

IMPORTANT

WARNING/CAUTION/NOTE

Please read this manual and follow its instructions carefully. To emphasize special information, the words

⚠ WARNING, **⚠ CAUTION** and **NOTE** have special meanings. Pay special attention to the messages highlighted by these signal words.

⚠ WARNING

Indicates a potential hazard that could result in death or injury.

⚠ CAUTION

Indicates a potential hazard that could result in vehicle damage.

NOTE:

Indicates special information to make maintenance easier or instructions clearer.

⚠ WARNING

This service manual is intended for authorized Suzuki dealers and qualified service technicians only. Inexperienced technicians or technicians without the proper tools and equipment may not be able to properly perform the services described in this manual.

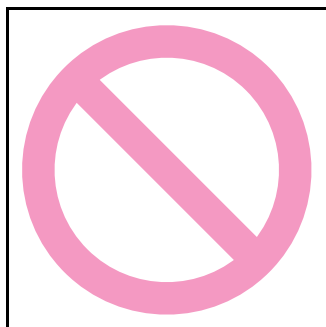
Improper repair may result in injury to the technician and may render the vehicle unsafe for the driver and passengers.

⚠ WARNING

For vehicles equipped with a Supplemental Restraint (Air Bag) System:

- Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to “Air Bag System Components and Wiring Location View” under “General Description” in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and “Service Precautions” under “On-Vehicle Service” in air bag system section before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.
 - If the air bag system and another vehicle system both need repair, Suzuki recommends that the air bag system be repaired first, to help avoid unintended air bag system activation.
 - Do not modify the steering wheel, instrument panel or any other air bag system component on or around air bag system components or wiring. Modifications can adversely affect air bag system performance and lead to injury.
 - If the vehicle will be exposed to temperatures over 93 °C (200 °F), for example, during a paint baking process, remove the air bag system components, that is air bag (inflator) modules, SDM and/or seat belt with pretensioner, beforehand to avoid component damage or unintended activation.
-

The circle with a slash in this manual means “Don’t do this” or “Don’t let this happen”.



FOREWORD

This SUPPLEMENTARY SERVICE MANUAL is a supplement to SX4 (RW415/RW416) SERVICE MANUAL. It has been prepared exclusively for the following applicable model.

Applicable model:

SX4 (RW415) HONG KONG model

This supplementary service manual describes only different service information of the above applicable model as compared with SX4 (RW415/RW416) SERVICE MANUAL. Therefore, whenever servicing the above applicable models, consult this supplement first. And for any section, item or description not found in this supplement, refer to the related manual below.

When replacing parts or servicing by disassembling, it is recommended to use SUZUKI genuine parts, tools and service materials as specified in each description.

All information, illustrations and specifications contained in this literature are based on the latest product information available at the time of publication approval. And used as the main subject of description is the vehicle of standard specifications among others.

Therefore, note that illustrations may differ from the vehicle being actually serviced.

The right is reserved to make changes at any time without notice.

Related Manuals:

Manual Name	Manual No.
SX4 (RW415/RW416) SERVICE MANUAL	99500-52L00-01E

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RECOMMENDATION OF GENUINE SUZUKI PARTS AND ACCESSORIES USE

SUZUKI strongly recommends the use of genuine SUZUKI parts* and accessories. Genuine SUZUKI parts and accessories are built to the highest standards of quality and performance, and are designed to fit the vehicle's exact specifications.

A wide variety of non-genuine replacement parts and accessories for SUZUKI vehicles are currently available in the market. Using these parts and accessories can affect the vehicle performance and shorten its useful life. Therefore, installation of non-genuine SUZUKI parts and accessories is not covered under warranty.

Non-Genuine SUZUKI Parts and Accessories

Some parts and accessories may be approved by certain authorities in your country.

Some parts and accessories are sold as SUZUKI authorized replacement parts and accessories. Some genuine SUZUKI parts and accessories are sold as re-use parts and accessories. These parts and accessories are non-genuine Suzuki parts and accessories and use of these parts are not covered under warranty.

Re-use of Genuine SUZUKI Parts and Accessories

The resale or re-use of the following items which could give rise to safety hazards for users is expressly forbidden:

- 1) Air bag components and all other pyrotechnic items, including their components (e.g. cushion, control devices and sensors)
- 2) Seatbelt system, including their components (e.g. webbing, buckles, and retractors)

The air bag and seat belt pretensioner components contain explosive chemicals. These components should be removed and disposed of properly by SUZUKI authorized service shop or scrap yard to avoid unintended explosion before scrapping.

*The parts remanufactured under SUZUKI's approval can be used as genuine SUZUKI parts in Europe.

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Engine

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Engine General Information and Diagnosis

Precautions

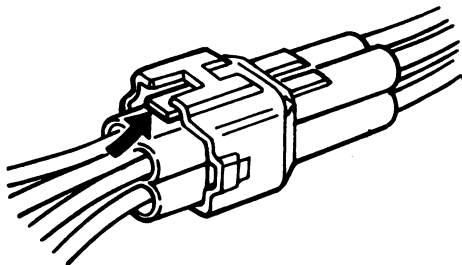
Precautions on Engine Service

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⚠ CAUTION

The following information on engine service should be noted carefully, as it is important in preventing damage, and in contributing to reliable engine performance.

- When raising or supporting engine for any reason, do not use a jack under oil pan. Due to small clearance between oil pan and oil pump strainer, jacking against oil pan may cause it to be bent against strainer, resulting in damaged oil pick-up unit.
- It should be kept in mind, while working on engine, that 12-volt electrical system is capable of violent and damaging short circuits.
When performing any work where electrical terminals can be grounded, ground cable of the battery should be disconnected at battery.
- Any time the air cleaner, throttle body or intake manifold is removed, the intake opening should be covered. This will protect against accidental entrance of foreign material which could follow intake passage into cylinder and cause extensive damage when engine is started.



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Precautions in Diagnosing Trouble

S6RW0E1100003

- Don't disconnect ECM couplers from ECM, battery cable from battery, ECM ground wire harness from engine or main fuse before confirming diagnostic information (DTC, freeze frame data, etc.) stored in ECM memory. Such disconnection will erase memorized information in ECM memory.
- Diagnostic information stored in ECM memory can be cleared as well as checked by using SUZUKI scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.

- Priorities for diagnosing troubles
If two or more DTCs are stored, proceed to the DTC flow which has been detected earliest in the order and follow the instruction in that flow.
If no instructions are given, troubleshoot DTCs according to the following priorities.
 - a. DTCs other than DTC P0171 / P0172 (Fuel system too lean / too rich), and DTC P0401 / P0402 (EGR flow malfunction)
 - b. DTC P0171 / P0172 (Fuel system too lean / too rich) and DTC P0401 / P0402 (EGR flow malfunction)
- Be sure to read "Precautions for Electrical Circuit Service in Section 00 in related manual" before inspection and observe what is written there.
- ECM replacement:
When substituting a known-good ECM, check for the following conditions. Neglecting this check may cause damage to a known-good ECM.
 - Resistance value of all relays, actuators is as specified respectively.
 - MAP sensor, A/C refrigerant pressure sensor (if equipped with A/C), accelerator pedal position (APP) sensor and TP sensor are in good condition and none of power circuits of these sensors is shorted to ground.
- Communication of ECM, BCM, combination meter, keyless start control module (if equipped with keyless start control system), 4WD control module (if equipped), TCM (for A/T model) and ABS control module, is established by CAN (Controller Area Network). (For more detail of CAN communication for ECM, refer to "CAN Communication System Description"). Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System in Section 00 in related manual".
- Immobilizer transponder code registration after replacing ECM (Immobilizer model)
When ECM is replaced with new one or with another one, make sure to register immobilizer transponder code to ECM correctly according to "Procedure after ECM Replacement in Section 10C in related manual".

Precautions for DTC Troubleshooting

S6RW0E1100004

- Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection".
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits".

- Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.

Precautions of ECM Circuit Inspection

S6RW0E1100005

- ECM connectors are waterproofed. Each terminal of the ECM connectors is sealed up with the grommet. Therefore, when measuring circuit voltage, resistance and/or pulse signal at ECM connector, do not insert the tester's probe into the sealed terminal at the harness side. When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to the ECM connectors. And, insert the tester's probe into the special tool's connectors at the harness side, and then measure voltage, resistance and/or pulse signal. Or, ECM and its circuits may be damaged by water.
- Wire colors of the special tool's connectors are different from the ones of the ECM connectors. However, the circuit arrangement of the special tool's connectors is same as the one of the ECM

connectors. Therefore, measure circuit voltage and resistance by identifying the terminal location subject to the measurement.

Precautions of Electric Throttle Body System Calibration

S6RW0E1100006

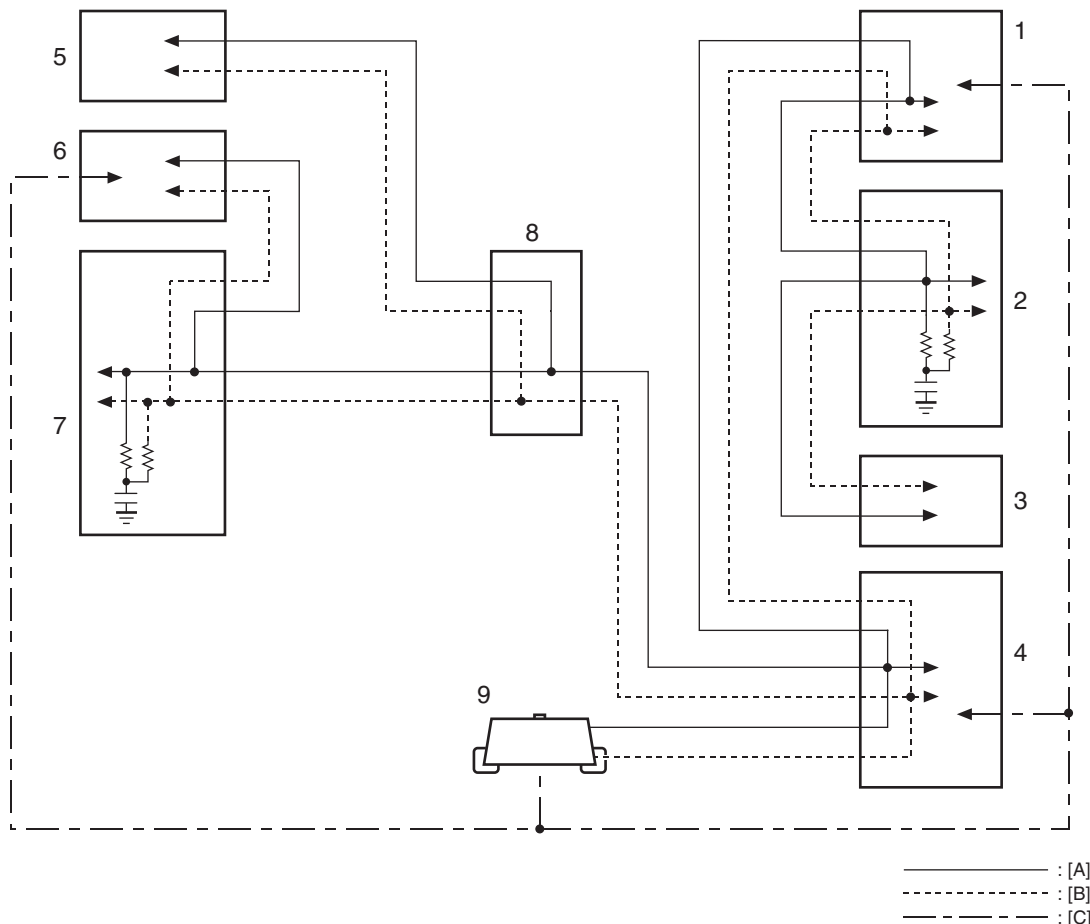
After performing one of works described below, it is necessary to re-register the completely closed throttle valve reference position stored in memory of ECM. (For detailed information, refer to “Description of Electric Throttle Body System Calibration”.) For the procedure to register such data in ECM, refer to “Electric Throttle Body System Calibration in Section 1C”.

- To shut off backup power of ECM for such purposes of battery replacement or “DOME” fuse removal
- To erase DTCs P0122, P0123, P0222, P0223, P2101, P2102, P2103, P2111, P2119 and/or P2135
- To replace ECM
- To replace throttle body and/or accelerator pedal position (APP) sensor assembly

Precaution on CAN Troubleshooting

CAN schematic and routing diagram

S6RW0E1100007



I6RW0C110002-03

[A]: CAN high line (RED)

[B]: CAN low line (WHT)

[C]: K-line

1A-3 Engine General Information and Diagnosis:

No.	Part Name	Communication with scan tool	Monitor of CAN-DTC
1.	ABS control module	K-line	Not available
2.	ECM	CAN	Available
3.	TCM	CAN	Available
4.	BCM	K-line	Available
5.	Keyless start control module	Not available	Available
6.	4WD control module	K-line	Available
7.	Combination meter	Not available	Not available
8.	CAN junction connector	—	—
9.	DLC	—	—

Outline of troubleshooting

When there is a trouble with CAN, perform “Troubleshooting for Communication Error with Scan Tool Using CAN” and/or “Troubleshooting for CAN-DTC”. Not using this procedure or performing troubleshooting in any other way may skip some check points resulting in misdiagnosis or take a longer time than necessary.

- 1) Checking connector related to CAN
- 2) Checking CAN line
- 3) Checking each control module/sensor using “DTC check” or “Bus Check”
- 4) Checking power and ground connection of each control module/sensor

CAN-DTC

Even when DTC related to CAN (= CAN-DTC) as described below is detected, it is not possible to point out the specific trouble point by CAN-DTC itself. Be sure to troubleshoot according to “Troubleshooting for CAN-DTC”.

CAN-DTC table

Detected Control Module	CAN-DTC
ECM	U0073/U0101/U0121/U0140/P1618
TCM	U0073/U0100
BCM	U0073/U0100/U0101/U0155/U1144
4WD control module	U0073/U0100/U0121/U0155
Keyless start control module	No.31/No.33

Communication with scan tool

- K line or CAN line is used for communication between each control module and scan tool.
Refer to “CAN schematic and routing diagram: ” to determine which line is used for communication between each control module and scan tool.
- ECM and TCM use CAN line for communication with scan tool. Even if CAN has a trouble other than between DLC and BCM, communication may also fail between scan tool and these control modules. In such case, perform troubleshooting according to “Troubleshooting for Communication Error with Scan Tool Using CAN”.
- BCM, ABS control module and 4WD control module use K-line for communication with scan tool. Even if CAN has a trouble, it is possible to communicate between scan tool and these control modules.

Bus check with SUZUKI scan tool

SUZUKI scan tool (SUZUKI-SDT) efficiently diagnoses a CAN bus malfunction by “Communication Bus Check” and “Communication Malfunction DTC” under “Bus check”.

“Communication Bus Check” can display all control modules/sensors name communicated by CAN.

Also, “Communication Malfunction DTC” can display only CAN-DTC which is detected by the control modules (ECM and TCM) communicating with scan tool using CAN line.

General Description

Statement on Cleanliness and Care

S6RW0E1101001

An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the thousands of an millimeter (ten thousands of an inch).

Accordingly, when any internal engine parts are serviced, care and cleanliness are important.

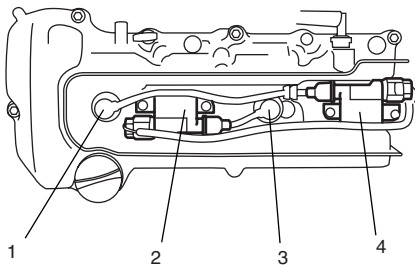
It should be understood that proper cleaning and protection of machined surfaces and friction areas is part of the repair procedure. This is considered standard shop practice even if not specifically stated.

- A liberal coating of engine oil should be applied to friction areas during assembly to protect and lubricate the surfaces on initial operation.

- Whenever valve train components, pistons, piston rings, connecting rods, rod bearings, and crankshaft journal bearings are removed for service, they should be retained in order.

At the time of installation, they should be installed in the same locations and with the same mating surfaces as when removed.

- Battery cables should be disconnected before any major work is performed on the engine. Failure to disconnect cables may result in damage to wire harness or other electrical parts.
- The four cylinders of the engine are identified by numbers; No.1 (1), No.2 (2), No.3 (3) and No.4 (4) counted from crankshaft pulley side to flywheel side.



I3RM0A110001-01

Engine Diagnosis General Description

S6RW0E1101002

This vehicle is equipped with an engine and emission control system which are under control of ECM.

The engine and emission control system in this vehicle are controlled by ECM. ECM has an On-Board Diagnostic system which detects a malfunction in this system and abnormality of those parts that influence the engine exhaust emission. When diagnosing engine troubles, be sure to have full understanding of the outline of "On-Board Diagnostic System Description" and each item in "Precautions in Diagnosing Trouble" and execute diagnosis according to "Engine and Emission Control System Check".

There is a close relationship between the engine mechanical, engine cooling system, ignition system, exhaust system, etc. and the engine and emission control system in their structure and operation. In case of an engine trouble, even when the malfunction indicator lamp (MIL) doesn't turn ON, it should be diagnosed according to "Engine and Emission Control System Check".

On-Board Diagnostic System Description

S6RW0E1101003

ECM diagnosis troubles which may occur in the area including the following parts when the ignition switch is ON and the engine is running, and indicates the result by turning on or flashing malfunction indicator lamp (1).

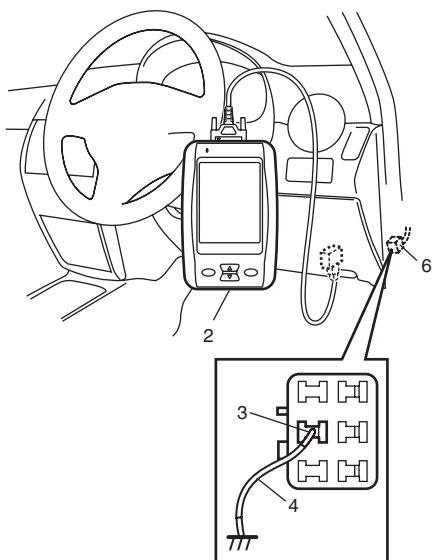
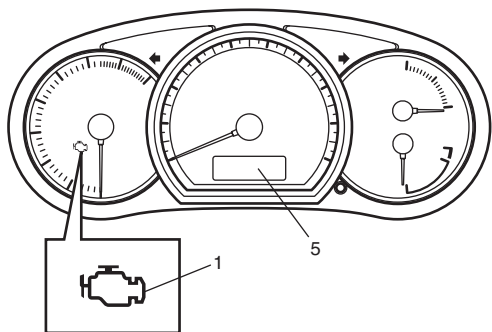
- Heated oxygen sensor
- A/F sensor
- ECT sensor
- TP sensor
- MAF sensor
- IAT sensor
- MAP sensor
- CMP sensor
- CKP sensor
- Knock sensor
- VSS
- CPU (Central Processing Unit) of ECM
- APP sensor
- Throttle actuator
- Oil control valve (VVT model)
- Radiator cooling fan relay
- EVAP canister purge valve
- EGR valve
- Barometric pressure sensor
- CAN
- ECM back up power supply

ECM and malfunction indicator lamp (1) operate as follows.

- Malfunction indicator lamp (1) lights when the ignition switch is turned ON (but the engine at stop) with the diagnosis switch terminal ungrounded regardless of the condition of Engine and Emission control system. This is only to check the malfunction indicator lamp (1) in the combination meter and its circuit.
- If the above areas of Engine and Emission control system is free from any trouble after the engine start (while engine is running), malfunction indicator lamp (1) turns OFF.

1A-5 Engine General Information and Diagnosis:

- When ECM detects a trouble which has occurred in the above areas, it makes malfunction indicator lamp (1) turn ON while the engine is running to warn the driver of such occurrence of trouble and at the same time it stores the trouble area in ECM back-up memory. (The memory is kept as it is even if the trouble was only temporary and disappeared immediately. And it is not erased unless the power to ECM is shut off for specified time or it is cleared by SUZUKI scan tool (2).)
In addition, DTC can be read by not only using SUZUKI scan tool but also displayed on odometer (5) of the combination meter. (i.e. when diagnosis switch terminal (3) is grounded with a service wire (4) and ignition switch is turned ON.) For further detail of the checking procedure, refer to "DTC Check".



I6RW0E110055-01

6. Diagnosis connector

Warm-Up Cycle

A warm-up cycle means sufficient vehicle operation such that the coolant temperature has risen by at least 22 °C (40 °F) from engine starting and reaches a minimum temperature of 70 °C (160 °F).

Driving Cycle

A "Driving Cycle" consists of engine startup and engine shutoff.

2 Driving Cycle Detection Logic

The malfunction detected in the first driving cycle is stored in ECM memory (in the form of pending DTC) but the malfunction indicator lamp does not light at this time. It lights up at the second detection of same malfunction also in the next driving cycle.

Pending DTC

Pending DTC means a DTC detected and stored temporarily at 1 driving cycle of the DTC which is detected in the 2 driving cycle detection logic.

Freeze Frame Data

ECM stores the engine and driving conditions (in the form of data as shown in the figure) at the moment of the detection of a malfunction in its memory. This data is called "Freeze frame data".

Therefore, it is possible to know engine and driving conditions (e.g., whether the engine was warm or not, where the vehicle was running or stopped, where air/fuel mixture was lean or rich) when a malfunction was detected by checking the freeze frame data. Also, ECM has a function to store each freeze frame data for three different malfunctions in the order as each malfunction is detected. Utilizing this function, it is possible to know the order of malfunctions that have been detected. Its use is helpful when rechecking or diagnosing a trouble.

For example

Function View System Bar Help				
Sub System / Freeze Frame Data				
P0100	Mass or Volume Air Flow Circuit Malfunction			
Parameter		Value	Units	▲
Calculated Engine Speed		15	%	
Vehicle Speed		15	MPH	
Engine Speed		2500	rpm	
Ignition Advance		10	deg	
Intake Air Temperature		165	F	
Throttle Position #1		20	%	
MIL Status		ON		
Vapor Pressure		-1.116	V	
Shift Position		D		▼
				Exit
DTC	Data List	View	Active Test	Utility

I5RW0C110028-03

Priority of freeze frame data:

ECM has 4 frames where the freeze frame data can be stored. The first frame stores the freeze frame data of the malfunction which was detected first. However, the freeze frame data stored in this frame is updated according to the priority described. (If malfunction as described in the upper square "1" is detected while the freeze frame data in the lower square "2" has been stored, the freeze frame data "2" will be updated by the freeze frame data "1".)

Priority	Freeze frame data in frame 1
1	Freeze frame data at initial detection of malfunction fuel system too lean (P0171) and fuel system too rich (P0172)
2	Freeze frame data when a malfunction other than those in "1" is detected

In the 2nd through the 4th frames, the freeze frame data of each malfunction is stored in the order as each malfunction is detected. These data are not updated.

Shown in the table are examples of how freeze frame data are stored when two or more malfunctions are detected.

Malfunction detected order	Frame			
	Frame 1	Frame 2	Frame 3	Frame 4
	Freeze frame data to be updated	1st freeze frame data	2nd freeze frame data	3rd freeze frame data
No malfunction	No freeze frame data			
1 P0401 (EGR) detected	Data at P0401 detection	Data at P0401 detection	—	—
2 P0171 (Fuel system) detected	Data at P0171 detection	Data at P0401 detection	Data at P0171 detection	—
3 P0172 (Fuel system) detected	Data at P0171 detection	Data at P0401 detection	Data at P0171 detection	Data at P0172 detection

Freeze frame data clearance:

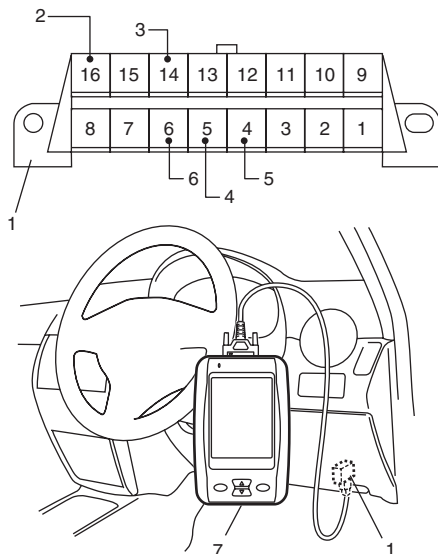
The freeze frame data is cleared at the same time as clearance of DTC.

Data Link Connector (DLC)

S6RW0E1101004

DLC (1) is in compliance with SAE J1962 in the shape of connector and pin assignment.

OBD CAN Hi line (6) and Low line (3) (CAN line of ISO 15765-4) are used for SUZUKI scan tool (SUZUKI-SDT) (7) or CAN communication OBD generic scan tool to communicate with ECM (included in immobilizer control) and TCM (Transmission Control Module) (for A/T model).



I6RW0E110056-01

2. B + (Unswitched vehicle battery positive)
4. ECM ground (Signal ground)
5. Vehicle body ground (Chassis ground)

Engine and Emission Control System Description

S6RW0E1101005

The engine and emission control system is divided into 4 major sub-systems: air intake system, fuel delivery system, electronic control system and emission control system.

Air intake system includes air cleaner, throttle body and intake manifold.

Fuel delivery system includes fuel pump, delivery pipe, etc.

Electronic control system includes ECM, various sensors and controlled devices.

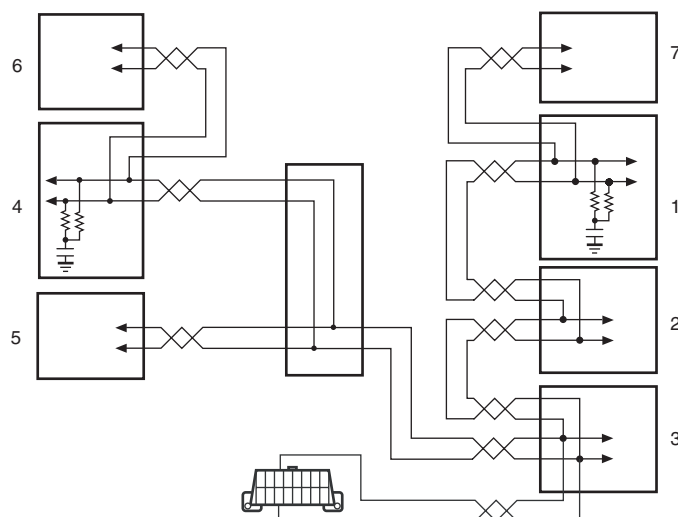
Emission control system includes EGR, EVAP and PCV system.

CAN Communication System Description

S6RW0E1101006

ECM (1), ABS control module (2), BCM (3), combination meter (4), keyless start control module (if equipped with keyless start control system) (5), 4WD control module (for 4WD model) (6) and TCM (for A/T model) (7) of this vehicle communicate control data between each control module.

Communication of each control module is established by CAN (Controller Area Network) communication system.



I6RW0E110003-01

CAN communication system uses the serial communication in which data is transmitted at a high speed. It uses a twisted pair of two communication lines for the high-speed data transmission. As one of its characteristics, multiple control modules can communicate simultaneously. In addition, it has a function to detect a communication error automatically. Each module reads necessary data from the received data and transmits data. ECM communicates control data with each control module as follows.

ECM Transmission Data

				TCM	BCM	Combination Meter	4WD Control Module	Keyless Start Control Module
ECM	Transmit	DATA	Driving cycle active	○				
			Warm up cycle active	○				
			Throttle position signal	○				
			A/C compressor clutch signal	○	○			
			A/C refrigerant pressure signal		○			
			Fuel consumption signal		○			
			Engine coolant temperature signal	○	○	○		
			Fuel level signal		○	○		
			Odometer signal			○		
			MIL control signal			○		
			Immobilizer indicator light control signal			○		
			Engine type signal		○		○	
			Engine torque signal	○			○	
			Accelerator pedal position signal	○			○	
			Brake pedal switch signal	○	○		○	
			Engine speed signal	○	○	○	○	
			Vehicle speed signal	○	○	○		○

I6RW0D110003-02

ECM Reception Data

				TCM	BCM	ABS control module	4WD control module
ECM	Receive	DATA	Torque request signal	○			
			A/T selector lever position signal	○			
			Transmission actual gear position signal	○			
			Transmission oil temperature signal	○			
			Vehicle speed pulse signal	○			
			MIL control signal	○			
			Transmission warning light signal	○			
			A/C switch ON signal		○		
			Electric load signal		○		
			Wheel speed signal (front right)			○	
			Wheel speed signal (front left)			○	
			ABS indication signal			○	
			4WD mode status				○

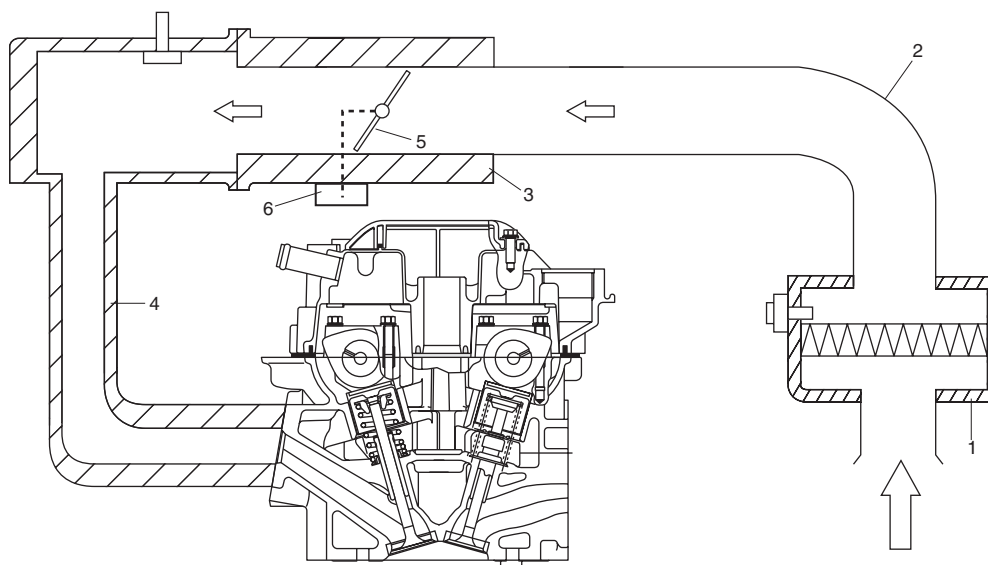
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Air Intake System Description

S6RW0E1101007

The main components of the air intake system are air cleaner (1), air cleaner outlet hose (2), electric throttle body (3) (for the details, refer to “Description of Electric Throttle Body System”.), and intake manifold (4).

The air (by the amount corresponding to throttle valve (5) opening and engine speed) is filtered by the air cleaner, distributed by the intake, and finally drawn into each combustion chamber. Electric throttle body is not equipped with IAC valve for idle speed control. Idle speed control is done by the throttle actuator (6) which opens/closes the throttle valve. (For the details, refer to “Description of Electric Throttle Body System”).



I5RW0A110006-02

Description of Electric Throttle Body System Calibration

S6RW0E1101008

ECM calculates controlled opening of the throttle valve on the basis of the completely closed throttle valve position of the electric throttle body system. The completely closed position data is saved in memory of ECM. However, the completely closed position of the throttle valve of the electric throttle body system (signal voltage from throttle position sensor when throttle is completely closed) differs one from the other depending on individual differences of the throttle valve and throttle

position sensor. As such individual differences must be taken into account for controlling the throttle valve, it is necessary to register the completely closed throttle valve position data in ECM. When such data is registered in ECM, it is saved in RAM (memory) of ECM and used as the base data for controlling the throttle valve. This data is cleared, when any of the works described in “Precautions of Electric Throttle Body System Calibration” is performed.

1A-9 Engine General Information and Diagnosis:

Also, after replacement of the throttle body and/or APP sensor assembly, the completely closed position data in memory of ECM must be cleared once and a new one must be registered, or ECM cannot judge the complete closure position properly.

For the procedure to register such data, refer to "Electric Throttle Body System Calibration in Section 1C". (After the completely closed position data is cleared, ECM, for

the first time only, opens and closes the throttle valve for about 5 seconds after the ignition switch is turned ON position, for registration of the completely closed throttle valve position. If the engine is started during this registration process, such symptom as "longer cranking time" or "slow rise of revolution speed immediately after start-up" may occur. However, turning OFF the ignition switch once and restarting will set correct registration.)

Description of Electric Throttle Body System

S6RW0E1101009

The Electric Throttle Body System consists of electric throttle body assembly, accelerator pedal position (APP) sensor assembly, ECM and throttle actuator control relay.

Among them, assembly components are as follows.

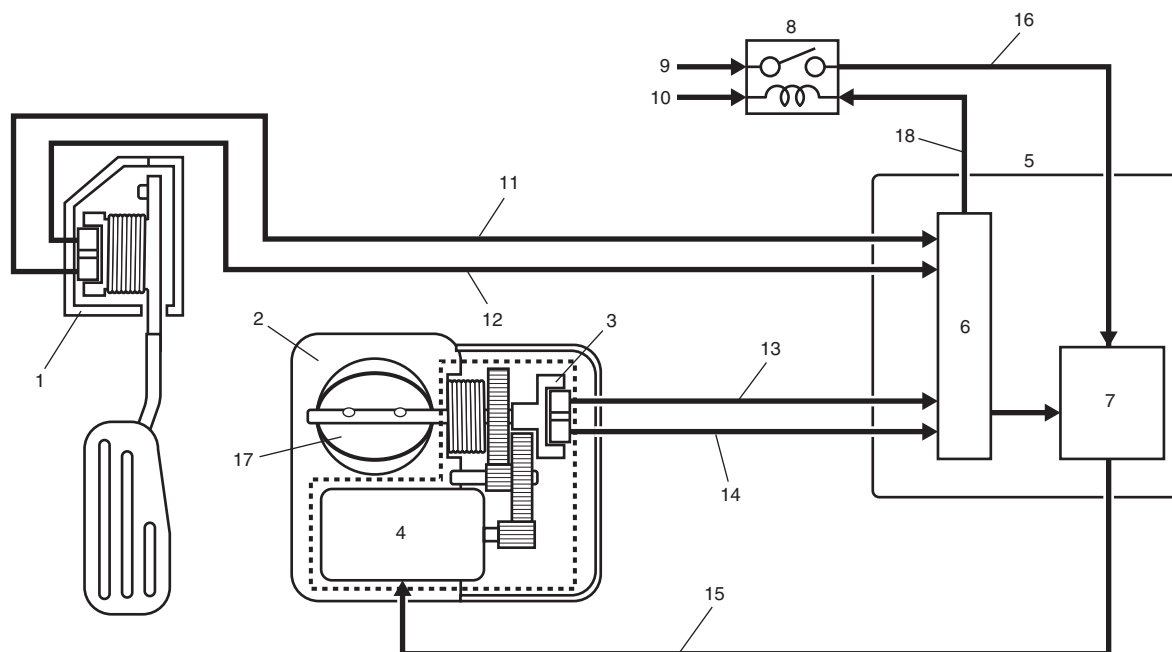
- Electric throttle body assembly: throttle valve, throttle actuator, 2 throttle position sensors
- APP sensor assembly: Accelerator pedal, 2 accelerator position sensors

Operation Description

ECM (5) detects opening (depressed extent of pedal) of the accelerator pedal based on signal voltage of the APP sensor (1) and using that data and engine operation condition, it calculates the optimum throttle valve opening. On the other hand, it detects the throttle valve opening based on the signal voltage of the throttle position sensor (3) included in the throttle body (2) and compares it with the above calculated optimum throttle valve opening. When there is a difference between them, ECM controls the duty ratio (100% – 0%) according to this difference to drive the throttle actuator (motor) (4) included in the throttle body. When there is no difference, ECM controls the duty ratio to about 15% to maintain the throttle valve opening. In this way, the throttle valve (17) is opened and closed to achieve the optimum throttle valve opening.

In this system, as the throttle position sensor and APP sensor have 2 sensors (main and sub) each, highly accurate and highly reliable control and abnormality detection are assured. Also, when ECM detects an abnormality in the system, it turns OFF the throttle actuator control relay (8) to stop controlling the throttle actuator. When the throttle actuator control relay is turned OFF, the throttle valve is fixed at the opening of about 7° from its completely closed position (default opening) by the force of the return spring and open spring included in the throttle body.

This throttle body is not equipped with IAC valve for idle speed control. Idle speed control is done by the throttle actuator which opens/closes the throttle valve.



I4RS0B110007-02

6. CPU	11. APP sensor (main) signal	15. Drive signal of throttle actuator
7. Drive circuit of throttle actuator	12. APP sensor (sub) signal	16. Power supply of throttle actuator
9. From "THR MOT" fuse	13. Throttle position sensor (main) signal	18. Control signal of throttle actuator control relay
10. From main relay	14. Throttle position sensor (sub) signal	

Generator Control System Description

S6RW0E1101011

Generator Control System consists of a generator (1), electric load current sensor (7) located in the main fuse box (4) and ECM (5).

ECM controls generated electricity (adjusting voltage of IC regulator (2)) so that it is suitable for the engine and electric load conditions. When the electric load increases quickly, generation load of the generator increases quickly and causes idling to change. To prevent this, ECM makes generated electricity volume vary gradually to stabilize idling. Also, it reduces the engine load caused by temporary increase in electricity generation to cope with the engine condition (such as when accelerating).

Operation

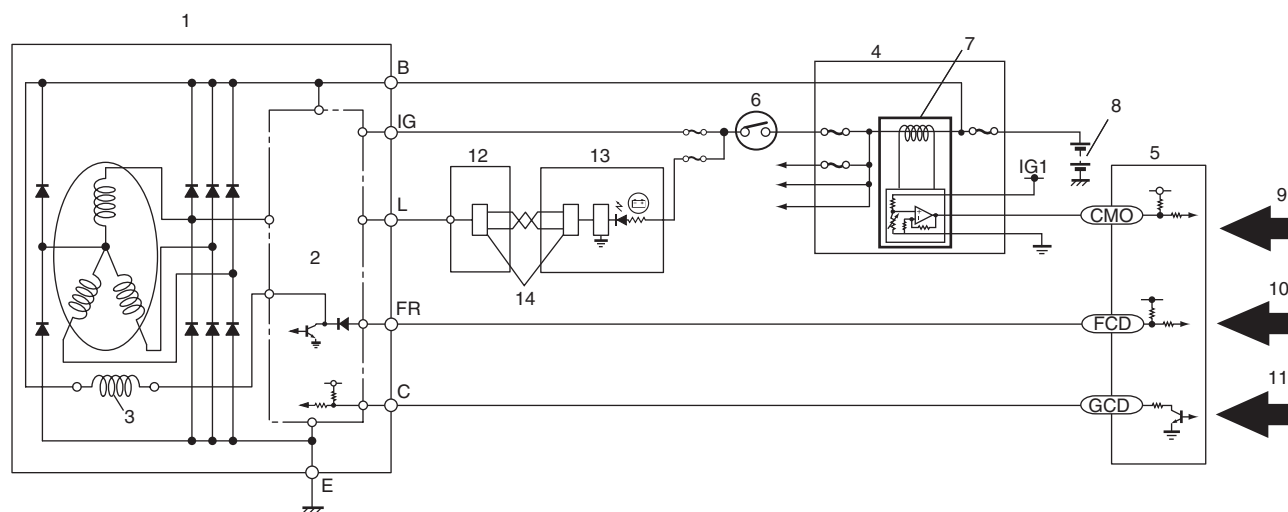
ECM controls the generated voltage of the generator using "C" terminal (generator control terminal) duty, based on following information.

- Engine condition (ECT, vehicle speed, engine speed, TP, etc.) (9)
- Battery voltage (ECM backup power voltage) (10)
- Electric load condition (blower motor, rear defogger, head lights, radiator fan, A/C, etc.) (11)
- "FR" terminal output (field coil (3) control duty) which indicates the operation rate (electricity generation condition) of the generator.

Then the generator uses "C" terminal duty to regulate the adjusting voltage of the IC regulator with the field coil control duty so as to control its generated voltage ("B" terminal output voltage).

(For more information of the generated voltage, refer to "Charging System in Section 1J in related manual".)

Furthermore, the generation condition of the generator is controlled to the optimum level by the electric load current sensor (7) which detects the electrical load condition (current consumption) linearly even when a sudden electrical load variation occurs and thus the engine load is reduced.



I6RW0E110004-01

6. Ignition switch	12. BCM	14. CAN driver
8. Battery	13. Combination meter	

A/F Sensor Description

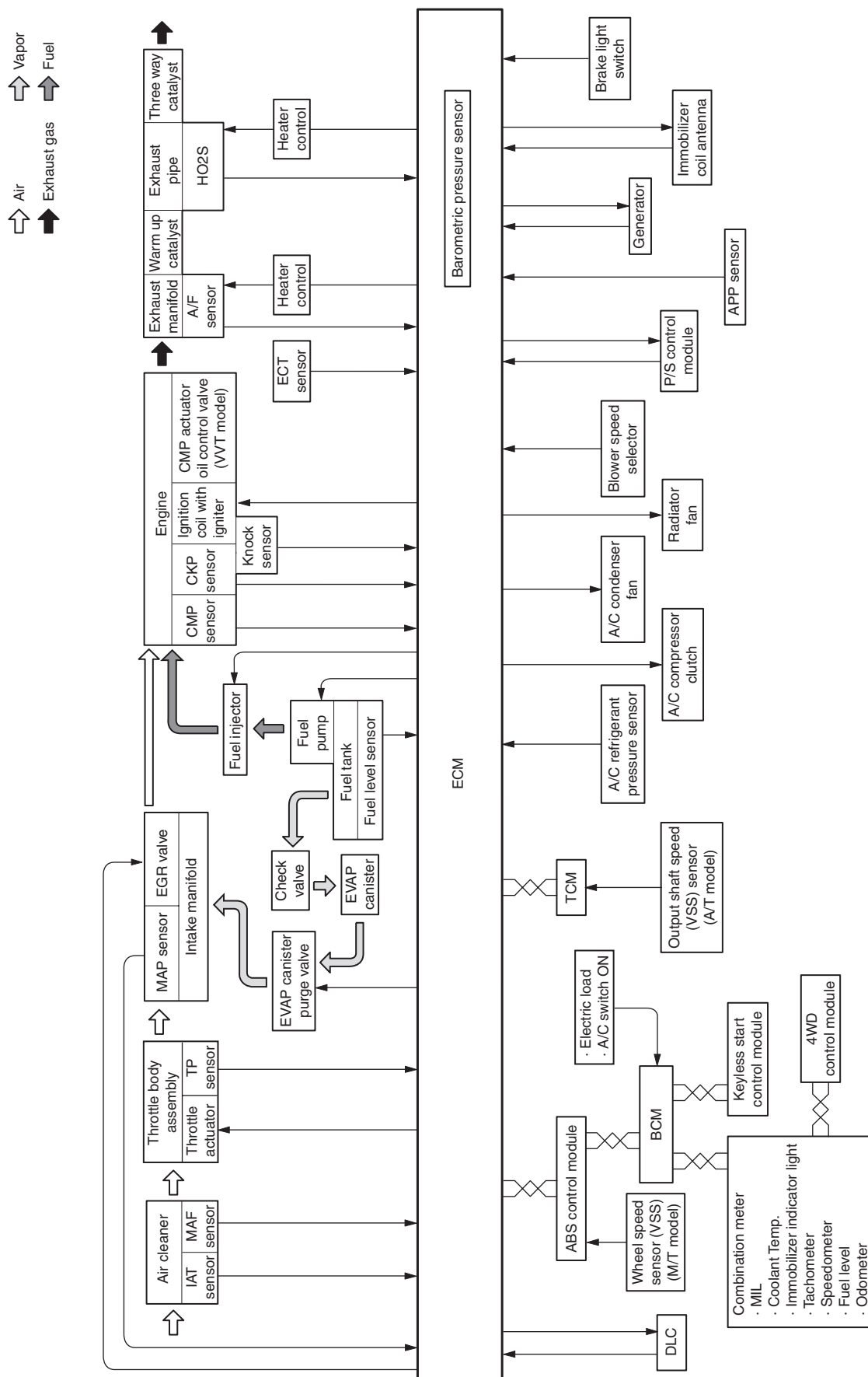
S6RW0E1101013

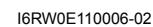
A/F sensor (1), in place of the conventional HO2S-1, is installed in the center of the exhaust manifold joining section and it consists of a zirconia element (2) which causes the output current to vary according to difference in the oxygen concentration and a heater (3) which activates the element.

A/F sensor detects oxygen concentration in exhaust gas (9) (A/F ratio of the air-fuel mixture) linearly, ranging from LEAN to RICH.

Especially, ECM (Engine Control Module), BCM (Body electrical Control Module), combination meter, ABS / control module, keyless start control module (if equipped with keyless start control system), TCM (Transmission Control Module) (A/T model) and 4WD control module (if equipped) intercommunicate by means of CAN (Controller Area Network) communication.

Engine and Emission Control System Flow Diagram

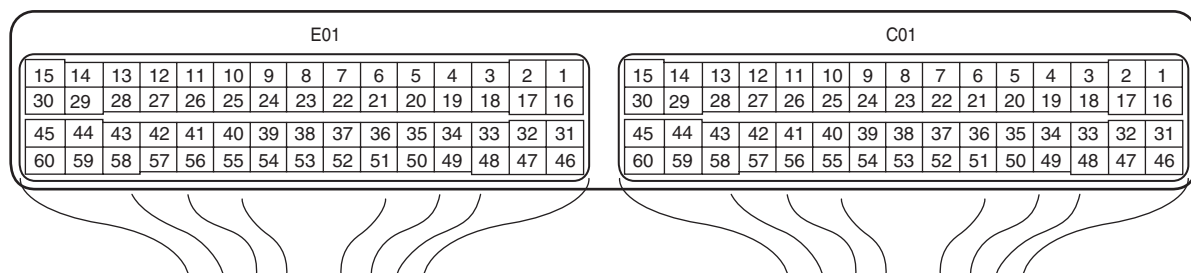




1. ECM	25. Electric load current sensor	49. Ignition coil assembly for No.2 and No.3 spark plugs)
2. APP sensor assembly	26. Throttle actuator control relay	50. P/S control module
3. Shield wire	27. "THR MOT" fuse	51. Brake light
4. CMP sensor	28. Electric throttle body assembly	52. Brake light switch
5. CKP sensor	29. Throttle actuator	53. "STOP" fuse
6. HO2S	30. TP sensor	54. To ABS control module
7. A/F sensor	31. Fuel injector No.1	55. Main relay

8. Knock sensor	32. Fuel injector No.2	56. Transmission range switch (A/T model)
9. MAF and IAT sensor	33. Fuel injector No.3	57. Starting motor control relay
10. MAP sensor	34. Fuel injector No.4	58. Starting motor
11. ECT sensor	35. EVAP canister purge valve	59. Diagnosis connector
12. A/C refrigerant pressure sensor	36. Oil control valve (VVT model)	60. "IG COIL" fuse
13. Blower motor relay	37. EGR valve	61. "IG2 SIG" fuse
14. Blower motor	38. Fuel pump relay	62. "DOME" fuse
15. Blower speed selector (Auto A/C model)	39. Fuel pump	63. "FI" fuse
16. Blower speed selector (Manual A/C model)	40. Radiator cooling fan relay	64. "ST" fuse
17. A/C switch	41. Radiator cooling fan motor	65. "ST SIG" fuse
18. To BCM	42. "RDTR" fuse	66. Ignition switch
19. Generator	43. A/C condenser cooling fan relay	67. "IGN" fuse
20. ABS control module	44. A/C condenser cooling fan motor	68. Main fuse box
21. TCM	45. A/C compressor relay	69. Battery
22. To other control module connected CAN and DLC	46. A/C compressor	70. Barometric pressure sensor
23. Fuel level sensor	47. "A/C" fuse	71. Engine ground
24. Immobilizer coil antenna	48. Ignition coil assembly for No.1 and No.4 spark plugs)	72. Body ground

Terminal Arrangement of ECM Coupler (Viewed from Harness Side)



1A-15 Engine General Information and Diagnosis:**Connector: C01**

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
1	BLU/YEL	Fuel injector No.1	31	BLK	Ground for A/F sensor heater
2	BLU/WHT	Fuel injector No.2	32	RED	Heater output of A/F sensor
3	WHT/RED	EGR valve (stepper motor coil 3) output	33	BLK	Shield ground for TP sensor circuit
4	BRN/YEL	EGR valve (stepper motor coil 4) output	34	—	—
5	GRN/RED	EGR valve (stepper motor coil 1) output	35	—	—
6	GRN/ORN	EGR valve (stepper motor coil 2) output	36	—	—
7	—	—	37	BLK	A/F sensor signal (-)
8	BRN/WHT	Generator field coil monitor signal	38	WHT	A/F sensor signal (+)
9	PNK/BLU	Electric load current sensor signal	39	BLK/RED	Ground for HO2S
10	—	—	40	WHT	TP sensor (sub) signal
11	BRN	Oxygen signal of HO2S	41	BLK	Ground for TP sensor
12	RED/BLU	A/C refrigerant pressure sensor signal	42	—	—
13	BLU/BLK	EVAP canister purge valve output	43	—	—
14	GRY/RED	Output of 5 V power source for A/C refrigerant pressure sensor	44	YEL	Output of throttle actuator
15	BLK	Ground for ECM	45	BLU	Output of throttle actuator
16	BLU/RED	Fuel injector No.3	46	—	—
17	BLU/ORN	Fuel injector No.4	47	RED/BLU	Heater output of HO2S
18	—	—	48	BLK/ORN	Ground for ECM
19	—	—	49	WHT	CAN (low) communication line (active low signal) to TCM
20	GRN/WHT	Ignition coil No.2 and No.3 output	50	RED	CAN (high) communication line (active high signal) to TCM
21	GRN/YEL	Ignition coil No.1 and No.4 output	51	PNK	CKP sensor signal
22	YEL/GRN	Starting motor signal	52	RED/YEL	CMP sensor signal
23	—	—	53	RED	Output for 5 V power source of TP sensor
24	LT GRN	ECT sensor signal	54	GRN	TP sensor (main) signal
25	LT GRN/BLK	IAT sensor signal	55	RED/BLK	MAP sensor signal
26	PNK/BLK	MAF sensor signal	56	RED	Knock sensor signal
27	GRY	Ground for MAF sensor	57	GRY/BLU	Ground for sensors
28	BLU/YEL	Generator control signal output	58	BLK/ORN	Ground for ECM
29	BLK	Ground for ECM	59	GRN/WHT	Oil control valve ground
30	BLK	Ground for ECM	60	GRN/RED	Oil control valve output

Connector: E01

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
1	BLK/RED	Main power supply	31	—	—
2	WHT/RED	Power source for ECM internal memory	32	—	—
3	—	—	33	—	—
4	RED	CAN (high) communication line (active high signal) to ABS control module	34	—	—
5	—	—	35	BLU/WHT	Electric load signal for heater blower motor
6	—	—	36	ORN	Ground for sensor
7	—	—	37	—	—
8	—	—	38	—	—
9	—	—	39	—	—
10	—	—	40	—	—
11	—	—	41	WHT/BLK	A/C evaporator outlet air temp. sensor signal (Manual A/C model)
12	—	—	42	—	—
13	YEL/RED	Clock signal for immobilizer coil antenna	43	—	—
14	—	—	44	BRN	Engine speed signal output for P/S control module
15	GRN/WHT	Fuel pump relay output	45	—	—
16	BLK/RED	Main power supply	46	LT GRN	Radiator cooling fan relay output
17	GRN	Power supply of throttle actuator drive circuit	47	—	—
18	—	—	48	RED/BLK	A/C condenser cooling fan relay output
19	WHT	CAN (low) communication line (active low signal) to ABS control module	49	GRY	A/C compressor relay output
20	GRN/WHT	Brake light switch signal	50	BRN	Throttle actuator control relay output
21	—	—	51	WHT	Ground for APP sensor (sub)
22	—	—	52	YEL	APP sensor (sub) signal
23	—	—	53	RED	Output for 5 V power source of APP sensor (sub)
24	YEL/RED	Fuel level sensor signal	54	BLU	Ground for APP sensor (main)
25	—	—	55	GRN	APP sensor (main) signal
26	—	—	56	BRN	Out put for 5 V power source of APP sensor (main)
27	RED/BLU	EPS active signal (idle up signal)	57	—	—
28	YEL/BLK	Serial communication line for immobilizer coil antenna	58	—	—
29	BLK/WHT	Ignition switch signal	59	—	—
30	WHT	Starting motor control relay output	60	BRN/WHT	Main power supply relay output

Engine and Emission Control Input / Output Table

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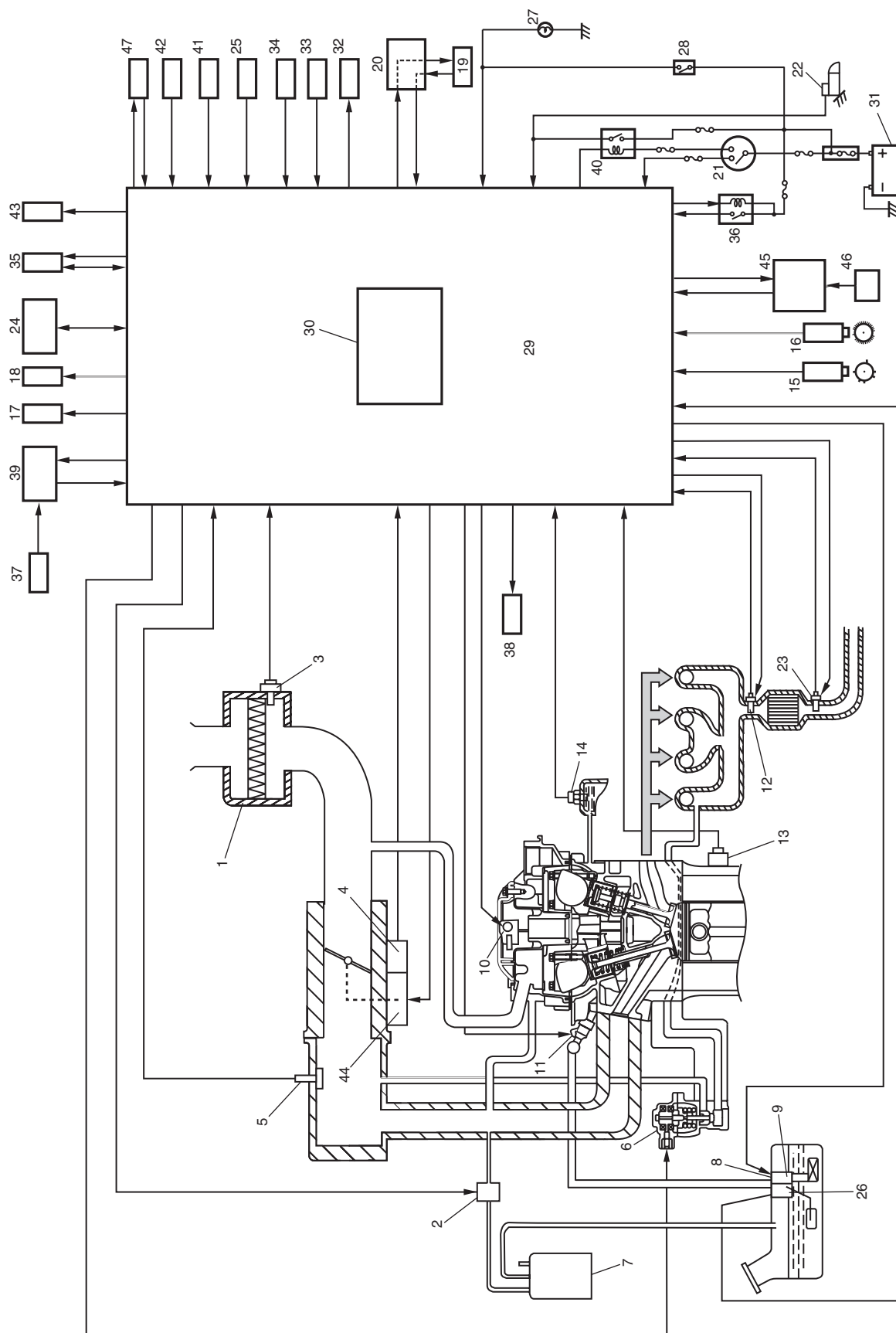
INPUT OUTPUT		ELECTRIC CONTROL DEVICE													
		FUEL PUMP RELAY	FUEL INJECTOR	A/F SENSOR HEATER AND HO2S HEATER	THROTTLE ACTUATOR	IGNITION COIL WITH IGNITER	EGR VALVE (if equipped)	EVAP CANISTER PURGE VALVE	A/C COMPRESSOR RELAY	A/C CONDENSER FAN RELAY	RADIATOR FAN RELAY	MIL	MAIN RELAY	OIL CONTROL VALVE (VVT model)	THROTTLE ACTUATOR CONTROL RELAY
SIGNAL FROM SENSOR, SWITCH AND CONTROL MODULE	BAROMETRIC PRESSURE SENSOR		○	○	○	○	○	○				○			
	BRAKE LIGHT SWITCH		○		○										
	START SWITCH	○	○	○	○	○	○		○						
	IGNITION SWITCH	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	A/C REFRIGERANT PRESSURE SENSOR		○		○				○	○	○				
	BLOWER SWITCH				○	○		○	○	○	○				
	A/C SWITCH		○		○	○		○	○	○	○				
	A/C EVAP OUTLET AIR TEMP. SENSOR (manual A/C model)		○		○				○	○	○				
	WHEEL SPEED SENSOR		○		○	○	○	○	○	○	○	○		○	
	A/F SENSOR		○		○		○	○				○			
	HEATED OXYGEN SENSOR		○		○		○	○				○			
	MAF SENSOR OF MAF AND IAT SENSOR		○	○	○	○	○	○				○		○	
	IAT SENSOR OF MAF AND IAT SENSOR		○	○	○	○	○	○				○		○	
	ECT SENSOR		○	○	○	○	○	○	○	○	○	○		○	
	TP SENSOR		○	○	○	○	○	○	○			○		○	○
	APP SENSOR				○							○			○
	MAP SENSOR		○		○	○	○					○			
	CMP SENSOR		○			○						○		○	
	CKP SENSOR	○	○	○	○	○	○	○	○			○		○	
	KNOCK SENSOR					○						○			
	ABS CONTROL MODULE		○		○										
	IMMOBILIZER CONTROL MODULE (in ECM)	○	○			○						○			
	ELECTRIC LOAD (head light, rear defogger)				○										
	TCM (A/T model)		○	○	○	○									
	P/S CONTROL MODULE		○		○										

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Schematic and Routing Diagram

Engine and Emission Control System Diagram

S6RW0E1102001



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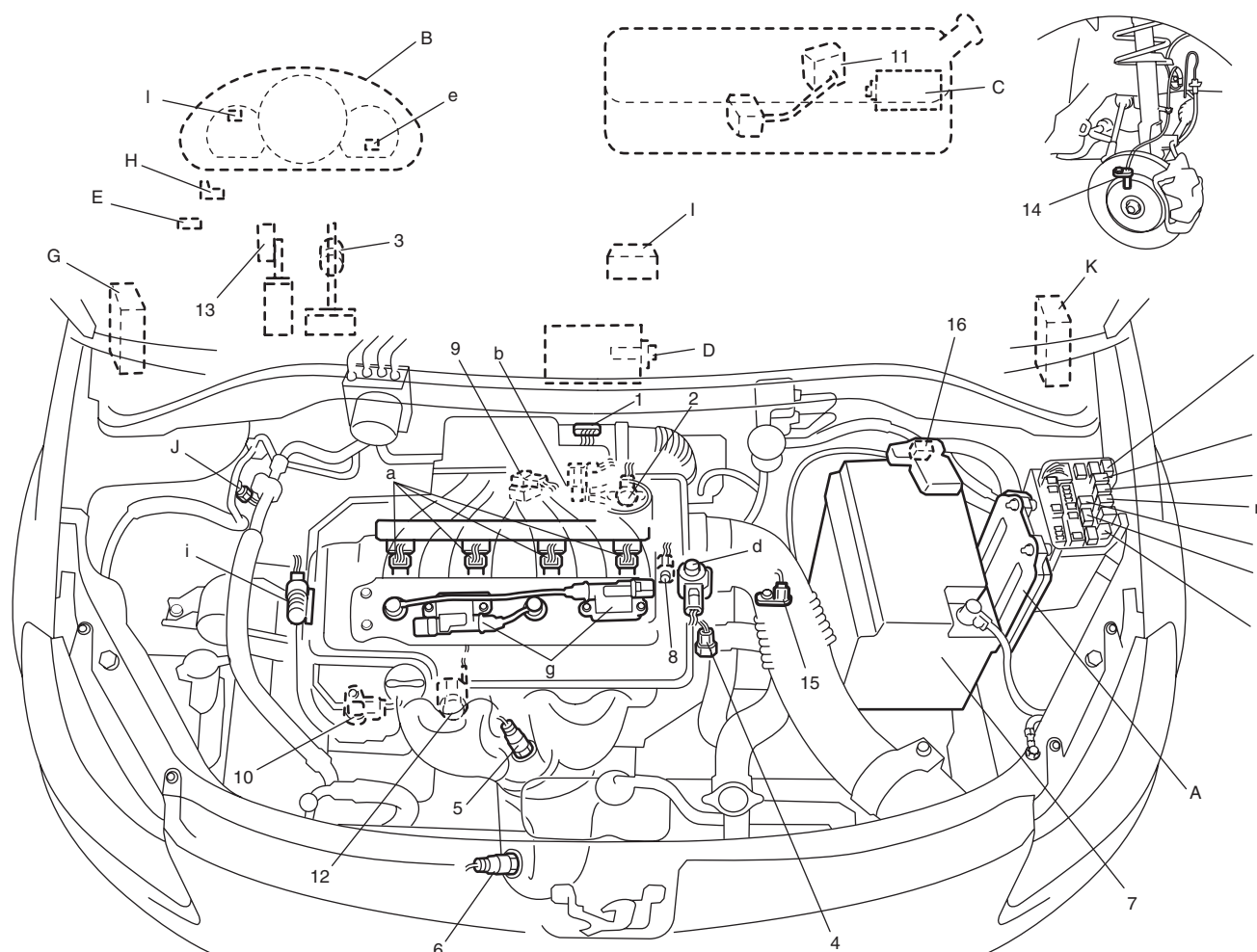
1A-19 Engine General Information and Diagnosis:

1. Air cleaner	17. Radiator cooling fan	33. A/C switch
2. EVAP canister purge valve	18. A/C condenser cooling fan	34. A/C evaporator outlet air temp. sensor (manual A/C model)
3. MAF and IAT sensor	19. Combination meter	35. Immobilizer coil antenna
4. TP sensor	20. BCM	36. Main relay
5. MAP sensor	21. Ignition switch	37. Wheel speed sensor (VSS) (M/T model)
6. EGR valve	22. Starter magnetic switch	38. Oil control valve (VVT model)
7. EVAP canister	23. Heated oxygen sensor (HO2S)	39. ABS control module
8. Tank pressure control valve (built-in fuel pump)	24. DLC	40. Starting motor control relay
9. Fuel pump (with pressure regulator)	25. Electric load	41. A/C refrigerant pressure sensor
10. Ignition coil assembly	26. Fuel level sensor	42. APP sensor
11. Fuel injector	27. Brake light	43. Throttle actuator control relay
12. A/F sensor	28. Brake light switch	44. Throttle actuator
13. Knock sensor	29. ECM	45. TCM (A/T model)
14. ECT sensor	30. Barometric pressure sensor	46. Output shaft speed sensor (VSS) (A/T model)
15. CMP sensor	31. Battery	47. Generator
16. CKP sensor	32. A/C compressor relay	

Component Location

Electronic Control System Components Location

S6RW0E1103001



I6RW0E110013-01

Information sensors	Control devices	Others
1. MAF and IAT sensor	a: Fuel injector	A: ECM
2. Electric throttle body assembly (built-in throttle position sensor and throttle actuator)	b: EVAP canister purge valve	B: Combination meter
3. Brake light switch	c: Fuel pump relay	C: EVAP canister
4. ECT sensor	d: EGR valve (if equipped)	D: A/C evaporator outlet air temp. sensor

Information sensors	Control devices	Others
5. A/F sensor	e: Malfunction indicator lamp	E: Data link connector
6. HO2S	f: Radiator cooling fan relay	F: A/C compressor relay
7. Battery	g: Ignition coil assembly (with ignitor)	G: BCM (included in junction block assembly)
8. CMP sensor	h: Main relay	H: Immobilizer coil antenna
9. MAP sensor	i: Oil control valve (VVT model)	I: P/S control module
10. CKP sensor	j: A/C condenser cooling fan relay	J: A/C refrigerant pressure sensor
11. Fuel level sensor	k: Starting motor control relay	K: TCM (A/T model)
12. Knock sensor	l: Immobilizer indicator lamp	
13. APP sensor	m: Throttle actuator control relay	
14. Front wheel speed sensor (RH, LH) (VSS) (M/T model)		
15. Output shaft speed sensor (VSS) (A/T model)		
16. Electric load current sensor		

Diagnostic Information and Procedures

Engine and Emission Control System Check

S6RW0E1104001

Refer to the following items for the details of each step.

Step	Action	Yes	No
1	☞ Customer complaint analysis 1) Perform customer complaint analysis referring to “Step 1: Customer Complaint Analysis: ”. <i>Was customer complaint analysis performed?</i>	Go to Step 2.	Perform customer complaint analysis.
2	☞ DTC / Freeze frame data check, record and clearance 1) Check for DTC (including pending DTC) referring to “Step 2: DTC / Freeze Frame Data Check, Record and Clearance: ”. <i>Is there any DTC(s)?</i>	Print DTC and freeze frame data or write them down and clear them by referring to “DTC Clearance”, and go to Step 3.	Go to Step 4.
3	☞ Visual inspection 1) Perform visual inspection referring to “Visual Inspection”. <i>Is there any faulty condition?</i>	Repair or replace malfunction part, and go to Step 11.	Go to Step 5.
4	☞ Visual inspection 1) Perform visual inspection referring to “Visual Inspection”. <i>Is there any faulty condition?</i>	Repair or replace malfunction part, and go to Step 11.	Go to Step 8.
5	☞ Trouble symptom confirmation 1) Confirm trouble symptom referring to “Step 5: Trouble Symptom Confirmation: ”. <i>Is trouble symptom identified?</i>	Go to Step 6.	Go to Step 7.
6	☞ Rechecking and record of DTC / Freeze frame data 1) Recheck for DTC and freeze frame data referring to “DTC Check”. <i>Is there any DTC(s)?</i>	Go to Step 9.	Go to Step 8.
7	☞ Rechecking and record of DTC / Freeze frame data 1) Recheck for DTC and freeze frame data referring to “DTC Check”. <i>Is there any DTC(s)?</i>	Go to Step 9.	Go to Step 10.

1A-21 Engine General Information and Diagnosis:

Step	Action	Yes	No
8	🔧 Engine basic inspection and engine symptom diagnosis 1) Check and repair according to “Engine Basic Inspection” and “Engine Symptom Diagnosis”. <i>Are check and repair complete?</i>	Go to Step 11.	Check and repair malfunction part(s), and go to Step 11.
9	🔧 Troubleshooting for DTC 1) Check and repair according to applicable DTC diag. flow. <i>Are check and repair complete?</i>	Go to Step 11.	Check and repair malfunction part(s), and go to Step 11.
10	🔧 Intermittent problems check 1) Check for intermittent problems referring to “Step 10: Intermittent Problems Check: ”. <i>Is there any faulty condition?</i>	Repair or replace malfunction part(s), and go to Step 11.	Go to Step 11.
11	🔧 Final confirmation test 1) Clear DTC if any. 2) Perform final confirmation test referring to “Step 11: Final Confirmation Test: ”. <i>Is there any problem symptom, DTC or abnormal condition?</i>	Go to Step 6.	End.

Step 1: Customer Complaint Analysis

Record details of the problem (failure, complaint) and how it occurred as described by the customer. For this purpose, use of such an inspection form will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer problem inspection form (Example)

User name:	Model:	VIN:	
Date of issue:	Date Reg.	Date of problem:	Mileage:

PROBLEM SYMPTOMS	
☐ Difficult Starting ☐ No cranking ☐ No initial combustion ☐ No combustion ☐ Poor starting at (☐ cold ☐ warm ☐ always) ☐ Other _____	☐ Poor Driveability ☐ Hesitation on acceleration ☐ Back fire/ ☐ After fire ☐ Lack of power ☐ Surging ☐ abnormal knocking ☐ Other _____
☐ Poor Idling ☐ Poor fast idle ☐ Abnormal idling speed (☐ High ☐ Low) (r/min.) ☐ Unstable ☐ Hunting (r/min. to r/min.) ☐ Other _____	☐ Engine Stall when ☐ Immediately after start ☐ Accel. pedal is depressed ☐ Accel. pedal is released ☐ Load is applied ☐ A/C ☐ Electric load ☐ P/S ☐ Other _____ ☐ Other _____
☐ OTHERS:	

VEHICLE/ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS	
Environmental Condition	
Weather	☐ Fair ☐ Cloudy ☐ Rain ☐ Snow ☐ Always ☐ Other _____
Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (°F/ °C) ☐ Always
Frequency	☐ Always ☐ Sometimes (times/ day, month) ☐ Only once ☐ Under certain condition
Road	☐ Urban ☐ Suburb ☐ Highway ☐ Mountainous (☐ Uphill ☐ Downhill) ☐ Tarmacadam ☐ Gravel ☐ Other _____
Vehicle Condition	
Engine condition	☐ Cold ☐ Warming up phase ☐ Warmed up ☐ Always ☐ Other at starting ☐ Immediately after start ☐ Racing without load ☐ Engine speed (r/min)
Vehicle condition	During driving: ☐ Constant speed ☐ Accelerating ☐ Decelerating ☐ Right hand corner ☐ Left hand corner ☐ When shifting (Lever position) ☐ At stop ☐ Vehicle speed when problem occurs (km/h, Mile/h) ☐ Other

Malfunction indicator lamp condition	☐ Always ON ☐ Sometimes ON ☐ Always OFF ☐ Good condition
Diagnostic trouble code	First check: ☐ No code ☐ Malfunction code () Second check: ☐ No code ☐ Malfunction code ()

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NOTE

This form is a standard sample. It should be modified according to conditions characteristic of each market.

Step 2: DTC / Freeze Frame Data Check, Record and Clearance

First, check DTC (including pending DTC), referring to "DTC Check". If DTC is indicated, print it and freeze frame data or write them down and then clear them by referring to "DTC Clearance". DTC indicates malfunction that occurred in the system but does not indicate whether it exists now or it occurred in the past and the normal condition has been restored now. To check which case applies, check the symptom in question according to Step 5 and recheck DTC according to Step 6 and 7. Attempt to diagnose a trouble based on DTC in this step only or failure to clear the DTC in this step will lead to incorrect diagnosis, trouble diagnosis of a normal circuit or difficulty in troubleshooting.

Step 3 and 4: Visual Inspection

As a preliminary step, be sure to perform visual check of the items that support proper function of the engine referring to "Visual Inspection".

Step 5: Trouble Symptom Confirmation

Based on information obtained in "Step 1: Customer Complaint Analysis: " and "Step 2: DTC / Freeze Frame Data Check, Record and Clearance: ", confirm trouble symptoms. Also, reconfirm DTC according to "DTC Confirmation Procedure" described in each DTC diag. flow.

Step 6 and 7: Rechecking and Record of DTC / Freeze Frame Data

Refer to "DTC Check" for checking procedure.

Step 8: Engine Basic Inspection and Engine Symptom Diagnosis

Perform basic engine check according to "Engine Basic Inspection" first. When the end of the flow has been reached, check the parts of the system suspected as a possible cause referring to "Engine Symptom Diagnosis" and based on symptoms appearing on the vehicle (symptoms obtained through steps of customer complaint analysis, trouble symptom confirmation and/or basic engine check) and repair or replace faulty parts, if any.

Step 9: Troubleshooting for DTC (See each DTC Diag. Flow)

Based on the DTC indicated in Step 6 or 7 and referring to the applicable DTC diag. flow, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, ECM or other part and repair or replace faulty parts.

Step 10: Intermittent Problems Check

Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual" and related circuit of DTC recorded in Step 2.

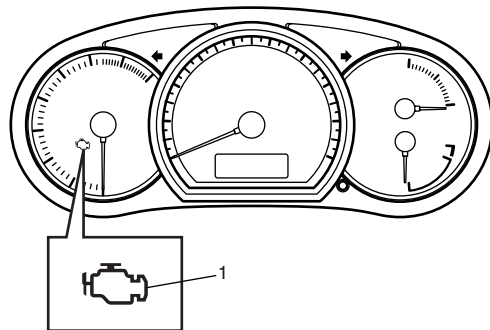
Step 11: Final Confirmation Test

Confirm that the problem symptom has gone and the engine is free from any abnormal conditions. If what has been repaired is related to the DTC, clear the DTC once, perform DTC confirmation procedure and confirm that no DTC is indicated.

Malfunction Indicator Lamp (MIL) Check

S6RW0E1104002

- 1) Turn ON ignition switch (with engine at stop) and check that MIL (1) lights.
If MIL does not light up (or MIL dims) but engine can be starting, go to "MIL Does Not Come ON with Ignition Switch ON and Engine Stop (but Engine Can Be Started)" for troubleshooting.
If MIL does not light with ignition switch ON and engine does not start though it is cranked up, go to "ECM Power and Ground Circuit Check".
- 2) Start engine and check that MIL turns OFF.
If MIL remains ON and no DTC is stored in ECM, go to "MIL Remains ON after Engine Starts" for troubleshooting.



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DTC Check

S6RW0E1104085

NOTE

The MIL is turned on when the ECM and/or TCM detect malfunction(s). Each ECM and TCM stores diagnostic information as the diagnostic trouble code (DTC) in its memory and outputs the DTC to the scan tool. Therefore, check both of the ECM and TCM for any DTC with the scan tool because the DTC stored in ECM and TCM is not read and displayed at a time. However, each of the ECM and TCM needs not to be checked with the generic scan tool because the DTC stored in ECM and TCM is read and displayed at a time.

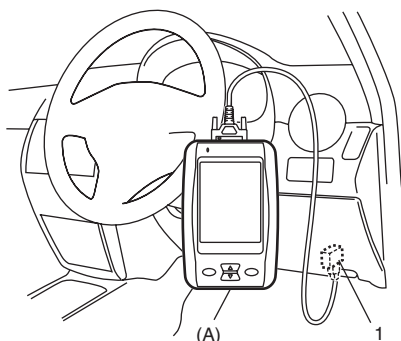
Using Scan Tool

- 1) Prepare SUZUKI scan tool.

Special tool

(A): SUZUKI scan tool (SUZUKI-SDT)

- 2) With ignition switch turned OFF, connect it to data link connector (DLC) (1) located on underside of instrument panel at driver's seat side.

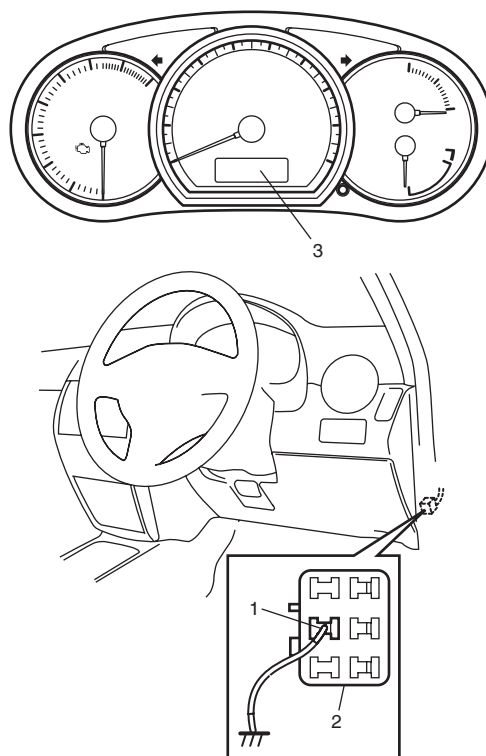


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- 3) Turn ignition switch ON and confirm that MIL lights.
- 4) Read DTC, pending DTC and freeze frame data according to instructions displayed on scan tool and print them or write them down. Refer to scan tool operator's manual for further details. If communication between scan tool and ECM is impossible, go to "Troubleshooting for Communication Error with Scan Tool Using CAN".
- 5) After completing the check, turn ignition switch OFF and disconnect scan tool from data link connector.

Using Diagnosis connector

- 1) Turn ignition switch to OFF position.
 - 2) Using service wire, ground diagnosis switch terminal (1) of diagnosis connector (2).
 - 3) Turn ON ignition switch and check DTC displayed on odometer (3) of combination meter.
- When 2 or more DTCs are stored in memory, blinking for each DTC starts with the smallest DTC number in increasing order. Also, DTC is indicated repeatedly until the ignition switch is turned OFF or disconnect service wire.



I6RW0E110015-01

NOTE

When no DTC is detected, display on odometer of combination meter is "0000".

- 4) After completing the check, turn ignition switch to OFF position and disconnect service wire from diagnosis connector.

DTC Clearance

S6RW0E1104086

Using Scan Tool

- 1) Connect SUZUKI scan tool to data link connector in the same manner as when making this connection for DTC check.
- 2) Turn ignition switch OFF and then ON.
- 3) Erase DTC and pending DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further details.
- 4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector.

NOTE

DTC and freeze frame data stored in ECM memory are also cleared in the following cases. Be careful not to clear them before keeping their record.

- When power to ECM is cut off (by disconnecting battery cable, removing fuse or disconnecting ECM connectors).
- When the same malfunction (DTC) is not detected again during 40 engine warm-up cycles. (See "Warm-Up Cycle" of "On-Board Diagnostic System Description".)

Without Using Scan Tool

- 1) Turn ignition switch to OFF position.
- 2) Disconnect battery negative cable for specified time below to erase diagnostic trouble code stored in ECM memory and reconnect it.

Time required to erase DTC

Ambient temperature	Time to cut power to ECM
Over 0 °C (32 °F)	30 sec. or longer
Under 0 °C (32 °F)	Not specifiable. Select a place with higher than 0 °C (32 °F) temperature.

Troubleshooting for Communication Error with Scan Tool Using CAN

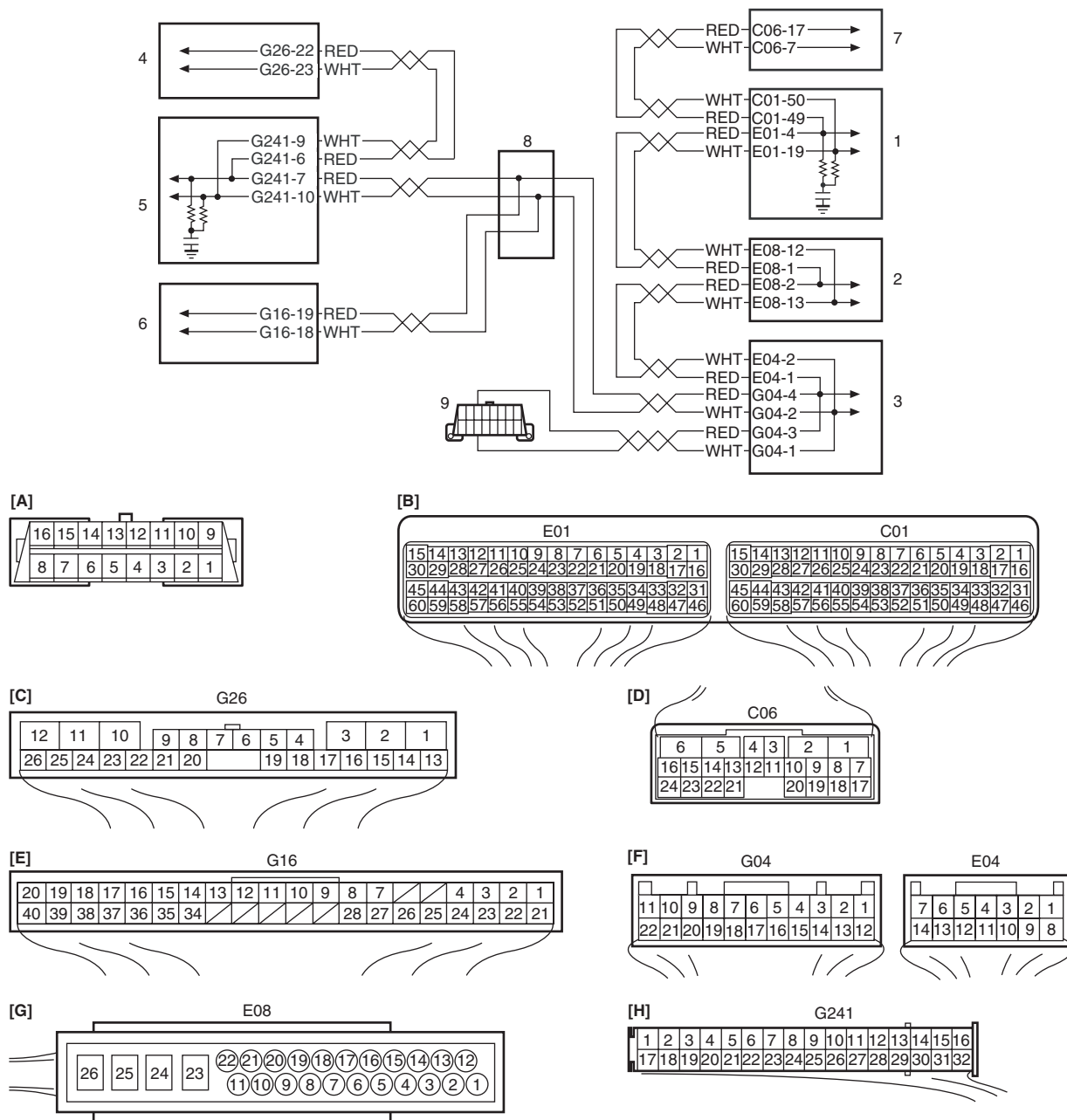
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Perform this troubleshooting when it is not possible to communicate between scan tool and ECM/TCM.

NOTE

- When performing this troubleshooting, be sure to have full understanding of "Precaution on CAN Troubleshooting" and observe it.
- It may be possible that CAN system has trouble because of fuse blown or low battery voltage. Before troubleshooting, check to make sure that fuse, battery voltage and generator status are normal.
- When disconnecting each control module connector in this troubleshooting, various DTCs will be detected. Be sure to clear DTCs in the following control modules after completing this troubleshooting.
 - ECM
 - BCM
 - TCM
 - Keyless start control module
 - 4WD control module
 - HVAC control module (Auto A/C model)
 - P/S control module

Wiring Diagram



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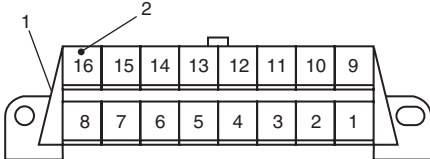
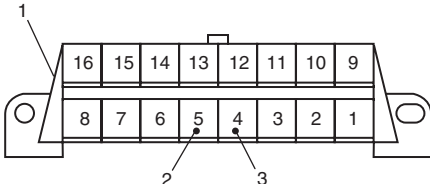
[A]: DLC connector (viewed from terminal side)	1. ECM
[B]: ECM connector (viewed from harness side)	2. ABS control module
[C]: 4WD control module connector (viewed from harness side)	3. BCM
[D]: TCM connector (viewed from harness side)	4. 4WD control module
[E]: Keyless start control module connector	5. Combination meter
[F]: BCM connector (viewed from harness side)	6. Keyless start control module
[G]: ABS control module connector (viewed from terminal side)	7. TCM
[H]: Combination meter connector (viewed from terminal side)	8. CAN junction connector
	9. DLC

1A-27 Engine General Information and Diagnosis:

Trouble area

- Scan tool
- Connector related to CAN line (included in DLC)
- CAN line
- Power or ground circuit of DLC
- Control module communicated by CAN
 - ECM
 - TCM
 - ABS control module
 - BCM
 - Combination meter
 - Keyless start control module
 - 4WD control module
- Power or ground circuit of control module communicated by CAN

Troubleshooting

Step	Action	Yes	No
1	Scan tool check 1) Disconnect scan tool from DLC with ignition switch turned OFF. 2) Check for proper connection to all terminals of scan tool connector. 3) If OK, connect scan tool to another vehicle of this type with ignition switch turned OFF. 4) Check communication between scan tool and ECM by DTC check in ECM. <i>Is it possible to check DTC in ECM?</i>	Go to Step 2.	Scan tool faulty. Refer to its operator's manual.
2	DLC power circuit check 1) Check for proper connection to all DLC (1) terminals with ignition switch turned OFF. 2) If OK, measure voltage between +B terminal (2) of DLC and vehicle body ground with ignition switch turned to ON position.  I7RW01110096-01 <i>Is voltage 10 – 14 V?</i>	Go to Step 3.	Repair power circuit.
3	DLC ground circuit check 1) Ignition switch turn to OFF position. 2) Check DLC (1) ground circuits as follows. • Measure resistance between signal ground terminal (2) of DLC and vehicle body ground. • Measure resistance between body ground terminal (3) of DLC and vehicle body ground.  I7RW01110097-01 <i>Is resistance 1 Ω or less?</i>	Go to Step 4.	Repair ground circuit(s).

Step	Action	Yes	No
4	DTC Check 1) Turn ignition switch to OFF position. 2) Connect scan tool to DLC. 3) Check DTC in the following control modules that communicate with scan tool by K-line. • BCM • Keyless start control module • 4WD control module <i>Is there any DTC other than CAN-DTC?</i>	Go to applicable troubleshooting of DTC other than CAN-DTC.	Go to Step 5.
5	CAN line check between DLC and BCM 1) Turn ignition switch to OFF position. 2) Disconnect BCM connector from BCM. 3) Check for proper connection to all terminals of BCM connector. 4) If OK, check CAN lines between DLC and BCM connector for open, short to power circuit, short to ground circuit, short to other CAN line and high resistance. <i>Are CAN lines between DLC and BCM connector in good condition?</i>	Go to Step 6.	Repair CAN line.
6	Control module connector check 1) Turn ignition switch to OFF position. 2) Disconnect all the following control module connectors. • Control modules communicated by CAN – ECM – TCM – ABS control module – BCM – Combination meter – Keyless start control module – 4WD control module 3) Check for proper connection to each CAN line terminal of all control module (communicated by CAN) connectors. 4) If OK, connect connectors of all control module/sensor communicated by CAN securely. 5) Check communication between scan tool and ECM/TCM by DTC check in ECM/TCM. <i>Is it possible to check DTC in ECM and TCM?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 7.

1A-29 Engine General Information and Diagnosis:

Step	Action	Yes	No
7	CAN line check 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control module communicated by CAN. 3) Check all the following CAN lines for open, short to power circuit, short to ground circuit, short to other CAN line and high resistance. • Between BCM connector and ABS control module connector • Between ABS control module connector and ECM connector • Between ECM connector and TCM connector • Between BCM connector and keyless start control module connector • Between combination meter connector and 4WD control module connector • Between BCM connector and combination meter connector <i>Are all CAN lines in good condition?</i>	Go to Step 8.	Repair CAN line.
8	Communication check between scan tool and ECM 1) Turn ignition switch to OFF position. 2) Connect ECM, BCM, ABS control module and combination meter connectors. 3) Check communication between scan tool and ECM by DTC check in ECM. <i>Is it possible to check DTC in ECM?</i>	A/T model: Go to Step 9. M/T model: Substitute a known-good ECM and recheck.	Go to Step 4 through Step 11 of "Troubleshooting for CAN-DTC".
9	Communication check between scan tool and TCM 1) Turn ignition switch to OFF position. 2) Connect TCM connectors. 3) Check communication between scan tool and TCM by DTC check in TCM. <i>Is it possible to check DTC in TCM?</i>	Identify malfunction control module by performing Step 13 through Step 14 of "Troubleshooting for CAN-DTC".	Go to Step 10.
10	Internal circuit check in ECM 1) Turn ignition switch to OFF position and then disconnect negative (–) cable at battery. 2) Disconnect TCM connectors. 3) Measure resistance between the followings • Between CAN High terminal on DLC and "C06-17" terminal on TCM connector • Between CAN Low terminal on DLC and "C06-7" terminal on TCM connector <i>Is each resistance 0 – 1 Ω?</i>	Substitute a known-good TCM and recheck.	Substitute a known-good ECM and recheck.

DTC Table

NOTE

- 1 driving cycle: MIL lights up when DTC is detected during 1 driving cycle.
- 2 driving cycles: MIL lights up when the same DTC is detected also in the next driving cycle after DTC is detected and stored temporarily in the first driving cycle.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
P0010	Camshaft position actuator circuit (for engine with VVT system)	Oil control valve circuit open or short.	1 driving cycle
P0011	Camshaft position – timing over-advanced or system performance (for engine with VVT system)	Actual value of advanced valve timing does not reach target value, or valve timing is advanced although ECM command is most retarding.	2 driving cycles
P0012	Camshaft position – timing over-retarded (for engine with VVT system)		2 driving cycles
P0031	HO2S heater control circuit low (Sensor-1)	Heater control circuit voltage of A/F sensor is lower than specified value for specified time even though control duty ratio of A/F sensor heater is lower than 90% with engine running. (Heater control duty pulse is not detected in its circuit of ECM)	2 driving cycles
P0032	HO2S heater control circuit high (Sensor-1)	Heater control circuit voltage of A/F sensor is higher than specified value for specified time even though control duty ratio of A/F sensor heater is higher than 10% with engine running. (Heater control duty pulse is not detected in its circuit of ECM)	2 driving cycles
P0037	HO2S heater control circuit low (Sensor-2)	Heater current is lower than specified value while heater ON.	2 driving cycles
P0038	HO2S heater control circuit high (Sensor-2)	Heater current is higher than specified value while heater ON.	2 driving cycles
P0102	Mass air flow circuit low input	Output voltage of MAF sensor is lower than specified value.	1 driving cycle
P0103	Mass air flow circuit high input	Output voltage of MAF sensor is higher than specified value.	1 driving cycle
P0107	Manifold absolute pressure circuit low input	Output voltage of MAP sensor is lower than specified value.	1 driving cycle
P0108	Manifold absolute pressure circuit high input	Output voltage of MAP sensor is higher than specified value.	1 driving cycle
P0112	Intake air temperature sensor circuit low	Circuit voltage of IAT sensor is lower than specified value.	1 driving cycle
P0113	Intake air temperature sensor circuit high	Circuit voltage of IAT sensor is higher than specified value.	1 driving cycle
P0117	Engine coolant temperature circuit low	Circuit voltage of ECT sensor is lower than specified value.	1 driving cycle
P0118	Engine coolant temperature circuit high	Circuit voltage of ECT sensor is higher than specified value.	1 driving cycle
P0122	Throttle position sensor (main) circuit low	Output voltage of throttle position sensor (main) is lower than specified value.	1 driving cycle
P0123	Throttle position sensor (main) circuit high	Output voltage of throttle position sensor (main) is higher than specified value.	1 driving cycle
P0131	O2 sensor (HO2S) circuit low voltage (Sensor-1)	A/F sensor terminal voltage is lower than specified value or A/F sensor output current is lower than specified value for 5 sec. With engine running.	2 driving cycles
P0132	O2 sensor (HO2S) circuit high voltage (Sensor-1)	A/F sensor terminal voltage is higher than specified value or A/F sensor output current is higher than specified value for 5 sec. With engine running.	2 driving cycles

1A-31 Engine General Information and Diagnosis:

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
P0134	O2 sensor (HO2S) circuit no activity detected (Sensor-1)	Impedance of A/F sensor element is higher than specified value for 15 sec. even though A/F sensor heater is turned ON for specified time with engine running.	2 driving cycles
P0140	O2 sensor (HO2S) circuit no activity detected (Sensor-2)	Output voltage of HO2S is higher than specified value after warming up engine.	2 driving cycles
P0171	System too lean	Total fuel trim is higher than specified value for specified time. (Fuel trim toward rich side is large.)	2 driving cycles
P0172	System too rich	Total fuel trim is lower than specified value for specified time. (Fuel trim toward lean side is large.)	2 driving cycles
P0222	Throttle position sensor (sub) circuit low	Output voltage of throttle position sensor (sub) is lower than specified value.	1 driving cycle
P0223	Throttle position sensor (sub) circuit high	Output voltage of throttle position sensor (sub) is higher than specified value.	1 driving cycle
P0327	Knock sensor circuit low	Output voltage of knock sensor is lower than specified value.	1 driving cycle
P0328	Knock sensor circuit high	Output voltage of knock sensor is higher than specified value.	1 driving cycle
P0335	Crankshaft position sensor circuit	No signal of CKP sensor for specified time even if starting motor signal is input.	1 driving cycle
P0340	Camshaft position sensor circuit	CMP sensor pulse is out of specification.	1 driving cycle
P0350	Ignition coil primary / secondary circuit	Ignition signal is not inputted to monitor circuit 5 times or more continuously.	1 driving cycle
P0401	Exhaust gas recirculation flow detected as insufficient	Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is less than specification.	2 driving cycles
P0402	Exhaust gas recirculation flow detected as excessive	Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is more than specification.	2 driving cycles
P0403	Exhaust gas recirculation control circuit	Output voltage is different from output command with more than one pole out of 4 poles.	1 driving cycle
P0443	Evaporative emission system purge control valve circuit	Monitor signal of EVAP canister purge valve is different from command signal. (circuit open or shorted to ground)	2 driving cycles
P0462	Fuel level sensor circuit low	Circuit voltage of fuel level sensor is lower than specified value.	—
P0463	Fuel level sensor circuit high	Circuit voltage of fuel level sensor is higher than specified value.	—
P0480	Fan 1 control circuit	Monitor signal of radiator cooling fan relay is different from command signal.	1 driving cycle
P0481	Fan 2 control circuit	Monitor signal of A/C condenser cooling fan relay is different from command signal.	—
P0500	Vehicle speed sensor	No VSS signal during fuel cut for specified time or longer.	2 driving cycles
P0532	A/C refrigerant pressure sensor circuit low	Output voltage of A/C refrigerant pressure sensor is lower than specified value.	—
P0533	A/C refrigerant pressure sensor circuit high	Output voltage of A/C refrigerant pressure sensor is higher than specified value.	—
P0601	Internal control module memory check sum error	Data write error or check sum error.	1 driving cycle
P0602	Control module programming error	Data programming error.	1 driving cycle
P0607	Control module performance	Data programming error.	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
P0620	Generator control circuit	Battery voltage is higher than specified value for specified time even through generator control is maximum regulation, or battery voltage is lower than specified value for specified time even through generator control is minimum regulation and electric load is less than specified value.	—
P0625	Generator field terminal circuit low	Generator field coil duty is 100% (low voltage) for specified time even through generator control is maximum regulation, or generator field coil duty is 100% (low voltage) when engine is starting.	—
P0626	Generator field terminal circuit high	Generator field coil duty is 1% or less (high voltage) for specified time even through generator control is minimum regulation.	—
P1501	Electric load current sensor circuit low	Electric load current is lower than specified value (electric load current sensor voltage is higher than specified value).	—
P1502	Electric load current sensor circuit high	Electric load current is higher than specified value (electric load current sensor voltage is lower than specified value).	—
P1510	ECM backup power supply malfunction	Backup power voltage is out of specification after starting engine.	1 driving cycle
P2101	Throttle actuator control motor circuit range/performance	Monitor signal of throttle actuator output (duty output) is inconsistent with throttle actuator control command.	1 driving cycle
P2102	Throttle actuator control motor circuit low	Power supply voltage of throttle actuator control circuit is lower than specified value even if throttle actuator control relay turned ON.	1 driving cycle
P2103	Throttle actuator control motor circuit high	Power supply voltage of throttle actuator control circuit is higher than specified value even if throttle actuator control relay turned OFF.	1 driving cycle
P2111	Throttle actuator control system – stuck open	Throttle valve default opening is higher than specified value from complementary closed position when diagnosing throttle valve at ignition switch turned OFF.	1 driving cycle
P2119	Throttle actuator control throttle body range/performance	Difference between actual throttle valve opening angle and opening angle calculated by ECM is higher than specified value.	1 driving cycle
P2122	Pedal position sensor (main) circuit low input	Output voltage of pedal position sensor (main) is lower than specified value.	1 driving cycle
P2123	Pedal position sensor (main) circuit high input	Output voltage of pedal position sensor (main) is higher than specified value.	1 driving cycle
*P2127	Pedal position sensor (sub) circuit low input	Output voltage of pedal position sensor (sub) is lower than specified value.	1 driving cycle
P2128	Pedal position sensor (sub) circuit high input	Output voltage of pedal position sensor (sub) is higher than specified value.	1 driving cycle
P2135	Throttle position sensor (main / sub) voltage correlation	Difference between the opening angle based on throttle position sensor (main) and the opening angle based on throttle position sensor (sub) is higher than specified value.	1 driving cycle
P2138	Pedal position sensor (main / sub) voltage correlation	Difference between the opening angle based on accelerator pedal position sensor (main) and the opening angle based on accelerator pedal position sensor (sub) is higher than specified value.	1 driving cycle
P2228	Barometric pressure circuit low	Barometric pressure sensor voltage is lower than specified value.	1 driving cycle
P2229	Barometric pressure circuit high	Barometric pressure sensor voltage is higher than specified value.	1 driving cycle

1A-33 Engine General Information and Diagnosis:

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
U0073	Control Module Communication Bus Off	Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 30 times continuously.	—
U0101	Lost Communication With Transmission Control Module	Reception error of communication data for TCM is detected for longer than specified time continuously.	1 driving cycle
U0121	Lost Communication Anti-Lock Brake System (ABS) Control Module	Reception error of communication data for ESP® control module or ABS hydraulic unit / control module assembly is detected for longer than specified time continuously.	1 driving cycle
U0140	Lost Communication With Body Control Module	Reception error of communication data for BCM is detected for longer than specified time continuously.	—
P1614	Transponder response error	Refer to “DTC Table in Section 10C in related manual”.	—
P1615	ID code does not registered (vehicle equipped with keyless start system only)		—
P1616	Different registration ID codes (vehicle equipped with keyless start system only)		—
P1618	CAN communication error (reception error for keyless start control module) (vehicle equipped with keyless start system only)		—
P1621	Immobilizer communication line error		—
P1622	EEPROM error		—
P1623	Unregistered transponder		—
P1625	Immobilizer antenna error		—
P1636	Immobilizer information registration failure		—
P1638	Immobilizer information mismatched		—

Fail-Safe Table

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When any of the following DTCs is detected, ECM enters fail-safe mode as long as malfunction continues to exist but that mode is cancelled when ECM detects normal condition after that.

DTC No.	Detected item	Fail-safe operation
P0031	HO2S Heater Control Circuit Low (Sensor-1)	ECM stops air/fuel ratio feed back (closed loop) control.
P0032	HO2S Heater Control Circuit High (Sensor-1)	
P0102	Mass air flow circuit low input	- ECM controls injector drive time (fuel injection volume) according to throttle valve opening (closed throttle position or not). - ECM stops EGR control.
P0103	Mass air flow circuit high input	
P0112	Intake air temperature sensor circuit low	ECM controls actuators assuming that intake air temperature is 20 °C (68 °F).
P0113	Intake air temperature sensor circuit high	
P0117	Engine coolant temperature circuit low	- ECM controls actuators assuming that engine coolant temperature is 80 °C (176 °F). - ECM operates radiator cooling fan.
P0118	Engine coolant temperature circuit high	
P0122	Throttle position sensor (main) circuit low	- ECM turns OFF throttle actuator control relay and throttle valve is fixed at the opening of about 7° from its completely closed position (default opening). - ECM controls fuel cut at specified engine speed. - ECM stops air/fuel ratio control.

DTC No.	Detected item	Fail-safe operation
P0123	Throttle position sensor (main) circuit high	- ECM turns OFF throttle actuator control relay and throttle valve is fixed at the opening of about 7° from its completely closed position (default opening). - ECM controls fuel cut at specified engine speed. - ECM stops air/fuel ratio control.
P0131	O2 Sensor (HO2S) Circuit Low Voltage (Sensor-1)	- ECM stops A/F sensor heater control. - ECM stops EVAP canister purge valve control. - ECM stops air/fuel ratio feed back (closed loop) control.
P0132	O2 Sensor (HO2S) Circuit High Voltage (Sensor-1)	
P0134	O2 Sensor (HO2S) No Activity Detected (Sensor-1)	
P0222	Throttle position sensor (sub) circuit low	- ECM turns OFF throttle actuator control relay and throttle valve is fixed at the opening of about 7° from its completely closed position (default opening). - ECM controls fuel cut at specified engine speed. - ECM stops air/fuel ratio control.
P0223	Throttle position sensor (sub) circuit high	
P0335	Crankshaft position sensor circuit	Ignition timing is fixed.
P0340	Camshaft position sensor circuit	ECM changes injection control system from sequential injection to simultaneous one.
P0350	Ignition coil primary / secondary circuit	ECM cuts fuel injection of abnormal side (No.1 and No. 4 side or No. 2 and No. 3 side).
P0500	Vehicle speed sensor	- ECM controls actuators assuming that vehicle speed is 0 km/h (0 mile/h). - ECM stops IAC feedback control.
P0620	Generator control circuit	ECM stops part of IAC feedback control.
P0625	Generator field terminal circuit low	- ECM stops part of IAC feedback control. - ECM stops generator control.
P0626	Generator field terminal circuit high	
P1501	Electric load current sensor circuit low	- ECM stops part of generator control. - ECM stops part of IAC feedback control.
P1502	Electric load current sensor circuit high	
P2101	Throttle actuator control motor circuit range / performance)	- ECM turns OFF throttle actuator control relay and throttle valve is fixed at the opening of about 7° from its completely closed position (default opening). - ECM controls fuel cut at specified engine speed.
P2102	Throttle actuator control motor circuit low	
P2103	Throttle actuator control motor circuit high	
P2111	Throttle actuator control system – stuck open)	- ECM turns OFF throttle actuator control relay and throttle valve is fixed at the opening of about 7° from its completely closed position (default opening). - ECM controls fuel cut at specified engine speed.
P2119	Throttle actuator control throttle body range / performance)	- ECM turns OFF throttle actuator control relay and throttle valve is fixed at the opening of about 7° from its completely closed position (default opening). - ECM controls fuel cut at specified engine speed.

1A-35 Engine General Information and Diagnosis:

DTC No.	Detected item	Fail-safe operation
P2122	Pedal position sensor (main) circuit low input)	- ECM turns OFF throttle actuator control relay and throttle valve is fixed at the opening of about 7° from its completely closed position (default opening). - ECM controls fuel cut at specified engine speed.
P2123	Pedal position sensor (main) circuit high input)	
P2127	Pedal position sensor (sub) circuit low input)	
P2128	Pedal position sensor (sub) circuit high input)	
P2135	Throttle position sensor (main) / (sub) voltage correlation)	
P2138	Pedal position sensor (main) / (sub) voltage correlation)	
P2228	Barometric pressure circuit low	ECM controls actuators assuming that barometric pressure is 101.33 kPa (762 mmHg).
P2229	Barometric pressure circuit high	

Scan Tool Data

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As the data values are standard values estimated on the basis of values obtained from the normally operating vehicles by using a scan tool, use them as reference values. Even when the vehicle is in good condition, there may be cases where the checked value does not fall within each specified data range. Therefore, judgment as abnormal should not be made by checking with these data alone.

Also, conditions that can be checked by the scan tool are those detected by ECM and output from ECM as commands and there may be cases where the engine or actuator is not operating (in the condition) as indicated by the scan tool. Be sure to use the timing light to check the ignition timing.

NOTE

When checking the data with the engine running at idle or racing, be sure to shift M/T gear to the neutral position and A/T gear to the “Park” position and pull the parking brake fully. Also, if nothing or “no load” is indicated, turn OFF A/C (if equipped with A/C), all electric loads, P/S and all the other necessary switches.

Scan tool data	Vehicle condition		Normal condition / reference values
COOLANT TEMP (ENGINE COOLANT TEMP.)	At specified idle speed after warming up		80 – 100 °C, 176 – 212 °F
INTAKE AIR TEMP.	At specified idle speed after warming up		–5 °C (23 °F) + environmental temp. to 40 °C (104 °F) + environmental temp.
ENGINE SPEED	It idling with no load after warming up		Desired idle speed ± 50 rpm
DESIRED IDLE (DESIRED IDLE SPEED)	It idling with radiator cooling fan stopped and all electrical parts turned OFF after warming up, M/T at neutral		700 rpm
MAF (MASS AIR FLOW RATE)	At specified idle speed with no load after warming up		1.0 – 4.0 g/s 0.14 – 0.52 lb/min.
	At 2500 r/min. with no load after warming up		4.0 – 9.0 g/s 0.53 – 1.58 lb/min.
CALC LOAD (CALCULATED LOAD VALUE)	At specified idle speed with no load after warming up		16 – 36%
	At 2500 r/min. with no load after warming up		10 – 30%
MAP (INTAKE MANIFOLD ABSOLUTE PRESSURE) (if equipped)	At specified idle speed with no load after warming up		24 – 38 kPa, 7.1 – 11.2 in.Hg
THROTTLE POSITION (RELATIVE THROTTLE POSITION)	Ignition switch ON / warmed up engine stopped	Accelerator pedal released	0 – 12%
		Accelerator pedal depressed fully	90 – 100%
BAROMETRIC PRES	—		Barometric pressure is displayed
FUEL TANK LEVEL	Ignition switch ON		0 – 100%
BATTERY VOLTAGE	Ignition switch ON / engine at stop		10 – 14 V
BRAKE SWITCH	Ignition switch ON	Brake pedal is released	OFF
		Brake pedal is depressed	ON

Scan tool data	Vehicle condition		Normal condition / reference values
FUEL SYSTEM B1 (FUEL SYSTEM STATUS)	At specified idle speed after warming up		CLSD (closed loop)
O2S B1 S1 (HEATED OXYGEN SENSOR-1)	At specified idle speed after warming up		0.1 – 0.95 V
O2S B1 S2 (HEATED OXYGEN SENSOR-2) (if equipped)	At 2000 r/min. for 3 min. or longer after warming up		0.1 – 0.95 V
SHORT FT B1 (SHORT TERM FUEL TRIM)	At specified idle speed after warming up		–20 – +20%
LONG FT B1 (LONG TERM FUEL TRIM)	At specified idle speed after warming up		–20 – +20%
TOTAL FUEL TRIM B1	At specified idle speed after warming up		–35 – +35%
FUEL CUT	Engine at fuel cut condition		ON
	Engine at other than fuel cut condition		OFF
O2S B1 S2 ACT (HEATED OXYGEN SENSOR-2) (if equipped)	At specified idle speed after warming up		ACTIVE
O2S B1 S1 ACT (HEATED OXYGEN SENSOR-1)	At specified idle speed after warming up		ACTIVE
CANIST PRG DUTY (EVAP CANISTER PURGE FLOW DUTY)	At specified idle speed after warming up		0%
IGNITION ADVANCE (IGNITION TIMING ADVANCE FOR NO.1 CYLINDER)	At specified idle speed with no load after warming up		5 – 15° BTDC
EGR VALVE OPENING (if equipped)	At specified idle speed after warming up		0%
VVT GAP (TARGET-ACTUAL POSITION) (VVT model)	At specified idle speed after warming up		0 – 3°
FUEL PUMP	Within 2 seconds after ignition switch ON or engine running		ON
	Engine at stop with ignition switch ON		OFF
STARTER SW (STARTER SWITCH)	Ignition switch is turned to ST (engine cranking) position		ON
A/C PRESSURE (A/C REFERIGERANT ABSOLUTE PRESSURE)	Engine running	A/C ON (A/C is operating) at ambient temperature: 30 °C (86 °F) and humidity: 50%	1350 – 1650 kPa For more details, refer to pressure of high pressure gage under “A/C System Performance Inspection Manual Type in Section 7B in related manual”.
		A/C OFF (A/C is not operating) at ambient temperature: 30 °C (86 °F) and engine coolant temperature: 90 – 100 °C (194 – 212 °F)	600 – 1000 kPa After longer than 10 min from A/C switch turned OFF
A/C SWITCH	Engine running after warming up, A/C not operating		OFF
	Engine running after warming up, A/C operating		ON
A/C COMP RELAY	Engine running	A/C switch and blower motor switch turned ON	ON
		A/C switch and blower motor switch turned OFF	OFF

1A-37 Engine General Information and Diagnosis:

Scan tool data	Vehicle condition		Normal condition / reference values
BLOWER FAN	Ignition switch ON	Blower fan switch: 2nd speed position or more	ON
		Blower fan switch: under 1st speed position	OFF
ELECTRIC LOAD	Ignition switch ON / Headlight, small light, all turned OFF		OFF
	Ignition switch ON / Headlight, small light, all turned ON		ON
RADIATOR FAN (RADIATOR COOLING FAN CONTROL RELAY)	Ignition switch ON	Engine coolant temp.: lower than 97.5 °C (207.5 °F)	OFF
		Engine coolant temp.: 100 °C (212 °F)	ON
A/C COND FAN (A/C CONDENSER COOLING FAN CONTROL RELAY)	Engine running	Blower motor switch and A/C switch turned ON/ECT over 102.5 °C (216.5 °F)	ON
		Blower motor switch and/or A/C switch turned OFF	OFF
TP SENSOR 1 VOLT (THROTTLE POSITION SENSOR (MAIN) OUTPUT VOLTAGE)	Ignition switch ON after warmed up engine	Accelerator pedal released	0.48 – 0.90 V
		Accelerator pedal depressed fully	3.37 – 4.55 V
TP SENSOR 2 VOLT (THROTTLE POSITION SENSOR (SUB) OUTPUT VOLTAGE)	Ignition switch ON after warmed up engine	Accelerator pedal released	1.36 – 1.75 V
		Accelerator pedal depressed fully	3.58 – 4.76 V
APP SENSOR 1 VOLT (ACCELERATOR PEDAL POSITION (APP) SENSOR (MAIN) OUTPUT VOLTAGE)	Ignition switch ON after warmed up engine	Accelerator pedal released	0.69 – 0.81 V
		Accelerator pedal depressed fully	3.43 – 4.56 V
APP SENSOR 2 VOLT (ACCELERATOR PEDAL POSITION (APP) SENSOR (SUB) OUTPUT VOLTAGE)	Ignition switch ON after warmed up engine	Accelerator pedal released	0.31 – 0.44 V
		Accelerator pedal depressed fully	1.71 – 2.29 V
ACCEL POSITION (RELATIVE ACCELERATOR PEDAL POSITION)	Ignition switch ON after warmed up engine	Accelerator pedal released	0 – 3%
		Accelerator pedal depressed fully	90 – 100%
TARGET THROTTLE POSI (TARGET THROTTLE VALVE POSITION)	Ignition switch ON after warmed up engine	Accelerator pedal released	0 – 3%
		Accelerator pedal depressed fully	90 – 100%
IAC THROTTLE OPENING (IDLE AIR CONTROL THROTTLE VALVE OPENING)	It idling with no load after warming up		5 – 25%
THROTTLE MOTOR VOLT	Ignition switch ON / engine at stop		10.0 – 14.0 V
CLOSED THROTTLE POS (CLOSED THROTTLE POSITION)	Throttle valve at idle position		ON
	Throttle valve opens larger than idle position		OFF
THROTTLE MOTOR RELAY	At specified idle speed after warming up		ON
VEHICLE SPEED	At stop		0 km/h (0 mph)
INJ PULSE WIDTH (FUEL INJECTION PULSE WIDTH)	At specified idle speed with no load after warming up		1.5 – 3.5 msec.
	At 2500 r/min. no load after warming up		1.5 – 3.0 msec.
BATTERY CURRENT	At specified idle speed with no load after warming up		5.0 – 60.0 A

Scan tool data	Vehicle condition	Normal condition / reference values
⚙️ GENERATOR CONT DUTY (GENERATOR CONTROL DUTY)	At specified idle speed with no load after warming up	20.0 – 100.0%
⚙️ GENERATOR FIELD DUTY (GENERATOR FIELD COIL DUTY)	At specified idle speed with no load after warming up	20.0 – 100.0%

Scan Tool Data Definitions**COOLANT TEMP (ENGINE COOLANT TEMPERATURE, °C, °F)**

It is detected by engine coolant temp. sensor.

INTAKE AIR TEMP. (°C, °F)

It is detected by intake air temp. sensor.

ENGINE SPEED (rpm)

It is computed by reference pulses from the camshaft position sensor.

DESIRED IDLE (DESIRED IDLE SPEED, rpm)

The Desired Idle Speed is an ECM internal parameter which indicates the ECM requested idle. If the engine is not running, this number is not valid.

MAF (MASS AIR FLOW RATE, g/s, lb/min.)

It represents total mass of air entering intake manifold which is measured by mass air flow sensor.

CALC LOAD (CALCULATED LOAD VALUE, %)

Engine load displayed as a percentage of maximum possible load. Value is calculated mathematically using the formula: actual (current) intake air volume ÷ maximum possible intake air volume × 100%

MAP (MANIFOLD ABSOLUTE PRESSURE, in.Hg, kPa)

This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical. It is detected by manifold absolute pressure sensor.

THROTTLE POS (RELATIVE THROTTLE POSITION, %)

When throttle position sensor is at fully closed position, throttle opening is indicated as 0 – 12% and 90 – 100% full open position.

BAROMETRIC PRESS (kPa, in.Hg)

This parameter represents a measurement of barometric air pressure and is used for altitude correction of the fuel injection quantity.

FUEL TANK LEVEL (%)

This parameter indicates approximate fuel level in fuel tank. As detectable range of fuel level sensor is set as 0 to 100%, however, with some models whose fuel tank capacity is smaller, indicated fuel level may be only 70% even when fuel tank is full.

BATTERY VOLTAGE (V)

This parameter indicates battery positive voltage inputted from main relay to ECM.

BRAKE SW (ON/OFF)

This parameter indicates the state of the brake switch.

FUEL SYSTEM B1 (FUEL SYSTEM STATUS)

Air/fuel ratio feedback loop status displayed as one of the followings.

OPEN: Open-loop has not yet satisfied conditions to go closed loop.

CLOSED: Closed-loop using oxygen sensor(s) as feedback for fuel control.

OPEN-DRIVE COND: Open-loop due to driving conditions (Power enrichment, etc.).

OPEN SYS FAULT: Open-loop due to detected system fault.

O2S SENSOR B1 S1 (HEATED OXYGEN SENSOR-1, V)

It indicates output voltage of A/F sensor installed on exhaust manifold (pre-catalyst.)

O2S SENSOR B1 S2 (HEATED OXYGEN SENSOR-2, V)

It indicates output voltage of HO2S installed on exhaust pipe (post-catalyst). It is used to detect catalyst deterioration.

SHORT FT B1 (SHORT TERM FUEL TRIM, %)

Short term fuel trim value represents short term corrections to the air/fuel mixture computation. A value of 0 indicates no correction, a value greater than 0 means an enrichment correction, and a value less than 0 implies an enleanment correction.

LONG FT B1 (LONG TERM FUEL TRIM, %)

Long term fuel trim value represents long term corrections to the air/fuel mixture computation. A value of 0 indicates no correction, a value greater than 0 means an enrichment correction, and a value less than 0 implies an enleanment correction.

TOTAL FUEL TRIM B1 (%)

The value of Total Fuel Trim is obtained by calculating based on values of Short Term Fuel Trim and Long Term Fuel Trim. This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical.

FUEL CUT (ON/OFF)

ON: Fuel being cut (output signal to injector is stopped)

OFF: Fuel not being cut

O2S B1 S2 ACT (HEATED OXYGEN SENSOR-2, ACTIVE / INACTIVE)

This parameter indicates activation condition of HO2S

ACTIVE: Activating

INACTIVE: warming up or at stop

O2S B1 S1 ACT (HEATED OXYGEN SENSOR-1, ACTIVE / INACTIVE)

This parameter indicates activation condition of A/F sensor

ACTIVE: Activating

INACTIVE: warming up or at stop

CANIST PRG DUTY (EVAP CANISTER PURGE FLOW DUTY, %)

This parameter indicates valve ON (valve open) time rate within a certain set cycle of EVAP canister purge valve which controls the amount of EVAP purge.

IGNITION ADVANCE (IGNITION TIMING ADVANCE FOR NO.1 CYLINDER, °)

Ignition timing of No.1 cylinder is commanded by ECM.

The actual ignition timing should be checked by using the timing light.

EGR VALVE OPENING (%)

This parameter indicates opening rate of EGR valve which controls the amount of EGR flow.

VVT GAP (TARGET-ACTUAL POSITION, °) (VVT model)

It is calculated using the formula: target valve timing advance – actual valve timing advance.

FUEL PUMP (ON/OFF)

ON is displayed when ECM activates the fuel pump via the fuel pump relay switch.

STARTER SW (STARTER SWITCH, ON/OFF)

This parameter indicates condition of starting motor relay output.

ON: Starting motor relay is ON

OFF: Starting motor relay is OFF

A/C PRESSURE (A/C REFRIGERANT ABSOLUTE PRESSURE, kPa)

This parameter indicates A/C refrigerant absolute pressure calculated by ECM.

A/C SWITCH (ON/OFF)

ON: Command for A/C operation being output from ECM to HVAC.

OFF: Command for A/C operation not being output.

A/C COMP RELAY (A/C COMPRESSOR RELAY, ON/OFF)

This parameter indicates the state of the A/C switch.

BLOWER FAN (ON/OFF)

This parameter indicates the state of the blower fan motor switch.

ELECTRIC LOAD (ON/OFF)

ON: Headlight or small light ON signal inputted.

OFF: Above electric loads all turned OFF.

RADIATOR COOLING FAN (RADIATOR COOLING FAN CONTROL RELAY, ON/OFF)

ON: Command for radiator cooling fan control relay operation being output.

OFF: Command for relay operation not being output.

A/C COND FAN (A/C CONDENSER COOLING FAN CONTROL RELAY, ON/OFF)

ON: Command for A/C condenser cooling fan control relay operation being output.

OFF: Command for relay operation not being output.

TP SENSOR 1 VOLT (THROTTLE POSITION SENSOR (MAIN) OUTPUT VOLTAGE, V)

The Throttle Position Sensor (Main) reading provides throttle valve opening information in the form of voltage.

TP SENSOR 2 VOLT (THROTTLE POSITION SENSOR (SUB) OUTPUT VOLTAGE, V)

The Throttle Position Sensor (Sub) reading provides throttle valve opening information in the form of voltage.

APP SENSOR 1 VOLT (ACCELERATOR PEDAL POSITION (APP) SENSOR (MAIN) OUTPUT VOLTAGE, V)

The Accelerator Pedal Position (APP) Sensor (Main) reading provides accelerator pedal opening information in the form of voltage.

APP SENSOR 2 VOLT (ACCELERATOR PEDAL POSITION (APP) SENSOR (SUB) OUTPUT VOLTAGE, V)

The Accelerator Pedal Position (APP) Sensor (Sub) reading provides accelerator pedal opening information in the form of voltage.

ACCEL POSITION (RELATIVE ACCELERATOR PEDAL POSITION, %)

When accelerator pedal is at fully released position, accelerator pedal is indicated as 0 – 3% and 90 – 100% fully depressed position.

TARGET THROTTLE POSI (TARGET THROTTLE VALVE POSITION, %)

Target Throttle Valve Position is ECM internal parameter which indicates the ECM requested throttle valve position.

IAC THROTTLE OPENING (IDLE AIR (SPEED) CONTROL THROTTLE VALVE OPENING, %)

This parameter indicates throttle valve opening of idle air control in %.

(100% indicates the maximum idle air flow.)

THROTTLE MOTOR VOLT (V)

This parameter indicates power supply voltage of throttle actuator (motor) control circuit (input voltage from throttle actuator control relay).

CLOSED THROTTLE POS (CLOSED THROTTLE POSITION, ON/OFF)

This parameter reads ON when throttle valve is fully closed, or OFF when it is not fully closed.

THROTTLE MOTOR RELAY (ON/OFF)

ON: Throttle actuator (motor) control activated by ECM.

OF: Throttle actuator (motor) control stopped by ECM.

VEHICLE SPEED (km/h, mph)

It is computed based on pulse signals from front wheel speed sensor (RH, LH) (for M/T model) or output shaft speed sensor (VSS) (for A/T model).

INJ PULSE WIDTH (FUEL INJECTION PULSE WIDTH, msec.)

This parameter indicates time of the injector drive (valve opening) pulse which is output from ECM (but injector drive time of NO.1 cylinder for multiport fuel injection).

BATTERY CURRENT (A)

This parameter indicates electric load value (current consumption) that detected by electric load current sensor.

GENERATOR CONT DUTY (GENERATOR CONTROL DUTY, %)

This parameter indicates generator control duty ratio that controls production electricity of generator by ECM.

100%: No limitation for the generating

0%: Maximum limitation for the generating

GENERATOR FIELD DUTY (GENERATOR FIELD COIL DUTY, %)

This parameter indicates operating rate (status of production electricity) for generator by field coil duty ratio.

100%: maximum operation.

0%: minimum operation.

Visual Inspection

Visually check the following parts and systems.

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Inspection item	Reference section
• Engine oil – level, leakage • Engine coolant – level, leakage • Fuel – level, leakage • Air cleaner element – dirt, clogging • Battery – fluid level, corrosion of terminal • Water pump belt – tension damage • Throttle valve – operating sound • Vacuum hoses of air intake system – disconnection, looseness, deterioration, bend • Connectors of electric wire harness – disconnection, friction • Fuses – burning • Parts – installation, bolt – looseness • Parts – deformation • Other parts that can be checked visually Also check the following items at engine start, if possible • Malfunction indicator lamp – Operation • Charge warning lamp – Operation • Engine oil pressure warning lamp – Operation • Engine coolant temp. meter – Operation	“Engine Oil and Filter Change in Section 0B in related manual” “Coolant Level Check in Section 1F in related manual” “Fuel Lines and Connections Inspection in Section 0B in related manual” “Air Cleaner Filter Inspection in Section 0B in related manual” “Battery Dismounting and Remounting in Section 1J in related manual” “Accessory Drive Belt Inspection in Section 0B in related manual” “Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C” “Vacuum Hose Inspection in Section 1B” “Malfunction Indicator Lamp (MIL) Check” “Generator Symptom Diagnosis in Section 1J in related manual” “Oil Pressure Switch Inspection in Section 9C in related manual” “Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C”

1A-41 Engine General Information and Diagnosis:

Inspection item	Reference section
- Fuel level meter – Operation - Tachometer – Operation	“Fuel Level Sensor Inspection in Section 9C in related manual”
- Abnormal air being inhaled from air intake system - Exhaust system – leakage of exhaust gas, noise - Other parts that can be checked visually	

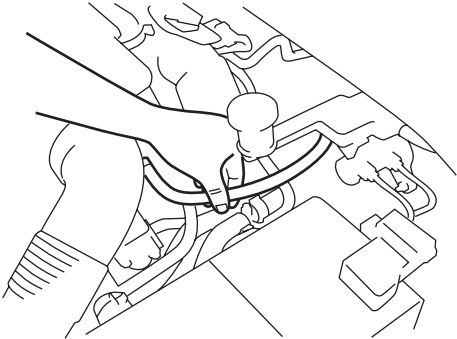
Engine Basic Inspection

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This check is very important for troubleshooting when ECM has detected no DTC and no abnormality has been found in “Visual Inspection”.

Follow the flow carefully.

Step	Action	Yes	No
1	<i>Was “Engine and Emission Control System Check” performed?</i>	Go to Step 2.	Go to “Engine and Emission Control System Check”.
2	Check battery voltage <i>Is it 11 V or more?</i>	Go to Step 3.	Charge or replace battery.
3	<i>Is vehicle equipped with keyless start control system?</i>	Go to Step 4.	Go to Step 5.
4	Check keyless start control system malfunction 1) Check keyless start control system referring to “Keyless Start System Operation Inspection in Section 10E”. <i>Is check result satisfactory?</i>	Go to Step 5.	Keyless start control system malfunction.
5	<i>Is engine cranked?</i>	Go to Step 6.	Go to “Cranking System Symptom Diagnosis in Section 1I in related manual”.
6	<i>Does engine start?</i>	Go to Step 7.	Go to Step 9.
7	Check idle speed 1) Check engine idle speed referring to “Idle Speed and IAC Throttle Valve Opening Inspection”. <i>Is check result as specified?</i>	Go to Step 8.	Go to “Engine Symptom Diagnosis”.
8	Check ignition timing 1) Check ignition timing referring to “Ignition Timing Inspection in Section 1H”. <i>Is check result as specified?</i>	Go to “Engine Symptom Diagnosis”.	Check ignition control related parts referring to “Ignition Timing Inspection in Section 1H”.
9	Check immobilizer system malfunction 1) Check immobilizer indicator lamp for flashing. <i>Is it flashing when ignition switch is turned to ON position?</i>	Go to “DTC Check in Section 10C”.	Go to Step 10.

Step	Action	Yes	No
10	Check fuel supply 1) Check to make sure that enough fuel is filled in fuel tank. 2) Turn ON ignition switch for 2 seconds and then OFF. 3) Repeat Step 2) a few times. <i>Is fuel pressure felt from fuel feed hose when ignition switch is turned ON?</i>  I5RW0A110014-01	Go to Step 12.	Go to Step 11.
11	Check fuel pump for operation <i>Was fuel pump operating sound heard from fuel filler for about 2 seconds after ignition switch ON and stop?</i>	Go to "Fuel Pressure Check".	Go to "Fuel Pump and Its Circuit Check".
12	Check ignition spark 1) Check ignition spark referring to "Ignition Spark Test in Section 1H". <i>Is it in good condition?</i>	Go to Step 13.	Go to "Ignition System Symptom Diagnosis in Section 1H".
13	Check fuel injector circuit 1) Check fuel injector circuit referring to "Fuel Injector Circuit Check". <i>Is it in good condition?</i>	Go to "Engine Symptom Diagnosis".	Go to "Fuel Injector Circuit Check".

Engine Symptom Diagnosis

Perform troubleshooting referring to the followings when ECM has detected no DTC and no abnormality has been found in "Visual Inspection" and "Engine Basic Inspection".

Condition	Possible cause	Correction / Reference Item
Hard starting (Engine cranks OK)	Faulty spark plug	"Spark Plug Inspection in Section 1H"
	Leaky high-tension cord	"High-Tension Cord Inspection in Section 1H"
	Loose connection or disconnection of high-tension cord(s) or lead wire(s)	"High-Tension Cord Removal and Installation in Section 1H"
	Faulty ignition coil	"Ignition Coil Assembly (Including Ignitor) Inspection in Section 1H"
	Dirty or clogged fuel hose or pipe	"Fuel Pressure Check"
	Malfunctioning fuel pump	"Fuel Pressure Check"
	Air drawn in through intake manifold gasket or throttle body gasket	
	Faulty electric throttle body assembly	"Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C"
	Faulty APP sensor assembly	"Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C"
	Faulty ECT sensor or MAF sensor	"Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C" or "Intake Air Temperature (IAT) Sensor Inspection in Section 1C"
	Faulty ECM	
	Low compression	"Compression Check in Section 1D in related manual"
	Poor spark plug tightening or faulty gasket	"Spark Plug Removal and Installation in Section 1H"
	Compression leak from valve seat	"Valves and Valve Guides Inspection in Section 1D in related manual"
	Sticky valve stem	"Valves and Valve Guides Inspection in Section 1D in related manual"
	Weak or damaged valve springs	"Valve Spring Inspection in Section 1D in related manual"
	Compression leak at cylinder head gasket	"Cylinder Head Inspection in Section 1D in related manual"
	Sticking or damaged piston ring	"Cylinders, Pistons and Piston Rings Inspection in Section 1D in related manual"
	Worn piston, ring or cylinder	"Cylinders, Pistons and Piston Rings Inspection in Section 1D in related manual"
	Malfunctioning PCV valve	"PCV Valve Inspection in Section 1B"
Low oil pressure	Camshaft position control (VVT) system out of order (for engine with VVT system)	"Oil Control Valve Inspection (For Engine with VVT) in Section 1D in related manual"
	Faulty EGR system	"EGR System Inspection in Section 1B"
	Improper oil viscosity	"Engine Oil and Filter Change in Section 0B in related manual"
	Malfunctioning oil pressure switch	"Oil Pressure Switch Inspection in Section 9C in related manual"
	Clogged oil strainer	"Oil Pan and Oil Pump Strainer Cleaning in Section 1E in related manual"
	Functional deterioration of oil pump	"Oil Pump Inspection in Section 1E in related manual"
	Worn oil pump relief valve	"Oil Pump Inspection in Section 1E in related manual"
	Excessive clearance in various sliding parts	

Condition	Possible cause	Correction / Reference Item
Engine noise – Valve noise	Improper valve lash	<i>“Camshaft, Tappet and Shim Inspection in Section 1E in related manual”</i>
	Worn valve stem and guide	<i>“Valves and Valve Guides Inspection in Section 1D in related manual”</i>
NOTE		
Before checking mechanical noise, make sure that:	Weak or broken valve spring	<i>“Valve Spring Inspection in Section 1E in related manual”</i>
	Warped or bent valve	<i>“Valves and Valve Guides Inspection in Section 1D in related manual”</i>
• Specified spark plug is used. • Specified fuel is used.		
Engine noise – Piston, ring and cylinder noise	Worn piston, ring and cylinder bore	<i>“Cylinders, Pistons and Piston Rings Inspection in Section 1D in related manual”</i>
NOTE		
Before checking mechanical noise, make sure that:		
• Specified spark plug is used. • Specified fuel is used.		
Engine noise – Connecting rod noise	Worn piston, ring and cylinder bore	<i>“Cylinders, Pistons and Piston Rings Inspection in Section 1D in related manual”</i>
	Worn rod bearing	<i>“Crank Pin and Connecting Rod Bearings Inspection in Section 1D in related manual”</i>
NOTE		
Before checking mechanical noise, make sure that:	Worn crank pin	<i>“Crank Pin and Connecting Rod Bearings Inspection in Section 1D in related manual”</i>
	Loose connecting rod nuts	<i>“Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation in Section 1D in related manual”</i>
• Specified spark plug is used. • Specified fuel is used.	Low oil pressure	Condition “Low oil pressure”
Engine noise – Crankshaft noise	Low oil pressure	Condition “Low oil pressure”
	Worn bearing	<i>“Main Bearings Inspection in Section 1D in related manual”</i>
NOTE		
Before checking mechanical noise, make sure that:	Worn crankshaft journal	<i>“Crankshaft Inspection in Section 1D in related manual”</i>
	Loose bearing cap bolts	<i>“Main Bearings Inspection in Section 1D in related manual”</i>
• Specified spark plug is used. • Specified fuel is used.	Excessive crankshaft thrust play	<i>“Crankshaft Inspection in Section 1D in related manual”</i>

1A-45 Engine General Information and Diagnosis:

Condition	Possible cause	Correction / Reference Item
Engine overheating	Inoperative thermostat	<i>"Thermostat Inspection in Section 1F in related manual"</i>
	Poor water pump performance	<i>"Water Pump Inspection in Section 1F in related manual"</i>
	Clogged or leaky radiator	<i>"Radiator On-Vehicle Inspection and Cleaning in Section 1F in related manual"</i>
	Improper engine oil grade	<i>"Engine Oil and Filter Change in Section 0B in related manual"</i>
	Clogged oil filter or oil strainer	<i>"Oil Pressure Check in Section 1F in related manual"</i>
	Poor oil pump performance	<i>"Oil Pressure Check in Section 1F in related manual"</i>
	Faulty radiator cooling fan control system	<i>"Radiator Cooling Fan Control System Check"</i>
	Dragging brakes	<i>Condition "Dragging brakes" in "Brakes Symptom Diagnosis in Section 4A in related manual"</i>
	Slipping clutch (for M/T model)	<i>Condition "Slipping clutch" in "Clutch System Symptom Diagnosis in Section 5C in related manual" for M/T model</i>
	Blown cylinder head gasket	<i>"Cylinder Head Inspection in Section 1D in related manual"</i>
	Air mixed in cooling system	
Poor gasoline mileage	Leaks or loose connection of high-tension cord	<i>"High-Tension Cord Removal and Installation in Section 1H"</i>
	Faulty spark plug (improper gap, heavy deposits and burned electrodes, etc.)	<i>"Spark Plug Inspection in Section 1H"</i>
	Malfunctioning EGR valve	<i>"EGR Valve Inspection in Section 1B"</i>
	High idle speed	<i>Condition "Improper engine idling or engine fails to idle"</i>
	Poor performance of ECT sensor, MAF sensor	<i>"Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C", or "Intake Air Temperature (IAT) Sensor Inspection in Section 1C"</i>
	Faulty electric throttle body assembly	<i>"Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C"</i>
	Faulty APP sensor assembly	<i>"Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C"</i>
	Faulty fuel injector(s)	<i>"Fuel Injector Circuit Check"</i>
	Faulty ECM	
	Low compression	<i>"Compression Check in Section 1D in related manual"</i>
	Poor valve seating	<i>"Valves and Valve Guides Inspection in Section 1D in related manual"</i>
	Dragging brakes	<i>Condition "Dragging brakes" in "Brakes Symptom Diagnosis in Section 4A in related manual"</i>
	Slipping clutch (for M/T model)	<i>Condition "Slipping clutch" in "Clutch System Symptom Diagnosis in Section 5C in related manual" for M/T model</i>
	Thermostat out of order	<i>"Thermostat Inspection in Section 1F in related manual"</i>
	Improper tire pressure	<i>"Tires Description in Section 2D in related manual"</i>
	Camshaft position control (VVT) system out of order (for engine with VVT system)	<i>"Oil Control Valve Inspection (For Engine with VVT) in Section 1D in related manual"</i>

Condition	Possible cause	Correction / Reference Item
Excessive engine oil consumption – Oil leakage	Blown cylinder head gasket	"Cylinder Head Inspection in Section 1D in related manual"
	Leaky camshaft oil seals	"Camshaft, Tappet and Shim Inspection in Section 1D in related manual"
Excessive engine oil consumption – Oil entering combustion chamber	Sticky piston ring	"Cylinders, Pistons and Piston Rings Inspection in Section 1D in related manual"
	Worn piston and cylinder	"Cylinders, Pistons and Piston Rings Inspection in Section 1D in related manual"
	Worn piston ring groove and ring	"Cylinders, Pistons and Piston Rings Inspection in Section 1D in related manual"
	Improper location of piston ring gap	"Pistons, Piston Rings, Connecting Rods and Cylinders Disassembly and Assembly in Section 1D in related manual"
	Worn or damaged valve stem seal	"Valves and Valve Guides Inspection in Section 1D in related manual"
	Worn valve stem	"Valves and Valve Guides Inspection in Section 1D in related manual"
Engine hesitates – Momentary lack of response as accelerator is depressed. Can occur at all vehicle speeds. Usually most severe when first trying to make vehicle move, as from a stop sign.	Spark plug faulty or plug gap out of adjustment	"Spark Plug Inspection in Section 1H"
	Leaky high-tension cord	"High-Tension Cord Inspection in Section 1H"
	Fuel pressure out of specification	"Fuel Pressure Check"
	Malfunctioning EGR valve	"EGR Valve Inspection in Section 1B"
	Poor performance of ECT sensor or MAF sensor	, "Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C" or "Intake Air Temperature (IAT) Sensor Inspection in Section 1C"
	Faulty electric throttle body assembly	"Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C"
	Faulty APP sensor assembly	"Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C"
	Faulty fuel injector	"Fuel Injector Circuit Check"
	Faulty ECM	
	Engine overheating	Condition "Engine overheating"
	Low compression	"Compression Check in Section 1D in related manual"
	Camshaft position control (VVT) system out of order (for engine with VVT system)	"Oil Control Valve Inspection (For Engine with VVT) in Section 1D in related manual"
Surge – Engine power variation under steady throttle or cruise. Feels like vehicle speeds up and down with no change in accelerator pedal.	Leaky or loosely connected high-tension cord	"High-Tension Cord Removal and Installation in Section 1H"
	Faulty spark plug (excess carbon deposits, improper gap, burned electrodes, etc.)	"Spark Plug Inspection in Section 1H"
	Variable fuel pressure	"Fuel Pressure Check"
	Kinky or damaged fuel hose and lines	
	Faulty fuel pump (clogged fuel filter)	
	Malfunctioning EGR valve	"EGR Valve Inspection in Section 1B"
	Poor performance of MAF sensor	"Intake Air Temperature (IAT) Sensor Inspection in Section 1C"
	Faulty fuel injector	"Fuel Injector Circuit Check"
	Faulty ECM	
	Faulty electric throttle body assembly	"Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C"
	Faulty APP sensor assembly	"Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C"

1A-47 Engine General Information and Diagnosis:

Condition	Possible cause	Correction / Reference Item
Excessive detonation – Engine makes continuously sharp metallic knocks that change with throttle opening. Sounds like pop corn popping.	Faulty spark plug	<i>“Spark Plug Inspection in Section 1H”</i>
	Loose connection of high-tension cord	<i>“High-Tension Cord Removal and Installation in Section 1H”</i>
	Engine overheating	<i>Condition “Engine overheating”</i>
	Clogged fuel filter (faulty fuel pump) or fuel lines	<i>“Fuel Pressure Check” or “Fuel Pump and Its Circuit Check”</i>
	Air drawn in through intake manifold or throttle body gasket	
	Malfunctioning EGR valve	<i>“EGR Valve Inspection in Section 1B”</i>
	Poor performance of knock sensor, ECT sensor or MAF sensor	<i>“DTC P0327 / P0328: Knock Sensor Circuit Low / High”, “Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C” or “Intake Air Temperature (IAT) Sensor Inspection in Section 1C”</i>
	Faulty fuel injector(s)	<i>“Fuel Injector Circuit Check”</i>
	Faulty ECM	
	Excessive combustion chamber deposits	<i>“Cylinders, Pistons and Piston Rings Inspection in Section 1D in related manual” and/or “Piston Pins and Connecting Rods Inspection in Section 1D in related manual”</i>
	Camshaft position control (VVT) system out of order (for engine with VVT system)	<i>“Oil Control Valve Inspection (For Engine with VVT) in Section 1D in related manual”</i>
Engine has no power	Faulty spark plug	<i>“Spark Plug Inspection in Section 1H”</i>
	Faulty ignition coil with ignitor	<i>“Ignition Coil Assembly (Including Ignitor) Inspection in Section 1H”</i>
	Leaks, loose connection or disconnection of high-tension cord	<i>“High-Tension Cord Removal and Installation in Section 1H”</i>
	Faulty knock sensor	<i>“DTC P0327 / P0328: Knock Sensor Circuit Low / High”</i>
	Clogged fuel hose or pipe	<i>“Fuel Pressure Check”</i>
	Malfunctioning fuel pump	<i>“Fuel Pump and Its Circuit Check”</i>
	Air drawn in through intake manifold gasket or throttle body gasket	
	Engine overheating	<i>Condition “Engine overheating”</i>
	Malfunctioning EGR valve	<i>“EGR Valve Inspection in Section 1B”</i>
	Poor performance of ECT sensor or MAF sensor	<i>“Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C” or “Intake Air Temperature (IAT) Sensor Inspection in Section 1C”</i>
	Faulty electric throttle body assembly	<i>“Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C”</i>
	Faulty APP sensor assembly	<i>“Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C”</i>
	Faulty fuel injector(s)	<i>“Fuel Injector Circuit Check”</i>
	Faulty ECM	
	Dragging brakes	<i>Condition “Dragging brakes” in “Dragging brakes” in “Brakes Symptom Diagnosis in Section 4A in related manual”</i>
	Slipping clutch (for M/T model)	<i>Condition “Slipping clutch” in “Slipping clutch” in “Clutch System Symptom Diagnosis in Section 5C in related manual” (for M/T model)</i>
	Low compression	<i>“Compression Check in Section 1D in related manual”</i>
	Camshaft position control (VVT) system out of order (for engine with VVT system)	<i>“Oil Control Valve Inspection (For Engine with VVT) in Section 1D in related manual”</i>

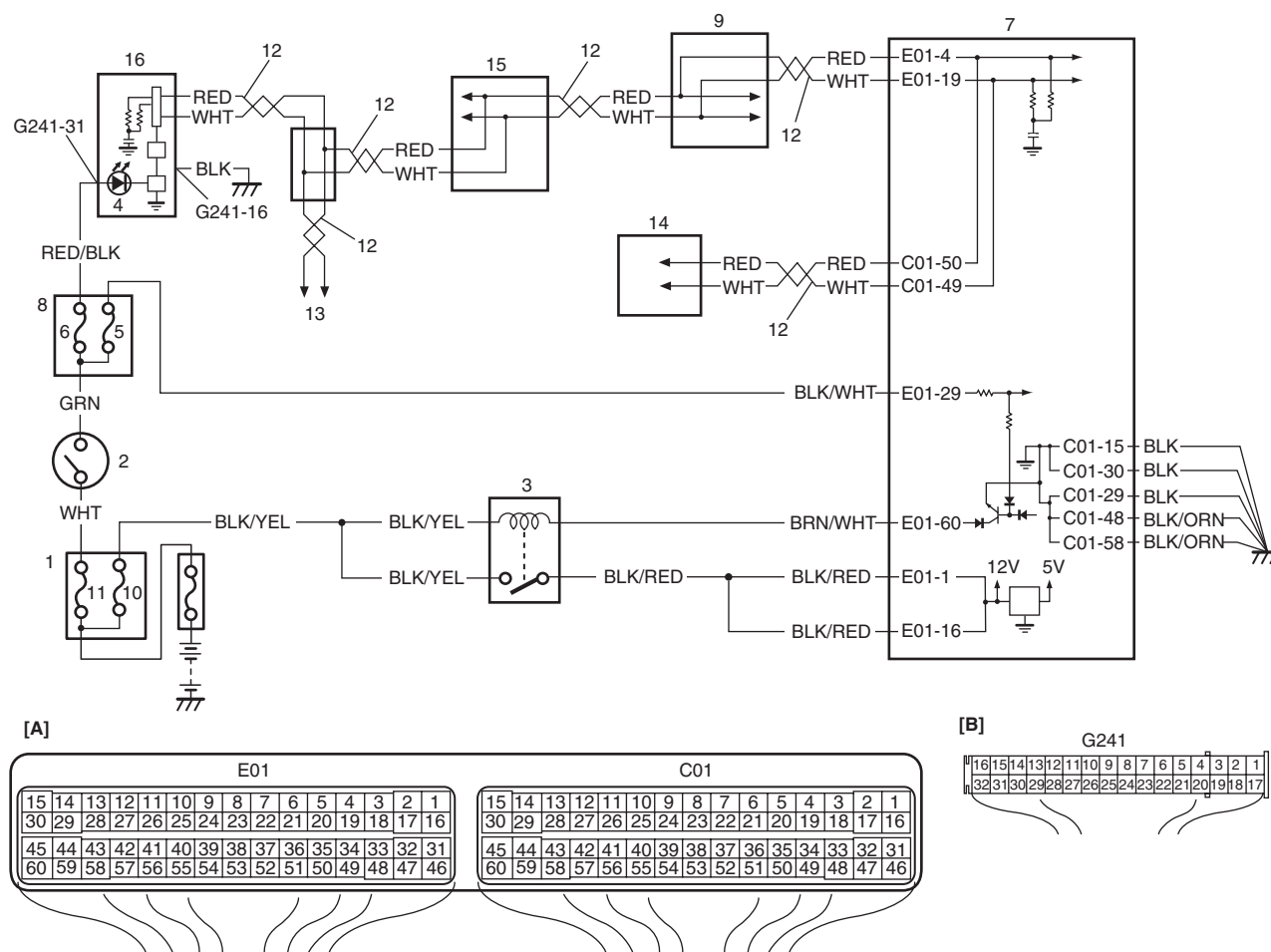
Condition	Possible cause	Correction / Reference Item
Improper engine idling or engine fails to idle	Faulty spark plug	<i>"Spark Plug Inspection in Section 1H"</i>
	Leaky or disconnected high-tension cord	<i>"High-Tension Cord Removal and Installation in Section 1H"</i>
	Faulty ignition coil with ignitor	<i>"Ignition Coil Assembly (Including Ignitor) Inspection in Section 1H"</i>
	Fuel pressure out of specification	<i>"Fuel Pressure Check"</i>
	Leaky manifold, throttle body, or cylinder head gasket	
	Malfunctioning EGR valve	<i>"EGR Valve Inspection in Section 1B"</i>
	Faulty evaporative emission control system	<i>"EVAP Canister Purge Inspection in Section 1B"</i>
	Faulty EGR system	<i>"EGR System Inspection in Section 1B"</i>
	Faulty fuel injector(s)	<i>"Fuel Injector Circuit Check"</i>
	Poor performance of ECT sensor or MAF sensor	<i>"Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C", or "Intake Air Temperature (IAT) Sensor Inspection in Section 1C"</i>
	Faulty electric throttle body assembly	<i>"Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C"</i>
	Faulty APP sensor assembly	<i>"Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C"</i>
	Faulty ECM	
	Loose connection or disconnection of vacuum hoses	
	Malfunctioning PCV valve	<i>"PCV Valve Inspection in Section 1B"</i>
	Engine overheating	<i>Condition "Engine overheating"</i>
	Low compression	<i>"Compression Check in Section 1D in related manual"</i>
	Camshaft position control (VVT) system out of order (for engine with VVT system)	<i>"Oil Control Valve Inspection (For Engine with VVT) in Section 1D in related manual"</i>

1A-49 Engine General Information and Diagnosis:

Condition	Possible cause	Correction / Reference Item
Excessive hydrocarbon (HC) emission or carbon monoxide (CO)	Faulty spark plug	"Spark Plug Inspection in Section 1H"
	Leaky or disconnected high-tension cord	"High-Tension Cord Removal and Installation in Section 1H"
	Faulty ignition coil with ignitor	"Ignition Coil Assembly (Including Ignitor) Inspection in Section 1H"
	Low compression	"Compression Check in Section 1D in related manual"
	Lead contamination of three way catalytic converter	Check for absence of filler neck restricture.
	Faulty evaporative emission control system	"EVAP Canister Purge Inspection in Section 1B"
	Fuel pressure out of specification	"Fuel Pressure Check"
	Closed loop system (A/F feedback compensation) fails (Poor performance of ECT sensor or MAF sensor)	"Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C" or "Intake Air Temperature (IAT) Sensor Inspection in Section 1C"
	Faulty electric throttle body assembly	"Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C"
	Faulty APP sensor assembly	"Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C"
	Faulty injector(s)	"Fuel Injector Circuit Check"
	Faulty ECM	
	Engine not at normal operating temperature	
	Clogged air cleaner	"Air Cleaner Filter Inspection and Cleaning in Section 1D in related manual"
	Vacuum leaks	"Engine Vacuum Check in Section 1D in related manual"
	Camshaft position control (VVT) system out of order (for engine with VVT system)	"Oil Control Valve Inspection (For Engine with VVT) in Section 1D in related manual"
Excessive nitrogen oxides (NOx) emission	Improper ignition timing	"Ignition Timing Inspection in Section 1H"
	Lead contamination of catalytic converter	Check for absence of filler neck restrictor.
	Faulty EGR system	"EGR System Inspection in Section 1B"
	Fuel pressure out of specification	"Fuel Pressure Check"
	Closed loop system (A/F feedback compensation) fails (Poor performance of ECT sensor or MAF sensor)	"Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C" or "Intake Air Temperature (IAT) Sensor Inspection in Section 1C"
	Faulty electric throttle body assembly	"Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C"
	Faulty APP sensor assembly	"Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C"
	Faulty injector(s)	"Fuel Injector Circuit Check"
	Faulty ECM	
	Camshaft position control (VVT) system out of order (for engine with VVT system)	"Oil Control Valve Inspection (For Engine with VVT) in Section 1D in related manual"

MIL Does Not Come ON with Ignition Switch ON and Engine Stop (but Engine Can Be Started)

S6RW0E1104087

Wiring Diagram

I6RW0C110011-02

[A]: ECM connector (viewed from harness side)	5. "IG COIL" fuse	11. "IGN" fuse
[B]: Combination meter connector (viewed from harness side)	6. "METER" fuse	12. CAN communication line
1. Individual circuit fuse box No.1	7. ECM	13. To 4WD control module
2. Ignition switch	8. Junction block	14. TCM
3. Main relay	9. ABS control module	15. BCM
4. MIL in combination meter	10. "FI" fuse	16. Combination meter

Circuit Description

When the ignition switch is turned ON, ECM causes the main relay to turn ON (close the contact point). Then, ECM being supplied with the main power, transmits indication ON signal of MIL to combination meter in order to turn MIL ON. And then, combination meter turns MIL ON. When the engine starts to run and no malfunction is detected in the system, ECM transmits MIL indication OFF signal to combination meter in order to turn MIL OFF. And then, combination meter turns MIL OFF, but if a malfunction was or is detected, MIL remains ON even when the engine is running.

