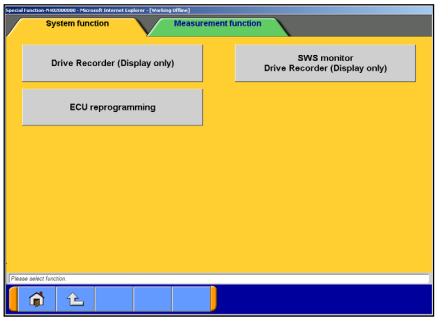
(8) After completion of data transfer, a dialog appears asking whether to delete the transferred data.

: Deletes the data
: Cancel -- to (5)



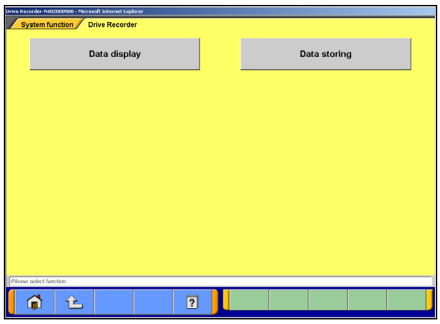
(9) Data Deletes Confirmation
: Deletes the data
: Cancel -- to (5)

6-2-2. Data Edit Functions

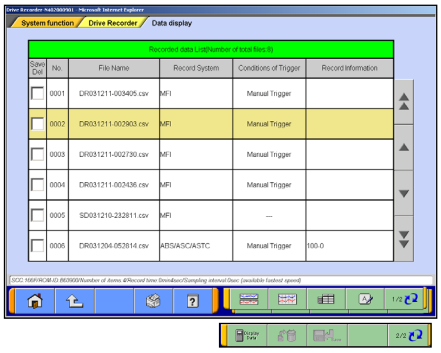


(1) Select **Special Function** on the Start menu screen.
Then select [**System Functions**] tab on the upper part of the screen, then select **Drive Recorder (Display only)**.

Or, if V.C.I. is already connected to the vehicle, you can select **Data display** from the menu screen of the recorded system. (Refer to 6-1-1(3)) --to (3)

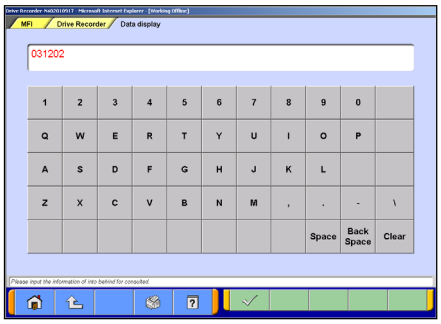


(2) Select **Data display** button.



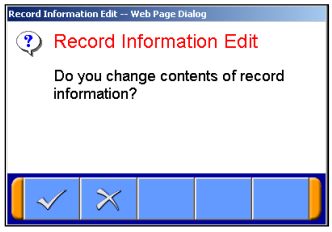
(3) Recorded data file list
-The file list of the drive recorder (and data list records) saved into the PC is displayed.
-You can view the data details by selecting the data you wish to view from the list and pressing the button.
In addition, you can view graph data by pressing the button. (to 6-3-1(3))
-The background color of the line containing the selected file changes into yellow.
-- Edit record information – refer to (4)
-- Delete the data file -- refer to (5)
-- Save the data file -- refer to (6)
Note:
-The configuration of the displayed file names is DR+Year Month Day+Time(military time including seconds), using the PC time.
-The most recent recorded data appears on top of the list.
-Those file names, which begin with “SD”, contain the data of Data List records. (Refer to 4-2-2.(2))

Caution: About “CSV file”
If you open the CSV file in MUT-3 using EXCEL, never overwrite and save it. (However, they are allowed after the file is transferred from MUT-3 to another PC or copied in another folder.)

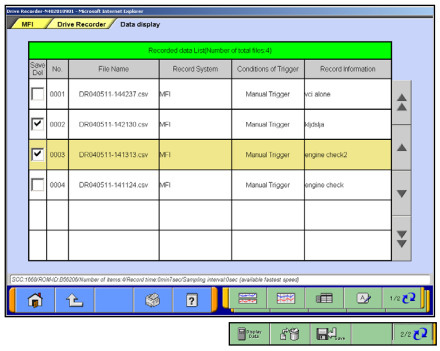


(4) Edit Data Information

1. Select a file to edit and press the button to display the screen illustrated on the left, where you can edit the record information that was entered in 6-1-1(10) or 6-1-2(10).
   Press the button.



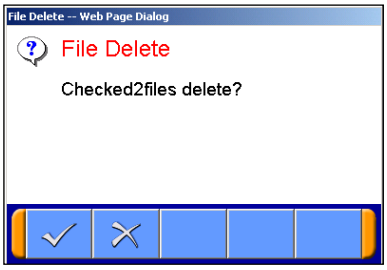
2. Edit Confirmation
   Press the button. -- to (3)



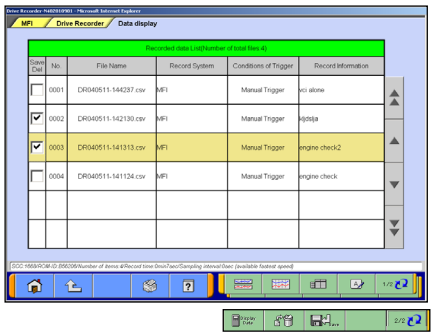
(5) Delete Data

1. To delete a data file loaded on the PC, click the check box next to file No. in the file list (refer to (3)) to place a check mark, and press the button.
   (Two or more check marks can be placed.)

Note:
☑ mark will be displayed, if cursor is moved on a check box and it clicks. (Selection)
☑ mark is eliminated by clicking again. (Selection release)



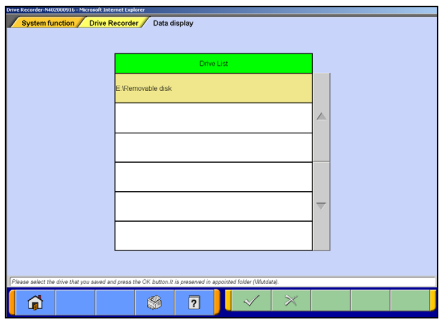
2. File Delete Confirmation
   A message appears asking if you wish to delete the data file. Press the button to delete the file.



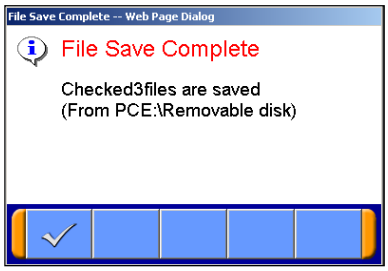
(6) Save Data

1. The data file can be saved to a removable disk (floppy disk or memory card).
   -Insert a disk into the PC, first.
   -Click the check box next to the file No. in the file list to place a check mark, and press the Save button.
   (Two or more file selections are possible.)

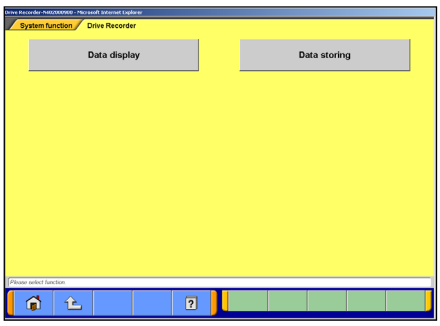
Note:
☑ mark will be displayed, if cursor is moved on a check box and it clicks. (Selection)
☑ mark is eliminated by clicking again. (Selection release)



2. Drive Select
   Select a drive for saving the data files, and press the ✓ button.

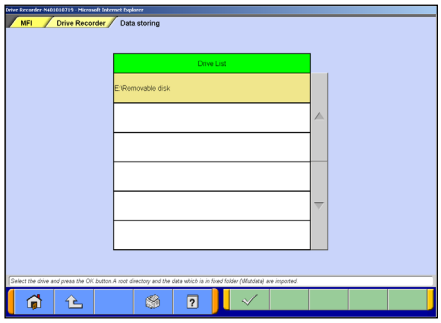


3. Data Saved
   The files are saved. Press the ✓ button.

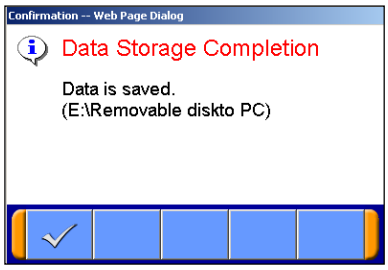


(7) Data Storing

1. The data saved in a removable disk before can be stored into the PC.
   -Insert the disk into the PC, first.
   -Select the **Data Storing** button in the drive recorder select function screen. (Refer to (2))



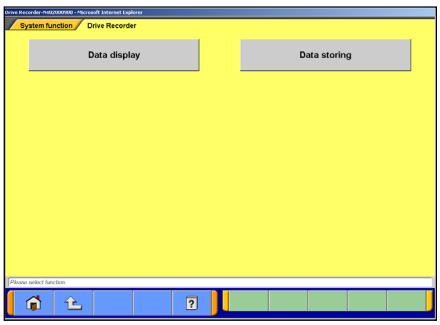
2. Drive Select
   Select the drive storing the data.



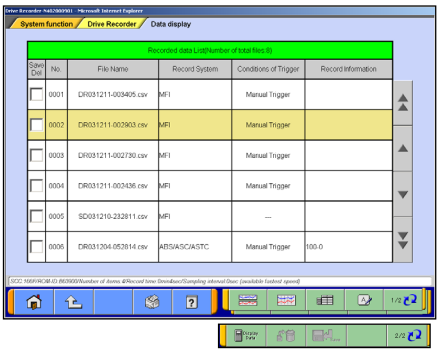
3. Data Storage Complete
   The data has been loaded to PC.
   Press the button.

6-3. Display and Analysis of the Recorded Data

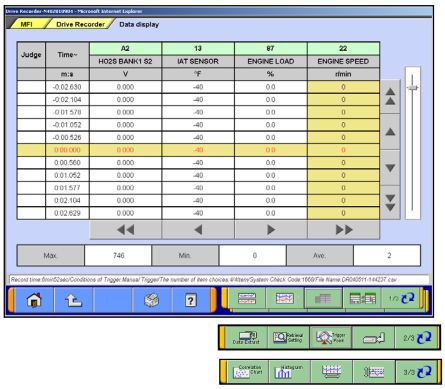
6-3-1. Display the recorded data



(1) Select **Special Function** on the Start menu screen.
Then select the **System Functions** tab on the upper part of the screen, and select **Drive Recorder (Display only)**,. then select **Data display** button.
-Or, if the PC is connected to the vehicle through V.C.I., you can select **Data display** from the function menu screen of the recorded system.



(2) Recorded data file list
Data file list that contains record of Drive recorder and Data list saved in PC will be displayed.
You can view the data details by selecting the data you want to display from the list and pressing the button.
In addition, you can view graph data by pressing the or button.
-The background color of the line containing the selected file changes into yellow.



(3) Displaying Text Data
- --Graph data 1
- --Graph data 2
- --Select item (to (4))
- --Edits extraction conditions (to 6-3-2.(1))
- --Sets search conditions (to 6-3-2.(2))
- --Jumps to a trigger point.
- --Saves data (to (6-3-2.(3))
- --Displays a correlation diagram (to 6-3-3.(1))
- --Displays a distribution chart (to 6-3-3.(2))
- --View 1/3
- --View 2/3
- --View 3/3

Displaying Graph 1

--Text data

--Graph data 2

--Select item (to (4))

--Edits extraction conditions (to 6-3-2.(1))

--Jumps to a trigger point

--Saves data (to 6-3-2.(3))

--Displays a correlation diagram (to 6-3-3.(1))

--Displays a distribution chart (to 6-3-3.(2))

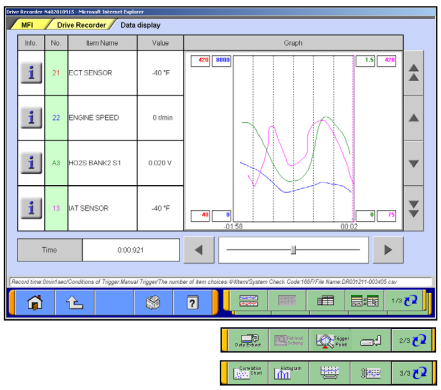
--Change Time Scale

--Change Data Scale

--View 1/3

--View 2/3

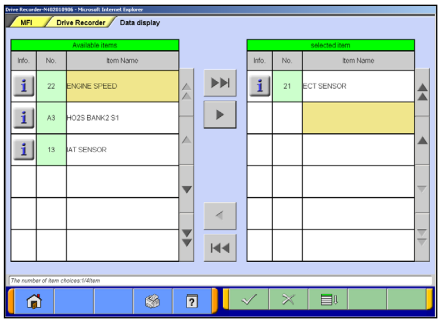
--View 3/3



Displaying Graph 2

Displayed items are overlaid on a graph.

-The function buttons are the same as Graph1.



(4) Select item

button allows you to select items to be displayed from recorded data.

When complete the selection, press the button.

The item number of Data List OBD basic items appears green.

-- Inserts all the items from "*Available items* list" into the selected areas of "*Selected items* list."

-- Inserts the item selected in "*Available items list*" into the selected area of "*Selected items* list".

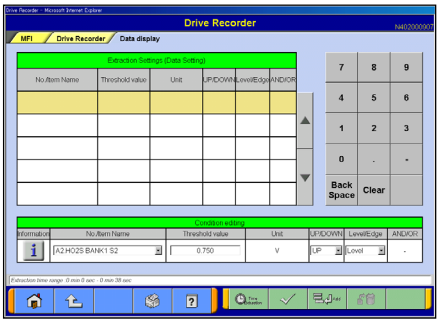
-- Inserts the item selected in "*Selected items* list" into the lowermost area of "*Available items* list".

-- Inserts all the items from "*Selected items* list" into the lowermost areas of "*Available items* list."

-- Changes the order in which the items are displayed in "*Selected items* list" and "*Available items* list," in the sequence of default setting.

6-3-2. Extraction and Search of the recorded data

Recorded data can be extracted or retrieved for display on predetermined conditions.
<Extraction: Only matching data will be displayed>
<Retrieval: Matching data will be displayed with *(asterisk)>
Time range, threshold of item etc. can be set as condition of extraction or retrieval.



(1) Condition setting for data extraction

Extraction condition setting screen shown on the left will be displayed after pressing the Data Extract button on text/graph display screen.

- Edit conditions in *Condition editing* table appears at the bottom of the screen.

Condition editing table

"UP/DOWN": Threshold or higher / Threshold or lower

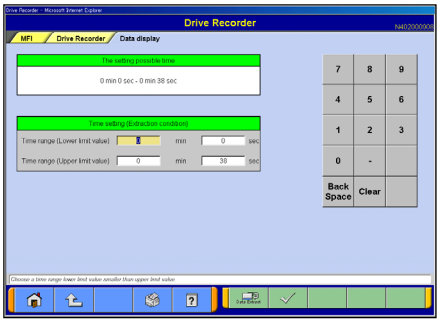
"Level/Edge": Matching data / Data as of the time when it turns to be matching from not matching.

"AND/OR": Data matching with both of this condition and the other one upper row on *Extraction Setting* table./ Data matching with either of this condition or the other one upper row on *Extraction Setting* table.

- Then, press the Add button to set those conditions in *Extraction Setting* table.
  (*Extraction Setting* table can include up to 8 conditions.)
- Press the ✓ button to display extracted data only in text/graph.

Time Extraction --Set time extraction condition.

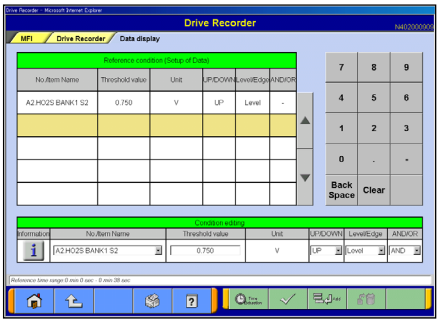
--Delete extraction condition data selected.



