

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.

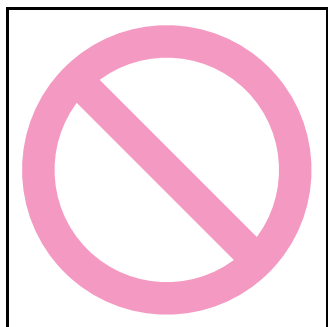
Improper repair may result in injury to the technician and may render the vehicle unsafe for the driver and passengers.

⚠ 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 (RW420) SERVICE MANUAL. It has been prepared exclusively for the following applicable model.

Applicable model:

SX4 (RW420) HONG KONG model

This supplementary service manual describes only different service information of the above applicable model as compared with SX4 (RW420) 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 (RW420) SERVICE MANUAL	99500-80J00-01E

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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.

TABLE OF CONTENTS

Precautions	00-i
Precautions	00-1
General Information	0-i
General Information	0A-1
Engine	1-i
Engine General Information and Diagnosis	1A-1
Engine Electrical Devices.....	1C-1
Charging System.....	1J-1
Suspension	2-i
Suspension General Diagnosis.....	2A-1
Wheels and Tires	2D-1
Brakes	4-i
Brake Control System and Diagnosis	4A-1
Electronic Stability Program	4F-1
Restraint	8-i
Air Bag System	8B-1
Body, Cab and Accessories	9-i
Instrumentation / Driver Info. / Horn	9C-1
Glass / Windows / Mirrors	9E-1
Seats	9G-1
Control Systems	10-i
Body Electrical Control System.....	10B-1
Keyless Start System	10E-1

Section 00

00

Precautions

CONTENTS

Precautions	00-1
Precautions.....	00-1

Precaution for Vehicle Equipped with ESP®	
System	00-1

Precautions

Precautions

Precaution for Vehicle Equipped with ESP® System

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- When testing with any of the following equipments (when vehicle is tested by rotating wheels (tires) under vehicle stop), be sure to deactivate ESP® system referring to “Precautions in Speedometer Test or Other Tests in Section 4F” to obtain correct data.

When vehicle acceleration is not sensed and wheels are rotating, ESP® control module judges that wheels are in slip condition and controls engine torque to reduce by TCS control.

- 2 or 4-wheel chassis dynamometer
- Speedometer tester
- Brake tester
- Etc.

ESP® control module

- When ESP® control module is removed / installed, do not use impact wrenches which generate shock or impact to avoid damaging sensors in ESP® control module.
- When any of the following operation is done, calibrate steering angle sensor, G sensor and master cylinder pressure sensor (in ESP® control module) referring to “Sensor Calibration in Section 4F”.
 - When battery or dome fuse is removed.
 - When steering angle sensor is replaced.
 - When ESP® control module is removed or replaced.

Section 0

General Information

CONTENTS

General Information	0A-1	General Description	0A-1
		Abbreviations	0A-1

General Information

General Description

Abbreviations

S6RW0H0101001

A:
ABDC: After Bottom Dead Center
ABS: Anti-lock Brake System
AC: Alternating Current
A/C: Air Conditioning
A-ELR: Automatic-Emergency Locking Retractor
A/F: Air Fuel Mixture Ratio
ALR: Automatic Locking Retractor
API: American Petroleum Institute
APP sensor: Accelerator Pedal Position Sensor
A/T: Automatic Transmission, Automatic Transaxle
ATDC: After Top Dead Center
ATF: Automatic Transmission Fluid, Automatic Transaxle Fluid
B:
B+: Battery Positive Voltage
BBDC: Before Bottom Dead Center
BCM: Body Electrical Control Module
BTDC: Before Top Dead Center
C:
CAN: Controller Area Network
CKT: Circuit
CKP Sensor: Crankshaft Position Sensor
CMP Sensor: Camshaft Position Sensor
CO: Carbon Monoxide
CPP Switch: Clutch Pedal Position Switch (Clutch Switch, Clutch Start Switch)
CPU: Central Processing Unit
CRS: Child Restraint System

D:
DC: Direct Current
DLC: Data Link Connector (Assembly Line Diag. Link, ALDL, Serial Data Link, SDL)
DOHC: Double Over Head Camshaft
DOJ: Double Offset Joint
DRL: Daytime Running Light
DTC: Diagnostic Trouble Code (Diagnostic Code)
E:
EBCM: Electronic Brake Control Module, ABS Control Module
EBD: Electronic Brake Force Distribution
ECM: Engine Control Module
ECT Sensor: Engine Coolant Temperature Sensor (Water Temp. Sensor, WTS)
EFE Heater: Early Fuel Evaporation Heater (Positive Temperature Coefficient, PTC Heater)
EGR: Exhaust Gas Recirculation
EGRT Sensor: EGR Temperature Sensor (Recirculated Exhaust Gas Temp. Sensor, REGTS)
EPS: Electronic Power Steering
ESP®: Electronic Stability Program
EVAP: Evaporative Emission
EVAP Canister: Evaporative Emission Canister (Charcoal Canister)
F:
4WD: 4 Wheel Drive
G:
GEN: Generator
GND: Ground
GPS: Global Positioning System
H:
HAVC: Heating, Ventilating and Air Conditioning
HC: Hydrocarbons
HO2S: Heated Oxygen Sensor

I:

IAC Valve: Idle Air Control Valve (Idle Speed Control Solenoid Valve, ISC Solenoid Valve)

IAT Sensor: Intake Air Temperature Sensor (Air temperature Sensor, ATS)

ICM: Immobilizer Control Module

IG: Ignition

IMT: Intake Manifold Tuning

ISC Actuator: Idle Speed Control Actuator

L:

LH: Left Hand

LSPV: Load Sensing Proportioning Valve

M:

MAF Sensor: Mass Air Flow Sensor (Air Flow Sensor, AFS, Air Flow Meter, AFM)

MAP Sensor: Manifold Absolute Pressure Sensor (Pressure Sensor, PS)

Max: Maximum

MFI: Multiport Fuel Injection (Multipoint Fuel Injection)

Min: Minimum

MIL: Malfunction Indicator Lamp ("SERVICE ENGINE SOON" Light)

M/T: Manual Transmission, Manual Transaxle

N:

NOx: Nitrogen Oxides

O:

OBD: On-Board Diagnostic System (Self-Diagnosis Function)

O/D: Overdrive

OHC: Over Head Camshaft

O2S: Oxygen Sensor

P:

PCM: Powertrain Control Module

PCV: Positive Crankcase Ventilation

PNP: Park / Neutral Position

P/S: Power Steering

PSP Switch: Power Steering Pressure Switch (P/S Pressure Switch)

R:

RH: Right Hand

S:

SAE: Society of Automotive Engineers

SDM: Sensing and Diagnostic Module (Air Bag Controller, Air bag Control Module)

SDT: Smart Diagnostic Tester

SFI: Sequential Multiport Fuel Injection

SOHC: Single Over Head Camshaft

T:

TBI: Throttle Body Fuel Injection (Single-Point Fuel Injection, SPI)

TCC: Torque Converter Clutch

TCM: Transmission Control Module (A/T Controller, A/T Control Module)

TDC: Top Dead Center

TP Sensor: Throttle Position Sensor

TVV: Thermal Vacuum Valve (Thermal Vacuum Switching Valve, TVSV, Bimetal Vacuum Switching Valve, BVSV)

TWC: Three Way Catalytic Converter (Three Way Catalyst)

2WD: 2 Wheel Drive

U:

USB: Universal Serial Bus

V:

VIN: Vehicle Identification Number

VSS: Vehicle Speed Sensor

VVT: Variable Valve Timing (Camshaft Position Control)

W:

WU-OC: Warm Up Oxidation Catalytic Converter

WU-TWC: Warm Up Three Way Catalytic Converter

Section 1

Engine

CONTENTS

Engine General Information and Diagnosis	1A-1	Engine Basic Inspection	1A-48
Precautions.....	1A-1	Engine Symptom Diagnosis	1A-49
Precautions on Engine Service	1A-1	MIL Does Not Come ON with Ignition Switch	
Precautions in Diagnosing Trouble	1A-1	ON and Engine Stop (but Engine Can Be	
Precautions for DTC Troubleshooting	1A-2	Started)	1A-56
Precautions of ECM Circuit Inspection.....	1A-2	MIL Remains ON after Engine Starts.....	1A-58
Precautions of Electric Throttle Body System		DTC P0031 / P0032: HO2S Heater Control	
Calibration	1A-2	Circuit Low / High (Sensor-1, Bank-1).....	1A-59
Precaution on CAN Troubleshooting	1A-3	DTC P0037 / P0038: HO2S Heater Control	
General Description	1A-5	Circuit Low / High (Sensor-2, Bank-1).....	1A-62
Statement on Cleanliness and Care	1A-5	DTC P0102 / P0103: Mass or Volume Air	
Engine Diagnosis General Description	1A-5	Flow Circuit Low / High Input	1A-64
On-Board Diagnostic System Description.....	1A-5	DTC P0112 / P0113: Intake Air Temperature	
DLC (Data Link Connector).....	1A-7	Sensor Circuit Low / High Input.....	1A-66
Engine and Emission Control System		DTC P0117 / P0118: Engine Coolant	
Description	1A-7	Temperature Circuit Low / High	1A-67
CAN Communication System Description.....	1A-8	DTC P0122 / P0123: Throttle / Pedal Position	
Air Intake System Description	1A-10	Sensor / Switch "A" Circuit Low / High	1A-69
Description of Electric Throttle Body System....	1A-11	DTC P0131 / P0132: O2 Sensor Circuit Low	
Description of Electric Throttle Body System		Voltage / High Voltage (Sensor-1, Bank-1).....	1A-71
Calibration	1A-12	DTC P0134: O2 Sensor Circuit No Activity	
Generator Control System Description	1A-12	Detected (Sensor-1, Bank-1)	1A-72
A/F Sensor Description	1A-13	DTC P0140: O2 Sensor (HO2S) Circuit No	
Electronic Control System Description.....	1A-14	Activity Detected (Sensor-2, Bank-1).....	1A-74
Engine and Emission Control Input / Output		DTC P0171 / P0172: System Too Lean / Too	
Table	1A-19	Rich (Sensor-1, Bank-1).....	1A-75
Schematic and Routing Diagram.....	1A-23	DTC P0222 / P0223: Throttle Position Sensor	
Engine and Emission Control System		(Sub) Circuit Low / High	1A-77
Diagram	1A-23	DTC P0327 / P0328: Knock Sensor Circuit	
Component Location	1A-25	Low / High	1A-79
Electronic Control System Components		DTC P0335: Crankshaft Position Sensor "A"	
Location	1A-25	Circuit	1A-80
Diagnostic Information and Procedures	1A-26	DTC P0340: Camshaft Position Sensor "A"	
Engine and Emission Control System Check....	1A-26	Circuit	1A-82
Malfunction Indicator Lamp (MIL) Check	1A-29	DTC P0350: Ignition Coil Primary / Secondary	
DTC Check	1A-30	Circuit	1A-84
DTC Clearance	1A-31	DTC P0443: EVAP Emission System Purge	
Troubleshooting for Communication Error		Control Valve Circuit	1A-86
with Scan Tool Using CAN.....	1A-31	DTC P0462 / P0463: Fuel Level Sensor	
DTC Table.....	1A-36	Circuit Low / High	1A-88
Fail-Safe Table.....	1A-40	DTC P0480: Fan 1 Control Circuit	1A-90
Scan Tool Data	1A-42	DTC P0481: Fan 2 Control Circuit	1A-93
Visual Inspection	1A-47	DTC P0500: Vehicle Speed Sensor "A"	1A-95
		DTC P0532 / P0533: A/C Refrigerant	
		Pressure Sensor Circuit Low / High	1A-96

DTC P0601 / P0602 / P0607: Internal Control Module Memory Check Sum Error / Control Module Programming Error / Control Module Performance	1A-98	DTC U0101: Lost Communication with TCM ..	1A-119
DTC P0620: Generator Control Circuit	1A-99	DTC U0121: Lost Communication with ABS / ESP® Control Module	1A-119
DTC P0625 / P0626: Generator Field Terminal Circuit Low / High	1A-101	DTC U0140: Lost Communication with Body Control Module	1A-119
DTC P0660 / P0662: Intake Manifold Tuning Valve Control Circuit Open / High	1A-103	Troubleshooting for CAN-DTC	1A-120
DTC P1501 / P1502: Electric Load Current Sensor Circuit Low / High	1A-105	Inspection of ECM and Its Circuits	1A-125
DTC P1510: ECM Back-Up Power Supply Malfunction	1A-107	ECM Power and Ground Circuit Check	1A-144
DTC P2101: Throttle Actuator Control Motor Circuit Range / Performance	1A-108	Fuel Injector Circuit Check	1A-148
DTC P2102: Throttle Actuator Control Motor Circuit Low	1A-109	Fuel Pump and Its Circuit Check	1A-150
DTC P2103: Throttle Actuator Control Motor Circuit High	1A-110	Fuel Pressure Check	1A-153
DTC P2111: Throttle Actuator Control System - Stuck Open	1A-111	A/C Condenser Cooling Fan Control System Inspection	1A-155
DTC P2119: Throttle Actuator Control Throttle Body Range / Performance	1A-111	A/C System Circuits Check	1A-157
DTC P2122 / P2123: Throttle / Pedal Position Sensor / Switch "D" Circuit Low / High	1A-113	Electric Load Signal Circuit Check	1A-160
DTC P2127 / P2128: Throttle / Pedal Position Sensor / Switch "E" Circuit Low / High Input ..	1A-115	Radiator Cooling Fan Low Speed Control System Check	1A-162
DTC P2135: Throttle / Pedal Position Sensor / Switch "A" / "B" Voltage Correction	1A-117	Radiator Cooling Fan High Speed Control System Check	1A-164
DTC P2138: Pedal Position Sensor (Main / Sub) Voltage Correction	1A-118	Repair Instructions	1A-165
DTC P2228 / P2229: Barometric Pressure Circuit Low / High	1A-119	Idle Speed and IAC Throttle Valve Opening Inspection	1A-165
DTC U0073: Control Module Communication Bus Off	1A-119	Special Tools and Equipment	1A-166
		Special Tool	1A-166
		Engine Electrical Devices	1C-1
		Repair Instructions	1C-1
		Electric Load Current Sensor On-Vehicle Inspection	1C-1
		Charging System	1J-1
		General Description	1J-1
		Generator Description	1J-1

Engine General Information and Diagnosis

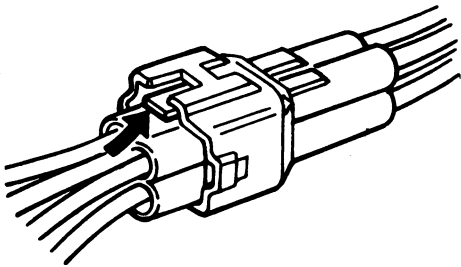
Precautions

Precautions on Engine Service

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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 could possibly 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.
- When disconnecting couplers, don't pull wire harness but make sure to hold coupler itself. With lock type coupler, be sure to unlock before disconnection. Attempt to disconnect coupler without unlocking may result in damage to coupler. When connecting lock type coupler, insert it till clicking sound is heard and connect it securely.