Troubleshooting

NOTE

When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits".

Step	Action	Yes	No
1	MIL power supply check 1) Turn ignition switch to ON position. <i>Do other warning lights come ON?</i>	Go to Step 2.	Go to Step 4.
2	DTC check in ECM 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check DTC in ECM. <i>Is there DTC(s) U0073 and/or U0121?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	DTC check in BCM 1) Check DTC in BCM. <i>Is there DTC U0100?</i>	Go to applicable DTC diag. flow.	Substitute a known-good combination meter and recheck. If MIL still remains OFF, substitute a known-good ECM and recheck.
4	CAN communication line circuit check 1) Check CAN communication line circuit between control modules for open, short, high resistance and connections referring to Step 5 to 10 under "Troubleshooting for Communication Error with Scan Tool Using CAN". <i>Is circuit in good condition?</i>	Go to Step 5.	Repair or replace.
5	"METER" fuse check 1) Turn ignition switch to OFF position. 2) Check for fuse blown at "METER" fuse in junction block. <i>Is "METER" fuse in good condition?</i>	Go to Step 6.	Replace "METER" fuse and check for short.
6	Combination meter power supply check 1) Remove combination meter referring to "Combination Meter Removal and Installation in Section 9C in related manual". 2) Check for proper connection to combination meter connector at "G241-31" and "G241-16" terminals. 3) If OK, then turn ignition switch to ON position and measure voltage between combination meter connector at "G241-31" terminal and vehicle body ground. <i>Is it 10 – 14 V?</i>	Go to Step 7.	"RED/BLK" wire is open circuit.
7	Combination meter circuit check 1) Turn ignition switch to OFF position. 2) Measure resistance between "G241-16" terminal of combination meter connector and vehicle body ground. <i>Is resistance 1 Ω or less?</i>	Substitute a known-good combination meter and recheck. If MIL still remains OFF, substitute a known-good ECM and recheck.	"BLK" wire is open or high resistance circuit.

MIL Remains ON after Engine Starts

Wiring Diagram

Refer to "MIL Does Not Come ON with Ignition Switch ON and Engine Stop (but Engine Can Be Started)".

Circuit Description

When the ignition switch is turned ON, ECM causes the main relay to turn ON (close the contact point). Then, ECM being supplied with the main power, transmits indication ON signal of MIL to combination meter in order to turn MIL ON. And then, combination meter turns MIL ON. When the engine starts to run and no malfunction is detected in the system, ECM transmits MIL indication OFF signal to combination meter in order to turn MIL OFF. And then, combination meter turns MIL OFF, but if a malfunction was or is detected, MIL remains ON even when the engine is running.

Troubleshooting

NOTE

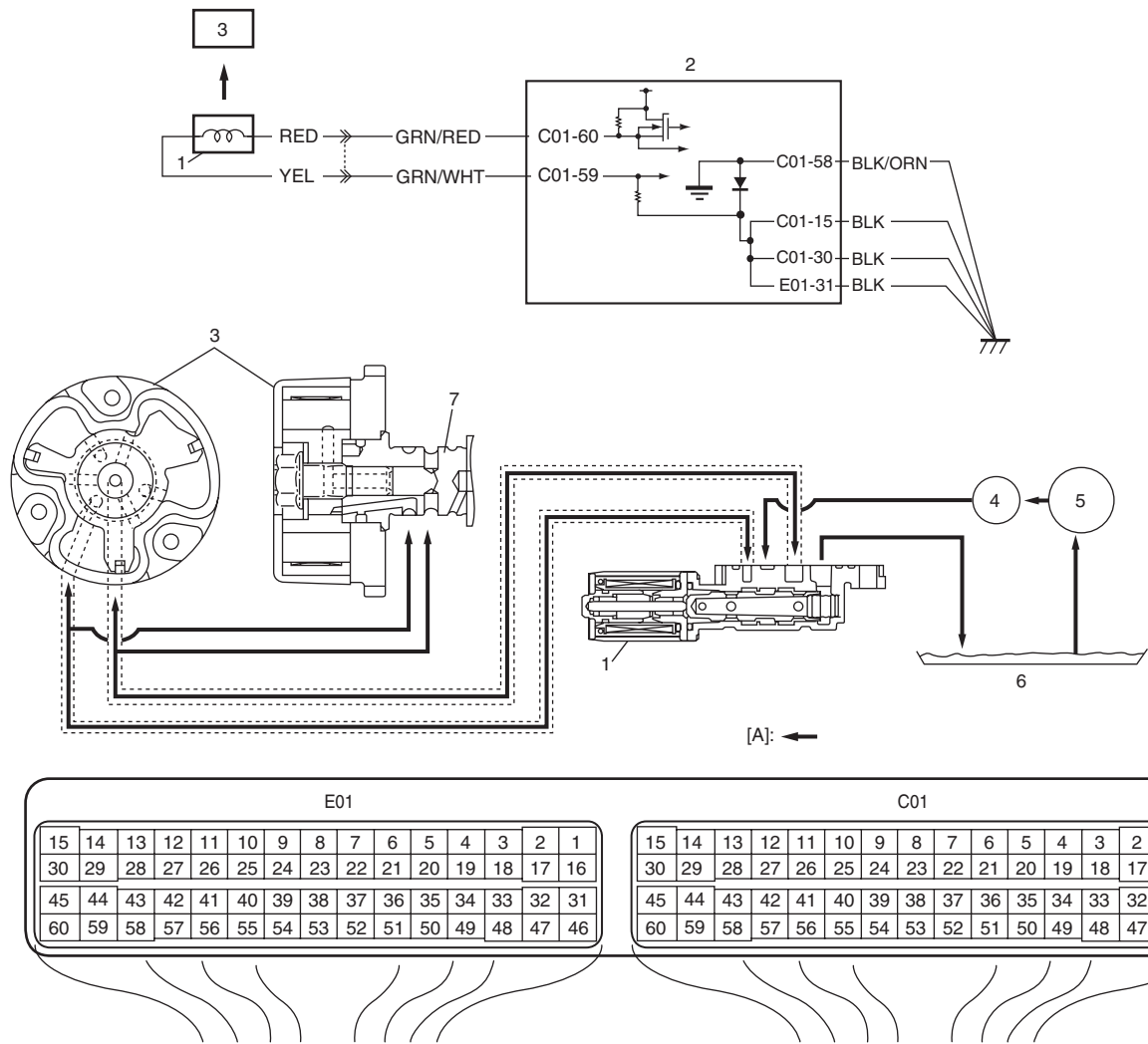
When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits".

Step	Action	Yes	No
1	DTC check 1) Start engine and recheck DTC of ECM and TCM while engine running. <i>Is there any DTC(s)?</i>	Go to Step 2 of "Engine and Emission Control System Check", Step 2 of "A/T System Check in Section 5A".	Go to Step 2.
2	CAN communication line circuit check 1) Check CAN communication line circuit between control modules for open, short, high resistance and connections referring to Step 5 to 10 under "Troubleshooting for Communication Error with Scan Tool Using CAN". <i>Is circuit in good condition?</i>	Substitute a known-good combination meter and recheck. If MIL still remains ON, substitute a known-good ECM and recheck.	Repair or replace CAN communication circuit.

DTC P0010: Camshaft Position Actuator Circuit (for engine with VVT system)

S6RW0E1104015

System and Wiring Diagram



I6RW0D110019-01

[A]: Oil flow	2. ECM	4. Oil filter	6. Oil pan
1. Oil control valve	3. Camshaft timing sprocket	5. Oil pump	7. Intake camshaft

Circuit Description

Actual valve timing fails to become close to target advance level of each function although advance control function or retarded advance control function is at work.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of oil control valve is different from command signal. (Circuit open or short) (1 driving cycle detection logic)	- Oil control valve - Oil control valve circuit - ECM

DTC Confirmation Procedure

- 1) Clear DTC. Refer to "DTC Clearance".
- 2) Start engine and keep it at idle for 10 seconds.
- 3) Check DTC. Refer to "DTC Check".

DTC Troubleshooting

NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Oil control valve electrical circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection at "C01-60" and "C01-59" terminals of ECM connector. 3) If OK, measure resistance between "C01-60" and "C01-59" terminals of ECM connector. <i>Is resistance below 10 Ω?</i>	Go to Step 3.	Go to Step 8.
3	Oil control valve electrical circuit check <i>Was resistance more than 6.5 Ω in Step 2?</i>	Go to Step 4.	Go to Step 7.
4	Oil control valve electrical circuit for power short check 1) Turn ON ignition switch. 2) Measure voltage between "C01-60" terminal of ECM connector and engine ground. <i>Is voltage below 1 V?</i>	Go to Step 5.	"RED", "GRN/RED", "YEL" or "GRN/WHT" wire is shorted to power supply circuit.
5	Oil control valve electrical circuit for ground short check 1) Disconnect connector from oil control valve with ignition switch turned OFF. 2) Measure resistance between "C01-60" terminal of ECM connector and engine ground. <i>Is resistance infinity?</i>	Go to Step 6.	"GRN/RED" wire is shorted to ground circuit.
6	Oil control valve electrical circuit for ground short check 1) Measure resistance between "C01-59" terminal of ECM connector and engine ground. <i>Is resistance infinity?</i>	Go to Step 7.	"GRN/WHT" wire is shorted to ground circuit.
7	Oil control valve electrical circuit for short check 1) Disconnect connector from oil control valve with ignition switch turned OFF. 2) Measure resistance between "C01-60" and "C01-59" terminals of ECM connector. <i>Is resistance infinity?</i>	Go to Step 8.	"GRN/RED" wire is shorted to "GRN/WHT" wire.
8	Oil control valve electrical circuit check 1) Disconnect connector from oil control valve with ignition switch turned OFF. 2) Measure resistance between "C01-60" terminal of ECM connector and "GRN/RED" wire terminal of oil control valve connector and between "C01-59" terminal of ECM connector and "GRN/WHT" wire terminal of oil control valve connector. <i>Is resistance below 1 Ω?</i>	Go to Step 9.	"GRN/RED" wire or "GRN/WHT" wire circuit is open or high resistance.

1A-55 Engine General Information and Diagnosis:

Step	Action	Yes	No
9	Oil control valve check Check oil control valve referring to "Oil Control Valve Inspection (For Engine with VVT) in Section 1D in related manual". <i>Is resistance within specified value?</i>	Substitute a known-good ECM and recheck.	Faulty oil control valve.

DTC P0011 / P0012: Camshaft Position - Timing Over-Advanced or System Performance / Retarded (for engine with VVT system)

S6RW0E1104016

System Description

Actual value of advanced valve timing does not reach target value.
Valve timing is advanced although ECM command is most retarding.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Actual value of advanced valve timing does not reach target value, or valve timing is advanced although ECM command is most retarding. (2 driving cycle detection logic)	• Oil control valve • Oil galleries of timing sprocket • Intake camshaft timing sprocket (Camshaft position control (VVT) actuator) • Oil control valve circuit • ECM

DTC Confirmation Procedure**▲ WARNING**

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out by 2 persons, a driver and tester, on a level road.

NOTE

Check to make sure that the following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Altitude (barometric pressure): 2500 m, 8200 ft or less (560 mmHg, 74.4 kPa or more)**

- 1) Clear DTC. Refer to "DTC Clearance".
- 2) Start engine and drive vehicle under usual driving condition for 5 minutes or longer until engine is warmed up to normal operating temperature.
- 3) Stop vehicle.
- 4) Run engine at idle speed for 1 minute.
- 5) Start vehicle and increase vehicle speed up to 120 km/h (70 mile/h).
- 6) Keep vehicle speed at 120 km/h (70 mile/h) for 1 minute or longer at 5th gear position or D range.
- 7) Decrease vehicle speed gradually.
- 8) Stop vehicle and turn OFF ignition switch.
- 9) Repeat Step 4) to 7) one time.
- 10) Stop vehicle.
- 11) Check DTC. Refer to "DTC Check".

DTC Troubleshooting

NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Do you have SUZUKI scan tool?	Go to Step 3.	Go to Step 5.
3	Camshaft position control check 1) With ignition switch turned OFF, connect SUZUKI scan tool. 2) Start engine and warm up to normal operating temperature. 3) Select menu to "Data List". 4) Check that "VVT GAP" displayed on SUZUKI scan tool is 0 – 3°. <i>Is it OK?</i>	Go to Step 4.	Check valve timing referring to "Timing Chain and Chain Tensioner Removal and Installation in Section 1D in related manual". If OK, go to Step 5.
4	Camshaft position control check 1) Drive vehicle under following conditions. - Vehicle speed at 80 km/h (50 mile/h). - Gear position at 5th or D range. 2) Check that "VVT GAP" displayed on SUZUKI scan tool is 0 – 5°. <i>Is it OK?</i>	Substitute a known-good ECM and recheck.	Go to Step 5.
5	Oil control circuit visual inspection 1) Remove cylinder head cover referring to "Cylinder Head Cover Removal and Installation in Section 1D in related manual". 2) Check oil pressure leakage from oil control circuit. <i>Is it in good condition?</i>	Go to Step 6.	Repair or replace.
6	Oil control valve and oil gallery pipe check 1) Remove oil control valve referring to "Oil Control Valve Removal and Installation (For Engine with VVT) in Section 1D in related manual". 2) Remove oil gallery pipe referring to "Timing Chain Cover Removal and Installation in Section 1D in related manual". 3) Check oil gallery pipe and oil control valve for clog or sludge. <i>Are they in good condition?</i>	Go to Step 7.	Clean oil control valve and oil gallery pipe. Replace oil control valve if a problem is not solved after cleaning oil control valve and oil gallery pipe.
7	Oil control valve electrical circuit check 1) Check that oil control valve circuit is in good condition referring to "DTC P0010: Camshaft Position Actuator Circuit (for engine with VVT system)". <i>Is circuit in good condition?</i>	Repair circuit.	Go to Step 8.

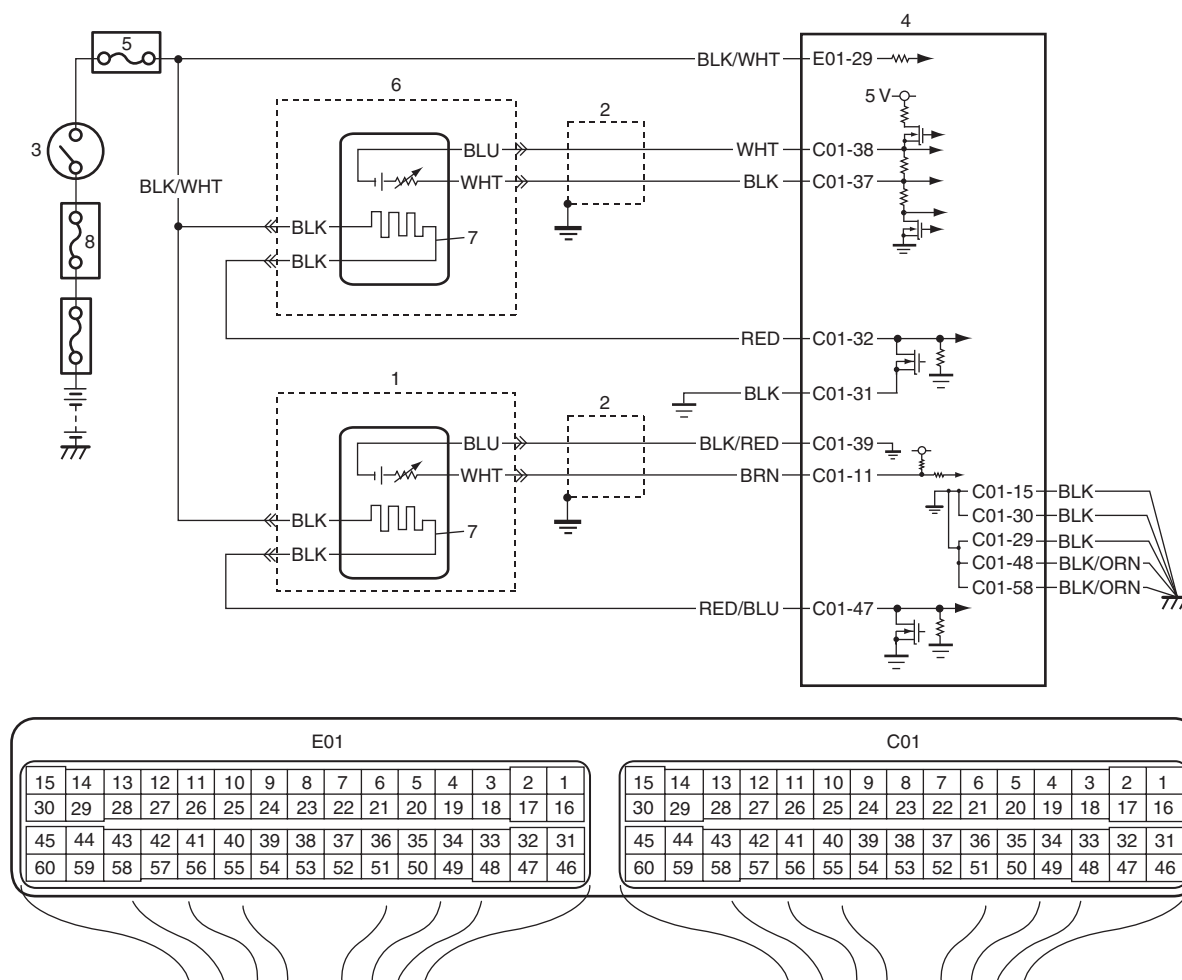
1A-57 Engine General Information and Diagnosis:

Step	Action	Yes	No
8	Oil control valve check 1) Check oil control valve referring to "Oil Control Valve Inspection (For Engine with VVT) in Section 1D in related manual". <i>Is it in good condition?</i>	Replace camshaft timing sprocket.	Replace oil control valve.

DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1)

S6RW0E1104089

Wiring Diagram



I6RW0E110017-01

1. HO2S	4. ECM	7. Sensor heater
2. Shield wire	5. "IG COIL" fuse	8. "IGN" fuse
3. Ignition switch	6. A/F sensor	

A/F Sensor Description

Refer to "A/F Sensor Description"

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0031: Heater control circuit voltage of A/F sensor is lower than specified value for specified time even though control duty ratio of A/F sensor heater is lower than 90% with engine running. (Heater control duty pulse is no detected in its circuit of ECM) (2 driving cycle detection logic) P0032: Heater control circuit voltage of A/F sensor is higher than specified value for specified time even though control duty ratio of A/F sensor heater is higher than 10% with engine running. (Heater control duty pulse is not detected in its circuit of ECM) (2 driving cycle detection logic)	• A/F sensor heater and/or its circuit • ECM

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool to DLC.
- 2) Turn ON ignition switch and clear DTC.
- 3) Start engine and warm up to normal operating temperature.
- 4) Run engine at idle speed for 1 min. or more.
- 5) Check DTC and pending DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	A/F sensor heater circuit check 1) Disconnect connector from A/F sensor with ignition switch turned OFF. 2) Check for proper terminal connection to A/F sensor connector. 3) If connections are OK, measure circuit voltage between "BLK/WHT" wire terminal and vehicle body ground with ignition switch turned ON. <i>Is measured voltage 10 – 14 V?</i>	Go to Step 3.	Repair or replace defective wiring harness / connector.
3	A/F sensor heater circuit check 1) Check that A/F sensor heater control circuit is as follows. • Circuit voltage between "RED" wire terminal and vehicle body ground is 0 V with ignition switch turned ON. <i>Is it good condition?</i>	Go to Step 4.	Repair or replace defective wiring harness / connector.

1A-59 Engine General Information and Diagnosis:

Step	Action	Yes	No
4	A/F sensor heater circuit check 1) Disconnect connectors from ECM and check for proper terminal connection to ECM connector. 2) If connections are OK, check that A/F sensor heater circuit is as follows. • Insulation resistance of wire harness is infinity between "RED" wire terminal and each other terminal at A/F sensor connector. • Wiring harness resistance between "RED" wire terminal of A/F sensor heater and "C01-32" terminal of ECM connector is less than 1 Ω or less. • Wiring harness resistance between "C01-31" terminal of ECM connector and vehicle body ground is less than 1 Ω or less. • Insulation resistance between "C01-31" and "C01-32" terminals of ECM connector is infinity. <i>Are they in good condition?</i>	Go to Step 5.	Repair or replace defective wiring harness / connector.
5	A/F sensor heater check 1) Check heater resistance of A/F sensor referring to "Air Fuel Ratio (A/F) Sensor On-Vehicle Inspection in Section 1C". <i>Is A/F sensor heater in good condition?</i>	Substitute a known-good ECM and recheck.	Replace A/F sensor.

DTC P0037 / P0038: HO2S Heater Control Circuit Low / High (Sensor-2)

S6RW0E1104018

Wiring Diagram

Refer to "DTC P0131 / P0132: O2 Sensor Circuit Low Voltage / High Voltage (Sensor-1)".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of HO2S heater is higher than specified value or lower than specified value for 5 seconds even through its control duty ratio is within 25 – 75%. (2 driving cycle detection logic)	• HO2S heater • HO2S heater circuit • ECM

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Start engine and warm up to normal operating temperature.
- 4) Run engine at idle speed for 1 min.
- 5) Check DTC and pending DTC.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".

Step	Action	Yes	No
2	HO2S heater power circuit check 1) Disconnect connector from HO2S with ignition switch turned OFF. 2) Check for proper connection to HO2S at "BLK/WHT" and "RED/BLU" wire terminals. 3) If wire and connection are OK, measure voltage between "BLK/WHT" wire terminal of HO2S connector and engine ground with ignition switch turned ON. <i>Is voltage over 10 V?</i>	Go to Step 3.	"BLK/WHT" wire is open circuit or shorted to ground circuit.
3	HO2S heater power circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "BLK/WHT" wire terminal of HO2S connector and "E01-29" terminal wire of ECM connector. <i>Is resistance below 5 Ω?</i>	Go to Step 4.	"BLK/WHT" wire is high resistance circuit.
4	HO2S heater drive circuit check 1) Measure resistance between "RED/BLU" wire terminal of HO2S connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 5.	"RED/BLU" wire is shorted to ground circuit.
5	HO2S heater drive circuit check 1) Turn ON ignition switch. 2) Measure voltage between "RED/BLU" wire terminal of HO2S connector and vehicle body ground. <i>Is voltage 0 V?</i>	Go to Step 6.	"RED/BLU" wire is shorted to power circuit.
6	HO2S heater drive circuit check 1) Connect connector to HO2S with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between "C01-47" terminal of disconnected ECM connector and vehicle body ground. <i>Is voltage over 10 V?</i>	Go to Step 7.	"RED/BLU" wire is open circuit.
7	HO2S heater check 1) Disconnect HO2S connector with ignition switch turned OFF. 2) Check HO2S heater resistance referring to "Heated Oxygen Sensor (HO2S-2) Heater On-Vehicle Inspection in Section 1C". <i>Is resistance within specified value?</i>	Go to Step 8.	Replace HO2S.
8	HO2S heater power circuit check 1) Connect connector to HO2S with ignition switch turned OFF. 2) Measure resistance between "E01-29" and "C01-47" terminals of ECM connector. <i>Is resistance below 30 Ω?</i>	HO2S heater circuit is OK. Substitute a known-good ECM and recheck.	"RED/BLU" wire is high resistance circuit.

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".

Step	Action	Yes	No
2	MAF sensor and its circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and check MAF value displayed on scan tool. (Refer to "Scan Tool Data" for normal value.) <i>Is normal value indicated?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 3.
3	MAF sensor power supply voltage check 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLK/RED" wire terminal of MAF and IAT sensor connector. <i>Is voltage 10 – 14 V?</i>	Go to Step 4.	"BLK/RED" wire is open circuit.
4	MAF sensor ground circuit check 1) Turn OFF ignition switch, measure resistance between "GRY" wire terminal of MAF and IAT sensor connector and engine ground. <i>Is resistance below 5 Ω?</i>	Go to Step 6.	Go to Step 5.
5	Ground circuit check 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between "C01-27" terminal of ECM connector and engine ground. <i>Is resistance below 5 Ω?</i>	"GRY" wire is open or high resistance circuit.	ECM grounds "C01-15", "C01-29", "C01-30", "C01-48" and/or "E01-58" circuit is open or high resistance. If wires are OK, substitute a known-good ECM and recheck.
6	MAF sensor signal circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure voltage between "PNK/BLK" wire terminal of MAF and IAT sensor connector and engine ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 7.	"GRN/BLK" wire is shorted to other circuit.
7	MAF sensor signal circuit check 1) Measure resistance between "PNK/BLK" wire terminal of MAF and IAT sensor connector and engine ground with ignition switch turned OFF. <i>Is resistance infinity?</i>	Go to Step 8.	"GRN/BLK" wire is shorted to ground circuit.
8	MAF sensor signal circuit check 1) Measure resistance between "PNK/BLK" wire terminal of MAF and IAT sensor connector and "C01-26" terminal of ECM connector. <i>Is resistance below 3 Ω?</i>	Go to Step 9.	"GRN/BLK" wire is open or high resistance circuit.
9	MAF sensor output signal check 1) Connect connectors to MAF and IAT sensor and ECM with ignition switch turned OFF. 2) Measure voltage between "C01-26" and "C01-27" terminals of ECM connector referring to "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection in Section 1C". <i>Is each value within specified range?</i>	Substitute a known-good ECM and recheck.	Faulty MAF and IAT sensor.

DTC P0103: Mass Air Flow Circuit High Input

S6RW0E1104021

Wiring Diagram

Refer to "DTC P0102: Mass Air Flow Circuit Low Input".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of MAF sensor output is higher than specified value for specified time with engine running. (1 driving cycle detection logic)	• Open or short in MAF sensor circuit • MAF sensor • ECM

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Start engine and run it for 10 sec.
- 4) Check DTC and pending DTC.

DTC Troubleshooting**NOTE**

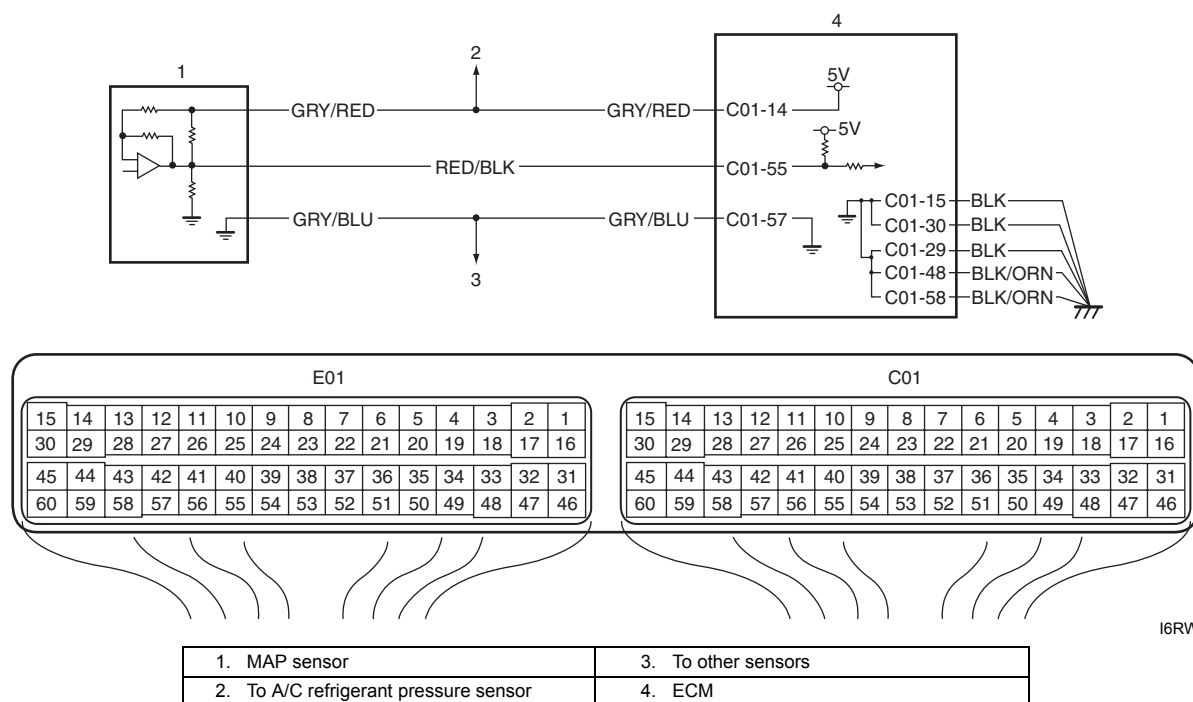
Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	MAF sensor and its circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and check MAF value displayed on scan tool. (Refer to "Scan Tool Data" for normal value.) <i>Is normal value indicated?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 3.
3	MAF sensor power supply voltage check 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLK/RED" wire terminal of MAF and IAT sensor connector. <i>Is voltage 10 – 14 V?</i>	Go to Step 4.	"BLK/RED" wire is open circuit.
4	MAF sensor ground circuit check 1) Turn OFF ignition switch, measure resistance between "GRY" wire terminal of MAF and IAT sensor connector and engine ground. <i>Is resistance below 5 Ω?</i>	Go to Step 6.	Go to Step 5.
5	Ground circuit check 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between "C01-27" terminal of ECM connector and engine ground. <i>Is resistance below 5 Ω?</i>	"GRY" wire is open or high resistance circuit.	ECM grounds "C01-15", "C01-29", "C01-30", "C01-48" and/or "C01-58" circuit are open or high resistance. If wires are OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
6	MAF sensor signal circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure voltage between "GRY/BLK" wire terminal of MAF and IAT sensor connector and engine ground. <i>Is voltage 0 V?</i>	Go to Step 7.	"GRY/BLK" wire is shorted to other circuit.
7	MAF sensor output signal check 1) Connect connector to MAF and IAT sensor and ECM with ignition switch turned OFF. 2) Measure voltage between "C01-26" and "C01-27" terminal of ECM connector referring to "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection in Section 1C". <i>Is each value within specified range?</i>	Substitute a known-good ECM and recheck.	Faulty MAF and IAT sensor.

DTC P0107: Manifold Absolute Pressure Circuit Low Input

S6RW0E1104023

Wiring Diagram

I6RW0E110019-01

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Manifold absolute pressure sensor output voltage is lower than specified value for specified time. (1 driving cycle detection logic)	- Manifold absolute pressure sensor circuit - Manifold absolute pressure sensor - A/C refrigerant pressure sensor (if equipped with A/C) - ECM

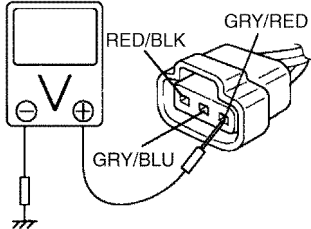
DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch and clear DTC using scan tool and warm up engine completely.
- 3) Run engine at idle speed for 1 min.
- 4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	MAP sensor and its circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check intake manifold pressure displayed on scan tool. <i>Is it 0 kPa (0 in.Hg)?</i>	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
3	MAP sensor power supply voltage check 1) Disconnect connector from MAP sensor with ignition switch turned OFF. 2) Check for proper connection of MAP sensor at "GRY/RED", "RED/BLK" and "GRY/BLU" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector.  <i>Is voltage 4 – 6 V?</i>	Go to Step 5.	Go to Step 4.
4	MAP sensor power supply circuit check 1) Disconnect connectors from A/C refrigerant pressure sensor (if equipped with A/C) with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector. <i>Is voltage 4 – 6 V?</i>	Faulty A/C refrigerant pressure sensor (if equipped with A/C).	"GRY/RED" wire is shorted to ground circuit. If wires are OK, substitute a known-good ECM and recheck.
5	MAP sensor signal circuit check 1) Measure voltage between "RED/BLK" wire terminal of MAP sensor connector and engine ground. <i>Is voltage 4 – 6 V?</i>	Go to Step 7.	Go to Step 6.
6	MAP sensor signal circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C01-55" terminal of ECM connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 7.	"RED/BLK" wire is shorted to ground circuit.

Step	Action	Yes	No
7	MAP sensor output signal check 1) Check MAP sensor according to "Manifold Absolute Pressure (MAP) Sensor Inspection in Section 1C". <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Faulty MAP sensor.

DTC P0108: Manifold Absolute Pressure Circuit High Input

S6RW0E1104024

Wiring Diagram

Refer to "DTC P0107: Manifold Absolute Pressure Circuit Low Input".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Manifold absolute pressure sensor output voltage is higher than specified value for specified time. (1 driving cycle detection logic)	• Manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • A/C refrigerant pressure sensor (if equipped with A/C) • ECM

NOTE

 When DTC P0113 and P0118 are indicated together, it is possible that "GRY/BLU" wire circuit is open.

DTC Confirmation Procedure

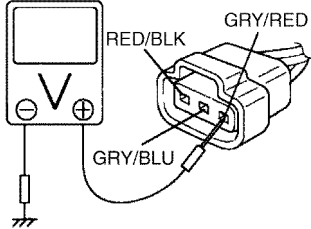
- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch and clear DTC using scan tool and warm up engine completely.
- 3) Run engine at idle speed for 1 min.
- 4) Check DTC and pending DTC.

DTC Troubleshooting**NOTE**

 Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	<i>Was "Engine and Emission Control System Check" performed?</i>	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	MAP sensor and its circuit check 1) Connect scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON. 3) Check intake manifold pressure displayed on scan tool. <i>Is it 127 kPa (37.5 in.Hg)?</i>	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".

1A-67 Engine General Information and Diagnosis:

Step	Action	Yes	No
3	MAP sensor power supply voltage check 1) Disconnect connector from MAP sensor with ignition switch turned OFF. 2) Check for proper connection of MAP sensor at "GRY/RED", "RED/BLK" and "GRY/BLU" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector.  I5RW0A110021-01 <i>Is voltage 4 – 6 V?</i>	Go to Step 5.	Go to Step 4.
4	MAP sensor power supply circuit check 1) Disconnect connectors from A/C refrigerant pressure sensor (if equipped with A/C) with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector. <i>Is voltage 4 – 6 V?</i>	Faulty A/C refrigerant pressure sensor (if equipped with A/C).	"GRY/RED" wire is open or shorted to power circuit.
5	MAP sensor ground circuit check 1) Measure resistance between "GRY/BLU" wire terminal of MAP sensor connector and engine ground with ignition switch turned OFF. <i>Is resistance below 5 Ω?</i>	Go to Step 7.	Go to Step 6.
6	Ground circuit check 1) Measure resistance between "C01-57" terminal of ECM connector and vehicle body ground. <i>Is resistance below 5 Ω?</i>	"GRY/BLU" wire is open or high resistance circuit.	ECM grounds "C01-15", "C01-29", "C01-30", "C01-48" and/or "C01-58" circuit are open or high resistance. If wires are OK, substitute a known-good ECM and recheck.
7	MAP sensor signal circuit check 1) Turn ON ignition switch. 2) Measure voltage between "RED/BLK" wire terminal of MAP sensor connector and engine ground. <i>Is voltage 4 – 6 V?</i>	Go to Step 9.	Go to Step 8.
8	MAP sensor signal circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "RED/BLK" wire terminal of MAP sensor connector and "C01-55" terminal of ECM connector. <i>Is resistance below 2 Ω?</i>	"RED/BLK" wire is shorted to power supply circuit.	"RED/BLK" wire is open or high resistance circuit.

Step	Action	Yes	No
9	MAP sensor output signal check 1) Check MAP sensor according to "Manifold Absolute Pressure (MAP) Sensor Inspection in Section 1C". <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Faulty MAP sensor.

DTC P0112: Intake Air Temperature Sensor Circuit Low

S6RW0E1104026

Wiring Diagram

Refer to "DTC P0102: Mass Air Flow Circuit Low Input".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of IAT sensor output is lower than specified value for specified time with engine running. (High intake air temperature (low voltage / low resistance)) (1 driving cycle detection logic)	• IAT sensor circuit • IAT sensor • ECM

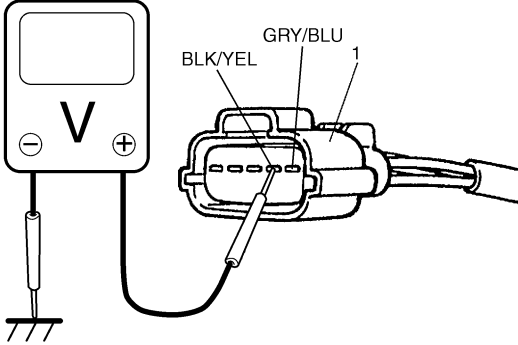
DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Start engine and run it for 10 sec.
- 4) Check DTC and pending DTC.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	<i>Was "Engine and Emission Control System Check" performed?</i>	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	IAT sensor and its circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check intake air temp. displayed on scan tool. <i>Is 119 °C (246 °F) indicated?</i>	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".

Step	Action	Yes	No
3	ECM voltage check 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Check for proper connection to MAF and IAT sensor at "LT GRN/BLK" and "GRY/BLU" wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between "LT GRN/BLK" wire terminal of MAF and IAT sensor connector (1) and vehicle body ground.  I4RS0B110020-01 <i>Is voltage about 4 – 6 V?</i>	Go to Step 6.	Go to Step 4.
4	IAT short circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "LT GRN/BLK" wire terminal of MAF and IAT sensor connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 5.	"LT GRN/BLK" wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.
5	IAT short circuit check 1) Turn ON ignition switch. 2) Measure voltage between "LT GRN/BLK" wire terminal of MAF and IAT sensor connector and vehicle body ground. <i>Is voltage about 0 V?</i>	Go to Step 6.	"LT GRN/BLK" wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
6	IAT sensor for performance check 1) Check IAT sensor according to "Intake Air Temperature (IAT) Sensor Inspection in Section 1C". <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Replace MAF and IAT sensor.

DTC P0113: Intake Air Temperature Sensor Circuit High

S6RW0E1104027

Wiring Diagram

Refer to "DTC P0102: Mass Air Flow Circuit Low Input".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of IAT sensor output is higher than specified value for specified time with engine running. (Low intake air temperature (high voltage / high resistance)) (1 driving cycle detection logic)	• IAT sensor circuit • IAT sensor • ECM

NOTE

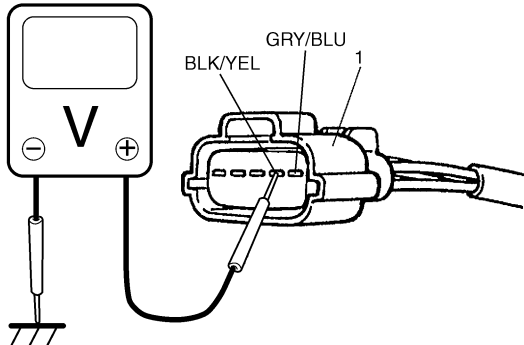
When DTC P0108 and P0118 are indicated together, it is possible that “GRY/BLU” wire circuit is open.

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Start engine and run it for 10 sec.
- 4) Check DTC and pending DTC.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to “Precautions for DTC Troubleshooting”.

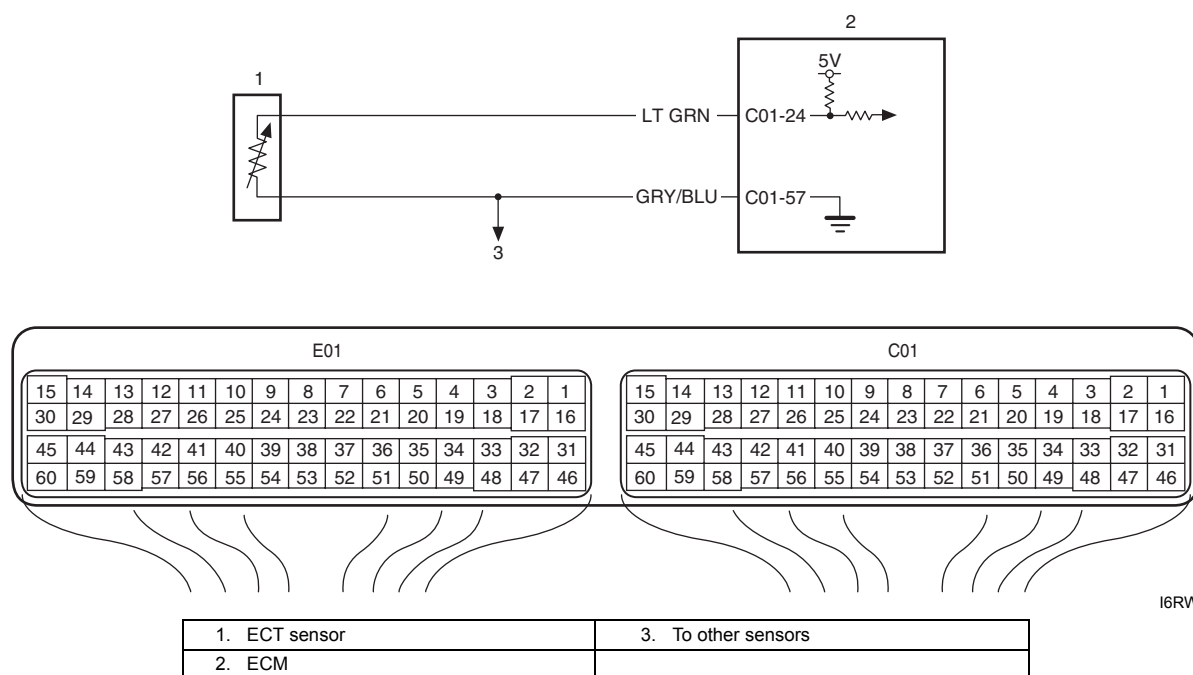
Step	Action	Yes	No
1	Was “Engine and Emission Control System Check” performed?	Go to Step 2.	Go to “Engine and Emission Control System Check”.
2	IAT sensor and its circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check intake air temp. displayed on scan tool. Is -40°C (-40°F) indicated?	Go to Step 3.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00 in related manual”.
3	IAT sensor voltage check 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Check for proper connection to MAF and IAT sensor at “LT GRN/BLK” and “GRY/BLU” wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between “LT GRN/BLK” wire terminal of MAF and IAT sensor connector (1) and vehicle body ground.  I4RS0B110020-01 Is voltage about 4 – 6 V?	Go to Step 7.	Go to Step 4.

1A-71 Engine General Information and Diagnosis:

Step	Action	Yes	No
4	ECM voltage check 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C01-25" terminal. 4) If OK, then turn ON ignition switch, measure voltage between "C01-25" terminal of ECM connector and vehicle body ground. <i>Is voltage about 4 – 6 V?</i>	"LT GRN/BLK" wire is open circuit. If wire and connection are OK, go to Step 5.	Go to Step 5.
5	Wire circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between "LT GRN/BLK" wire terminal of MAF and IAT sensor connector and vehicle body ground. <i>Is voltage about 0 V?</i>	Go to Step 6.	"LT GRN/BLK" wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
6	Wire circuit check 1) Measure resistance between "C01-25" terminal of ECM connector and "LT GRN/BLK" wire terminal of MAF and IAT sensor connector with ignition switch turned OFF. <i>Is resistance below 5 Ω?</i>	Go to Step 7.	"LT GRN/BLK" wire is high resistance circuit.
7	Ground circuit check 1) Connect connectors to ECM. 2) Measure resistance between "GRY/BLU" wire terminal of MAF and IAT sensor connector and vehicle body ground with ignition switch turned OFF. <i>Is resistance below 5 Ω?</i>	Go to Step 9.	Go to Step 8.
8	Ground circuit check 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between "C01-57" terminal of ECM connector and vehicle body ground. <i>Is resistance below 5 Ω?</i>	"GRY/BLU" wire is open circuit or high resistance circuit. Poor "C01-57" connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
9	IAT sensor for performance check 1) Check IAT sensor according to "Intake Air Temperature (IAT) Sensor Inspection in Section 1C". <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Replace MAF and IAT sensor.

DTC P0117: Engine Coolant Temperature Circuit Low

S6RW0E1104029

Wiring Diagram

I6RW0E110020-01

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of ECT sensor output is lower than specified value for specified time with engine running. (High engine coolant temperature (low voltage / low resistance)) (1 driving cycle detection logic)	- ECT sensor circuit - ECT sensor - ECM

DTC Confirmation Procedure

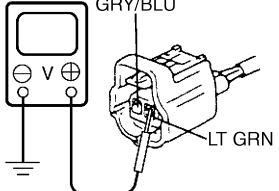
- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Start engine and run it for 10 sec. or more.
- 4) Check DTC and pending DTC.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	ECT sensor and its circuit check 1) Connect scan tool with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check engine coolant temp. displayed on scan tool. Is 119 °C (246 °F) indicated?	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".

1A-73 Engine General Information and Diagnosis:

Step	Action	Yes	No
3	ECM voltage check 1) Disconnect connector from ECT sensor with ignition switch turned OFF. 2) Check for proper connection to ECT sensor at "LT GRN" and "GRY/BLU" wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground.  <i>Is voltage about 4 – 6 V?</i>	Go to Step 6.	Go to Step 4.
4	ECT sensor short circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 5.	"LT GRN" wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.
5	ECT sensor short circuit check 1) Turn ON ignition switch. 2) Measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground. <i>Is voltage about 0 V?</i>	Go to Step 6.	"LT GRN" wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
6	ECT sensor for performance check 1) Check ECT sensor according to "Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C". <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Replace ECT sensor.

DTC P0118: Engine Coolant Temperature Circuit High

S6RW0E1104030

Wiring Diagram

Refer to "DTC P0117: Engine Coolant Temperature Circuit Low".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of ECT sensor output is higher than specified value for specified time with engine running. (Low engine coolant temperature (high voltage / high resistance)) (1 driving cycle detection logic)	- ECT sensor circuit - ECT sensor - ECM

NOTE

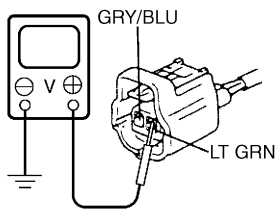
When DTC P0108 and P0113 are indicated together, it is possible that "GRY/BLU" wire circuit open.

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Start engine and run it for 10 sec. or more.
- 4) Check DTC and pending DTC.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

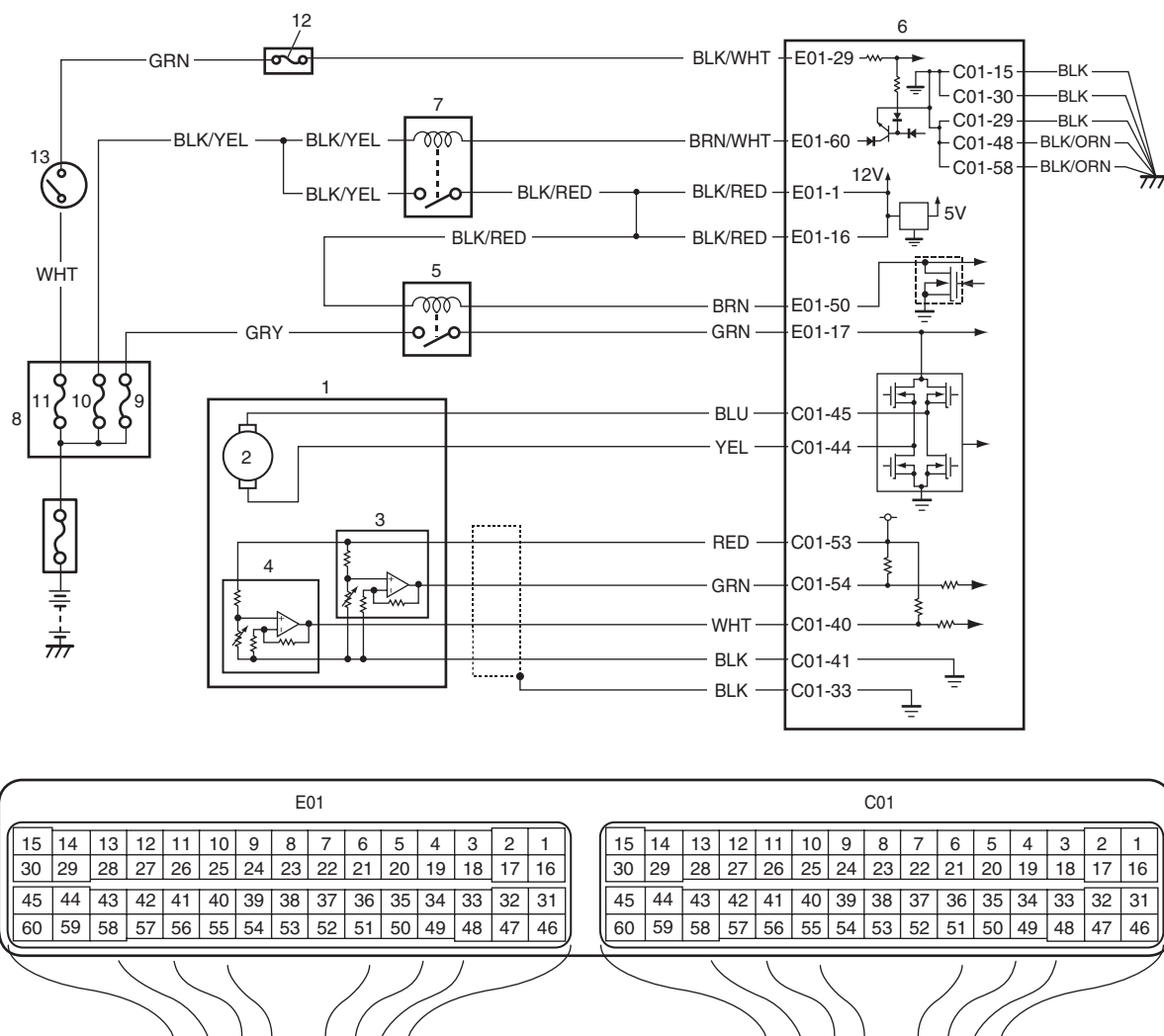
Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	ECT sensor and its circuit check 1) Connect scan tool with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check engine coolant temp. displayed on scan tool. Is -40°C (-40°F) indicated?	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
3	ECT voltage check 1) Disconnect connector from ECT sensor with ignition switch turned OFF. 2) Check for proper connection to ECT sensor at "LT GRN" and "GRY/BLU" wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground.  I5RW0A110025-01 Is voltage about 4 – 6 V?	Go to Step 6.	Go to Step 4.
4	ECM voltage check 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C01-24" terminal. 4) If OK, then turn ON ignition switch, measure voltage between "C01-24" wire terminal of ECM connector and vehicle body ground. Is voltage about 4 – 6 V?	"LT GRN" wire is open circuit. If wire and connection are OK, go to Step 5.	Go to Step 5.

1A-75 Engine General Information and Diagnosis:

Step	Action	Yes	No
5	ECT sensor harness voltage check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground. <i>Is voltage about 0 V?</i>	Go to Step 6.	"LT GRN" wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
6	ECT sensor harness resistance check 1) Measure resistance between "C01-24" terminal of ECM connector and "LT GRN" wire terminal of ECT sensor connector with ignition switch turn OFF. <i>Is resistance below 5 Ω?</i>	Go to Step 7.	"LT GRN" wire is high resistance circuit.
7	ECT sensor ground circuit check 1) Connect connectors to ECM. 2) Check for proper connection of ECT sensor connector at "GRY/BLU" wire terminal. 3) Measure resistance between "GRY/BLU" wire terminal of ECT sensor connector and vehicle body ground. <i>Is resistance below 5 Ω?</i>	Go to Step 9.	Go to Step 8.
8	ECT sensor ground circuit check 1) Measure resistance between "C01-57" terminal of ECM connector and vehicle body ground. <i>Is resistance below 5 Ω?</i>	"GRY/BLU" wire is open circuit or high resistance circuit. Poor "C01-57" connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
9	ECT sensor for performance check 1) Check ECT sensor according to "Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C". <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Replace ECT sensor.

DTC P0122: Throttle Position Sensor (Main) Circuit Low

S6RW0E1104031

Wiring Diagram

I6RW0E110021-01

1. Electric throttle body assembly	6. ECM	11. "IGN" fuse
2. Throttle actuator	7. Main relay	12. "IG COIL" fuse
3. Throttle position sensor (main)	8. Fuse Box No.2	13. Ignition switch
4. Throttle position sensor (sub)	9. THR MOT fuse	
5. Throttle actuator control relay	10. "FI" fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of throttle position sensor (main) is lower than specified value for specified time. (1 driving detection logic)	- Throttle position sensor (main) circuit - Electric throttle body assembly - ECM

NOTE

When DTC P0122 and P0222 are indicated together, it is possible that "RED" wire open circuit.

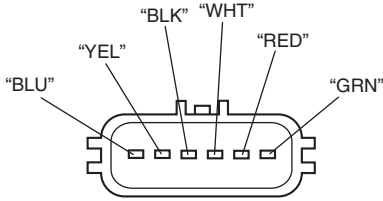
DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 seconds.
- 4) Keep the accelerator pedal at fully depressed position for 2 seconds.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check DTC.

DTC Troubleshooting

NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Throttle position sensor and its circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "TP Sensor 1 Volt" displayed on scan tool when accelerator pedal is idle position and fully depressed. Is displayed TP sensor value as described voltage in "Scan Tool Data"?	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 3.
3	ECM voltage check 1) Disconnect connector from electric throttle body assembly with ignition switch turned OFF. 2) Check for proper connection to electric throttle body assembly at "RED", "GRN" and "BLK" wire terminals.  I5RW0C110016-01 3) If OK, measure voltage between "RED" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. Is voltage 4 – 6 V?	Go to Step 6.	Go to Step 4.
4	ECM voltage check 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C01-53" terminal. 4) If OK, measure voltage between "C01-53" terminal of ECM connector and engine ground with ignition switch turned ON. Is voltage 4 – 6 V?	"RED" wire is open or high resistance circuit.	Go to Step 5.

Step	Action	Yes	No
5	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C01-53" terminal of ECM connector and engine ground. <i>Is resistance infinity?</i>	Substitute a known-good ECM and recheck.	"RED" wire is shorted to ground circuit.
6	Wire harness check 1) Measure voltage between "GRN" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 9.	Go to Step 7.
7	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "C01-54" and "C01-41" terminals. 3) If OK, measure resistance between "GRN" and "BLK" wire terminals of electric throttle body assembly connector. <i>Is resistance infinity?</i>	Go to Step 8.	"GRN" wire is shorted to "BLK" wire.
8	Wire harness check 1) Measure resistance between "GRN" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned OFF. <i>Is resistance infinity?</i>	Substitute a known-good ECM and recheck.	"GRN" wire is shorted to ground circuit.
9	Electric throttle body assembly check 1) Check throttle pedal position sensor referring to "Throttle Position Sensor Performance Check" under "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C". <i>Is output voltage within specified value?</i>	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P0123: Throttle Position Sensor (Main) Circuit High

S6RW0E1104032

Wiring Diagram

Refer to "DTC P0122: Throttle Position Sensor (Main) Circuit Low".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of throttle position sensor (main) is higher than specified value for specified time. (1 driving detection logic)	• Throttle position sensor (main) circuit • Electric throttle body assembly • ECM

NOTE

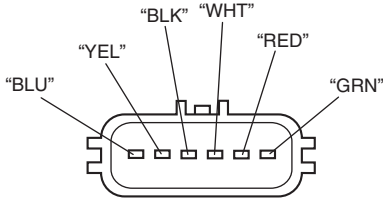
When DTC P0123 and P0223 are indicated together, it is possible that "RED" wire shorted to power circuit and/or "BLK" wire open.

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 seconds.
- 4) Keep the accelerator pedal at fully depressed position for 2 seconds.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check DTC.

DTC Troubleshooting
NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Throttle position sensor and its circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "TP Sensor 1 Volt" displayed on scan tool when accelerator pedal is idle position and fully depressed. <i>Is displayed TP sensor value as described voltage in "Scan Tool Data"?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 3.
3	ECM voltage check 1) Disconnect connector from electric throttle body assembly with ignition switch turned OFF. 2) Check for proper connection to electric throttle body assembly at "RED", "GRN" and "BLK" wire terminals.  I5RW0C110016-01 3) If OK, measure voltage between "RED" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 5.	Go to Step 4.
4	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "C01-53" terminal. 3) Measure voltage between "C01-53" terminal of ECM connector and engine ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Substitute a known-good ECM and recheck.	"RED" wire is shorted to power circuit.

Step	Action	Yes	No
5	Wire harness check 1) Measure voltage between "GRN" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 9.	Go to Step 6.
6	Wire harness check 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C01-53" and "C01-54" terminals. 4) If OK, measure voltage between "C01-54" terminal of ECM connector and engine ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	"GRN" wire is open or high resistance circuit.	Go to Step 7.
7	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "GRN" and "RED" wire terminals of electric throttle body assembly connector. <i>Is resistance infinity?</i>	Go to Step 8.	"GRN" wire is shorted to "RED" wire.
8	Wire harness check 1) Turn ON ignition switch. 2) Measure voltage between "C01-54" terminal of ECM connector and engine ground. <i>Is voltage 0 V?</i>	Substitute a known-good ECM and recheck.	"GRN" wire is shorted to power circuit.
9	Ground circuit check 1) Turn OFF ignition switch. 2) Measure resistance between "BLK" wire terminal of electric throttle body assembly connector and engine ground. <i>Is resistance below 5 Ω?</i>	Go to Step 11.	Go to Step 10.
10	Ground circuit check 1) Remove ECM from its bracket with ECM connectors connected. 2) Check for proper connection of ECM connector at "C01-41" terminal. 3) Measure resistance between "C01-41" terminal of ECM connector and engine ground with ignition switch turned OFF. <i>Is resistance below 5 Ω?</i>	"BLK" wire is open or high resistance circuit.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
11	Electric throttle body assembly check 1) Check throttle pedal position sensor referring to "Throttle Position Sensor Performance Check" under "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C". <i>Is output voltage within specified value?</i>	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P0131 / P0132: O2 Sensor Circuit Low Voltage / High Voltage (Sensor-1)

S6RW0E1104090

Wiring Diagram

Refer to "DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1)".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC detecting condition DTC P0131: A/F sensor terminal voltage is lower than specified value or A/F sensor output current is lower than specified value for 5 sec. with engine running. (2 driving cycle detection logic) DTC P0132: A/F sensor terminal voltage is higher than specified value or A/F sensor output current is higher than specified value for 5 sec. with engine running. (2 driving cycle detection logic)	• A/F sensor and/or its circuit • ECM

DTC Confirmation Procedure**NOTE**

Check to make sure that the following conditions are satisfied when using this "DTC Confirmation Procedure".

- The following DTCs are not detected: DTCs related to A/F sensor heater

- 1) With ignition switch OFF, connect scan tool to DLC.
- 2) Turn ON ignition switch and clear DTC.
- 3) Start engine and warm up to normal operating temperature.
- 4) Run engine at idle speed for 1 min. or more.
- 5) Check DTC and pending DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Is there DTC(s) other than A/F sensor?	Go to applicable DTC diag. flow.	Go to Step 3.
3	A/F sensor signal check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec. 3) Repeat racing engine (Repeat depressing accelerator pedal 5 to 6 times continuously to enrich A/F mixture and take foot off from pedal to enlean it). Does A/F sensor output current between -0.2 mA and 0.2 mA?	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 4.

Step	Action	Yes	No
4	A/F sensor circuit check 1) Disconnect connector from A/F sensor and ECM with ignition switch turned OFF. 2) Check for proper connection of each A/F sensor circuit terminal to A/F sensor connector and to ECM connector. 3) If connections are OK, check A/F sensor circuit for the following. - Resistance of each sensing circuit wire ("WHT" and "BLK") of A/F sensor between A/F sensor connector and ECM connector is less than 2 Ω - Resistance between sensing circuit wires ("WHT" and "BLK") of A/F sensor connector are infinity - Resistance between each sensing circuit wire ("WHT" and "BLK") of A/F sensor connector and vehicle body ground is infinity - Voltage of between each sensing circuit wire ("WHT" and "BLK") of A/F sensor connector and vehicle body ground is 0 V with ignition switch tuned ON <i>Is it in good condition?</i>	Replace A/F sensor and recheck. If this DTC is detected again, substitute a known-good ECM.	Repair or replace defective wire.

DTC P0134: O2 Sensor Circuit No Activity Detected (Sensor-1)

S6RW0E1104091

Wiring Diagram

Refer to "DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1)".

A/F Sensor Description

Refer to "A/F Sensor Description".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Impedance of A/F sensor element is higher than specified value for 2 sec. even though A/F sensor heater is turned ON for specified time with engine running. (2 driving cycle detection logic)	- A/F sensor and/or its circuit - ECM

DTC Confirmation Procedure**NOTE**

Check to make sure that the following conditions are satisfied when using this "DTC Confirmation Procedure".

- The following DTCs are not detected: DTCs related to A/F sensor heater

- 1) With ignition switch OFF, connect scan tool to DLC.
- 2) Turn ON ignition switch and clear DTC.
- 3) Start engine and warm up to normal operating temperature.
- 4) Run engine at idle speed for 2 min. or more.
- 5) Check DTC and pending DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	A/F sensor signal check 1) Connect scan tool with ignition switch turned OFF. 2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec. 3) Repeat racing engine (Repeat depressing accelerator pedal 5 to 6 times continuously to enrich A/F mixture and take foot off from pedal to enlean it). 4) Check for A/F sensor output current displayed on scan tool. <i>Does A/F sensor output current between -0.2 mA and 0.2 mA?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 3.
3	A/F sensor circuit check 1) Disconnect connector from A/F sensor with ignition switch turned OFF. 2) Check for proper terminal connection to A/F sensor connector. 3) If connections are OK, check that A/F sensor circuit is as follows. • Wiring harness resistance between "WHT" wire terminal of A/F sensor heater and "C01-38" terminal of ECM connector is less than 1 Ω or less. • Wiring harness resistance between "BLK" wire terminal of A/F sensor heater and "C01-37" terminal of ECM connector is less than 1 Ω or less. • Wiring harness resistance between "RED" wire terminal of A/F sensor heater and "C01-32" terminal of ECM connector is less than 1 Ω or less. • Wiring harness resistance between "C01-31" terminal of ECM connector and vehicle body ground is less than 1 Ω or less. <i>Are they in good condition?</i>	Replace A/F sensor and recheck. If this DTC is detected again, substitute a known-good ECM and recheck.	Repair or replace defective wiring harness / connector.

DTC P0140: O2 Sensor (HO2S) Circuit No Activity Detected (Sensor-2)

S6RW0E1104037

Wiring Diagram

Refer to "DTC P0131 / P0132: O2 Sensor Circuit Low Voltage / High Voltage (Sensor-1)".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HO2S voltage is higher than specified value after warming up engine (circuit open). (2 driving cycle detection logic)	• HO2S • HO2S circuit • ECM • Exhaust gas leakage • Air intake system

DTC Confirmation Procedure

▲ WARNING

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out by 2 persons, a driver and a tester, on a level road.

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Start engine and warm up to normal operating temperature.
- 4) Increase vehicle speed to 60 – 80 km/h (37 – 50 mile/h) at 5th gear or D range.
- 5) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 4 sec. or more), then stop vehicle and run engine at idle speed for 60 sec. or more.
- 6) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	HO2S ground check 1) Disconnect connector from HO2S with ignition switch turned OFF. 2) Check for proper connection to HO2S connector at "RED/BLU", "BRN", "BLK/RED" and "BLK/WHT" wire terminals. 3) If connections are OK, measure resistance between "BLK/RED" wire terminal of HO2S connector and engine ground. Is resistance less than 5 Ω?	Go to Step 3.	"BLK/RED" wire is open or high resistance circuit. Poor "C01-39" terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
3	Wire circuit check 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure resistance between "BRN" wire terminal of HO2S connector and "C01-11" terminal of ECM connector. Is resistance less than 5 Ω?	Go to Step 4.	"BRN" wire is high resistance circuit or open circuit. Poor "C01-11" terminal connection. If they are OK, substitute a known-good ECM and recheck.
4	HO2S signal circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure voltage between "BRN" wire terminal of HO2S connector and vehicle body ground. Is voltage 0 V?	Go to Step 5.	"BRN" wire is shorted to other circuit.

1A-85 Engine General Information and Diagnosis:

Step	Action	Yes	No
5	HO2S heater circuit check 1) Check HO2S heater circuit referring to "DTC P0037 / P0038: HO2S Heater Control Circuit Low / High (Sensor-2)". <i>Is circuit in good condition?</i>	Go to Step 6.	Repair HO2S circuit. If circuit is OK, substitute a known-good ECM and recheck.
6	Exhaust system check 1) Check exhaust system for exhaust gas leakage. <i>Is it OK?</i>	Go to Step 4 in "DTC P0171 / P0172: Fuel System Too Lean / Rich". If it is in good condition, go to Step 8.	Repair leakage of exhaust system.
7	Air intake system check 1) Check air intake system for clog or leak. <i>Is it OK?</i>	Replace HO2S referring to "Air Fuel / Ratio (A/F) Sensor and Heated Oxygen Sensor (HO2S-2) Removal and Installation in Section 1C". If DTC still exists, substitute a known-good ECM and recheck.	Repair or replace air intake system.

DTC P0171 / P0172: Fuel System Too Lean / Rich

S6RW0E1104038

Wiring Diagram

Refer to "DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1)".

A/F Sensor Description

Refer to "A/F Sensor Description".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0171: Total fuel trim (short term fuel trim + long term fuel trim) is higher than specified value for 10 sec. 3 times. (2 driving cycle detection logic) DTC P0172: Total fuel trim (short term fuel trim + long term fuel trim) is lower than specified value for 10 sec. 3 times. (2 driving cycle detection logic)	• Vacuum leakage • Exhaust gas leakage • Fuel pressure out of specification • Fuel injector • A/F sensor • MAF sensor • ECT sensor • ECM

DTC Confirmation Procedure**▲ WARNING**

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out by 2 persons, a driver and a tester, on a level road.

NOTE

Check to make sure that the following conditions are satisfied when using this “DTC Confirmation Procedure”.

- Intake air temperature at engine start: -10°C (14°F) to 80°C (176°F)
- Intake air temperature: -10°C (14°F) to 70°C (158°F)
- Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)
- The following DTCs are not detected: DTCs related to MAF sensor, ECT sensor, IAT sensor, EGR valve, barometric pressure sensor and A/F sensor

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and print Freeze Frame Data or write them down using scan tool.
- 3) Clear DTC using scan tool.
- 4) Start engine and warm up to normal operating temperature.
- 5) Operate vehicle with condition as noted freeze frame data for 5 min.
- 6) Stop vehicle and check DTC and pending DTC.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to “Precautions for DTC Troubleshooting”.

Step	Action	Yes	No
1	Was “Engine and Emission Control System Check” performed?	Go to Step 2.	Go to “Engine and Emission Control System Check”.
2	Is there DTC(s) other than fuel system (DTC P0171 / P0172)?	Go to applicable DTC diag. flow.	Go to Step 3.
3	Intake system and exhaust system for leakage check Are intake system and exhaust system in good condition?	Go to Step 4.	Repair or replace defective part.
4	Fuel pressure check 1) Check fuel pressure referring to “Fuel Pressure Check”. Is check result satisfactory?	Go to Step 5.	Repair or replace defective part.
5	Fuel injectors and its circuit check 1) Check fuel injectors referring to “Fuel Injector Inspection in Section 1G in related manual”. Is check result satisfactory?	Go to Step 6.	Faulty injector(s) or its circuit.
6	Visual inspection 1) Check MAF sensor and air intake system. • Objects which block measuring duct and resistor of MAF sensor. • Other air flow which does not pass MAF sensor. Are they in good condition?	Go to Step 7.	Repair or replace defective part.
7	MAF sensor for performance check 1) With ignition switch turned OFF, install scan tool. 2) Start engine and warm up to normal operating temperature. 3) Check MAF value using scan tool (Refer to “Scan Tool Data” for normal value.). Is each value within specified range?	Go to Step 8.	Go to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection in Section 1C”.

1A-87 Engine General Information and Diagnosis:

Step	Action	Yes	No
8	ECT sensor for performance check 1) Check ECT sensor referring to Step 3 and 4 of "DTC P0118: Engine Coolant Temperature Circuit High". <i>Is check result satisfactory?</i>	Go to Step 9.	Faulty ECT sensor or its circuit.
9	A/F sensor for performance check 1) Check A/F sensor referring to Step 3 of "DTC P0131 / P0132: O2 Sensor Circuit Low Voltage / High Voltage (Sensor-1)". <i>Is check result satisfactory?</i>	Replace A/F sensor and recheck, if this DTC is detect again, substitute a known-good ECM.	Faulty A/F sensor or its circuit.

DTC P0222: Throttle Position Sensor (Sub) Circuit Low

S6RW0E1104039

Wiring Diagram

Refer to "DTC P0122: Throttle Position Sensor (Main) Circuit Low".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of throttle position sensor (sub) is lower than specified value for specified time. (1 driving detection logic)	• Throttle position sensor (sub) circuit • Electric throttle body assembly • ECM

NOTE

When DTC P0122 and P0222 are indicated together, it is possible that "RED" wire open circuit.

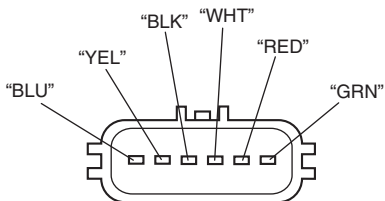
DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 seconds.
- 4) Keep the accelerator pedal at fully depressed position for 2 seconds.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check DTC.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Throttle position sensor and its circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "TP Sensor 2 Volt" displayed on scan tool when accelerator pedal is idle position and fully depressed. <i>Is each TP sensor voltage within specified value in the table "Scan Tool Data"?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 3.

Step	Action	Yes	No
3	ECM voltage check 1) Disconnect connector from electric throttle body assembly with ignition switch turned OFF. 2) Check for proper connection to electric throttle body assembly at "RED", "WHT" and "BLK" wire terminals.  I5RW0C110016-01 3) If OK, measure voltage between "RED" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 6.	Go to Step 4.
4	ECM voltage check 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C01-53" terminal. 4) If OK, measure voltage between "C01-53" terminal of ECM connector and engine ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	"RED" wire is open or high resistance circuit.	Go to Step 5.
5	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C01-53" terminal of ECM connector and engine ground. <i>Is resistance infinity?</i>	Substitute a known-good ECM and recheck.	"RED" wire is shorted to ground circuit.
6	Wire harness check 1) Measure voltage between "WHT" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 9.	Go to Step 7.
7	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "C01-40" and "C01-41" terminals. 3) If OK, measure resistance between "WHT" and "BLK" wire terminals of electric throttle body assembly connector. <i>Is resistance infinity?</i>	Go to Step 8.	"WHT" wire is shorted to "BLK" wire.

1A-89 Engine General Information and Diagnosis:

Step	Action	Yes	No
8	Wire harness check 1) Measure resistance between "WHT" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned OFF. <i>Is resistance infinity?</i>	Substitute a known-good ECM and recheck.	"WHT" wire is shorted to ground circuit.
9	Electric throttle body assembly check 1) Check throttle pedal position sensor referring to "Throttle Position Sensor Performance Check" under "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C". <i>Is output voltage within specified value?</i>	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P0223: Throttle Position Sensor (Sub) Circuit High

S6RW0E1104040

Wiring Diagram

Refer to "DTC P0122: Throttle Position Sensor (Main) Circuit Low".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of throttle position sensor (sub) is higher than specified value for specified time. (1 driving detection logic)	• Throttle position sensor (sub) circuit • Electric throttle body assembly • ECM

NOTE

When DTC P0123 and P0223 are indicated together, it is possible that "RED" wire shorted to power circuit and/or "BLK" wire open.

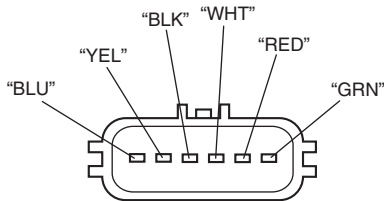
DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 seconds.
- 4) Keep the accelerator pedal at fully depressed position for 2 seconds.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check DTC.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	<i>Was "Engine and Emission Control System Check" performed?</i>	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Throttle position sensor and its circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "TP Sensor 2 Volt" displayed on scan tool when accelerator pedal is idle position and fully depressed. <i>Is each TP sensor voltage within specified value in the table "Scan Tool Data"?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 3.

Step	Action	Yes	No
3	ECM voltage check 1) Disconnect connector from electric throttle body assembly with ignition switch turned OFF. 2) Check for proper connection to electric throttle body assembly at "RED", "WHT" and "BLK" wire terminals.  I5RW0C110016-01 3) If OK, measure voltage between "RED" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 5.	Go to Step 4.
4	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "C01-53" terminal. 3) Measure voltage between "C01-53" terminal of ECM connector and engine ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Substitute a known-good ECM and recheck.	"RED" wire is shorted to power circuit.
5	Wire harness check 1) Measure voltage between "WHT" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 9.	Go to Step 6.
6	Wire harness check 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C01-53" and "C01-40" terminals. 4) If OK, measure voltage between "C01-40" terminal of ECM connector and engine ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	"WHT" wire is open or high resistance circuit.	Go to Step 7.
7	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "WHT" and "RED" wire terminals of electric throttle body assembly connector. <i>Is resistance infinity?</i>	Go to Step 8.	"WHT" wire is shorted to "RED" wire.

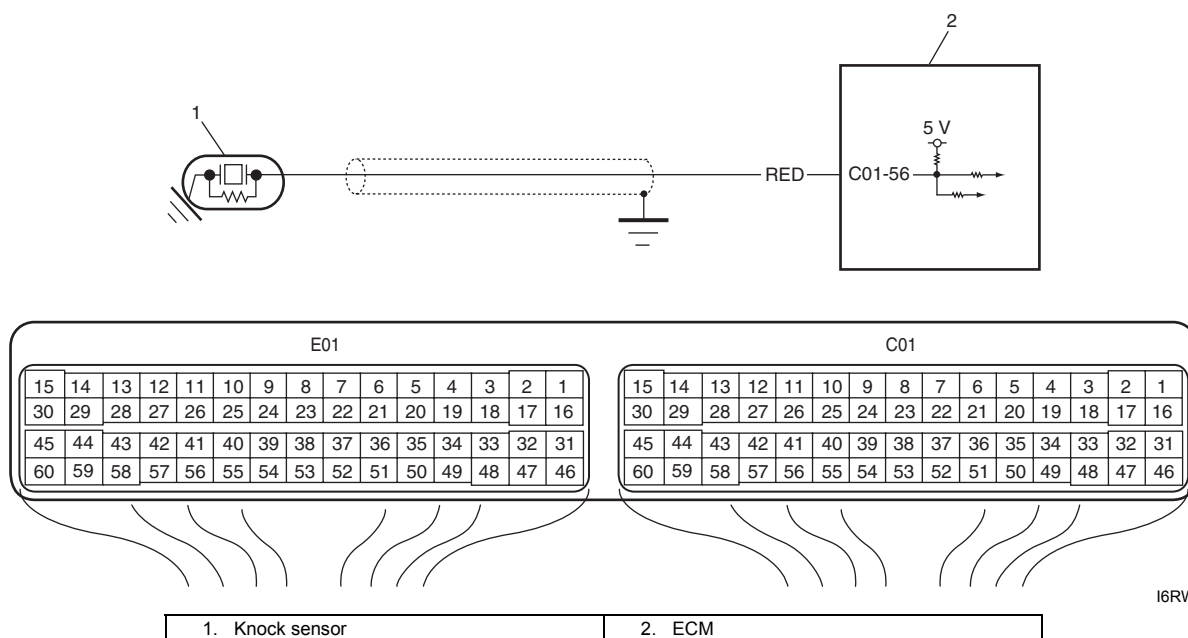
1A-91 Engine General Information and Diagnosis:

Step	Action	Yes	No
8	Wire harness check 1) Turn ON ignition switch. 2) Measure voltage between "C01-40" terminal of ECM connector and engine ground. <i>Is voltage 0 V?</i>	Substitute a known-good ECM and recheck.	"WHT" wire is shorted to power circuit.
9	Ground circuit check 1) Turn OFF ignition switch. 2) Measure resistance between "BLK" wire terminal of electric throttle body assembly connector and engine ground. <i>Is resistance below 5 Ω?</i>	Go to Step 11.	Go to Step 10.
10	Ground circuit check 1) Remove ECM from its bracket with ECM connectors connected. 2) Check for proper connection of ECM connector at "C01-41" terminal. 3) Measure resistance between "C01-41" terminal of ECM connector and engine ground with ignition switch turned OFF. <i>Is resistance below 5 Ω?</i>	"BLK" wire is open or high resistance circuit.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
11	Electric throttle body assembly check 1) Check throttle position sensor referring to "Throttle Position Sensor Performance Check" under "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C". <i>Is output voltage within specified value?</i>	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P0327 / P0328: Knock Sensor Circuit Low / High

S6RW0E1104042

Wiring Diagram



I6RW0D110030-01

DTC Detecting Condition and Trouble Area

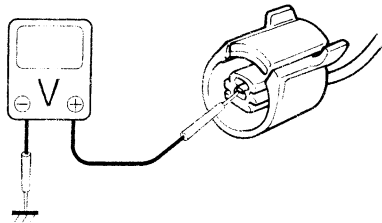
DTC detecting condition	Trouble area
DTC P0327: Voltage of knock sensor is lower than specified value for specified time with engine running. (1 driving cycle detection logic) DTC P0328: Voltage of knock sensor is higher than specified value for specified time with engine running. (1 driving cycle detection logic)	• Knock sensor circuit (open or short) • Knock sensor • ECM

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
- 3) Start engine and run it for 10 sec.
- 4) Check DTC by using scan tool.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Knock sensor circuit check 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure voltage between "C01-56" terminal of ECM connector and vehicle body ground with engine running. <i>Is voltage within 1.23 – 3.91 V?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good ECM and recheck.	Go to Step 3.
3	Knock sensor circuit for open check 1) Disconnect connector from knock sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between "RED" wire of knock sensor connector and engine ground.  <i>Is voltage 4 – 6 V?</i>	Go to Step 6.	Go to Step 4.
4	Knock sensor circuit for open check 1) Turn ON ignition switch, measure voltage between "C01-56" terminal of ECM connector and engine ground. <i>Is voltage 4 – 6 V?</i>	"RED" wire is open circuit.	Go to Step 5.

I2RH01110089-01

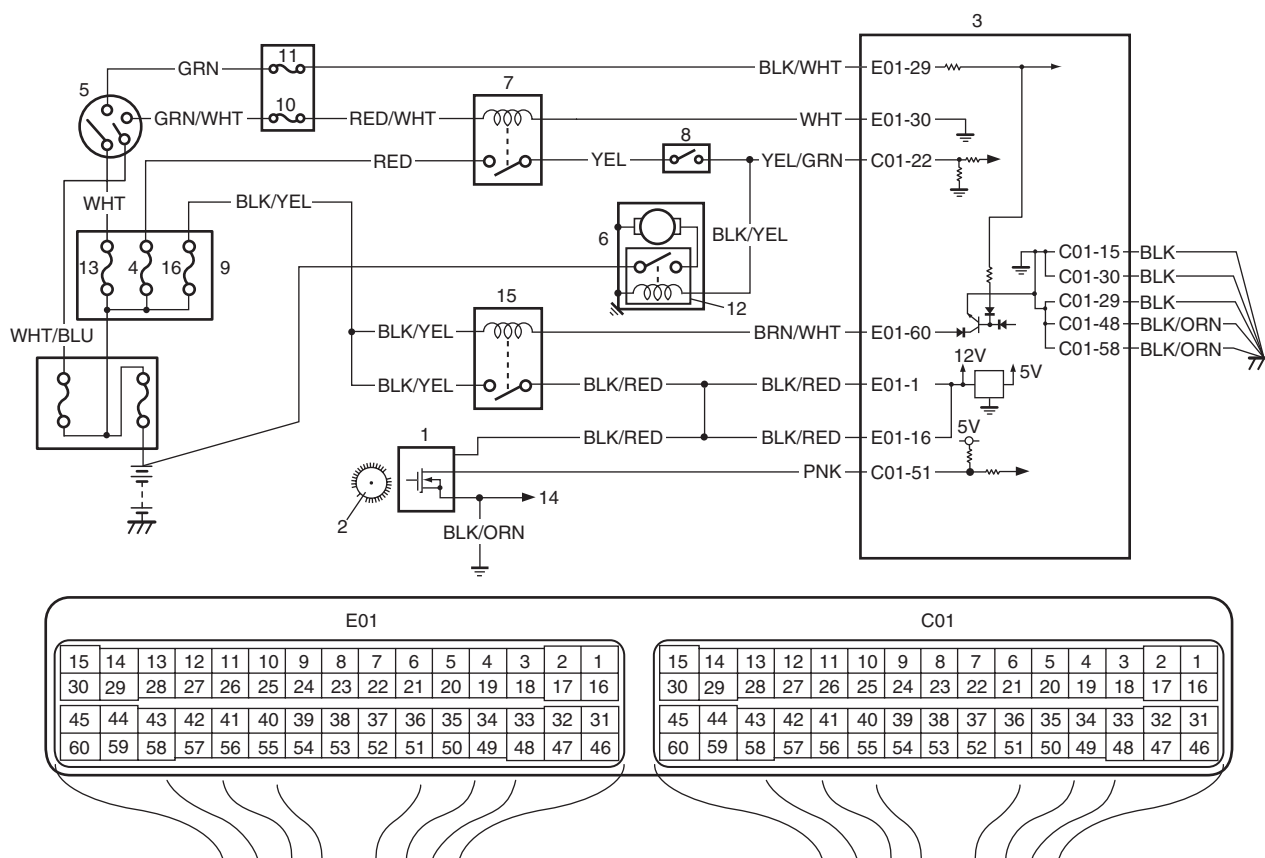
1A-93 Engine General Information and Diagnosis:

Step	Action	Yes	No
5	Knock sensor circuit for short check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C01-56" terminal of ECM connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 6.	"RED" wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.
6	Knock sensor circuit for short check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between "C01-56" terminal of ECM connector and vehicle body ground. <i>Is voltage 0 V?</i>	Go to Step 7.	"RED" wire is shorted to other circuit.
7	Knock sensor circuit for high resistance check 1) Turn OFF ignition switch, measure resistance between "C01-56" terminal of ECM connector and "RED" wire terminal of knock sensor harness connector. <i>Is resistance below 5 Ω?</i>	Faulty knock sensor.	"RED" wire is high resistance circuit.

DTC P0335: Crankshaft Position (CKP) Sensor Circuit

S6RW0E1104043

Wiring Diagram



I6RW0E110022-01

1. CKP sensor	7. Starting motor control relay	13. "IGN" fuse
2. Sensor plate on crankshaft	8. Transmission range switch (A/T model)	14. To CMP sensor
3. ECM	9. Individual circuit fuse box No.1	15. Main relay
4. "ST" fuse	10. "ST SIG" fuse	16. "FI" fuse
5. Ignition switch	11. "IG COIL" fuse	
6. Starting motor	12. Starting motor magnet clutch	

DTC Detecting Condition and Trouble Area

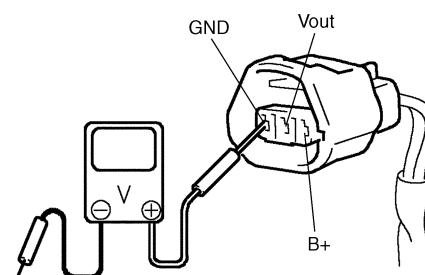
DTC detecting condition	Trouble area
No CKP sensor signal for 2 sec. even if starting motor signal is inputted at engine cranking. (1 driving cycle detection logic)	• CKP sensor circuit open or short • Sensor plate teeth damaged • CKP sensor malfunction, foreign material being attached or improper installation • ECM • Engine start signal circuit malfunction

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Crank engine for 3 – 5 sec.
- 4) Check DTC and pending DTC.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to “Precautions for DTC Troubleshooting”.

Step	Action	Yes	No
1	Was “Engine and Emission Control System Check” performed?	Go to Step 2.	Go to “Engine and Emission Control System Check”.
2	CKP sensor and connector for proper installation check <i>Is CKP sensor installed properly and connector connected securely?</i>	Go to Step 3.	Correct.
3	Wire harness and connection check 1) Disconnect connector from CKP sensor with ignition switch turned OFF. 2) Check for proper connection to CKP sensor at “BLK/RED”, “PNK” and “BLK/ORN” wire terminals. 3) If OK, turn ON ignition switch and check voltage at “BLK/RED”, “PNK” and “BLK/ORN” wire terminals of disconnected CKP sensor connector. CKP sensor voltage Terminal “B+”: 10 – 14 V Terminal “Vout”: 4 – 5 V Terminal “GND”: 0 V  <i>Is check result satisfactory?</i>	Go to Step 7.	Go to Step 4.

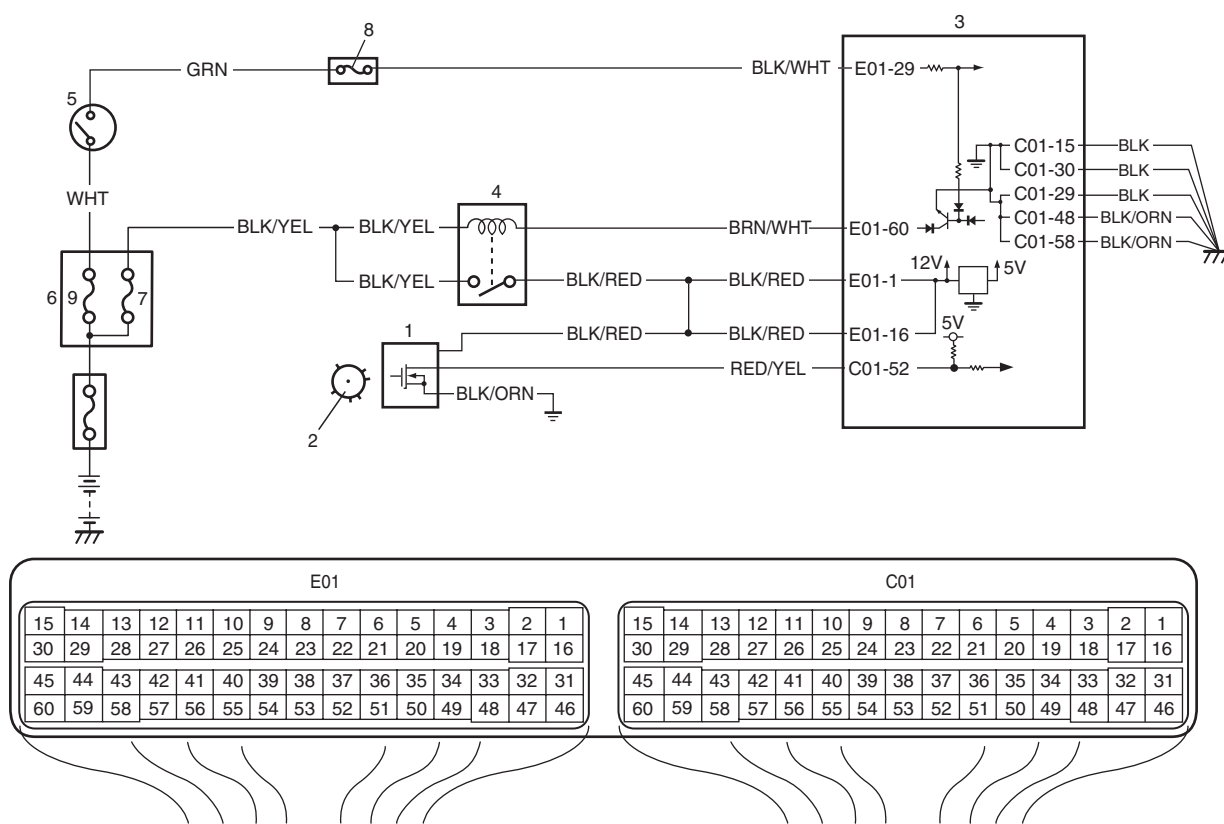
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1A-95 Engine General Information and Diagnosis:

Step	Action	Yes	No
4	<i>Was terminal "Vout" voltage in Step 3 within specification?</i>	Go to Step 5.	"PNK" wire is open or shorted to ground / power supply circuit. If wire and connection are OK, substitute a known-good ECM and recheck.
5	Ground circuit check 1) Turn ignition switch to OFF position. 2) Measure resistance between "BLK/ORN" wire terminal of CKP sensor connector and engine ground. <i>Is measured resistance value less than 3 Ω?</i>	Go to Step 6.	"BLK/ORN" wire is open or high resistance.
6	<i>Was terminal "B+" voltage in Step 3 within specification?</i>	Go to Step 7.	"BLK/RED" wire is open circuit. If wire and connection are OK, substitute a known-good ECM and recheck.
7	Engine start signal check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check that circuit voltage between start signal terminal of ECM connector and vehicle body ground. • Ignition switch is at "START" position: 8 – 14 V • Ignition switch is at other than "START" position: 0 – 1 V <i>Is it in good condition?</i>	Go to Step 8.	Repair or replace start signal circuit.
8	CKP sensor check 1) Check CKP sensor and sensor plate tooth referring to "Camshaft Position (CMP) Sensor Inspection in Section 1C". <i>Is check result satisfactory?</i>	Substitute a known-good ECM and recheck.	Replace CKP sensor and/or sensor plate.

DTC P0340: Camshaft Position (CMP) Sensor Circuit

S6RW0E1104044

Wiring Diagram

I6RW0E110023-01

1. CMP sensor	4. Main relay	7. "FI" fuse
2. Signal rotor	5. Ignition switch	8. "IG COIL" fuse
3. ECM	6. Fuse box No.2	9. "IGN" fuse

System Description

The CMP sensor located on the transmission side of cylinder head (VVT model) or timing chain cover (non-VVT model) consists of the signal generator (magnetic sensor) and signal rotor (intake camshaft portion (VVT model) or exhaust camshaft timing sprocket (non-VVT model)).

The signal generator generates reference signal through slits in the slit plate which turns together with the camshaft.

1A-97 Engine General Information and Diagnosis:

Reference signal

The CMP sensor generates 6 pulses of signals each of which has a different waveform length while the camshaft makes one full rotation. Refer to "Inspection of ECM and Its Circuits".

Based on these signals, ECM judges which cylinder piston is in the compression stroke and the engine speed.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• CMP sensor pulse is lower than 20 pulses per crankshaft 8 revolutions or • CMP sensor pulse is higher than 28 pulses per crankshaft 8 revolutions or • CMP sensor pulse is lower than 20 pulses between BTDC 75° CA and BTDC 5° CA with crankshaft 8 revolutions from engine start. (1 driving cycle detection logic)	• CMP sensor circuit open or short • Signal rotor teeth damaged • CMP sensor malfunction, foreign material being attached or improper installation • ECM

DTC Confirmation Procedure

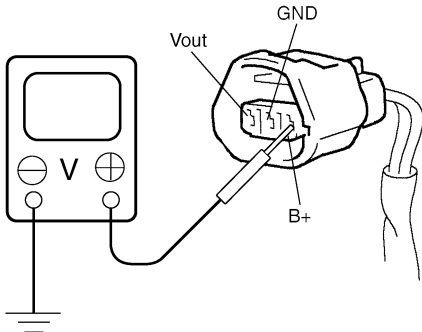
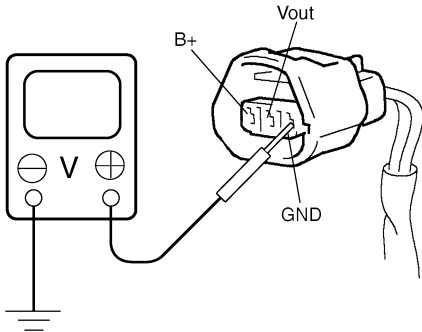
- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Crank engine for 5 sec.
- 4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	CMP sensor and connector for proper installation check <i>Is CMP sensor installed properly and connector connected securely?</i>	Go to Step 3.	Correct.

Step	Action	Yes	No
3	Wire harness and connection check 1) Disconnect connector from CMP sensor. 2) Check for proper connection to CMP sensor at “BLK/RED”, “RED/YEL” and “BLK/ORN” wire terminals. 3) If OK, turn ON ignition switch and check voltage at “BLK/RED”, “RED/YEL” and “BLK/ORN” wire terminals of disconnected CMP sensor connector. CMP sensor voltage Terminal “B+”: 10 – 14 V Terminal “Vout”: 4 – 5 V Terminal “GND”: 0 V VVT model  I4RS0B110031-01 Non-VVT model  I4RS0B110094-01 <i>Is check result satisfactory?</i>	Go to Step 7.	Go to Step 4.
4	<i>Was terminal “Vout” voltage in Step 3 within specification?</i>	Go to Step 5.	“RED/YEL” wire is open or shorted to ground / power supply circuit. If wire and connection are OK, substitute a known-good ECM and recheck.
5	Ground circuit check 1) Turn ignition switch to OFF position. 2) Measure resistance between “BLK/ORN” wire terminal of CMP sensor connector and engine ground. <i>Is measured resistance value less than 3 Ω?</i>	Go to Step 6.	“BLK/ORN” wire is open or high resistance circuit.
6	<i>Was terminal “B+” voltage in Step 3 within specification?</i>	Go to Step 7.	“BLK/RED” wire is open circuit. If wire and connection are OK, substitute a known-good ECM and recheck.

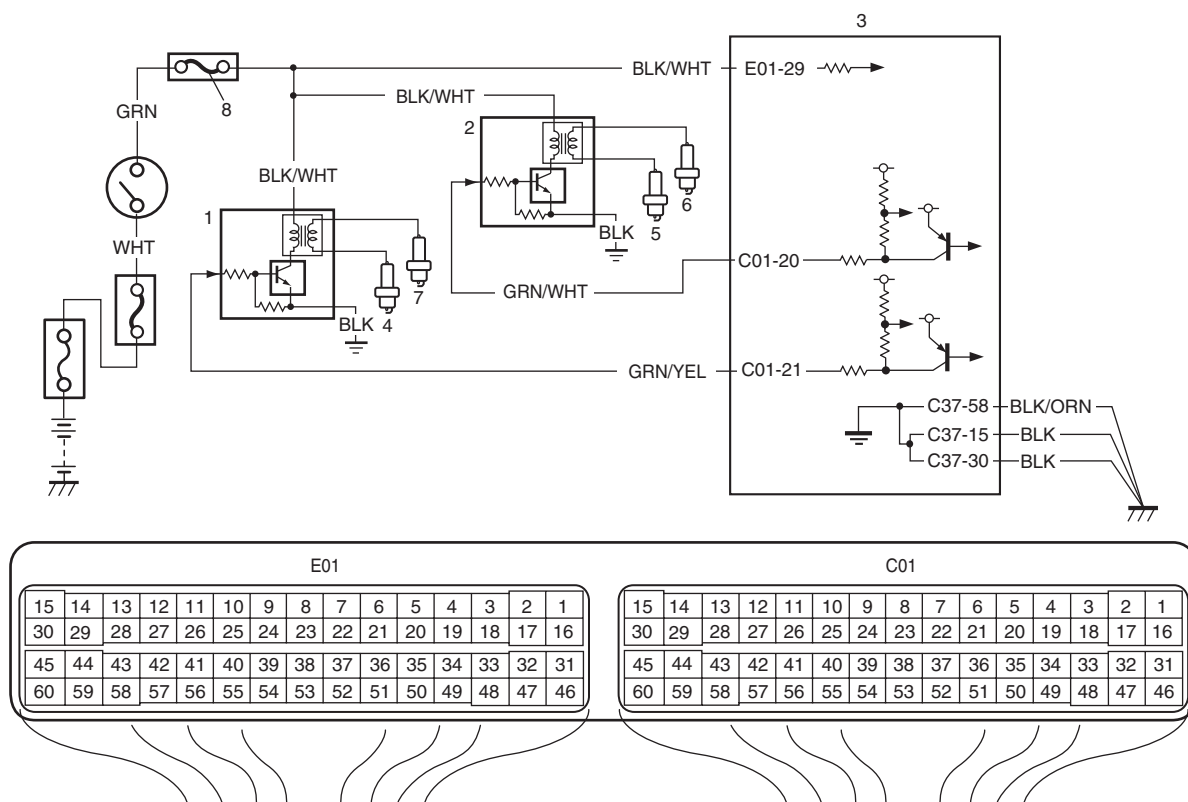
1A-99 Engine General Information and Diagnosis:

Step	Action	Yes	No
7	CMP sensor check 1) Check CMP sensor and signal rotor tooth referring to "Camshaft Position (CMP) Sensor Inspection in Section 1C". <i>Is check result satisfactory?</i>	Substitute a known-good ECM and recheck.	Replace CMP sensor and/or intake camshaft.

DTC P0350: Ignition Coil Primary / Secondary Circuit

S6RW0E1104092

Wiring Diagram



I6RW0E110024-01

1. Ignition coil assembly for No.1 and No.4 spark plugs	4. No.1 spark plug	7. No.4 spark plug
2. Ignition coil assembly for No.2 and No.3 spark plugs Intake manifold	5. No.2 spark plug	8. "IG COIL" fuse
3. ECM	6. No.3 spark plug	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Ignition signal is not inputted to monitor circuit 5 times or more continuously. (1 driving cycle detection logic)	- Ignition coil assembly and/or its circuit - ECM

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool to DLC.
- 2) Turn ON ignition switch and clear DTC.
- 3) Crank engine for 3 – 5 sec.
- 4) Check DTC.

DTC Troubleshooting

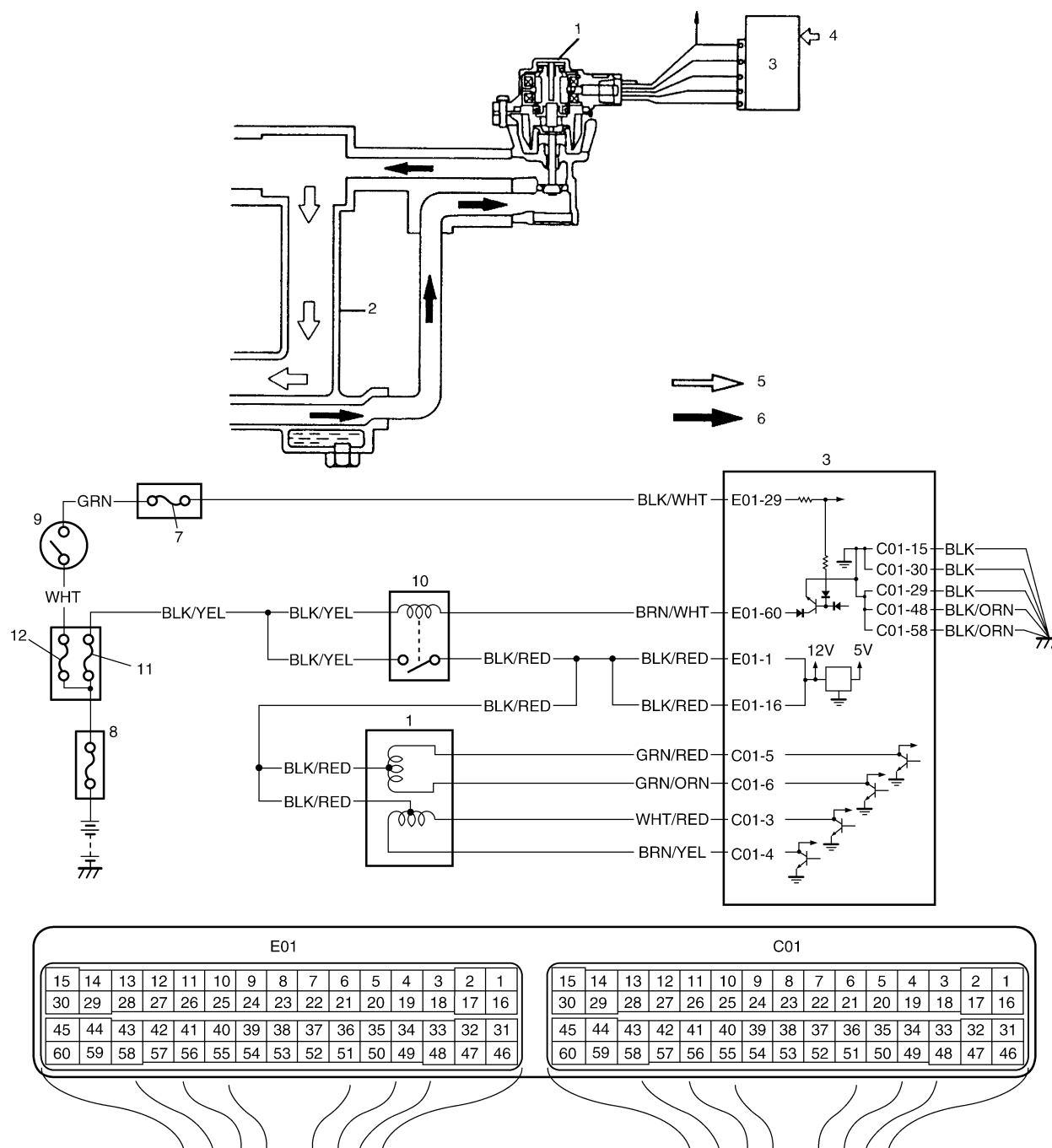
NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Ignition spark check 1) Check that each spark plug for spark referring to "Ignition Spark Test in Section 1H". Is check result satisfactory?	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 3.
3	Ignition coil assembly power, output and ground circuit check 1) Disconnect ignition coil assembly connector of the cylinder found as faulty in Step 2. 2) Check ignition coil assembly circuit of the cylinder found as faulty in Step 2 for the following. • Voltage between power circuit wire ("BLK/WHT") terminal of ignition coil assembly connector and vehicle body ground is 10 – 14V with ignition switch turned ON. • Voltage between output circuit wire ("GRN/WHT" and "GRN/YEL") terminal of ignition coil assembly connector and vehicle body ground is 4 – 6V with ignition switch turned ON. • Resistance between ground circuit wire ("BLK") terminal of ignition coil assembly connector and vehicle body ground is less than 2 Ω. Are they in good condition?	Go to Step 4.	Repair or replace defective wire.
4	Ignition coil assembly check 1) Replace ignition coil assembly for No.1 and No.4 spark plugs with ignition coil assembly for No.2 and No.3 spark plugs. 2) Check spark plug for spark as the same manner as Step 2). Is the cylinder found as faulty in good condition now?	Faulty ignition coil assembly.	Go to Step 5.
5	Ignition coil assembly output circuit check 1) Disconnect connectors from ECM. 2) Check ignition coil assembly circuit of the cylinder found as faulty in Step 2 for the following. • Resistance of output wire ("GRN/WHT" and "GRN/YEL") circuit between ignition coil assembly connector and ECM connector is less than 2 Ω. • Resistance of output wire ("GRN/WHT" and "GRN/YEL") circuit between ignition coil assembly connector and vehicle body ground is infinity. Are they in good condition?	Substitute a known-good ECM and recheck.	Repair or replace defective wire.

DTC P0401 / P0402: Exhaust Gas Recirculation Flow Insufficient Detected / Excessive Detected

S6RW0E1104045

System and Wiring Diagram

I6RW0E110025-01

1. EGR valve	4. Sensed information	7. "IG COIL" fuse	10. Main relay
2. Intake manifold	5. Fresh air	8. Main fuse box	11. "FI" fuse
3. ECM	6. Exhaust gas	9. Ignition switch	12. "IGN" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0401: Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is smaller than specified value. (2 driving cycle detection logic, monitoring once / 1 driving) DTC P0402: Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is larger than specified value. (2 driving cycle detection logic, monitoring once / 1 driving)	• EGR valve • EGR passage • MAP sensor • ECM

DTC Confirmation Procedure**▲ WARNING**

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out by 2 persons, a driver and a tester, on a level road.

NOTE

Check to make sure that following conditions are satisfied when using this “DTC confirmation procedure”.

- Intake air temperature at engine start: -10°C (14°F) to 80°C (176°F)
- Intake air temperature: -10°C (14°F) to 70°C (158°F)
- Engine coolant temperature: 70°C (158°F) or more
- Altitude (barometric pressure): 2500 m, 8200 ft or less (560 mmHg, 74.4 kPa or more)

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Start engine and warm up to normal operating temperature.
- 4) Run engine at idle for 10 min.
- 5) Drive vehicle and increase engine speed 3000 rpm in 3rd gear or “3” range.
- 6) Release accelerator pedal and with engine brake applied, keep vehicle coasting for 5 sec. or more. (Keep fuel cut condition for 5 sec. or more) If fuel cut condition is not kept for 5 sec. or more, coast down a slope in engine speed 1000 – 3000 rpm for 5 sec. or more.
- 7) Stop vehicle and run engine at idle.
- 8) For european market model, check whether EGR system readiness/monitoring test has completed or not by using scan tool.
If evaporative system readiness/monitoring test has not completed, check vehicle conditions (environmental) and repeat Steps 3) through 7).
- 9) Check DTC and pending DTC.

DTC Troubleshooting

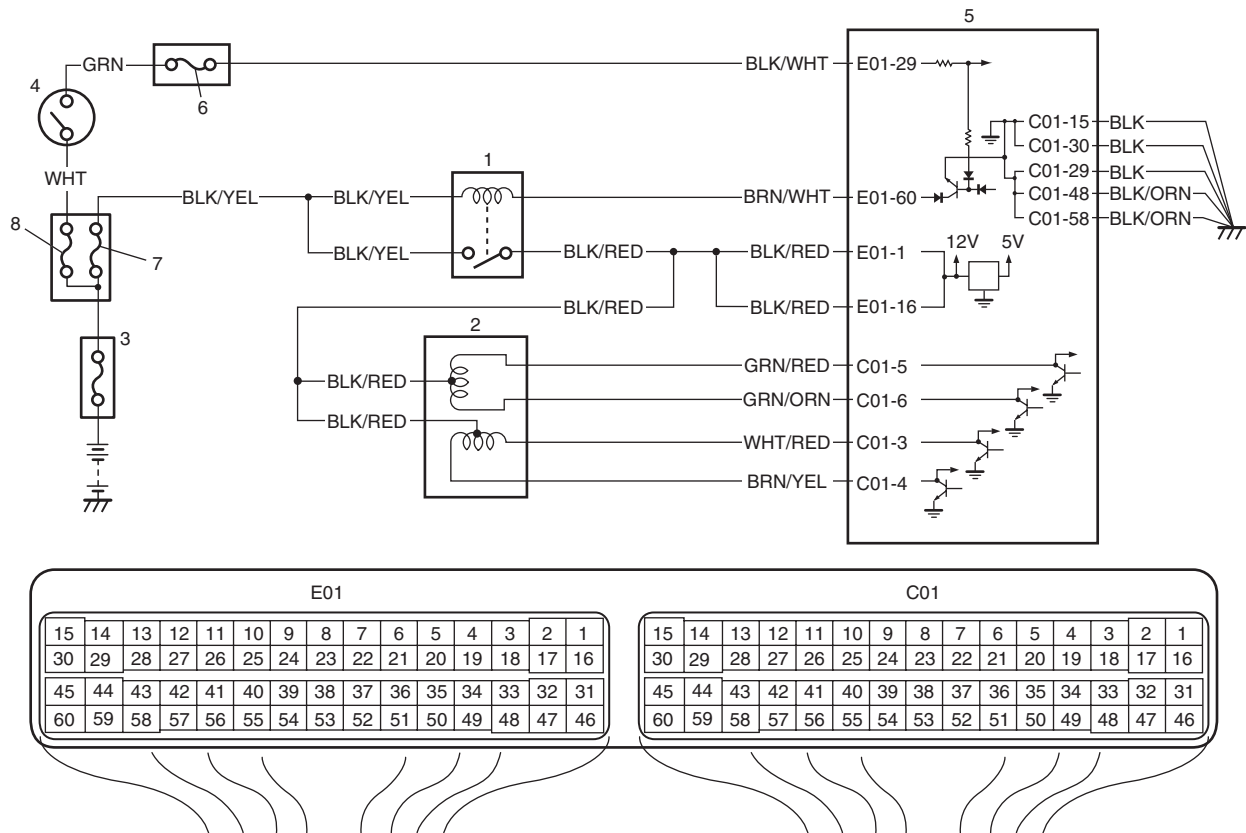
NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Do you have SUZUKI scan tool?	Go to Step 3.	Go to Step 5.
3	EGR valve operation check 1) With ignition switch turned OFF, install SUZUKI scan tool to DTC. 2) Check EGR system referring to "EGR System Inspection in Section 1B". <i>Is it in good condition?</i>	Go to Step 4.	Go to Step 5.
4	MAP sensor check 1) Check MAP sensor for performance referring to "Manifold Absolute Pressure (MAP) Sensor Inspection in Section 1C". <i>Is check result satisfactory?</i>	Intermittent trouble or faulty ECM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Replace MAP sensor.
5	EGR valve control circuit check 1) Check that EGR valve control circuits are in good condition referring to Step 2 to 5 of "DTC P0403: Exhaust Gas Recirculation Control Circuit". <i>Are circuits in good condition?</i>	Go to Step 6.	Repair or replace EGR valve control circuit(s).
6	EGR valve check 1) Check EGR valve referring to "EGR Valve Inspection in Section 1B". <i>Is check result satisfactory?</i>	Go to Step 7.	Faulty EGR valve.
7	MAP sensor check 1) Check MAP sensor for performance referring to "Manifold Absolute Pressure (MAP) Sensor Inspection in Section 1C". <i>Is check result satisfactory?</i>	EGR passage clogged. If OK, substitute a known-good ECM and recheck.	Replace MAP sensor.

DTC P0403: Exhaust Gas Recirculation Control Circuit

S6RW0E1104046

Wiring Diagram

I6RW0E110027-01

1. Main relay	3. Main fuse box	5. ECM	7. "FI" fuse
2. EGR valve	4. Ignition switch	6. "IG COIL" fuse	8. "IGN" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
EGR valve output voltage is different from output command with more than one pole out of 4 poles. (1 driving cycle detection logic)	- EGR valve circuit open - EGR valve - ECM

DTC Confirmation Procedure**▲ WARNING**

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out by 2 persons, a driver and a tester, on a level road.

- With ignition switch turned OFF, connect scan tool to DLC.
- Turn ON ignition switch and clear DTC using scan tool.
- Start engine and warm it up to normal operating temperature.
- Drive vehicle in 2000 – 3500 rpm of engine speed.
- Keep above vehicle speed for 1 min. (Throttle valve opening is kept constant in this step.)
- Stop vehicle and check DTC and pending DTC.

DTC Troubleshooting

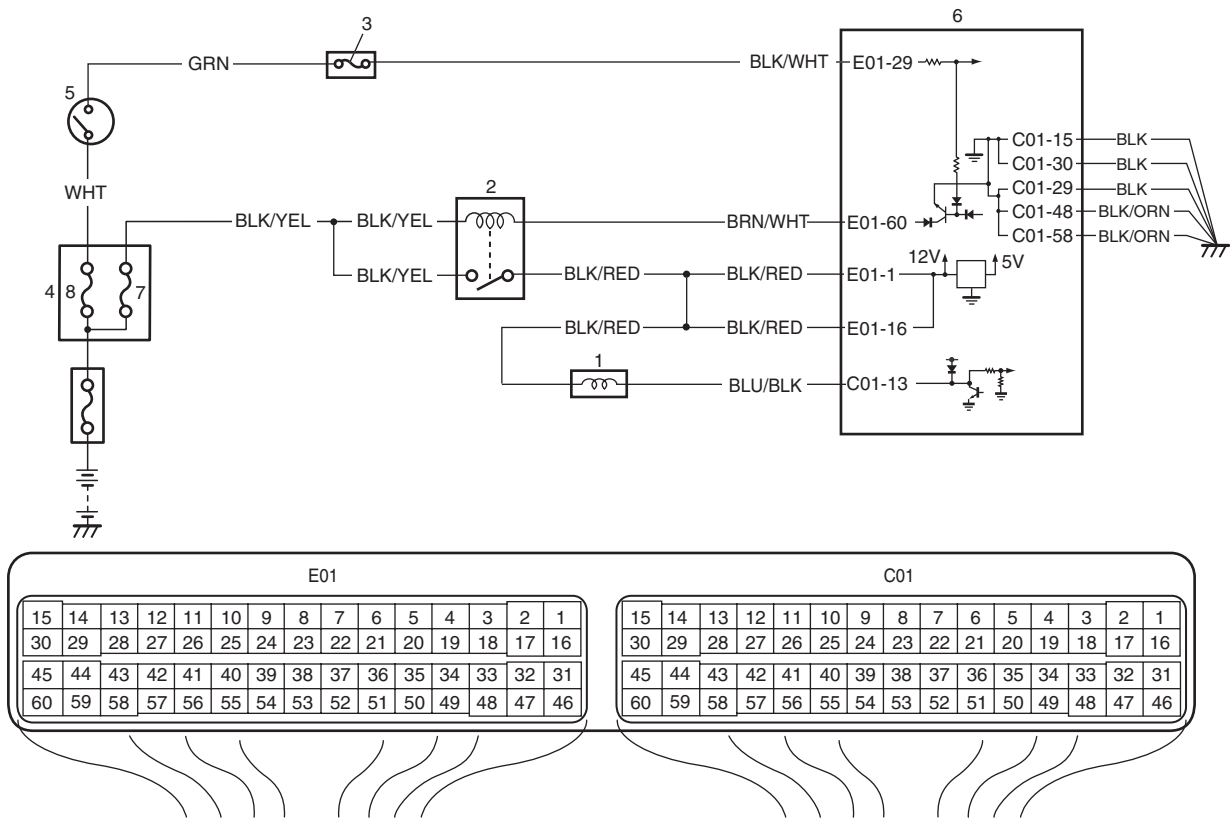
NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Description".
2	EGR valve power supply circuit check 1) Remove air intake pipe. 2) With ignition switch turned OFF, disconnect EGR valve connector. 3) With ignition switch turned ON, measure voltage between "BLK/RED" wire terminal of EGR valve connector and vehicle body ground. <i>Is check voltage 10 – 14 V?</i>	Go to Step 3.	"BLK/RED" wire is open circuit.
3	Wire circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between engine ground and each "GRN/RED", "GRN/ORN", "WHT/RED", "BRN/YEL" wire terminals of EGR valve connector. <i>Is each voltage 0 V?</i>	Go to Step 4.	Faulty wire(s) are shorted to other circuit. If wires are OK, substitute a known-good ECM and recheck.
4	Wire circuit check 1) With ignition switch turned OFF, measure resistance between engine ground and each "GRN/RED", "GRN/ORN", "WHT/RED", "BRN/YEL" wire terminals of EGR valve connector. <i>Is resistance infinity?</i>	Go to Step 5.	Faulty wire(s) are shorted to ground circuit. If wires are OK, substitute a known-good ECM and recheck.
5	Short circuit check for EGR valve control circuit 1) With ignition turned OFF, measure resistance between each EGR valve control circuit wire ("GRN/RED", "GRN/ORN", "WHT/RED" and "BRN/YEL" wire) and each EGR valve control circuit wire. <i>Is each resistance infinity?</i>	Go to Step 6.	Faulty wire(s) are short circuit.
6	EGR valve stepper motor coil circuit check 1) With ignition switch turned OFF, connect EGR valve connector. 2) Measure resistance between "E01-1/16" and each "C01-5", "C0-6", "C01-3", "C01-4" terminals of ECM connector. <i>Is each resistance 20 – 31 Ω at 20 °C, 68 °F?</i>	Faulty ECM. Substitute a known-good ECM and recheck.	Go to Step 7.
7	EGR valve check 1) Check EGR valve resistance referring to "EGR Valve Inspection in Section 1B". <i>Is resistance within specified value?</i>	Faulty wire(s) are open or high resistance circuit. If wires are OK, substitute a known-good ECM and recheck.	Faulty EGR valve.

DTC P0443: Evaporative Emission System Purge Control Valve Circuit

S6RW0E1104048

Wiring Diagram

I6RW0E110028-01

1. EVAP canister purge valve	3. "IG COIL" fuse	5. Ignition switch	7. "FI" fuse
2. Main relay	4. Individual circuit fuse box No.1	6. ECM	8. "IGN" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of EVAP canister purge valve is different from command signal. (Circuit open or short) (2 driving cycle detection logic)	- EVAP canister purge valve - EVAP canister purge valve circuit - ECM

DTC Confirmation Procedure**⚠ WARNING**

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out by 2 persons, a driver and a tester, on a level road.

- With ignition switch OFF, connect scan tool to DLC.
- Turn ON ignition switch and clear DTC using scan tool.
- Start engine and warm up normal operating temperature.
- Drive vehicle at more than 40 km/h, 25 mph for 5 min. or more.
- Check DTC and pending DTC.

DTC Troubleshooting

⚠ WARNING

In order to reduce risk of fire and personal injury, this work must be performed in a well ventilated area and away from any open flames such as gas water heater.

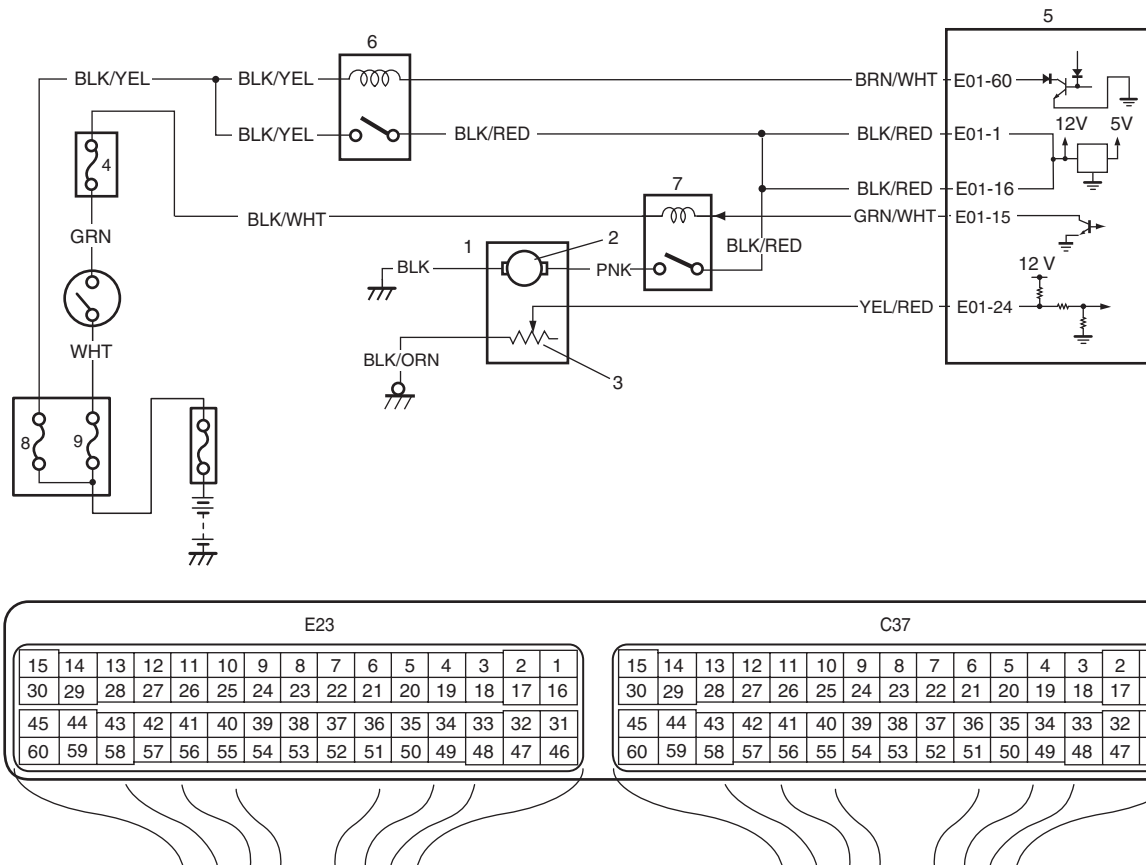
NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	EVAP canister purge power supply circuit check 1) Turn OFF ignition switch and disconnect connector from EVAP canister purge valve. 2) Measure voltage between engine ground and "BLK/RED" wire terminal of EVAP canister purge valve connector with ignition switch turned ON. <i>Is it voltage 10 – 14 V?</i>	Go to Step 3.	"BLK/RED" wire is open circuit.
3	Wire circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C01-13" terminal of ECM connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 4.	"BLU/BLK" wire is shorted to ground circuit.
4	Wire circuit check 1) Measure voltage between "C01-13" terminal of ECM connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 5.	"BLU/BLK" wire is shorted to other circuit.
5	Wire circuit check 1) Connect connector to purge control valve with ignition switch turned OFF. 2) Turn ON ignition switch and measure voltage between "C01-13" terminal of ECM connector and vehicle body ground. <i>Is it voltage 10 – 14 V?</i>	Go to Step 6.	"BLU/BLK" wire is open circuit.
6	EVAP canister purge control valve check 1) Check EVAP canister purge control valve referring to "EVAP Canister Purge Valve Inspection in Section 1B". <i>Is it in good condition?</i>	Go to Step 7.	Faulty EVAP canister purge control valve.
7	EVAP canister purge control circuit check 1) With ignition switch turn OFF, measure resistance between "E01-1/16" terminal and "C01-13" terminal of ECM connector. <i>Is resistance below 34 Ω at 20 °C, 68 °F?</i>	Faulty ECM. Substitute a known-good ECM and recheck.	"BLK/RED" and/or "BLU/BLK" wire are high resistance circuit.

DTC P0462 / P0463: Fuel Level Sensor Circuit Low / High

S6RW0E1104049

Wiring Diagram

I7RW01110063-01

1. Fuel pump assembly	3. Fuel level sensor	5. ECM	7. Fuel pump relay ECM	9. "IGN" fuse
2. Fuel pump	4. "IG COIL" fuse	6. Main relay	8. "FI" fuse	

I7RW01110063-01

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0462: Fuel level sensor voltage is lower than specified value for 3 sec. (1 driving cycle detection logic but MIL does not light up)	• "YEL/RED" circuit malfunction • ECM power and/or ground circuit malfunction • ECM malfunction
P0463: Fuel level sensor voltage is higher than specified value for 30 sec. (1 driving cycle detection logic but MIL does not light up)	

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Start engine and run it for 30 sec. or more.
- 4) Check DTC and pending DTC.

DTC Troubleshooting

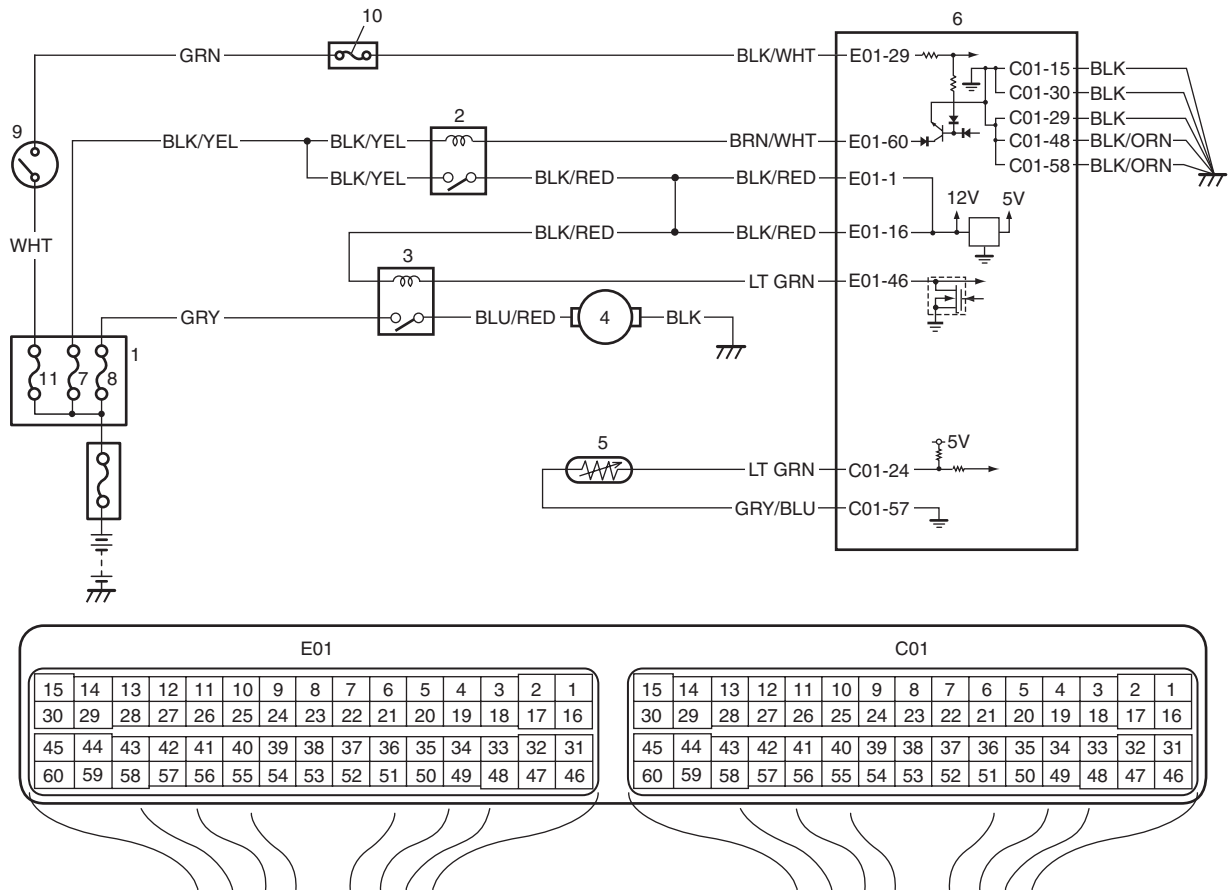
NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Clear DTC and recheck DTC with scan tool. <i>Is there P0463?</i>	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
3	Wire harness check 1) Check that fuel level sensor signal circuit ("YEL/RED" wire circuit) is in good condition. <i>Is it in good condition?</i>	Go to Step 4.	Repair fuel level sensor signal circuit.
4	ECM power and ground circuit check 1) Check that ECM power and ground circuits are in good condition referring to "ECM Power and Ground Circuit Check". <i>Are they in good condition?</i>	Substitute a known-good ECM and recheck.	Repair ECM power and/or ground circuit.

DTC P0480: Fan 1 (Radiator Cooling Fan) Control Circuit

S6RW0E1104050

Wiring Diagram

I6RW0E110029-02

1. Individual circuit fuse box No.1	5. ECT sensor	9. Ignition switch
2. Main relay	6. ECM	10. "IG COIL" fuse
3. Radiator cooling fan relay	7. "FI" fuse	11. "IGN" fuse
4. Radiator cooling fan motor	8. "RDTR" fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of radiator cooling fan relay is different from command signal. (1 driving cycle detection logic)	- Radiator cooling fan relay circuit malfunction - Radiator cooling fan relay malfunction - ECM malfunction

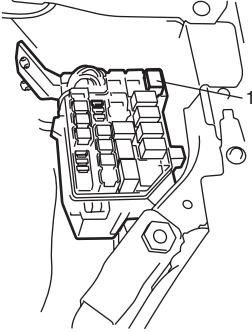
DTC Confirmation Procedure

- 1) Turn OFF ignition switch.
- 2) Clear DTC with ignition switch turned ON.
- 3) Run engine at idle speed.
- 4) Check DTC.

DTC Troubleshooting

NOTE

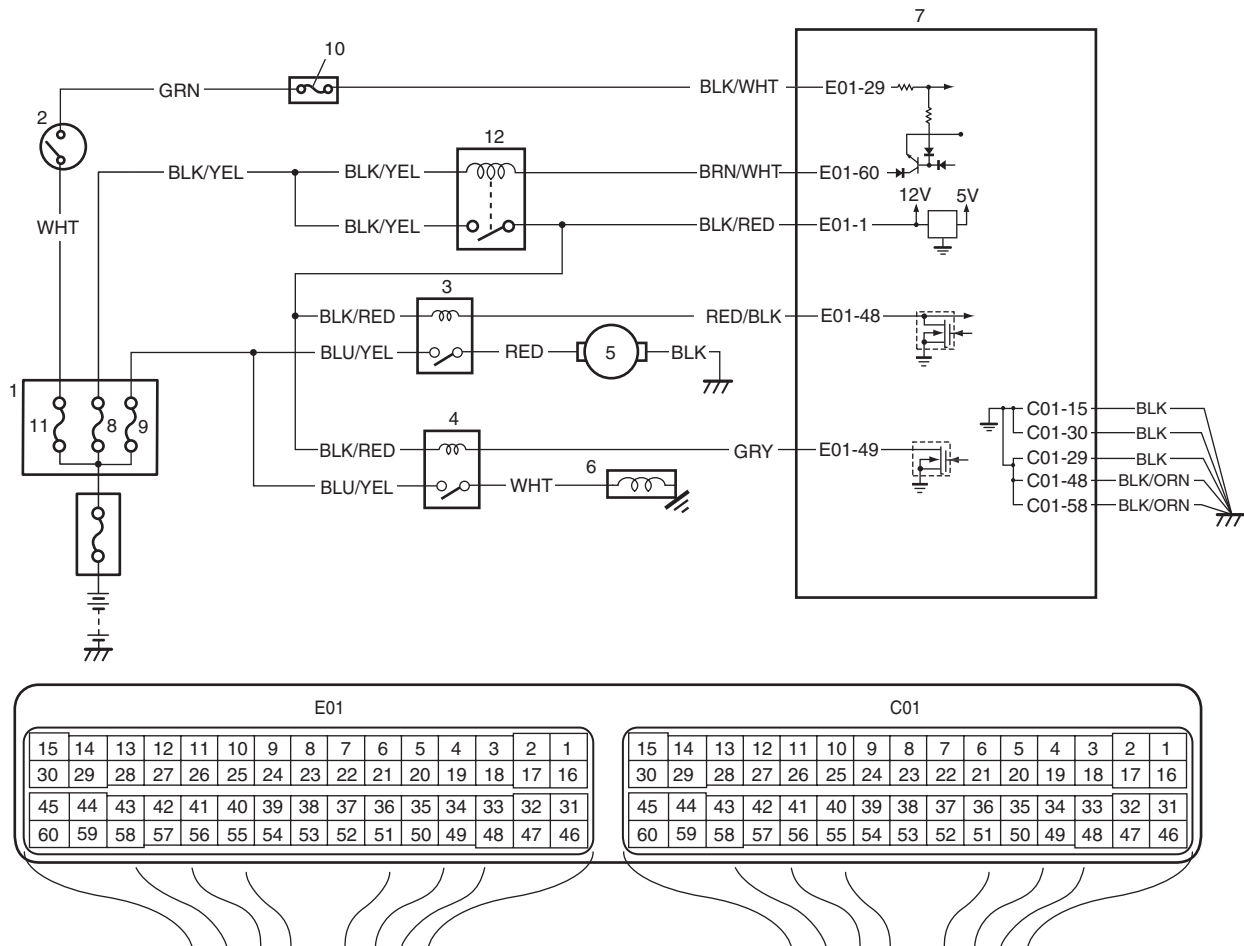
Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Wire circuit check 1) Disconnect radiator cooling fan relay (1) from individual circuit fuse box No.1 with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground to "BLK/RED" wire terminal.  I5RW0A110036-02 Is voltage 10 – 14 V?	Go to Step 3.	Open wire in "BLK/RED" wire is open circuit.
3	Wire circuit check 1) Connect radiator cooling fan relay to individual circuit fuse box No.1 with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between vehicle body ground and "E01-46" terminal of ECM connector when engine coolant temp. is below 100 °C, 212 °F. Is voltage 10 – 14 V?	Go to Step 7.	Go to Step 4.
4	Wire circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Disconnect radiator cooling fan relay from individual circuit fuse box No.1. 3) Measure resistance between "E01-46" terminal of ECM connector and vehicle ground. Is resistance infinity?	Go to Step 5.	"LT GRN" wire is shorted to ground circuit.
5	Wire circuit check 1) Turn ON ignition switch. 2) Measure voltage between "E01-46" terminal of ECM connector and vehicle body ground. Is voltage 0 V?	Go to Step 7.	"LT GRN" wire is shorted to other circuit.
6	Radiator cooling fan relay check 1) Check radiator cooling fan relay referring to "Radiator Cooling Fan Relay Inspection in Section 1F in related manual". Is check result satisfactory?	"LT GRN" wire is open circuit.	Replace relay.

Step	Action	Yes	No
7	Radiator cooling fan control check 1) Run engine until ECT is over 100 °C, 212 °F. 2) Measure voltage between vehicle body ground and "E01-46" terminal of ECM connector. <i>Is voltage lower than 1.5 V?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good ECM and recheck.	Faulty ECM. Substitute a known-good ECM and recheck.

DTC P0481: Cooling Fan 2 (A/C Condenser Fan) Control Circuit

S6RW0E1104051

Wiring Diagram

I6RW0E110030-01

1. Individual circuit fuse box No.1	5. A/C condenser cooling fan motor	9. A/C fuse
2. Ignition switch	6. A/C compressor	10. "IG COIL" fuse
3. A/C condenser cooling fan relay	7. ECM	11. "IGN" fuse
4. A/C compressor relay	8. "FI" fuse	12. Main relay

1A-113 Engine General Information and Diagnosis:

Circuit Description

A/C condenser cooling fan motor is turned ON and OFF by its relay which ECM controls. A/C condenser cooling fan motor is turned ON when ECM outputs A/C ON signal or when engine coolant temp. is 102.5 °C, 216.5 °F or more.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of A/C condenser cooling fan relay is different from command signal. (1 driving cycle detection logic but MIL does not light up)	• A/C condenser cooling fan relay circuit malfunction • A/C condenser cooling fan relay malfunction • ECM malfunction

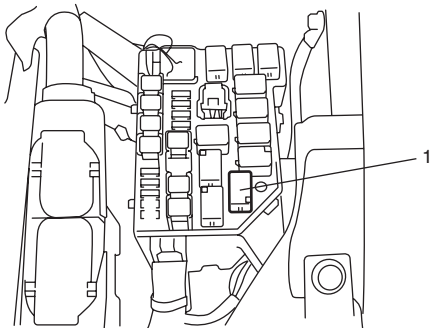
DTC Confirmation Procedure

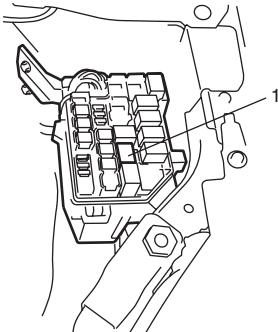
- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Start engine and warm up engine to normal operating temperature.
- 4) Run engine at idle and turn both A/C switch and heater blower switch ON (turn ON air conditioning) for 3 min. or more.
- 5) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Check wire circuit 1) Disconnect A/C condenser cooling fan control relay (1) from individual circuit fuse box No.1 with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLK/RED" wire terminal of A/C condenser cooling fan control relay.  I6RW0E110031-01 Is voltage 10 – 14 V?	Go to Step 5.	Go to Step 3.

Step	Action	Yes	No
3	Check wire circuit 1) Disconnect A/C compressor control relay (1) from individual circuit fuse box No.1 with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLK/RED" wire terminal of A/C condenser fan control relay connector.  I5RW0A110039-02 <i>Is voltage 10 – 14 V?</i>	Faulty A/C compressor control relay.	Go to Step 4.
4	Check wire circuit 1) Remove "A/C" fuse (20 A) from individual circuit fuse box No.1 with ignition switch turned OFF. 2) Measure resistance between "BLK/RED" wire terminal of "A/C" fuse connector and vehicle body ground. <i>Is resistance infinity?</i>	Open wire in "BLK/RED" circuit. If OK, go to Step 5.	"BLK/RED" wire shorted to ground circuit.
5	Check wire circuit 1) Connect A/C condenser cooling fan control relay to individual circuit fuse box No.1 box with ignition switch turned OFF. 2) Disconnect connectors from ECM. 3) Turn ON ignition switch, measure voltage between vehicle body ground and "E01-48" wire terminal of ECM connector. <i>Is voltage 10 – 14 V?</i>	Go to Step 9.	Go to Step 6.
6	Check wire circuit 1) Disconnect A/C condenser cooling fan control relay from individual circuit fuse box No.1 with ignition switch turned OFF. 2) Measure resistance between "E01-48" wire terminal of ECM connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 7.	"RED/BLK" wire shorted to ground circuit.
7	Check wire circuit 1) Turn ON ignition switch. 2) Check voltage between "E01-48" wire terminal of ECM connector and vehicle body ground. <i>Is voltage 0 V?</i>	Go to Step 8.	"RED/BLK" wire shorted to power supply circuit.
8	Check A/C condenser cooling fan control relay 1) Check A/C condenser cooling fan control relay referring to "A/C System Relay Inspection Manual Type in Section 7B in related manual". <i>Is result in good condition?</i>	Open wire in "RED/BLK" circuit.	Replace relay.

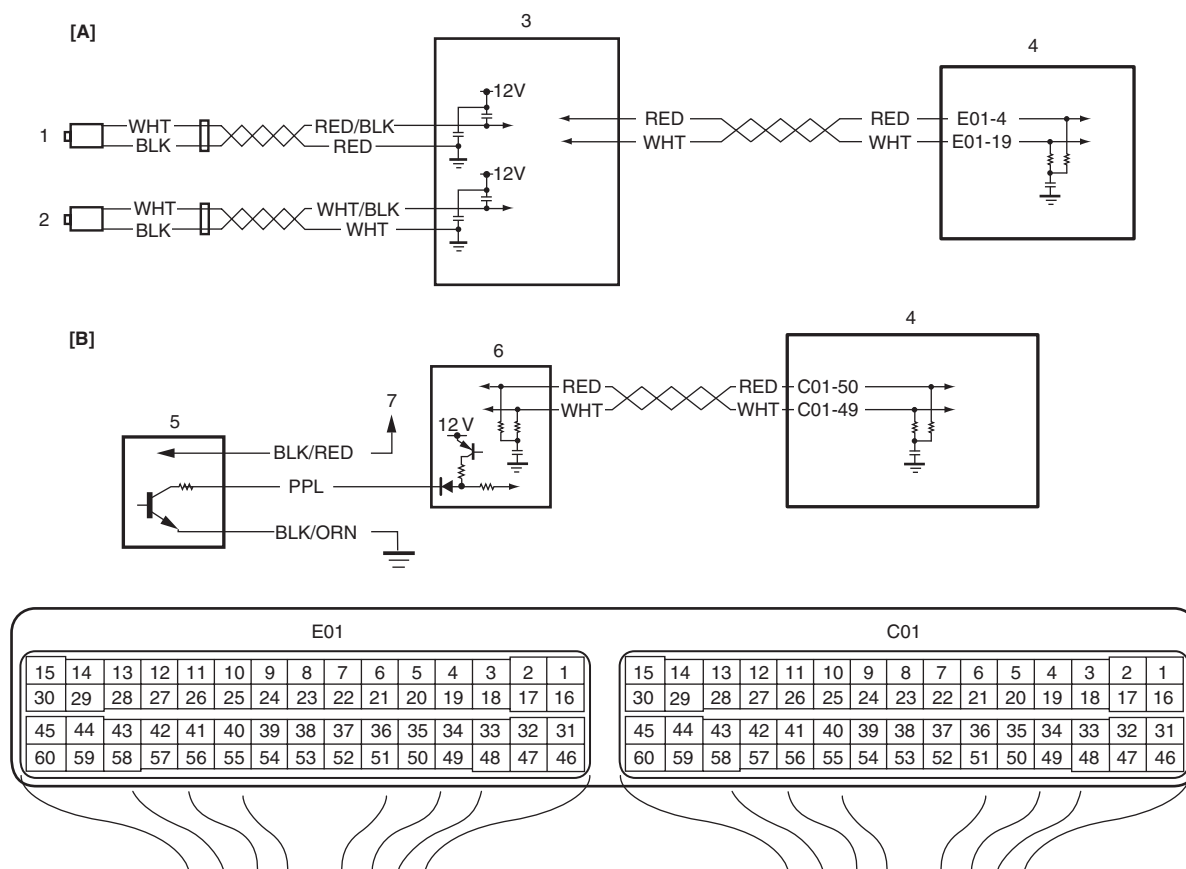
1A-115 Engine General Information and Diagnosis:

Step	Action	Yes	No
9	Check A/C condenser cooling fan control 1) Ignition switch turned OFF. 2) Remove ECM from vehicle body referring to "Engine Control Module (ECM) Removal and Installation in Section 1C" and connect connectors to ECM. 3) Run engine and turn ON A/C and blower fan switch. 4) Measure voltage between vehicle body ground and "E01-48" wire terminal of ECM connector. <i>Is voltage lower 1.5 V?</i>	Intermittent trouble. Check for intermittent refer to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good ECM and recheck.	Faulty ECM.

DTC P0500: Vehicle Speed Sensor (VSS) Malfunction

S6RW0E1104052

Wiring Diagram



I6RW0E110032-01

[A]: M/T model	2. Front right side wheel speed sensor (VSS 2)	5. Output shaft speed sensor
[B]: A/T model	3. ABS control module	6. TCM
1. Front left side wheel speed sensor (VSS 1)	4. ECM	7. To main relay

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Vehicle speed signal is not input while fuel is cut at deceleration for 4 seconds continuously at 3600 rpm or less. (2 driving cycle detection logic)	- Wheel speed sensor (VSS) (M/T model) - Wheel speed sensor circuit (M/T model) - ABS control module assembly (for M/T model) - Output shaft speed sensor (A/T model) - Output shaft speed sensor circuit (A/T model) - TCM malfunction (A/T model) - ECM malfunction

DTC Confirmation Procedure

⚠ WARNING

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out by 2 persons, a driver and a tester.

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Warm up engine to normal operating temperature.
- 4) Drive vehicle at 4000 rpm (engine speed) with 3rd gear or "3" range.
- 5) Release accelerator pedal and with engine brake applied, keep vehicle coasting for 6 sec. or more (fuel cut condition for 5 sec. or more) and stop vehicle.
- 6) Check pending DTC and DTC.

DTC Troubleshooting

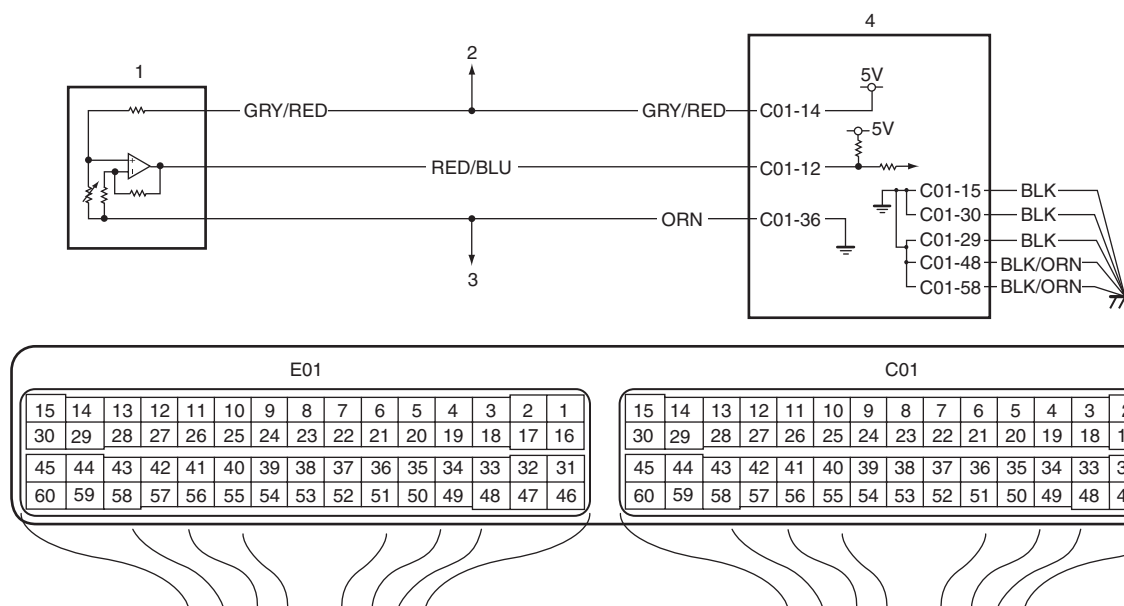
NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Vehicle speed signal check Is vehicle speed displayed on scan tool in Step 4) and 5) of "DTC Confirmation Procedure"?	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	For M/T model, go to Step 3. For A/T model, go to Step 4.
3	DTC check in ABS control module assembly 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ABS control module assembly for DTC. Is there any DTC(s) in ABS control module assembly?	Go to applicable DTC diag. flow.	Substitute a known-good ECM and recheck.
4	DTC check in TCM 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check TCM for DTC. Is DTC P0722 detected?	Go to "DTC P0722: Output Speed Sensor (VSS) Circuit No Signal in Section 5A".	Substitute a known-good ECM and recheck.