Time extraction condition setting

After pressing the Time Extraction button, time extraction condition setting screen shown on the left will be displayed. Set time range on this screen and press the ✓ button to display extracted data only.

Data Extract --Return to data extraction condition setting screen.



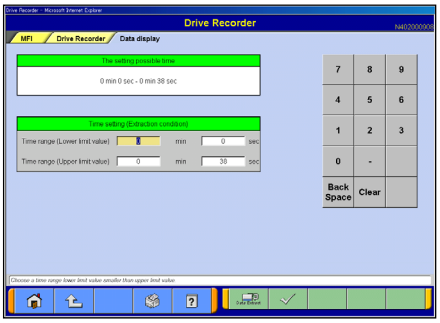
(2) Conditions setting for data search

Retrieval condition setting screen shown on the left will be displayed after pressing the Retrieval Setting button on text display screen.

- Edit conditions in *Condition editing* table appears at the bottom of the screen. (See (1) for more details.)
- Then, press the Add button to set those conditions in *Retrieval condition* table.
  (*Retrieval condition* table can include up to 8 conditions.)
- Press the ✓ button to display text data screen showing * (asterisk) in the Judge column of the data matching with the retrieval condition.

Time Extraction --Set time retrieval condition.

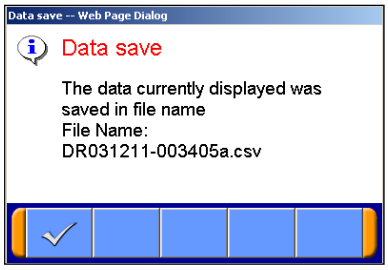
--Delete extracted condition item selected.



Time retrieval condition setting

After pressing the Time Extraction button, retrieval condition setting screen shown on the left will be displayed. Set time range on this screen and press the ✓ button to display text data screen showing * (asterisk) in the Judge column of the record data matching with the retrieval condition.

Data Extract --Return to data extraction condition setting screen.



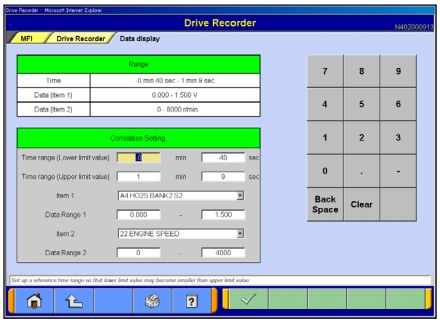
(3) Data save

When pressing the Save button on the screen of displaying data, you can save the extracted or retrieved data into the PC.

As massage illustrated on the left appears, press the ✓ button.

Note: The configuration of the file name is original data file name + alphabet (a,b..z).

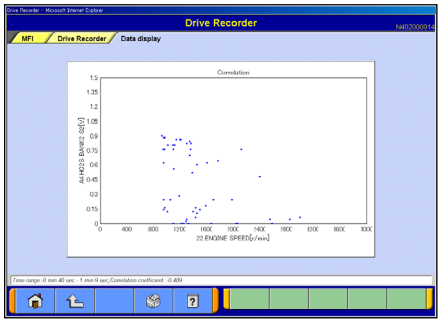
6-3-3. Diagram and chart



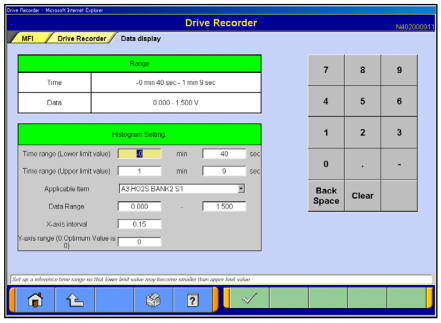
(1) Setting the Correlation Diagram

Pressing the Correlation Chart button on the screen illustrated in 6-3-1(3) displays the correlation diagram settings screen as illustrated on the left.

Setting the target data time range, item names and data display range and pressing the ✓ button displays the correlation diagram.



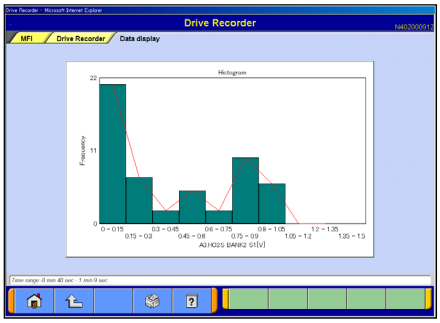
<Correlation Diagram>



(2) Setting the Distribution Chart

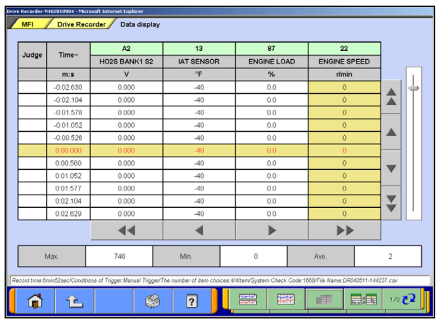
Pressing the Histogram button on the screen illustrated in 6-3-1(3) displays the distribution chart settings screen as illustrated on the left.

Setting the target data time range, item names, data range, division width, and frequency range and pressing the ✓ button displays the distribution chart.



<Distribution Chart>

6-3-4. Other Functions



(1) Changing Item Display Order

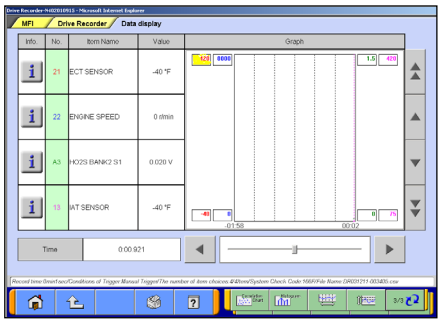
On the data list display screen, you can change the display order of the items. The change is possible for both text display and graph display.

-Selecting the name display area of an item fixes the item.

-Then over-scrolling only the items not selected using scroll keys changes the order.

-The selection can be released by selecting the item again.

-The function is not activated while a data range display area is selected in the data range change function. (Selection, release, and scroll functions of item are not available.)



(2) Data Range Change

Select a data range display area on the graph.

When the color of the selected area turns into yellow, you can enter values.

Entering method: Use PC keyboard or scroll keys.

-When the PC keyboard is used, enter a value from the keyboard and then press the [Enter] key or release the selection of the data range display area to determine the data range change.

-When the scroll keys, ▲ and ▼ , on the screen are used for the data range change, pressing the ▲ key each time changes the data range setting by +5 % of full scale and the ▼ key changes it by -5 %. The change is determined at each key pressing.

Chapter 7 SWS Monitor

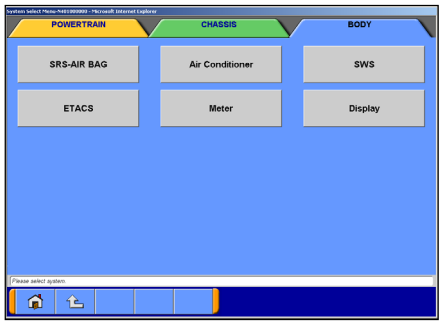
7-1. SWS Monitor Operation

Precautionary Notes

Prior to connecting or disconnecting the SWS monitor and vehicle, be sure to turn the ignition switch OFF.

1. If the SWS monitor is connected to the column switch connecter, connecting the SWS monitor cartridge and V.C.I. prior to V.C.I. power activation may cause damage to the V.C.I.
   Refer to connection instructions for more details – connect the monitor cartridge after the V.C.I. is connected to the vehicle and the V.C.I. power switch is ON.
2. If you wish to use the SWS monitor continuously for a long period of time, the V.C.I. and SWS cartridge will consume power. Take extra precautions to ensure that the battery does not die during use.
3. Use of cellular phones and amateur radios near the SWS monitor during use may cause the SWS monitor to not function properly. Avoid using such apparatuses near the monitor during use.
4. During use, the SWS monitor may affect systems employing weak electric currents such as GPS systems.
5. The tip of the door communication probe is sharp. Be careful during handling.

7-1-1. SWS Monitor Function

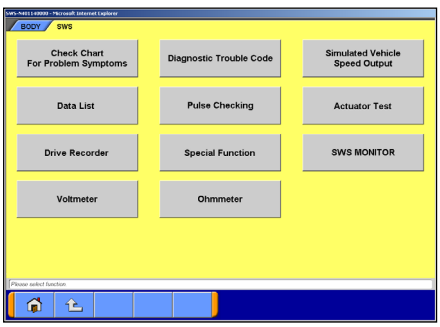


(1) System Select

Select **BODY** group using the tabs that appear on the upper part of the System Selection screen, then select **SWS**.

Note:

SWS monitor cartridge is required in MUT-III as well for SWS monitor. For details regarding how to connect the cartridge and harness, see the MUT-II reference manual (Pub. No. MSSP-310B-2002) or the service manual data of each vehicle.

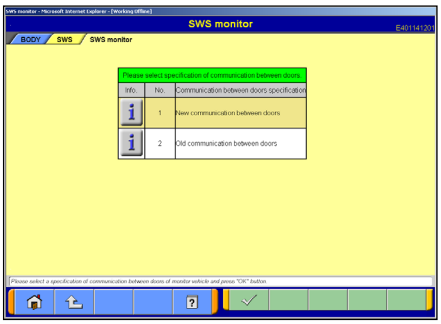


(2) Function Select

On the SWS function select menu screen, select **SWS MONITOR** button.

Note:

If the SWS monitor cartridge is not connected to the vehicle, **SWS MONITOR** button does not appear.



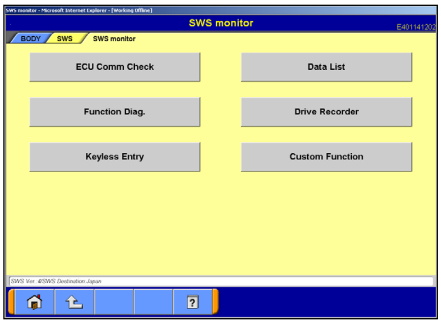
(3) This screen appears depending on vehicle SWS version. Select a specification of communication between doors of the vehicle that you monitor, and press the ✓ button.

[New communication between doors]

Power windows are controlled by multiplex communication between driver's seat Power window module and other Power window **switches**.

[Old Between-doors communication]

Power windows are controlled by multiplex communication between driver's seat Power window module and other Power window **motors**.



(4) Function Select

The SWS monitor menu screen appears.

ECU Comm Check button. to 7-1-2.

Data List button. to 7-1-3.

Function Diag. button. to 7-1-4.

Drive Recorder button. to 7-1-5.

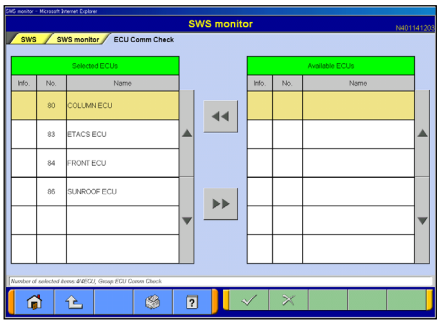
Keyless Entry button. to 7-1-6

Custom Function button. to 7-1-7

Note:

The Keyless entry and Custom Function buttons will appear depending on the SWS version of vehicle.

7-1-2. Checking ECU Communication



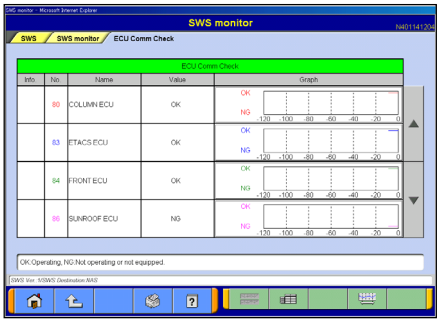
(1) Item Select

The item selection screen appears.

Select items to check and press ✓ button.

Note:

All items are selected as default.

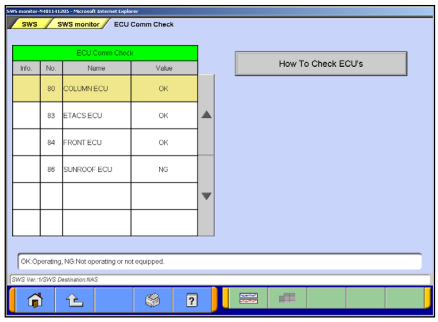


(2) Displaying Graph

"OK" appears if the ECU is communicating properly, and "NG" appears if there is a communication error. "NG" also appears if the system has not been installed or is installed but not communicating. Prior to performing the check, therefore, it is necessary to identify the system for the monitored vehicle.

--Change Time Scale

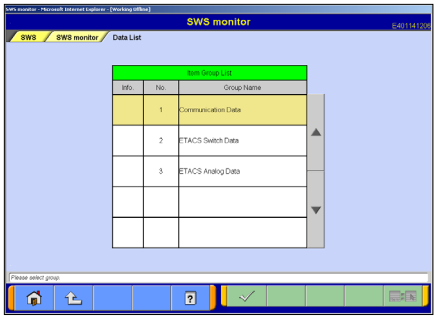
--View text style--to (3)



(3) Displaying Text style

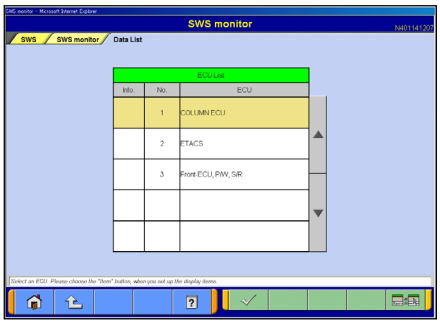
If you press **How to Check ECU's** button, you can view the Service Manual. (Not Available in US, Australia)

7-1-3. Data List



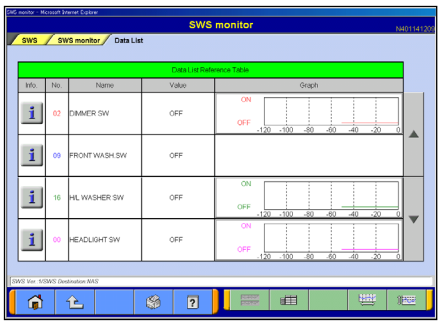
(1) When selecting **Data List** on SWS monitor menu screen, some vehicle SWS version shows "Item Group List" illustrated on the left. (others will go to (2) directly).
Select a group of data and press ✓ button.

-When selecting "Communication Data"-- to (2)
-When selecting "ETACS Switch Data" or
"ETACS Analog Data" -- to (3)
--Item Select (only when selecting "ETACS Switch Data" or "ETACS Analog Data")



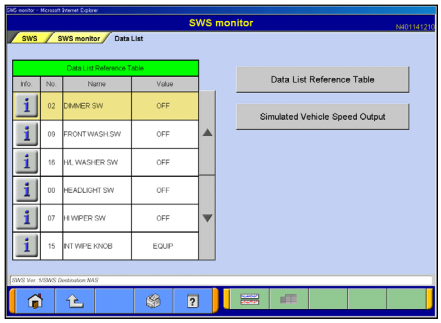
(2) Item Select

Select an ECU to monitor from the Data List, and press ✓ button.
--Item Select



(3) Displaying Graph

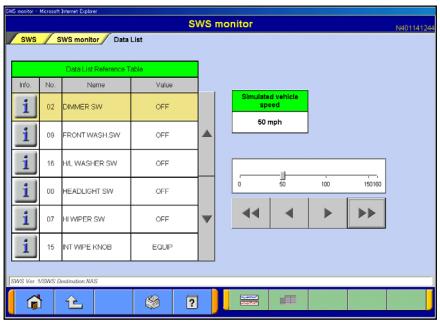
--View text --to (4)
--Change Time Scale
--Change Data Scale



(4) Displaying Texts

Data List Reference Table--Displays the Data List of the Service manual. (Not Available in US, Australia)

Simulated Vehicle Speed Output--
Allows you to simultaneously view the Simulated Vehicle speed and Data List. --to (5)
--View graph



(5) Simulated Vehicle Speed Output

The Simulated Vehicle speed output function displays the simulated vehicle speed and Data List simultaneously.

