

SUZUKI DIAGNOSIS SYSTEM OPERATION MANUAL

Specifications and Functions of Suzuki Diagnosis System







- (1) This system diagnoses trouble by communicating with the onboard computer using specially designed software that operates on commercially available Windows 95, 98, 2000, XP, Vista and 7, the special interface box that translates/converts the computer communication signals, and the special communication cable.
- (2) Taking application in motorcycles into consideration, the interface box has been made compact and light in weight (98 × 77 × 25 mm; 150 g). In addition to providing a connector to the vehicle, the system is equipped with two types of connector, USB and RS-232C, for communication with the computer so as to be compatible with both new and old computers.
- (3) The interface box is not waterproof because standardized connectors are used. The operable temperature range is 0 – 50 °C. The maximum vibration resistance is 2.2G, which requires protection from impact and vibration.
- (4) For communication protocol between the computer and adaptor, the international standard ISO14230 is used.
- (5) This special software is compatible with nine languages: Japanese, English, French, German, Italian, Spanish, Greek, Portuguese, and Chinese(PRC).
- (6) Whether the engine is operating or at halt, the data received from various sensors can be displayed in real time or can be plotted. The data or graphs displayed can be saved and printed.
- (7) The type of data to be displayed can be selected.
- (8) The saved data can be re-displayed and plotted in the graph.
- (9) The failure code (both past and current) that has been memorized at the time of failure can be called back and displayed. The change of data record at the time of failure (2 cases maximum) can also be displayed.
- (10) A “trigger” can be set up for the diagnostic data. The trigger is a function that starts recording the data from where the set value is exceeded (or comes short) for one or more data. This function can also record the timing to display the trouble code in the monitoring graph.
- (11) Active control is possible (such as secondary air solenoid drive, etc.).
- (12) The system can record the data of about 30 minutes of operation as well as driving data. They can be read out and verified.
- (13) The system requires setting up an additional function to the onboard ECU and use of a special connector. The diagnosis system is applicable to the new models produced in and after May 2002 (AN 650 onward) and their model changes. This system is not applicable to those models that were produced earlier than the above.

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INSTRUCTIONS FOR SAFE OPERATION OF THIS PRODUCT

- To protect the operators or other persons from hazard or property damage, the instructions for proper and safe operation of the system are shown below with symbols.
- These symbols call special attention to the following messages.
Make sure to check these messages carefully and observe the instructions contained.

 CAUTION	The following symbols show potential hazard of personal injury or property damage that could occur if operated improperly.	
SYMBOLS		Indicates forbidden operation.
		Indicates compulsory operation.
		Indicates prohibited operation with wet hand.
		Indicates prohibition of disassembly.
		Indicates instruction not to wet the product.

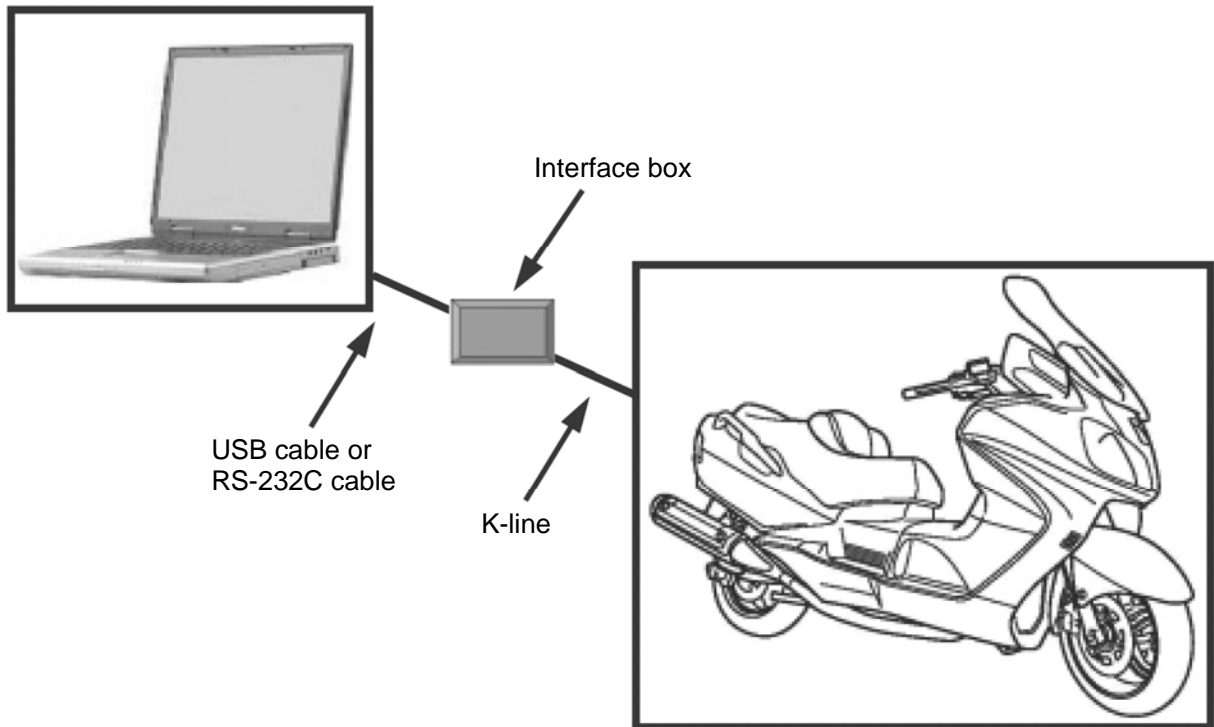
For the safe operation of this product, make sure to observe the following instructions.

 CAUTION	
<p>This product is designed for use in vehicles with a DC12V battery. Do not use the product with voltage other than DC12V. (Use with EMS01 is possible.)</p> <ul style="list-style-type: none"> • This could result in failure. 	
<p>Do not cause this product to be wet with water.</p> <ul style="list-style-type: none"> • This could result in failure. 	
<p>Do not attempt to disassemble or modify this product. (If failure is suspected, contact the dealer.)</p> <ul style="list-style-type: none"> • This could result in failure. 	
<p>Remove the cable both from the unit and computer when not in use.</p> <ul style="list-style-type: none"> • Cable disconnection or failure may result. 	
<p>Use the Suzuki specified K-line (diagnosis cable).</p> <ul style="list-style-type: none"> • Use of a cable other than specified may cause damage or malfunction due to excess voltage or contact failure. 	
<p>When disconnecting the K-line (diagnosis cable), make sure to firmly hold and pull its coupler with both hands.</p> <ul style="list-style-type: none"> • Do not pull on the wiring harness, or the K-line (diagnosis cable) may break. 	
<p>Do not handle the connecting cable with a wet hand.</p> <ul style="list-style-type: none"> • This could result in electrical shock or injury. 	
<p>Do not position this product in direct sunlight or high temperature areas, and do not leave it out in hot weather.</p> <ul style="list-style-type: none"> • This could result in failure. 	
<p>Do not drop this product, or subject it to strong impacts.</p> <ul style="list-style-type: none"> • This could result in failure. 	
<p>Do not get any engine oil, gasoline, coolant or battery fluid on the casing or cables. Do not wipe with solvents such as paint thinner and benzine.</p>	
<p>Should smoke or abnormal odor emit from this product, immediately stop the operation.</p> <ul style="list-style-type: none"> • Such a condition may cause failure or fire. 	
<p>Do not use a cable with the covering fractured or frayed.</p> <ul style="list-style-type: none"> • Such a condition may cause failure or fire. 	
<p>Do not operate if the connecting cable is frayed or connected loose with the unit.</p> <ul style="list-style-type: none"> • This could result in electrical shock or injury. 	

CONNECTING CABLES

❗ Prior to connecting the cable, install SDS software.

Hook up the PC, interface box and vehicle as shown below.



PARTS USED FOR CONNECTION

To set up the connection, use the interface box, K-line and USB cable.



Interface box
(Part number: 09904-41010-001)



K-line (Diagnosis cable)
(Part number: 09904-41010-002)



USB cable
(Part number: 09904-41010-003)

OPTIONAL PARTS

Use of RS-232C (option) port

If there is no USB port in your PC, use the optional RS-232C cable.



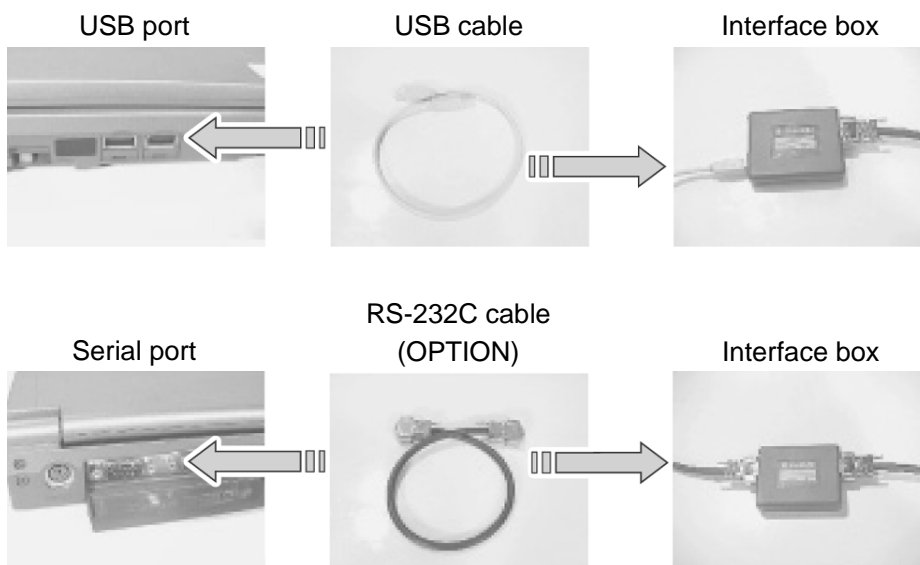
RS-232C (OPTION)
(Part number: 09904-41020)

CONNECTION SETUP

1. Select "RS-232C" for "Communication port".
2. Select default "57600 bps" for Baud rate.
3. Select "OK" button below the property sheet.
4. Connect K-line (diagnosis cable).
5. When using RS-232C, select COM port for RS-232C cable.

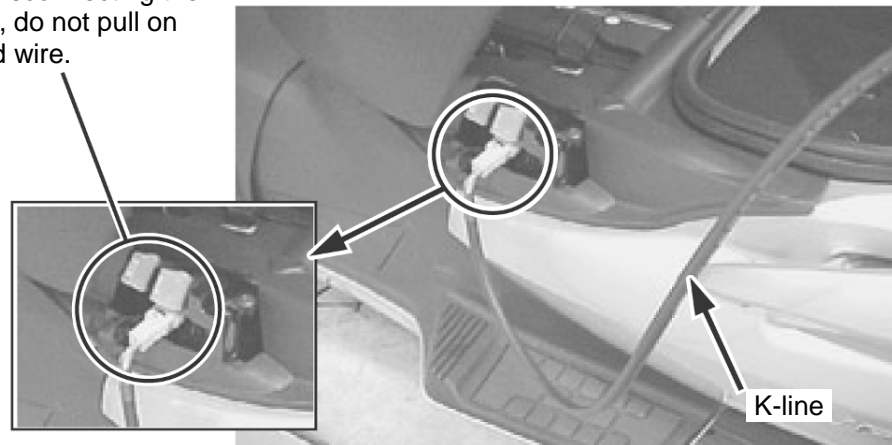
CONNECTIONS

Connect USB cable or RS-232C cable as shown below.



CONNECTION TO VEHICLE

- ⓘ When disconnecting the coupler, do not pull on the lead wire.



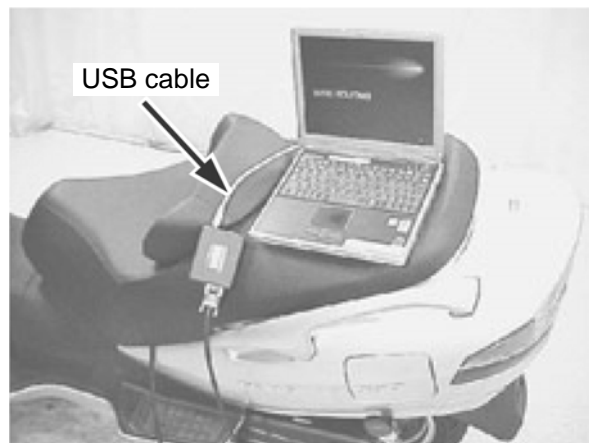
To hook up the system to the vehicle, connect K-line coupler to the mode select switch coupler for use in setting up the diagnosis mode.

- ⓘ Make sure to hold and pull on the coupler when disconnecting it. Never pull on the lead wire, or it may break.

Insert one end of K-line into the interface box.

CONNECTION TO PC

Connect the USB cable to the PC and the interface box.

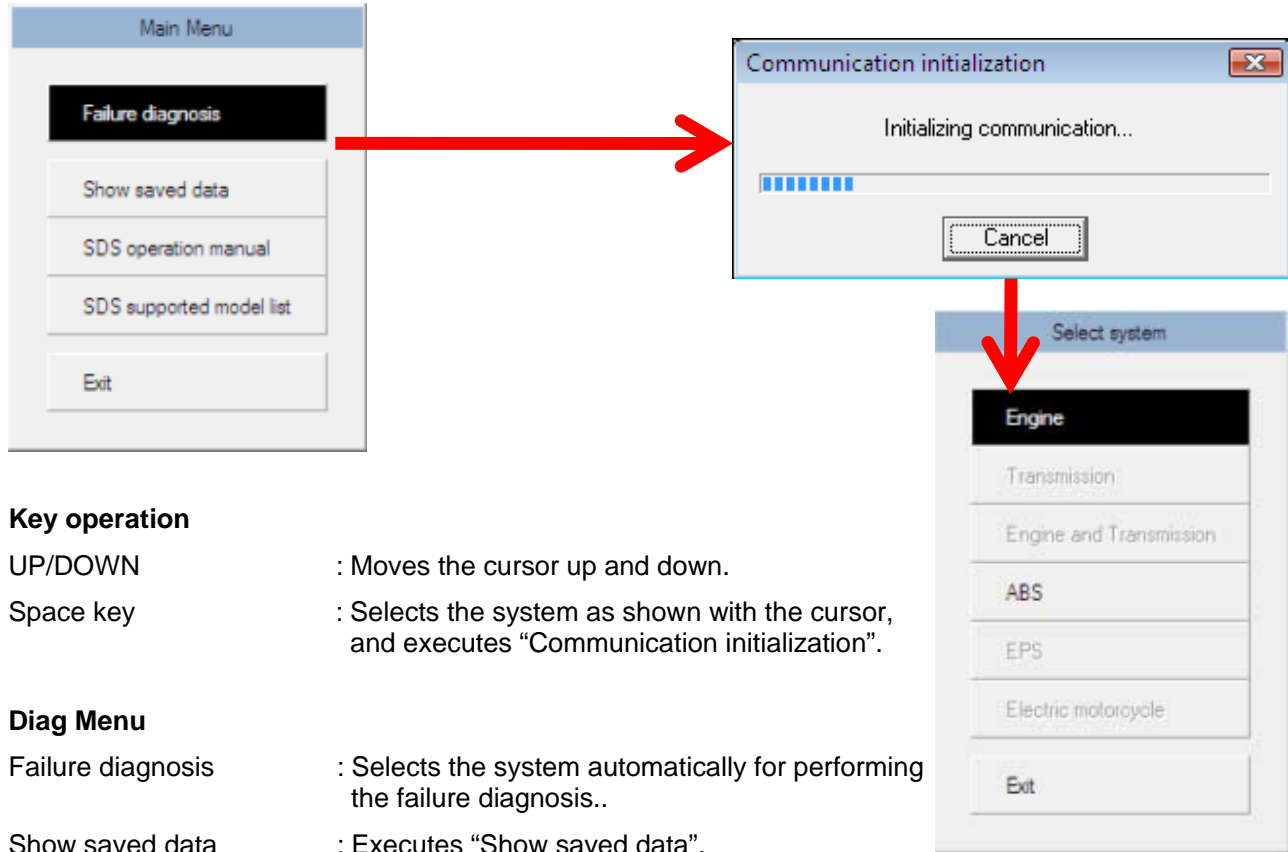


SYSTEM SELECTION

Select the system for performing the failure diagnosis.

Systems that can be used with the connected vehicle are automatically selected.

Systems that can be used for each model can be confirmed in the “SDS model application list”.



Key operation

- UP/DOWN : Moves the cursor up and down.
- Space key : Selects the system as shown with the cursor, and executes “Communication initialization”.

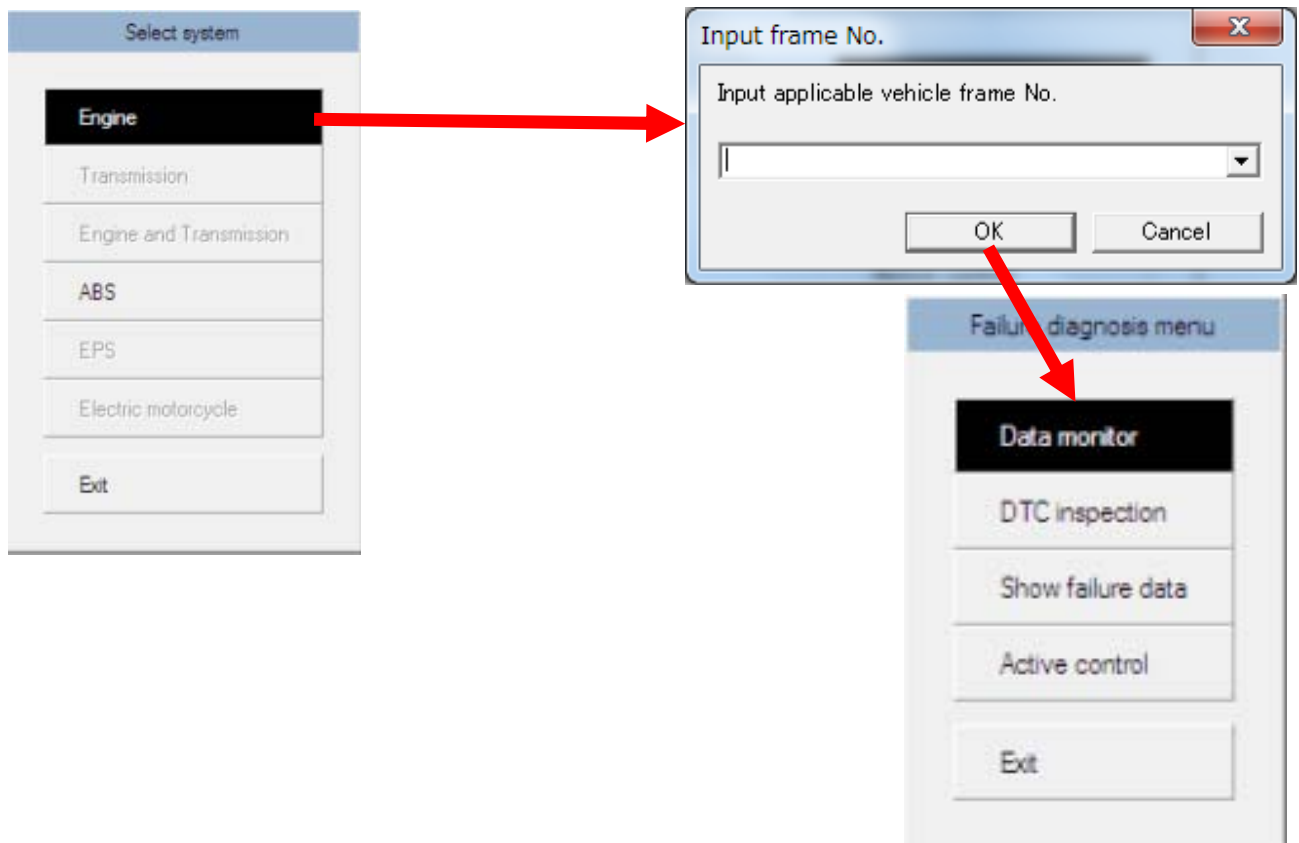
Diag Menu

- Failure diagnosis : Selects the system automatically for performing the failure diagnosis..
- Show saved data : Executes “Show saved data”. This redisplay previously saved data.
- SDS operation manual : Opens the SDS operation manual.
- SDS supported model list : Opens the SDS model application list.
- Exit : Exits the SDS software.