DTC P0532: A/C Refrigerant Pressure Sensor Circuit Low

S6RW0E1104053

Wiring Diagram

I6RW0E110033-01

1. A/C refrigerant pressure sensor	2. To MAP sensor	3. To other sensors	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
A/C refrigerant pressure sensor signal voltage is lower than specified value. (1 driving detection logic but MIL does not light up)	- A/C refrigerant pressure sensor circuit - A/C refrigerant pressure sensor - MAP sensor - ECM

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Start engine and warm up engine to normal operating temperature.
- 4) Run engine at idle and turn both A/C switch and heater blower switch ON (turn ON air conditioning) for 3 min. or more.
- 5) Check DTC and pending DTC.

Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".

Step	Action	Yes	No
2	A/C refrigerant pressure sensor power supply circuit check 1) Disconnect connector from A/C refrigerant pressure sensor with ignition switch turned OFF. 2) Check for proper connection of A/C refrigerant pressure sensor at "GRY/RED", "RED/BLU" and "ORN" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. <i>Is voltage 4 – 6 V?</i>	Go to Step 5.	Go to Step 3.
3	A/C refrigerant pressure sensor power supply circuit check 1) Disconnect connectors from MAP sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. <i>Is voltage 4 – 6 V?</i>	Faulty MAP sensor.	Go to Step 4.
4	A/C refrigerant pressure sensor power supply circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between engine ground and "C01-14" terminal of ECM connector. <i>Is resistance infinity?</i>	Go to Step 6.	"GRY/RED" wire is shorted to ground circuit.
5	A/C refrigerant pressure sensor signal circuit check 1) Connect connectors to ECM. 2) Turn ON ignition switch, measure voltage between engine ground and "RED/BLU" wire terminal of A/C refrigerant pressure sensor connector. <i>Is voltage 4 – 6 V?</i>	Go to Step 7.	Go to Step 6.
6	A/C refrigerant pressure sensor signal circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between engine ground and "E01-12" terminal of ECM connector. <i>Is resistance infinity?</i>	Go to Step 7.	"RED/BLU" wire is shorted to ground circuit.
7	A/C refrigerant pressure sensor check 1) Check A/C refrigerant pressure sensor referring to "A/C Refrigerant Pressure Sensor and Its Circuit Inspection Manual Type in Section 7B in related manual" or "A/C Refrigerant Pressure Sensor and Its Circuit Inspection Automatic Type in Section 7B in related manual". <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Faulty A/C refrigerant pressure sensor.

DTC P0533: A/C Refrigerant Pressure Sensor Circuit High

S6RW0E1104054

Wiring Diagram

Refer to "DTC P0532: A/C Refrigerant Pressure Sensor Circuit Low".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
A/C refrigerant pressure sensor signal voltage is higher than specified value. (1 driving detection logic but MIL does not light up)	• A/C refrigerant pressure sensor circuit • A/C refrigerant pressure sensor • MAP sensor • ECM

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Start engine and warm up engine to normal operating temperature.
- 4) Run engine at idle and turn both A/C switch and heater blower switch ON (turn ON air conditioning) for 3 min. or more.
- 5) Check DTC and pending DTC.

Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	A/C refrigerant pressure sensor power supply circuit check 1) Disconnect connector from A/C refrigerant pressure sensor with ignition switch turned OFF. 2) Check for proper connection of A/C refrigerant pressure sensor at "GRY/RED", "RED/BLU" and "ORN" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. <i>Is voltage 4 – 6 V?</i>	Go to Step 4.	Go to Step 3.
3	A/C refrigerant pressure sensor power supply circuit check 1) Disconnect connectors from MAP sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. <i>Is voltage 4 – 6 V?</i>	Faulty MAP sensor.	"GRY/RED" wire is open or shorted to power circuit.
4	A/C refrigerant pressure sensor signal circuit check 1) Turn ON ignition switch, measure voltage between engine ground and "RED/BLU" wire terminal of A/C refrigerant pressure sensor connector. <i>Is voltage 4 – 6 V?</i>	Go to Step 6.	Go to Step 5.

Step	Action	Yes	No
5	A/C refrigerant pressure sensor signal circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "RED/BLU" wire terminal of A/C refrigerant pressure sensor connector and "E01-55" terminal of ECM connector. <i>Is resistance below 2 Ω?</i>	"RED/BLU" wire is shorted to power supply circuit.	"RED/BLU" wire is open or high resistance circuit.
6	A/C refrigerant pressure sensor ground circuit check 1) Turn OFF ignition switch, measure resistance between engine ground and "ORN" wire terminal of A/C refrigerant pressure sensor connector. <i>Is resistance below 5 Ω?</i>	Go to Step 8.	Go to Step 7.
7	ECM ground circuit check 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between engine ground and "E01-36" terminal of ECM connector. <i>Is resistance below 5 Ω?</i>	"ORN" wire is open or high resistance circuit.	ECM grounds "C01-15", "C01-29", "C01-30", "C01-48" and/or "C01-58" is open or high resistance circuit.
8	A/C refrigerant pressure sensor check 1) Check A/C refrigerant pressure sensor referring to "A/C Refrigerant Pressure Sensor and Its Circuit Inspection Manual Type in Section 7B in related manual" or "A/C Refrigerant Pressure Sensor and Its Circuit Inspection Automatic Type in Section 7B in related manual". <i>Is it good condition?</i>	Substitute a known-good ECM and recheck.	Faulty A/C refrigerant pressure sensor.

DTC P0601 / P0602 / P0607: Internal Control Module Memory Check Sum Error / Control Module Programming Error / Control Module Performance

S6RW0E1104055

System Description

Internal control module is installed in ECM.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0601: Data write error or check sum error (1 driving cycle detection logic) DTC P0602: Data programming error (1 driving cycle detection logic but MIL does not light up) DTC P0607: Data programming error (1 driving cycle detection logic)	ECM

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
- 3) Start engine and run it at idle if possible.
- 4) Check DTC and pending DTC by using scan tool.

DTC Troubleshooting

NOTE

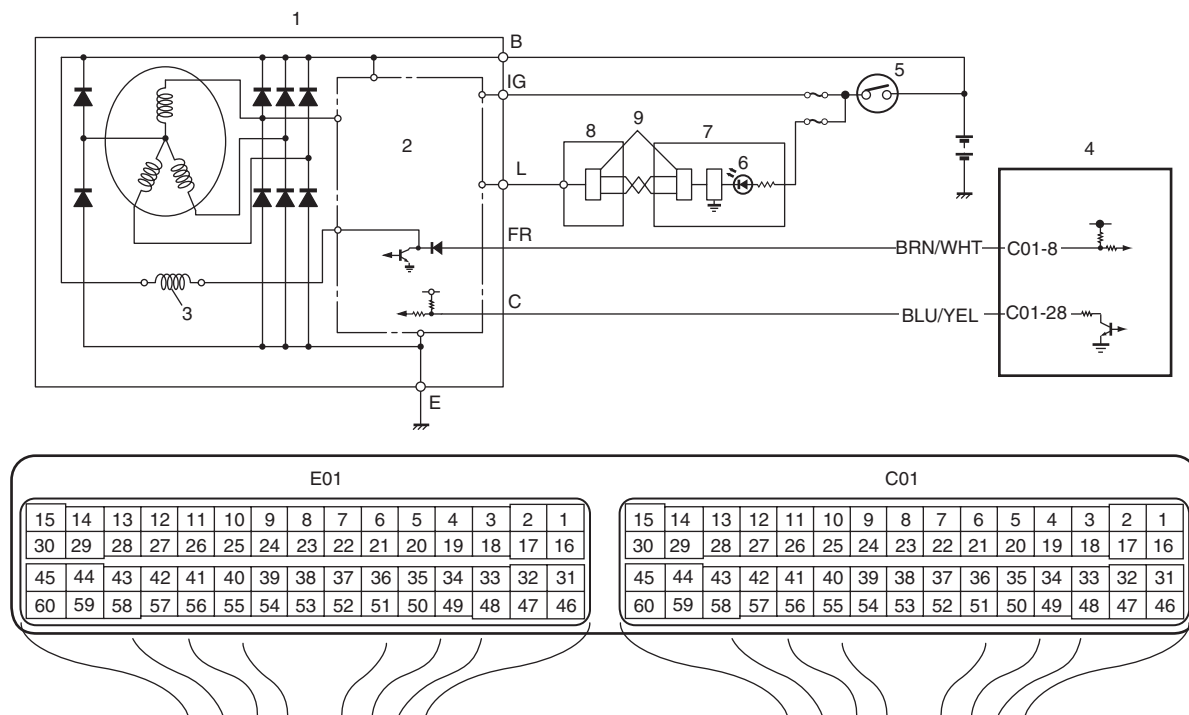
Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	DTC recheck 1) Clear DTC referring to "DTC Clearance". 2) Turn OFF ignition switch. 3) Turn ON ignition switch and check DTC. <i>Is DTC P0601 or P0607 still indicated?</i>	Go to Step 2.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
2	ECM reprogramming check <i>Was reprogramming of ECM executed?</i>	Execute reprogramming of ECM correctly once again.	Go to step 3.
3	ECM power and ground circuit check 1) Check that ECM power supply circuit and ECM ground circuit is in good condition referring to "ECM Power and Ground Circuit Check". <i>Are check results OK?</i>	Substitute a known-good ECM and recheck.	Repair ECM power or ground circuit.

DTC P0620: Generator Control Circuit

S6RW0E1104093

System and Wiring Diagram



I6RW0E110034-01

1. Generator	4. ECM	7. Combination meter
2. IC regulator	5. Ignition switch	8. BCM
3. Field coil	6. Charge lamp	9. CAN driver

Generator Control System Description

Refer to “Generator Control System Description”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
- Battery voltage is higher than specified value for specified time even through generator control is maximum regulation (duty 100%). - Battery voltage is lower than specified value for specified time even through generator control is minimum regulation (duty 0%) and electric load is less than 15 A. (1 driving cycle detection logic but MIL does not light up)	- Generator and/or its circuit - Electric load current sensor - ECM - Generator drive belt

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool to DLC.
- 2) Turn ON ignition switch and clear DTC.
- 3) Make sure that all accessory switches are tuned OFF.
- 4) Start engine and warm it up to normal operating temperature (ECT approx. 90 – 95 °C, 193 – 203 °F).
- 5) Turn ON the following accessory switches.
 - Head light switch.
 - Blower motor switch (max position).
 - Rear defogger switch.
- 6) Increase engine speed to 4000 rpm and keep it for 10 sec. or more.
- 7) Decrease engine speed to idle.
- 8) Check DTC and pending DTC.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to “Precautions for DTC Troubleshooting”.

Step	Action	Yes	No
1	Was “Engine and Emission Control System Check” performed?	Go to Step 2.	Go to “Engine and Emission Control System Check”.
2	Generator drive belt check 1) Check generator drive belt tension referring to “Water Pump / Generator Drive Belt Tension Inspection and Adjustment in Section 1F in related manual”. Is check result satisfactory?	Go to Step 3.	Adjust or replace generator drive belt.

1A-123 Engine General Information and Diagnosis:

Step	Action	Yes	No
3	Generator control circuit check 1) Disconnect connector from generator and ECM with ignition switch turned OFF. 2) Check for proper connection of wire terminal to generator connector and to ECM connector. 3) If connections are OK, check generator control circuit for the following. • Resistance of generator control circuit wire ("BLU/YEL") between generator connector and ECM connector is less than 1 Ω (continuity check) • Resistance between generator control circuit wire ("BLU/YEL") of generator connector and vehicle body ground is infinity (ground circuit short check) • Voltage between generator control circuit wire ("BLU/YEL") of generator connector and vehicle body ground is 0 V with ignition switch turned ON (power circuit short check) <i>Are they in good condition?</i>	Go to Step 3.	Repair or replace defective wire.
4	Generator check 1) Check for generator output referring to "Generator Test (Undercharged Battery Check) in Section 1J in related manual". <i>Is check result satisfactory?</i>	Go to Step 4.	Repair or replace generator.
5	Electric load current sensor check 1) Check for electric load current sensor output referring to "Electric Load Current Sensor On-Vehicle Inspection in Section 1C". <i>Is check result satisfactory?</i>	Substitute a known-good ECM and recheck.	Replace electric load current sensor.

DTC P0625 / P0626: Generator Field Terminal Circuit Low / High

S6RW0E1104094

System and Wiring Diagram

Refer to "DTC P0620: Generator Control Circuit".

Generator Control System Description

Refer to "Generator Control System Description".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0625: Generator field coil duty is 100% (low voltage) for specified time even through generator control is maximum regulation (control duty 100%) or Generator field coil duty is 100% (low voltage) when engine is starting. (1 driving cycle detection logic but MIL does not light up) P0626: Generator field coil duty is lower than 1% (high voltage) for specified time even through generator control is minimum regulation (control duty 0%). (1 driving cycle detection logic but MIL does not light up)	• Generator and/or its circuit • ECM

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool to DLC.
- 2) Turn ON ignition switch and clear DTC.
- 3) Make sure that all accessory switch is tuned OFF.
- 4) Start engine and warm it up to normal operating temperature (ECT approx. 90 – 95 °C, 193 – 203 °F).
- 5) Turn ON following accessory switch.
 - Head lights switch.
 - Blower motor switch (max position).
 - Rear defogger switch.
- 6) Increase engine speed to 4000 rpm and keep it for 10 sec. or more.
- 7) Decrease engine speed to idle.
- 8) Check DTC and pending DTC.

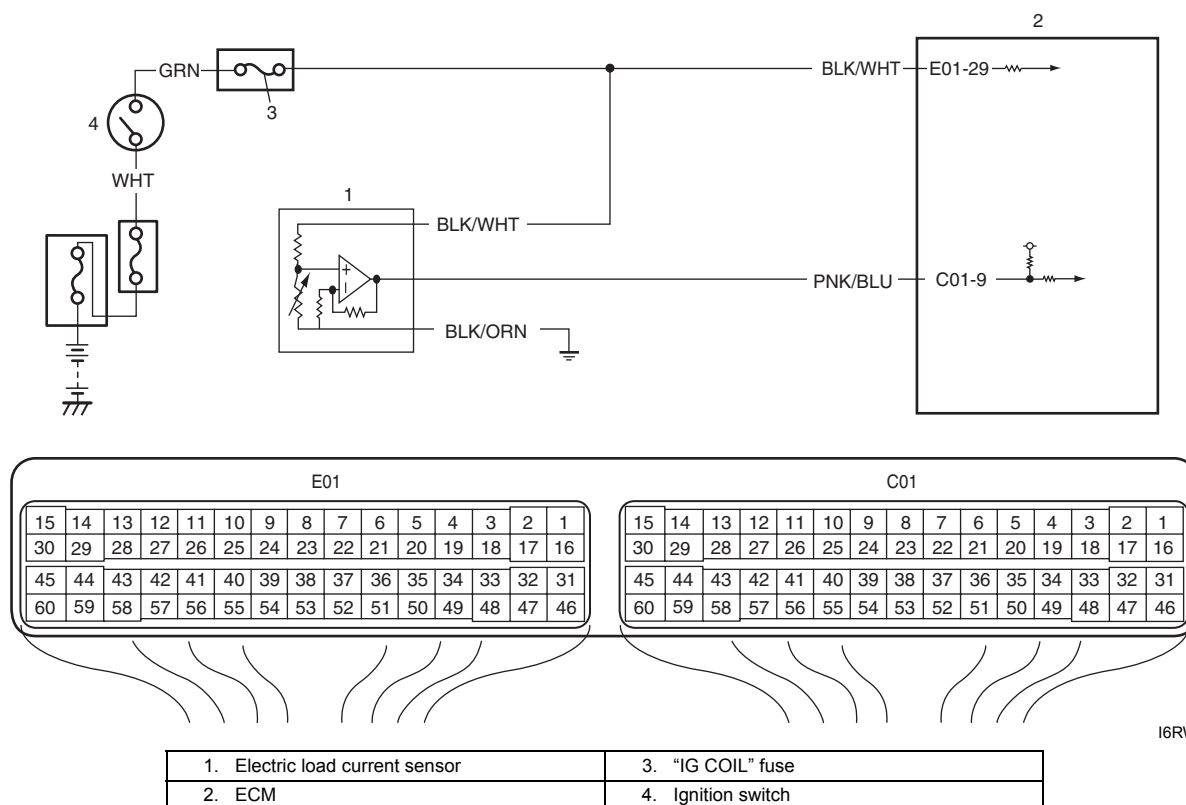
DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Generator control circuit check 1) Disconnect connector from generator and ECM with ignition switch turned OFF. 2) Check for proper connection of wire terminal to generator connector and to ECM connector. 3) If connections are OK, check generator control circuit and field coil monitor circuit for the following. • Resistance of each generator control wire ("BLU/YEL") and field coil monitor wire ("BRN/WHT") between generator connector and ECM connector is less than 1 Ω (continuity check) • Resistance between generator control wire ("BLU/YEL") and field coil monitor wire ("BRN/WHT") of generator connector is infinity (insulation check) • Resistance between each generator control wire ("BLU/YEL") and field coil monitor wire ("BRN/WHT") of generator connector and vehicle body ground is infinity (ground circuit short check) • Voltage between each generator control wire ("BLU/YEL") and field coil monitor wire ("BRN/WHT") of generator connector and vehicle body ground is 0 V with ignition switch tuned ON (power circuit short check) Are they in good condition?	Go to Step 3.	Repair or replace defective wire.
3	Generator check 1) Check for generator output referring to "Generator Test (Undercharged Battery Check) in Section 1J in related manual" and "Generator Inspection in Section 1J in related manual". Is check result satisfactory?	Substitute a known good ECM and recheck.	Repair or replace generator.

DTC P1501 / P1502: Electric Load Current Sensor Circuit Low / High

S6RW0E1104095

System and Wiring Diagram

I6RW0E110035-01

Electric Load Current Sensor Description

Refer to "Generator Control System Description".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1501: Electric load current is lower than specified value (electric load current sensor voltage is higher than specified value). (1 driving cycle detection logic but MIL does not light up)	- Electric load current sensor and/or its circuit - ECM
P1502: Electric load current is higher than specified value (electric load current sensor voltage is lower than specified value). (1 driving cycle detection logic but MIL does not light up)	

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool to DLC.
- 2) Turn ON ignition switch and clear DTC.
- 3) Make sure that all accessory switch is tuned OFF.
- 4) Start engine and warm it up to normal operating temperature (ECT approx. 90 – 95 °C, 193 – 203 °F).
- 5) Increase engine speed to 3000 rpm.
- 6) In this state, Turn ON following accessory switch.
 - Head lights switch.
 - Blower motor switch (max position).
 - Rear defogger switch.
- 7) Decrease engine speed to idle.
- 8) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

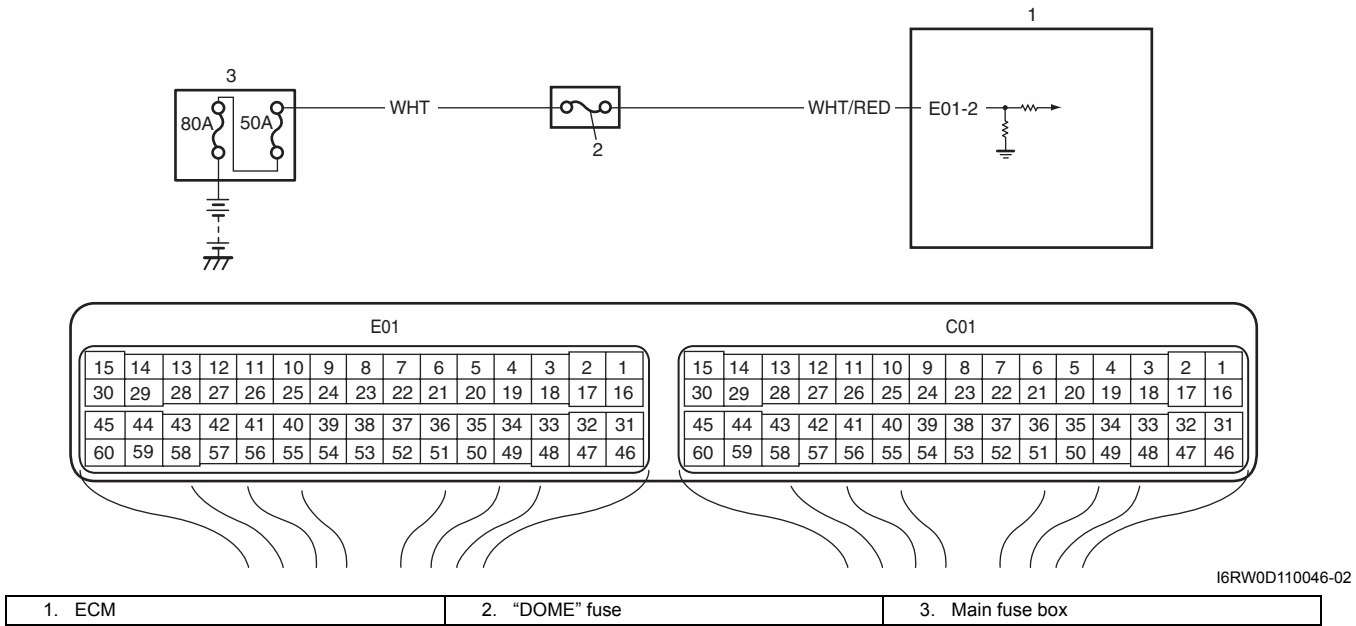
Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Electric load current sensor power and ground circuit check 1) Disconnect connector from electric load current sensor. 2) Check electric load current sensor circuit for the following. • Voltage between "BLK/WHT" wire terminal of electric load current sensor connector and vehicle body ground is 10 – 14 V with ignition switch turned ON • Resistance between "BLK/ORN" wire terminal of electric load current sensor connector and vehicle body ground is less than 2 Ω Are they in good condition?	Go to Step 3.	Repair or replace defective wire.
3	Electric load current sensor output circuit check 1) Disconnect connectors from ECM. 2) Check electric load current sensor circuit for the following. • Resistance between "PNK/BLU" wire terminal of electric load current sensor connector and "C01-9" terminal of ECM connector is less than 2 Ω • Resistance between "PNK/BLU" wire terminal of electric load current sensor connector and vehicle body ground is infinity • Voltage between "PNK/BLU" wire terminal of electric load current sensor connector and vehicle body ground is 0V with ignition switch turned ON Are they in good condition?	Go to Step 4.	Repair or replace defective wire.
4	Electric load current sensor check 1) Check for electric load current sensor output referring to "Electric Load Current Sensor On-Vehicle Inspection in Section 1C". Is check result satisfactory?	Substitute a known-good ECM and recheck.	Faulty electric load current sensor.

DTC P1510: ECM Back-Up Power Supply Malfunction

S6RW0E1104058

Wiring Diagram



Circuit Description

Battery voltage is supplied so that DTC memory, values for engine control learned by ECM, etc. are kept in ECM even when the ignition switch is turned OFF.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Back-up power circuit voltage is lower than specified value for 5 sec. with engine running. (1 driving cycle detection logic)	Battery voltage supply circuit

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch and clear DTC using scan tool and run engine at idle speed for 1 min.
- 3) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".

Step	Action	Yes	No
2	Battery voltage supply circuit check 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) With engine running, measure voltage between "E01-2" terminal of ECM connector and engine ground. <i>Is voltage 10 – 14 V?</i>	Poor "E01-2" connection or intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If wire and connections are OK, substitute a known-good ECM and recheck.	"DOME" fuse blown, "WHT" or "WHT/RED" wire is circuit open or short circuit.

DTC P2101: Throttle Actuator Control Motor Circuit Range / Performance

S6RW0E1104059

Wiring Diagram

Refer to "DTC P0122: Throttle Position Sensor (Main) Circuit Low".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of throttle actuator output (duty output) is inconsistent with throttle actuator control command. (1 driving detection logic)	- Throttle actuator circuit - Electric throttle body assembly - ECM

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 seconds.
- 4) Keep the accelerator pedal at fully depressed position for 2 seconds.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check DTC.

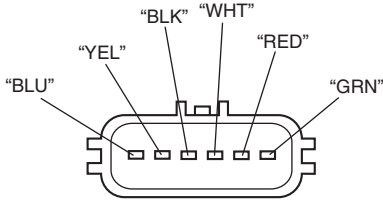
DTC Troubleshooting

NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".

1A-129 Engine General Information and Diagnosis:

Step	Action	Yes	No
2	Throttle actuator circuit check 1) Disconnect connectors from electric throttle body assembly and ECM with ignition switch turned OFF. 2) Check for proper connection of electric throttle body assembly and ECM connectors at "BLU" wire, "YEL" wire, "C01-45" and "C01-44" terminals.  I5RW0C110016-01 3) Turn ON ignition switch. 4) Measure voltage between "BLU" wire terminal of electric throttle body assembly connector and engine ground, between "YEL" wire terminal of electric throttle body assembly connector and engine ground. <i>Is voltage 0 V?</i>	Go to Step 3.	"BLU" wire and/or "YEL" wire is shorted to power circuit.
3	Throttle actuator circuit check 1) Turn OFF ignition switch. 2) Measure resistance between "BLU" wire terminal of electric throttle body assembly connector and engine ground, between "YEL" wire terminal of electric throttle body assembly connector and engine ground. <i>Is resistance infinity?</i>	Go to Step 4.	"BLU" wire and/or "YEL" wire is shorted to ground circuit.
4	Throttle actuator circuit check 1) Check throttle actuator referring to "Throttle Actuator Performance Check" under "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C". <i>Is check result satisfactory?</i>	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P2102: Throttle Actuator Control Motor Circuit Low

S6RW0E1104060

Wiring Diagram

Refer to "DTC P0122: Throttle Position Sensor (Main) Circuit Low".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Power supply voltage of throttle actuator control circuit is lower than specified value for specified time even if throttle actuator control relay is turned ON. (1 driving detection logic)	• Throttle actuator control relay circuit • Throttle actuator control relay • ECM

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Start engine and run it for 1 min. or more.
- 4) Check DTC.

DTC Troubleshooting

NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Throttle actuator control relay circuit check 1) Remove ECM from its bracket with ECM connectors connected. 2) Check for proper connection of ECM connector at "E01-50" and "E01-17" terminals. 3) Turn ON ignition switch. 4) Measure voltage between "E01-17" terminal of ECM connector and engine ground. <i>Is voltage 10 – 14 V?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 3.
3	Is "THR MOT" fuse in good condition?	Go to Step 4.	Replace fuse and check for short in circuits connected to this fuse.
4	Throttle actuator control relay circuit check 1) Remove throttle actuator control relay from individual circuit fuse box No.1 with ignition switch turned OFF. 2) Check for proper connection to throttle actuator control relay at "BLK/RED", "GRY", "BRN" and "GRN" wire terminals. 3) Measure voltage between engine ground and each "BLK/RED", "GRY" wire terminal with ignition switch turned ON. <i>Is each voltage 10 – 14 V?</i>	Go to Step 5.	"BLK/RED" wire and/or "GRY" wire is open or high resistance.
5	Throttle actuator control relay circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance at following connector terminals. - Between "BRN" wire terminal of throttle actuator control relay connector and "E01-50" terminal of ECM connector - Between "GRN" wire terminal of throttle actuator control relay connector and "E01-17" terminal of ECM connector <i>Is each resistance below 5 Ω?</i>	Go to Step 6.	"BRN" wire and/or "GRN" wire is open or high resistance.
6	Throttle actuator control relay check 1) Check throttle actuator control relay referring to "Engine and Emission Control System Relay Inspection in Section 1C". <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Replace throttle actuator control relay.

DTC P2103: Throttle Actuator Control Motor Circuit High

Wiring Diagram

Refer to "DTC P0122: Throttle Position Sensor (Main) Circuit Low".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Power supply voltage of throttle actuator control circuit is higher than specified value for specified time even if throttle actuator control relay is turned OFF. (1 driving detection logic)	- Throttle actuator control relay circuit - Throttle actuator control relay - ECM

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Ignition switch turned OFF for 20 sec. or more.
- 4) Turn ON ignition switch and check DTC.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Throttle actuator control relay circuit check 1) Remove throttle actuator control relay from individual circuit fuse box No.1 with ignition switch turned OFF. 2) Check for proper connection to throttle actuator control relay at "BLK/RED", "GRY", "BRN" and "GRN" wire terminals. 3) Turn ON ignition switch. 4) Measure voltage between engine ground and "E01-17" terminal of ECM connector. Is voltage 0 V?	Go to Step 3.	"GRN" wire is shorted to other circuit.
3	Throttle actuator control relay circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between engine ground and "E01-50" terminal of ECM connector. Is resistance infinity?	Go to Step 4.	"BRN" wire is shorted to ground circuit.
4	Throttle actuator control relay check 1) Check throttle actuator control relay referring to "Engine and Emission Control System Relay Inspection in Section 1C". Is it in good condition?	Substitute a known-good ECM and recheck.	Replace throttle actuator control relay.

DTC P2111: Throttle Actuator Control System - Stuck Open

S6RW0E1104062

Wiring Diagram

Refer to "DTC P0122: Throttle Position Sensor (Main) Circuit Low".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Throttle position does not change by specified value during diagnosing throttle valve at ignition switch turned OFF. (1 driving detection logic)	- Electric throttle body assembly - ECM

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Ignition switch turned OFF for 20 sec. or more.
- 4) Turn ON ignition switch and check DTC.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Throttle valve visual check 1) Check that there isn't any foreign matter caught between throttle valve and throttle body housing referring to "Throttle Valve Visual Check" under "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C". <i>Is it in good condition?</i>	Go to Step 3.	Take it out after removing throttle body and clean inside of throttle body thoroughly.
3	Throttle valve operation check 1) Check operation of throttle valve referring to "Throttle Valve Operation Check" under "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C". <i>Is check result satisfactory?</i>	Go to Step 4.	Replace electric throttle body assembly.
4	Throttle actuator operation check 1) Check operation of throttle actuator referring to "Throttle Actuator Operation Check" under "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C". <i>Is check result satisfactory?</i>	Go to Step 5.	Replace electric throttle body assembly.
5	Throttle position sensor performance check 1) Check performance of throttle position sensor referring to "Throttle Position Sensor Performance Check" under "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C". <i>Is check result satisfactory?</i>	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P2119: Throttle Actuator Control Throttle Body Range / Performance

S6RW0E1104063

Wiring Diagram

Refer to "DTC P0122: Throttle Position Sensor (Main) Circuit Low".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference between the measured (actual) throttle valve opening angle and the target throttle valve opening angle which is calculated based on accelerator pedal opening angle and engine condition is higher than specified value for specified time. (1 driving detection logic)	• Throttle actuator circuit • Electric throttle body assembly • ECM

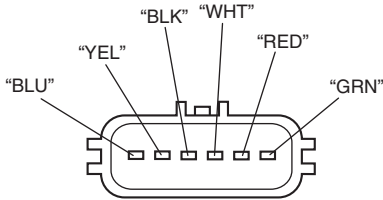
DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 seconds.
- 4) Keep the accelerator pedal at fully depressed position for 2 seconds.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check DTC.

DTC Troubleshooting

NOTE

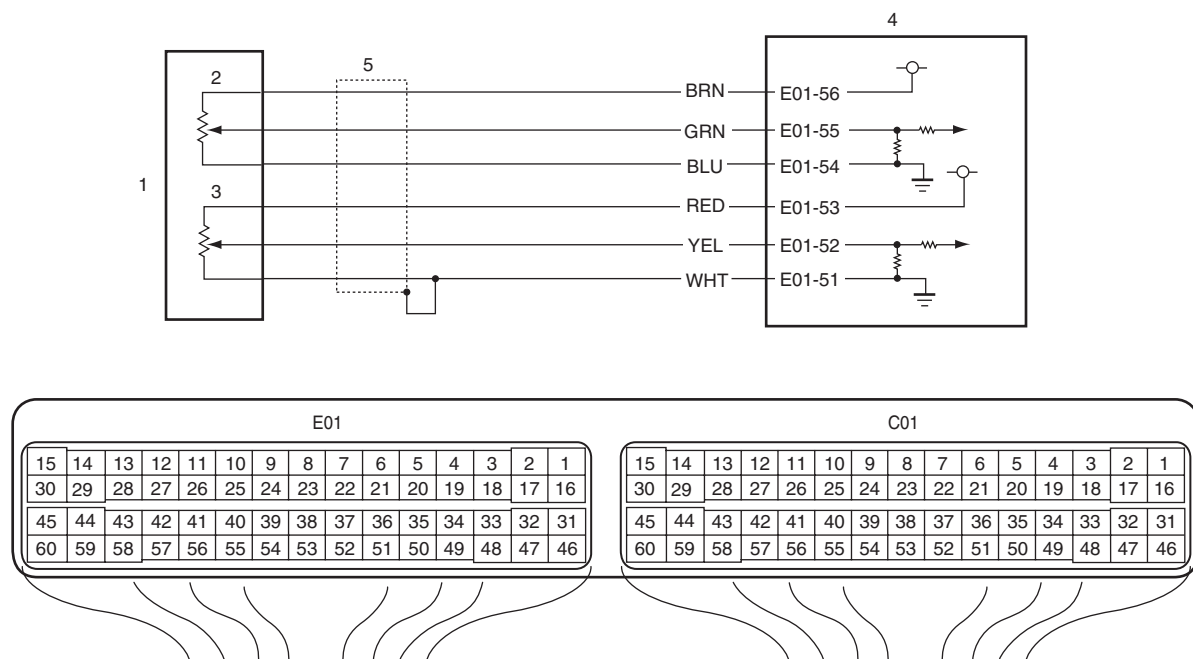
Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Electric throttle body assembly system check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check each voltage of "TP Sensor 1 Volt" and "TP Sensor 2 Volt" displayed on scan tool when accelerator pedal is idle position and fully depressed. Is displayed each TP sensor value as described voltage in "Scan Tool Data"?	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 3.
3	Throttle actuator circuit check 1) Disconnect connector from electric throttle body assembly with ignition switch turned OFF. 2) Check for proper connection to electric throttle body assembly at "BLU" and "YEL" wire terminals.  I5RW0C110016-01 3) Disconnect connectors from ECM. 4) Check for proper connection to ECM at "C01-45" and "C01-44" terminals. 5) Measure resistance at following connector terminals. • Between "BLU" wire terminal of electric throttle body assembly connector and "C01-45" terminal of ECM connector • Between "YEL" wire terminal of electric throttle body assembly connector and "C01-44" terminal of ECM connector Is each resistance below 5 Ω?	Go to Step 4.	"BLU" wire and/or "YEL" wire is open or high resistance.

Step	Action	Yes	No
4	Electric throttle body assembly check 1) Check electric throttle body assembly referring to "Electric Throttle Body Assembly and Its Circuit Check" under "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C". <i>Is check result satisfactory?</i>	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P2122: Pedal Position Sensor (Main) Circuit Low Input

S6RW0E1104064

Wiring Diagram

I6RW0E110036-01

1. APP sensor assembly	3. APP sensor (sub)	5. Ground of APP sensor for shield wire
2. APP sensor (main)	4. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of APP sensor (main) is lower than specified value. (1 driving detection logic)	• APP sensor (main) circuit • APP sensor assembly • ECM • Incorrect mounting of APP sensor assembly

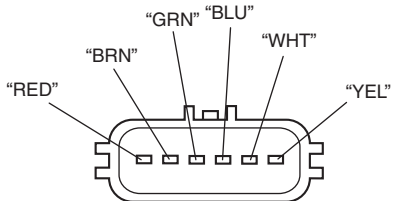
DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 seconds.
- 4) Keep the accelerator pedal at fully depressed position for 2 seconds.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check DTC.

DTC Troubleshooting

NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	APP sensor assembly mounting check 1) Check that APP sensor assembly has been mounted to vehicle body properly (no pinched floor carpet, etc.). <i>Is it OK?</i>	Go to Step 3.	Reinstall APP sensor assembly properly referring to "Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation in Section 1C".
3	APP sensor (main) and its circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "APP Sensor 1 Volt" displayed on scan tool. <i>Is displayed voltage below 0.167 V?</i>	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
4	ECM voltage check 1) Disconnect connector from APP sensor assembly with ignition switch turned OFF. 2) Check for proper connection to APP sensor assembly at "BRN", "GRN" and "BLU" wire terminals.  I6RW0E110037-01 3) If OK, measure voltage between "BRN" wire terminal of APP sensor assembly connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 7.	Go to Step 5.
5	ECM voltage check 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "E01-56" terminal. 4) If OK, measure voltage between "E01-56" terminal of ECM connector and engine ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	"BRN" wire is open or high resistance circuit.	Go to Step 6.

Step	Action	Yes	No
6	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "E01-56" terminal of ECM connector and engine ground. <i>Is resistance infinity?</i>	Substitute a known-good ECM and recheck.	"BRN" wire is shorted to ground circuit.
7	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "E01-55", "E01-54" and "E01-51" terminals. 3) If OK, measure resistance between "GRN" wire terminal of APP sensor assembly connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 8.	"GRN" wire is shorted to ground circuit.
8	Wire harness check 1) Measure resistance between "E01-55" and each "E01-54", "E01-51" terminals of ECM connector with ignition switch turned OFF. <i>Is each resistance infinity?</i>	Go to Step 9.	"GRN" wire is shorted to "BLU" wire and/or "WHT" wire.
9	Wire harness check 1) Measure resistance between "GRN" wire terminal of APP sensor assembly connector and "E01-37" terminal of ECM connector with ignition switch turned OFF. <i>Is resistance below 5 Ω?</i>	Go to Step 10.	"GRN" wire is open or high resistance circuit.
10	APP sensor assembly check 1) Check APP sensor (main) referring to "Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C". <i>Is output voltage within specified value?</i>	Substitute a known-good ECM and recheck.	Replace APP sensor assembly.

DTC P2123: Pedal Position Sensor (Main) Circuit High Input

S6RW0E1104065

Wiring Diagram

Refer to "DTC P2122: Pedal Position Sensor (Main) Circuit Low Input".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of APP sensor (main) is higher than specified value. (1 driving detection logic)	• APP sensor (main) circuit • APP sensor assembly • ECM • Incorrect mounting of APP sensor assembly

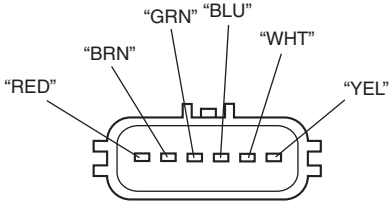
DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 seconds.
- 4) Keep the accelerator pedal at fully depressed position for 2 seconds.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check DTC.

DTC Troubleshooting

NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	APP sensor assembly mounting check 1) Check that APP sensor assembly has been mounted to vehicle body properly (no pinched floor carpet, etc.). <i>Is it OK?</i>	Go to Step 3.	Reinstall APP sensor assembly properly referring to "Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation in Section 1C".
3	APP sensor (main) and its circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "APP Sensor 1 Volt" displayed on scan tool. <i>Is displayed voltage 4.76 V or more?</i>	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
4	ECM voltage check 1) Disconnect connector from APP sensor assembly with ignition switch turned OFF. 2) Check for proper connection to APP sensor assembly at "BRN", "GRN" and "BLU" wire terminals.  I6RW0E110037-01 3) If OK, measure voltage between "BRN" wire terminal of APP sensor assembly connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 6.	Go to Step 5.
5	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "E01-56" terminal. 3) If OK, measure voltage between "E01-56" terminal of ECM connector and engine ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Substitute a known-good ECM and recheck.	"BRN" wire is shorted to power circuit.

Step	Action	Yes	No
6	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "E01-56", "E01-55" and "E01-53" terminals. 3) If OK, measure resistance between "GRN" wire terminal and each "BRN", "RED" wire terminals of APP sensor assembly connector. <i>Is each resistance infinity?</i>	Go to Step 7.	"GRN" wire is shorted to "BRN" wire and/or "RED" wire.
7	Wire harness check 1) Turn ON ignition switch. 2) Measure voltage between "E01-55" terminal of ECM connector and engine ground. <i>Is voltage 0 V?</i>	Go to Step 8.	"GRN" wire is shorted to power circuit.
8	Ground circuit check 1) Connect connectors to ECM with ignition switch turned OFF. 2) Measure resistance between "BLU" wire terminal of APP sensor assembly connector and vehicle body ground. <i>Is resistance below 5 Ω?</i>	Go to Step 10.	Go to Step 9.
9	Ground circuit check 1) Remove ECM from its bracket with ECM connectors connected. 2) Check for proper connection of ECM connector at "E01-54" terminal. 3) If OK, measure resistance between "E01-54" terminal of ECM connector and engine ground. <i>Is resistance below 5 Ω?</i>	"BLU" wire is open or high resistance circuit.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
10	APP sensor assembly check 1) Check APP sensor (main) referring to "Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C". <i>Is output voltage within specified value?</i>	Substitute a known-good ECM and recheck.	Replace APP sensor assembly.

DTC P2127: Pedal Position Sensor (Sub) Circuit Low Input

S6RW0E1104066

Wiring Diagram

Refer to "DTC P2122: Pedal Position Sensor (Main) Circuit Low Input".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of APP sensor (sub) is less than specified value. (1 driving detection logic)	• APP sensor (sub) circuit • APP sensor assembly • ECM • Incorrect mounting of APP sensor assembly

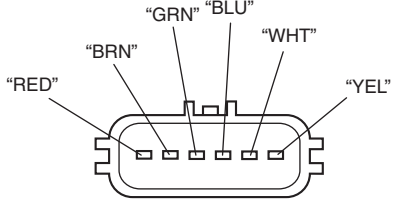
DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 seconds.
- 4) Keep the accelerator pedal at fully depressed position for 2 seconds.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check DTC.

DTC Troubleshooting

NOTE

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	APP sensor assembly mounting check 1) Check that APP sensor assembly has been mounted to vehicle body properly (no pinched floor carpet, etc.). Is it OK?	Go to Step 3.	Reinstall APP sensor assembly properly referring to "Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation in Section 1C".
3	APP sensor (sub) and its circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "APP Sensor 2 Volt" displayed on scan tool. Is displayed voltage below 0.179 V?	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
4	ECM voltage check 1) Disconnect connector from APP sensor assembly with ignition switch turned OFF. 2) Check for proper connection to APP sensor assembly at "RED", "YEL" and "WHT" wire terminals.  3) If OK, measure voltage between "RED" wire terminal of APP sensor assembly connector and vehicle body ground with ignition switch turned ON. Is voltage 4 – 6 V?	Go to Step 7.	Go to Step 5.

Step	Action	Yes	No
5	ECM voltage check 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "E01-53" terminal. 4) If OK, measure voltage between "E01-53" terminal of ECM connector and engine ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	"RED" wire is open or high resistance circuit.	Go to Step 6.
6	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "E01-53" terminal of ECM connector and engine ground. <i>Is resistance infinity?</i>	Substitute a known-good ECM and recheck.	"RED" wire is shorted to ground circuit.
7	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "E01-52", "E01-51" and "E01-54" terminals. 3) If OK, measure resistance between "YEL" wire terminal of APP sensor assembly connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 8.	"YEL" wire is shorted to ground circuit.
8	Wire harness check 1) Measure resistance between "E01-52" and each "E01-51", "E01-54" terminals of ECM connector with ignition switch turned OFF. <i>Is each resistance infinity?</i>	Go to Step 9.	"YEL" wire is shorted to "BLU" wire and/or "WHT".
9	Wire harness check 1) Measure resistance between "YEL" wire terminal of APP sensor assembly connector and "E01-52" terminal of ECM connector with ignition switch turned OFF. <i>Is resistance below 5 Ω?</i>	Go to Step 10.	"YEL" wire is open or high resistance circuit.
10	APP sensor assembly check 1) Check APP sensor (sub) referring to "Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C". <i>Is output voltage within specified value?</i>	Substitute a known-good ECM and recheck.	Replace APP sensor assembly.

DTC P2128: Pedal Position Sensor (Sub) Circuit High Input

S6RW0E1104067

Wiring Diagram

Refer to "DTC P2122: Pedal Position Sensor (Main) Circuit Low Input".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of APP sensor (sub) is higher than specified value. (1 driving detection logic)	• APP sensor (sub) circuit • APP sensor assembly • ECM • Incorrect mounting of APP sensor assembly

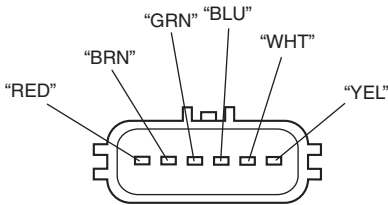
DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 seconds.
- 4) Keep the accelerator pedal at fully depressed position for 2 seconds.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check DTC.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	APP sensor assembly mounting check 1) Check that APP sensor assembly has been mounted to vehicle body properly (no pinched floor carpet, etc.). <i>Is it OK?</i>	Go to Step 3.	Reinstall APP sensor assembly properly referring to "Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation in Section 1C".
3	APP sensor (sub) and its circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "APP Sensor 2 Volt" displayed on scan tool. <i>Is displayed voltage 4.76 V or more?</i>	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".

Step	Action	Yes	No
4	ECM voltage check 1) Disconnect connector from APP sensor assembly with ignition switch turned OFF. 2) Check for proper connection to APP sensor assembly at "RED", "YEL" and "WHT" wire terminals.  I6RW0E110037-01 3) If OK, measure voltage between "RED" wire terminal of APP sensor assembly connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 6.	Go to Step 5.
5	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "E01-53" terminal. 3) If OK, measure voltage between "E01-53" terminal of ECM connector and engine ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Substitute a known-good ECM and recheck.	"RED" wire is shorted to power circuit.
6	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "E01-56", "E01-53" and "E01-52" terminals. 3) If OK, measure resistance between "YEL" wire terminal and each "BRN", "RED" wire terminals of APP sensor assembly connector. <i>Is each resistance infinity?</i>	Go to Step 7.	"YEL" wire is shorted to "BRN" wire and/or "RED" wire.
7	Wire harness check 1) Turn ON ignition switch. 2) Measure voltage between "E01-52" terminal of ECM connector and engine ground. <i>Is voltage 0 V?</i>	Go to Step 8.	"YEL" wire is shorted to power circuit.
8	Ground circuit check 1) Connect connectors to ECM with ignition switch turned OFF. 2) Measure resistance between "WHT" wire terminal of APP sensor assembly connector and vehicle body ground. <i>Is resistance below 5 Ω?</i>	Go to Step 10.	Go to Step 9.

1A-143 Engine General Information and Diagnosis:

Step	Action	Yes	No
9	Ground circuit check 1) Remove ECM from its bracket with ECM connectors connected. 2) Check for proper connection of ECM connector at "E01-51" terminal. 3) If OK, measure resistance between "E01-51" terminal of ECM connector and engine ground. <i>Is resistance below 5 Ω?</i>	"WHT" wire is open or high resistance circuit.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
10	APP sensor assembly check 1) Check APP sensor (sub) referring to "Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C". <i>Is output voltage within specified value?</i>	Substitute a known-good ECM and recheck.	Replace APP sensor assembly.

DTC P2135: Throttle Position Sensor (Main / Sub) Voltage Correlation

S6RW0E1104068

Wiring Diagram

Refer to "DTC P0122: Throttle Position Sensor (Main) Circuit Low".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference between the opening angle based on throttle position sensor (main) and the opening angle based on throttle position sensor (sub) is higher than specified value for specified time. (1 driving detection logic)	- Throttle position sensor (main) and (sub) circuit - Electric throttle body assembly - ECM

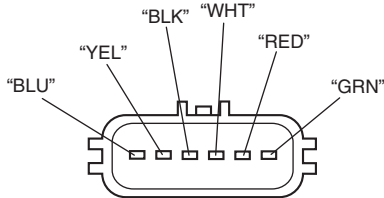
DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 seconds.
- 4) Keep the accelerator pedal at fully depressed position for 2 seconds.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check DTC.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	Throttle position sensor and its circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check each voltage of "TP Sensor 1 Volt" and "TP Sensor 2 Volt" displayed on scan tool when accelerator pedal is idle position and fully depressed. <i>Is each TP sensor voltage within specified value in the table "Scan Tool Data"?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 3.

Step	Action	Yes	No
3	ECM voltage check 1) Disconnect connector from electric throttle body assembly with ignition switch turned OFF. 2) Check for proper connection to electric throttle body assembly at "RED", "GRN", "WHT" and "BLK" wire terminals.  3) If OK, measure voltage between "RED" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. <i>Is voltage 4 – 6 V?</i>	Go to Step 6.	Go to Step 4.
4	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C01-53" terminal of ECM connector and engine ground. <i>Is resistance infinity?</i>	Go to Step 5.	"RED" wire is shorted to other circuit.
5	Wire harness check 1) Measure voltage between "C01-53" terminal of ECM connector and engine ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Substitute a known-good ECM and recheck.	"RED" wire is shorted to other circuit.
6	Wire harness check 1) Measure voltage between "GRN" wire terminal of electric throttle body assembly connector and engine ground, between "WHT" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. <i>Is each voltage 4 – 6 V?</i>	Go to Step 9.	Go to Step 7.
7	Wire harness check 1) Turn OFF ignition switch. 2) Disconnect connectors from ECM. 3) Check for proper connection of ECM connector at "C01-54" and "C01-40" terminals. 4) If OK, measure voltage between "C01-54" terminal of ECM connector and engine ground, between "C01-40" terminal of ECM connector and engine ground. <i>Is each voltage 0 V?</i>	Go to Step 8.	"GRN" wire or "WHT" wire is shorted to other circuit.
8	Wire harness check 1) Measure resistance between "GRN" wire terminal of electric throttle body assembly connector and engine ground, between "WHT" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned OFF. <i>Is each resistance infinity?</i>	Substitute a known-good ECM and recheck.	"GRN" wire or "WHT" wire is shorted to other circuit.

1A-145 Engine General Information and Diagnosis:

Step	Action	Yes	No
9	Electric throttle body assembly check 1) Check throttle position sensor referring to "Throttle Position Sensor Performance Check" under "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C". <i>Is each output voltage within specified value?</i>	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P2138: Pedal Position Sensor (Main / Sub) Voltage Correlation

S6RW0E1104069

Wiring Diagram

Refer to "DTC P2122: Pedal Position Sensor (Main) Circuit Low Input".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference between the opening angle based on APP sensor (main) and the opening angle based on APP sensor (sub) is higher than specified value for specified time. (1 driving detection logic)	• APP sensor (main) and (sub) circuit • APP sensor assembly • ECM

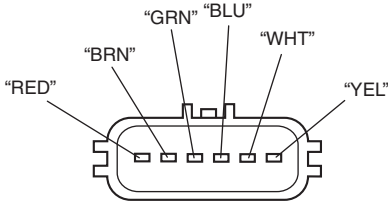
DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 seconds.
- 4) Keep the accelerator pedal at fully depressed position for 2 seconds.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check DTC.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

Step	Action	Yes	No
1	<i>Was "Engine and Emission Control System Check" performed?</i>	Go to Step 2.	Go to "Engine and Emission Control System Check".
2	APP sensor and its circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check each voltage of "APP Sensor 1 Volt" and "APP Sensor 2 Volt" displayed on scan tool when accelerator pedal is idle position and fully depressed. <i>Is each APP sensor voltage within specified value in the table "Scan Tool Data"?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 3.

Step	Action	Yes	No
3	ECM voltage check 1) Disconnect connector from APP sensor assembly with ignition switch turned OFF. 2) Check for proper connection to APP sensor assembly at "BRN", "GRN", "BLU", "RED", "YEL" and "WHT" wire terminals.  3) If OK, measure voltage between "BRN" wire terminal of APP sensor assembly connector and vehicle body ground, between "RED" wire terminal of APP sensor assembly connector and vehicle body ground with ignition switch turned ON. <i>Is each voltage 4 – 6 V?</i>	Go to Step 6.	Go to Step 4.
4	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "E01-56" and "E01-53" terminals. 3) If OK, measure resistance between "E01-56" terminal of ECM connector and engine ground, between "E01-53" terminal of ECM connector and engine ground. <i>Is each resistance infinity?</i>	Go to Step 5.	"BRN" wire or "RED" wire is shorted to other circuit.
5	Wire harness check 1) Measure voltage between "E01-56" terminal of ECM connector and engine ground, between "E01-53" terminal of ECM connector and engine ground with ignition switch turned ON. <i>Is each voltage 0 V?</i>	Substitute a known-good ECM and recheck.	"BRN" wire or "RED" wire is shorted to other circuit.
6	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "E01-55", "E01-54", "E01-52" and "E01-51" terminals. 3) If OK, measure resistance between "GRN" wire terminal of APP sensor assembly connector and vehicle body ground, between "YEL" wire terminal of APP sensor assembly connector and vehicle body ground. <i>Is each resistance infinity?</i>	Go to Step 7.	"GRN" wire or "YEL" wire is shorted to other circuit.
7	Wire harness check 1) Turn ON ignition switch. 2) Measure voltage between "E01-55" terminal of ECM connector and engine ground, between "E01-52" terminal of ECM connector and engine ground. <i>Is each voltage 0 V?</i>	Go to Step 8.	"GRN" wire or "YEL" wire is shorted to other circuit.

1A-147 Engine General Information and Diagnosis:

Step	Action	Yes	No
8	APP sensor assembly check 1) 1)Check APP sensor referring to “Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C”. <i>Is output voltage within specified value?</i>	Substitute a known-good ECM and recheck.	Replace APP sensor assembly.

DTC P2228 / P2229: Barometric Pressure Circuit High/Low

S6RW0E1104070

DTC P2228: Barometric Pressure Circuit Low**DTC P2229: Barometric Pressure Circuit High****System Description**

Barometric pressure sensor is installed in ECM.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P2228: Barometric pressure signal lower than specified value. (1 driving cycle detection logic)	Barometric pressure sensor in ECM
DTC P2229: Barometric pressure signal higher than specified value. (1 driving cycle detection logic)	

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch, clear DTC by using scan tool and run engine for 1 min.
- 3) Check DTC and pending DTC by using scan tool.

DTC Troubleshooting**NOTE**

Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to “Precautions for DTC Troubleshooting”.

Step	Action	Yes	No
1	<i>Was “Engine and Emission Control System Check” performed?</i>	Go to Step 2.	Go to “Engine and Emission Control System Check”.
2	MAP sensor check 1) Check MAP sensor and its circuit referring to “DTC P0107: Manifold Absolute Pressure Circuit Low Input”and/or “DTC P0108: Manifold Absolute Pressure Circuit High Input”. <i>Is check result satisfactory?</i>	Substitute a known-good ECM and recheck.	MAP sensor or its circuit malfunction.

DTC U0073: Control Module Communication Bus Off

S6RW0E1104071

Refer to "Troubleshooting for CAN-DTC".

DTC U0101: Lost Communication with TCM

S6RW0E1104072

Refer to "Troubleshooting for CAN-DTC".

DTC U0121: Lost Communication with ABS Control Module

S6RW0E1104073

Refer to "Troubleshooting for CAN-DTC".

DTC U0140: Lost Communication with Body Control Module

S6RW0E1104074

Refer to "Troubleshooting for CAN-DTC".

Troubleshooting for CAN-DTC

S6RW0E1104075

Perform this troubleshooting when CAN-DTC is detected.

NOTE

- When performing this troubleshooting, be sure to have full understanding of "Precaution on CAN Troubleshooting" and observe it.
- It may be possible that CAN system has trouble because of fuse blown or low battery voltage. Before troubleshooting, check to make sure that fuse, battery voltage and generator status are normal.
- When performing "Communication Bus Check" using SUZUKI scan tool (SUZUKI-SDT) in each step of this troubleshooting, use the following table to determine whether the control module is in good condition or not.
Also, while performing "Communication Bus Check", do not perform any work other than instructed in this troubleshooting. Or, it may occur that display of control module/sensor on SUZUKI-SDT screen and/or its background color may change.

Judgment	Display of Communication Bus Check
Normal	• All connected control modules/sensors (communicated by CAN) are displayed and its back ground color is "White".
Abnormal	• Even one of connected control modules/sensors (communicated by CAN) is not displayed. • Display of even one of connected control modules/sensors (communicated by CAN) changes. • Background color of even one of connected control modules/sensors (communicated by CAN) is displayed in "Gray" or "Light green". • Background color of even one of connected control modules/sensors (communicated by CAN) changes.

- When disconnecting each control module connector in this troubleshooting, various DTCs will be detected. Be sure to clear DTCs in the following control modules after completing this troubleshooting.
 - ECM
 - BCM
 - TCM
 - Keyless start control module
 - 4WD control module
 - HVAC control module (Auto A/C model)
 - P/S control module

Wiring Diagram

Refer to “Troubleshooting for Communication Error with Scan Tool Using CAN”.

Trouble area

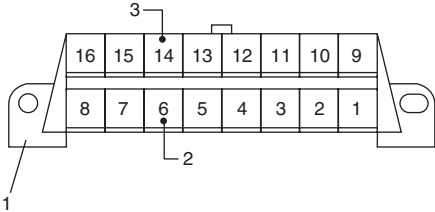
Refer to “Troubleshooting for Communication Error with Scan Tool Using CAN”.

Troubleshooting

Step	Action	Yes	No
1	DTC Check 1) Turn ignition switch to OFF position. 2) Connect scan tool to DLC. 3) Check DTC in the following control modules. • ECM • TCM • BCM • Keyless start control module • 4WD control module <i>Is there any DTC other than CAN-DTC?</i>	Go to applicable troubleshooting of DTC other than CAN-DTC.	Go to Step 2.
2	Control module connector check 1) Turn ignition switch to OFF position. 2) Be sure to disconnect scan tool from DLC. 3) Disconnect all the following control module connectors. • Control modules communicated by CAN – ECM – TCM – ABS control module – BCM – Combination meter – Keyless start control module – 4WD control module 4) Check for proper connection to terminal of each CAN line of all control module (communicated by CAN) connectors. 5) If OK, connect all connectors of control module communicated by CAN securely. 6) Recheck DTC for all control modules communicated by CAN. <i>Is there any CAN-DTC?</i>	Go to Step 3.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00 in related manual”.

Step	Action	Yes	No
3	CAN line check 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control module communicated by CAN. 3) Check all the following CAN lines for open, short to power circuit, short to ground circuit, short to other CAN line and high resistance. • Between BCM connector and DLC • Between BCM connector and ABS control module connector • Between ABS control module connector and ECM connector • Between ECM connector and TCM connector • Between BCM connector and keyless start control module connector • Between combination meter connector and 4WD control module connector • Between BCM connector and combination meter connector <i>Are all CAN lines in good condition?</i>	Go to Step 4.	Repair CAN line.
4	Power and ground circuits check of BCM, ECM, ABS control module and combination meter 1) Check power and ground circuits of the following control module. • ECM: Refer to "ECM Power and Ground Circuit Check". • BCM: Refer to "BCM Power Circuit and Ground Circuit Check in Section 10B in related manual". • Combination meter: Refer to "Combination Meter Circuit Diagram in Section 9C in related manual". • ABS control module: Refer to "ABS Hydraulic Unit / Control Module Assembly Power and Ground Circuit Check in Section 4E in related manual". <i>Are they in good condition?</i>	Go to Step 5.	Repair power and/or ground circuit.
5	CAN communication check of BCM, ECM, ABS control module and combination meter 1) Turn ignition switch to OFF position. 2) Connect BCM, ECM, ABS control module and combination meter connectors. 3) Perform "Communication Bus Check" under "Bus Check" using SUZUKI-SDT with ignition switch turned ON. <i>Are all of BCM, ECM, ABS control module and combination meter normally displayed?</i>	Go to Step 12.	Go to Step 6.

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Step	Action	Yes	No
6	Terminating resistance check in ECM and combination meter 1) Turn ignition switch to OFF position and then disconnect negative (–) cable at battery. 2) Measure resistance between CAN High terminal (2) and CAN Low terminal (3) on DLC (1).  I7RW01110098-01 <i>If resistance 57 – 67 Ω?</i>	Go to Step 7.	Go to Step 8.
7	Substitute ECM and recheck 1) Substitute a known-good ECM and recheck. <i>Is it in good condition?</i>	End.	Substitute a known-good combination meter and recheck. If NG, go to Step 11.
8	Terminating resistance check in ECM 1) Make sure that ignition switch is OFF position and battery negative (–) cable is disconnected. 2) Disconnect combination meter connector. 3) Measure resistance between CAN high terminal and CAN low terminal on DLC as the same manner as Step 6. <i>Is resistance 114 – 134 Ω?</i>	Substitute a known-good combination meter.	Go to Step 9.
9	Internal circuit check in BCM 1) Make sure that ignition switch is OFF position and battery negative (–) cable is disconnected. 2) Disconnect ABS control module connector. 3) Measure resistance between the followings - Between CAN high terminal on DLC and “E08-2” terminal on ABS control module connector - Between CAN low terminal on DLC and “E08-13” terminal on ABS control module connector <i>Is each resistance 0 – 1 Ω?</i>	Go to Step 10.	Substitute a known-good BCM.
10	Internal circuit check in ABS control module 1) Make sure that ignition switch is OFF position and battery negative (–) cable is disconnected. 2) Connect ABS control module connector and disconnect ECM connector. 3) Measure resistance between the followings - Between CAN High terminal on DLC and “E01-3” terminal on ECM connector - Between CAN Low terminal on DLC and “E01-18” terminal on ECM connector <i>If each resistance 0 – 1 Ω?</i>	Substitute a known-good ECM and recheck. If NG, go to Step 11.	Substitute a known-good ABS control module.
11	Substitute BCM and recheck 1) Substitute a known-good BCM and recheck. <i>Is it in good condition?</i>	End.	Substitute a known-good ABS control module.

Step	Action	Yes	No
12	CAN communication check of TCM 1) Turn ignition switch to OFF position. 2) Connect TCM connectors. 3) Perform "Communication Bus Check" under "Bus Check" using SUZUKI-SDT with ignition switch turned ON. <i>Are all of BCM, ECM, ABS control module, combination meter and TCM normally displayed?</i>	Go to Step 13.	Check power and ground circuits of TCM referring to "TCM Power and Ground Circuit Check in Section 5A". If OK, substitute a known-good TCM.
13	CAN communication check of keyless start control module 1) Turn ignition switch to OFF position. 2) Connect keyless start control module connector. 3) Perform "Communication Bus Check" under "Bus Check" using SUZUKI-SDT with ignition switch turned ON. <i>Are all of BCM, ECM, ABS control module, combination meter, TCM and keyless start control module normally displayed?</i>	Go to Step 14.	Check power and ground circuits of keyless start control module referring to "Keyless Start Control Module Power and Ground Circuit Check in Section 10E". If OK, substitute a known-good keyless start control module.
14	CAN communication check of 4WD control module 1) Turn ignition switch to OFF position. 2) Connect combination meter connector and 4WD control module. 3) Perform "Communication Bus Check" under "Bus Check" on SUZUKI-SDT with ignition switch turned ON. <i>Are all of BCM, ECM, ABS control module, combination meter, TCM, keyless start control module, combination meter and 4WD control module normally displayed?</i>	Recheck DTC.	Check power and ground circuits of 4WD control module referring to "Step 2" and "Step 3" under "DTC C1240: 4WD Control Module Power Supply Circuit Malfunction in Section 3B in related manual". If OK, substitute a known-good 4WD control module.

Inspection of ECM and Its Circuits

ECM and its circuits can be checked by measuring voltage, pulse signal and resistance with special tool connected.

⚠ CAUTION

ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with ECM connectors disconnected from it.

Voltage Check

- 1) Remove ECM (1) from its bracket referring to “Engine Control Module (ECM) Removal and Installation in Section 1C”.
- 2) Connect special tool between ECM and ECM connectors securely.

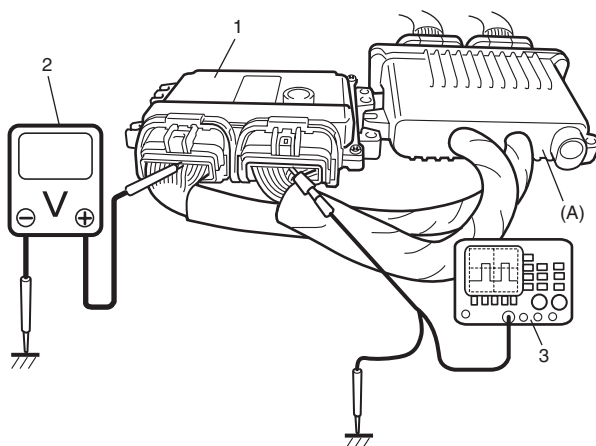
Special tool

(A): 09933-06320

- 3) Check voltage and/or pulse signal using voltmeter (2) and oscilloscope (3).

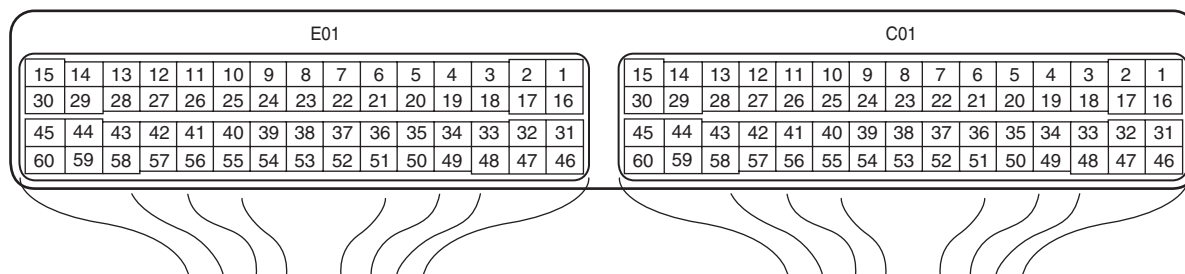
NOTE

- As each terminal voltage is affected by battery voltage, confirm that it is 11 V or more when ignition switch is turned ON.
- Voltage with asterisk (*) cannot be measured with voltmeter because it is pulse signal. Use oscilloscope for its check if necessary.
- Before this inspection, be sure to read the “Precautions of ECM Circuit Inspection”.



I5JB0A110073-01

Viewed from harness side



I6RW0D110051-01

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C01-1	BLU/ YEL	Fuel injector No.1	10 – 14 V	IG switch: ON	—
			*0 – 0.6 V ↑↓ 10 – 14 V ("Reference waveform No.1: ", "Reference waveform No.2: " and "Reference waveform No.28: ")	Engine: Idle speed after warming up	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C01-2	BLU/ WHT	Fuel injector No.2	10 – 14 V	IG switch: ON	—
			*0 – 0.6 V ↑↓ 10 – 14 V ("Reference waveform No.1: " and "Reference waveform No.3: ")	Engine: Idle speed after warming up	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C01-3	WHT/ RED	EGR valve (stepper motor coil 3) output	10 – 14 V	IG switch: ON	—
			*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.4: ")	IG switch: ST (engine cranking)	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C01-4	BRN/ YEL	EGR valve (stepper motor coil 4) output	10 – 14 V	IG switch: ON	—
			*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.4: ")	IG switch: ST (engine cranking)	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C01-5	GRN/ RED	EGR valve (stepper motor coil 1) output	10 – 14 V	IG switch: ON	—
			*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.4: ")	IG switch: ST (engine cranking)	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C01-6	GRN/ ORN	EGR valve (stepper motor coil 2) output	10 – 14 V	IG switch: ON	—
			*0 – 1 V 10 – 14 V ("Reference waveform No.4: ")	IG switch: ST (engine cranking)	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C01-7	—	—	—	—	—
C01-8	BRN/ WHT	Generator field coil monitor signal	10 – 14 V	IG switch: ON	Signal is duty pulse. Duty ratio varies depending on vehicle condition.
			*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.31: ")	Engine: idle speed after warmed up	
C01-9	PNK/ BLU	Electric load current sensor signal	Approx 0.8 V	IG switch: ON	—
			Approx 2.1 V	IG switch: ON Headlight switch: ON (HI beam).	
			Approx 2.4 V	IG switch: ON Headlight switch: ON (HI beam). Blower selector: MAX position.	

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Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C01-10	—	—	—	—	—
C01-11	BRN	Oxygen signal of HO2S	4 – 5 V	IG switch: ON	—
			*Deflects between over 0.5 V and under 0.45 V ("Reference waveform No.10: ")	While engine running at 2,000 r/min. or more after vehicle running over 30 km/h, 19 mph for 5 min.	
C01-12	RED/ BLU	A/C refrigerant pressure sensor signal	1.38 – 1.52 V	Engine: Running A/C switch: OFF Blower selector: OFF A/C refrigerant pressure: 800 kPa (116 psi)	—
			2.15 – 2.38 V	Engine: Running A/C switch: ON Blower selector > OFF A/C refrigerant pressure: 1400 kPa (203 psi)	
			2.67 – 2.95 V	Engine: Running A/C switch: ON Blower selector > OFF A/C refrigerant pressure: 1800 kPa (261 psi)	
C01-13	BLU/ BLK	EVAP canister purge valve output	10 – 14 V	Engine: Stop IG switch: ON	—
			*0 – 0.6 V ↑↓ 10 – 14 V ("Reference waveform No.16: ")	EVAP canister purge valve: 52% (using scan tool)	
C01-14	GRY/ RED	Output of 5 V power source for A/C refrigerant pressure sensor	4.5 – 5.5 V	IG switch: ON	—
C01-15	BLK	Ground for ECM	Below 0.3 V	IG switch: ON	—
C01-16	BLU/ RED	Fuel injector No.3	10 – 14 V	IG switch: ON	—
			*0 – 0.6 V ↑↓ 10 – 14 V ("Reference waveform No.1: " and "Reference waveform No.11: ")	Engine: Idle speed after warming up	
C01-17	BLU/ ORN	Fuel injector No.4	10 – 14 V	IG switch: ON	—
			*0 – 0.6 V ↑↓ 10 – 14 V ("Reference waveform No.1: " and "Reference waveform No.12: ")	Engine: Idle speed after warming up	
C01-18	—	—	—	—	—
C01-19	—	—	—	—	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C01-20	GRN/ WHT	Ignition coil No.2 and No.3 output	0 – 0.6 V	IG switch: ON	—
			*0 – 0.6 V ↑↓ 3 – 5 V ("Reference waveform No.9: " and "Reference waveform No.6: ")	Engine: Idle speed after warming up	Output signal is active high pulse. Pulse frequency varies depending on engine speed.
C01-21	GRN/ YEL	Ignition coil No.1and No.4 output	0 – 0.6 V	IG switch: ON	—
			*0 – 0.6 V ↑↓ 3 – 5 V ("Reference waveform No.6: ", "Reference waveform No.7: " and "Reference waveform No.28: ")	Engine: Idle speed after warming up	Output signal is active high pulse. Pulse frequency varies depending on engine speed.
C01-22	YEL/ GRN	Starting motor signal	0 – 1 V	IG switch: ON	—
			6 – 14 V	IG switch: ST (engine cranking)	
C01-23	—	—	—	—	—
C01-24	LT GRN	ECT sensor signal	3.5 – 4.0 V	IG switch: ON ECT: 0 °C (32 °F)	—
			1.38 – 1.72 V	IG switch: ON ECT: 50 °C (122 °F)	
			0.40 – 0.53 V	IG switch: ON ECT: 100 °C (212 °F)	
C01-25	LT GRN/ BLK	IAT sensor signal	3.18 – 3.67 V	IG switch: ON IAT: 0 °C (32 °F)	—
			1.32 – 1.65 V	IG switch: ON IAT: 40 °C (104 °F)	
			0.46 – 0.60 V	IG switch: ON IAT: 80 °C (176 °F)	
C01-26	PNK/ BLK	MAF sensor signal	0.5 – 1.0 V	Engine: Stop IG switch: ON	—
			1.5 – 2.0 V ("Reference waveform No.15: ")	Engine: Idle speed after warming up	
C01-27	GRY	Ground for MAF sensor	Below 0.3 V	IG switch: ON	—
C01-28	BLU/ YEL	Generator control signal output	*0 – 0.6 V ↑↓ 7 – 9 V ("Reference waveform No.9: ")	Engine: Stop IG switch: ON	—
				Engine: Idle speed	
C01-29	BLK	Ground for ECM	Below 0.3 V	IG switch: ON	—
C01-30	BLK	Ground for ECM	Below 0.3 V	IG switch: ON	—
C01-31	BLK	Ground for A/F sensor heater	Below 0.3 V	IG switch: ON	—
C01-32	RED	Heater output of A/F sensor	10 – 14 V	IG switch: ON	—
			*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.8: ")	Engine: Idle speed after warming up	
C01-33	BLK	Shield ground for TP sensor circuit	Below 0.3 V	IG switch: ON	—

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Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C01-34	—	—	—	—	—
C01-35	—	—	—	—	—
C01-36	—	—	—	—	—
C01-37	BLK	A/F sensor signal (–)	2.35 – 2.55 V ("Reference waveform No.8: ")	Engine: Idle speed after warming up	—
C01-38	WHT	A/F sensor signal (+)	2.7 – 2.9 V ("Reference waveform No.8: ")	Engine: Idle speed after warming up	—
C01-39	BLK/ RED	Ground for HO2S	Below 0.3 V	IG switch: ON	—
C01-40	WHT	TP sensor (sub) signal	1.57 – 1.90 V	IG switch: ON Engine: After warmed up Accelerator pedal: Released	—
			3.88 – 4.45 V ("Reference waveform No.29: ")	IG switch: ON Engine: After warmed up Accelerator pedal: Depressed fully	—
C01-41	BLK	Ground for TP sensor	Below 0.3 V	IG switch: ON	—
C01-42	—	—	—	—	—
C01-43	—	—	—	—	—
C01-44	YEL	Output of throttle actuator	0 – 1 V	IG switch: ON Engine: After warmed up Accelerator pedal: Released	Output signal is duty pulse. Duty ratio varies depending on throttle valve and accelerator pedal position.
			*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.26: " and "Reference waveform No.27: ")	IG switch: ON Engine: After warmed up Accelerator pedal: Depressed fully	
C01-45	BLU	Output of throttle actuator	0 – 1 V	IG switch: ON Engine: After warmed up Accelerator pedal: Depressed fully	Output signal is duty pulse. Duty ratio varies depending on throttle valve and accelerator pedal position.
			*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.26: " and "Reference waveform No.27: ")	IG switch: ON Engine: After warmed up Accelerator pedal: Released	
C01-46	—	—	—	—	—
C01-47	RED/ BLU	Heater output of HO2S	10 – 14 V	IG switch: ON	—
			0 – 1 V ("Reference waveform No.10: ")	Engine running at idle after vehicle running over 30 km/h, 19 mph for 5 min.	
C01-48	BLK/ ORN	Ground for ECM	Below 0.3 V	IG switch: ON	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C01-49	WHT	CAN (low) communication line (active low signal) to TCM	1.5 – 2.5 V ("Reference waveform No.23: ")	Engine: Stop IG switch: ON	CAN communication signal is serial communication signal pulse. Pulse signal displayed with a regular frequency varies depending on engine condition.
C01-50	RED	CAN (high) communication line (active high signal) to TCM	2.5 – 3.5 V ("Reference waveform No.23: ")	Engine: Stop IG switch: ON	CAN communication signal is serial communication signal pulse. Pulse signal displayed with a regular frequency varies depending on engine condition.
C01-51	PNK	CKP sensor signal	0 – 1 V or 4 – 5 V	IG switch: ON	—
			*4 – 5 V ↑↓ 0 – 0.6 V ("Reference waveform No.13: " and "Reference waveform No.14: ")	Engine: Idle speed after warming up	Sensor signal is pulse. Pulse frequency varies depending on engine speed. (30 (36 – 6) pulses are generated per 1 crankshaft revolution.)
C01-52	RED/ YEL	CMP sensor signal	0 – 1 V or 4 – 5 V	IG switch: ON	—
			*0 – 0.6 V ↑↓ 4 – 5 V ("Reference waveform No.13: " and "Reference waveform No.14: ")	Engine: Idle speed after warming up	Sensor signal is pulse. Pulse frequency varies depending on engine speed. (6 pulses are generated per 1 camshaft revolution.)
C01-53	RED	Output for 5 V power source of TP sensor	4.5 – 5.5 V	IG switch: ON	—
C01-54	GRN	TP sensor (main) signal	0.75 – 1.08 V	IG switch: ON Engine: After warmed up Accelerator pedal: Released	—
			3.67 – 4.24 V ("Reference waveform No.29: ")	IG switch: ON Engine: After warmed up Accelerator pedal: Depressed fully	
C01-55	RED/ BLK	MAP sensor signal	Approx. 4 V ("Reference waveform No.17: ")	IG switch: ON Barometric pressure: 100 kPa (760 mmHg)	—
			0.4 – 2.0 V ("Reference waveform No.18: ")	Engine: idle speed after warmed up Barometric pressure: 100 kPa (760 mmHg)	
C01-56	RED	Knock sensor signal	2 – 3 V ("Reference waveform No.19: " and "Reference waveform No.20: ")	Engine: Running at 4000 r/min. after warmed up	—
C01-57	GRY/ BLU	Ground for sensors	Below 0.3 V	IG switch: ON	—

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Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C01-58	BLK/ORN	Ground for ECM	Below 0.3 V	IG switch: ON	—
C01-59	GRN/WHT	Oil control valve ground	Below 1.3 V	IG switch: ON	—
C01-60	GRN/RED	Oil control valve output	*0 – 0.6 V ↑↓ 10 – 14 V ("Reference waveform No.21: " and "Reference waveform No.22: ")	At the moment of ignition switch turned ON.	Output signal is active high pulse. Duty ratio varies depending on vehicle condition.

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E01-1	BLK/RED	Main power supply	10 – 14 V	IG switch: ON	—
E01-2	WHT/RED	Power source for ECM internal memory	10 – 14 V	IG switch: ON	—
E01-3	—	—	—	—	—
E01-4	RED	CAN (high) communication line (active high signal) to ABS control module	*2.5 – 4.5 V ("Reference waveform No.23: ")	Engine: Stop IG switch: ON	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency which varies depending on engine condition.
E01-5	—	—	—	—	—
E01-6	—	—	—	—	—
E01-7	—	—	—	—	—
E01-8	—	—	—	—	—
E01-9	—	—	—	—	—
E01-10	—	—	—	—	—
E01-11	—	—	—	—	—
E01-12	—	—	—	—	—
E01-13	YEL/RED	Clock signal for immobilizer coil antenna	10 – 14 V	IG switch: ON	—
E01-14	—	—	—	—	—
E01-15	GRN/WHT	Fuel pump relay output	0 – 2.5 V	Time: Within 2 sec. after turning ignition switch ON Engine: Running	—
			10 – 14 V	Time: After 2 sec. after turning ignition switch ON Engine: Stop	
E01-16	BLK/RED	Main power supply	10 – 14 V	IG switch: ON	—
E01-17	GRN	Power supply of throttle actuator drive circuit	10 – 14 V	IG switch: ON	—
E01-18	—	—	—	—	—
E01-19	WHT	CAN (low) communication line (active low signal) to ABS control module	*0.5 – 2.5 V ("Reference waveform No.22: ")	Engine: Stop IG switch: ON	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency which varies depending on engine condition.

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E01-20	GRN/ WHT	Brake light switch signal	0 – 1 V	IG switch: ON Brake light: OFF	—
			10 – 14 V	IG switch: ON Brake light: ON	
E01-21	—	—	—	—	—
E01-22	—	—	—	—	—
E01-23	—	—	—	—	—
E01-24	YEL/ RED	Fuel level sensor signal	0 – 6 V	IG switch: ON	Voltage varies depends on fuel level
E01-25	—	—	—	—	—
E01-26	—	—	—	—	—
E01-27	RED/ BLU	EPS active signal (idle up signal)	Approx. 12 V	Ignition switch ON	—
			0 – 1 V	Engine idling and turned steering wheel to the right or left until it stops	
E01-28	YEL/ BLK	Serial communication line for immobilizer coil antenna	10 – 14 V	IG switch: ON	—
E01-29	BLK/ WHT	Ignition switch signal	0 – 1 V	IG switch: OFF	—
			10 – 14 V	IG switch: ON	
E01-30	WHT	Starting motor control relay output	0 – 1 V	IG switch: ON	—
				IG switch: ST (engine cranking)	
E01-31	—	—	—	—	—
E01-32	—	—	—	—	—
E01-33	—	—	—	—	—
E01-34	—	—	—	—	—
E01-35	BLU/ WHT	Electric load signal for heater blower motor	0 – 14 V	IG switch: ON Blower selector < 2nd position	—
			0 – 1 V	IG switch: ON Blower selector > 2nd position	
E01-36	ORN	Ground for sensors	Below 0.3 V	IG switch: ON	—
E01-37	—	—	—	—	—
E01-38	—	—	—	—	—
E01-39	—	—	—	—	—
E01-40	—	—	—	—	—
E01-41	WHT/ BLK	A/C evaporator outlet air temp. sensor signal (auto A/C model)	0 – 2 V	IG switch: ON	—
E01-42	—	—	—	—	—
E01-43	—	—	—	—	—
E01-44	BRN	Engine speed signal output for P/S control module	0 – 0.8 V	IG switch: ON	Output signal is pulse. Pulse frequency varies depending on engine speed. (2 pulses are generated per 1 crankshaft revolution.) (3000 r/min. = 100 Hz)
			*0 – 1 V ↑↓ 8 – 14 V ("Reference waveform No.24: " and "Reference waveform No.25: ")	While engine running.	
E01-45	—	—	—	—	—

1A-161 Engine General Information and Diagnosis:

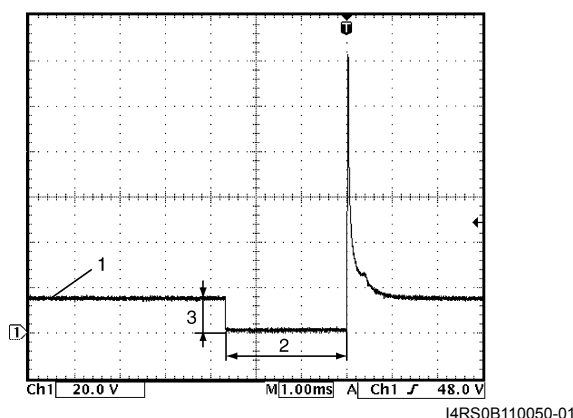
Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E01-46	LT GRN	Radiator cooling fan relay output	10 – 14 V	IG switch: ON ECT < 100 °C (212 °F) A/C refrigerant pressure < 1500 kPa (215 psi) A/C switch: ON Engine: Running	—
			0 – 2 V	IG switch: ON ECT < 100 °C (212 °F) A/C refrigerant pressure > 1500 kPa (215 psi) Blower selector > OFF A/C switch: ON Engine: Running	
E01-47	—	—	—	—	—
E01-48	RED/ BLK	A/C condenser cooling fan relay	0 – 1 V	A/C refrigerant pressure > 1100 kPa (158 psi) Blower selector > OFF A/C switch: ON Defroster switch: ON Engine: Running ECT > 102.5 °C (216.5 °F) Engine: Running	—
			10 – 14 V	Except the above mentioned-condition with engine running	
E01-49	GRY	A/C compressor relay output	10 – 14 V	Engine: Running A/C switch: OFF Blower selector > OFF	—
			0 – 1 V	Engine: Running A/C switch: ON Blower selector > OFF	
E01-50	BRN	Throttle actuator control relay output	0 – 1 V	IG switch: ON	—
E01-51	WHT	Ground for APP sensor (sub)	Below 0.3 V	IG switch: ON	—
E01-52	YEL	APP sensor (sub) signal	0.37 – 0.38 V	IG switch: ON Engine: After warmed up Accelerator pedal: Released	—
			1.70 – 2.00 V ("Reference waveform No.30: ")	IG switch: ON Engine: After warmed up Accelerator pedal: Depressed fully	
E01-53	RED	Output for 5 V power source of APP sensor (sub)	4.5 – 5.5 V	IG switch: ON	—
E01-54	BLU	Ground for APP sensor (main)	Below 0.3 V	IG switch: ON	—
E01-55	GRN	APP sensor (main) signal	0.75 – 0.85 V	IG switch: ON Engine: After warmed up Accelerator pedal: Released	—
			3.46 – 4.24 V ("Reference waveform No.30: ")	IG switch: ON Engine: After warmed up Accelerator pedal: Depressed fully	

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E01-56	BRN	Output for 5 V power source of APP sensor (main)	4.5 – 5.5 V	IG switch: ON	—
E01-57	—	—	—	—	—
E01-58	—	—	—	—	—
E01-59	—	—	—	—	—
E01-60	BRN/WHT	Main power supply relay output	10 – 14 V	IG switch: OFF	—
			0 – 2 V	IG switch: ON	

Reference waveform No.1

Fuel injector signal (1) with engine idling

Measurement terminal	CH1: "C01-2" to "C01-58"
Oscilloscope setting	CH1: 20 V/DIV TIME: 1 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed

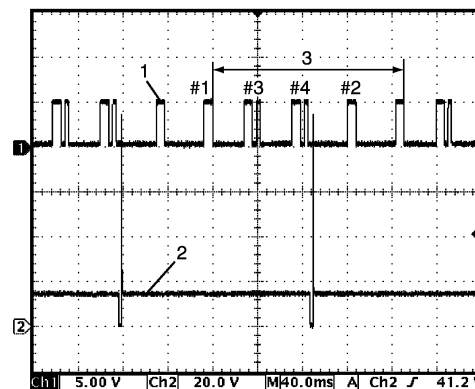


2. Fuel injection pulse width: 2 – 4 msec.	3. 10 – 14 V

Reference waveform No.2

No.1 fuel injector signal (2) with engine idling

Measurement terminal	CH1: "C01-20" to "C01-58" CH2: "C01-1" to "C01-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



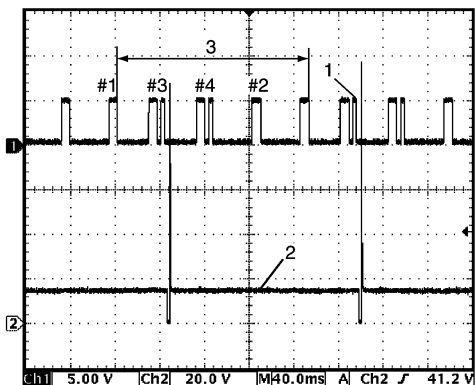
I6RW0E110038-01

- | |
|---|
| 1. Cylinder reference signal (CMP reference signal) |
| 3. 720° crank angle |

Reference waveform No.3

No.2 fuel injector signal (2) with engine idling

Measurement terminal	CH1: "C01-20" to "C01-58" CH2: "C01-2" to "C01-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



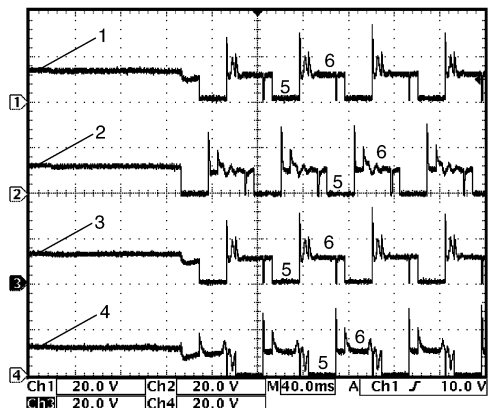
I6RW0E110039-01

- | |
|---|
| 1. Cylinder reference signal (CMP reference signal) |
| 3. 720° crank angle |

Reference waveform No.4

EGR valve signal

Measurement terminal	CH1: "C01-5" to "C01-58" CH2: "C01-6" to "C01-58" CH3: "C01-3" to "C01-58" CH4: "C01-4" to "C01-58"
Oscilloscope setting	CH1: 20 V/DIV, CH2: 20 V/DIV CH3: 20 V/DIV, CH4: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	Engine at cranking



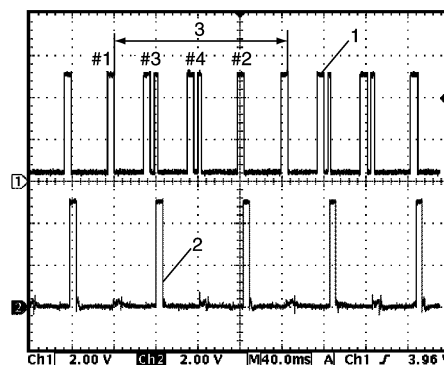
I4RS0B110053-01

- | |
|--|
| 1. EGR valve stepper motor coil 1 signal |
| 2. EGR valve stepper motor coil 2 signal |
| 3. EGR valve stepper motor coil 3 signal |
| 4. EGR valve stepper motor coil 4 signal |
| 5. ON signal |
| 6. OFF signal |

Reference waveform No.5

Ignition coil No.2 and No.3 signal (2) with engine idling

Measurement terminal	CH1: "C01-52" to "C01-58" CH2: "C01-20" to "C01-58"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



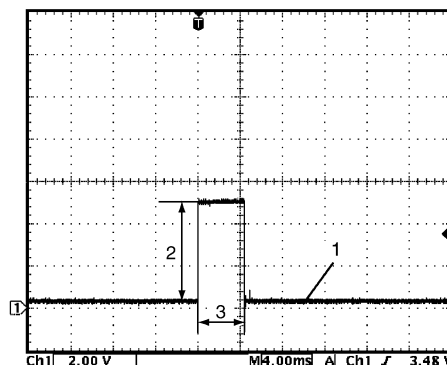
I6RW0E110040-01

- | |
|---|
| 1. Cylinder reference signal (CMP reference signal) |
| 3. 720° crank angle |

Reference waveform No.6

Ignition coil signal (1) with engine idling

Measurement terminal	CH1: "C01-21" to "C01-58"
Oscilloscope setting	CH1: 2 V/DIV TIME: 4 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



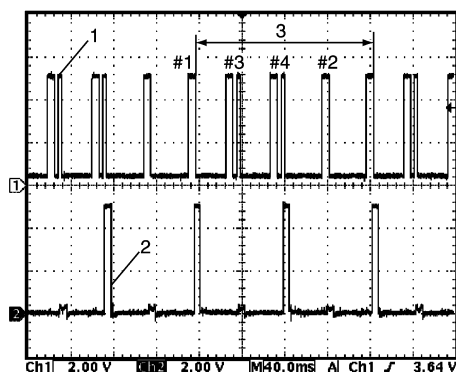
I4RS0B110055-02

- | |
|---|
| 2. 4 – 6 V |
| 3. Ignition coil pulse width: 4 – 5 msec. |

Reference waveform No.7

Ignition coil No.1 and No.4 signal (2) with engine idling

Measurement terminal	CH1: "C01-52" to "C01-58" CH2: "C01-21" to "C01-58"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



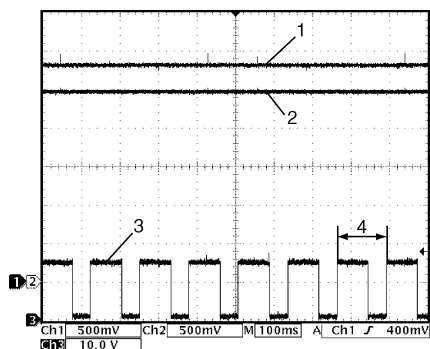
I6RW0E110041-01

- | |
|---|
| 1. Cylinder reference signal (CMP reference signal) |
| 3. 720° crank angle |

Reference waveform No.8

A/F sensor signal with engine idling

Measurement terminal	CH1: "C01-38" to "C01-58" "C01-37" to "C01-58" "C01-32" to "C01-31"
Oscilloscope setting	CH1: 500 mV/DIV, CH2: 500 mV/DIV, CH3: 10 V/DIV TIME: 100 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



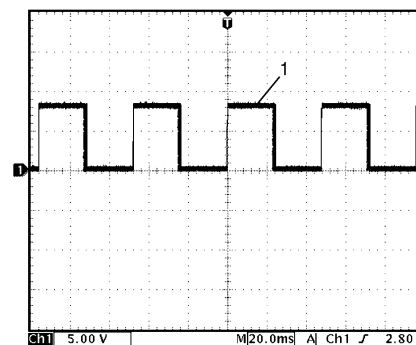
I7RW01110020-01

1. A/F sensor signal (+)	3. A/F sensor heater signal
2. A/F sensor signal (-)	4. One duty cycle

Reference waveform No.9

Generator output control signal (1) at engine idling

Measurement terminal	CH1: "C01-28" to "C01-58"
Oscilloscope setting	CH1: 5 V/DIV TIME: 20 ms/DIV
Measurement condition	Engine running at idle.



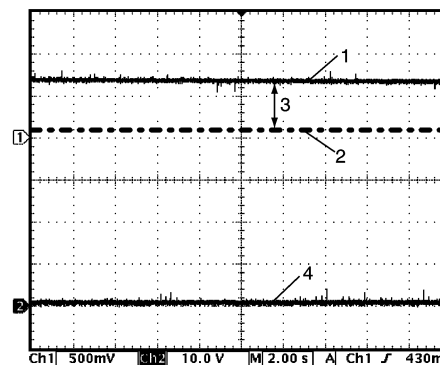
I6RW0E110042-02

1. Heated oxygen sensor-1 signal	4. ON signal
3. OFF signal	5. One duty cycle

Reference waveform No.10

Heated oxygen sensor heater signal (4) with engine idling

Measurement terminal	CH1: "C01-11" to "C01-39" CH2: "C01-47" to "C01-58"
Oscilloscope setting	CH1: 500 mV/DIV, CH2: 10 V/DIV TIME: 2 s/DIV
Measurement condition	- After warmed up to normal operating temperature - Vehicle driving at 60 km/h (37 mph) for 10 min. - Engine at specified idle speed



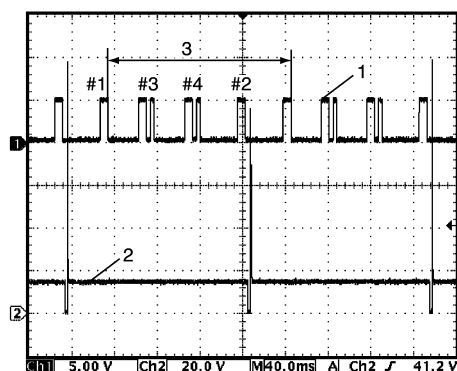
I4RS0B110060-01

- | |
|--|
| 1. Heated oxygen sensor-2 signal upper limit |
| 2. Heated oxygen sensor-2 signal lower limit |
| 3. Normal waveform range |

Reference waveform No.11

No.3 fuel injector signal (2) with engine idling

Measurement terminal	CH1: "C01-52" to "C01-58" CH2: "C01-16" to "C01-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



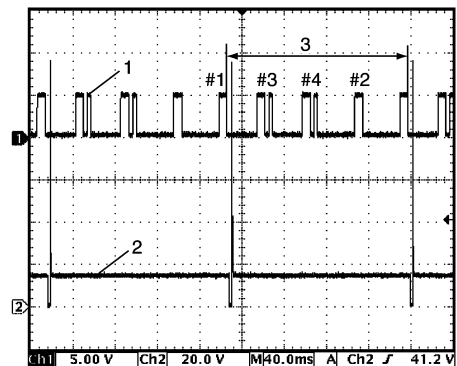
I6RW0E110043-01

- | |
|---|
| 1. Cylinder reference signal (CMP reference signal) |
| 3. 720° crank angle |

Reference waveform No.12

No.4 fuel injector signal (2) with engine idling

Measurement terminal	CH1: "C01-52" to "C01-58" CH2: "C01-17" to "C01-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



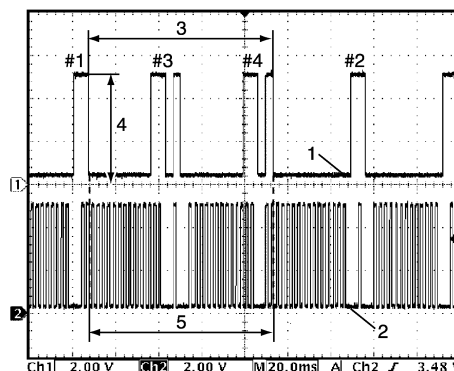
I6RW0E110044-01

- | |
|---|
| 1. Cylinder reference signal (CMP reference signal) |
| 3. 720° crank angle |

Reference waveform No.13

CMP sensor signal with engine idling

Measurement terminal	CH1: "C01-52" to "C01-58" CH2: "C01-51" to "C01-58"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 20 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



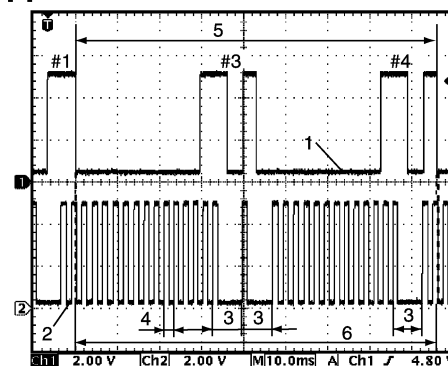
I6RW0E110045-01

- | |
|---|
| 1. Cylinder reference signal (CMP reference signal) |
| 2. CKP signal |
| 3. 360° crank angle |
| 4. 4 – 5 V |
| 5. 36 – 6 = 30 CKP pulse |

Reference waveform No.14

CMP sensor signal with engine idling

Measurement terminal	CH1: "C01-52" to "C01-58" CH2: "C01-51" to "C01-58"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 10 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



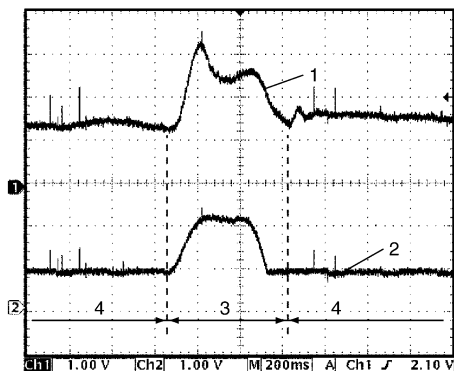
I6RW0E110046-01

- | |
|---|
| 1. Cylinder reference signal (CMP reference signal) |
| 2. CKP signal |
| 3. 30° crank angle |
| 4. 10° crank angle |
| 5. 360° crank angle |
| 6. 36 – 6 = 30 CKP pulse |

Reference waveform No.15

Mass air flow sensor signal (1) with engine racing

Measurement terminal	CH1: "C01-26" to "C01-27" CH2: "C01-54" to "C01-55"
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 200 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine racing



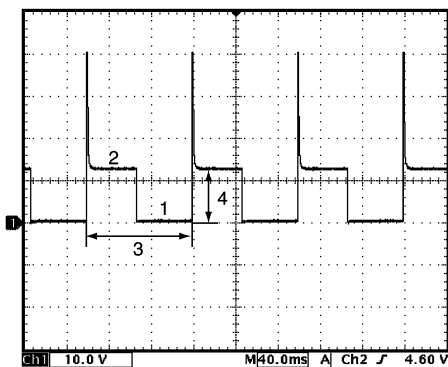
I4RS0B110066-01

2. Throttle position sensor signal
3. Racing
4. Idle

Reference waveform No.16

EVAP canister purge valve signal

Measurement terminal	CH1: "C01-13" to "C01-58"
Oscilloscope setting	CH1: 10 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - EVAP canister purge valve setting at 52% by using "Engine / Active Test" of scan tool.



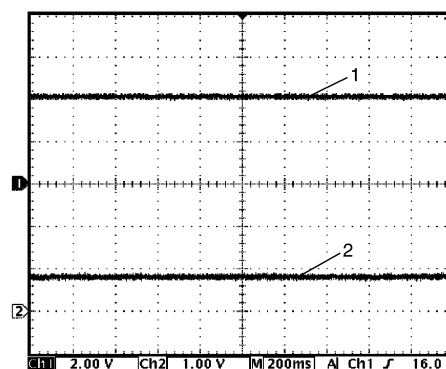
I4RS0B110067-01

1. ON signal	3. One duty cycle
2. OFF signal	4. 10 - 14 V

Reference waveform No.17

Manifold absolute pressure sensor signal (1) with ignition switch turned ON

Measurement terminal	CH1: "C01-55" to "C01-57" CH2: "C01-54" to "C01-57"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 1 V/DIV TIME: 200 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Ignition switch turned ON



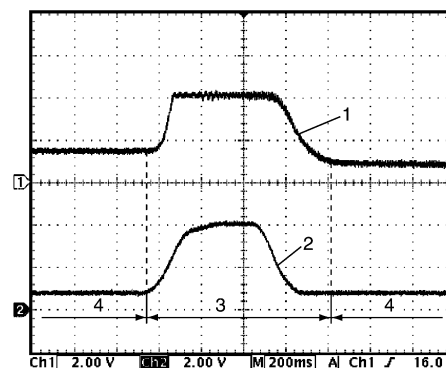
I4RS0B110070-01

2. Throttle position sensor signal

Reference waveform No.18

Manifold absolute pressure sensor signal (1) with engine racing

Measurement terminal	CH1: "C01-55" to "C01-57" CH2: "C01-54" to "C01-57"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 200 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine racing



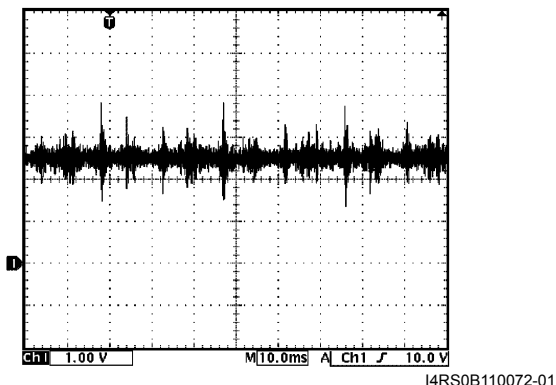
I4RS0B110071-01

2. Throttle position sensor signal
3. Racing
4. Idle

Reference waveform No.19

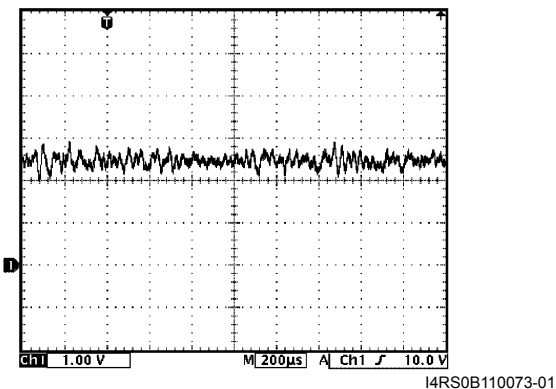
Knock sensor signal at engine speed 4000 r/min.

Measurement terminal	CH1: "C01-56" to "C01-58"
Oscilloscope setting	CH1: 1 V/DIV TIME: 10 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine running at 4000 r/min.

**Reference waveform No.20**

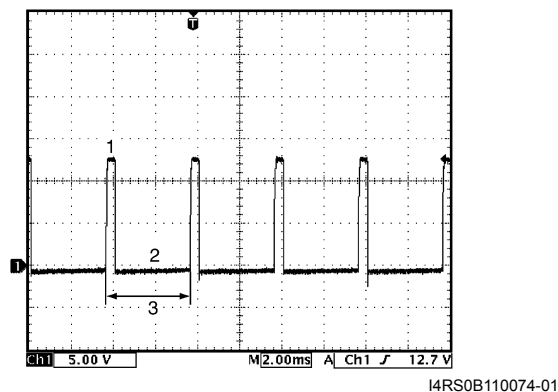
Knock sensor signal at engine speed 4000 r/min.

Measurement terminal	CH1: "C01-56" to "C01-58"
Oscilloscope setting	CH1: 1 V/DIV TIME: 200 μ s/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine running at 4000 r/min.

**Reference waveform No.21**

Oil control valve signal with engine idling (VVT model)

Measurement terminal	CH1: "C01-60" to "C01-59"
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	At the moment of the ignition switch turned ON

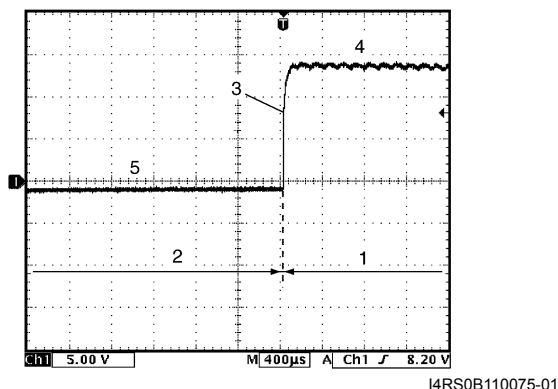


1. ON signal	3. Only duty cycle
2. OFF signal	

Reference waveform No.22

Oil control valve signal with engine racing (VVT model)

Measurement terminal	CH1: "C01-60" to "C01-59"
Oscilloscope setting	CH1: 5 V/DIV TIME: 400 μ s/DIV
Measurement condition	- After warmed up to normal operating temperature - Vehicle running at 20 km/h (12 mph) and depress accelerator pedal fully

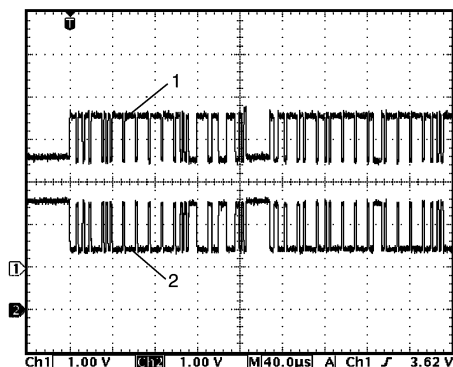


1. Accelerator pedal depressed fully	4. ON signal
2. Accelerator pedal depressed partially	5. OFF signal
3. Oil control valve signal	

Reference waveform No.23

CAN communication line signal from ABS control module assembly or TCM with ignition switch turned ON

Measurement terminal	CH1: "E01-4" to "C01-58" / CH1: "C01-50" to "C01-58" CH2: "E01-19" to "C01-58" / CH2: "C01-49" to "C01-58"
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 40 μ s/DIV
Measurement condition	Ignition switch turned ON (Signal pattern is depending on engine condition)



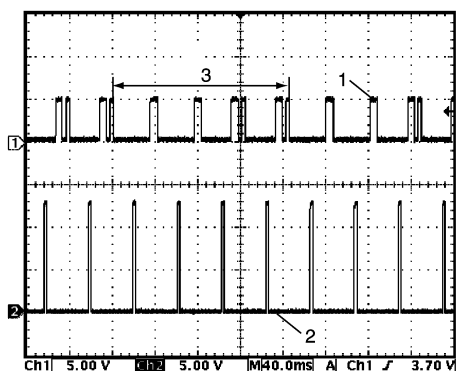
I4RS0B110076-01

- | |
|---|
| 1. CAN communication line signal (High) |
| 2. CAN communication line signal (Low) |

Reference waveform No.24

Ignition pulse (engine revolution) signal (2) with engine idling

Measurement terminal	CH1: "C01-52" to "C01-58" CH2: "E01-44" to "C01-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 40 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



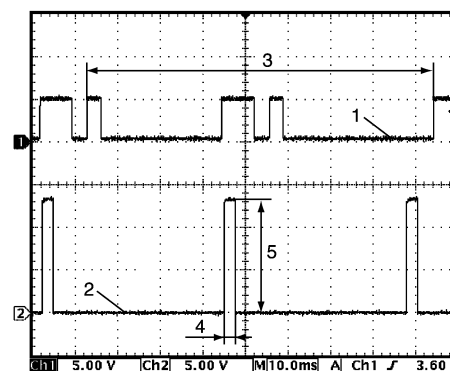
I6RW0E110047-01

- | |
|---|
| 1. Cylinder reference signal (CMP reference signal) |
| 3. 720° crank angle |

Reference waveform No.25

Ignition pulse (engine revolution) signal (2) with engine idling

Measurement terminal	CH1: "C01-52" to "C01-58" CH2: "E01-44" to "C01-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed



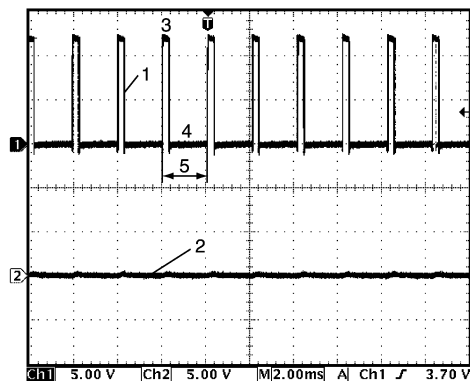
I6RW0E110048-01

- | |
|---|
| 1. Cylinder reference signal (CMP reference signal) |
| 3. 360° crank angle |
| 4. 2 to 4 msec. |
| 5. 10 – 14 V |

Reference waveform No.26

Throttle actuator output signal with ignition switch turned ON

Measurement terminal	CH1: "C01-45" to "C01-58" CH2: "C01-44" to "C01-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Ignition switch turned ON and accelerator pedal at idle position



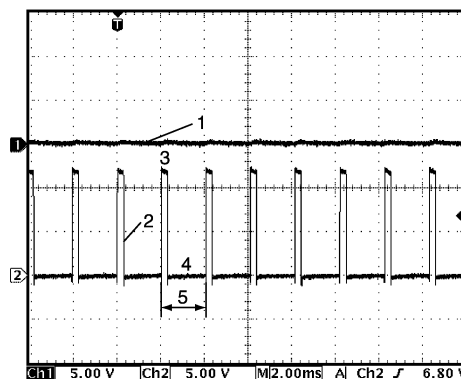
I4RSOB110081-02

1. Throttle actuator drive signal ("C01-45" terminal)
2. Throttle actuator drive signal ("C01-44" terminal)
3. ON signal
4. OFF signal
5. One duty cycle

Reference waveform No.27

Throttle actuator output signal with ignition switch turned ON

Measurement terminal	CH1: "C01-45" to "C01-58" CH2: "C01-44" to "C01-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Ignition switch turned ON and accelerator pedal at full depressed position



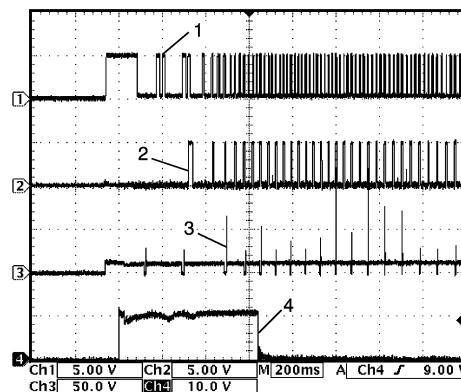
I4RSOB110082-02

1. Throttle actuator drive signal ("C01-45" terminal)
2. Throttle actuator drive signal ("C01-44" terminal)
3. ON signal
4. OFF signal
5. One duty cycle

Reference waveform No.28

Ignition coil signal and fuel injector signal with engine cranking

Measurement terminal	CH1: "C01-20" to "C01-58" CH2: "C01-6" to "C01-58" CH3: "C01-1" to "C01-58" CH4: "C01-48" to "C01-58"
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV CH3: 50 V/DIV, CH4: 10 V/DIV TIME: 200 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at cranking



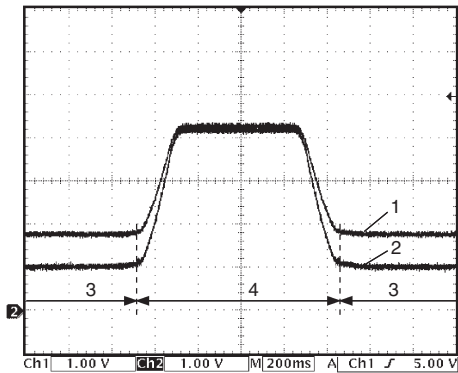
I6RW0E110049-01

1. Cylinder reference signal (CMP reference signal)
2. Ignition coil No.1 and No.4 signal
3. No.1 fuel injector signal
4. Engine start signal

Reference waveform No.29

Throttle position sensor main (1) and sub (2) signal

Measurement terminal	CH1: "C01-54" to "C01-58" CH2: "C01-40" to "C01-58"
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 200 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Ignition switch turned ON and depress accelerator pedal fully



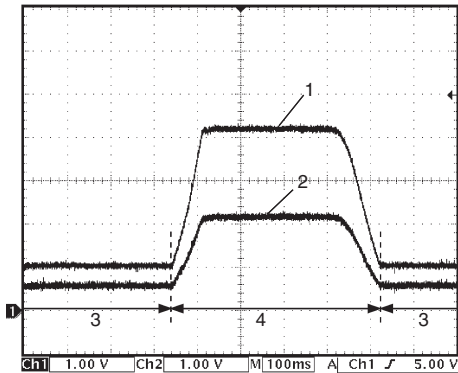
I5RWOC110023-01

3. Accelerator pedal released
4. Accelerator pedal depressed fully

Reference waveform No.30

Pedal position sensor main (1) and sub (2) signal

Measurement terminal	CH1: "E01-55" to "C01-58" CH2: "E01-52" to "C01-58"
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 100 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Ignition switch turned ON and depress accelerator pedal fully



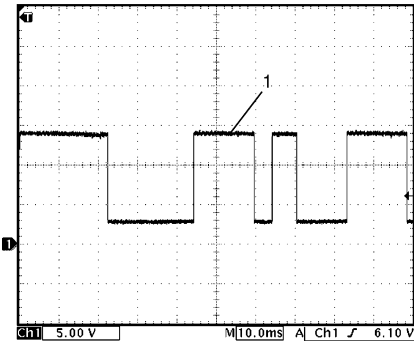
I5RWOC110024-01

3. Accelerator pedal released
4. Accelerator pedal depressed fully

Reference waveform No.31

Generator field coil monitor signal (1) at engine idling

Measurement terminal	CH1: "C01-8" to "C01-58"
Oscilloscope setting	CH1: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Headlight switch turned ON (clearance light).



I6RW0E110050-01

Resistance Check

1) Remove ECM from its bracket referring to “Engine Control Module (ECM) Removal and Installation in Section 1C”.

⚠ CAUTION

Never touch terminals of ECM itself or connect voltmeter or ohmmeter (2).

2) Connect special tool to ECM connectors (1) securely.

NOTE

Do not connect the other connector of special tool to ECM.

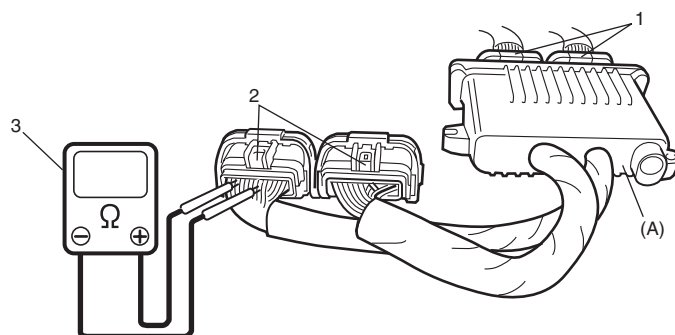
Special tool

(A): 09933–06320

3) Check resistance between each pair of terminals of special tool connectors (1) as listed in the following table.

⚠ CAUTION

- **Be sure to connect ohmmeter probe from wire harness side of coupler.**
- **Be sure to turn OFF ignition switch for this check.**
- **Resistance in the following table represents that measured when parts temperature is 20 °C (68 °F).**



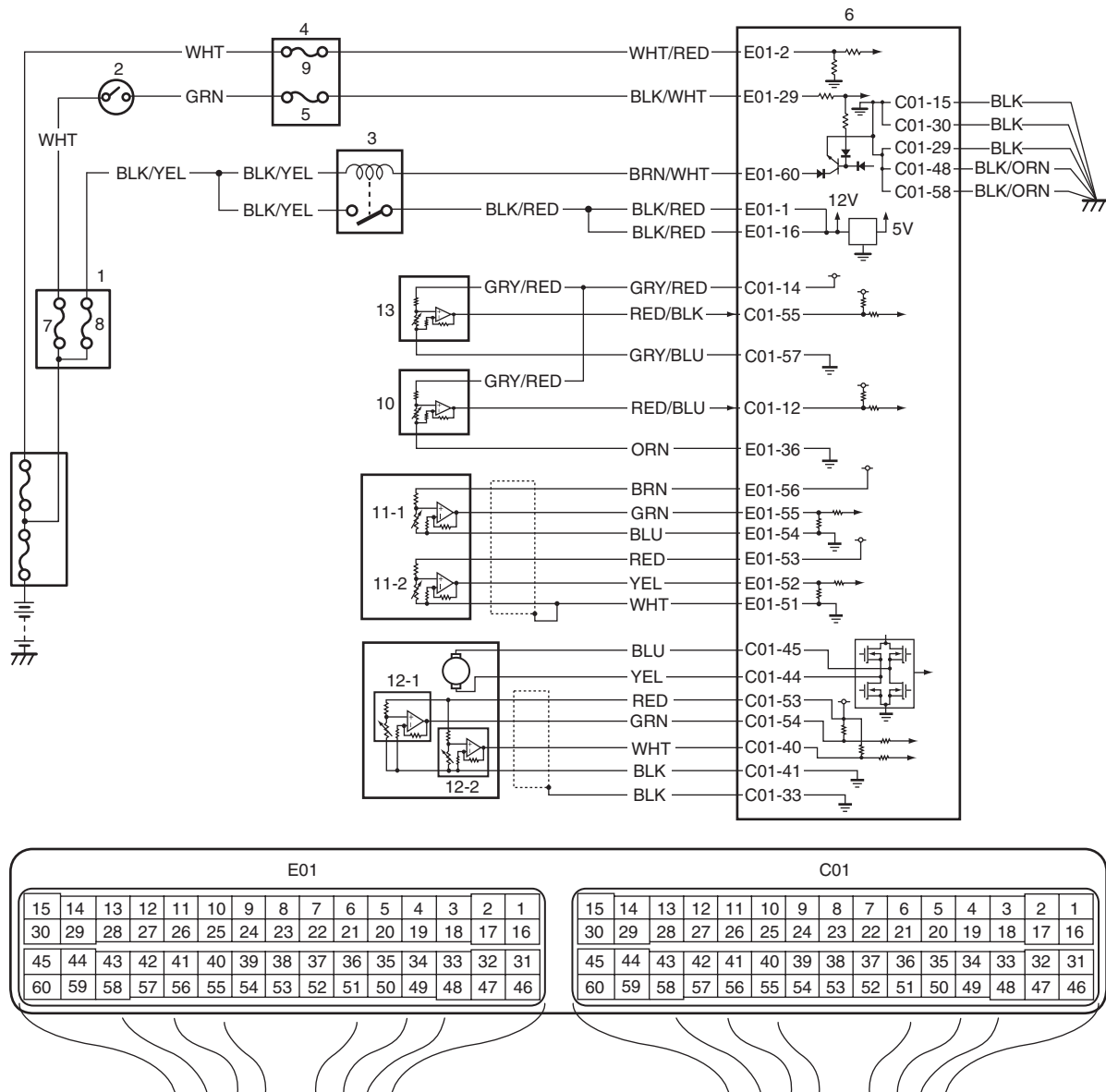
I7RW01110032-02

Terminals	Circuit	Standard resistance	Condition
C01-47 to E01-29	Heater of HO2S	4 – 15 Ω	—
E01-46 to E01-1/16	Radiator cooling fan relay	160 – 240 Ω	—
E01-60 to E01-29	Main relay	160 – 240 Ω	Battery disconnected and ignition switch turned ON
E01-15 to E01-29	Fuel pump relay	160 – 240 Ω	
C01-16 to E01-1/16	No.3 fuel injector	10.8 – 18.2 Ω	—
C01-17 to E01-1/16	No.4 fuel injector		
C01-4 to E01-1/16	EGR valve (stepping motor No.1 coil)	20 – 31 Ω	—
C01-13 to E01-1/16	EVAP canister purge valve	28 – 35 Ω	—
C01-2 to E01-1/16	No.2 fuel injector	10.8 – 18.2 Ω	—
C01-3 to E01-1/16	EGR valve (stepping motor No.2 coil)	20 – 31 Ω	—
C01-4 to E01-1/16	EGR valve (stepping motor No.4 coil)		
C01-3 to E01-1/16	EGR valve (stepping motor No.3 coil)		
C01-1 to E01-1/16	No.1 fuel injector	10.8 – 18.2 Ω	—
E01-49 to E01-47	A/C compressor relay	160 – 240 Ω	—
E01-48 to E01-1/16	A/C condenser cooling fan relay	160 – 240 Ω	—
C01-60 to C01-59	Oil control valve (VVT model)	6 – 15 Ω	—
E01-50 to E01-1/16	Throttle actuator control relay	160 – 240 Ω	—

ECM Power and Ground Circuit Check

S6RW0E1104096

Wiring Diagram



I6RW0E110052-01

1. Individual circuit fuse box No.1	5. "IG COIL" fuse	9. "DOME" fuse	12-1. TP sensor (main)
2. Ignition switch	6. ECM	10. A/C refrigerant pressure sensor	12-2. TP sensor (sub)
3. Main relay	7. "IGN" fuse	11-1. APP sensor (main)	13. MAP sensor
4. Junction block	8. "FI" fuse	11-2. APP sensor (sub)	

Circuit Description

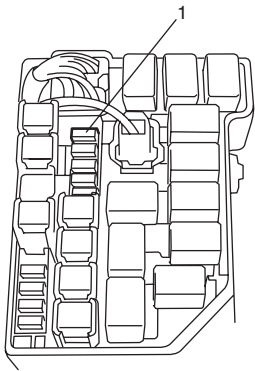
When the ignition switch is turned ON, the main relay turns ON (the contact point closes) and the main power is supplied to ECM. And then ECM supplies 5 V power to each sensor (A/C refrigerant pressure sensor, MAP sensor, APP sensor and TP sensor).

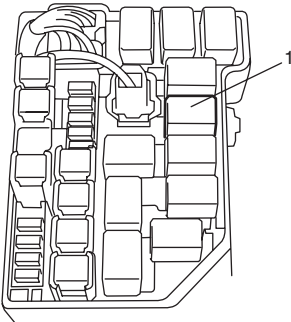
If 5 V power circuit to each sensors from ECM is shorted to ground, ECM stops engine and emission control operation.

Troubleshooting

NOTE

- Before performed troubleshooting, be sure to read the “Precautions of ECM Circuit Inspection”.
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits”.

Step	Action	Yes	No
1	Circuit fuse check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection to ECM connector at “E01-2”, “E01-29”, “E01-60”, “E01-1”, “E01-16”, “C01-15”, “C01-30”, “C01-29”, “C01-48” and “C01-58” terminals. 3) If OK, check “DOME” fuse and “IG COIL” fuse for blowing. <i>Are “DOME” fuse and “IG COIL” fuse in good condition?</i>	Go to Step 2.	Replace fuse (s) and check for short in circuits connected to fuse(s).
2	Power supply circuit check 1) Measure voltage between “E01-2” terminal of ECM connector and body ground. <i>Is voltage 10 – 14 V?</i>	Go to Step 3.	“WHT/RED” wire is open circuit.
3	Ignition signal check 1) Turn ignition switch to ON position. 2) Measure voltage between “E01-29” terminal of ECM connector and body ground. <i>Is voltage 10 – 14 V?</i>	Go to Step 4.	“BLK/WHT” or “GRN” wire is open circuit.
4	Main relay circuit check 1) Turn ignition switch to OFF position. 2) Check “FI” fuse (1) (15 A) in fuse box No.2 for blowing.  I7RW01110034-01 3) If OK, measure voltage between “E01-60” terminal of ECM connector and body ground. <i>Is voltage 10 – 14 V?</i>	Go to Step 5.	Go to Step 9.
5	Main relay circuit check 1) Connect connectors to ECM with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Measure voltage between “E01-60” terminal of ECM connector and body ground. <i>Is voltage 0 – 1 V?</i>	Go to Step 7.	Go to Step 6.

Step	Action	Yes	No
6	ECM ground circuit check 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Measure resistance between each "C01-15", "C01-30", "C01-29", "C01-48" and "C01-58" terminals of ECM connector and body ground. <i>Is resistance 1 Ω or less?</i>	Substitute a known-good ECM and recheck.	"BLK/ORN" or "BLK" wire is open or high resistance circuit.
7	Main relay circuit check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Using service wire, ground "E01-60" terminal of ECM connector and measure voltage between each "E01-1" and "E01-16" terminals of ECM connector and body ground. <i>Is voltage 10 – 14 V?</i>	Go to Step 11.	Go to Step 8.
8	Main relay circuit check 1) Remove main relay (1) from individual circuit fuse box No.1.  I7RW01110035-01 2) Check for proper connection to main relay connector at "BLK/YEL" and "BLK/RED" wire terminals. 3) If OK, measure resistance between each "E01-1" and "E01-16" wire terminals of ECM connector and "BLK/RED" wire terminal of main relay connector. <i>Is resistance 1 Ω or less?</i>	Go to Step 9.	"BLK/RED" wire is open circuit or high resistance circuit.
9	Main relay circuit check 1) Remove main relay from fuse box No.2 with ignition switch turned OFF. 2) Measure voltage between "BLK/YEL" wire terminal of main relay connector and body ground. <i>Is voltage 10 – 14 V?</i>	Go to Step 10.	"BLK/YEL" wire is open circuit.
10	Main relay check 1) Check main relay referring to "Engine and Emission Control System Relay Inspection in Section 1C". <i>Is main relay in good condition?</i>	"BRN/WHT" wire is open or high resistance circuit.	Replace main relay.

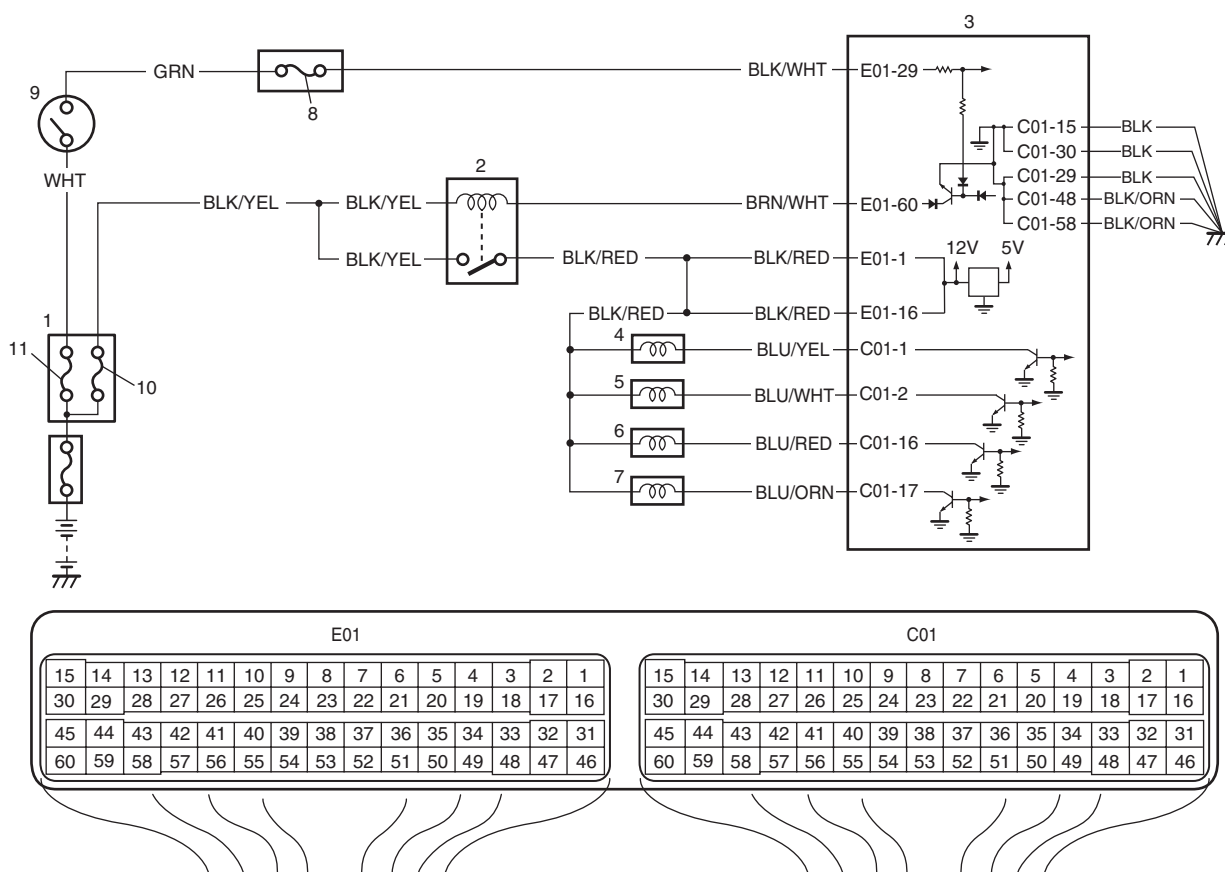
1A-175 Engine General Information and Diagnosis:

Step	Action	Yes	No
11	Sensor 5 V power source circuit check 1) Connect connectors to ECM with ignition switch turned OFF. 2) Turn ON ignition switch, measure each voltage between “C01-14”, “E01-56”, “E01-53” and “C01-53”, terminal of ECM connector and vehicle body ground. <i>Is each voltage 4 – 6 V?</i>	ECM power and ground circuit is in good condition.	Go to Step 12.
12	Sensor 5 V power source circuit check 1) Disconnect connectors from ECM, TP sensor, MAP sensor, A/C refrigerant pressure sensor and APP sensor with ignition switch turned OFF. 2) Measure each resistance between, “C01-14”, “E01-56”, “E01-53” and “C01-53” terminal of ECM connector and vehicle body ground. <i>Is each resistance infinity?</i>	Check internal short circuit of TP sensor, A/C refrigerant pressure sensor and/or APP sensor.	“GRY/RED”, “RED” and/or “BRN” wire is shorted to ground circuit.

Fuel Injector Circuit Check

S6RW0E1104097

Wiring Diagram



I7RW01110036-01

1. individual circuit fuse box No.1	3. ECM	5. No.2 injector	7. No.4 injector	9. Ignition switch	11. "IGN" fuse
2. Main relay	4. No.1 injector	6. No.3 injector	8. "IG COIL" fuse	10. "FI" fuse	

Troubleshooting

NOTE

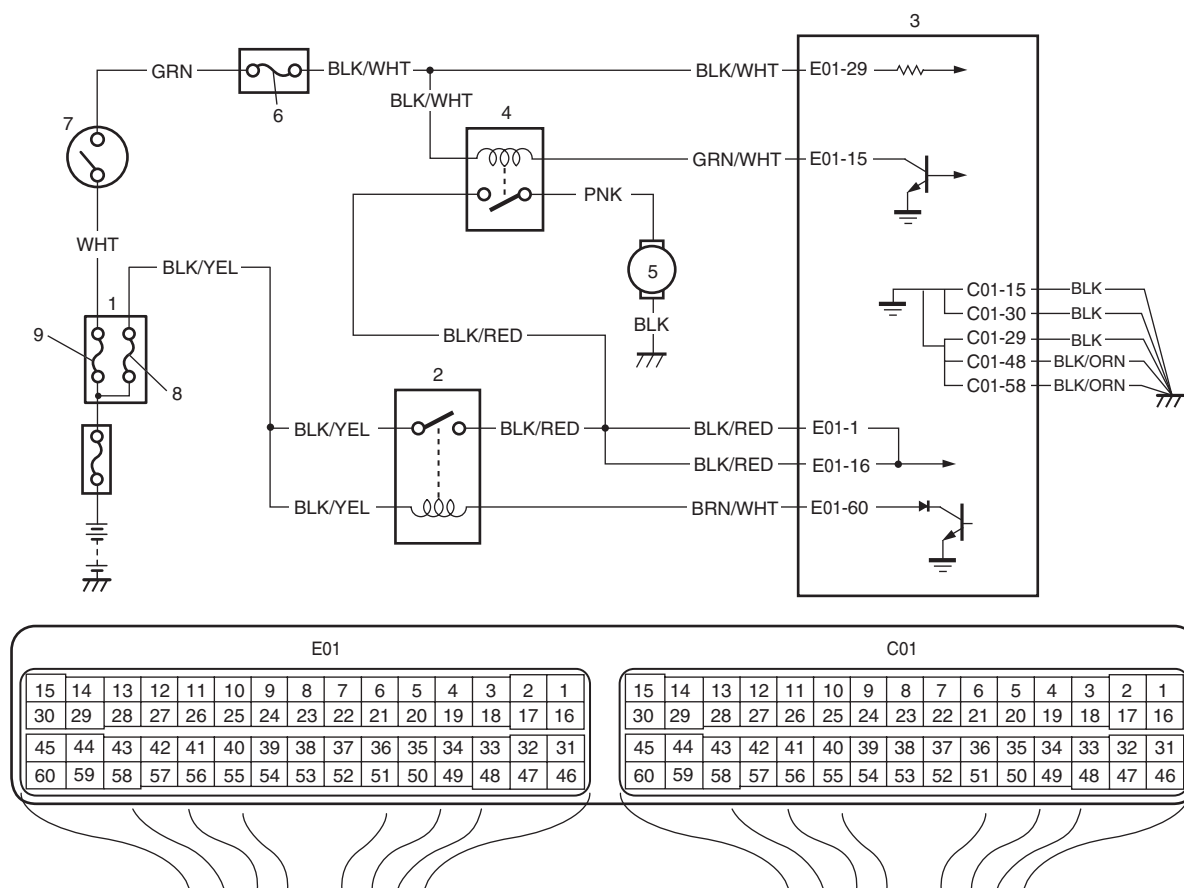
- Before performed troubleshooting, be sure to read the “Precautions of ECM Circuit Inspection”.
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits”.

Step	Action	Yes	No
1	Fuel injector check for operating sound 1) Using sound scope, check each injector for operating sound at engine cranking. <i>Do all 4 injector make operating sound?</i>	Fuel injectors circuit is in good condition.	Go to Step 2.
2	Fuel injector resistance check 1) Disconnect connectors from fuel injectors with ignition switch turned OFF. 2) Check for proper connection to fuel injector at each terminals. 3) If OK, check all 4 fuel injectors for resistance referring to “Fuel Injector On-Vehicle Inspection in Section 1G in related manual”. <i>Are all injectors in good condition?</i>	Go to Step 3.	Faulty fuel injector.
3	Fuel injector insulation resistance check 1) Check that there is insulation between each fuel injector terminal and engine ground. <i>Is there insulation?</i>	Go to Step 4.	Faulty fuel injector.
4	Fuel injector power supply check 1) Measure voltage between each “BLK/RED” wire terminal of fuel injector connector and engine ground with ignition switch turned ON. <i>Is voltage 10 – 14 V?</i>	Go to Step 5.	“BLK/RED” wire is open or shorted to ground circuit. If it is in good condition, go to “ECM Power and Ground Circuit Check”.
5	Wire circuit check 1) Turn OFF ignition switch. 2) Disconnect connectors from ECM. 3) Measure resistance between each “BLU/YEL”, “BLU/WHT”, “BLU/RED”, “BLU/ORN” wire terminal of fuel injector connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 6.	“BLU/YEL”, “BLU/WHT”, “BLU/RED” and/or “BLU/ORN” wire(s) are shorted to ground.
6	Wire circuit check 1) Measure voltage between each “BLU/YEL”, “BLU/WHT”, “BLU/RED”, “BLU/ORN” wire terminal of fuel injector connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 7.	“BLU/YEL”, “BLU/WHT”, “BLU/RED” and/or “BLU/ORN” wire(s) are shorted to power supply circuit.
7	Fuel injector drive signal check 1) Connect connectors to each fuel injector and ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between each “C01-1”, “C01-2”, “C01-16”, “C01-17” terminal of ECM connector and vehicle body ground. <i>Is voltage 10 – 14 V?</i>	Check fuel injector referring to “Fuel Injector Inspection in Section 1G in related manual”. If check result is satisfactory, substitute a known-good ECM and recheck.	“BLU/YEL”, “BLU/WHT”, “BLU/RED” and/or “BLU/ORN” wire(s) are open circuit.

Fuel Pump and Its Circuit Check

S6RW0E1104098

Wiring Diagram



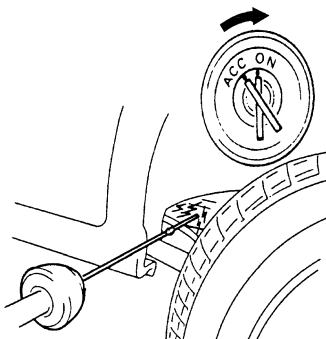
I7RW01110037-01

1. individual circuit fuse box No.1	3. ECM	5. Fuel pump	7. Ignition switch	9. "IGN" fuse
2. Main relay	4. Fuel pump relay	6. "IG COIL" fuse	8. "FI" fuse	

Troubleshooting

NOTE

- Before performed troubleshooting, be sure to read the “Precautions of ECM Circuit Inspection”.
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits”.

Step	Action	Yes	No
1	Fuel pump control system check for operation <i>Is fuel pump heard to operate 2 sec. after ignition switch is turned ON?</i>  I2RH01110132-01	Fuel pump circuit is in good condition.	Go to Step 2.
2	Fuel pump relay power supply check 1) Disconnect fuel pump relay from individual circuit fuse box No.1 with ignition switch turned OFF. 2) Check for proper connection to fuel pump relay at each terminal. 3) If OK, turn ON ignition switch, measure voltage between “BLK/WHT” wire terminal of fuel pump relay connector and engine ground. <i>Is voltage 10 – 14 V?</i>	Go to Step 3.	“BLK/WHT” wire is open or shorted to ground circuit.
3	Fuel pump relay power supply check 1) Turn ON ignition switch, measure voltage between “BLK/RED” wire terminal of fuel pump relay connector and engine ground. <i>Is voltage 10 – 14 V?</i>	Go to Step 4.	“BLK/RED” wire is open circuit.
4	Fuel pump relay check 1) Check fuel pump relay referring to “Engine and Emission Control System Relay Inspection in Section 1C”. <i>Is relay in good condition?</i>	Go to Step 5.	Faulty relay.
5	Fuel pump relay drive signal check 1) Connect fuel pump relay to fuse box No.2. 2) Connect voltmeter between “E01-15” terminal of ECM connector and vehicle body ground. 3) Measure voltage 2 sec. after ignition switch is turned ON. <i>Is voltage 10 – 14 V?</i>	Go to Step 6.	“GRN/WHT” wire is open circuit or shorted to ground circuit.

1A-179 Engine General Information and Diagnosis:

Step	Action	Yes	No
6	Fuel pump relay drive signal check 1) Measure voltage within 2 sec. after ignition switch is turned ON. <i>Is voltage 0 – 1 V?</i>	Go to Step 7.	Substitute a known-good ECM and recheck.
7	Wire circuit check 1) Turn OFF ignition switch. 2) Detach fuel tank referring to “Fuel Tank Removal and Installation in Section 1G in related manual”. 3) Disconnect connector from fuel pump. 4) Measure resistance between “PNK” wire terminal of fuel pump connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 8.	“PNK” wire is shorted to ground.
8	Fuel pump circuit check 1) Connect service wire between “E01-15” terminal of ECM connector and vehicle body ground. 2) Turn ON ignition switch, measure voltage between “PNK” terminal at fuel pump connector and vehicle body ground. <i>Is voltage 10 – 14 V?</i>	Go to Step 9.	“PNK” wire is open circuit.
9	Fuel pump circuit check 1) Turn OFF ignition switch. 2) Measure resistance between “BLK” wire terminal at fuel pump connector and vehicle body ground. <i>Is resistance less than 5 Ω?</i>	Faulty fuel pump.	“BLK” wire is open circuit.

Fuel Pressure Check

S6RW0E1104099

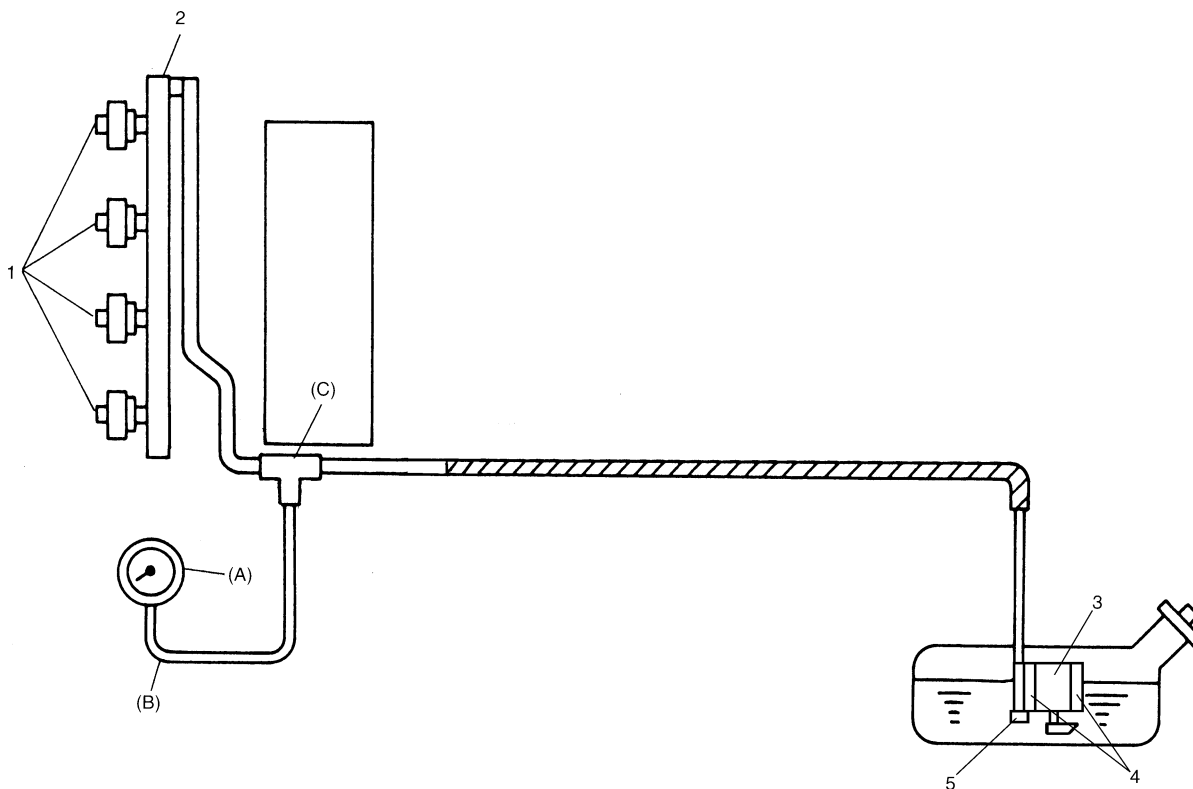
System Diagram

Special tool

(A): 09912-58442

(B): 09912-58432

(C): 09912-58490



I7RW01110038-01

1. Injector	2. Delivery pipe	3. Fuel pump	4. Fuel filter	5. Fuel pressure regulator

Troubleshooting

NOTE

Before using the following flow chart, check to make sure that battery voltage is higher than 11 V. If battery voltage is low, pressure becomes lower than specification even if fuel pump and line are in good condition.

Step	Action	Yes	No
1	Fuel pump operating sound check 1) Remove fuel filler cap and then turn ON ignition switch. <i>Can you hear operating sound?</i>	Go to Step 2.	Go to "Fuel Pump and Its Circuit Check".
2	Fuel pressure check 1) Check fuel pressure referring to "Fuel Pressure Inspection in Section 1G in related manual". <i>Is check result satisfactory?</i>	Go to Step 3.	Go to Step 6.
3	Fuel pressure check 1) Start engine and warm it up to normal operating temperature. 2) Keep engine speed at 4000 rpm. <i>Does fuel pressure show about the same value as Step 2?</i>	Go to Step 4.	Go to Step 8.

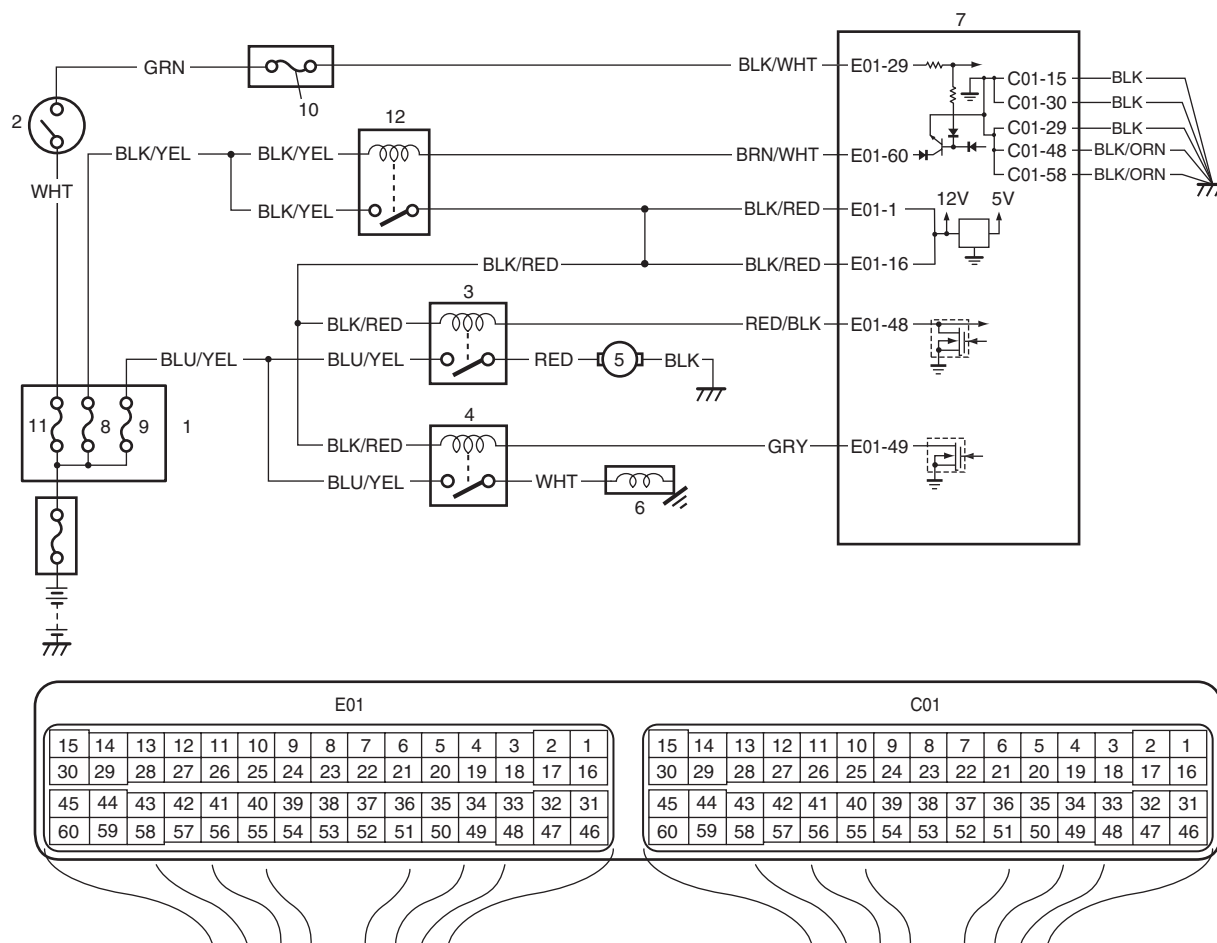
1A-181 Engine General Information and Diagnosis:

Step	Action	Yes	No
4	Fuel line check 1) Check fuel pipe, fuel hose and joint for fuel leakage. <i>Are they in good condition?</i>	Go to Step 5.	Repair or replace defective part.
5	Fuel line check 1) Check fuel pipe, fuel hose and joint for damage or deform. <i>Are they in good condition?</i>	Fuel system is in good condition.	Repair or replace damaged or damaged part.
6	<i>Was fuel pressure higher than specification in Step 2?</i>	Go to Step 7.	Go to Step 8.
7	Fuel line check 1) Check fuel pipe, fuel hose and joint for damage or deform. <i>Are they in good condition?</i>	Faulty fuel pressure regulator.	Repair or replace damaged or damaged part.
8	Fuel line check 1) Check fuel pipe, fuel hose and joint for damage or deform. <i>Are they in good condition?</i>	Clogged fuel filter, faulty fuel pump, faulty fuel pressure regulator or fuel leakage from hose connection in fuel tank.	Repair or replace defective part.