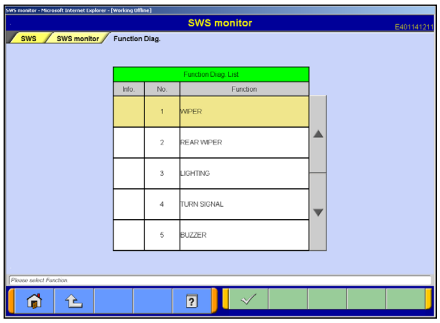
Speed output can be changed in 1 mph or 10 mph increments using the speed adjusting buttons.

--Unit: 1mph

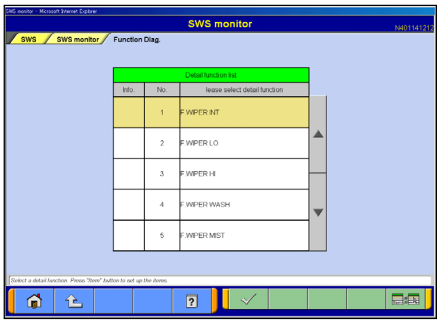
 --Unit: 10mph

--View graph

7-1-4. Function Diagnosis

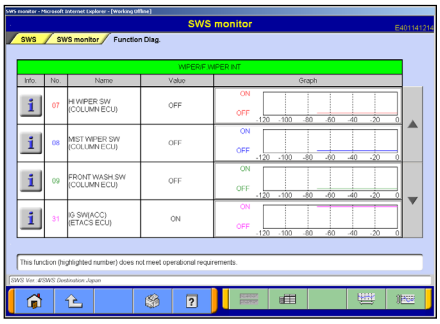


(1) Select **Function Diag.** button on the screen illustrated in 7-1-1(4). Select the function you wish to diagnose and press button.



(2) Select a detailed function and press button.

--Item Select



(3) Displaying Graph

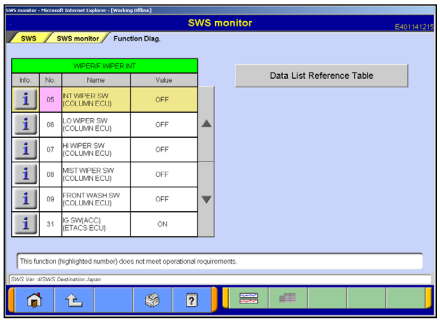
--View Text --to (4)

--Change Time Scale

--Change Data Scale

Note:

If required operating conditions are not met, the item number appears in pink color.



(4) Displaying Text

Data List Reference Table: (Not Available in US, Australia)

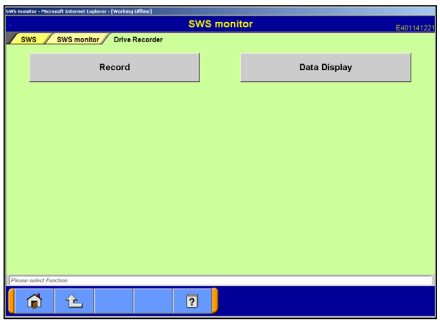
Displays the Data list of the Service manual.

--View Graph

Note:

If required operating conditions are not met, the item number appears in pink color.

7-1-5. Drive Recorder Function

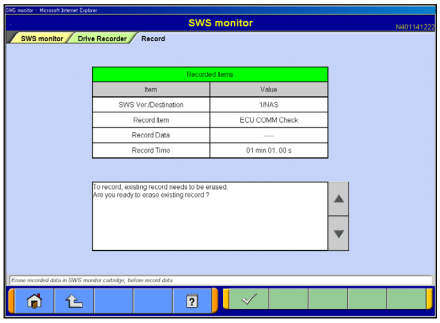


(1) **Record**

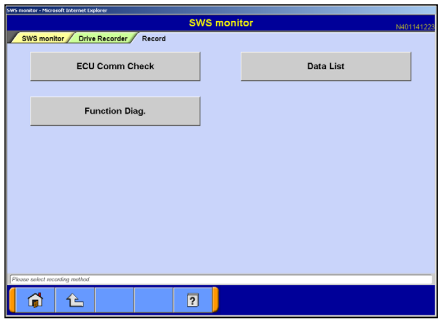
--Records data such as Data List in the built-in memory of SWS monitor cartridge. to (2).

Data Display

--Displays the data recorded with the drive recorder. to (9).



(2) The left figure is displayed when the last record remains. Erase recorded data in SWS monitor cartridge, before record data. Press ✓ button.



(3) Recording Data

Select an item you wish to record.

Select **ECU Comm Check** button--to (4)

Data List-- to (4) after ECU selection

Function Diag.-- to (4) after function selection.

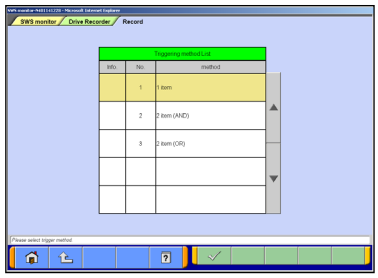
(4) Selecting the Trigger Method

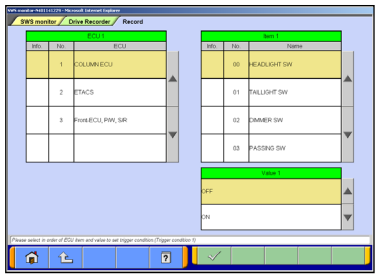
Manual trigger--

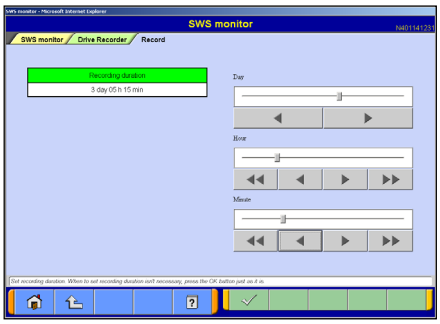
Allows you to apply the trigger manually.

Item trigger--

Allows you to select one or two items and uses the ON or OFF signal of the item(s) as a trigger to start recording.







(5) Setting the Recording Time

The recording time can be set from 0day 0h 0min to 5days 0h 0min. If you do not wish to set a recording time, press the ✓ button without setting the time.

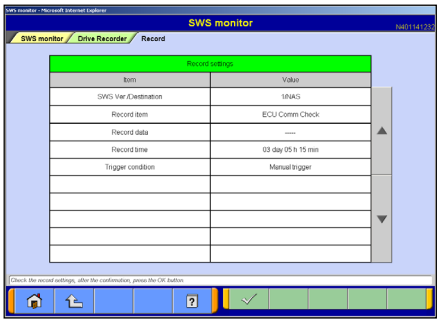
The day and time are set using the ◀◀ ◀ ▶ ▶▶ buttons.

-Day --Unit: 1 day

-Hour-- ◀ ▶ Unit: 1h, ◀◀ ▶▶ Unit: 5h

-Minute-- ◀ ▶ Unit: 1min, ◀◀ ▶▶ Unit: 10min

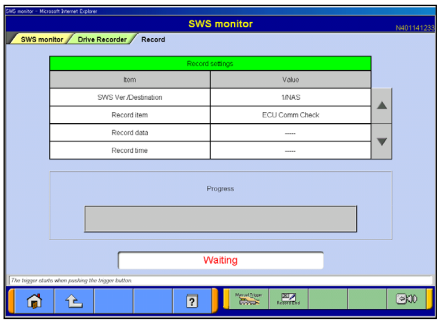
You can also set the time using the slide bars.



(6) Checking the Recording Settings

Check the recording settings and press the ✓ button to transmit the data to the SWS monitor cartridge.

A message appears indicating that the recording settings will be transmitted to the I/F cartridge. Press ✓ button.



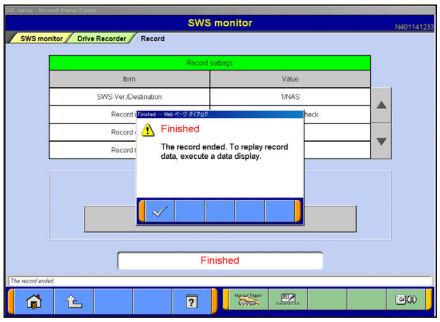
(7) Recording Using the Drive Recorder

Once the data have been transmitted to the SWS monitor cartridge, the screen shown at left appears. If the trigger set was a manual trigger, press the Manual Trigger button to start recording.

If the trigger set was an item trigger, recording begins when the set conditions are met.

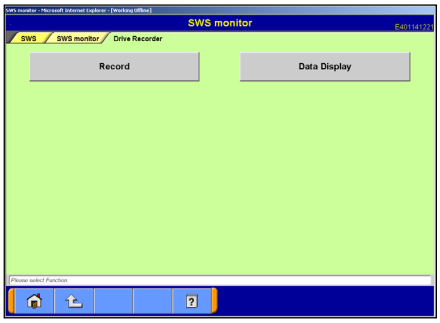
Note:

To disconnect the SWS monitor cartridge, press the ⏻ button. The following message appears: “Do you wish to disconnect the I/F cartridge? (If so, select YES, then wait for the ready message to appear.)” Once the ready message appears, disconnect the cartridge.



(8) Ending Recording

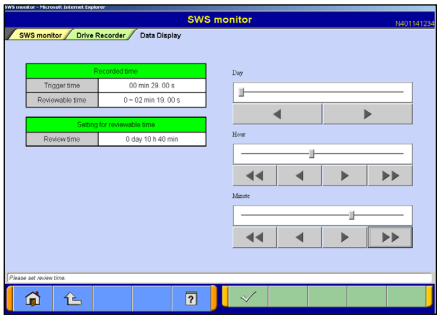
To end recording, press the Record End button.



(9) Data Display

Select **Data Display** button on the screen of (1).

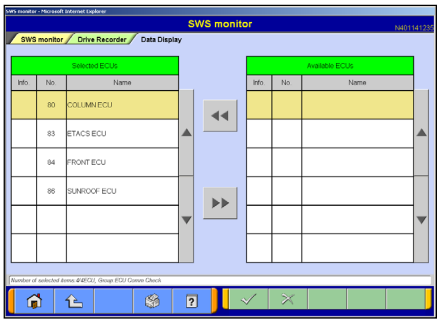
You can also display recorded data by returning to the Start menu screen, selecting **Special Functions**, then selecting the system function **SWS Drive Recorder**. In this case, you can view the data without connecting VCI to the vehicle by using an AC-DC adapter (MB991878).



(10) You can set a time in which you wish to regenerate and view the data as described below.

The day and hour can be set using ◀◀ ◀ ▶ ▶▶ buttons.

After the setting, press ✓ button.

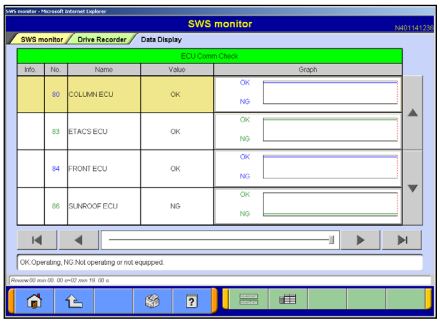


(11) Displaying Recorded Data

Select the items you wish to display and press ✓ button.

Note:

All items are selected as default.



(12) Displaying Data

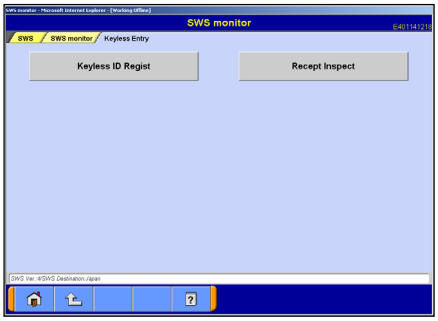
The recorded data are displayed in graph format by default.

-- View Text

--Displays the previous or next data change point.

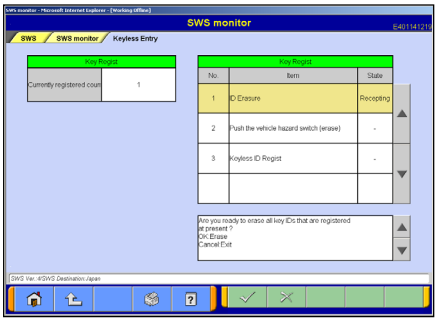
--Displays the previous or next record. You can also set the settings by operating the slide bar.

7-1-6. Keyless Entry Function

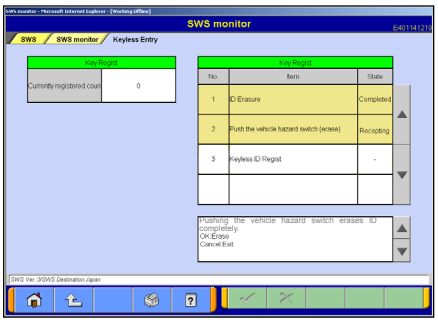


(1) When selecting **Keyless Entry** button in 7-1-1.(4), the screen illustrated on the left appears.

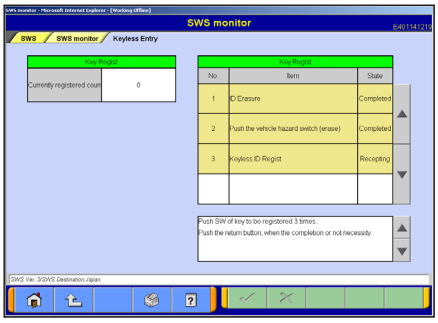
Keyless ID Regist --Delete and register ID to (2)
Recept Inspect --Check for signal detection. To (5)



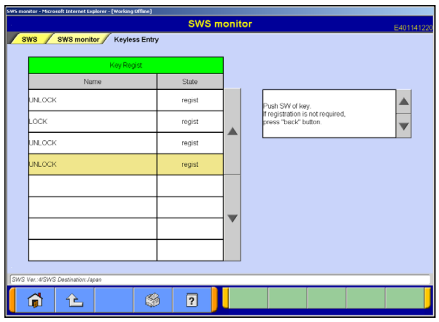
(2) Deleting Keyless ID
When pressing **Keyless ID Regist** button in (1), the screen illustrated on the left appears. In this screen, all of registered Key ID at present can be deleted.
-- Delete all Key ID
-- Cancel



(3) Pressing Hazard warning lamp switch of the vehicle deletes the ID completely.

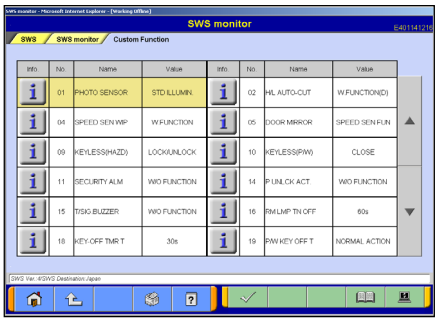


(4) Keyless ID Registration
Press Lock-switch or Unlock-switch of the key to be registered three times continuously.



(5) Checking for signal detection
Select **Recept Inspect** button in (1), and the screen illustrated on the left appears.
Press Lock-switch or Unlock-switch of the key to be checked. When ECU acknowledges the Lock or Unlock signal, it displays the signal name and state of the key for the vehicle.

7-1-7. Customize Function

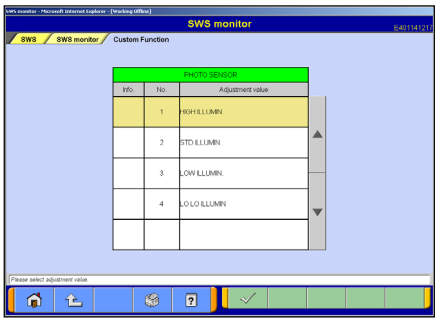


(1) Displaying Data

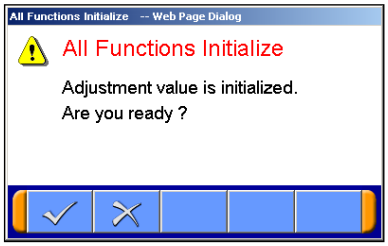
When pressing **Custom Function** button in 7-1-1.(4), a massage indicating that a short time is required to display the data appears.