System

- Engine : Selects the Engine system.
- Transmission : Selects the Transmission system.
- Engine & Transmission : Selects the Engine and Transmission systems.
- ABS : Selects the ABS system.
- EPS : Selects the EPS system.
- Electric motorcycle : Selects the Electric motorcycle system.
- Exit : Exits the SDS software

EXECUTING SYSTEM



Enter the frame number of the vehicle being diagnosed into the “Input frame No.” box and click “OK”. The Failure diagnosis menu will appear.

Select menu items, then click with the mouse, or press the Space key.

Key operation

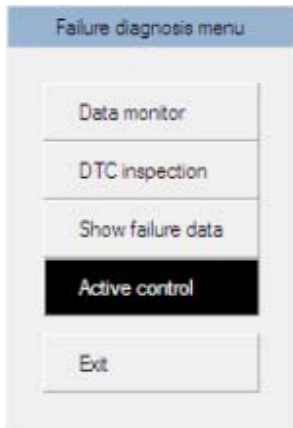
- UP/DOWN : Moves the cursor up and down.
- Space key : Executes the failure diagnosis service as shown with the cursor.

Failure diagnosis menu

- Data monitor : Shows the present vehicle condition using a numerical or graph display.
Executes “Data monitor”.
- DTC inspection : Shows diagnostic trouble codes saved in ECU.
Executes “DTC inspection”.
- Show failure data : Shows the vehicle condition before and after failure using a numerical display.
Executes “Show failure data”.
- Active control : Controls the vehicle temporarily from the computer.
Enables confirmation of the system.
Executes the “Active control menu”.
- Exit : Closes “Failure diagnosis menu”.

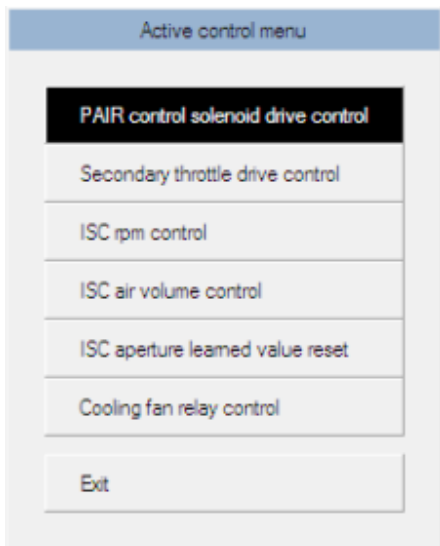
EXECUTING ACTIVE CONTROL

Active control menu will appear.

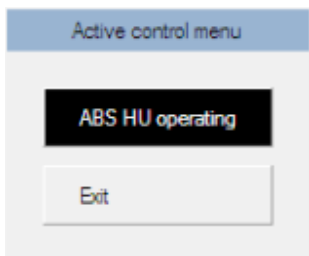


Enables control of the vehicle temporarily from the computer.
Control that can be performed on selected systems or models will differ.
For details, refer to the service manual.

1. Engine system example (differs between models)

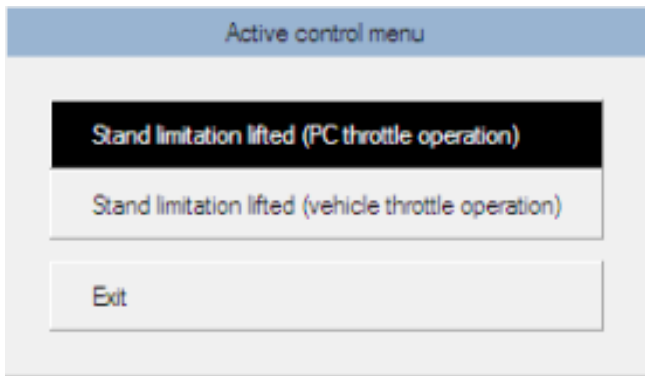


2. ABS system example



3. For the Electric motorcycle system

The motor can be controlled when the center stand is operating.



Stand limitation lifted (PC throttle operation) :

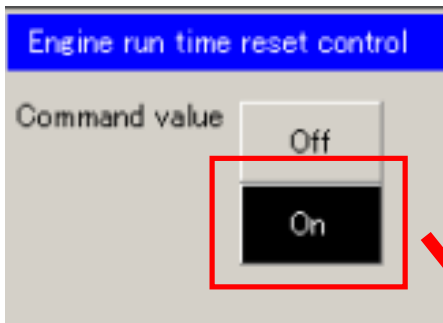
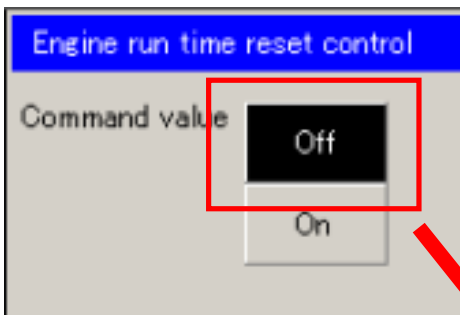
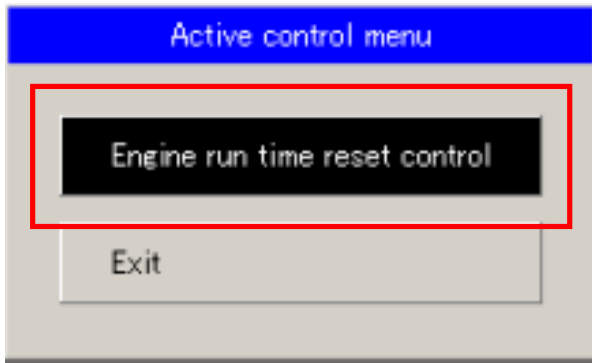
When the center stand is operating, control the motor using numerals input into the PC.
Confirmation of systems other than the throttle sensor is possible.

Stand limitation lifted (vehicle throttle operation) :

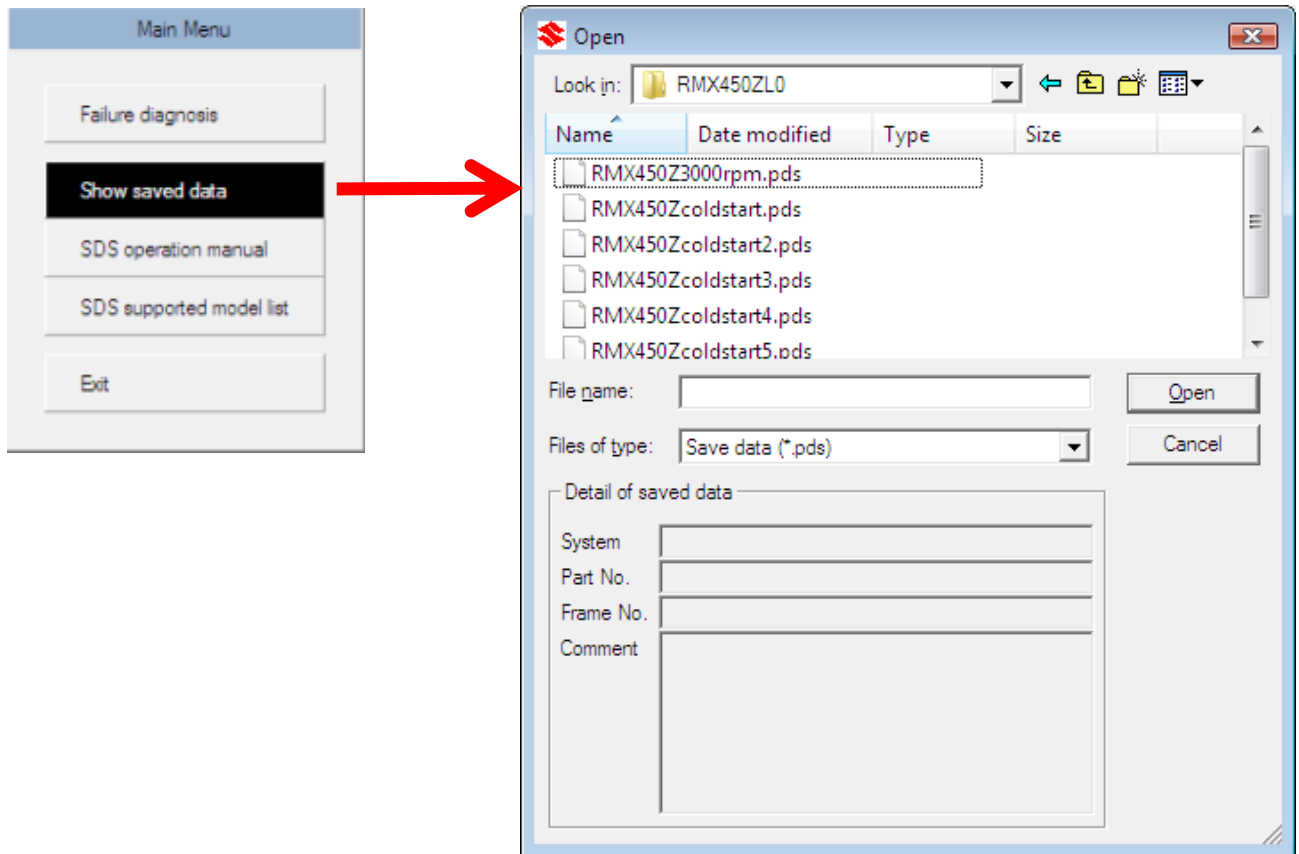
When the center stand is operating, control the motor using the vehicle throttle.
Confirmation of systems including the throttle sensor is possible.

Exit : Exits the "Active control menu".

4. Engine run time reset control (RM-Z450L3-, RM-Z250L3-)



SELECTING SAVED DATA DISPLAY SYSTEM



Description of file information

- File location : Select the location of the file to display.
- File name : Select the file name to display.
- System : The system of vehicle from which the sample data was taken is shown.
- Part No. : The part number of the controller from which the sample data was taken is shown.
- Frame No. : If entered when the data is saved, the frame number of the vehicle is shown.
- Comment : If entered when the data is saved, then comments about the applicable sample data are shown.

Button operation

- Open : Opens the designated file and executes the data monitor / hold mode / numerical display.
- Cancel : Closes the window without displaying the data.

PRINCIPAL DATA MONITOR ITEMS

Item	Details
Vehicle speed	Vehicle speed detected by the vehicle speed sensor.
Engine speed	Engine speed detected by the engine speed sensor.
Throttle position	Throttle valve angle (opening, gasoline engine) Throttle valve angle (opening, electric motorcycle)
Manifold absolute pressure	Manifold air pressure detected by the intake air pressure sensor.
Intake air temperature	Intake air temperature detected by the intake air temperature sensor.
Barometric pressure	Barometric pressure detected by the atmospheric pressure sensor.
Battery voltage	Battery voltage (some models require engine start-up)
O2 sensor (Bank1-Sensor1)	O2 sensor output voltage.
PAIR control solenoid valve	PAIR control solenoid status (either ON or OFF).
PTC heater	Status of the heater (operating or not operating)
Spec select terminal	Spec select terminal (short or open)
Ignition switch signal	Ignition voltage (normal or abnormal).
Tip over (fuel cut) switch	Tip over (fuel cut) switch Status of fuel cut sensor (ON or OFF)
Starter	Starter signal from starter button.
Motor revolutions	Motor revolutions detected by hall sensor
Output torque	Torque generated from electric current in the motor
Battery total capacity	Capacity of the battery when fully charged
Battery remaining capacity	Remaining capacity when the battery is in use
Number of recharges	Number of times the battery has been charged to full capacity
Battery pack mounting sensor	Status of battery pack mounting sensor (mounted or not mounted)
Tip over sensor	Status of tip over sensor (normal or tipped over)
Drive output restriction	Operating output restriction status (ON or OFF)
Drive mode settings	Drive mode settings (eco or power)
Brakes	Status of brakes (ON or OFF)
Sensorless control	Status of sensorless control not using the hall sensor (ON or OFF)

COMPARISON OF DIAGNOSTIC TROUBLE CODES

Diagnostic trouble code	SUZUKI Code	Item
P0105-H	C13	Intake air pressure sensor
P0105-L		
P0110-H	C21	Intake air temperature sensor
P0110-L		
P0115-H	C15	Coolant temperature sensor
P0115-L		
P0120-H	C14	Throttle position sensor
P0120-L		
P0130	C44 (*C45)	O2 sensor (* : Displayed depending on machine type concerned)
P0135	C44	O2 sensor heater
P0201	C32	Fuel injector signal #1
P0202	C33	Fuel injector signal #2
P0335	C12	Crankshaft position sensor
P0340	C11	Camshaft position sensor
P0351	C24	Ignition signal #1
P0352	C25	Ignition signal #2
P0230-H	C41	Fuel pump control system
P0230-L		
P0500	C16	Speed sensor
P1450-H	C22	Atmospheric pressure sensor
P1450-L		
P1650	C42	Ignition switch signal
P1651-H	C23	Tip over (fuel cut) sensor
P1651-L		
P1652	C40	Idle air control valve (PTC heater)
P1C61	E- 600	Key sensor detection abnormality at start-up
P1C62	E- 610	Primary TPS abnormality at start-up
P1C63	E- 611	Secondary TPS abnormality at start-up
P1C66	E- 614	TPS signal mismatch
P1C67	E- 620	Tip over sensor abnormality at start-up
P1C68	E- 621	Tip over sensor abnormality
U1C01	E- 150	Inverter communication abnormality at start-up (EV controller detection)
U1C05	E- 105	EV controller signal abnormality at start-up (inverter detection)
U1C0B	E- 330	Battery signal abnormality at start-up (inverter detection)

This diagnostic trouble code comparison table is a sample. For details, refer to the service manual for the corresponding model.

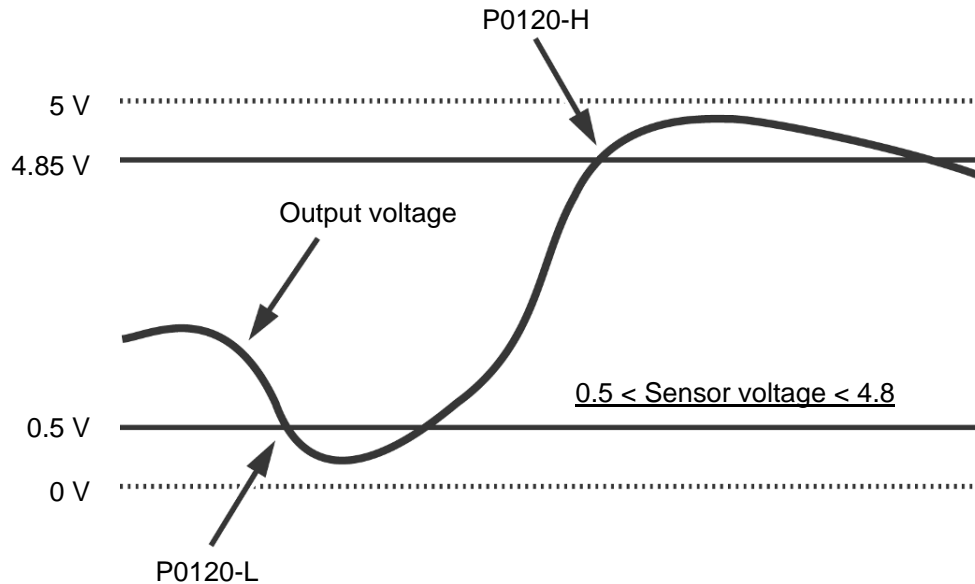
EXAMPLE OF TROUBLE CODE

OUTPUT VOLTAGE DISPLAY

P CODE: DIFFERENCE BETWEEN P0120-H AND P0120-L {EX. THROTTLE POSITION SENSOR (C14)}

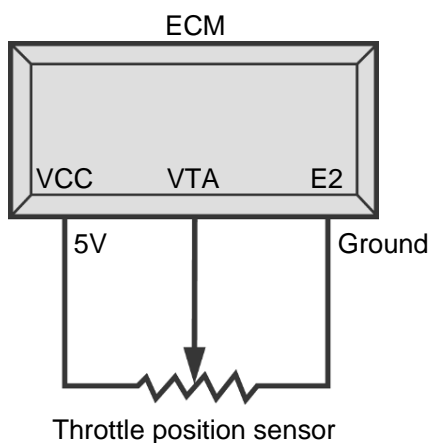
Trouble code for throttle position sensor: Difference between P0120-H and P0120-L.

- 4.85V or higher: P0120-H will be displayed.
- 0.5V or lower: P0120-L will be displayed.



THROTTLE POSITION SENSOR

P CODE: DIFFERENCE BETWEEN P0120-H AND P0120-L



VTA line	P code
Disconnection	P0120-L
Short-circuited to ground E2	P0120-L
Short-circuited to VCC	P0120-H

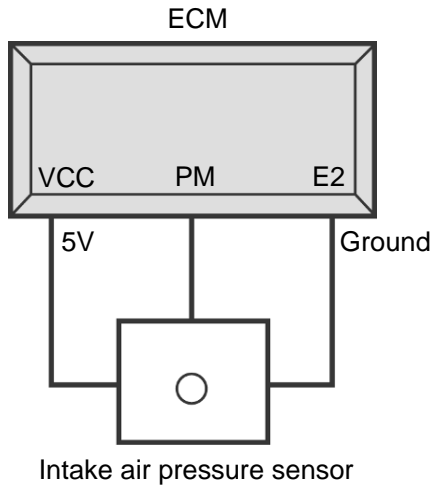
VCC	P code
Disconnection	P0120-L

E2 ground	P code
Disconnection	P0120-H

Depending on model, H (High) and L (Low) may be reversed.