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- According to the specification / market of the vehicle, immobilizer system parts may not be equipped. Be sure to keep it in mind during servicing the vehicle.

Precautions in Diagnosing Trouble

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- 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 diagnostic trouble codes (DTCs) are stored, proceed to the flow of the DTC which has detected earliest in the order and follow the instruction in that table.
If no instructions are given, DTCs according to the following priorities.
 - a. Diagnostic trouble codes (DTCs) other than DTC P0171 / P0172 (Fuel system too lean/too rich)
 - b. DTC P0171 / P0172 (Fuel system too lean/too rich)
- Be sure to read "Precaution for CAN Communication System 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 known good ECM.
 - Resistance value of all relays, actuators is as specified respectively.
 - APP sensor, TP sensor and A/C refrigerant pressure 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, ABS / ESP® control module, 4WD control module, steering angle sensor (ESP® model), yaw rate / G sensor (ESP® model) and TCM, 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)

1A-2 Engine General Information and Diagnosis:

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

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- 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

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- 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

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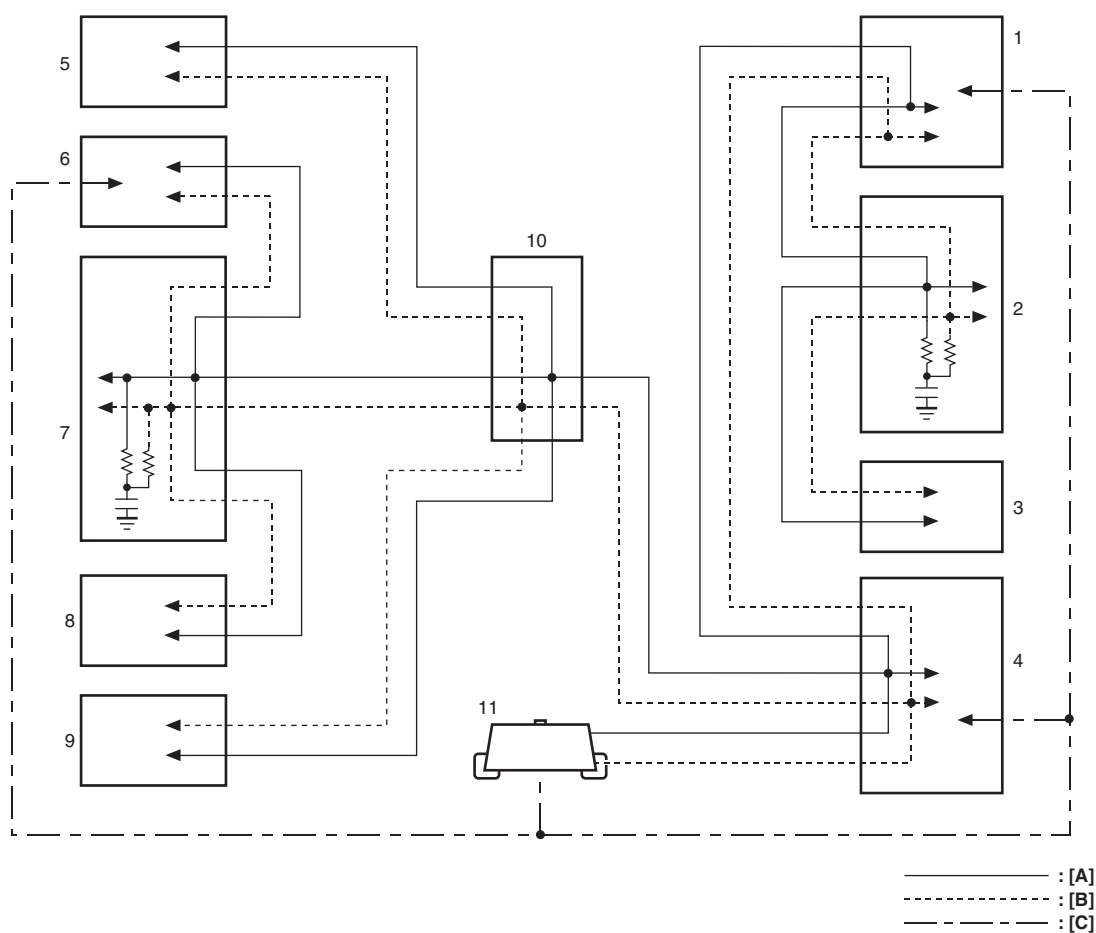
After performing one of works described below, it is necessary to re-register the completely closed throttle valve reference position stored in memory of ECM. (For detailed information, refer to "Description of Electric Throttle Body System Calibration".) For the procedure to register such data in ECM,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

- To shut off backup power of ECM for such purposes of battery replacement or "DOME" fuse removal.
- To erase DTCs P0607, P0122, P0123, P0222, P0223, P2101, P2102, P2103, P2111, P2119, P2122, P2123, P2127, P2128, P2135 and/or P2138.
- To replace ECM.
- To replace throttle body and/or APP sensor assembly.

Precaution on CAN Troubleshooting

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CAN schematic and routing diagram



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[A]: CAN high line (RED)

[B]: CAN low line (WHT)

[C]: K-line

No.	Part Name	Communication with scan tool	Monitor of CAN-DTC
1.	ESP® control module	K-line	Available
	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.	Steering angle sensor (ESP® model)	Not available	Not available
9.	Yaw rate / G sensor (ESP® model)	Not available	Not available
10.	CAN junction connector	—	—
11.	DLC	—	—

1A-4 Engine General Information and Diagnosis:

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
ESP® control module	U0073/U0100/U0101/U0114/U0123/U0126
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 / ESP® 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

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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).

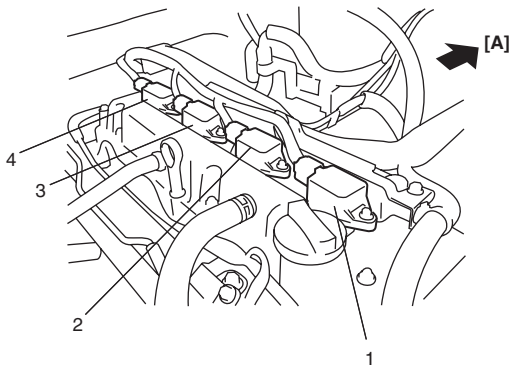
Accordingly, when any internal engine parts are serviced, care and cleanliness are important.

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.



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[A]: Forward

Engine Diagnosis General Description

S6RW0H1101002

The engine and emission control systems 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

S6RW0H1101013

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).

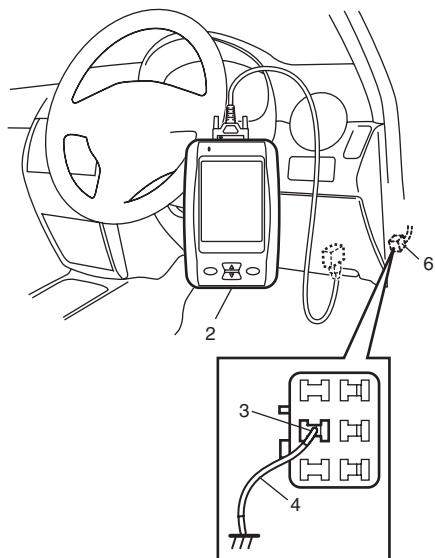
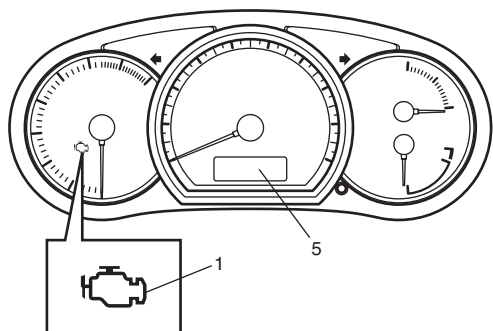
- Heated oxygen sensor
- A/F sensor
- ECT sensor
- TP sensor
- MAF sensor
- IAT sensor
- CMP sensor
- CKP sensor
- Knock sensor
- Wheel speed sensor (VSS)
- CPU (Central Processing Unit) of ECM
- APP sensor
- Throttle actuator
- Ignition coil
- Radiator cooling fan relay
- A/C condenser cooling fan relay
- EVAP canister purge valve
- Barometric pressure sensor
- CAN
- ECM back up power supply

1A-6 Engine General Information and Diagnosis:

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.
- 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.

Frame		Frame 1	Frame 2	Frame 3	Frame 4
Malfunction detected order		Freeze frame data	1st freeze frame data	2nd freeze frame data	3rd freeze frame data
1	No malfunction detected	—	—	—	—
2	P0031 (Pending DTC)	P0031 data	P0031 data	—	—
3	No malfunction detected	P0031 data	P0031 data	—	—
4	No malfunction detected	—	—	—	—
5	P0500 (Pending DTC)	P0500 data	P0500 data	—	—
6	P0500 P0031 (Pending DTC)	P0500 data	P0500 data	P0031 data	—
7	P0171 (Pending DTC)	P0171 data	P0500 data	P0031 data	P0171 data
8	P0171	P0171 data	P0500 data	P0171 data	—

Freeze frame data clearance:

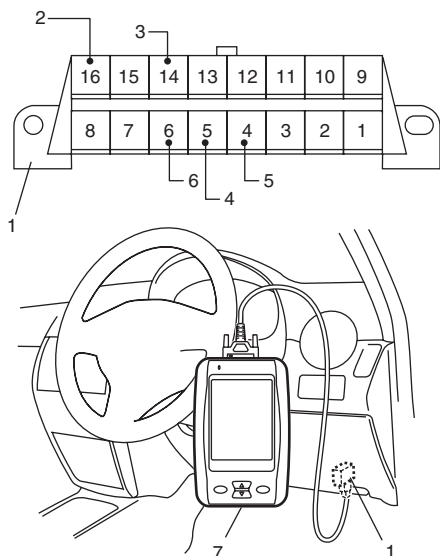
The freeze frame data is cleared at the same time as clearance of DTC.

DLC (Data Link Connector)

S6RW0H1101004

DLC (1) is in compliance with SAE J1962 in its installation position, 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) to communicate with ECM (included in immobilizer control) and TCM.



I6RW0E110056-01

- | |
|---|
| 2. B + (Continuously battery power) |
| 4. ECM ground (Signal ground) |
| 5. Vehicle body ground (Chassis ground) |

Engine and Emission Control System Description

S6RW0H1101005

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.

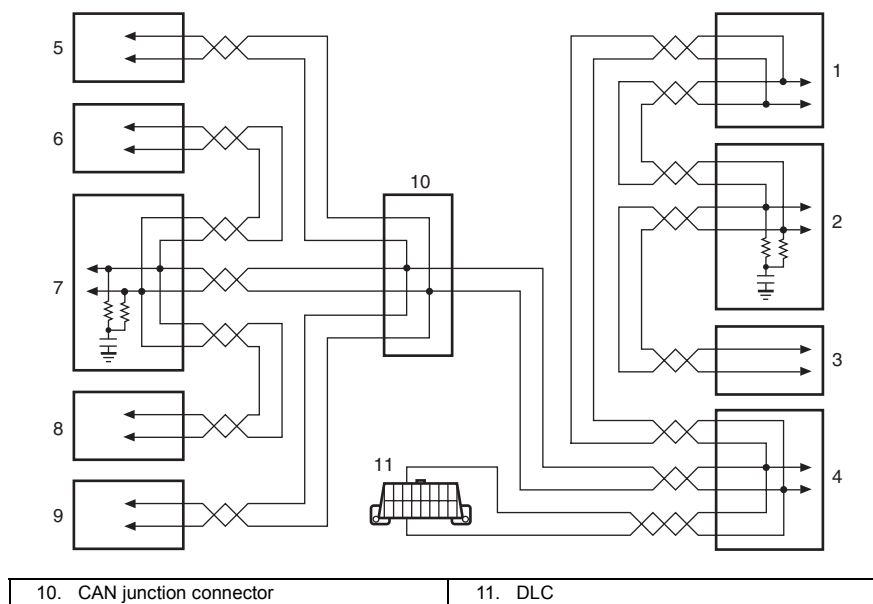
Emission control system includes EVAP and PCV systems.

CAN Communication System Description

S6RW0H1101006

ECM (2), ABS / ESP® control module (1), TCM (3), BCM (4), 4WD control module (6), combination meter (7), steering angle sensor (ESP® model) (8), yaw rate / G sensor (ESP® model) (9) and keyless start control module (5) communicate control data between each control module.