A/C Condenser Cooling Fan Control System Inspection

S6RW0E1104100

Wiring Diagram



I6RW0C110020-01

1. Individual circuit fuse box No.1	4. A/C compressor relay	7. ECM	10. "IG COIL" fuse
2. Ignition switch	5. A/C condenser cooling fan motor	8. "FI" fuse	11. "IGN" fuse
3. A/C condenser cooling fan relay	6. A/C compressor	9. "A/C" fuse	12. Main relay

Troubleshooting

Step	Action	Yes	No
1	Check A/C condenser fan control system <i>Is A/C condenser fan started when A/C is operating?</i>	System is in good condition.	Go to Step 2.
2	Check A/C condenser fan relay and its circuit 1) Connect scan tool to DLC with ignition switch OFF. 2) Check pending DTC and DTC with scan tool. <i>Is DTC P0481 displayed?</i>	Go to "DTC P0481: Cooling Fan 2 (A/C Condenser Fan) Control Circuit".	Go to Step 3.
3	Check A/C refrigerant 1) Check amount of A/C refrigerant referring to "A/C System Performance Inspection Manual Type in Section 7B in related manual". <i>Is it good condition?</i>	Go to Step 4.	Recharge refrigerant.
4	Check wire circuit 1) Disconnect A/C condenser cooling fan relay from individual circuit fuse box No.1 with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLU/YEL" wire terminal of A/C condenser cooling fan relay connector. <i>Is voltage 10 – 14V?</i>	Go to Step 7.	Go to Step 5.
5	Check wire circuit 1) Disconnect A/C compressor relay from individual circuit fuse box No.1 with ignition switch turn OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLU/YEL" wire terminal of A/C compressor relay connector. <i>Is voltage 10 – 14 V?</i>	Faulty A/C compressor relay.	Go to Step 6.
6	Check wire circuit 1) Remove "A/C" fuse "20 A" from fuse box No.2 with ignition switch turned OFF. 2) Measure resistance between "BLU/YEL" wire terminal of main fuse connector and engine ground. <i>Is resistance infinity?</i>	Open wire in "BLU/YEL" circuit. If OK, go to Step 7.	"BLU/YEL" wire shorted to ground circuit.
7	Check wire circuit 1) Disconnect connector from A/C condenser cooling fan with ignition switch tun OFF. 2) Measure resistance between engine ground and "RED" wire terminal of A/C condenser fan connector. <i>Is resistance infinity?</i>	Go to Step 8.	"RED" wire shorted to ground circuit.
8	Check A/C condenser cooling fan control relay 1) Check A/C condenser cooling fan control relay referring to "A/C System Relay Inspection Manual Type in Section 7B in related manual". <i>Is result in good condition?</i>	Go to Step 9.	Replace relay.

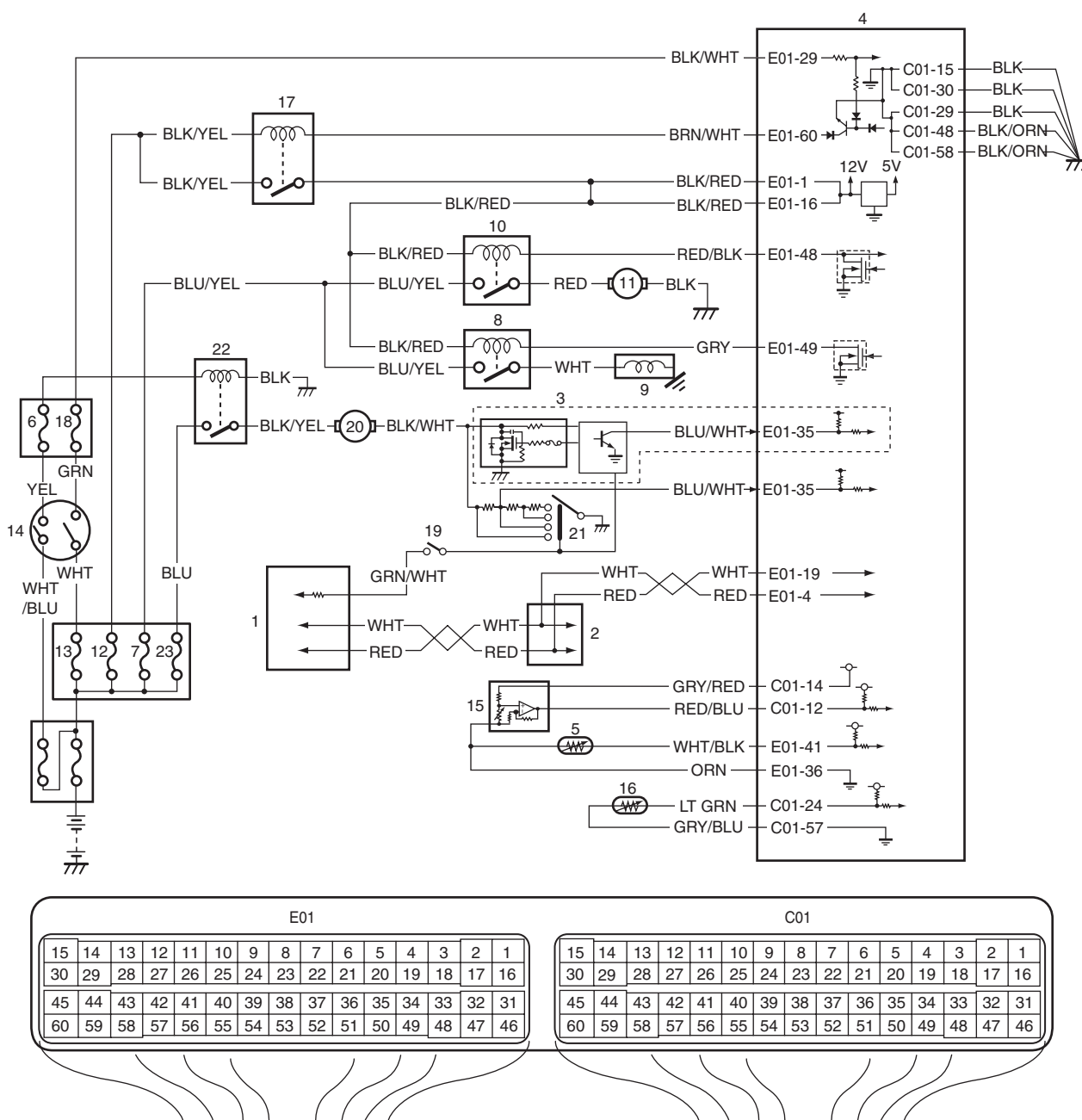
1A-183 Engine General Information and Diagnosis:

Step	Action	Yes	No
9	Check wire circuit 1) Install "A/C" fuse "20 A" to fuse box No.2. 2) Connect A/C condenser cooling fan relay to fuse box No.2 with ignition switch turn OFF. 3) Start engine then turn ON A/C switch and blower motor switch. 4) Measure voltage between engine ground and "RED" wire terminal in A/C condenser fan harness connector. <i>Is voltage 10 – 14 V?</i>	Go to Step 10.	Open wire in "RED" circuit.
10	Check wire circuit 1) Disconnect connector from A/C condenser cooling fan with ignition switch turned OFF. 2) Measure resistance between "BLK" wire terminal of A/C condenser cooling fan connector and engine ground. <i>Is resistance below 1 Ω?</i>	Go to Step 11.	Open or high resistance wire in "BLK" circuit.
11	Check A/C condenser cooling fan 1) Check A/C condenser cooling fan operates referring to "Condenser Cooling Fan Inspection Manual Type in Section 7B in related manual". <i>Is it good condition?</i>	Substitute a known-good ECM and recheck.	Faulty A/C condenser cooling fan.

A/C System Circuits Check

S6RW0E1104101

Wiring Diagram



I6RW0C110021-01

1. BCM	9. A/C compressor	17. Main relay
2. ABS control module	10. A/C condenser cooling fan motor relay	18. "IG COIL" fuse
3. Blower speed selector (Auto A/C model)	11. A/C condenser cooling fan motor	19. A/C switch
4. ECM	12. "FI" fuse	20. Blower motor
5. A/C evaporator outlet air temp. sensor (Manual A/C model)	13. "IGN" fuse	21. Blower speed selector (Manual A/C model)
6. "IG2 SIG" fuse	14. Ignition switch	22. Blower motor relay
7. "A/C" fuse	15. A/C refrigerant pressure sensor	23. "BLW" fuse
8. A/C compressor relay	16. ECT sensor	

Troubleshooting

NOTE

- Before performed troubleshooting, be sure to read the “Precautions of ECM Circuit Inspection”.
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits”.
- When A/C evaporator outlet air temp. is below 2 °C (35.6 °F), A/C remains OFF (“E01-49” terminal voltage becomes 10 – 14 V). This condition is not abnormal.

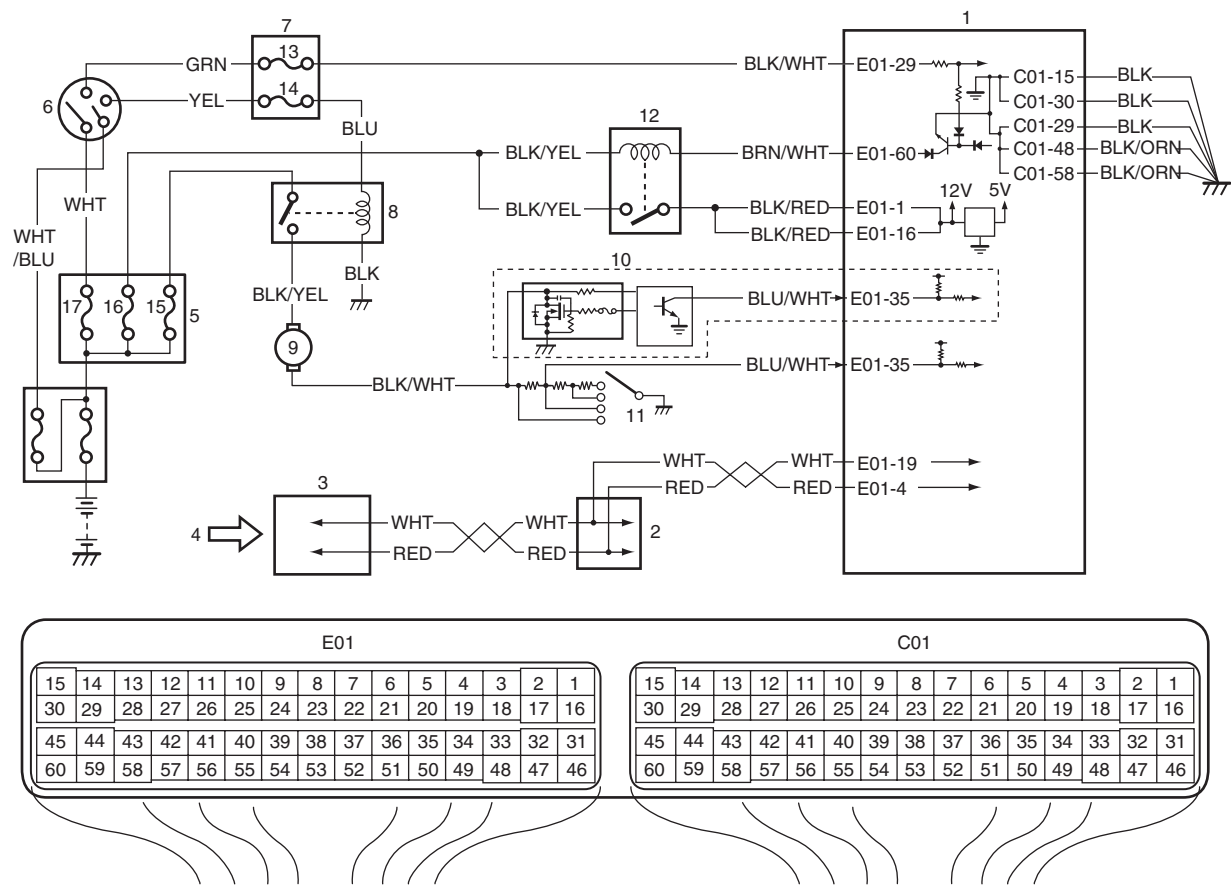
Step	Action	Yes	No
1	Reception data check from BCM 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check DTC for CAN-DTC. <i>Is there any CAN-DTC?</i>	Go to “Troubleshooting for CAN-DTC”.	Go to Step 2.
2	DTC check of HVAC control module 1) Check HVAC control module for DTC. <i>Is there DTC(s)?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	A/C switch signal circuit check 1) Start engine and select “Data List” mode on scan tool. 2) Check A/C switch signal under the following conditions respectively. <u>A/C switch signal</u> Engine running, A/C switch OFF: OFF Engine running, A/C switch ON and blower speed selector turned 1st position or more: ON <i>Is check result satisfactory?</i>	Go to Step 4.	Check HVAC control module and its circuit.
4	DTC check of ECT sensor circuit 1) Check ECM for DTC of ECT sensor circuit. <i>Is there DTC P0117 or DTC P0118?</i>	Go to applicable DTC diag. flow.	Go to Step 5.
5	A/C condenser cooling fan control system check <i>Is A/C condenser cooling fan started when A/C and blower speed selector switch are turned ON with engine running?</i>	Go to Step 11.	Go to Step 6.
6	A/C condenser cooling fan control circuit check 1) Check DTC with scan tool. <i>Is DTC P0481 displayed?</i>	Go to “DTC P0481: Cooling Fan 2 (A/C Condenser Fan) Control Circuit”.	Go to Step 7.
7	DTC check of A/C refrigerant pressure sensor circuit 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check ECM for DTC of A/C refrigerant pressure sensor circuit. <i>Is there DTC P0532 or DTC P0533?</i>	Go to applicable DTC diag. flow.	Go to Step 8.
8	A/C refrigerant pressure sensor voltage check 1) Check A/C refrigerant pressure sensor voltage referring to “Inspection of ECM and Its Circuits”. <i>Is voltage within specified value?</i>	Go to Step 9.	Check amount of refrigerant. If OK, replace A/C refrigerant pressure sensor.

Step	Action	Yes	No
9	A/C evaporator temperature sensor check 1) Check A/C evaporator temperature sensor referring to "Evaporator Temperature Sensor Inspection Manual Type in Section 7B in related manual". <i>Is resistance within specification?</i>	Go to Step 10.	Faulty A/C evaporator temperature sensor.
10	A/C condenser cooling fan check 1) Check A/C condenser cooling fan referring to "Condenser Cooling Fan Inspection Manual Type in Section 7B in related manual". <i>Is check result satisfactory?</i>	A/C condenser cooling fan drive circuit malfunction. If circuit is OK, go to Step 5.	Replace A/C condenser cooling fan motor.
11	A/C compressor control system check <i>Is A/C compressor started when A/C and blower speed selector switch are turned ON with engine running?</i>	A/C system is in good condition.	Go to Step 12.
12	A/C compressor relay circuit check 1) Measure voltage between "E01-49" wire terminal of ECM connector and vehicle body ground under the following conditions respectively. <u>Voltage between "E01-49" terminal of ECM connector and ground</u> While engine running and A/C switch turned OFF: 10 – 14 V While engine running, A/C and blower speed selector switch turned ON: 0 – 1 V <i>Is check result satisfactory?</i>	Go to Step 13.	Go to Step 14.
13	A/C compressor relay check 1) Check A/C compressor relay referring to "A/C System Relay Inspection Manual Type in Section 7B in related manual". <i>Is it in good condition?</i>	A/C compressor drive circuit malfunction.	Replace A/C compressor relay.
14	A/C compressor relay circuit check 1) Remove A/C compressor relay with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between "BLU/YEL" wire terminal of A/C compressor relay connector and vehicle body ground. <i>Is voltage 10–14 V?</i>	Go to Step 15.	"BLU/YEL" wire is open circuit.
15	A/C compressor relay check 1) Check A/C compressor relay referring to "A/C System Relay Inspection Manual Type in Section 7B in related manual". <i>Is it in good condition?</i>	"GRY" wire is open circuit. If OK, substitute a known-good ECM and recheck.	Replace A/C compressor relay.

Electric Load Signal Circuit Check

S6RW0E1104102

Wiring Diagram



1. ECM	7. Junction block	13. "IG COIL" fuse
2. ABS control module	8. Blower motor relay	14. "IG2 SIG" fuse
3. BCM	9. Blower motor	15. "BLW" fuse
4. Electric load signal (blower motor signal, rear defogger signal and headlight signal), etc.	10. Blower speed selector (Auto A/C model)	16. "FI" fuse
5. Individual circuit fuse box No.1	11. Blower speed selector (Manual A/C model)	17. "IGN" fuse
6. Ignition switch	12. Main relay	

I6RW0C110022-01

Troubleshooting

NOTE

- Before performed troubleshooting, be sure to read the “Precautions of ECM Circuit Inspection”.
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits”.

Step	Action	Yes	No
1	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check DTC. <i>Is there any CAN-DTC?</i>	Go to “Troubleshooting for CAN-DTC”.	Go to Step 2.
2	Electric load signal circuit check 1) Start engine and select “Data List” mode on scan tool. 2) Check electric load signal under following conditions respectively. <u>Blower fan signal (Manual A/C model)</u> Blower speed selector turned 2nd position or less: OFF Blower speed selector turned to 3rd position or more: ON <u>Blower fan signal (Automatic A/C model)</u> Blower speed selector OFF or 1st position: OFF Blower speed selector turned to 3rd position or more: ON <u>Radiator fan signal</u> Engine coolant temperature is lower than 100 °C (212 °F): OFF Engine coolant temperature is higher than 100 °C (212 °F): ON <u>Electric load signal</u> Engine running, rear defogger switch, small light or headlight switch OFF: OFF Engine running, rear defogger switch, small light or headlight switch ON: ON <i>Is check result satisfactory?</i>	Electric load signal circuit is in good condition.	Check defective signal circuit.

Step	Action	Yes	No
2	Radiator cooling fan control circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and select "Data List" on scan tool. 3) Warm up engine until coolant temp. is 100 °C, 212 °F or higher and A/C switch turns OFF (if equipped with A/C). (If engine coolant temp. does not rise, check engine cooling system or ECT sensor.) <i>Is radiator cooling fan started when engine coolant temp. reached above temp.?</i>	Radiator cooling fan control system is in good condition.	Perform from Step 2 to Step 7 in DTC P0480 diag. flow. If OK, Go to Step 3.
3	Radiator cooling fan control check 1) Disconnect radiator cooling fan motor connector with ignition switch turned OFF. 2) Run engine when ECT is over 100 °C, 212 °F. 3) Measure voltage between vehicle body ground and "BLU/RED" wire terminal of disconnected radiator cooling fan motor connector. <i>Is voltage 10 – 14 V?</i>	Go to Step 4.	"BLU/RED" wire is open or high resistance circuit.
4	Check radiator cooling fan wire circuit check 1) Turn ignition switch to OFF position. 2) Measure resistance between "BLK" wire terminal of disconnected radiator cooling fan motor connector and vehicle body ground. <i>Is resistance below 1 Ω?</i>	Go to Step 5.	"BLK" wire is open or high resistance circuit.
5	Radiator cooling fan check 1) Check radiator cooling fan referring to "Radiator Cooling Fan Assembly On-Vehicle Inspection in Section 1F in related manual". <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Faulty radiator cooling fan.

Repair Instructions

Idle Speed and IAC Throttle Valve Opening Inspection

S6RW0E1106001

Before idle speed check, make sure of the following.

- Lead wires and hoses of electronic fuel injection and engine and emission control systems are connected securely.
- Valve lash is checked according to maintenance schedule.
- Ignition timing is within specification.
- All accessories (wipers, heater, lights, A/C, etc.) are out of service.
- Air cleaner has been properly installed and is in good condition.
- No abnormal air drawn in from air intake system.

After all items are confirmed, check idle speed and IAC throttle opening as follows.

NOTE

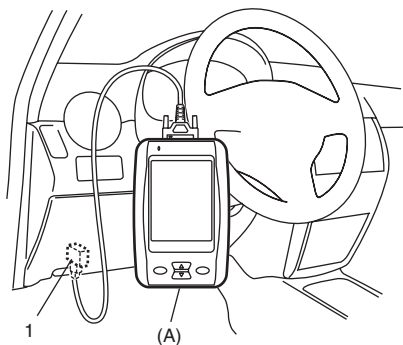
Before starting engine, place transmission gear shift lever in "Neutral", and set parking brake and block drive wheels.

1A-191 Engine General Information and Diagnosis:

- 1) Connect SUZUKI scan tool to DLC (1) with ignition switch turned OFF.

Special tool

(A): SUZUKI scan tool (SUZUKI-SDT)



I5RW0C110011-01

- 2) Warm up engine to normal operating temperature.

- 3) Check engine idle speed and "IAC throttle opening" by using "Data List" mode on scan tool to check "IAC throttle opening".
- 4) If check result is out of specification, inspect electric throttle body assembly referring to "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C".

Engine idle speed and IAC throttle valve opening

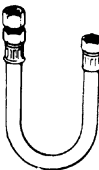
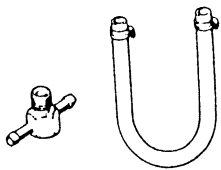
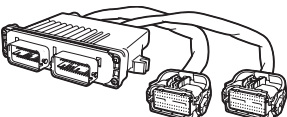
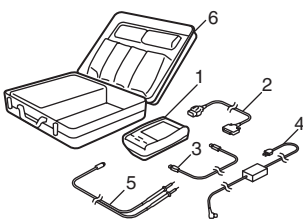
A/C OFF	A/C ON
700 ± 50 rpm 5 – 25%	750 ± 50 rpm

- 5) Check that specified engine idle speed is obtained with A/C turned ON if vehicle is equipped with A/C. If not, check A/C system referring to "A/C System Circuits Check".

Special Tools and Equipment

Special Tool

S6RW0E1108001

09912-58432 Fuel pressure gauge hose This tool is included in fuel pressure gauge set (09912-58413). 	09912-58442 Fuel pressure gauge This tool is included in fuel pressure gauge set (09912-58413). 
09912-58490 3-way joint & hose 	09933-06320 ECM check harness (120P) 
SUZUKI scan tool (SUZUKI-SDT) — This kit includes following items. 1. SUZUKI-SDT 2. DLC3 cable 3. USB cable 4. AC/DC power supply 5. Voltage meter probe 6. Storage case 	

Aux. Emission Control Devices

Diagnostic Information and Procedures

EGR System Inspection

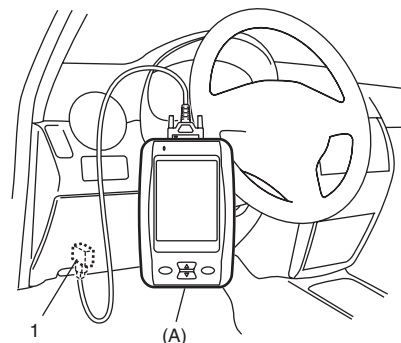
S6RW0E1204001

- 1) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch turned OFF.
- 2) Turn ON ignition switch and erase DTC using "Delete" in "DTC" menu of scan tool.
- 3) Start engine and warm it up to normal operating temperature, then select "Data List" mode on scan tool.
- 4) Make sure that vehicle condition is as follows.
 - Vehicle speed = 0 km/h (0 KPH)
 - Engine speed $\leq$ 900 rpm
 - Engine coolant temp. $\geq$ 90 °C, 164 °F

- 5) With engine idling (without depressing accelerator pedal), open EGR valve by using "Step EGR Control" mode in "Engine / Active Test" menu. In this state, as EGR valve opening increases engine idle speed drops. If not, possible cause is clogged EGR gas passage, stuck or faulty EGR valve.

Special tool

(A): SUZUKI scan tool (SUZUKI-SDT)



I5RW0C110011-01

Repair Instructions

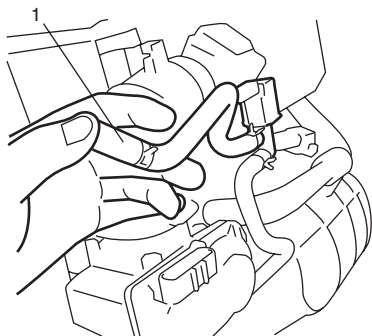
EVAP Canister Purge Inspection

S6RW0E1206001

NOTE

Before inspection, check to make sure that gear shift lever is in neutral position and that parking brake lever is pulled all the way up.

- 1) Disconnect purge hose (1) from purge pipe.
- 2) Place finger against the end of disconnected hose and check that vacuum is not felt there when engine is cool and running at idle speed. If check result is not satisfactory, check EVAP canister purge valve, wire harness and ECM.



I5RW0A120006-01

EVAP Canister Purge Valve and Its Circuit Inspection

S6RW0E1206002

⚠ WARNING

Do not apply vacuum by mouth; otherwise harmful fuel vapor can be breathed in.

⚠ CAUTION

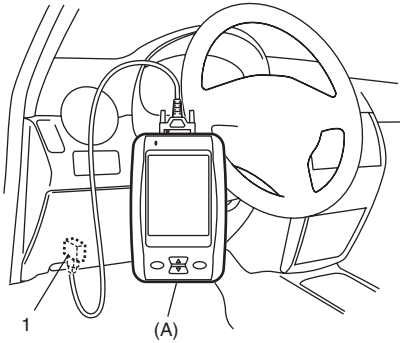
Do not apply vacuum more than -86 kPa (-12.47 psi); otherwise EVAP canister purge valve could be damaged.

1B-2 Aux. Emission Control Devices:

- 1) Prepare to operate EVAP canister purge valve as follows.
 - a) When using SUZUKI scan tool:
 - i) Connect SUZUKI scan tool to DLC (1) with ignition switch turned OFF and disconnect purge valve vacuum hoses from intake manifold and EVAP canister.
 - ii) Turn ON ignition switch, clear DTC and select "Engine / Active Test" mode on SUZUKI scan tool.

Special tool

(A): SUZUKI scan tool (SUZUKI-SDT)



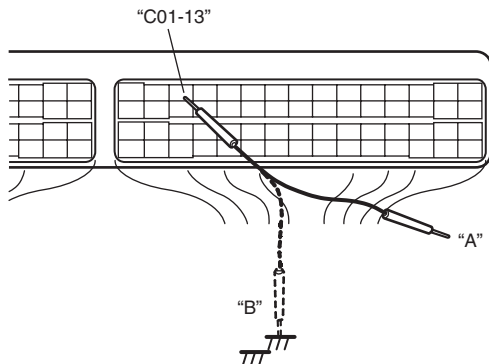
I5RW0C110011-01

- b) When not using SUZUKI scan tool:

NOTE

Before performed this check, be sure to read the "Precautions of ECM Circuit Inspection in Section 1A".

- iii) Disconnect purge valve vacuum hoses from intake manifold and purge pipe.
 - iv) Remove ECM from its bracket referring to "Engine Control Module (ECM) Removal and Installation in Section 1C".
 - v) Connect special tool between ECM and ECM connector referring to "Inspection of ECM and Its Circuits in Section 1A".
 - vi) Turn ON ignition switch. Using service wire, ground "C01-13" terminal circuit of special tool (valve ON: "B") and unground it (valve OFF: "A").



I6RW0E120001-01

- ii) Check purge valve for operation and vacuum passage for clog when valve is switched ON and OFF by using SUZUKI scan tool or service wire. If check result is not satisfactory, check vacuum hoses, EVAP canister purge valve, wire harness and connections.

EVAP canister purge valve specification

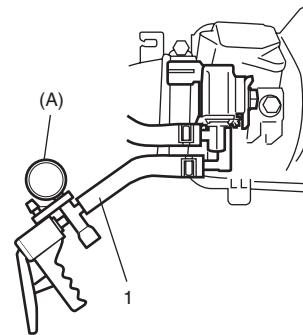
[A] Valve OFF: When vacuum (-60 kPa (-8.7 psi)) is applied to hose (1), vacuum can be applied.

[B] Valve ON: When vacuum is applied to hose (1), vacuum can not be applied.

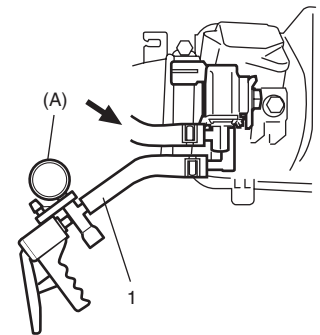
Special tool

(A): 09917-47011

[A]



[B]



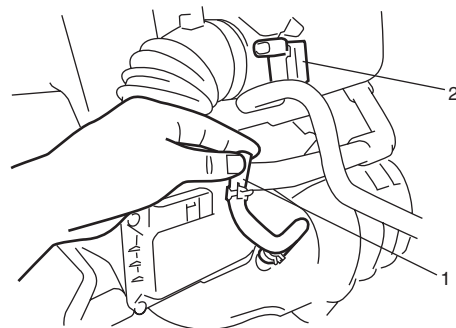
I5RW0A120008-01

Vacuum Passage Inspection

S6RW0E1206003

Start engine and run it at idle speed. Disconnect vacuum hose (1) from EVAP canister purge valve (2). With finger placed against disconnected hose, check that vacuum is applied.

If it is not applied, clean vacuum passage by blowing compressed air.



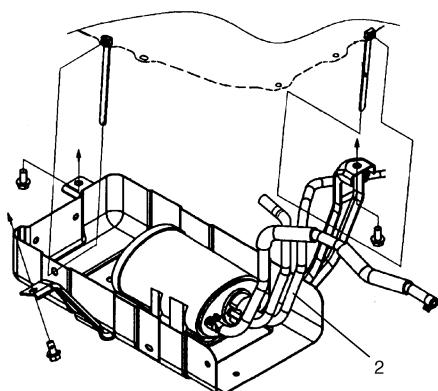
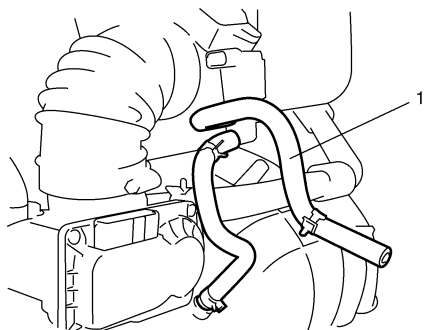
I5RW0A120003-01

Vacuum Hose Inspection

S6RW0E1206004

Check hoses for connection, leakage, clog and deterioration.

Replace as necessary.



I6RW0D120002-02

- | |
|--|
| 1. Purge hose (EVAP canister purge valve side) |
| 2. Purge pipe (EVAP canister side) |

EVAP Canister Purge Valve Inspection

S6RW0E1206005

⚠ WARNING

Do not apply vacuum by mouth; otherwise harmful fuel vapor can be breathed in.

⚠ CAUTION

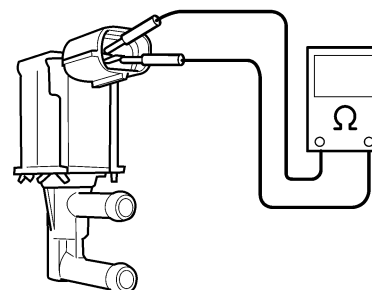
Do not apply vacuum more than -86 kPa (-12.47 psi); otherwise EVAP canister purge valve could be damaged.

- 1) With ignition switch turned OFF, disconnect coupler and vacuum hoses from canister purge valve.
- 2) Remove EVAP canister purge valve from air cleaner assembly.

- 3) Check resistance between two terminals of EVAP canister purge valve.
If resistance is not as specified, replace EVAP canister purge valve.

EVAP canister resistance

$30 - 34 \Omega$ at 20°C (68°F)



I3RM0A120008-01

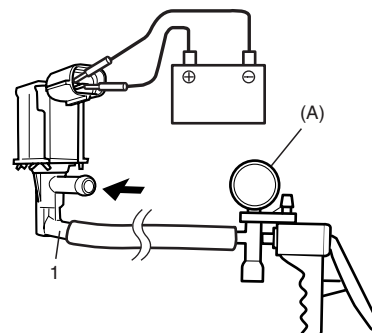
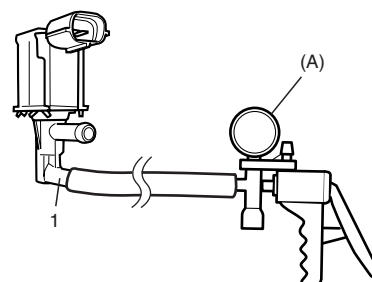
- 4) With coupler disconnected, apply vacuum (-60 kPa (-8.7 psi)) to pipe (1). If vacuum can be applied, go to next step. If vacuum can not be applied, replace EVAP canister purge valve.
- 5) In this state, connect 12 V-battery to EVAP canister purge valve terminals. If vacuum can not be applied, EVAP canister purge valve is in good condition. If applied, replace EVAP canister purge valve.

⚠ WARNING

Do not suck the air through valve. Fuel vapor inside valve is harmful.

Special tool

(A): 09917-47011



I3RB0A120007-01

- 6) Install EVAP canister purge valve to air cleaner assembly.

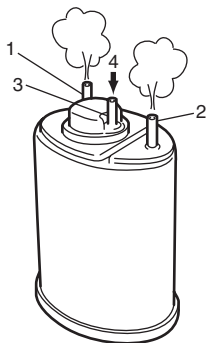
EVAP Canister Inspection

S6RW0E1206006

⚠ WARNING

DO NOT SUCK nozzles on EVAP canister.
Fuel vapor inside EVAP canister is harmful.

- 1) Check outside of EVAP canister visually.
 - 2) Disconnect vacuum hoses from EVAP canister.
 - 3) Check that there is no restriction of flow through purge pipe (1) and air pipe (2) when air is blown (4) into tank pipe (3).
- If any faulty condition is found in this inspection, replace EVAP canister.



I6RW0D120003-01

EGR Valve Removal and Installation

S6RW0E1206007

Removal

- 1) Disconnect negative cable at battery.
- 2) Remove air intake pipe.
- 3) Remove EGR pipe and gaskets.
- 4) Disconnect EGR valve connector.
- 5) Remove EGR valve and gasket from cylinder head.

Installation

Reverse removal procedure noting the following.

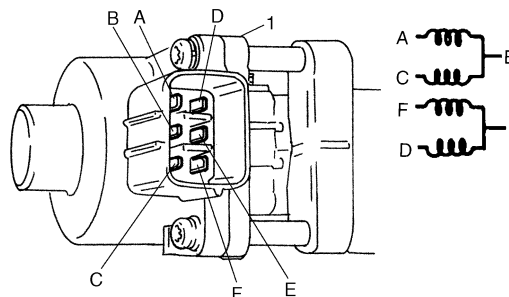
- Clean mating surface of valve and cylinder head.
- Use new gaskets.

EGR Valve Inspection

S6RW0E1206008

- 1) Check resistance between following terminals of EGR valve (1) in each pair.
 If found faulty, replace EGR valve assembly.

EGR valve resistance (A – B, C – B, F – E, D – E terminal)
20 – 24 Ω



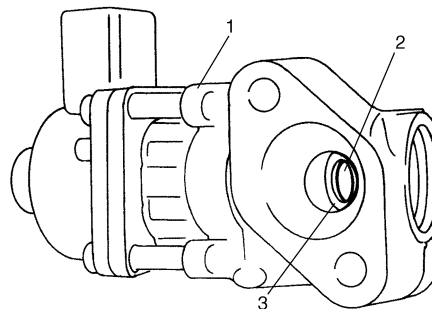
I2RH0B120005-01

- 2) Remove carbon from EGR valve gas passage.

⚠ CAUTION

Do not use any sharp-edged tool to remove carbon.
Be careful not to damage or bend EGR valve (1), valve seat (3) and rod.

- 3) Inspect valve (2), valve seat and rod for fault, cracks, bend or other damage.
 If found faulty, replace EGR valve assembly.



I2RH0B120006-01

PCV Hose Inspection

S6RW0E1206009

NOTE

Be sure to check that there is no obstruction in PCV valve or its hoses before checking IAC throttle valve opening, for obstructed PCV valve or hose hampers its accurate adjustment.

Check hoses for connection, leakage, clog and deterioration.

Replace as necessary.

PCV Valve Inspection

S6RW0E1206010

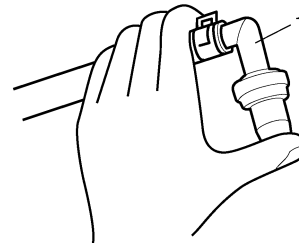
NOTE

Be sure to check that there is no obstruction in PCV valve or its hoses before checking IAC throttle valve opening, for obstructed PCV valve or hose hampers its accurate adjustment.

- 1) Detach air cleaner assembly.
- 2) Disconnect PCV valve from cylinder head cover and install plug to head cover hole.
- 3) Install air cleaner assembly temporarily.
- 4) Run engine at idle.

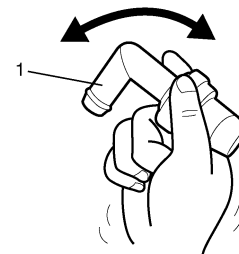
- 5) Place your finger over end of PCV valve (1) to check for vacuum.

If there is no vacuum, check for clogged valve. Replace as necessary.



I2RH0B120007-01

- 6) After checking vacuum, stop engine and remove PCV valve (1). Shake valve and listen for rattle of check needle inside the valve. If valve does not rattle, replace PCV valve.



I2RH0B120008-01

- 7) After checking, remove plug and install PCV valve.
- 8) Install air cleaner assembly securely.

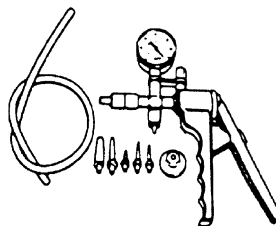
Special Tools and Equipment

Special Tool

S6RW0E1208001

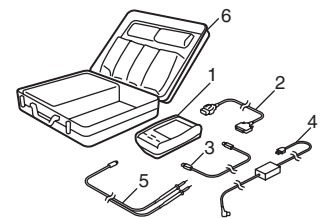
09917-47011

Vacuum pump gauge



SUZUKI scan tool (SUZUKI-SDT)

—
This kit includes following items. 1. SUZUKI-SDT 2. DLC3 cable 3. USB cable 4. AC/DC power supply 5. Voltage meter probe 6. Storage case



Engine Electrical Devices

Repair Instructions

Engine Control Module (ECM) Removal and Installation

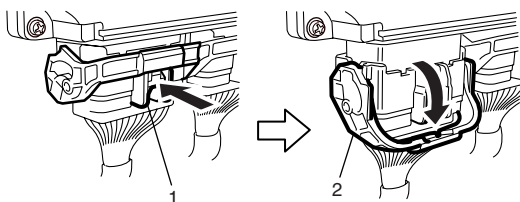
S6RW0E1306001

⚠ CAUTION

As ECM consists of precision parts, be careful not to expose it to excessive shock.

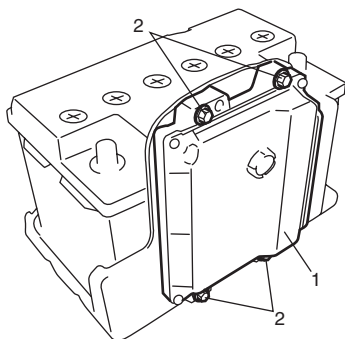
Removal

- 1) Disconnect negative cable at battery.
- 2) Disconnect connectors from ECM as follows.
 - a) Push lock (1) to release locking of lock lever (2).
 - b) Turn lock lever to arrow direction until it stops.



I4RS0A130003-01

- 3) Remove ECM (1) from its bracket by removing its mounting bolts (2).



I5RW0A130001-01

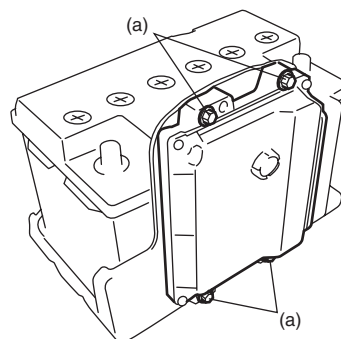
Installation

Reverse removal procedure noting the following:

- Tighten ECM mounting bolts to specified torque.

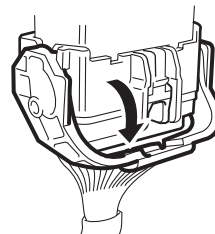
Tightening torque

ECM mounting bolt (a): 8 N·m (0.8 kgf-m, 6.0 lb-ft)



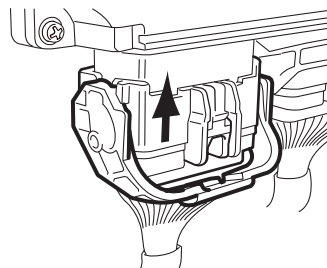
I5RW0A130002-01

- Connect connectors to ECM as follows.
 - a. Make sure that lock lever of ECM connector is unlock position.



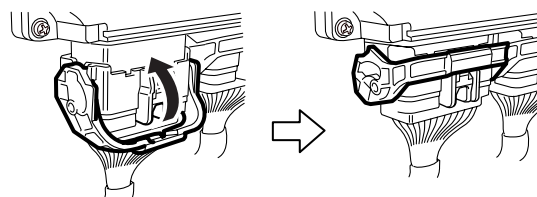
I4RS0B130021-01

- b. Insert ECM connectors to ECM until it stops with unlocked lock lever.



I4RS0B130022-01

- c. Lock ECM connectors securely by pulling its lock lever up.



I4RS0A130004-01

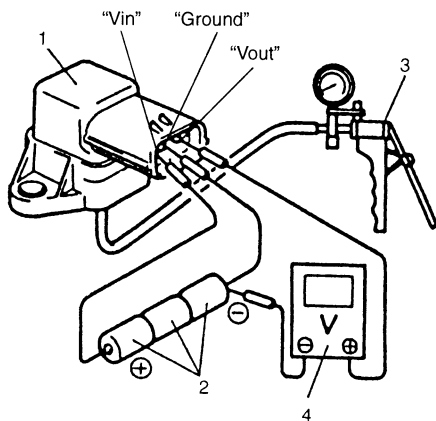
Manifold Absolute Pressure (MAP) Sensor Inspection

S6RW0E1306002

- 1) Remove air cleaner assembly.
- 2) Disconnect connector from MAP sensor.
- 3) Remove MAP sensor.
- 4) Arrange 3 new 1.5 V batteries (2) in series (check that total voltage is 4.5 – 5.0 V) and connect its positive terminal to “Vin” terminal of sensor and negative terminal to “Ground” terminal. Then check voltage between “Vout” and “Ground”. Also, check if voltage reduces when vacuum is applied up to 400 mmHg by using vacuum pump (3).
If check result is not satisfactory, replace MAP sensor (1).

Output voltage (When input voltage is 4.5 – 5.5 V, ambient temp. 20 – 30 °C, 68 – 86 °F)

Altitude (Reference)		Barometric pressure		Output voltage
(ft)	(m)	(mmHg)	(kPa)	(V)
0 – 2000	0 – 610	760 – 707	100 – 94	3.3 – 4.3
2001 – 5000	611 – 1524	Under 707 over 634	94 – 85	3.0 – 4.1
5001 – 8000	1525 – 2438	Under 634 over 567	85 – 76	2.7 – 3.7
8001 – 10000	2439 – 3048	Under 567 over 526	76 – 70	2.5 – 3.3



I3RM0A130005-01

- 5) Install MAP sensor securely.
- 6) Connect MAP sensor connector securely.
- 7) Install air cleaner assembly.

Electric Throttle Body Assembly On-Vehicle Inspection

S6RW0E1306003

⚠ WARNING

Never touch throttle valve with finger while ignition switch is turned ON and accelerator pedal is depressed. Otherwise, injury may result by pinching the finger between throttle valve and throttle body housing.

⚠ CAUTION

- Do not disassemble electric throttle body assembly.
- Do not expose electric throttle body assembly to excessive shock like a dropping it. If electric throttle body assembly has been exposed to excessive shock, it should be replaced.
- Be careful not to accrete a foreign material (like dust and/or metallic particle) to the throttle body housing and/or throttle valve. Otherwise, the throttle body assembly is breaking down by throttle valve accretion.
- Do not apply excessive moving force to throttle valve for throttle valve operation check and/or TP sensor performance check.
Otherwise, the throttle body assembly is breaking down by damaging the internal resinous gear of throttle valve actuator.

NOTE

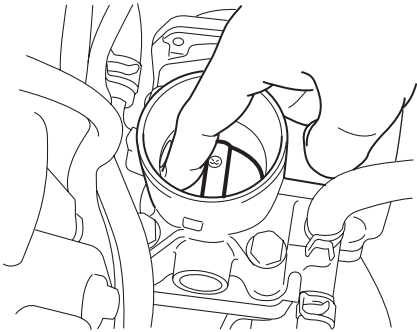
After replacing electric throttle body assembly, perform calibration of electric throttle body assembly referring to “Electric Throttle Body System Calibration”.

Throttle Valve Visual Check

- 1) Remove air cleaner outlet hose.
- 2) Check that there isn't any foreign matter caught between throttle valve and throttle body housing. If there is, take it out after removing throttle body referring to "Electric Throttle Body Assembly Removal and Installation in Section 1D in related manual" and clean inside of throttle body thoroughly.

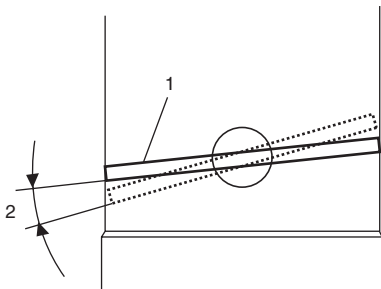
Throttle Valve Operation Check

- 1) Remove air cleaner outlet hose.
- 2) Turn OFF ignition switch.
- 3) Move throttle valve with finger to its full open position and check that it moves smoothly.



I4RS0B130004-01

- 4) Take off finger from opened throttle valve (1) which is at full open position and check that it moves smoothly by its return spring and open spring force back to default position (position where throttle valve is open by 7° (2) from completely closed position).
- 5) Move throttle valve with finger to its completely closed position and check that it moves smoothly.
- 6) Take off finger from closed throttle valve (1) which is at completely closed position and check that it moves smoothly by its return spring and open spring force back to default position.

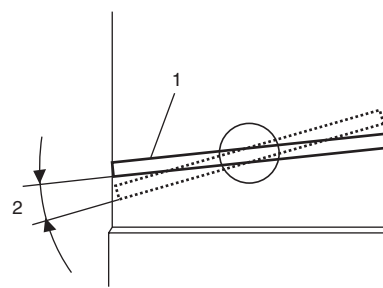


I4RS0B130005-01

If check result is not satisfactory, replace electric throttle body assembly.

Electric Throttle Body Assembly Operation Check

- 1) Remove air cleaner outlet hose.
- 2) Turn ON ignition switch.
- 3) Depress accelerator pedal gradually and check that throttle valve moves smoothly until it opens fully.
- 4) Release accelerator pedal depressed in Step 3) and check that throttle valve (1) moves back to default position (position where throttle valve is open by 7° (2) from its completely closed position).



I4RS0B130005-01

If check result is satisfactory, electric throttle body system is in good condition. If check result is not satisfactory, proceed to next step.

- 5) Perform "Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection", "Throttle Actuator (Motor) Check" and "Throttle Position Sensor Performance Check".

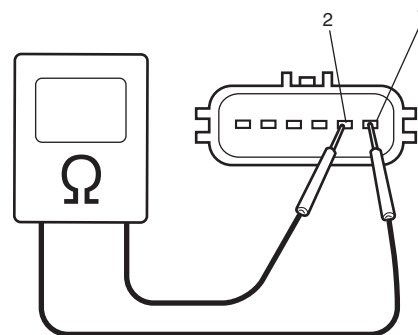
If check results are not satisfactory, replace electric throttle body assembly.

If check results are satisfactory, wire circuit and/or ECM are faulty.

Throttle Actuator (Motor) Check

- 1) Turn OFF ignition switch.
- 2) Disconnect connector from electric throttle body assembly.
- 3) Measure resistance between "M1" terminal (1) and "M2" terminal (2) of electric throttle body assembly. If measured resistance is out of specified value, replace electric throttle body assembly.

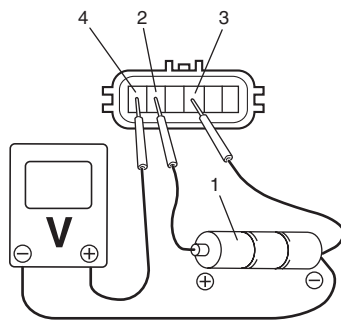
Throttle actuator (motor) resistance
0.3 – 100 Ω at 20 °C (68 °F)



I4RS0B130023-01

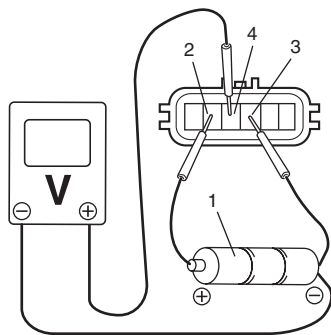
Throttle Position Sensor Performance Check

- 1) Remove air cleaner outlet hose.
- 2) Turn OFF ignition switch.
- 3) Disconnect connector from electric throttle body assembly.
- 4) Check throttle position sensor (main and sub) output voltage as following steps.
 - a) For throttle position sensor (main), arrange 3 new 1.5 V batteries (1) in series (check that total voltage is 4.5 – 5.0 V) and connect its positive terminal to “Vin” terminal (2) and negative terminal to “Ground” terminal (3) of sensor. Then using voltmeter, connect positive terminal to “Vout 1” terminal (4) of sensor and negative terminal to battery.



I4RS0B130007-02

- b) For throttle position sensor (sub), arrange 3 new 1.5 V batteries (1) in series (check that total voltage is 4.5 – 5.0 V) and connect its positive terminal to “Vin” terminal (2) and negative terminal to “Ground” terminal (3) of sensor. Then using voltmeter, connect positive terminal to “Vout 2” terminal (4) of sensor and negative terminal to battery.



I4RS0B130008-01

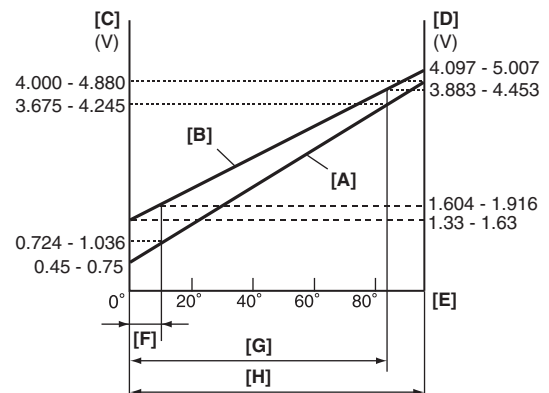
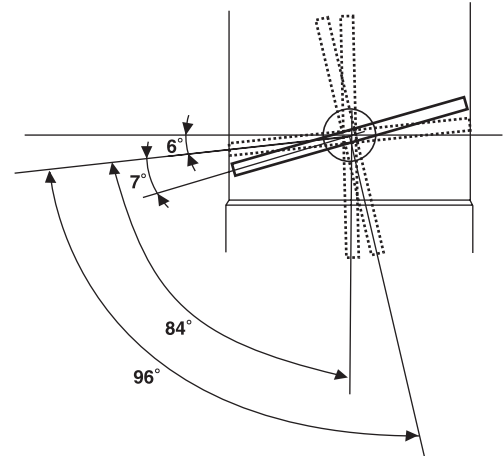
- c) Measure output voltage variation while throttle valve is opened and closed as following specification.

If sensor voltage is out of specified value and linear variation as the following graph, replace electric throttle body assembly.

TP sensor output voltage

TP sensor (main) [A]: 0.45 – 4.88 V, varying according to throttle valve opening by finger (Voltage should vary by 0.04 V for each 1° valve opening)

TP sensor (sub) [B]: 1.33 – 5.007 V, varying according to throttle valve opening by finger (Voltage should vary by about 0.032 V for each 1° valve opening)



I7RW01130019-05

[C]:	TP sensor (main) output voltage
[D]:	TP sensor (sub) output voltage
[E]:	Throttle valve opening
[F]:	Position where throttle valve is open by 7° from completely closed position (default position)
[G]:	Angle obtained when accelerator pedal is depressed fully (84°)
[H]:	Angle obtained when throttle valve is fully opened with finger (96°)

Electric Throttle Body System Calibration

S6RW0E1306004

NOTE

If the service described under the “Precautions of Electric Throttle Body System Calibration in Section 1A” is performed, calibrate electric throttle body system as follows.

- 1) If electric throttle body assembly and/or accelerator pedal position (APP) sensor assembly are replaced, perform following steps.
 - a) Disconnect negative cable at battery for 20 seconds or more for the purpose of clearing calibration data of closed throttle position from memory in ECM.
 - b) Connect negative cable to battery.
- 2) Keep ignition switch at ON position for 5 seconds or more without running engine.

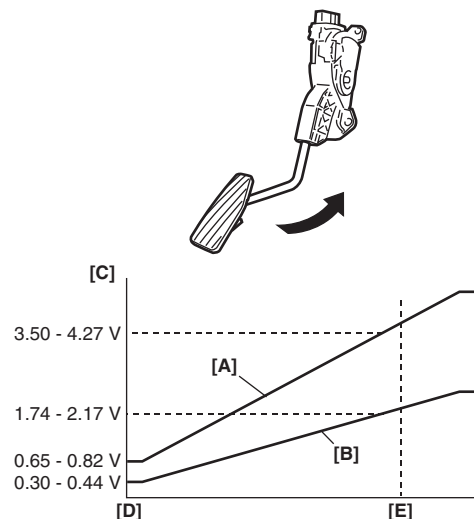
Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection

S6RW0E1306005

- 1) Check that APP sensor assembly has been mounted to vehicle body properly (no pinched floor carpet, etc.).
If mounting is not properly, reinstall APP sensor assembly properly referring to “Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation”.
- 2) Connect scan tool to DLC with ignition switch turned OFF.
- 3) Turn ON ignition switch and select “Data List” mode on scan tool.

- 4) Check that accelerator pedal position sensor voltage varies as the following graph.

If sensor voltage is out of specified value or does not vary linearly as the following graph, check APP sensor assembly referring to “Accelerator Pedal Position (APP) Sensor Assembly Inspection”.



I7RW01130020-01

[A]:	APP sensor (main) voltage
[B]:	APP sensor (sub) voltage
[C]:	Voltage
[D]:	Idle position of accelerator pedal
[E]:	Full depressed position of accelerator pedal

Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation

S6RW0E1306006

⚠ CAUTION

- Do not expose APP sensor assembly to excessive shock like a dropping it. If APP sensor assembly has been exposed to excessive shock, it should be replaced.
- Be careful not to expose sensor section of APP sensor assembly to water.

NOTE

After replacing APP sensor assembly, perform calibration of throttle valve referring to “Electric Throttle Body System Calibration”.

Removal

- 1) Disconnect negative cable at battery.
- 2) Disconnect connector from APP sensor assembly.
- 3) Remove APP sensor assembly from its bracket.

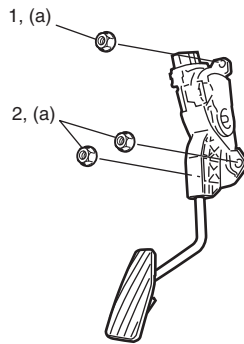
Installation

Reverse removal procedure for installation noting the following.

- Tighten APP sensor assembly upper nut (1) first and then lower nuts (2) to specified torque.

Tightening torque

APP sensor assembly nut (a): 6 N·m (0.6 kgf·m, 4.5 lb-ft)



I5RW0A130004-01

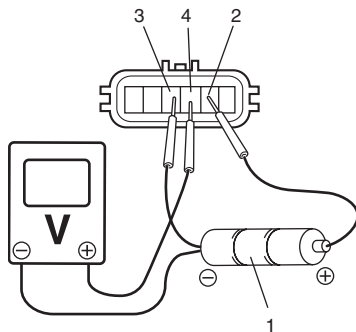
- Connect connector to APP sensor assembly securely.

Accelerator Pedal Position (APP) Sensor Assembly Inspection

S6RW0E1306007

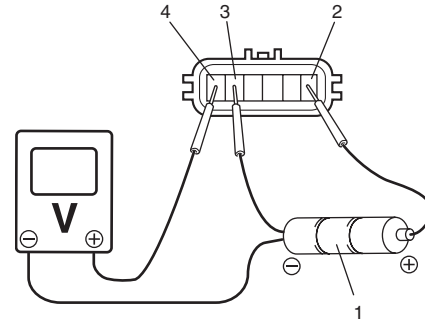
Check APP sensor (main and sub) output voltage as following steps.

- 1) For APP sensor (main), arrange 3 new 1.5 V batteries (1) in series (check that total voltage is 4.5 – 5.0 V) and connect its positive terminal to “Vin 1” terminal (2) and negative terminal to “Ground 1” terminal (3) of sensor. Then using voltmeter, connect positive terminal to “Vout 1” terminal (4) of sensor and negative terminal to battery.



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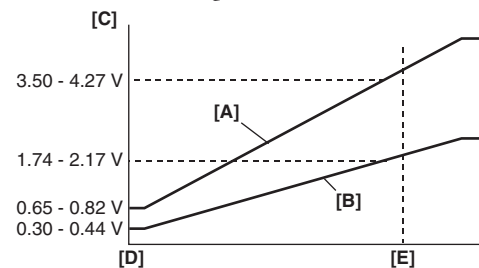
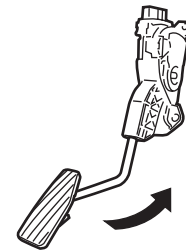
- 2) For APP sensor (sub), arrange 3 new 1.5 V batteries (1) in series (check that total voltage is 4.5 – 5.0 V) and connect its positive terminal to “Vin 2” terminal (2) and negative terminal to “Ground 2” terminal (3) of sensor. Then using voltmeter, connect positive terminal to “Vout 2” terminal (4) of sensor and negative terminal to battery.



I5RW0A130006-02

- 3) Measure output voltage variation while accelerator pedal is no depressed and fully depressed as following graph.

If sensor voltage is out of specified value or does not vary linearly as the following graph, replace APP sensor assembly.



I7RW01130020-01

[C]:	Voltage
[D]:	Idle position of accelerator pedal
[E]:	Fully depressed position of accelerator pedal

Engine Coolant Temperature (ECT) Sensor Removal and Installation

S6RW0E1306008

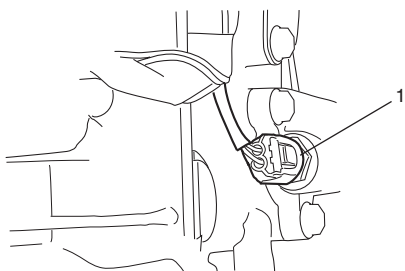
Removal

- 1) Disconnect negative cable at battery.
- 2) Drain coolant referring to "Cooling System Draining in Section 1F in related manual".

⚠ WARNING

To avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot.
Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

- 3) Remove air intake pipe.
- 4) Disconnect connector from ECT sensor (1).



I2RH0B130008-01

- 5) Remove ECT sensor from water outlet.

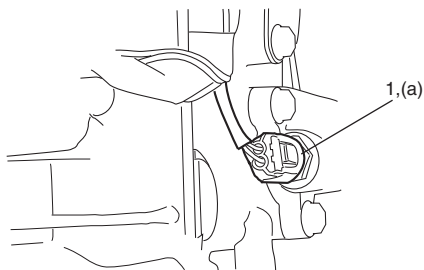
Installation

Reverse removal procedure noting the following:

- Clean mating surfaces of ECT sensor and water outlet.
- Check O-ring for damage and replace, if necessary.
- Tighten ECT sensor (1) to specified torque.

Tightening torque

ECT sensor (a): 15 N·m (1.5 kgf-m, 11.0 lb-ft)



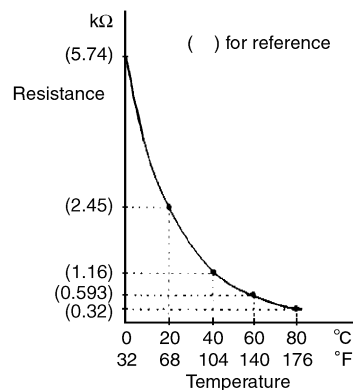
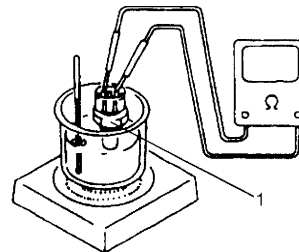
I2RH0B130009-01

- Connect connector to ECT sensor securely.
- Refill coolant referring to "Cooling System Flush and Refill in Section 1F in related manual".

Engine Coolant Temperature (ECT) Sensor Inspection

S6RW0E1306009

Immerse temperature sensing part of ECT sensor (1) in water (or ice) and measure resistance between sensor terminals while heating water gradually. If measured resistance doesn't show such characteristic as shown, replace ECT sensor.



I5RW0A130007-01

Air Fuel Ratio (A/F) Sensor On-Vehicle Inspection

S6RW0E1306021

Heater

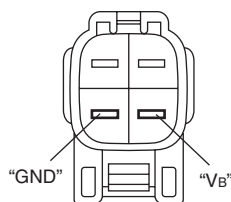
- 1) Disconnect A/F sensor connector.
- 2) Using ohmmeter, measure resistance of Sensor heater between terminals "VB" and "GND" at sensor connector. If found faulty, replace A/F sensor.

NOTE

Temperature of sensor affects resistance value largely. Make sure that sensor heater is at correct temperature.

A/F sensor heater resistance
 $2.2 - 2.6 \, \Omega$ at $20 \, ^\circ\text{C}$ ($68 \, ^\circ\text{F}$)

Viewed from terminal side



I6RW0E130001-01

- 3) Connect A/F sensor connector securely.

Heated Oxygen Sensor (HO2S-2) Heater On-Vehicle Inspection

S6RW0E1306010

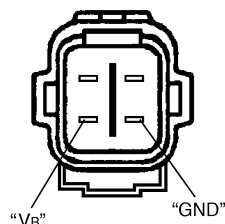
- 1) Disconnect sensor connector.
- 2) Using ohmmeter, measure resistance between terminals "V_B" and "GND" of sensor connector. If found faulty, replace oxygen sensor.

NOTE

Temperature of sensor affects resistance value largely. Make sure that sensor heater is at correct temperature.

Resistance of oxygen sensor heater
 $11.7 - 14.5 \, \Omega$ at $20 \, ^\circ\text{C}$ ($68 \, ^\circ\text{F}$)

Viewed from terminal side



I6RW0E130002-01

- 3) Connect sensor connector securely.

Air Fuel / Ratio (A/F) Sensor and Heated Oxygen Sensor (HO2S-2) Removal and Installation

S6RW0E1306011

Removal

⚠ WARNING

To avoid danger of being burned, do not touch exhaust system when system is hot. Oxygen sensor removal should be performed when system is cool.

- 1) Disconnect negative cable at battery.
- 2) Disconnect connector of A/F sensor and/or HO2S-2 and release its wire harness from clamps.
- 3) Perform following items before removing A/F sensor and/or HO2S-2.
 - a) For A/F sensor, remove exhaust manifold referring to "Exhaust Manifold Removal and Installation in Section 1K in related manual", if necessary.
 - b) For HO2S-2, hoist vehicle.
- 4) Remove HO2S-2 from exhaust pipe or exhaust manifold.

Installation

Reverse removal procedure noting the following.

- Tighten A/F sensor and/or HO2S-2 to specified torque.

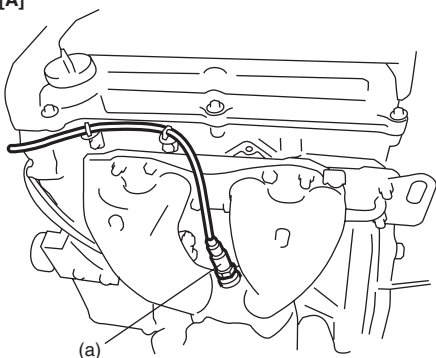
Tightening torque

A/F sensor (a): 45 N·m (4.5 kgf-m, 32.5 lb-ft)

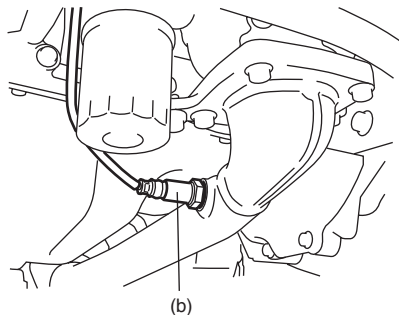
HO2S-2 (b): 45 N·m (4.5 kgf-m, 32.5 lb-ft)

- Install exhaust manifold referring to "Exhaust Manifold Removal and Installation in Section 1K in related manual", if removed.
- Connect connector of A/F sensor and/or HO2S-2 and clamp wire harness securely.
- After installing A/F sensor and/or HO2S-2, start engine and check that no exhaust gas leakage exists.

[A]



[B]



I6RW0E130003-02

[A]: A/F sensor

[B]: HO2S-2

Camshaft Position (CMP) Sensor Removal and Installation

S6RW0E1306012

Removal

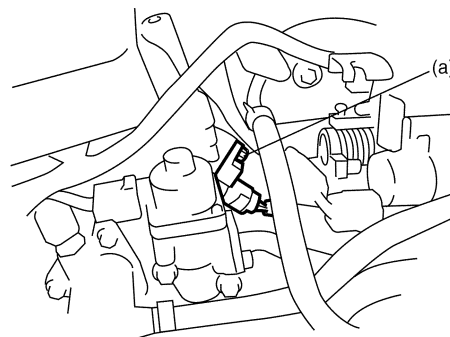
- 1) Disconnect negative cable at battery.
- 2) Disconnect connector from CMP sensor.
- 3) Remove camshaft position sensor from cylinder head.

Installation

- 1) Install camshaft position sensor to cylinder head.

Tightening torque

CMP sensor bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)



I6RW0E130004-02

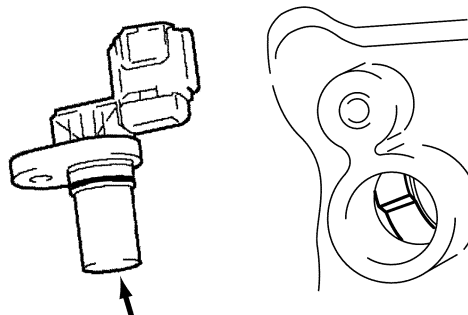
- 2) Connect connector to CMP sensor securely.
- 3) Connect negative cable to battery.

Camshaft Position (CMP) Sensor Inspection

S6RW0E1306013

Visual check

- Check that O-ring is free from damage.
- Check that end face of sensor and signal rotor tooth are free from any metal particles and damage.



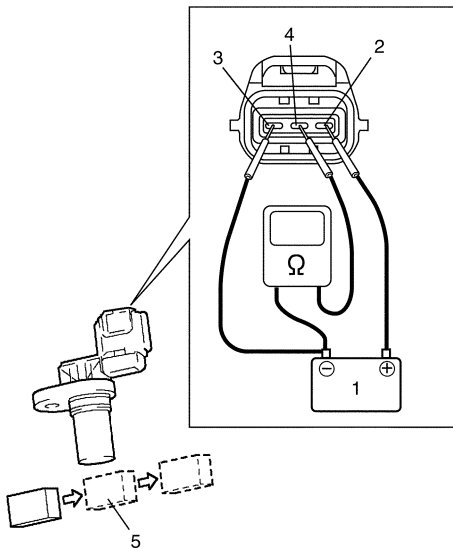
I4RS0B130015-01

Performance check

- 1) Remove metal particles on end face of CMP sensor, if any.
- 2) Arrange 12 V battery (1) and connect its positive terminal to "Vin" terminal (2) and negative terminal to "Ground" terminal (3) of sensor. Then using ohmmeter, measure resistance between "Vout" terminal (4) of sensor and negative terminal of battery by passing magnetic substance (iron) (5) while keeping approximately 1 mm (0.03 in.) gap with respect to end face of CMP sensor.
If resistance does not vary as specified below, replace CMP sensor.

CMP sensor resistance

Resistance varies from less than 220 Ω (ON) to infinity (OFF) or from infinity (OFF) to less than 220 Ω (ON)



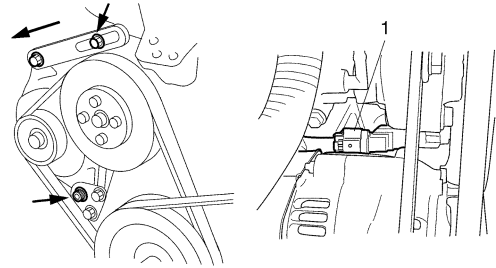
I6RW0E130005-01

Crankshaft Position (CKP) Sensor Removal and Installation

S6RW0E1306014

Removal

- 1) Disconnect negative cable at battery.
- 2) Remove generator drive belt, loosen pivot bolt and move generator rearward.
- 3) Disconnect connector from crankshaft position sensor.
- 4) Remove crankshaft position sensor (1) from cylinder block.



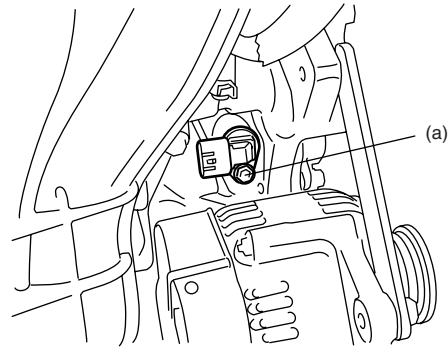
I2RH0B130012-01

Installation

- 1) Install crankshaft position sensor to cylinder block. Tighten CKP sensor bolt to specified torque.

Tightening torque

CKP sensor bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)



I4RS0A130007-01

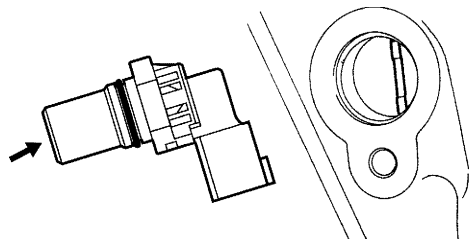
- 2) Connect connector to CKP sensor securely.
- 3) Adjust generator drive belt tension referring to "Water Pump / Generator Drive Belt Tension Inspection and Adjustment in Section 1F in related manual".
- 4) Connect negative cable to battery.

Crankshaft Position (CKP) Sensor Inspection

S6RW0E1306015

Visual check

- Check that O-ring is free from damage.
- Check that end face of sensor and signal pulley tooth are free from any metal particles and damage.



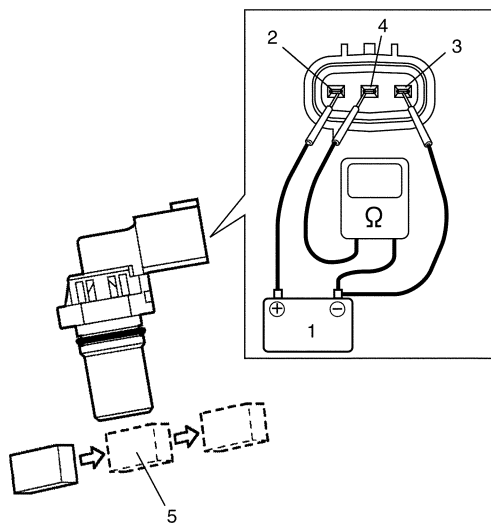
I3RB0A130006-01

Performance check

- 1) Remove metal particles on end face of CKP sensor, if any.
- 2) Arrange 12 V battery (1) and connect its positive terminal to "Vin" terminal (2) and negative terminal to "Ground" terminal (3) of sensor. Then using ohmmeter, measure resistance between "Vout" terminal (4) of sensor and negative terminal of battery by passing magnetic substance (iron) (5) while keeping approximately 1 mm (0.03 in.) gap with respect to end face of CKP sensor. If resistance does not vary as specified below, replace CKP sensor.

CKP sensor resistance

Resistance varies from less than 220 Ω (ON) to infinity (OFF) or from infinity (OFF) to less than 220 Ω (ON)



I4RS0B130017-01

Knock Sensor Removal and Installation

S6RW0E1306016

Removal

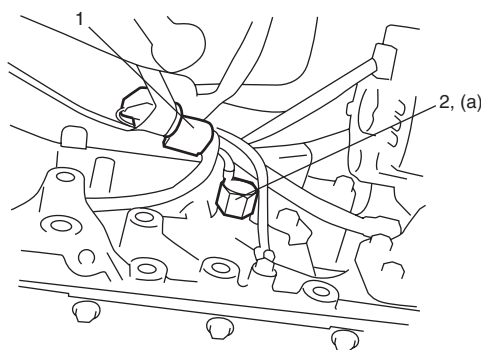
- 1) Disconnect negative cable at battery.
- 2) Hoist vehicle.
- 3) Remove right side drive shaft referring to "Front Drive Shaft Assembly Removal and Installation: Front in Section 3A in related manual".
- 4) Disconnect knock sensor connector (1).
- 5) Remove knock sensor (2) from cylinder block.

Installation

Reverse removal procedure for installation.

Tightening torque

Knock sensor (a): 22 N·m (2.2 kgf-m, 16.0 lb-ft)

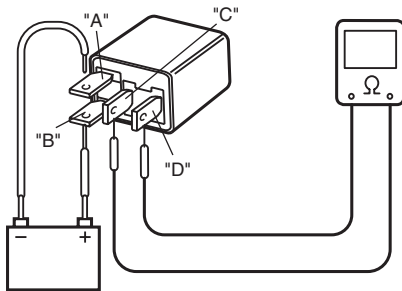
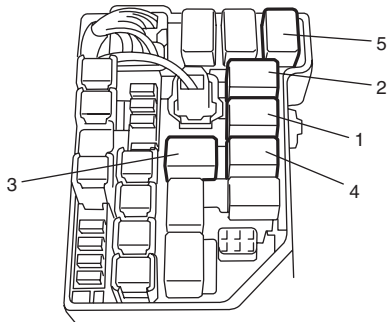


I5RW0A130009-01

Engine and Emission Control System Relay Inspection

S6RW0E1306017

- 1) Disconnect negative cable at battery.
- 2) Remove main relay (1), fuel pump relay (3), starting motor control relay (2), throttle actuator control relay (4) and/or radiator cooling fan relay (5) from individual circuit fuse box No.1.
- 3) Check that there is no continuity between terminal "C" and "D". If there is continuity, replace relay.
- 4) Connect battery positive (+) terminal to terminal "B" of relay. Connect battery negative (-) terminal to terminal "A" of relay. Check for continuity between terminal "C" and "D". If there is no continuity when relay is connected to the battery, replace relay.



I5RW0A130014-01

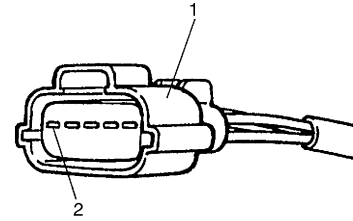
Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection

S6RW0E1306018

NOTE

Before performed this inspection, be sure to read the "Precautions of ECM Circuit Inspection in Section 1A".

- 1) Disconnect negative cable at battery.
- 2) Disconnect MAF and IAT sensor connector.
- 3) Connect voltmeter to "BLK/RED" wire terminal (2) of MAF and IAT sensor connector (1) disconnected and ground.

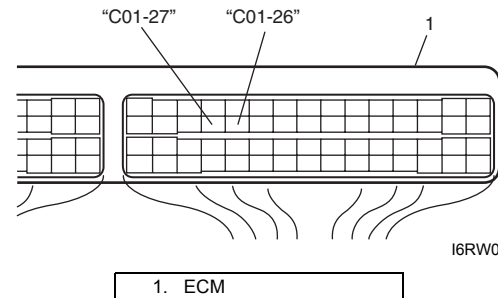


I3RB0A130009-01

- 4) Turn ON ignition switch position and check that voltage is battery voltage. If not, check if wire harness is open or connection is poor.
- 5) Turn OFF ignition switch position and connect connector to MAF and IAT sensor.
- 6) Remove ECM from its bracket referring to "Engine Control Module (ECM) Removal and Installation".
- 7) Connect special tool between ECM and ECM connector referring to "Inspection of ECM and Its Circuits in Section 1A".
- 8) Turn ON ignition switch position and check MAF signal voltage between "C01-26" terminal circuit and "C01-27" terminal circuit of special tool.

MAF signal voltage between "C01-26" terminal circuit and "C01-27" terminal circuit of special tool

MAF signal voltage of MAF and IAT sensor with ignition switch turned ON: 0.5 – 1.0 V



I6RW0D130003-02

- 9) Start engine and check that voltage is lower than 5 V and it rises as engine speed increases.

MAF signal voltage between "C01-26" terminal circuit and "C01-27" terminal circuit of special tool

MAF signal reference voltage of MAF and IAT sensor at specified Idle speed: 1.3 – 1.8 V

- 10) If check result is not as specified above, cause may lie in wire harness, connector connection, MAF and IAT sensor or ECM.

Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Removal and Installation

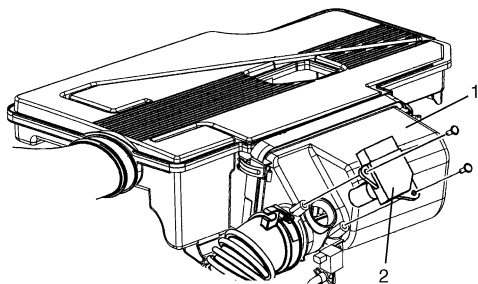
S6RW0E1306019

⚠ CAUTION

- Do not disassemble MAF and IAT sensor.
- Do not expose MAF and IAT sensor to any shock.
- Do not clean MAF and IAT sensor.
- If MAF and IAT sensor has been dropped, it should be replaced.
- Do not blow compressed air by using air gun or the like.
- Do not put finger or any other object into MAF and IAT sensor. Malfunction may occur.

Removal

- 1) Disconnect negative cable at battery.
- 2) Disconnect MAF and IAT sensor connector.
- 3) Remove air cleaner case (1).
- 4) Remove MAF and IAT sensor (2) from air cleaner case.



I6RW0D130004-02

Installation

Reverse removal procedure noting the followings.

- Tighten MAF and IAT sensor screws to specified torque.

Tightening torque

MAF and IAT sensor screw: 1.5 N·m (0.15 kgf-m, 1.1 lb-ft)

- Connect MAF and IAT sensor connector securely.

Intake Air Temperature (IAT) Sensor Inspection

S6RW0E1306020

⚠ CAUTION

Do not heat up MAF and IAT sensor more than 100 °C (212 °F). Otherwise, MAF and IAT sensor will be damaged.

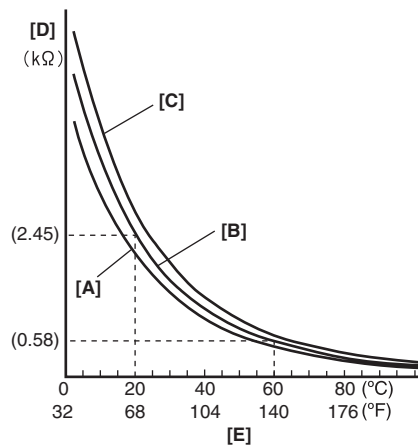
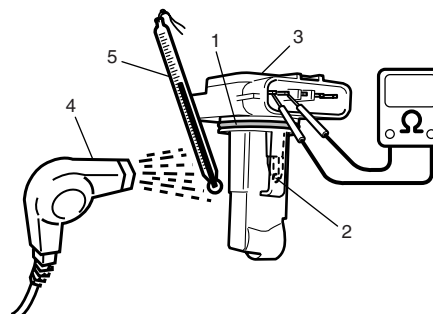
- Check sensor O-ring (1) for damage and deterioration. Replace as necessary.
 - Blow hot air to temperature sensing part (2) of MAF and IAT sensor (3) using hot air drier (4) and measure resistance between sensor terminals while heating air gradually.
- If measured resistance does not show such characteristic as shown, replace MAF and IAT sensor.

Intake air temperature sensor resistance

-20 °C (-4 °F): 13.6 – 18.4 kΩ

20 °C (68 °F): 2.21 – 2.69 kΩ

60 °C (140 °F): 0.493 – 0.667 kΩ



I4RS0A130012-01

[A]: Lower limit	[D]: Resistance
[B]: Nominal	[E]: Temperature
[C]: Upper limit	5. Temperature gauge

Electric Load Current Sensor On-Vehicle Inspection

S6RW0E1306022

Using SUZUKI Scan Tool

- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Check "Battery Current" displayed on scan tool at following condition.

Battery current

Ignition switch ON: 5.0 – 10.0 A

Ignition switch ON, headlight ON: 22.0 – 27.0 A

Ignition switch ON, headlight ON and blower motor switch is HI position: 35.0 – 40.0 A

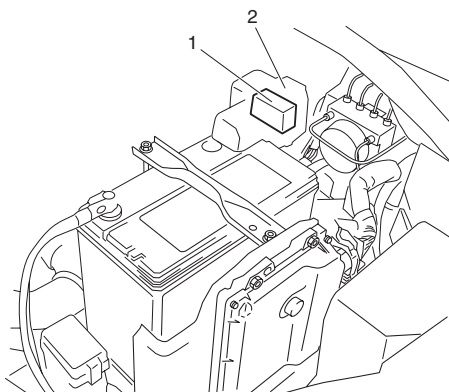
Engine running at idle speed, headlight ON, blower motor switch is HI position and rear defogger switch ON: 50.0 – 58.0 A

If check result is satisfactory, electric load current sensor is in good condition.

If check result is not satisfactory, check the following parts and circuit.

- Electric load current sensor circuit (power, ground and output)
- Following charging system components
 - Battery (refer to "Battery Inspection in Section 1J in related manual")
 - Generator (refer to "Generator Inspection in Section 1J in related manual")
 - Generator output control circuit (refer to "Generator Test (Undercharged Battery Check) in Section 1J in related manual")
 - Generator field coil monitor circuit (refer to "Generator Inspection in Section 1J in related manual")

If electric load current sensor circuit and charging system is in good condition, electric load current sensor (1) is faulty.



I6RW0E130006-01

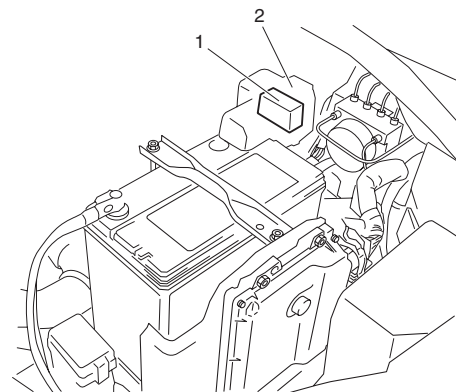
2. Main fuse box

Without Using SUZUKI Scan Tool

- 1) Measure sensor voltage between "C01-9" terminal of ECM connector and vehicle body ground referring to "Inspection of ECM and Its Circuits in Section 1A". If check result is satisfactory, electric load current sensor is in good condition. If check result is not satisfactory, check the following parts and circuit.

- Electric load current sensor circuit (power, ground and output)
- Following charging system components
 - Battery (refer to "Battery Inspection in Section 1J in related manual")
 - Generator (refer to "Generator Inspection in Section 1J in related manual")
 - Generator output control circuit (refer to "Generator Test (Undercharged Battery Check) in Section 1J in related manual")
 - Generator field coil monitor circuit (refer to "Generator Inspection in Section 1J in related manual")

If electric load current sensor circuit and charging system is in good condition, electric load current sensor (1) is faulty.



I6RW0E130006-01

2. Main fuse box

Specifications

Tightening Torque Specifications

S6RW0E1307001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
ECM mounting bolt	8	0.8	6.0	☞
ECT sensor	15	1.5	11.0	☞
A/F sensor	45	4.5	32.5	☞
HO2S-2	45	4.5	32.5	☞
CMP sensor bolt	11	1.1	8.0	☞
CKP sensor bolt	11	1.1	8.0	☞
Knock sensor	22	2.2	16.0	☞
MAF and IAT sensor screw	1.5	0.15	1.1	☞

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A in related manual”.

Ignition System

General Description

Ignition System Construction

S6RW0E1801001

The ignition system is an electronic (distributorless) ignition system. It consists of the parts as described below.

- **ECM**

It detects the engine and vehicle conditions through the signals from the sensors, determines the most suitable ignition timing and time for electricity to flow to the primary coil and sends a signal to the ignitor (power unit) in the ignition coil assembly.

- **Ignition coil assembly (including an ignitor)**

The ignition coil assembly has a built-in ignitor which turns ON and OFF the current flow to the primary coil according to the signal from ECM. When the current flow to the primary coil is turned OFF, a high voltage is induced in the secondary coil.

- **High-tension cords and spark plugs**

- **CMP sensor (Camshaft position sensor) and CKP sensor (Crankshaft position sensor)**

Using signals from these sensors, ECM identifies the specific cylinder whose piston is in the compression stroke, detects the crank angle and adjusts initial ignition timing automatically.

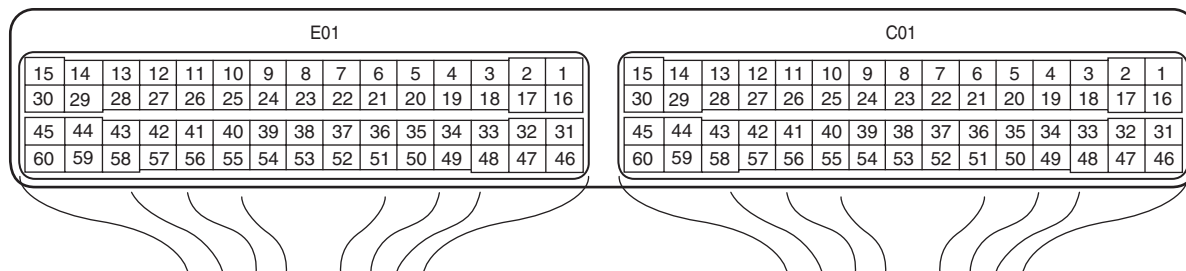
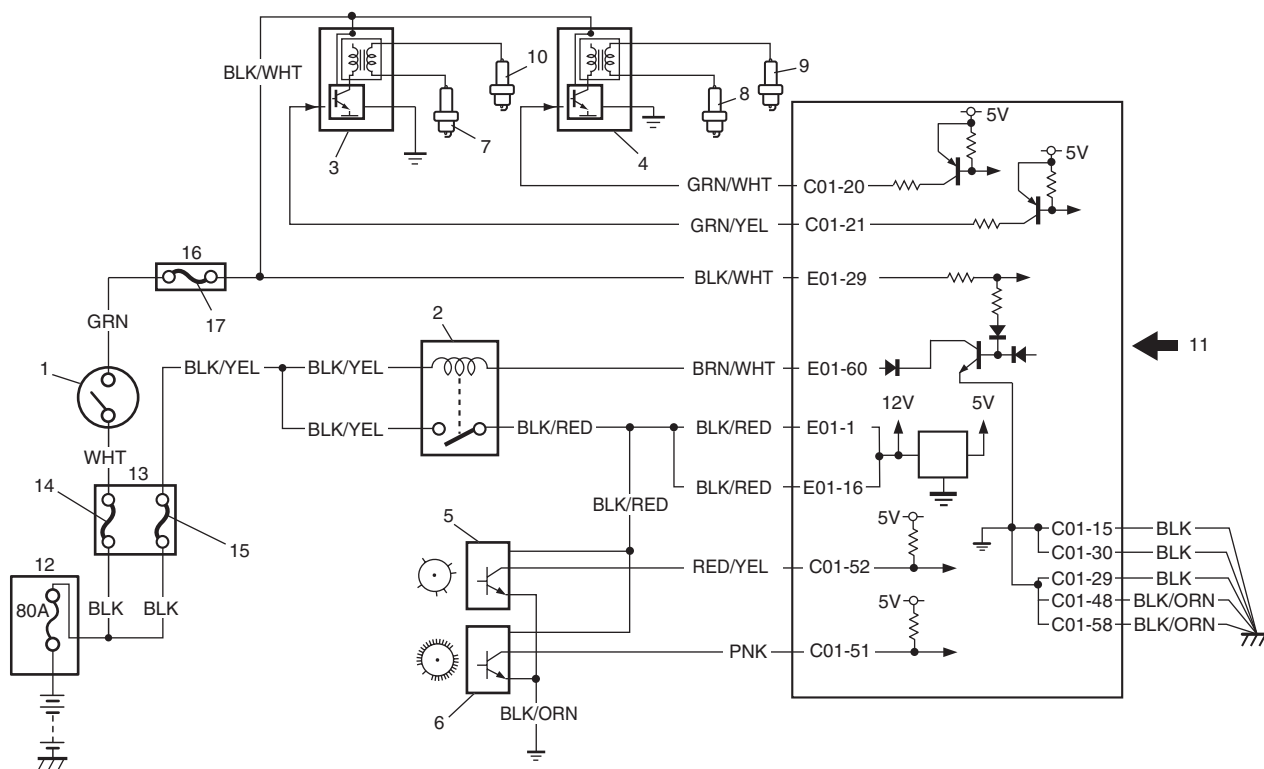
- **TP sensor, ECT sensor, MAP sensor, MAF sensor, IAT sensor, knock sensor and other sensors / switches**

Although this ignition system does not have a distributor, it has two ignition coil assemblies (one is for No.1 and No.4 spark plugs and the other is for No.2 and No.3 spark plugs). When an ignition signal is sent from ECM to the ignitor in the ignition coil assembly for No.1 and No.4 spark plugs, a high voltage is induced in the secondary coil and that passes through the high-tension cords and causes No.1 and No.4 spark plugs to spark simultaneously. Likewise, when an ignition signal is sent to the ignitor in the other ignition coil assembly, No.2 and No.3 spark plugs spark simultaneously.

Schematic and Routing Diagram

Ignition System Wiring Circuit Diagram

S6RW0E1802001



I6RW0E180001-01

1. Ignition switch	7. No.1 spark plug	13. Relay box
2. Main relay	8. No.2 spark plug	14. "IG ACC" fuse
3. Ignition coil assembly for No.1 and No.4 spark plugs	9. No.3 spark plug	15. "FI" fuse
4. Ignition coil assembly for No.2 and No.3 spark plugs	10. No.4 spark plug	16. Junction block assembly
5. CMP sensor	11. Sensed information	17. "IG COIL" fuse
6. CKP sensor	12. Battery fuse box	

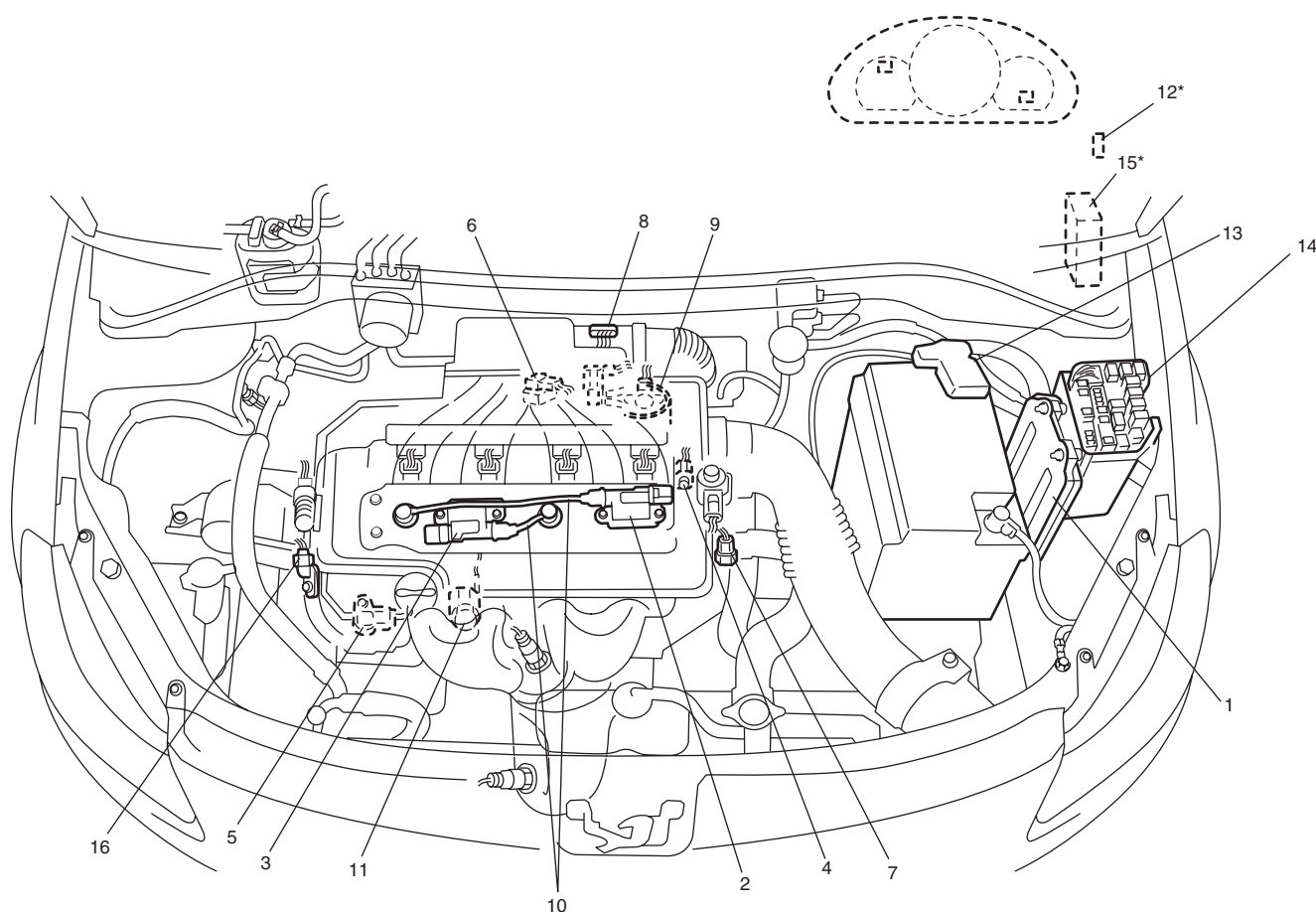
Component Location

Ignition System Components Location

S6RW0E1803001

NOTE

The figure shows left-hand steering vehicle. For right-hand steering vehicle, parts with (*) are installed at the opposite side.



I5RW0C180002-01

1. ECM	7. ECT sensor	13. Battery fuse box
2. Ignition coil assembly for No.1 and No.4 spark plugs	8. MAF and IAT sensor	14. Relay box
3. Ignition coil assembly for No.2 and No.3 spark plugs	9. Electric throttle body assembly	15. Junction block assembly
4. CMP sensor	10. High-tension cords	16. CMP sensor
5. CKP sensor	11. Knock sensor	
6. MAP sensor	12. Data link connector	

Diagnostic Information and Procedures

Ignition System Symptom Diagnosis

S6RW0E1804001

Condition	Possible cause	Correction / Reference Item
Engine cranks, but will not start or hard to start (No spark)	Blown fuse for ignition coil	Replace.
	Loose connection or disconnection of lead wire or high-tension cord(s)	Connect securely.
	Faulty high-tension cord(s)	Replace.
	Faulty spark plug(s)	Replace.
	Faulty ignition coil	Replace ignition coil assembly.
	Faulty CKP sensor or CKP sensor plate	Clean, tighten or replace.
	Faulty CMP sensor or sensor rotor tooth of camshaft	Clean, tighten or replace.
	Faulty ECM	Replace.
Poor fuel economy or engine performance	Incorrect ignition timing	Check related sensors and CKP sensor plate.
	Faulty spark plug(s) or high-tension cord(s)	Adjust, clean or replace.
	Faulty ignition coil assembly	Replace.
	Faulty CKP sensor or CKP sensor plate	Clean, tighten or replace.
	Faulty CMP sensor or sensor rotor tooth of camshaft	Clean, tighten or replace.
	Faulty knock sensor	Replace.
	Faulty ECM	Replace.

Reference Waveform of Ignition System

S6RW0E1804002

Refer to "Reference waveform No.5", "Reference waveform No.6" and "Reference waveform No.7" under "Inspection of ECM and Its Circuits in Section 1A" for waveform of Ignition trigger signal.

Ignition System Check

S6RW0E1804003

Step	Action	Yes	No
1	Was "Engine and Emission Control System Check" performed?	Go to Step 2.	Go to "Engine and Emission Control System Check in Section 1A".
2	Ignition spark test 1) Check all spark plugs for condition and type referring to "Spark Plug Inspection". 2) If OK, perform ignition spark test referring to "Ignition Spark Test". <i>Is spark emitted from all spark plugs?</i>	Go to Step 12.	Go to Step 3.
3	DTC check 1) Perform DTC check referring to "DTC Check in Section 1A". <i>Is DTC stored in ECM?</i>	Go to applicable DTC diag. flow.	Go to Step 4.
4	Electrical connection check 1) Check ignition coil assemblies and high-tension cords for electrical connection. <i>Are they connected securely?</i>	Go to Step 5.	Connect securely.
5	High-tension cords check 1) Check high-tension cord for resistance referring to "High-Tension Cord Inspection". <i>Is check result satisfactory?</i>	Go to Step 6.	Replace high-tension cord(s).

Step	Action	Yes	No
6	Ignition coil assembly power supply and ground circuit check 1) Check ignition coil assembly power supply and ground circuits for open and short. <i>Are circuits in good condition?</i>	Go to Step 7.	Repair or replace.
7	Ignition coil assembly check 1) Check ignition coil for resistance referring to "Ignition Coil Assembly (Including Ignitor) Inspection". <i>Is check result satisfactory?</i>	Go to Step 8.	Replace ignition coil assembly.
8	CKP sensor check 1) Check CKP sensor referring to "Crankshaft Position (CKP) Sensor Inspection in Section 1C". <i>Is check result satisfactory?</i>	Go to Step 9.	Tighten CKP sensor bolt, replace CKP sensor or CKP sensor plate.
9	CMP sensor check 1) Check CMP sensor referring to "Camshaft Position (CMP) Sensor Inspection in Section 1C". <i>Is check result satisfactory?</i>	Go to Step 10.	Tighten CMP sensor bolt, replace CMP sensor or intake camshaft.
10	Ignition trigger signal circuit check 1) Check ignition trigger signal wire for open, short and poor connection. <i>Is circuit in good condition?</i>	Go to Step 11.	Repair or replace.
11	A known-good ignition coil assembly substitution 1) Substitute a known-good ignition coil assembly and then repeat Step 2. <i>Is check result of Step 2 satisfactory?</i>	Go to Step 12.	Substitute a known-good ECM and then repeat Step 2.
12	Ignition timing check 1) Check initial ignition timing and ignition timing advance referring to "Ignition Timing Inspection". <i>Is check result satisfactory?</i>	System is in good condition.	Go to Step 13.
13	Knock sensor check 1) Confirm that knock sensor circuit is in good condition referring to "DTC P0327 / P0328: Knock Sensor Circuit Low / High in Section 1A". 2) Check oscilloscope waveform of knock sensor signal referring to "Reference waveform No.19" and "Reference waveform No.20" under "Inspection of ECM and Its Circuits in Section 1A". <i>Is check result satisfactory?</i>	Check CMP sensor, CMP sensor rotor tooth of camshaft, CKP sensor, CKP sensor plate and/or input signals related to this system.	Substitute a known-good knock sensor and recheck.

Ignition Spark Test

S6RW0E1804004

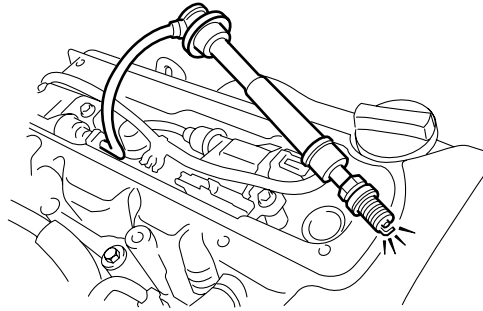
- 1) Remove air cleaner assembly with air intake pipe.
- 2) Disconnect all injector couplers from injectors.

⚠ WARNING

Without disconnection of injector couplers, combustible gas may come out from spark plug holes during this test and may get ignited in engine room.

- 3) Remove spark plug and check it for condition and type referring to "Spark Plug Inspection".
- 4) If OK, connect ignition coil coupler to ignition coil assembly and connect spark plug to ignition coil assembly or high-tension cord. Ground spark plug.

- 5) Crank engine and check if each spark plug sparks.



I4RS0A180006-01

- 6) If no spark is emitted, inspect the related parts as described in "Ignition System Symptom Diagnosis".

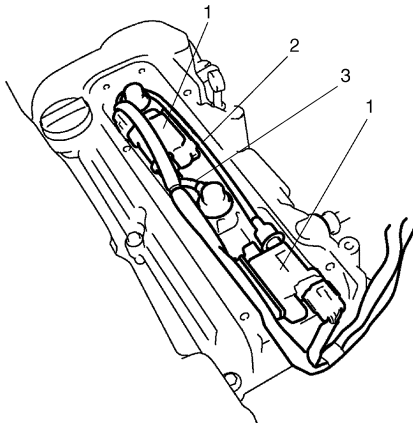
Repair Instructions

High-Tension Cord Removal and Installation

S6RW0E1806001

Removal

- 1) Remove air cleaner assembly with air intake pipe and cylinder head upper cover.
- 2) Disconnect No.1 cylinder (2) and No.3 cylinder (3) high-tension cords from ignition coil assemblies (1) while gripping each cap.



I4RS0A180003-01

- 3) Pull out high-tension cords from spark plugs while gripping each cap.

⚠ CAUTION

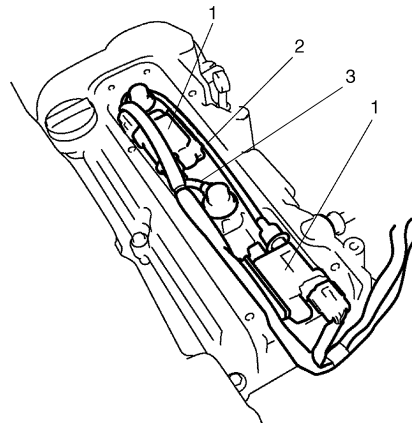
- Removal of high-tension cords together with clamps will be recommended so as not to damage their inside wire (resistive conductor).
- For the same reason, pull out each connection by gripping cap portion.

Installation

- 1) Install No.1 cylinder (2) and No.3 cylinder (3) high-tension cords to spark plugs and ignition coil assemblies (1) while gripping each cap.

⚠ CAUTION

- Never attempt to use metal conductor high-tension cords as replacing parts.
- Insert each cap portion fully when installing high-tension cords.



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High-Tension Cord Inspection

S6RW0E1806002

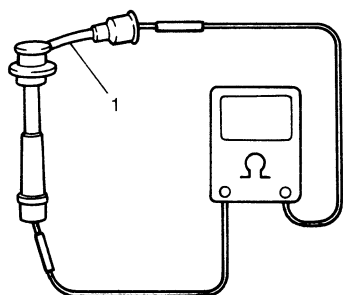
Measure resistance of high-tension cord (1) by using ohmmeter.

If resistance exceeds specification, replace high-tension cord(s).

High-tension cord resistance

No.1 cylinder high-tension cord resistance: 1.4 – 4.0 kΩ

No.3 cylinder high-tension cord resistance: 0.6 – 2.0 kΩ



I2RH0B180005-01

Spark Plug Removal and Installation

S6RW0E1806003

Removal

- 1) Remove air cleaner assembly with air intake pipe and cylinder head upper cover.
- 2) Pull out high-tension cords by gripping their caps and then remove ignition coil assemblies referring to "Ignition Coil Assembly (Including Ignitor) Removal and Installation".
- 3) Remove spark plugs.

Installation

- 1) Install spark plugs and tighten them to specified torque.

Tightening torque

Spark plug: 25 N·m (2.5 kgf-m, 18.0 lb-ft)

- 2) Install ignition coil assemblies referring to "Ignition Coil Assembly (Including Ignitor) Removal and Installation".
- 3) Install high-tension cords securely by gripping their caps.
- 4) Install cylinder head upper cover and air cleaner assembly with air intake pipe.

Spark Plug Inspection

S6RW0E1806004

⚠ CAUTION

- When servicing the iridium / platinum spark plugs (slender center electrode type plugs), do not touch the center electrode to avoid damage to it. The electrode is not strong enough against mechanical force as it is slender and its material is not mechanically tough.
- Do not clean or adjust gap for the iridium / platinum spark plugs.

Inspect spark plug for:

- Electrode wear
- Carbon deposits
- Insulator damage

If any abnormality is found for nickel spark plugs, adjust air gap, clean with spark plug cleaner or replace it with specified new plug.

For iridium / platinum spark plugs, replace it with new plug.

Spark plug air gap

"a": 1.0 – 1.1 mm (0.040 – 0.043 in.)

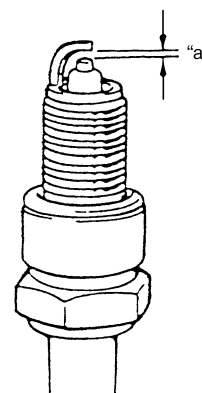
Spark plug type

NGK: BKR6E-11 (Nickel) / IFR6J11 (Iridium)

DENSO: K20PR-U11 (Nickel)

NOTE

NGK IFR6J11 is highly recommended for better engine starting performance under –25 °C (–13 °F).



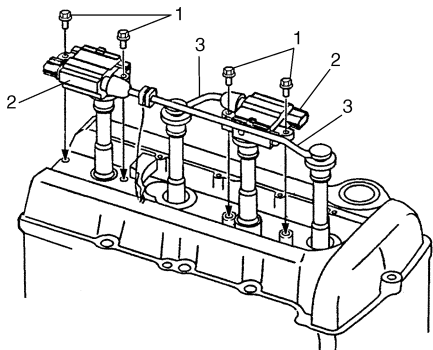
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Ignition Coil Assembly (Including Ignitor) Removal and Installation

S6RW0E1806005

Removal

- 1) Disconnect negative cable at battery.
- 2) Remove air cleaner assembly with air intake pipe and cylinder head upper cover.
- 3) Disconnect ignition coil coupler.
- 4) Disconnect high-tension cord (3) from ignition coil assembly (2).
- 5) Remove ignition coil bolts (1) and then pull out ignition coil assembly.



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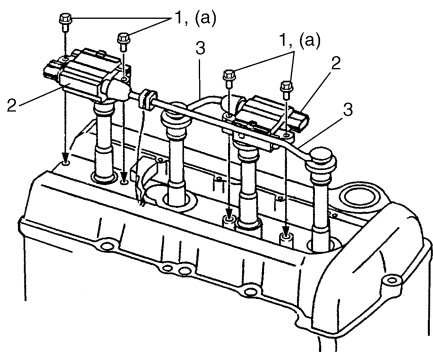
Installation

- 1) Install ignition coil assembly (2).
- 2) Tighten ignition coil bolts (1) to specified torque, and then connect ignition coil coupler.

Tightening torque

Ignition coil bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)

- 3) Install high-tension cord (3) to ignition coil assembly while gripping its cap.



I3RM0A180004-01

- 4) Install cylinder head upper cover and air cleaner assembly with air intake pipe.
- 5) Connect negative cable to battery.

Ignition Coil Assembly (Including Ignitor) Inspection

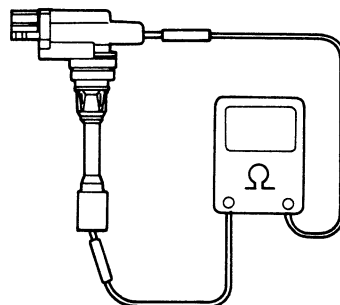
S6RW0E1806006

Measure secondary coil for resistance.

If resistance is out of specification, replace ignition coil assembly.

Secondary coil resistance

7.6 – 10.2 kΩ at 20 ° (68 °F)



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Ignition Timing Inspection

S6RW0E1806007

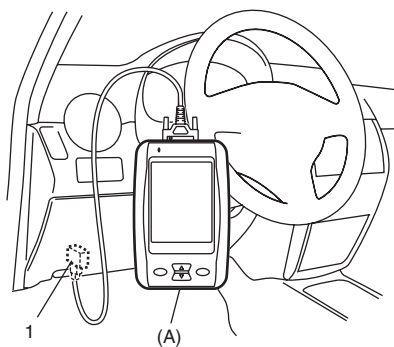
NOTE

- Ignition timing is not adjustable. If ignition timing is out of specification, check system related parts.
- Before starting engine, place transmission gear shift lever in "Neutral", and set parking brake.

- 1) Connect scan tool to DLC (1) with ignition switch OFF.

Special tool

(A): SUZUKI scan tool (SUZUKI-SDT)



I5RW0C110011-01

- 2) Start engine and warm it up to normal operating temperature.
- 3) Make sure that all of electrical loads except ignition are switched off.
- 4) Check to be sure that idle speed is within specification.
- 5) Fix ignition timing by using "Fixed Spark Control" of "Engine / Active Test" mode on scan tool.
- 6) Set timing light (1) to high-tension cord for No.1 cylinder and check that ignition timing is within specification.

Initial ignition timing (fixed with SUZUKI scan tool)

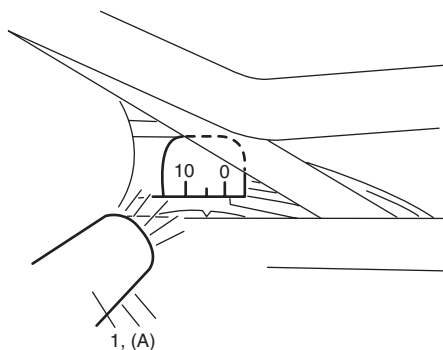
5 ± 3° BTDC (at specified idle speed)

Ignition order

1 – 3 – 4 – 2

Special tool

(A): 09930-76420



I3RB0A180004-01

- 7) If ignition timing is out of specification, check the followings.
 - CKP sensor
 - CKP sensor plate
 - TP sensor
 - CMP sensor
 - CMP sensor rotor tooth of camshaft
 - Vehicle speed signal from ABS hydraulic unit / control module
 - Knock sensor
 - Timing chain cover installation
 - 8) After checking initial ignition timing, release ignition timing fixation by using scan tool.
 - 9) With engine idling (throttle opening at closed position and vehicle stopped), check that ignition timing is about 5° – 15° BTDC (Constant variation within a few degrees from 5° – 15° BTDC indicates no abnormality but proves operation of electronic timing control system.) Also, check that increasing engine speed advances ignition timing.
- If the check results are not satisfactory, check CKP sensor and ECM.

Specifications

Tightening Torque Specifications

S6RW0E1807001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Spark plug	25	2.5	18.0	
Ignition coil bolt	11	1.1	8.0	

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A in related manual”.

Special Tools and Equipment

Special Tool

S6RW0E1808001

09930-76420		SUZUKI scan tool (SUZUKI-SDT)	
Timing-light (dry cell type)		— This kit includes following items. 1. SUZUKI-SDT 2. DLC3 cable 3. USB cable 4. AC/DC power supply 5. Voltage meter probe 6. Storage case	

Section 5

Transmission / Transaxle

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Automatic Transmission/Transaxle

Precautions

Precautions in Diagnosing Trouble

S6RW0E5100001

- Do not disconnect couplers from TCM, battery cable from battery, TCM ground wire harness from engine or main fuse before checking the diagnostic information (DTC, freeze frame data, etc.) stored in TCM memory. Such disconnection will clear memorized information in TCM memory.
- Diagnostic information stored in TCM memory can be cleared as well as checked by using SUZUKI scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
- Be sure to read "Precautions for Electrical Circuit Service in Section 00 in related manual" before inspection and observe what is written there.
- TCM and/or ECM replacement
 - When substituting a known-good TCM and/or ECM, check that all relays and actuators have resistance of specified value.
Neglecting this check may result in damage to good TCM and/or ECM.
- Communication of ECM, BCM, combination meter, keyless start control module (if equipped), ABS control module, 4WD control module (if equipped), steering angle sensor (if equipped), TCM and DLC, is established by CAN (Controller Area Network). (For more detail of CAN communication for ECM, refer to "CAN Communication System Description"). Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System in Section 00 in related manual".

Precautions for Disassembly and Reassembly

S6RW0E5100002

When repairing automatic transaxle, it is necessary to conduct the on-vehicle test to investigate where the cause of the trouble lies first.

Then whether overhaul should be done or not is determined. If the transaxle is disassembled without such preliminary procedure, not only the cause of the trouble would be unknown, but also a secondary trouble may occur and often time would be wasted.

As the automatic transaxle consists of high precision component, the following cautions should be strictly observed when handling its parts in disassembly and reassembly.

- Disassembling valve body assembly is prohibited essentially. However, a few parts can be disassembled. When disassembling valve body component parts, confirm whether their parts are allowed to disassemble or not referring to "Valve Body Assembly Disassembly and Reassembly".
- When component part of forward clutch, direct clutch, 2nd brake and/or O/D and 2nd coast brake, namely clutch disc, brake disc, retaining plate and/or separator plate, have been replaced, all learned contents, which have been stored in TCM memory by executing learning control, should be initialized referring to "Learning Control Initialization".
- Make sure to wash dirt off from the transaxle so that no such dirt will enter the transaxle during dismounting and remounting.
- Select a clean place free from dust and dirt for overhauling.
- Place a rubber mat on the work bench to protect parts from damage.
- Work gloves or shop cloth should not be used. (Use a nylon cloth or a paper towel.)
- When separating the case joint, do not pry with a screwdriver or such but tap with a plastic hammer lightly.
- Make sure to wash dirt off from the transaxle so that no such dirt will enter the transaxle during disassembly and reassembly.
- Wash the disassembled parts in ATF (Automatic Transaxle Fluid) or kerosene (using care not to allow ATF or kerosene to get on your face, etc.) and confirm that each fluid passage is not clogged by blowing air into it. But use kerosene to wash the discs, resin washers and rubber parts.
- Replace each gasket, oil seal and O-ring with a new one.
- Apply ATF to sliding or rotating parts before reassembly.

⚠ CAUTION

- Keep component parts in group for each subassembly and avoid mixing them up.
 - Clean all parts with cleaning solvent thoroughly and air dry them.
 - Use kerosene or automatic transaxle fluid as cleaning solvent.
 - Do not use wiping cloths or rags to clean or dry parts.
 - All oil passages should be blown out and checked to make sure that they are not obstructed.
 - Keep face and eyes away from solvent spray while air blowing parts.
 - Check mating surface for irregularities and remove them, if any, and clean it again.
 - Soak new clutch discs and brake discs in transaxle fluid for at least 2 hours before assembly.
 - Replace all gaskets and O-ring with new ones.
 - Apply automatic transaxle fluid to all O-rings.
 - When installing seal ring, be careful so that it is not expanded excessively, extruded or caught.
 - Replace oil seals that are removed and apply grease to their lips.
 - Before installing, be sure to apply automatic transaxle fluid to sliding, rolling and thrusting surface of all component part. Also after installation, make sure to check each part for proper operation.
 - Always use torque wrench when tightening bolts.
-
- A new discs should be soaked in ATF at least 2 hours before use.

Part Inspection and Correction Table

Part	Inspect for	Correction
Casted part, machined part	Small flaw, burr	Remove with oil stone.
	Deep or grooved flaw	Replace part.
	Clogged fluid passage	Clean with air or wire.
	Flaw on installing surface, residual gasket	Remove with oil stone or replace part.
	Crack	Replace part.
Bearing	Unsmooth rotation	Replace.
	Streak, pitting, flaw, crack	Replace.
Bushing, thrust washer	Flaw, burr, wear, burning	Replace.
Oil seal, gasket	Flawed or hardened seal ring	Replace.
	Worn seal ring on its periphery or side	Replace.
	Piston seal ring, oil seal, gasket, etc.	Replace.
Gear	Flaw, burr	Replace.
	Worn gear tooth	Replace.
Splined part	Burr, flaw, torsion	Correct with oil stone or replace.
Snap ring	Wear, flaw, distortion	Replace.
	No interference	Replace.
Thread	Burr	Replace.
	Damage	Replace.
Spring	Settling, sign of burning	Replace.
Friction plate	Wear, burning, distortion, damaged claw	Replace.
Separator plate, retaining plate	Wear, burning, distortion, damaged claw	Replace.
Sealing surface (where lip contacts)	Flaw, rough surface, stepped wear, foreign material	Replace.

General Description

A/T Description

S6RW0E5101001

This automatic transaxle is electronic control full automatic transaxle with forward 4-speed and reverse 1-speed.

The torque converter is a 3-element, 1-step and 2-phase type and is equipped with an automatically controlled lock-up mechanism.

The gear change device consists of a ravnigneau type planetary gear unit, 3 multiple disc type clutches, 3 multiple disc type brakes and 2 one-way clutches.

The hydraulic pressure control device consists of a valve body assembly, pressure control solenoid valve (linear solenoid), 2 shift solenoid valves, TCC pressure control solenoid valve (linear solenoid) and a timing solenoid valve. Optimum line pressure complying with engine torque is produced by the pressure control solenoid valve in dependence upon control signal from transmission control module (TCM). This makes it possible to control the line pressure with high accuracy in accordance with the engine power and running conditions to achieve smooth shifting characteristics and high efficiency.

A clutch-to-clutch control system is provided for shifting between 3rd gear and 4th gear. This clutch-to-clutch control system is made to function optimally, so that hydraulic pressure controls such as shown below are conducted.

- When upshifting from 3rd gear to 4th gear, to adjust the drain hydraulic pressure at releasing the forward clutch, a timing solenoid valve is used to switch a hydraulic passage with an orifice to another during shifting.
- When downshifting from 4th gear to 3rd gear, to adjust the line pressure applied to the forward clutch at engaging the forward clutch, a timing solenoid valve is used to switch a hydraulic passage with an orifice to another during shifting.
- When upshifting from 3rd gear to 4th gear with engine throttle opened, to optimize the line pressure applied to the forward clutch at releasing the forward clutch, the learning control is processed to compensate the switching timing of the timing solenoid at every shifting.
- When downshifting from 4th gear to 3rd gear with engine throttle opened, to optimize the line pressure applied to the forward clutch at engaging the forward clutch, the learning control is processed to compensate the line pressure at every shifting.

Employing the ravnigneau type planetary gear unit and this clutch-to-clutch control system greatly simplifies the construction to make possible a lightweight and compact transaxle.

A line pressure learning control is conducted to provide optimum shifting time at every upshifting with engine throttle opened. If long upshifting time is detected, the subsequent line pressure applied during upshifting is intensified. On the contrary, if short upshifting time is detected, the subsequent line pressure applied during upshifting is weakened.

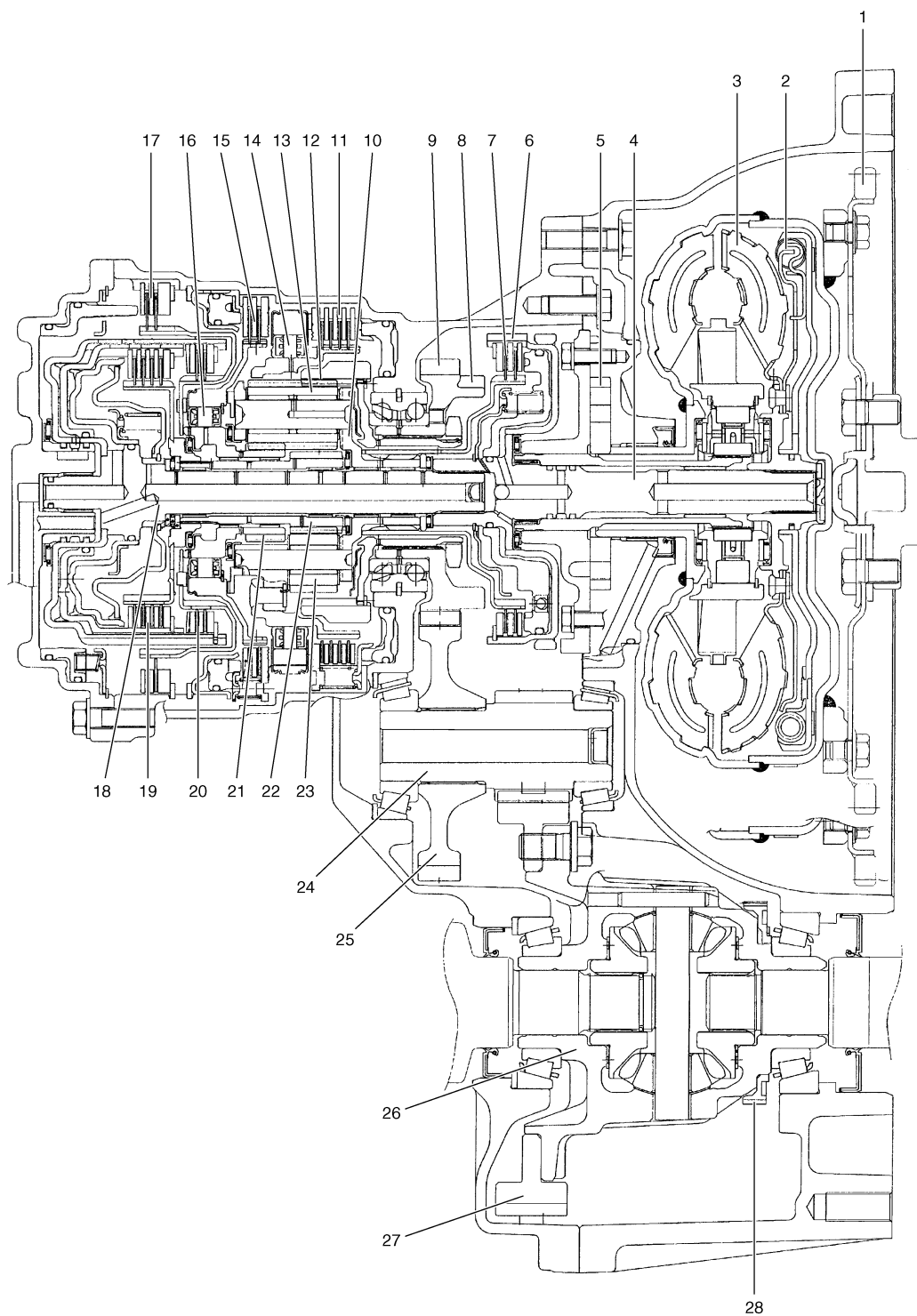
Slip controlled lock-up function

Even at a lower speed than when the TCC gets engaged completely, control over the TCC pressure control solenoid works to cause the TCC to slip (be engaged slightly), thereby improving the transmission efficiency. While such slip control is being executed, the oil pressure applied to the TCC is controlled by the TCC pressure control solenoid so that the difference between the engine speed and the input shaft speed becomes close to the specified value.

Also, during deceleration, the TCC is made to slip (be engaged slightly) to raise the engine speed and enlarge the fuel cut operation range so that better fuel consumption is achieved.

Due to this reason, it is absolutely necessary for the automatic transmission to use ATF suitable for slip control. Use of any fluid other than the specified ATF may cause juddering or some other faulty condition to occur.

5A-4 Automatic Transmission/Transaxle:



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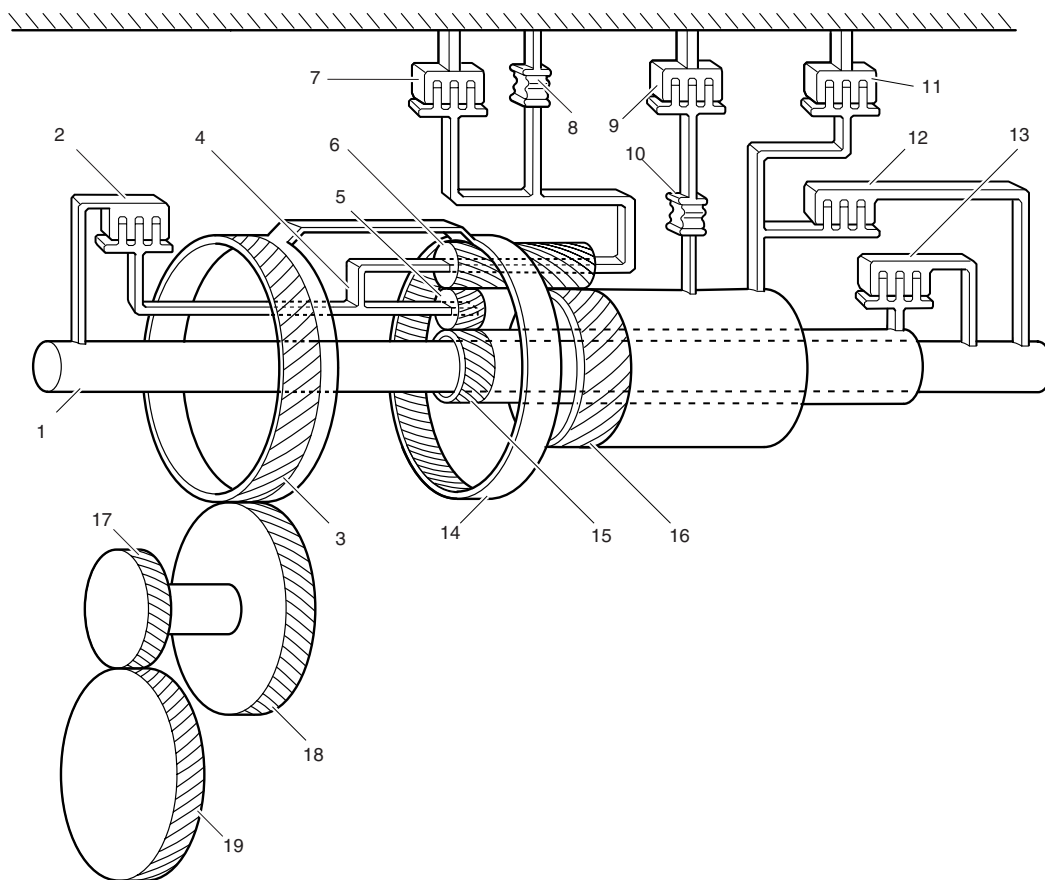
1. Drive plate	11. 1st and reverse brake	21. Rear sun gear
2. Torque converter clutch (TCC)	12. Ring gear	22. Front sun gear
3. Torque converter	13. Long planet pinion	23. Short planet pinion
4. Input shaft	14. One-way No.2 clutch	24. Countershaft
5. Oil pump	15. 2nd brake	25. Reduction driven gear
6. Direct clutch drum (double as sensor rotor for input shaft speed sensor)	16. One-way No.1 clutch	26. Differential case assembly
7. Direct clutch	17. O/D and 2nd coast brake	27. Final gear
8. Parking lock gear	18. Intermediate shaft	28. Output shaft speed sensor (VSS) drive gear
9. Reduction drive gear	19. Forward clutch	
10. Planet carrier	20. Reverse clutch	

Specifications

Item		Specifications	
Torque converter	Type	3-element, 1-step, 2-phase type (with TCC (lock-up) mechanism)	
	Stall torque ratio	1.9 – 2.1	
Oil pump	Type	Internal involute gear type oil pump (non crescent type)	
	Drive system	Engine driven	
Gear change device	Type	Forward 4-step, reverse 1-step planetary gear type	
	Shift position	"P" range	Gear in neutral, output shaft fixed, engine start
		"R" range	Reverse
		"N" range	Gear in neutral, engine start
		"D" range	Forward 1st ↔ 2nd ↔ 3rd ↔ 4th automatic gear change
		"3" range	Forward 1st ↔ 2nd ↔ 3rd ← 4th automatic gear change
		"2" range	Forward 1st ↔ 2nd ← 3rd automatic gear change
		"L" range	Forward 1st ← 2nd ← 3rd reduction, and fixed at 1st gear
	Gear ratio	1st	2.875
		2nd	1.568
		3rd	1.000
		4th (overdrive gear)	0.697
		Reverse (reverse gear)	2.300
	Control elements		Wet type multiple-disc clutch... 3 sets Wet type multiple-disc brake... 3 sets One-way clutch... 2 sets
	Reduction gear ratio		1.023
	Final gear reduction ratio		4.277
Lubrication	Lubrication system		Force feed system by oil pump
Cooling	Cooling system		Radiator assisted cooling (water-cooled)
Fluid used		SUZUKI ATF 3317 or Mobil ATF 3309	

Clutch / Brake / Planetary Gear Function of Automatic Transaxle

S6RW0E5101002



I4RS0A510001-01

1. Input shaft and intermediate shaft	8. One-way No.2 clutch	15. Front sun gear
2. Direct clutch	9. 2nd brake	16. Rear sun gear
3. Reduction drive gear	10. One-way No.1 clutch	17. Final drive gear
4. Planet carrier	11. O/D and 2nd coast brake	18. Reduction driven gear
5. Short planet pinion	12. Reverse clutch	19. Final driven gear
6. Long planet pinion	13. Forward clutch	
7. 1st and reverse brake	14. Ring gear	

Functions

Part name	Function
Forward clutch	Meshes intermediate shaft and front sun gear
Direct clutch	Meshes input shaft and planet carrier
Reverse clutch	Meshes intermediate shaft and rear sun gear
O/D and 2nd coast brake	Fixes rear sun gear
2nd brake	Fixes rear sun gear
1st and reverse brake	Fixes planet carrier
One-way No.1 clutch	Prevents rear sun gear from turning counterclockwise
One-way No.2 clutch	Prevents planet carrier from turning counterclockwise

Table of Component Operation

S6RW0E5101003

Select lever position	Gear position	Part					
		Shift solenoid valve-A (No.1)	Shift solenoid valve-B (No.2)	TCC solenoid valve	Forward clutch	Direct clutch	Reverse clutch
P	Parking	○	○	×	×	×	×
R	Reverse	○	○	×	×	×	○
N	Neutral	○	○	×	×	×	×

Select lever position	Gear position	Part					
		Shift solenoid valve-A (No.1)	Shift solenoid valve-B (No.2)	TCC solenoid valve	Forward clutch	Direct clutch	Reverse clutch
D	1st	○	○	×	○	×	×
	2nd	○	×	×	○	×	×
	3rd	×	×	△	○	○	×
	4th	×	○	△	×	○	×
2	1st	○	○	×	○	×	×
	2nd	○	×	×	○	×	×
L	1st	○	○	×	○	×	×

Select lever position	Gear position	Part				
		O/D and 2nd coast brake	2nd brake	1st and reverse brake	One-way No.1 clutch	One-way No.2 clutch
P	Parking	×	×	×	×	×
R	Reverse	×	×	○	×	×
N	Neutral	×	×	×	×	×
D	1st	×	×	×	×	○
	2nd	×	○	×	○	×
	3rd	×	○	×	×	×
	4th	○	○	×	×	×
2	1st	×	×	×	×	○
	2nd	○	○	×	○	×
L	1st	×	×	○	×	○

○: ON

×: OFF

△: ON only when TCC is operating

A/T Diagnosis General Description

S6RW0E5101004

This vehicle is equipped with an electronic transaxle control system, which controls the automatic shift up and shift down timing, TCC operation, etc. suitably to vehicle driving conditions.

TCM has an On-Board Diagnostic System which detects a malfunction in this system.

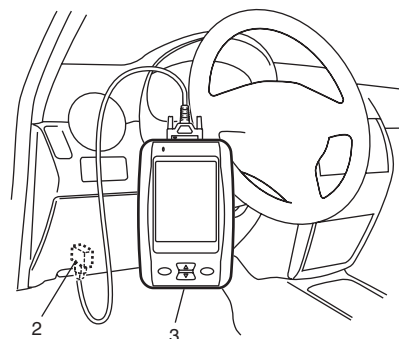
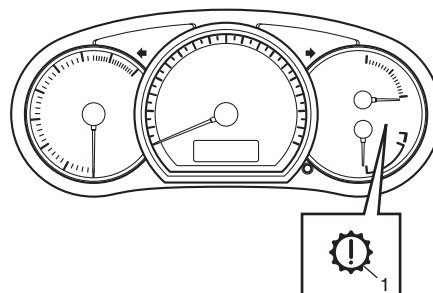
When diagnosing a trouble in transaxle including this system, be sure to have full understanding of the outline of "On-Board Diagnostic System Description" and each item in "Precautions in Diagnosing Trouble" and execute diagnosis according to "A/T System Check" to obtain correct result smoothly.

On-Board Diagnostic System Description

S6RW0E5101005

For automatic transaxle control system, TCM has the following functions.

- When ignition switch is turned ON with no malfunction in A/T control system is detected, transmission warning light (1) lights for about 2 seconds after ignition switch is turned ON and then goes OFF for bulb check.
- When TCM detects a malfunction in A/T control system, it indicates transmission warning light (1) and stores malfunction DTC in its memory.
- It is possible to communicate with TCM through data link connector (DLC) (2) by using SUZUKI scan tool (3).



I6RW0E510001-01

- For information about the following items, refer to "On-Board Diagnostic System Description in Section 1A"
 - Warm-up cycle
 - Driving cycle
 - 2 driving cycle detection logic
 - Pending DTC
 - Freeze frame date

CAN Communication System Description

S6RW0E5101006

Refer to “CAN Communication System Description in Section 1A” for CAN communication System description. TCM communicates control data with each control module as follows.

TCM Transmission Data

				ECM	Combination meter	BCM	4WD control module (if equipped)
TCM		DATA	Transmission oil temperaturure signal	○			
			Torque request signal	○			
			Vehicle speed pulse signal	○			
			Transmission warning light signal	○	○		
			Transmission actual gear position	○			○
			A/T select lever position signal	○	○	○	○
			Transmission diagnostic trouble code (DTC)	○	○	○	○

I6RW0E510002-01

TCM Reception Data

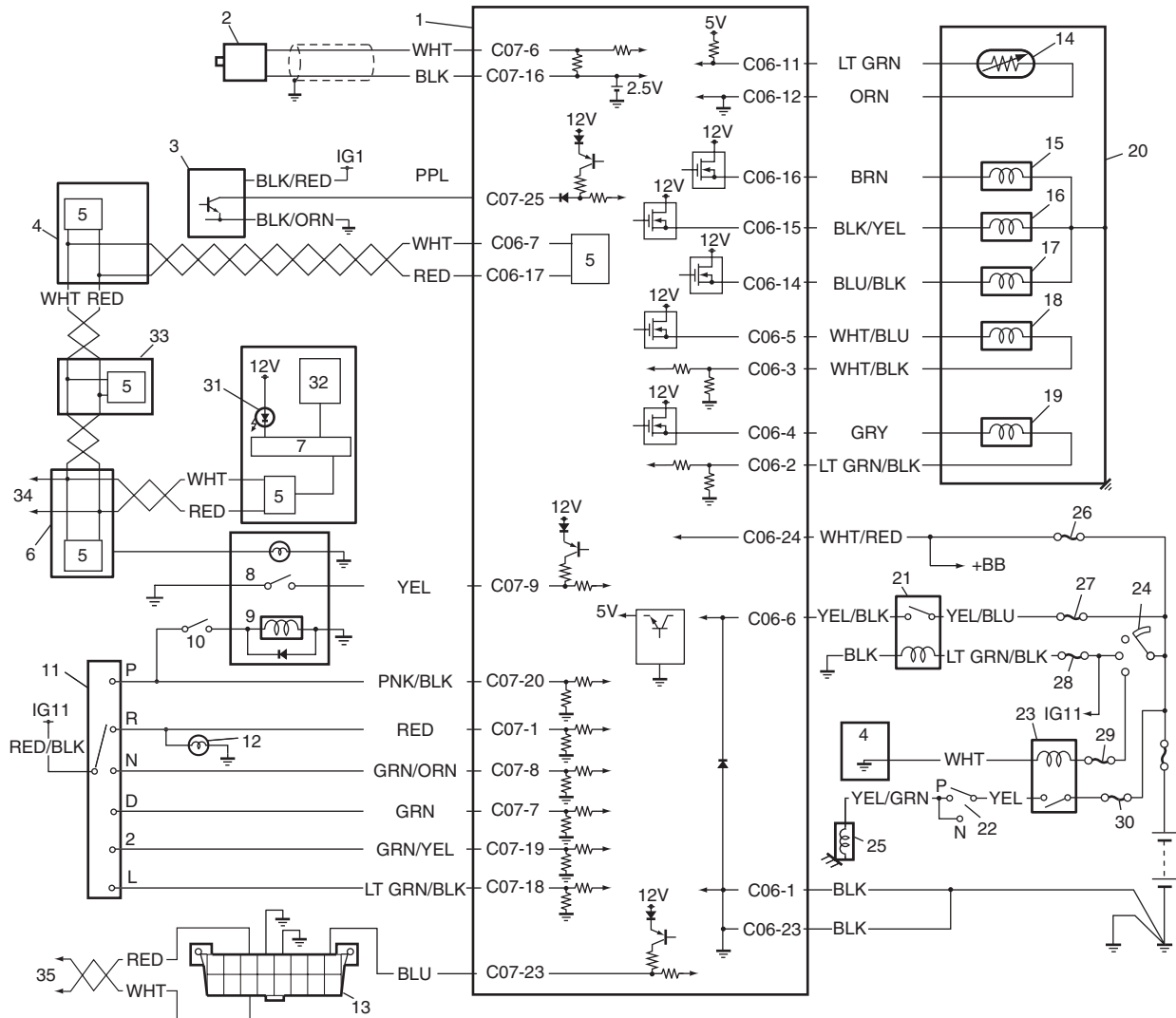
Reception data from ECM	Engine torque signal
	Accelerator pedal position signal
	Engine speed signal
	Throttle position signal
	A/C compressor clutch signal
	Engine coolant temperature signal
	Vehicle speed pulse signal
	Brake pedal switch signal
	Driving cycle active
	Warm up cycle active

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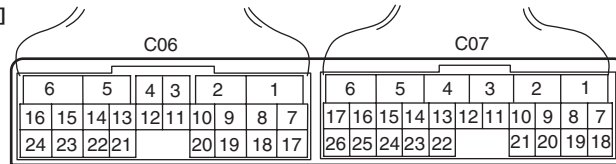
Schematic and Routing Diagram

Transmission Control Module (TCM) Wiring Diagram

S6RW0E5102001



[A]



I6RW0E510004-02

1. TCM	13. Data link connector (DLC)	25. Starter motor
2. Input shaft speed sensor	14. Transmission fluid temperature sensor	26. "DOME" fuse
3. Output shaft speed sensor / VSS	15. Shift solenoid valve-A (No.1)	27. "AT" fuse
4. ECM	16. Shift solenoid valve-B (No.2)	28. "IG1 SIG" fuse
5. CAN driver	17. Timing solenoid valve	29. "ST SIG" fuse
6. BCM	18. TCC lock-up pressure control solenoid valve	30. "ST" fuse
7. Meter driver	19. Pressure control solenoid valve	31. Transmission warning light
8. "3" position switch	20. A/T	32. Transaxle select lever position indicator (with ODO-TRIP)
9. Shift lock solenoid	21. A/T relay	33. ABS control module
10. Brake light switch	22. Inhibitor switch (including transmission range sensor)	34. To Data link connector
11. Transmission range sensor	23. Starter motor relay	35. To BCM
12. Backup lamp	24. Ignition switch	[A]: Terminal arrangement of TCM connector (viewed from harness side)

5A-10 Automatic Transmission/Transaxle:
Operation of Shift Solenoid Valves, Timing Solenoid Valve and TCC Solenoid Valve

Select lever position	Gear position	Solenoid				Condition
		Shift solenoid valve-A (No.1)	Shift solenoid valve-B (No. 2)	Timing solenoid valve	TCC solenoid valve	
P	Parking	○	○	×	×	
R	Reverse	○	○	×	×	When vehicle is traveling forwards in less than 9 km/h, 6 mile/h vehicle speed
		○	○	○	×	When vehicle is traveling forwards in 9 km/h, 6 mile/h or more vehicle speed
	(Reverse)	×	×	×	×	When fail-safe function is operating
N	Neutral	○	○	×	×	
D	Neutral → 1st	—	—	○	—	Timing solenoid is turned ON for about 0.5 sec. while on gear shifting
	1st	○	○	×	×	
	2nd	○	×	×	×	
	3rd	×	×	×	△	
	3rd ↔ 4th	—	—	○	—	Timing solenoid is turned ON for about 0.5 sec. while on gear shifting
	4th	×	○	×	△	
	(3rd)	×	×	×	×	When fail-safe function is operating
2	1st	○	○	×	×	
	2nd	○	×	×	×	
	(3rd)	×	×	×	×	When fail-safe function is operating
L	1st	○	○	×	×	
	(3rd)	×	×	×	×	When fail-safe function is operating

○: ON (Turn power ON)

×: OFF (Turn power OFF)

△: ON only when TCC is operating

	Valve status	
	Turn power ON	Turn power OFF
Shift solenoid valve-A (No.1)	Close	Open
Shift solenoid valve-B (No.2)	Close	Open
Timing solenoid	Open	Close
TCC (lock-up) pressure control solenoid	Close	Open

Automatic Gear Shift Table

S6RW0E5102002

Automatic gear shift schedule is shown in the following table. Test-drive the vehicle on a flat road in the D position.