INTAKE AIR PRESSURE SENSOR

P CODE: DIFFERENCE BETWEEN P0105-H AND P0105-L



PM line	P code
Disconnection	P0105-H
Short-circuited to ground E2	P0105-L
Short-circuited to VCC	P0105-H

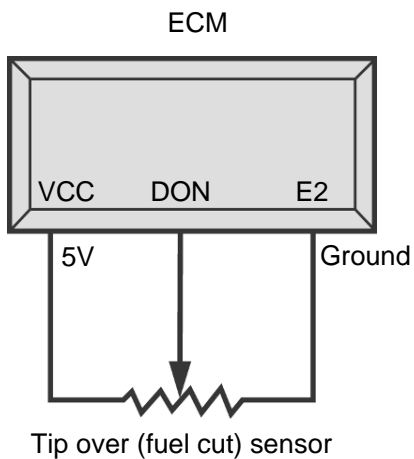
VCC	P code
Disconnection	P0105-L

E2 ground	P code
Disconnection	P0105-H

Depending on the model, H (High) and L (Low) may be reversed.

TIP OVER (FUEL CUT) SENSOR

P CODE: DIFFERENCE BETWEEN P1651-H AND P1651-L



DON	P code
Disconnection	P1651-L
Short-circuited to ground E2	P1651-L
Short-circuited to VCC	P1651-H

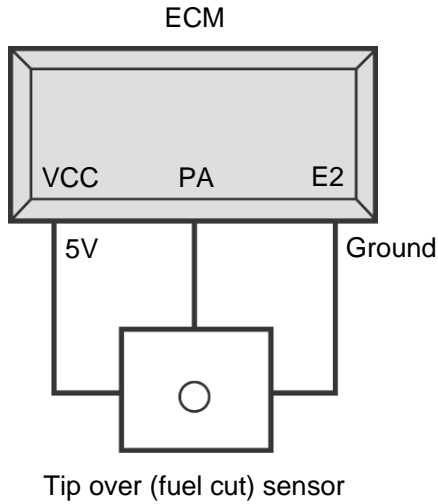
VCC	P code
Disconnection	P1651-L

E2 ground	P code
Disconnection	P1651-H

Depending on the model, H (High) and L (Low) may be reversed.

ATMOSPHERIC PRESSURE SENSOR

P CODE: DIFFERENCE BETWEEN P1450-H AND P1450-L



PA	P code
Disconnection	P1450-H
Short-circuited to ground E2	P1450-L
Short-circuited to VCC	P1450-H

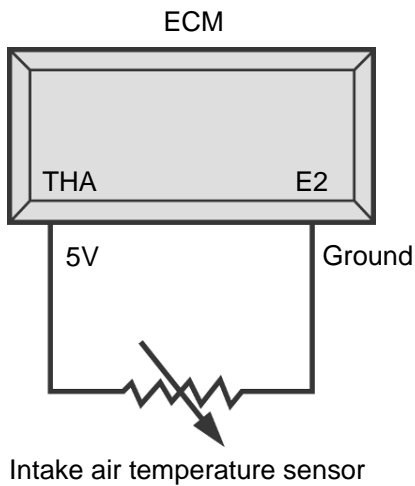
VCC	P code
Disconnection	P1450-L

E2 ground	P code
Disconnection	P1450-H

Depending on the model, H (High) and L (Low) may be reversed.

INTAKE AIR TEMPERATURE SENSOR

P CODE: DIFFERENCE BETWEEN P0110-H AND P0110-L



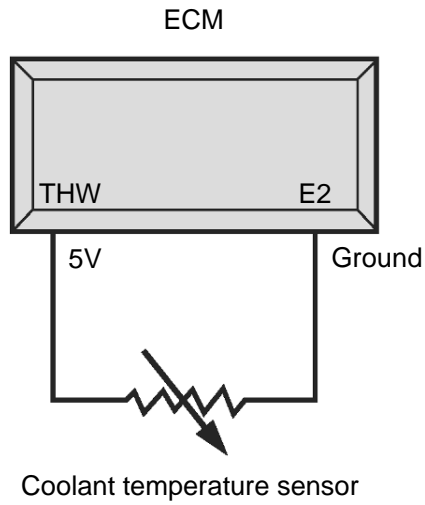
THA	P code
Disconnection	P0110-H
Short-circuit	P0110-L

E2 ground	P code
Disconnection	P0110-H

Depending on the model, H (High) and L (Low) may be reversed.

COOLANT TEMPERATURE SENSOR

P CODE: DIFFERENCE BETWEEN P0115-H AND P0115-L



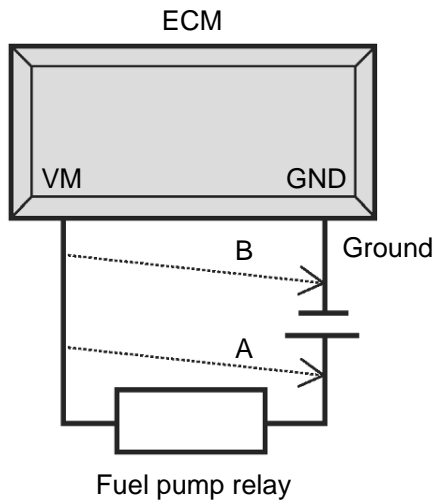
THW	P code
Disconnection	P0115-H
Short-circuit	P0115-L

E2 ground	P code
Disconnection	P0115-H

Depending on the model, H (High) and L (Low) may be reversed.

FUEL PUMP RELAY

P CODE: DIFFERENCE BETWEEN P0230-H AND P0230-L



VM		P code
Disconnection		P0230-L
A	Short-circuit	P0230-H
B	Short-circuited to ground GND	P0230-L

Depending on the model, H (High) and L (Low) may be reversed.

EXPLANATION OF PARAMETERS

ENGINE

PARAMETER	UNIT	DISPLAY	EXPLANATION
Vehicle speed	km/h		Vehicle speed data to be input to ECM. The value shows speed that is calculated from the frequency of the pulse signal received from vehicle speed sensor.
Engine speed	rpm		Engine speed data to be input to ECM. The value shows engine speed that is calculated from the frequency of the pulse signal received from crank angle sensor.
Throttle position	°		Throttle position value as converted from throttle sensor input data. The value shows the throttle open angle.
Manifold absolute pressure	kPa, mmHg		Intake manifold pressure data to be input to ECM. The value shows pressure as converted from the voltage of the pressure sensor connected to the intake port.
Engine coolant temperature	°C, °F		Coolant temperature data to be input to ECM. The value shows the temperature converted from the coolant temperature sensor voltage.
Intake air temperature	°C, °F		Intake air temperature data to be input to ECM. The value shows the intake air temperature converted from the intake air temperature sensor voltage.
Barometric pressure	kPa, mmHg		Barometric pressure data to be input to ECM. The value shows the barometric pressure converted from the atmospheric pressure sensor voltage.
Battery voltage (Injector input)	V		Data of battery voltage supplied to the injector.
O2 sensor Bank1-Sensor1 (Bank1-Sensor1)	V		O2 sensor data to be input to ECM.
PAIR control solenoid valve		ON or OFF	Status of PAIR control solenoid valve operation is shown. ON indicates the valve is in operation and OFF indicates it is not in operation.
PTC heater		Operating or Not operating	PTC heater operating status is shown.
Spec select terminal		GND or OPEN	Spec select terminal connection status is shown. GND indicates a normal condition and OPEN indicates a disconnection.
Ignition switch signal		Normal or Abnormal	The condition of the ignition switch when the ignition is turned on is shown.
Tip over sensor (Fuel cut)		ON or OFF	Fuel cut condition is shown. ON indicates fuel cut is in operation and OFF indicates it is not in operation.
Starter signal		ON or OFF	Status of starter switch is shown. ON indicates the switch is on and OFF indicates it is off.

The number of parameters and parameters displayed differ depending on the machine type concerned.

TRANSMISSION

PARAMETER	UNIT	DISPLAY	EXPLANATION
Vehicle speed	km/h		ECM output vehicle speed data to be input to CVT control unit.
Throttle position	%		ECM output throttle position data to be input to CVT control unit. Throttle open angle is shown in %.
Engine coolant temperature	°C, °F		ECM output coolant temperature data to be input to CVT control unit.
Engine speed	rpm		ECM output engine speed data to be input to CVT control unit.
Secondary pulley speed sensor	rpm		CVT secondary pulley speed is shown.
Pulley position sensor ratio	—		Value indicates primary/secondary pulley ratio that is calculated from the pulley position sensor output.
Pulley speed ratio	—		Value indicates primary/secondary pulley ratio that is calculated from CKP sensor and CVT secondary pulley speed sensor outputs.
Battery voltage	V		Battery voltage is shown.
Relay contact voltage	V		Voltage of the relay that supplies power to the CVT actuator motor control circuit is shown.
Motor terminal voltage A	V		Voltage of the CVT actuator motor is shown. (Normal direction)
Motor terminal voltage B	V		Voltage of the CVT actuator motor is shown. (Reverse direction)
Motor current	A		Current flowing to the CVT actuator motor is shown.
Gear position		Auto mode or Manual mode	Drive mode is shown.
Motor lock		ON or OFF	Status of the CVT actuator motor is shown. ON appears when there is a failure (lock) and OFF when in normal condition.
Motor short		ON or OFF	Status of the CVT actuator motor is shown. ON appears when there is a failure (short) and OFF when in normal condition.
Motor disconnection		ON or OFF	Status of the CVT actuator motor is shown. ON appears when there is a failure (disconnection) and OFF when in normal condition.
Relay contact welding		ON or OFF	Condition of the relay that supplies power to CVT actuator motor control circuit. ON appears when there is a failure (fused) and OFF when in normal condition.
Relay contact failure		ON or OFF	Condition of the relay that supplies power to the CVT actuator motor control circuit. ON appears when there is a failure (poor contact) and OFF when in normal condition.
Motor lock (History)		ON or OFF	Past condition of the CVT actuator motor is shown. ON appears when a past failure (lock) is detected and OFF when in normal condition.

PARAMETER	UNIT	DISPLAY	EXPLANATION
Motor short (History)		ON or OFF	Past condition of the CVT actuator motor is shown. ON appears when a past failure (short) is detected and OFF when in normal condition.
Motor disconnection (History)		ON or OFF	Past condition of the CVT actuator motor is shown. ON appears when a past failure (disconnection) is detected and OFF when in normal condition.
Relay contact welding (History)		ON or OFF	Past condition of the relay that supplies power to the CVT actuator motor control circuit. ON appears when a past failure (fused) is detected and OFF when in normal condition.
Relay contact failure (History)		ON or OFF	Past condition of the relay that supplies power to the CVT actuator motor control circuit. ON appears when a past failure (poor contact) is detected and OFF when in normal condition.
Power mode switch circuit malfunction		ON or OFF	Power mode switch circuit condition is shown. ON appears when a malfunction is detected in the circuit and OFF when it is normal.
Auto shift mode switch circuit malfunction		ON or OFF	Auto shift mode switch circuit condition is shown. ON appears when a malfunction is detected in the circuit and OFF when it is normal.
Up shift switch circuit malfunction		ON or OFF	Upshift switch circuit condition is shown. ON appears when a malfunction is detected in the circuit and OFF when it is normal.
Down shift switch circuit malfunction		ON or OFF	Downshift switch circuit condition is shown. ON appears when a malfunction is detected in the circuit and OFF when it is normal.
Center stand switch		ON or OFF	Center stand switch operating condition is shown. ON appears when operating and OFF when not operating.
Brake switch		ON or OFF	Brake switch operating condition is shown. ON appears when operating and OFF when not operating.
Power mode switch		ON or OFF	Power mode switch operating condition is shown. ON appears when operating and OFF when not operating.
Auto shift mode switch		ON or OFF	Auto shift mode switch condition is shown. ON appears when operating and OFF when not operating.
Up shift switch		ON or OFF	Up shift switch operating condition is shown. ON appears when operating and OFF when not operating.
Down shift switch		ON or OFF	Down shift switch operating condition is shown. ON appears when operating and OFF when not operating.
Shift control switch		ON or OFF	This operates at the time of shifting to prevent over speed. ON appears when operating and OFF when not operating.
Normal mode		ON or OFF	Status of drive mode is shown. ON appears when operating in normal mode and OFF when in power mode.

PARAMETER	UNIT	DISPLAY	EXPLANATION
Power mode		ON or OFF	Status of drive mode is shown. ON appears when operating in power mode and OFF when in normal mode.
Auto shift mode		ON or OFF	Status of drive mode is shown. ON appears when operating in auto shift mode and OFF when in manual mode.
Manual shift mode		ON or OFF	Status of drive mode is shown. ON appears when operating in manual mode and OFF when in auto shift mode.

ELECTRIC MOTORCYCLE

Parameter	Unit	Display	Explanation
Battery voltage	V	—	Voltage for the special 50V battery.
Motor revolutions	rpm	—	Drive motor revolutions.
TPS output voltage	V	—	Throttle sensor output voltage.
EV controller commanded torque	Nm	—	Torque for the inverter commanded by the EV controller.
Inverter commanded torque	Nm	—	Torque for the drive motor commanded by the inverter.
Output torque	Nm	—	Torque generated by the current in the drive motor.
Inverter DC voltage	V	—	DC voltage supplied by the EV controller to the inverter.
Battery current	A	—	DC current supplied by the special 50V battery to the EV controller.
Inverter DC current	A	—	DC current supplied by the EV controller to the inverter.
Direct axis current	A	—	Current converted to the polarity of the drive motor.
Battery total capacity	mAh	—	Electrical discharge available when the battery is fully charged.
Battery remaining capacity	mAh	—	Electrical discharge available when the battery is being used.
EV controller temperature	°C	—	EV controller circuit temperature.
Inverter temperature	°C	—	Inverter circuit temperature.
Hall IC temperature	°C	—	Drive motor hall sensor circuit IC temperature.
Battery temperature 1-3	°C	—	Temperature of sensors at 3 locations within the special 50V battery.
Number of cycles	Times	—	Usage cycles for the special 50V battery converted from the cumulative discharge/total capacity.
Number of recharges	Times	—	Number of times the special 50V battery has been recharged.
Main key switch	—	ON or OFF	Switch to start the electric motorcycle.
Conduction sensor	—	ON or OFF	Sensor to confirm power to the drive motor.
Center stand switch	—	ON or OFF	Sensor that confirms whether the center stand is down or stored. OFF indicates it is down, and ON indicates it is stored.

Parameter	Unit	Display	Explanation
Battery pack mounting sensor	—	Mounted or Not mounted	Sensor that confirms that the battery pack is correctly mounted.
Key sensor	—	Normal or Abnormal	Sensor that checks the main key switch.
Tip over sensor	—	Normal or Tipped over	Sensor that detects the tilt of the vehicle.
Overcharge sensor	—	Normal or Abnormal	Sensor that detects overcharging of the special 50V battery.
Power supply	—	ON or OFF	EV controller power supply status.
Operating mode (EV controller)	—	Awaiting start-up, eco-drive, or power-drive	Electric motorcycle operating status. In start-up with the main key switch ON, in eco-mode or power mode with the START/MODE switch ON.
EV controller operating torque restriction	—	ON or OFF	Status of drive torque restriction by EV controller.
EV controller regenerative torque restriction	—	ON or OFF	Status of drive torque restriction by EV controller.
Recharge current restriction	—	ON or OFF	Recharge current restriction status.
U phase hall signal	—	ON or OFF	Status of input to the U phase hall sensor output inverter.
V phase hall signal	—	ON or OFF	Status of input to the V phase hall sensor output inverter.
W phase hall signal	—	ON or OFF	Status of input to the W phase hall sensor output inverter.
Drive output restriction	—	ON or OFF	Status of output torque restriction by the inverter.
Inverter drive torque restriction	—	ON or OFF	Status of drive torque restriction by the inverter.
Inverter regenerative torque restriction	—	ON or OFF	Status of regenerative torque restriction by the inverter.
Motor lock torque restriction	—	ON or OFF	Torque is in a restricted status because of the possibly of motor lock.
Regenerative output restriction	—	ON or OFF	Restriction status of regenerative output.
Battery pack connected	—	ON or OFF	Connection status of the battery pack EV controller.
Battery pack not connected	—	ON or OFF	Status of the battery pack as a separate item.
Low temperature restriction	—	ON or OFF	Status in which current is restricted because of low battery temperature.

Parameter	Unit	Display	Explanation
High temperature restriction	—	ON or OFF	Status in which current is restricted because of high battery temperature.
Drive mode settings	—	Eco or Power	Drive mode status.
Brakes	—	ON or OFF	Status of brakes.
Sensorless control	—	ON or OFF	Status of sensorless control not using the hall sensor.

SDS OPERATING INSTRUCTIONS

SDS is a tool that can perform the vehicle failure diagnosis on a PC.

MAIN PAGE - Engine

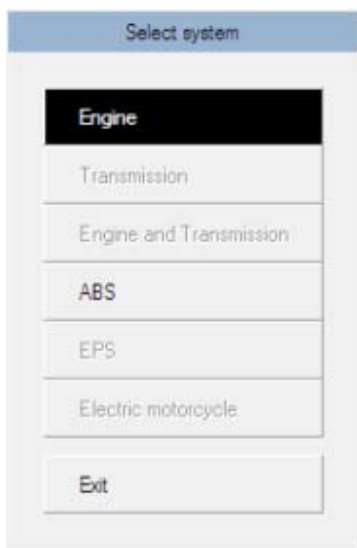
Select the system for performing failure diagnosis.

Systems that can be selected with the connected vehicle are automatically selected.

Key operation

UP/DOWN : Moves cursor.

Space key : Selects the system as shown with the cursor, and executes "Communication initialization".



:Selects the Engine system.

:Selects the Transmission system.

:Selects the Engine and Transmission systems.