When the data illustrated on the left displayed, select an item to customize and press the ✓ button.

-- Initialize all adjustment value to(3)



(2) Select adjustment value and press the ✓ button.



(3) Adjustment Value Initialization

When pressing button in (1), you can initialize adjustment value of all functions.

Then a confirmation massage appears, press ✓ button.

Chapter 8 Coding Function

8-1. VIN Writing Function

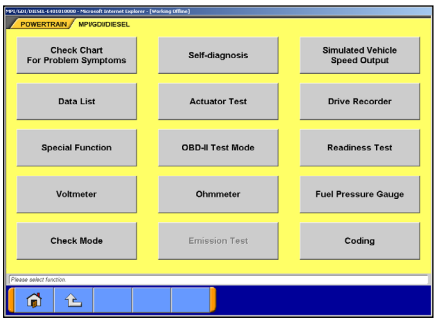
- This is the function for VIN writing to ECU, which is required by U.S. regulation. You need to set it for a new installed ECU when replace ECUs.
- In case VIN is not written and has no records in ECU, DTC (Diagnostic Trouble Code) will be recorded and MIL (Malfunction Indicator Lamp) will light up.

8-1-1. VIN Writing Function

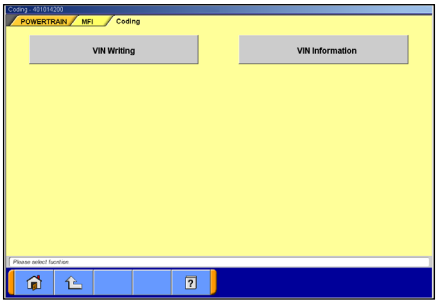
(1) Select **POWERTRAIN** tab on the upper part of the System Selection screen, and then select **MPI/GDI/DIESEL** or **MPI/DIESEL** button.

Note:

-If the engine is OBD, the check code appears.



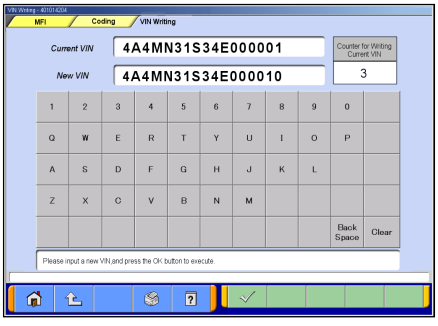
(2) Select **Coding** button on the Function selection screen.



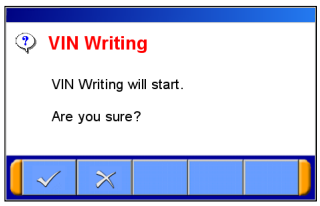
(3) The screen illustrated on the left appears. Select **VIN Writing** button.

Note:

VIN Information--to 8-1-2.

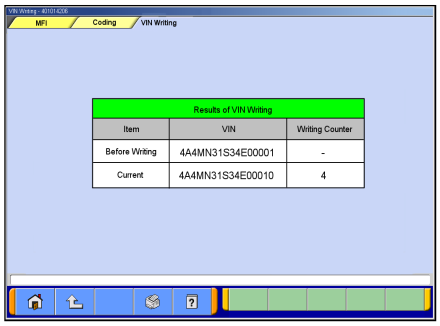


(4) Currently registered VIN is displayed on “Current VIN” box. Input a new VIN in the “NEW VIN” input box and then press button.



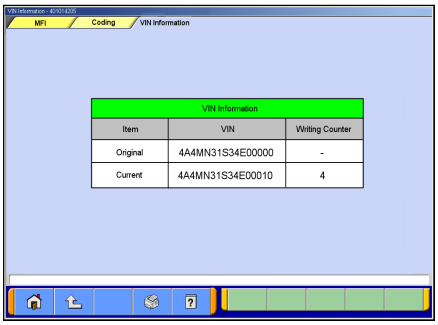
(5) A confirmation massage appears.
Press button to execute VIN writing.

When VIN writing completes, another massage appears.
Press button again.



(6) The Results of VIN Writing are displayed.
To exit this screen, press or button.

8-1-2. VIN information display



(1) Select **VIN Information** button on 8-1-1(3), and the screen illustrated on the left appears.

To exit this screen, press or button.

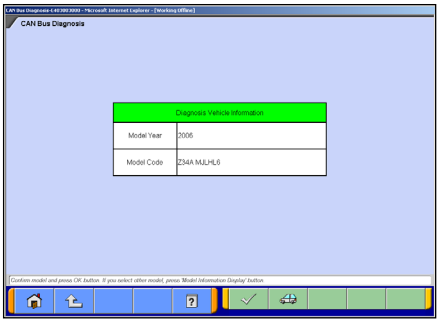
Chapter 9 CAN Bus Diagnosis

9-1. Diagnosing the CAN Bus

< CAUTION >

- When you execute CAN Bus diagnosis, use MUT-III main harness A.
- When you execute CAN Bus diagnosis, halt the vehicle.
- Calibrate ohmmeter to 0 point periodically for proper diagnosis. (refer to 11-2-2.)

9-1-1. CAN Bus Diagnosis

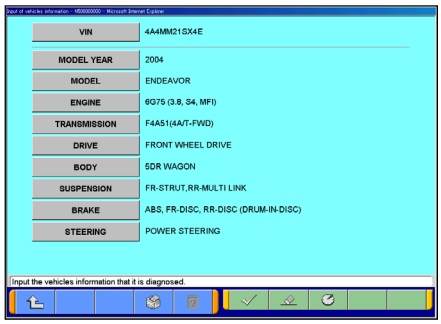


(1) Start Screen

Select **CAN Bus Diagnosis** button on the Start Menu screen (illustrated on 3-3-1(2)).

Verify that the registered vehicle displayed on the screen and the vehicle you wish to diagnose are the same. Press the ✓ button. --to (3)

If the vehicles are not the same, press the button and enter the correct vehicle information. --to (2)

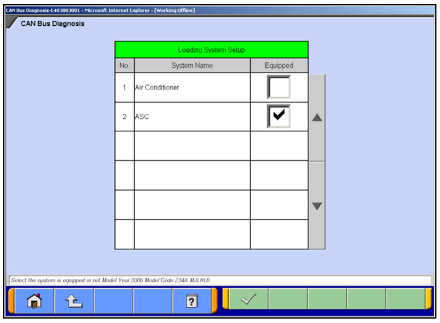


(2) Vehicle Selection Screen

Select the vehicle you wish to diagnose, and press the ✓ button to return to screen (1).

Note:

VIN number is compulsory for this diagnosis.



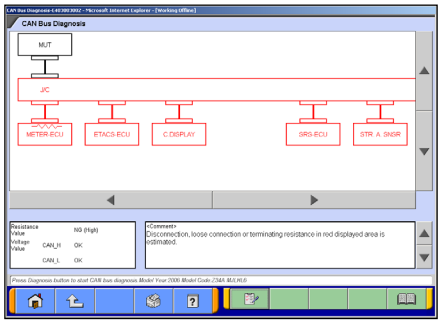
(3) Equipping System Setup

Put a check mark if the equipment is existence, and press the ✓ button.

Note:

✔ mark will be displayed, if you move cursor onto a check box and click it. (Selection)

✔ mark will be eliminated, if you click again. (Selection release)



(4) CAN Bus Diagnosis

Pressing the button starts the CAN bus diagnostic process. The results of the diagnosis are reflected on the configuration screen. (Error locations are indicated in red.)

--Displays the data of the Service manual pertaining to the error locations. (Not Available in US, Australia)

Chapter 10 ECU Reprogramming

Notes:

- This function enables the program installed in ECU to be reprogrammed using MUT-III.
- As VIN or other ECU setting information is not erased by this reprogramming, you do not need to rewrite VIN.

10-1. Process Flow Chart

■ **Reprogramming by <u>K-Line</u> communication system** (Models except for Colt in EU)

-There are 7 different ways for ECU reprogramming as shown below.
-Procedure (a) is recommendable due to the most simple in operation.
-File extension code is “ .rpg”.

Process flow chart (Chapter No.)

Device		**VCI alone**			PC + VCI (Optional)			
Procedure name		**(a) Auto data retrieval**	(b) Load RPG file	(c) ECU reprogram	(d) Automatic reprogramming (K-line)	(e) Database File Display	(f) Reprogram Data Selection	(g) Search
Data selection method		**Automatic**	Select from Data library	-	Automatic	Select from data library in PC	Select from data library in any drive	Select by key of vehicle info.
1	CD-Rom => PC	**10-3-1**	10-3-1	-	10-3-1	10-3-1	10-3-1	10-3-1
2	PC => CF memory card	**10-4-1**	10-4-1	-	-	-	-	-
3	CF memory card => VCI	**10-4-2 + 10-4-3(a)**	10-4-2 + 10-4-3(b)	-	-	-	-	-
4	PC => VCI (<u>Not via</u> memory card)	**-**	-	-	10-5-1 + 10-5-2(a)	10-5-1 + 10-5-2(b)	10-5-1 + 10-5-2(c)	10-5-1 + 10-5-2(d)
5	VCI => ECU	**10-4-4**	10-4-4	10-4-3(c)+ 10-4-4	10-5-3	10-5-3	10-5-3	10-5-3
Note		Recommended	In case of (a) failure	Special use only (When data stored in VCI)	In case memory card is N/A	In case memory card is N/A and (d) failure	In case memory card is N/A and (d) failure	In case memory card is N/A and (d) failure

■ **Reprogramming by <u>CAN</u> communication system** (Colt:Z30# model)

-This is the only way for reprogramming Colt:Z30#car.
-This procedure allows you to select an arbitrary system (ECU) to reprogram as required.
-File extension code is “ .cff”.

Device		**PC+VCI**
Process name		**Automatic Reprogramming (CAN)**
Data selection		**Automatic**
1	CD-Rom => PC	**10-3-1**
2	PC => VCI =>ECU	**10-6**

10-2. Equipments

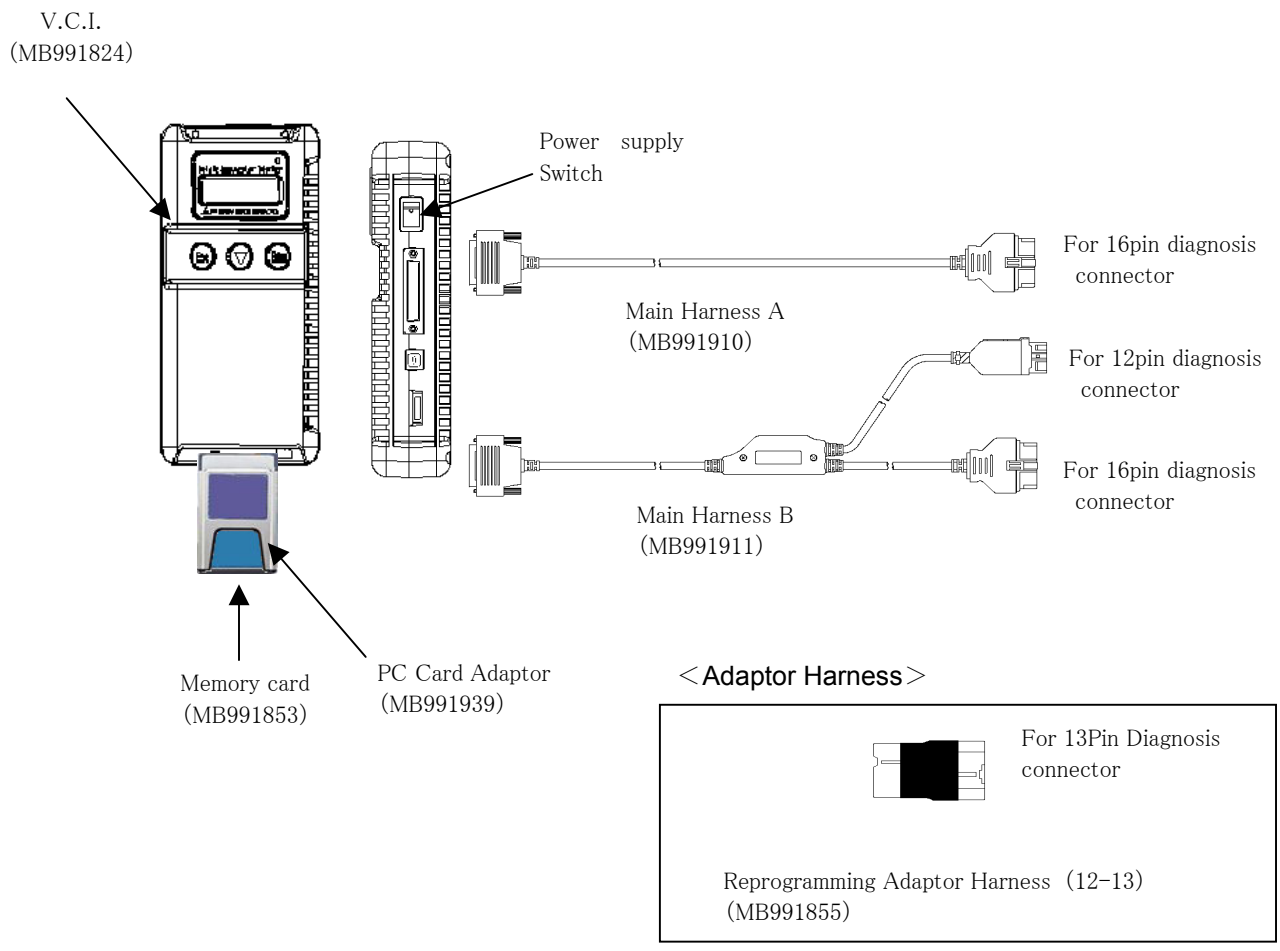
Necessary parts for ECU reprogramming are as follows

Parts Name	Parts Number	
MUT-III Personal Computer	-	
Update CD-ROM of reprogramming data	-	
CF Memory card (128MB)	MB991853	← Only when reprogramming with VCI alone
CF Memory Card Adaptor	MB991939	← Only when reprogramming with VCI alone
V.C.I.	MB991824	
MUT-Ⅲ Main Harness A (44-16) ＊1	MB991910	
MUT-Ⅲ Main Harness B (44-16/12)	MB991911	
Reprogramming adapter Harness (12-13) ＊2	MB991855	

Remarks

＊ 1: Vehicle which is only equipped with a 16 pin diagnosis connector.

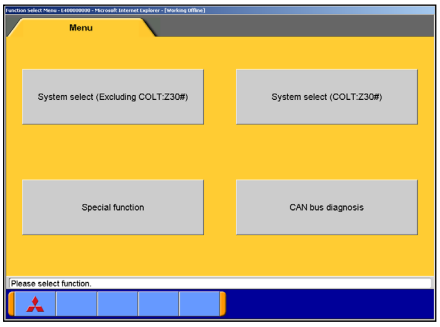
＊ 2: Vehicle which is equipped with 16 pin and 13 pin diagnosis connector.