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



I6RW0H110002-01

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	ESP® control module	4WD control module	Keyless start control module
ECM	Transmit	DATA	Engine torque signal	○			○	○	
			Accelerator pedal position signal	○			○	○	
			Engine speed signal	○	○	○	○	○	
			Throttle position signal	○					
			Driving cycle active	○					
			Warm up cycle active	○					
			Immobilizer indicator light control signal			○			
			MIL control signal			○			
			Diagnostic trouble code (DTC)			○			
			Engine coolant temperature signal	○	○	○			
			Fuel level signal			○			
			Vehicle speed signal		○	○			○
			Brake pedal switch signal	○	○			○	
			A/C compressor clutch signal	○	○				
			Fuel consumption signal		○				
			Odometer signal			○			
			A/C refrigerant pressure signal		○				
			Engine type signal		○			○	
			ECM-keyless start control module code						○

I6RW0H110003-01

ECM Reception Data

				TCM	BCM	ESP® control module	4WD control module	Keyless start control module
ECM	Receive	DATA	Torque request signal	○				
			Transmission actual gear position signal	○				
			Transmission warning light signal	○				
			Transmission selector lever position signal	○				
			Transmission oil temperature signal	○				
			Vehicle speed pulse signal	○				
			A/C switch ON signal		○			
			Electric load signal		○			
			Wheel speed signal (front right)			○		
			Wheel speed signal (front left)			○		
			Fuel cut inhibit signal			○		
			ESP® states signal			○		
			ABS active			○		
			4WD mode status				○	
			ECM-keyless start control module code					○
			ID code of keyless start control module					○

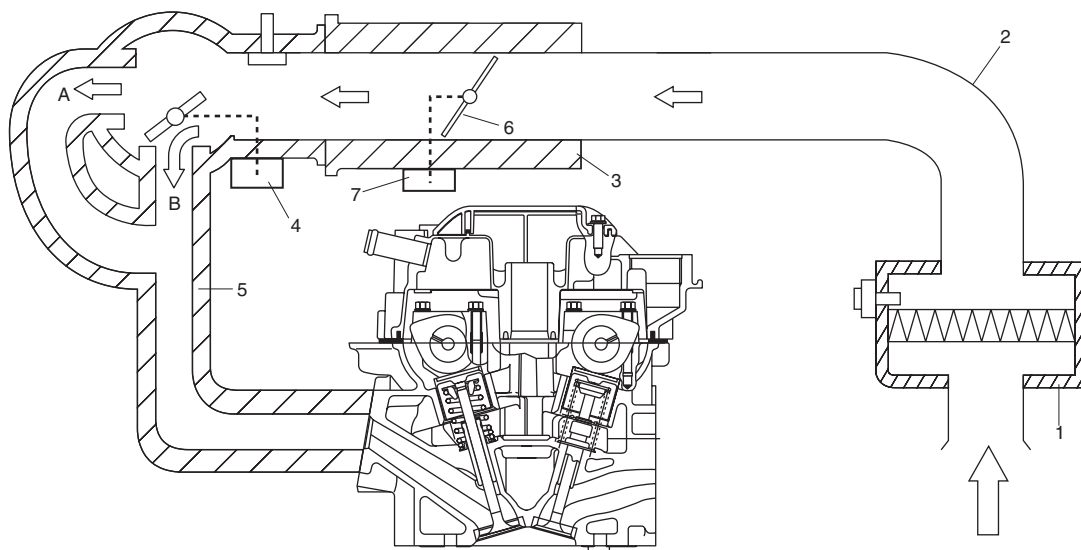
I6RW0H110004-02

Air Intake System Description

S6RW0H1101007

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”), intake manifold tuning (IMT) valve (4) which adjusts the distributor pipe length of intake manifold to “A” or “B” (for the details, refer to “IMT (Intake Manifold Tuning) System in Section 1D in related manual”) and intake manifold (5).

The air (by the amount corresponding to throttle valve (6) 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 (7) which opens/closes the throttle valve. (For the details, refer to “Description of Electric Throttle Body System”).



I7RW01110005-02

Description of Electric Throttle Body System

S6RW0H1101008

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.

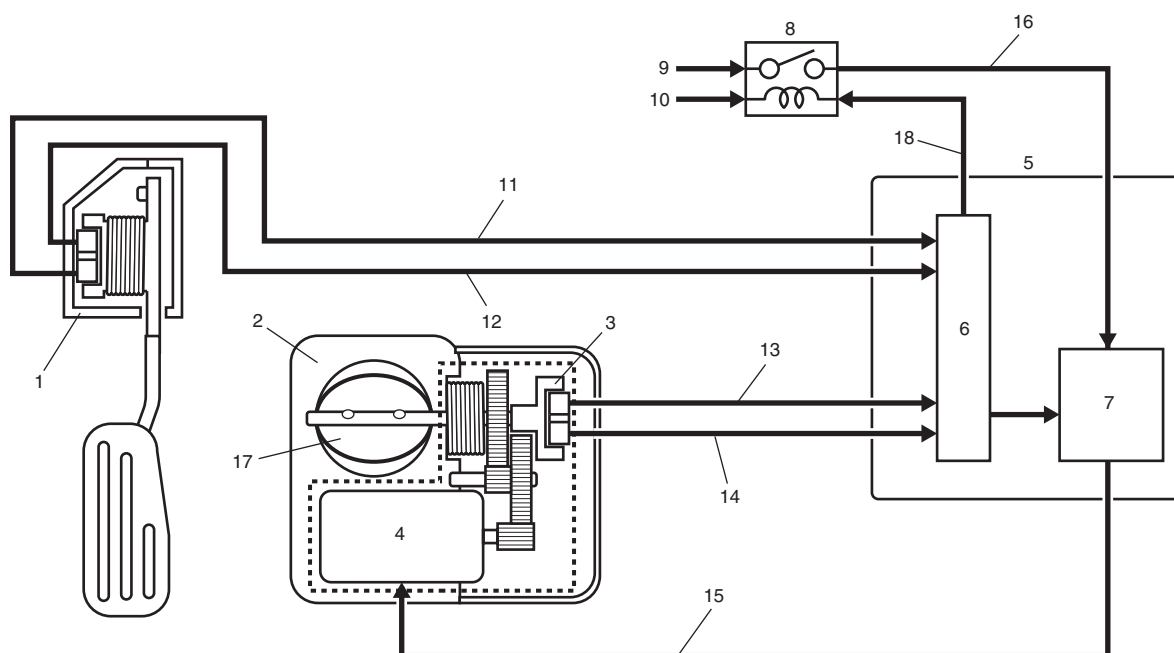
- Electric throttle body assembly: throttle valve, throttle actuator, 2 throttle position (TP) sensors
- APP sensor assembly: Accelerator pedal, 2 APP sensors

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 TP 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%) of throttle actuator control 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 of throttle actuator control 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, TP 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. TP sensor (main) signal	18. Control signal of throttle actuator control relay
10. From main relay	14. TP sensor (sub) signal	

Description of Electric Throttle Body System Calibration

S6RW0H1101009

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 TP sensor when throttle is completely closed) differs one from the other depending on individual differences of the throttle valve and TP 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.

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 in related manual". (After the completely closed position data is cleared, ECM, for the first time only, opens and closes the throttle valve for about 5 sec. 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.)

Generator Control System Description

S6RW0H1101014

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

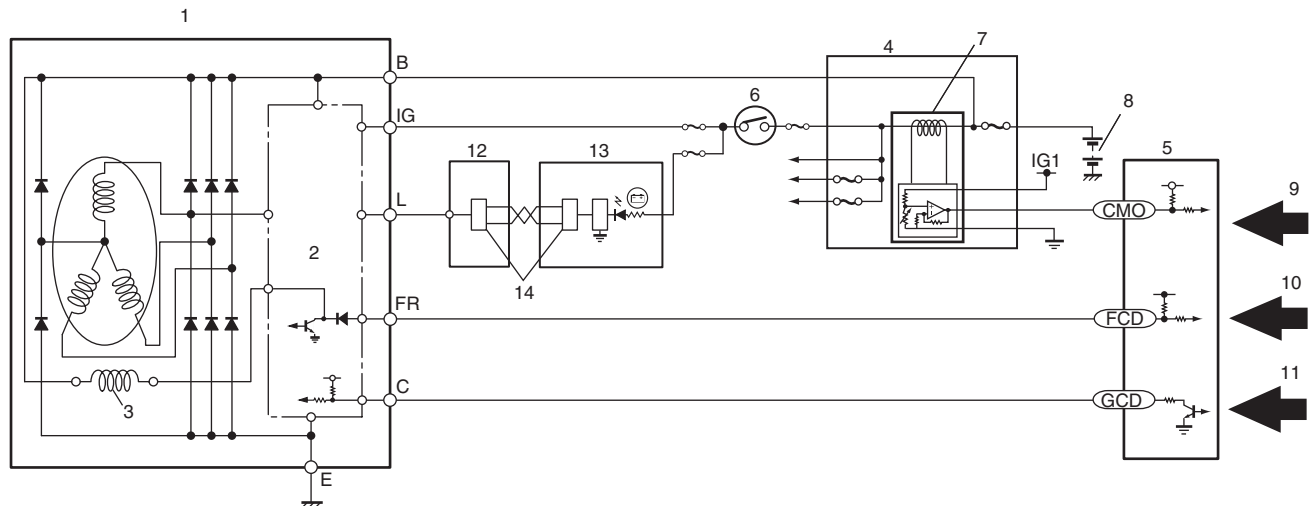
ECM controls the generated voltage of the generator using "C" terminal (generator control terminal) duty, based on following information.

- 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 Specifications 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.



I6RW0H110005-01

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

A/F Sensor Description

S6RW0H1101010

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.

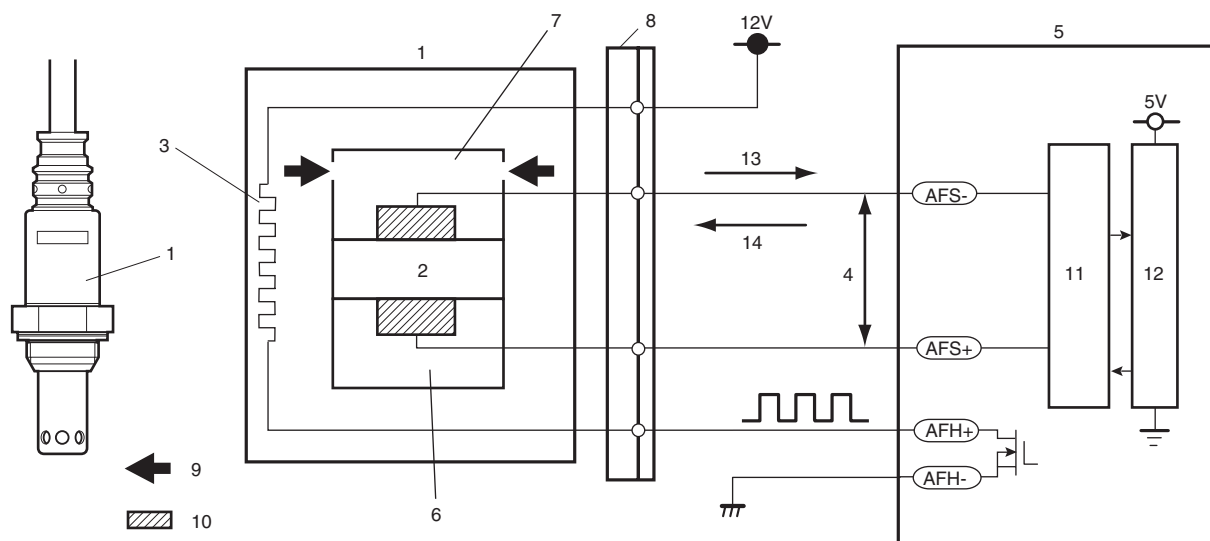
A/F sensor detects oxygen concentration in exhaust gas (9) (A/F ratio of the air-fuel mixture) linearly, ranging from LEAN to RICH.

Operation

ECM (5) controls the sensor heater (3) and keeps the sensor element temperature at the specified level (about 750 °C) constantly so that the A/F sensor is activated in the specified way for accurate A/F detection. When the sensor element reaches the specified temperature (it is activated), its impedance drops to the specified value (approx. 30 Ω) by its characteristic.

When a certain voltage (about 0.4 V) is applied between sensor elements in this state, circuit current corresponding to the sensor element impedance flows in the sensor circuit. ECM detects this circuit current and judges whether the sensor is in the active state or not. At this time, sensor current is output linearly in the range of +0.01 mA to +some mA on the lean side and −0.01 mA to −some mA on the rich side. The variation in these ranges depends on the difference from the stoichiometry A/F ratio, that is, the amount of oxygen between the atmosphere side (6) and exhaust manifold (7).

According to this sensor output, ECM executes A/F feedback (fuel trim) to achieve the target A/F ratio.