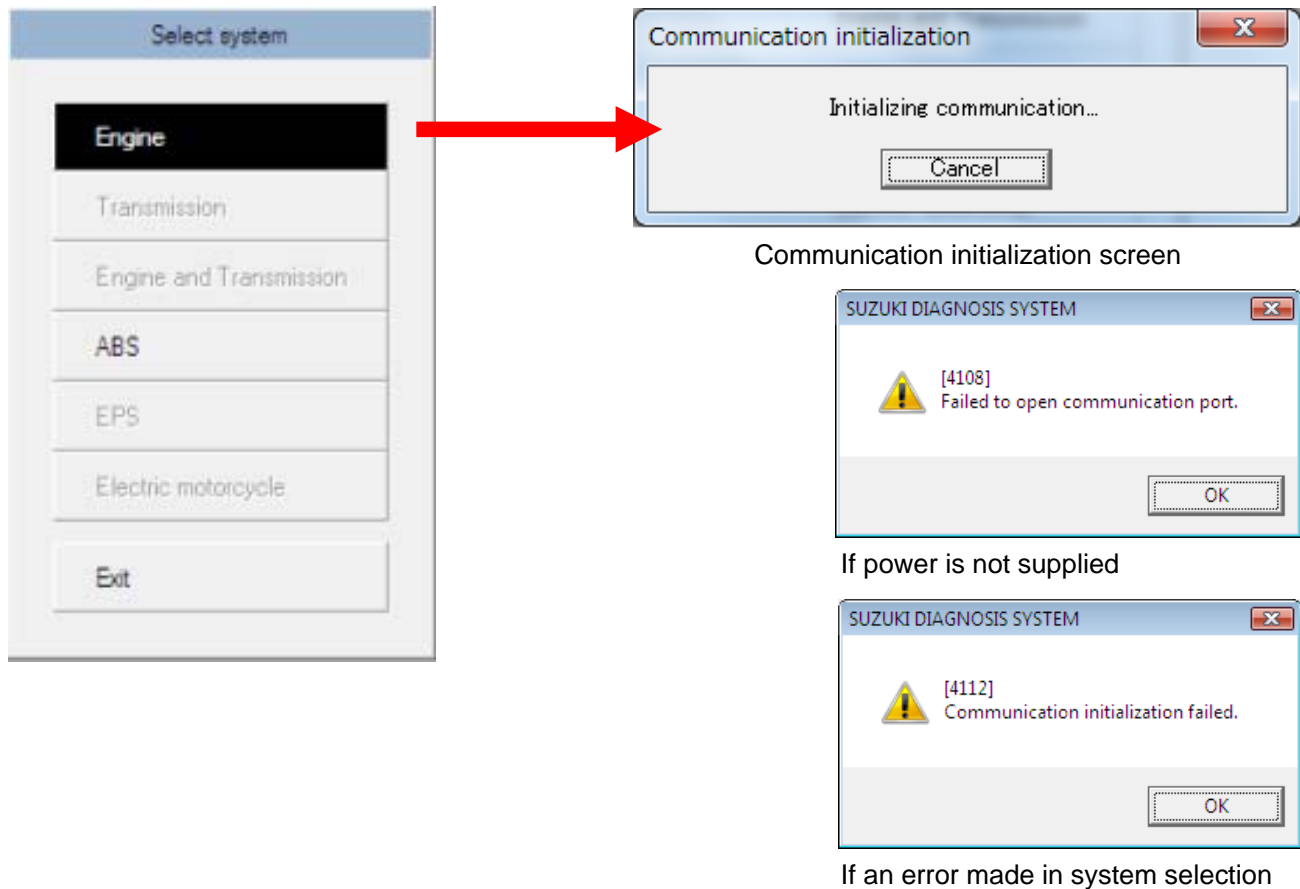
:Selects the ABS system.

:Selects the EPS system.

:Selects the Electric motorcycle system.

:Close the application.

COMMUNICATION INITIALIZATION



When the communication initialization has been successfully performed, the “Input frame number” box will be displayed.

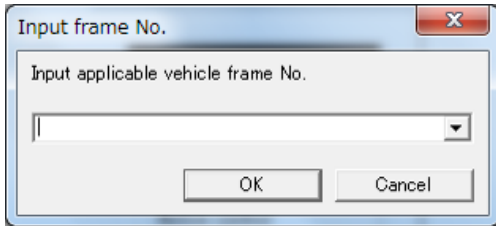
With the data input in “Input frame number,” “Failure diagnosis menu” will be displayed.

If an error has occurred in the communication initialization, an error message will be displayed. In this case, check the system again. The main probable causes for this error are listed below. If the error message is displayed even when there is no abnormal condition, the display returns automatically to the “Select system” window in approximately eight seconds.

Cause of errors

- Interface box is not connected to PC.
→ Refer to “Preparation”, and connect the interface box to the PC.
- Interface box is not connected to the vehicle.
→ Refer to “Preparation”, and connect the vehicle to the interface box.
- Vehicle is not supported by the system.
→ Confirm that the connected vehicle is in the SDS model application list.
- 14V is not being supplied to the vehicle SDS coupler.
→ Confirm that 14V is being supplied between the SDS coupler and GND while the ignition switch and main switch are ON.
- A system that cannot be selected for that vehicle has been selected.
→ Check for a system that can be selected for the vehicle from the SDS model application list.

MAIN PAGE - Input frame No.



Input the frame number.

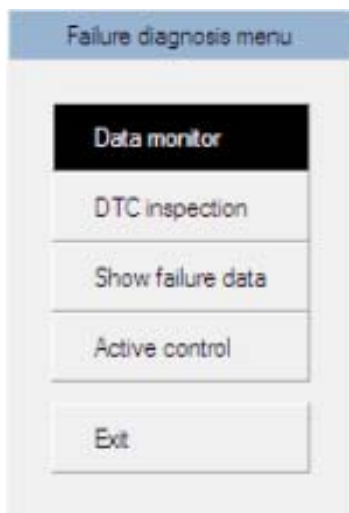
MAIN PAGE - Data monitor

Failure diagnosis menu

This menu is used to select the failure diagnosis service to be executed.

Key operation

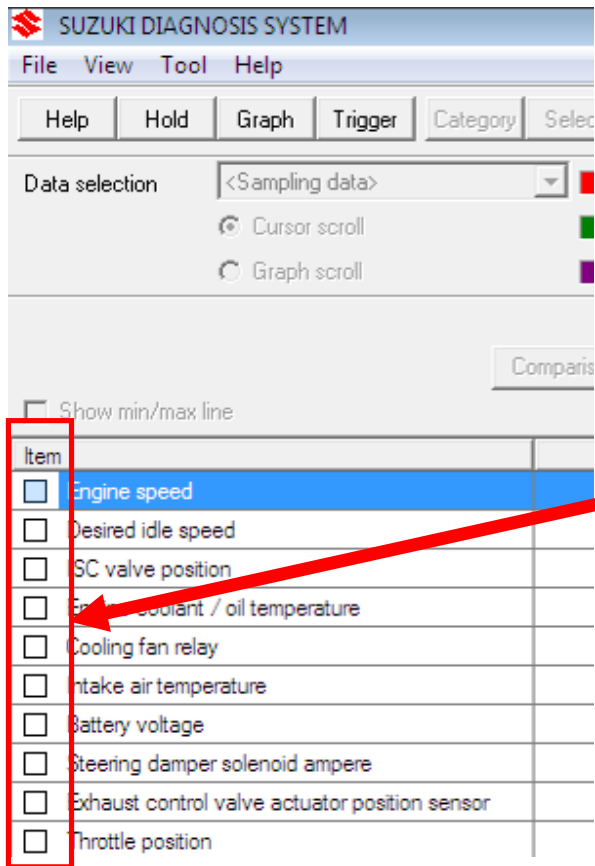
- UP/DOWN : Moves cursor.
- Space key : Executes the diagnostic service as shown with the cursor.



Services that can be selected

- : Shows the present vehicle condition using a numerical or graph display.
- : Shows diagnostic trouble codes saved in ECU.
- : Shows the vehicle condition before and after failure using a numerical display.
- : Temporarily changes the current vehicle status from the PC.
- : Exits the Failure diagnosis menu.

MAIN PAGE - Data monitor - Value display



Icons showing selected status

Key operation

Key : Processes.

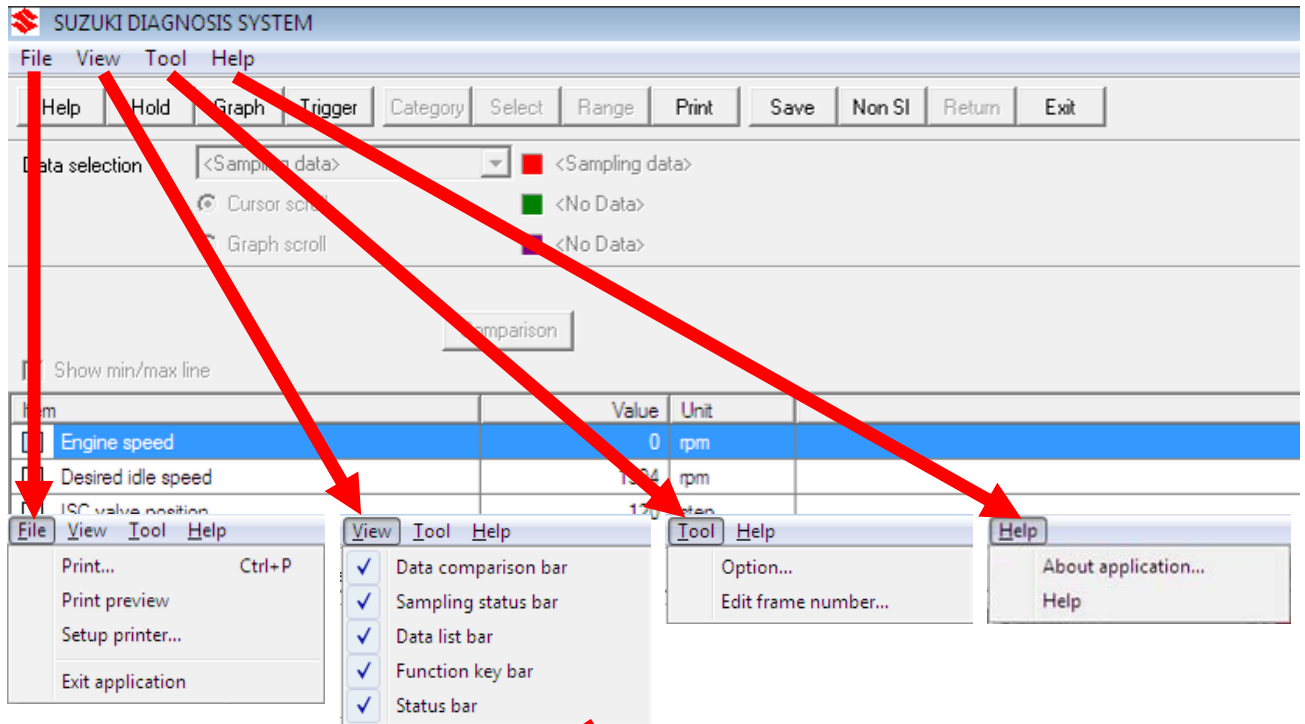
UP/DOWN : Moves cursor.

Ctrl + Shift + UP/DOWN : Moves the item as shown with the cursor.

Space key : Changes the selection of item as shown with the cursor.

The selection is indicated with a check mark on the left of the item.

Commands (File, View, Tools, Help)



File : Print Ctrl + P
 Print preview
 Setup printer
 Exit application

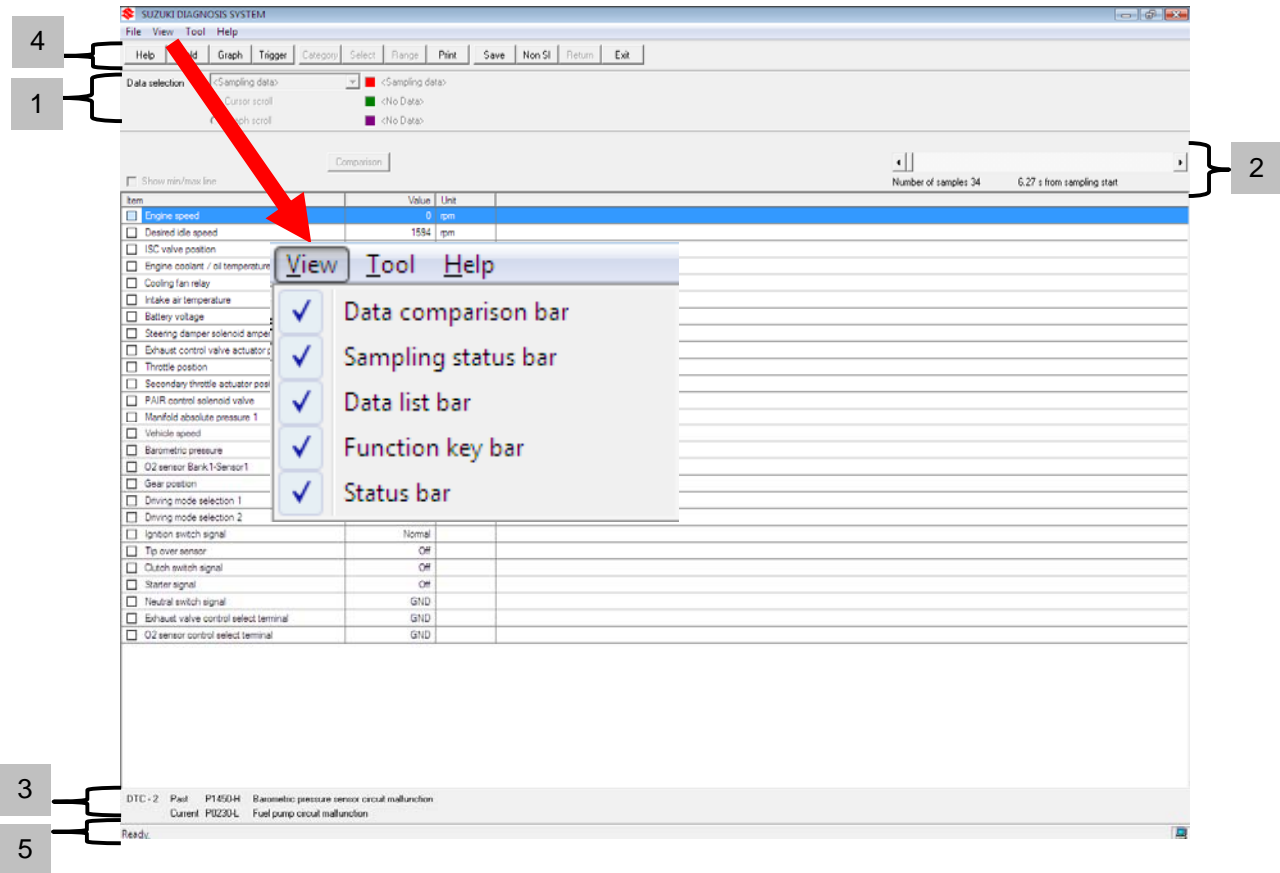
Explained on the next page.

View : Data comparison bar showing or hiding
 Sampling status bar showing or hiding
 Data list bar showing or hiding
 Function key bar showing or hiding
 Status bar showing or hiding

Tool : Option (Setup interface box, font, unit and language)
 Edit frame number

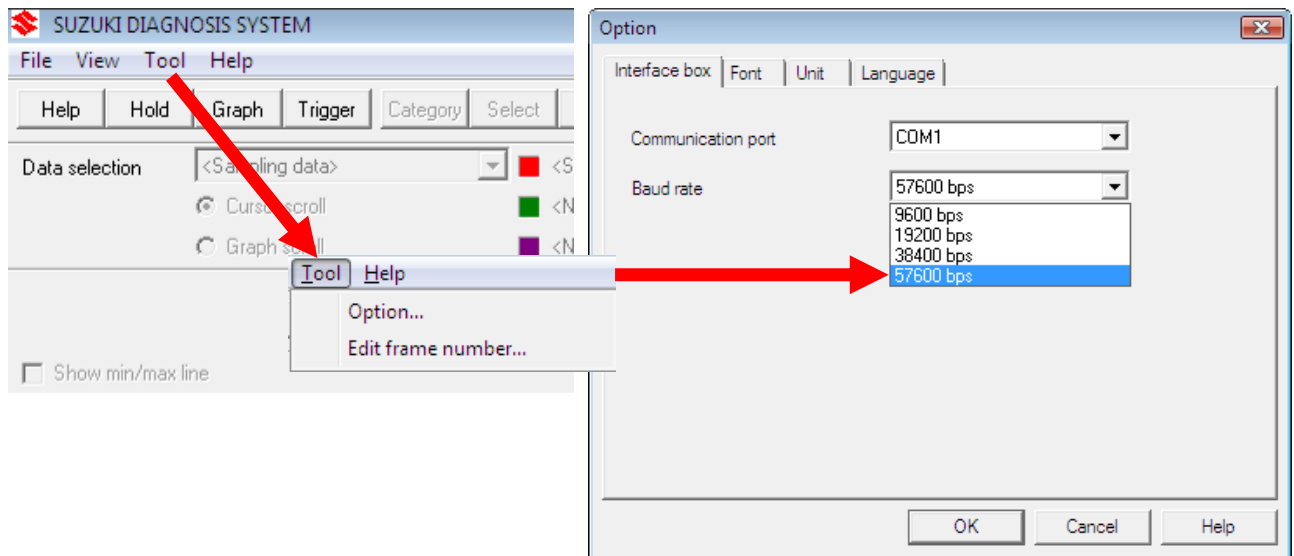
Help : About application
 Help document

MAIN PAGE - Data monitor - View



- 1. Data comparison bar** : Select to display or hide comparison data.
- 2. Sampling status bar** : Select to display or hide the number of samples and start time.
- 3. Data list bar** : Select to display or hide diagnostics trouble codes saved in the ECM.
- 4. Function key bar** : Select to display or hide various PC functions.
- 5. Status bar** : Select to display or hide the status bar.

MAIN PAGE - Tools - Options - Interface box



Port : In the case of a USB connection, select “USB”.

In the case of an RS-232C connection, select “COM1” – “COM4.”

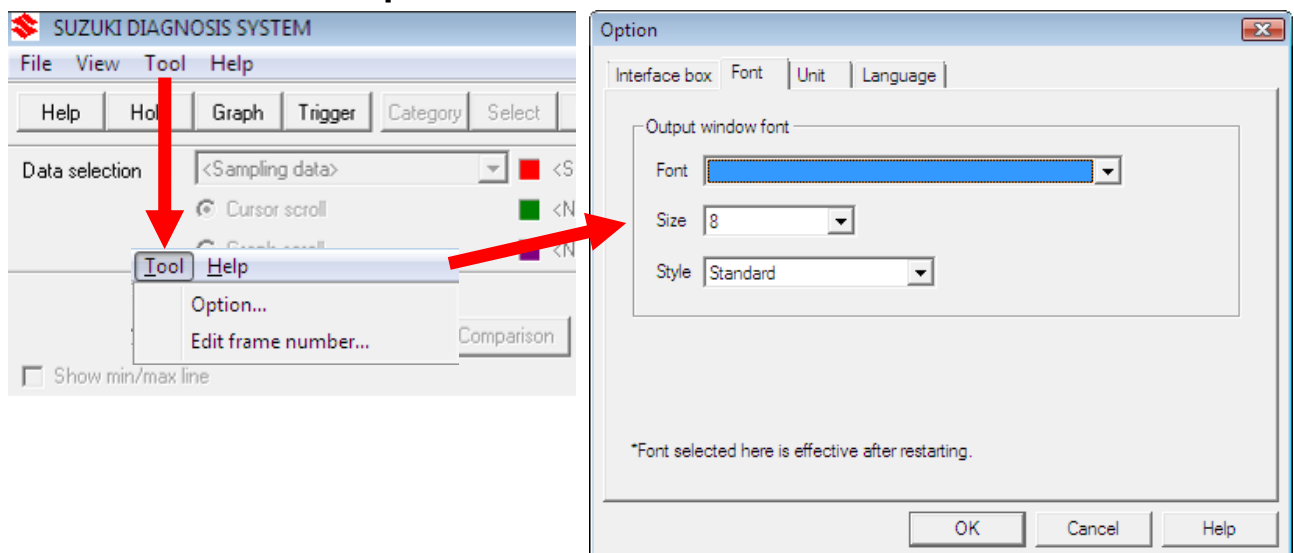
Baud rate : In the case of a USB connection, this does not need to be specified, and so cannot be selected.