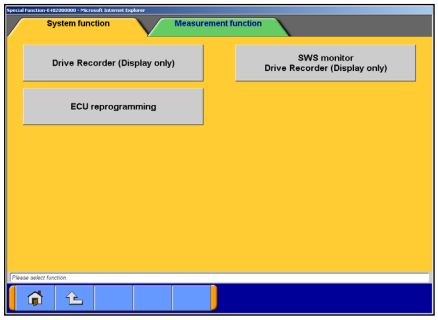
10-3. Data preparation on PC from Update CD-ROM

10-3-1. PC Update Operation (CD-ROM -> PC)

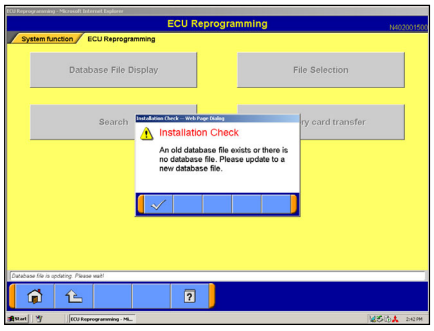
(1) When an Update CD-ROM of ECU reprogramming data is distributed newly, insert the CD-ROM into CD-drive on PC.



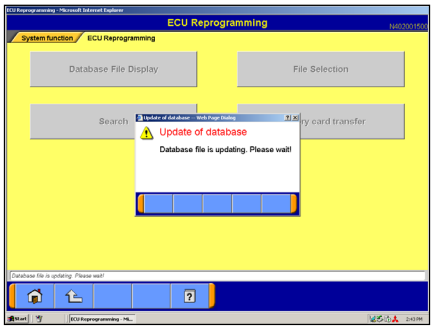
(2) Select **Special function** button on Start Menu screen.



(3) Select **System Function** tab, and **ECU reprogramming** button.



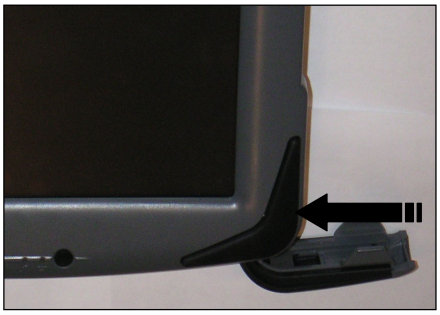
(4) The message “Please update to a new database file.” is displayed when the new Update CD-ROM is recognized. Press the button.



(5) The message “Please wait!” is displayed during progress. When complete the updating, the message disappears. You can remove the CD-ROM from PC.

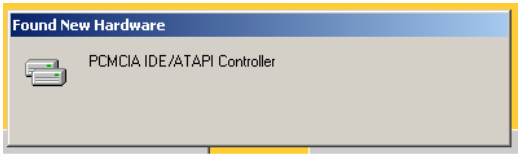
10-4. Reprogramming Operation (VCI alone)

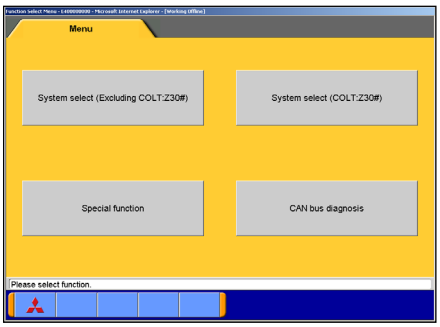
10-4-1. Data transfer (PC -> Memory Card)



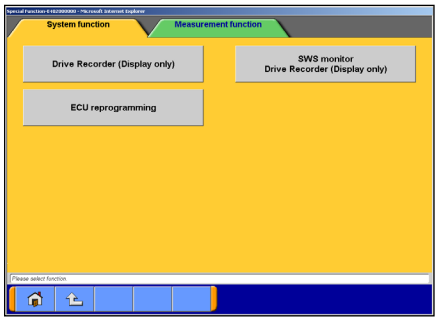
(1) Start up the MUT-III system.
Insert the Memory card (MB991853) into the Card Adaptor (MB991939), and then insert them into m-card slot on PC.

The message will be displayed on the monitor when the card inserted properly. Wait till the message disappears.



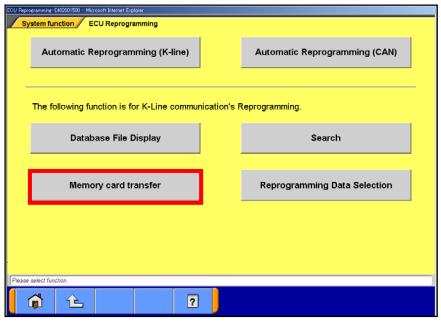


(2) Select **Special function** button on Start menu screen.



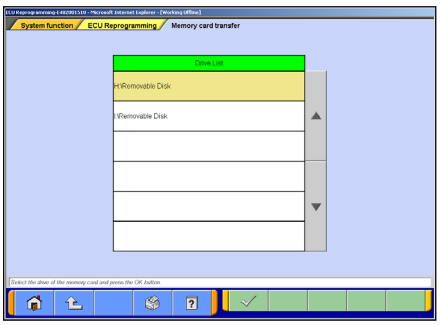
(3) Select **System Function** tab, and **ECU reprogramming** button.

Caution:
-In case an update CD-ROM is set in the PC with update undone, data update starts. (refer to 10-3-1(4))

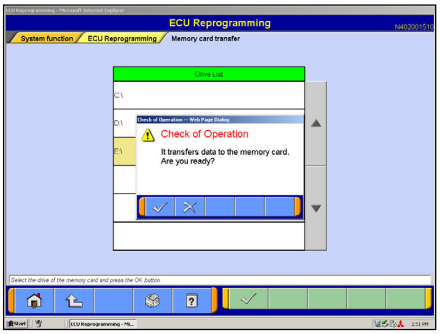


(4) Select **Memory card transfer** button.
ALL reprogramming data in the MUT-III PC are transferred to Memory card.

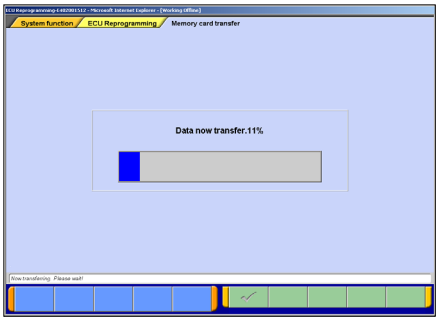
[Caution]
-Do not remove the Memory card from PC.



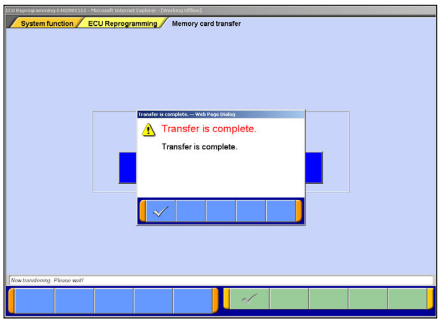
(5) Select a memory card drive and press the button.



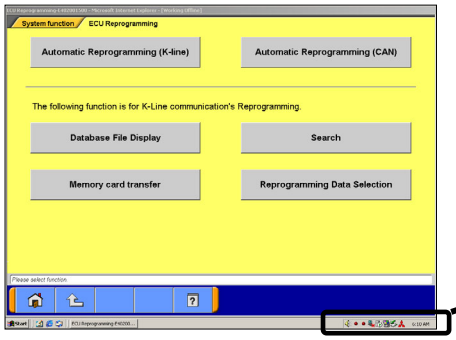
(6) Press ✓ button when the message “It transfers data to the memory card. Are you ready?” is displayed.



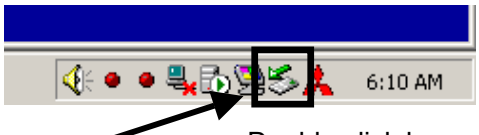
(7) Data transfer
The progress bar is displayed during the transfer.



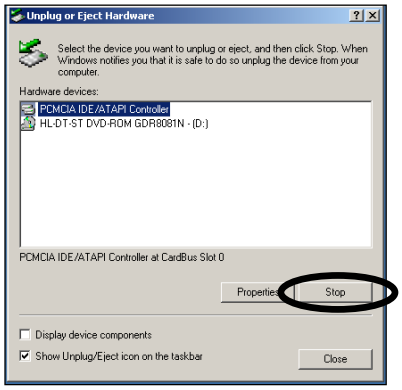
(8) The data transfer is completed.
Press ✓ button.



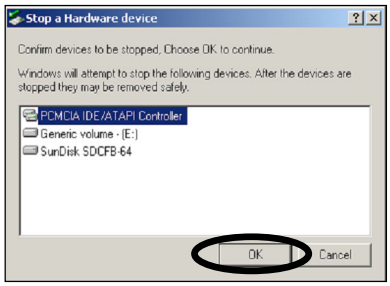
(9) Before you remove a memory card, double-click the below icon for removal of the adaptor.



Double click here



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



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

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

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

10-4-2. Equipment Set-Up

(1) Insert the Memory card (MB991853), which is storing the reprogramming data, into the Card adaptor (MB991939) and insert them into V.C.I. main unit (MB991824)

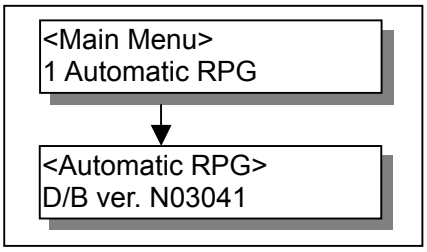
(2) Connect MUT-III Main Harness B (MB991911) or A (MB991910) to V.C.I. main unit securely. (Refer to 10-2.)

Note:
Select appropriate harness by instruction below.
- Main harness A: For vehicle only equipping 16 pin diagnosis connector.
- Main harness B: For other vehicles.
- Adaptor harness (12-13): Outlander, Montero (after ‘02MY)
(To connect Main harness B and 13pin diagnosis connector)

(3) After verifying the ignition switch position at LOCK (OFF), connect the MUT-III Main harness B or A to the diagnosis connector.

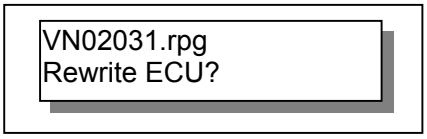
(4) Turn Ignition switch on, and turn V.C.I. main switch on.
(**Do not start engine**)

10-4-3(a). Data Auto Retrieval (Memory card -> VCI)



(1) Select “Automatic RPG” in main menu and press Enter key. Version No.of data base file appears.

By waiting 10sec or pressing Enter key, V.C.I starts communicating with ECU and retrieves reprogramming data file with the ECU’s parts No.and ROM-ID.

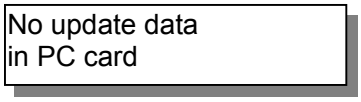


（2）The appropriate reprogramming data file No.is displayed. Pressing Enter key starts transferring the data file into V.C.I built-in-memory.

Remark:

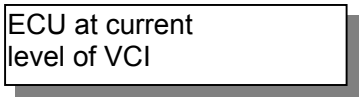
- To search another data, press Esc key. If another appropriate reprogramming data exist, it will be displayed.

- The message bellows are displayed depends on ECU parts No, ROM-ID and condition of ECU. Press Enter Key to move back to Main menu.



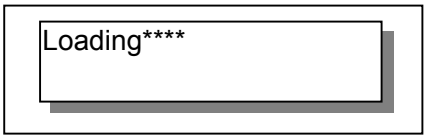
(a) “No update data in PC card”

This message appears if no pertinent reprogramming data exists. No data will be transferred.

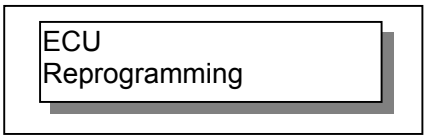


(b) “ECU at current level of VCI”

This message appears if the ECU has been already reprogrammed. No data will be transferred.

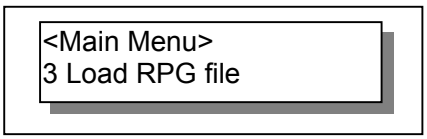


(3) Progress is displayed on the monitor.
* mark is increased by steps.

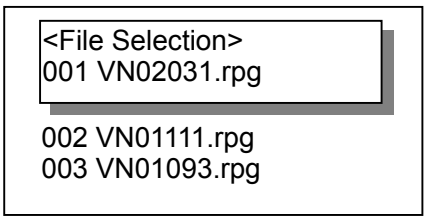


(4) After completing data transfer, ECU reprogramming starts sequentially.
For next steps, refer to 10-4-4.

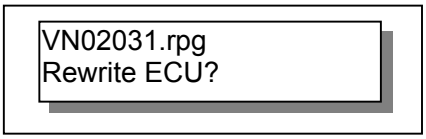
10-4-3(b). Select and Load Data (Memory card -> VCI)



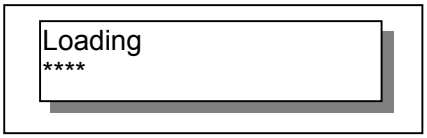
(1) Select “Load RPG file” in main menu by ▼ key, and press Enter key.



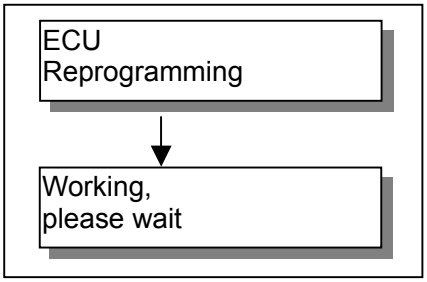
(2) Select a reprogramming data file by ▼ key, and press Enter key.
Esc key: Move back to main menu.
Remark:
-The data files are displayed in numeric order of data No.. (From big to small; new to old)



(3) Reconfirm the data file No., and press Enter key to start transferring the data into V.C.I. built-in-memory.
Esc Key: Cancel

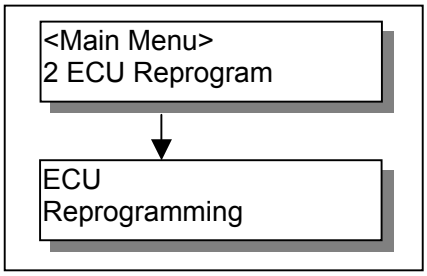


(4) Progress is displayed on monitor
* mark is increased by steps.



(5) After completing data transfer, ECU reprogramming starts sequentially.
For next steps, Refer to 10-4-4.

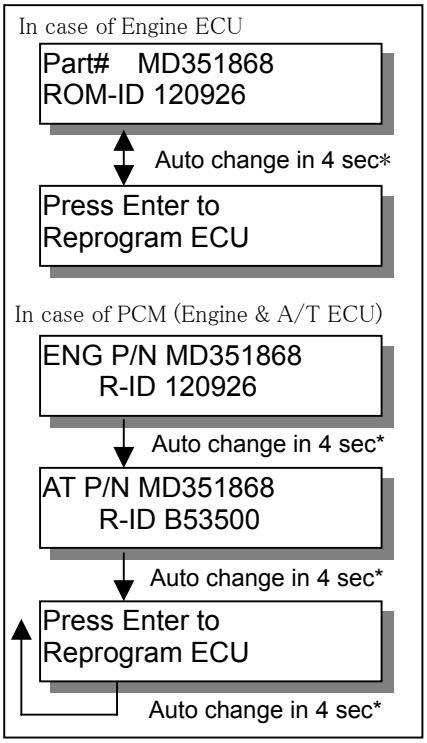
10-4-3(c). (Special case)



(1) If V.C.I. has already stored the reprogramming data, select “ECU Reprogram” in main menu, and press Enter key.
(Refer to 10-4-2.(2)-(4) for setting up the equipments.)

Reprogramming data file No.and program version No. in the V.C.I. memory are displayed for a few seconds, and then ECU reprogramming starts sequentially.

For next steps, refer to 10-4-4.



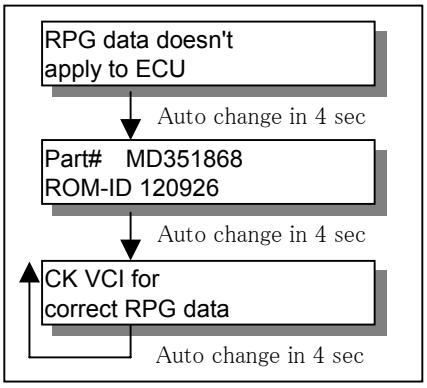
10-4-4. ECU reprogramming (VCI -> Vehicle ECU)

(1) ECU parts No.and ROM-ID No. are displayed.
Press Enter key to start reprogramming.
ESC / ▼ key : restart V.C.I.