I7RW01110007-02

4. 0.4 V	10. Electrode	12. CPU	14. Rich
8. A/F sensor connector	11. A/F signal processing circuit	13. Lean	

Electronic Control System Description

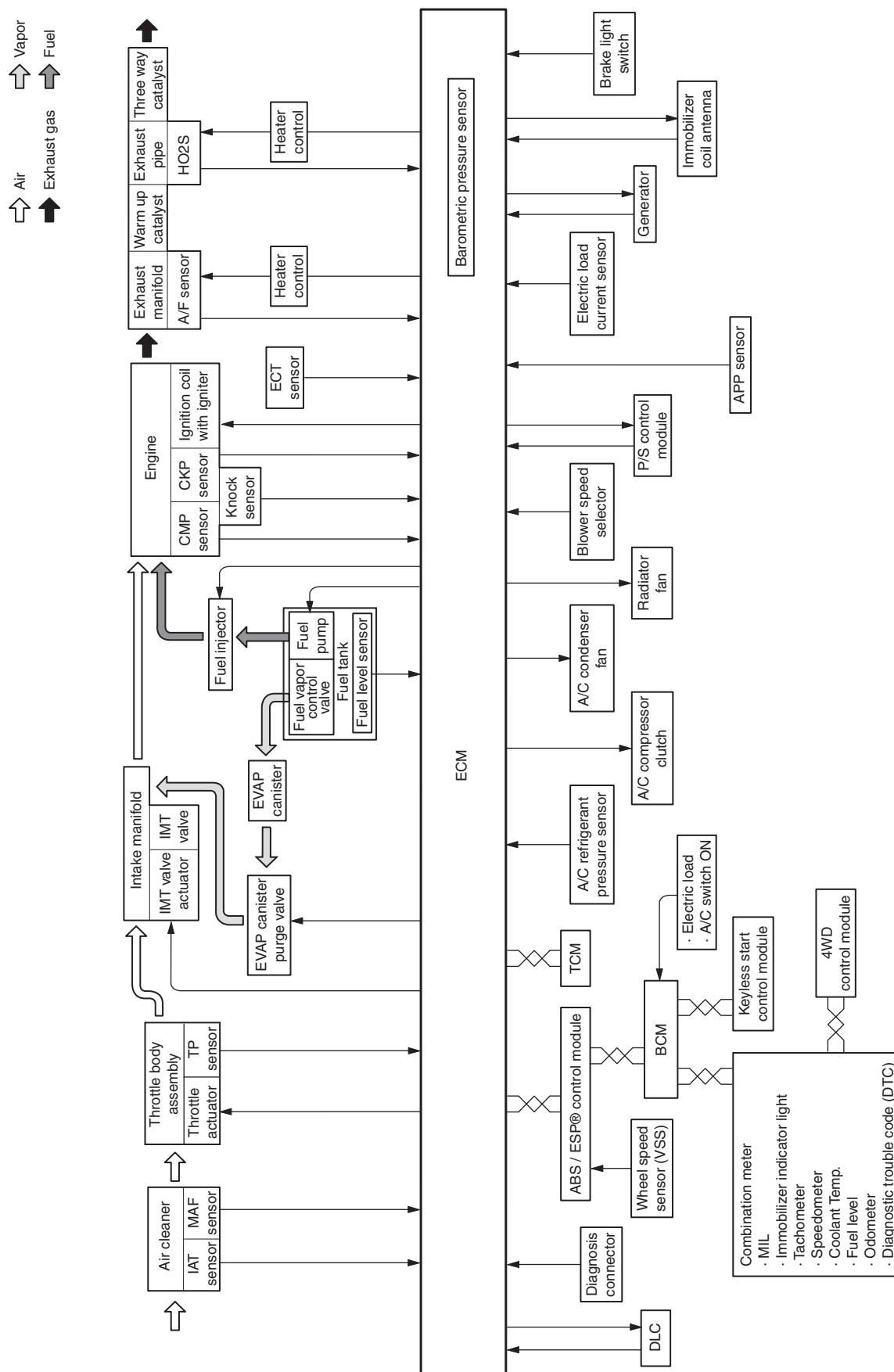
S6RW0H1101011

The electronic control system consists of 1) various sensors which detect the state of engine and driving conditions, 2) ECM which controls various devices according to the signals from the sensors and 3) various controlled devices. Functionally, it is divided into the following sub systems:

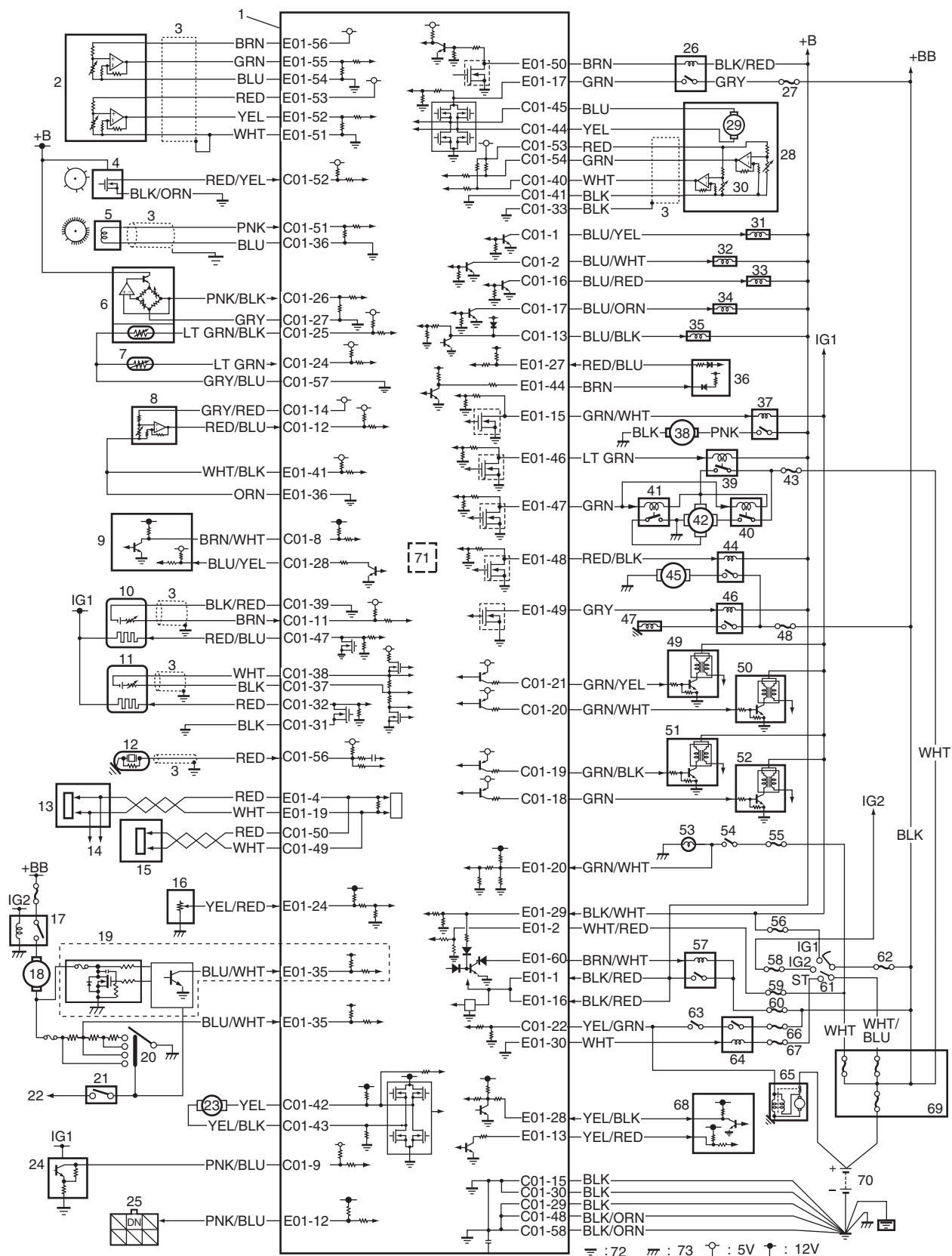
- Fuel injection control system
- Ignition control system
- IMT valve control system
- Electric throttle body control system
- Fuel pump control system
- Radiator cooling fan control system
- Evaporative emission control system
- A/F sensor heater control system
- HO2S heater control system
- A/C control system
- Immobilizer control system
- Generator control system
- Controller (computer) communication system

Especially, ECM, BCM, combination meter, TCM, ABS / ESP® control module, 4WD control module and keyless start control module intercommunicate by means of CAN (Controller Area Network) communication.

Engine and Emission Control System Flow Diagram



ECM Input / Output Circuit Diagram

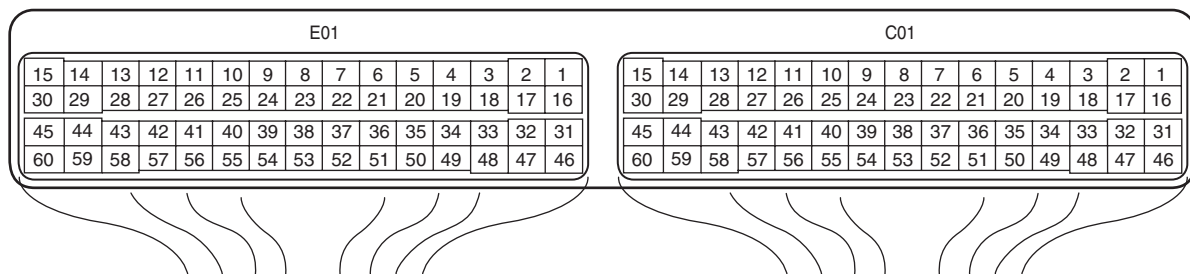


I6RW0H110007-01

1. ECM	26. Throttle actuator control relay	51. Ignition coil assembly (for No.3 spark plug)
2. APP sensor assembly	27. "THR MOT" fuse	52. Ignition coil assembly (for No.4 spark plug)
3. Shield wire	28. Electric throttle body assembly	53. Brake light
4. CMP sensor	29. Throttle actuator	54. Brake light switch
5. CKP sensor	30. TP sensor	55. "STOP" fuse

6. MAF and IAT sensor	31. Fuel injector No.1	56. "IG COIL" fuse
7. ECT sensor	32. Fuel injector No.2	57. Main relay
8. A/C refrigerant pressure sensor	33. Fuel injector No.3	58. "IG2 SIG" fuse
9. Generator	34. Fuel injector No.4	59. "DOME" fuse
10. HO2S	35. EVAP canister purge valve	60. "FI" fuse
11. A/F sensor	36. P/S control module	61. Ignition switch
12. Knock sensor	37. Fuel pump relay	62. "IGN" fuse
13. ABS / ESP® control module	38. Fuel pump	63. Transmission range switch (A/T model)
14. To other control module and DLC connected CAN	39. Radiator cooling fan relay No.1	64. Starting motor control relay
15. TCM	40. Radiator cooling fan relay No.2	65. Starting motor
16. Fuel level sensor	41. Radiator cooling fan relay No.3	66. "ST" fuse
17. Blower motor relay	42. Radiator cooling fan motor	67. "ST SIG" fuse
18. Blower motor	43. "RDTR" fuse	68. Immobilizer coil antenna
19. Blower speed selector (Auto A/C model)	44. A/C condenser cooling fan relay	69. Main fuse box
20. Blower speed selector (Manual A/C model)	45. A/C condenser cooling fan motor	70. Battery
21. A/C switch	46. A/C compressor relay	71. Barometric pressure sensor
22. To BCM	47. A/C compressor	72. Engine ground
23. IMT valve actuator	48. "A/C" fuse	73. Body ground
24. Electric load current sensor	49. Ignition coil assembly (for No.1 spark plug)	
25. Diagnosis connector	50. Ignition coil assembly (for No.2 spark plug)	

Terminal Arrangement of ECM Coupler (Viewed from Harness Side)



I7RW01110010-02

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	—	—	33	BLK	Shield ground for TP sensor circuit
4	—	—	34	—	—
5	—	—	35	—	—
6	—	—	36	BLU	CKP sensor (—)
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	YEL	IMT valve actuator (+)
13	BLU/BLK	EVAP canister purge valve output	43	YEL/BLK	IMT valve actuator (—)
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

1A-18 Engine General Information and Diagnosis:

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
18	GRN	Ignition coil No.4	48	BLK/ORN	Ground for ECM
19	GRN/BLK	Ignition coil No.3	49	WHT	CAN (low) communication line (active low signal) to TCM
20	GRN/WHT	Ignition coil No.2	50	RED	CAN (high) communication line (active high signal) to TCM
21	GRN/YEL	Ignition coil No.1	51	PNK	CKP sensor (+)
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	—	—
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	—	—
30	BLK	Ground for ECM	60	—	—

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 / ESP® 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	PNK/BLU	Diagnosis switch terminal	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 No.1 output
17	GRN	Power supply of throttle actuator drive circuit	47	GRN	Radiator cooling fan relay No.2/No.3 output
18	—	—	48	RED/BLK	A/C condenser cooling fan relay output
19	WHT	CAN (low) communication line (active low signal) to ABS / ESP® 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

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
26	—	—	56	BRN	Output 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

S6RW0H1101012

Function	Output	Input
Main relay control	Main relay	<ul style="list-style-type: none"> • Ignition switch
Fuel pump control	Fuel pump relay	<ul style="list-style-type: none"> • CKP sensor • Ignition switch • Starter switch • Immobilizer control module (in ECM)
Injection control	Fuel injection	<ul style="list-style-type: none"> • CKP sensor • CMP sensor • MAF sensor • IAT sensor • TP sensor • ECT sensor • A/F sensor • HO2S • P/S control module • ABS / ESP® control module • Transmission range sensor • Brake light switch • A/C switch • Blower speed selector • Barometric pressure sensor • Ignition switch • Starter switch • Immobilizer control module (in ECM)
A/F sensor and HO2S heater control	A/F sensor and HO2S	<ul style="list-style-type: none"> • Ignition switch • MAF sensor • ECT sensor • IAT sensor • TP sensor • CKP sensor

1A-20 Engine General Information and Diagnosis:

Function	Output	Input
Idle speed control	Throttle actuator	<ul style="list-style-type: none">• CKP sensor• MAF sensor• IAT sensor• TP sensor• ECT sensor• APP sensor• Wheel speed sensor (VSS)• A/C refrigerant pressure sensor• A/C evaporator outlet air temp. sensor (manual A/C model)• P/S control module• ABS / ESP® control module• Transmission range sensor• Transmission fluid temperature sensor• Lighting switch• Rear end door defogger switch• Brake light switch• A/C switch• Blower speed selector• Barometric pressure sensor• Ignition switch• Starter switch• Immobilizer control module (in ECM)
Ignition control	Ignition coil with igniter	<ul style="list-style-type: none">• Ignition switch• Starter switch• MAF sensor• IAT sensor• TP sensor• ECT sensor• CKP sensor• CMP sensor• Knock sensor• Wheel speed sensor (VSS)• Transmission range sensor• Barometric pressure sensor• Immobilizer control module (in ECM)
EVAP purge control	EVAP canister purge valve	<ul style="list-style-type: none">• Barometric pressure sensor• Ignition switch• A/C switch• Blower speed selector• A/F sensor• MAF sensor• IAT sensor• TP sensor• ECT sensor• CKP sensor

Function	Output	Input
Radiator cooling fan control	Radiator cooling fan relay No.1, No.2 and No.3	<ul style="list-style-type: none"> • Ignition switch • A/C switch • Blower speed selector • Wheel speed sensor (VSS) • ECT sensor • A/C refrigerant pressure sensor • A/C evaporator outlet air temp. sensor (manual A/C model)
MIL control	MIL	<ul style="list-style-type: none"> • Barometric pressure sensor • Ignition switch • Wheel speed sensor (VSS) • A/F sensor • HO2S • MAF sensor • IAT sensor • TP sensor • ECT sensor • APP sensor • CKP sensor • CMP sensor • Knock sensor • Immobilizer control module (in ECM)
Throttle actuator power supply control	Throttle actuator control relay	<ul style="list-style-type: none"> • Ignition switch • TP sensor • APP sensor
IMT valve control	IMT valve actuator	<ul style="list-style-type: none"> • Ignition switch • ECT sensor • TP sensor • CMP sensor
Generator control	Generator	<ul style="list-style-type: none"> • Ignition switch • TP sensor • ECT sensor • CKP sensor • CMP sensor • Wheel speed sensor (VSS) • Blower speed selector • Lighting switch • Rear end door defogger switch • Electric load current sensor
A/C compressor control	A/C compressor relay	<ul style="list-style-type: none"> • Ignition switch • Starter switch • ECT sensor • A/C refrigerant pressure sensor • A/C evaporator outlet air temp. sensor (manual A/C model) • Blower speed selector • A/C switch • Wheel speed sensor (VSS) • TP sensor • CKP sensor

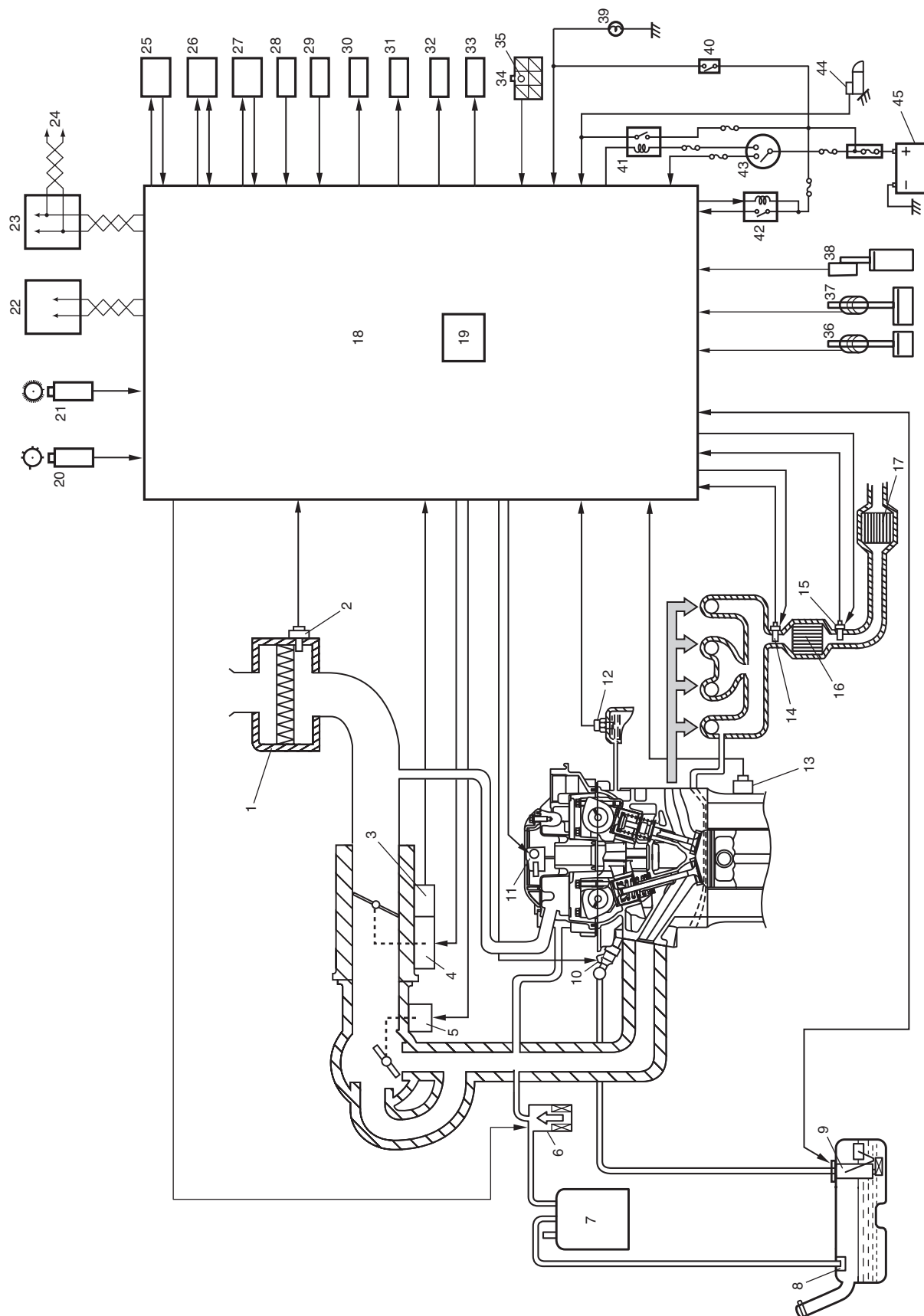
1A-22 Engine General Information and Diagnosis:

Function	Output	Input
A/C condenser cooling fan control	A/C condenser cooling fan relay	<ul style="list-style-type: none">• Wheel speed sensor (VSS)• A/C refrigerant pressure sensor• A/C evaporator outlet air temp. sensor (manual A/C model)• ECT sensor• A/C switch• Blower speed selector• Ignition switch

Schematic and Routing Diagram

Engine and Emission Control System Diagram

S6RW0H1102001



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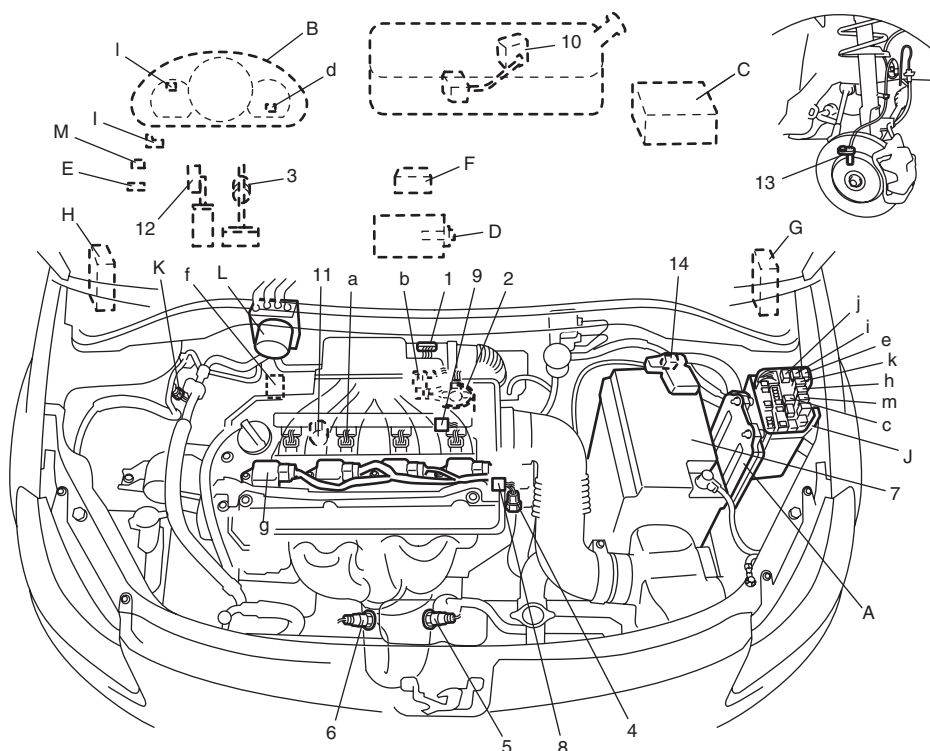
1A-24 Engine General Information and Diagnosis:

1. Air cleaner	16. Warm-up three way catalytic converter	31. Radiator cooling fan relay
2. MAF and IAT sensor	17. Three way catalytic converter	32. A/C condenser cooling fan relay
3. TP sensor	18. ECM	33. A/C compressor relay
4. Throttle actuator	19. Barometric pressure sensor	34. Diagnosis connector
5. IMT valve actuator	20. CMP sensor	35. Diagnosis switch terminal
6. EVAP canister purge valve	21. CKP sensor	36. Clutch switch (cruise control model)
7. EVAP canister	22. TCM	37. Brake switch (cruise control model)
8. Vapor control valve (assembled into the fuel tank)	23. ABS / ESP® control module	38. APP sensor
9. Fuel pump	24. To other control module and DLC connected CAN	39. Brake light
10. Fuel injector	25. P/S control module	40. Brake light switch
11. Ignition coil assembly	26. Immobilizer coil antenna	41. Starting motor control relay
12. ECT sensor	27. Generator	42. Main relay
13. Knock sensor	28. Electric load current sensor	43. Ignition switch
14. A/F sensor	29. A/C refrigerant pressure sensor	44. Starter magnetic switch
15. HO2S	30. Throttle actuator control relay	45. Battery

Component Location

Electronic Control System Components Location

S6RW0H1103001



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Information sensors	Control devices	Others
1. MAF and IAT sensor	a: Fuel injector	A: ECM
2. Electric throttle body assembly (built-in TP 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: MIL	D: A/C evaporator temperature sensor (manual A/C model)
5. A/F sensor	e: Radiator cooling fan relay No.1	E: DLC
6. HO2S	f: IMT valve actuator	F: P/S control module
7. Battery	g: Ignition coil assembly (with ignitor)	G: TCM
8. CMP sensor	h: Main relay	H: BCM
9. CKP sensor	i: Radiator cooling fan relay No.2	I: Immobilizer coil antenna
10. Fuel level sensor	j: Radiator cooling fan relay No.3	J: Fuse box No.2
11. Knock sensor	k: Starting motor control relay	K: A/C refrigerant pressure sensor
12. APP sensor	l: Immobilizer indicator light	L: ABS / ESP® control module
13. Front wheel speed sensor (VSS)	m: Throttle actuator control relay	M: Diagnosis connector
14. Electric load current sensor		

Diagnostic Information and Procedures

Engine and Emission Control System Check

S6RW0H1104001

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 "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 "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 "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.
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 "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.

Step	Action	Yes	No
11	<p>🔧 Final confirmation test</p> <p>1) Clear DTC if any.</p> <p>2) Perform final confirmation test referring to “Final Confirmation Test”.</p> <p><i>Is there any problem symptom, DTC or abnormal condition?</i></p>	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	
<input type="checkbox"/> Difficult Starting <input type="checkbox"/> No cranking <input type="checkbox"/> No initial combustion <input type="checkbox"/> No combustion <input type="checkbox"/> Poor starting at (<input type="checkbox"/> cold <input type="checkbox"/> warm <input type="checkbox"/> always) <input type="checkbox"/> Other _____	<input type="checkbox"/> Poor Driveability <input type="checkbox"/> Hesitation on acceleration <input type="checkbox"/> Back fire/ <input type="checkbox"/> After fire <input type="checkbox"/> Lack of power <input type="checkbox"/> Surging <input type="checkbox"/> abnormal knocking <input type="checkbox"/> Other _____
<input type="checkbox"/> Poor Idling <input type="checkbox"/> Poor fast idle <input type="checkbox"/> Abnormal idling speed (<input type="checkbox"/> High <input type="checkbox"/> Low) (r/min.) <input type="checkbox"/> Unstable <input type="checkbox"/> Hunting (r/min. to r/min.) <input type="checkbox"/> Other _____	<input type="checkbox"/> Engine Stall when <input type="checkbox"/> Immediately after start <input type="checkbox"/> Accel. pedal is depressed <input type="checkbox"/> Accel. pedal is released <input type="checkbox"/> Load is applied <input type="checkbox"/> A/C <input type="checkbox"/> Electric load <input type="checkbox"/> P/S <input type="checkbox"/> Other _____ <input type="checkbox"/> Other _____
<input type="checkbox"/> OTHERS:	

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

Malfunction indicator lamp condition	<input type="checkbox"/> Always ON <input type="checkbox"/> Sometimes ON <input type="checkbox"/> Always OFF <input type="checkbox"/> Good condition
Diagnostic trouble code	First check: <input type="checkbox"/> No code <input type="checkbox"/> Malfunction code () Second check: <input type="checkbox"/> No code <input type="checkbox"/> 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.