1. Shift Point in D, 3 and/or 2 position

	Throttle opening (%)	Shift	Vehicle speed km/h (mph)	Remark
UP shift	Over 90%	1st → 2nd	50 – 55 (31 – 34)	
		2nd → 3rd	105 – 110 (65 – 68)	
		3rd → 4th	162 – 167 (101 – 104)	
	50%	1st → 2nd	34 – 39 (21 – 24)	
		2nd → 3rd	72 – 77 (45 – 48)	
		3rd → 4th	110 – 115 (68 – 71)	
	10%	1st → 2nd	9 – 14 (6 – 9)	
		2nd → 3rd	32 – 37 (20 – 23)	
		3rd → 4th	46 – 51 (29 – 32)	
DOWN shift	Over 95%	4th → 3rd	144 – 149 (89 – 93)	
		3rd → 2nd	96 – 101 (60 – 63)	
		2nd → 1st	44 – 49 (27 – 30)	
	50%	4th → 3rd	85 – 90 (53 – 56)	
		3rd → 2nd	41 – 46 (25 – 29)	
		2nd → 1st	11 – 16 (7 – 10)	
	0%	4th → 3rd	35 – 40 (22 – 25)	With applying brake pedal (coast down condition)
		3rd → 2nd	15 – 20 (9 – 12)	
		2nd → 1st	6 – 11 (4 – 7)	

2. Lock-up point in D and/or 3 position

	Lock-up clutch status	Throttle opening (%)	Vehicle speed km/h (mph)	Remark
2nd gear lock-up	ON	Over 90%	66 – 71 (41 – 47)	D, 3 range
		50%	35 – 40 (22 – 25)	
	OFF	Over 95%	58 – 63 (36 – 39)	
		50%	31 – 36 (19 – 22)	
3rd gear lock-up	ON	Over 90%	105 – 110 (65 – 68)	
		50%	72 – 77 (45 – 48)	
	OFF	Over 95%	96 – 101 (60 – 63)	
		50%	52 – 57 (32 – 35)	
4th gear lock-up	ON	Over 90%	162 – 167 (101 – 104)	D range only
		50%	110 – 115 (68 – 71)	
	OFF	Over 95%	144 – 149 (89 – 93)	
		50%	86 – 91 (53 – 57)	

3. Slip lock-up point in D and/or 3 position

	Slip Lock-up clutch status	Throttle opening (%)	Vehicle speed km/h (mph)	Remark
2nd gear	Slip ON	15%	23 – 28 (14 – 17)	• D, 3 range • Without lock-up condition
	Slip OFF		20 – 25 (12 – 16)	
3rd gear	Slip ON		36 – 41 (22 – 25)	
	Slip OFF		31 – 36 (19 – 22)	
4th gear	Slip ON		52 – 57 (32 – 35)	• D range • Without lock-up condition
	Slip OFF		46 – 51 (29 – 32)	

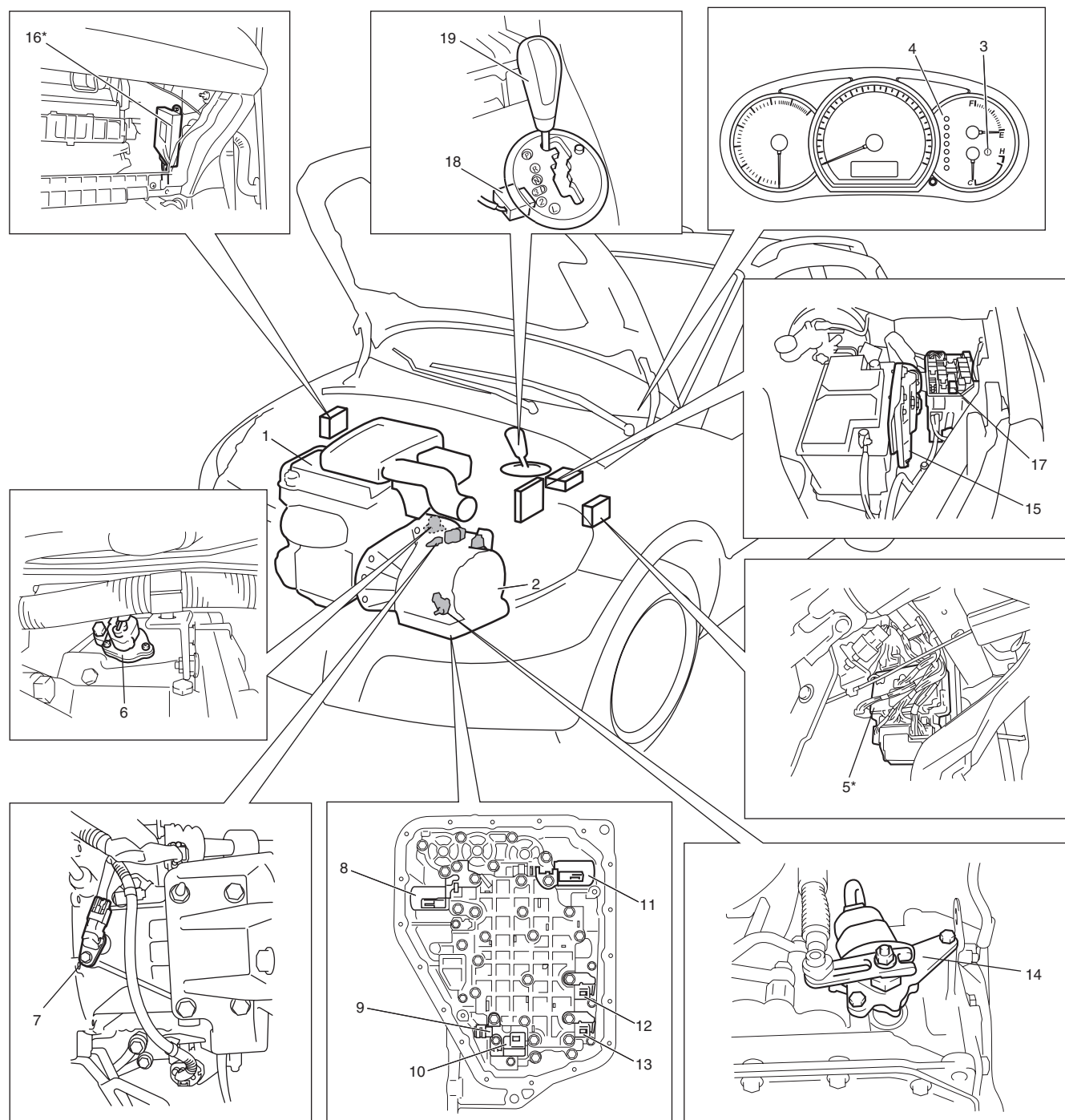
Component Location

Electronic Shift Control System Components Location

S6RW0E5103001

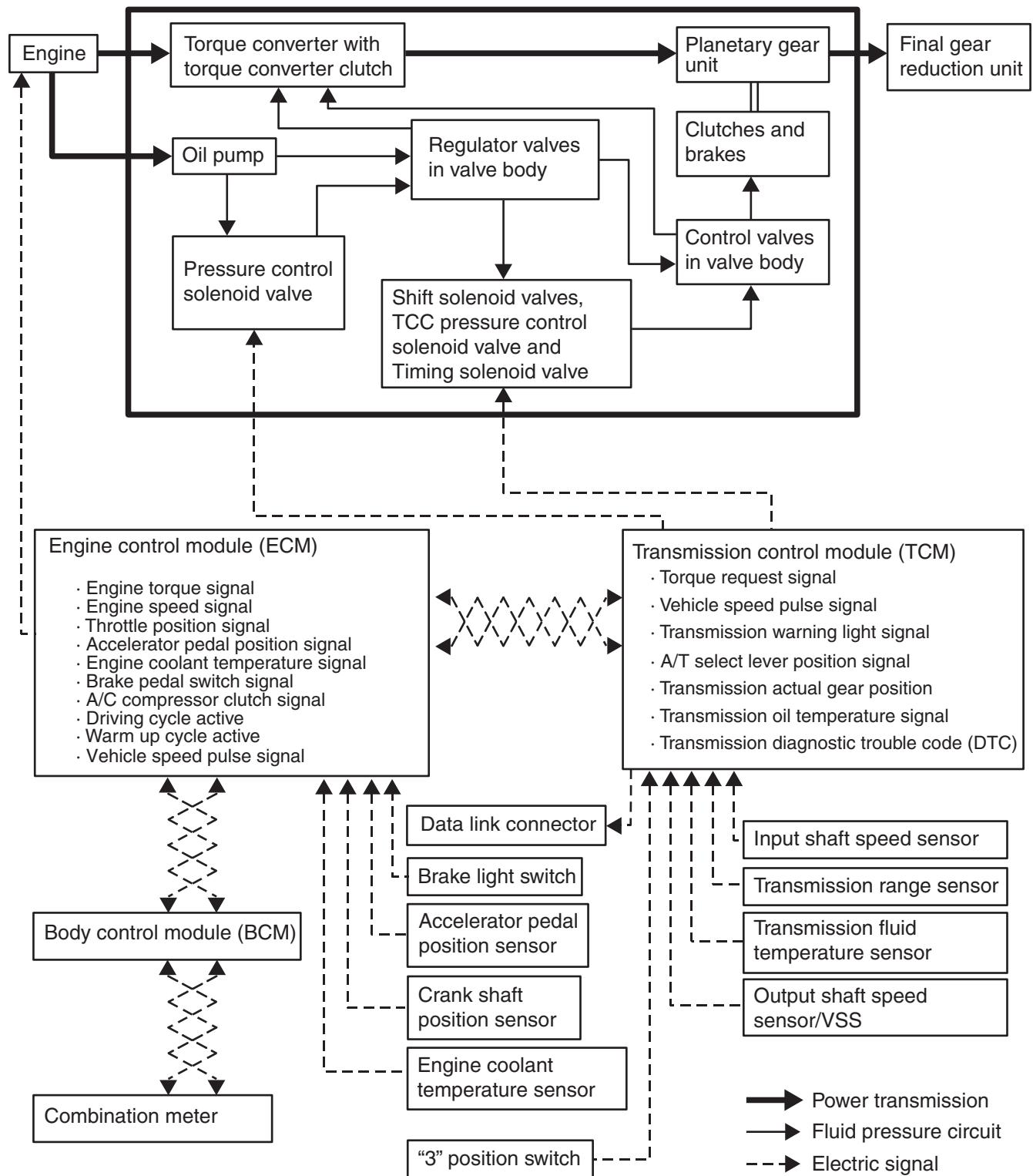
NOTE

The figure shows left-hand steering vehicle. For right-hand steering vehicle, parts with (*) are installed at the opposite side.



I6RW0E510005-01

1. Engine	8. TCC pressure control solenoid valve	15. ECM
2. Transaxle	9. Transmission fluid temperature sensor	16. TCM
3. Transmission warning light	10. Timing solenoid valve	17. AT relay
4. Transaxle select lever position indicator (with ODO-TRIP)	11. Pressure control solenoid valve	18. "3" position switch
5. Junction block assembly (included in BCM)	12. Shift solenoid valve-B (No.2)	19. Select lever
6. Output shaft speed sensor (VSS)	13. Shift solenoid valve-A (No.1)	
7. Input shaft speed sensor	14. Transmission range sensor	



Diagnostic Information and Procedures

A/T System Check

S6RW0E5104001

Refer to the following items for the details of each step.

Step	Action	Yes	No
1	☞ Customer complaint analysis 1) Perform customer complaint analysis. <i>Was customer complaint analysis performed?</i>	Go to Step 2.	Perform customer complaint analysis.
2	☞ DTC / freeze frame data check, record and clearance 1) Check for DTC. <i>Is there any DTC(s)?</i>	Print DTC or write them down and clear them by referring to "DTC Clearance". Go to Step 3.	Go to Step 4.
3	☞ Visual inspection 1) Perform visual inspection. <i>Is there any faulty condition?</i>	Repair or replace malfunction part. Go to Step 11.	Go to Step 5.
4	☞ Visual inspection 1) Perform visual inspection. <i>Is there any faulty condition?</i>	Repair or replace malfunction part. Go to Step 11.	Go to Step 8.
5	☞ Trouble symptom confirmation 1) Confirm trouble symptom. <i>Is trouble symptom identified?</i>	Go to Step 6.	Go to Step 7.
6	☞ Rechecking and record of DTC / freeze frame data 1) Recheck for DTC referring to "DTC Check". <i>Is there any DTC(s)?</i>	Go to Step 9.	Go to Step 8.
7	☞ Rechecking and record of DTC / freeze frame data 1) Recheck for DTC referring to "DTC Check". <i>Is there any DTC(s)?</i>	Go to Step 9.	Go to Step 10.
8	☞ A/T basic check and A/T symptom diagnosis 1) Check and repair according to "A/T Basic Check" and "A/T Symptom Diagnosis". <i>Are check and repair complete?</i>	Go to Step 11.	Check and repair malfunction part(s). Go to Step 11.
9	☞ Troubleshooting for DTC 1) Check and repair according to applicable DTC flow. <i>Are check and repair complete?</i>	Go to Step 11.	Check and repair malfunction part(s). Go to Step 11.
10	☞ Check for intermittent problems 1) Check for intermittent problems. <i>Is there any faulty condition?</i>	Repair or replace malfunction part(s). Go to Step 11.	Go to Step 11.
11	☞ Final confirmation test 1) Clear DTC if any. 2) Perform final confirmation test. <i>Is there any problem symptom, DTC or abnormal condition?</i>	Go to Step 6.	End.

Step 1. Customer Complaint Analysis

Record details of the problem such as failure, complaint and how it occurred as described by the customer.

For this purpose, use of such an inspection form will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer problem inspection form (Example)

User name:	Model:	VIN:	
Date of issue:	Date of Reg.:	Date of problem:	Mileage:

PROBLEM SYMPTOMS	
☐	Vehicle does not move (R, D, 3, 2, L or any range)
☐	No upshift automatically (☐ 1st to 2nd ☐ 2nd to 3rd ☐ 3rd to 4th ☐ 3 range ☐ 2 range ☐ D range)
☐	No downshift automatically (☐ 3rd to 2nd ☐ 2nd to 1st ☐ 4th to 3rd ☐ 3 range ☐ 2 range ☐ D range)
☐	No gear change manually (☐ 1st ↔ 3rd ☐ 3rd ↔ 4th)
☐	TCC no lock-up ☐ TCC no lock-up off
☐	Automatic shift point too high or too low
☐	Excessive gear change shock (1st/2nd/3rd/4th/Reverse)
☐	No kickdown
☐	Transmission slipping in (1st/2nd/3rd/4th/Reverse)
☐	Others _____

VEHICLE/ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS	
Environmental Condition	
Weather	☐ Fair ☐ Cloudy ☐ Rain ☐ Always ☐ Other _____
Temperature	(°F/ °C) ☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ always
Frequency	☐ Always ☐ Sometimes (times/ day, month) ☐ Only once ☐ Under certain condition
Read	☐ Urban ☐ Suburb ☐ Highway ☐ Mountainous ☐ Uphill ☐ Downhill ☐ Tarmacadam
	☐ Gravel ☐ Other _____
Vehicle Condition	
Engine & transmission condition	☐ Cold/ ☐ Warming up phase/ ☐ Warmed up Engine speed (r/min.) Throttle opening (☐ Idle/ ☐ About % ☐ full) "3" position switch (☐ ON/ ☐ OFF)
Vehicle condition	☐ At stop/ ☐ During driving (☐ Constant speed ☐ Accelerating ☐ Decelerating ☐ Braking) ☐ Right hand corner ☐ Left hand corner ☐ Vehicle speed (km/h mile/h) ☐ Other _____

Transmission warning light	☐ Blink ☐ Always ON ☐ Sometimes ON ☐ Always OFF ☐ Good condition
Malfunction indicator lamp	☐ Blink ☐ Always ON ☐ Sometimes ON ☐ Always OFF ☐ Good condition
Diagnostic trouble code	First check: ☐ No code ☐ Malfunction code () Second check: ☐ No code ☐ Malfunction code ()

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NOTE

The form is a standard sample. It should be modified according to conditions characteristic of each market.

Step 2. DTC / Freeze Frame Data Check, Record and Clearance

First, referring to “DTC Check”, check DTC and pending DTC. If DTC exists, print or write down DTC and freeze frame data and then clear malfunction DTC(s) by referring to “DTC Clearance”. Malfunction DTC indicates malfunction in the system but it is not possible to know from it whether the malfunction is occurring now or it occurred in the past and normal condition has been restored. In order to know that, check symptom in question according to Step 5 and then recheck DTC according to Step 6.

Diagnosing a trouble based on the DTC in this step only or failure to clear the DTC in this step may result in an faulty diagnosis, trouble diagnosis of a normal circuit or difficulty in troubleshooting which is otherwise unnecessary.

Step 3 and 4. Visual Inspection

As a preliminary step, be sure to perform visual check of the items that support proper function of the engine and automatic transaxle referring to “Visual Inspection”.

Step 5. Trouble Symptom Confirmation

Check trouble symptoms based on information obtained in “Step 1. Customer Complaint Analysis: ” and “Step 2. DTC / Freeze Frame Data Check, Record and Clearance: ”.

Also, reconfirm DTC according to “DTC Confirmation Procedure” described in each DTC flow.

Step 6 and 7. Rechecking and Record of DTC and Freeze Frame Data

Refer to “DTC Check” for checking procedure.

Step 8. A/T Basic Check and A/T Symptom Diagnosis

Perform basic check of A/T according to “A/T Basic Check” first. When the end of the flow has been reached, check the parts of the system suspected as a possible cause referring to “A/T Symptom Diagnosis” and based on symptoms appearing on the vehicle (symptoms obtained through steps of customer complaint analysis, trouble symptom confirmation and/or A/T basic check) and repair or replace faulty parts, if any.

Step 9. Troubleshooting for DTC

Based on the DTC indicated in Step 6 / 7 and referring to “applicable DTC flow”, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, TCM or other part and repair or replace faulty parts.

Step 10. Check for Intermittent Problem

Check parts where an intermittent trouble is easy to occur (e.g. wire harness, connector, etc.), referring to “Intermittent and Poor Connection Inspection in Section 00 in related manual” and related circuit of DTC recorded in Step 2.

Step 11. Final Confirmation Test

Confirm that the problem symptom has gone and the vehicle is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, clear the DTC once and check to ensure that no malfunction DTC is indicated.

Visual Inspection

Visually check the following parts and systems.

S6RW0E5104002

Inspection item	Referring
- A/T fluid ----- level, leakage, color - A/T fluid hoses ----- disconnection, looseness, deterioration - Throttle cable (if equipped) ----- play (under warm engine), installation - A/T select cable ----- installation - Engine oil ----- level, leakage - Engine coolant ----- level, leakage - Engine mountings ----- play, looseness, damage - Suspension ----- play, looseness - Drive shafts ----- damage - Battery ----- indicator condition, corrosion of terminal - Connectors of electric wire harness ----- disconnection, friction	“Automatic Transaxle Fluid Level Inspection in Section 0B in related manual” “A/T Fluid Cooler Hoses Replacement” “Select Cable Removal and Installation” “Engine Oil and Filter Change in Section 0B in related manual” “Engine Coolant Change in Section 0B in related manual” “Engine Assembly Removal and Installation in Section 1D in related manual” “Suspension, Wheels and Tires Symptom Diagnosis in Section 2A in related manual” “Front Drive Shaft Assembly On-Vehicle Inspection: Front in Section 3A in related manual” “Battery Inspection in Section 1J in related manual” “Electronic Shift Control System Components Location”

Inspection item	Referring
- Fuses ----- burning - Parts ----- installation, damage - Bolts ----- looseness - Other parts that can be checked visually	
Also check the following items at engine start, if possible. - Malfunction indicator lamp ----- Operation - Charge warning lamp ----- Operation - Engine oil pressure warning lamp ----- Operation - Engine coolant temp. meter ----- Operation - Other parts that can be checked visually	“Transmission Warning Light Check” “Generator Symptom Diagnosis in Section 1J in related manual” “Oil Pressure Warning Light Symptom Diagnosis in Section 9C in related manual” “Engine Coolant Temperature (ECT) Meter Symptom Diagnosis in Section 9C in related manual”

Transmission Warning Light Check

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- 1) Turn ignition switch ON.
- 2) Check that transmission warning light lights for about 2 – 4 sec. and then goes OFF.
If anything faulty is found, advance “Transmission Warning Light Circuit Check – Light Does Not Come “ON” at Ignition Switch ON” or “Transmission Warning Light Circuit Check – Light Remains “ON” at Ignition Switch ON”.

DTC Table

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NOTE

- **1 driving cycle:** transmission warning light lights up when DTC is detected during 1 driving cycle.
- **2 driving cycles:** transmission warning light lights up when the same DTC is detected also in the next driving cycle after DTC is detected and stored temporarily in the first driving cycle.
- **Driving cycle with (*):** Transmission warning light does not light up but TCM detects and stores DTC.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Driving cycle when transmission warning light lighted
P0602	Control module Programming Error	Data programming error.	—
P0705	Transmission range sensor circuit malfunction (PRNDL input)	Multiple signals are inputted simultaneously.	1 driving cycle
P0707	Transmission range sensor circuit low	No sensor signal is inputted.	2 driving cycles
P0712	Transmission fluid temperature sensor circuit low	Sensor output voltage is too low.	1 driving cycle
P0713	Transmission fluid temperature sensor circuit high	Sensor output voltage is too high.	1 driving cycle
P0717	Input / Turbine speed sensor circuit no signal	No sensor signal is detected although output speed sensor signal is inputted.	1 driving cycle
P0722	Output speed sensor circuit no signal	No sensor signal is inputted although input speed sensor signal is inputted.	1 driving cycle
P0787	Shift / Timing solenoid control circuit low	Voltage of timing solenoid terminal is low although TCM is commanding timing solenoid to turn ON.	1 driving cycle
P0788	Shift / Timing solenoid control circuit high	Voltage of timing solenoid terminal is high although TCM is commanding timing solenoid to turn OFF.	1 driving cycle

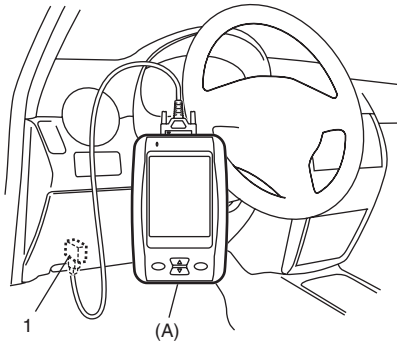
5A-18 Automatic Transmission/Transaxle:

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Driving cycle when transmission warning light lighted
☞ P0961	Pressure Control Solenoid "A" Control Circuit Range / Performance	Difference between actual current of control solenoid valve circuit and current of control solenoid valve circuit calculated by ECM is more than specification.	1 driving cycle
☞ P0962	Pressure control solenoid control circuit low	No electric flow is detected on pressure control solenoid circuit.	1 driving cycle
☞ P0963	Pressure control solenoid control circuit high	Too much electric flow is detected on pressure control solenoid circuit.	1 driving cycle
☞ P0973	Shift solenoid-A (No.1) control circuit low	Voltage of shift solenoid terminal is low although TCM is commanding shift solenoid to turn ON.	1 driving cycle
☞ P0974	Shift solenoid-A (No.1) control circuit high	Voltage of shift solenoid terminal is high although TCM is commanding shift solenoid to turn OFF.	1 driving cycle
☞ P0976	Shift solenoid-B (No.2) control circuit low	Voltage of shift solenoid terminal is low although TCM is commanding shift solenoid to turn ON.	1 driving cycle
☞ P0977	Shift solenoid-B (No.2) control circuit high	Voltage of shift solenoid terminal is high although TCM is commanding shift solenoid to turn OFF.	1 driving cycle
☞ P1702	Internal control module memory check sum error	Calculation of current data stored in TCM is not correct comparing with pre-stored checking data in TCM.	1 driving cycle
☞ P1723	Range select switch malfunction	"3" position switch ON signal is inputted although transmission range switch signal is inputted P, R, N or L. range.	1 driving cycle*
☞ P1878	Torque converter clutch shudder	Variation in the output revolution speed of the specified amplitude and specified cycle is detected under slip lock-up condition.	20 driving cycles*
☞ P2762	Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit Range / Performance	Difference between actual current of TCC lock-up pressure control solenoid valve circuit and current of TCC lock-up pressure control solenoid valve circuit calculated by ECM is more than specification.	1 driving cycle
☞ P2763	Torque converter clutch pressure control solenoid control circuit high	Too much electric flow is detected on TCC solenoid circuit.	1 driving cycle
☞ P2764	Torque converter clutch pressure control solenoid control circuit low	No electric flow is detected on TCC solenoid circuit.	1 driving cycle
☞ U0073	Control Module Communication Bus Off	Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than specified time continuously.	1 driving cycle
☞ U0100	Lost Communication with ECM / PCM "A"	Receiving error from ECM detected to TCM for specified time continuously.	1 driving cycle

DTC Check

S6RW0E5104005

- 1) Turn ignition switch to OFF position.
- 2) Connect scan tool to data link connector (DLC) (1).

Special tool**(A): SUZUKI scan tool (SUZUKI-SDT)**

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- 3) Turn ignition switch ON.
- 4) Read DTC, pending DTC and freeze frame data according to instructions displayed on scan tool and print it down. Refer to scan tool operator's manual for further details.
If communication between scan tool and TCM is not possible, check if scan tool is communicable by connecting it to TCM in another vehicle. If communication is possible in this case, scan tool is in good condition. Then check data link connector and serial data line (circuit) in the vehicle with which communication was not possible.
- 5) After completing the check, turn ignition switch off and disconnect scan tool from data link connector.

DTC Clearance

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⚠ WARNING

When performing a driving test, select a safe place where there is neither any traffic nor any traffic accident possibility and be very careful during testing to avoid occurrence of an accident.

After repair or replace malfunction part(s), clear all DTCs by performing the following procedure.

- 1) Connect SUZUKI scan tool to data link connector in the same manner as when making this connection for "DTC Check".
- 2) Turn ignition switch ON.
- 3) Erase DTC and pending DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further details.
- 4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector (DLC).

NOTE

DTC and freeze frame data stored in TCM memory are also cleared in the following cases. Be careful not to clear them before keeping their record.

- **When the same malfunction (DTC) is not detected again during 40 engine warm-up cycles.**

Fail-Safe Table

This function is provided by the safe mechanism that assures safe driveability even when the solenoid valve, sensor or its circuit fails. The following table shows the fail-safe function for each fail condition of sensor, solenoid or its circuit.

DTC No.	Trouble area	Fail-safe operation
P0705	Transmission range sensor circuit malfunction (PRNDL input)	- Selected range is set in priority order shown below. D > 2 > L > R > N > P - Slip controlled lock-up function is inhibited to operate. - Learning control is inhibited.
P0707	Transmission range sensor circuit low	- Selected range is assumed to be "D" range. - Slip controlled lock-up function is inhibited to operate. - Learning control is inhibited.
P0712 P0713	Transmission fluid temperature sensor circuit low	- A/T fluid temperature is assumed to be 200 °C (392 °F). - Upshifting to 4th gear is inhibited. - Lock-up function is inhibited to operate. - Garage shift control is inhibited. - Learning control is inhibited.
P0717	Input / Turbine speed sensor circuit no signal	- Upshifting to 4th gear is inhibited. - Lock-up function is inhibited to operate. - Line pressure control at gear shifting is inhibited. - Torque reducing request to ECM (torque reduction control) is inhibited. - Garage shift control is inhibited. - Learning control is inhibited.
P0722	Output speed sensor circuit no signal	- Vehicle speed which is calculated by input shaft speed sensor signal is used for gear shifting control instead of vehicle speed calculated by output shaft speed sensor (VSS) signal. - Upshifting to 4th gear is inhibited. - Lock-up function is inhibited to operate. - Line pressure control at gear shifting is inhibited. - Torque reducing request to ECM (torque reduction control) is inhibited. - Garage shift control is inhibited. - Learning control is inhibited.
P0787	Shift / Timing solenoid Control Circuit Low	- Power supply for all solenoid valves is cut. - Gear position is fixed in 3rd gear. - Line pressure control at gear shifting is inhibited. - Look-up function is inhibited to operate.
P0788	Shift / Timing solenoid Control Circuit High	
P0962	Pressure control solenoid control circuit low	
P0963	Pressure control solenoid control circuit high	
P0973	Shift solenoid-A (No.1) control circuit low	
P0974	Shift solenoid-A (No.1) control circuit high	
P0976	Shift solenoid-B (No.2) control circuit low	
P0977	Shift solenoid-B (No.2) control circuit high	
P0961	Pressure Control Solenoid "A" Control Circuit Range / Performance	- Upshifting to 4th gear is inhibited. - Lock-up function is inhibited to operate. - Slip controlled lock-up function is inhibited to operate. - Line pressure control at gear shifting is inhibited. - Torque reducing request to ECM (torque reduction control) is inhibited. - Garage shift control is inhibited. - Leaning control is inhibited.

DTC No.	Trouble area	Fail-safe operation
P1702	Internal control module memory check sum error	- Power supply for all solenoid valves is cut. - Gear position is fixed in 3rd gear. - Line pressure control at gear shifting is inhibited. - Lock-up function is inhibited to operate.
P1723	Range select switch malfunction	"3" position switch is assumed to be OFF.
P1878	Torque converter clutch shudder	Slip controlled lock-up function is inhibited to operate.
P2762	Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit Range / Performance	- Lock-up function is inhibited to operate. - Slip controlled lock-up function is inhibited to operate. - Upshifting to 4th gear is inhibited when Transmission Fluid Temperature is 150 °C (302 °F) or more. - Gear position is fixed in 1st gear when vehicle speed is 10 km/h (6 mile/h) or less.
P2763	Torque converter clutch pressure control solenoid control circuit high	- Lock-up function is inhibited to operate. - Upshifting to 4th gear is inhibited when A/T fluid temperature is more than 150 °C (302 °F). - Vehicle speed is slower than 10 km/h (6 mile/h), gear position is fixed in 1st gear for prevention of engine stall.
P2764	Torque converter clutch pressure control solenoid control circuit low	- Lock-up function is inhibited to operate. - Upshifting to 4th gear is inhibited when A/T fluid temperature is more than 150 °C (302 °F).
U0073	Control module communication bus off	- Throttle opening used for line pressure control is assumed to be 100%. - Throttle opening used for gear shifting control is assumed to be 0%. - Engine revolution is assumed to be 0 RPM. - After 15 minutes pass from detecting malfunction, engine coolant temperature is assumed to be 90 °C (194 °F). - Lock-up function is inhibited to operate. - Line pressure control at gear shifting is inhibited. - Torque reducing request to ECM (torque reduction control) is inhibited. - Upshifting to 4th gear is inhibited. - Garage shift control is inhibited. - Learning control is inhibited.
U0100	TCM lost communication with ECM (Reception error)	- Throttle opening used for line pressure control is assumed to be 100%. - Throttle opening used for gear shifting control is assumed to be 0%. - Engine revolution is assumed to be 0 RPM. - After 15 minutes pass from detecting malfunction, engine coolant temperature is assumed to be 90 °C (194 °F). - Lock-up function is inhibited to operate. - Slip controlled lock-up function is inhibited to operate. - Line pressure control at gear shifting is inhibited. - Torque reducing request to ECM (torque reduction control) is inhibited. - Upshifting to 4th gear is inhibited. - Garage shift control is inhibited. - Learning control is inhibited.

Scan Tool Data

As the data values given in the following table are standard values estimated on the basis of values obtained from the normally operating vehicles by using a scan tool, use them as reference values. Even when the vehicle is in good condition, there may be cases where the checked value does not fall within each specified data range. Therefore, judgment as abnormal should not be made by checking with these data alone.

Also, condition in the following table that can be checked by the scan tool are those detected by TCM and output from TCM as commands and there may be cases where the automatic transaxle or actuator is not operating (in the condition) as indicated by the scan tool.

NOTE

The following scan tool data related to automatic transaxle can be checked only by communicating with TCM.

Scan tool data	Vehicle condition	Normal condition / reference values
GEAR POSITION	Ignition switch ON	Select lever is in "P" position
		Select lever is in "R" position
		Select lever is in "N" position
		Select lever is in "D" position
		Select lever is in "3" position
		Select lever is in "2" position
		Select lever is in "L" position
ENGINE SPEED	At engine idle speed	Engine idle speed is displayed
INPUT SHAFT REVOLUTION	Ignition switch ON and engine stop	0 RPM
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear ("3" range)	2300 RPM (displayed in increments of 0.25 rpm)
OUTPUT SHAFT REVOLUTION	At vehicle stop	0 RPM
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear ("3" range)	2300 RPM (displayed in increments of 0.25 rpm)
BATTERY VOLTAGE	Ignition switch ON and engine stop	Battery voltage is displayed (8 – 16 V)
ATF TEMPERATURE	After driving at 60 km/h (37.5 mile/h) for 15 minutes or more, and A/T fluid temperature around sensor reaches 70 – 80 °C (158 – 176 °F)	70 – 80 °C (158 – 176 °F)
SHIFT SOLENOID-A COMMAND	At vehicle stop	ON
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear ("3" range)	OFF
SHIFT SOLENOID-A MONITOR	At vehicle stop	ON
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear ("3" range)	OFF
SHIFT SOLENOID-B COMMAND	At vehicle stop	ON
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear ("3" range)	OFF
SHIFT SOLENOID-B MONITOR	At vehicle stop	ON
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear ("3" range)	OFF
TIMING SOLENOID COMMAND	Ignition switch ON and select lever is in "N" range	OFF
	For about 0.5 sec. while on gear shifting between 3rd and 4th or gear shifting "N" to "D"	ON
TIMING SOLENOID MONITOR	Ignition switch ON and select lever is in "N" range	OFF
	For about 0.5 sec. while on gear shifting between 3rd and 4th or gear shifting "N" to "D"	ON
TCC SOLENOID	At vehicle stop, closed throttle, engine idle speed and 1st gear	0%
PRESSURE CONTROL SOLENOID	At vehicle stop, closed throttle, engine idle speed and 1st gear	0%
VEHICLE SPEED	At vehicle stop	0 km/h, 0 MPH

Scan tool data	Vehicle condition		Normal condition / reference values
☞ "3" POSITION SWITCH	Ignition switch ON	Shift select lever to "3" or "2" range	ON
		Shift select lever to other above range	OFF
☞ TRANSAXLE RANGE	Ignition switch ON	Select lever is in "P" position	P
		Select lever is in "R" position	R
		Select lever is in "N" position	N
		Select lever is in "D" position	D
		Select lever is in "3" position	D
		Select lever is in "2" position	2
		Select lever is in "L" position	L
☞ D RANGE SIGNAL	Ignition switch ON	Select lever is in "P" position	OFF
		Select lever is in "R" position	ON
		Select lever is in "N" position	OFF
		Select lever is in "D" position	ON
		Select lever is in "3" position	ON
		Select lever is in "2" position	ON
		Select lever is in "L" position	ON
☞ THROTTLE POSITION	Ignition switch ON	Accelerator pedal is depressed	0 – 100% (Varies depending on depressed value)
		Accelerator pedal is released	0%
☞ BRAKE SWITCH	Ignition switch ON	Brake pedal is depressed	ON
		Brake pedal is released	OFF
☞ TORQUE REDUCTION SIGNAL	While on gear upshifting with 25% or more throttle opening		ON
	Under condition of not shifting gear		OFF
☞ ENGINE COOLANT TEMPERATURE	Ignition switch ON		Engine coolant temperature is displayed
☞ AIR CONDITIONER SIGNAL	Ignition switch ON and air conditioner switch OFF		OFF
☞ SLIP RPM	Engine running at idle speed and select lever is in "P" range		0 RPM
	Engine running, vehicle stop and select lever is in "D" range		Engine speed is displayed

Scan Tool Data Definitions:**GEAR POSITION**

Current gear position computed by throttle position coming from ECM and vehicle speed.

ENGINE SPEED (RPM)

Engine speed computed by reference pulses from crankshaft position sensor.

INPUT SHAFT REVOLUTION (RPM)

Input shaft revolution computed by reference pulses coming from input shaft speed sensor on transaxle case.

OUTPUT SHAFT REVOLUTION (RPM)

Output shaft revolution computed by reference pulses coming from output shaft speed sensor (VSS) on transaxle case.

BATTERY VOLTAGE (V)

Battery voltage read by TCM as analog input signal by TCM.

ATF TEMPERATURE (°C, °F)

ATF temperature decided by signal from transmission fluid temperature sensor installed on valve body.

SHIFT SOLENOID-A COMMAND

ON: ON command being outputted to shift solenoid valve-A (No.1)
OFF: ON command not being outputted to shift solenoid valve-A (No.1)

SHIFT SOLENOID-A MONITOR

ON: Electricity being passed to shift solenoid valve-A (No.1)
OFF: Electricity not being passed to shift solenoid valve-A (No.1)

SHIFT SOLENOID-B COMMAND

ON: ON command being outputted to shift solenoid valve-B (No.2)
OFF: ON command not being outputted to shift solenoid valve-B (No.2)

SHIFT SOLENOID-B MONITOR

ON: Electricity being passed to shift solenoid valve-B (No.2)

OFF: Electricity not being passed to shift solenoid valve-B (No.2)

TIMING SOLENOID COMMAND

ON: ON command being outputted to timing solenoid valve

OFF: ON command not being outputted to timing solenoid valve

TIMING SOLENOID MONITOR

ON: Electricity being passed to timing solenoid valve

OFF: Electricity not being passed to timing solenoid valve

TCC SOLENOID

Electric current value ratio between electric current value being outputted from TCM to solenoid and maximum value can be outputted by TCM.

PRESSURE CONTROL SOLENOID

Electric current value ratio between electric current value being outputted from TCM to solenoid and maximum value can be outputted by TCM.

VEHICLE SPEED (KPH/MPH)

Vehicle speed computed by reference pulse signals coming from vehicle speed sensor on transaxle case.

“3” POSITION SWITCH

Inputted signal from “3” position switch in select lever assembly.

ON: Shift select lever to “3” or “2” range

OFF: Shift select lever to other above range

TRANSAXLE RANGE

Transaxle range detected by signal fed from transmission range sensor.

D RANGE SIGNAL

ON: Signal which TCM require ECM to increase idle speed

OFF: Signal which TCM does not require ECM to increase idle speed

THROTTLE POSITION (%)

Throttle opening ratio computed by duty signal from ECM.

BRAKE SWITCH

Inputted signal from brake light switch on pedal bracket.

ON: Brake pedal depressed

OFF: Brake pedal released

TORQUE REDUCTION SIGNAL

ON: Signal which TCM require ECM to reduce output torque at shifting gear

OFF: Signal which TCM does not require ECM to reduce output torque

ENGINE COOLANT TEMPERATURE (°C, °F)

Engine coolant temperature computed by duty signal from ECM.

AIR CONDITIONER SIGNAL

ON: Signal which inform that air conditioner compressor is turned ON.

OFF: Signal which inform that air conditioner compressor is not turned ON.

SLIP RPM (RPM)

This parameter indicates slipping rotation in the torque converter (difference between input shaft rotation and engine rotation).

A/T Basic Check

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This check is important for troubleshooting when TCM has detected no DTC and no abnormality has been noted in “Visual Inspection”. Follow the flow carefully.

Step	Action	Yes	No
1	Was “A/T System Check” preformed?	Go to Step 2.	Go to “A/T System Check”.
2	Perform “Road Test”. <i>Is it OK?</i>	Go to Step 3.	Proceed to “Troubleshooting” in “Road Test”.
3	Perform “Manual Road Test”. <i>Is it OK?</i>	Go to Step 4.	Proceed to “Troubleshooting” in “Manual Road Test”.
4	Perform “Engine Brake Test”. <i>Is it OK?</i>	Go to Step 5.	Proceed to “Troubleshooting” in “Engine Brake Test”.
5	Perform “Stall Test”. <i>Is it OK?</i>	Go to Step 6.	Proceed to “Troubleshooting” in “Stall Test”.

Step	Action	Yes	No
6	Perform "Time Lag Test". <i>Is it OK?</i>	Go to Step 7.	Proceed to "Troubleshooting" in "Time Lag Test".
7	Perform "Line Pressure Test". <i>Is it OK?</i>	Go to Step 8.	Proceed to "Troubleshooting" in "Line Pressure Test".
8	Proceed to "Trouble Diagnosis 1" in "A/T Symptom Diagnosis". <i>Is trouble identified?</i>	Repair or replace faulty parts.	Go to Step 9.
9	Proceed to "Trouble Diagnosis 2" in "A/T Symptom Diagnosis". <i>Is trouble identified?</i>	Repair or replace faulty parts.	Proceed to "Trouble Diagnosis 3" in "A/T Symptom Diagnosis".

Road Test

S6RW0E5104010

This test is to check if upshift, downshift and lock-up take place at specified speeds while actually driving vehicle on a level road.

⚠ WARNING

- Carry out test in very little traffic area to prevent an accident.
- Test requires 2 persons, a driver and a tester.

- 1) Warm up engine.
- 2) With engine running at idle, shift select lever "D" range.
- 3) Accelerate vehicle speed by depressing accelerator pedal gradually.
- 4) While driving in "D" range, check if gear shift and lock-up occur properly as shown in "Automatic Gear Shift Table".

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Unable to run in all range	Faulty valve body component	Replace valve body assembly.
	Faulty oil pump	Inspect. If NG, replace.
	Seized or broken planetary gear	Inspect. If NG, replace.
	Faulty one-way No.2 clutch	Inspect. If NG, replace.
	Faulty forward clutch	Inspect. If NG, replace.
	Faulty reverse clutch	Inspect. If NG, replace.
	Faulty 1st and reverse brake	Inspect. If NG, replace.
	Damaged drive plate	Inspect. If NG, replace.
	Faulty torque converter	Replace.
No gear shift as 3rd gear	Malfunction of shift solenoid valve-A and/or -B	Inspect. If NG, replace.
	Malfunction of timing solenoid valve	Inspect. If NG, replace.
	Malfunction of pressure control solenoid valve	Inspect. If NG, replace valve body assembly.
1 → 2 upshift fails to occur	Malfunction of shift solenoid valve-B	Inspect. If NG, replace.
	Malfunction of output shaft speed sensor (VSS)	Inspect. If NG, replace.
	Malfunction of throttle position sensor	Inspect. If NG, replace.
	Malfunction of transmission range sensor	Inspect. If NG, replace.
	Faulty valve body component	Replace valve body assembly.
	Faulty 2nd brake	Inspect. If NG, replace.
	Faulty one-way No.1 clutch	Inspect. If NG, replace.

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Condition	Possible cause	Correction / Reference Item
2 → 3 upshift fails to occur	Malfunction of shift solenoid valve-A	<i>Inspect. If NG, replace.</i>
	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of throttle position sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of transmission range sensor	<i>Inspect. If NG, replace.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
	Faulty direct clutch	<i>Inspect. If NG, replace.</i>
3 → 4 upshift fails to occur	Malfunction of shift solenoid valve-B	<i>Inspect. If NG, replace.</i>
	Malfunction of "3" position switch	<i>Inspect. If NG, replace.</i>
	Malfunction of engine coolant temperature sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of input shaft speed sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of throttle position sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of transmission range sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of crankshaft position sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of timing solenoid valve	<i>Inspect. If NG, replace.</i>
	Malfunction of transmission fluid temperature sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of pressure control solenoid valve	<i>Inspect. If NG, replace valve body assembly.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
	Faulty O/D and 2nd coast brake	<i>Inspect. If NG, replace.</i>
	Abnormal engine condition	<i>Inspect and repair engine.</i>
Gear shift point is incorrect	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of throttle position sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of pressure control solenoid valve	<i>Inspect. If NG, replace valve body assembly.</i>
4 → 3 downshift fails to occur	Malfunction of shift solenoid valve-A	<i>Inspect. If NG, replace.</i>
	Malfunction of "3" position switch	<i>Inspect. If NG, replace.</i>
	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of input shaft speed sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of throttle position sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of timing solenoid valve	<i>Inspect. If NG, replace.</i>
	Malfunction of pressure control solenoid valve	<i>Inspect. If NG, replace valve body assembly.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
3 → 2 downshift fails to occur	Faulty forward clutch	<i>Inspect. If NG, replace.</i>
	Malfunction of shift solenoid valve-A	<i>Inspect. If NG, replace.</i>
	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of throttle position sensor	<i>Inspect. If NG, replace.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
2 → 1 downshift fails to occur	Faulty one-way No.1 clutch	<i>Inspect. If NG, replace.</i>
	Malfunction of shift solenoid valve-B	<i>Inspect. If NG, replace.</i>
	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of throttle position sensor	<i>Inspect. If NG, replace.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
	Faulty one-way No.2 clutch	<i>Inspect. If NG, replace.</i>

Condition	Possible cause	Correction / Reference Item
TCC (lock-up) function pressure control does not operate	Malfunction of TCC pressure control solenoid valve	<i>Inspect. If NG, replace.</i>
	Malfunction of shift solenoid valve-A and/or -B	<i>Inspect. If NG, replace.</i>
	Malfunction of brake light switch	<i>Inspect. If NG, replace.</i>
	Malfunction of engine coolant temperature sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of input shaft speed sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of throttle position sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of transmission range sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of transmission fluid temperature sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of pressure control solenoid valve	<i>Inspect. If NG, replace valve body assembly.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
	Faulty torque converter	<i>Replace.</i>

Manual Road Test

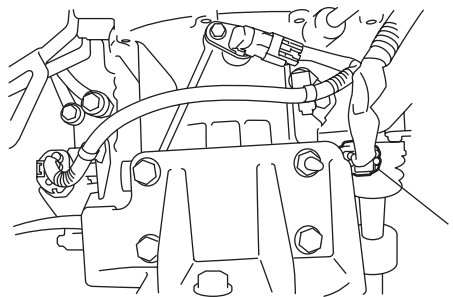
S6RW0E5104011

⚠ WARNING

- Carry out test in very little traffic area to prevent an accident.
- Test requires 2 persons, a driver and a tester.

The purpose of this test is to judge whether causal factor of trouble which occurred in automatic transaxle is electrical or mechanical by disconnecting valve body harness connector (1) and fixing automatic transaxle gear position.

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch to OFF position and disconnect valve body harness connector (1).



I5RW0C510010-01

- 3) Turn OFF all electrical loads.
With select lever shifted to each range ("L", "2", "3" and "D"), drive vehicle at 1,000 rpm engine speed and then check vehicle speed by referring to "Fixed gear position".
If vehicle speed is not as specified in "Fixed gear position" table, go to troubleshooting.
- 4) Connect valve body harness connector and clear DTC.

Fixed gear position

Select lever position	Fixed gear position	Vehicle speed
L range	3rd gear	Approx. 25.0 km/h (15.5 mile/h)
2 range		
3 range		
D range		
R range	Reverse gear	Approx. 10.9 km/h (6.8 mile/h)

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Operated gear is not correct	Faulty valve body component	<i>Replace valve body assembly.</i>
	Faulty clutch or brake	<i>Inspect clutch and brake. If any parts are faulty, replace them.</i>

Engine Brake Test

S6RW0E5104012

⚠ WARNING

Before test, make sure that there is no vehicle behind so as to prevent rear-end collision.

- 1) While driving vehicle in 3rd gear of "D" range, shift select lever down to "2" range and check if engine brake operates.
- 2) In the same way as in Step 1), check engine brake for operation when select lever is shifted down to "L" range.
- 3) Engine brake should operate in the test.

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Failure to operate when shifted down to "2" range	Faulty valve body component	<i>Replace valve body assembly.</i>
	Faulty O/D and 2nd coast brake	<i>Inspect. If NG, replace.</i>
Failure to operate when shifted down to "L" range	Faulty valve body component	<i>Replace valve body assembly.</i>
	Faulty 1st and reverse brake	<i>Inspect. If NG, replace.</i>

Stall Test

S6RW0E5104013

This test is to check overall performance of automatic transaxle and engine by measuring stall speed at "D" and "R" ranges. Be sure to perform this test only when transaxle fluid is at normal operating temperature and its level is between FULL and LOW marks.

⚠ CAUTION

- **Do not run engine at stall more than 5 seconds continuously, or fluid temperature may rise excessively high.**
- **After performing stall test, be sure to leave engine running at idle for longer than 1 minute before another stall test.**

- 1) Apply parking brake and block wheels.
- 2) Install tachometer.
- 3) Start engine with select lever shifted to "P" range.
- 4) Depress brake pedal fully.
- 5) Shift select lever to "D" range and depress accelerator pedal fully while watching tachometer. Read engine rpm quickly when it has become constant (stall speed).
- 6) Release accelerator pedal immediately after stall speed is checked.
- 7) In the same way, check stall speed in "R" range.
- 8) Stall speed should be within the following specification.

Engine stall speed

Standard: 2,200 – 2,600 rpm

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Lower than standard level in both "D" and "R" range	Engine output torque failure	<i>Inspect and repair engine.</i>
	Faulty one-way clutch of torque converter	<i>Replace torque converter.</i>
Higher than standard level in "D" range	Malfunction of pressure control solenoid valve (Low line pressure)	<i>Inspect. If NG, replace valve body assembly.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
	Slippery forward clutch	<i>Inspect. If NG, replace.</i>
	Faulty one-way No.2 clutch	<i>Inspect. If NG, replace.</i>
	Leakage from "D" range fluid pressure circuit	<i>Overhaul or replace valve body assembly.</i>
Higher than standard level in "R" range	Malfunction of pressure control solenoid valve (Low line pressure)	<i>Inspect. If NG, replace valve body assembly.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
	Slippery reverse clutch	<i>Inspect. If NG, replace.</i>
	Slippery 1st and reverse brake	<i>Inspect. If NG, replace.</i>
	Leakage from "R" range fluid pressure circuit	<i>Overhaul or replace valve body assembly.</i>
Higher than standard level in both "D" and "R" range	Malfunction of pressure control solenoid valve (Low line pressure)	<i>Inspect. If NG, replace valve body assembly.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
	Clogged oil strainer	<i>Replace.</i>
	Faulty oil pump	<i>Inspect. If NG, replace.</i>
	Leakage from both "D" and "R" range fluid pressure circuit	<i>Overhaul or replace valve body assembly.</i>

Time Lag Test

S6RW0E5104014

This test is to check conditions of clutch, brake and fluid pressure. "Time lag" means time elapsed since select lever is shifted with engine idling till shock is felt.

- 1) With chocks placed before and behind front and rear wheels respectively, depress brake pedal.
- 2) Start engine.
- 3) With stop watch ready, shift select lever from "N" to "D" range and measure time from that moment till shock is felt.
- 4) Similarly measure time lag by shifting select lever from "N" to "R" range.

Gear shifting time lag**"N" → "D": Less than 0.7 sec.****"N" → "R": Less than 1.2 sec.****NOTE**

- When repeating this test, be sure to wait at least one minute after select lever is shifted back to "N" range.
- Engine should be warmed up fully for this test.
- Repeat test 3 times and take average of those data for final time lag data.

Troubleshooting

Condition	Possible cause	Correction / Reference Item
"N" → "D" time lag exceeds specification	Malfunction of transmission fluid temperature sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of pressure control solenoid valve (Low line pressure)	<i>Inspect. If NG, replace valve body assembly.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
	Clogged oil strainer	<i>Replace.</i>
	Faulty oil pump	<i>Inspect. If NG, replace.</i>
	Faulty forward clutch	<i>Inspect. If NG, replace.</i>
	Faulty one-way No.2 clutch	<i>Inspect. If NG, replace.</i>
	Leakage from "D" range fluid pressure circuit	<i>Overhaul or replace valve body assembly.</i>
"N" → "R" time lag exceeds specification	Malfunction of transmission fluid temperature sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of pressure control solenoid valve (Low line pressure)	<i>Inspect. If NG, replace valve body assembly.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
	Clogged oil strainer	<i>Replace.</i>
	Faulty oil pump	<i>Inspect. If NG, replace.</i>
	Faulty reverse clutch	<i>Inspect. If NG, replace.</i>
	Faulty 1st and reverse brake	<i>Inspect. If NG, replace.</i>
	Leakage from "R" range fluid pressure circuit	<i>Overhaul or replace valve body assembly.</i>

Line Pressure Test

S6RW0E5104015

Purpose of this test is to check operating conditions of each part by measuring fluid pressure in fluid pressure line.
Line pressure test requires the following conditions.

- Automatic fluid is at normal operating temperature (70 – 80 °C / 158 – 176 °F).
- Fluid is replenished to proper level (between FULL and LOW on dipstick).
- Air conditioner switch is turned OFF.
 - 1) Apply parking brake securely and place chocks against wheels.
 - 2) Remove fluid pressure check hole plug bolt.
 - 3) Attach oil pressure gauge to fluid pressure check hole in transaxle case.

Special tool**(A): 09925–37811–001****⚠ CAUTION**

After attaching oil pressure gauge, check that no fluid leakage exists.

- 4) Depress foot brake fully, run engine at idle and stall then check fluid pressure in "D" or "R" range.

⚠ CAUTION

- Do not continue running engine at stall speed longer than 5 seconds.
 - After performing line pressure test, be sure to leave engine running at idle for longer than one minute before performing another line pressure test.
-

Automatic transaxle line pressure

	"D" range	"R" range
At idle speed	3.8 – 4.2 kg/cm ² , 54 – 60 psi	5.9 – 6.9 kg/cm ² , 84 – 98 psi
At stall speed	11.6 – 12.9 kg/cm ² , 165 – 183 psi	16.8 – 19.5 kg/cm ² , 239 – 277 psi

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Higher than standard level in each range	Malfunction of pressure control solenoid valve (Low line pressure)	<i>Inspect. If NG, replace valve body assembly.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
Lower than standard level in each range	Malfunction of pressure control solenoid valve (Low line pressure)	<i>Inspect. If NG, replace valve body assembly.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
	Clogged oil strainer	<i>Replace.</i>
	Faulty oil pump	<i>Inspect. If NG, replace.</i>
	Leakage from both "D" and "R" range fluid pressure circuit	<i>Overhaul or replace valve body assembly.</i>
Lower than standard level only in "D" range	Leakage from "D" range fluid pressure circuit	<i>Overhaul or replace valve body assembly.</i>
Lower than standard level only in "R" range	Leakage from "R" range fluid pressure circuit	<i>Overhaul or replace valve body assembly.</i>

"P" Range Test

S6RW0E5104016

- 1) Stop vehicle on a slope of 5 degrees or more, shift select lever to "P" range and at the same time apply parking brake.
- 2) After stopping engine, depress brake pedal and release parking brake.
- 3) Then, release brake pedal gradually and check that vehicle remains stationary.
- 4) Depress brake pedal and shift select lever to "N" range.
- 5) Then, release brake pedal gradually and check that vehicle moves.

▲ WARNING

Before test, make sure no one is around vehicle or down on a slope and keep watchful for safety during test.

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Vehicle moves at "P" range or remains stationary at "N" range	Defective parking lock pawl or spring	<i>Inspect. If NG, repair.</i>

A/T Symptom Diagnosis

Trouble Diagnosis 1

Electrical repair

Condition	Possible cause	Correction / Reference Item
Excessive shift shock	Shift solenoid valve-A and/or -B circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Pressure control solenoid valve circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Timing solenoid valve circuit faulty only when N → D or 3 ↔ 4 shifting	Inspect circuit for open, short and intermittent. If NG, repair.
	Output shaft speed sensor (VSS) circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Input shaft speed sensor circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Transmission fluid temperature sensor circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	CAN communication circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Throttle position sensor circuit faulty	Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor (Main) Circuit Low in Section 1A" and/or "DTC P0123: Throttle Position Sensor (Main) Circuit High in Section 1A". If NG, repair.
	Crankshaft position sensor circuit faulty	Inspect circuit for open, short and intermittent referring to "DTC P0335: Crankshaft Position (CKP) Sensor Circuit in Section 1A". If NG, repair.
	TCM	Substitute a known-good TCM and recheck.
No gear shift as 3rd gear	ECM	Substitute a known-good ECM and recheck.
	Shift solenoid valve-A and/or -B circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Pressure control solenoid valve circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Timing solenoid valve circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	TCM	Substitute a known-good TCM and recheck.
Poor 1 → 2 shift	Shift solenoid valve-B circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Output shaft speed sensor (VSS) circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Transmission range sensor circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	CAN communication circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Throttle position sensor circuit faulty	Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor (Main) Circuit Low in Section 1A" and/or "DTC P0123: Throttle Position Sensor (Main) Circuit High in Section 1A". If NG, repair.
	TCM	Substitute a known-good TCM and recheck.
	ECM	Substitute a known-good ECM and recheck.

Condition	Possible cause	Correction / Reference Item
Poor 2 → 3 shift	Shift solenoid valve-A circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Output shaft speed sensor (VSS) circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Transmission range sensor circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	CAN communication circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Throttle position sensor circuit faulty	<i>Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor (Main) Circuit Low in Section 1A" and/or "DTC P0123: Throttle Position Sensor (Main) Circuit High in Section 1A". If NG, repair.</i>
	TCM	<i>Substitute a known-good TCM and recheck.</i>
	ECM	<i>Substitute a known-good ECM and recheck.</i>
Poor 3 → 4 shift	Shift solenoid valve-B circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Pressure control solenoid valve circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Timing solenoid valve circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Output shaft speed sensor (VSS) circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Input shaft speed sensor circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Transmission range sensor circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Transmission fluid temperature sensor circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	CAN communication circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Throttle position sensor circuit faulty	<i>Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor (Main) Circuit Low in Section 1A" and/or "DTC P0123: Throttle Position Sensor (Main) Circuit High in Section 1A". If NG, repair.</i>
	Engine coolant temperature sensor circuit faulty	<i>Inspect circuit for open, short and intermittent referring to "DTC P0117: Engine Coolant Temperature Circuit Low in Section 1A" and/or "DTC P0118: Engine Coolant Temperature Circuit High in Section 1A". If NG, repair.</i>
	Crankshaft position sensor circuit faulty	<i>Inspect circuit for open, short and intermittent referring to "DTC P0335: Crankshaft Position (CKP) Sensor Circuit in Section 1A". If NG, repair.</i>
	"3" position switch circuit faulty	<i>Inspect. If NG, repair.</i>
	TCM	<i>Substitute a known-good TCM and recheck.</i>
	ECM	<i>Substitute a known-good ECM and recheck.</i>

5A-34 Automatic Transmission/Transaxle:

Condition	Possible cause	Correction / Reference Item
Poor 4 → 3 shift	Shift solenoid valve-B circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Pressure control solenoid valve circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Timing solenoid valve circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Output shaft speed sensor (VSS) circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Input shaft speed sensor circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	CAN communication circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Throttle position sensor circuit faulty	<i>Inspect circuit for open, short and intermittent referring to “DTC P0122: Throttle Position Sensor (Main) Circuit Low in Section 1A” and/or “DTC P0123: Throttle Position Sensor (Main) Circuit High in Section 1A”. If NG, repair.</i>
	“3” position switch circuit faulty	<i>Inspect. If NG, repair.</i>
	TCM	<i>Substitute a known-good TCM and recheck.</i>
	ECM	<i>Substitute a known-good ECM and recheck.</i>
Poor 3 → 2 shift	Shift solenoid valve-A circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Output shaft speed sensor (VSS) circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	CAN communication circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Throttle position sensor circuit faulty	<i>Inspect circuit for open, short and intermittent referring to “DTC P0122: Throttle Position Sensor (Main) Circuit Low in Section 1A” and/or “DTC P0123: Throttle Position Sensor (Main) Circuit High in Section 1A”. If NG, repair.</i>
	TCM	<i>Substitute a known-good TCM and recheck.</i>
	ECM	<i>Substitute a known-good ECM and recheck.</i>
Poor 2 → 1 shift	Shift solenoid valve-A circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Output shaft speed sensor (VSS) circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	CAN communication circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Throttle position sensor circuit faulty	<i>Inspect circuit for open, short and intermittent referring to “DTC P0122: Throttle Position Sensor (Main) Circuit Low in Section 1A” and/or “DTC P0123: Throttle Position Sensor (Main) Circuit High in Section 1A”. If NG, repair.</i>
	TCM	<i>Substitute a known-good TCM and recheck.</i>
	ECM	<i>Substitute a known-good ECM and recheck.</i>
Incorrect gear shift point	Output shaft speed sensor (VSS) circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Pressure control solenoid valve circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	CAN communication circuit faulty	<i>Inspect circuit for open, short and intermittent. If NG, repair.</i>
	Throttle position sensor circuit faulty	<i>Inspect circuit for open, short and intermittent referring to “DTC P0122: Throttle Position Sensor (Main) Circuit Low in Section 1A” and/or “DTC P0123: Throttle Position Sensor (Main) Circuit High in Section 1A”. If NG, repair.</i>
	TCM	<i>Substitute a known-good TCM and recheck.</i>
	ECM	<i>Substitute a known-good ECM and recheck.</i>

Condition	Possible cause	Correction / Reference Item
Non operate TCC (lock-up) system	TCC pressure control solenoid valve circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Shift solenoid valve-A and/or-B circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Pressure control solenoid valve circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Output shaft speed sensor (VSS) circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Input shaft speed sensor circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Transmission range sensor circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Transmission fluid temperature sensor circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	CAN communication circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Throttle position sensor circuit faulty	Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor (Main) Circuit Low in Section 1A" and/or "DTC P0123: Throttle Position Sensor (Main) Circuit High in Section 1A". If NG, repair.
	Engine coolant temperature sensor circuit faulty	Inspect circuit for open, short and intermittent referring to "DTC P0117: Engine Coolant Temperature Circuit Low in Section 1A" and/or "DTC P0118: Engine Coolant Temperature Circuit High in Section 1A". If NG, repair.
	Brake light switch circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	TCM	Substitute a known-good TCM and recheck.
	ECM	Substitute a known-good ECM and recheck.
Higher or lower stall speed	Pressure control solenoid valve circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	TCM	Substitute a known-good TCM and recheck.
Excessive "N" → "D" or "N" → "R" time lag	Pressure control solenoid valve circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	Transmission fluid temperature sensor circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	TCM	Substitute a known-good TCM and recheck.
Higher or lower line pressure	Pressure control solenoid valve circuit faulty	Inspect circuit for open, short and intermittent. If NG, repair.
	TCM	Substitute a known-good TCM and recheck.

Trouble Diagnosis 2

On-vehicle repair

Condition	Possible cause	Correction / Reference Item
Unable to run in all range	Faulty valve body component	<i>Replace valve body assembly.</i>
Excessive shift shock	Engine abnormal condition	<i>Inspect and repair engine.</i>
	Malfunction of shift solenoid valve-A and/or -B	<i>Inspect. If NG, replace.</i>
	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of input shaft speed sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of transmission range sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of transmission fluid temperature sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of timing solenoid valve only when N → D or 3 ↔ 4 shifting	<i>Inspect. If NG, replace.</i>
	Malfunction of pressure control solenoid valve	<i>Inspect. If NG, replace valve body assembly.</i>
	Malfunction of brake light switch except N → D or N → R shifting	<i>Inspect referring to “Brake Light Switch Inspection in Section 9B in related manual”. If NG, replace.</i>
	Malfunction of crankshaft position sensor	<i>Inspect referring to “Camshaft Position (CMP) Sensor Inspection in Section 1C”. If NG, replace.</i>
	Malfunction of Accelerator pedal position (APP) sensor	<i>Inspect referring to “Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection in Section 1C”. If NG, replace.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
Poor 1 → 2 shift	Malfunction of shift solenoid valve-B	<i>Inspect. If NG, replace.</i>
	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of transmission range sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of Accelerator pedal position (APP) sensor	<i>Inspect referring to “Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection in Section 1C”. If NG, replace.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
Poor 2 → 3 shift	Malfunction of shift solenoid valve-A	<i>Inspect. If NG, replace.</i>
	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of transmission range sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of Accelerator pedal position (APP) sensor	<i>Inspect referring to “Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection in Section 1C”. If NG, replace.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>

Condition	Possible cause	Correction / Reference Item
Poor 3 → 4 shift	Malfunction of shift solenoid valve-B	<i>Inspect. If NG, replace.</i>
	Malfunction of timing solenoid valve	<i>Inspect. If NG, replace.</i>
	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of input shaft speed sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of transmission range sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of transmission fluid temperature sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of "3" position switch	<i>Inspect. If NG, replace.</i>
	Malfunction of engine coolant temperature sensor	<i>Inspect referring to "Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C". If NG, replace.</i>
	Malfunction of Accelerator pedal position (APP) sensor	<i>Inspect referring to "Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection in Section 1C". If NG, replace.</i>
	Malfunction of pressure control solenoid valve	<i>Inspect. If NG, replace valve body assembly.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
Poor 4 → 3 shift	Malfunction of shift solenoid valve-B	<i>Inspect. If NG, replace.</i>
	Malfunction of timing solenoid valve	<i>Inspect. If NG, replace.</i>
	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of input shaft speed sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of "3" position off switch	<i>Inspect. If NG, replace.</i>
	Malfunction of Accelerator pedal position (APP) sensor	<i>Inspect referring to "Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection in Section 1C". If NG, replace.</i>
	Malfunction of pressure control solenoid valve	<i>Inspect. If NG, replace valve body assembly.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
Poor 3 → 2 shift	Malfunction of shift solenoid valve-A	<i>Inspect. If NG, replace.</i>
	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of Accelerator pedal position (APP) sensor	<i>Inspect referring to "Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection in Section 1C". If NG, replace.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
Poor 2 → 1 shift	Malfunction of shift solenoid valve-B	<i>Inspect. If NG, replace.</i>
	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of Accelerator pedal position (APP) sensor	<i>Inspect referring to "Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection in Section 1C". If NG, replace.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
Incorrect shift point	Engine abnormal condition	<i>Inspect and repair engine.</i>
	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of Accelerator pedal position (APP) sensor	<i>Inspect referring to "Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection in Section 1C". If NG, replace.</i>

5A-38 Automatic Transmission/Transaxle:

Condition	Possible cause	Correction / Reference Item
Non operate TCC (lock-up) system	Malfunction of TCC solenoid valve	<i>Inspect. If NG, replace.</i>
	Malfunction of shift solenoid valve-A and/or -B	<i>Inspect. If NG, replace.</i>
	Malfunction of output shaft speed sensor (VSS)	<i>Inspect. If NG, replace.</i>
	Malfunction of input shaft speed sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of transmission range sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of transmission fluid temperature sensor	<i>Inspect. If NG, replace.</i>
	Malfunction of pressure control solenoid valve	<i>Inspect. If NG, replace valve body assembly.</i>
	Malfunction of Accelerator pedal position (APP) sensor	<i>Inspect referring to "Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection in Section 1C". If NG, replace.</i>
	Malfunction of engine coolant temperature sensor	<i>Inspect referring to "Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C". If NG, replace.</i>
	Malfunction of brake light switch	<i>Inspect referring to "Brake Light Switch Inspection in Section 9B in related manual". If NG, replace.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>
Excessive "N" → "D" or "N" → "R" time lag	Malfunction of transmission fluid temperature sensor	<i>Inspect. If NG, replace.</i>
	Pressure control solenoid valve circuit faulty	<i>Inspect. If NG, replace valve body assembly.</i>
	Clogged oil strainer	<i>Replace.</i>
	Faulty valve body component	<i>Replace valve body assembly.</i>

Trouble Diagnosis 3
Off-vehicle repair

Condition	Possible cause	Correction / Reference Item
Unable to run in all range	Faulty oil pump	<i>Inspect. If NG, replace.</i>
	Seized or broken planetary gear	<i>Inspect. If NG, replace.</i>
	Faulty one-way No.2 clutch	<i>Inspect. If NG, replace.</i>
	Damaged drive plate	<i>Inspect. If NG, replace.</i>
	Faulty forward clutch	<i>Inspect. If NG, replace.</i>
	Faulty reverse clutch	<i>Inspect. If NG, replace.</i>
	Faulty 1st and reverse brake	<i>Inspect. If NG, replace.</i>
	Faulty torque converter	<i>Replace.</i>
Excessive "N" → "D" shift shock	Faulty forward clutch	<i>Inspect. If NG, replace.</i>
Excessive "N" → "R" shift shock	Faulty reverse clutch	<i>Inspect. If NG, replace.</i>
	Faulty 1st and reverse brake	<i>Inspect. If NG, replace.</i>
Poor 1 → 2 shift, excessive shock or slippage	Faulty 2nd brake	<i>Inspect. If NG, replace.</i>
	Faulty one-way No.1 clutch	<i>Inspect. If NG, replace.</i>
Poor 2 → 3 shift, excessive shock or slippage	Faulty direct clutch	<i>Inspect. If NG, replace.</i>
Poor 3 ↔ 4 shift, excessive shock or slippage	Faulty forward clutch	<i>Inspect. If NG, replace.</i>
	Faulty O/D and 2nd coast brake	<i>Inspect. If NG, replace.</i>
Poor 3 → 2 shift, excessive shock or slippage	Faulty direct clutch	<i>Inspect. If NG, replace.</i>
	Faulty one-way No.1 clutch	<i>Inspect. If NG, replace.</i>

Condition	Possible cause	Correction / Reference Item
Poor 2 → 1 shift, excessive shock or slippage	Faulty 2nd brake	<i>Inspect. If NG, replace.</i>
	Faulty one-way No.2 clutch	<i>Inspect. If NG, replace.</i>
Non operate TCC (lock-up) system	Faulty torque converter	<i>Replace.</i>
Excessive "N" → "D" time lag	Faulty oil pump	<i>Inspect. If NG, replace.</i>
	Faulty forward clutch	<i>Inspect. If NG, replace.</i>
	Faulty one-way No.2 clutch	<i>Inspect. If NG, replace.</i>
	Leakage from "D" range fluid pressure circuit	<i>Overhaul or replace valve body assembly.</i>
Excessive "N" → "R" time lag	Faulty oil pump	<i>Inspect. If NG, replace.</i>
	Faulty reverse clutch	<i>Inspect. If NG, replace.</i>
	Faulty 1st and reverse brake	<i>Inspect. If NG, replace.</i>
	Leakage from "R" range fluid pressure circuit	<i>Overhaul or replace valve body assembly.</i>
Poor engine brake in downshift to "2" range	Faulty O/D and 2nd coast brake	<i>Inspect. If NG, replace.</i>
Poor engine brake in downshift to "L" range	Faulty 1st and reverse brake	<i>Inspect. If NG, replace.</i>

Transmission Warning Light Circuit Check – Light Does Not Come "ON" at Ignition Switch ON

S6RW0E5104054

Troubleshooting

Step	Action	Yes	No
1	Combination Meter Power Supply Check 1) Turn ignition switch ON. <i>Does other indicator / warning lights in combination meter comes ON?</i>	Go to Step 2.	Repair combination meter power supply circuit referring to "Combination Meter Circuit Diagram in Section 9C in related manual".
2	1) TCM power and ground circuit check referring to "TCM Power and Ground Circuit Check". <i>Is it in good condition?</i>	Go to Step 3.	Repair or replace.
3	DTC check 1) Check DTC referring to "DTC Check". <i>Is there DTC U0073 or U0100?</i>	Go to applicable DTC diag. flow.	Go to Step 4.
4	Combination Meter Function Check 1) Turn ignition switch ON. <i>Does A/T selector position indicator show correct select lever position?</i>	Replace combination meter.	Substitute a known-good TCM and recheck.

Transmission Warning Light Circuit Check – Light Remains "ON" at Ignition Switch ON

S6RW0E5104055

Troubleshooting

Step	Action	Yes	No
1	Diagnostic Trouble Code (DTC) Check 1) Check DTC referring to "DTC Check". <i>Is there any DTC(s)?</i>	Perform DTC Flow to repair and retry.	Substitute a known-good TCM and recheck. If OK, substitute a known-good combination meter and recheck.

DTC P0602: Control Module Programming Error

S6RW0E5104047

System Description

Internal control module is installed in ECM.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Data programming error (1 driving cycle detection logic)	TCM

DTC Confirmation Procedure

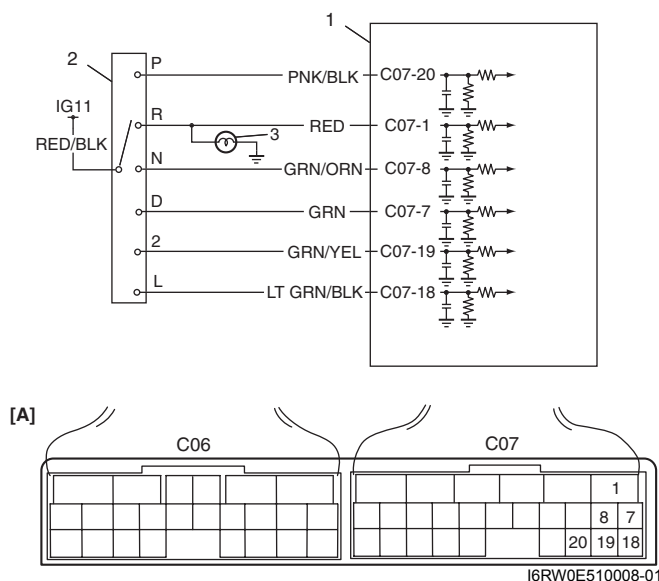
- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
- 3) Start engine and run it at idle if possible.
- 4) Check DTC and pending DTC by using scan tool.

DTC Troubleshooting

Step	Action	Yes	No
1	DTC check 1) Clear DTC referring to "DTC Clearance". 2) Turn OFF ignition switch. 3) Turn ON ignition switch and check DTC. <i>Is DTC P0602 still indicated?</i>	Go to Step 2.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
2	TCM power ground circuit check 1) Check that TCM power supply circuit and TCM ground circuit is in good condition referring to "TCM Power and Ground Circuit Check". <i>Are check results OK?</i>	Substitute a known-good TCM and recheck.	Repair TCM power or ground circuit.

DTC P0705: Transmission Range Sensor Circuit Malfunction (PRNDL Input)

S6RW0E5104020

Wiring Diagram

1. TCM	3. Backup lamp
2. Transmission range sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Multiple or more signals are inputted simultaneously for 10 seconds.	• Select cable maladjusted • Transmission range sensor maladjusted • Transmission range sensor or its circuit malfunction • TCM

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch OFF.
- 2) Clear DTCs in TCM memory by using scan tool.
- 3) Start engine and shift select lever to "D" range.
- 4) Keep engine running at idle speed for 25 seconds or more.
- 5) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".
2	Do you have SUZUKI scan tool?	Go to Step 3.	Go to Step 4.
3	Check transmission range sensor circuit for operation Check by using SUZUKI scan tool: 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON and check transmission range signal ("P", "R", "N", "D", "2" or "L") on display when shifting select lever to each range. <i>Is applicable range indicated?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 5.
4	Check transmission range sensor circuit for operation Check by not using SUZUKI scan tool: 1) Turn ignition switch ON. 2) Check voltage at terminals "C07-1", "C07-7", "C07-8", "C07-18", "C07-19" and "C07-20" respectively with select lever shifted to each range. Taking terminal "C07-19" as an example, is battery voltage indicated only when select lever is shifted to "2" range and 0 V for other ranges as shown in the following table. Check voltage at other terminals likewise, referring to the following table. <i>Are check results satisfactory?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 5.
5	1) Check select cable for adjustment referring to "Select Cable Adjustment". <i>Is it adjusted correctly?</i>	Go to Step 6.	Adjust.
6	Check transmission range sensor for installation position 1) Shift select lever to "N" range. 2) Check that "N" reference line on sensor and needle direction shaped on lock washer are aligned. <i>Are they aligned?</i>	Go to Step 7.	Adjust.

5A-42 Automatic Transmission/Transaxle:

Step	Action	Yes	No
7	1) Check transmission range sensor referring to "Transmission Range Sensor Inspection and Adjustment". <i>Are check results satisfactory?</i>	"RED/BLK", "PNK/BLK", "RED", "GRN/ORN", "GRN", "GRN/YEL" or "LT GRN/BLK" circuit shorted to power circuit or shorted each other. If wires and connections are OK, substitute a know-good TCM and recheck.	Replace transmission range sensor.

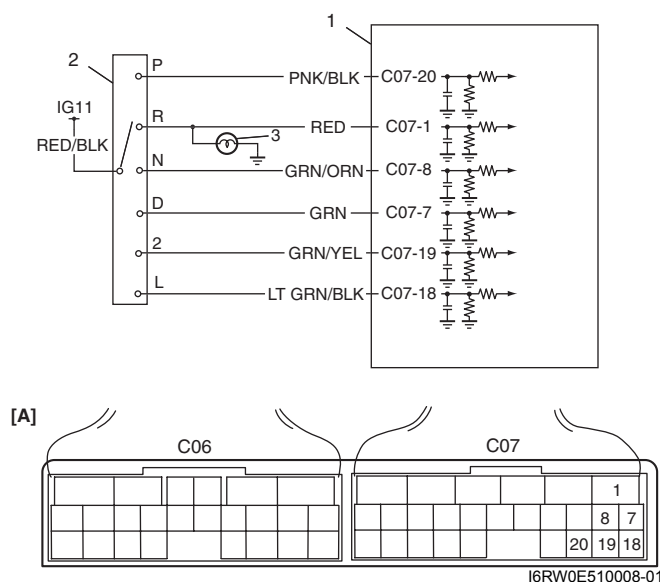
Table for Step 4

		Terminal					
		C07-20	C07-1	C07-8	C07-7	C07-19	C07-18
Select lever position	P	8 – 14 V	0 V	0 V	0 V	0 V	0 V
	R	0 V	8 – 14 V	0 V	0 V	0 V	0 V
	N	0 V	0 V	8 – 14 V	0 V	0 V	0 V
	D or 3	0 V	0 V	0 V	8 – 14 V	0 V	0 V
	2	0 V	0 V	0 V	0 V	8 – 14 V	0 V
	L	0 V	0 V	0 V	0 V	0 V	8 – 14 V

DTC P0707: Transmission Range Sensor Circuit Low

S6RW0E5104021

Wiring Diagram



1. TCM	3. Backup lamp
2. Transmission range sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission range switch signal (P, R, N, D, 2, or L) is not inputted for more than 28 seconds when vehicle speed is faster than 30 km/h (19 mile/h) and engine speed is faster than 1500 rpm.	- Select cable maladjusted - Transmission range sensor maladjusted - Transmission range sensor or its circuit malfunction - TCM

DTC Confirmation Procedure

⚠ WARNING

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out with 2 persons, a driver and a tester, on a level road.

- 1) Connect scan tool to DLC with ignition switch OFF.
- 2) Clear DTCs in TCM memory by using scan tool.
- 3) Start engine and shift select lever to "D" range.
- 4) Start vehicle and increase vehicle speed to 40 km/h (25 mile/h) or more for 1 minutes.
- 5) Stop vehicle and turn ignition switch OFF.
- 6) Repeat Step 3) to 4) one time.
- 7) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".
2	Do you have SUZUKI scan tool?	Go to Step 3.	Go to Step 4.
3	Check transmission range sensor circuit for operation Check by using SUZUKI scan tool: 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON and check transmission range signal (P, R, N, D, 2 or L) on display when shifting select lever to each range. <i>Is applicable range indicated?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 5.
4	Check transmission range sensor circuit for operation Check by not using SUZUKI scan tool: 1) Turn ignition switch ON. 2) Check voltage at terminals "C07-1", "C07-7", "C07-8", "C07-18", "C07-19" and "C07-20" respectively with select lever shifted to each range. Taking terminal "C07-19" as an example, is battery voltage indicated only when select lever is shifted to "2" range and 0 V for other ranges as shown in the following table. Check voltage at other terminals likewise, referring to the following table. <i>Are check results satisfactory?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".	Go to Step 5.
5	1) Check select cable for adjustment referring to "Select Cable Adjustment". <i>Is it adjusted correctly?</i>	Go to Step 6.	Adjust.
6	Check transmission range sensor for installation position 1) Shift select lever to "N" range. 2) Check that "N" reference line on sensor and needle direction shaped on lock washer are aligned. <i>Are they aligned?</i>	Go to Step 7.	Adjust.

5A-44 Automatic Transmission/Transaxle:

Step	Action	Yes	No
7	1) Check transmission range sensor referring to "Transmission Range Sensor Inspection and Adjustment". <i>Are check results satisfactory?</i>	"RED/BLK", "PNK/BLK", "RED", "GRN/ORN", "GRN", "GRN/YEL" or "LT GRN/BLK" circuit open or short to ground. If wires and connections are OK, substitute a know-good TCM and recheck.	Replace transmission range sensor.

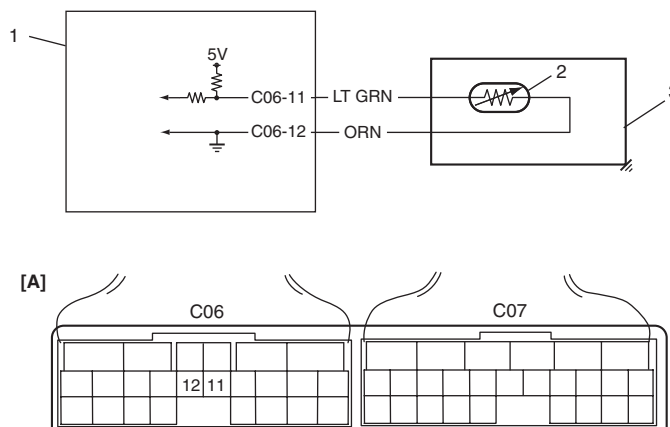
Table for Step 4

		Terminal					
		C07-20	C07-1	C07-8	C07-7	C07-19	C07-18
Select lever position	P	8 – 14 V	0 V	0 V	0 V	0 V	0 V
	R	0 V	8 – 14 V	0 V	0 V	0 V	0 V
	N	0 V	0 V	8 – 14 V	0 V	0 V	0 V
	D or 3	0 V	0 V	0 V	8 – 14 V	0 V	0 V
	2	0 V	0 V	0 V	0 V	8 – 14 V	0 V
	L	0 V	0 V	0 V	0 V	0 V	8 – 14 V

DTC P0712: Transmission Fluid Temperature Sensor Circuit Low

S6RW0E5104022

Wiring Diagram



I6RW0E510009-01

1. TCM	3. A/T
2. Transmission fluid temperature sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission temperature sensor terminal voltage is less than specified value for 5 minutes or more after turning ignition switch ON.	- Transmission fluid temperature sensor or its circuit malfunction - TCM

DTC Confirmation Procedure

⚠ WARNING

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out with 2 persons, a driver and a tester, on a level road.

- 1) Connect scan tool to DLC with ignition switch OFF, if available.
- 2) Clear DTC in TCM memory and start engine and keep for 20 minutes or more.
- 3) Stop vehicle and check DTC.

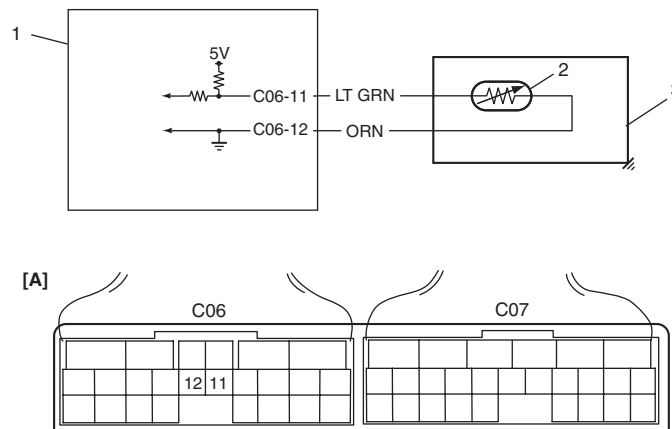
DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".
2	Check transmission fluid temperature circuit for ground short 1) Check continuity between terminal "C06-11" of disconnected harness side TCM connector and ground. <i>Is continuity indicated?</i>	"LT GRN" circuit shorted to ground.	Go to Step 3.
3	Inspect transmission fluid temperature sensor 1) Inspect transmission fluid temperature sensor referring to "Transmission Fluid Temperature Sensor Inspection". <i>Is result satisfactory?</i>	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good TCM and recheck.	Replace transmission fluid temperature sensor.

DTC P0713: Transmission Fluid Temperature Sensor Circuit High

S6RW0E5104023

Wiring Diagram



I6RW0E510009-01

1. TCM	3. A/T
2. Transmission fluid temperature sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission fluid temperature sensor terminal voltage is more than specified value even though engine was running in "R", "D", "3", "2" or "L" range for 12 minutes after starting engine.	- Transmission fluid temperature sensor or its circuit malfunction - TCM

DTC Confirmation Procedure

▲ WARNING

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out with 2 persons, a driver and a tester, on a level road.

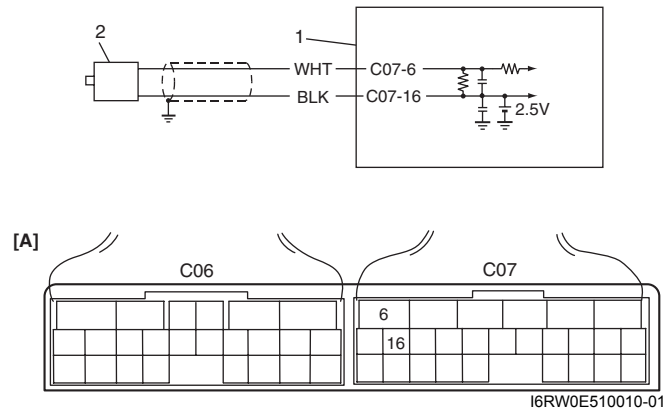
- 1) Connect scan tool to DLC with ignition switch OFF, if available.
- 2) Clear DTC in TCM memory and start engine.
- 3) Increase engine coolant temperature to about 50 °C (122 °F) and more.
- 4) Start vehicle and increase vehicle speed to about 20 km/h (12 mile/h) for 10 minutes or more.
- 5) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".
2	Check transmission fluid temperature circuit for open 1) Turn ignition switch OFF. 2) Disconnect TCM connectors from TCM. 3) Check for proper connection to transmission fluid temperature sensor at terminals "C06-11" and "C06-12". 4) If OK, check continuity between terminals "C06-11" and "C06-12" of disconnected harness side TCM connector. <i>Is continuity indicated?</i>	Go to Step 3.	"LT GRN" or "ORN" circuit open.
3	Check transmission fluid temperature circuit for IG short 1) Cool down A/T fluid temperature under ambient temperature. 2) Connect TCM connectors to TCM with ignition switch OFF. 3) Turn ignition switch ON. 4) Measure voltage between terminal "C06-11" of TCM connector and ground. <i>Is it 4.6 V or more?</i>	"LT GRN" circuit shorted to power circuit. If circuit is OK, go to Step 4.	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good TCM and recheck.
4	Inspect transmission fluid temperature sensor 1) Inspect transmission fluid temperature sensor referring to "Transmission Fluid Temperature Sensor Inspection". <i>Is result satisfactory?</i>	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good TCM and recheck.	Replace transmission fluid temperature sensor.

DTC P0717: Input / Turbine Speed Sensor Circuit Malfunction

S6RW0E5104024

Wiring Diagram

1. TCM	2. Input shaft speed sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No input shaft speed sensor signal is detected although output shaft speed sensor signals are detected.	- Input shaft speed sensor or its circuit malfunction - Improper input shaft speed sensor installation - Damaged direct clutch drum - Foreign material attachment to sensor or drum - TCM

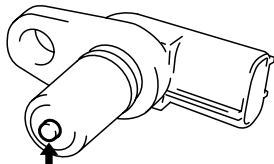
DTC Confirmation Procedure**⚠ WARNING**

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out with 2 persons, a driver and a tester, on a level road.

- Connect scan tool to DLC with ignition switch OFF, if available.
- Clear DTC in TCM memory and start engine.
- Shift select lever to "D" range and drive vehicle at 25 km/h (15 mile/h) or more with 3rd gear at least for 1 km (0.6 mile).
- Stop vehicle and check DTC.

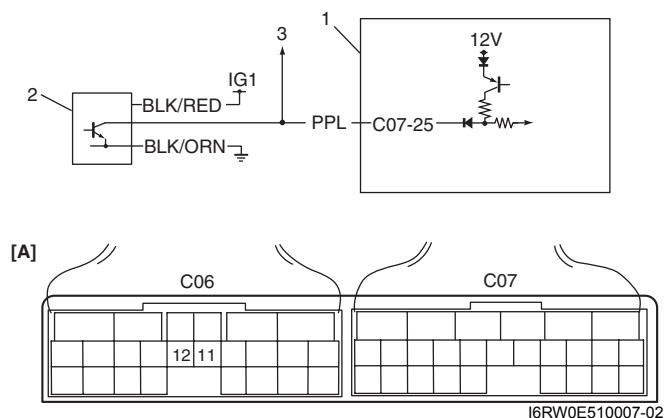
DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".
2	Check input shaft speed sensor circuit - Disconnect TCM connectors with ignition switch OFF. - Check for proper connection to input shaft speed sensor at "C07-6" and "C07-16" terminals. - If OK, check resistance of sensor circuit. Input shaft speed sensor specification Between terminals "C07-6" and "C07-16": 560 – 680 Ω at 20 °C (68 °F) Between terminal "C07-6" / "C07-16" and ground: No continuity Are check result satisfactory?	Go to Step 4.	Go to Step 3.

Step	Action	Yes	No
3	Inspect input shaft speed sensor 1) Inspect input shaft speed sensor referring to "Input Shaft Speed Sensor Inspection". <i>Is result satisfactory?</i>	"WHT" or "BLK" circuit open or short.	Replace input shaft speed sensor.
4	Check visually input shaft speed sensor and direct clutch drum for the following - No damage - No foreign material attached - Correct installation  I2RH0B510020-01 <i>Are they in good condition?</i>	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good TCM and recheck.	Clean, repair or replace.

DTC P0722: Output Speed Sensor (VSS) Circuit No Signal

S6RW0E5104025

Wiring Diagram

1. TCM	3. To ECM
2. Output shaft speed sensor (VSS)	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No output shaft speed sensor signal is detected although input shaft speed sensor signals are detected with "D", "2" or "L" range.	- Output shaft speed sensor or its circuit malfunction - Damaged sensor gear (driven gear) - Damaged output shaft speed sensor (VSS) drive gear - TCM

DTC Confirmation Procedure**▲ WARNING**

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out with 2 persons, a driver and a tester, on a level road.

- 1) Connect scan tool to DLC with ignition switch OFF, if available.
- 2) Clear DTC in TCM memory and start engine.
- 3) Shift select lever to "D" range and drive vehicle at 9 km/h (6 mile/h) or more vehicle speed at least for 1 km (0.6 mile).
- 4) Stop vehicle and check DTC.

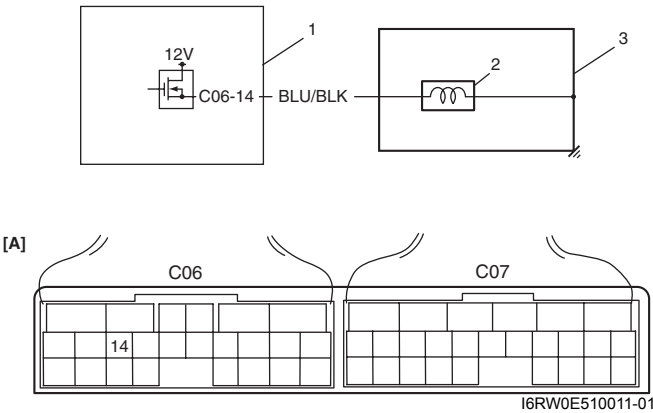
DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".
2	Check output shaft speed sensor (VSS) power circuit 1) Turn ignition switch OFF. 2) Disconnect output shaft speed sensor connector. 3) Turn ignition switch ON. 4) Measure voltage between "BLK/WHT" wire terminal of disconnected output shaft speed sensor harness side connector and ground. <i>Is it 10 – 14 V?</i>	Go to Step 3.	"BLK/WHT" wire open or shorted to ground.
3	Check output shaft speed sensor (VSS) ground circuit 1) Turn ignition switch OFF. 2) Check continuity between "BLK/ORN" wire terminal of disconnected output shaft speed sensor harness side connector and ground. <i>Is continuity indicated?</i>	Go to Step 4.	"BLK/ORN" wire open.
4	Check output shaft speed sensor (VSS) signal circuit for short 1) Disconnect TCM connectors. 2) Check continuity between "PPL" wire terminal of disconnected output shaft speed sensor harness side connector and ground. <i>Is continuity indicated?</i>	"PPL" wire shorted to ground.	Go to Step 5.
5	Check output shaft speed sensor (VSS) signal circuit for open 1) Check continuity between "PPL" wire terminal of disconnected output shaft speed sensor harness side connector and terminal "C07-25" of disconnected harness side TCM connector. <i>Is continuity indicated?</i>	Go to Step 6.	"PPL" wire open.
6	Inspect output shaft speed sensor (VSS) 1) Inspect output shaft speed sensor referring to "Output Shaft Speed Sensor (VSS) Inspection". <i>Is check result satisfactory?</i>	Go to Step 7.	Replace output shaft speed sensor (VSS).
7	Check output shaft speed sensor (VSS) gears visually 1) Check output shaft speed sensor gears for the followings. • No damage in drive gear on differential case • No damage in driven gear in output shaft speed sensor <i>Is result satisfactory?</i>	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good TCM and recheck.	Replace drive gear and/or driven gear of output shaft speed sensor.

DTC P0787: Shift / Timing Solenoid Control Circuit Low

S6RW0E5104028

Wiring Diagram



1. TCM	3. A/T
2. Timing solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

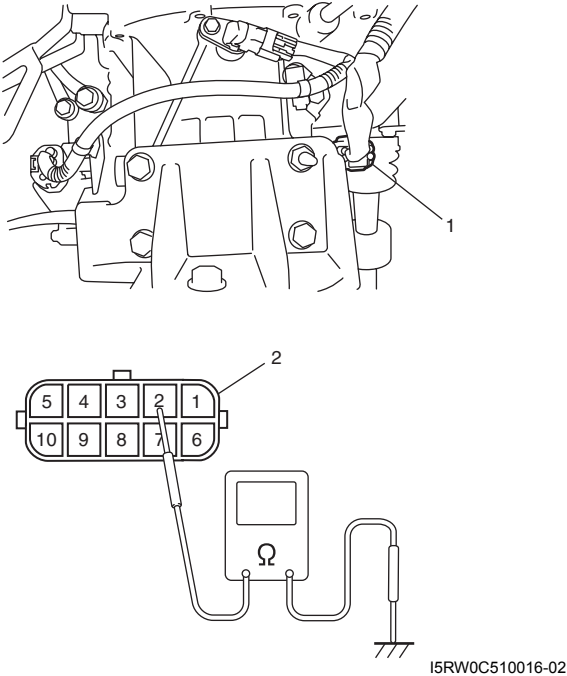
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of timing solenoid valve TCM terminal is low although TCM is commanding timing solenoid valve to turn ON.	• Timing solenoid valve circuit shorted to ground • Timing solenoid valve malfunction • TCM

DTC Confirmation Procedure

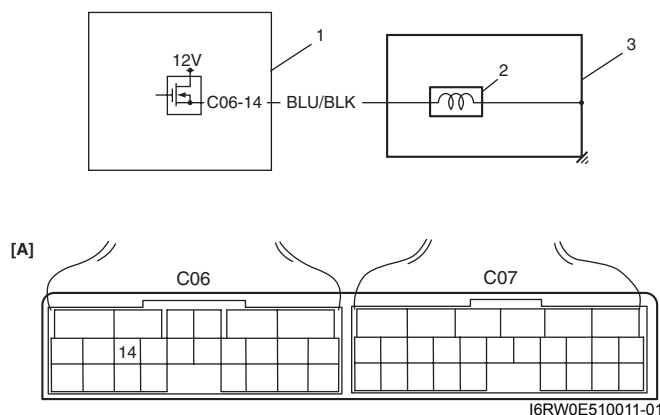
- 1) Connect scan tool to DLC with ignition switch OFF, if available.
- 2) Clear DTC in TCM memory.
- 3) Start engine and shift select lever to “N” range.
- 4) Repeat shifting select lever from “N” range to “D” range and vice versa for 3 times.
- 5) Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".
2	Check timing solenoid valve resistance 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on transaxle. 3) Check for proper connection to solenoid valve at "BLU/BLK" circuit. 4) Check resistance of solenoid valve. Timing solenoid valve resistance Between terminal of transaxle side valve body harness connector and transaxle: 11 – 15 Ω at 20 °C (68 °F)  I5RW0C510016-02 Is check result satisfactory?	Go to Step 3.	Replace timing solenoid valve or lead wire.
3	Check timing solenoid valve circuit for ground short 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Measure resistance between terminal "C06-14" of disconnected harness side TCM connector and ground. Is it 11 – 15 Ω at 20 °C (68 °F)?	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good TCM and recheck.	"BLU/BLK" circuit shorted to ground.

DTC P0788: Shift / Timing Solenoid Control Circuit High

S6RW0E5104029

Wiring Diagram

1. TCM	3. A/T
2. Timing solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

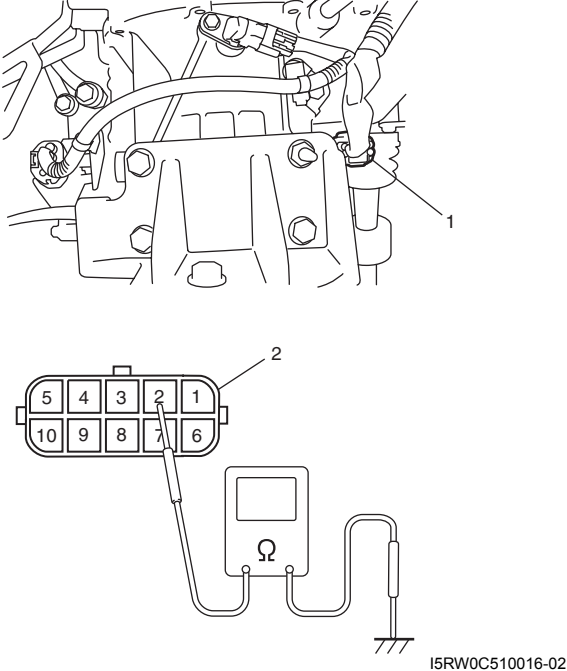
DTC detecting condition	Trouble area
Voltage of timing solenoid valve TCM terminal is high although TCM is commanding timing solenoid valve to turn OFF.	- Timing solenoid valve circuit open or shorted to power circuit - Timing solenoid valve malfunction - TCM

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch OFF, if available.
- 2) Clear DTC in TCM memory.
- 3) Start engine and shift select lever to "N" range.
- 4) Repeat shifting select lever from "N" range to "D" range and vice versa for 3 times.
- 5) Check DTC.

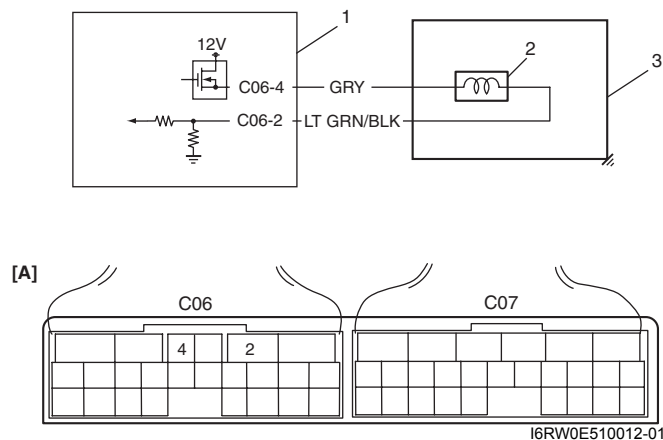
DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".
2	Check timing solenoid valve circuit for IG short 1) Disconnect TCM connectors. 2) Turn ignition switch ON and measure voltage between terminal "C06-14" of harness side TCM connector and ground. <i>Is it 0 – 1 V?</i>	Go to Step 3.	"BLU/BLK" circuit shorted to power circuit.
3	Check timing solenoid valve circuit for open 1) Measure resistance between terminal "C06-14" of disconnected harness side TCM connector and ground. <i>Is it 11 – 15 Ω at 20 °C (68 °F)?</i>	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good TCM and recheck.	Go to Step 4.

Step	Action	Yes	No
4	Check timing solenoid valve resistance 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on transaxle. 3) Check for proper connection to solenoid valve at “BLU/BLK” circuit. 4) Check resistance of solenoid valve. Timing solenoid valve resistance Between terminal of transaxle side valve body harness connector and transaxle: 11 – 15 Ω at 20 °C (68 °F)  I5RW0C510016-02 <i>Is check result satisfactory?</i>	“BLU/BLK” circuit open.	Replace timing solenoid valve or lead wire.

DTC P0961: Pressure Control Solenoid “A” Control Circuit Range / Performance

S6RW0E5104049

Wiring Diagram

1. TCM	3. A/T
2. Pressure control solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

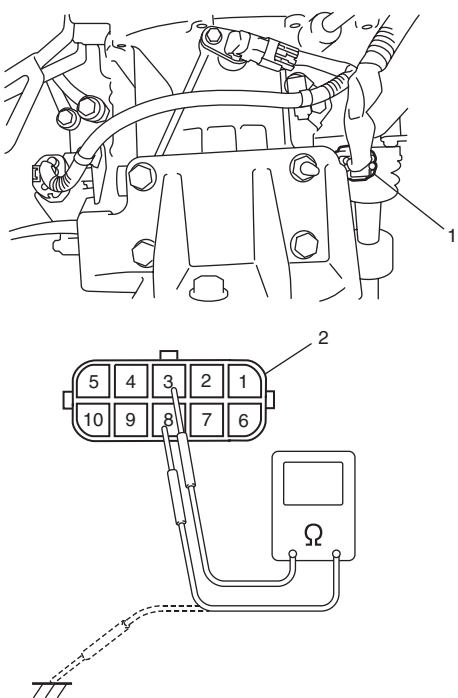
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference between actual current of control solenoid valve circuit and current of control solenoid valve circuit calculated by ECM is more than specification.	- Malfunction of pressure control solenoid valve or its circuit malfunction - TCM

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch OFF, if available.
- 2) Clear DTC in TCM memory.
- 3) Start engine.
- 4) Keep engine running at idle speed for 30 seconds or more.
- 5) Stop vehicle and check DTC.

DTC Troubleshooting

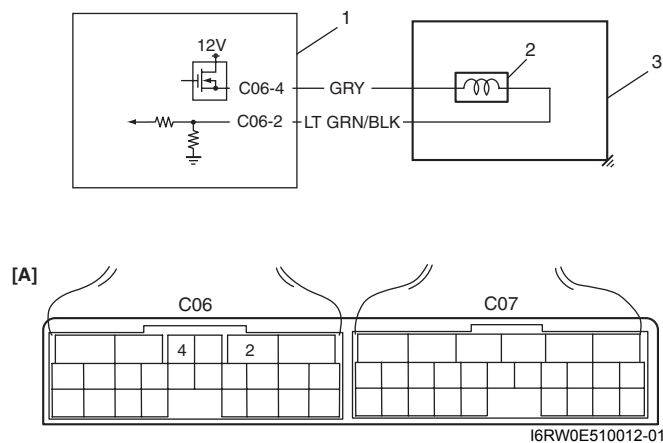
Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".
2	Check pressure control solenoid valve resistance 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to terminal of valve body harness connector at "GRY" and "LT GRN/BLK" circuit. 4) check resistance of pressure control solenoid valve. Pressure control solenoid valve resistance Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F) Between terminals of transaxle side valve body harness connector and transaxle: Infinity  Is check results satisfactory?	Go to Step 3.	Replace pressure control solenoid valve or valve body harness.

I5RW0C510018-03

Step	Action	Yes	No
3	Check for pressure control solenoid valve circuit 1) Disconnect TCM connectors. 2) Check for proper connection to TCM at terminals "C06-2" and "C06-4". If connection is OK, check circuit for open, short, and high resistance for the following circuit. • Between "C06-2" terminal of TCM connector and "LT GRN/BLK" terminal of valve body harness connector. • Between "C06-4" terminal of TCM connector and "GRY" terminal of valve body harness connector. <i>Are they in good condition?</i>	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good TCM and recheck.	Repair "LT GRN/BLK" and/or "GRY" circuit.

DTC P0962: Pressure Control Solenoid Control Circuit Low

S6RW0E5104030

Wiring Diagram

1. TCM	3. A/T
2. Pressure control solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

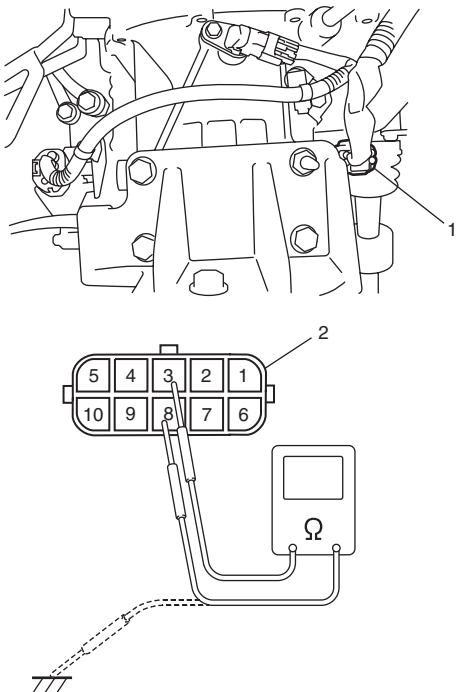
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Pressure control solenoid valve output voltage is too low comparing with TCM command value.	• Pressure control solenoid valve circuit open or shorted to ground • Malfunction of pressure control solenoid valve • TCM

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch OFF, if available.
- 2) Clear DTC in TCM memory.
- 3) Start engine.
- 4) Keep engine running at idle speed for 30 seconds or more.
- 5) Stop vehicle and check DTC.

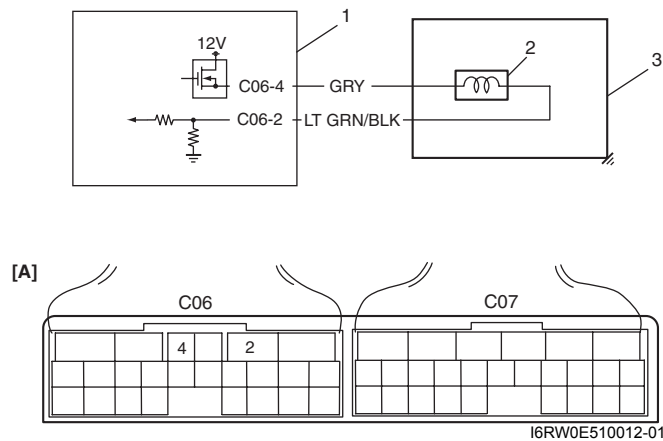
DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".
2	Check pressure control solenoid valve resistance 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at "GRY" and "LT GRN/BLK" circuit. 4) Check resistance of pressure control solenoid. Pressure control solenoid valve resistance Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F) Between terminals of transaxle side valve body harness connector and Transaxle: Infinity  I5RW0C510018-03 <i>Is check results satisfactory?</i>	Go to Step 3.	Replace pressure control solenoid valve or valve body harness.
3	Check pressure control solenoid valve circuit for ground short 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminals "C06-2" and "C06-4". If connection is OK, check continuity between terminal "C06-4" of disconnected harness side TCM connector and ground. <i>Is continuity indicated?</i>	"GRY" or "LT GRN/BLK" circuit shorted to ground.	Go to Step 4.

Step	Action	Yes	No
4	Check pressure control solenoid valve circuit for open 1) Check resistance continuity between terminals “C06-2” and “C06-4” of disconnected harness side TCM connector. <i>Is it infinite?</i>	“GRY” or “LT GRN/BLK” circuit open.	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00 in related manual”. If OK, substitute a known-good TCM and recheck.

DTC P0963: Pressure Control Solenoid Control Circuit High

S6RW0E5104031

Wiring Diagram

1. TCM	3. A/T
2. Pressure control solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

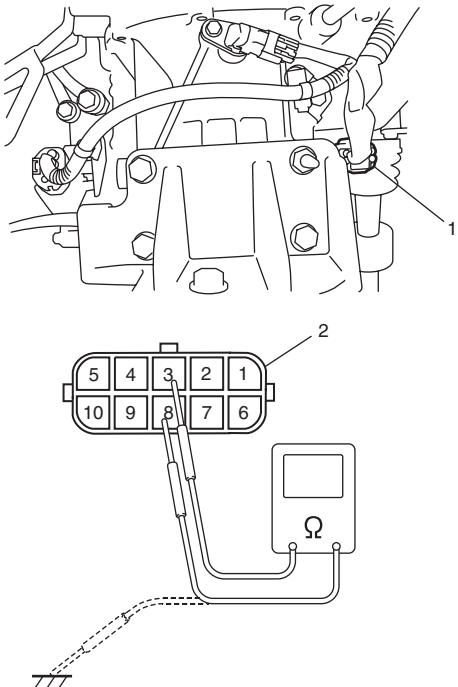
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Pressure control solenoid valve output voltage is too high comparing with TCM command value.	- Pressure control solenoid valve circuit shorted to power circuit - Pressure control solenoid valve malfunction - TCM

DTC Confirmation Procedure

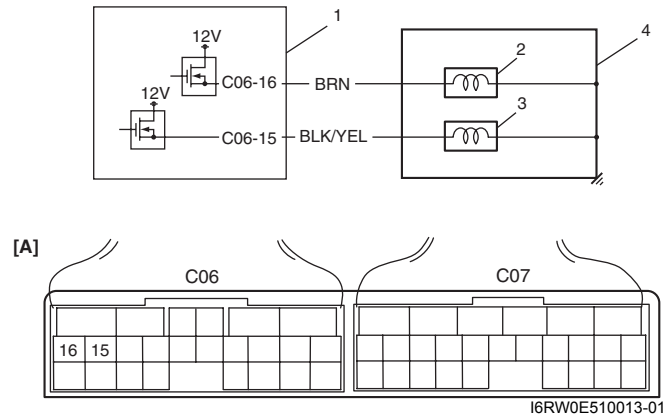
- 1) Connect scan tool to DLC with ignition switch OFF, if available.
- 2) Clear DTC in TCM memory.
- 3) Start engine.
- 4) Keep engine running at idle speed for 15 seconds or more.
- 5) Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".
2	Check pressure control solenoid circuit for IG short 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminal "C06-2" and "C06-4". 4) If connection is OK, turn ignition switch ON and measure voltage between terminal "C06-4" of disconnected harness side TCM connector and ground. <i>Is it 0 – 2 V?</i>	Go to Step 3.	"BRN/YEL" or "LT GRN" circuit shorted to power circuit.
3	Check pressure control solenoid valve resistance 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at "GRY" and "LT GRN/BLK" circuit. 4) Check resistance of pressure control solenoid. Pressure control solenoid valve resistance Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F) Between terminals of transaxle valve body harness connector and transaxle: Infinity 	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection" in Section 00 in related manual". If OK, substitute a known-good TCM and recheck.	Replace pressure control solenoid valve or valve body harness.
	<i>Is check results satisfactory?</i> I5RW0C510018-03		

DTC P0973 / P0976: Shift Solenoid-A (No.1) Control Circuit Low / Shift Solenoid-B (No.2) Control Circuit Low

S6RW0E5104032

Wiring Diagram

1. TCM	3. Shift solenoid valve-B (No.2)
2. Shift solenoid valve-A (No.1)	[A]: Terminal arrangement of TCM connector (Viewed from harness side)

DTC Detecting Condition and Trouble Area

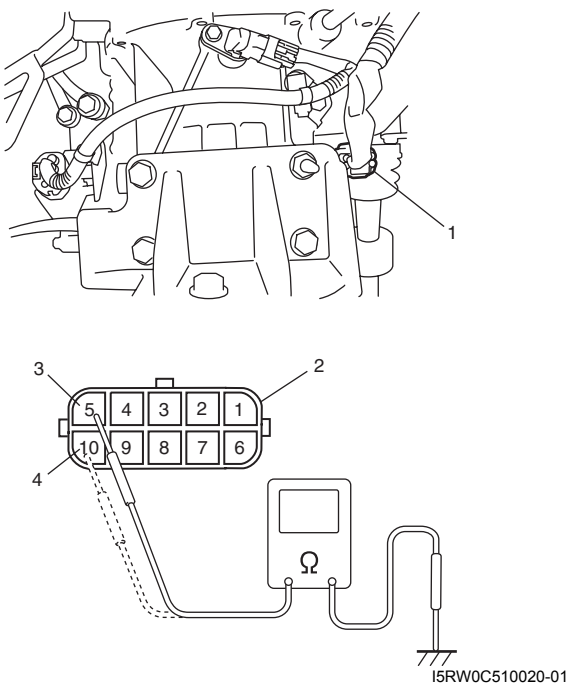
DTC detecting condition	Trouble area
Voltage of shift solenoid valve TCM terminal is low although TCM is commanding shift solenoid to turn ON	- Shift solenoid valve circuit shorted to ground - Malfunction of shift solenoid valve - TCM

DTC Confirmation Procedure**⚠ WARNING**

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out with 2 persons, a driver and tester, on a level road.

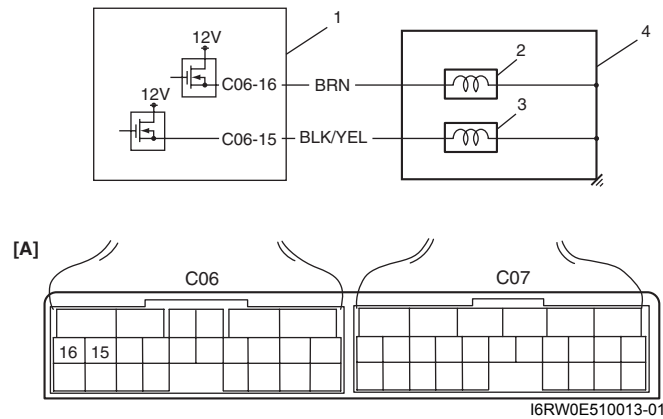
- Connect scan tool to DLC with ignition switch OFF, if available.
- Clear DTC in TCM memory.
- Start engine shift select lever to "D" range.
- Start vehicle and increase vehicle speed until gear position reaches 3rd or 4th gear.
- Decrease vehicle speed and stop vehicle.
- Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".
2	Check shift solenoid valve resistance 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transmission. 3) Check for proper connection to solenoid at "BRN" (for shift solenoid valve-A (No.1)) or "BLK/YEL" (for shift solenoid valve-B (No.2)) circuit. Check resistance of solenoid valve. Shift solenoid valve resistance Between shift solenoid valve-A (No.1) terminal (3) and transaxle: 11 – 15 Ω at 20 °C (68 °F) Between shift solenoid valve-B (No.2) terminal (4) and transaxle: 11 – 15 Ω at 20 °C (68 °F)  I5RW0C510020-01 <i>Is check results satisfactory?</i>	Go to Step 3.	Replace applicable shift solenoid valve or valve body harness.
3	Check shift solenoid valve circuit for ground short 1) Disconnect TCM connectors. 2) Check for proper connection to TCM at terminals "C06-16" (for shift solenoid valve-A (No.1)) or "C06-15" (for shift solenoid valve-B (No.2)). 3) If connection is OK, check continuity between terminal "C06-16" (for shift solenoid valve-A (No.1)) or "C06-15" (for shift solenoid valve-B (No.2)) of disconnected harness side TCM connector and ground. <i>Is continuity indicated?</i>	DTC P0973: "BRN" circuit shorted to ground. DTC P0976: "BLK/YEL" circuit shorted to ground.	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good TCM and recheck.

DTC P0974 / P0977: Shift Solenoid-A (No.1) / Shift Solenoid-B (No.2) Control Circuit High

S6RW0E5104033

Wiring Diagram

1. TCM	3. Shift solenoid valve-B (No.2)	[A]: Terminal arrangement of TCM connector (viewed from harness side)
2. Shift solenoid valve-A (No.1)	4. A/T	

DTC Detecting Condition and Trouble Area

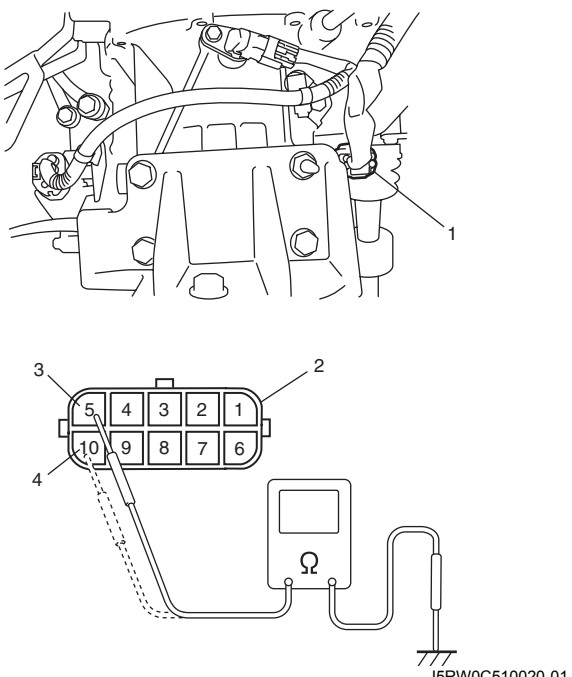
DTC detecting condition	Trouble area
Voltage of shift solenoid valve TCM terminal is high although TCM is commanding shift solenoid to turn OFF	- Shift solenoid valve circuit open or shorted to power circuit - Malfunction of shift solenoid valve - TCM

DTC Confirmation Procedure**⚠ WARNING**

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out with 2 persons, a driver and a tester, on a level road.

- Connect scan tool to DLC with ignition switch OFF, if available.
- Clear DTC in TCM memory.
- Start engine and shift select lever to "D" range.
- Start vehicle and increase vehicle speed until gear position reaches 3rd or 4th gear.
- Decrease vehicle speed and stop vehicle.
- Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".
2	Check shift solenoid valve circuit for IG short 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminal "C06-16" (for shift solenoid valve-A (No.1)) or "C06-15" (for shift solenoid valve-B (No.2)). 4) If connection is OK, turn ignition switch ON and measure voltage between terminal "C06-16" (for shift solenoid valve-A (No.1)) or "C06-15" (for shift solenoid valve-B (No.2)) of disconnected harness side TCM connector and ground. <i>Is it 0 – 2 V?</i>	Go to Step 3.	DTC P0974: "BRN" circuit shorted to power circuit. DTC P0977: "BLK/YEL" circuit shorted to power circuit.
3	Check shift solenoid valve resistance 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at "BRN" (for shift solenoid valve-A (No.1)) or "BLK/YEL" (for shift solenoid valve-B (No.2)) circuit. Check resistance of solenoid valve. <u>Shift solenoid valve resistance</u> Between shift solenoid valve-A (No.1) terminal (3) and transaxle: 11 – 15 Ω at 20 °C (68 °F) Between shift solenoid valve-B (No.2) terminal (4) and transaxle: 11 – 15 Ω at 20 °C (68 °F)  15RW0C510020-01	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good TCM and recheck.	Replace applicable shift solenoid valve or valve body harness.
	<i>Is check results satisfactory?</i>		

DTC P1702: Internal Control Module Memory Check Sum Error

S6RW0E5104034

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Calculation of current data stored in TCM is not correct comparing with pre-stored checking data in TCM.	TCM

DTC Confirmation Procedure

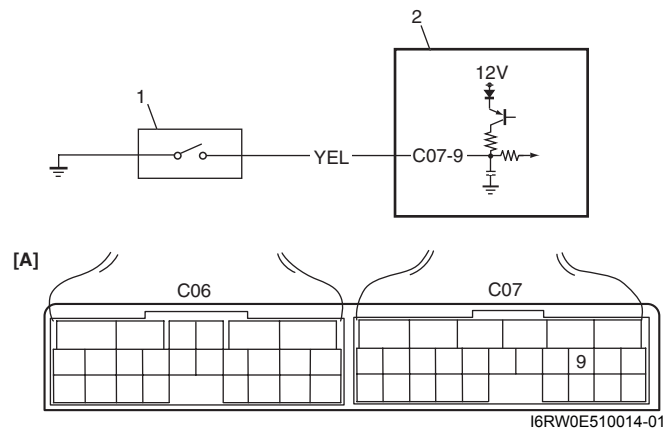
- 1) Connect scan tool to DLC with ignition switch OFF.
- 2) Clear DTC in TCM memory.
- 3) After 10 seconds passed from turning ignition switch ON, check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	Is DTC P1702 detected after performing "DTC Confirmation Procedure"?	Faulty TCM. Replace TCM.	Could be a temporary malfunction of TCM.

DTC P1723: Range Select Switch Malfunction

S6RW0E5104036

Wiring Diagram

1. "3" position switch	2. TCM	[A]: TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
"3" position switch ON signal is inputted although transmission range switch signal is inputted P, R, N or L. range.	• "3" position switch or its circuit malfunction • TCM

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch OFF.
- 2) Clear DTCs in TCM and ECM memories by using scan tool and turn ignition switch ON.
- 3) Shift select lever to each of "L", "2", "3", "D", "N", "R" and "P" ranges for 20 seconds each.
- 4) Check DTC, pending DTC and freeze-frame data.

DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".

5A-64 Automatic Transmission/Transaxle:

Step	Action	Yes	No
2	“3” position switch circuit for operation 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON and check “3” position switch signal on scan tool data display when shifting select lever to each range. <i>Does indicate “3” position switch condition OFF when shifting select lever to “P”, “R”, “N” and “L” range?</i>	Substitute a known-good TCM and recheck.	Go to Step 3.
3	“3” position switch signal inspection With ignition switch ON, check voltage between “C07-9” terminal of TCM coupler and ground. “3” position switch specifications Shift select lever to “3” or “2” range: Battery voltage Shift select lever to other above range: 0 V <i>Is the result as specified?</i>	Substitute a known-good BCM and recheck.	Go to Step 4.
4	Check “3” position switch operation <i>Is it in good condition?</i>	“YEL” wire shorted to ground.	Replace “3” position switch.

DTC P1878: Torque Converter Clutch Shudder

S6RW0E5104041

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
The acceleration slip control function stops when the variation in the output revolution speed of the specified amplitude and specified cycle is detected within a specified period of time. When the specified variation is not detected after the acceleration slip control stops.	• Mismatching ATF • Torque converter clutch malfunction • Valve body

DTC Confirmation Procedure**▲ WARNING**

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out with 2 persons, a driver and tester, on a level road.

- 1) Connect scan tool to DLC with ignition switch OFF.
- 2) Clear DTCs in TCM and ECM memories by using scan tool.
- 3) Start engine and warm it up to normal operating temperature.
- 4) Drive vehicle with 3rd or 4th gear in “D” range and slip controlled lock-up ON for 20 seconds or longer referring to “Automatic Gear Shift Table”.
- 5) Stop vehicle.
- 6) Check DTC, pending DTC and freeze-frame data.

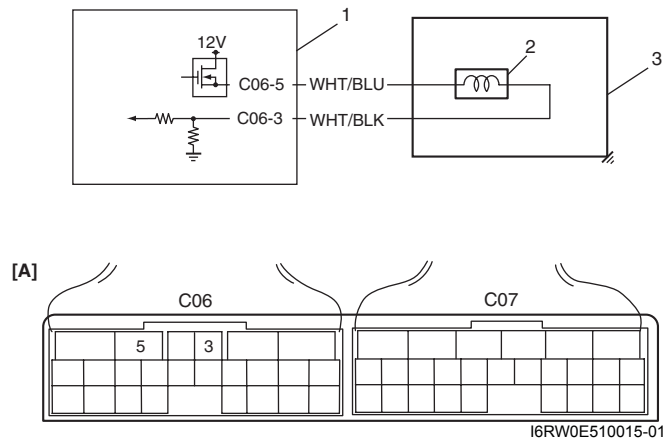
DTC Troubleshooting

Step	Action	Yes	No
1	Was “A/T System Check” performed?	Go to Step 2.	Go to “A/T System Check”.
2	Change A/T fluid referring to “A/T Fluid Change”. Check DTC after performing “DTC Confirmation Procedure”. <i>Is DTC P1878 still indicated?</i>	Faulty torque converter clutch. Replace torque converter.	System is in good condition.

DTC P2762: Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit Range / Performance

S6RW0E5104050

Wiring Diagram



1. TCM	3. A/T
2. TCC lock-up pressure control solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

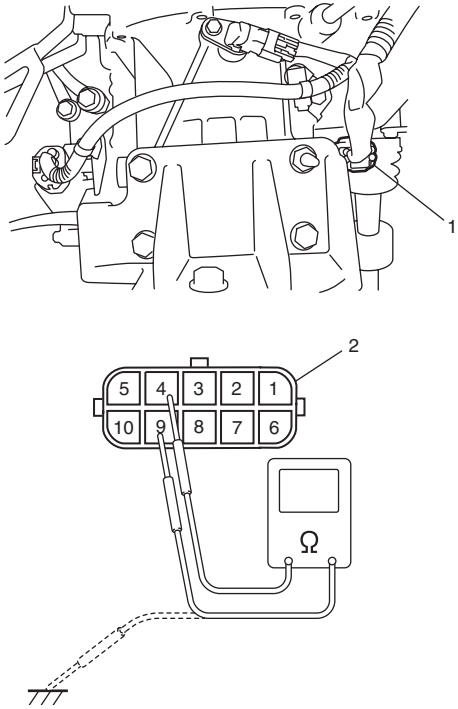
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference between actual current of TCC lock-up pressure control solenoid valve circuit and current of TCC lock-up pressure control solenoid valve circuit calculated by ECM is more than specification.	- TCC lock-up pressure control solenoid valve or its circuit malfunction - TCM

DTC Confirmation Procedure

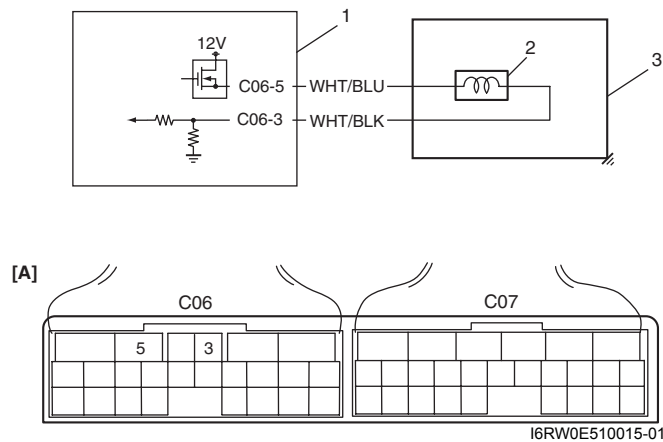
- 1) Connect scan tool to DLC with ignition switch OFF, if available.
- 2) Clear DTC in TCM memory.
- 3) Start engine.
- 4) Keep engine running at idle speed for 30 seconds or more.
- 5) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".
2	Check TCC lock-up pressure control solenoid valve resistance 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to terminal at "WHT/BLU" and "WHT/BLK" circuit. 4) Check resistance of TCC lock-up pressure control solenoid valve. <u>TCC lock-up Pressure control solenoid valve resistance</u> Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F) Between terminals of transaxle valve body harness connector and transaxle: Infinity  I5RW0C510023-01 Is check results satisfactory?	Go to Step 3.	Replace TCC lock-up pressure control solenoid valve or valve body harness.
3	Check for pressure control solenoid valve circuit 1) Disconnect TCM connectors 2) Check for proper connection to TCM at terminals "C06-3" and "C06-5". If connection is OK, check circuit for open, short and high resistance for the following circuit. • Between "C06-3" terminal of TCM connector and "WHT/BLK" terminal of valve body harness connector. • Between "C06-4" terminal of TCM connector and "WHT/BLU" terminal of valve body harness connector. Are they in good condition?	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good TCM and recheck.	Repair "WHT/BLU" and/or "WHT/BLK" circuit.

DTC P2763: Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit High

S6RW0E5104042

Wiring Diagram

1. TCM	3. A/T
2. TCC lock-up pressure control solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of TCC lock-up pressure control solenoid valve TCM terminal is high although TCM is commanding TCC lock-up pressure control solenoid to turn OFF.	- TCC lock-up pressure control solenoid valve circuit shorted to ground - Malfunction of TCC lock-up pressure control solenoid valve - TCM

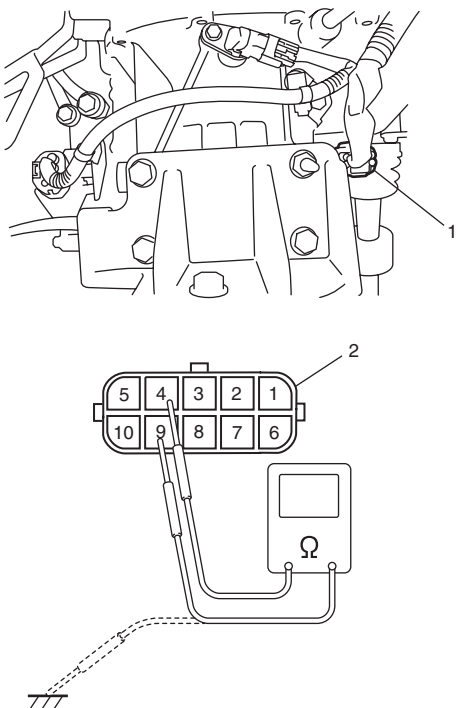
DTC Confirmation Procedure**▲ WARNING**

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out with 2 persons, a driver and a tester, on a level road.

- Connect scan tool to DLC with ignition switch OFF, if available.
- Clear DTC in TCM memory.
- Start engine.
- Keep engine running at idle speed in "P" range for 10 seconds or more.
- Check DTC.

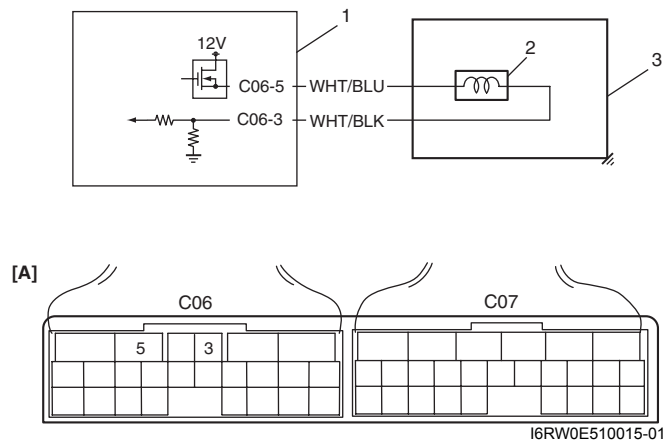
DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".

Step	Action	Yes	No
2	Check TCC lock-up pressure control solenoid valve circuit for IG short 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminal "C06-3" and "C06-5". 4) If connection is OK, turn ignition switch ON and measure voltage between terminal "C06-3" of disconnected harness side TCM connector and ground between terminal "C06-5" of disconnected harness side TCM connector and ground. <i>Are voltage 1 V or less?</i>	Go to Step 3.	"WHT/BLU" or "WHT/BLK" circuit shorted to power circuit.
3	Check TCC lock-up pressure control solenoid valve resistance 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at "WHT/BLU" and "WHT/BLK" circuits. 4) Check resistance of TCC lock-up pressure control solenoid valve. <u>TCC lock-up pressure control solenoid valve resistance</u> Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F) Between terminals of transaxle side valve body harness connector and transaxle: Infinity  I5RW0C510023-01 <i>Is check results satisfactory?</i>	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good TCM and recheck.	Replace TCC lock-up pressure control solenoid valve or lead wire.

DTC P2764: Torque Converter Clutch (TCC) Circuit Pressure Control Solenoid Control Circuit Low

S6RW0E5104043

Wiring Diagram

1. TCM	3. A/T
2. TCC pressure control solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

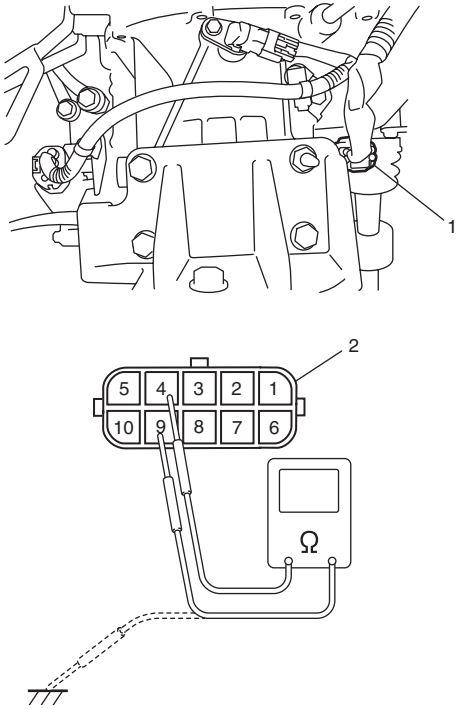
DTC detecting condition	Trouble area
Voltage of TCC lock-up pressure control solenoid valve TCM terminal is low although TCM is commanding TCC lock-up pressure control solenoid to turn ON.	- TCC lock-up pressure control solenoid valve circuit shorted to ground - Malfunction of TCC lock-up pressure control solenoid valve - TCM

DTC Confirmation Procedure**▲ WARNING**

- When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.
- Road test should be carried out with 2 persons, a driver and a tester, on a level road.

- Connect scan tool to DLC with ignition switch OFF, if available.
- Clear DTC in TCM memory.
- Start engine.
- Keep engine running at idle speed in "P" range for 20 seconds or more.
- Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	Was "A/T System Check" performed?	Go to Step 2.	Go to "A/T System Check".
2	Check TCC lock-up pressure control solenoid valve resistance 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at "WHT/BLU" and "WHT/BLK" circuits. 4) Check resistance of TCC lock-up pressure control solenoid valve. <u>TCC lock-up pressure control solenoid valve resistance</u> Between shift terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F) Between shift terminals of transaxle side valve body harness connector and transaxle: Infinity  I5RW0C510023-01 <i>Is check results satisfactory?</i>	Go to Step 3.	Replace TCC lock-up pressure control solenoid valve or valve body harness.
3	Check TCC lock-up pressure control solenoid valve circuit for ground short 1) Disconnect TCM connectors. 2) Check for proper connection to TCM at terminals "C06-3" and "C06-5". 3) If connection is OK, check continuity between terminal "C06-5" of disconnected harness side TCM connector and ground, between terminal "C06-3" of disconnected harness side TCM connector and ground. <i>Are continuity indicated?</i>	"WHT/BLU" or "WHT/BLK" circuit shorted to ground.	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". If OK, substitute a known-good TCM and recheck.

DTC U0073: Control Module Communication Bus Off

S6RW0E5104051

Refer to "Troubleshooting for CAN-DTC in Section 1A".

DTC U0100: Lost Communication with ECM / PCM "A"

S6RW0E5104052

Refer to "Troubleshooting for CAN-DTC in Section 1A".

Inspection of TCM and Its Circuits

S6RW0E5104044

TCM and its circuits can be checked at TCM wiring connectors by measuring voltage, pulse signal and resistance.

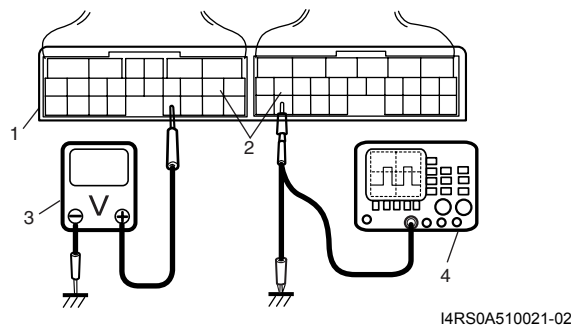
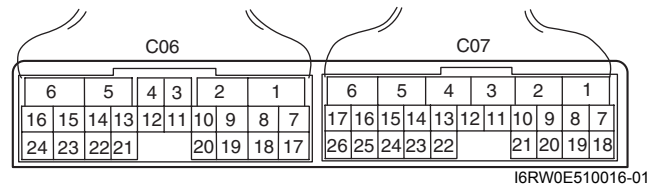
⚠ CAUTION

TCM cannot be checked by itself, it is strictly prohibited to connect voltmeter or ohmmeter to TCM with connector disconnected from it.

- 1) Remove TCM (1) from vehicle referring to "Transmission Control Module (TCM) Removal and Installation".
- 2) Connect TCM connectors (2) to TCM.
- 3) Check voltage and/or pulse signal at each terminal of connectors connected using voltmeter (3) and oscilloscope (4).

NOTE

- As each terminal voltage is affected by battery voltage, confirm that it is 11 V or more when ignition switch is ON.
- Voltage with asterisk(*) cannot be measured by voltmeter because it is pulse signal. Check it with oscilloscope if necessary.

**Terminal arrangement of TCM coupler (Viewed from harness side)**

Connector "C06"

Terminal	Wire color	Circuit	Standard voltage	Condition
1	BLK	Ground	0 – 1 V	Ignition switch ON
2	LT GRN/ BLK	Pressure control solenoid valve (–)	0.6 – 1.0 V	Ignition switch ON
3	WHT/BLK	TCC pressure control solenoid valve (–)	0.6 – 1.0 V	Ignition switch ON
4	GRY	Pressure control solenoid valve (+)	*0 – 0.6 V ↑↓ 10 – 14 V ("Reference waveform No. 1: ")	Engine running at idling. (Output signal is duty pulse. Duty ratio varies depending on throttle valve opening.)
5	WHT/BLU	TCC pressure control solenoid valve (+)	*0 – 0.6 V ↑↓ 10 – 14 V ("Reference waveform No. 2: ")	Engine running at idling. (Output signal is duty pulse. Duty ratio varies depending on torque converter clutch operating condition.)
6	YEL/BLK	Power source	10 – 14 V	Ignition switch ON
7	WHT	CAN communication line (Low)	*2.5 – 3.6 V ↑↓ 1.6 – 2.5 V ("Reference waveform No. 3: ")	Engine running at idling with after warming up. (CAN communication signal is pulse. Pulse signal frequency varies depending on engine condition.)
8	—	—	—	—
9	—	—	—	—
10	—	—	—	—
11	LT GRN	Transmission fluid temperature sensor (+)	2.9 – 3.1 V 0.3 – 0.5 V	Ignition switch ON, fluid temperature is 20 °C (68 °F) Ignition switch ON, fluid temperature is 100 °C (212 °F)
12	ORN	Transmission fluid temperature sensor (–)	0 – 1 V	Ignition switch ON
13	—	—	—	—
14	BLU/BLK	Timing solenoid valve	0 – 1 V	Ignition switch ON
15	BLK/YEL	Shift solenoid valve-B (No.2)	9 – 14 V	Ignition switch ON, select lever in "P" range
16	BRN	Shift solenoid valve-A (No.1)	9 – 14 V	Ignition switch ON, select lever in "P" range
17	RED	CAN communication line (High)	*2.5 – 3.6 V ↑↓ 1.6 – 2.5 V ("Reference waveform No. 3: ")	Engine running at idling with after warming up. (CAN communication signal is pulse. Pulse signal frequency varies depending on engine condition.)
18	—	—	—	—
19	—	—	—	—
20	—	—	—	—
21	—	—	—	—
22	—	—	—	—
23	BLK	Ground	0 – 1 V	Ignition switch ON
24	WHT/RED	Power source for back-up	10 – 14 V	Constantly

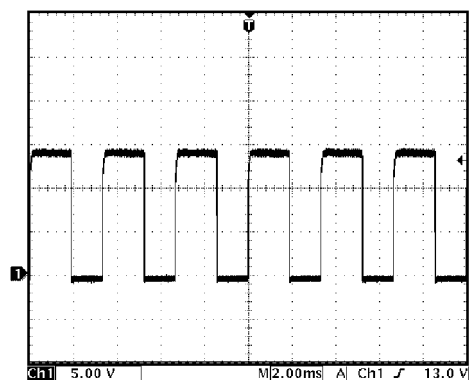
Connector "C07"

Terminal	Wire color	Circuit	Standard voltage	Condition
1	RED	Transmission range sensor ("R" range)	8 – 14 V	Ignition switch ON, select lever at "R" range
2	—	—	0 – 1 V	Ignition switch ON, select lever at other than "R" range
3	—	—	—	—
4	—	—	—	—
5	—	—	—	—
6	WHT	Input shaft speed sensor (+)	2 – 3 V	Ignition switch turned ON, engine stops.
			*("Reference waveform No. 4: ")	While engine running. (Output signal is waveform. Waveform frequency varies depending on output shaft speed. (16 pulses are generated par 1 input shaft revolution.))
7	GRN	Transmission range sensor ("D" or "3" range)	8 – 14 V	Ignition switch ON, select lever at "D" or "3" range
			0 – 1 V	Ignition switch ON, select lever at other than "D" or "3" range
8	GRN/ORN	Transmission range sensor ("N" range)	8 – 14 V	Ignition switch ON, select lever at "N" range
			0 – 1 V	Ignition switch ON, select lever at other than "N" range
9	YEL	"3" position switch	8 – 14 V	Ignition switch ON, select lever at other than "3" or "2" range
			0 – 1 V	Ignition switch ON, select lever at "3" or "2" range
10	—	—	—	—
11	—	—	—	—
12	—	—	—	—
13	—	—	—	—
14	—	—	—	—
15	—	—	—	—
16	BLK	Input shaft speed sensor (-)	2 – 3 V	Ignition switch ON, engine at stop
17	—	—	—	—
18	LT GRN/BLK	Transmission range sensor ("L" range)	8 – 14 V	Ignition switch ON, select lever at "L" range
			0 – 1 V	Ignition switch ON, select lever at other than "L" range
19	GRN/YEL	Transmission range sensor ("2" range)	8 – 14 V	Ignition switch ON, select lever at "2" range
			0 – 1 V	Ignition switch ON, select lever at other than "2" range
20	PNK/BLK	Transmission range sensor ("P" range)	8 – 14 V	Ignition switch ON, select lever at "P" range
			0 – 1 V	Ignition switch ON, select lever at other than "P" range
21	—	—	—	—
22	—	—	—	—
23	BLU	Data link connector	8 – 14 V	Ignition switch ON
24	—	—	—	—
25	PPL	Output shaft speed sensor (VSS)	8 – 14 V	Ignition switch ON
			*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No. 5: ")	Vehicle running. (Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (8190 pulses are generated par 60 km/h, 37.5 mile/h))
26	—	—	—	—

Reference waveform No. 1

Pressure control solenoid valve signal at engine idling.

Measurement terminal	CH1: "C06-4" to "C06-1"
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed with "P" range.

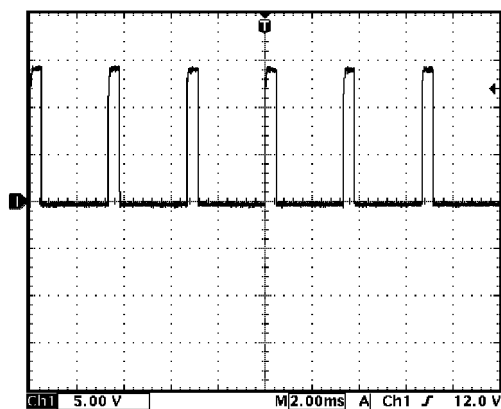


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Reference waveform No. 2

TCC pressure control solenoid valve signal at engine idling.

Measurement terminal	CH1: "C06-5" to "C06-1"
Oscilloscope setting	CH1: 5 V/DIV Time: 2 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed with "P" range

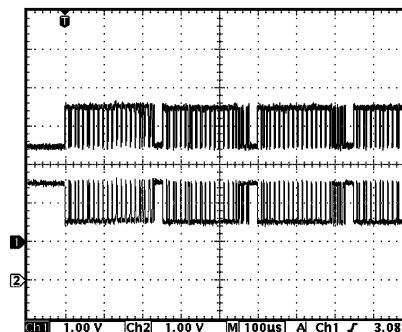


I4RS0A510024-01

Reference waveform No. 3

CAN communication line (High & Low) signal at engine idling.

Measurement terminal	CH1: "C06-7" to "C06-1" CH2: "C06-17" to "C06-1"
Oscilloscope setting	CH1: 1 V/DIV TIME: 100 μ s/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed with "P" range.

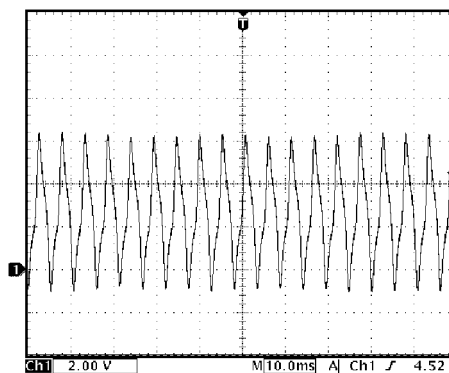


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Reference waveform No. 4

Input shaft speed sensor signal at engine idling.

Measurement terminal	CH1: "C07-6" to "C06-1"
Oscilloscope setting	CH1: 2 V/DIV TIME: 10 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Engine at specified idle speed with "P" range.

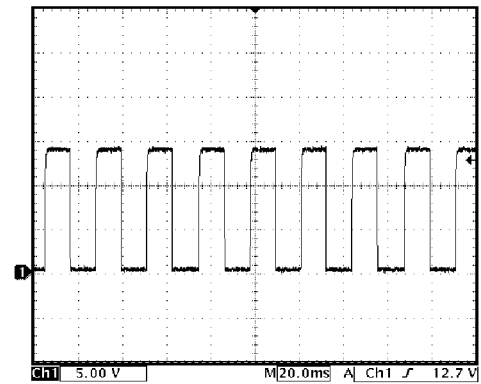


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Reference waveform No. 5

Output shaft speed sensor (VSS) signal at vehicle speed 60 km/h (37 mile/h).

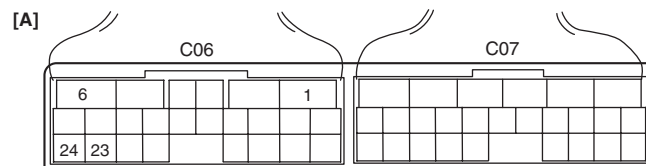
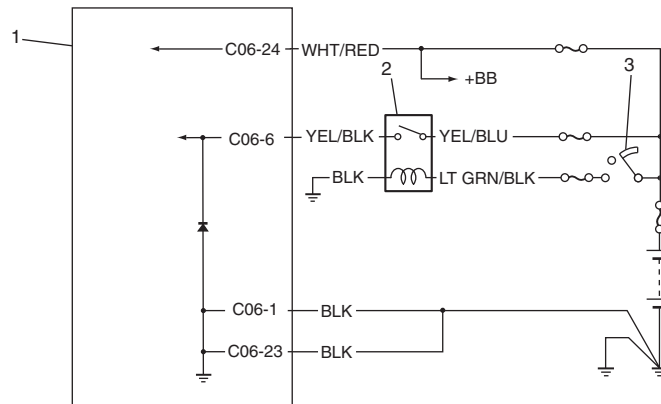
Measurement terminal	CH1: "C07-25" to "C06-1"
Oscilloscope setting	CH1: 5 V/DIV TIME: 20 ms/DIV
Measurement condition	- After warmed up to normal operating temperature - Drive vehicle at 60 km/h (37 mile/h).



I3RM0B510028-01

TCM Power and Ground Circuit Check

S6RW0E5104045

Wiring Diagram

I6RW0E510017-01

1. TCM	3. Ignition switch
2. A/T relay	[A]: Terminal arrangement of TCM connector (viewed from harness side)

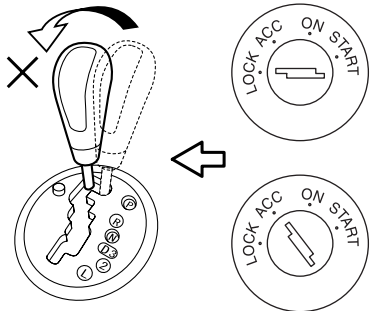
Troubleshooting

Step	Action	Yes	No
1	Check TCM back-up power circuit 1) Disconnect TCM connector with ignition switch OFF. 2) Check for proper connection to TCM at "C06-24" terminal. 3) If OK, check voltage at terminal "C06-24" of disconnected TCM connector. <i>Is it 10 – 14 V?</i>	Go to Step 2.	"WHT/RED" circuit open or shorted to ground.
2	Check TCM power circuit 1) Disconnect TCM connector with ignition switch OFF. 2) Check for proper connection to TCM at "C06-6" terminal. 3) If OK, turn ignition switch ON and check voltage at terminal "C06-6" of disconnected TCM connector. <i>Is it 10 – 14 V?</i>	Go to Step 4.	Go to Step 3.
3	Check A/T relay operation 1) Check A/T relay operation referring to "A/T Relay Inspection". <i>Is check result satisfactory?</i>	"YEL/BLK", "YEL/BLU", "LT GRN/BLK" or "BLK" circuit for power supply open.	Replace A/T relay.
4	Check TCM ground circuit 1) Turn ignition switch OFF. 2) With TCM connectors disconnected, check for proper connection to TCM at "C06-1" / "C06-23" terminal. 3) If OK, check resistance between "C06-1" / "C06-23" terminal of disconnected TCM connector and body ground. <i>Is continuity indicated?</i>	TCM power and ground circuits are in good condition.	"BLK" circuit for TCM ground open.

Brake Interlock System Inspection

S6RW0E5104046

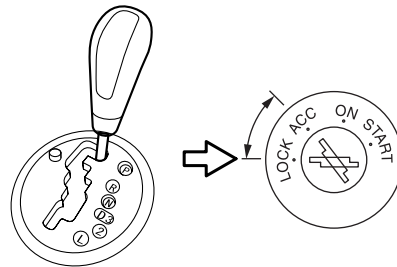
- 1) Check that select lever cannot be moved to any other range from "P" range position when ignition switch key is at ACC position, at LOCK position or it is removed from keyhole of ignition switch, or brake pedal is not depressed.



I4RS0A510047-01

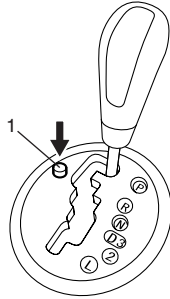
- 2) Shift select lever to "P" range position, check for the following.

- Ignition key can be turned between LOCK and ACC positions back and forth and also it can be removed from ignition switch.



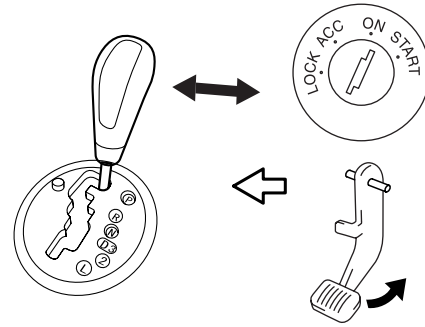
I4RS0A510048-01

- With shift lock solenoid release button (1) pushed and ignition key turned to ACC position, select lever can be shifted from "P" range position to any other range.
- With shift lock solenoid release button (1) pushed and ignition key turned to LOCK position, select lever can not be shifted from "P" range position to any other range.