* : By pressing ▼ key, immediately move to next.

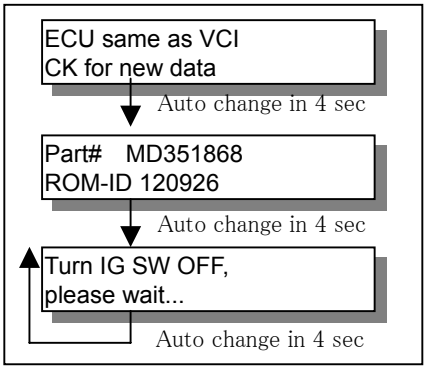
Note:
- Reprogramming must carry out on the condition of engine stop and IG switch on.
- Do not disconnect harness/ turn off the IG switch during ECU reprogramming.

[Messages before/during reprogramming process]

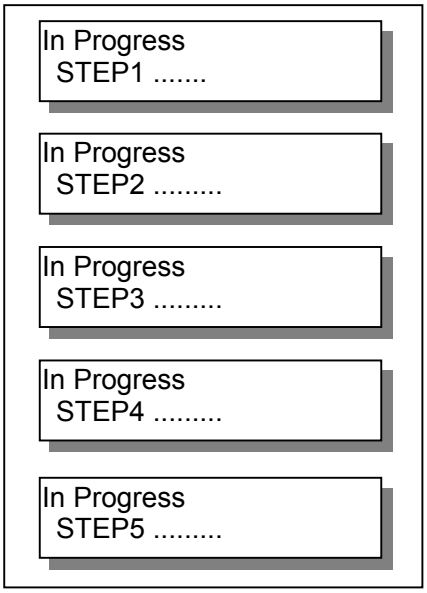


a) “RPG data doesn’t apply to ECU”
Reprogramming stopped owing to the data in V.C.I.memory being not appropriate for the ECU.

- Note down the displayed ECU parts No.and ROM-ID.
- Restart V.C.I. by pressing Enter key, and confirm the matching of the data file No, which is displayed by reboot, and the ECU part No./ ROM-ID for reprogramming.



b) “ECU same as VCI, CK for new data” (CK; check)
Reprogramming stopped because reprogramming has been already done.

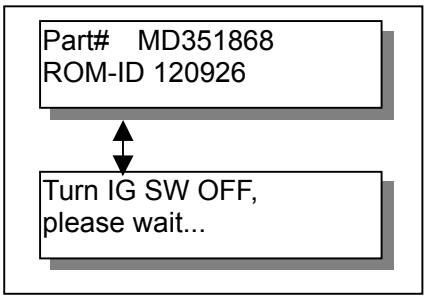


(2) 5 steps progress is displayed while reprogramming.

Caution:

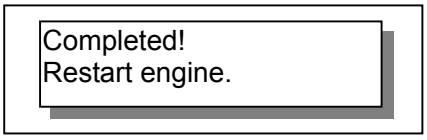
- Do not press any key during reprogramming automatically proceeding.
- Do not turn off V.C.I power or IG switch during reprogramming.

STEP1: Saving the data to the back up memory.
STEP2: Erasing data in ECU.
STEP3: Writing reprogramming data
STEP4: Verifying the data between ECU and V.C.I.
STEP5: Erasing diagnosis code and back up memory



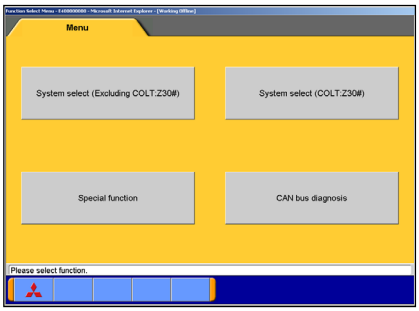
（3）On completion of the 5steps, new reprogrammed ECU parts No. and ROM-ID are displayed.
Turn IG switch LOCK（OFF）.

Note:
Diagnosis code might be memorized in ECU if without turning IG switch Lock (off)



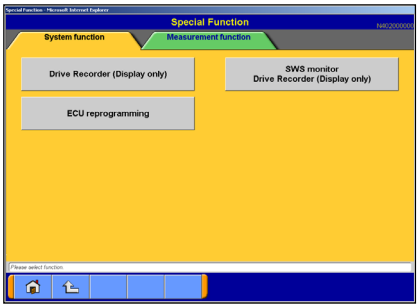
（4）ECU reprogramming completed
Verify the system properly operated by starting engine.
Enter key: V.C.I. restart

10-5. Reprogramming Operation (VCI - PC connected)

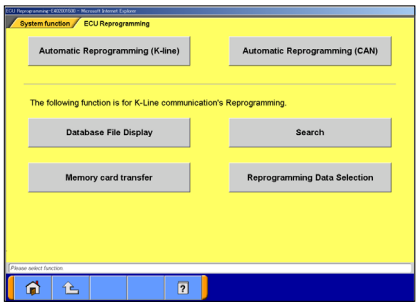


10-5-1. Search method Selection

(1) Select **Special function** button on Start Menu screen.



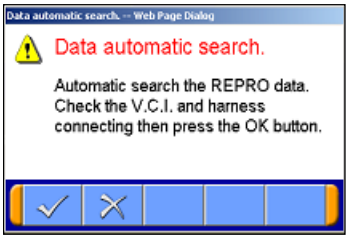
(2) Select **ECU Reprogramming** button.



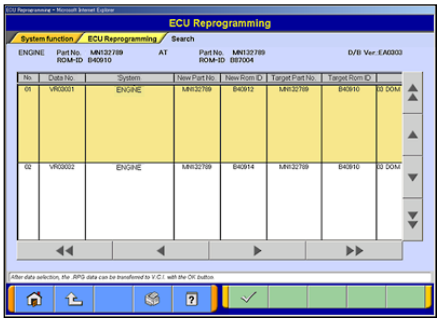
(3) Select an appropriate button.
Automatic Reprogramming (K-line) --to 10-5-2(a).
Database File Display --to 10-5-2(b).
Repro Data Selection --to 10-5-2(c).
Search --to 10-5-2(d)

•Connect PC and V.C.I., and prepare 10-4-2(2)-(4).

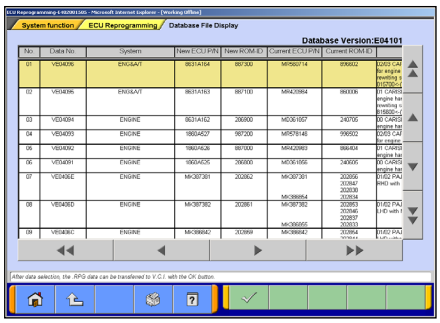
10-5-2(a). Automatic Data Search (PC -> VCI)



(1) Select **Automatic Reprogramming (K-line)** button from the function menu, then the left massage appears.
Check connection of V.C.I. and harness, and press ✓
Applicable reprogramming data is searched from database installed in PC automatically.



(2) Result of the search appears.
Select an appropriate data file with scrolling the list using ▲ ▲ ▼ ▼ ◀◀ ◀ ▶ ▶▶ buttons, and press ✓ to start transferring the data into V.C.I. memory.
-After completing the data transfer, ECU reprogramming will start sequentially. (Refer to 10-5-3.)
Note:
Press **OK** button when message window of device removal warning comes out at start and end of data transfer.



10-5-2(b). Database File display (PC -> VCI)

(1) Select **Database File Display** button from the function menu screen.

Reprogramming data files in the hard disk are listed.

Select an appropriate data file with scrolling the list using buttons, and press to start transferring the data into V.C.I memory.

--10 lines scrolling

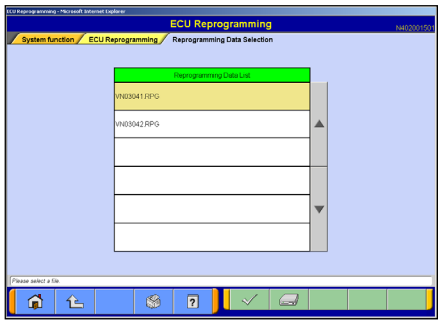
-After completing the data transfer, ECU reprogramming will start sequentially. (Refer to 10-5-3.)

Note:

Press **OK** button when message window of device removal warning comes out at start and end of data transfer

10-5-2(c). Reprogramming Data Selection (PC -> VCI)

This is the function to select the reprogramming data from arbitrary directories.



(1) Select **Reprogramming Data Selection** button from the function menu screen.

--to select arbitrary drive and directory -- (2)

On this screen, select an appropriate data file and press to start transferring the data into V.C.I memory.

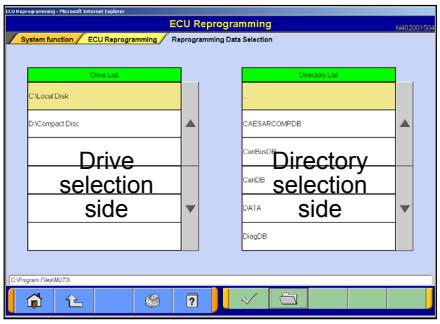
Note:

-The displayed data as default is in the folder shown below.

C:¥Program Files¥MUT3¥RPGDATA

This directory is the default reprogramming data pool of MUT-III, referred from 10-4-1, 10-5-2(a),(b),(d).

-After completing the data transfer, ECU reprogramming will start sequentially. (Refer to 10-5-3.)



(2) Data selection

Select a drive on the left chart, and the directories in the drive are displayed on the right chart.

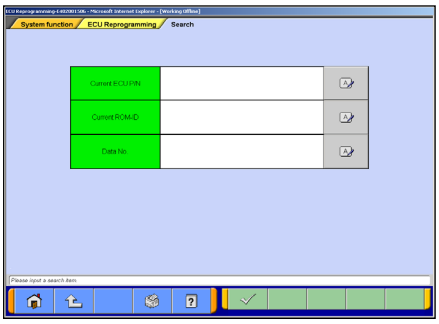
-To move to a lower directory, select appropriate row and press button on the right chart.

-To move to an upper directory, select row and press button on the right chart.

Select appropriate directory name row on the right chart, and press button to return to (1) and list the files contained in the directory.

10-5-2(d). Search (PC -> VCI)

To search the reprogramming data by vehicle info, e.g. ECU Part No., Rom-ID, etc



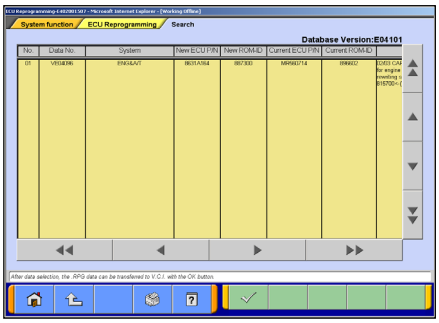
(1) Input search item

Select **Search** button from the function menu screen.

Input search key info in the appropriate row, and press button.

Note:

1) To input, 2 ways can be taken.
   By PC keyboard
   By virtual keyboard --press
2) Some info need to be a combination with the other info for data search
   - ECU P/N & ROM-ID need to be together.
   - Data No. needs no other info.



(2) Results

Select appropriate data with scrolling the list using buttons and press to start transferring the data into V.C.I memory.

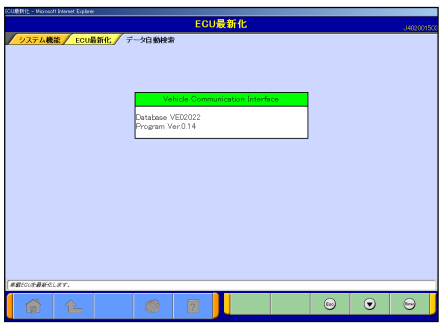
--10 lines scrolling

-After completing the data transfer, ECU reprogramming will start sequentially. (Refer to 10-5-3.)

Note:

Press **OK** button when message window of device removal warning comes out at start and end of data transfer.

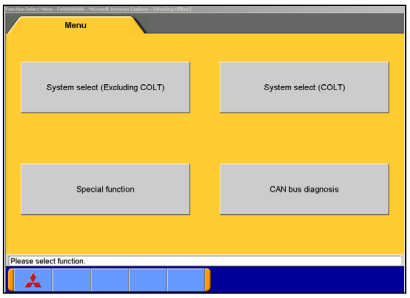
10-5-3. Reprogramming ECU (VCI ->vehicle ECU)



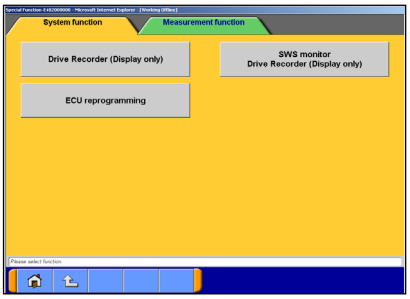
(1) Operate Esc Enter button on screen according to directions of screen display.

Same operation of chapter 10-4-4. need to be taken on PC screen.

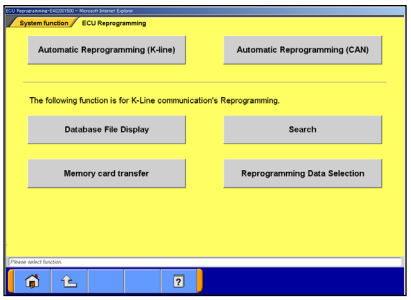
10-6. Reprogramming by CAN communication (for Colt:Z30#)



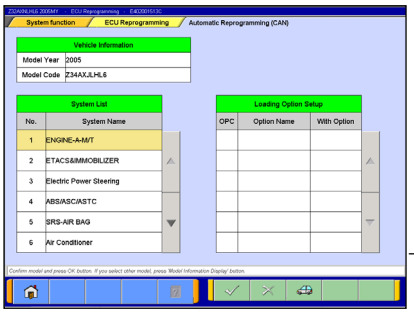
(1) Select **Special Function** button on Start Menu Screen.



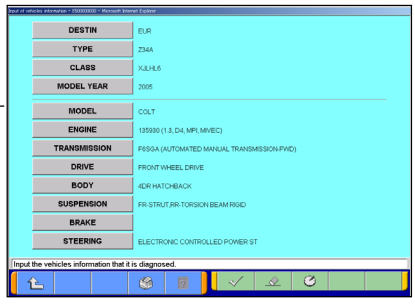
(2) Select **ECU reprogramming** button.

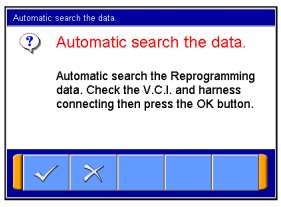


(3) Select **Automatic Reprogramming (CAN)** button.
Note:
Other 5 buttons are for K-line system and not for CAN system.

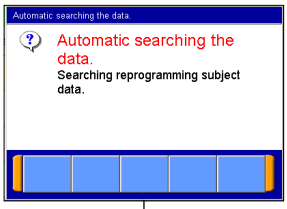


(4) Vehicle choice
-Selected Model year and Model Code of the vehicle are indicated.
-Select a system (ECU) and loading option, and press ✓ button.
-If you select other Model year and Model code, press 🚗 button and select model.





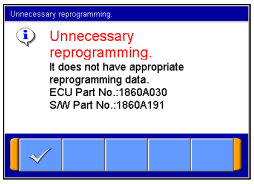
(5) Check
Check all equipment properly then press ✓ button.



(6) Data search

Searching the target reprogramming data.

Unnecessary reprogramming



< Unnecessary reprogramming >

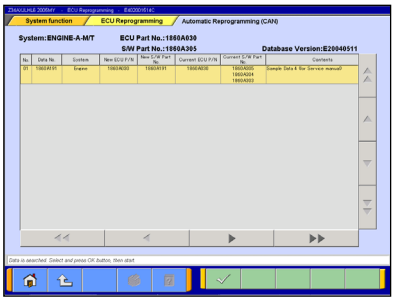
- Appropriate reprogramming data is not released.
- Onboard ECU Part No. and S/W Part No. are indicated.