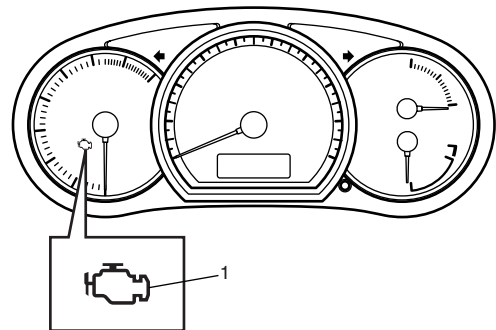
Step 11: Final Confirmation Test

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

S6RW0H1104002

- 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

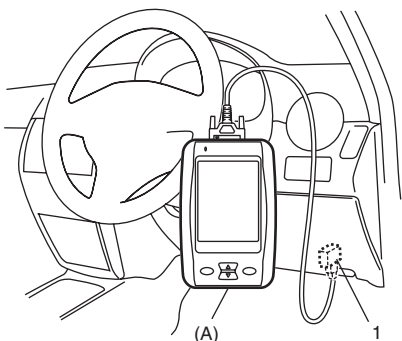
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Using Scan Tool

- 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.



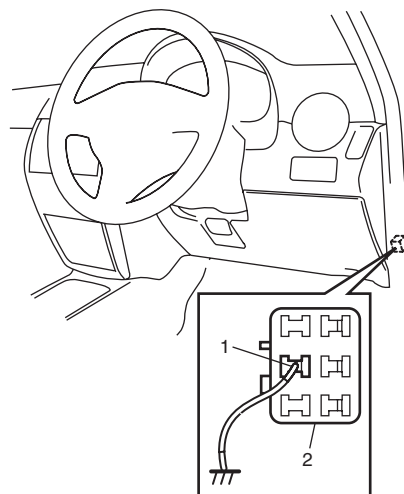
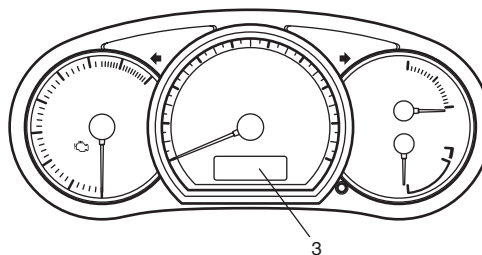
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- 3) Turn ignition switch ON and confirm that MIL lights.
- 4) Read DTC, pending DTC and freeze frame data according to instructions displayed on scan tool and print them or write them down. Refer to scan tool operator's manual for further details.
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.



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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

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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

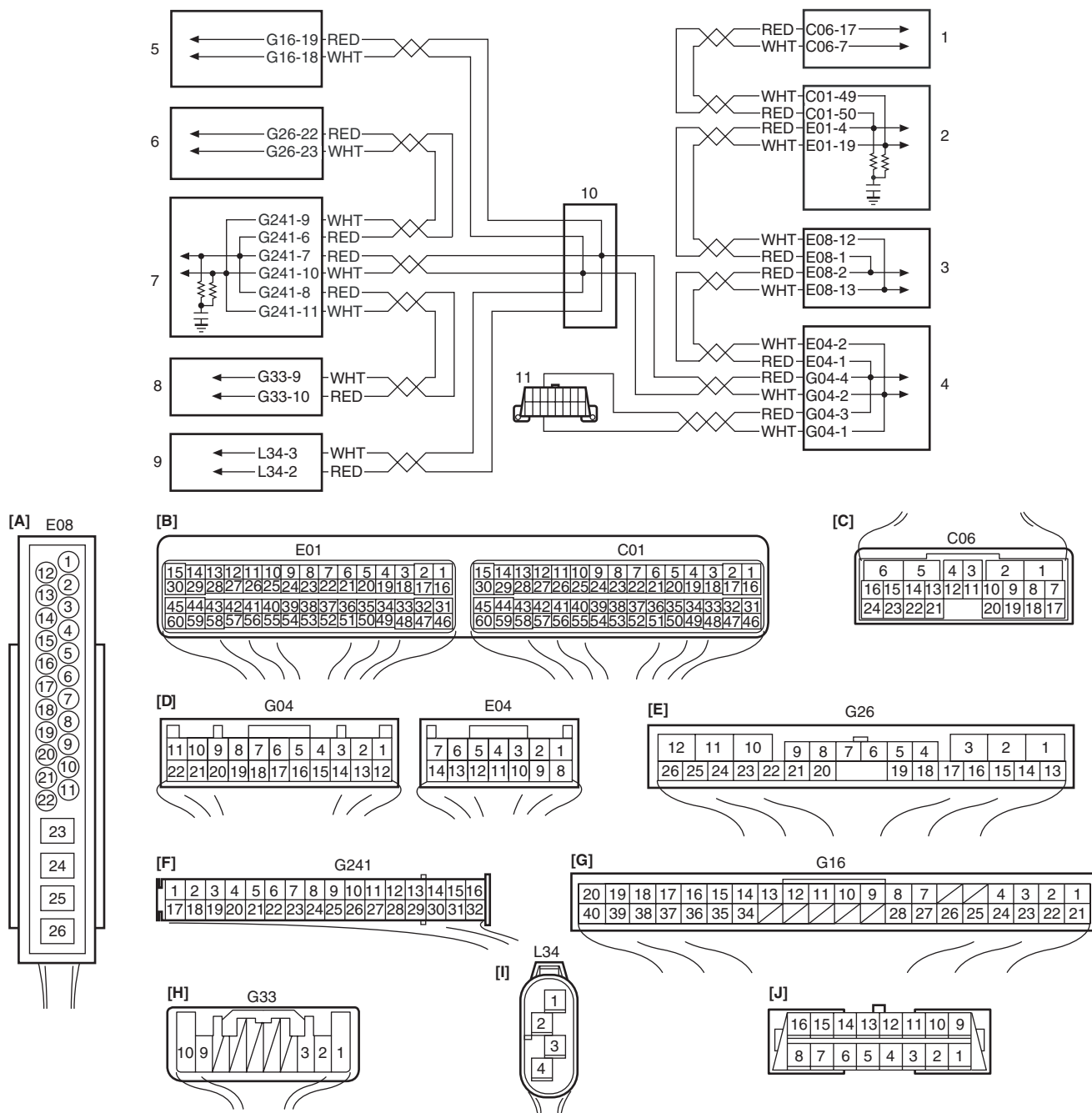
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Perform this troubleshooting when it is not possible to communicate between scan tool and ECM/TCM.

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
 - ESP® control module
 - 4WD control module
 - HVAC control module (Auto A/C model)
 - P/S control module

Wiring Diagram



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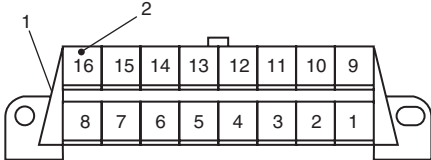
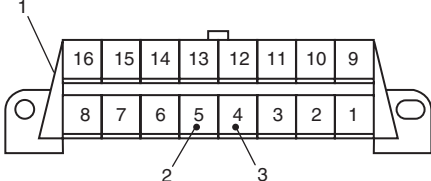
[A]: ABS / ESP® control module connector (viewed from terminal side)	2. ECM
[B]: ECM connector (viewed from harness side)	3. ABS / ESP® control module
[C]: TCM connector (viewed from harness side)	4. BCM
[D]: BCM connector (viewed from harness side)	5. Keyless start control module
[E]: 4WD control module connector (viewed from harness side)	6. 4WD control module
[F]: Combination meter connector (viewed from terminal side)	7. Combination meter
[G]: Keyless start control module connector (viewed from harness side)	8. Steering angle sensor
[H]: Steering angle sensor connector (viewed from harness side)	9. Yaw rate / G sensor
[I]: Yaw rate / G sensor connector (viewed from harness side)	10. CAN junction connector
[J]: DLC (viewed from terminal side)	11. DLC
1. TCM	

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 / ESP® control module

- BCM
- Combination meter
- Keyless start control module
- 4WD control module
- Sensor communication by CAN
 - Steering angle sensor (ESP® model)
 - Yaw rate / G sensor (ESP® model)
- Power or ground circuit of control module communicated by CAN

Troubleshooting

Step	Action	Yes	No
1	Scan tool check <ol style="list-style-type: none"> 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. <p><i>Is it possible to check DTC in ECM?</i></p>	Go to Step 2.	Scan tool faulty. Refer to its operator's manual.
2	DLC power circuit check <ol style="list-style-type: none"> 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.  <p style="text-align: right; font-size: small;">I7RW01110096-01</p> <p><i>Is voltage 10 – 14 V?</i></p>	Go to Step 3.	Repair power circuit.
3	DLC ground circuit check <ol style="list-style-type: none"> 1) Ignition switch turn to OFF position. 2) Check DLC (1) ground circuits as follows. <ul style="list-style-type: none"> • 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.  <p style="text-align: right; font-size: small;">I7RW01110097-01</p> <p><i>Is resistance 1 Ω or less?</i></p>	Go to Step 4.	Repair ground circuit(s).

1A-34 Engine General Information and Diagnosis:

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. <ul style="list-style-type: none"> • ESP® control module • 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. <ul style="list-style-type: none"> • Control modules communicated by CAN <ul style="list-style-type: none"> – ECM – TCM – ABS / ESP® control module – BCM – Combination meter – Keyless start control module – 4WD control module • Sensors communicated by CAN <ul style="list-style-type: none"> – Steering angle sensor (ESP® model) – Yaw rate / G sensor (ESP® model) 3) Check for proper connection to each CAN line terminal of all control module sensor (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.

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. <ul style="list-style-type: none"> Between BCM connector and ABS / ESP® control module connector Between ABS / ESP® control module connector and ECM connector Between ECM connector and TCM connector Between BCM connector and yaw rate / G sensor 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 Between combination meter connector and steering angle sensor connector <p><i>Are all CAN lines in good condition?</i></p>	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 / ESP® control module and combination meter connectors. 3) Check communication between scan tool and ECM by DTC check in ECM. <p><i>Is it possible to check DTC in ECM?</i></p>	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. <p><i>Is it possible to check DTC in TCM?</i></p>	Identify malfunction control module by performing Step 13 through Step 16 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 <ul style="list-style-type: none"> 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 <p><i>Is each resistance 0 – 1 Ω?</i></p>	Substitute a known-good TCM and recheck.	Substitute a known-good ECM and recheck.

DTC Table

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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:)	DTC	MIL
☞ P0031	HO2S Heater Control Circuit Low (Bank-1 Sensor-1)	Heater control circuit voltage of A/F sensor is lower than specification for more than specified time even though control duty ratio of A/F sensor heater is less than 90% with engine running. (Heater control duty pulse is not detected in its circuit of ECM)	2 driving cycles	2 driving cycles
☞ P0032	HO2S Heater Control Circuit High (Bank-1 Sensor-1)	Heater control circuit voltage of A/F sensor is higher than specification for more than specified time even though control duty ratio of A/F sensor heater is more than 10% with engine running. (Heater control duty pulse is not detected in its circuit of ECM)	2 driving cycles	2 driving cycles
☞ P0037	HO2S Heater Control Circuit Low (Bank-1 Sensor-2)	HO2S circuit voltage is lower than specification for specified time even though control duty ratio of HO2S heater is less than 75% with engine running. (Heater control duty pulse is not detected in its monitor signal)	2 driving cycles	2 driving cycles
☞ P0038	HO2S Heater Control Circuit High (Bank-1 Sensor-2)	HO2S circuit voltage is higher than specification for specified time even though control duty ratio of HO2S heater is more than 25% with engine running. (Heater control duty pulse is not detected in its monitor signal)	2 driving cycles	2 driving cycles
☞ P0102	Mass or Volume Air Flow Circuit Low Input	Output voltage of MAF sensor is lower than 0.15 V for specified time.	1 driving cycle	1 driving cycle
☞ P0103	Mass or Volume Air Flow Circuit High Input	Output voltage of MAF sensor is higher than 4.85 V for specified time.	1 driving cycle	1 driving cycle
☞ P0112	Intake Air Temperature Sensor 1 Circuit Low	Circuit voltage of IAT sensor is lower than 0.15 V for specified time.	1 driving cycle	1 driving cycle
☞ P0113	Intake Air Temperature Sensor 1 Circuit High	Circuit voltage of IAT sensor is higher than 4.85 V for specified time.	1 driving cycle	1 driving cycle
☞ P0117	Engine Coolant Temperature Circuit Low	Circuit voltage of ECT sensor is lower than 0.15 V for specified time.	1 driving cycle	1 driving cycle
☞ P0118	Engine Coolant Temperature Circuit High	Circuit voltage of ECT sensor is higher than 4.85 V for specified time.	1 driving cycle	1 driving cycle
☞ P0122	Throttle/Pedal Position Sensor/Switch "A" (Main) Circuit Low	Output voltage of TP sensor (main) is lower than 0.3 V.	1 driving cycle	1 driving cycle
☞ P0123	Throttle/Pedal Position Sensor/Switch "A" (Main) Circuit High	Output voltage of TP sensor (main) is higher than 4.6 V.	1 driving cycle	1 driving cycle
☞ P0131	O2 Sensor (HO2S) Circuit Low Voltage (Bank-1 Sensor-1)	A/F sensor terminal voltage is lower than 1.8 V or A/F sensor output current is lower than -5 mA for specified time. with engine running.	2 driving cycles	2 driving cycles
☞ P0132	O2 Sensor (HO2S) Circuit High Voltage (Bank-1 Sensor-1)	A/F sensor terminal voltage is higher than 3.8 V or A/F sensor output current is higher than 5 mA for specified time. with engine running.	2 driving cycles	2 driving cycles
☞ P0134	O2 Sensor (HO2S) No Activity Detected (Bank-1 Sensor-1)	Impedance of A/F sensor element is higher than 500 Ω for 2 sec. even though A/F sensor heater is turned ON for specified time with engine running.	2 driving cycles	2 driving cycles
☞ P0140	O2 Sensor Circuit No Activity Detected (Bank-1 Sensor-2)	Output voltage of HO2S is higher than 4.5 V for 0.5 sec.	2 driving cycles	2 driving cycles