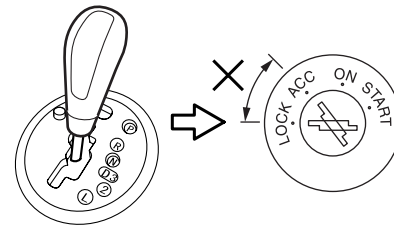
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- When ignition switch is turned ON and brake pedal is depressed, select lever can be shifted from "P" range position to any other range.



I4RS0A510050-01

- 3) With select lever shifted to any position other than "P" range, check that ignition key cannot be turned LOCK position and it cannot be removed from ignition switch unless it is at LOCK position.



I4RS0A510051-01

Repair Instructions

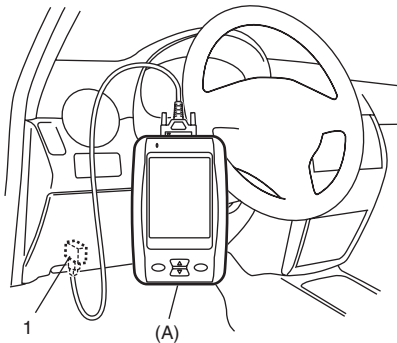
Learning Control Initialization

S6RW0E5106001

- 1) Connect scan tool to DLC (1) with ignition switch OFF.

Special tool

(A): SUZUKI scan tool (SUZUKI-SDT)



I5RW0C510072-01

- 2) Start engine and shift select lever to "P" range.
 3) Select "Misc Test" mode on scan tool.
 4) Perform "AT learned initialize" on scan tool.

A/T Fluid Level Check

S6RW0E5106002

⚠ CAUTION

Do not use any fluid other than the specified ATF. Use of any fluid other than the specified ATF may cause juddering or some other faulty condition to occur.

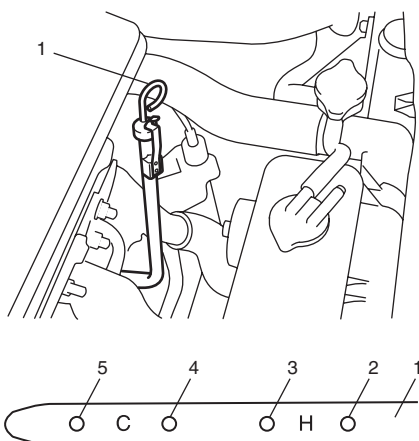
Level Check at Normal Operating (Hot) Temperature – Hot Check

- 1) Stop vehicle and place it level.
- 2) Apply parking brake and place chocks against wheels.
- 3) With select lever at "P" position, start engine.
- 4) Warm up engine till fluid temperature reaches normal operating temperature (70 – 80 °C / 158 – 176 °F). As a guide to check fluid temperature, warm up engine to normal operating.
- 5) Keep engine idling and shift select lever slowly to "L" and back to "P" position.

- 6) With engine idling, pull out fluid level gauge, wipe it off with a clean cloth and put it back into place.
- 7) Pull out fluid level gauge (1) again and check fluid level indicated on it. The lowest fluid level should be between FULL HOT (2) and LOW HOT (3). If it is below LOW HOT, add SUZUKI ATF 3317 or Mobil ATF 3309 up to FULL HOT.

Automatic transaxle fluid**SUZUKI ATF 3317 or Mobil ATF 3309****NOTE**

- **Do not race engine while checking fluid level, even after the engine start.**
- **Do not overfill. Overfilling can cause foaming and loss of fluid through breather. Then slippage and transaxle failure can result.**
- **Bringing the level from LOW HOT to FULL HOT requires 0.4 liters (0.85 / 0.70 US/Imp. pt).**
- **If vehicle was driven under high load such as pulling a trailer, fluid level should be checked about half an hour after it is stopped.**



I5RW0C510027-01

4. "FULL COLD" mark	5. "LOW COLD" mark

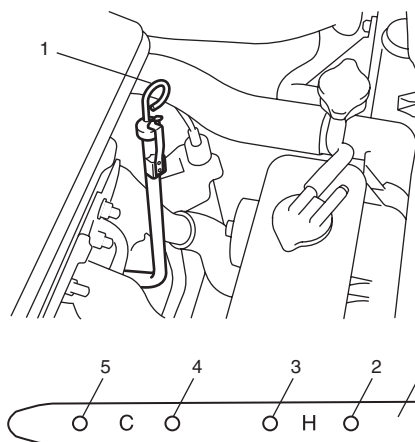
Level Check at Room (Cold) Temperature – Cold Check

Fluid level can be checked temporarily at room (cold) temperature which correspond to 20 – 30 °C (68 – 86 °F). This level check is considered to be preparation before performing level check under normal operating (hot) temperature. Checking procedure itself is the same as that described in "Level Check at Normal Operating (Hot) Temperature – Hot Check: ". If fluid level is between "FULL COLD" (4) and "LOW COLD" (5), proceed to test drive. And when fluid temperature has reached normal operating temperature, check fluid level again and adjust it as necessary.

⚠ CAUTION

Fluid level check at room (cold) temperature is recommended only for preparation of level check under normal (hot) operating condition.

Failure to perform fluid level check under normal (hot) operating temperature may result in damage to transaxle.



I5RW0C510027-01

1. Fluid level gauge	3. "LOW HOT" mark
2. "FULL HOT" mark	

A/T Fluid Change

S6RW0E5106003

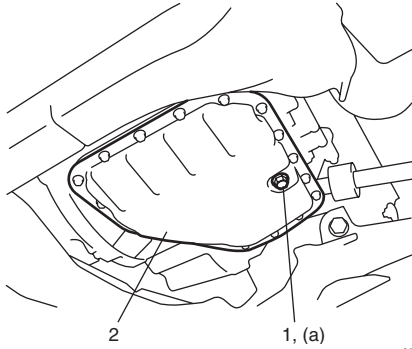
⚠ CAUTION

Do not use any fluid other than the specified ATF. Use of any fluid other than the specified ATF may cause juddering or some other faulty condition to occur.

- 1) Lift up vehicle.
- 2) Remove left side engine under cover.
- 3) When engine is cool, remove drain plug (1) from oil pan (2) and drain A/T fluid.
- 4) Install drain plug (1).

Tightening torque

A/T fluid drain plug (a): 17 N·m (1.7 kgf-m, 12.5 lb-ft)



I5RW0C510029-02

- 5) Lower vehicle and pour proper amount of SUZUKI ATF 3317 or Mobil ATF 3309.
- 6) Check fluid level referring to "A/T Fluid Level Check".

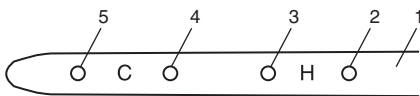
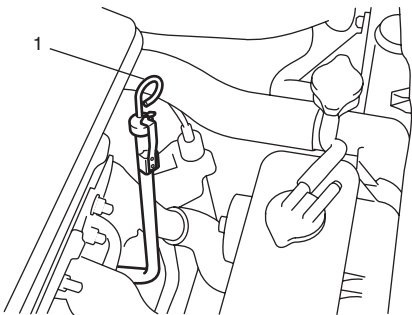
Automatic transaxle fluid

SUZUKI ATF 3317 or Mobil ATF 3309

Automatic transaxle fluid capacity

When draining from drain plug hole: 2.6 liters (5.49 / 4.58 US/Imp. pt.)

When overhauling: 5.8 liters (12.26 / 10.21 US/Imp. pt.)

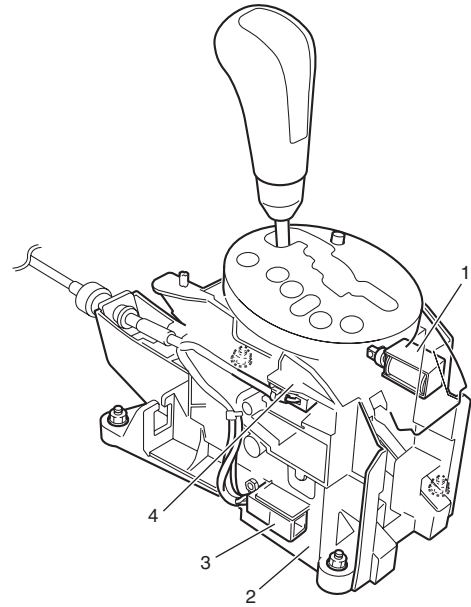


I5RW0C510027-01

1. Fluid level gauge	4. "FULL COLD" mark
2. "FULL HOT" mark	5. "LOW COLD" mark
3. "LOW HOT" mark	

Select Lever Components

S6RW0E5106004



I5RW0C510028-04

1. Shift lock solenoid	3. Connector
2. Select lever assembly	4. "3" position switch

Select Lever Assembly Installation

S6RW0E5106059

Note the following when installing select lever assembly:

- After installing select lever assembly, adjust select cable referring to "Select Cable Adjustment".

Select Lever Knob Installation

S6RW0E5106060

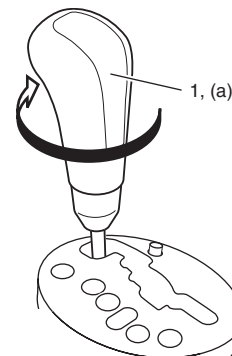
Screw select lever knob onto select lever by specified numbers of rotation below.

Rotation numbers for select lever knob installation

(a): 11 – 12 rotations

⚠ CAUTION

When installing select lever knob, do not turn more than specified numbers of rotation. Otherwise select lever knob is damaged.



I5RW0C510030-01

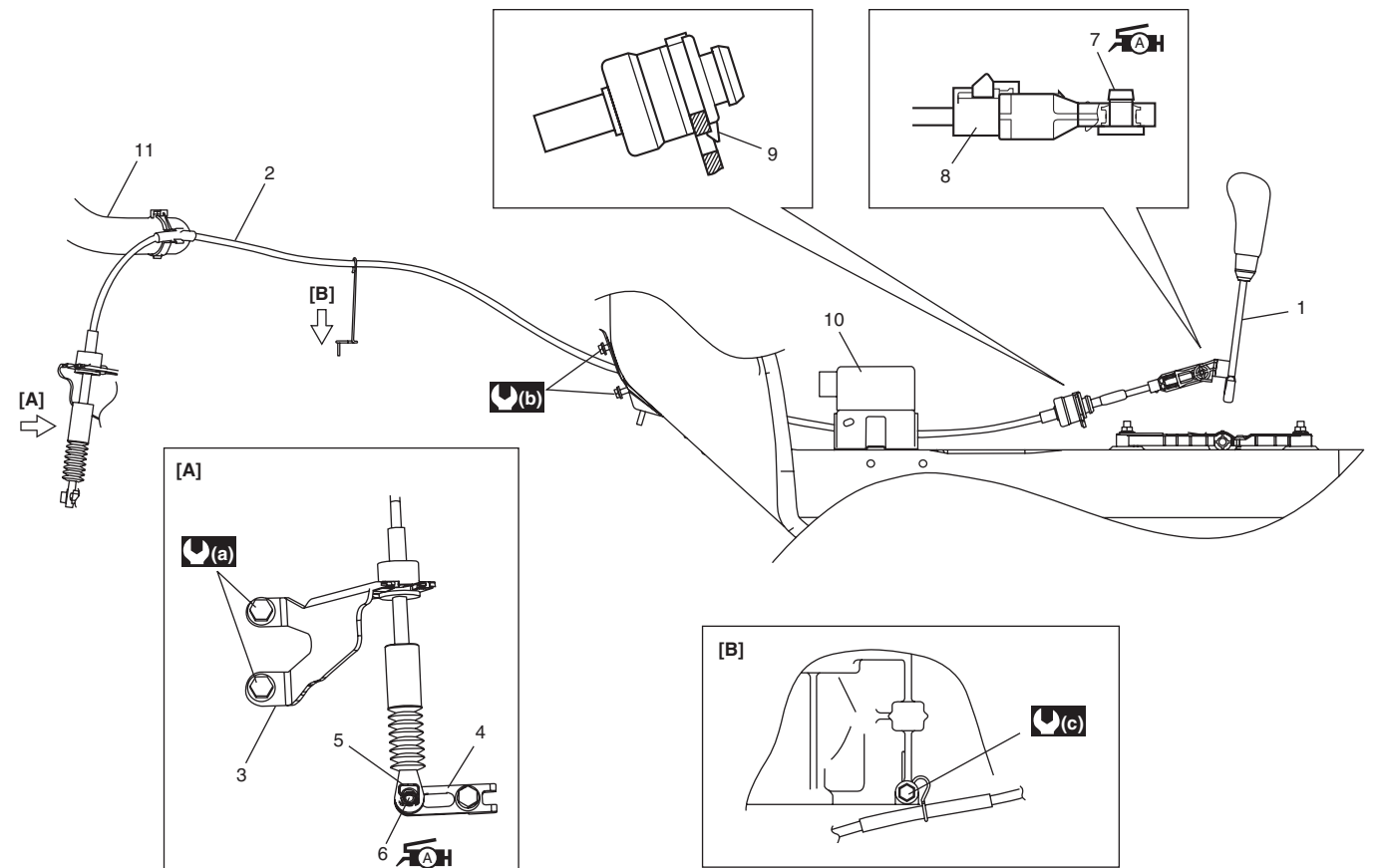
Select Lever Inspection

S6RW0E5106005

Check select lever for smooth and clear-cut movement individually. If a malfunction is found, replace select lever assembly.

Select Cable Components

S6RW0E5106006



I5RW0C510031-01

[A]: View [A]	5. Clip	11. Radiator inlet hose
[B]: View [B]	6. Manual select lever pin : Apply lithium grease 99000-25010 to all around pin (0.15 g)	(a) : 23 N·m (2.0 kgf-m, 17.0 lb-ft)
1. Select lever assembly	7. Select lever pin : Apply lithium grease 99000-25010 to all around pin (0.15 g)	(b) : 6.5 N·m (0.65 kgf-m, 5.0 lb-ft)
2. Select cable	8. Adjuster case	(c) : 13 N·m (1.3 kgf-m, 9.5 lb-ft)
3. Cable bracket	9. Lock	
4. Manual select lever	10. P/S control module	

Select Cable Removal and Installation

S6RW0E5106007

Removal

- 1) Remove console box referring to “Console Box Components in Section 9H in related manual”.
- 2) Disconnect select cable from select lever and then detach from bracket.
- 3) Remove clip and disconnect select cable from manual select lever.
- 4) Remove select cable retainer from dash panel.

Installation

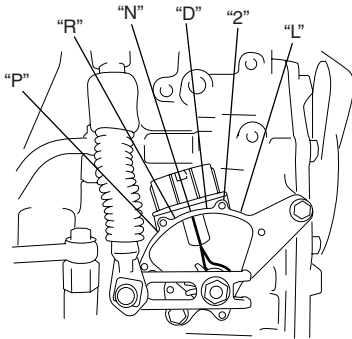
Install select cable by reversing removal procedure. The important steps in installation are as follows.

- Apply grease to pin and cable joint.
- Tighten bolts to specified torque referring to “Select Cable Components”.
- Adjusting procedure is as follows. Refer to “Select Cable Adjustment”.

Select Cable Adjustment

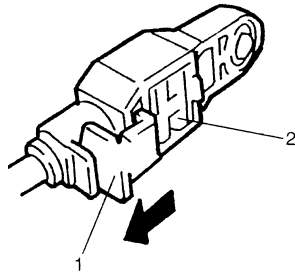
S6RW0E5106008

- 1) Shift manual shift lever to "N" range (transmission range sensor "N" range).



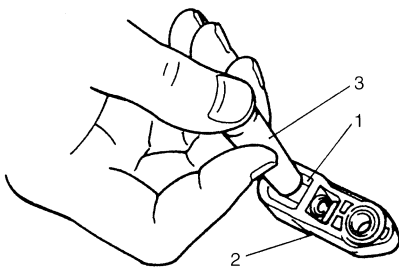
I2RH0B510040-01

- 2) Remove adjuster (cable end) from select lever pin of select lever assembly.
- 3) Release lock plate (1) which restrict moving of cable end holder (2).



I2RH01510046-01

- 4) Push cable end holder (1) out from eye-end (2) using an appropriate tool (3) to disengage cable.



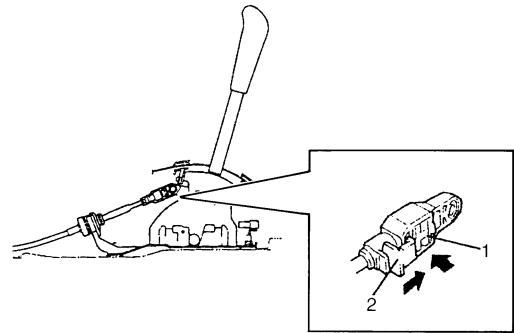
I2RH01510047-01

- 5) Shift select lever to "N" position.

- 6) Apply grease to select lever pin and install adjuster (cable end) to it.

: Grease 99000-25010 (SUZUKI Super Grease A)

- 7) With both select lever and transmission range sensor kept each "N" position, drive cable end holder (1) in until it locks cable.
- 8) Slide lock plate (2) to secure cable end holder in position.



I3RM0B510037-01

- 9) After select cable was installed, check for the following.

- Push vehicle with select lever shifted to "P" range. Vehicle should not move.
- Vehicle can not be driven in "N" range.
- Vehicle can be driven in "D", "3", "2" and "L" ranges.
- Vehicle can be backed in "R" range.

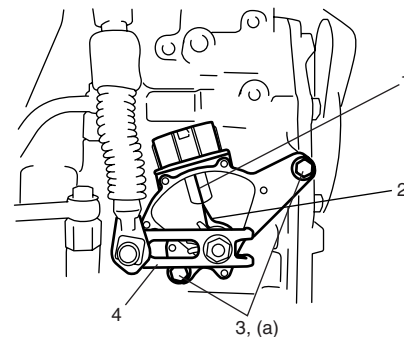
Transmission Range Sensor Inspection and Adjustment

S6RW0E5106009

- 1) Shift manual select lever (4) to "N" range.
- 2) Check that needle direction shaped on lock washer (2) and "N" reference line (1) on transmission range sensor are aligned. If not, loosen sensor bolts (3) and align them.

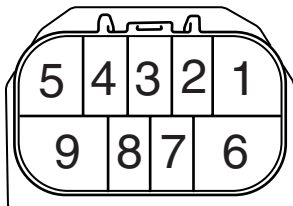
Tightening torque

Transmission range sensor bolt (a): 5.5 N·m (0.55 kgf-m, 4.0 lb-ft)



I2RH0B510041-01

- 3) Check that engine starts in "N" and "P" ranges but it doesn't start in "D", "2", "L" or "R" range. Also, check that back-up lamp lights in "R" range. If faulty condition cannot be corrected by adjustment, disconnect transmission range sensor connector and check that continuity exists as shown by moving manual select lever.



		Terminal No.								
		1	2	3	4	5	6	7	8	9
Sensor Position	P	○	○				○			○
	R		○	○						
	N			○		○		○		○
	D			○				○		
	2			○	○					
	L			○						○

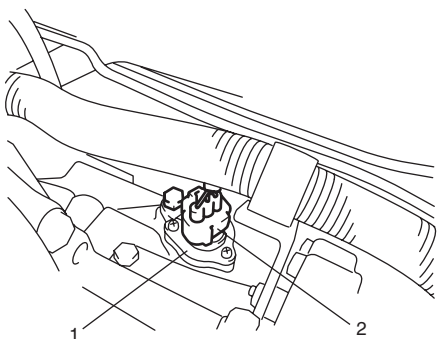
I3RH0A510038-01

Output Shaft Speed Sensor (VSS) Removal and Installation

S6RW0E5106010

Removal

- 1) Disconnect negative cable at battery.
- 2) Disconnect output shaft speed sensor connector (2).
- 3) Remove output shaft speed sensor (VSS) (1) by removing its bolt.



I5RW0C510032-01

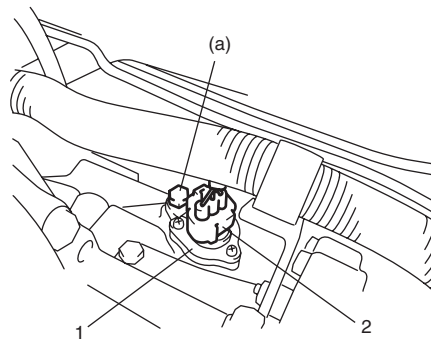
Installation

- 1) Apply A/T fluid to output shaft speed sensor O-ring.
- 2) Install output shaft speed sensor (VSS) (1) to A/T case and tighten bolt to specified torque.

Tightening torque

Output shaft speed sensor (VSS) bolt (a): 13 N·m (1.3 kgf-m, 9.5 lb-ft)

- 3) Connect output shaft speed sensor connector (2) to output shaft speed sensor (VSS) (1).



I5RW0C510033-01

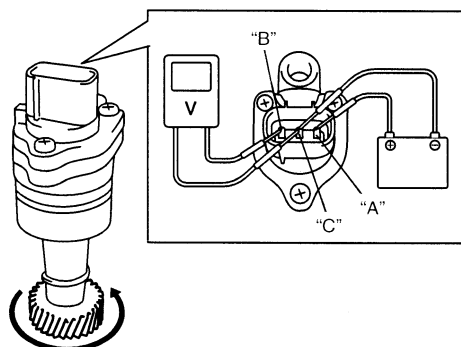
- 4) Connect negative cable to battery.

Output Shaft Speed Sensor (VSS) Inspection

S6RW0E5106011

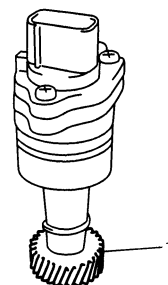
- 1) Connect positive cable of 12 volt battery to "A" terminal of sensor and ground cable to "C" terminal. Then using voltmeter, check voltage between "B" terminal and "C" terminal with output shaft speed sensor (VSS) driven gear rotated. If measured voltage (pulse signal) is not as specified, replace sensor.

Output shaft speed sensor (VSS) output voltage
Pulse signal of alternating 0 – 1 V and 10 – 14 V



I2RH0B510045-01

- 2) Check output shaft speed sensor (VSS) driven gear (1) for wear. Replace if necessary.



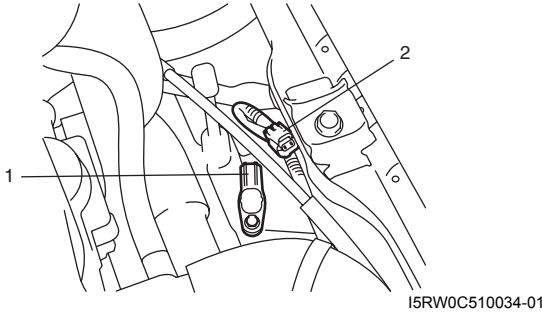
I2RH0B510046-01

Input Shaft Speed Sensor Removal and Installation

S6RW0E5106012

Removal

- 1) Disconnect negative cable at battery.
- 2) Disconnect input shaft speed sensor connector (2).
- 3) Remove input shaft speed sensor (1) by removing its bolt.



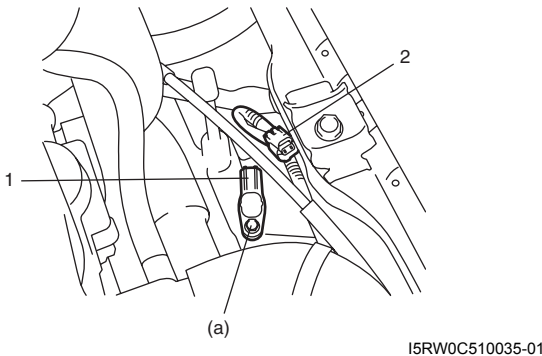
Installation

- 1) Apply A/T fluid to input shaft speed sensor O-ring.
- 2) Install input shaft speed sensor (1) to A/T case and tighten bolt to specified torque.

Tightening torque

Input shaft speed sensor bolt (a): 5.5 N·m (0.55 kgf-m, 4.0 lb-ft)

- 3) Connect input shaft speed sensor connector (2) to input shaft speed sensor (1).



- 4) Connect negative cable to battery.

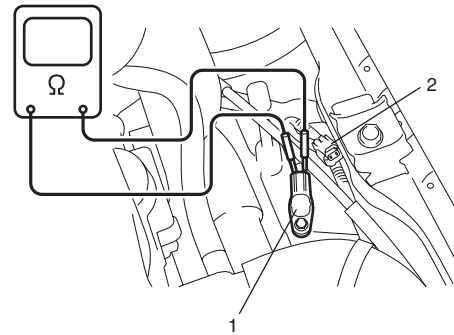
Input Shaft Speed Sensor Inspection

S6RW0E5106013

- 1) Disconnect negative cable at battery.
- 2) Disconnect input shaft speed sensor connector (2).
- 3) Check resistance between input shaft speed sensor (1) terminals.

Input shaft speed sensor resistance

Standard: 560 – 680 Ω at 20 °C (68 °F)



Transmission Fluid Temperature Sensor Removal and Installation

S6RW0E5106014

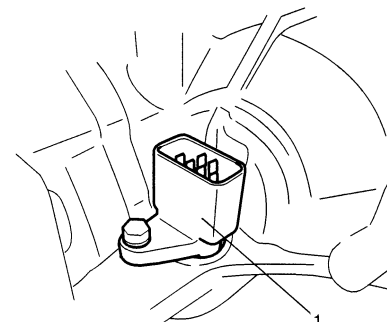
Removal

- 1) Disconnect negative cable at battery.
- 2) Lift up vehicle.
- 3) Remove left side engine under cover.
- 4) With engine is cool, remove drain plug and drain A/T fluid.
- 5) Install drain plug. Refer to "A/T Fluid Change".
- 6) Remove A/T oil pan.
- 7) Remove oil strainer assembly.
- 8) Remove valve body assembly referring to "Automatic Transaxle Unit Disassembly".

⚠ CAUTION

**When pulling solenoid wire harness out of transaxle case, take care not to damage transmission fluid temperature sensor at narrow exit of case.
Careless sensor treatment might cause sensor malfunction.**

- 9) Remove solenoid wire harness (1).



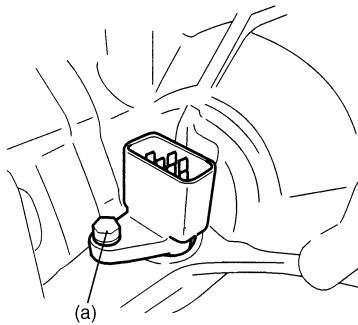
Installation

Reverse removal procedure to install solenoid wire harness and valve body assembly noting the following points.

- For details of valve body assembly and their connectors installation, refer to "Automatic Transaxle Unit Assembly".
- For details of A/T oil pan installation, refer to "Automatic Transaxle Unit Assembly". Use new oil pan gasket.
- Tighten valve body harness connector bolt to specified torque.

Tightening torque

Valve body harness connector bolt (a): 5.5 N·m (0.55 kgf-m, 4.0 lb-ft)



I2RH0B510051-01

- Pour A/T fluid and check fluid level according to procedure described in "A/T Fluid Change".
- Check for fluid leakage after warming up A/T.

Transmission Fluid Temperature Sensor Inspection

S6RW0E5106015

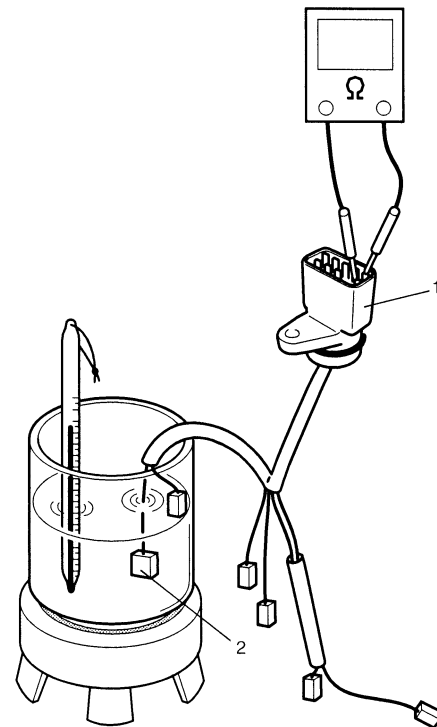
Warm up transmission fluid temperature sensor (2). Check resistance between terminals of valve body harness connector (1). Thus make sure its resistance decrease as its temperature increase.

Transmission fluid temperature sensor resistance

10 °C (50 °F): 5.8 – 7.1 kΩ

110 °C (230 °F): 231 – 263 Ω

145 °C (293 °F): 105 – 117 Ω



I2RH0B510052-01

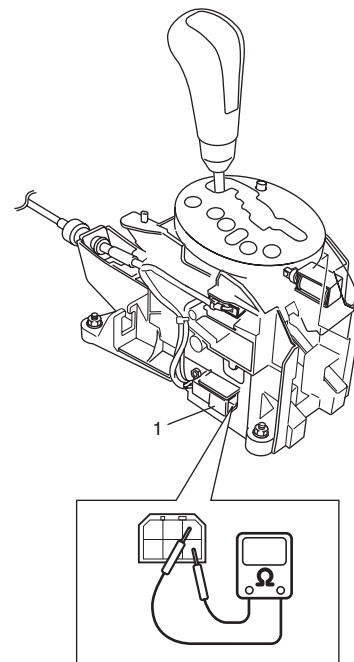
"3" Position Switch Inspection

S6RW0E5106016

- 1) Remove console box referring to "Console Box Components in Section 9H in related manual".
- 2) Disconnect "3" position switch connector (1).
- 3) Check continuity between "3" position switch terminals.

"3" position switch specification

Shift select lever to "3" or "2" range: Continuity
Shift other above range: No continuity



I5RW0C510037-02

Solenoid Valves (Shift Solenoid Valves and Timing Solenoid Valve) Removal and Installation

S6RW0E5106017

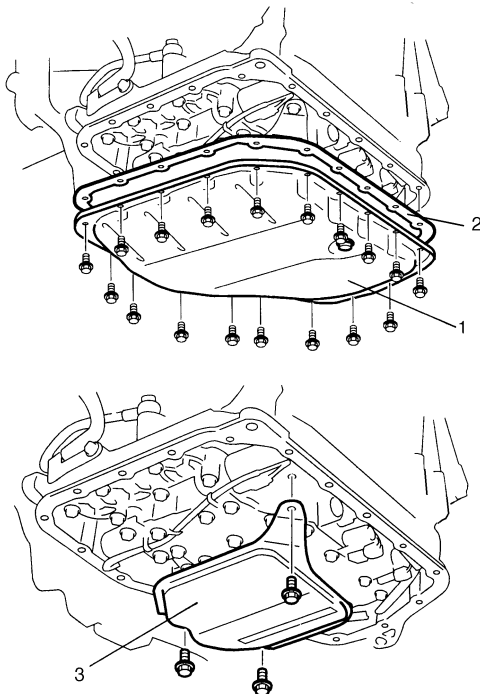
Removal

- 1) Disconnect negative cable at battery.
- 2) Lift up vehicle.
- 3) Remove left side engine under cover.
- 4) Remove drain plug and drain A/T fluid.
- 5) Install drain plug.

Tightening torque

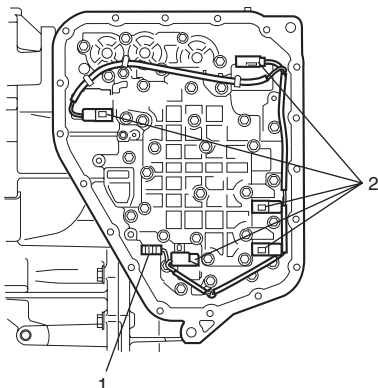
A/T fluid drain plug: 17 N·m (1.7 kgf-m, 12.5 lb-ft)

- 6) Remove A/T oil pan (1) and oil pan gasket (2).
- 7) Remove oil strainer assembly (3).



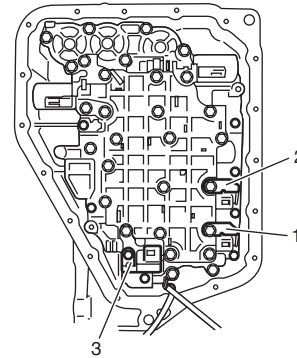
I2RH0B510054-01

- 8) Remove transmission fluid temperature sensor (1) from sensor clamp.
- 9) Disconnect solenoid connectors (2).



I5RW0C510038-02

- 10) Remove shift solenoid valve-A (No.1) (1), shift solenoid valve-B (No.2) (2) and timing solenoid valve (3) by removing bolts.



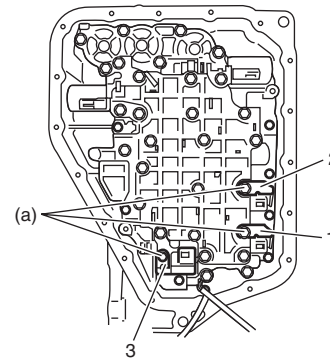
I4RS0A510028-01

Installation

- 1) Install shift solenoid valve-A (No.1) (1), shift solenoid valve-B (No.2) (2) and timing solenoid valve (3).

Tightening torque

Shift solenoid bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)

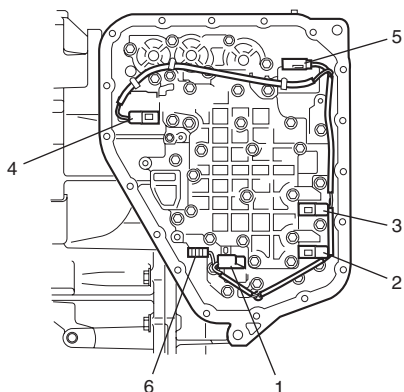


I4RS0A510029-01

- 2) Connect solenoid connectors identifying their installing positions by wire color.

Solenoid coupler	Wire color
Shift solenoid valve-A (No.1) (2)	White
Shift solenoid valve-B (No.2) (3)	Black
Timing solenoid valve (1)	Yellow
TCC pressure control solenoid valve (4)	Light green / Brown
Pressure control solenoid valve (5)	Green / Gray

- 3) Install transmission fluid sensor (6) and sensor wire to clamp.

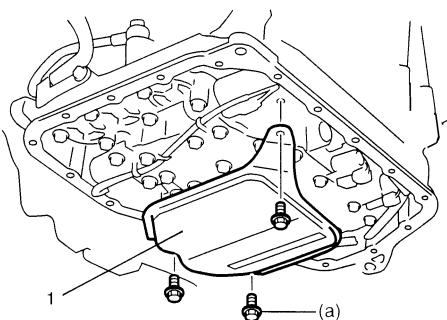


I5RW0C510039-02

- 4) Install oil strainer assembly (1).

Tightening torque

Oil strainer bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)

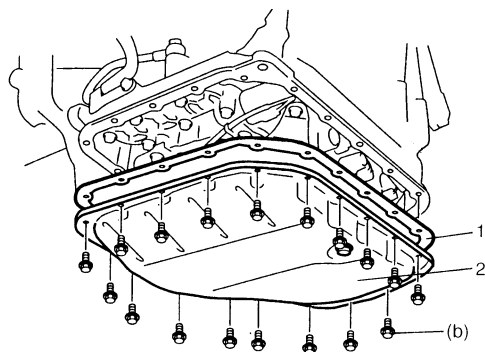


I2RH0B510059-01

- 5) Install new oil pan gasket (1) and oil pan (2).
6) Tighten oil pan bolts to specified torque diagonally and little by little.

Tightening torque

Oil pan bolt (b): 7.0 N·m (0.7 kgf-m, 5.0 lb-ft)



I2RH0B510060-01

- 7) Install left side engine under cover.
8) Lower vehicle.
9) Connect negative cable at battery.

Solenoid Valves (Shift Solenoid Valves, and Timing Solenoid Valve) Inspection

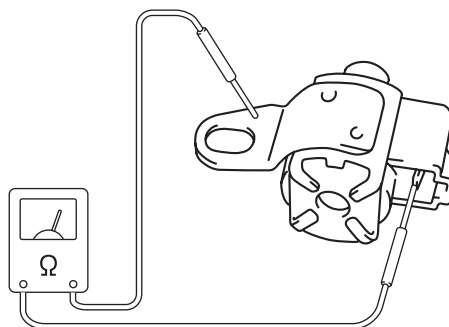
S6RW0E5106018

Resistance Check

Check shift solenoid valves and timing solenoid valve.

Shift solenoid valves and timing solenoid valve resistance

Standard: 11 – 15 Ω at 20 °C (68 °F)



I2RH0B510061-01

Operation Check

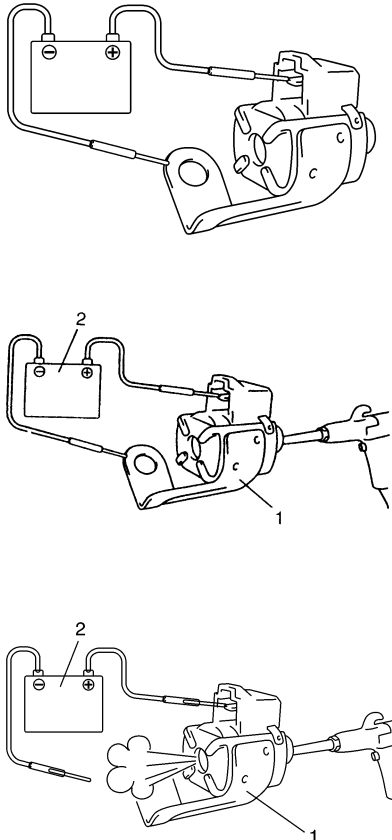
Shift solenoid valve-A (No.1) and -B (No.2)

⚠ CAUTION

- Do not insert air gun against strainer installed on inlet of solenoid valve too deeply, when blowing air into solenoid valve. If not, the strainer will be damaged.
 - Be very careful as dust etc. does not enter when solenoid valves are inspected.
-
- Check that solenoid valve (1) actuate with click sound when battery voltage is conducted.
 - When solenoid valve (1) is connected to battery (2), confirm that solenoid valve is close condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm², 7 – 28.5 psi) into solenoid valve as shown in figure.
 - When solenoid valve (1) is not connected to battery (2), confirm that solenoid valve is open condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm², 7 – 28.5 psi) into solenoid valve as shown in figure.

NOTE

Do not fail to inspect with air to prevent mistaken checking because return spring for valve is not installed into solenoid valve.



I2RH0B510062-01

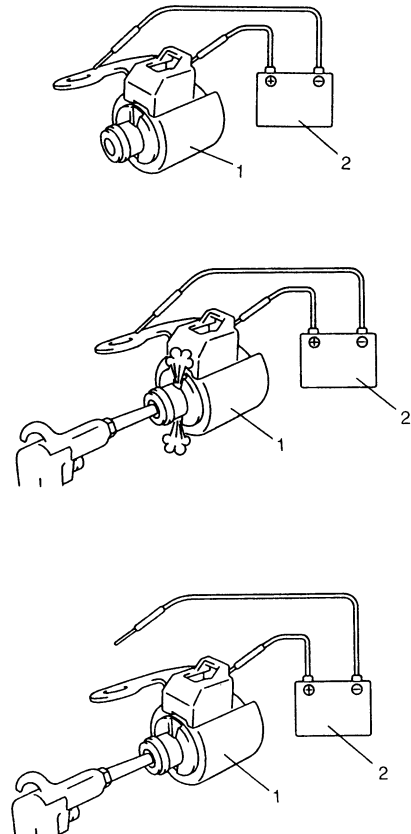
Timing solenoid valve

⚠ CAUTION

- Do not insert air gun against strainer installed on inlet of solenoid valve too deeply, when blowing air into solenoid valve. If not, the strainer will be damaged.
 - Be very careful as dust etc. does not enter when solenoid valves are inspected.
-
- Check that solenoid valve (1) actuate with click sound when battery voltage is conducted.
 - When timing solenoid valve (1) is connected to battery (2), confirm that timing solenoid valve is open condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm², 7 – 28.5 psi) into solenoid valve as shown in figure.
 - When timing solenoid valve (1) is not connected to battery (2), confirm that timing solenoid valve is close condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm², 7 – 28.5 psi) into solenoid valve as shown in figure.

NOTE

Do not fail to inspect with air to prevent mistaken checking because return spring for valve is not installed into solenoid valve.



I2RH0B510063-01

Pressure Control Solenoid Valves (Pressure Control Solenoid and TCC Pressure Control Solenoid) Removal and Installation

S6RW0E5106019

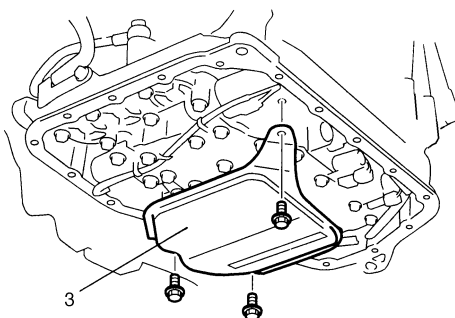
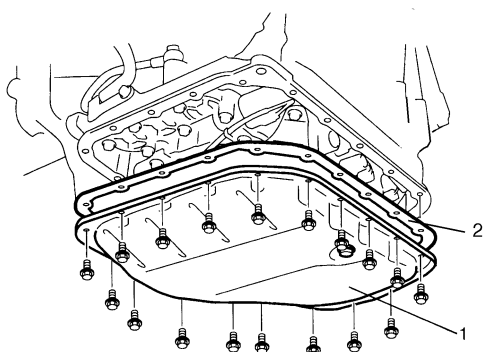
Removal

- 1) Disconnect negative cable at battery.
- 2) Lift up vehicle.
- 3) Remove left side engine under cover.
- 4) Remove drain plug and drain A/T fluid.
- 5) Install drain plug.

Tightening torque

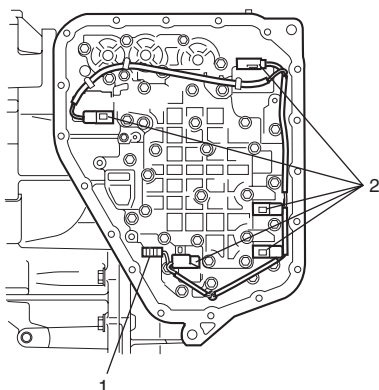
A/T fluid drain plug: 17 N·m (1.7 kgf-m, 12.5 lb-ft)

- 6) Remove A/T oil pan (1) and oil pan gasket (2).
- 7) Remove oil strainer assembly (3).



I2RH0B510054-01

- 8) Remove transmission fluid temperature sensor (1) from sensor clamp.
- 9) Disconnect solenoid connectors (2).



I5RW0C510038-02

- 10) Remove valve body assembly referring to "Automatic Transaxle Unit Disassembly".
- 11) Remove pressure control solenoid valve and TCC pressure control solenoid valve referring to "Valve Body Assembly Disassembly and Reassembly".

Installation

Reverse removal procedure to install pressure control solenoid valve and valve body assembly noting the following points.

- For detail of pressure control solenoid valve and TCC pressure control solenoid valve installation, refer to "Valve Body Assembly Disassembly and Reassembly".
- For detail of valve body assembly installation, refer to "Automatic Transaxle Unit Assembly".
- For detail of installing wire harness for solenoid valves and sensor, refer to "Automatic Transaxle Unit Assembly". Use new O-rings.
- For detail of A/T oil pan and oil strainer assembly installation, refer to "Automatic Transaxle Unit Assembly". Use new oil pan gasket.
- Pour A/T fluid and check fluid level according to procedure described in "A/T Fluid Change".
- Check for fluid leakage after warming up A/T.

Pressure Control Solenoid Valve Inspection

S6RW0E5106020

⚠ CAUTION

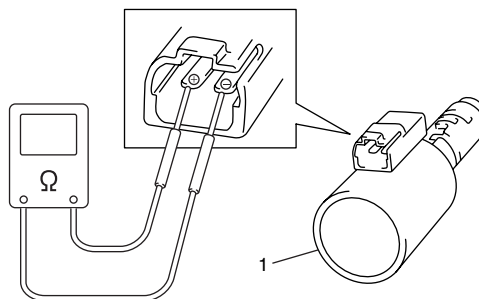
- Be very careful as dust etc. does not enter when pressure control solenoid valves are inspected.

Resistance Check

Measure resistance between pressure control solenoid valves (Pressure control solenoid and TCC pressure control solenoid) (1) terminals.

Pressure control solenoid valve and TCC pressure control solenoid valve resistance

Standard: 5.0 – 5.6 Ω at 20 °C (68 °F)



I2RH01510071-01

Operation Check

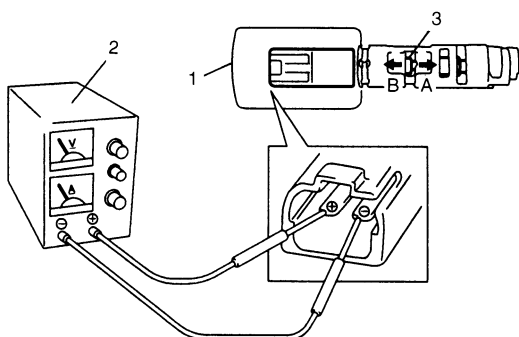
Check pressure control solenoid valves (Pressure control solenoid and TCC pressure control solenoid) operation in the either manner of the following.

Using regulated DC power supply

- 1) Connect pressure control solenoid valve (1) with regulated DC power supply (2) as shown in figure.
- 2) Turn regulated DC power supply switch ON and increase voltage of power supply keeping current within 1.0 A.
- 3) Check for gradual movement of valve (3) in the direction of arrow "A" as voltage is increased.
- 4) Check movement of valve (3) in the direction of arrow "B" as voltage is decreased.
- 5) Turn power supply switch OFF.

⚠ CAUTION

Do not pass current 1.0 A or more, or pressure control solenoid is burned out.



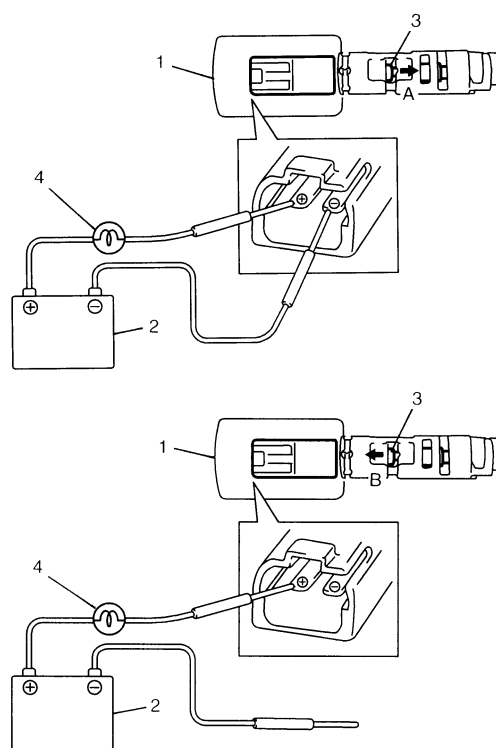
I2RH0B510064-01

Not using regulated DC power supply

- 1) Connect pressure control solenoid valve (1) to battery (2) setting 21 W bulb (4) on the way as shown in figure.
- 2) Check for movement of valve (3) in the direction of arrow "A".
- 3) Disconnect pressure control solenoid valve (1) from battery (2) and check movement of valve (3) in the direction of arrow "B" as shown in figure.

⚠ CAUTION

Set 21 W bulb on the way, or pressure control solenoid valve is burned out.



I4RS0A510031-01

Transmission Control Module (TCM) Removal and Installation

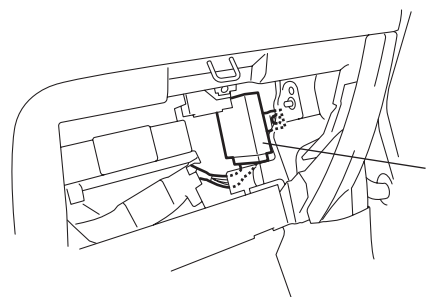
S6RW0E5106021

⚠ CAUTION

- TCM and ECM consists of highly precise parts, therefore when handling it, be careful not to expose to excessive shock.
- When replacing TCM with used one, all learned contents, which have been stored in TCM memory by executing learning control, should be initialized after replacement.

Removal

- 1) Disconnect negative cable at battery.
- 2) If the vehicle is equipped with air bag system, disable air bag system. Refer to "Disabling Air Bag System in Section 8B in related manual".
- 3) Disconnect connectors from TCM (1).
- 4) Remove TCM by removing its nuts.



I5RW0C510040-01

Installation

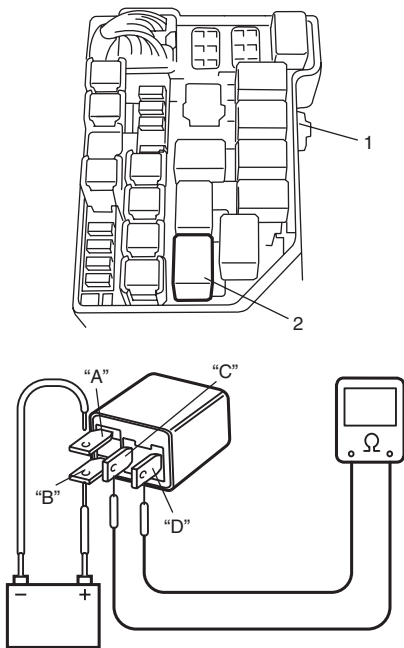
Reverse removal procedure noting the following.

- Connect TCM connectors securely.
- If the vehicle is equipped with air bag system, be sure to enable air bag system after TCM is back in place. Refer to "Enabling Air Bag System in Section 8B in related manual".

A/T Relay Inspection

S6RW0E5106022

- 1) Disconnect negative cable at battery.
- 2) Remove A/T relay (2) from fuse and relay box (1).
- 3) Check that there is no continuity between terminal "C" and "D".
If continuity is indicated, replace A/T relay.
- 4) Connect battery positive (+) terminal to terminal "A" of A/T relay and battery negative (–) terminal to terminal "B" of A/T relay.
Check continuity between terminal "C" and "D" of A/T relay.
If continuity does not indicated, replace A/T relay.



I5RW0C510041-02

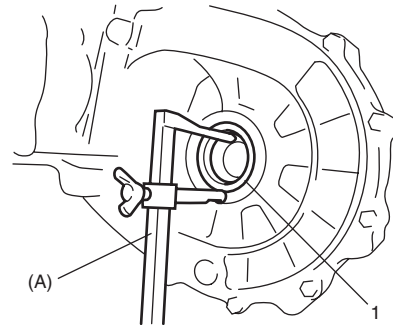
Differential Side Oil Seal Replacement

S6RW0E5106023

- 1) Lift up vehicle and drain automatic transaxle fluid.
- 2) Remove drive shaft assembly and center shaft referring to "Front Drive Shaft Assembly Removal and Installation: Front in Section 3A in related manual".
- 3) Remove differential side oil seal (1) by using special tool.

Special tool

(A): 09913–50121



I5RW0A520006-02

- 4) Apply grease to new differential side oil seal lips.
: Grease 99000–25030 (SUZUKI Super Grease C)
- 5) Install new differential side oil seals (1) by using special tool.

Special tool

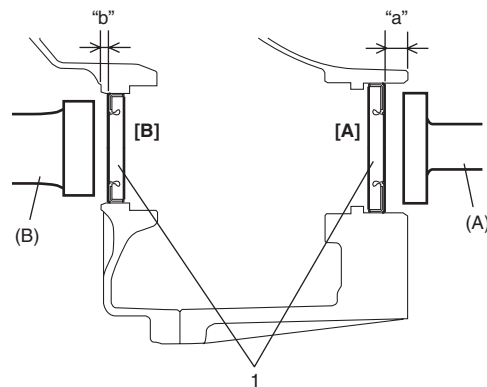
(A): 09913–75510

(B): 09913–75810

Differential side oil seal installing depth

Right side "a": 13.2 – 14.2 mm (0.52 – 0.56 in.)

Left side "b": 3.8 – 4.8 mm (0.15 – 0.19 in.)



I5RW0C510042-01

[A]: Right side

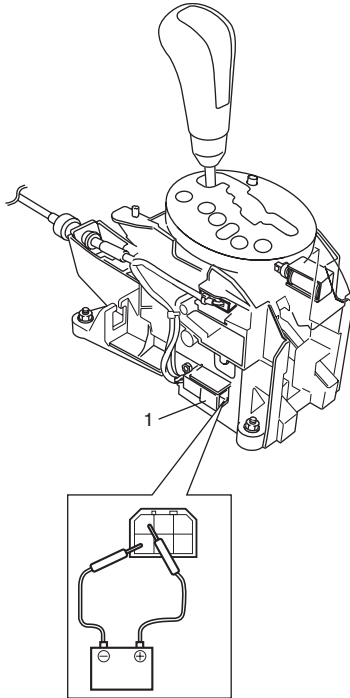
[B]: Left side

- 6) Insert drive shaft assembly and center shaft referring to "Front Drive Shaft Assembly Removal and Installation: Front in Section 3A in related manual".
- 7) Pour A/T fluid referring to "A/T Fluid Change".

Shift Lock Solenoid Inspection

S6RW0E5106024

Check that shift lock solenoid (1) actuate when battery voltage is conducted.

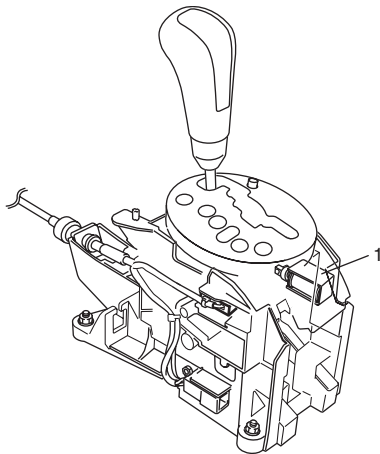


I5RW0C510043-02

Shift Lock Solenoid Replacement

S6RW0E5106025

- 1) Remove console box referring to "Console Box Components in Section 9H in related manual".
- 2) Replace shift lock solenoid (1) using flat head or like.
- 3) Install covers as they were.



I5RW0C510044-01

Key Interlock Cable Removal and Installation

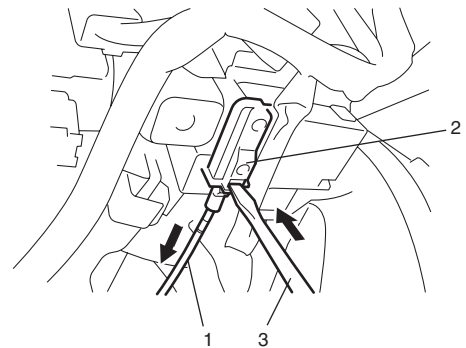
S6RW0E5106026

NOTE

Don't bend interlock cable excessively when removing and installing it, or system will not operate correctly.

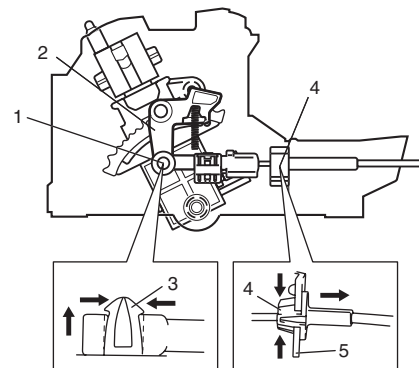
Removal

- 1) If the vehicle is equipped with air bag system, disconnect negative cable at battery and disable air bag system, referring to "Disabling Air Bag System in Section 8B in related manual".
- 2) Remove steering column cover.
- 3) Turn ignition switch to ACC position.
- 4) Pull out key interlock cable (1) from key cylinder cover (2) while pressing checkhook with slotted screwdriver (3) or the like.



I5RW0C510045-01

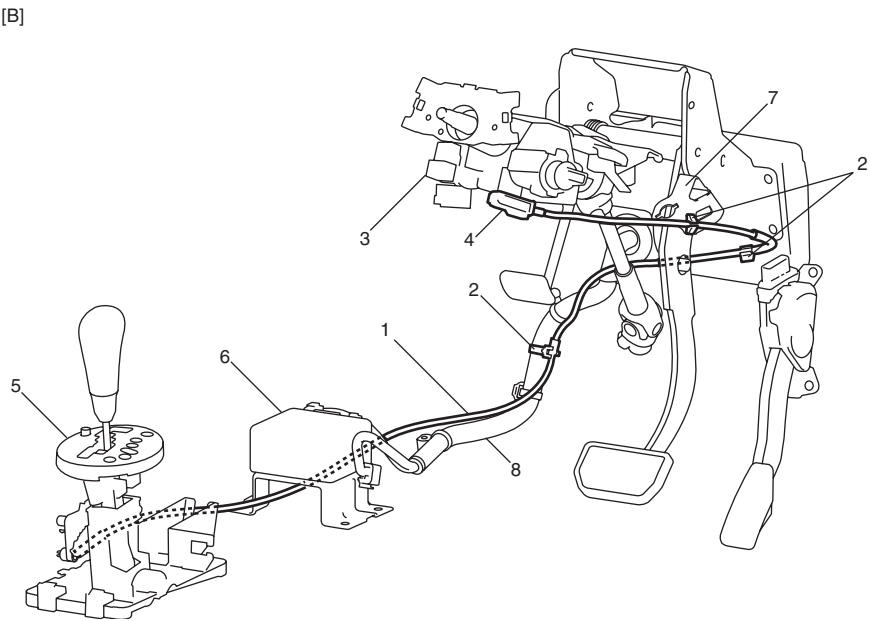
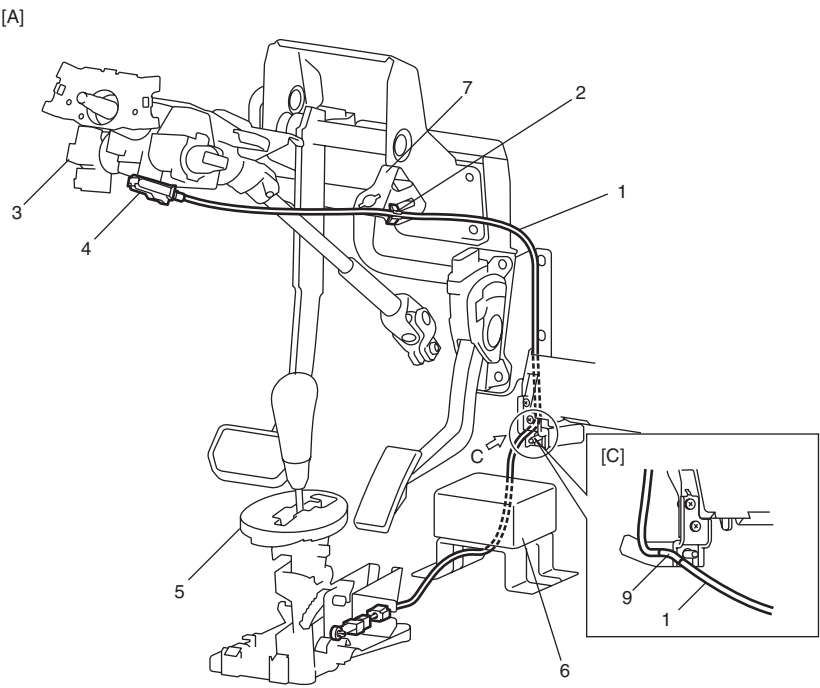
- 5) Turn ignition switch to LOCK position.
- 6) Remove console box referring to "Console Box Components in Section 9H in related manual".
- 7) Detach cable end (1) from interlock cam (2) while pressing claws (3) of interlock cam boss. At this time, be careful not to cause damage to its claws. Detach cable casing cap (4) from bracket (5) while pressing checkhook.
- 8) Remove interlock cable.



I5RW0C510046-01

Installation

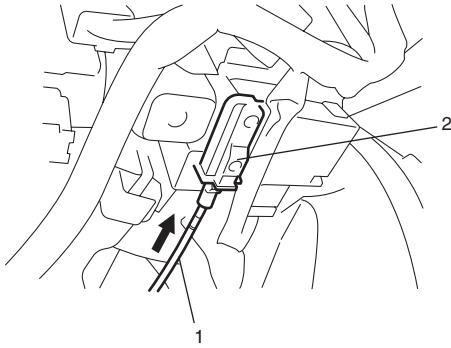
1) Lay interlock cable to its original cabling route.



I5RW0C510073-01

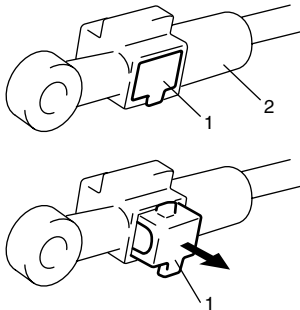
[A]: LH steering vehicle	2. Clamp	6. EPS control module
[B]: RH steering vehicle	3. Steering lock assembly / Steering lock unit (if equipped with Keyless start system)	7. Brake switch bracket
[C]: View C	4. Key cylinder cover	8. Wiring harness
1. Key interlock cable	5. Select lever assembly	9. Marking

- 2) Turn ignition switch to ACC position.
- 3) Insert cable casing cap (1) into key cylinder cover (2) securely.



I5RW0C510047-01

- 4) Pull out lock button (1) of select lever side cable end (2).



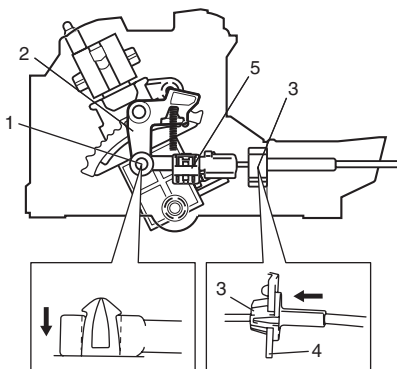
I2RH01510086-01

- 5) Shift select lever to "N" position.

NOTE

If select lever is in "P" position, shift select lever referring to "Select Lever Inspection".

- 6) Install cable casing cap (3) to bracket (4).
- 7) Connect cable end (1) to interlock cam (2) with ignition switch turned to ACC position.
- 8) Drive lock button (5) in cable end until it locks cable expansion and contraction.



I5RW0C510048-01

- 9) With select lever set at "P" position, turn ignition key to ACC position and then check for the following conditions.

- With knob button released, ignition key can be turned from ACC position to LOCK position.
- With knob button pressed, ignition key cannot be turned from ACC position to LOCK position.

- 10) Install knee protector to steering column.

- 11) Install steering column cover.

- 12) If the vehicle is equipped with air bag system, connect negative cable at battery and enable air bag system, referring to "Enabling Air Bag System in Section 8B in related manual".

A/T Fluid Cooler Hoses Replacement

S6RW0E5106027

The rubber hoses for the A/T fluid cooler should be checked at specified interval. If replacing them, be sure to note the following.

- to replace clamps at the same time
- to insert hose as far as its limit mark
- to clamp clamps securely



I5RW0C510049-01

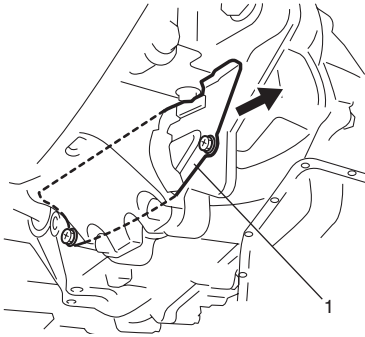
- | |
|--|
| 1. Inlet hose (Outlet from A/T fluid cooler) |
| 2. Outlet hose (Inlet to A/T fluid cooler) |

Automatic Transaxle Unit Dismounting and Remounting

S6RW0E5106029

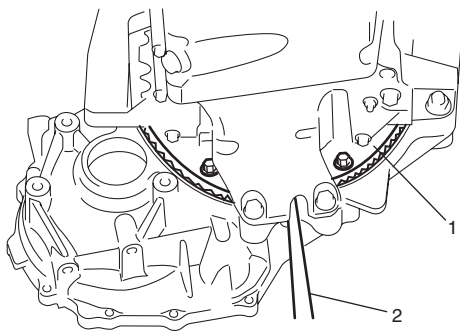
Dismounting

- 1) Take down transaxle with engine. For its procedure, refer to "Engine Assembly Removal and Installation in Section 1D in related manual".
- 2) Remove transaxle housing lower plate (1).



I5RW0C510051-01

- 3) Remove drive plate to torque converter bolts (1) engage flat head rod or the like (2) with drive plate ring gear.



I5RW0C510052-01

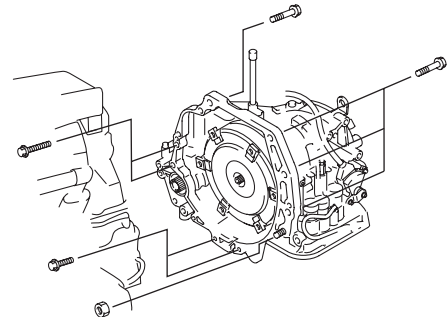
- 4) Remove starting motor.
- 5) Remove bolts and nut fastening engine and transaxle, then detach transaxle from engine.

⚠ WARNING

Be sure to keep transaxle with torque converter horizontal or facing up throughout the work. Should it be tilted with torque converter down, converter may fall off and cause personal injury.

NOTE

When detaching transaxle from engine, move it in parallel with crankshaft and use care so as not to apply excessive force to drive plate and torque converter.



I5RW0C510053-01

Remounting

- 1) Make sure that torque converter is installed correctly to transaxle.
Refer to "Automatic Transaxle Unit Assembly".
- 2) Attach transaxle to engine. Tighten engine oil pan bolts (1) to specified torque.

⚠ WARNING

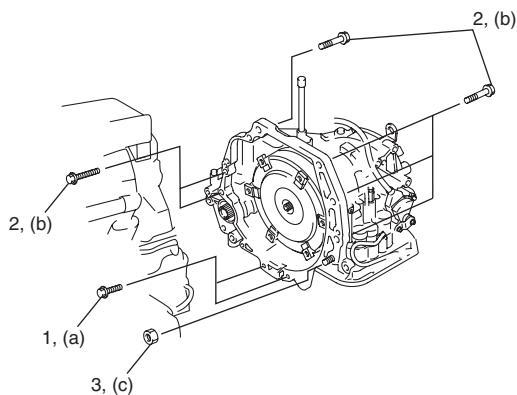
Be sure to keep transaxle with torque converter horizontal or facing up throughout the work. Should it be tilted with torque converter down, converter may fall off and cause personal injury.

Tightening torque

Engine oil pan bolt (a): 55 N·m (5.5 kgf-m, 40.0 lb-ft)

Transaxle and engine fastening bolt (b): 85 N·m (8.5 kgf-m, 61.5 lb-ft)

Transaxle and engine fastening nut (c): 85 N·m (8.5 kgf-m, 61.5 lb-ft)

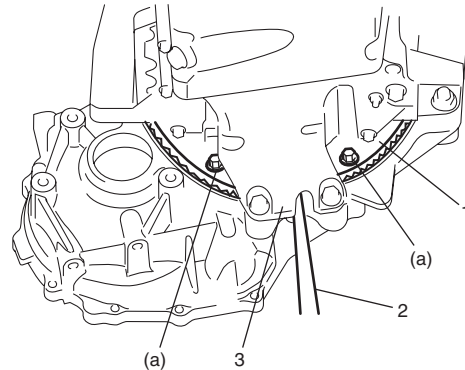


I5RW0C510054-01

- 3) Tighten drive plate to torque converter bolts. Align bolt hole of drive plate and torque converter then tighten bolts through torque converter housing lower plate opening.
Lock drive plate (1) by engaging flat head rod or the like (2) with drive plate gear.

Tightening torque

Drive plate to torque converter bolt (a): 19 N·m (1.9 kgf-m, 14.0 lb-ft)



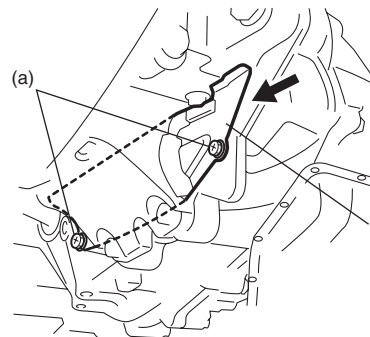
I5RW0C510055-01

3. Engine oil pan

- 4) Install transaxle housing lower plate (1).

Tightening torque

Transaxle housing lower plate bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)

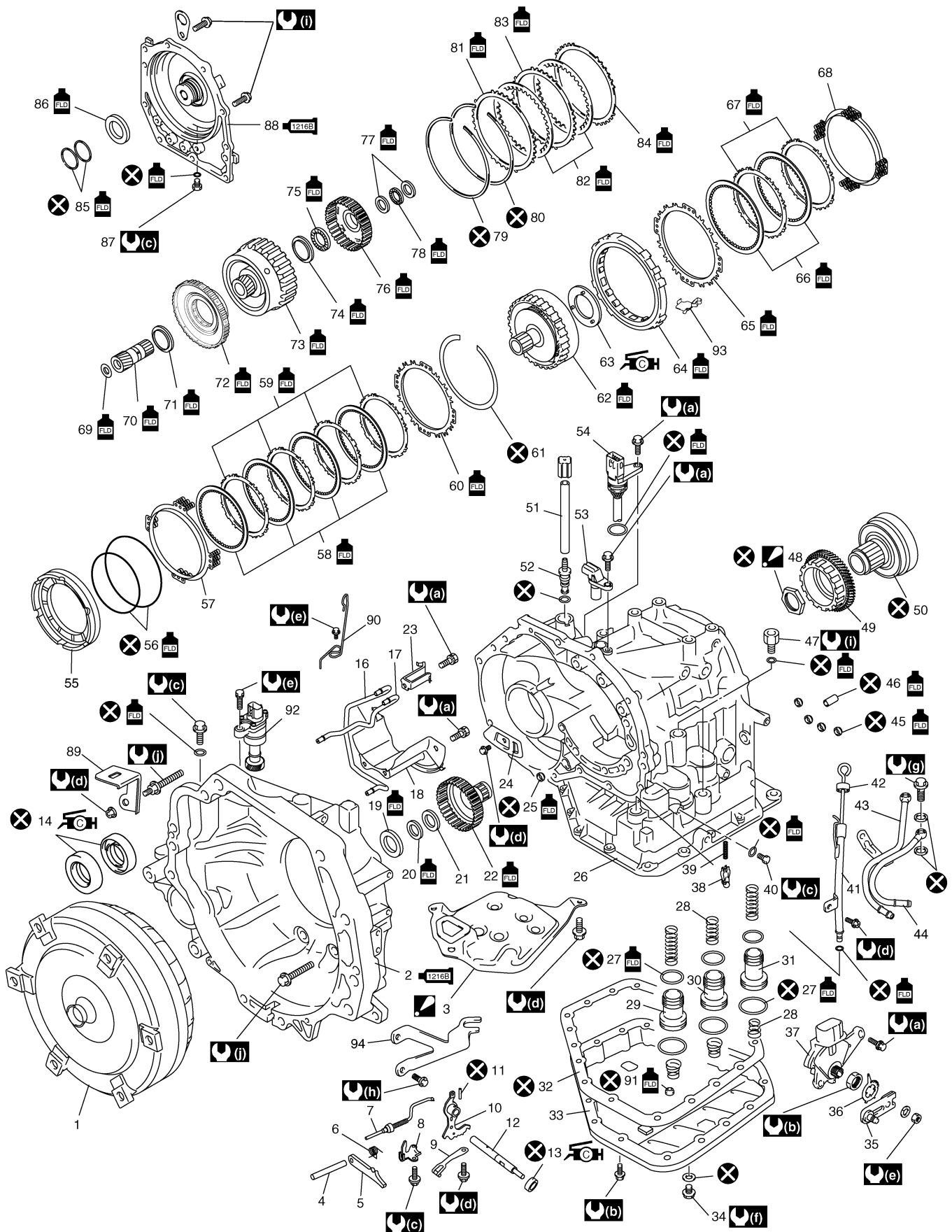


I5RW0C510056-01

- 5) Install starter motor referring to "Starting Motor Dismounting and Remounting in Section 11 in related manual".
- 6) Remount engine with transaxle assembly to vehicle.
Refer to "Engine Assembly Removal and Installation in Section 1D in related manual" for its procedure.

Automatic Transaxle Assembly Components

S6RW0E5106030



5A-98 Automatic Transmission/Transaxle:

1. Torque converter	37. Transmission range sensor	73. Rear planetary sun gear subassembly
 2. Torque converter housing : Apply sealant 99000-31230 to mating surface to transaxle case.	38. Cooler check valve	74. Rear sun gear thrust bearing race
 3. Oil strainer assembly : Replace oil strainer when overhauling.	39. Spring	75. Rear sun gear thrust bearing
4. Parking lock pawl shaft	40. Transaxle case plug	76. Forward clutch hub
5. Parking lock pawl	41. Fluid filler tube	77. Intermediate shaft thrust bearing race
6. Parking lock pawl return spring	42. Fluid level gauge	78. Intermediate shaft thrust bearing
7. Parking lock pawl rod	43. Fluid cooler inlet pipe	79. 2nd brake piston snap ring
8. Parking lock pawl bracket	44. Fluid cooler outlet pipe	80. O/D and 2nd coast brake retaining plate snap ring
9. Manual detent spring	45. 2nd brake gasket	81. O/D and 2nd coast brake retaining plate
10. Manual valve lever	46. Brake drum gasket	82. O/D and 2nd coast brake disc
11. Manual valve lever pin	47. Pipe union	83. O/D and 2nd coast brake separator plate
12. Manual shift shaft	 48. Reduction drive gear nut : After tightening nut so as rotational torque of reduction drive gear to be in specified value, caulk nut securely.	84. O/D and 2nd coast brake rear plate
 13. Manual shift shaft oil seal : Apply grease 99000-25030 to oil seal lip.	49. Reduction drive gear	85. Rear cover seal ring
 14. Differential side oil seal : Apply grease 99000-25030 to oil seal lip.	50. Planetary ring gear subassembly	86. Reverse clutch drum thrust bearing
15. Torque converter housing plug	51. Breather hose	87. Rear cover plug
16. Lubrication LH tube	52. Breather union	 88. Transaxle rear cover : Apply sealant 99000-31230 to mating surface.
17. Lubrication RH tube	53. Input shaft speed sensor	89. Harness bracket
18. Fluid reservoir RH plate	54. Valve body harness	90. Select cable clamp
19. Input shaft front thrust bearing	55. 1st and reverse brake piston	91. Governor apply No.1 gasket
20. Input shaft rear thrust bearing	56. O-ring	92. Output shaft speed sensor (VSS)
21. Input shaft rear thrust bearing race	57. 1st and reverse brake return spring subassembly	93. One-way clutch outer race retainer
22. Direct clutch hub	58. 1st and reverse brake disc	94. Select cable bracket
23. Lubrication tube clamp	59. 1st and reverse brake separator plate	 : Do not reuse.
24. Fluid reservoir LH plate	60. 1st and reverse brake retaining plate	 : Apply automatic transaxle fluid.
25. Governor apply No.2 gasket	61. 1st and reverse brake snap ring	 (a) : 5.5 N·m (0.55 kgf-m, 4.0 lb-ft)
26. Automatic transaxle case	62. Planetary gear assembly	 (b) : 7.0 N·m (0.7 kgf-m, 5.0 lb-ft)
27. Accumulator piston O-ring	 63. Planetary carrier thrust washer : Apply grease 99000-25030 to slide contact face.	 (c) : 7.5 N·m (0.75 kgf-m, 5.5 lb-ft)
28. Accumulator spring	64. One-way clutch No.2 assembly	 (d) : 10 N·m (1.0 kgf-m, 7.5 lb-ft)
29. C2 accumulator piston	65. 2nd brake retaining plate	 (e) : 13 N·m (1.3 kgf-m, 9.5 lb-ft)
30. C1 accumulator piston	66. 2nd brake disc	 (f) : 17 N·m (1.7 kgf-m, 12.5 lb-ft)
31. B1 accumulator piston	67. 2nd brake separator plate	 (g) : 22 N·m (2.2 kgf-m, 16.0 lb-ft)
32. Oil pan gasket	68. 2nd brake return spring subassembly	 (h) : 23 N·m (2.3 kgf-m, 17.0 lb-ft)
33. Oil pan	69. Front sun gear thrust bearing race	 (i) : 25 N·m (2.5 kgf-m, 18.0 lb-ft)
34. A/T fluid drain plug	70. Front planetary sun gear	 (j) : 33 N·m (3.3 kgf-m, 24.0 lb-ft)
35. Manual select lever	71. Planetary gear thrust bearing	
36. Lock washer	72. One-way clutch No.1 assembly	

Automatic Transaxle Unit Disassembly

S6RW0E5106031

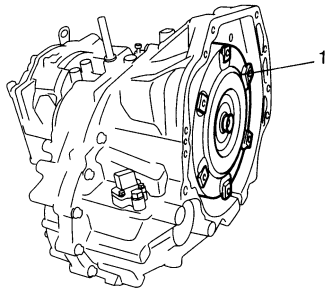
⚠ CAUTION

- Thoroughly clean transaxle exterior before overhauling it.
- Keep working table, tools and hands clean while overhauling.
- Use special care to handle aluminum parts so as not to damage them.
- Do not expose removed parts to dust. Keep them always clean.

1) Remove torque converter (1).

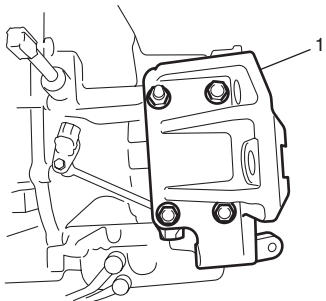
⚠ CAUTION

Remove torque converter as much straight as possible. Leaning it may cause to damage oil seal lip.



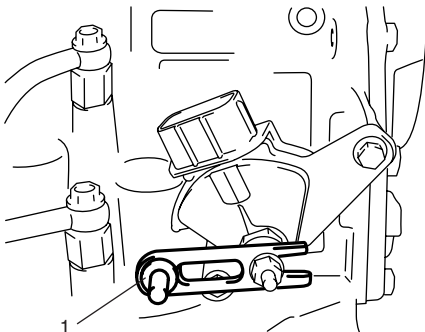
I2RH0B510078-01

2) Remove engine mounting LH bracket (1).



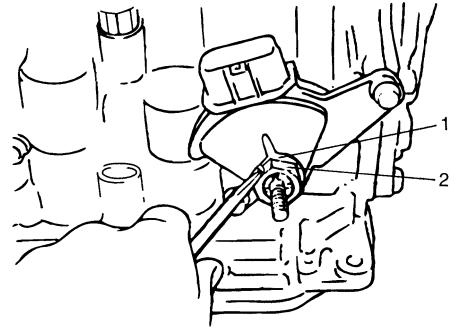
I5RW0C510058-01

3) Remove manual select lever (1).



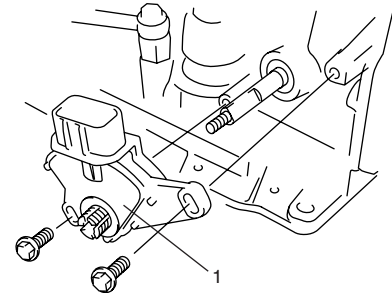
I2RH0B510080-01

4) Uncaulk lock washer (1), then remove lock nut (2) and lock washer.



I2RH0B510081-01

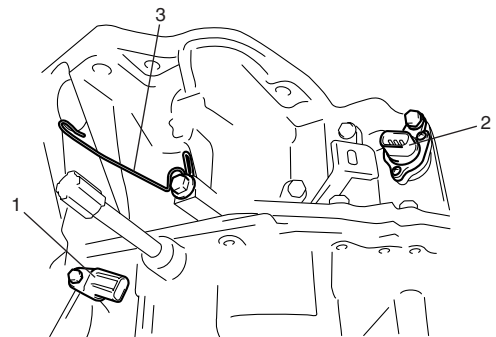
5) Remove transmission range sensor (1).



I2RH0B510082-01

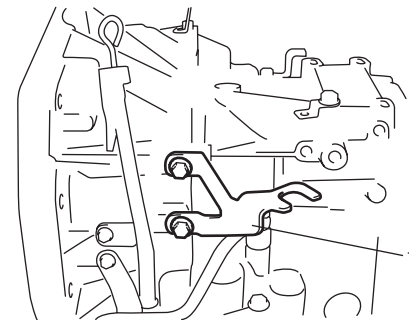
6) Remove output shaft speed sensor (VSS) (2) and input shaft speed sensor (1).

7) Remove harness bracket and select cable clamp (3).



I2RH0B510083-01

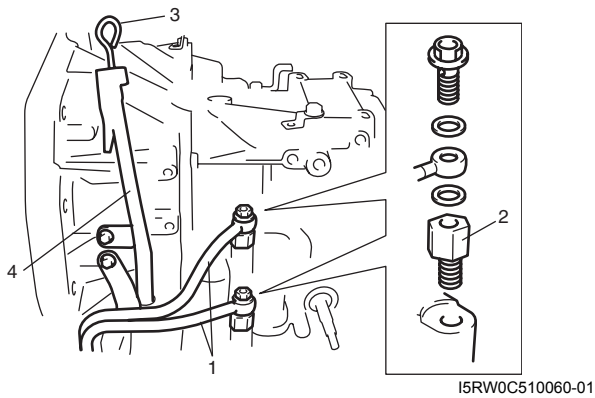
8) Remove select cable bracket (1).



I5RW0C510059-01

5A-100 Automatic Transmission/Transaxle:

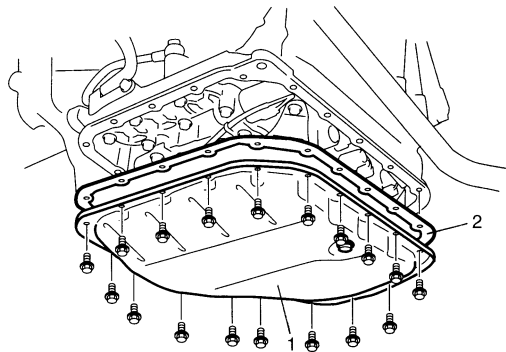
- 9) Remove fluid cooler pipes (1) and pipe unions (2).
10) Remove fluid level gauge (3) and fluid filler tube (4).



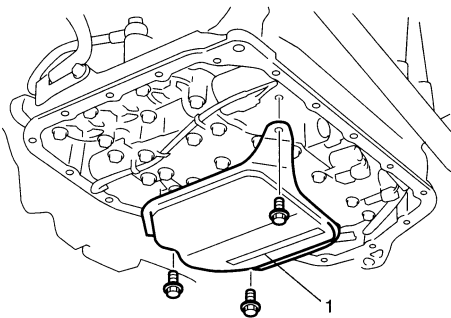
- 11) Remove oil pan (1) and oil pan gasket (2).

NOTE

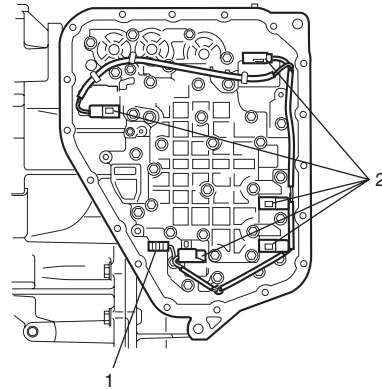
- For removal of oil pan, do not turn transaxle over as this will contaminate valve body with foreign materials in bottom of oil pan.
- When removing oil pan, tap around it lightly with plastic hammer. Do not force it off by using screwdriver or the like.



- 12) Remove oil strainer assembly (1).



- 13) Disconnect connectors (2) from solenoid valves and transmission fluid temperature sensor (1).



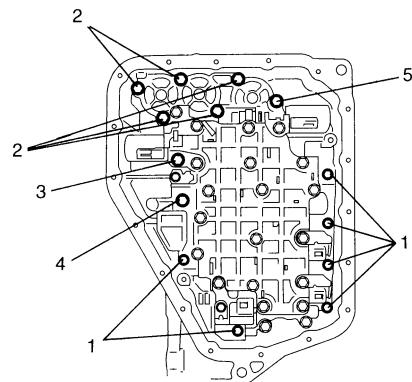
- 14) Remove valve body assembly bolts.

⚠ CAUTION

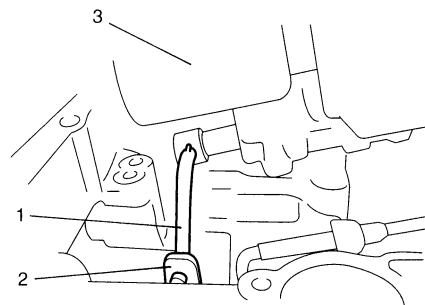
Be careful not to let manual valve fall off when removing valve body assembly.

NOTE

There are five kinds of bolts (bolts A (1), B (2), C (3), D (4) and E (5)) fixing valve body assembly.



- 15) Remove manual valve rod (1) from manual valve lever (2), then remove valve body assembly (3).

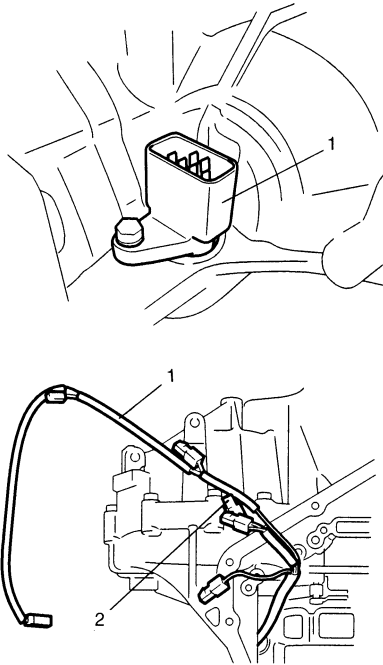


- 16) Remove valve body harness (1).

⚠ CAUTION

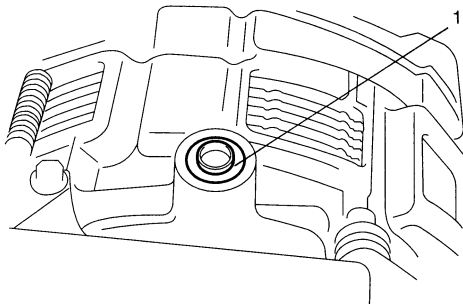
When pulling valve body harness out of transaxle case, take care not to damage transmission fluid temperature sensor (2) at narrow exit of case.

Careless sensor treatment might cause sensor malfunction.



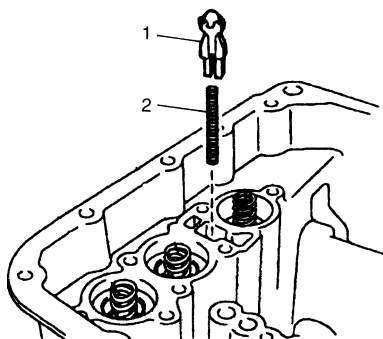
I2RH0B510091-01

- 17) Remove governor apply No.1 gasket (1).



I2RH0B510092-01

- 18) Remove cooler check valve (1) and spring (2).



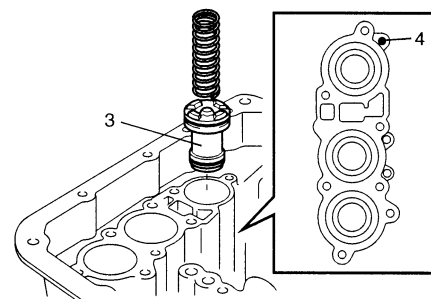
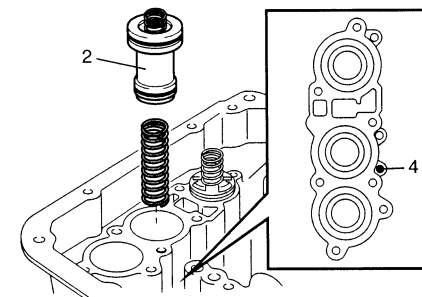
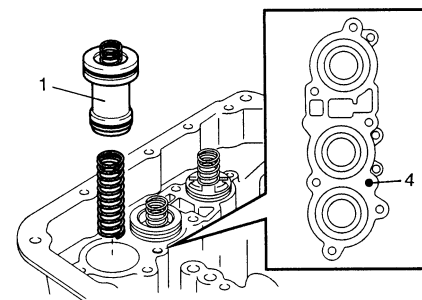
I2RH0B510093-01

- 19) Remove accumulator pistons and springs.

To remove C2 (1), C1 (2) and B1 (3) accumulator pistons and springs, position rag on pistons to catch each piston. To remove pistons, force low-pressure compressed air (1 kg/cm², 15 psi, 100 kPa, max) into hole (4) as shown in figure, and pop each piston into rag.

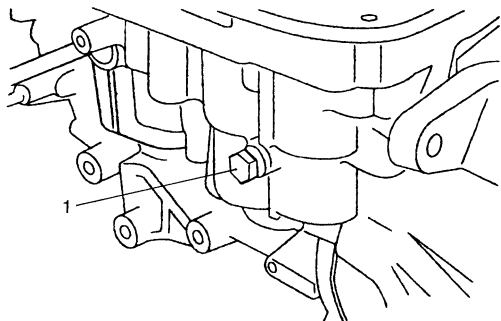
NOTE

Do not push accumulator pistons with fingers or anything before removing them. Pushing them may cause compressed fluid in accumulator to spew out of hole and get to your face and clothes.



I2RH0B510094-01

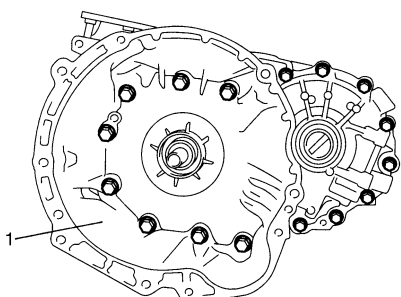
20) Remove transaxle case plug (1).



I2RH0B510095-01

21) Remove torque converter housing bolts.

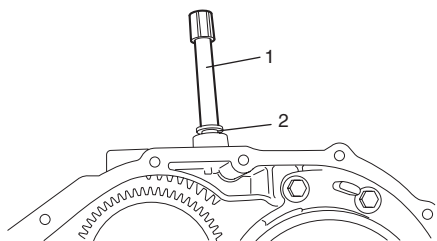
22) Remove torque converter housing (1) while tapping around it lightly with plastic hammer.



I3RM0B510060-01

23) Remove breather hose (1).

24) Remove breather union (2).



I2RH0B510097-01

25) Measure input shaft thrust play.

Apply dial gauge onto input shaft end (1) and measure thrust play of input shaft.
When input shaft thrust play is out of specification, select input shaft front thrust bearing with proper thickness from among the list below and replace it.

Special tool

(A): 09900-20607

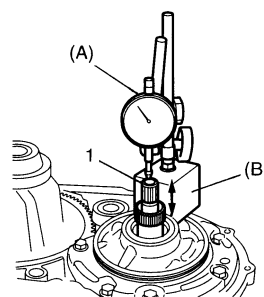
(B): 09900-20701

Input shaft thrust play

0.3 – 0.9 mm (0.012 – 0.035 in.)

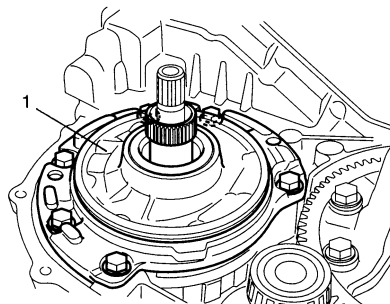
Available input shaft front thrust bearing thickness

: 0.8, 1.4 mm (0.032, 0.055 in.)



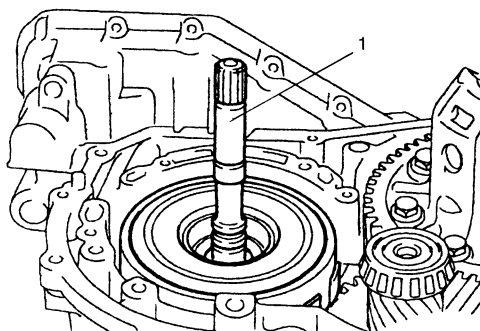
I2RH0B510098-01

26) Remove oil pump assembly (1).



I2RH0B510099-01

27) Remove direct clutch assembly (1).

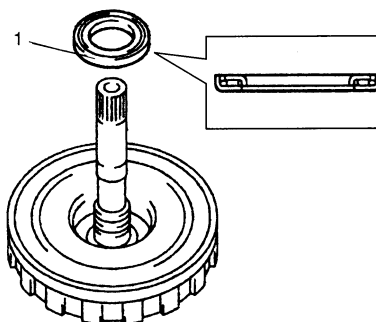


I2RH0B510100-01

28) Remove input shaft front thrust bearing (1).

NOTE

If input shaft front thrust bearing is not found, it may have been taken out with oil pump assembly.

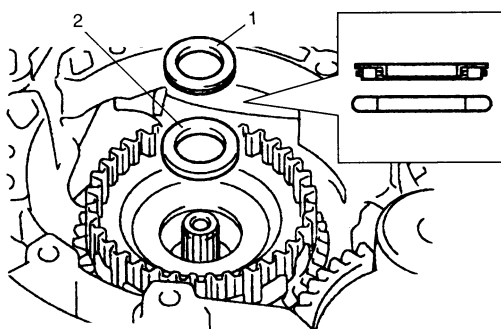


I2RH0B510101-01

- 29) Remove input shaft rear thrust bearing (1) and thrust bearing race (2).

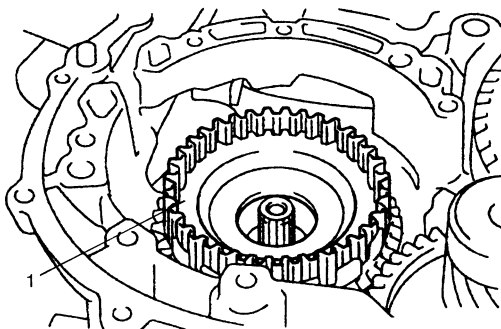
NOTE

If input shaft rear thrust bearing is not found, it may have been taken out with direct clutch assembly.



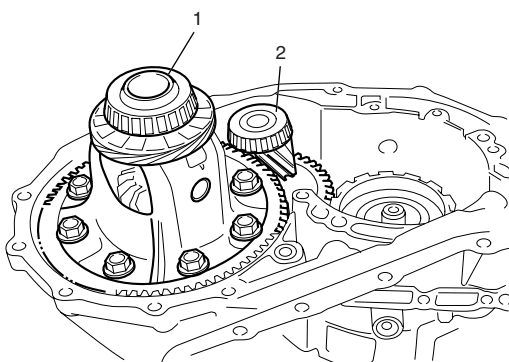
I2RH0B510102-01

- 30) Remove direct clutch hub (1).



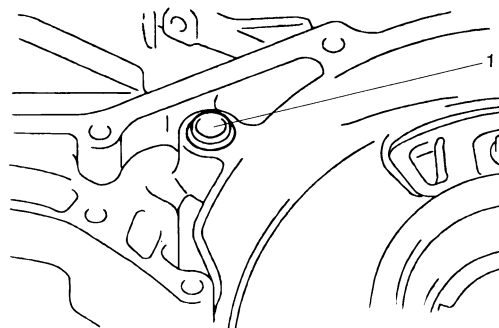
I2RH0B510103-01

- 31) Remove differential assembly (1) and countershaft assembly (2).



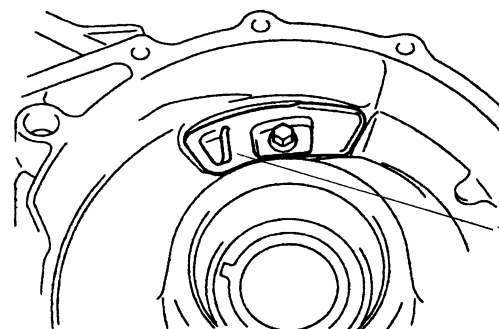
I4RS0A510036-01

- 32) Remove governor apply No.2 gasket (1).



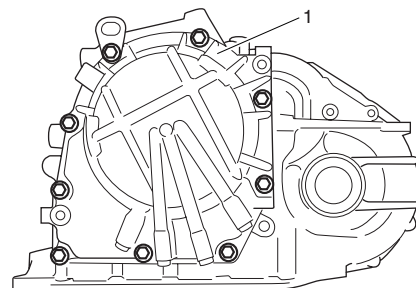
I2RH0B510105-01

- 33) Remove fluid reservoir LH plate (1).



I2RH0B510106-01

- 34) Turn over transaxle and remove rear cover assembly (1).

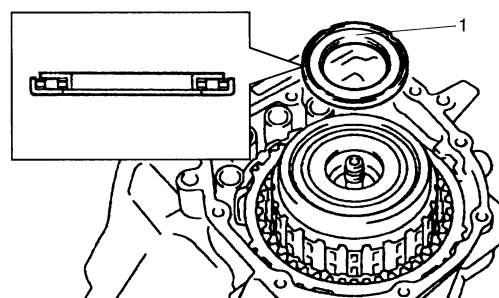


I4RS0A510037-01

- 35) Remove reverse clutch drum thrust bearing (1).

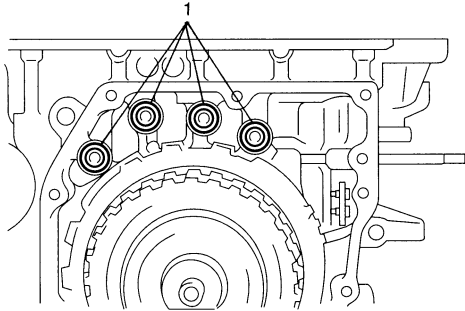
NOTE

If reverse clutch drum thrust bearing is not found, it may have been taken out with rear cover assembly.



I2RH0B510108-01

36) Remove 2nd brake gasket (1).



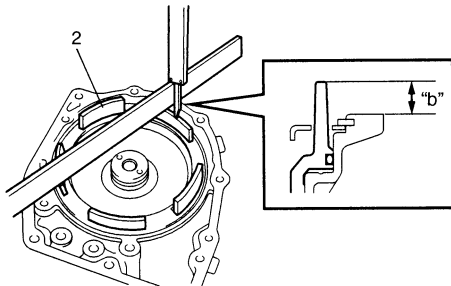
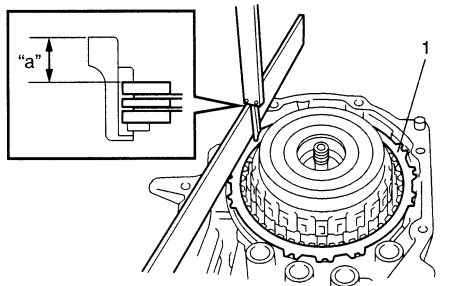
I2RH0B510109-01

37) Measure O/D and 2nd coast brake piston stroke. If piston stroke exceeds specification, inspect and replace plates and discs.

- Measure dimension "a" from mating surface of transaxle case to O/D and 2nd coast brake rear plate (1) using straightedge and micrometer caliper.
- Measure dimension "b" from O/D and 2nd coast brake piston (2) to rear cover assembly mating surface using straightedge and micrometer caliper.
- Calculate piston stroke from measured value of dimensions "a" and "b".
- Piston stroke = "a" – "b"

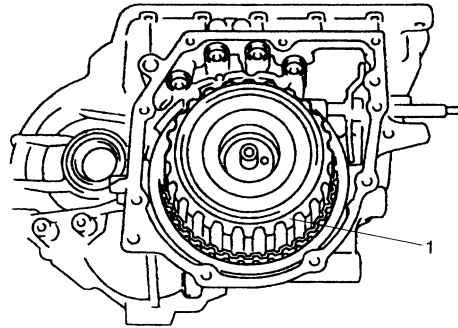
O/D and 2nd coast brake piston stroke

Standard: 0.65 – 1.05 mm (0.026 – 0.041 in.)



I2RH0B510110-01

38) Remove forward and reverse clutch assembly (1).

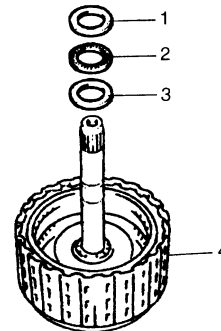


I2RH0B510111-01

39) Remove intermediate shaft thrust bearing front race (1), thrust bearing (2) and rear race (3) from forward and reverse clutch assembly (4).

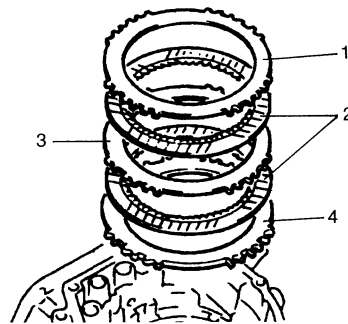
NOTE

If intermediate shaft thrust bearing and/or races are not found on forward and reverse clutch assembly, they may have been left in transaxle.



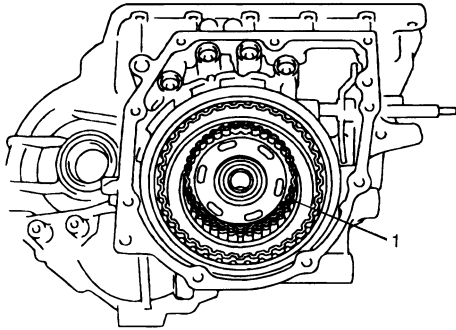
I2RH0B510112-01

40) Remove O/D and 2nd coast brake rear plate (1), discs (2), separator plate (3) and retaining plate (4).



I2RH0B510113-01

41) Remove forward clutch hub (1).

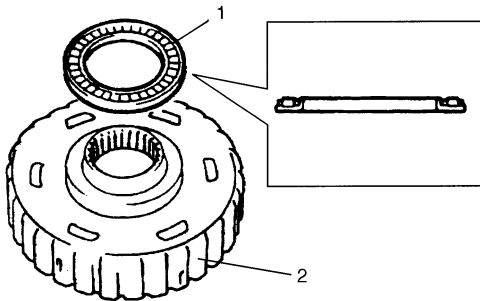


I2RH0B510114-01

42) Remove rear sun gear thrust bearing (1) from forward clutch hub (2).

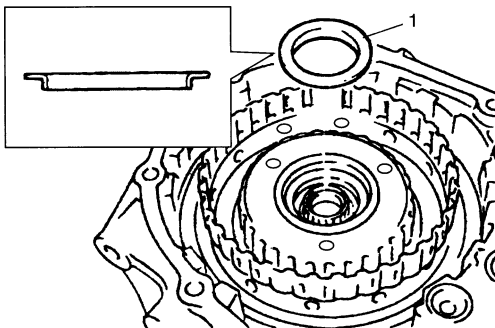
NOTE

If rear sun gear thrust bearing is not found on forward clutch hub, it may have been left in transaxle.



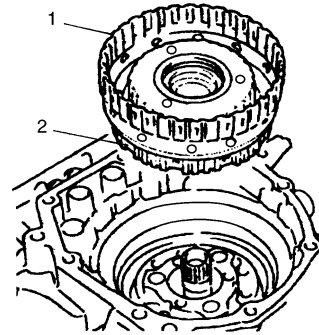
I2RH0B510115-01

43) Remove rear sun gear thrust bearing race (1).



I2RH0B510116-01

44) Remove rear planetary sun gear subassembly (1) and one-way clutch No.1 assembly (2).



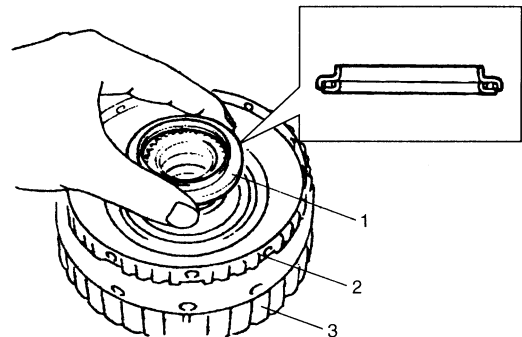
I2RH0B510117-01

45) Remove planetary gear thrust bearing (1).

NOTE

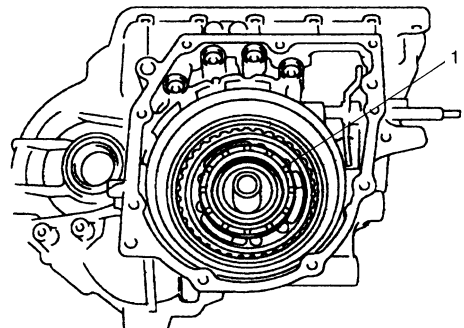
If planetary gear thrust bearing is not found on one-way clutch No.1 assembly, it may have been left in transaxle.

46) Remove one-way clutch No.1 assembly (2) from rear planetary sun gear subassembly (3).



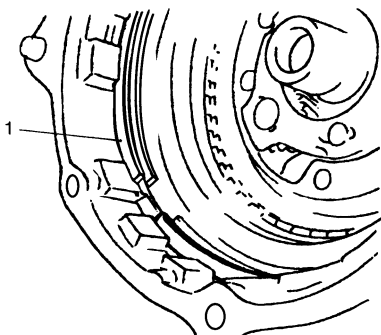
I2RH0B510118-01

47) Remove planetary carrier thrust washer (1).



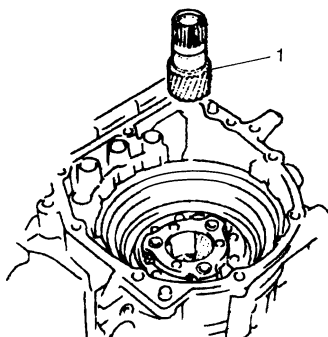
I2RH0B510119-01

- 48) Remove O/D and 2nd coast brake retaining plate snap ring (1).



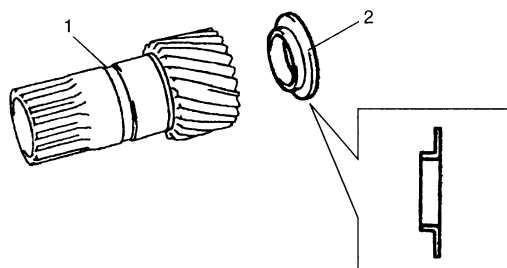
I2RH0B510120-01

- 49) Remove front planetary sun gear (1).



I2RH0B510121-01

- 50) Remove front sun gear thrust bearing race (2) from front planetary sun gear (1).



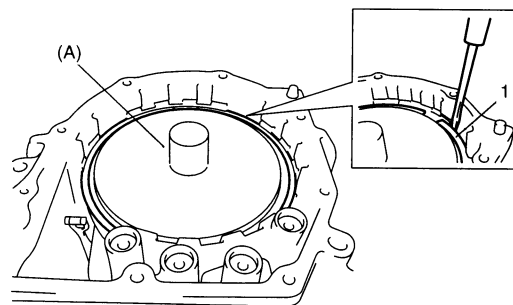
I2RH0B510122-01

- 51) Using special tool and hydraulic press, remove 2nd brake piston snap ring (1).

⚠ CAUTION

Do not press 2nd brake piston assembly in over 0.4 mm (0.016 in.).
Excessive compression may cause damage to piston assembly, return spring, plates and/or discs.

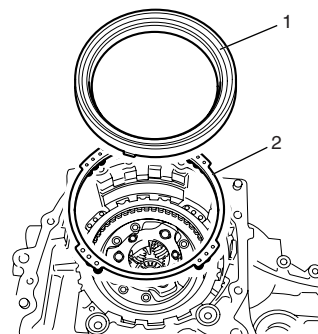
Special tool
(A): 09926-96050



I2RH0B510124-01

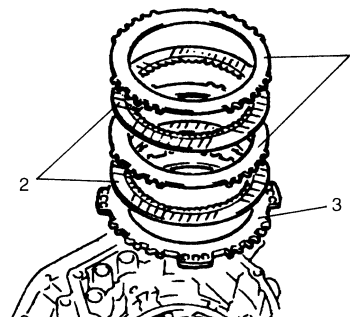
- 52) Remove 2nd brake piston assembly (1).

- 53) Remove 2nd brake return spring subassembly (2).



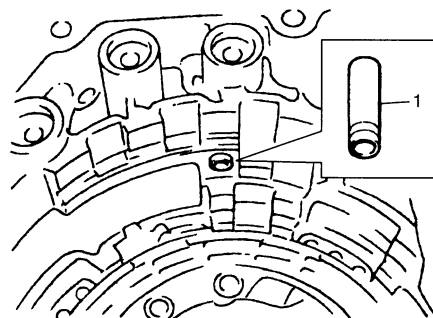
I4RS0A510038-01

- 54) Remove 2nd brake separator plates (1), discs (2) and retaining plate (3).



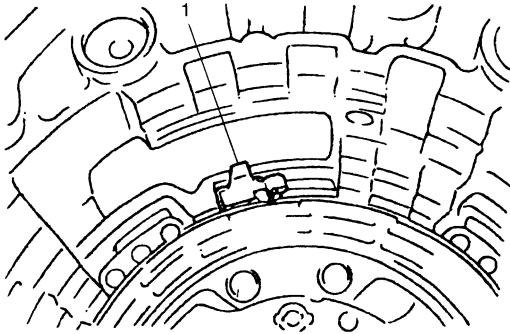
I2RH0B510127-01

- 55) Remove brake drum gasket (1).



I2RH0B510128-01

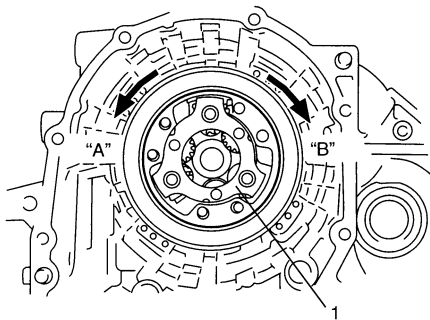
56) Remove one-way clutch outer race retainer (1).



I2RH0B510129-01

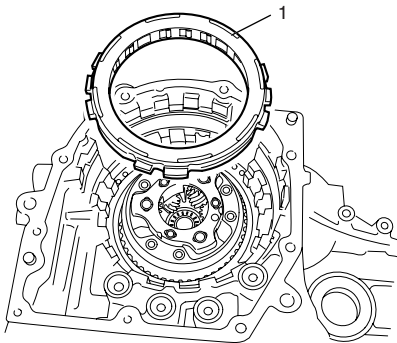
57) Check one-way clutch No.2 as follows.

- Ensure planetary carrier (1) rotates only in counterclockwise direction "A", never in clockwise direction "B".
- If the planetary carrier rotates both ways or does not rotate either way, one-way clutch No.2 assembly will need to be replaced with new one-way clutch No.2 assembly.



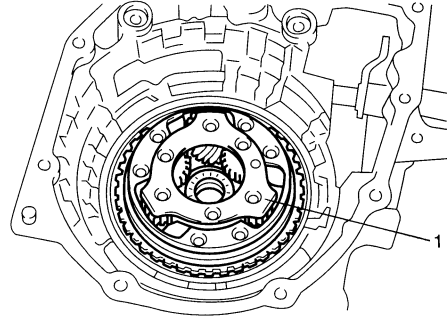
I2RH0B510130-01

58) Remove one-way clutch No.2 assembly (1).



I4RS0A510039-01

59) Remove planetary gear assembly (1).



I2RH0B510132-01

60) Measure 1st and reverse brake piston stroke.

If piston stroke exceeds specified value, disassemble, inspect and replace discs and plates.

- Using special tool, measure 1st and reserve brake piston stroke when compressed air (400 – 800 kPa, 4 – 8 kg/cm², 57 – 113 psi) is blown through oil hole.

Special tool

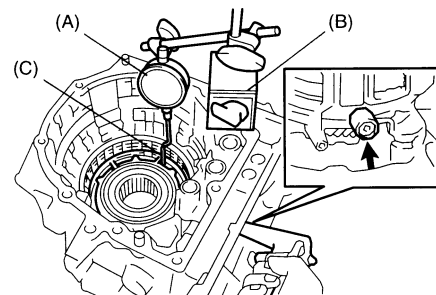
(A): 09900–20607

(B): 09900–20701

(C): 09952–06020

1st and reverse brake piston stroke

Standard: 0.79 – 1.49 mm (0.031 – 0.059 in.)



I2RH0B510133-01

- 61) Remove snap ring while the 1st and reverse brake piston return springs are compressed using special tool and hydraulic press.

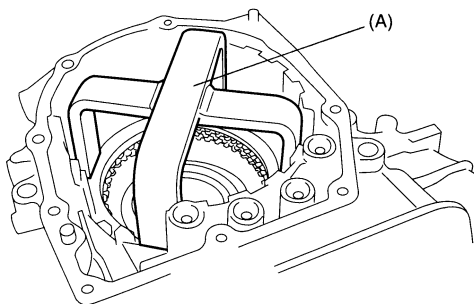
⚠ CAUTION

Do not press 1st and reverse brake return spring subassembly in over 0.8 mm (0.031 in.).

Excessive compression may cause damage to return spring subassembly, discs, plates and/or piston.

Special tool

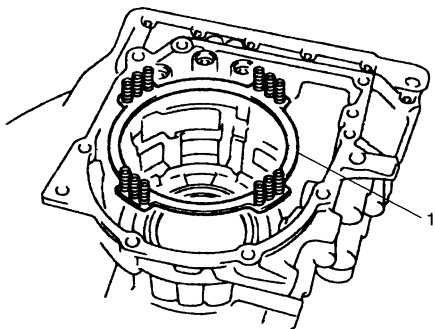
(A): 09926-97620



I2RH0B510134-01

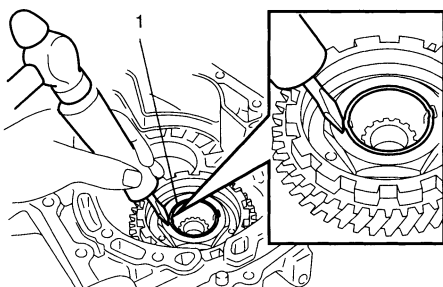
- 62) Remove 1st and reverse brake retaining plate, discs and separator plates.

- 63) Remove 1st and reverse brake return spring subassembly (1).



I2RH0B510135-01

- 64) Turn over transaxle and uncaulk reduction drive gear nut (1).

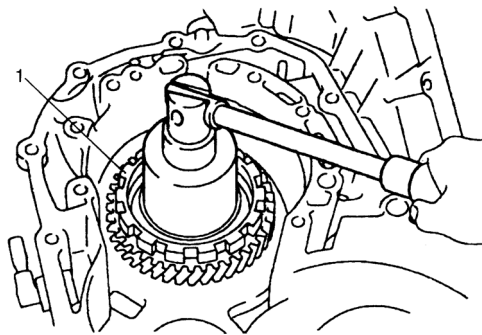


I2RH0B510136-01

- 65) Secure reduction drive gear (1) with parking lock pawl, then remove reduction drive gear nut.

⚠ CAUTION

- It is recommended that this operation should be carried out on rubber mat to prevent damaging transaxle case.
- Never reuse removed nut.



I2RH0B510137-02

- 66) Using special tools and hydraulic press, remove planetary ring gear subassembly (1).

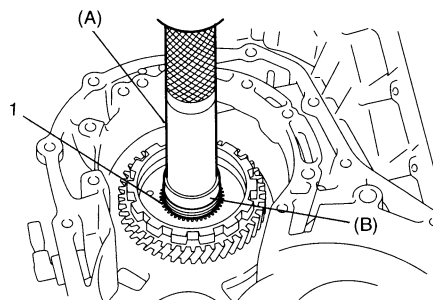
⚠ CAUTION

Do not reuse planetary ring gear subassembly. Otherwise it may cause damage to planetary gear unit and/or reduction gears.

Special tool

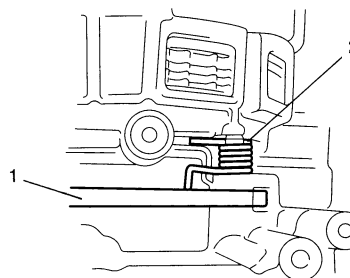
(A): 09913-84510

(B): 09923-78210



I2RH0B510138-01

- 67) Remove parking lock pawl shaft, then spring (2) and parking lock pawl (1).



I2RH0B510139-01

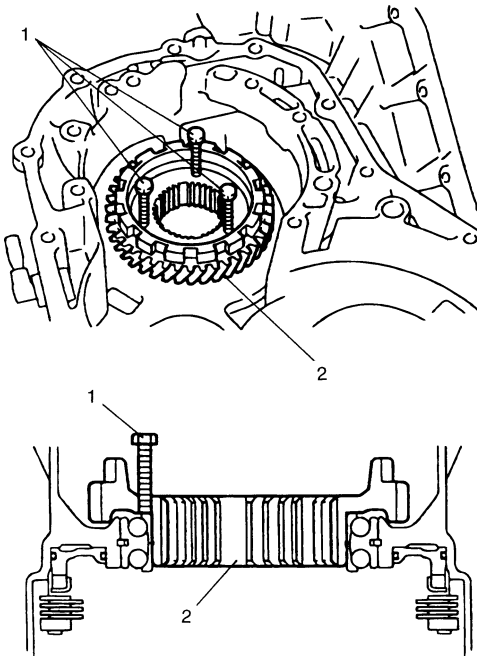
- 68) Screwing 3 bolts (1), remove reduction drive gear (2).

⚠ CAUTION

Screw 3 bolts into reduction drive gear uniformly, or reduction drive gear, bearing and transaxle case may be damaged.

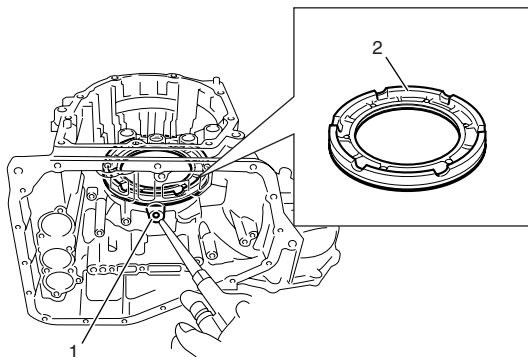
Bolt length

30 mm (1.20 in.)



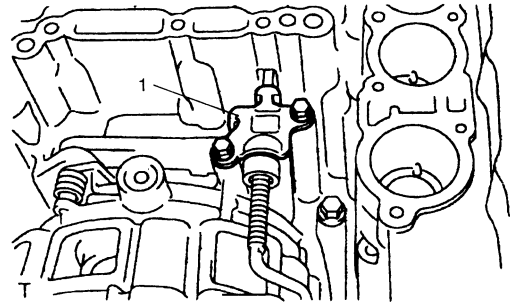
I2RH0B510140-01

- 69) Blowing compressed air from oil hole (1) of oil pump, remove 1st and reverse brake piston (2).



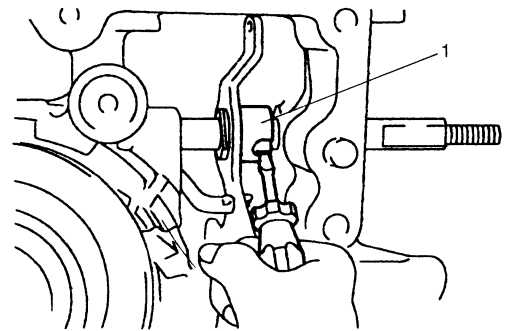
I4RS0A510040-01

- 70) Remove parking lock pawl bracket (1).



I2RH0B510142-01

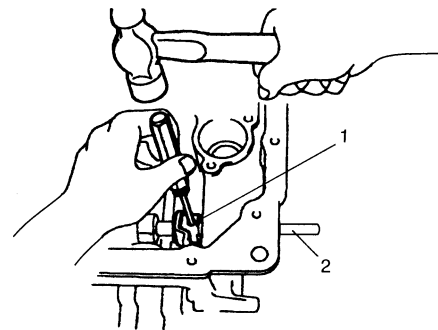
- 71) With slotted screwdriver, cut and unfold manual valve lever spacer (1) and proceed to remove manual valve lever spacer.



I2RH0B510143-01

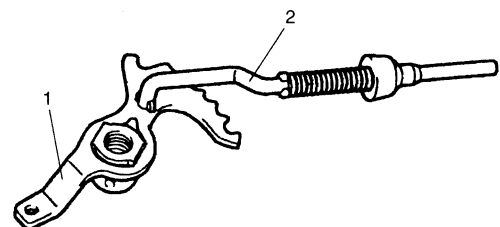
- 72) Using spring pin remover with 3 mm (0.12 in.) in diameter and hammer, drive out manual valve lever pin (1).

- 73) Remove manual shift shaft (2).



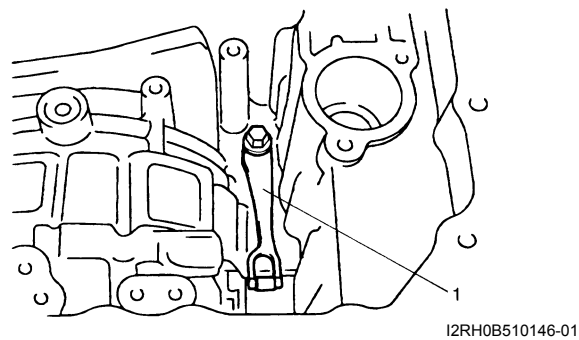
I2RH0B510144-01

- 74) Remove parking lock pawl rod (2) from manual valve lever (1).

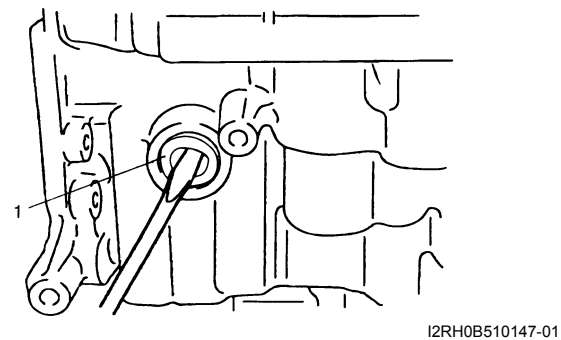


I2RH0B510145-01

75) Remove manual detent spring (1).

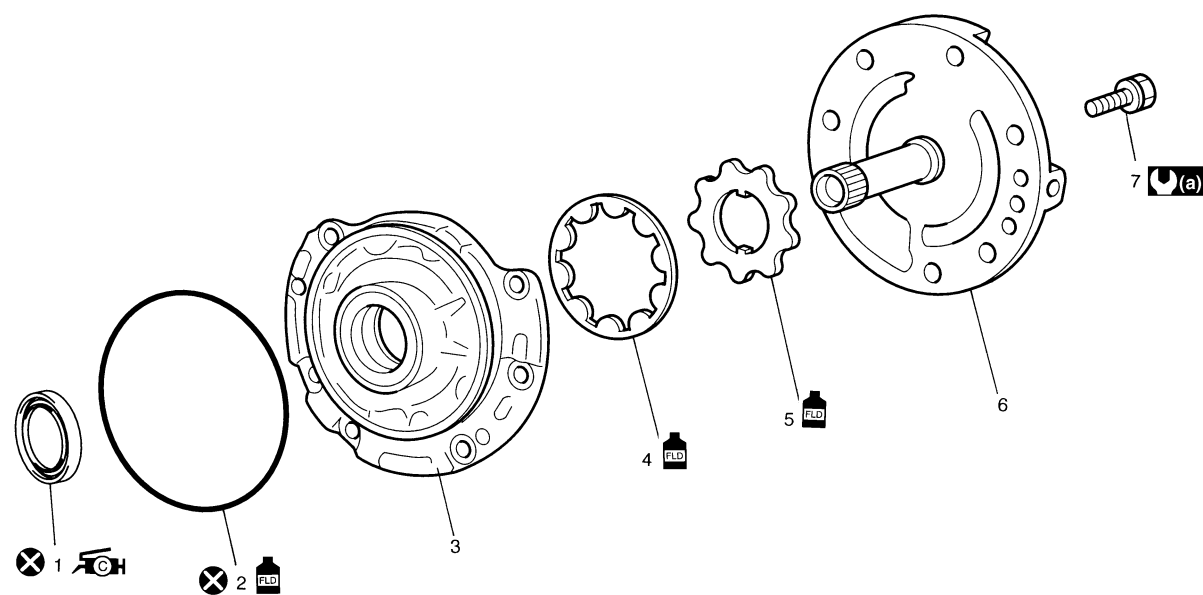


76) Remove manual shift shaft oil seal (1).



Oil Pump Assembly Components

S6RW0E5106032



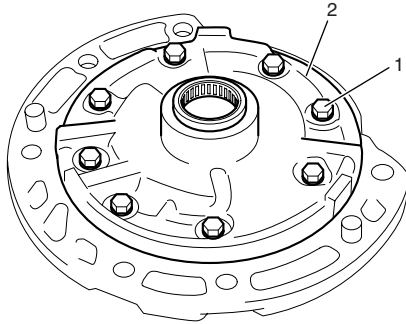
1. Oil seal : Apply grease 99000-25030 to oil seal lip.	5. Oil pump drive gear	: Apply automatic transaxle fluid.
2. O-ring	6. Stator shaft assembly	(a) : 10 N·m (1.0 kgf-m, 7.5 lb-ft)
3. Oil pump body	7. Oil pump subassembly bolts	: Do not reuse.
4. Oil pump driven gear		

Oil Pump Assembly Disassembly and Reassembly

S6RW0E5106033

Disassembly

- 1) Remove O-ring from pump body.
- 2) Remove 8 oil pump subassembly bolts (1) and stator shaft assembly (2).

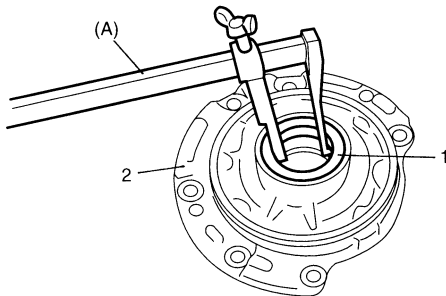


I4RS0A510041-01

- 3) Remove oil seal (1) using special tool.

Special tool

(A): 09913-50121



I2RH0B510150-01

2. Oil pump body

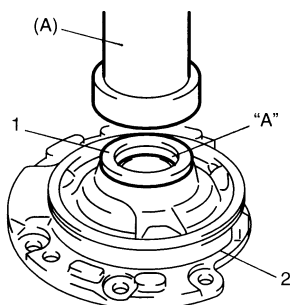
Reassembly

- 1) Install new oil pump body oil seal (1).
Use special tool and hammer to install it, and then apply grease to its lip portion.

Special tool

(A): 09913-85210

"A": Grease 99000-25030 (SUZUKI Super Grease C)



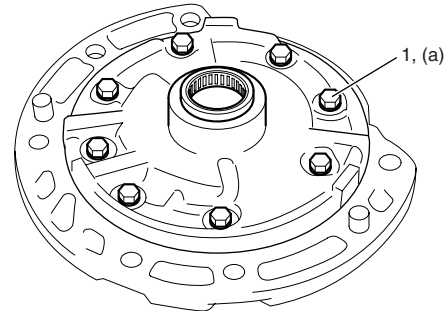
I2RH0B510151-01

2. Oil pump body

- 2) Install driven gear and drive gear to oil pump body after applying A/T fluid.
- 3) Install stator shaft assembly to oil pump body and tighten 8 pump subassembly bolts (1) to specification.

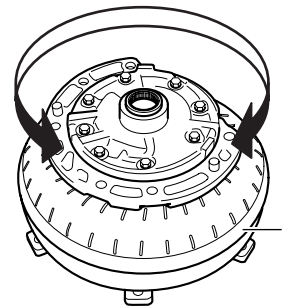
Tightening torque

Oil pump subassembly bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)



I4RS0A510042-01

- 4) After applying A/T fluid to new O-ring, install it to oil pump body.
- 5) Check drive gear for smooth rotation by using torque converter (1).



I4RS0A510043-01

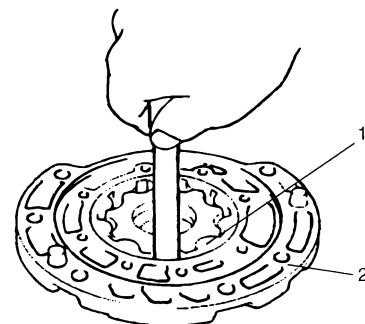
Oil Pump Assembly Inspection

S6RW0E5106034

- 1) Check body clearance of driven gear (1).
Push driven gear to one side of oil pump body (2).
Using a feeler gauge, measure clearance between driven gear and body. If clearance exceeds its standard value, replace oil pump assembly.

Clearance between oil pump driven gear and oil pump body

Standard: 0.10 – 0.17 mm (0.0039 – 0.0067 in.)

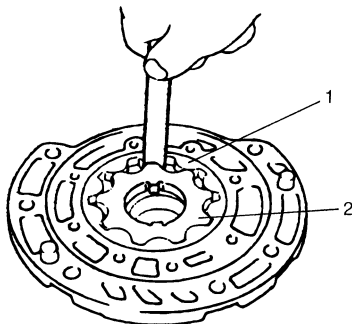


I2RH0B510154-01

- 2) Check tip clearance of both drive and driven gears. Using a feeler gauge, measure clearance between drive and driven gear tips. If clearance exceeds its standard value, replace oil pump assembly.

Tip clearance between oil pump drive gear and oil pump driven gear

Standard: 0.07 – 0.15 mm (0.0028 – 0.0059 in.)

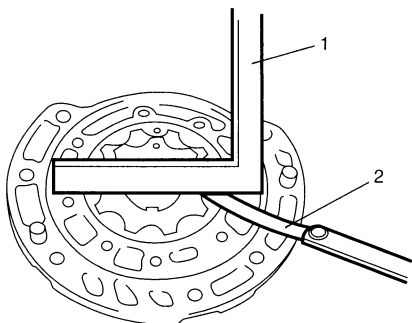


I2RH0B510155-01

- 3) Check side clearance of both gears. Using a straightedge (1) and a feeler gauge (2), measure side clearance between gears and pump body. If clearance exceeds its standard value, replace oil pump assembly.

Side clearance between gears and oil pump body

Standard: 0.02 – 0.05 mm (0.0008 – 0.0019 in.)



I2RH0B510156-01

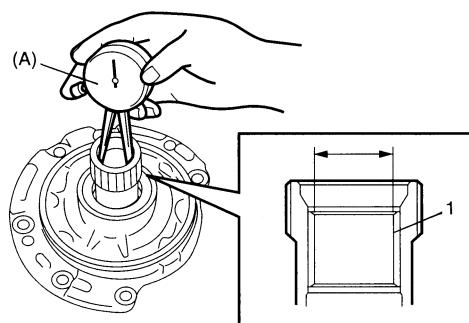
- 4) Using special tool, measure stator shaft bush (1) bore. If measured stator shaft bush bore is out of specifications, replace oil pump assembly with new one.

Special tool

(A): 09900–20605

Stator shaft bush bore

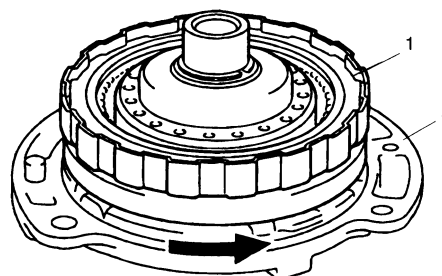
Standard: 18.424 – 18.450 mm (0.7254 – 0.7264 in.)



I2RH0B510157-01

- 5) Install direct clutch assembly (1) to stator shaft assembly (2), then ensure that direct clutch assembly turns smoothly.

If unsmooth rotation or noise are found in oil pump assembly, replace oil pump assembly with new one. This check should also be done to input shaft assembly and replace input shaft assembly if necessary.



I2RH0B510158-01

- 6) Using special tool, measure oil pump body bush bore.

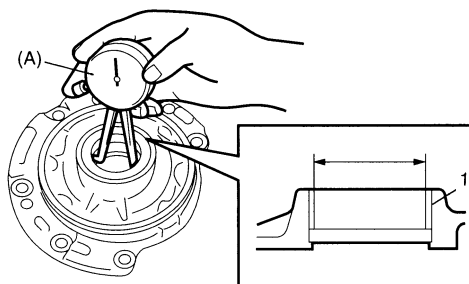
If measured oil pump body bush (1) bore is out of specifications, replace oil pump assembly with new one. Torque converter also needs to be checked. Replace torque converter, if necessary.

Special tool

(A): 09900–20605

Oil pump body bush bore

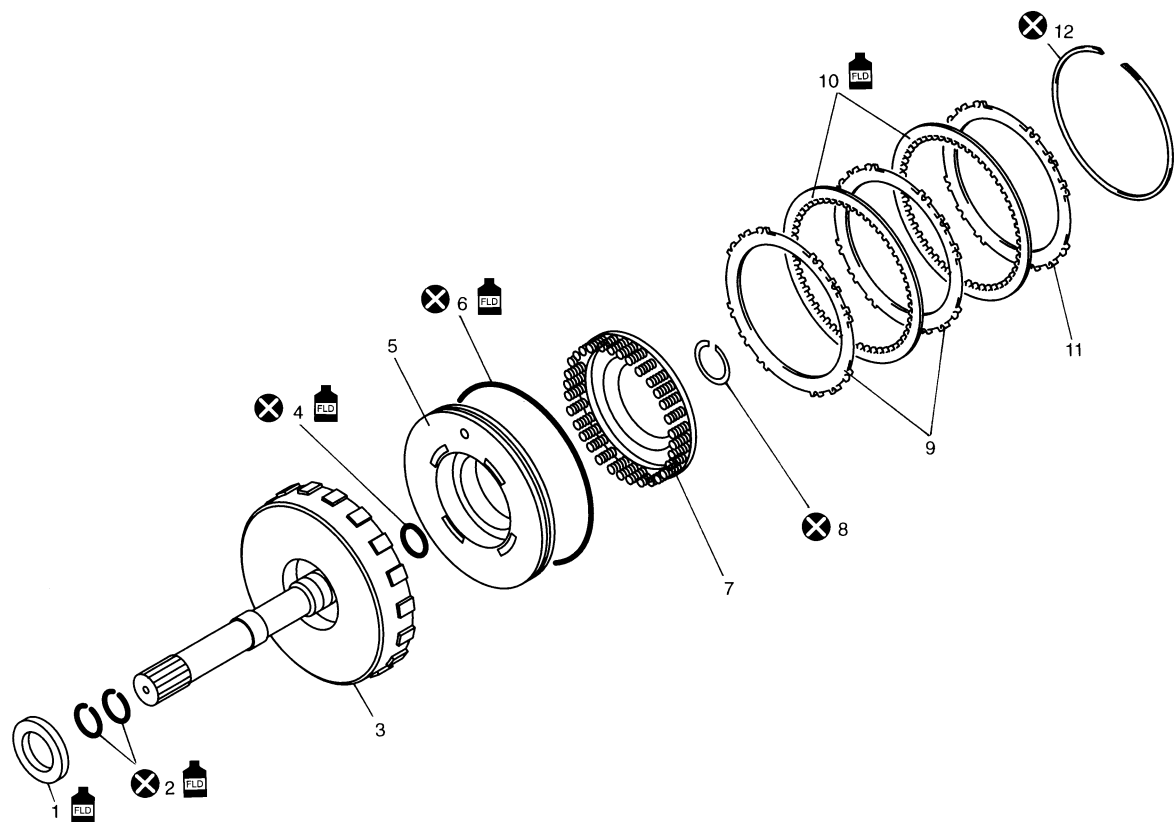
Standard: 38.113 – 38.138 mm (1.5005 – 1.5015 in.)



I2RH0B510159-01

Direct Clutch Assembly Components

S6RW0E5106035



I2RH0B510160-01

1. Input shaft front thrust bearing	6. Outer O-ring	11. Direct clutch retaining plate
2. Input shaft seal ring	7. Direct clutch return spring subassembly	12. Plate snap ring
3. Input shaft subassembly	8. Shaft snap ring	 : Apply automatic transaxle fluid.
4. Inner O-ring	9. Direct clutch separator plate	 : Do not reuse.
5. Direct clutch piston	10. Direct clutch disc	

Direct Clutch Assembly Preliminary Check

S6RW0E5106036

Install direct clutch assembly (1) to oil pump assembly (2) blow in air (400 – 800 kPa, 4 – 8 kg/cm², 57 – 113 psi) through oil hole (3) of oil pump assembly with special tool attached on upper surface of direct clutch piston, and measure piston stroke of direct clutch. If piston stroke exceeds specified value, disassemble, inspect and replace inner parts.

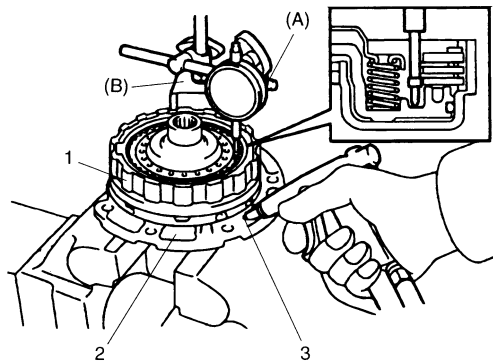
Special tool

(A): 09900–20607

(B): 09900–20701

Direct clutch piston stroke

0.4 – 0.7 mm (0.016 – 0.027 in.)



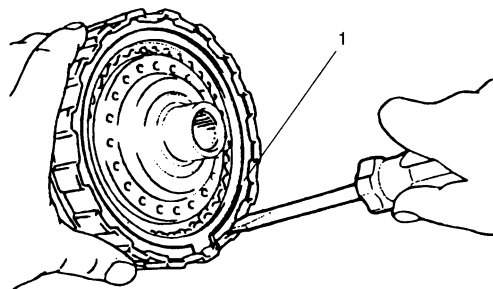
I2RH0B510161-01

Direct Clutch Assembly Disassembly and Reassembly

S6RW0E5106037

Disassembly

- 1) Remove plate snap ring (1) then remove direct clutch retaining plate, discs and separator plates.



I2RH0B510162-01

- 2) Using special tool and hydraulic press, remove shaft snap ring (1).

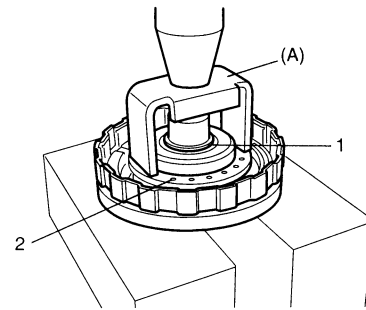
Special tool

(A): 09926–98310

CAUTION

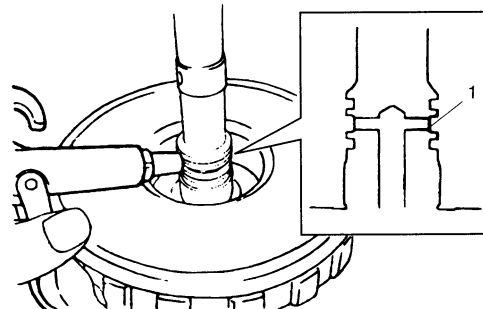
Do not press direct clutch return spring subassembly in over 0.7 mm (0.027 in.). Excessive compression may cause damage to direct clutch return spring subassembly and/or piston.

- 3) Remove direct clutch return spring assembly (2).



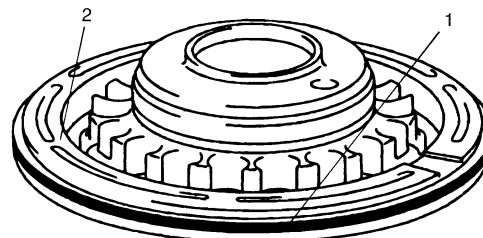
I2RH0B510163-01

- 4) Using a finger to block oil hole (1), apply compressed air (400 – 800 kPa, 4 – 8 kg/cm², 57 – 113 psi) to opposite hole, which will assist in removal of the clutch piston.



I2RH0B510164-01

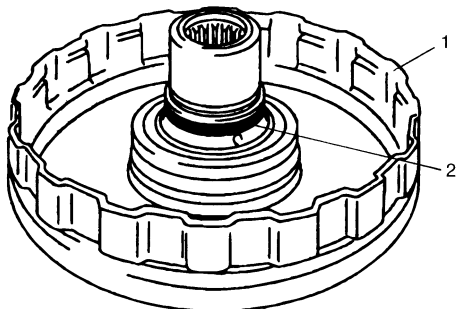
- 5) Remove outer O-ring (1).



I2RH0B510165-01

2. Direct clutch piston

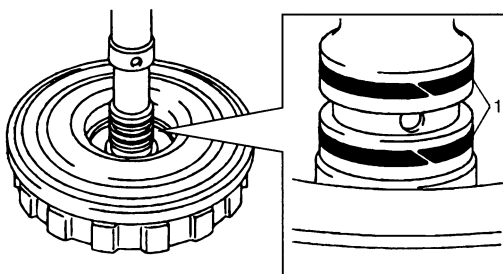
6) Remove inner O-ring (2).



I2RH0B510166-01

1. Input shaft subassembly

7) Remove input shaft seal rings (1).



I2RH0B510167-01

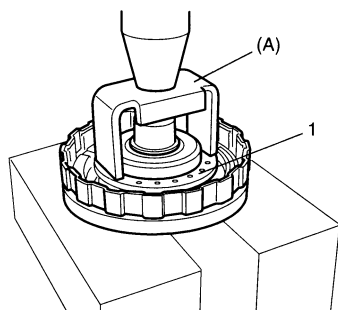
Reassembly

Reverse disassembly procedure for assembly, noting the following points.

- Use new seal ring and O-ring. Apply A/T fluid before installation.
- Do not damage direct clutch return spring subassembly (1) and piston by pressing in direct clutch return spring subassembly passing through its original installing position over 0.7 mm (0.027 in.).

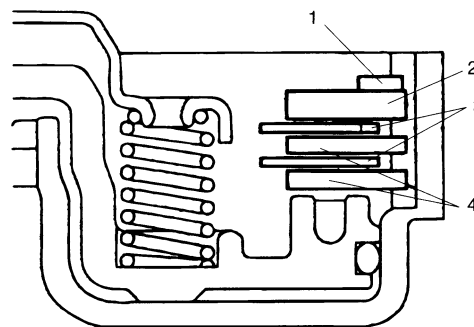
Special tool

(A): 09926-98310



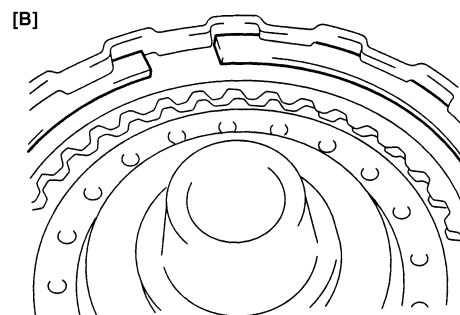
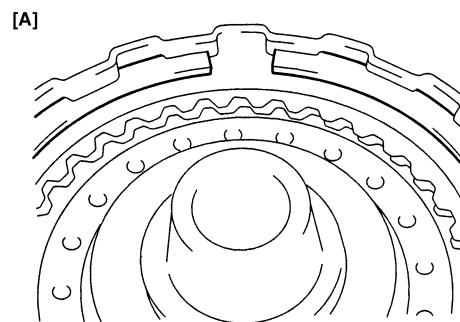
I2RH0B510168-01

- Apply A/T fluid to direct clutch separator plates (4), discs (3) and retaining plate (2).
- Install direct clutch separator plates (4), discs (3), retaining plate (2) and snap ring (1) to input shaft subassembly.



I2RH0B510169-01

- Install plate snap ring so that its both ends would be positioned in correct locations as shown in figure.



I2RH0B510170-01

[A]: Correct

[B]: Incorrect

- After assembly, measure direct clutch piston stroke.

Special tool

(A): 09900-20607

(B): 09900-20701

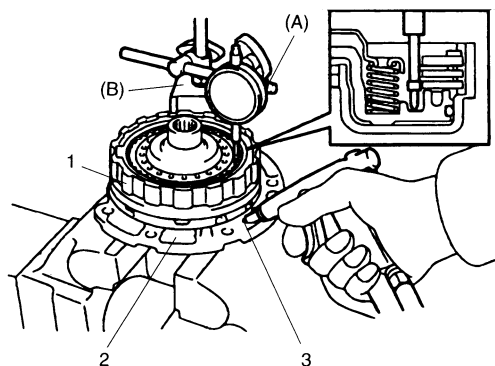
Direct clutch piston stroke

0.4 – 0.7 mm (0.016 – 0.027 in.)

When piston stroke is out of specification, select direct clutch retaining plate with suitable thickness from among the following table and replace it.

Available direct clutch retaining plate thickness

Thickness	Identification mark
3.0 mm (0.118 in.)	1
3.2 mm (0.126 in.)	2
3.4 mm (0.134 in.)	3
2.8 mm (0.110 in.)	4



I2RH0B510171-01

1. Direct clutch assembly	3. Oil hole
2. Oil pump assembly	

Direct Clutch Assembly Inspection

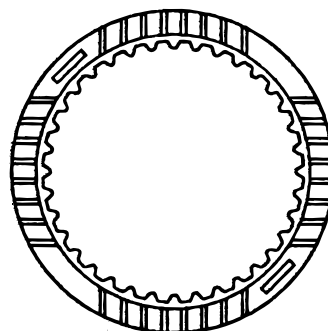
S6RW0E5106038

Clutch Discs, Plates and Retaining Plate

Check that sliding surfaces of discs, separator plates and retaining plate are not worn hard or burnt. If necessary, replace.

NOTE

- If disc lining is exfoliated, discolored, replace all discs.
- Before assembling new discs, soak them in A/T fluid for at least two hours.



I2RH0B510172-01

Direct Clutch Return Spring Subassembly

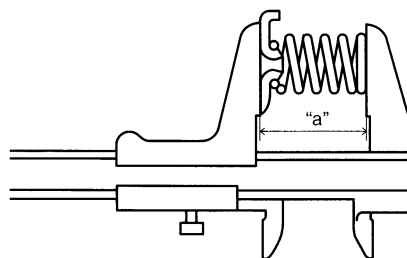
Measure free length of direct clutch return spring.

Direct clutch return spring free length

“a”: 36.04 mm (1.419 in.)

NOTE

Do not apply excessive force when measuring spring free length. Perform measurement at several points.

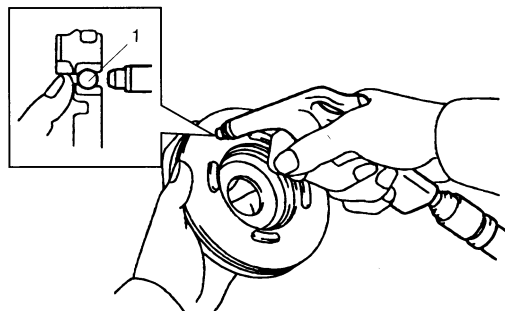


I2RH0B510173-01

Direct Clutch Piston

Shake direct clutch piston lightly and check that check ball (1) is not stuck.