In the case of an RS-232C connection, select “57600 bps” as the default value.

* When connecting the PC and the interface box, connect the cable to the communication port specified here.

Especially when selecting RS-232C, be careful not to confuse the COM port number.

MAIN PAGE - Tool - Option - Font



Font : Select the font from the list.

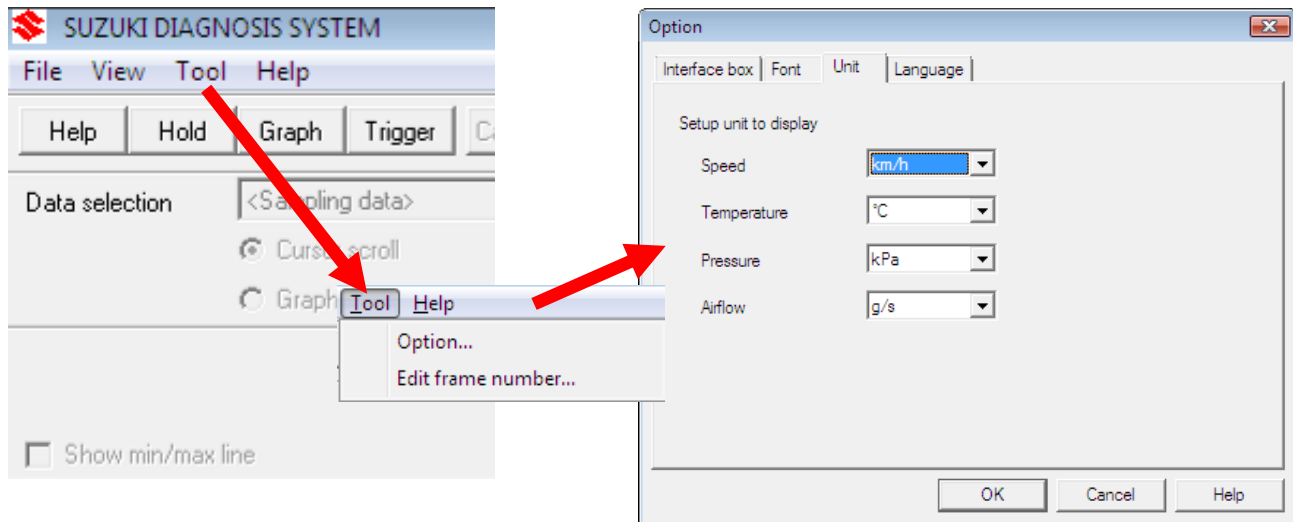
Size : Select the font size from the list.

Style : Select the font style.

Standard... A standard typeface is applied.

Bold... Bold face is applied.

MAIN PAGE - Tool - Option - Unit



Speed : Select the unit used in the speed related item.

km/h, MPH

Temperature : Select the unit used in the temperature related item.

°C, °F

Pressure : Select the unit used in the pressure related item.

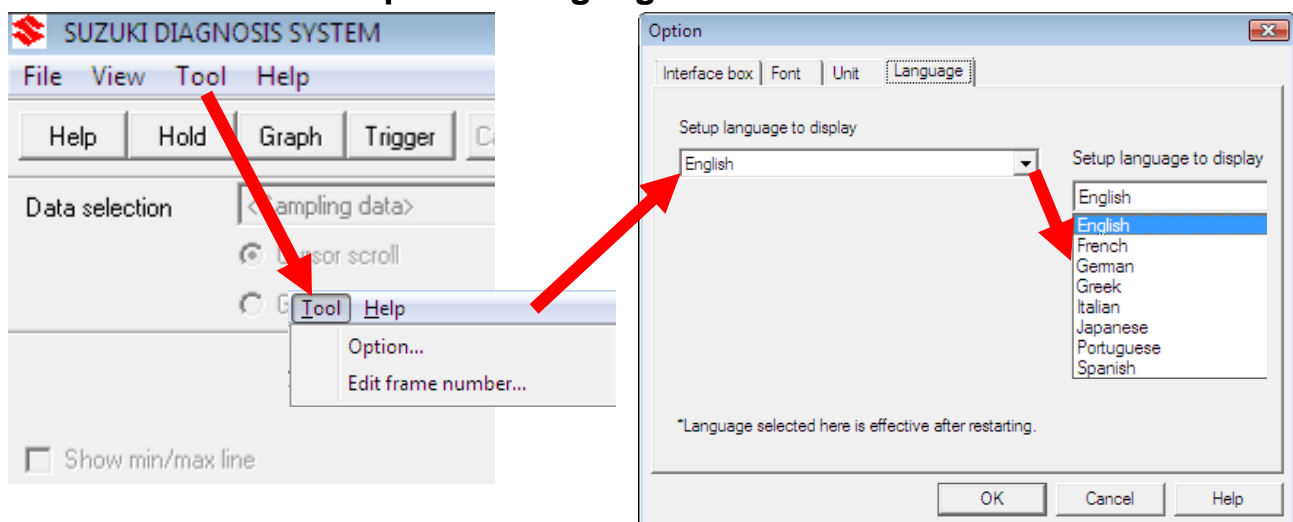
kPa, mmHg, inHg, psig

Airflow : Select the unit used in the airflow related item.

g/s, lb/min

* Default SI units are shown in bold.

MAIN PAGE - Tool - Option - Language

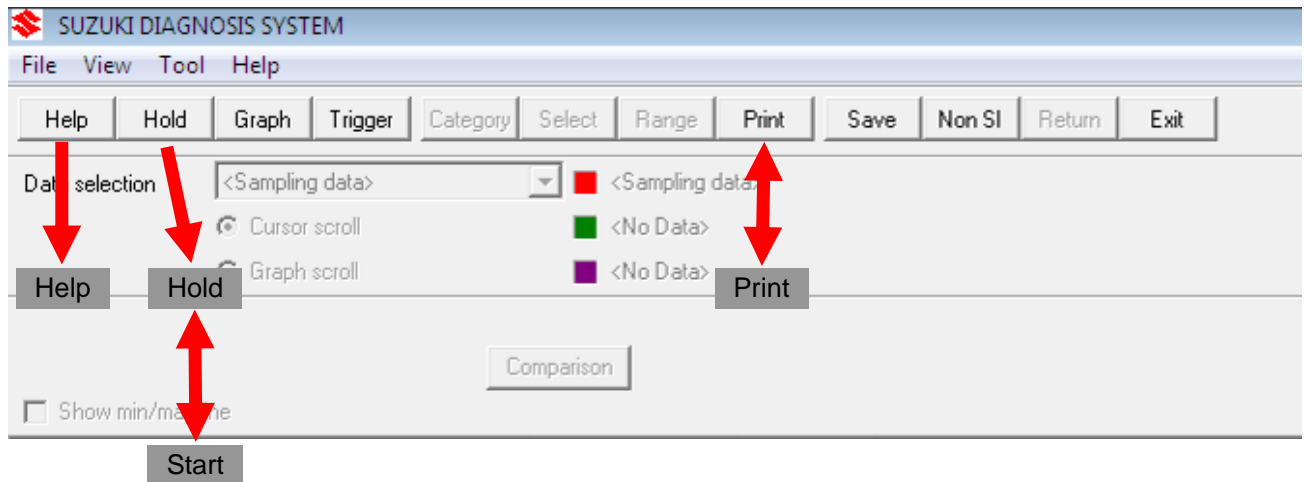


Select the language to use.

* Depending on the language and the environment used, the system may not show the proper display.

* The language selected here can be used from the next time the SUZUKI DIAGNOSIS SYSTEM is restarted.

MAIN PAGE - Data monitor - Function



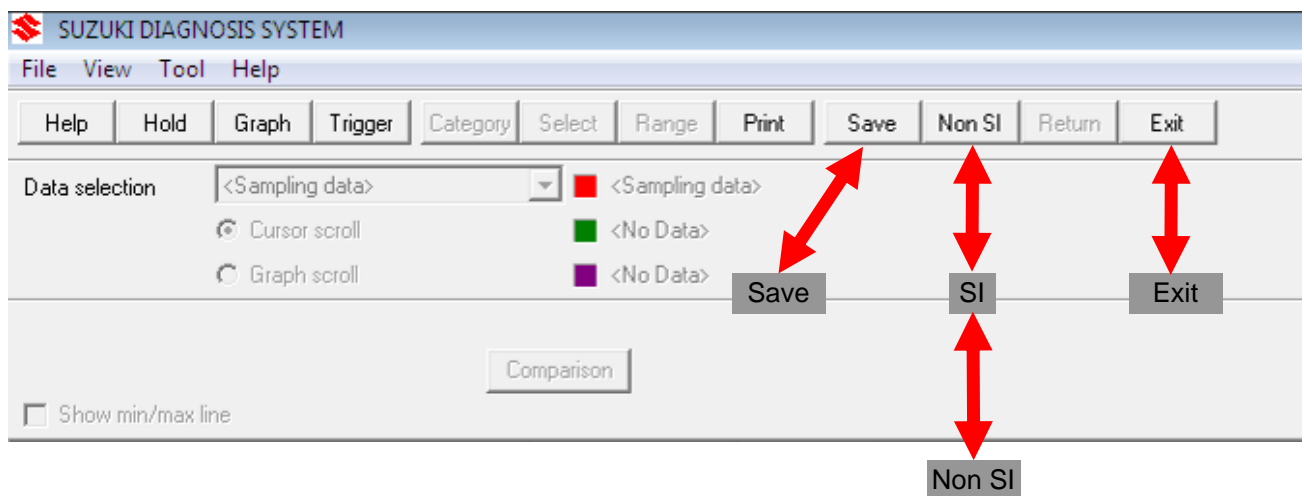
Help : Opens help documents.

Hold : Moves to Hold mode display.

Start : Moves to Run mode display.

Print : Executes printing.

When printing is executed, the display will be automatically changed to Hold mode.



Save : Saves the data.

SI : "SI" displayed - Regardless of the current unit setting, the display will be in km/h (speed), °C (temperature), kPa (pressure), and g/s (airflow).

"Non SI" displayed - In non SI, the unit changes to what has been selected in the unit setting. (If it does not change, restart the PC.)

Exit : Quits the data monitor and returns to "Failure diagnosis menu".

MAIN PAGE - Data monitor - Graph

SUZUKI DIAGNOSIS SYSTEM

File View Tool Help

Help F2 Numerical F4 Category Select Range Print F9 SI Return Exit

Data selection: RMX450Zcoldstart.pds (selected) RMX450Zcoldstart.pds (red)
 RMX450Zcoldstart2.pds (green)
 RMX450Zcoldstart3.pds (purple)

Comparison

Show min/max line

Item	Range	Graph
<input checked="" type="checkbox"/> Engine speed	10000	
0 rpm		
<input checked="" type="checkbox"/> Manifold absolute pressure 1	99.9	
100 kPa		

Select the display.

Numerical display ↔ Graph display

If “Show min/max line” checkbox is checked, the maximum and minimum lines for the graph selected will be displayed.

SUZUKI DIAGNOSIS SYSTEM

File View Tool Help

Help F2 Numerical F4 Category Select Range Print

Data selection: coldtohot.pds (selected) coldtohot.pds (red)
 <No Data> (green)
 <No Data> (purple)

Comparison

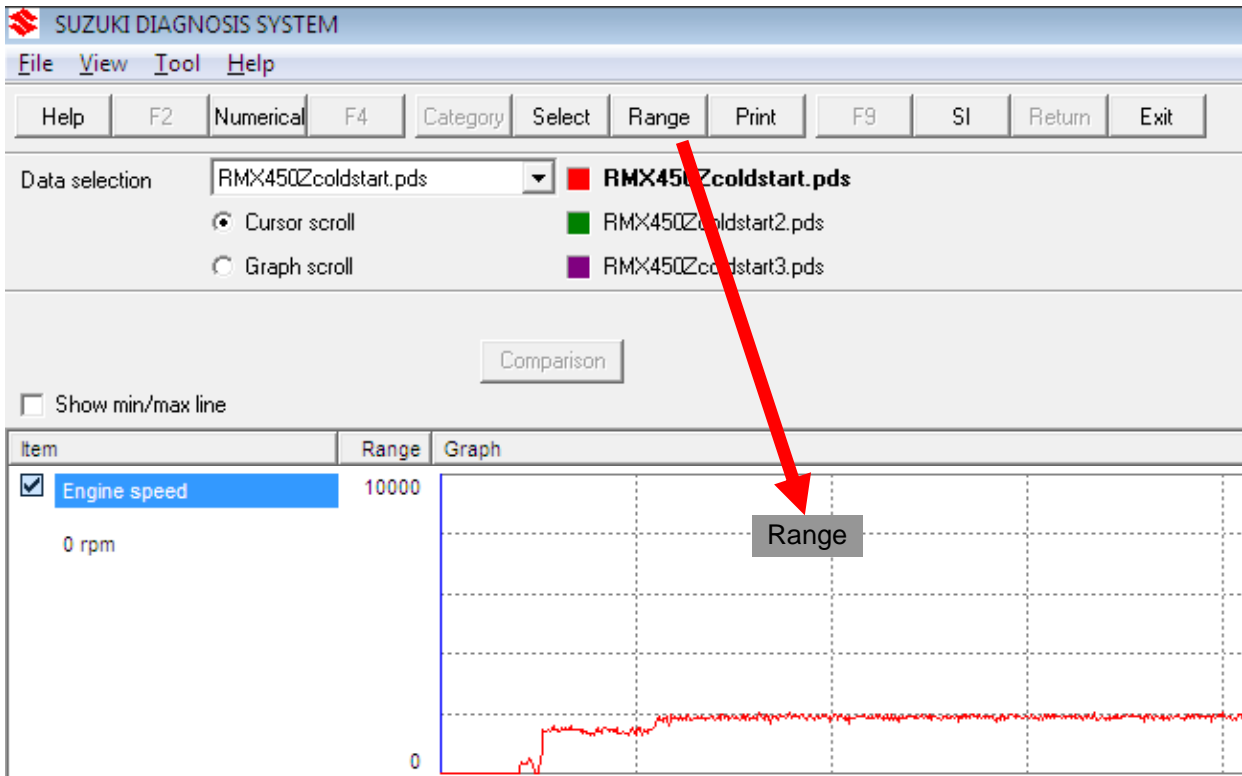
Show min/max line

Item	Range	Graph
<input checked="" type="checkbox"/> Manifold absolute pressure 1	100.1	
100.1 kPa		

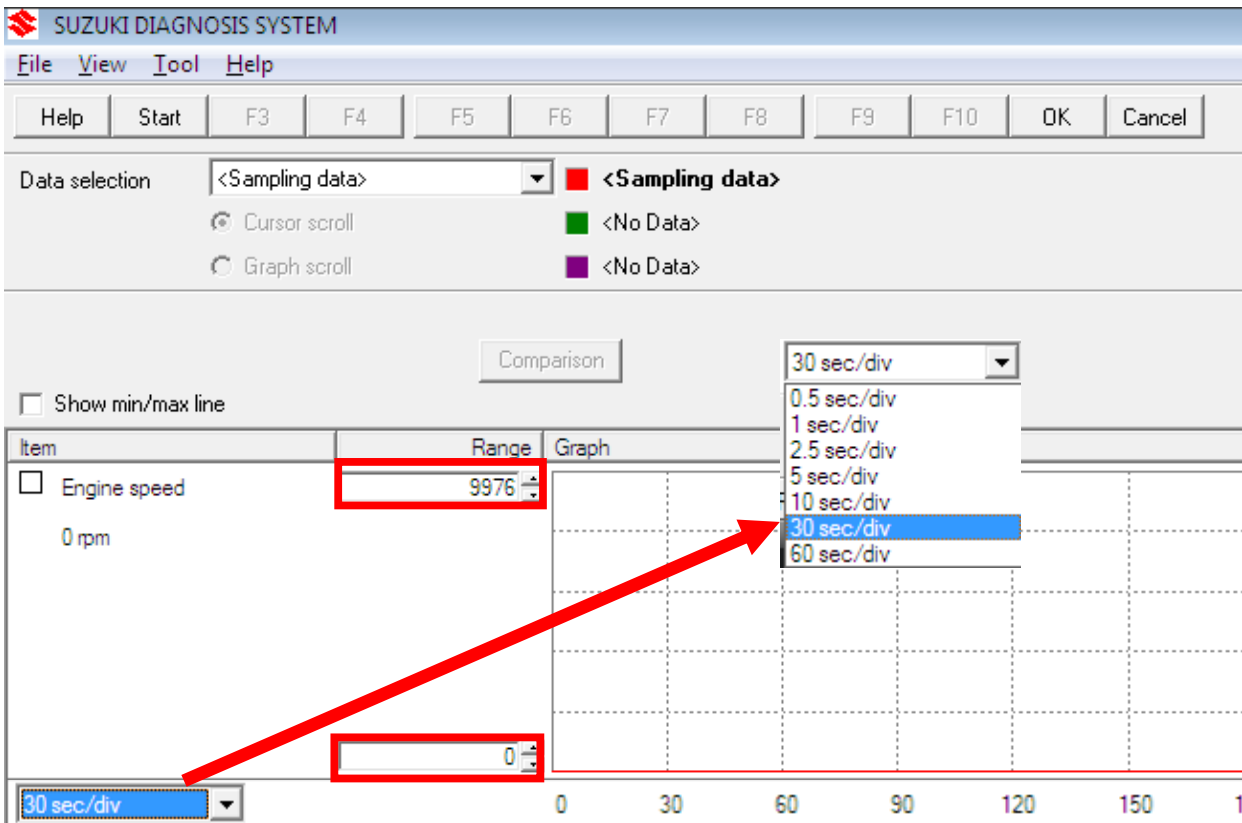
Max line

Min line

MAIN PAGE - Data monitor - Range

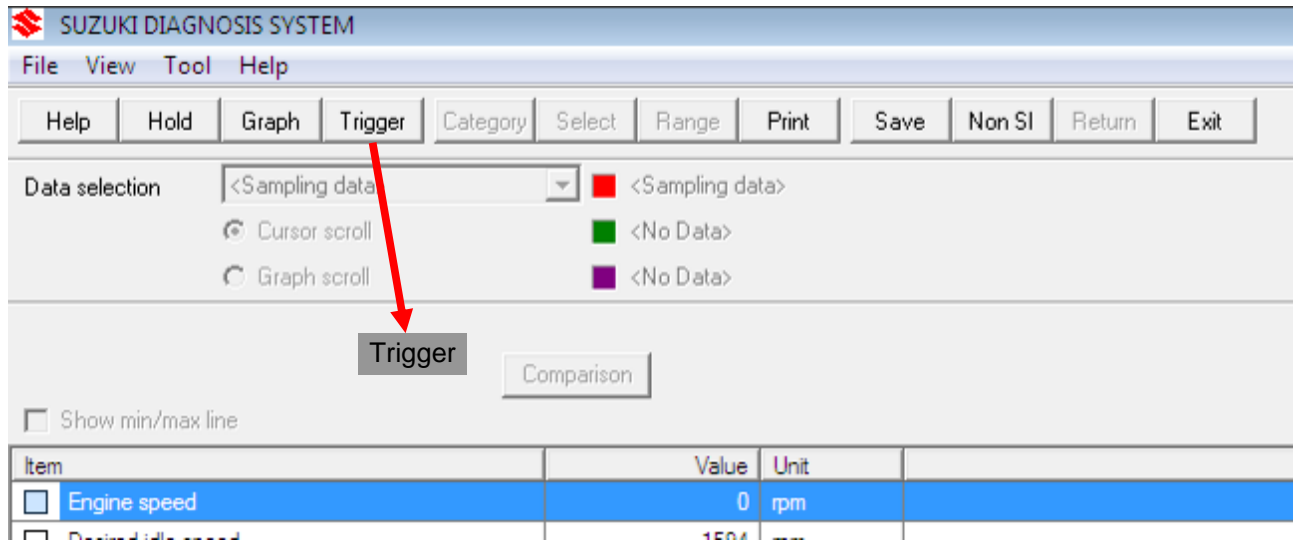


For each item, any vertical axis range can be set as desired.