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	DTC	MIL
P0171	Fuel System Too Lean	Total fuel trim (short term fuel trim + long term fuel trim) is higher than specified range for 10 sec. specified times.	2 driving cycles	2 driving cycles
P0172	Fuel System Too Rich	Total fuel trim (short term fuel trim + long term fuel trim) is lower than specified range for 10 sec. specified times.	2 driving cycles	2 driving cycles
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	Output voltage of TP sensor (sub) is lower than 0.74 V.	1 driving cycle	1 driving cycle
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	Output voltage of TP sensor (sub) is higher than 4.74 V.	1 driving cycle	1 driving cycle
P0327	Knock Sensor 1 Circuit Low	Output voltage of knock sensor is lower than 1.23 V for specified time.	1 driving cycle	1 driving cycle
P0328	Knock Sensor 1 Circuit High	Output voltage of knock sensor is higher than 3.91 V for specified time.	1 driving cycle	1 driving cycle
P0335	Crankshaft Position (CKP) Sensor "A" Circuit	CKP sensor signal is not detected for 2 sec. even though starter is operated.	1 driving cycle	1 driving cycle
P0340	Camshaft Position (CMP) Sensor "A" Circuit	If either of the following condition is fulfilled: <ul style="list-style-type: none"> CMP sensor pulse is lower than 20 pulses per crankshaft 8 revolutions. CMP sensor pulse is higher than 28 pulses per crankshaft 8 revolutions. CMP sensor pulse is lower than 20 pulses per crankshaft 8 revolutions from engine start. 	1 driving cycle	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	1 driving cycle
P0443	Evaporative Emission System Purge Control Valve Circuit	<ul style="list-style-type: none"> Monitor signal of EVAP canister purge valve is not varied for 5 sec. even though EVAP canister purge valve control duty is between 10% and 90%. Monitor signal of EVAP canister purge valve is lower than specified voltage for 5 sec. even though EVAP canister purge valve control duty is 0%. 	2 driving cycles	2 driving cycles
P0462	Fuel Level Sensor "A" Circuit Low	Circuit voltage of fuel level sensor is lower than 0.45 V for 3 sec. with engine running.	1 driving cycle	Not applicable
P0463	Fuel Level Sensor "A" Circuit High	Circuit voltage of fuel level sensor is higher than 4.94 V for 30 sec. with engine running.	1 driving cycle	Not applicable
P0480	Fan 1 Control Circuit	Monitor signal of radiator cooling fan relay No.1 is lower than specified voltage for 5 sec. even though radiator cooling fan relay No.1 is OFF.	1 driving cycle	1 driving cycle
P0481	Fan 2 Control Circuit	Monitor signal of A/C condenser cooling fan relay is lower than specified voltage for 5 sec. even though A/C switch is ON and A/C condenser fan is OFF.	2 driving cycles	2 driving cycles
P0500	Vehicle Speed Sensor "A" (VSS)	Vehicle speed signal is not input for 10 sec. while fuel shuts off at deceleration below 3,600 rpm.	2 driving cycles	2 driving cycles
P0532	A/C Refrigerant Pressure Sensor "A" Circuit Low	Output voltage of A/C refrigerant pressure sensor is lower than 0.2 V for specified time.	1 driving cycle	Not applicable
P0533	A/C Refrigerant Pressure Sensor "A" Circuit High	Output voltage of A/C refrigerant pressure sensor is higher than 4.93 V for specified time.	1 driving cycle	Not applicable
P0601	Internal Control Module Memory Check Sum Error	Data write error or check sum error.	1 driving cycle	1 driving cycle
P0602	Control Module Programming Error	Data programming error.	1 driving cycle	Not applicable
P0607	Control Module Performance	ECM internal processor error.	1 driving cycle	1 driving cycle

1A-38 Engine General Information and Diagnosis:

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	DTC	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.	1 driving cycle	Not applicable
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.	1 driving cycle	Not applicable
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.	1 driving cycle	Not applicable
P0660	Intake Manifold Tuning Valve Control Circuit/ Open	Monitor signal of IMT valve is different from command signal for 5 sec.	1 driving cycle	Not applicable
P0662	Intake Manifold Tuning Valve Control Circuit High	Circuit voltage of IMT valve is higher than specification for 5 sec. when engine revolution is 3,000 rpm or less.	1 driving cycle	Not applicable
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).	1 driving cycle	Not applicable
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).	1 driving cycle	Not applicable
P1510	ECM Back-Up Power Supply Malfunction	Backup power voltage of internal circuit is lower than specified voltage for 5 sec.	1 driving cycle	1 driving cycle
P2101	Throttle Actuator Control Motor Circuit Range / Performance	Throttle actuator control circuit is higher than specified current or temperature for 0.5 sec.	1 driving cycle	1 driving cycle
P2102	Throttle Actuator Control Motor Circuit Low	Power supply voltage of throttle actuator control relay is lower than 5 V for 0.5 sec. even though throttle actuator control relay turned ON.	1 driving cycle	1 driving cycle
P2103	Throttle Actuator Control Motor Circuit High	Power supply voltage of throttle actuator control relay is higher than 5 V for 0.6 sec. even though throttle actuator control relay is turned OFF.	1 driving cycle	1 driving cycle
P2111	Throttle Actuator Control System - Stuck Open	Throttle position does not change by 2° during diagnosing throttle valve at ignition switch turned OFF.	1 driving cycle	1 driving cycle
P2119	Throttle Actuator Control Throttle Body Range / Performance	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 more than specification for specified time.	1 driving cycle	1 driving cycle
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	Output voltage of APP sensor (main) is lower than 0.45 V for 0.5 sec.	1 driving cycle	1 driving cycle
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	Output voltage of APP sensor (main) is higher than 4.8 V for 0.5 sec.	1 driving cycle	1 driving cycle
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	Output voltage of APP sensor (sub) is lower than 0.23 V for 0.5 sec.	1 driving cycle	1 driving cycle
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	Output voltage of APP sensor (sub) is higher than 2.4 V for 0.5 sec.	1 driving cycle	1 driving cycle
P2135	Throttle/Pedal Position Sensor/Switch "A" / "B" Voltage Correlation	Difference between the opening angle based on TP sensor (main) and the opening angle based on TP sensor (sub) is more than specification for 0.2 sec.	1 driving cycle	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	DTC	MIL
P2138	Throttle/Pedal Position Sensor/Switch "D" / "E" Voltage Correlation	Difference between the opening angle based on APP sensor (main) and the opening angle based on APP sensor (sub) is more than specification for 0.5 sec.	1 driving cycle	1 driving cycle
P2228	Barometric Pressure Circuit Low	Output signal of barometric pressure sensor is lower than 1.95 V for 0.5 sec.	1 driving cycle	1 driving cycle
P2229	Barometric Pressure Circuit High	Output signal of barometric pressure sensor is higher than 4.7 V for 0.5 sec.	1 driving cycle	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 30 times continuously.	1 driving cycle	Not applicable
U0101	ECM Lost Communication With TCM	Reception error of communication data for TCM is detected for longer than specified time.	1 driving cycle	1 driving cycle
U0121	ECM Lost Communication With ABS / ESP® Control Module	Reception error of communication data for ABS / ESP® control module assembly is detected for longer than specified time.	1 driving cycle	1 driving cycle
U0140	ECM Lost Communication With BCM	Reception error of communication data for BCM is detected for longer than specified time.	1 driving cycle	Not applicable
P1614	Transponder response error	Refer to "DTC Table in Section 10C in related manual".	1 driving cycle	Not applicable
P1615	ID code does not registered (vehicle equipped with keyless start system only)	Refer to "DTC Table in Section 10C in related manual".	1 driving cycle	Not applicable
P1616	Different registration ID codes (vehicle equipped with keyless start system only)	Refer to "DTC Table in Section 10C in related manual".	1 driving cycle	Not applicable
P1618	CAN communication error (reception error for keyless start control module) (vehicle equipped with keyless start system only)	Refer to "DTC Table in Section 10C in related manual".	1 driving cycle	Not applicable
P1621	Immobilizer communication line error	Refer to "DTC Table in Section 10C in related manual".	1 driving cycle	Not applicable
P1622	EEPROM error	Refer to "DTC Table in Section 10C in related manual".	1 driving cycle	Not applicable
P1623	Unregistered transponder	Refer to "DTC Table in Section 10C in related manual".	1 driving cycle	Not applicable
P1625	Immobilizer antenna error	Refer to "DTC Table in Section 10C in related manual".	1 driving cycle	Not applicable
P1636	Immobilizer information registration failure	Refer to "DTC Table in Section 10C in related manual".	1 driving cycle	Not applicable
P1638	Immobilizer information mismatched	Refer to "DTC Table in Section 10C in related manual".	1 driving cycle	Not applicable

Fail-Safe Table

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

DTC No.	Detected item	Fail-safe operation
☞ P0031	HO2S Heater Control Circuit Low (Bank-1 Sensor-1)	ECM stops air/fuel ratio feed back (closed loop) control.
☞ P0032	HO2S Heater Control Circuit High (Bank-1 Sensor-1)	
☞ P0037	HO2S Heater Control Circuit Low (Bank-1 Sensor-2)	ECM stops HO2S heater control.
☞ P0038	HO2S Heater Control Circuit High (Bank-1 Sensor-2)	
☞ P0102	Mass or Volume Air Flow Circuit Low Input	<ul style="list-style-type: none"> • ECM calculates intake air volume according to engine load and engine speed. • ECM stops EVAP canister purge valve control.
☞ P0103	Mass or Volume Air Flow Circuit High Input	
☞ P0112	Intake Air Temperature Sensor 1 Circuit Low	<ul style="list-style-type: none"> • ECM controls actuators assuming that intake air temperature is 20 °C (68 °F). • ECM stops IAC feedback control. • ECM stops air/fuel ratio feed back (closed loop) control.
☞ P0113	Intake Air Temperature Sensor 1 Circuit High	
☞ P0117	Engine Coolant Temperature Circuit Low	<ul style="list-style-type: none"> • ECM controls actuators assuming that engine coolant temperature is 80 °C (176 °F). • ECM operates radiator cooling fan. (high speed) • ECM operates condenser fan. • ECM stops air/fuel ratio feed back (closed loop) control. • ECM stops IAC feedback control. • ECM stops A/C control.
☞ P0118	Engine Coolant Temperature Circuit High	
☞ P0122	Throttle/Pedal Position Sensor/Switch "A" (Main) Circuit Low	<ul style="list-style-type: none"> • 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 feed back (closed loop) control.
☞ P0123	Throttle/Pedal Position Sensor/Switch "A" (Main) Circuit High	
☞ P0131	O2 Sensor (HO2S) Circuit Low Voltage (Bank-1 Sensor-1)	<ul style="list-style-type: none"> • 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 (Bank-1 Sensor-1)	
☞ P0134	O2 Sensor (HO2S) No Activity Detected (Bank-1 Sensor-1)	
☞ P0171	Fuel System Too Lean	ECM stops EVAP canister purge valve control.
☞ P0172	Fuel System Too Rich	
☞ P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	<ul style="list-style-type: none"> • 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 feed back (closed loop) control.
☞ P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	
☞ P0327	Knock Sensor 1 Circuit Low	ECM stops knock control.
☞ P0328	Knock Sensor 1 Circuit High	
☞ P0335	Crankshaft Position (CKP) Sensor "A" Circuit	<ul style="list-style-type: none"> • ECM controls ignition timing. • ECM controls fuel cut at specified engine speed.

DTC No.	Detected item	Fail-safe operation
☞ P0340	Camshaft Position (CMP) Sensor "A" Circuit	<ul style="list-style-type: none"> • ECM controls ignition timing. • ECM controls fuel cut at specified engine speed. • ECM stops knock control.
☞ P0500	Vehicle Speed Sensor "A" (VSS)	<ul style="list-style-type: none"> • ECM controls actuators assuming that vehicle speed is 0 km/h (0 mph). • ECM stops IAC feedback control. • ECM controls fuel cut at specified engine speed.
☞ P0532	A/C Refrigerant Pressure Sensor "A" Circuit Low	ECM stops A/C control.
☞ P0533	A/C Refrigerant Pressure Sensor "A" Circuit High	
☞ P0607	Control Module Performance	<ul style="list-style-type: none"> • 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.
☞ P0660	Intake Manifold Tuning Valve Control Circuit/Open	ECM stops IMT valve control.
☞ P0662	Intake Manifold Tuning Valve Control Circuit High	
☞ P2101	Throttle Actuator Control Motor Circuit Range / Performance	<ul style="list-style-type: none"> • 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	ECM controls fuel cut at specified engine speed.
☞ P2111	Throttle Actuator Control System - Stuck Open	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.
☞ P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	<ul style="list-style-type: none"> • 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	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	
☞ P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	
☞ P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	
☞ P2135	Throttle/Pedal Position Sensor/Switch "A" / "B" Voltage Correlation	
☞ P2138	Throttle/Pedal Position Sensor/Switch "D" / "E" Voltage Correlation	
☞ P2228	Barometric Pressure Circuit Low	ECM controls actuators assuming that barometric pressure is 101 kPa (760 mmHg).
☞ P2229	Barometric Pressure Circuit High	

Scan Tool Data

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. (Refer to "Ignition Timing Inspection in Section 1H in related manual".)