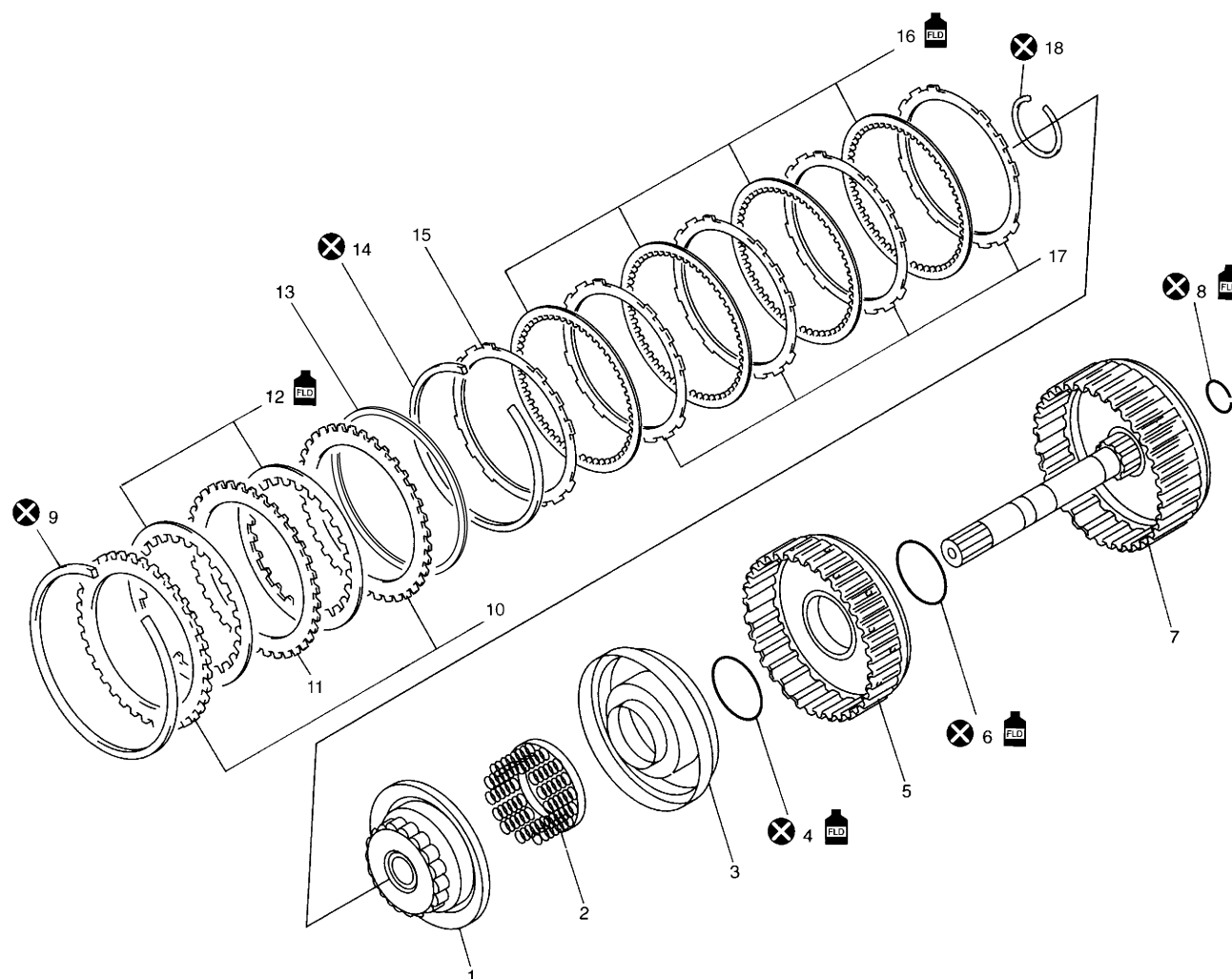
Blow in low pressure air (Max. 100 kPa, 1 kg/cm², 15 psi) to check that there is no leakage.



I2RH0B510174-01

Forward and Reverse Clutch Assembly Components

S6RW0E5106039



I3RM0B510061-01

1. Forward clutch balancer	8. Intermediate shaft seal ring	15. Forward clutch retaining plate
2. Forward clutch return spring subassembly	9. Reverse clutch plate snap ring	16. Forward clutch disc
3. Forward clutch piston	10. Reverse clutch retaining plate	17. Forward clutch separator plate
4. Forward clutch piston O-ring	11. Reverse clutch separator plate	18. Balancer snap ring
5. Forward clutch drum	12. Reverse clutch disc	 : Apply automatic transaxle fluid.
6. Forward clutch drum O-ring	13. Reverse clutch cushion plate	 : Do not reuse.
7. Intermediate shaft subassembly	14. Forward clutch plate snap ring	

Forward and Reverse Clutch Assembly Preliminary Check

S6RW0E5106040

- 1) Install forward and reverse clutch assembly (1) to transaxle rear cover (2), blow in compressed air (400 – 800 kPa, 4 – 8 kg/cm², 57 – 113 psi) through oil hole (4) of transaxle rear cover with the special tool attached on the upper surface of reverse clutch retaining plate (3), and measure reverse clutch piston stroke.

If piston stroke exceeds specified value, disassemble, inspect and replace inner parts.

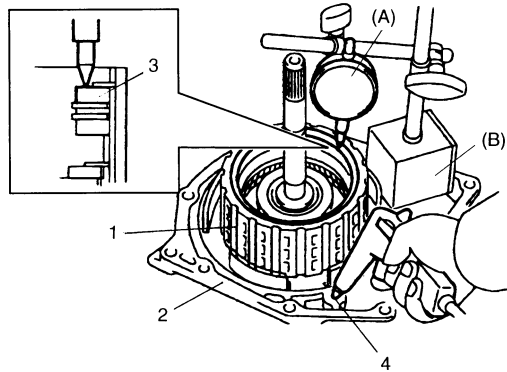
Special tool

(A): 09900–20607

(B): 09900–20701

Reverse clutch piston stroke

1.20 – 1.60 mm (0.047 – 0.063 in.)



I2RH0B510176-01

- 2) Blow compressed air (400 – 800 kPa, 4 – 8 kg/cm², 57 – 113 psi) through oil hole (1) of transaxle rear cover with the special tool attached on the upper surface of forward clutch retaining plate, and measure forward clutch piston stroke. If piston stroke exceeds specified value, disassemble, inspect and replace inner parts.

Special tool

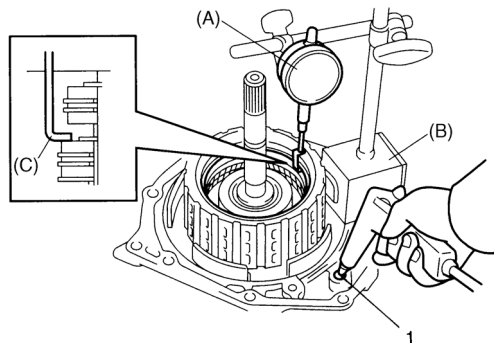
(A): 09900–20607

(B): 09900–20701

(C): 09952–06020

Forward clutch piston stroke

1.30 – 1.50 mm (0.051 – 0.059 in.)



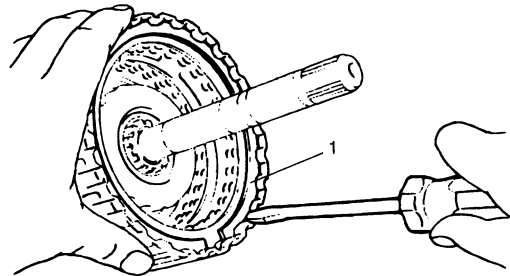
I2RH0B510177-02

Forward and Reverse Clutch Assembly Disassembly and Reassembly

S6RW0E5106041

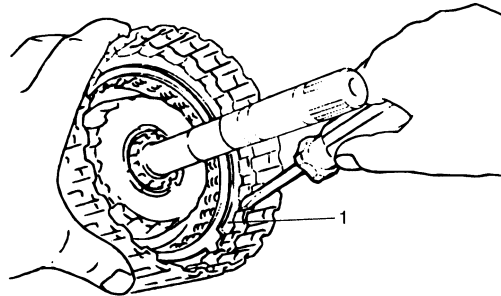
Disassembly

- 1) Remove reverse clutch plate snap ring (1) and take out reverse clutch retaining plate, discs, separator plates and clutch cushion plate from intermediate shaft subassembly.



I2RH0B510178-01

- 2) Remove forward clutch plate snap ring (1) and take out forward clutch retaining plate, discs and separator plates from forward clutch drum.



I2RH0B510179-01

- 3) Remove balancer snap ring by using special tool and hydraulic press.

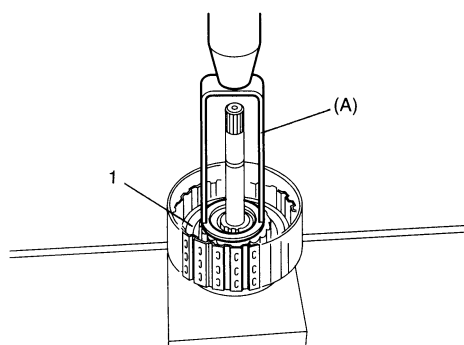
Special tool

(A): 09926-97610

⚠ CAUTION

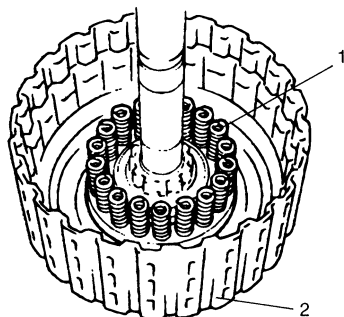
Do not press forward clutch return spring subassembly in over 1.5 mm (0.059 in.). Excessive compression may cause damage to return spring subassembly and/or balancer.

- 4) Remove forward clutch balancer (1).



I2RH0B510180-01

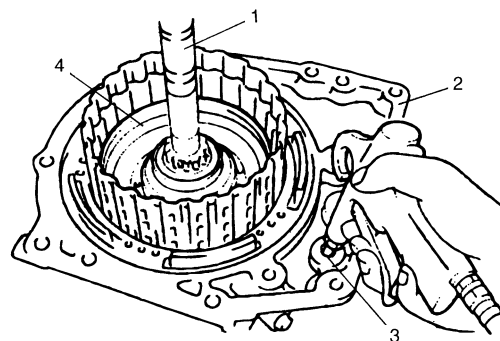
- 5) Remove forward clutch return spring subassembly (1).



I2RH0B510181-01

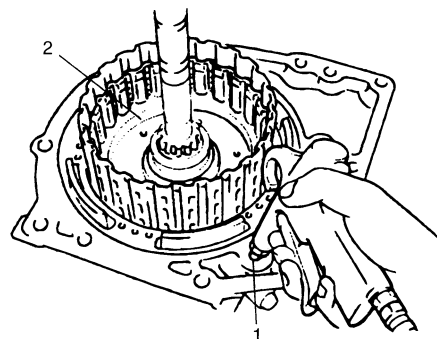
2. Intermediate shaft subassembly

- 6) Install intermediate shaft subassembly (1) to transaxle rear cover (2). Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm², 57 – 113 psi) to oil hole (3) of transaxle rear cover to remove forward clutch piston (4).



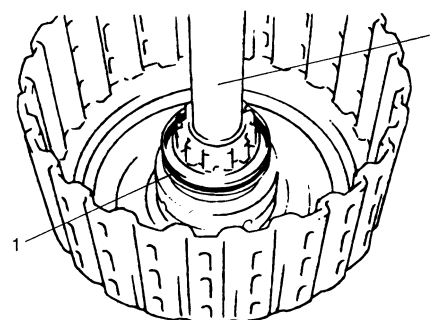
I2RH0B510182-01

- 7) Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm², 57 – 113 psi) to oil hole (1) of transaxle rear cover to remove forward clutch drum (2).



I2RH0B510183-01

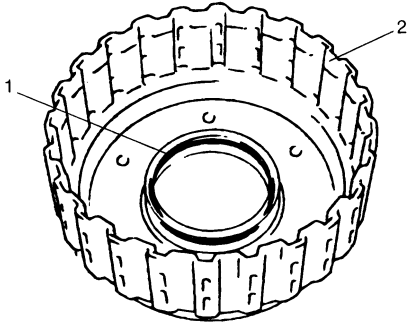
- 8) Remove forward clutch piston O-ring (1) from intermediate shaft subassembly (2).



I2RH0B510184-01

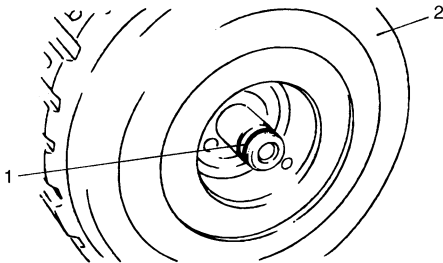
5A-120 Automatic Transmission/Transaxle:

- 9) Remove forward clutch drum O-ring (1) from forward clutch drum (2).



I2RH0B510185-01

- 10) Remove intermediate shaft seal ring (1) from intermediate shaft subassembly (2).



I2RH0B510186-01

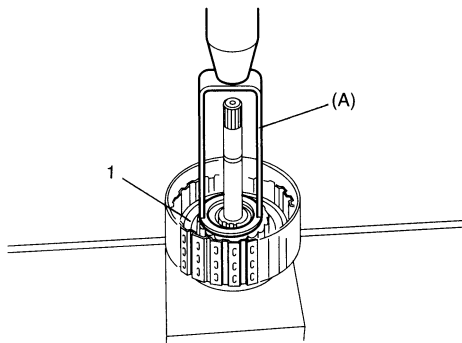
Reassembly

Reverse disassembly procedure for assembly, noting the following points.

- Before assembling, apply automatic transaxle fluid to component parts.
- Replace O-rings and seal ring with new ones.
- Do not damage forward clutch return spring subassembly and balancer (1) by pressing forward clutch return spring subassembly passing through its original installing position over 1.5 mm (0.059 in.).

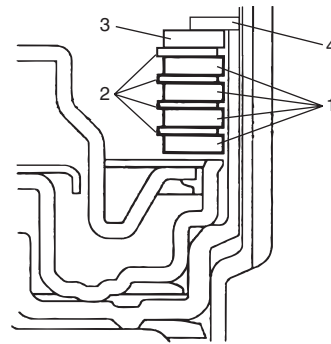
Special tool

(A): 09926-97610



I2RH0B510180-01

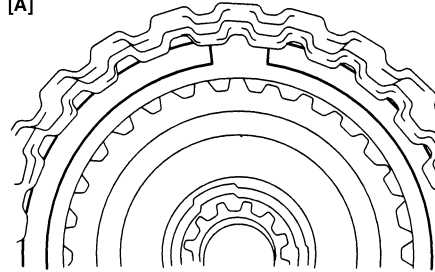
- Apply A/T fluid to forward clutch separator plates (1), discs (2) and retaining plate (3).
- Install forward clutch separator plates (1), discs (2) and retaining plate (3), then snap ring (4) to forward clutch drum.



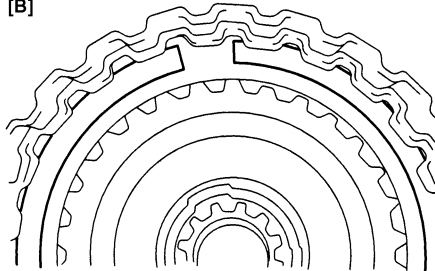
I5RW0C510062-01

- Install forward clutch plate snap ring so that its both ends would be positioned in correct locations as shown in figure.

[A]



[B]



I2RH0B510188-01

[A]: Correct

[B]: Incorrect

- Measure forward clutch piston stroke in the same manner as "Forward and Reverse Clutch Assembly Preliminary Check".
When piston stroke is out of specification, select forward clutch retaining plate with proper thickness from among the following table and replace it.

Special tool

(A): 09900-20607

(B): 09900-20701

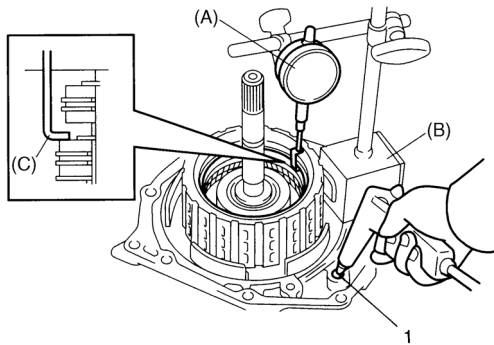
(C): 09952-06020

Forward clutch piston stroke

1.30 – 1.50 mm (0.051 – 0.059 in.)

Available forward clutch retaining plate thickness

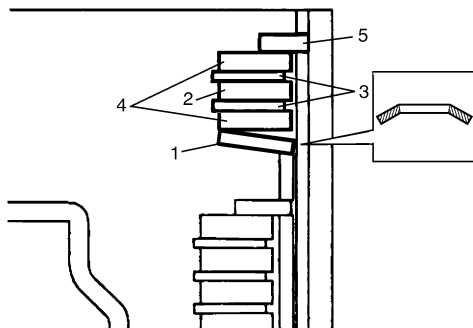
Thickness	Identification mark
3.0 mm (0.118 in.)	1
3.1 mm (0.122 in.)	5
3.2 mm (0.126 in.)	2
3.3 mm (0.130 in.)	6
3.4 mm (0.134 in.)	3
3.5 mm (0.138 in.)	7
3.6 mm (0.142 in.)	4



I2RH0B510177-02

1. Oil hole

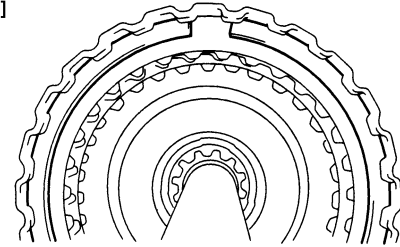
- Install reverse clutch cushion plate (1) in correct direction as shown in figure.
- Apply A/T fluid to reverse clutch cushion plate (1), reverse clutch separator plate (2), discs (3) and retaining plate (4).
- Install reverse clutch cushion plate (1), reverse clutch separator plate (2), discs (3), retaining plate (4) and then snap ring (5) to intermediate shaft subassembly.



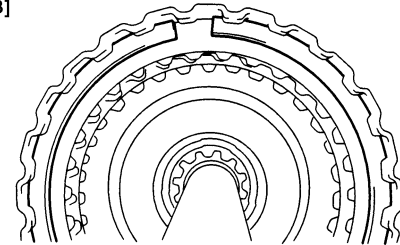
I3RM0B510062-01

- Install reverse clutch plate snap ring so that its both ends would be positioned in correct locations as shown in figure.

[A]



[B]



I2RH0B510190-01

[A]: Correct

[B]: Incorrect

- Measure reverse clutch piston stroke in the same manner as "Forward and Reverse Clutch Assembly Preliminary Check".
When piston stroke is out of specification, select reverse clutch retaining plate with proper thickness from among the following table and replace it.

Special tool

(A): 09900-20607

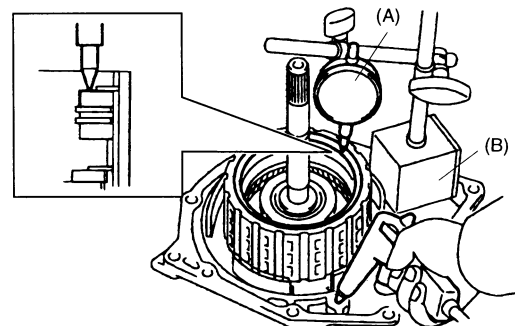
(B): 09900-20701

Reverse clutch piston stroke

1.20 – 1.60 mm (0.047 – 0.063 in.)

Available reverse clutch retaining plate thickness

Thickness	Identification mark
3.0 mm (0.118 in.)	1
3.2 mm (0.126 in.)	2
3.4 mm (0.134 in.)	3
3.6 mm (0.142 in.)	4



I2RH0B510191-01

Forward and Reverse Clutch Assembly Inspection

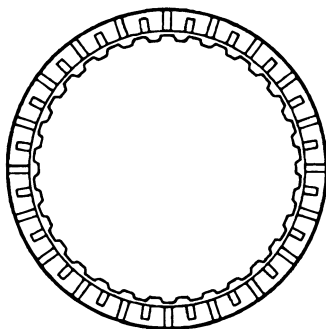
S6RW0E5106042

Clutch, Discs, Separator Plates and Retaining Plate

Check that sliding surfaces of discs, separator plates and retaining plate are not worn hard or burnt. If necessary, replace.

NOTE

- If disc lining is exfoliated or discolored, replace all discs.
- Before assembling new discs, soak them in A/T fluid for at least two hours.



I2RH0B510192-01

Forward Clutch Return Spring Subassembly

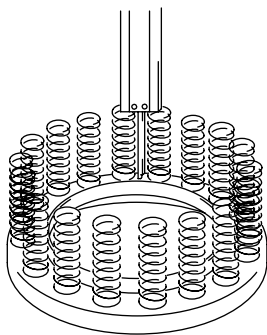
Measure free length of forward clutch return spring.

Forward clutch return spring free length

24.04 mm (0.946 in.)

NOTE

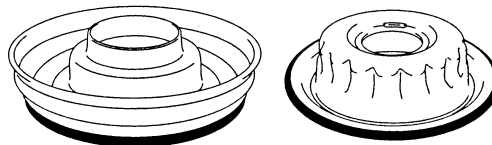
Do not apply excessive force when measuring spring free length. Perform measurement at several points.



I2RH0B510193-01

Forward Clutch Piston Lip and Forward Clutch Balancer Lip

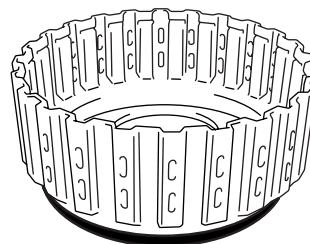
Check each lip for wear, deformation, cut and/or hardening. If necessary, replace.



I2RH0B510194-01

Forward Clutch Drum Lip

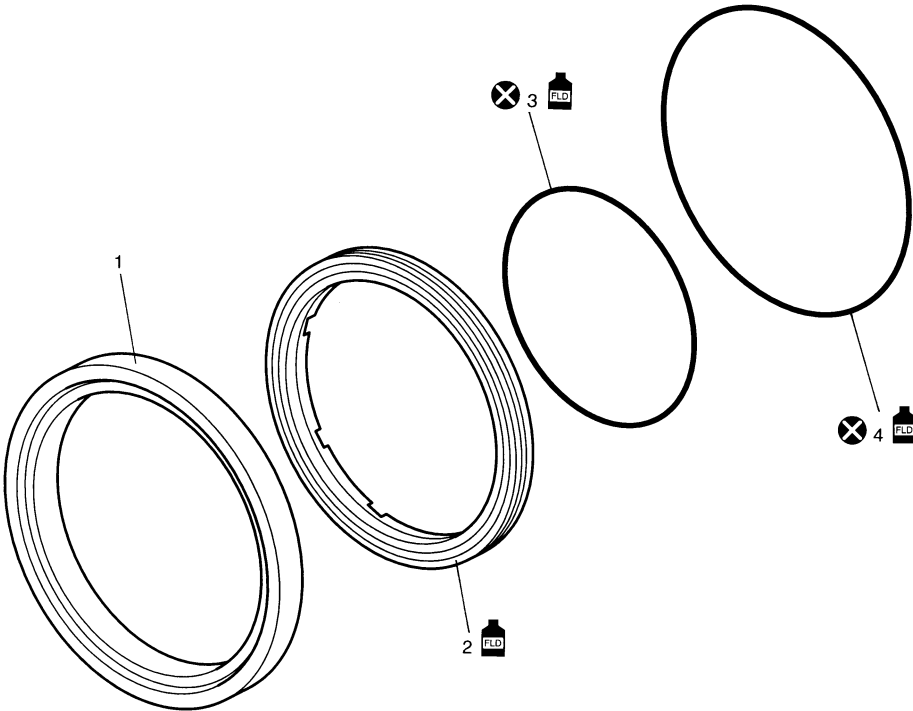
Check each lip for wear, deformation, cut and/or hardening. If necessary, replace.



I2RH0B510195-01

2nd Brake Piston Assembly Components

S6RW0E5106043



I2RH0B510196-01

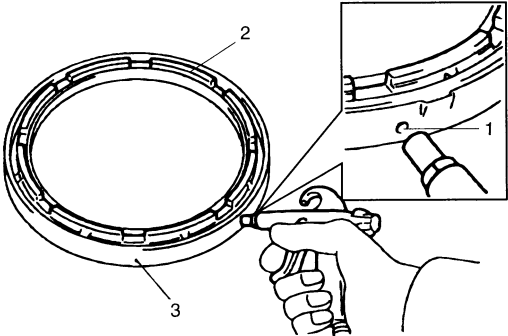
1. 2nd brake cylinder	4. Outer O-ring
2. 2nd brake piston	 : Apply automatic transaxle fluid.
3. Inner O-ring	 : Do not reuse.

2nd Brake Piston Assembly Disassembly and Reassembly

S6RW0E5106044

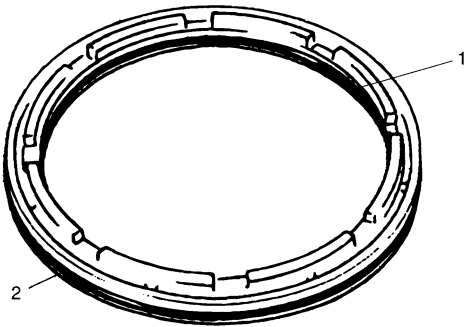
Disassembly

- 1) Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm², 57 – 113 psi) to oil hole (1) of 2nd brake cylinder (3) to remove 2nd brake piston (2).



I2RH0B510197-01

- 2) Remove inner O-ring (1) and outer O-ring (2).

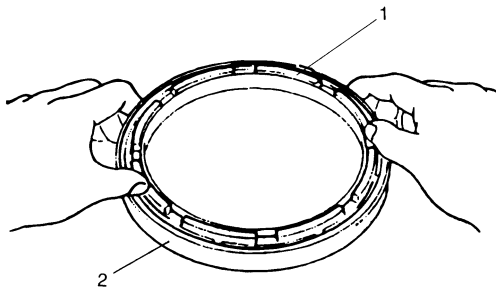


I2RH0B510198-01

Reassembly

Reverse disassembly procedure for assembly, noting the following points.

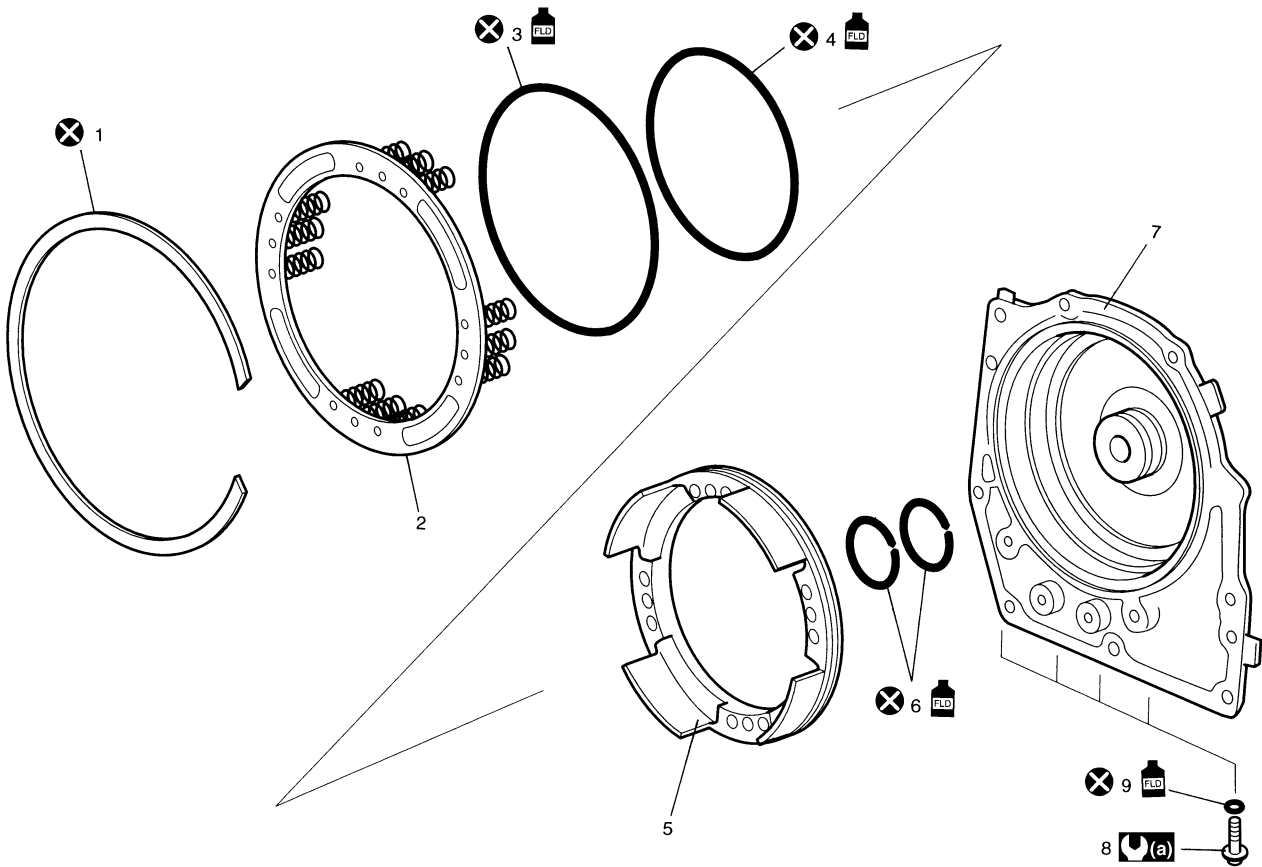
- Use new O-rings. Apply A/T fluid to the O-rings, before installation.
- Install 2nd brake piston (1) to which A/T fluid is applied to 2nd brake cylinder (2).
Do not damage O-ring when installing 2nd brake piston.



I2RH0B510199-01

Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Components

S6RW0E5106045



I5RW0C510063-01

1. Snap ring	5. O/D and 2nd coast brake piston	9. Rear cover plug O-ring
2. O/D and 2nd coast brake return spring subassembly	6. Rear cover seal ring	: Apply automatic transaxle fluid.
3. O/D and 2nd coast brake piston front O-ring	7. Transaxle rear cover	: Do not reuse.
4. O/D and 2nd coast brake piston rear O-ring	8. Rear cover plug	: 7.5 N·m (0.75 kgf-m, 5.5 lb-ft)

Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Disassembly and Reassembly

S6RW0E5106046

Disassembly

- 1) Remove snap ring by using special tools and hydraulic press.

Special tool

(A): 09926–96030

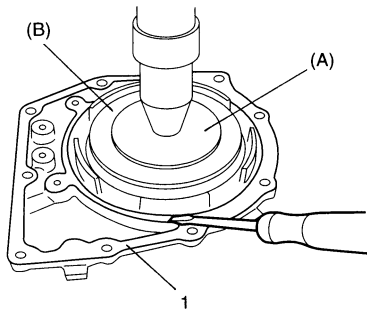
(B): 09946–06710

CAUTION

Do not press O/D and 2nd coast brake return spring subassembly in over 1.0 mm (0.039 in.).

Excessive compression may cause damage to O/D and 2nd coast brake return spring subassembly and/or piston.

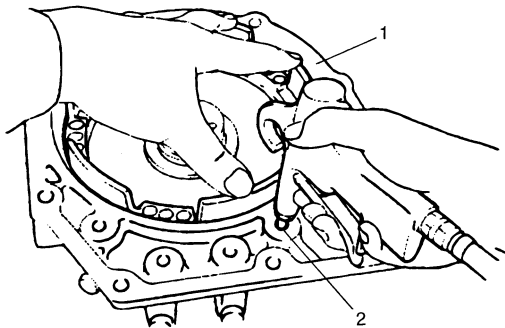
- 2) Remove O/D and 2nd coast brake return spring assembly.



I2RH0B510201-01

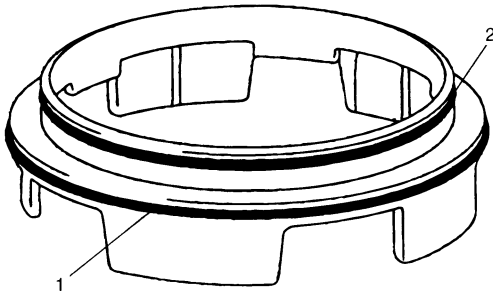
1. Transaxle rear cover

- 3) Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm², 57 – 113 psi) to oil hole (2) of transaxle rear cover (1) to remove O/D and 2nd coast brake piston.



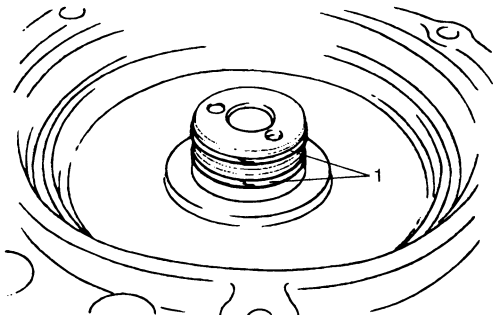
I2RH0B510202-01

- 4) Remove O/D and 2nd coast brake piston front O-ring (1) and rear O-ring (2).



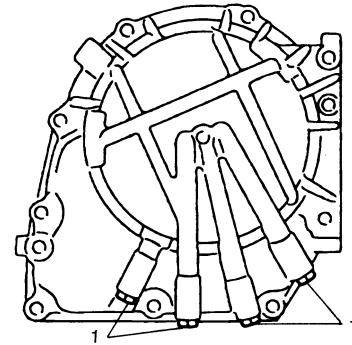
I2RH0B510203-01

- 5) Remove rear cover seal rings (1).



I2RH0B510204-01

- 6) Remove rear cover plugs (1).



I2RH0B510205-01

Reassembly

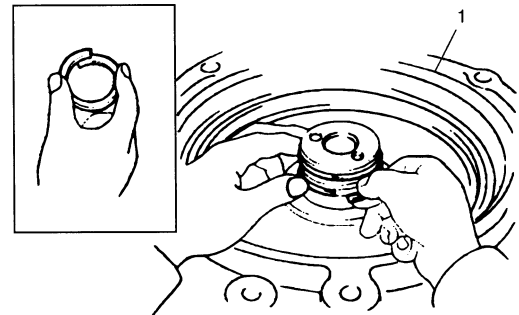
Reverse disassembly procedure for assembly, noting the following points.

- Use new seal rings and O-rings. Apply A/T fluid to seal rings and O-rings before installation.
- Tighten rear cover plugs to specified torque.

Tightening torque

Rear cover plug: 7.5 N·m (0.75 kgf-m, 5.5 lb-ft)

- Before installing rear cover seal ring, apply A/T fluid to ring. First, tighten seal ring to 5 mm (0.197 in.), then install seal ring.
- Do not open rear cover seal ring too wide to attach.



I2RH0B510206-01

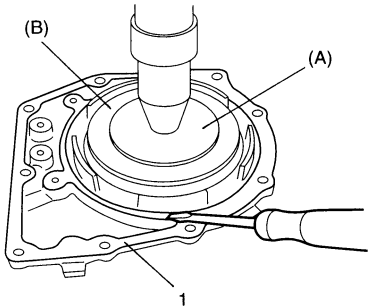
1. Transaxle rear cover

- Do not damage O/D and 2nd coast brake return spring subassembly and piston by pressing in O/D and 2nd coast brake return spring subassembly passing through its original installing position over 1.0 mm (0.039 in.).

Special tool

(A): 09926–96030

(B): 09946–06710



I2RH0B510201-01

1. Transaxle rear cover

Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Inspection

S6RW0E5106047

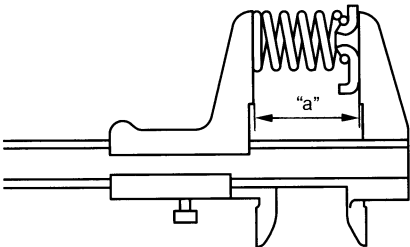
O/D and 2nd Coast Brake Return Spring Subassembly

Measure free length of O/D and 2nd coast brake return spring.

Free length of O/D and 2nd coast brake return spring “a”: 18.99 mm (0.748 in.)

NOTE

- Do not apply excessive force when measuring spring free length.
- Perform measurement at several points.



I2RH0B510207-01

Transaxle Rear Cover Bush

Measure transaxle rear cover bush bore by using special tool.

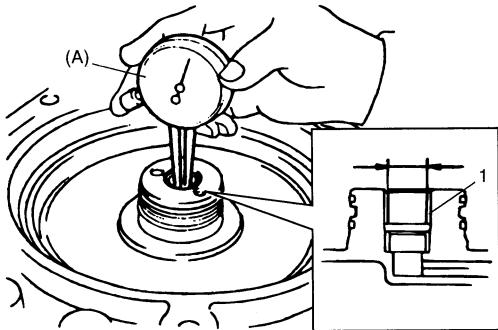
If measured transaxle rear cover bush bore is out of specifications, replace transaxle rear cover with new one. In replacement, intermediate shaft subassembly also needs to be checked. Replace intermediate shaft subassembly, if necessary.

Special tool

(A): 09900–20605

Transaxle rear cover bush bore

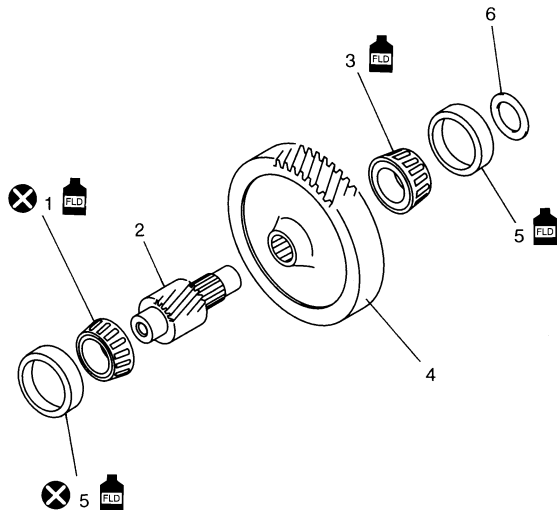
Standard: 13.94 – 13.96 mm (0.549 – 0.550 in.)



I2RH0B510208-01

Countershaft Assembly Components

S6RW0E5106048



I2RH0B510209-01

1. Countershaft RH bearing	5. Bearing cap
2. Countershaft	6. Countershaft bearing shim
3. Countershaft LH bearing	FLD : Apply automatic transaxle fluid.
4. Reduction driven gear	X : Do not reuse.

Countershaft Assembly Disassembly and Reassembly

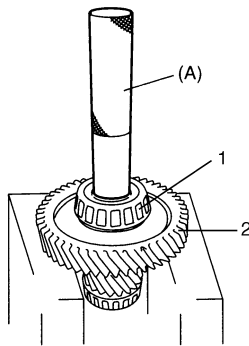
S6RW0E5106049

Disassembly

- 1) Remove countershaft LH bearing (1) and reduction driven gear (2) at once by using special tool and hydraulic press.

Special tool

(A): 09925-98221



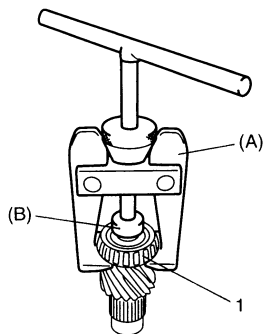
I2RH0B510210-01

- 2) Remove countershaft RH bearing (1) by using special tools.

Special tool

(A): 09913-61510

(B): 09926-58010



I2RH0B510211-01

Reassembly

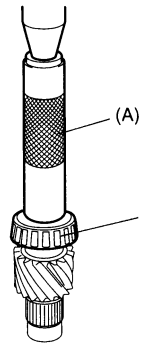
- 1) Install new countershaft RH bearing (1) by using special tool and hydraulic press.

Special tool

(A): 09913-84510

NOTE

Replace countershaft RH bearing together with bearing cup as a set.



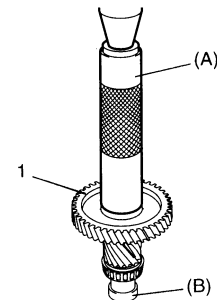
I2RH0B510212-01

- 2) Install reduction driven gear (1) with special tools and hydraulic press.

Special tool

(A): 09913-84510

(B): 09925-88210



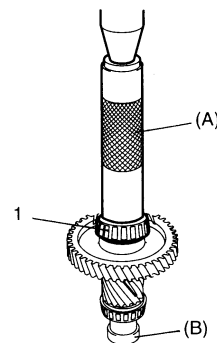
I2RH0B510213-01

- 3) Install countershaft LH bearing (1) with special tools and hydraulic press.

Special tool

(A): 09913-84510

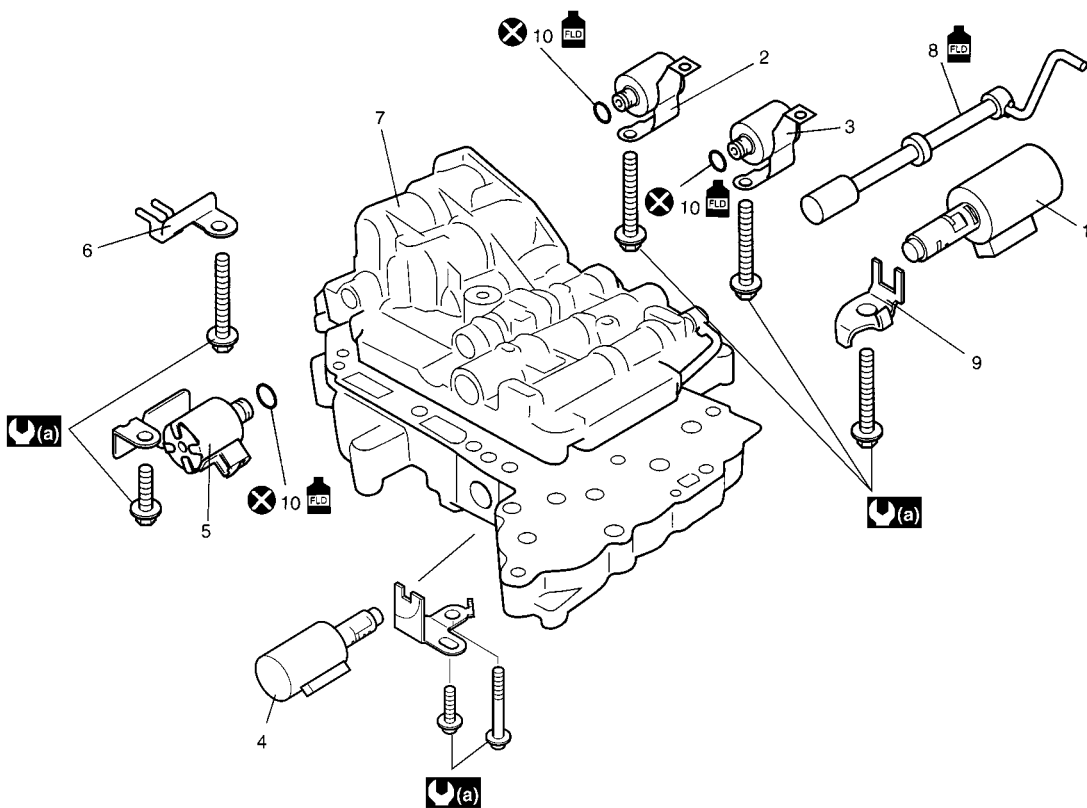
(B): 09925-88210



I2RH0B510214-01

Valve Body Assembly Components

S6RW0E5106050



I4RS0A510044-01

1. Pressure control solenoid valve	6. Temperature sensor clamp	: Apply automatic transaxle fluid.
2. Shift solenoid valve-A (No.1)	7. Valve body assembly	: 11 N-m (1.1 kgf-m, 8.0 lb-ft)
3. Shift solenoid valve-B (No.2)	8. Manual valve	: Do not reuse.
4. TCC pressure control solenoid valve	9. Solenoid lock plate	
5. Timing solenoid valve	10. O-ring	

Valve Body Assembly Disassembly and Reassembly

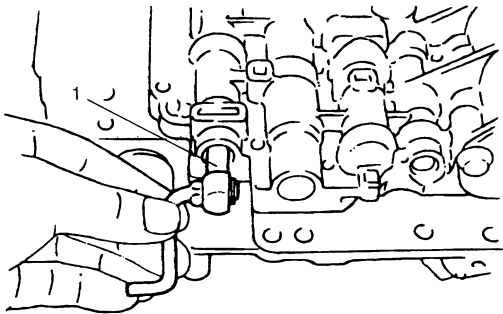
S6RW0E5106051

CAUTION

When replacing pressure control solenoid valve and/or TCC pressure control solenoid valve, it is strictly required to replace it together with valve body assembly as a set. Replacing pressure control solenoid valve and/or TCC pressure control solenoid valve independently may cause excessive shift shock.

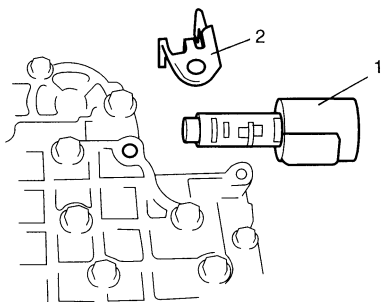
Disassembly

- 1) Pull out manual valve (1).



I2RH0B510216-01

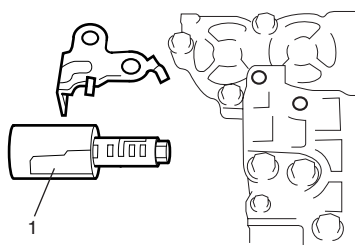
2) Remove pressure control solenoid valve (1).



I2RH0B510217-01

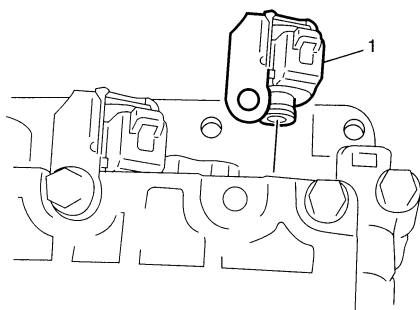
2. Solenoid lock plate

3) Remove TCC pressure control solenoid valve (1).



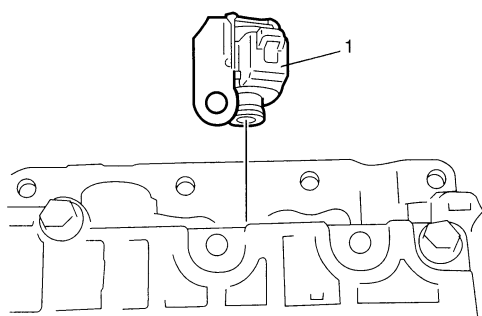
I4RS0A510045-01

4) Remove shift solenoid valve-A (1).



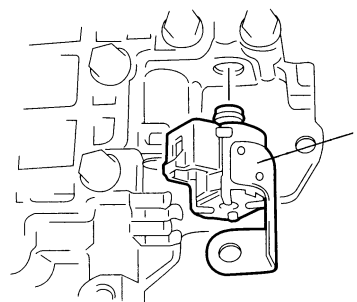
I2RH0B510219-01

5) Remove shift solenoid valve-B (1).



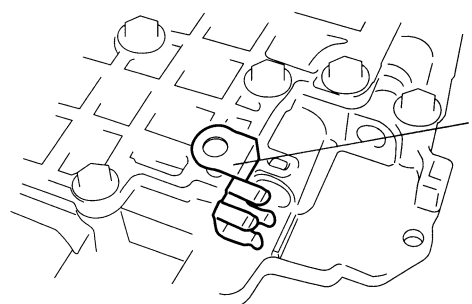
I2RH0B510220-01

6) Remove timing solenoid valve (1).



I2RH0B510221-01

7) Remove temperature sensor clamp (1).



I2RH0B510222-01

Reassembly

Reverse disassembly procedure for assembly, noting the following points.

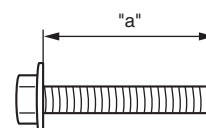
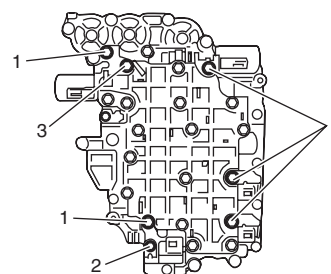
- Shift solenoid valve-A and -B are identical
- After applying A/T fluid to new O-rings, fit them to solenoid valves, then install solenoid valves to valve body.
- Tighten solenoid valve bolts to specified torque

Tightening torque

Solenoid valve bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)

Solenoid valve bolt specification

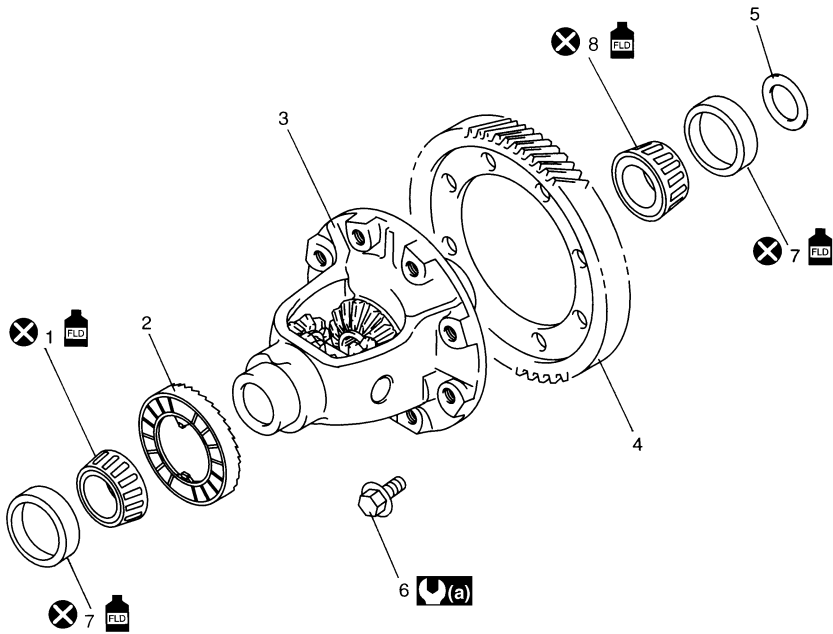
Bolt	Length "a"	Pieces
A (1)	49 mm (1.93 in.)	5
B (2)	20 mm (0.79 in.)	1
C (3)	60 mm (2.36 in.)	1



I4RS0A510046-01

Differential Assembly Components

S6RW0E5106052



I5RW0C510064-01

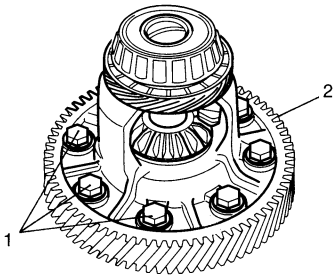
1. Differential side RH bearing	5. Side bearing shim	: Apply automatic transaxle fluid.
2. Output shaft speed sensor (VSS) drive gear	6. Final gear bolt	: 78 N·m (7.8 kgf-m, 56.5 lb-ft)
3. Differential case subassembly	7. Side bearing cup	: Do not reuse.
4. Final gear	8. Differential side LH bearing	

Differential Assembly Disassembly and Reassembly

S6RW0E5106053

Disassembly

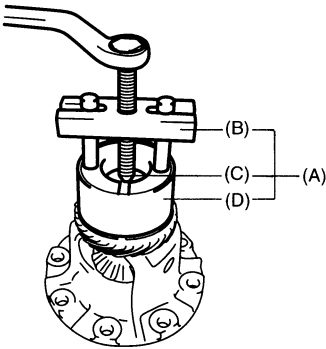
- 1) Remove final gear bolts (1), and then final gear (2).



I2RH0B510225-01

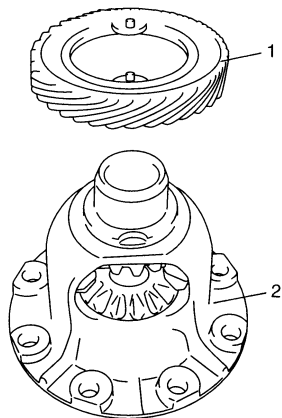
- 2) Remove differential side RH bearing by using special tools.

Special tool
(A): 09926-37610
(B): 09926-37610-001
(C): 09926-37610-003
(D): 09926-37610-002



I2RH0B510226-01

- 3) Remove output shaft speed sensor (VSS) drive gear (1).



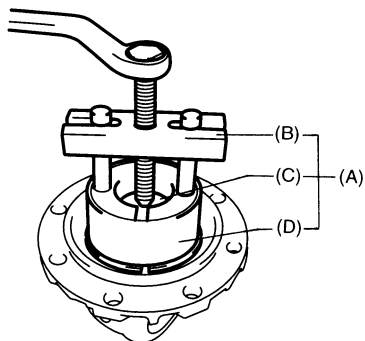
I2RH0B510227-01

2. Differential case subassembly

- 4) Remove differential side LH bearing by using special tools.

Special tool

- (A): 09926-37610
(B): 09926-37610-001
(C): 09926-37610-003
(D): 09926-37610-002



I2RH0B510228-01

Reassembly

⚠ WARNING

- When taking warmed final driven gear out of vessel, use tongs or the like. Taking out it with bare hand will cause severe burn.
- While installing warmed final driven gear, use oven glove such as leather glove. Picking up it with bare hand may cause burn.

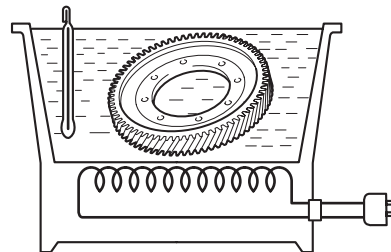
⚠ CAUTION

Do not leave final driven gear in boiling water for longer than 5 min. Overheating the gear may cause strength reduction of gear.

- 1) Put final driven gear in water vessel, heat and remove when it boils, then remove moisture.

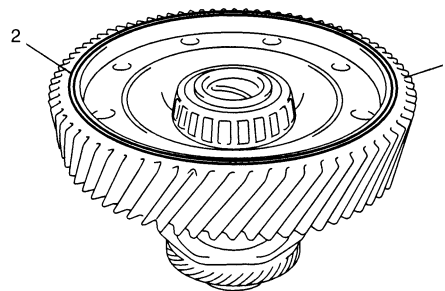
NOTE

After removing moisture on final driven gear, install final driven gear to differential case as quickly as possible.



I2RH0B510229-01

- 2) As shown in figure, facing groove (2) side upward, install final driven gear (1) to differential case.



I2RH0B510230-01

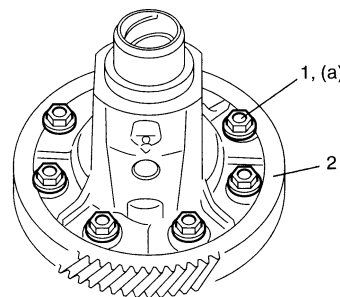
- 3) Tighten final gear bolts (1) to specified torque.

NOTE

To avoid rust, apply A/T fluid to final driven gear after installation.

Tightening torque

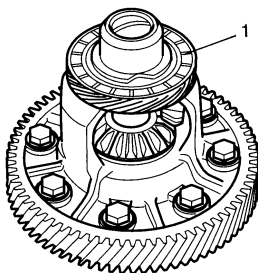
Final gear bolt (a): 78 N·m (7.8 kgf-m, 56.5 lb-ft)



I2RH0B510231-01

2. Final driven gear

- 4) After applying A/T fluid to output shaft speed sensor (VSS) drive gear (1), install output shaft speed sensor drive gear.



I2RH0B510232-01

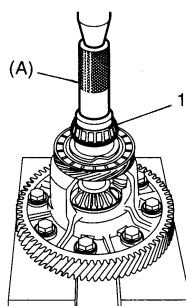
- 5) Install new differential side RH bearing (1) by using special tool and hydraulic press.

NOTE

Replace differential side RH bearing together with bearing cup as a set.

Special tool

(A): 09913-70123



I2RH0B510233-01

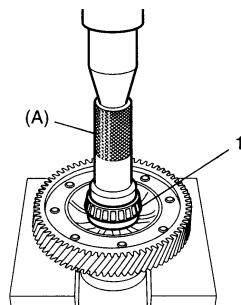
- 6) Install new differential side LH bearing (1) by using special tool and hydraulic press.

NOTE

Replace differential side LH bearing together with bearing cup as a set.

Special tool

(A): 09913-70123



I2RH0B510234-01

Differential Assembly Inspection

S6RW0E5106054

- 1) Hold differential case subassembly with soft jawed vice and set special tools as shown.

Special tool

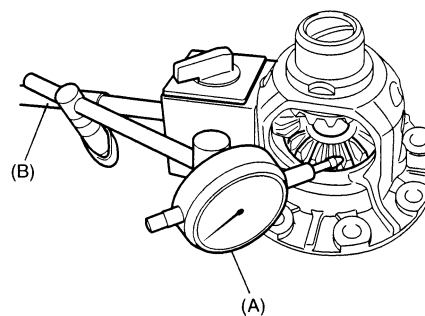
(A): 09900-20607

(B): 09900-20701

- 2) Measure differential gear thrust play.

Differential gear thrust play

Standard: 0.06 – 0.22 mm (0.002 – 0.009 in.)



I2RH0B510235-01

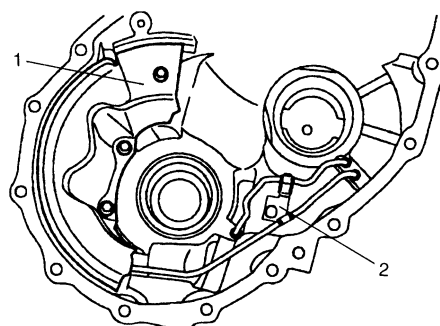
- 3) If thrust play is out of specification, replace differential case subassembly.

Torque Converter Housing Disassembly and Reassembly

S6RW0E5106055

Disassembly

- 1) Remove fluid reservoir RH plate (1) and lubrication tube clamp (2).

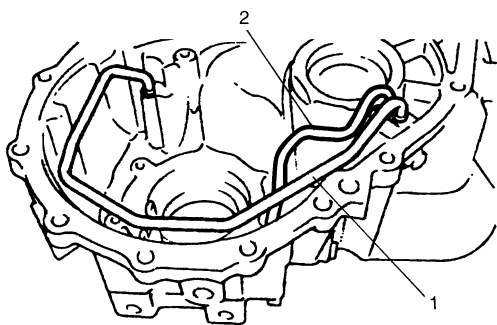


I2RH0B510236-01

- 2) Remove lubrication LH tube (1) and RH tube (2).

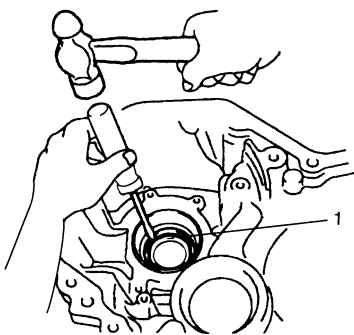
NOTE

Do not bend lubrication tube with excessive force.



I2RH0B510237-01

- 3) Remove differential side oil seal (1).



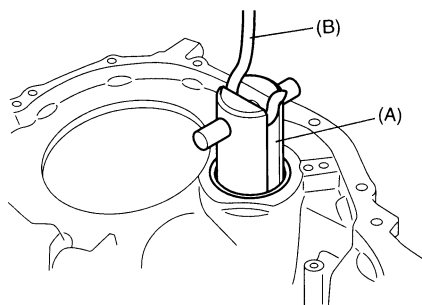
I2RH0B510238-01

- 4) Remove countershaft RH bearing cup by using special tools.

Special tool

(A): 09944-96011

(B): 09942-15511



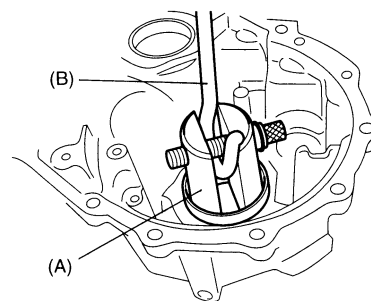
I2RH0B510239-01

- 5) Remove differential side RH bearing cup by using special tools.

Special tool

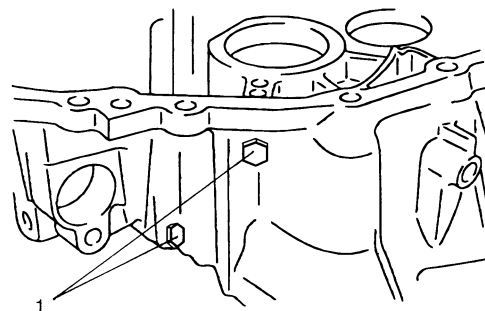
(A): 09944-96011

(B): 09942-15511



I2RH0B510240-01

- 6) Remove torque converter case plugs (1).



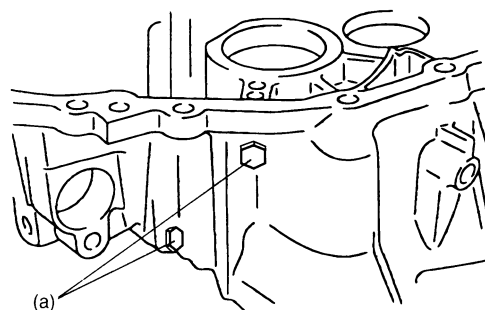
I2RH0B510241-01

Reassembly

- 1) After applying A/T fluid to new O-rings, fit them to housing plugs. Finally install plugs to torque converter housing.

Tightening torque

Torque converter housing plug (a): 7.5 N·m (0.75 kgf-m, 5.5 lb-ft)



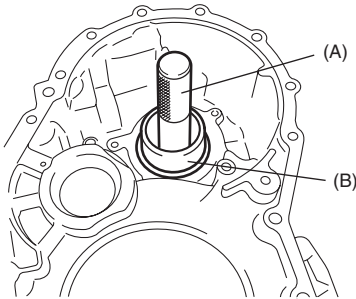
I2RH0B510242-01

- 2) Using special tools, assemble differential side RH bearing cup.

Special tool

(A): 09924-74510

(B): 09944-88220



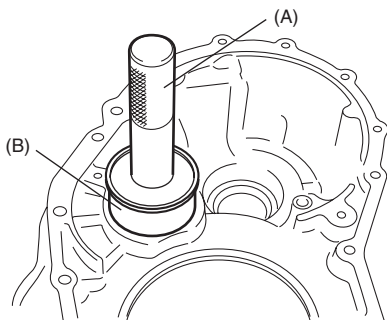
I3RM0B510063-01

- 3) Using special tool, install countershaft RH bearing cup.

Special tool

(A): 09924-74510

(B): 09944-88220



I3RM0B510064-01

- 4) Using special tools, install new differential side oil seal to torque converter housing.

Special tool

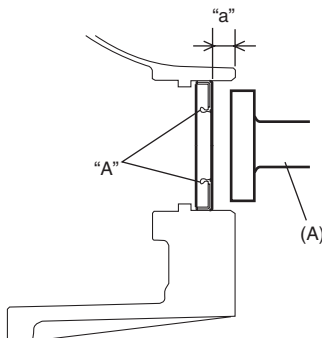
(A): 09913-75510

Differential side oil seal installing depth

“a”: 13.2 – 14.2 mm (0.52 – 0.56 in.)

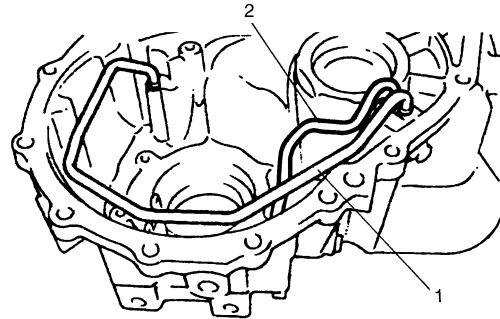
- 5) Apply grease to oil seal lip.

“A”: Grease 99000-25030 (SUZUKI Super Grease C)



I5RW0C510065-02

- 6) Install lubrication LH tube (1) and RH tube (2).



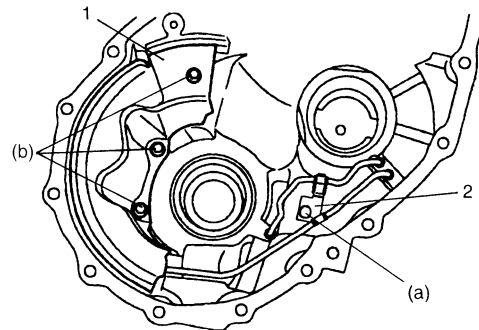
I2RH0B510237-01

- 7) Install fluid reservoir RH plate (1) and lubrication tube clamp (2).

Tightening torque

Lubrication tube clamp bolt (a): 5.5 N·m (0.55 kgf-m, 4.0 lb-ft)

Fluid reservoir RH plate bolt (b): 5.5 N·m (0.55 kgf-m, 4.0 lb-ft)



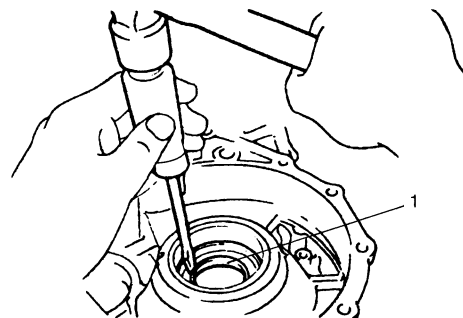
I2RH0B510246-01

Transaxle Case Disassembly and Reassembly

S6RW0E5106056

Disassembly

- 1) Remove differential side oil seal (1).



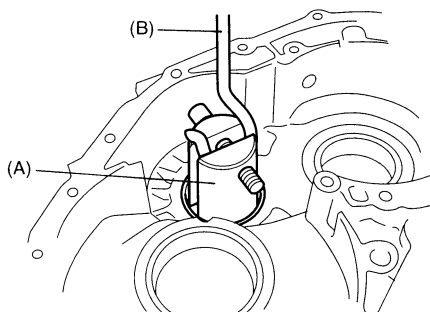
I2RH0B510247-01

- 2) Remove countershaft LH bearing cup and shim with special tools.

Special tool

(A): 09944-96011

(B): 09942-15511



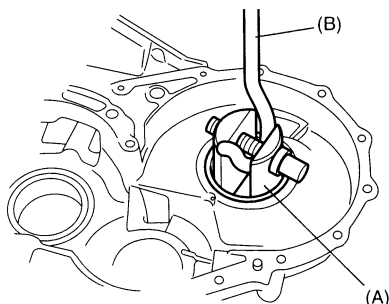
I2RH0B510248-01

- 3) Remove differential side LH bearing cup and shim with special tools.

Special tool

(A): 09944-96011

(B): 09942-15511



I2RH0B510249-01

Reassembly

- 1) Using special tools, assemble shim and differential side LH bearing cup.

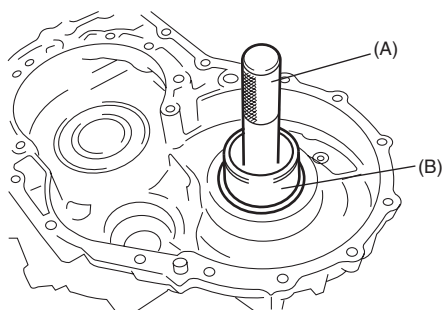
NOTE

Use shim with same thickness as the removed one.

Special tool

(A): 09924-74510

(B): 09944-88220



I3RM0B510065-01

- 2) Using special tools, assemble shim and countershaft LH bearing cup.

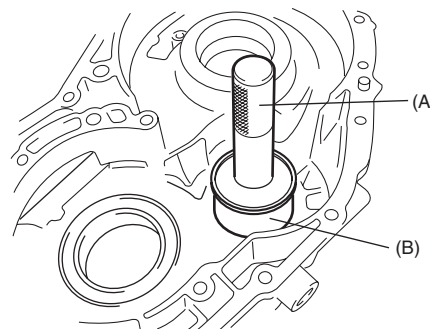
NOTE

Use shim with same thickness as the removed one.

Special tool

(A): 09924-74510

(B): 09944-88220



I3RM0B510066-01

- 3) Install new differential side oil seal to transaxle case by using special tools.

Special tool

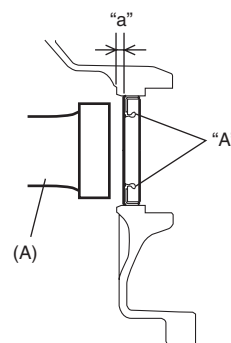
(A): 09913-75810

Differential side oil seal installing depth

"a": 3.8 – 4.8 mm (0.15 – 0.19 in.)

- 4) Apply grease to oil seal lip.

"A": Grease 99000-25030 (SUZUKI Super Grease C)



I5RW0C510066-02

Automatic Transaxle Unit Inspection and Adjustment

S6RW0E5106057

Inspection

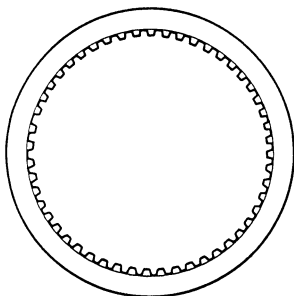
Brake discs

Dry and inspect them for pitting, burn flaking, significant wear, glazing, cracking, charring and chips or metal particles imbedded in lining.

If discs show any of the above conditions, replacement is required.

NOTE

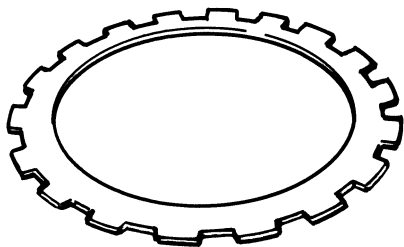
- If disc lining is exfoliated or discolored, replace all discs.
- Before assembling new discs, soak them in A/T fluid for at least two hours.



I2RH01510147-01

Brake separator plates and retaining plates

Dry plates and check for discoloration. If plate surface is smooth and even color smear is indicated, plate should be reused. If severe heat spot discoloration or surface scuffing is indicated, plate must be replaced.



I2RH0B510253-01

Brake return spring subassembly

Measure brake return springs.

Evidence of extreme heat or burning in the area of clutch may have caused springs to take heat set and would require their replacement.

Free length of 1st & reverse brake return spring

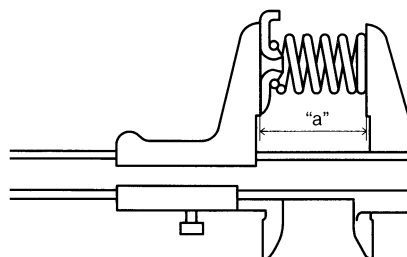
"a": 21.71 mm (0.855 in.)

Free length of 2nd brake return spring

"a": 15.85 mm (0.624 in.)

NOTE

- Do not apply excessive force when measuring spring free length.
- Perform measurement at several points.

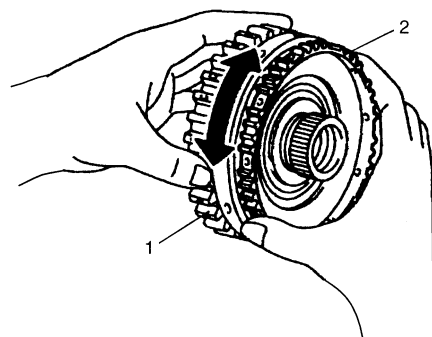


I2RH0B510173-01

One-way clutch No.1 assembly

- 1) Install one-way clutch No.1 assembly (2) to rear planetary sun gear subassembly (1).
- 2) Securing rear planetary sun gear subassembly, ensure that one-way clutch No.1 assembly rotates only in one direction.

If the one-way clutch rotates in both directions or it does not rotate in either direction, replace it with new one.



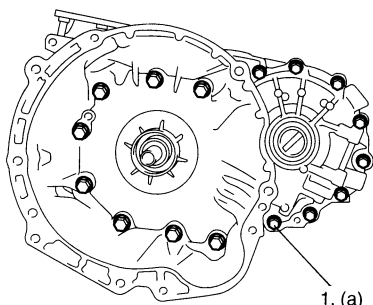
I2RH0B510254-01

Adjustment**Differential side bearing preload**

- 1) After applying A/T fluid to differential assembly, fit it to transaxle case.
- 2) Install torque converter housing to transaxle case, then tighten bolts (1) to specified torque.

Tightening torque

Torque converter housing bolt (a): 33 N·m (3.3 kgf-m, 24.0 lb-ft)



I2RH0B510255-01

- 3) Measure bearing preload (a) by using a special tool.

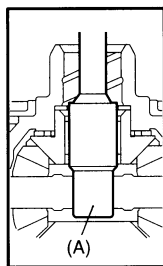
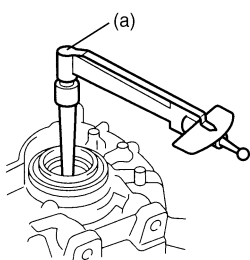
Special tool

(A): 09928-06050

Differential side bearing preload (a) measured as starting torque

In the case of new bearing: 0.78 – 1.37 N·m (7.9 – 13.9 kg-cm, 0.58 – 1.01 lb-ft)

In the case of reused bearing: 0.39 – 0.69 N·m (3.9 – 6.9 kg-cm, 0.29 – 0.51 lb-ft)



I2RH0B510256-01

- 4) If bearing preload is out of specification, select shim with suitable thickness from among the list below and replace it. Then adjust differential side bearing preload within specification.

Available shim thickness

Thickness	Identification mark
1.80 mm (0.070 in.)	A
1.85 mm (0.072 in.)	B
1.90 mm (0.074 in.)	C
1.95 mm (0.076 in.)	D
2.00 mm (0.078 in.)	E
2.05 mm (0.080 in.)	F
2.08 mm (0.081 in.)	G
2.11 mm (0.083 in.)	H
2.14 mm (0.084 in.)	J
2.17 mm (0.085 in.)	K
2.20 mm (0.087 in.)	L
2.23 mm (0.088 in.)	M
2.26 mm (0.089 in.)	N
2.29 mm (0.090 in.)	P
2.32 mm (0.091 in.)	Q
2.35 mm (0.092 in.)	R
2.40 mm (0.094 in.)	S
2.45 mm (0.096 in.)	T
2.50 mm (0.098 in.)	U
2.55 mm (0.100 in.)	V
2.60 mm (0.102 in.)	W
2.65 mm (0.104 in.)	X
2.70 mm (0.106 in.)	Y

NOTE

Record measured differential side bearing, because it is necessary to adjust countershaft bearing preload.

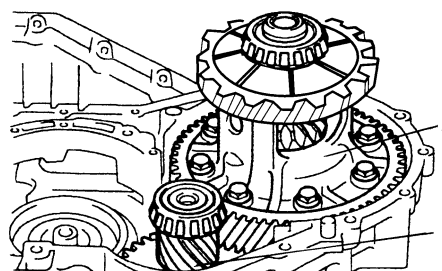
- 5) Remove differential assembly.

Countershaft bearing preload

- 1) After applying A/T fluid to countershaft assembly (1) and differential assembly (2), fit them.
- 2) Install torque converter housing to transaxle case, then tighten bolts to specified torque.

Tightening torque

Torque converter housing bolt: 33 N·m (3.3 kgf-m, 24.0 lb-ft)



I2RH0B510257-01

3) Measure bearing preload (b) by using special tool.

Special tool

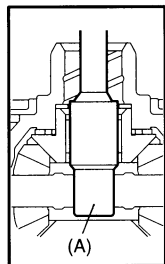
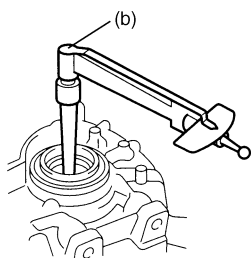
(A): 09928-06050

Countershaft bearing preload	=	(b) – Differential side bearing preload (a)

Countershaft bearing preload (b) measured as starting torque

In the case of new bearing: 0.33 – 0.76 N·m (3.3 – 7.6 kg-cm, 0.24 – 0.55 lb-ft)

In the case of reused bearing: 0.17 – 0.38 N·m (1.7 – 3.8 kg-cm, 0.12 – 0.28 lb-ft)



I3RM0B510067-01

4) If bearing preload is out of specification, select shim with suitable thickness from among the list below and replace it. Then adjust countershaft bearing preload within specification.

Available shim thickness

Thickness	Identification mark
1.70 (0.066 in.)	1
1.75 (0.068 in.)	2
1.80 (0.070 in.)	3
1.85 (0.072 in.)	4
1.90 (0.074 in.)	5
1.93 (0.075 in.)	6
1.96 (0.077 in.)	7
1.99 (0.078 in.)	A
2.02 (0.079 in.)	B
2.05 (0.080 in.)	C
2.08 (0.081 in.)	D
2.11 (0.083 in.)	E
2.14 (0.084 in.)	F
2.17 (0.085 in.)	G
2.20 (0.086 in.)	H
2.25 (0.088 in.)	K
2.30 (0.090 in.)	L
2.35 (0.092 in.)	M
2.40 (0.094 in.)	N
2.45 (0.096 in.)	P
2.50 (0.098 in.)	Q
2.55 (0.100 in.)	R
2.60 (0.102 in.)	S
2.65 (0.104 in.)	U
2.70 (0.106 in.)	W

5) Remove differential assembly and countershaft assembly.

Automatic Transaxle Unit Assembly

S6RW0E5106058

⚠ CAUTION

- Automatic transaxle consists of highly precise parts. As even flaw in small part may cause oil leakage or decrease in function, check each part carefully before installation.
- Clean all parts with compressed air. Never use wiping cloths or rags.
- Before assembling new clutch or brake discs, soak them in automatic transaxle fluid for at least 2 hours.
- Be sure to use new gaskets and O-rings.
- Lubricate O-rings with automatic transaxle fluid.
- Apply automatic transaxle fluid on sliding or rotating surfaces of the parts before assembly.
- Use Suzuki Super Grease “C” to retain parts in place.
- Be sure to install thrust bearings and races in correct direction and position.
- Make sure that snap ring ends are not aligned with one of cutouts and are installed in groove correctly.
- Do not use adhesive cements on gaskets and similar parts.
- Be sure to torque each bolt and nut to specification.

1) Install new manual shift shaft oil seal to transaxle case.

Use special tool and hammer to install it, and then apply grease to its lip.

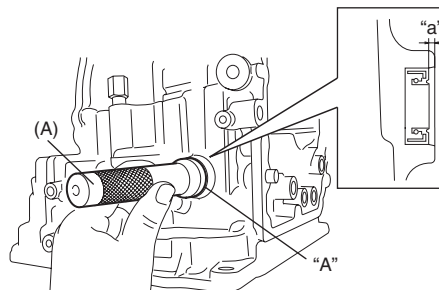
Special tool

(A): 09925-98210

“A”: Grease 99000-25030 (SUZUKI Super Grease C)

Manual shift shaft oil seal installing depth

“a”: 0.75 – 1.25 mm (0.03 – 0.05 in.)

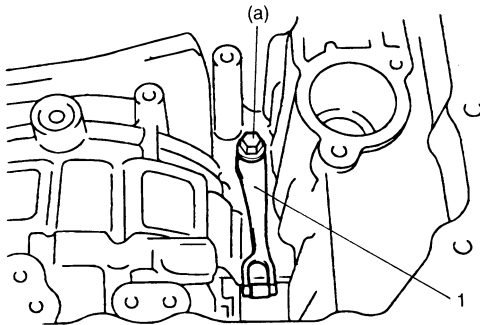


I2RH0B510258-01

- 2) Install manual detent spring (1) to transaxle case and tighten manual detent spring bolt to specified torque.

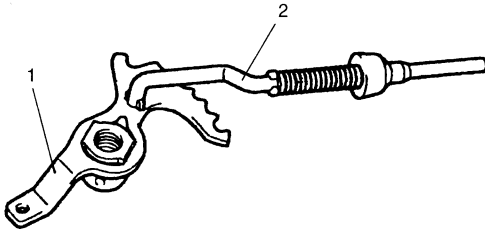
Tightening torque

Manual detent spring bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)



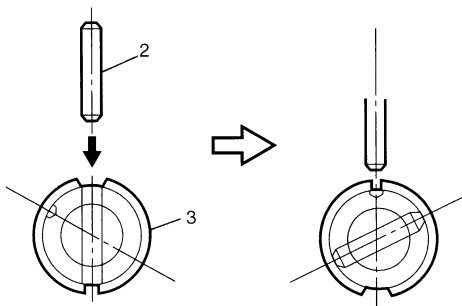
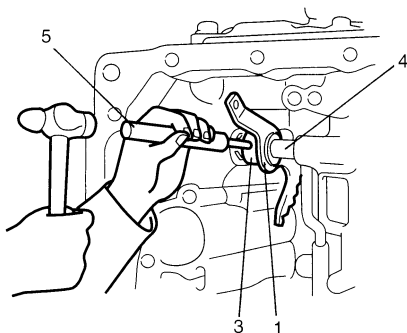
I2RH0B510259-01

- 3) Install parking lock pawl rod (2) to manual valve lever (1).



I2RH0B510260-01

- 4) After applying A/T fluid to new manual valve lever (1), install new manual shift shaft (4), new spacer (3) and manual valve lever to transaxle case.
- 5) After installing manual valve lever pin (2) by using spring pin remover with 3 mm (0.12 in.) in diameter (5) and hammer, turn spacer to set the position as shown in figure. Then caulk spacer with a punch.

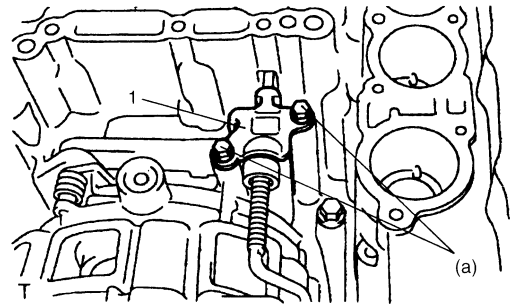


I2RH0B510261-01

- 6) Install parking lock pawl bracket (1) to transaxle case.

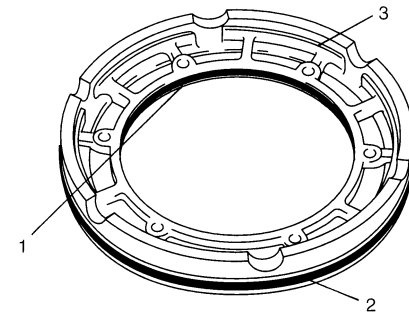
Tightening torque

Parking lock pawl bracket bolt (a): 7.5 N·m (0.75 kgf-m, 5.5 lb-ft)



I2RH0B510262-01

- 7) After applying A/T fluid to new O-rings, install them to 1st and reverse brake piston (3).



I2RH0B510263-01

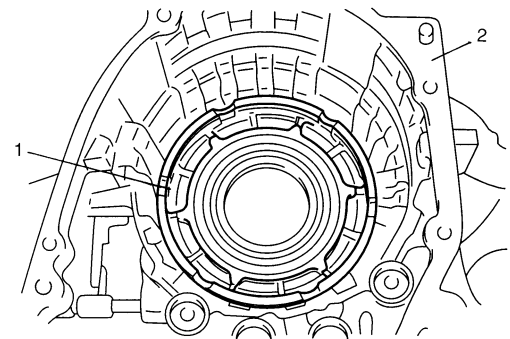
1. Inner O-ring

2. Outer O-ring

- 8) Install 1st and reverse brake piston (1) to transaxle case (2).

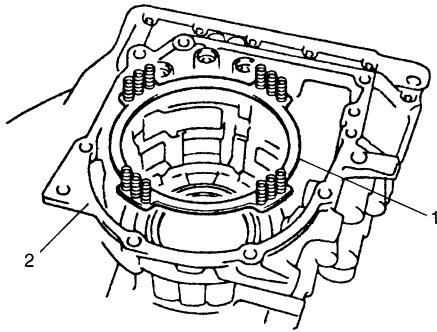
NOTE

Be careful not to damage O-ring when installing 1st and reverse brake piston.



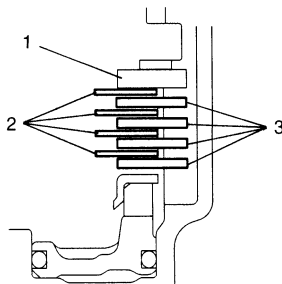
I2RH0B510264-01

- 9) Install 1st and reverse brake return spring subassembly (1) to transaxle case (2).



I2RH0B510265-01

- 10) Apply A/T fluid to 1st and reverse brake discs (3), separator plates (2) and retaining plate (1), then install them to transaxle case.



I2RH0B510266-01

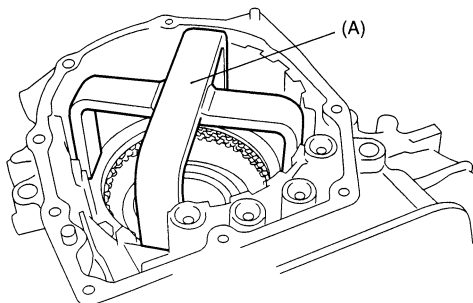
- 11) Compress 1st and reverse brake return spring using special tool and hydraulic press, then attach snap ring.

⚠ CAUTION

Do not damage 1st and reverse brake return spring subassembly discs, plates and piston by pressing in 1st and reverse brake return spring subassembly passing through its original installing position over 0.8 mm (0.031 in.).

Special tool

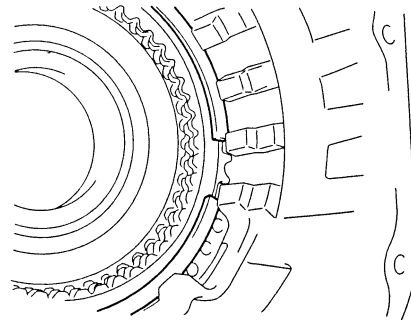
(A): 09926-97620



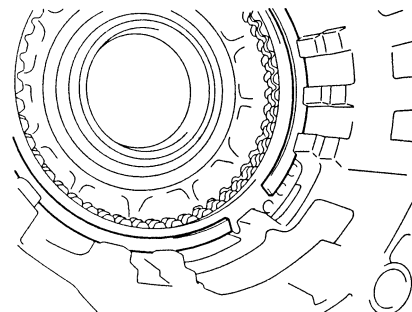
I2RH0B510267-01

- 12) Install 1st and reverse brake plate snap ring so that its both ends would be positioned in correct locations as shown in figure.

[A]



[B]



I2RH0B510268-01

[A]: Correct

[B]: Incorrect

- 13) Using special tools, measure 1st and reverse brake piston stroke when compressed air (400 – 800 kPa, 4 – 8 kg/cm², 57 – 113 psi) is blown through oil hole.

Special tool

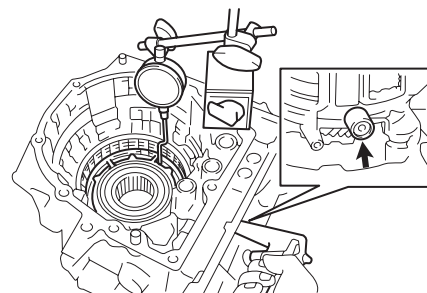
(A): 09900-20607

(B): 09900-20701

(C): 09952-06020

1st and reverse brake piston stroke

Standard: 0.791 – 1.489 mm (0.0311 – 0.0586 in.)



I2RH0B510269-01

- 14) Install reduction drive gear (1) to transaxle case (3) by using special tools and hydraulic press.

⚠ CAUTION

- Do not use transaxle case as groundwork to press fit reduction drive gear.
- Do not give load more than 20 kN (2000 kg, 4410 lb) with hydraulic press. Otherwise, it may result in damaging reduction drive gear bearing.

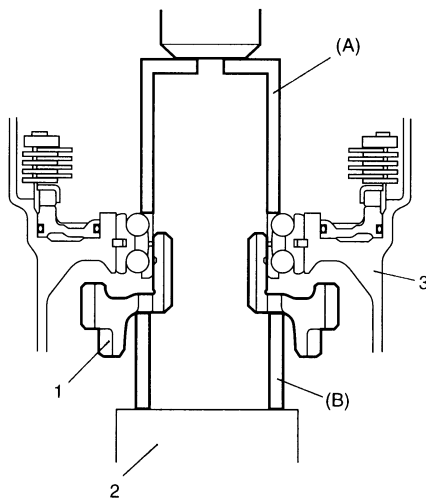
NOTE

When replacing reduction drive gear, replace it together with reduction driven gear as a set.

Special tool

(A): 09951-18210

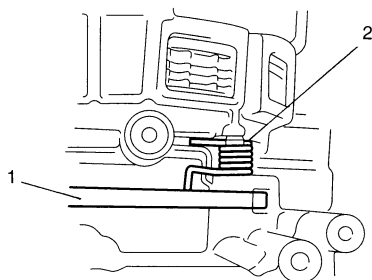
(B): 09944-78210



I2RH0B510270-01

2. Stand that can slightly lift transaxle case.

- 15) Install parking lock pawl (1) and spring (2). Apply A/T fluid to parking lock pawl shaft, then insert it into transaxle case.



I2RH0B510271-01

- 16) Install new planetary ring gear subassembly (1) to reduction drive gear (3) by using special tools and hydraulic press.

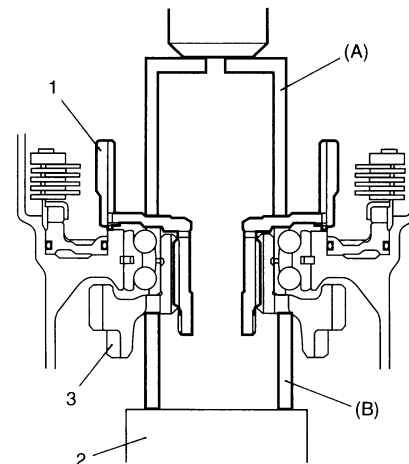
⚠ CAUTION

- Do not reuse planetary ring gear subassembly. Otherwise it may cause damage to planetary gear unit and/or reduction gears.
- Do not use transaxle case as groundwork to press fit planetary ring gear subassembly.
- Do not give load more than 20 kN (2000 kg, 4410 lb) with hydraulic press. Otherwise, it may result in damaging reduction drive gear bearing.

Special tool

(A): 09951-18210

(B): 09944-78210



I2RH0B510272-01

2. Stand that can slightly lift transaxle case.

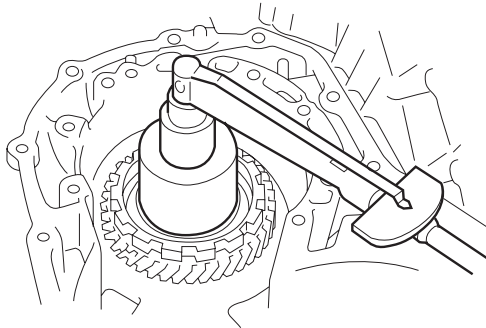
- 17) Using a small torque wrench, while turning to counter drive gear 100 rpm and measure the preload.

⚠ CAUTION

- Do not tighten nut over the specifications so that reduction drive gear nut would not be broken.
- Carry out this procedure on rubber mat in order not to damage transaxle case.

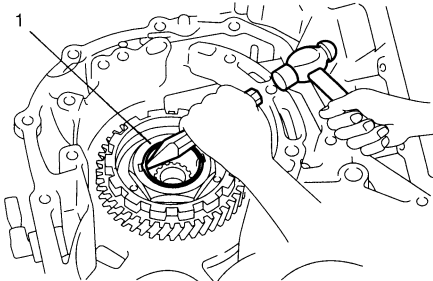
Reduction drive gear bearing preload measured as starting torque

Standard: 0.05 – 0.35 N·m (0.5 – 3.5 kg·cm, 0.036 – 0.253 lb·ft)



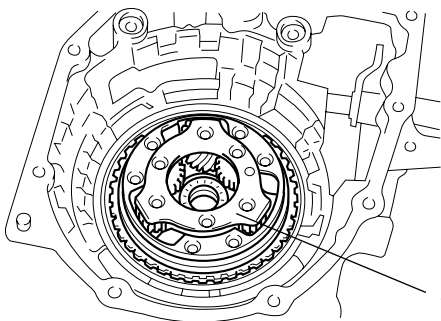
I2RH0B510273-01

- 18) Caulk reduction drive gear nut (1).



I2RH0B510274-01

- 19) Apply A/T fluid to planetary gear assembly (1), then fit it to planetary ring gear assembly.

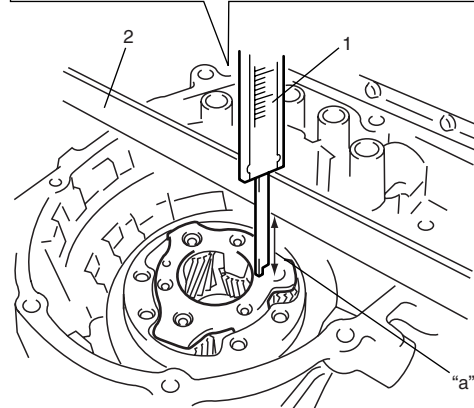
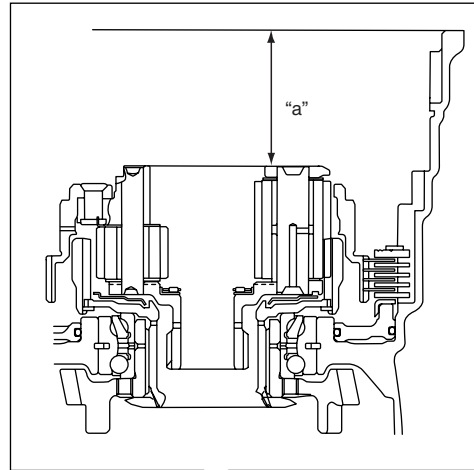


I2RH0B510275-01

- 20) Check for correct installation of planetary gear assembly as follows.
Measure the distance "a" by using micrometer caliper (1) and straightedge (2). If measured value is out of specification, remove planetary gear assembly and reinstall it properly.

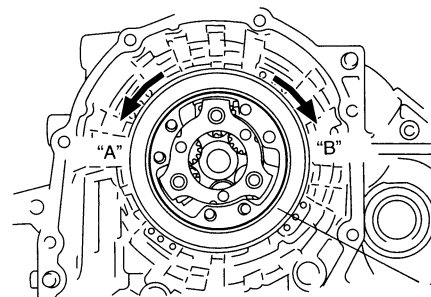
Distance between planetary gear assembly and mating surface of transaxle case

"a": More than 49.9 mm (1.965 in.)



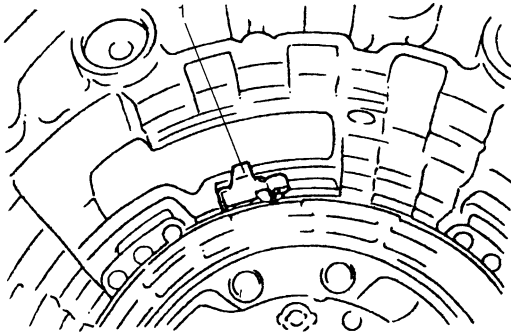
I2RH0B510276-01

- 21) Apply A/T fluid to one-way clutch No.2 assembly (1), then install it to planetary gear assembly. After that, ensure that planetary carrier rotates only in counterclockwise direction "A", not in clockwise direction "B".



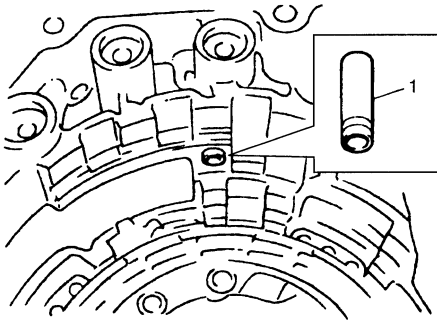
I2RH0B510277-01

- 22) Install one-way clutch outer race retainer (1).



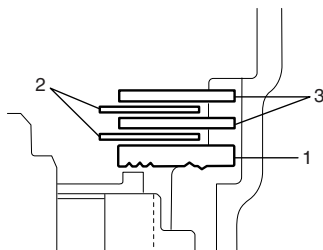
I2RH0B510278-01

- 23) Apply A/T fluid to new brake drum gasket (1), then install it to transaxle case.



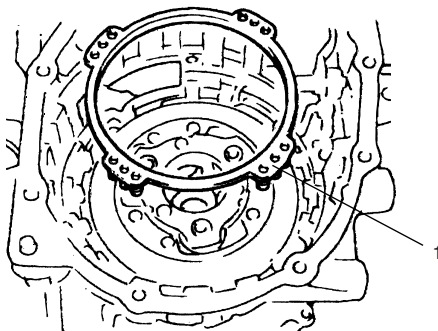
I2RH0B510279-01

- 24) Apply A/T fluid to 2nd brake retaining plate (1), discs (2) and separator plates (3), then install them to transaxle case.



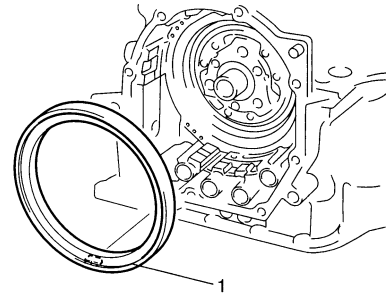
I2RH0B510280-01

- 25) Install 2nd brake return spring subassembly (1) to transaxle case.



I2RH0B510281-01

- 26) Apply A/T fluid to 2nd brake piston assembly (1), and align the projection of 2nd brake piston assembly with the groove of transaxle case, then put together.



I2RH0B510282-01

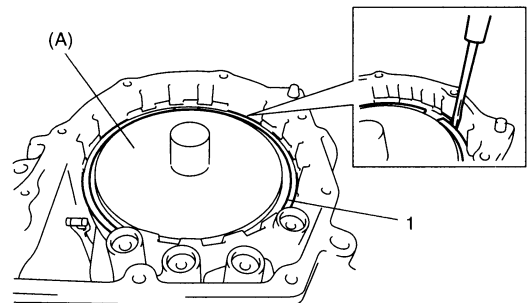
- 27) Install 2nd brake piston snap ring (1) by using special tool and hydraulic press.

⚠ CAUTION

Do not damage 2nd brake piston assembly, return spring subassembly, plates and discs by pressing in 2nd brake assembly passing through its original installing position over 0.4 mm (0.016 in.).

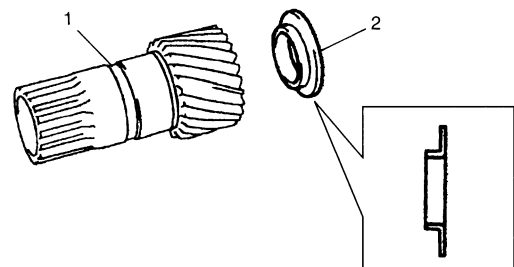
Special tool

(A): 09926-96050



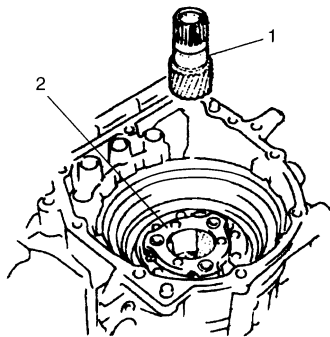
I2RH0B510283-01

- 28) After applying A/T fluid to front sun gear thrust bearing race (2), install it to front planetary sun gear (1).



I2RH0B510285-01

- 29) Apply A/T fluid to front planetary sun gear (1) and install it to planetary gear assembly (2).

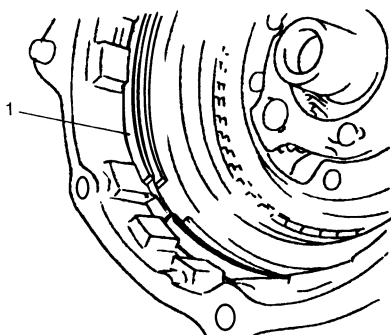


I2RH0B510286-01

- 30) Install O/D and 2nd coast brake retaining plate snap ring (1).

⚠ CAUTION

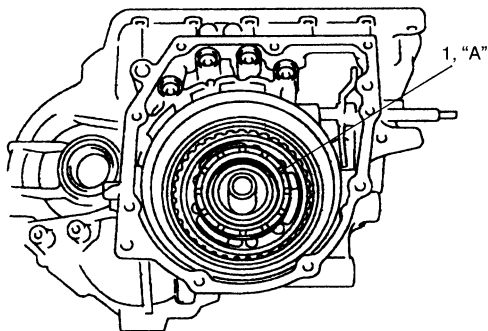
Be sure to install O/D and 2nd coast brake retaining plate snap ring correctly in groove of transaxle case.



I2RH0B510287-01

- 31) After applying grease to slide contact face of planetary carrier thrust washer (1), install it to planetary gear assembly.

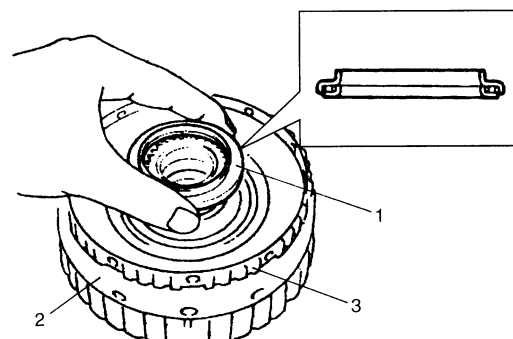
“A”: Grease 99000-25030 (SUZUKI Super Grease C)



I2RH0B510288-01

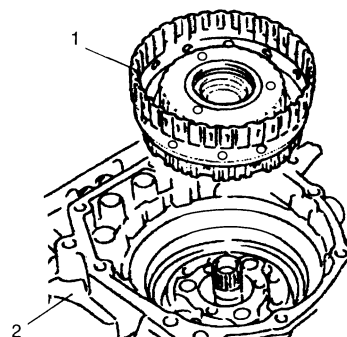
- 32) Apply A/T fluid to one-way clutch No.1 assembly (3) and install one-way clutch No.1 assembly (3) to rear planetary sun gear subassembly (2).

- 33) Apply A/T fluid to planetary gear thrust bearing (1), then install it to one-way clutch No.1 assembly (3).



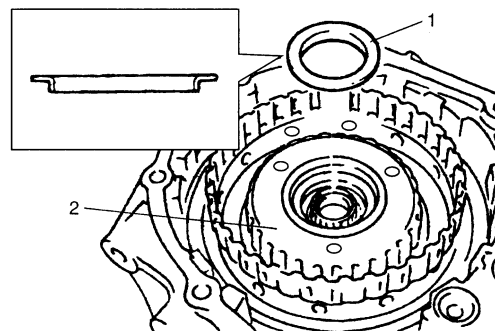
I2RH0B510289-01

- 34) After applying A/T fluid to rear planetary sun gear subassembly and one-way clutch No.1 assembly (1), install them in transaxle case (2).



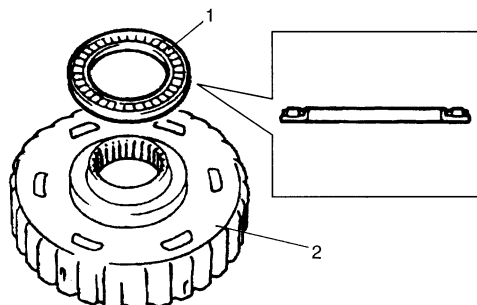
I2RH0B510290-01

- 35) After applying A/T fluid to rear sun gear thrust bearing race (1), install it to rear planetary sun gear (2).



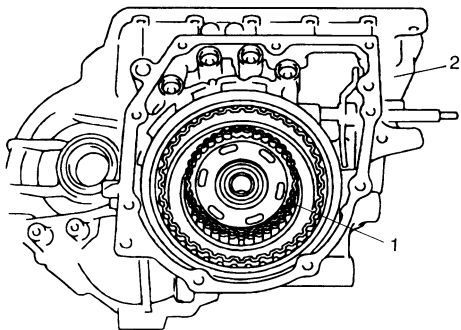
I2RH0B510291-01

- 36) After applying A/T fluid to rear sun gear thrust bearing (1), install it to forward clutch hub (2).



I2RH0B510292-01

- 37) After applying A/T fluid to forward clutch hub (1), install it in transaxle case (2).

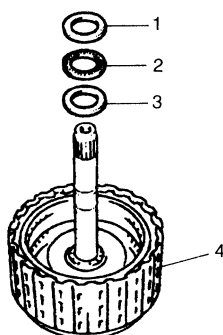


I2RH0B510293-01

- 38) After applying A/T fluid to intermediate shaft thrust bearing rear race (3), thrust bearing (2) and front race (1), install them to forward and reverse clutch assembly (4).

Bearing race dimension

	Front race	Rear race
Outside diameter	30.6 mm (1.20 in.)	28.2 mm (1.11 in.)
Thickness	2.0 mm (0.08 in.)	2.0 mm (0.08 in.)

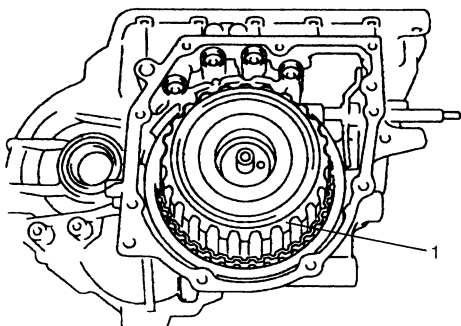


I2RH0B510294-01

- 39) Apply A/T fluid to forward and reverse clutch assembly (1).
Install forward and reverse clutch assembly while rotating clockwise and counterclockwise frequently to fit clutch discs to mating hubs.

NOTE

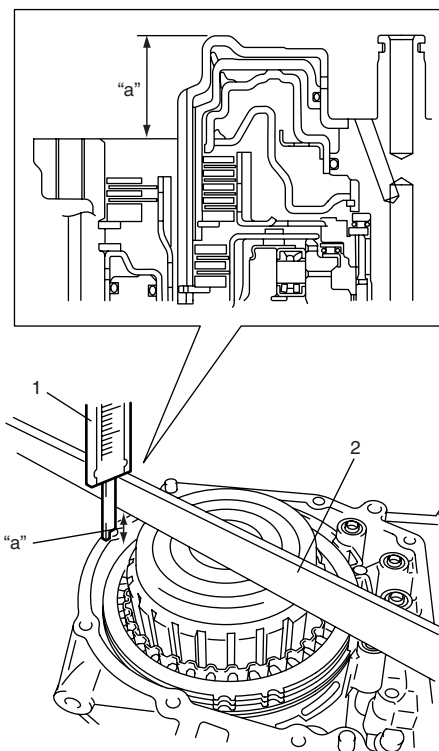
Before installation, align teeth of forward and reverse clutch discs to facilitate installation.



I2RH0B510295-01

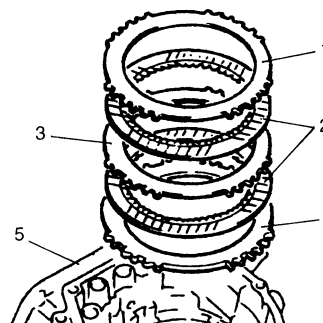
- 40) Check for correct installation of forward and reverse clutch assembly as follows.
Measure distance "a" by using micrometer caliper (1) and straightedge (2). If out of specification, remove forward and reverse clutch assembly, forward clutch hub, rear planetary sun gear subassembly and one-way clutch No.1 assembly, and reinstall them properly.

Distance between forward and reverse clutch assembly and mating surface of transaxle case "a": 27.1 – 29.4 mm (1.067 – 1.157 in.)



I2RH0B510296-01

- 41) After applying A/T fluid to O/D and 2nd coast brake retaining plate (4), separator plate (3), discs (2) and rear plate (1), install them to transaxle case (5).



I2RH0B510297-01

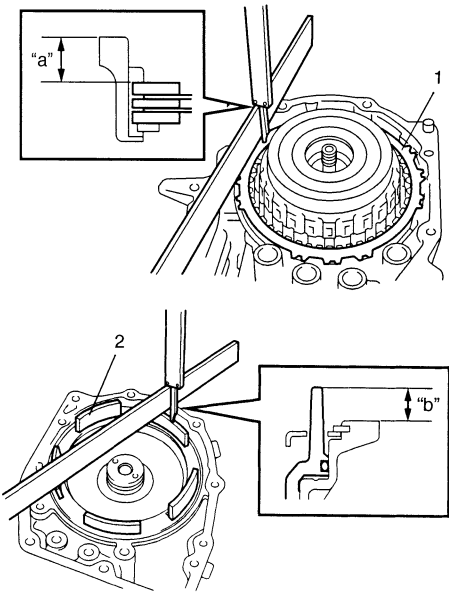
- 42) Measure O/D and 2nd coast brake piston stroke.
- Measure dimension “a” from end face of transaxle case to O/D and 2nd coast brake rear plate (1) using straightedge and micrometer caliper.
 - Measure dimension “b” from O/D and 2nd coast brake piston (2) to rear cover assembly mating surface using straightedge and micrometer caliper.
 - Calculate piston stroke from measured value of dimensions “a” and “b”.
 - Piston stroke = “a” – “b”

O/D and 2nd coast brake piston stroke
Standard: 0.65 – 1.05 mm (0.026 – 0.041 in.)

When piston stroke is out of specification, select O/D and 2nd coast brake rear plate with proper thickness from among the following table and replace it.

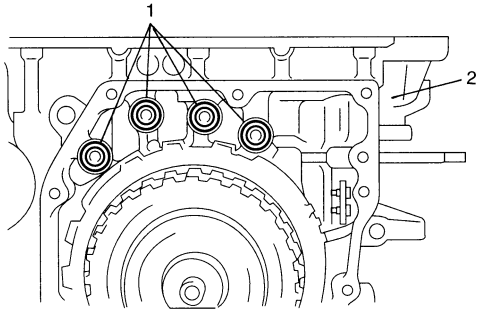
Available O/D and 2nd coast brake rear plate thickness

Thickness	Identification mark
1.8 mm (0.071 in.)	1
2.0 mm (0.079 in.)	2
2.2 mm (0.087 in.)	3
2.4 mm (0.094 in.)	4
2.6 mm (0.102 in.)	5



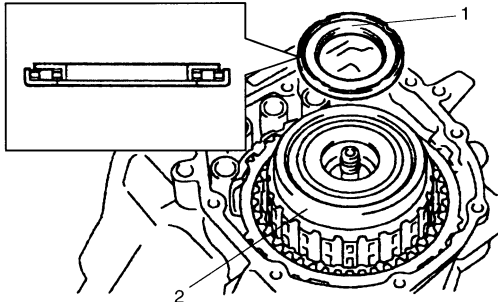
I2RH0B510298-01

- 43) After applying A/T fluid to new 2nd brake gaskets (1), install them to transaxle case (2).



I2RH0B510299-01

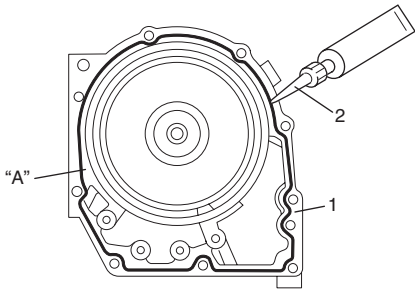
- 44) After applying A/T fluid to reverse clutch drum thrust bearing (1), install it to forward and reverse clutch assembly (2).



I2RH0B510300-01

- 45) Remove sealant attached to mating surface of transaxle rear cover (1) completely.
- 46) Apply sealant to mating surface of transaxle rear cover (1) by using a nozzle (2) as shown in figure by such amount that its section is 1.2 mm (0.047 in.) in diameter.

“A”: Sealant 99000–31230 (SUZUKI Bond No.1216B)

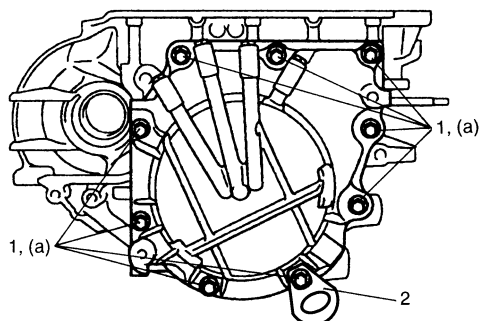


I2RH0B510301-01

- 47) Install transaxle rear cover assembly on transaxle case.
 48) Install hook (2) to location shown in figure.
 49) Tighten rear cover bolts (1).

Tightening torque

Rear cover bolt (a): 25 N·m (2.5 kgf-m, 18.0 lb-ft)

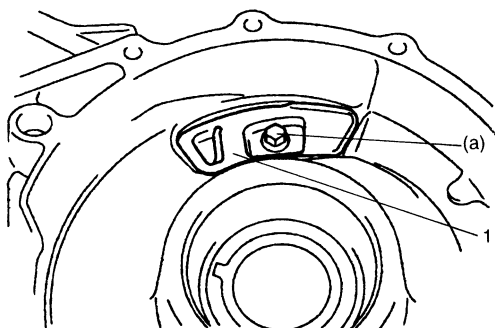


I3RM0B510068-01

- 50) Install fluid reservoir LH plate (1).

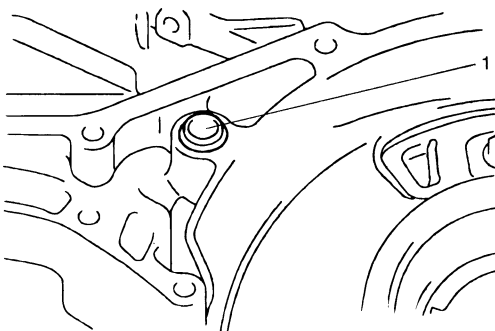
Tightening torque

Fluid reservoir LH plate bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)



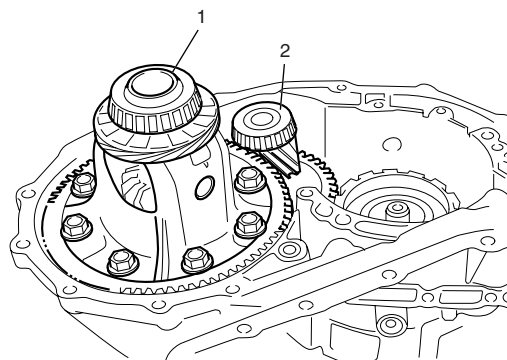
I2RH0B510303-01

- 51) After applying A/T fluid to new governor apply No.2 gasket (1), install it to transaxle case.



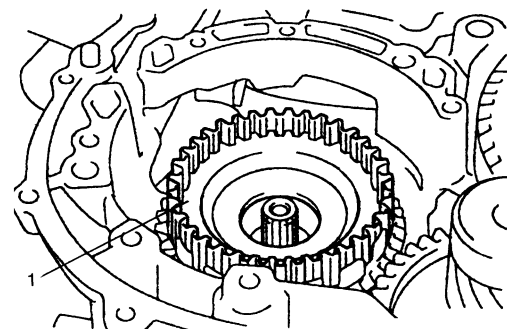
I2RH0B510304-01

- 52) After applying A/T fluid to differential assembly (1) and countershaft assembly (2), install them to transaxle case.



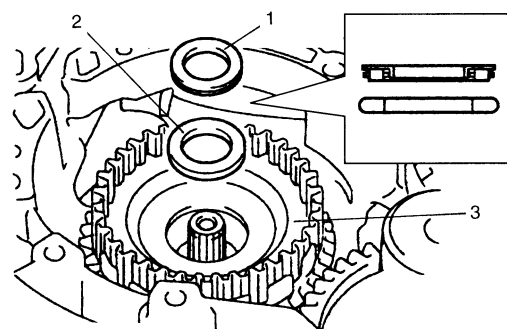
I4RS0A510036-01

- 53) After applying A/T fluid to direct clutch hub (1), install it to planetary gear assembly.



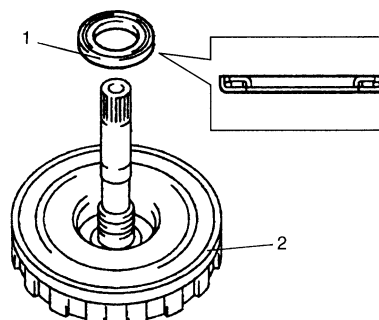
I2RH0B510306-01

- 54) After applying A/T fluid to input shaft rear thrust bearing (1) and thrust bearing race (2), install them into direct clutch hub (3).



I2RH0B510307-01

- 55) After applying A/T fluid to input shaft front thrust bearing (1), install it to direct clutch assembly (2).

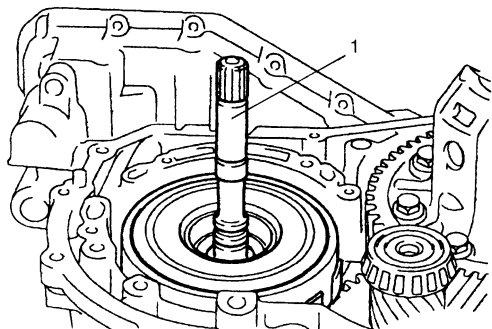


I2RH0B510308-01

- 56) Apply A/T fluid to direct clutch assembly (1).
Install direct clutch assembly while rotating clockwise and counterclockwise frequently to fit clutch discs to mating hub.

NOTE

Before installation, align teeth of direct clutch discs to facilitate installation.

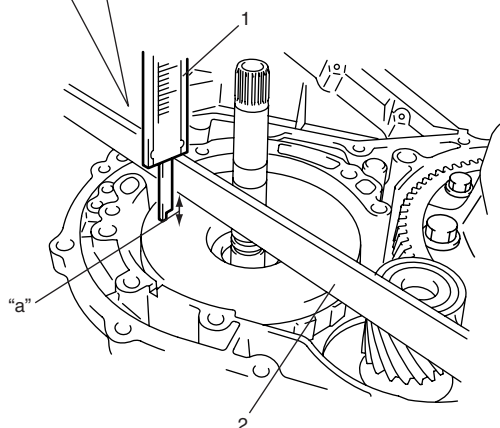
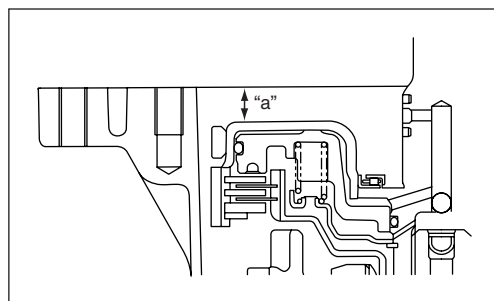


I2RH0B510309-01

- 57) Check for correct installation of direct clutch assembly as follows.
Measure distance "a" by using micrometer caliper (1) and straightedge (2). If out of specification, remove direct clutch assembly, direct clutch hub and reinstall them properly.

Distance between direct clutch assembly and mating surface of transaxle case

"a": 10.5 – 11.3 mm (0.413 – 0.445 in.)

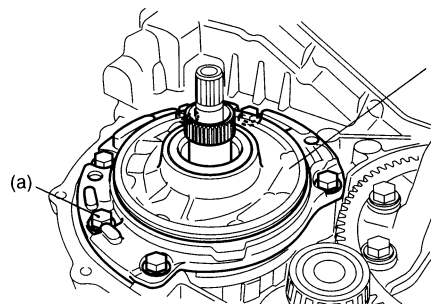


I2RH0B510310-01

- 58) Install oil pump assembly (1) to transaxle case.

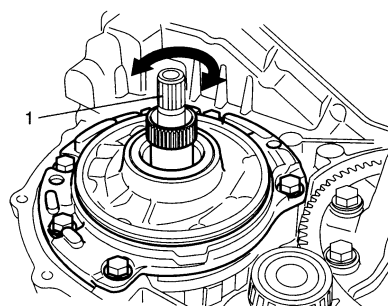
Tightening torque

Oil pump assembly bolt (a): 25 N·m (2.5 kgf-m, 18.0 lb-ft)



I2RH0B510311-01

- 59) Make sure that input shaft (1) turns smoothly.



I2RH0B510312-01

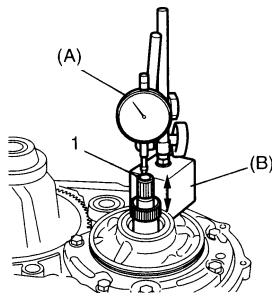
- 60) Measure input shaft thrust play.
Apply dial gauge onto input shaft end (1) and measure thrust play of input shaft.

Special tool**(A): 09900-20607****(B): 09900-20701****Input shaft thrust play****0.3 – 0.9 mm (0.012 – 0.035 in.)**

When input shaft thrust play is out of specification, select input shaft front thrust bearing with proper thickness from among the following table and replace it.

Available input shaft front thrust bearing thickness

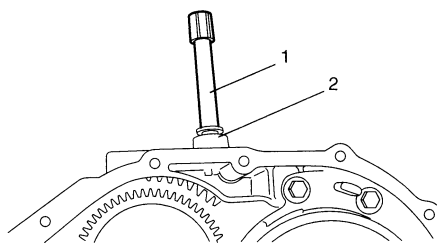
Thickness	Outside diameter	Inside diameter
3.45 mm (0.14 in.)	48.5 mm (1.90 in.)	32.9 mm (1.30 in.)
4.05 mm (0.16 in.)	48.5 mm (1.90 in.)	32.5 mm (1.28 in.)



I2RH0B510313-01

- 61) After applying A/T fluid to new O-ring, fit it to breather union (2). Then install breather union to transaxle case.

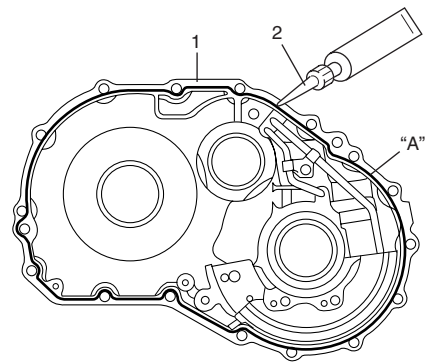
- 62) Install breather hose (1).



I2RH0B510314-01

- 63) Wipe off and clean mating surface between transaxle case (1) and torque converter housing.
- 64) Apply sealant to torque converter housing by using a nozzle (2) as shown in figure by such amount that its section is 1.2 mm (0.047 in.) in diameter.

“A”: Sealant 99000-31230 (SUZUKI Bond No.1216B)



I2RH0B510315-01

- 65) Install torque converter housing to transaxle case, tighten bolts to specified torque.

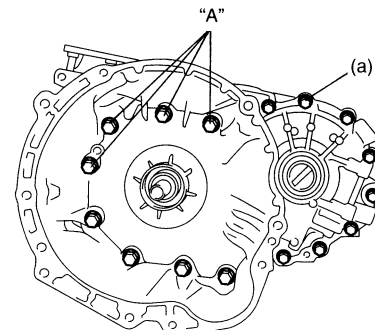
⚠ CAUTION

Apply sealant to threads of four bolts shown in figure before tightening.

“A”: Sealant 99000-31230 (SUZUKI Bond No.1216B)

Tightening torque

Torque converter housing bolt (a): 33 N·m (3.3 kgf-m, 24.0 lb-ft)

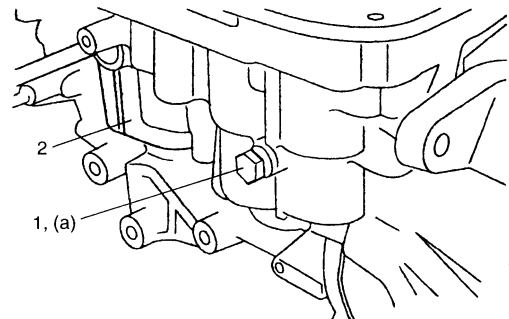


I3RM0B510069-01

- 66) After applying A/T fluid to new O-ring, fit it to transaxle case plug (1). Then install the transaxle case plug to transaxle case (2).

Tightening torque

Transaxle case plug (a): 7.5 N·m (0.75 kgf-m, 5.5 lb-ft)



I2RH0B510317-01

67) Install new O-rings to each accumulator piston and apply A/T fluid to them.

Accumulator O-ring dimension

O-ring name	Inside diameter	Section diameter
Large B1 accumulator O-ring (2)	29.4 mm (1.16 in.)	2.6 mm (0.10 in.)
Large C1 accumulator O-ring (2)		
Large C2 accumulator O-ring (2) – Above three O-rings are same.		
Small B1 accumulator O-ring (4)	19.7 mm (0.78 in.)	2.6 mm (0.10 in.)
Small C1 accumulator O-ring (6)	21.8 mm (0.86 in.)	2.6 mm (0.10 in.)
Small C2 accumulator O-ring (6) – Above two O-rings are same.		

NOTE

Make sure that O-rings are not twisted or caught when installing.

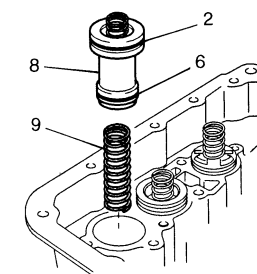
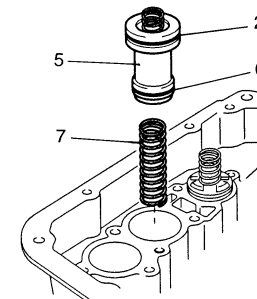
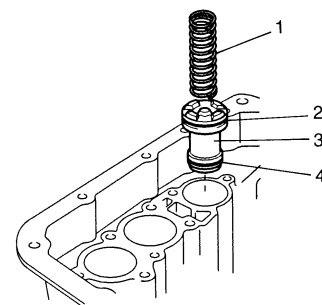
68) Install B1, C1, C2 accumulator pistons and springs.

Accumulator piston identification

Piston name	Identification as embossed letters on piston
B1 accumulator piston (3)	SB-1
C1 accumulator piston (5)	SC-1
C2 accumulator piston (8)	SC-2

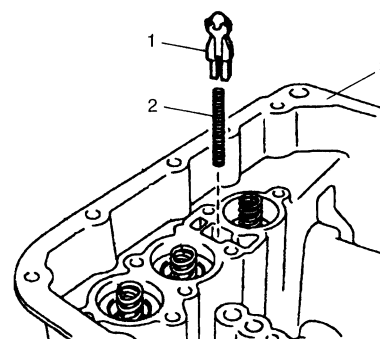
Accumulator spring identification

Spring name	Color of identification paint
B1 accumulator No.2 spring (1)	Pink
C1 accumulator No.2 spring (7)	Blue
C2 accumulator No.2 spring (9)	Light green



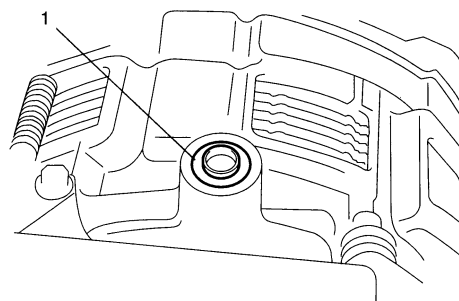
I2RH0B510318-01

69) After applying A/T fluid to cooler check valve (1) and spring (2), install them to transaxle case (3).



I2RH0B510319-01

70) After applying A/T fluid to new governor apply No.1 gasket (1), install it to transaxle case.



I2RH0B510320-01

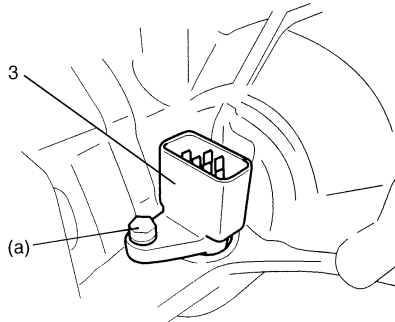
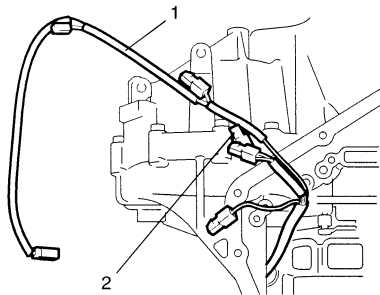
- 71) After applying A/T fluid to new O-ring, fit it to valve body harness connector (3), then install valve body harness to transaxle case.

⚠ CAUTION

When put valve body harness (1) into transaxle case, take care not to damage transmission fluid temperature sensor (2) at narrow entrance of case. Careless sensor treatment might cause sensor malfunction.

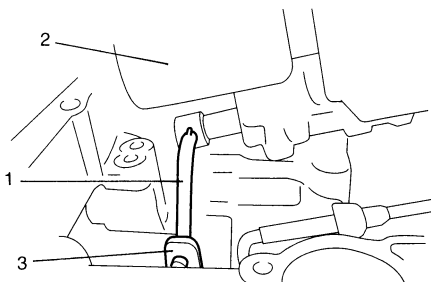
Tightening torque

Valve body harness connector bolt (a): 5.5 N·m (0.55 kgf-m, 4.0 lb-ft)



I2RH0B510321-01

- 72) Install manual valve rod (1) to manual valve lever (3) and then install valve body assembly (2) to transaxle case.



I2RH0B510322-01

- 73) Tighten valve body bolts to specified torque.

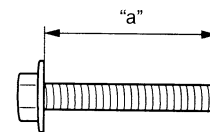
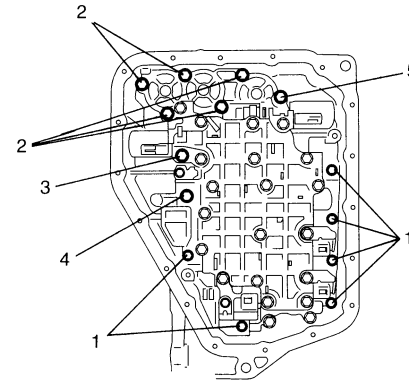
Tightening torque

Valve body bolt: 11 N·m (1.1 kgf-m, 8.0 lb-ft)

Valve body bolt length

Bolt	Length "a"	Pieces
A (1)	20 mm (0.79 in.)	6

Bolt	Length "a"	Pieces
B (2)	28 mm (1.10 in.)	5
C (3)	49 mm (1.93 in.)	1
D (4)	36 mm (1.42 in.)	1
E (5)	40 mm (1.58 in.)	1

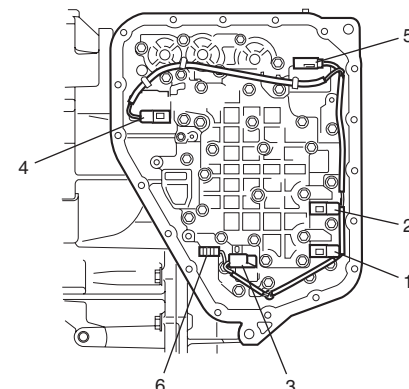


I2RH0B510323-01

- 74) Connect solenoid connectors to solenoid valves identifying their installing positions by wire colors, and install transmission fluid temperature sensor to its clamp.

Solenoid valve coupler specification

Solenoid valve coupler	Wire color
Shift solenoid valve-A (1)	White
Shift solenoid valve-B (2)	Black
Timing solenoid valve (3)	Yellow
TCC pressure control solenoid valve (4)	Light green / Brown
Pressure control solenoid valve (5)	Gray / Green
Transmission fluid temperature sensor (6)	Orange

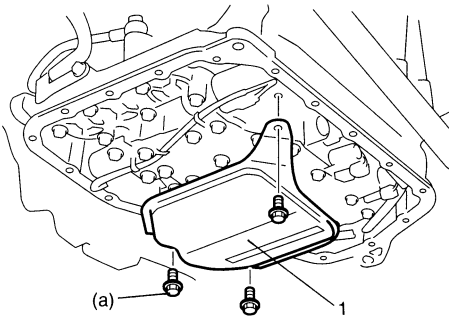


I5RW0C510067-02

75) Install oil strainer assembly (1).

Tightening torque

Oil strainer bolt (a): 10 N·m (1.0 kgf-m, 7.5 lb-ft)

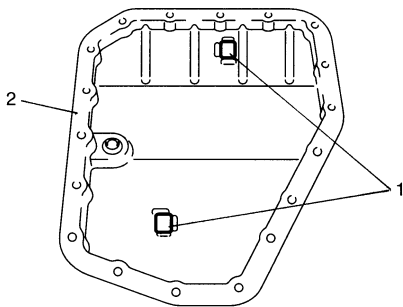


I2RH0B510325-01

76) Install oil cleaner magnets (1) in oil pan (2).

NOTE

If metal particles are attached to the magnets, clean them before installing.



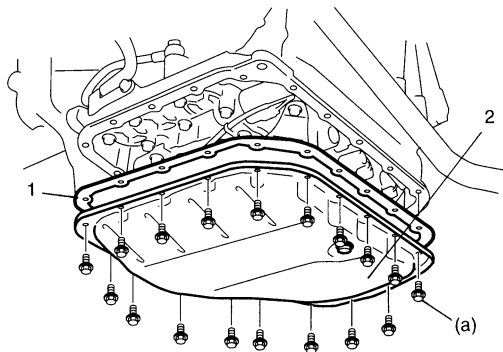
I2RH0B510326-01

77) Install new oil pan gasket (1) between transaxle case and oil pan (2).

78) Tighten oil pan bolts to specified torque diagonally and little by little.

Tightening torque

Oil pan bolt (a): 7.0 N·m (0.7 kgf-m, 5.0 lb-ft)



I2RH0B510327-01

79) After applying A/T fluid to new O-rings, fit it to fluid cooler pipe unions (1). Then install fluid cooler pipe unions to transaxle case.

Tightening torque

Fluid cooler pipe union (a): 25 N·m (2.5 kgf-m, 18.0 lb-ft)

80) Install new gaskets (2) and then install fluid cooler pipes.

Tightening torque

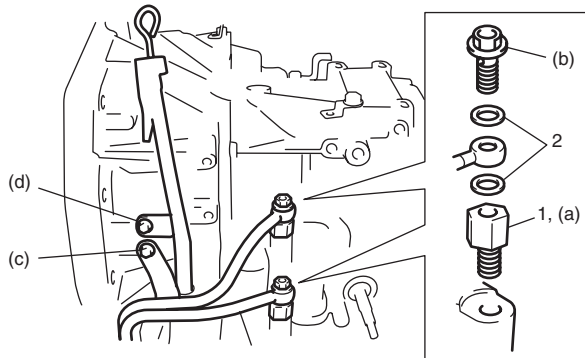
Fluid cooler pipe union bolt (b): 22 N·m (2.2 kgf-m, 16.0 lb-ft)

Fluid cooler pipe bracket bolt (c): 10 N·m (1.0 kgf-m, 7.5 lb-ft)

81) After applying A/T fluid to new O-ring, fit it to fluid filler tube. Then install fluid filler tube to transaxle case.

Tightening torque

Fluid filler tube bolt (d): 10 N·m (1.0 kgf-m, 7.5 lb-ft)

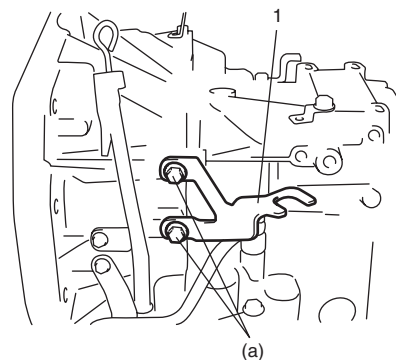


I5RW0C510068-01

82) Install select cable bracket (1).

Tightening torque

Select cable bracket bolt (a): 23 N·m (2.3 kgf-m, 17.0 lb-ft)



I5RW0C510069-02

- 83) Apply A/T fluid to O-rings of each sensor and install input shaft speed sensor (1) and output shaft speed sensor (VSS) (2).

Tightening torque

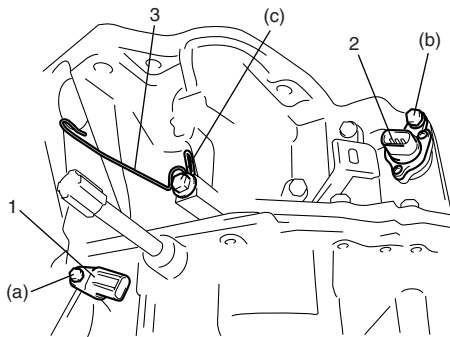
Input shaft speed sensor bolt (a): 5.5 N·m (0.55 kgf-m, 4.0 lb-ft)

Output shaft speed sensor (VSS) bolt (b): 13 N·m (1.3 kgf-m, 9.5 lb-ft)

- 84) Install harness bracket and select cable clamp (3).

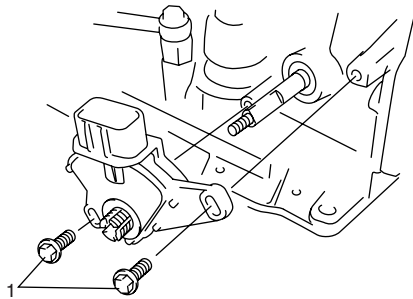
Tightening torque

Select cable clamp bolt (c): 13 N·m (1.3 kgf-m, 9.5 lb-ft)



I2RH0B510330-01

- 85) Install transmission range sensor to transaxle case, tighten bolts temporarily at this step.

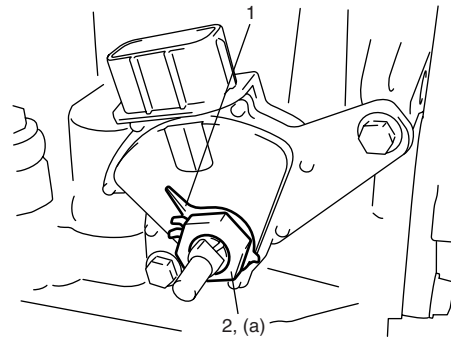


I2RH0B510331-01

- 86) Install lock washer (1) and tighten lock nut (2) to specified torque.

Tightening torque

Transmission range sensor lock nut (a): 7 N·m (0.7 kgf-m, 5.0 lb-ft)



I2RH0B510332-01

- 87) Install manual select lever (1) temporarily at this step.

- 88) After shifting manual select lever counterclockwise fully, select "N" range position by bringing it back 2 notches clockwise.

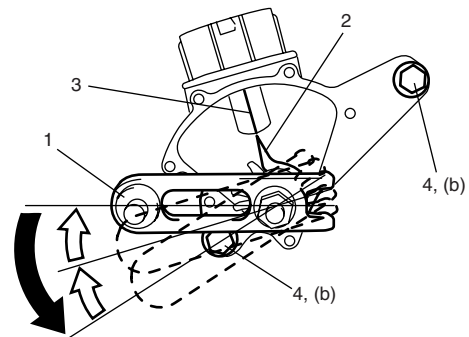
- 89) Remove manual select lever (1) at this step.

- 90) Loosen sensor bolts (4) and align needle direction shaped on lock washer (2) with "N" reference line (3) on transmission range sensor by moving sensor in rotative direction.

- 91) Tighten sensor bolts to specified torque.

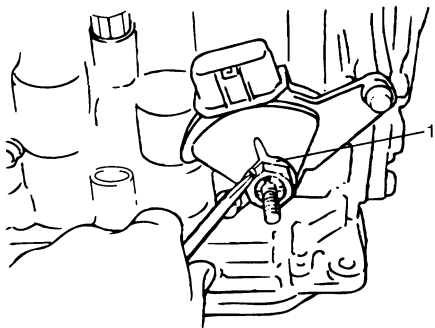
Tightening torque

Transmission range sensor bolt (b): 5.5 N·m (0.55 kgf-m, 4.0 lb-ft)



I2RH0B510333-01

- 92) Bend dents of lock washer (1) in order to prevent displacement of lock washer.

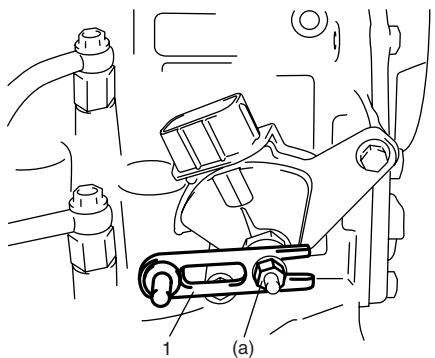


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- 93) Install manual select lever (1).

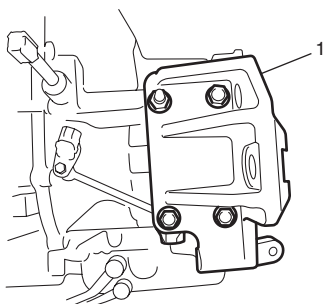
Tightening torque

Manual select lever nut (a): 13 N·m (1.3 kgf-m, 9.5 lb-ft)



I2RH0B510335-01

- 94) Install engine mounting LH bracket (1). Tighten engine mounting LH bracket bolts and nut to specified torque referring to "Engine Mountings Components in Section 1D in related manual".



I5RW0C510058-01

- 95) Install torque converter (3) noting the following points.

⚠ CAUTION

- Before installing converter, make sure that its pump hub portion is free from nicks, burrs or damage which may cause oil seal to leak.
- Be very careful not to drop converter on oil pump gear. Damage in gear, should it occur, may cause a critical trouble.

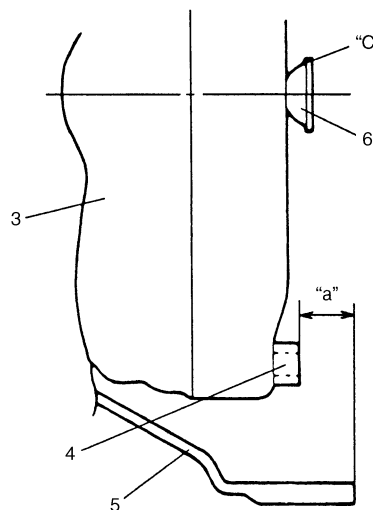
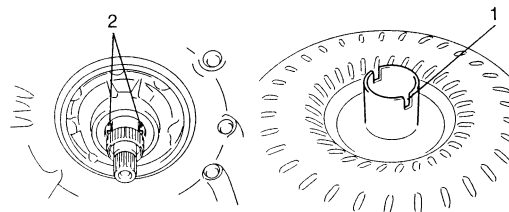
- Install torque converter aligning grooves (1) of torque converter and projection (2) of oil pump drive gear.
- Install torque converter, using care not to damage oil seal of oil pump.
- After installing torque converter, check that distance "a" is within specification.

Torque converter installing position

"a": More than 19.9 mm (0.783 in.)

- Check torque converter for smooth rotation.
- Apply grease around cup (6) at the center of torque converter.

"C": Grease 99000-25010 (SUZUKI Super Grease A)



I2RH0B510337-01

4.	Flange nut
5.	Torque converter housing

Specifications

Tightening Torque Specifications

S6RW0E5107001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
A/T fluid drain plug	17	1.7	12.5	⌚ / ⌚ / ⌚
Transmission range sensor bolt	5.5	0.55	4.0	⌚ / ⌚
Output shaft speed sensor (VSS) bolt	13	1.3	9.5	⌚ / ⌚
Input shaft speed sensor bolt	5.5	0.55	4.0	⌚ / ⌚
Valve body harness connector bolt	5.5	0.55	4.0	⌚ / ⌚
Shift solenoid bolt	11	1.1	8.0	⌚
Oil strainer bolt	10	1.0	7.5	⌚ / ⌚
Oil pan bolt	7.0	0.7	5.0	⌚ / ⌚
Engine oil pan bolt	55	5.5	40.0	⌚
Transaxle and engine fastening bolt	85	8.5	61.5	⌚
Transaxle and engine fastening nut	85	8.5	61.5	⌚
Drive plate to torque converter bolt	19	1.9	14.0	⌚
Transaxle housing lower plate bolt	11	1.1	8.0	⌚
Oil pump subassembly bolt	10	1.0	7.5	⌚
Rear cover plug	7.5	0.75	5.5	⌚
Solenoid valve bolt	11	1.1	8.0	⌚
Final gear bolt	78	7.8	56.5	⌚
Torque converter housing plug	7.5	0.75	5.5	⌚
Lubrication tube clamp bolt	5.5	0.55	4.0	⌚
Fluid reservoir RH plate bolt	5.5	0.55	4.0	⌚
Torque converter housing bolt	33	3.3	24.0	⌚ / ⌚ / ⌚
Manual detent spring bolt	10	1.0	7.5	⌚
Parking lock pawl bracket bolt	7.5	0.75	5.5	⌚
Rear cover bolt	25	2.5	18.0	⌚
Fluid reservoir LH plate bolt	10	1.0	7.5	⌚
Oil pump assembly bolt	25	2.5	18.0	⌚
Transaxle case plug	7.5	0.75	5.5	⌚
Valve body bolt	11	1.1	8.0	⌚
Fluid cooler pipe union	25	2.5	18.0	⌚
Fluid cooler pipe union bolt	22	2.2	16.0	⌚
Fluid cooler pipe bracket bolt	10	1.0	7.5	⌚
Fluid filler tube bolt	10	1.0	7.5	⌚
Select cable bracket bolt	23	2.3	17.0	⌚
Select cable clamp bolt	13	1.3	9.5	⌚
Transmission range sensor lock nut	7	0.7	5.0	⌚
Manual select lever nut	13	1.3	9.5	⌚

NOTE

The specified tightening torque is also described in the following.

“Select Cable Components”

“Automatic Transaxle Unit Components”

“Automatic Transaxle Assembly Components”

“Oil Pump Assembly Components”

“Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Components”

“Valve Body Assembly Components”

“Differential Assembly Components”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A in related manual”.

Special Tools and Equipment

Recommended Service Material

S6RW0E5108001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000-25010	㊦ / ㊦
	SUZUKI Super Grease C	P/No.: 99000-25030	㊦ / ㊦ / ㊦ / ㊦ / ㊦ / ㊦
Sealant	SUZUKI Bond No.1216B	P/No.: 99000-31230	㊦ / ㊦ / ㊦

NOTE

Required service material is also described in the following.