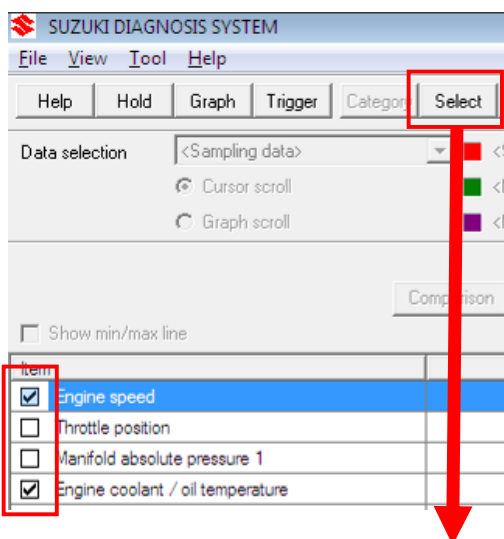
For each item, any horizontal axis range can be set as desired.
To set up the range, click OK.

MAIN PAGE - Data monitor - Trigger

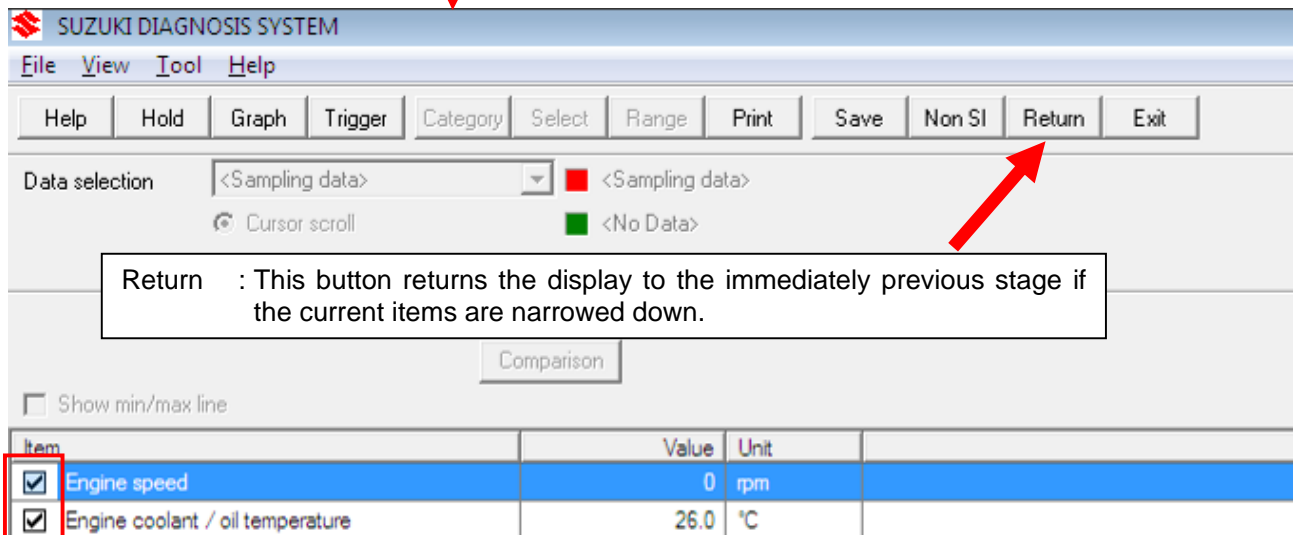


To set up or cancel the trigger, restart the trigger setup wizard.

MAIN PAGE - Data monitor - Select

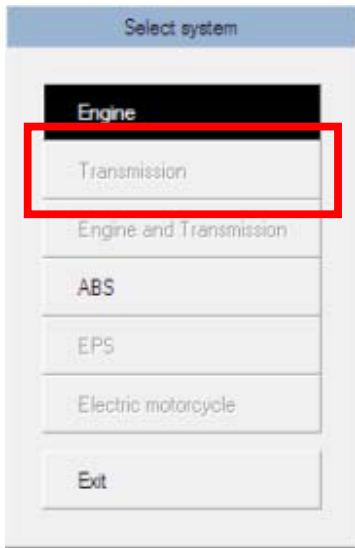


Select : This button re-displays the list by narrowing it down to select items, trigger items, and essential display items.



Return : This button returns the display to the immediately previous stage if the current items are narrowed down.

MAIN PAGE - Transmission



Transmission-related failure diagnosis

The operation of the PC is the same as the engine system troubleshooting.

PC operation of failure diagnosis for ABS, EPS, and Electric motorcycles is the same as for engine-related failure diagnosis.

SETUP TRIGGER

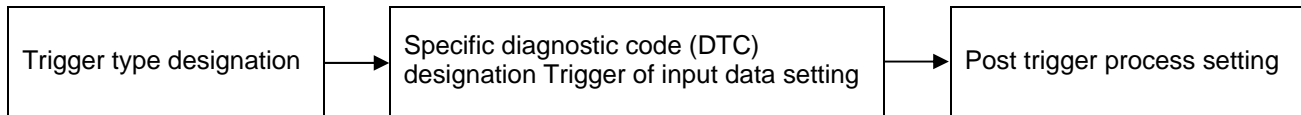
Set up the trigger to be used by the Data monitor.
Select the trigger from the five types listed below.

- Without trigger
- Any of DTC
- Specific DTC
- Trigger of input data
- Manual trigger

Trigger can record the timing of DTC display or can be operated as record start timing of the saved data.

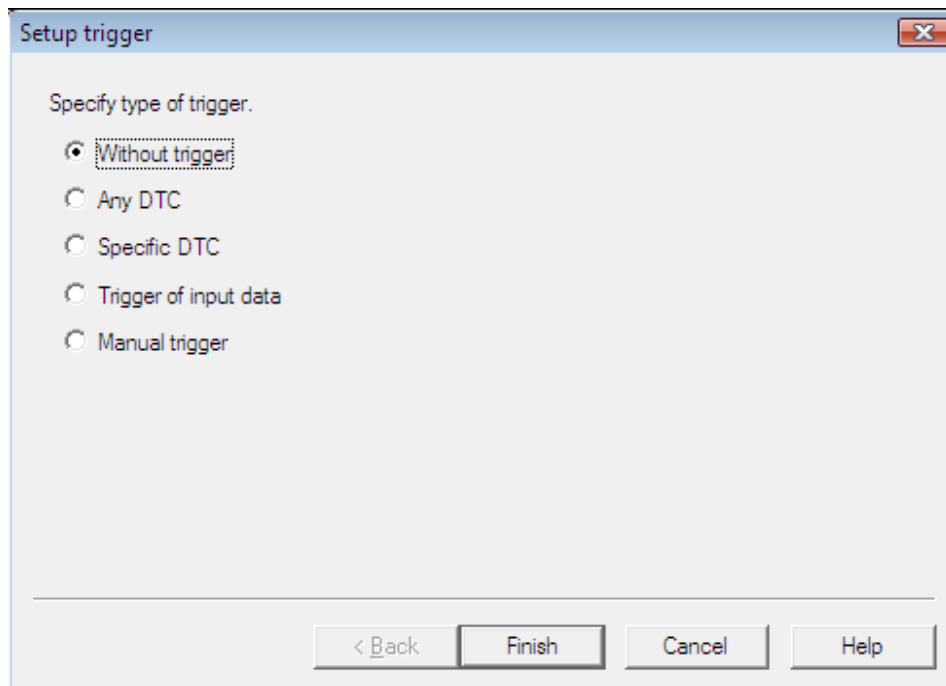
When the circumstances of the failure are not clear, it is necessary to determine the engine speed, throttle opening, and so on. at the time of the failure. The circumstances of the failure can be narrowed down by having the detected diagnostic code (DTC) memorized as a trigger. In addition, it is possible to set up the change of input data as a trigger.

The trigger setup is composed as shown below.



Trigger type designation

Select the trigger type as shown below.



SETTING

ITEM	DESCRIPTION
Without trigger	Voids trigger settings.
Any of DTC	Sets the change of the number of diagnostic codes detected in the vehicle as triggers.
Specific DTC	Sets a trigger when diagnostic code (DTC) designated on the Specific diagnostic code (DTC) designation page is detected in the vehicle.
Trigger of input data	Sets the change of input data (Data monitor item) value as a trigger. Details are set on the Trigger of input data setting page .
Manual trigger	Sets a trigger when the user presses the F2 key.

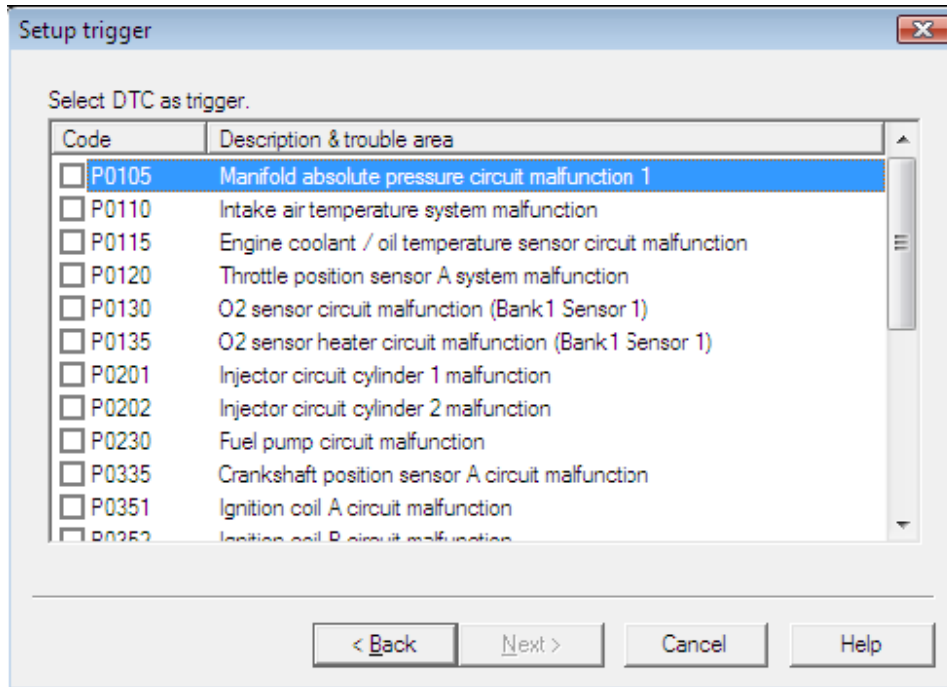
BUTTON OPERATION

BUTTON	PROCESS
Finish	Determines the designated trigger type and ends "Setup trigger". Only valid when "Without trigger" is selected.
Next	Moves to the next Trigger Setup Wizard page. Any of DTC Moves to Post trigger process setting page . Specific of DTC Moves to Specific diagnostic code (DTC) designation page . Trigger of input data Moves to Trigger of input data setting page . Manual trigger Moves to Post trigger process setting page .

Specific diagnostic code (DTC) designation

Select the specific diagnostic code as a trigger.

Clicking the checkbox on the left of the list enables switching between selected and unselected.



BUTTON OPERATION

BUTTON	PROCESS
Back	Return to <u>Trigger type designation page</u> .
Next	Moves to <u>Post trigger process setting page</u> .

Trigger of input data setting

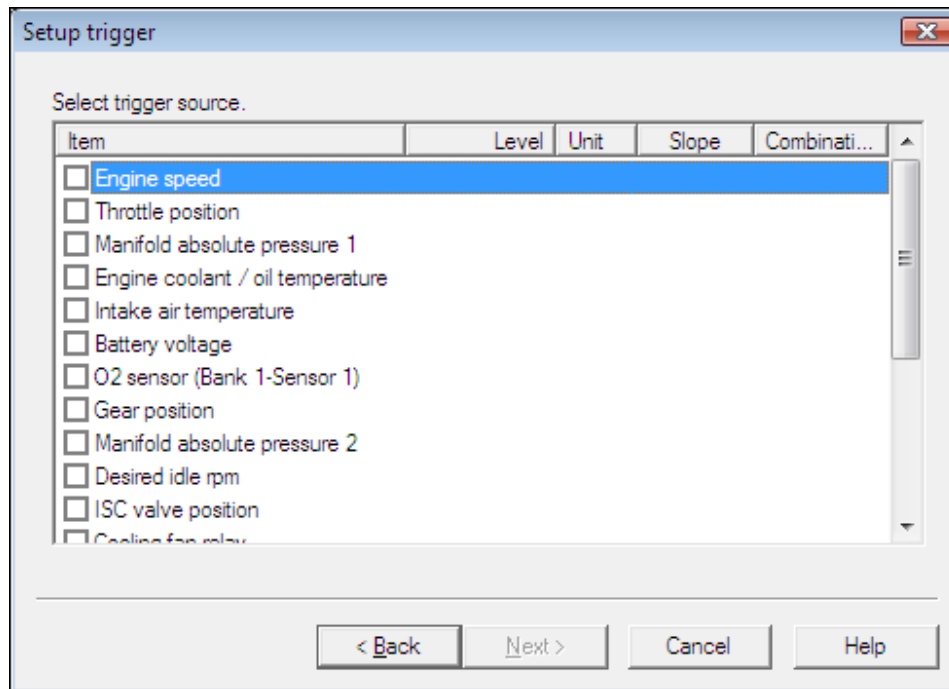
Select the trigger source for the input data trigger.

Clicking the checkbox on the left of the list enables switching between selected and unselected.

When an item is selected, the detail settings dialog will be displayed.

Numeric item selected Numeric item trigger setting dialog will be displayed.

Text item selected Text item trigger setting dialog will be displayed.



BUTTON OPERATION

BUTTON	OPERATION
Back	Returns to <u>Trigger type designation page</u> .
Next	Moves to <u>Post trigger process setting page</u> .

NUMERIC ITEM TRIGGER SETTING

Determine the detailed settings for the numeric item trigger used in Trigger of input data.

Setup trigger of input data

Trigger source: Engine speed

Level: 10000 rpm

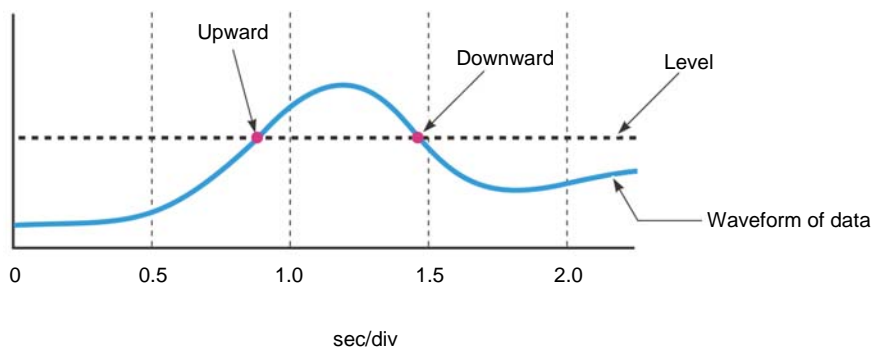
Slope condition: Upward Downward Both

Combined condition: OR AND

OK Cancel

SETTING

ITEM	SETTING	
Level	This sets up the level to be used as the threshold of the trigger.	
Slope condition	Upward	The trigger is performed when the value of the item rises from below "Level" and exceeds "Level".
	Downward	The trigger is performed when the value of the item falls from above "Level" and goes down past "Level".
	Both	The trigger is performed with either "Upward" or "Downward" above.
Combinations	OR	When an item specified with "OR" detects at least one trigger, trigger points are set, and after trigger samples are taken.
	AND	Only when all other items specified by "AND" detect triggers, trigger points are set, and after trigger samples are taken.



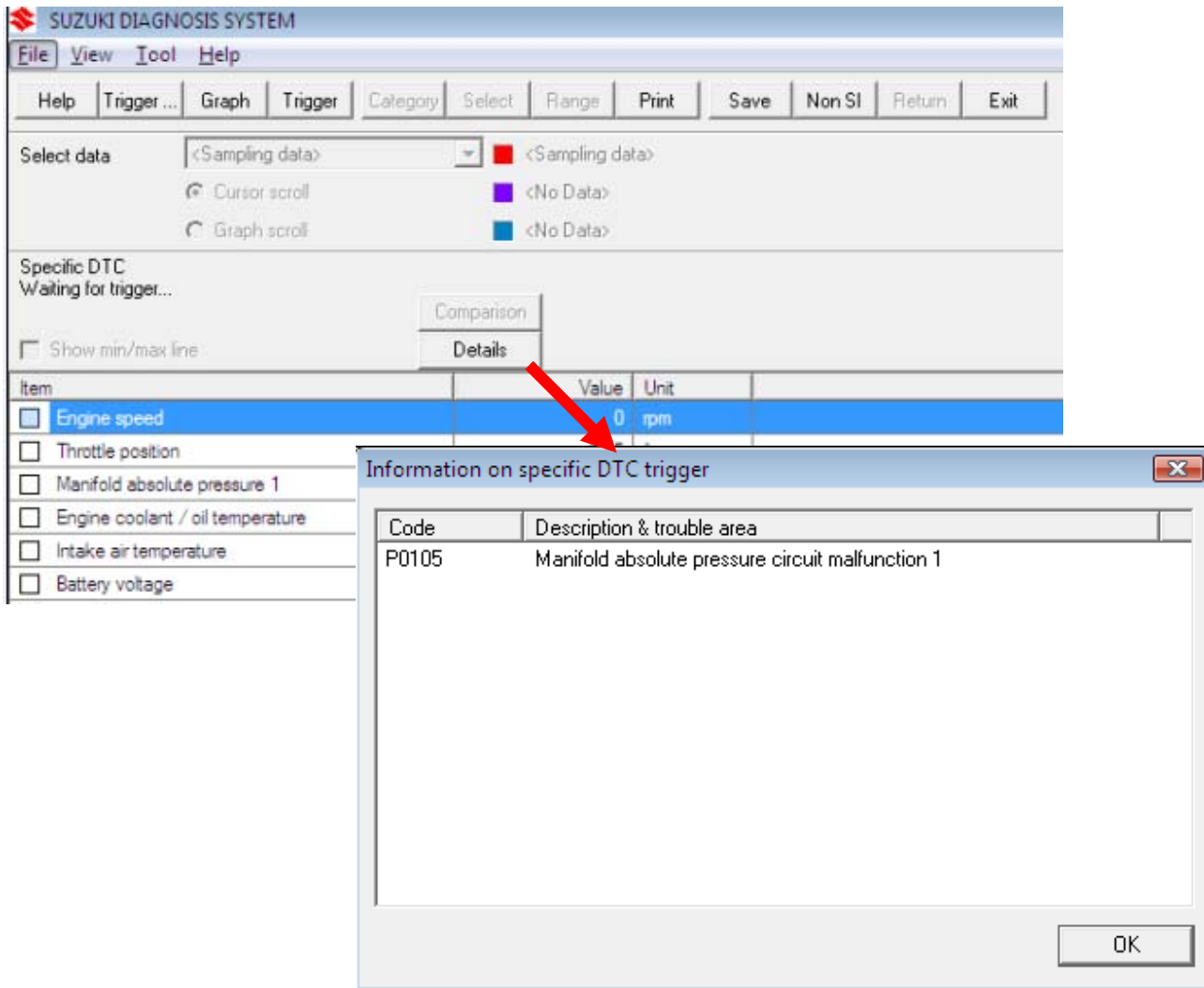
TEXT ITEM TRIGGER SETTING

Determine the detailed settings for a text item trigger used in Trigger of input data.