Complete reprogramming

< Complete reprogramming >

- Onboard ECU has reprogrammed.
- Onboard ECU Part No. and S/W Part No. are indicated.

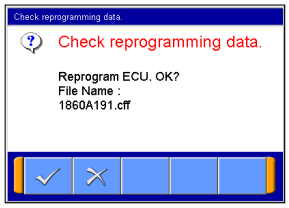
Target data found



(7) Data check

-The appropriate reprogramming data is indicated.

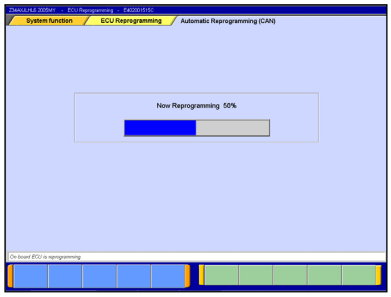
-Press ✓ button to go to next.



(8) Reprogramming data check

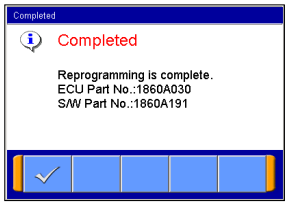
-Check and press ✓ button.

-If you select other repro. data, press ✕ button to back.



(9) Reprogramming

Reprogramming on board ECU starts.



(10) Reprogramming completed

-Reprogramming is completed properly.

-Reprogrammed ECU Part No. and S/W Part No. are indicated.

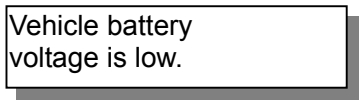
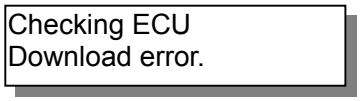
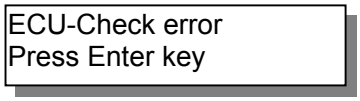
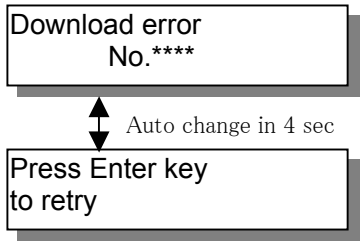
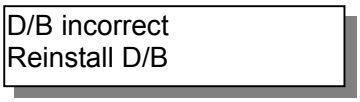
(11) DTC erase

After reprogramming completed, erase Time out DTC in ETACS as shown below.

1. Turn IG switch OFF
2. Wait 10 sec
3. Turn IG switch ON
4. Erase all DTC of ETACS

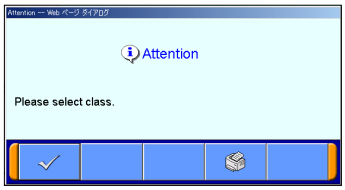
10-7. Troubleshooting of Reprogramming

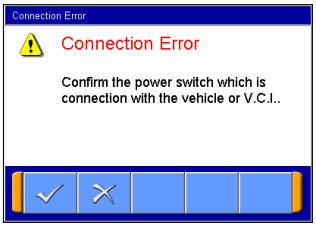
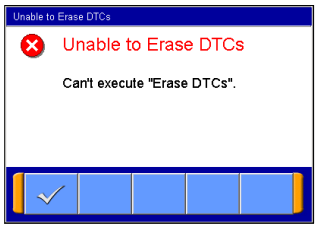
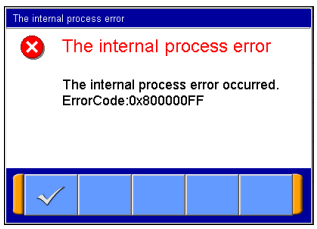
10-7-1.Trouble of Reprogramming on K-Line communication

No.	Message	Cause/Remedy
1	During ECU reprogramming 	<Cause> • Due to low battery supplied to V.C.I.. (The voltage of battery falls down 9.7V and below for 5 seconds.) • The V.C.I. has connected to PC without connection to vehicle during retry of reprogramming. <Remedy> 1. Verify the connection between V.C.I. and vehicle, and check the battery carried in the vehicle. Recharge or replace it as needed. 2. Press the V.C.I. “Enter” key to reboot the V.C.I.
2	During ECU reprogramming 	<Cause> Failed to communicate with ECU during ECU- checking. <Remedy> 1. Turn off the IG switch. 2. Press the V.C.I. “Enter” key and reboot the V.C.I. to restart the procedure.
3	During ECU reprogramming. 	<Cause> Disagreement of the data in ECU and it in memory card. <Remedy> 1. Press the V.C.I. “Enter” key The reprogramming will be continued using data in memory card.
4	During ECU reprogramming 	<Cause> • Disconnect during reprogramming • IG OFF during reprogramming • Communication error • Voltage of battery fall down <Remedy> 1. Verify the connection of harness, and condition of battery carried in the vehicle. 2. Press the V.C.I. “Enter” key and reboot the V.C.I. to retry. (Retry the procedure until the reprogramming completed properly on the error occurred vehicle.) [Error code list] 001A/B : Communication error A/B 002A/B : ECU data erasing error A/B 003A/B : Data writing error A/B 004A/B : Data reading error A/B 004C : Data verifying error 005A : Diagnosis erasing error
5	After select [Automatic RPG] from V.C.I. Main menu. 	<Cause> Reprogramming data base file (MUT-3REP.csv) in the memory card is incorrect. <Remedy> 1. Press the V.C.I. “Enter” key and back to Main menu. 2. Turn off the V.C.I. and eject the memory card from V.C.I.. 3. Insert the memory card into MUTⅢ (PC), and transfer the data to the card. Then retry the procedure.

No.	Message	Cause/Remedy
6	During Automatic RPG with V.C.I.alone. No response from vehicle ECU	<Cause> • There is no ECU for requiring reprogramming • IG switch not positioned “ON”. • Main Harness not connected. <Remedy> 1. Turn off the V.C.I. power. 2. Verify the connection of harness, and condition of harness itself. 3. Verify if the ECU for required reprogramming is installed. 4. Verify if the ECU can communicate with V.C.I. 5. Then redo the procedures.
7	During Automatic RPG with V.C.I.alone. CK VNxxxxx.rpg In PC card	<Cause> There is no reprogramming data in memory card although ECU is affected for reprogram. <Remedy> 1. Press the V.C.I. “Enter” key and back to Main menu. 2. Turn off the V.C.I. and eject the memory card from V.C.I.. 3. Insert the memory card into MUT-III (PC), and transfer the data to the card. Then retry the procedure.
8	During automatic RPG or Load RPG with V.C.I.alone. Load error	<Cause> Failure of data transfer from memory card to V.C.I.. <Remedy> 1. Press the V.C.I. “Enter” key and back to Main menu. 2. Retry Automatic RPG or Load RPG again.

10-7-2. Trouble of Reprogramming on CAN communication

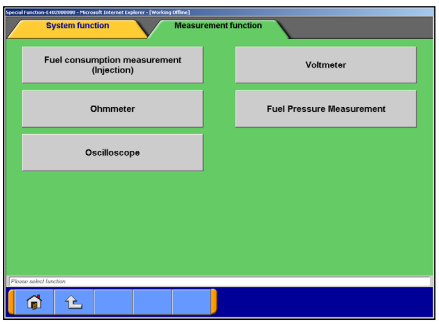
No.	Message	Cause/Remedy
1		< Cause > ・No reprogramming data exists for selected vehicle. < Remedy > ・Select vehicle type again.
2		< Cause > ・Model specifying information (Model Year, Type, Class) is insufficient. < Remedy > Select vehicle type again.
3		< Cause > ・No CBF file exists in PC. < Remedy > ・Reinstall MUT-III.

No.	Message	Cause/Remedy
4		< Cause > ・Connection between V.C.I. and vehicle malfunctioned. ・The power switch of V.C.I. is OFF. < Remedy > ・Confirm connection between V.C.I. and vehicle. ・Confirm the power switch of V.C.I.
5		< Cause > ・No reprogramming data (CFF file) exists in PC. < Remedy > ・Reinstall reprogramming data (CFF file).
6		< Cause > ・While reprogramming, an error occurred. < Remedy > ・Restart reprogramming process from beginning.
7		< Cause > ・Diagnosis cord couldn't be erased. < Remedy > ・Erase the DTC by diagnosis function of MUT-III.
8		< Cause > ・An error occurred in accessing database to search reprogramming data. < Remedy > ・Reinstall MUT-III.
9		< Cause > ・The internal process error occurred on database to search the reprogramming data. < Remedy > ・Reinstall MUT-III.

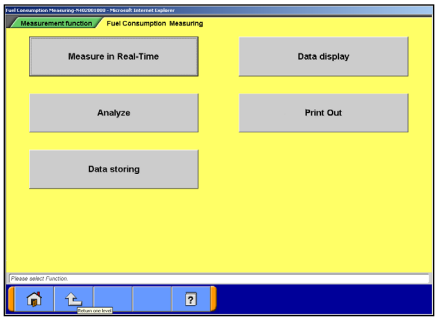
Chapter 11 Measurement Functions

11-1. Injector-Type Fuel Consumption Measurement

11-1-1. Function Select

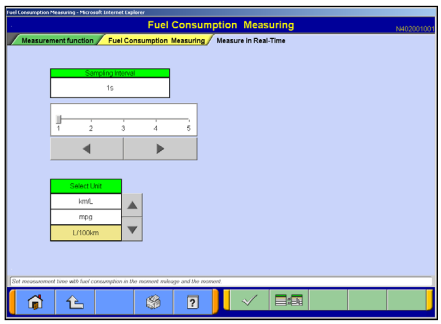


(1) Select **Special function** button on the Start Menu screen (illustrated on 3-3-1(2)), then select **Measurement Functions** tab on the upper part of the screen.
Select **Fuel consumption measurement (Injection)** button on this menu screen.



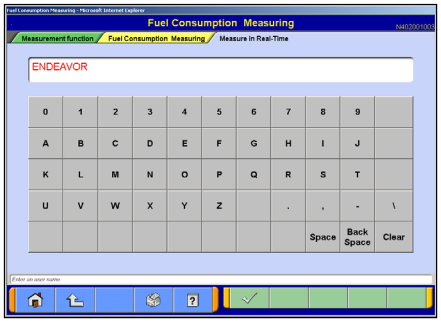
(2) Function Selection
Measurements in Real-time -- to 11-1-2.
Data Display -- to 11-1-3.
Analyze -- to 11-1-4.
Print out -- To print out the view graph.
Data storing -- To load the data, which is stored in a removal disc, onto the PC.

11-1-2. Measurement in Real-time

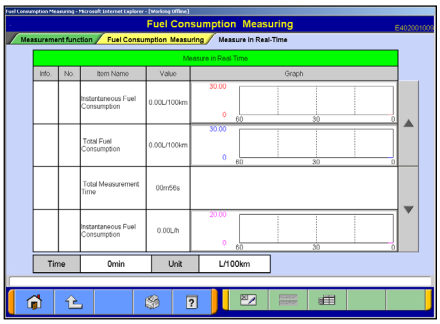


(1) Preparations Prior to Measurement
Set the sampling interval, and select the displayed unit of measurement by pressing the ▲ ▼ buttons.
If you wish to select display items, press the button.
When the setting complete, press the ✓ button.

Note:
The amount of recording time is proportional determined by the length of the sampling interval.



(2) Entering and Recording Record Information
Enter your user name and the vehicle model type.
The ✓ button starts the measurement process.



(3) View Graph

The data of 4 items/4 graphs are displayed.

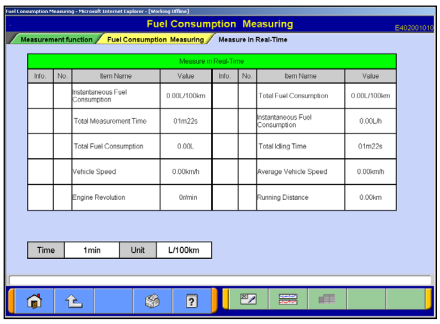
-Pressing the Record End button stops recording.

-Once recording has been stopped, the data is automatically saved.

--View Text To (4).

Note:

The file name is set as “FU+Year Month Day+Time (military time including seconds)”.

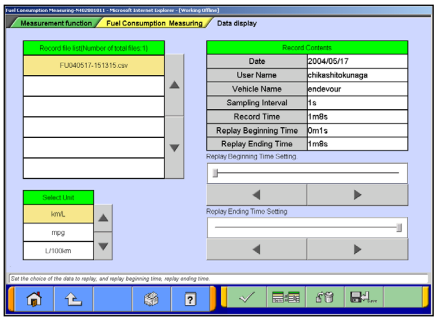


(4) View Text

--View Graph To (3)

Record End --Stop Record

11-1-3. Data Display



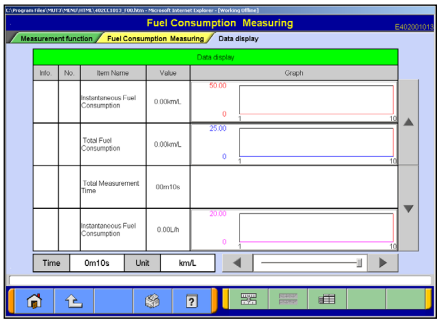
(1) Select a record file containing the data you wish to check. Set the necessary speed range with ◀ ▶, and select unit of measurement with ▲ ▼.

Then press the ✓ button.

--Delete Data

--Select item

--Save Data



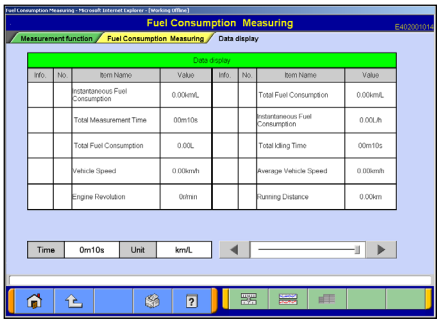
(2) View Graph

The data of 4 items/4 graphs are displayed.

Pressing the ◀ ▶ buttons or moving the slide bar displays the value of the cursor line.

--View Text To (1)

--Change displayed Unit

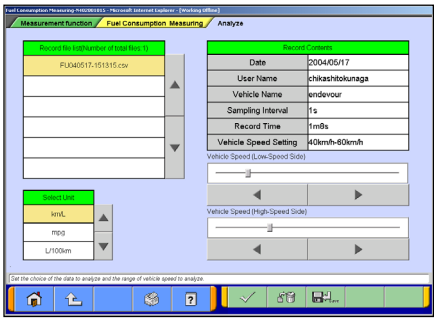


(3) View Text

--View Graph To (2)

--Change displayed Unit

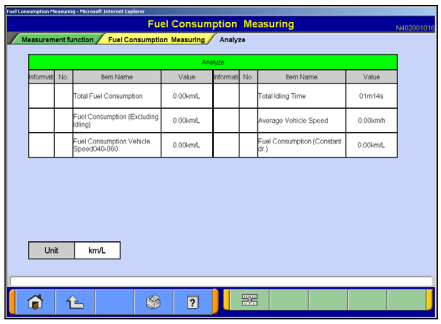
11-1-4. Performing Simplified Analysis



(1) Select a record file containing the data you wish to analyze. Set the necessary speed range and displayed unit of measurement, and then press the button.