“Select Cable Components”

“Automatic Transaxle Assembly Components”

“Oil Pump Assembly Components”

“Direct Clutch Assembly Components”

“Forward and Reverse Clutch Assembly Components”

“2nd Brake Piston Assembly Components”

“Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Components”

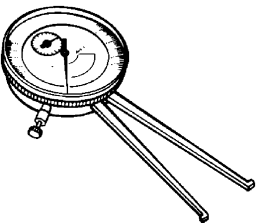
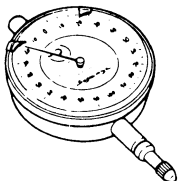
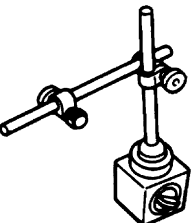
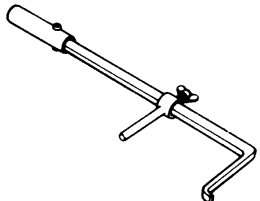
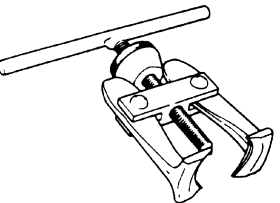
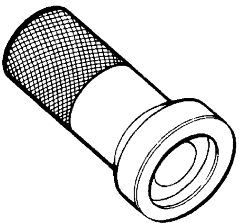
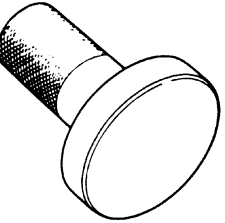
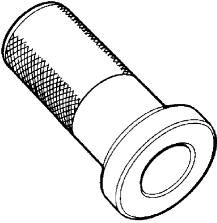
“Countershaft Assembly Components”

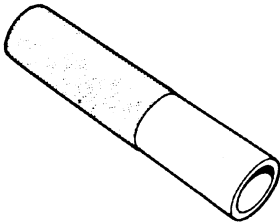
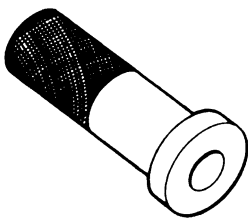
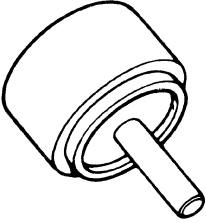
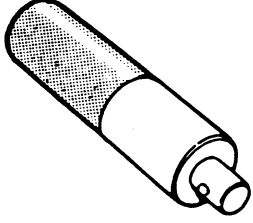
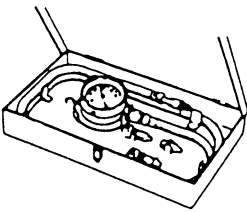
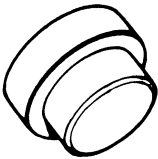
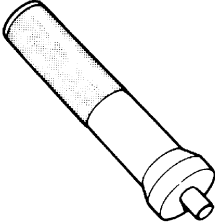
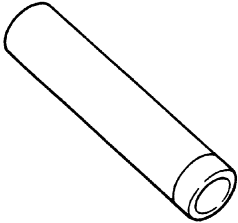
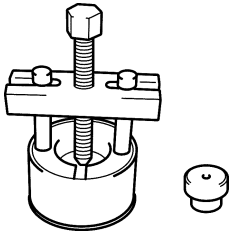
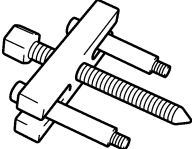
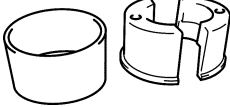
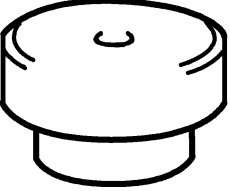
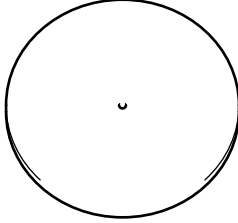
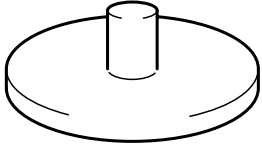
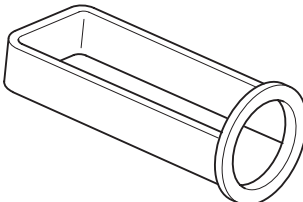
“Valve Body Assembly Components”

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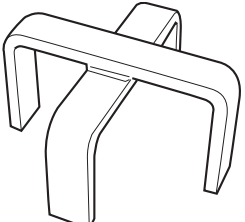
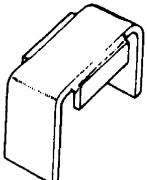
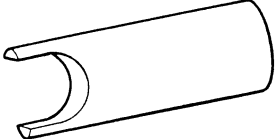
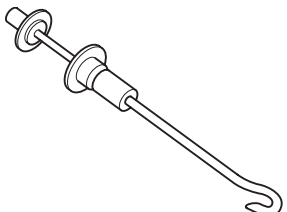
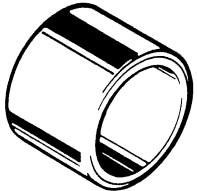
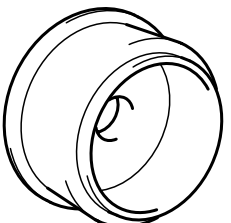
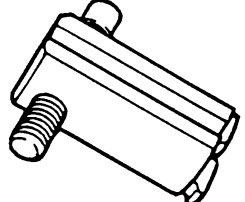
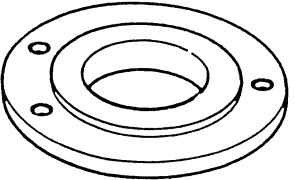
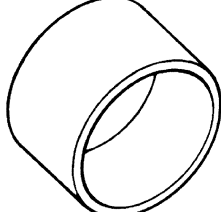
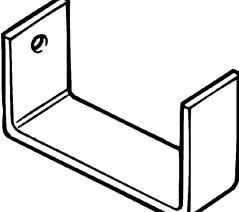
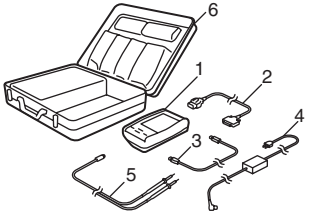
Special Tool

S6RW0F5108002

09900-20605 Dial calipers (1/100 mm, 10-34 mm)  /  /  	09900-20607 Dial gauge  /  /  /  /  /  /  /   /  /  /  
09900-20701 Magnetic stand  /  /  /  /  /  /  /   /  /  /  	09913-50121 Oil seal remover  /  
09913-61510 Bearing puller  	09913-70123 Bearing installing tool  /  
09913-75510 Bearing installer  /  	09913-75810 Bearing installer  /  

09913-84510 Bearing installer 	09913-85210 Bearing installer 
09923-78210 Bearing installer 	09924-74510 Bearing and oil seal handle 
09925-37811-001 Oil pressure gauge 	09925-88210 Bearing puller attachment 
09925-98210 Input shaft bearing installer 	09925-98221 Bearing installer 
09926-37610 Bearing remover 	09926-37610-001 Bearing puller 
09926-37610-002 Bearing puller attachment 	09926-37610-003 Bearing remover attachment 
09926-58010 Bearing remover attachment 	09926-96030 Clutch spring compressor No.7 
09926-96050 Brake piston compressor 	09926-97610 Spring compressor 

5A-158 Automatic Transmission/Transaxle:

09926-97620 Spring compressor 🔧 / 🔧 	09926-98310 Clutch spring compressor 🔧 / 🔧 
09928-06050 Differential preload adapter 🔧 / 🔧 	09942-15511 Sliding hammer 🔧 / 🔧 / 🔧 / 🔧 
09944-78210 Bearing installer support 🔧 / 🔧 	09944-88220 Oil seal installer 🔧 / 🔧 / 🔧 / 🔧 
09944-96011 Bearing outer race remover 🔧 / 🔧 / 🔧 / 🔧 	09946-06710 Transfer bearing dummy 🔧 / 🔧 
09951-18210 Oil seal remover & installer No. 2 🔧 / 🔧 	09952-06020 Dial gauge plate No.2 🔧 / 🔧 / 🔧 / 🔧 
SUZUKI scan tool (SUZUKI-SDT) — This kit includes following items. 1. SUZUKI-SDT 2. DLC3 cable 3. USB cable 4. AC/DC power supply 5. Voltage meter probe 6. Storage case 🔧 / 🔧 	

Section 10

Control Systems

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DTC No. 13 / No. 14: Release Signal Error from Steering Lock Unit / Steering Lock Unit Malfunction.....	10E-26	Antennas and Request Switches Removal and Installation	10E-28
DTC No. 21 / No. 22: Internal Error of Keyless Start Control Module (EEPROM Reading Error) / (EEPROM Writing Error).....	10E-26	Front Door (Driver and Passenger Side), Rear End Door Request Switch Inspection.....	10E-29
DTC No. 31: Lost Communication with BCM..	10E-27	Steering Lock Unit Removal and Installation ..	10E-29
DTC No. 33: Control Module Communication Bus Off	10E-27	Steering Lock Unit Inspection	10E-29
DTC No. 51 / No. 52 / No. 53: Driver Side / Passenger Side / Rear End Door Request Switch Failure	10E-27	Front Door Lock Switch Inspection	10E-29
Repair Instructions	10E-28	Keyless Start Control Module Removal and Installation	10E-30
		Remote Controller Inspection.....	10E-30
		Replacement of Remote Controller Battery	10E-30
		Registration Procedure for Remote Controller ID Code	10E-31
		Keyless Start Registration	10E-32

Immobilizer Control System

Precautions

Precautions in Diagnosing Troubles

S6RW0EA300001

- Before confirming the diagnostic trouble code (DTC), do not disconnect connector from ECM, battery cable from battery, ground wire harness, or main fuse. Such disconnection will erase DTC stored in ECM.
- DTC stored in ECM memory can be checked as well as cleared by using SUZUKI scan tool. Before using SUZUKI scan tool, read its operator's manual carefully to know how to use it and what functions are available.
- Be sure to read "Precautions for Electrical Circuit Service in Section 00 in related manual" before inspection.
- Communication of ECM, BCM, ABS control module, TCM (if equipped), 4WD control module (if equipped), keyless start control module (if equipped), combination meter and DLC is established by CAN (Controller Area Network). Therefore, handle CAN communication lines with care referring to "Precaution for CAN Communication System in Section 00 in related manual".
For CAN communication system, refer to description on "CAN Communication System Description in Section 1A".

Precaution in Replacing ECM

S6RW0EA300002

- If ECM is replaced with new or used one without Immobilizer control function, the engine will not be started. In case of the above, check if the newly installed ECM has Immobilizer control function.
- After ECM is replaced with new one or used one, the transponder code in the transponder built in the ignition key has to be registered with ECM. Or, the engine cannot be started up. For the registration procedure, refer to "Procedure after ECM Replacement".

Precaution in Replacing Ignition Key

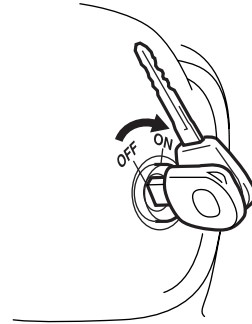
S6RW0EA300003

To register ignition key in case of replacing key(s) and/or making spare key(s), the transponder code in the ignition key is registered with ECM. Or the engine can not be started up. For the registration procedure, refer to "Registration of the Ignition Key".

Precautions in Handling Immobilizer Control System

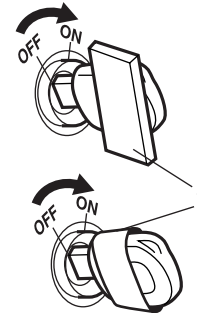
S6RW0EA300004

- Do not turn ON ignition switch with ignition key in contact with another one or quite close to another one. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



I3RH0AA30001-01

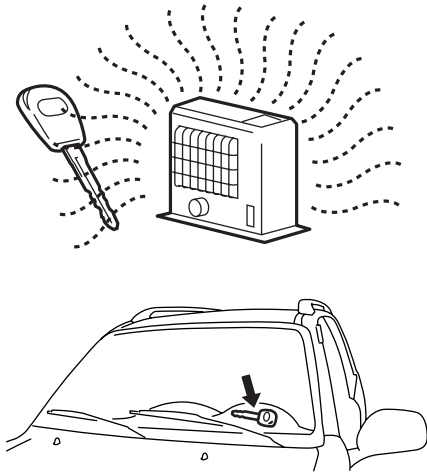
- Do not turn ON ignition switch by using ignition key with any type of metal (1) wrapped its grip or in contact with it. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



I3RH0AA30002-01

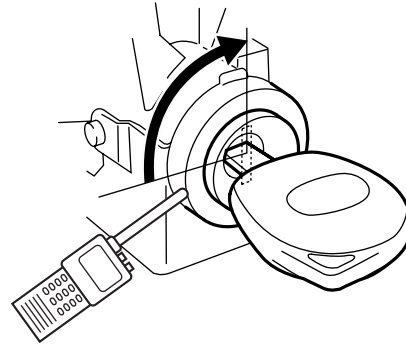
10C-2 Immobilizer Control System:

- Do not leave ignition key in a place where temperature is high. High temperature may cause damage to the transponder built in the ignition key.



I3RH0AA30003-01

- Do not turn ignition switch to ON position by bringing radio antenna close to coil antenna. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



I3RH0AA30004-01

General Description

Immobilizer Control System Introduction

S6RW0EA301001

The immobilizer control system is an anti-theft device that immobilizes the vehicle. It stops the engine from working and prevents the vehicle from being stolen. It mainly consists of the following components. For immobilizer control system components location, refer to “Immobilizer Control System Components Location”.

- ECM
- ICM with the built-in coil antenna
- Ignition key with the built-in transponder

A code called the transponder code is memorized in the transponder. And, the code is registered with ECM. Basically, when the ignition switch is turned ON, ECM reads the code by the coil antenna. Then, if the code in transponder in the ignition key does not match with the one registered with ECM, ECM stops the operation of the fuel injection so as not to start up the engine and turns the immobilizer indicator light ON and OFF using CAN communication lines. (In addition to the above operation, ECM also turns the immobilizer indicator light ON and OFF when some trouble is detected in the keyless start system.)

On-Board Diagnostic System Description (Self-diagnosis Function)

S6RW0EA301002

ECM diagnoses if there is any trouble with the immobilizer control system. The diagnostic information is stored as the diagnostic trouble code (DTC) in ECM. To read the diagnostic information, use SUZUKI scan tool referring to “DTC Check”.

With the ignition switch turned ON (but the engine at stop) regardless of the condition of the engine and emission control system, ECM indicates whether there is any trouble with the immobilizer control system or not by either lighting ON or flashing ON and OFF the immobilizer indicator light.

Immobilizer indicator light lights ON:

No trouble exists in the immobilizer control system. (After starting up the engine, the light turns OFF.)

Immobilizer indicator light flashes ON and OFF:

There is some trouble in the immobilizer control system or in the keyless start system. Its diagnostic information is stored in ECM.

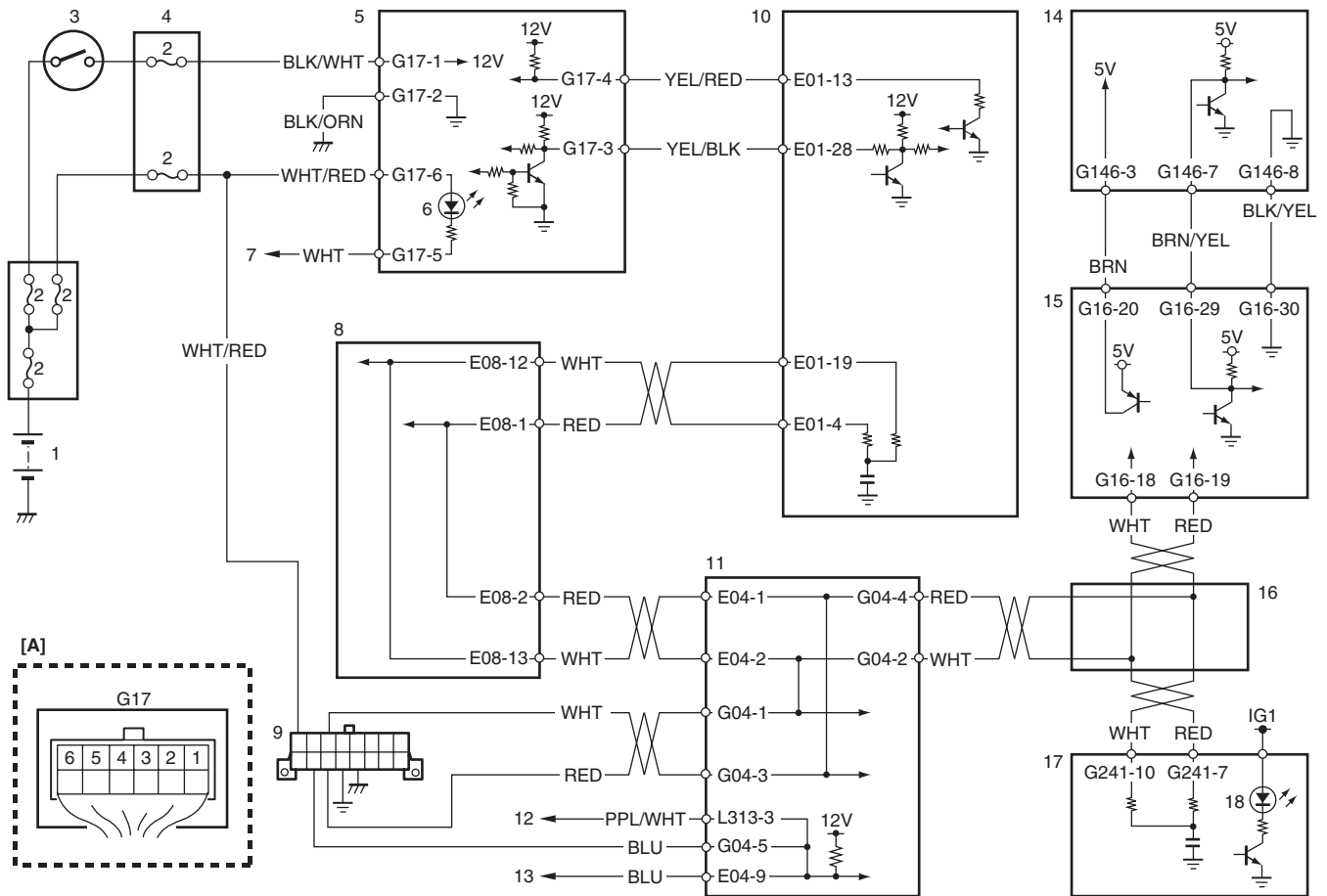
Schematic and Routing Diagram

Immobilizer Control System Wiring Circuit Diagram

S6RW0EA302001

NOTE

For more details about power supply circuit, ground wire circuit, and each circuit for ECM, BCM, ABS control module, keyless start control module and combination meter, refer to “System Circuit Diagram in Section 9A in related manual”.



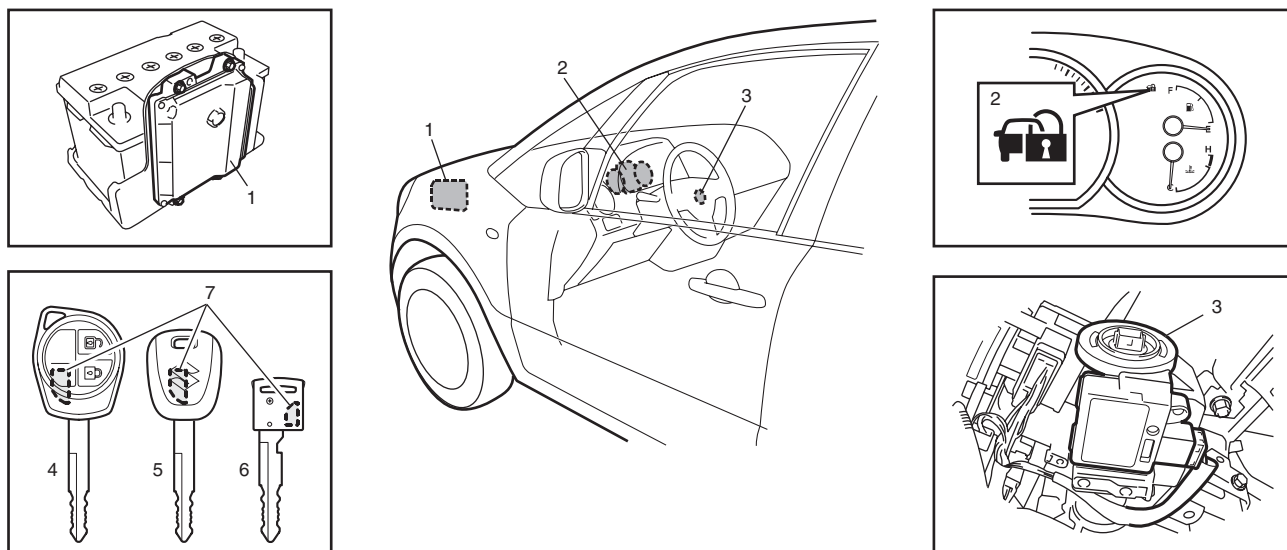
I6RW0CA30001-01

[A]: ICM connector (harness side view)	7. To BCM	14. Steering lock unit (keyless start model)
1. Battery	8. ABS control module	15. Keyless start control module (if equipped)
2. Fuse	9. DLC	16. CAN junction connector
3. Ignition switch	10. ECM	17. Combination meter
4. Junction block	11. BCM	18. Immobilizer indicator light
5. ICM	12. To SDM	
6. Illumination ring (if equipped)	13. To ABS control module	

Component Location

Immobilizer Control System Components Location

S6RW0EA303001



I6RW0BA30001-01

1. ECM	5. Ignition key (non keyless entry model)
2. Immobilizer indicator light	6. Ignition key (keyless start model)
3. ICM	7. Transponder
4. Ignition key (keyless entry model)	

Diagnostic Information and Procedures

Immobilizer Control System Check

S6RW0EA304001

Step	Action	Yes	No
1	Immobilizer indicator light check 1) Turn ignition switch to ON position using ignition key. <i>Does immobilizer indicator light come on?</i>	Go to Step 2.	Check if DTC P1636 and/or P1638 are detected by ECM referring to "DTC Check". If detected, go to applicable DTC diag. flow. If not detected, go to "Immobilizer Indicator Light Does Not Come ON with Ignition Switch ON and Engine Stop".
2	Immobilizer indicator light check <i>Does immobilizer indicator light flash on and off continuously in Step 1?</i>	Check ECM for DTC referring to "DTC Check". Then, go to applicable DTC diag. flow.	Go to Step 3.
3	Engine start check 1) Start engine using ignition key. <i>Does engine start?</i>	Go to Step 4.	Go to "Engine and Emission Control System Check in Section 1A".
4	Immobilizer indicator light check 1) Check if immobilizer indicator light remains ON after engine start. <i>Does immobilizer indicator light remains ON after engine start?</i>	Go to "Immobilizer Indicator Light Remains ON after Engine Start".	Immobilizer control system is in good condition. Then, go to "Keyless Start System Check in Section 10E" for keyless start model.

DTC Check

S6RW0EA304002

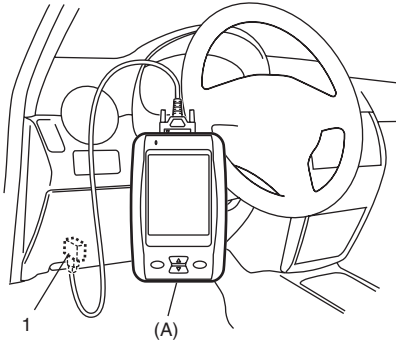
NOTE

To know how to use SUZUKI scan tool in detail, refer to its operator's manual.

- 1) Turn the ignition switch to OFF position.
- 2) Connect SUZUKI scan tool to data link connector (DLC) (1) located under instrument panel at driver's seat side.

Special tool

(A): SUZUKI scan tool (SUZUKI-SDT)



I5RW0CA30002-01

- 3) Turn the ignition switch to ON position.
- 4) Read DTC according to instructions displayed on SUZUKI scan tool and print them or write them down. Refer to scan tool operator's manual for details.
If communication between scan tool and ECM is not possible, go to "Troubleshooting for Communication Error with Scan Tool Using CAN in Section 1A".
- 5) After completing the check, turn ignition switch to OFF position, and then disconnect SUZUKI scan tool from DLC.

DTC Clearance

S6RW0EA304003

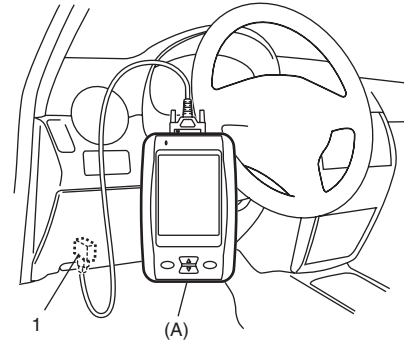
NOTE

To know how to use SUZUKI scan tool in detail, refer to its operator's manual.

- 1) Turn the ignition switch to OFF position,
- 2) Connect SUZUKI scan tool to data link connector (DLC) (1) located under instrument panel at driver's seat side.

Special tool

(A): SUZUKI scan tool (SUZUKI-SDT)



I5RW0CA30002-01

- 3) Turn the ignition switch to ON position.
- 4) Clear DTC(s) according to the instructions displayed on SUZUKI scan tool.
- 5) After completing the clearance, turn the ignition switch to OFF position, and then disconnect SUZUKI scan tool from DLC.

DTC Table

S6RW0EA304004

ECM

NOTE

ECM detects DTC. ICM does not.

DTC No.	Detecting Item	Detecting Condition	Immobilizer Indicator Light
P1614	Transponder response error	Transponder code in transponder built in ignition key cannot be read through ICM.	Flash
P1615	Steering lock unit communication error	- While registering the transponder code in the transponder built in the ignition key in ECM, the keyless start control module sent a signal to ECM indicating that the ID code could not be registered. - The ID code could not be registered in the keyless start control module or ECM.	Flash
P1616	Unregistered keyless start control module	ECM detects different ID codes registered in ECM and keyless start control module.	Flash
P1618	Keyless start control module CAN communication error	Reception error of communication data for keyless start control module is detected for longer than specified time continuously.	Flash
P1621	Immobilizer communication line error	Communication error between ICM and ECM.	Flash
P1622	EEPROM reading / writing error	EEPROM in ECM is corrupted.	Flash
P1623	Unregistered transponder	Transponder code in the transponder built in the ignition key is invalid.	Flash
P1625	Immobilizer antenna error	ICM is faulty.	Flash
P1636	Immobilizer information registration failure	Communication error between ECM and BCM.	No operation
P1638	Immobilizer information mismatched	- Communication error between ECM and BCM. - Wrong ECM or BCM is used.	No operation

NOTE

If any DTC other than the above DTCs is detected, refer to "DTC Table in Section 1A".

Scan Tool Data

Suzuki scan tool displays the following data using "Registration Information" mode.

Scan Tool Data (Registration Information Data)	Vehicle Condition	Normal Data
☞ Component ID	Ignition switch at ON position	****
☞ Keyfree System Code		Registered
☞ Remote Starter Code		Unregistered
☞ Number of the Registered Immobilizer Key		2 Keys
☞ Latest Year for the Key Registration		2006
☞ Latest Month for the Key Registration		June

Scan Tool Data Definitions

Component ID (****)

This parameter indicates the vehicle ID number of four digits used for the Suzuki scan tool.

Keyfree System Code (Keyless start control system ID code, Registered, Unregistered)

Registered: ID code of the keyless start system is registered in the ECM.

Unregistered: ID code of the keyless start system is unregistered in the ECM.

Remote Starter Code (Remote starter control system code, Registered, Unregistered)

Registered: Remote starter system is registered in the ECM.

Unregistered: Remote starter system is unregistered in the ECM.

Number of the Registered Immobilizer Key (0 – 4 keys)

The number of the transponder code in the transponder built in the ignition key that is registered with ECM.

NOTE

A maximum of four transponder codes can be registered with ECM. Therefore, the maximal value should be 4.

Latest Year for the Key Registration (2006 or Later)

The year in which the transponder code in the transponder built in the ignition key is registered with ECM.

Latest Month for the Key Registration (January-December)

The month in which the transponder code in the transponder built in the ignition key is registered with ECM.

Immobilizer Indicator Light Does Not Come ON with Ignition Switch ON and Engine Stop**Wiring Diagram**

Refer to “Immobilizer Control System Wiring Circuit Diagram”.

Circuit Description

When the ignition switch is turned ON, ECM transmits the indication ON signal to the combination meter to turn ON the immobilizer indicator light in case that there is not any problem with the immobilizer control system. Then, the combination meter turns ON the light. When the engine is started up, ECM transmits the indication OFF signal to the combination meter to turn OFF the light. Then, the combination meter turns OFF the immobilizer indicator light. However, in case that there is some trouble with the immobilizer control system, the immobilizer indicator light flashes ON and OFF when the ignition switch is turned ON.

Troubleshooting

Step	Action	Yes	No
1	Immobilizer indicator light power supply check 1) Turn the ignition switch to ON position. <i>Do other warning lights come ON?</i>	Go to Step 2.	Go to Step 4.
2	DTC check of ECM 1) Check ECM for DTC referring to “DTC Check in Section 1A”. <i>Is DTC U0073, U0101, U0121 and/or U0140 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	DTC check of BCM 1) Check BCM for DTC referring to “DTC Check in Section 10B in related manual”. <i>Is DTC U0073, U0100, U0101, U0155 and/or U1144 detected?</i>	Go to applicable DTC diag. flow.	Substitute a known-good combination meter and recheck. If immobilizer indicator light still remains OFF, substitute a known-good ECM and recheck.
4	Fuse check 1) Turn the ignition switch to OFF position. 2) Check fuse for combination meter circuit. <i>Is fuse blown?</i>	Replace blown fuse, and then check for short.	Go to Step 5.
5	Combination meter power supply wire circuit check 1) Remove combination meter referring to “Combination Meter Removal and Installation in Section 9C in related manual”. 2) Check for proper connection at terminals and wires of combination meter connector. 3) If OK, turn the ignition switch to ON position and measure voltage between power supply terminal of combination meter and vehicle body ground. Refer to “Combination Meter Circuit Diagram in Section 9C in related manual”. <i>Is it 10 – 14 V?</i>	Go to Step 6.	Repair open in power supply wire circuit.
6	Combination meter ground wire circuit check 1) Turn ignition switch OFF position. 2) Measure resistance between ground terminal of combination meter connector and vehicle body ground. Refer to “Combination Meter Circuit Diagram in Section 9C in related manual”. <i>Is resistance 1 Ω or less?</i>	Substitute a known-good combination meter and recheck. If still remains OFF, substitute a known-good ECM and recheck.	Repair open or high resistance in ground circuit.

Immobilizer Indicator Light Remains ON after Engine Start

S6RW0EA304007

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram".

Circuit Description

Refer to "Immobilizer Indicator Light Does Not Come ON with Ignition Switch ON and Engine Stop".

Troubleshooting

Step	Action	Yes	No
1	DTC check of ECM 1) Check ECM for DTC referring to "DTC Check in Section 1A". <i>Is DTC detected?</i>	Go to applicable DTC diag. flow.	Go to Step 2.
2	CAN communication circuit check 1) Disconnect connectors from ECM, BCM, ABS control module and combination meter. 2) Check CAN communication circuit for open, short and high resistance. - Between ECM and ABS control module - Between BCM and ABS control module - Between BCM and combination meter <i>Is each CAN communication circuit in good condition?</i>	Substitute a known-good combination meter and recheck. If immobilizer indicator light still remains ON, substitute a known-good ECM and recheck.	Repair circuit.

DTC P1614: Transponder Response Error

S6RW0EA304008

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram".

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Transponder code in transponder built in ignition key cannot be read through ICM.	- Use of ignition key without transponder - Use of unregistered ignition key - Corruption of transponder in ignition key - ICM - ECM

Troubleshooting

Step	Action	Yes	No
1	<i>Was "Immobilizer Control System Check" performed?</i>	Go to Step 2.	Go to "Immobilizer Control System Check".
2	DTC check of ECM 1) Check if any DTC other than P1614 is detected referring to "DTC Check". <i>Is DTC other than P1614 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	Registration of ignition key in use with ECM 1) Register ignition key in use with ECM referring to "Registration of the Ignition Key". <i>Was registration of ignition key completed?</i>	Recheck DTC.	Go to Step 4.
4	Registration of the spare ignition key 1) Register the spare ignition key with ECM referring to "Registration of the Ignition Key". <i>Was registration of spare ignition key completed?</i>	Replace ignition key which can not be registered.	Substitute a known-good ECM and recheck.

DTC P1615: Steering Lock Unit Communication Error**Wiring Diagram**

Refer to "Immobilizer Control System Wiring Circuit Diagram".

Circuit Description

When the transponder code in the ignition key is registered in ECM, the ID code is registered in both ECM and keyless start control module at the same time. This DTC is detected only in case that the ID code cannot be registered in both ECM and keyless start control module when the transponder code in the ignition key is registered in ECM.

NOTE

- Troubleshoot DTC P1618 first if both DTC P1615 and P1618 are detected at the same time.
- After replacing ECM, be sure to register the transponder code in the ignition key with ECM referring to "Registration of the Ignition Key". After replacing the keyless start control module of the vehicle equipped with the keyless start system, be sure to perform "Registration of the Ignition Key".

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
• While registering the transponder code in ECM, the keyless start control module sent a signal to ECM indicating that the ID code could not be registered. • The ID code could not be registered in the keyless start control module or ECM.	• Wire circuits between steering lock unit and keyless start control module • CAN communication circuit • Steering lock unit • Keyless start control module • Combination meter • TCM (if equipped) • 4WD control module (if equipped) • ABS control module • BCM • ECM

Troubleshooting

Step	Action	Yes	No
1	Was "Immobilizer Control System Check" performed?	Go to Step 2.	Go to "Immobilizer Control System Check".
2	Registration of ignition key 1) Register ignition key in use with ECM referring to "Registration of the Ignition Key". Was registration of ignition key completed?	Recheck ECM for DTC. If DTC P1615 is still detected, go to Step 3.	Go to Step 3.
3	DTC check of ECM 1) Check ECM for DTC referring to "DTC Check in Section 1A". Is DTC U0073, U0101, U0121 and/or U0140 detected?	Go to applicable DTC diag. flow.	Go to Step 4.
4	DTC check of keyless start control module 1) Check keyless start control module for DTC referring to "DTC Check in Section 10E". Is DTC detected?	Go to applicable DTC diag. flow.	Go to Step 5.
5	Check for communication circuit between steering lock unit and keyless start control module 1) Check for open, short, and high resistance in steering lock unit circuit. Refer to Step 2 in "DTC No. 11: Communication Error with Steering Lock Unit in Section 10E". Is each circuit in good condition?	Go to Step 6.	Repair malfunction part and recheck.

Step	Action	Yes	No
6	Steering lock unit power supply check 1) Connect keyless start control module connector. 2) With ignition switch at ON position, check power supply terminal voltage of steering lock unit connector. Refer to "Keyless Start Control Module Power and Ground Circuit Check in Section 10E". <i>Is voltage 4 – 6 V?</i>	Replace steering lock unit and recheck.	Substitute a known-good keyless start control module and recheck. If DTC P1615 is still detected, substitute a known-good ECM and recheck.

DTC P1616: Unregistered Keyless Start Control Module

S6RW0EA304010

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram".

Circuit Description

P1616 is detected when ECM detects different ID codes registered in ECM and keyless start control module after turning engine start knob to ON position. Normally, when keyless start control module is replaced with new one, ECM automatically registers the applicable code in keyless start control module after turning ignition switch to ON position. However, when keyless start control module is replaced with used one, ECM does not automatically register the applicable code in keyless start control module even if ignition switch is turned to ON position.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
ECM detects different ID codes registered in ECM and keyless start control module.	• Keyless start system wire circuit • Keyless start control module • ECM

Troubleshooting

Step	Action	Yes	No
1	<i>Was "Immobilizer Control System Check" performed?</i>	Go to Step 2.	Go to "Immobilizer Control System Check".
2	Registration of the ignition key 1) Register the ignition key with ECM referring to "Registration of the Ignition Key". <i>Was registration of ignition key completed?</i>	Recheck ECM for DTC.	Go to Step 3.
3	DTC check of ECM 1) Check DTC referring to "DTC Check". <i>Is DTC P1618 and/or P1615 detected other than P1616?</i>	Go to DTC P1618 troubleshooting.	Go to DTC P1615 troubleshooting.

DTC P1618: Keyless Start Control Module CAN Communication Error

S6RW0EA304011

Refer to "Troubleshooting for CAN-DTC in Section 1A".

DTC P1621: Immobilizer Communication Line Error

S6RW0EA304012

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram".

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Communication error between ICM and ECM.	• Related fuse(s) blown • Poor connection at ICM connector • Poor connection at ECM connector • Power supply circuit • Ground circuit • Communication circuits between ICM and ECM • ICM • ECM

Troubleshooting

Step	Action	Yes	No
1	Was "Immobilizer Control System Check" performed?	Go to Step 2.	Go to "Immobilizer Control System Check".
2	Fuse check 1) Check fuse for ICM circuit. <i>Is fuse in good condition?</i>	Replace blown fuse(s) and then, check for short circuit.	Go to Step 3.
3	Voltage check at power and ground terminal 1) Check power and ground terminal voltage of ICM connector referring to "Inspection of ICM and Its Circuit". <i>Is each terminal voltage in good condition?</i>	Go to Step 4.	Repair circuit.
4	ICM and ECM connector check 1) With the ignition switch at OFF position, check intermittent and poor connection of ICM connector and ECM connectors referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". <i>Is each connector in good condition?</i>	Go to Step 5.	Repair poor connection.
5	Communication circuit check between ICM and ECM 1) Check for open, short and high resistance in serial communication and clock circuit between ICM and ECM. <i>Is each communication circuit in good condition?</i>	Substitute a known-good ICM and recheck. If DTC P1621 is still detected, substitute a known good ECM and recheck.	Repair circuit.

DTC P1622: EEPROM Reading / Writing Error

S6RW0EA304013

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
EEPROM in ECM is corrupted.	Internal failure (EEPROM corruption) of ECM

Troubleshooting

- 1) Clear DTC(s) referring to "DTC Clearance".
- 2) Turn the ignition switch to OFF position.
- 3) Check if DTC P1622 is still detected referring to "DTC Check". If still detected, go to the next step. If not, the troubleshooting is completed.
- 4) Replace ECM with new one referring to "Engine Control Module (ECM) Removal and Installation in Section 1C".
- 5) Perform "Procedure after ECM Replacement".

DTC P1623: Unregistered Transponder

S6RW0EA304014

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram".

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Transponder code in the transponder built in the ignition key is invalid.	• Use of the unregistered ignition key • ICM • ECM

Troubleshooting

Step	Action	Yes	No
1	Was "Immobilizer Control System Check" performed?	Go to Step 2.	Go to "Immobilizer Control System Check".
2	DTC check of ECM 1) Check if any DTC other than P1623 is detected referring to "DTC Check". <i>Is DTC other than P1623 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	Registration of unregistered ignition key with ECM 1) Register the unregistered ignition key with ECM referring to "Registration of the Ignition Key". <i>Was registration of ignition key completed?</i>	Recheck DTC.	Go to Step 4.
4	Registration of the spare ignition key 1) Register the spare ignition key referring to "Registration of the Ignition Key". <i>Was registration of spare ignition key completed?</i>	Replace ignition key which cannot be registered.	Substitute a known-good ECM and recheck.

DTC P1625: Immobilizer Antenna Error

S6RW0EA304015

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram".

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
ICM is faulty.	• ICM • ECM

10C-14 Immobilizer Control System:

Troubleshooting

Step	Action	Yes	No
1	Was "Immobilizer Control System Check" performed?	Go to Step 2.	Go to "Immobilizer Control System Check".
2	DTC confirmation 1) Clear DTC referring to "DTC Clearance". 2) Turn the ignition switch to OFF position. 3) Check DTC referring to "DTC Check". <i>Is DTC P1625 still detected?</i>	Substitute a known-good ICM and recheck DTC. If DTC P1625 is still detected, substitute a known-good ECM and recheck.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".

DTC P1636: Immobilizer Information Registration Failure

S6RW0EA304016

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram".

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
The registration of the immobilizer control system information in ECM is failed.	• CAN communication circuit • Keyless start control module (if equipped) • Combination meter • TCM (A/T model) • 4WD control module (if equipped) • ABS control module • BCM • ECM

Troubleshooting

Step	Action	Yes	No
1	Was "Immobilizer Control System Check" performed?	Go to Step 2.	Go to "Immobilizer Control System Check".
2	DTC check of ECM 1) Check ECM for DTC referring to "DTC Check in Section 1A". <i>Is DTC U0073, U0101, U0121 and/or U0140 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	DTC check of BCM 1) Check BCM for DTC referring to "DTC Check in Section 10B in related manual". <i>Is DTC U0073, U0100, U0101, U0155 and/or U1144 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 4.
4	CAN communication circuit check 1) Disconnect connectors from ECM, BCM and ABS control module. 2) Check CAN communication circuit for open, short and high resistance. • Between ECM and ABS control module • Between BCM and ABS control module <i>Is each CAN communication circuit in good condition?</i>	Go to Step 5.	Repair circuit.

Step	Action	Yes	No
5	Replacement of BCM 1) Replace BCM with new one referring to "BCM (Included in Junction Block) Removal and Installation in Section 10B in related manual". 2) Check ECM for DTC referring to "DTC Check". <i>Is DTC P1636 still detected?</i>	Substitute a known-good ECM and recheck.	BCM faulty.

DTC P1638: Immobilizer Information Mismatched

S6RW0EA304017

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram".

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
- The immobilizer control system information in ECM and the one in BCM does not match. - The registration of the immobilizer control system information in ECM is failed.	- Use of the wrong ECM - CAN communication circuit - Keyless start control module (if equipped) - Combination meter - TCM (A/T model) 4WD control module (if equipped) - ABS control module - BCM - ECM

Troubleshooting

Step	Action	Yes	No
1	<i>Was "Immobilizer Control System Check" performed?</i>	Go to Step 2.	Go to "Immobilizer Control System Check".
2	DTC confirmation 1) Disconnect negative (–) cable from battery for more than 5 seconds. 2) Connect negative (–) cable to battery. 3) Check if any DTC is detected referring to "DTC Check". <i>Is DTC P1638 still detected?</i>	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual".
3	ECM specification check 1) Check ECM part number to see if ECM is applicable to the vehicle in service. <i>Is a correct ECM used for the vehicle in service?</i>	Go to Step 4.	Replace ECM with the correct one and recheck if DTC P1638 is still detected by ECM.
4	DTC check of ECM 1) Check ECM for DTC referring to "DTC Check in Section 1A". <i>Is DTC U0073, U0101, U0121 and/or U0140 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 5.
5	DTC check of BCM 1) Check BCM for DTC referring to "DTC Check in Section 10B in related manual". <i>Is DTC U0073, U0100, U0101, U0155 and/or U1144 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 6.

10C-16 Immobilizer Control System:

Step	Action	Yes	No
6	CAN communication circuit check 1) Disconnect connectors from ECM, BCM and ABS control module. 2) Check CAN communication circuit for open, short and high resistance. • Between ECM and ABS control module • Between BCM and ABS control module <i>Is each CAN communication circuit in good condition?</i>	Go to Step 7.	Repair circuit.
7	Replacement of BCM 1) Replace BCM with new one referring to "BCM (Included in Junction Block) Removal and Installation in Section 10B in related manual". 2) Check ECM for DTC referring to "DTC Check". <i>Is DTC P1638 still detected?</i>	Substitute a known-good ECM and recheck.	BCM faulty.

Inspection of ICM and Its Circuit

S6RW0EA304018

ICM and its circuit can be checked at ICM wiring connector by measuring voltage.

CAUTION

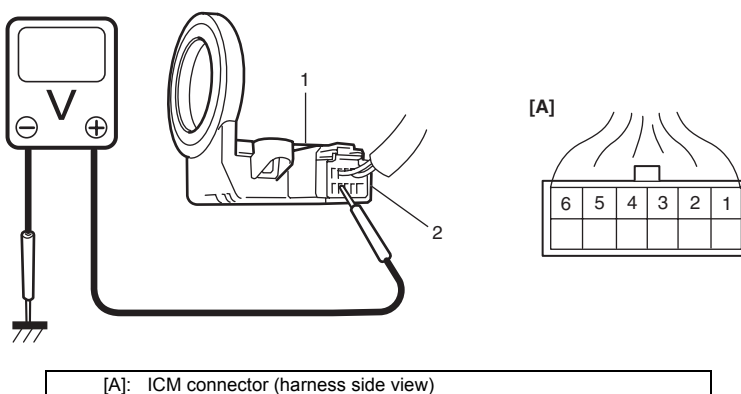
ICM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ICM with connector disconnected from it.

Voltage Check

- 1) Remove ICM (1) from steering lock assembly or steering lock unit referring to "ICM Removal and Installation".
- 2) Connect ICM connector (2) to ICM.
- 3) Check voltage at each terminal.

NOTE

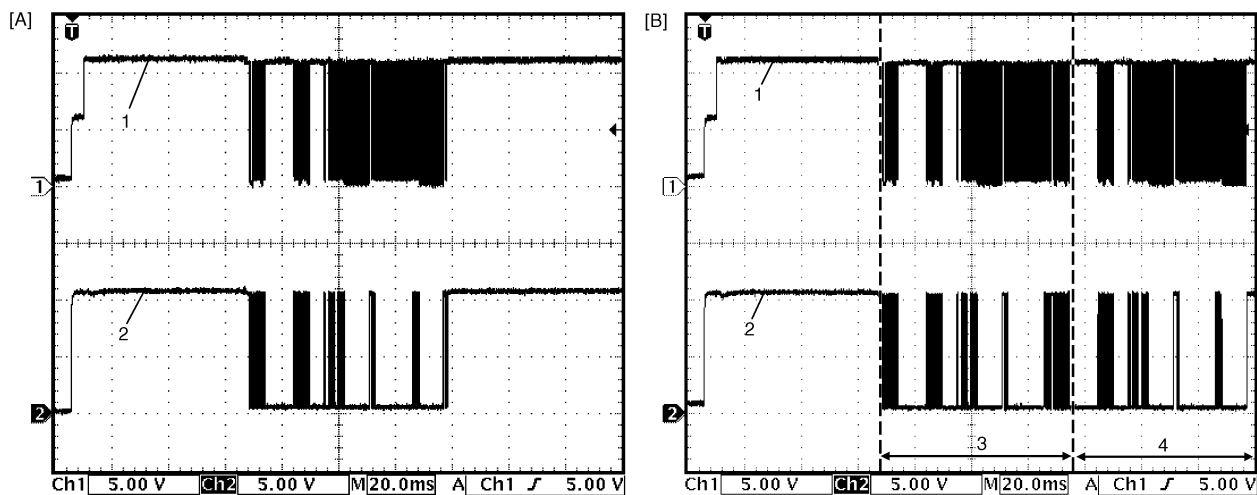
As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when the ignition switch is turned to ON position.



I6RW0BA30003-01

Terminal	Circuit	Normal Voltage	Condition
G17-1	Power supply	About 12.0 V	Ignition switch at ON position
		0.0 V	Ignition switch at OFF position
G17-2	Ground	0.0 V	—
G17-3	Serial communication line	See the reference waveform.	—
		0.0 V	Ignition switch at OFF position
G17-4	Clock line	See the reference waveform.	—
		0.0 V	Ignition switch at OFF position
G17-5	Illumination ring control (if equipped)	0 V	- Ignition key not inserted to the key cylinder - Door opened
		0 V → 12 V	- Ignition key at OFF position - From the time door is closed to the time interior light faded out completely (As the interior light fades out, the voltage increases.)
		0 V → 12 V	- Door closed - From the ignition switch is turned ON to the time interior light is completely faded out (As the interior light fades out, the voltage increases.)
G17-6	Illumination ring power supply (if equipped)	About 12.0 V	—

Reference Waveform



I6RW0CA30003-01

[A]: The transponder code read successfully at the first try.	2. Clock line
[B]: The transponder code read successfully at the second try.	3. First try
1. Serial communication line	4. Second try

NOTE

When ECM cannot read the transponder code at the first try, ECM tries to read the transponder code repeatedly up to 8 times. The second waveform is the example showing that ECM read the transponder code successfully at the second try.

Measurement terminals	CH1: G17-3 to G17-2 CH2: G17-4 to G17-2
Oscilloscope settings	CH1: 5 V/DIV CH2: 5 V/DIV TIME: 20 ms
Measurement condition	Right after the ignition switch is turned ON, the waveform can be read.

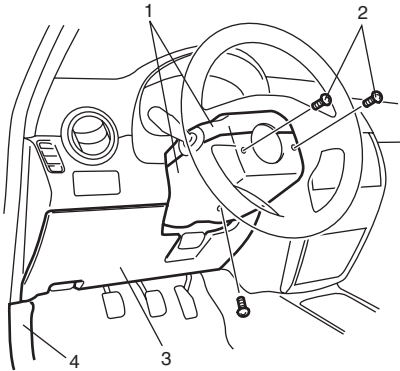
Repair Instructions

ICM Removal and Installation

S6RW0EA306001

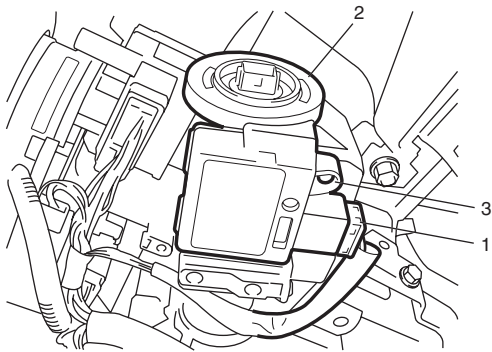
Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove dash side trim (4) and steering column hole cover (3).
- 3) Remove steering column covers (1).
Turn steering wheel to access steering column cover screws (2).



I6RW0BA30004-01

- 4) Remove engine start knob (keyless start model).
- 5) Disconnect connector (1) from ICM (2).
- 6) Remove a screw (3) from ICM.



I4RS0BA30007-03

- 7) Remove ICM from steering lock assembly or steering lock unit.

NOTE

The antenna part of ICM is fragile. Therefore, do not add strong power to the part or twist the part.

Installation

Reverse the removal procedure.

Registration of the Ignition Key

S6RW0EA306002

To finish the registration of the ignition key, the transponder code memorized in the transponder built in the ignition key has to be registered with ECM. To register the transponder code with ECM, perform "Immobilizer Key Registration" mode of SUZUKI scan tool referring to "SUZUKI scan tool Operator's Manual".

NOTE

- A maximum of four transponder codes can be registered with ECM.
- At an early part of the registration process, all transponder codes of the ignition keys in use already registered with ECM are cleared. Therefore, before starting the registration, prepare all ignition keys in use in addition to the new ignition key(s) to be registered with ECM.

Procedure after ECM Replacement

S6RW0EA306003

After ECM is replaced with new one or used one, the transponder code in the transponder built in the ignition key has to be registered with ECM. To register transponder code in the ignition key with ECM, perform "Immobilizer Key Registration" mode of SUZUKI scan tool referring to "SUZUKI scan tool Operator's Manual".

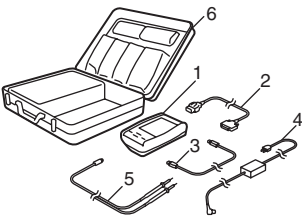
NOTE

A maximum of four transponder codes can be registered with ECM.

Special Tools and Equipment

Special Tool

S6RW0EA308001

SUZUKI scan tool (SUZUKI-SDT) — This kit includes following items. 1. SUZUKI-SDT 2. DLC3 cable 3. USB cable 4. AC/DC power supply 5. Voltage meter probe 6. Storage case  / 	

Keyless Start System

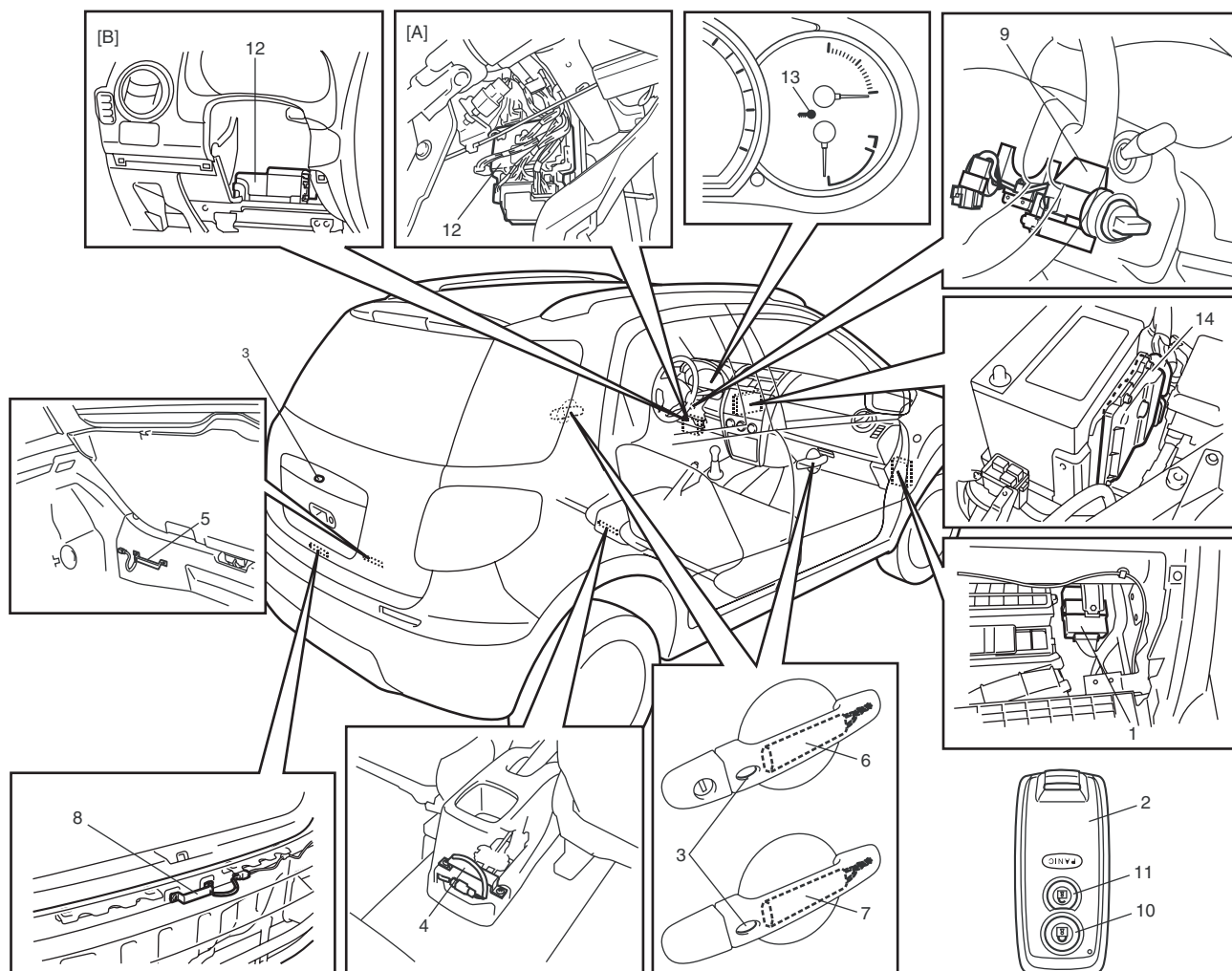
General Description

Keyless Start System Description

S6RW0EA501001

Keyless start system consisting of the parts shown below has three functions as described below.

- **Keyless engine start function:**
With the remote controller which has been registered in the keyless start control module carried with oneself, the engine can be started without using the ignition key.
- **Door lock function:**
Pushing the request switch incorporated in the outside handle of the driver side door, passenger side door or rear end door while carrying the remote controller which has been registered in the keyless start control module, doors can be locked or unlocked.
- **Keyless entry system function:**
It is possible to lock or unlock doors by pushing the lock or unlock button of remote controller.
The keyless start control module can accept registration of up to four remote controllers.



I6RW0DA50001-01

[A]: Junction block with BCM type	5. Luggage room antenna	11. Unlock button
[B]: Junction block without BCM type	6. Driver side door antenna	12. BCM
1. Keyless start control module	7. Passenger side door antenna	13. Key indicator light
2. Remote controller	8. Rear end door antenna	14. ECM
3. Request switch	9. Steering lock unit	
4. Center antenna	10. Lock button	

Parts and Functions

S6RW0EA501002

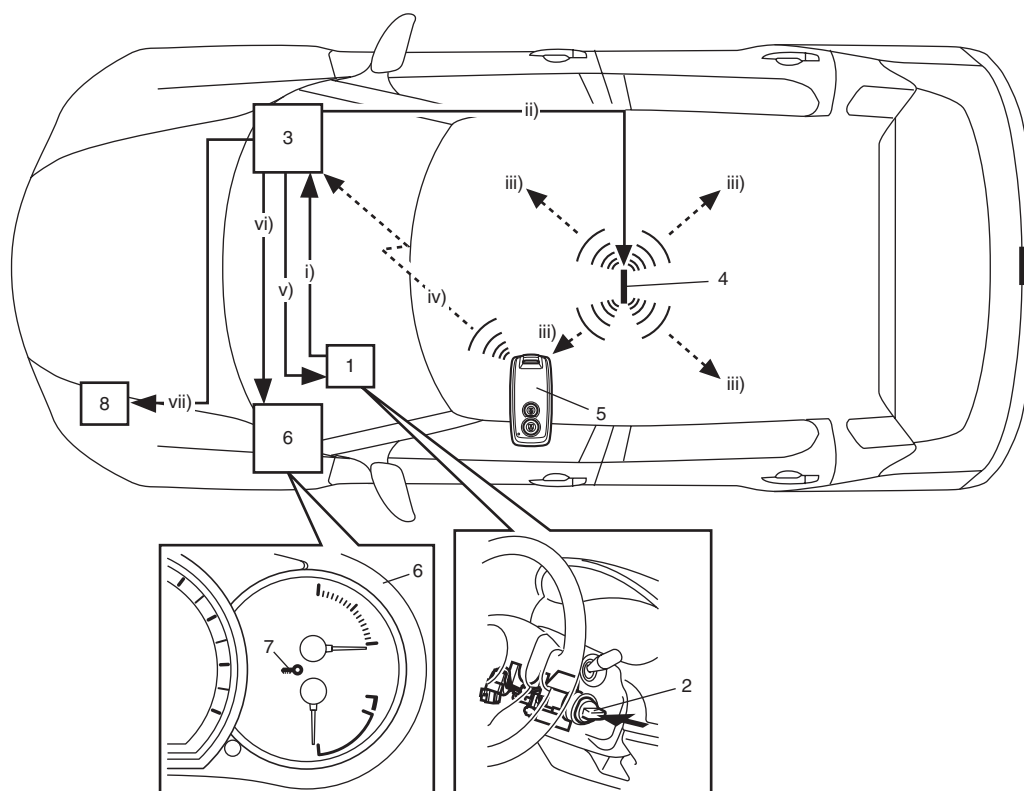
Parts	Function
Keyless start control module	• Activates each antenna • Verifies ID code of remote controller • Requests steering lock unit to release steering lock • Requests BCM to lock or unlock doors • Controls key indicator light in combination meter • Transmits its ID code to ECM
Remote controller	• Receives request signal from each antenna • Transmits ID code and request signal to keyless start control module • Request keyless start control module to lock or unlock doors (keyless entry system function)
Request switch	• Requests keyless start control module to activate each antenna
Center antenna	• Transmits request signal to remote controller
Luggage room antenna	• Transmits request signal to remote controller
Driver side door antenna	• Transmits request signal to remote controller
Passenger side door antenna	• Transmits request signal to remote controller
Rear end door antenna	• Transmits request signal to remote controller
Steering lock unit	• Releases steering lock
Unlock button	• Transmits door unlock request signal (keyless entry system function)
Lock button	• Transmits door lock request signal (keyless entry system function)
BCM	• Controls each door lock actuator • Controls warning buzzer • Lights hazard warning light and interior (DOME) light (answer back)
Key indicator light	• Indicates operation state of keyless start system (indicates check result of remote controller ID code)
ECM	• Checks keyless start control module ID code • Transmits its ID code to keyless start control module • Starts engine

Keyless Engine Start Function

When the ignition knob switch (2) installed to the steering lock unit (1) is pushed, the keyless start control module (3) activates the center antenna (4) to send out the request signal in the vehicle compartment. When the remote controller (5) receives the request signal from the center antenna, it transmits the ID code to the keyless start control module. The keyless start control module compares the ID code sent by the remote controller with the ID code registered in the keyless start control module. When these ID codes match, the keyless start control module makes the key indicator light (7) in the combination meter (6) light in blue and unlocks the steering lock unit to enable the ignition knob switch to turn. When the ignition knob switch is turned to ON position in this state, ID codes of ECM and keyless start control module are compared through CAN communication (immobilizer function). When they match, turning the ignition knob switch to start position will start the engine.

NOTE

When ignition knob switch is at ACC or ON position (engine not running) and any door has been kept open for a certain time, it may happen that engine fails to start. In such a case, turn ignition knob switch to OFF position once and then try to start engine again.



[A]: i) ~ vii)

[A]: Signal flow	8. ECM

I5RW0AA50002-03

When the ID code from the remote controller and the ID code registered in the keyless start control module do not match or when the remote controller is outside the operation area of the remote controller and the ignition knob switch is pushed, the steering lock unit cannot be unlocked and so the ignition knob switch cannot be turned. Then, the keyless start control module makes the key indicator light in the combination meter light in red to warn the driver that it is not possible to turn the ignition knob switch.

In case of vehicle equipped with immobilizer control system, when the ID code of ECM and that of the keyless start control module do not match, the engine cannot be started even if the ignition knob switch is turned to the start position. Then ECM makes the immobilizer indicator light in the combination meter flash to warn the driver that it is not possible to start the engine.

S6RW0EA501004

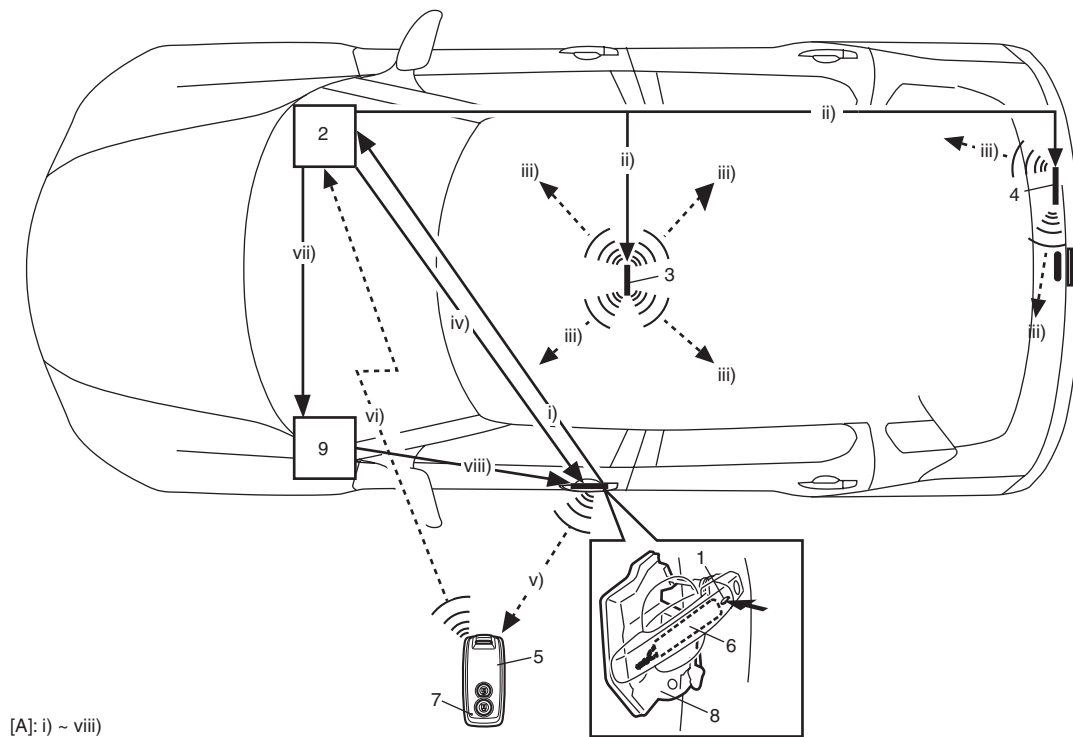
Door Lock Function of Keyless Start System

When the request switch (1) incorporated in the outside handle of the driver side door, front passenger side door or rear end door is pushed, the keyless start control module (2) activates the center antenna (3) and luggage room antenna (4) to send out the radio wave in the vehicle compartment to check if the remote controller (5) is in the vehicle compartment or not. When the keyless start control module receives no signal from the remote controller (i.e., the remote controller does not exist in the vehicle compartment), it activates the antenna (6) of the door of which the request switch has been pushed to send the request signal out of the compartment.

If the remote controller exists within the door lock operation area, it receives the request signal sent from the above said antenna, sends the ID code of the remote controller and the request signal to the keyless start control module and at the same time, it makes the operation indicator light (7) of the remote controller light up. Lighting of the operation indicator light indicates that the remote controller sent the ID code and the request signal.

The keyless start control module compares the ID code sent from the remote controller with the ID code registered in the keyless start control module. If both ID codes match, the keyless start control module outputs the lock or unlock request signal (depending on the door lock switch (8) state then) to BCM (9). When BCM receives such signal through CAN communication from the keyless start control module, it activates the door lock actuator to lock or unlock doors. When the keyless start control module receives a signal from the remote controller (i.e., the remote controller exists in the vehicle compartment), the function of the keyless start system to prevent the remote controller from being closed in the vehicle works and the keyless start control module sends a request signal to unlock doors to BCM. In this way, doors are kept unlocked.

Also, when the driver or passenger has left the vehicle with the remote controller left behind in the vehicle compartment and locked doors by using the door lock knob or manual door lock switch, the function to prevent the remote controller from being closed in the vehicle works to unlock doors.



[A]: i) ~ viii)

[A]: Signal flow

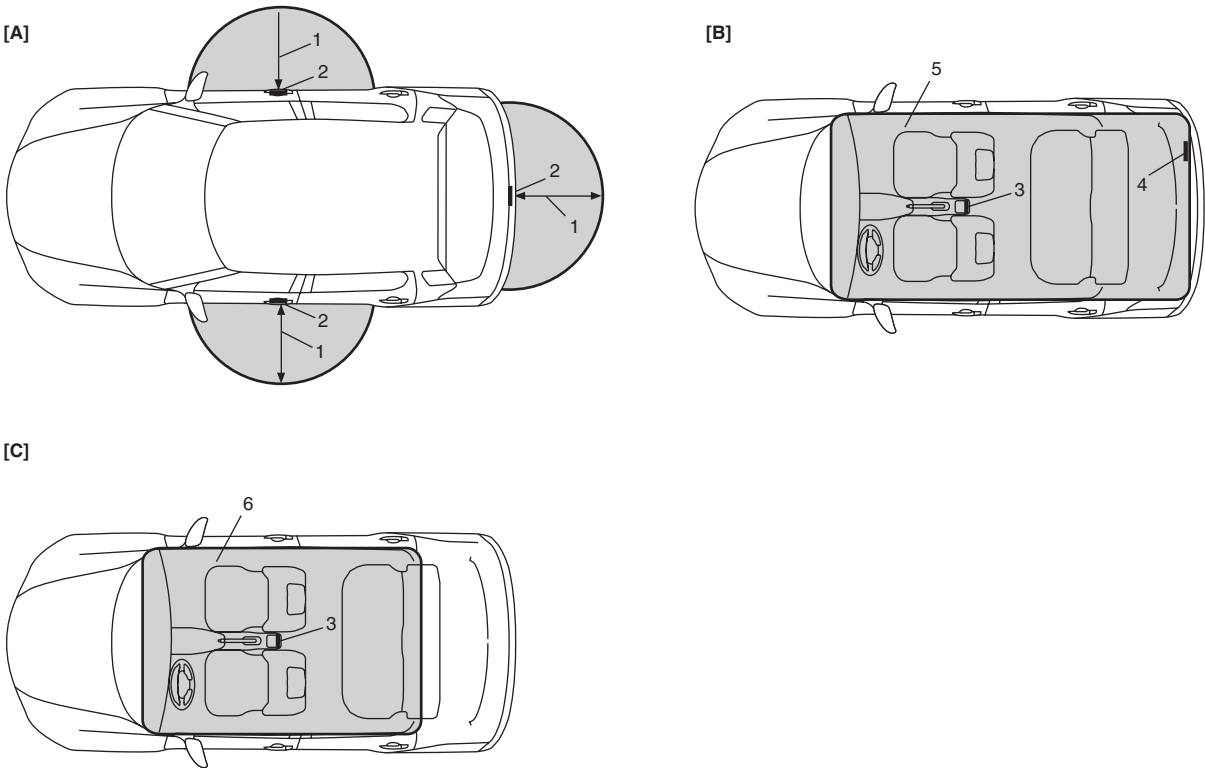
I5RW0AA50003-03

Furthermore, when ID codes of the remote controller and keyless start control module do not match or the remote controller exists outside of the operation area, doors are not locked or unlocked even if the request switch of the outside handle is operated.

Operation Area of Remote Controller

S6RW0EA501005

Shown below are the operation areas of the remote controller for the keyless engine start function and door lock function of the keyless start system.



I5RW0AA50004-04

[A]: Door lock function of keyless start system	3. Center antenna
[B]: Function of keyless start system to prevent remote controller from being closed in vehicle compartment	4. Luggage room antenna
[C]: Keyless engine start function	5. Vehicle compartment including luggage room
1. About 80 cm (31.5 in, 2.6 ft)	6. Vehicle compartment excluding luggage room
2. Each door antenna	

However, even when the remote controller is within the operation area as shown above, there are cases where the keyless start system doesn't work under certain conditions as described below. And when the keyless engine start function doesn't work, the key indicator light in the combination meter may light up.

- Doors cannot be locked or unlocked using the door lock function of keyless start system when:
 - The remote controller which has been registered in the keyless start control module and another un-registered one are both carried at the same time
 - The remote controller is kept in some metallic container which disturb radio wave transmission/reception
 - One of doors is open
 - The ignition key is inserted in the ignition key cylinder
- The function of the keyless start system to prevent the remote controller from being closed in the vehicle compartment doesn't work when:
 - The remote controller is in the door pocket or in the glove box
 - The remote controller is kept in some metallic container which disturb radio wave transmission/reception
 - The remote controller is placed close to outside of the vehicle compartment (such as on the instrument panel beside the front window shield glass, on the rear parcel shelf or in a corner of the luggage room)

- The ignition knob switch cannot be turned using the keyless engine start function fails to turn:
 - The remote controller which has been registered in the keyless start control module and another un-registered one are both carried at the same time
 - The remote controller is kept in some metallic container which disturbs radio wave transmission/reception
 - The ignition knob switch has been pushed for 5 seconds or longer
 - The remote controller is placed close to outside of the vehicle compartment (such as on the instrument panel beside the front window shield glass, on the rear parcel shelf or in a corner of the luggage room)

Alarm Function

S6RW0EA501006

Under conditions as described in the table below, the keyless start control module makes the key indicator light flash in red and the buzzer sound to call the driver's attention.

Condition	Buzzer operation	Key indicator light operation
Ignition knob switch has stopped between ACC and OFF positions while driver side door is opened (ignition knob switch un-returned alarm)	Intermittent	—
Ignition switch has stopped between ACC and OFF positions while driver side door is closed (ignition knob switch un-returned alarm)	2 times	Flashing in red
Remote controller is carried out of vehicle and doors are closed while ignition switch is at ON position (remote controller carried-out alarm)	5 times	Flashing in red
Remote controller is carried out of vehicle through a window without opening door while ignition switch is at ON position (engine is running) and vehicle has been driven at 10km/h (6 MPH) or more speed without remote controller in vehicle compartment (the first time 10 km/h (6 MPH) speed is exceeded only) (Remote controller carried-out alarm)	5 times	Flashing in red

CAN Communication System Description

S6RW0EA501007

Refer to "CAN Communication System Description in Section 1A" for CAN communication system description. Keyless start control module communicates control data with each control module as follows.

Keyless Start Control Module Transmission Data

				ECM	BCM	Combination Meter
Keyless Start Control Module		DATA	ID code of keyless start control module	○		
			ECM-keyless start control module code	○		
			Ignition knob switch signal		○	
			Door lock/unlock request signal		○	
			Buzzer request signal		○	
			Answer back request signal		○	
			Panic alarm request signal		○	
			Key indicator light control signal			○

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10E-7 Keyless Start System:

Keyless Start Control Module Reception Data

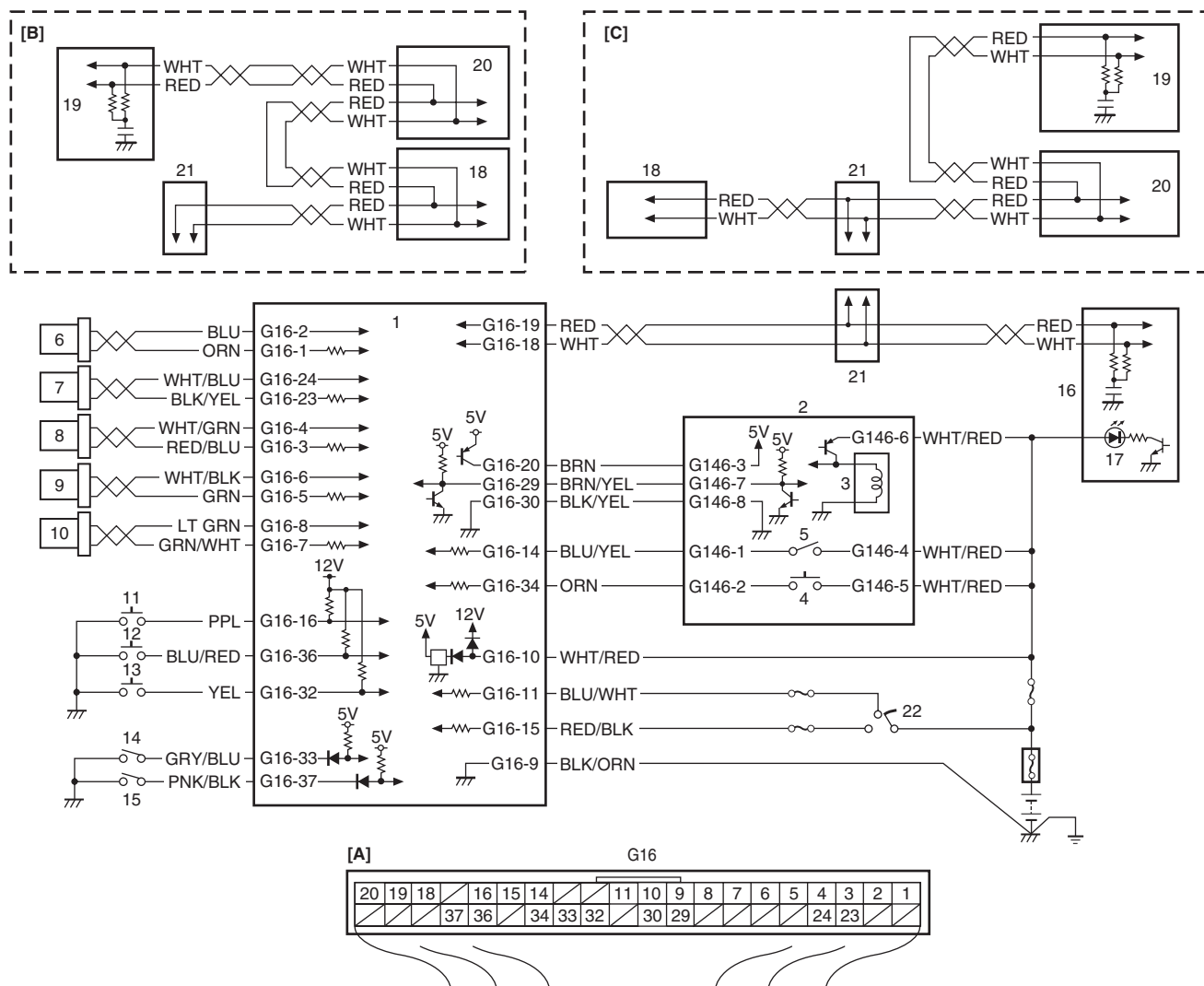
Keyless Start Control Module	Receive	DATA		ECM	BCM
			Vehicle speed signal	○	
			ECM-keyless start control module code	○	
			Door switch status		○
			Door lock status		○
			Charging system signal		○
			Engine oil pressure switch signal		○

I5RW0CA50001-02

Schematic and Routing Diagram

Keyless Start System Electric Wiring Circuit Diagram

S6RW0EA502001



I6RW0DA50002-01

[A]: Keyless start control module connector (viewed from harness side)	7. Passenger side door antenna	16. Combination meter
[B]: Junction block with BCM type	8. Rear end door antenna	17. Key indicator light
[C]: Junction block without BCM type	9. Center antenna	18. BCM
1. Keyless start control module	10. Luggage room antenna	19. ECM
2. Steering Lock unit	11. Driver side door request switch	20. ABS control module
3. Steering lock solenoid	12. Passenger side door request switch	21. CAN junction connector

4. Ignition knob switch	13. Rear end door request switch	22. Ignition Switch
5. Key reminder switch	14. Driver side door lock switch	
6. Driver side door antenna	15. Passenger side door lock switch	

Diagnostic Information and Procedures

Precautions in Diagnosing Troubles

S6RW0EA504001

- The keyless start system executes data transmission/reception by means of the radio wave. Therefore, proper operation may not be obtained if use of the door lock function and engine start function of the keyless start system is attempted near the place where strong radio wave is emitted (TV and radio broadcasting stations, etc.).
- Diagnostic information stored in keyless start control module memory can be checked only by key indicator light.
- Be sure to use the trouble diagnosis procedure as described in "Keyless Start System Check". Failure to follow it may result in incorrect diagnosis. (Some other DTC may be stored by mistake in the memory of keyless start control module during inspection.)
- Be sure to read "Precautions for Electrical Circuit Service in Section 00 in related manual" before inspection and observe what is written there.
- Communication of ECM, TCM (A/T model), BCM, ABS control module, 4WD control module (if equipped), keyless start control module and combination meter is established by CAN (Controller Area Network). (For detail of CAN communication for keyless start control module, refer to "CAN Communication System Description"). Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System in Section 00 in related manual".
- Replacement of the keyless start control module
When keyless start control module is replaced with new one, make sure that register remote controller ID code to keyless start control module correctly according to "Registration Procedure for Remote Controller ID Code".

- Keyless start control module substitution
When the keyless start control module used in another vehicle was installed in the vehicle being serviced, register the ID code of the remote controller to the keyless start control module first and then the following code.
 - With immobilizer control system, register the ignition key transponder code for the immobilizer control system in ECM. For registration procedure of that, refer to "Registration of the Ignition Key in Section 10C".
 - Without immobilizer control system, register the steering lock unit ID code in keyless start control module. For registration procedure of that, refer to "Keyless Start Registration".

Self-Diagnosis Function

S6RW0EA504002

The keyless start control module has self-diagnosis function to monitor the system components and circuits while the keyless start system is at work. When the keyless start control module detects an abnormality in the system, it saves the area where such abnormality has occurred as a DTC in its memory. The DTC stored in memory of the keyless start control module is indicated by the key indicator light in the combination meter flashing in a specific pattern. For DTC indication, refer to "DTC Check" and for the clearing procedure, to "DTC Clearance".

Keyless Start System Diagnosis Introduction

S6RW0EA504003

To ensure that the trouble diagnosis is done accurately and smoothly, observe "Precautions in Diagnosing Troubles" and follow "Keyless Start System Check".

Keyless Start System Check

S6RW0EA504004

Step	Action	Yes	No
1	1) Record details of the problem. For your record, use of a questionnaire form will facilitate collecting information for proper analysis and diagnosis. 2) Check if the problem described in "Customer Questionnaire (Example)" actually occurs in the vehicle. (This step should be performed with the customer if possible.) Perform "Keyless Start System Operation Inspection" procedure to check if the symptom which has occurred is abnormal or not. 3) Check for DTC referring to "DTC Check", and then record DTC(s). 4) Clear DTC referring to "DTC Clearance" if any DTC exists, and then recheck for DTC. <i>Is any DTC still detected?</i>	Go to Step 2.	Go to Step 3.
2	1) Check and repair referring to applicable "DTC Table". <i>Are check and repair complete?</i>	Go to Step 5.	Check and repair malfunction part(s), and go to Step 5.
3	1) Inspect and repair basic parts referring to "Keyless Start System Symptom Diagnosis". <i>Is there faulty condition?</i>	Repair or replace malfunction part(s), and go to Step 5.	Go to Step 4.
4	1) Check for intermittent problems referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual". <i>Is there any faulty condition?</i>	Repair or replace malfunction part(s), and go to Step 5.	Go to Step 5.
5	1) Confirm if the problem is solved and the keyless start system is free from any abnormal conditions. If what has been repaired is related to the DTC, clear the DTC once and then confirm that no DTC is indicated. <i>Is there any problem symptom, DTC or abnormal condition?</i>	Go to 2) of Step 1 and perform trouble diagnosis again.	End.

Customer Questionnaire (Example)

S6RW0EA504005

Customer's name:	Model:	VIN:	
Date of issue:	Date Reg:	Date of problem:	Mileage:

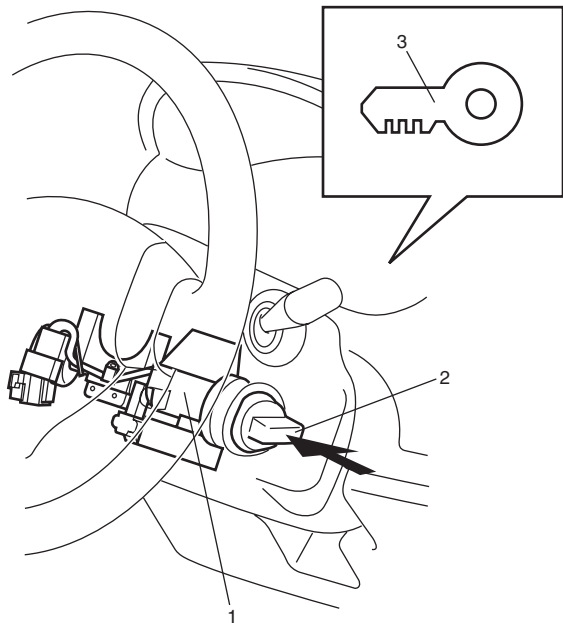
Problem Symptoms	• Engine can not be started by turning Ignition knob switch • All doors can not be locked / unlocked by all of request switches • Other_____
Frequency of Occurrence	• Continuous / Intermittent (times a day, a month) / Other_____
Environmental Condition	• Weather: Fine / Cloudy / Rain / Snow / Other_____ • Temperature: °C(° F) • Stopping near area where intense radio waves are emitted such as TV station, radio station, etc. Yes / No
Diagnostic Trouble Code	• First check: Normal code / malfunction code () • Second check: Normal code / malfunction code ()

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Key Indicator Light Check

S6RW0EA504006

Push the ignition knob switch (2) of the steering lock unit (1) and check that the key indicator light (3) in the combination meter lights up in red or blue. If it does not light, go to “Key Indicator Light Circuit Check (Key Indicator Light Doesn’t Light when Ignition Knob Switch is Pushed)”.

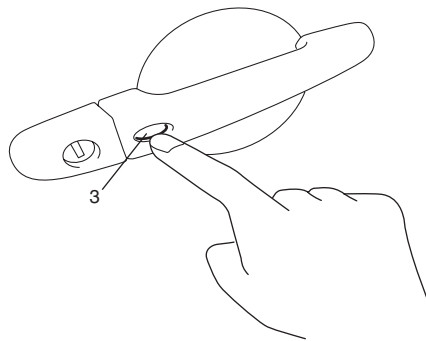
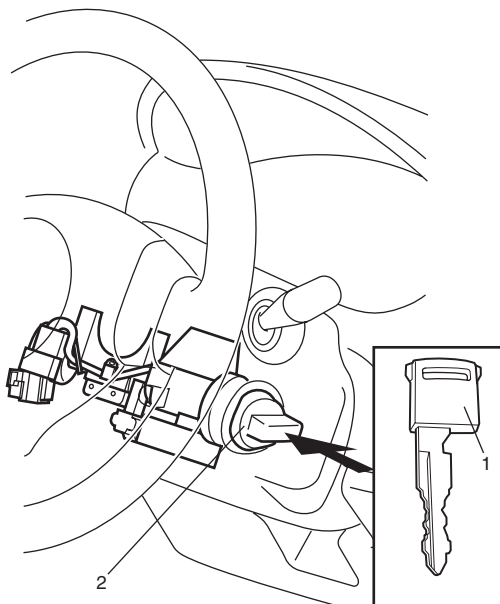


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DTC Check

S6RW0EA504007

- 1) Check to make sure that all doors are closed.
- 2) Open driver side door window glass and door.
- 3) Check to make sure that ignition key is not inserted in ignition key cylinder. If it is, remove it.
- 4) Perform “Key Indicator Light Check”.
- 5) Close driver side door and within 15 seconds after that, perform Steps a) through e) described below.
 - a) Insert ignition key (1) in ignition key cylinder.
 - b) Remove ignition key from ignition key cylinder.
 - c) Repeat Steps a) and b) twice.
 - d) Insert ignition key in ignition key cylinder.
 - e) Push driver side door request switch (3) 4 times. At the end of Step e), buzzer sounds 4 times to inform that trouble diagnosis mode has started.

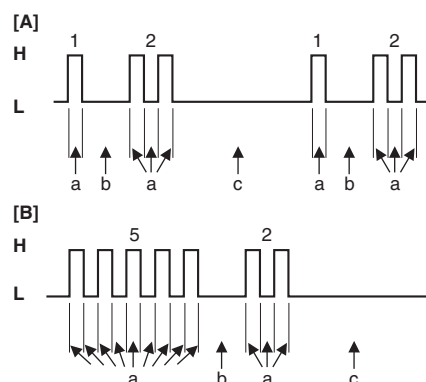
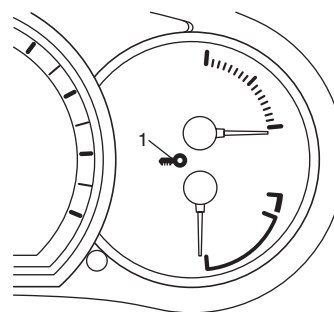


I4RS0BA50009-02

- 6) Read flashing pattern of key indicator light (1) which represents DTC as shown in example below and write it down. When more than 2 DTCs are stored in memory, flashing for each DTC is repeated three times starting with the smallest DTC number in increasing order.

NOTE

Go to “No DTC Detection After Performing DTC Check” in case that any DTC is detected after performing the procedure mentioned above.



14RS0BA50010-02

[A]: DTC No. 12 (Normal)	a: 0.3 seconds
[B]: DTC No. 52	b: 1.0 second
H: Key indicator light turned ON	c: 3.0 seconds
L: Key indicator light turned OFF	

- 7) After completing the check, remove ignition key from ignition key cylinder.

DTC Table

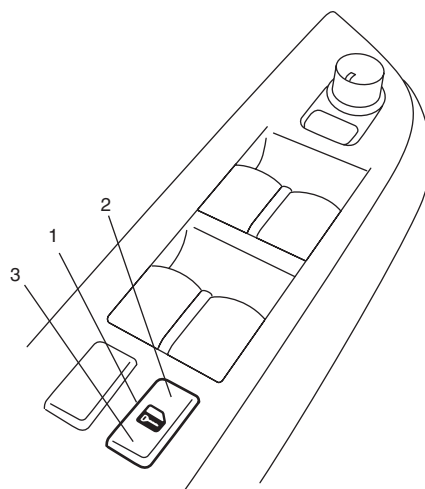
S6RW0EA504008

DTC (Flashing pattern of key indicator light)	Detected parts item	Detecting condition
11	Communication Error with Steering Lock Unit	No communication is available between keyless start control module and steering lock unit
12	—	Normal (No malfunction DTC is detected)
13	Release Signal Error from Steering Lock Unit	Although lock release signal is output to steering lock unit, it is not inputted from steering lock unit
14	Steering Lock Unit Malfunction	Steering lock unit cannot be unlocked due to its temperature rise
21	Internal Error in Keyless Start Control Module (EEPROM Reading Error)	Data cannot be read from memory in keyless start control module
22	Internal Error in Keyless Start Control Module (EEPROM Writing Error)	Data cannot be written into memory in keyless start control module
31	Lost Communication with BCM	Keyless start control module cannot receive data sent by CAN from BCM
33	Control Module Communication Bus Off	No communication is available with all control modules connected by CAN
51	Driver Side Door Request Switch Malfunction	Input signal from driver side door request switch remains ON, unchanged
52	Passenger Side Door Request Switch Malfunction	Input signal from passenger side door request switch remains ON, unchanged
53	Rear End Door Request Switch Malfunction	Input signal from rear end door request switch remains ON, unchanged

DTC Clearance

S6RW0EA504009

- 1) Perform Steps 1) through 5) of DTC check procedure and have DTC indicated.
- 2) Open driver side door.
- 3) Close driver side door and within 10 seconds after that, perform Steps a) to c) described below.
 - a) Push unlock side (3) of driver side manual door lock switch (1).
 - b) Push lock side (2) of driver side manual door lock switch.
 - c) Repeat Steps a) and b) 3 times.
 At the end of Step c), DTCs are cleared and key indicator light indicates DTC No. 12 (Normal).



I4RS0BA50011-02

- 4) After completing DTC clearance, remove ignition key from ignition key cylinder.

Keyless Start System Symptom Diagnosis

S6RW0EA504010

Door Lock Function of Keyless Start System**NOTE**

Before performing trouble diagnosis procedure for door lock function of keyless start system, check that power door lock system operates properly referring to "Power Door Lock System Operation Inspection (If Equipped) in Section 9F in related manual". If power door lock system does not operate properly, go to "Power Door Lock System Symptom Diagnosis (If Equipped) in Section 9F in related manual".

Condition	Possible cause	Correction / Reference Item
All doors can not be locked / unlocked by all of door request switches	Circuit fuse(s) blown	Replace fuse(s) and check for short circuit.
	Remote controller battery dead	Replace battery.
	Remote controller faulty	Check remote controller for operation referring to "Remote Controller Inspection".
	Wiring or grounding faulty	Repair circuit.
	Antennas or keyless start control module faulty	Check input and output signals of keyless start control module referring to "Inspection of Keyless Start Control Module and Its Circuits".
	BCM faulty	Check input and output signal of BCM referring to "Inspection of BCM and its Circuits in Section 10B in related manual".
All doors can not be locked / unlocked by any one of door request switch	Request switch faulty	Check request switch for operation referring to "Front Door (Driver and Passenger Side), Rear End Door Request Switch Inspection".
	Wiring or grounding faulty	Repair circuit.
	Antennas or keyless start control module faulty	Check input and output signals of keyless start control module referring to "Inspection of Keyless Start Control Module and Its Circuits".
	BCM faulty	Check input and output signal of BCM referring to "Inspection of BCM and its Circuits in Section 10B in related manual".

Keyless Engine Start Function

NOTE

Before performing symptom diagnosis procedure for keyless engine start system, check that engine starts by using ignition key. If it cannot be started by using ignition key, go to "Engine Symptom Diagnosis in Section 1A".

Condition	Possible cause	Correction / Reference Item
Engine can not be started by turning Ignition knob switch	Circuit fuse(s) blown	Replace fuse(s) and check for short circuit.
	Remote controller battery dead	Replace battery.
	Remote controller faulty	Check remote controller for operation referring to "Remote Controller Inspection".
	Steering lock unit faulty	Check steering lock unit for operation referring to "Steering Lock Unit Inspection".
	Wiring or grounding faulty	Repair circuit.
	Antennas or keyless start control module faulty	Check input and output signals of keyless start control module referring to "Inspection of Keyless Start Control Module and Its Circuits".
	ECM faulty	Check input and output signal of ECM referring to "Inspection of ECM and Its Circuits in Section 1A".

Keyless Start System Operation Inspection

S6RW0EA504011

Keyless Engine Start Operation

- 1) Sit in driver seat with remote controller carried with you.
- 2) Check that all doors are closed and ignition key is not inserted in ignition key cylinder.
- 3) While pushing ignition knob switch (1) of steering lock unit, check if ignition knob switch can be turned from its lock position.
If key indicator light (2) in combination meter lights in blue and ignition knob switch can be turned from its lock position in this check, keyless engine start operation is in good condition.
If key indicator light in combination meter lights in red and ignition knob switch cannot be turned from its lock position in this check, go to "Keyless Start System Check".

NOTE

Pushing ignition knob switch for 5 seconds or longer causes function to protect steering lock releasing solenoid against heat to work. Then steering lock unit stops energizing solenoid, preventing ignition knob switch from turning. At the same time, key indicator light in combination meter turns off. In such case, take your hand off from ignition knob switch once and operate it again.



I4RS0BA50012-01

Door Lock Operation (Keyless Start System)

S6RW0EA504012

- 1) Check that all door locks are released and all doors are closed.
- 2) With remote controller of which ID code is registered in keyless start control module carried with yourself, check that pushing driver door, passenger door or rear end door request switch once locks all doors.
- 3) Check that pushing request switch of driver door, passenger door or rear end door once releases all door locks.



I4RS0BA50013-01

Inspection of Keyless Start Control Module and Its Circuits

S6RW0EA504013

Keyless start control module and its circuits can be checked at keyless start control module wiring couplers by measuring voltage and resistance.

⚠ CAUTION

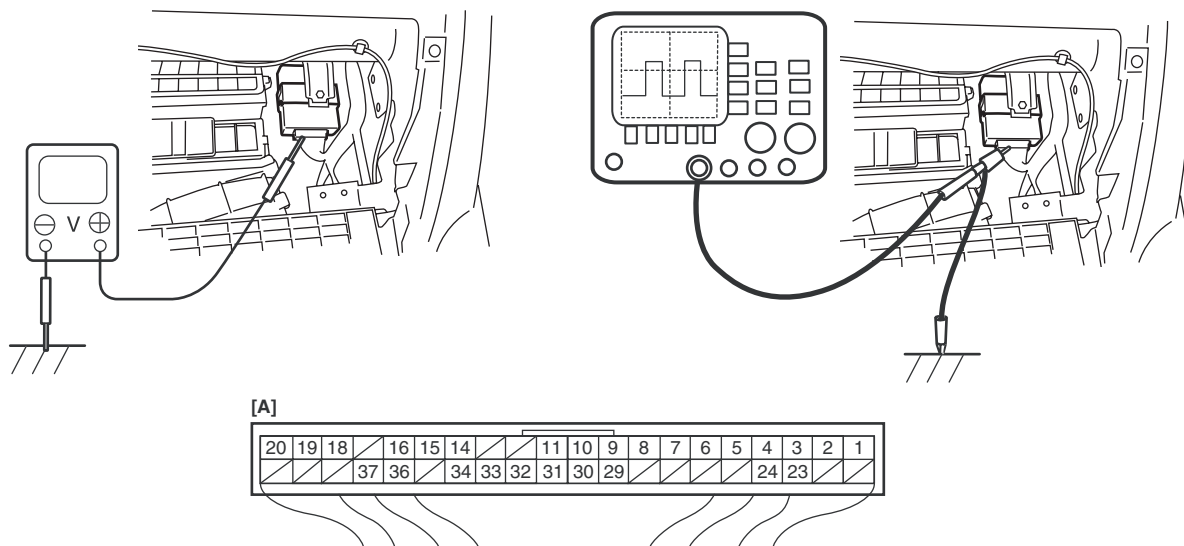
Keyless start control module cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to keyless start control module with coupler disconnected from it.

Voltage Check

- 1) Disconnect negative cable (–) at battery.
- 2) Remove keyless start control module from vehicle body referring to “Keyless Start Control Module Removal and Installation”.
- 3) Connect connector to keyless start control module.
- 4) Check voltage at each terminal number of couplers connected.

NOTE

- As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.
- Voltage with asterisk (*) cannot be measured by voltmeter because it is pulse signal.



[A]

20	19	18	16	15	14	11	10	9	8	7	6	5	4	3	2	1
37	36	34	33	32	31	30	29						24	23		

[A]: Keyless start control module connector (viewed from harness side)

I5RW0AA50008-03

Terminal Number	Circuit	Normal Voltage	Condition
G16-1	Driver side door antenna (–)	*0 – 5 V	Refer to “Reference waveform No. 1: ”
G16-2	Driver side door antenna (+)		
G16-3	Rear end door antenna (–)	*0 – 5 V	Refer to “Reference waveform No. 1: ”
G16-4	Rear end door antenna (+)		

Terminal Number	Circuit	Normal Voltage	Condition
G16-5	Center antenna (–)	*–2 – 2 V	Refer to “Reference waveform No. 2: ”
G16-6	Center antenna (+)	*–10 – 15 V	
G16-7	Luggage room antenna (–)	*–10 – 10 V	Refer to “Reference waveform No. 3: ”
G16-8	Luggage room antenna (+)	*–8 – 14 V	
G16-9	Ground for keyless start control module	0 – 1 V	Ignition switch is at all positions
G16-10	Power source	10 – 12 V	Ignition switch is at all positions
G16-11	Ignition switch (ACC signal)	10 – 12 V	Ignition switch is at ACC or ON position
		0 – 1 V	Ignition switch is at any position other than ACC or ON position
G16-12	—	—	—
G16-13	—	—	—
G16-14	Ignition switch (key reminder signal)	10 – 12 V	Insert ignition key to ignition key cylinder
		0 – 1 V	Pull out ignition key from ignition key cylinder
G16-15	Ignition switch (ON signal)	10 – 12 V	Ignition switch is at ON position
		0 – 1 V	Ignition switch is at any position other than ON position
G16-16	Driver side door request switch	10 – 12 V	Request switch of driver side door is released
		0 – 1 V	Request switch of driver side door is pushed
G16-17	—	—	—
G16-18	CAN communication line (low)	*1.6 – 2.5 V	Refer to “Reference waveform No. 4: ”
G16-19	CAN communication line (high)	*2.5 – 3.6 V	
G16-20	Power supply for steering lock unit	4 – 6 V	Full time
G16-21	—	—	—
G16-22	—	—	—
G16-23	Passenger side door antenna (–)	*0 – 5 V	Refer to “Reference waveform No. 1: ”
G16-24	Passenger side door antenna (+)		
G16-25	—	—	—
G16-26	—	—	—
G16-27	—	—	—
G16-28	—	—	—
G16-29	Signal for steering lock unit	4 – 6 V	Ignition knob switch is at any position other than ON and OFF position
		*0 – 5 V	Refer to “Reference waveform No. 5: ”
G16-30	Ground for steering lock unit	0 – 1 V	Full time
G16-31	—	—	—
G16-32	Rear end door request switch	10 – 12 V	Request switch of rear end door is released
		0 – 1 V	Request switch of rear end door is pushed
G16-33	Driver side door lock switch	0 – 1 V	Driver side door is at unlock position and passenger side door is at lock position
		4 – 6 V	Driver and passenger side door is at lock position
		*3 – 5 V	Refer to “Reference waveform No. 6: ”
G16-34	Ignition knob switch	10 – 12 V	When pushing ignition knob switch of steering lock unit
		0 – 1 V	When releasing ignition knob switch of steering lock unit
G16-35	—	—	—
G16-36	Passenger side door request switch	10 – 12 V	Request switch of passenger side door is released
		0 – 1 V	Request switch of passenger side door is pushed
G16-37	Passenger side door lock switch	0 – 1 V	Passenger side door is at unlock position and driver side door is at lock position
		4 – 6 V	Driver and passenger side door is at lock position
		*3 – 5 V	Refer to “Reference waveform No. 6: ”
G16-38	—	—	—
G16-39	—	—	—

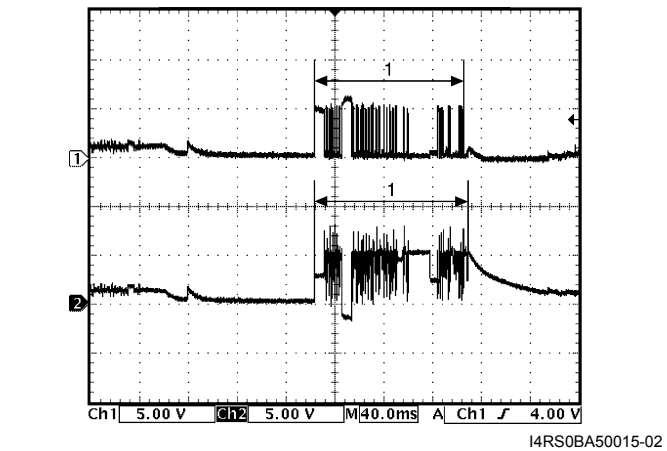
10E-17 Keyless Start System:

Terminal Number	Circuit	Normal Voltage	Condition
G16-40	—	—	—

Reference waveform No. 1

Driver, passenger and rear end door antenna request signals (Request signal (1) transmitted by each door antenna when each door request switch is pushed)

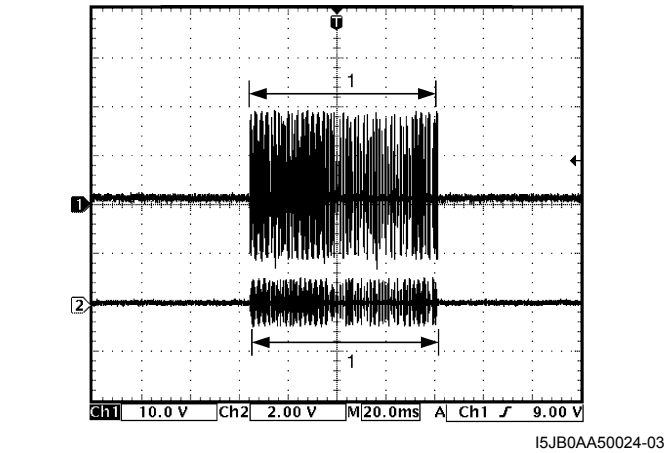
Measurement terminal	Driver side door antenna • CH1: “G16-2” to “G16-9” • CH2: “G16-1” to “G16-9” Passenger side door antenna • CH1: “G16-24” to “G16-9” • CH2: “G16-23” to “G16-9” Rear end door antenna • CH1: “G16-4” to “G16-9” • CH2: “G16-3” to “G16-9”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5V/DIV TIME: 40 ms/DIV
Measurement condition	Request switch of each door is pushed with remote controller carried



Reference waveform No. 2

Center antenna signal (Request signal (1) transmitted by center antenna when each door request switch is pushed)

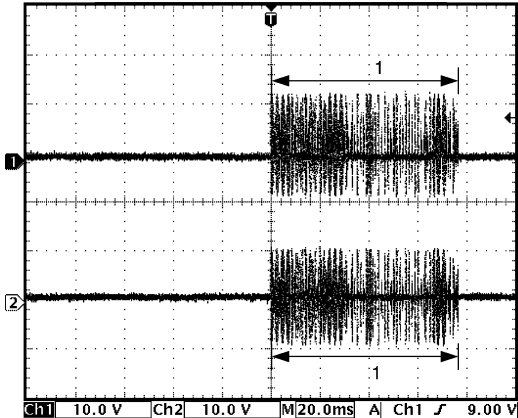
Measurement terminal	CH1: “G16-6” to “G16-9” CH2: “G16-5” to “G16-9”
Oscilloscope setting	CH1: 10 V/DIV, CH2: 2 V/DIV TIME: 20 ms/DIV
Measurement condition	• Ignition knob switch of steering lock unit is pushed • Request switch of each door is pushed with remote controller carried



Reference waveform No. 3

Luggage room antenna signal
(Request signal (1) transmitted by luggage room antenna when each door request switch is pushed)

Measurement terminal	CH1: "G16-8" to "G16-9" CH2: "G16-7" to "G16-9"
Oscilloscope setting	CH1: 10 V/DIV, CH2: 10 V/DIV TIME: 20 ms/DIV
Measurement condition	Request switch of each door is pushed with remote controller carried

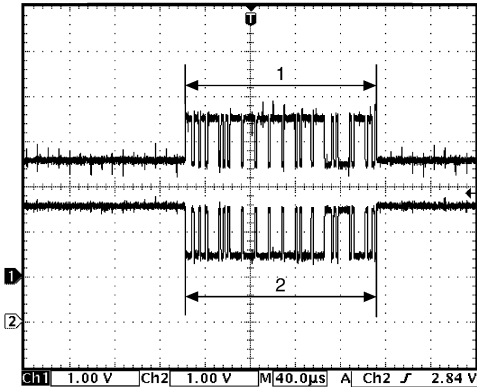


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Reference waveform No. 4

CAN communication signals
(CAN signal communicated to each control module when ignition switch is turned ON)

Measurement terminal	CH1: "G16-19" to "G16-9" CH2: "G16-18" to "G16-9"
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1V/DIV TIME: 40 μ s/DIV
Measurement condition	Ignition switch is at ON position



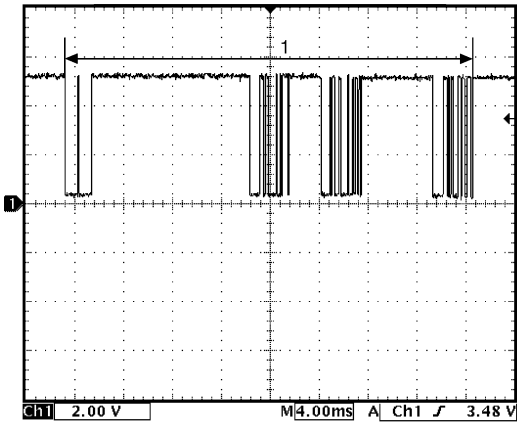
I5RS0DA50002-01

1. CAN communication line signal (high)
2. CAN communication line signal (low)

Reference waveform No. 5

Steering lock unit signal
(Signal (1) communicated between keyless start control module and steering lock unit when measurement condition described below applies)

Measurement terminal	CH1: "G16-29" to "G16-9"
Oscilloscope setting	CH1: 2 V/DIV TIME: 4 ms/DIV
Measurement condition	- Ignition knob switch of steering lock unit is pushed - Any one of door is opened - Request switch of each door is pushed



I4RS0BA50019-02

10E-19 Keyless Start System:

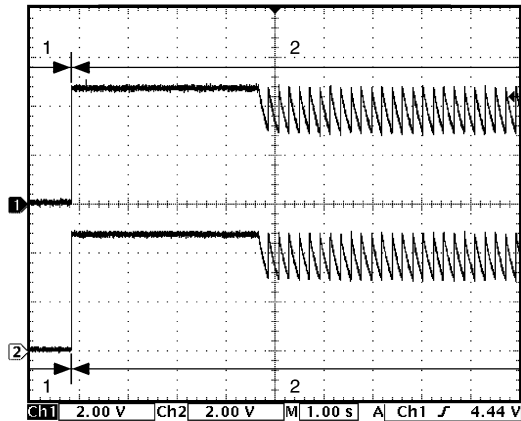
Reference waveform No. 6

Driver and passenger side door lock switch signals.

(This signal indicates door lock status.)

In case the position of driver and passenger side door lock is changed from the unlock to the lock.

Measurement terminal	Driver side door lock switch • CH1: "G16-33" to "G16-9" Passenger side door lock switch • CH2: "G16-37" to "G16-9"
Oscilloscope setting	CH1: 2 V/DIV CH2: 2 V/DIV TIME: 1 s/DIV
Measurement condition	Press lock side of manual door lock switch

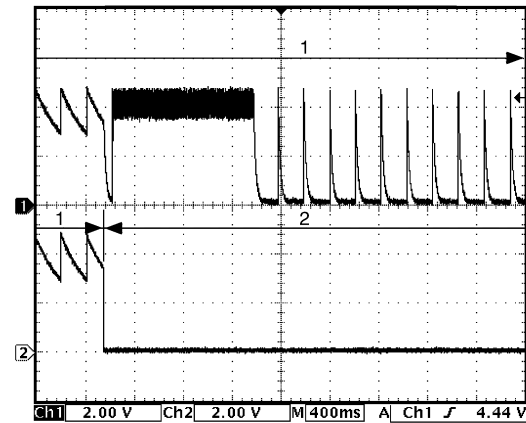


I5JB0AA50027-02

1. Unlock signal	2. Lock signal

In case the position of passenger side door lock is changed from the lock to the unlock when the position of driver and passenger side door is at the lock

Measurement terminal	Driver side door lock switch • CH1: "G16-33" to "G16-9" Passenger side door lock switch • CH2: "G16-37" to "G16-9"
Oscilloscope setting	CH1: 2 V/DIV CH2: 2 V/DIV TIME: 400 ms/DIV
Measurement condition	Driver door is at lock position and passenger side door is at unlock position

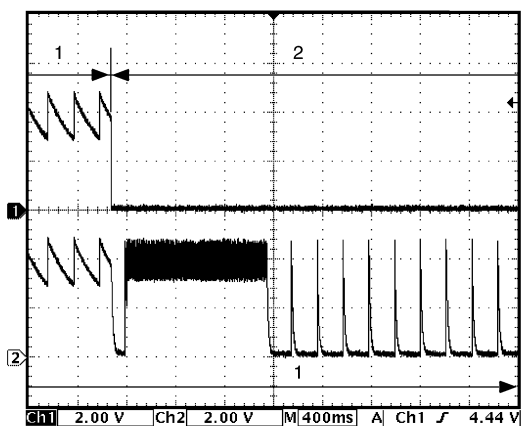


I5JB0AA50028-02

1. Lock signal	2. Unlock signal

In case the position of driver side door lock is changed from the lock to the unlock when the position of driver and passenger side door is at the lock.

Measurement terminal	Driver side door lock switch • CH1: "G16-33" to "G16-9" Passenger side door lock switch • CH2: "G16-37" to "G16-9"
Oscilloscope setting	CH1: 2 V/DIV CH2: 2 V/DIV TIME: 400 ms/DIV
Measurement condition	Driver door is at unlock position and passenger side door is at lock position



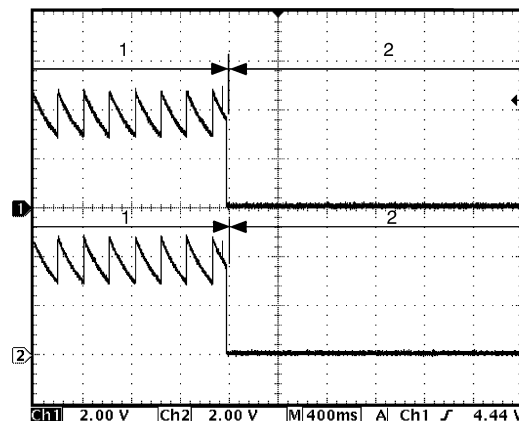
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1. Lock signal	2. Unlock signal

In case the position of driver and passenger side door lock is changed from the lock to the unlock.

Measurement terminal	Driver side door lock switch • CH1: “G16-33” to “G16-9” Passenger side door lock switch • CH2: “G16-37” to “G16-9”

Oscilloscope setting	CH1: 2 V/DIV CH2: 2 V/DIV TIME: 400 ms/DIV
Measurement condition	Driver door is at unlock position and passenger side door is at lock position



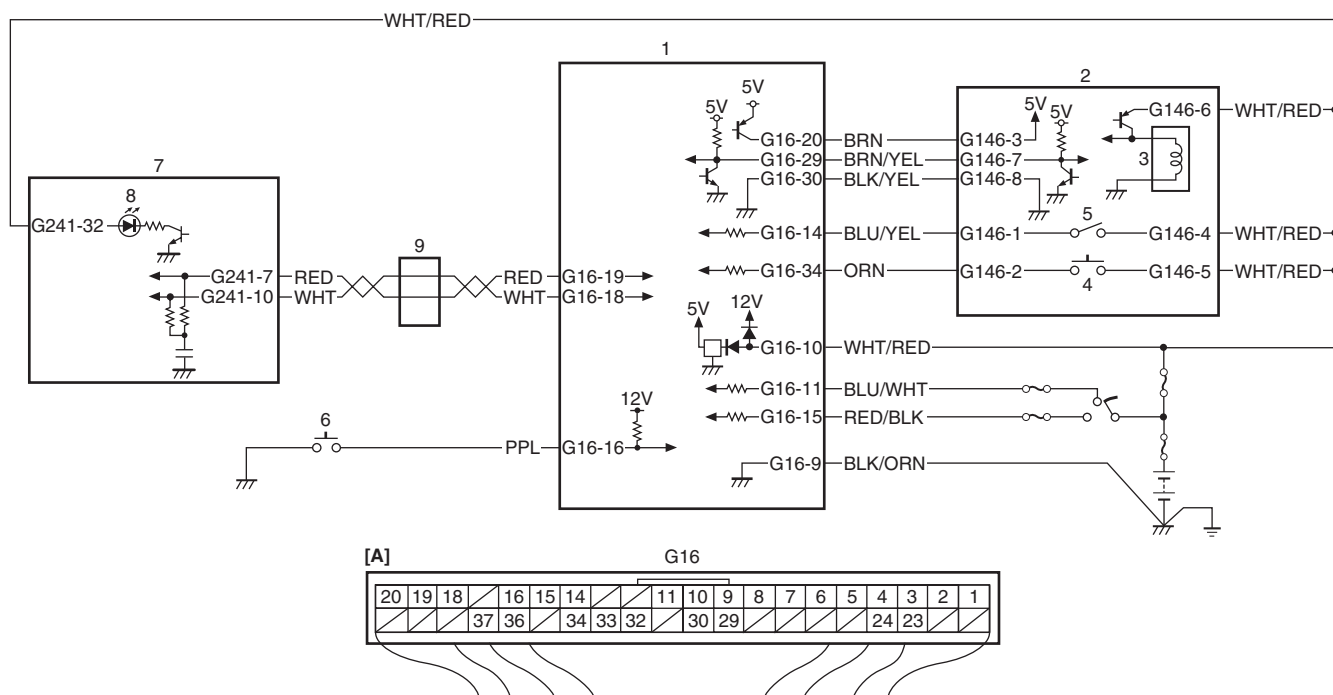
15JB0AA50030-03

1. Lock signal	2. Unlock signal

No DTC Detection After Performing DTC Check

Wiring Diagram

S6RW0EA504014



I7RW01A50004-02

[A]: Keyless start control module connector (viewed from harness side)	4. Ignition knob switch	8. Key indicator light
1. Keyless start control module	5. Key reminder switch	9. CAN junction connector
2. Steering lock unit	6. Driver side door request switch	
3. Steering lock solenoid	7. Combination meter	

10E-21 Keyless Start System:

Description

The keyless start control module detects DTC by using signals from the key reminder and driver side door request switches. The keyless start control module makes the key indicator light in the combination meter flash on and off by using CAN communication.

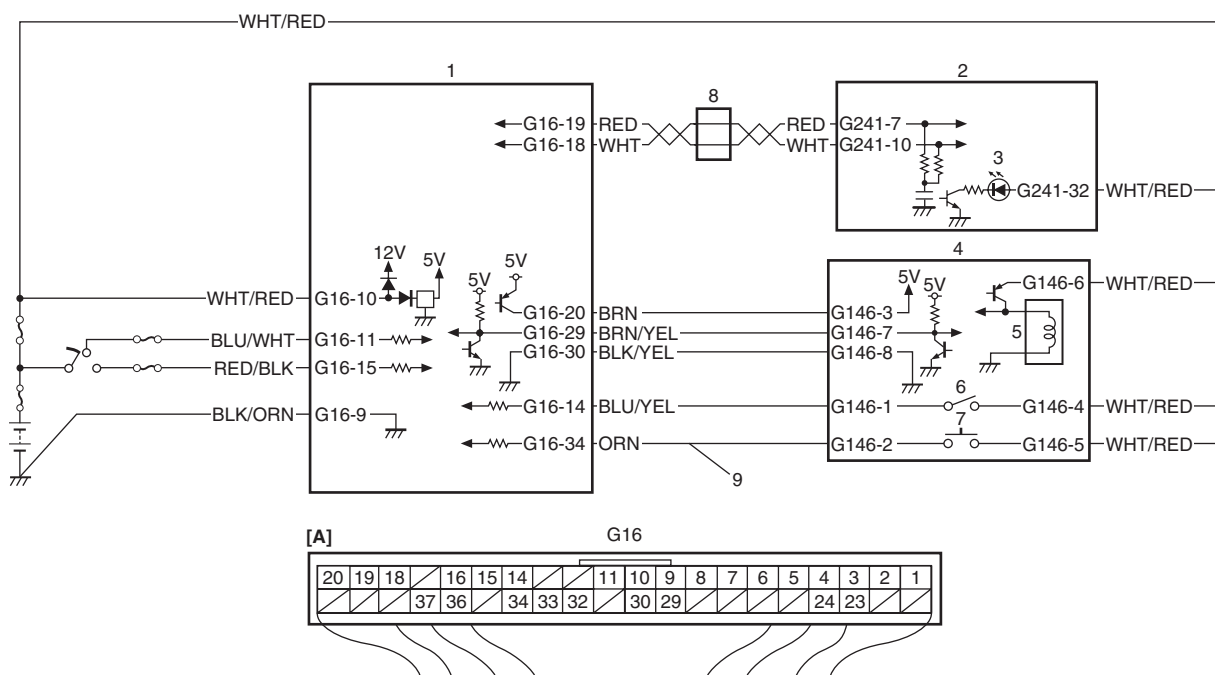
Troubleshooting

Step	Action	Yes	No
1	Combination meter power and ground circuit check 1) Turn ignition switch to ON position. <i>Do warning lights in combination meter other than key indicator light light up?</i>	Go to Step 2.	Check main fuse, circuit fuse, combination meter power and ground circuit.
2	Driver side door request switch and its circuit check 1) Check driver side door request switch and its circuit referring to "DTC No. 51 / No. 52 / No. 53: Driver Side / Passenger Side / Rear End Door Request Switch Failure". <i>Is it in good condition?</i>	Go to Step 3.	Repair or replace malfunction part.
3	Key reminder switch and its circuit check 1) Turn ignition switch to OFF position. 2) Disconnect connector from ignition switch. 3) Check key reminder switch for operation referring to "Ignition Switch Inspection in Section 9C in related manual". 4) If OK, check for open, short and high resistance in key reminder switch circuit. <i>Is it in good condition?</i>	Go to Step 4.	Repair or replace malfunction part.
4	Keyless start control module power and ground circuit check 1) Check keyless start control module power and ground circuit for condition referring to "Keyless Start Control Module Power and Ground Circuit Check". <i>Is it in good condition?</i>	Go to Step 5.	Repair circuit.
5	CAN communication circuit check 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	Substitute a known-good keyless start control module and recheck.	Repair circuit.

Key Indicator Light Circuit Check (Key Indicator Light Doesn't Light when Ignition Knob Switch is Pushed)

S6RW0EA504015

Wiring Diagram



I7RW01A50005-01

[A]: Keyless start control module connector (viewed from harness side)	5. Steering lock solenoid
1. Keyless start control module	6. Key reminder switch
2. Combination meter	7. Ignition knob switch
3. Key indicator light	8. CAN junction connector
4. Steering lock unit	9. Ignition knob switch signal circuit

Description

When the ignition knob switch is pushed, the key indicator light lights up in blue if you carry the remote controller registered in the keyless start control module and it lights in red if you carry the remote controller which has not been registered in the keyless start control module or if you carry no remote controller.

Troubleshooting

Step	Action	Yes	No
1	Combination meter power and ground circuit check 1) Turn ignition switch to ON position. <i>Do warning lights in combination meter other than key indicator light light up?</i>	Go to Step 2.	Check main fuse, circuit fuse, combination meter power and ground circuit.
2	Keyless start control module power and ground circuit check 1) Check keyless start control module power and ground circuit for condition referring to "Keyless Start Control Module Power and Ground Circuit Check". <i>Is it in good condition?</i>	Go to Step 3.	Repair circuit.
3	Steering lock unit ignition knob switch check 1) Check ignition knob switch of steering lock unit for operation referring to "Steering Lock Unit Inspection". <i>Is it in good condition?</i>	Go to Step 4.	Replace steering lock unit.

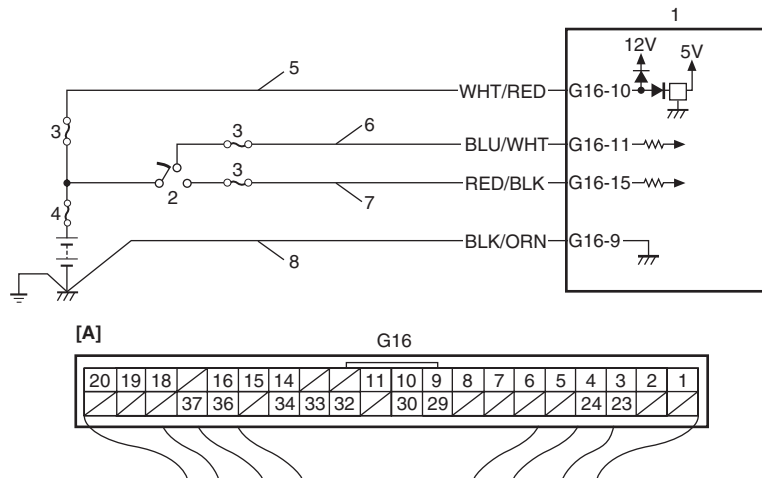
10E-23 Keyless Start System:

Step	Action	Yes	No
4	Wire harness check 1) Turn ignition switch to OFF position. 2) Disconnect connectors from keyless start control module, steering lock unit and combination meter. 3) Check for open, short and high resistance in following circuits. - Ignition knob switch signal circuit - Keyless start control module and combination meter CAN communication circuit <i>Is each circuit in good condition?</i>	Go to Step 5.	Repair circuit.
5	Keyless start system operation check 1) With remote controller of which ID code is registered in keyless start control module carried with you, try to turn ignition knob switch. <i>Can it be turned to any position other than "LOCK" position?</i>	Replace combination meter.	Substitute a known-good keyless start control module and recheck.

Keyless Start Control Module Power and Ground Circuit Check

S6RW0EA504016

Wiring Diagram



I7RW01A50006-02

[A]: Keyless start control module connector (viewed from harness side)	3. Circuit fuse	6. ACC signal circuit
1. Keyless start control module	4. Main fuse	7. IG ON signal circuit
2. Ignition switch	5. Power source circuit	8. Ground circuit

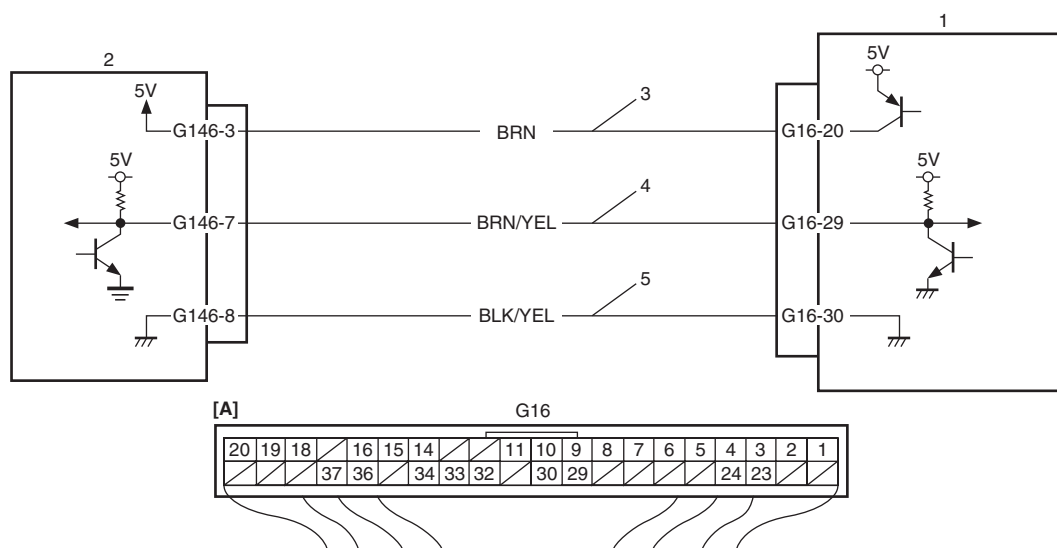
Troubleshooting

Step	Action	Yes	No
1	Fuse check 1) Turn ignition switch to OFF position. 2) Check circuit fuse and main fuse for condition. <i>Are fuses in good condition?</i>	Go to Step 2.	Replace fuse(s) and check for short.
2	Power supply circuit check 1) Disconnect connector from keyless start control module. 2) Check for proper connection to "Power source", "ACC signal" and "IG ON signal" terminal of keyless start control module connector. 3) If OK, measure voltage between following terminals. • "Power source" terminal of keyless start control module connector and vehicle body ground with ignition switch is at OFF position • "ACC signal" terminal of keyless start control module connector and vehicle body ground with ignition switch is at ACC position • "IG ON signal" terminal of keyless start control module connector and vehicle body ground with ignition switch is at ON position <i>Is each terminal voltage is 10 – 14 V?</i>	Go to Step 3.	Repair defective power supply circuit.
3	Ground circuit check 1) Check for proper connection to "Ground" terminal of keyless start control module connector. 2) If OK, measure resistance between "Ground" terminal of keyless start control module connector and vehicle body ground. <i>Is resistance 1 Ω or less?</i>	Power and ground circuit is in good condition.	Repair ground circuit.

DTC No. 11: Communication Error with Steering Lock Unit

S6RW0EA504017

Wiring Diagram



I7RW01A50007-02

[A]: Keyless start control module connector (viewed from harness side)	3. Steering lock unit power supply circuit
1. Keyless start control module	4. Steering lock unit signal circuit
2. Steering lock unit	5. Steering lock unit ground circuit

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No communication is available between keyless start control module and steering lock unit.	- Steering lock unit and its circuit - Keyless start control module

DTC Confirmation Procedure

- 1) Clear DTC referring to "DTC Clearance".
- 2) Turn ignition knob switch pushing ignition knob switch.
- 3) Check DTC referring to "DTC Check".

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Keyless Start System Check" performed?	Go to Step 2.	Go to "Keyless Start System Check".
2	Steering lock unit circuit check 1) Disconnect connector from keyless start control module. 2) Check for proper connection to "Steering lock unit power supply", "Steering lock unit signal" and "Steering lock unit ground" terminals of keyless start control module connector. 3) If OK, check for open, short and high resistance in following circuits. - Steering lock unit power supply circuit - Steering lock unit signal circuit - Steering lock unit ground circuit Is each circuit in good condition?	Go to Step 3.	Repair circuit.

Step	Action	Yes	No
3	Steering lock unit power supply voltage check 1) Connect connector to keyless start control module. 2) Measure voltage between "Steering lock unit power supply" terminal of steering lock unit connector and vehicle body ground. <i>Is voltage 4 – 6 V?</i>	Replace steering lock unit.	Substitute a known-good keyless start control module and recheck.

DTC No. 13 / No. 14: Release Signal Error from Steering Lock Unit / Steering Lock Unit Malfunction

S6RW0EA504018

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC No. 13: Although lock release signal is output to steering lock unit, no lock release signal is inputted from steering lock unit. (wire harness is normal) DTC No. 14: Although lock release signal is output to steering lock unit, steering lock is not released due to temperature rise of steering lock unit solenoid and no lock release signal is inputted. (wire harness is normal)	Steering lock unit

DTC Confirmation Procedure

- 1) Clear DTC referring to "DTC Clearance".
- 2) Turn ignition knob switch pushing ignition knob switch.
- 3) Check DTC referring to "DTC Check".

DTC Troubleshooting

Replace steering lock unit and recheck.

NOTE

Be sure to register the following code when a used keyless start control module is installed. Otherwise DTC No.13 is detected by keyless start control module though steering lock unit is normal.

- With immobilizer control system, ignition key transponder code is not registered in ECM.
- Without immobilizer control system, steering lock unit ID code is not registered in keyless start control module.

DTC No. 21 / No. 22: Internal Error of Keyless Start Control Module (EEPROM Reading Error) / (EEPROM Writing Error)

S6RW0EA504019

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC No. 21: Data cannot be read from memory in keyless start control module. DTC No. 22: Data cannot be written into memory in keyless start control module.	Keyless start control module

DTC Confirmation Procedure

- 1) Clear DTC referring to "DTC Clearance".
- 2) Turn ignition knob switch pushing ignition knob switch.
- 3) Push request switch of each door.
- 4) Check DTC referring to "DTC Check".

DTC Troubleshooting

Substitute a known-good keyless start control module and recheck.

DTC No. 31: Lost Communication with BCM

S6RW0EA504020

Refer to “Troubleshooting for CAN-DTC in Section 1A”.

DTC No. 33: Control Module Communication Bus Off

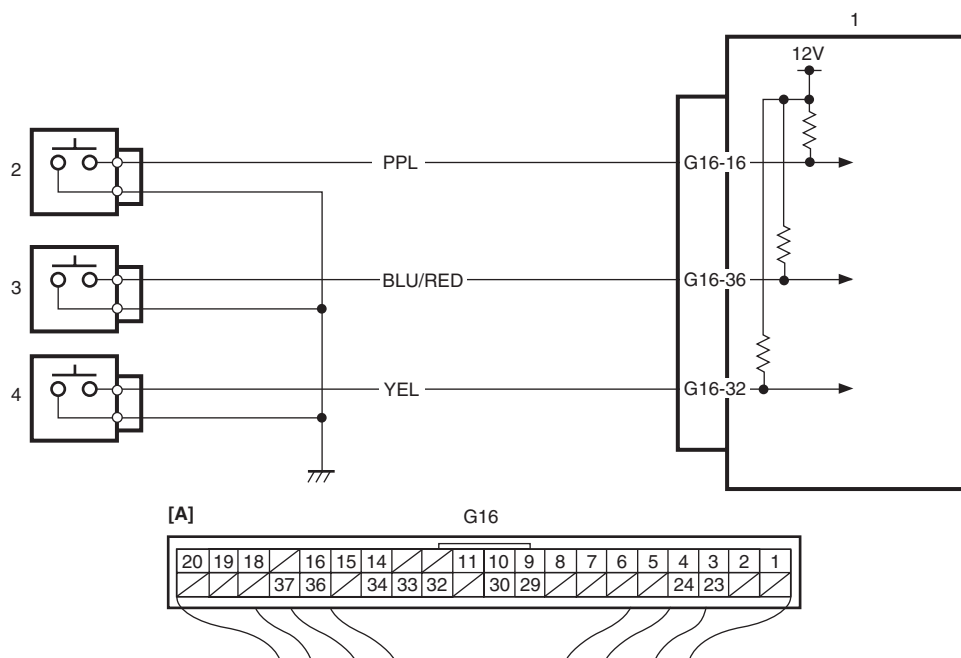
S6RW0EA504021

Refer to “Troubleshooting for CAN-DTC in Section 1A”.

DTC No. 51 / No. 52 / No. 53: Driver Side / Passenger Side / Rear End Door Request Switch Failure

S6RW0EA504022

Wiring Diagram



I7RW01A50009-02

[A]: Keyless start control module connector (viewed from harness side)	3. Passenger side door request switch
1. Keyless start control module	4. Rear end door request switch
2. Driver side door request switch	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC No. 51: Input signal from driver side door request switch remains ON, unchanged for 10 minutes or longer. DTC No. 52: Input signal from passenger side door request switch remains ON, unchanged for 10 minutes or longer. DTC No. 53: Input signal from rear end door request switch remains ON, unchanged for 10 minutes or longer.	• Driver side door request switch and its circuit • Passenger side door request switch and its circuit • Rear end door request switch and its circuit • Keyless start control module

DTC Confirmation Procedure

- 1) Clear DTC referring to “DTC Clearance”.
- 2) Push request switch of each door.
- 3) Check DTC referring to “DTC Check”.

DTC Troubleshooting

Step	Action	Yes	No
1	Was “Keyless Start System Check” performed?	Go to Step 2.	Go to “Keyless Start System Check”.

Step	Action	Yes	No
2	Request switch check 1) Check related door request switch for function referring to "Front Door (Driver and Passenger Side), Rear End Door Request Switch Inspection". <i>Is each switch in good condition?</i>	Go to Step 3.	Replace request switch.
3	Wire harness check 1) Disconnect connector from keyless start control module. 2) Check for open, short and high resistance in related door request switch circuit. <i>Is each circuit in good condition?</i>	Substitute a known-good keyless start control module and recheck.	Repair circuit.

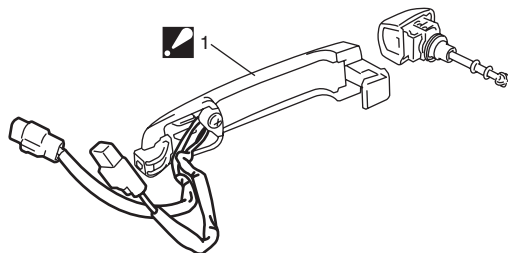
Repair Instructions

Antennas and Request Switches Removal and Installation

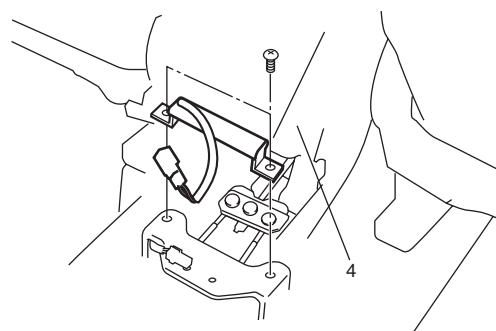
S6RW0EA506001

Remove and install antennas and request switches referring to the following figures.

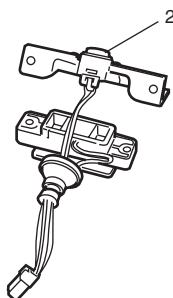
[A]



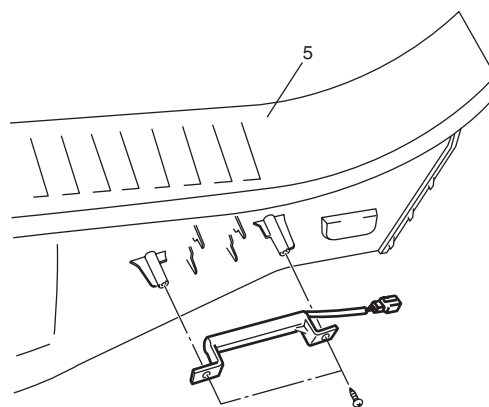
[D]



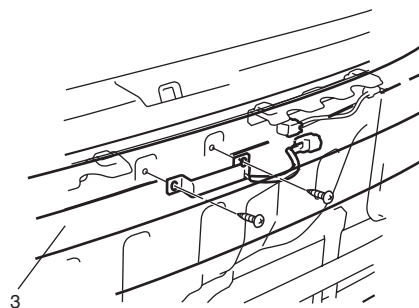
[B]



[E]



[C]



I5RW0AA50014-01

[A]: Front door antenna and request switch (included in outside door handle assembly)	1. Outside handle assembly : Antenna and request switch can not be removed from outside door handle assembly
[B]: Rear end door opener and request switch assembly	2. Rear end opener and request switch
[C]: Rear end door antenna	3. Rear bumper
[D]: Center antenna	4. Parking brake lever

Front Door (Driver and Passenger Side), Rear End Door Request Switch Inspection

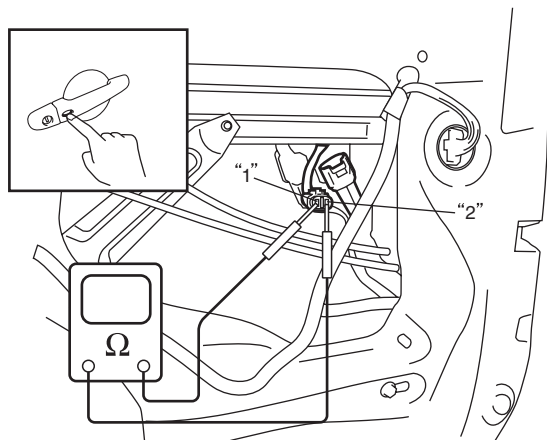
S6RW0EA506002

- 1) Remove door trim from door panel.
For front door trim, refer to Step 1) to 3) of "Front Door Glass Removal and Installation in Section 9E in related manual".
For rear end door trim, refer to Step 1) of "Rear End Door Assembly Removal and Installation in Section 9J in related manual".
- 2) Check for continuity between terminals "1" and "2" at each switch position as shown below. If check result is not as specified, replace.

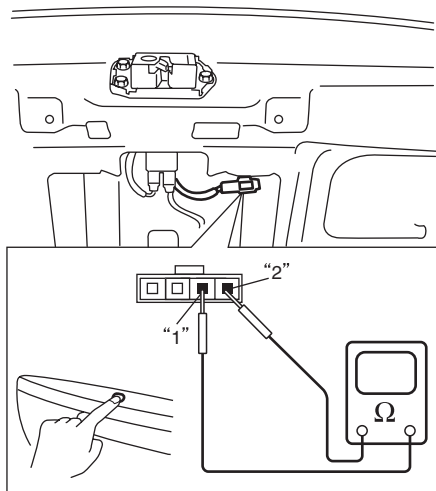
Request switch specification

ON position (request switch pushed): Continuity
OFF position (request switch released): No continuity

[A]



[B]



I5RW0AA50015-01

[A]: Front door request switch (driver and passenger side)

[B]: Rear end door request switch

Steering Lock Unit Removal and Installation

S6RW0EA506003

For removal and installation, refer to "Steering Lock Assembly (Ignition Switch) Removal and Installation in Section 6B in related manual".

Steering Lock Unit Inspection

S6RW0EA506004

Check key reminder switch and ignition knob switch in steering lock unit for operation referring to "Ignition Switch Inspection in Section 9C in related manual".

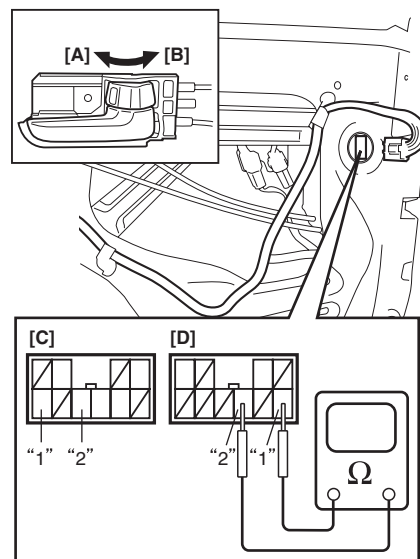
Front Door Lock Switch Inspection

S6RW0EA506005

- 1) Remove door trim from door panel referring to Step 1) to 3) of "Front Door Glass Removal and Installation in Section 9E in related manual".
- 2) Check for continuity between terminals "1" and "2" at each switch position as shown below. If check result is not as specified, replace.

Door lock switch specification

LOCK position: No continuity
UNLOCK position: Continuity



I4RS0BA50029-01

[A]: Lock

[C]: Right side door lock switch

[B]: Unlock

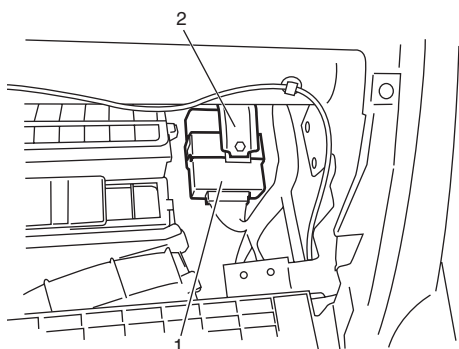
[D]: Left side door lock switch

Keyless Start Control Module Removal and Installation

S6RW0EA506006

Removal

- 1) Disconnect negative cable at battery.
- 2) Remove glove box from instrument panel.
- 3) Disconnect connector from keyless start control module.
- 4) Remove keyless start control module mounting bolt and then remove keyless start control module (1) from steering support member (2).



I5RW0AA50016-01

Installation

For installation, reverse removal procedure.

If keyless start control module is replaced, register ID code of remote controller into keyless start control module, referring to "Registration Procedure for Remote Controller ID Code".

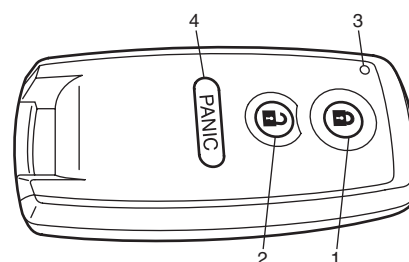
Remote Controller Inspection

S6RW0EA506007

Check that remote controller operation indicator light (3) lights up when lock (1), unlock (2) or panic (4) (if equipped) button of remote controller is pushed. If it doesn't light up in this check, replace battery and then recheck. If it doesn't light up even after battery replacement, replace remote controller.

NOTE

When remote controller transmits lock, unlock or panic signal, it makes operation indicator light light up.



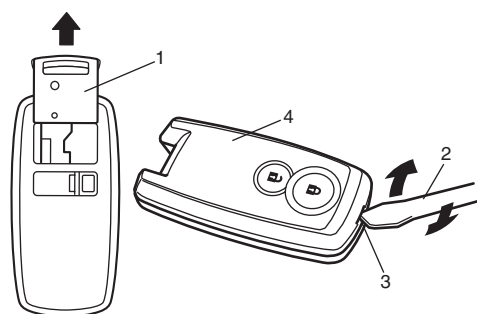
I6JB01A50007-01

Replacement of Remote Controller Battery

S6RW0EA506008

If remote controller operation indicator light fails to light up when lock or unlock button of remote controller is pushed, replace its battery as follows.

- 1) If ignition key (1) is inserted in remote controller, remove it.
- 2) With tip of flat blade screwdriver (2) put in slot (3) of remote controller (4), pry it open.



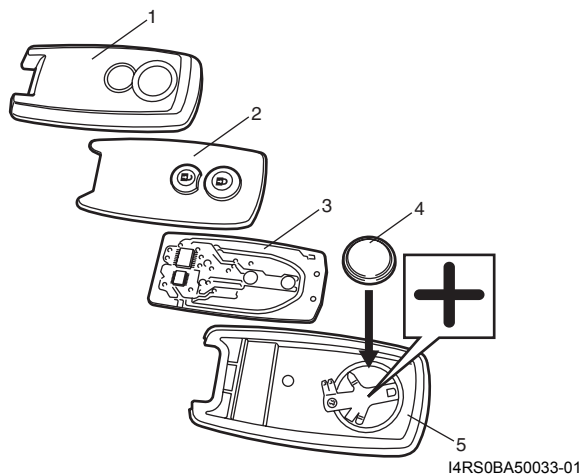
I4RS0BA50032-01

3) Remove battery (4) from lower case (5).

⚠ CAUTION

Use care not to allow grease or dirt to be attached on the printed circuit board and the battery.

4) Replace the battery (lithium disc-type CR 2032 or equivalent battery) so its (+) terminal faces on remote controller lower case.



1. Upper case	3. Printed circuit board
2. Rubber switch	

5) Install printed circuit board and rubber switch to upper case and then fit lower case securely.

NOTE

- To prevent theft, be sure to break the remote controller before discarding it.
- Dispose of the used battery properly according to applicable rules or regulations. Do not dispose of lithium batteries with ordinary household trash.

Registration Procedure for Remote Controller ID Code

S6RW0EA506009

NOTE

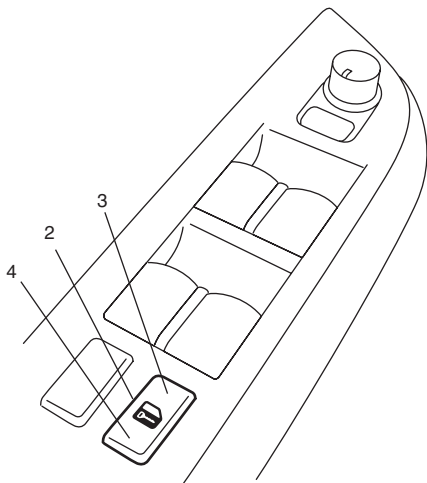
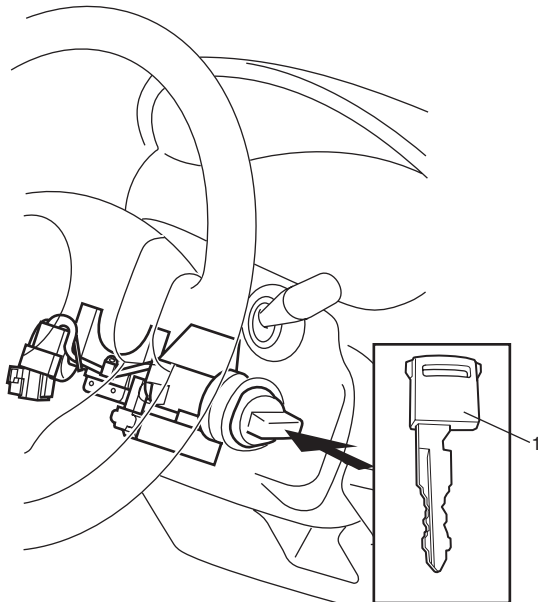
- It is possible to register up to 4 remote controllers in keyless start control module.
- Setting keyless start control module to ID code registration mode of remote controller will erase all remote controller ID codes that have been registered in keyless start control module.

Therefore, when registering remote controller ID codes in keyless start control module, have all of those to be registered ready and execute their registration at the same time.

- When registration of more than four remote controller ID codes is attempted, the oldest remote controller ID code will be erased and that inputted after the fourth one will be registered.
- When keyless start control module which was used in another vehicle has been installed, register the ID code of the remote controller to the keyless start control module first and then the following code.
 - With immobilizer control system, register the ignition key transponder code for the immobilizer control system in ECM. For registration procedure of that, refer to “Registration of the Ignition Key in Section 10C”.
 - Without immobilizer control system, register the steering lock unit ID code in keyless start control module. For registration procedure of that, refer to “Keyless Start Registration”.

If remote controller or keyless start control module is replaced or additional remote controller is necessary, register ID code(s) of remote controller.

- 1) Sit in driver seat and close all doors.
- 2) Check that door lock of driver seat is unlocked.
- 3) Insert ignition key (1) into ignition key cylinder.
- 4) Perform Steps a) through f) described below within 25 seconds after Step 3).
 - a) First push manual door lock switch (2) toward lock side (3) and then push it toward unlock side (4).
 - b) Repeat Step a) 2 more times.
 - c) Push lock side of manual door lock switch.
 - d) Remove ignition key from ignition key cylinder once and then insert it again.
 - e) Repeat Step d) 3 more times.
 - f) Start engine and wait for 3 seconds.



NOTE

When 60 seconds elapse after engine is started, the above process to enter registration mode will be cancelled. Therefore, be sure to proceed to the next step within 60 seconds.

- 5) Turn ignition switch to OFF position.
When ignition switch is turned to OFF position, buzzer sounds twice and door lock is activated from lock position to unlock position. This operation indicates that keyless start control module has entered registration mode.
- 6) Push lock or unlock button of remote controller within 30 seconds after Step 5) to be registered.
When lock or unlock button of remote controller is pushed, buzzer sounds twice, door lock is activated to lock position and then to unlock position. This operation indicates that remote controller ID code has been registered in keyless start control module. If an additional remote controller needs to be registered, repeat the procedure of Step 6) within 30 seconds after Step 5).
- 7) To end registration mode, remove ignition key from ignition key cylinder or turn it to ON position.
In case of vehicle equipped with immobilizer control system, if engine start function of keyless start system does not work after registration, check ECM if DTC P1615 is detected. If it is detected, go to "DTC P1615: Steering Lock Unit Communication Error in Section 10C". If it is not detected, perform registration procedure again.

Keyless Start Registration

S6RW0EA506010

In case of vehicle not equipped with immobilizer control system, register steering lock unit ID code in keyless start control module when keyless start control module which was used in another vehicle has been installed or steering lock unit was replaced, according to "Keyless start registration" of "Keyless Start System" under "Utility" of "Immobi and/or Keyless System" mode of SUZUKI scan tool (SUZUKI-SDT) referring to "SDT Diagnosis Software Operator's Manual".

Prepared by
SUZUKI MOTOR CORPORATION

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