SETTING

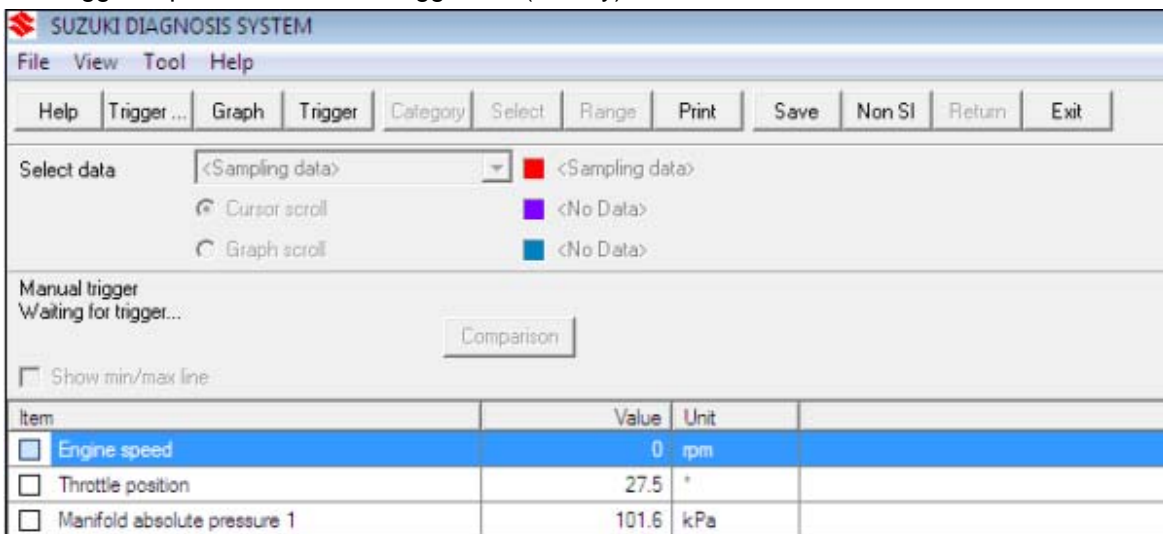
ITEM	SETTING	
Level	Designates the condition for trigger determination.	
Slope condition	ON	The trigger is performed when item value reaches the condition designated by "Level".
	OFF	The trigger is performed when item value deviates from the condition designated by "Level".
Combinations	OR	When an item specified with "OR" detects at least one trigger, a trigger point is set and an after trigger sample is taken.
	AND	Only when all other items specified by "AND" detect trigger, a trigger point is set and an after trigger sample is taken.

Confirm the trigger of input data in detail by clicking “Details”.



Manual trigger

The trigger is performed when “TriggerSw” (F2 key) is clicked.



After trigger process setting

Set up the process after trigger detection.

Setup trigger

Setup action after trigger.

Number of samples after trigger
50 (1 ~ 10000)

Trigger dot display in hold mode transit
3 Div (0 Div ~ 10 Div)

< Back Finish Cancel Help

SETTING VALUE

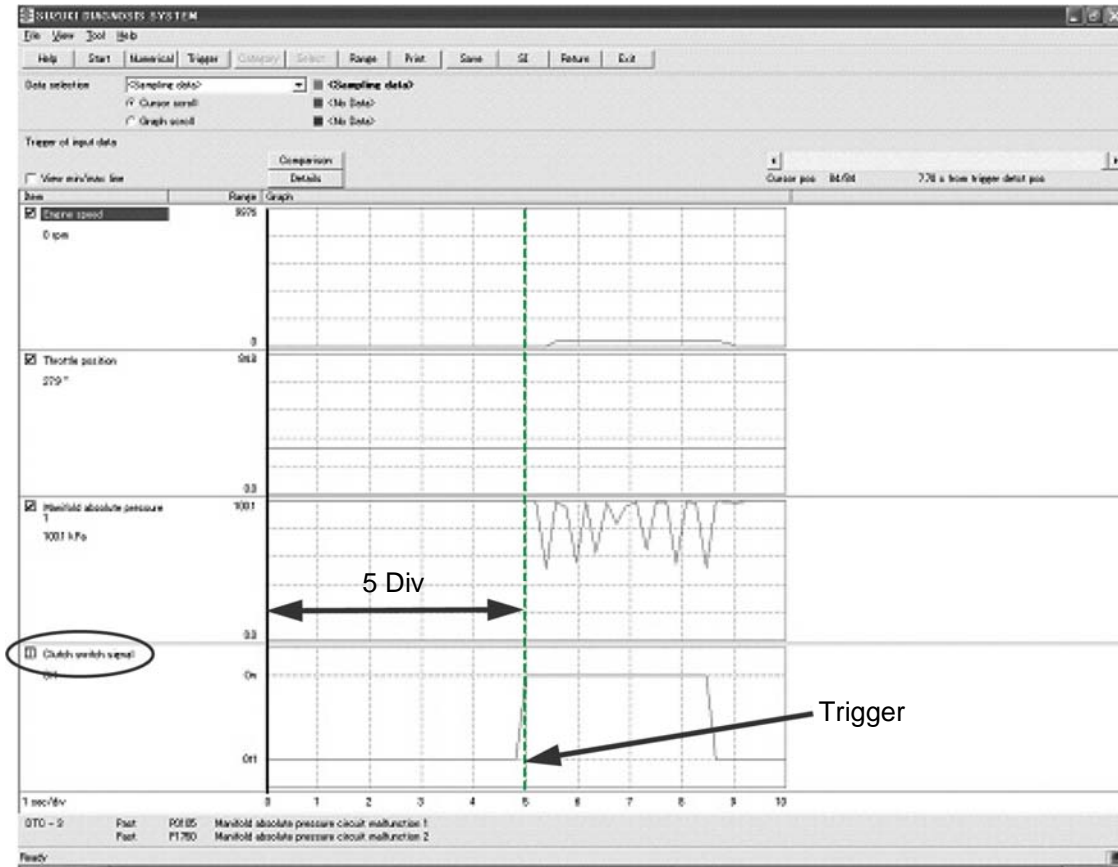
SETTING VALUE	DESCRIPTION
Number of samples after trigger	Designates the number of samples from after detection of a trigger to the end of sampling. One sampling takes 0.2 seconds (other than electric motorcycles) or 1.0 second (electric motorcycles).
Trigger dot display in hold mode transit	Automatically moves to Hold mode when sampling ends after trigger. At this time, designate in which point of the graph the trigger point is displayed. Number of Div stands for number of scale marks.

Confirm the trigger settings and close the window by clicking "Finish".

If the window is closed, all previous sampling data will be cleared and the sampling is restarted in Run mode.

SAMPLE DISPLAY OF TRIGGER POINT

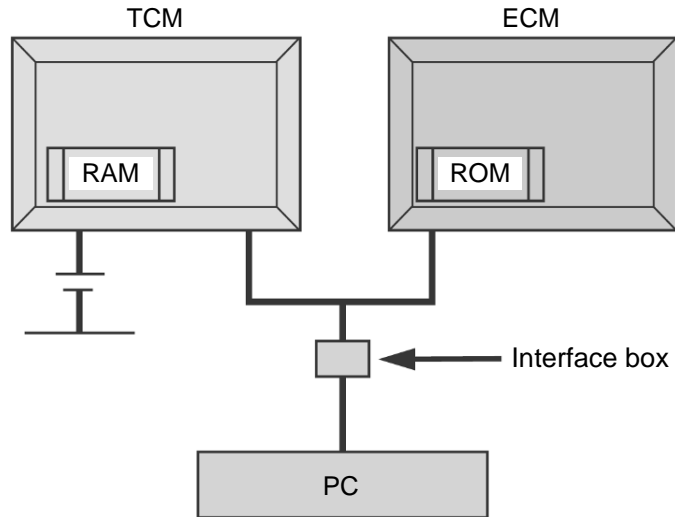
The following shows a sample display of the trigger point when the clutch switch signal is selected as a trigger and the trigger dot display is set to 5 Div.



* The trigger point is shown at the green dotted line in the graph.

DIAGNOSTIC TROUBLE CODE INSPECTION

DTC history



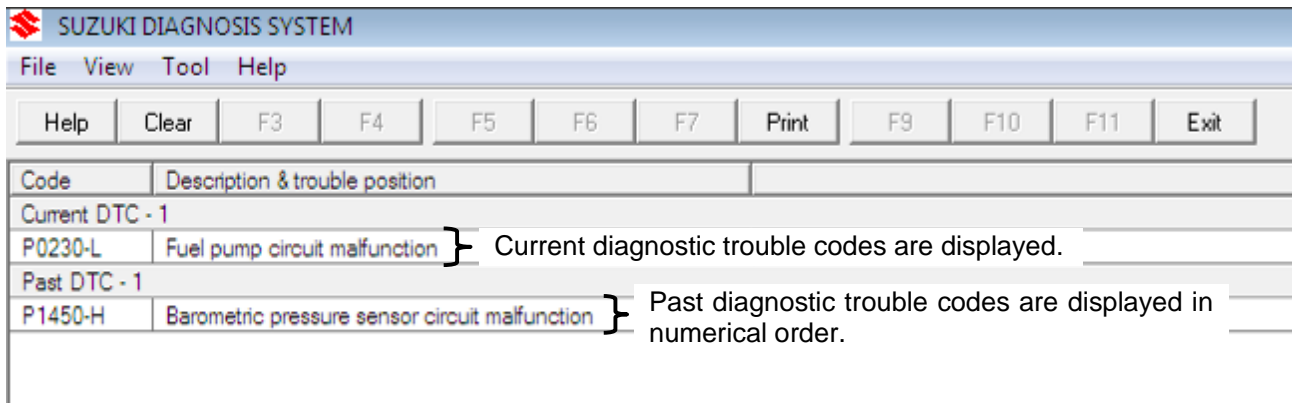
ECM integrating ROM can keep DTC data in its memory even with the battery disconnected. The TCM integrating RAM, however, loses the memorized DTC data once the battery has been disconnected, so use caution.

Make sure to take note or print out the DTC of the TCM (Transmission) before disconnecting the battery.



Click "DTC inspection" and the DTC history window will be displayed.

Diagnostic trouble code history display



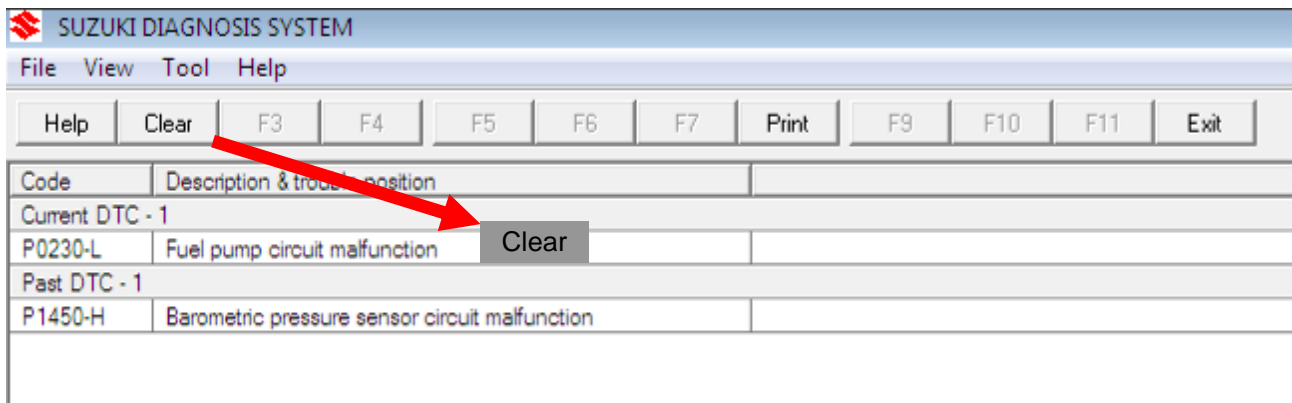
The screenshot shows the Suzuki Diagnosis System interface. At the top, there is a menu bar with 'File', 'View', 'Tool', and 'Help'. Below the menu bar is a toolbar with buttons for 'Help', 'Clear', 'F3', 'F4', 'F5', 'F6', 'F7', 'Print', 'F9', 'F10', 'F11', and 'Exit'. The main display area is divided into sections for 'Current DTC - 1' and 'Past DTC - 1'. The 'Current DTC - 1' section shows a code 'P0230-L' with the description 'Fuel pump circuit malfunction'. The 'Past DTC - 1' section shows a code 'P1450-H' with the description 'Barometric pressure sensor circuit malfunction'. A red bracket on the right side of the 'Current DTC - 1' section indicates that current diagnostic trouble codes are displayed. Another red bracket on the right side of the 'Past DTC - 1' section indicates that past diagnostic trouble codes are displayed in numerical order.

Code	Description & trouble position
Current DTC - 1	
P0230-L	Fuel pump circuit malfunction
Past DTC - 1	
P1450-H	Barometric pressure sensor circuit malfunction

Past diagnostic trouble codes will not be displayed in order of occurrence.

Note: The date of trouble cannot be identified.

Clearing diagnostic trouble code history



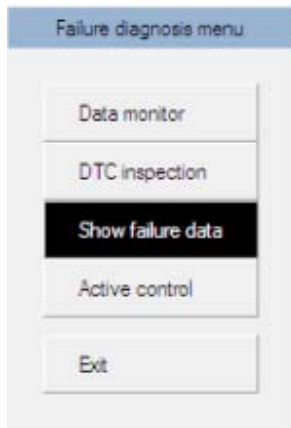
The screenshot shows the Suzuki Diagnosis System interface, similar to the previous one. The 'Clear' button in the toolbar is highlighted with a red arrow pointing to it. The main display area shows the same diagnostic trouble code history as in the previous screenshot.

Code	Description & trouble position
Current DTC - 1	
P0230-L	Fuel pump circuit malfunction
Past DTC - 1	
P1450-H	Barometric pressure sensor circuit malfunction

To clear past diagnostic trouble codes, click the "Clear" button.

After turning the ignition switch (main key switch) OFF, the codes are saved to the controller.

DISPLAYING DATA AT THE TIME OF TROUBLE



Click "Show failure data", and the window shown below will be displayed.

The first and second failures can be identified. Note: The date of trouble cannot be identified.

The screenshot shows a window for displaying failure data. At the top, there is a dropdown menu labeled "Failure #1" with a red box around it and a red arrow pointing to it. Below this, the text "P0110-H Intake air temperature circuit malfunction" is displayed. A table follows, with the first column highlighted by a black box and a red arrow pointing to a detailed view of that column below.

Item	Pre-detect	Detect point	Post-detect	Fix point	Cycle Min	Cycle Max	Unit
Engine speed	0	0	0	0	0	0	rpm
Throttle position	27.9	27.9	27.9	27.9	27.9	27.9	°
Manifold absolute pressure 1	69.4	69.4	103.6	126.4	69.4	126.4	kPa
Engine coolant / oil temperature	22.0	22.0	22.0	22.0	22.0	22.0	°C
Gear position	Neutral pos	Neutral pos	Neutral pos	Neutral pos	Neutral pos	Neutral pos	
Secondary throttle actuator position sensor	91.4	91.4	96.9	47.8	47.8	100.0	%
Manifold absolute pressure 2	102.1	102.1	102.1	102.1	102.1	102.1	kPa

The detailed view below shows a list of items with "Engine speed" selected and highlighted in blue:

- Item
- Engine speed
- Throttle position
- Manifold absolute pressure 1
- Engine coolant / oil temperature
- Gear position
- Secondary throttle actuator position sensor
- Manifold absolute pressure 2

In this window, the data at the time of trouble can be checked.

The data before and after trouble is detected can be checked.