--Delete Data

--Save Data



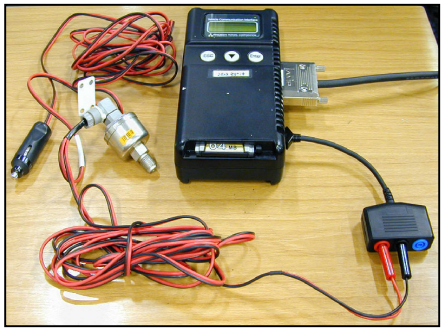
（2）Viewing Analysis Results

---Change displayed Unit

11-2. Fuel pressure, Voltage, Ohmmeter, Oscilloscope

11-2-1. Measuring Fuel Pressure (Not available in US)

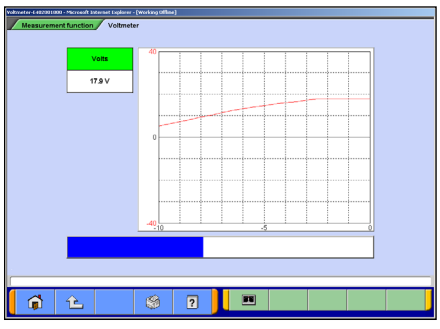
The fuel pressure can be measured using pressure gauge (LP: MB991655 or MB991979 / HP: MB991708 or MB992007), and displayed as text or graph style on PC.

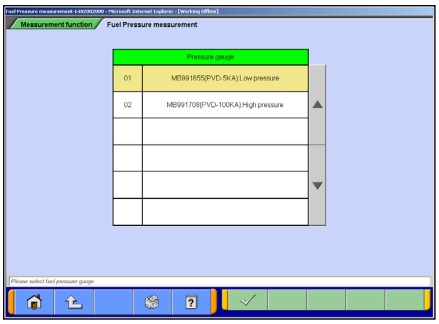


(1) Measuring the Calibration Volt

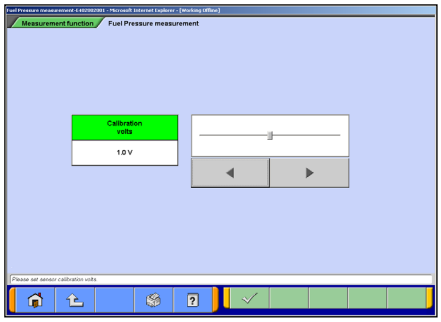
To adjust manufacturing difference of solid state in each pressure gauge, you need to input its calibration value. Please measure the calibration value as follows.

- Connect the pressure gauge to cigarette lighter socket, and to V.C.I. (Don't put the pressure gauge on the fuel pipeline yet.)
- Select **Voltmeter** on the menu screen of 11-1-1(1).
- The displayed voltage is the calibration value of the gauge.

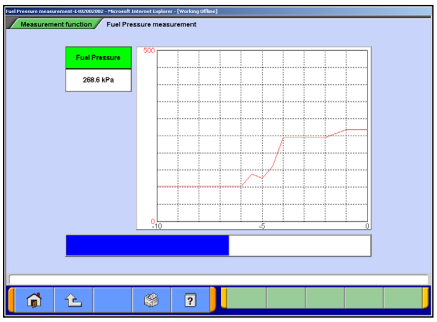




(2) Put the pressure gauge on the fuel pipeline.
Select **Fuel Pressure Measurement** on the menu screen of 11-1-1(1).
The selection screen of pressure gauge appears. Select a pressure gauge and press the ✓ button.

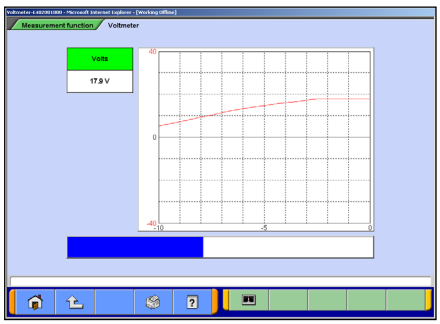


(3) Entering the Calibration value
Enter the calibration volt which you measured in (1), and press the ✓ button.



(4) Measuring Fuel Pressure
The measured value is displayed on the graph.

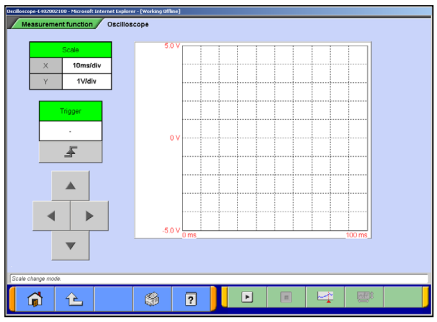
11-2-2. Measuring Voltage and Resistance



(1) Select **Voltmeter** or **Ohmmeter** on the menu screen of 11-1-1(1).
The voltage or resistance value comes from the test leads connected to the trigger terminal and displayed on the PC screen.
-For details on how to connect the measurement probe, and details for measuring using VCI alone, refer to 2-2-3.
-Prior to executing the measurement process, calibrate the instrument to 0 using the button.

Note:
-DC voltage can be measured in the range of 0-±40V.
-Resistance can be measured in the range of 0-100KΩ.

11-2-3. Oscilloscope Function

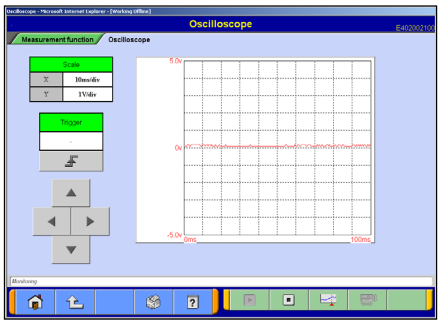


(1) Select **Oscilloscope** on the menu screen of 11-1-1(1).

This function allows you to observe the continuous waveform, loaded from the voltage measurement terminal, on PC screen using test leads (MB991499, etc).

--Starts the waveform display
--Stops the waveform display
--Switches to Scale mode
: to set the time axis and voltage axis --(2)
--Switches to Trigger mode
: to set trigger conditions --(3)

Note:
DC voltage can be measured in the range of 0-±40V, and resolution can be measured at 0.1V.
The shortest sampling interval is 500μs.

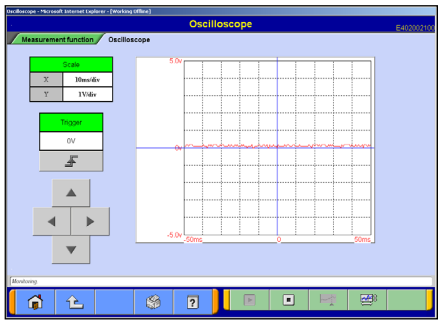


(2) Setting the Time Axis and Voltage Axis

The button switches to the scale mode, and the buttons can be used to set time axis and voltage axis.

--Changes time axis scale
--Changes voltage axis scale

Note:
Time scale: (10,20,40,100ms/div)
Voltage scale: (1,2,5,8V/div)



(3) Setting Trigger Conditions

The button switches to the trigger mode, and a trigger point can be changed by the buttons.

--Up Trigger
--Down Trigger

Chapter 12 Troubleshooting Procedures

12-1. Individual Troubleshooting Procedures

This chapter describes troubleshooting guidelines for the causes of main error messages as well as error symptoms.

Note:

- The messages described herein sometimes appear simultaneously with other screens.
- For details regarding circuit inspection, see the electrical wiring diagrams of the applicable vehicle.
- Communications lines are determined by the system and communication method.
- For details regarding the diagnosis connector terminal configuration, see the electrical wiring diagrams of the applicable vehicle.

No.	Message/Symptom	Cause	Remedy
1	The V.C.I. does not power up when connected correctly to the vehicle. Be sure the IG switch is ON.	Vehicle power supply failure due to: • V.C.I. switch turned OFF • Low battery • Vehicle harness not connected or a short exists • Hardware error	1. Verify that the V.C.I. switch is ON. 2. Verify the vehicle battery is sufficiently charged (12V). 3. Disconnect and reconnect the connector. 4. Check if there is a short in the harness. (Try using a different harness.) 5. If the problem is not resolved by remedies 1-4, there may be a hardware error. Request inspection with the harness.
2	The V.C.I. does not power up from the PC connection with the USB cable. V.C.I. is not connected to vehicle at this time.	PC power supply failure due to: • PC power not activated • USB cable not connected or a short exists • Hardware error (PC or V.C.I.)	1. Verify that PC is ON. 2. Verify that appropriate USB cable is firmly connected between the PC and V.C.I. (Do not use a USB hub.) 3. Disconnect and reconnect the connector. 4. Check if there is a short in the cable. (Try using a different harness.) 5. If the problem is not resolved by remedies 1-4, there may be a hardware error. Request inspection with the PC.
3	The screen “Maintenance Mode” appears as soon as the V.C.I. is powered up.	V.C.I. was powered on with pressing “Esc”key.	1. Turn the V.C.I. OFF. 2. Disconnect USB cable and connector. 3. Turn the V.C.I. power ON. (Do not touch “Esc” key.) 4. If the “Main Menu” or “PC Communication” display does not appear, the V.C.I.may be at fault. Request inspection.
4	The screen “ECU Reprogramming” appears as soon as the V.C.I. power is activated.	The V.C.I. basic application has not been installed.	1. Connect the unit to the PC (for power activation) while pressing the V.C.I. “Esc” key. 2. Verify that the V.C.I. screen display indicates “Maintenance Mode,” start the PC MUT-III diagnostic application and attempt diagnosis. 3. Verify that the application has been downloaded using the V.C.I. automatic version upgrade feature. 4. If, once the application has been downloaded and the V.C.I. power has been reactivated, the “Main Menu” or “PC Communication” display does not appear, request inspection.

No.	Message/Symptom	Cause	Remedy
5	The screen “Drive Recorder [1] Record error ” appears during recording the Drive recorder with V.C.I. alone.	Communication error	1. Press the V.C.I. “Enter” key. 2. Verify that the V.C.I. screen display indicates “Drive Recorder Continue? “, press the “Enter” key or wait 10seconds to start recording again.

Chapter 13 Maintenance and Support

13-1. Maintenance

13-2. Support

PENDING

Chapter 14 Reference Material

14-1. V.C.I. Electrical Properties

<Power Supply Properties>

Rated voltage	DC12V, 24V
Ground polarity	(-)
Power supply (guaranteed operation range)	DC 8.0 - 32.0 V
Power supply reverse current	DC - 40 V (1 minute period)
Unit current consumption (maximum)	1A

(When voltage is within the guaranteed operation range)

◆ Excludes conditions when the voltage is not within the guaranteed operation range and special conditions such as when a ground short occurs on an updated control terminal, etc.

The amount of current consumption when the unit is used with rated power supply is 420mA or less.

Appendix

<< Terminology >>

In alphabetical order

A

AMT: Abbreviation for Automated Manual Transmission Electronic Controlled Unit.

ASC: Abbreviation for Active Stability Control System.

C

CAN: Abbreviation for Controller Area Network. A system that shares data between ECUs through communication. The processing of each command (signal) is possible using a communication line only.

D

Data transmission: The transmission of data stored from one memory area to another memory area. In the case of MUT-III, this refers to the transmission of data from the V.C.I. memory area to the PC.

Default: Initial setting. A predetermined value that is set when an item that should be defined is not defined.

Diagnosis: Refers to the self-diagnosis function. A system in which the ECU installed in the vehicle monitors input signals from the various sensors and switches and, when an error occurs or erroneous information is identified, records the data in memory.

E

ECU: Abbreviation for Electronic Control Unit. The control unit of the electronic control system.

EPS: Abbreviation for Electric Power Steering

I

I/F cartridge: A cartridge used when the ECU communication method employed is a special method or when MUT-III functions have been expanded and support is not possible by the MUT-III unit alone. The various I/F cartridges, such as the cartridge for the SWS monitor set in MUT-II or the cartridge for DCC communication, can be used as is.

M

Memory card: A medium used to store data. Records data such as those used for ECU updates. With MUT-III, flash memory is employed which allows the user to electrically change the data as well as maintain the information even if the power is turned off. Batteries are not required.

O

Online help: Also referred to as the online manual. An operation manual loaded on MUT-III, which gives easy-to-understand explanations on how to use the various functions. It also provides processing methods related to the operation currently performed when the user is unsure how to perform an operation during application use.

R

RAM: Abbreviation for Random Access Memory. A memory device that is capable of both read and write operations. The information stored in this device is lost when the power is turned off.

ROM: Abbreviation for Read Only Memory. A memory device that is capable of read operations only. The information stored in this device is maintained even when the power is turned off.

S

Serial communication: A method in which the bits that make up digital data are transmitted in series one bit at a time on the communication line. The reading of diagnostic code via communication from the ECU using the MUT is referred to as “Pattern Diagnosis.”

Slide bar: A method in which a value is entered by moving a bar.

SWS: Abbreviation for Smart Wiring System. A system that centrally controls multiple electrical signals on one harness, thereby minimizing the number of harnesses used. The SWS lead to the development of the multiplex transmission system, making harness weight reduction and the development of multifunctional electrical components possible.

V

V.C.I.: Abbreviation for Vehicle Communication Interface. The communication interface used to connect the ECU mounted in the vehicle with a PC.

<< Screen Button Explanations >>

The name and function of each button icon are described below.

Button Image	Button Name	Button Function
	Main menu	Returns the screen to the main menu.
	Return one level	Returns the screen to the upper layer screen.
	Cancel	Cancels the operation or closes the screen.
	Help	Displays online help.
	OK or YES	Determines an outcome.
	Print screen	Print the screen image.
	Home	Returns the screen to the start screen.
	Information	Displays information.
	View graph1	Displays four items on four graphs.
	View graph2	Displays(overwrites)four items on one graph.
	View text	Displays text.
	Change time scale	Canges the graph display time scale.
	Change data scale	Canges the graph display data scale.
	Select item	*Select an item *Sets the CAN monitor ID.
	Zero point calibration	Corrects the measurement function.
	Data extraction settings	Opens the extraction condition (data) screen.
	Alphanumeric input screen	Opens the alphnumeric input screen.
	Previous page	Displays the previous page.
	Next page	Displays the next page.
	Delete file	Deletes files.
	View V.C.I. Regeneration data	Displays a list of V.C.I. Regeneration data.
	Open setting screen(PC)	Opens the setting screen used to record information on the PC.

Button Image	Button Name	Button Function
	Add	Adds items.
	Change scale	Changes the scale.
	Trigger setting	Trigger setting
	Run	Starts the item.
	Stop	Stops the item.
	Pause	Pause
	Up trigger	Generates a trigger at the time of a rise.
	Down trigger	Generates a trigger at the time of a fall.
	Related information	
	Change unit	Changes the displayed unit of measurement.
	Previous change point	Moves the SWS monitor data(using all item change points as reference).
	Next change point	Moves SWS monitor data(using all item change points as reference).
	Start diagnosis	Start diagnosis and display result diagnosis
	View vehicle information	Displays vehicle information.
	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.
	1/2	Change of function button (1/2 display)
	2/2	Change of function button (2/2 display)
	1/3	Change of function button (1/3 display)
	2/3	Change of function button (2/3 display)
	3/3	Change of function button (3/3 display)

Screen Button Explanations

Button Image	Button Name	Button Function
	Transmit data	Transmits the data of the selected block to the PC.
	Open setting screen(V.C.I.)	Opens the setting screen used to record information on the V.C.I.
	End recording	*Records data. *Ends recording.
	Manual trigger	*Generates a manual trigger. *Stars the CAN diagnostic trigger.
	Trigger point data	*Sets the oscillo function trigger. *Jumps to the trigger point.
	Save data	Sets extraction conditions and saves the extracted data in a file.
	Data search settings	Opens the search condition settings screen.
	Correlation chart	Opens the correlation chart settings screen.
	Distribution chart	Opens the distribution chart settings screen.
	Disconnect cartridge	Disconnects the SWS monitor cartridge.
	Time extraction Conditions	Opens the extraction conditions(time) settings screen.

Button Image	Button Name	Button Function
	Save to HDD	Save to Hard drive
	Erase Diagnosis data	Erase Diagnosis data
	Bookmark	Displays bookmarks(pages with bookmarks).
	Document information	Displays document information.
	Connector index	Displays the connector index.
	Search List	Returns the screen to the search list screen.
	Group top	Returns the screen to the list of the presently displayed groups (or to the list of reference groups
	Previous display	Returns the screen to the previously displayed screen.
	Zoom in	Enlarges the display.
	Zoom out	Reduces the display.