SUZUKI DIAGNOSIS SYSTEM

File View Tool Help

Help F2 F3 F4 F5 F6 F7 Print F9 Non SI F11 Exit

Failure #1

P1C06 D-axis overcurrent

Item	Fix point	100ms bef...	200ms bef...	300ms bef...	Cycle Min	Cycle Max	Unit
Vehicle speed	15	---	---	---	---	---	km/h
Center stand switch	Off	---	---	---	---	---	
Battery voltage	51.87	51.87	51.87	51.87	51.56	56.37	V
Battery total capacity	14334	---	---	---	---	---	mAh
Battery remaining capacity	8718	---	---	---	---	---	mAh
EV controller temperature	33	---	---	---	---	---	°C
Inverter temperature	43	---	---	---	---	---	°C
Hall IC temperature	70	---	---	---	---	---	°C
Battery temperature 1	27	---	---	---	---	---	°C
For Electric motorcycles	27	---	---	---	---	---	°C

For other than Electric motorcycles

Pre-detect	Detect point	Post-detect	Fix point	Cycle Min	Cycle Max	Unit
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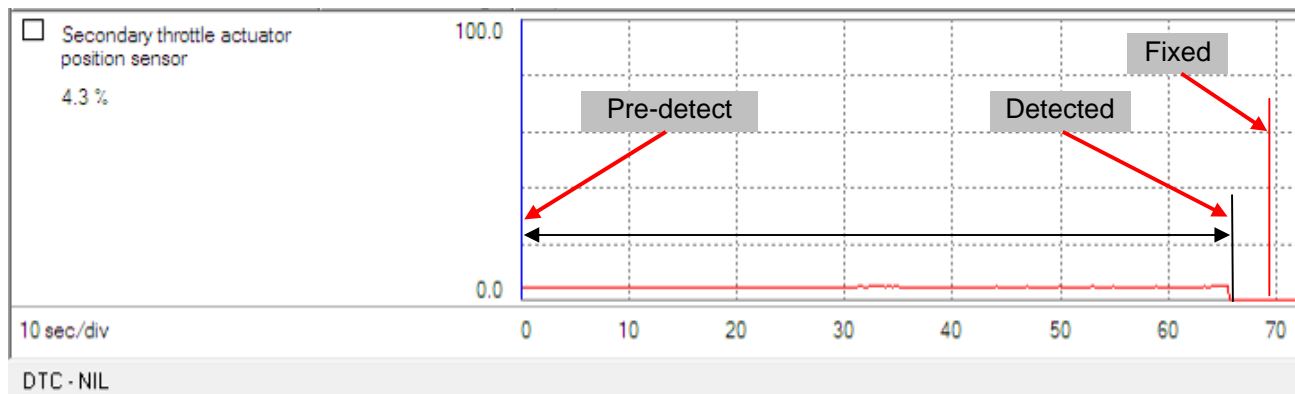
Interpreting failure data

Failure #1

P1654-L Secondary throttle actuator position sensor circuit malfunction

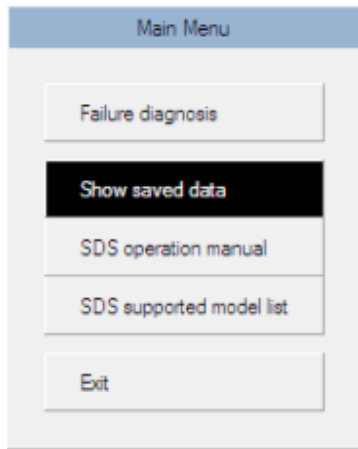
Item	Pre-detect	Detect point	Post-detect	Fix point	Cycle Min	Cycle Max	Unit
Vehicle speed	0.0	0.0	0.0	0.0	0.0	0.0	km/h
Engine speed	0	0	0	0	0	0	rpm
Throttle position	27.5	27.5	27.5	27.5	27.5	27.5	°
Manifold absolute pressure 1	100.9	100.9	100.9	100.9	100.9	100.9	kPa
Engine coolant / oil temperature	25.2	25.2	25.2	25.2	24.6	25.2	°C
Gear position	N	N	N	N	N	N	N
Secondary throttle actuator position sensor	5.1	0.0	0.0	0.0	0.0	100.0	%
Exhaust control valve actuator position sensor	55.3	56.1	56.1	56.1	3.5	100.0	%

This is the sensor output values waveform. A failure is determined when it is detected as outside the normal range and it is not compensated to within the specified range after several seconds.

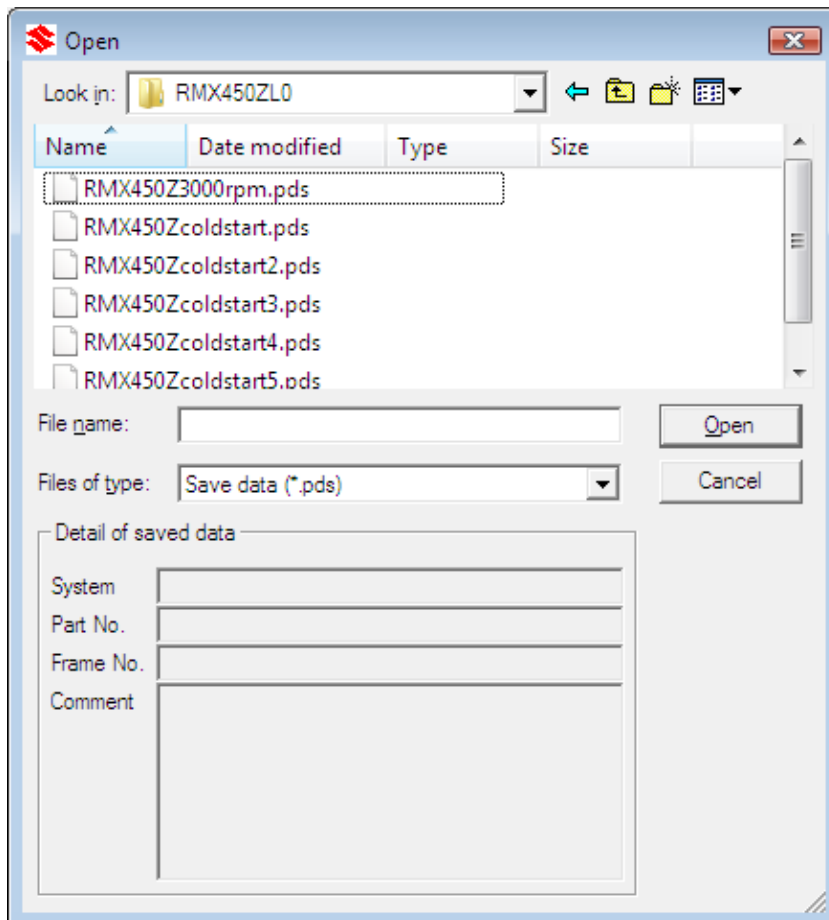


INSPECTION BY COMPARISON OF SAVED DATA

Click "Show saved data" in "Select system" screen.

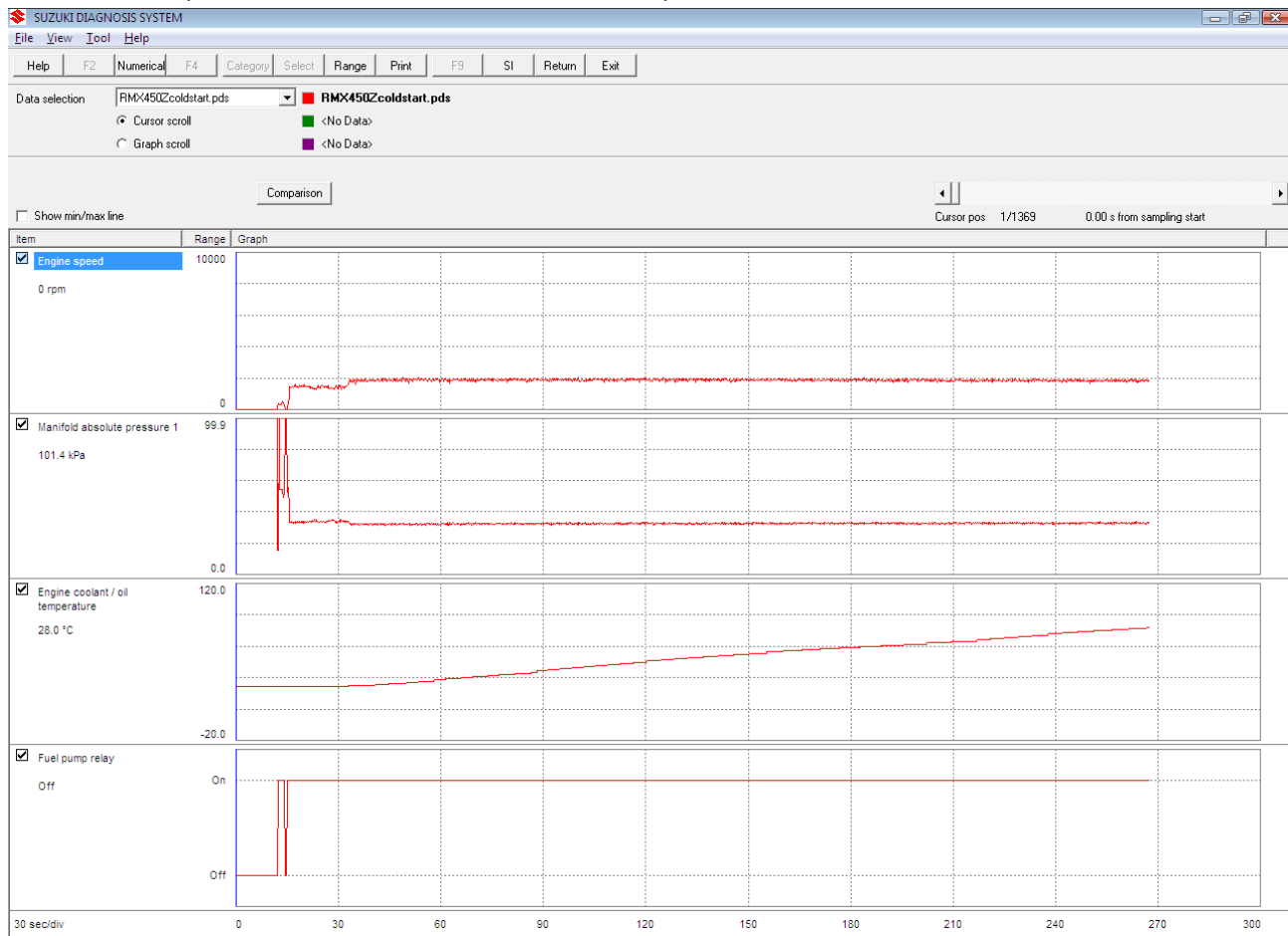


Select and open the first data.

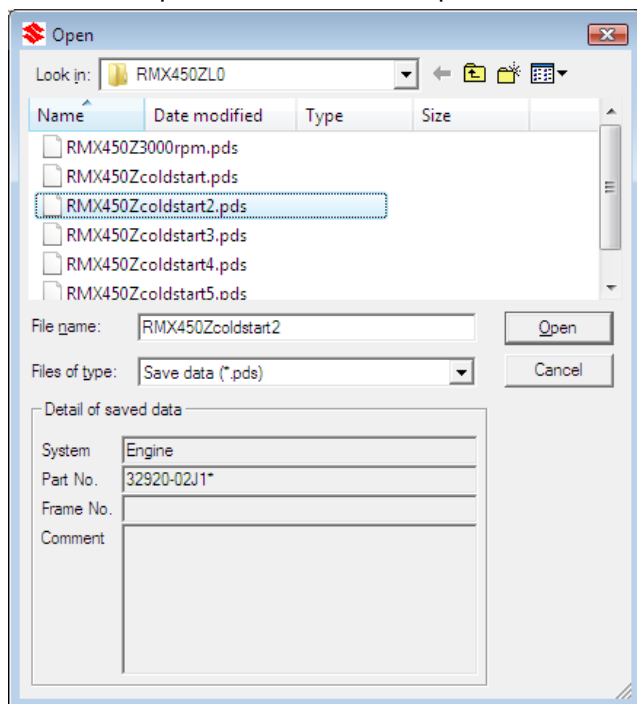


Note: Clicking the hold button on the data monitor screen activates the comparison button to compare measured data with the saved data.

Click the “Comparison” button to select data to be compared.

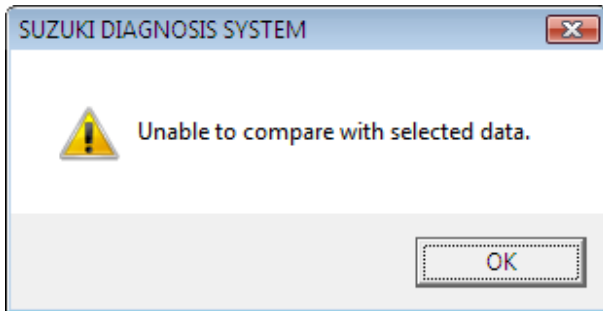


Select and open the data to be compared.

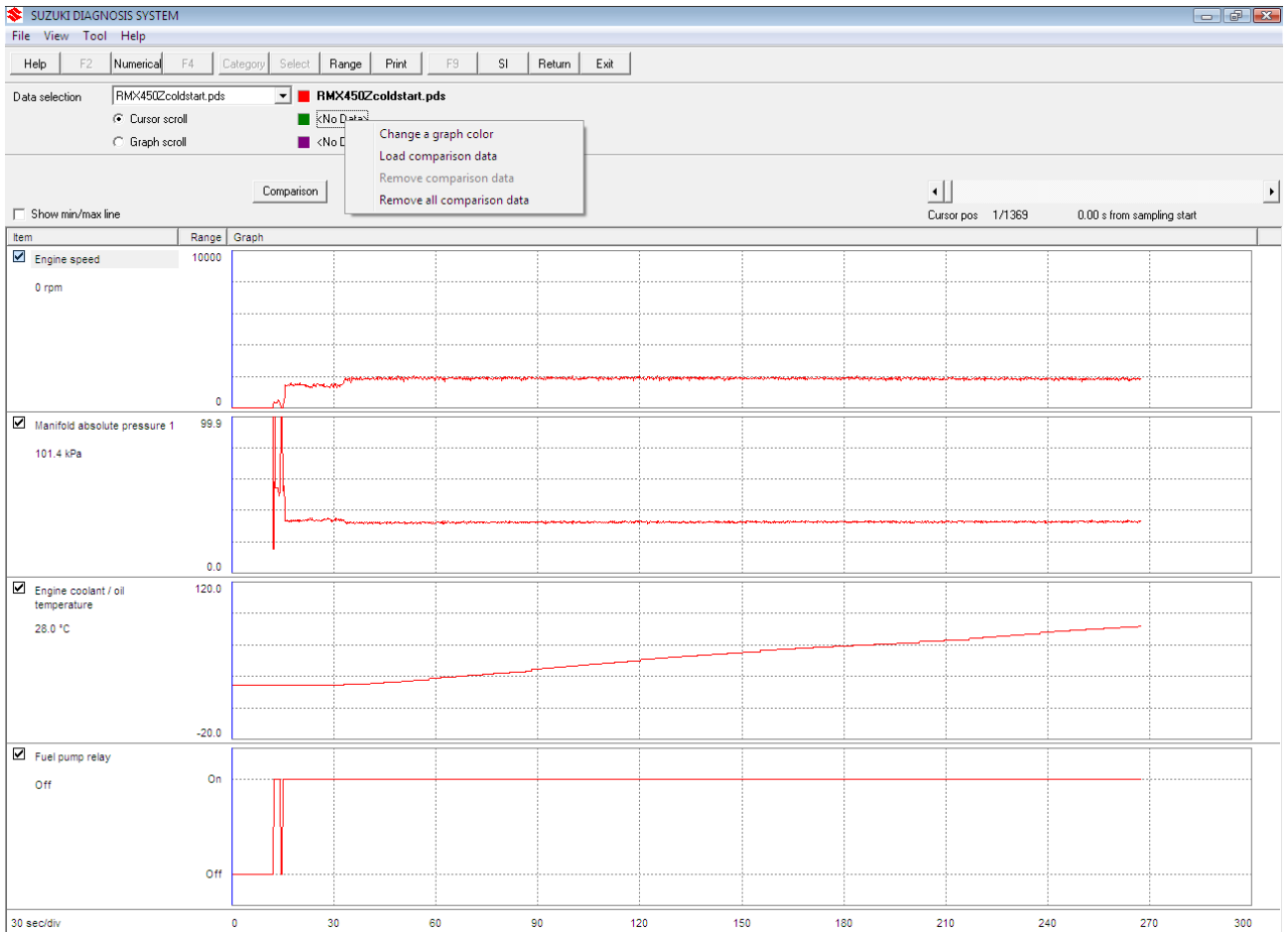


Note: Up to two data units to be compared can be selected.

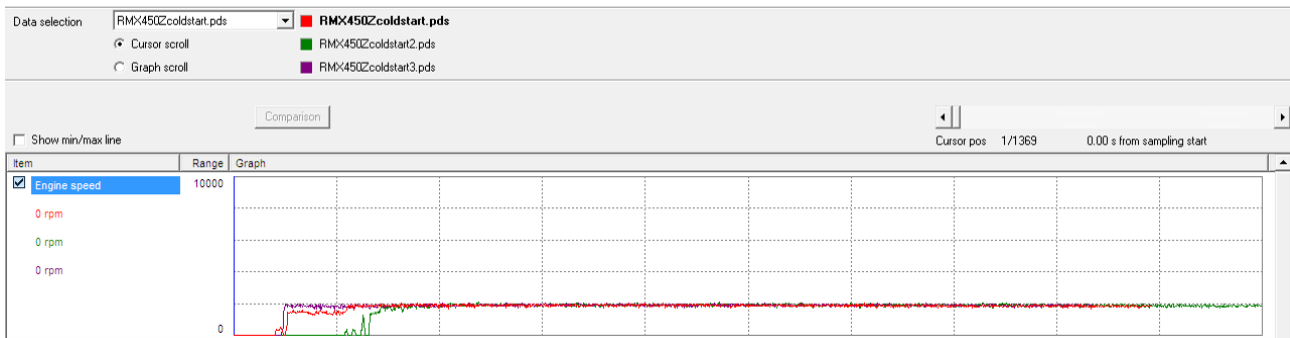
Note: If there is any discrepancy in system or model type between the stored data selected and the initial data, the following message will be displayed.



Right-clicking the file name displays the context menu, making it possible to "Change a graph color", "Load comparison data," and "Remove comparison data".



After all of the data selections are completed, the overlaying point of each graph is determined, and the most right-hand overlaying point on the screen is displayed.

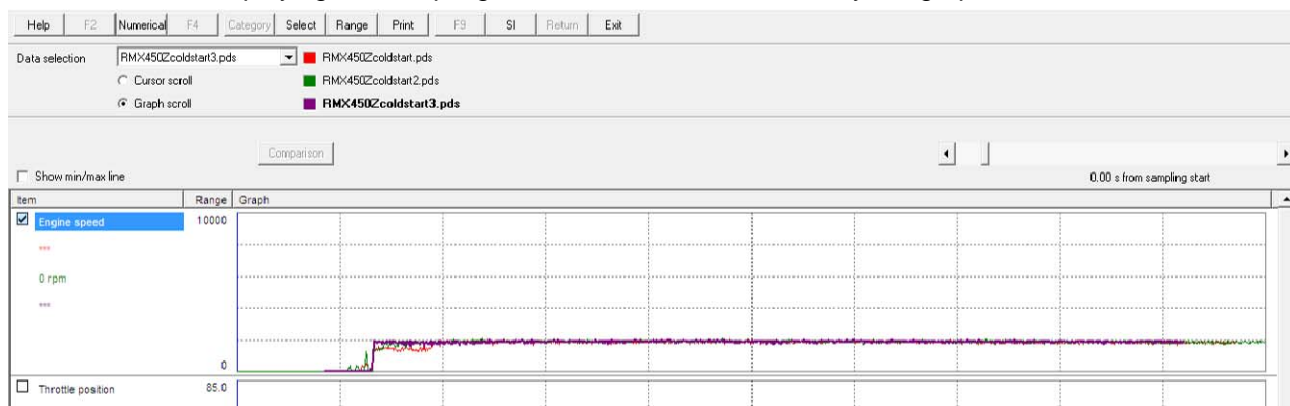


Click the graph scroll radio button to move the graph.

The graph of the data selected will be highlighted.

Select the data of graph to be moved from the drop-down list.

Move the cursor displaying the sampling time with the mouse to overlay the graphs.



After all graphs have been overlaid, click the radio button for cursor scroll.

Move the cursor to the point where the values are compared.

The value at the cursor will be shown below the item.