NOTE

When checking the data with the engine running at idle or racing, be sure to shift M/T gear to the neutral gear 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, 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		Approx. 730 rpm
☞ MAF (MASS AIR FLOW RATE)	At specified idle speed with no load after warming up		1.5 – 4.0 g/s 0.20 – 0.52 lb/min.
	At 2500 r/min. with no load after warming up		4.0 – 12.0 g/s 0.53 – 1.58 lb/min.
☞ CALC LOAD (CALCULATED LOAD VALUE)	At specified idle speed with no load after warming up		10 – 40%
	At 2500 r/min. with no load after warming up		10 – 30%
☞ THROTTLE POSITION (ABSOLUTE THROTTLE POSITION)	Ignition switch ON / warmed up engine stopped	Accelerator pedal released	0 – 5%
		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
☞ IMT VALVE ACTUATOR	Accelerator pedal depressed fully and engine speed at 5200 rpm or less		CLOSE
	Accelerator pedal depressed fully and engine speed at 5200 rpm or more		OPEN
☞ FUEL SYSTEM B1 (FUEL SYSTEM STATUS)	At specified idle speed after warming up		CL (closed loop)
☞ O2S B1 S2 (HO2S)	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 FT B1 (TOTAL FUEL TRIM)	At specified idle speed after warming up		–35 – +35%
☞ A/F B1 S1 CURRENT (A/F SENSOR OUTPUT CURRENT)	At specified idle speed after warming up		–0.10 – 0.10 mA

Scan tool data	Vehicle condition		Normal condition / reference values
FUEL CUT	Engine at fuel cut condition		CUT
	Engine at other than fuel cut condition		STOP
O2S B1 S2 ACT (HO2S)	At specified idle speed after warming up		ACTIVE
A/F B1 S1 ACT (A/F SENSOR)	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		3 – 17° BTDC
FUEL PUMP	Within 2 sec. 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 REFRIGERANT ABSOLUTE PRESSURE)	Engine running	A/C ON (A/C is operating) at ambient temperature: 30 °C (86 °F) and humidity: 50%	1240 – 1620 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
BLOWER FAN	Ignition switch ON	Blower fan switch: 3rd speed position or more	ON
		Blower fan switch: 1st speed position	OFF
ELECTRIC LOAD	Ignition switch ON / Headlight, small light, rear defogger all turned OFF		OFF
	Ignition switch ON / Headlight, small light, rear defogger turned ON		ON
TP SENSOR 1 VOLT (TP SENSOR (MAIN) OUTPUT VOLTAGE)	Ignition switch ON after warmed up engine	Accelerator pedal released	0.45 – 0.75 V
		Accelerator pedal depressed fully	3.67 – 4.25 V
TP SENSOR 2 VOLT (TP SENSOR (SUB) OUTPUT VOLTAGE)	Ignition switch ON after warmed up engine	Accelerator pedal released	1.33 – 1.63 V
		Accelerator pedal depressed fully	3.88 – 4.46 V
APP SENSOR 1 VOLT (APP SENSOR (MAIN) OUTPUT VOLTAGE)	Ignition switch ON after warmed up engine	Accelerator pedal released	0.65 – 0.82 V
		Accelerator pedal depressed fully	3.50 – 4.27 V
APP SENSOR 2 VOLT (APP SENSOR (SUB) OUTPUT VOLTAGE)	Ignition switch ON after warmed up engine	Accelerator pedal released	0.30 – 0.44 V
		Accelerator pedal depressed fully	1.74 – 2.17 V

1A-44 Engine General Information and Diagnosis:

Scan tool data	Vehicle condition		Normal condition / reference values
⚙ ACCEL POSITION (ABSOLUTE ACCELERATOR PEDAL POSITION)	Ignition switch ON after warmed up engine	Accelerator pedal released	0 – 2%
		Accelerator pedal depressed fully	90 – 100%
⚙ TARGET THROTTLE POSI (TARGET THROTTLE VALVE POSITION)	Ignition switch ON after warmed up engine	Accelerator pedal released	0 – 5%
		Accelerator pedal depressed fully	90 – 100%
⚙ IAC THROTTLE OPENING (IDLE AIR CONTROL THROTTLE VALVE OPENING)	It idling with no load after warming up		5 – 30%
⚙ 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 B1 (FUEL INJECTION PULSE WIDTH)	At specified idle speed with no load after warming up		1.5 – 4.0 msec.
	At 2500 r/min. with no load after warming up		2.0 – 3.6 msec.
⚙ RADIATOR FAN (RADIATOR COOLING FAN CONTROL RELAY)	Ignition switch ON	Engine coolant temp.: 97 °C (206 °F) or less	OFF
		Engine coolant temp.: 97 °C (206 °F) – 102 °C (215 °F)	Low
		Engine coolant temp.: 102 °C (215 °F) or more	High
⚙ A/C COND FAN (A/C CONDENSER COOLING FAN CONTROL RELAY)	Engine running	<ul style="list-style-type: none"> Blower fan speed selector ON and A/C or defroster switch ON with engine running Engine coolant temperature at more than 110 °C (230 °F) with engine running 	ON
		Blower motor switch and/or A/C or defroster switch turned OFF	OFF
⚙ PNP SIGNAL (TRANSMISSION RANGESENSOR) (A/T model)	Ignition switch ON / selector lever in “P” or “N” position		P/N
	Ignition switch ON / selector lever in other than “P” or “N” position		D
⚙ GENERATOR CONT DUTY (GENERATOR CONTROL DUTY)	At specified idle speed with no load after warming up		50 – 100%
⚙ GENERATOR FIELD DUTY (GENERATOR FIELD COIL DUTY)	At specified idle speed with no load after warming up		20 – 90%

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 MAF ÷ maximum possible intake MAF × 100%

THROTTLE POS (ABSOLUTE THROTTLE POSITION, %)

When TP sensor is at fully closed position, throttle opening is indicated as 0 – 5% 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.

IMT VALVE ACTUATOR (INTAKE MANIFOLD TUNING VALVE, OPEN/CLOSE)

This parameter indicates the state of IMT valve actuator.

FUEL SYSTEM B1 (FUEL SYSTEM STATUS)

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

OL: Open-loop has not yet satisfied engine conditions (ECT > 10 °C, IAT, TP, A/F sensor/system = OK) to go closed loop.

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

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

OL-FAULT: Open-loop due to detected system fault.

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

It indicates output voltage of HO2S installed on exhaust No.1 pipe (post-WU-TWC). 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 FT TRIM B1 (TOTAL FUEL TRIM, %)

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.

A/F B1 S1 CURRENT (A/F SENSOR OUTPUT CURRENT, mA)

This parameter indicates output current of A/F sensor installed on exhaust No.1 pipe (pre-WU-TWC).

FUEL CUT (ON/OFF)

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

STOP: 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.

A/F B1 S1 ACT (A/F SENSOR, 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.

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, small light or rear defogger ON signal inputted.

OFF: Above electric loads all turned OFF.

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

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

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

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

APP SENSOR 1 VOLT (APP SENSOR (MAIN) OUTPUT VOLTAGE, V)

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

APP SENSOR 2 VOLT (APP SENSOR (SUB) OUTPUT VOLTAGE, V)

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

ACCEL POSITION (ABSOLUTE ACCELERATOR PEDAL POSITION, %)

When accelerator pedal is at fully released position, accelerator pedal is indicated as 0 – 5% 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.

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

VEHICLE SPEED (km/h, mph)

It is computed based on pulse signals from front wheel speed sensors.

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).

RADIATOR FAN (RADIATOR COOLING FAN CONTROL RELAY, Low/High/OFF)

Low: ON command being output to radiator cooling fan relay No.1.

High: ON command being output to radiator cooling fan relay No.2 and No.3.

OFF: No command being output.

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

ON: ON command being output to A/C condenser cooling fan relay.

OFF: No command being output.

PNP SIGNAL (TRANSMISSION RANGE SENSOR, P/N or D range)

Whether the transmission range switch at P or N range or other range is displayed. If at P or N range, "P/N" is displayed and if at other than "P" and "N", "D" is displayed.

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

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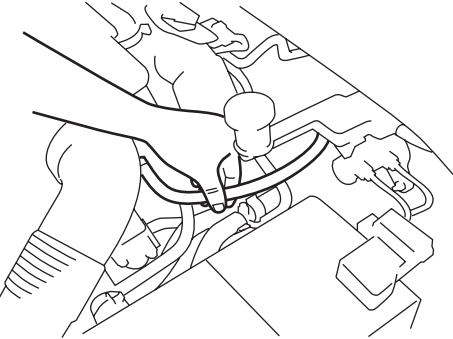
Visually check the following parts and systems.

Inspection Item		Referring section
Engine oil	Level, leakage	"Engine Oil and Filter Change in Section 1F in related manual"
Engine coolant	Level, leakage	"Coolant Level Check in Section 1F in related manual"
Fuel	Level, leakage	"Fuel Leakage Check Procedure in Section 1G in related manual"
A/T fluid	Level, leakage	"Automatic Transaxle Fluid Level Inspection in Section 0B in related manual"
Air cleaner element	Dirt, clogging	"Accessory Drive Belt Inspection in Section 0B in related manual"
Battery	Fluid level, corrosion of terminal	"Battery Description in Section 1J in related manual"
Water pump belt	Tension, damage	"Accessory Drive Belt Inspection in Section 0B in related manual"
Throttle valve	Operating sound	"Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C in related manual"
Vacuum hoses of air intake system	Disconnection, looseness, deterioration, bend	"Vacuum Hose and Purge Valve Chamber Inspection in Section 1B in related manual"
Connectors of electric wire harness	Disconnection, friction	
Fuses	Burning	"Intermittent and Poor Connection Inspection in Section 00 in related manual"
Parts	Installation, deformation	—
Bolt	Looseness	—
Other parts that can be checked visually		—
Also add the following items at engine start, if possible		
MIL	Operation	"Malfunction Indicator Lamp (MIL) Check"
Charging light	Operation	"Generator Symptom Diagnosis in Section 1J in related manual"
Engine oil pressure light	Operation	"Oil Pressure Switch Inspection in Section 9C in related manual"
Engine coolant temp. meter	Operation	"Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C in related manual"
Fuel level meter	Operation	"Fuel Level Sensor Inspection in Section 9C in related manual"
Tachometer	Operation	—
Exhaust system	Leakage of exhaust gas, noise	—
Abnormal air being inhaled from air intake system		—
Other parts that can be checked visually		—

Engine Basic Inspection

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	Was "Engine and Emission Control System Check" performed?	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 for operation 1) Check keyless start control system referring to "Keyless Start System Operation Inspection in Section 10E in related manual". <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 11 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 in related manual". <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 in related manual".
9	Check immobilizer system for operation 1) Check immobilizer control system referring to "Immobilizer Control System Check in Section 10C in related manual". <i>Is it in good condition?</i>	Go to Step 10.	Immobilizer control system malfunction.
10	Check fuel supply 1) Check to make sure that enough fuel is filled in fuel tank. 2) Turn ON ignition switch for 2 sec. 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> 	Go to Step 12.	Go to Step 11.

Step	Action	Yes	No
11	Check fuel pump for operation <i>Was fuel pump operating sound heard from fuel filler for about 2 sec. 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 in related manual". <i>Is it in good condition?</i>	Go to Step 13.	Go to "Ignition System Symptom Diagnosis in Section 1H in related manual".
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 Inspection in Section 1G in related manual".

Engine Symptom Diagnosis

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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 in related manual"
	Faulty ignition coil	"Ignition Coil Assembly (Including Ignitor) Inspection in Section 1H in related manual"
	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	Check air intake system.
	Faulty electric throttle body assembly	"Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C in related manual"
	Faulty APP sensor assembly	"Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C in related manual"
	Faulty ECT sensor or MAF sensor	"Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C in related manual" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection in Section 1C"
	Faulty ECM	"Inspection of ECM and Its Circuits"
	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 in related manual"
	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	"Pistons, Piston Rings, Connecting Rods and Cylinders Inspection and Cleaning in Section 1D in related manual"
	Worn piston, ring or cylinder	"Pistons, Piston Rings, Connecting Rods and Cylinders Inspection and Cleaning in Section 1D in related manual"
	Malfunctioning PCV valve	"PCV Valve Inspection in Section 1B in related manual"

1A-50 Engine General Information and Diagnosis:

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

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

1A-52 Engine General Information and Diagnosis:

Condition	Possible cause	Correction / Reference Item
Excessive engine oil consumption – Oil entering combustion chamber	Sticky piston ring	"Pistons, Piston Rings, Connecting Rods and Cylinders Inspection and Cleaning in Section 1D in related manual"
	Worn piston and cylinder	"Pistons, Piston Rings, Connecting Rods and Cylinders Inspection and Cleaning in Section 1D in related manual"
	Worn piston ring groove and ring	"Pistons, Piston Rings, Connecting Rods and Cylinders Inspection and Cleaning in Section 1D in related manual"
	Improper location of piston ring gap	"Pistons, Piston Rings, Connecting Rods and Cylinders Disassembly and Reassembly 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 in related manual"
	Fuel pressure out of specification	"Fuel Pressure Check"
	Poor performance of ECT sensor or MAF sensor	"Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C in related manual" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection in Section 1C in related manual"
	Faulty electric throttle body assembly	"Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C in related manual"
	Faulty APP sensor assembly	"Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C in related manual"
	Faulty fuel injector	"Fuel Injector Circuit Check"
	Faulty ECM	"Inspection of ECM and Its Circuits"
	Engine overheating	Condition "Engine overheating"
	Low compression	"Compression Check 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	Faulty spark plug (excess carbon deposits, improper gap, burned electrodes, etc.)	"Spark Plug Inspection in Section 1H in related manual"
	Variable fuel pressure	"Fuel Pressure Check"
	Kinky or damaged fuel hose and lines	"Fuel Pressure Check"
	Faulty fuel pump (clogged fuel filter)	"Fuel Pump and Its Circuit Check"
	Poor performance of MAF sensor	"Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection in Section 1C in related manual"
	Faulty fuel injector	"Fuel Injector Circuit Check"
	Faulty ECM	"Inspection of ECM and Its Circuits"
	Faulty electric throttle body assembly	"Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C in related manual"
	Faulty APP sensor assembly	"Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C in related manual"

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 in related manual”</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	<i>Check air intake system.</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 in related manual” or “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection in Section 1C in related manual”</i>
	Faulty fuel injector(s)	<i>“Fuel Injector Circuit Check”</i>
	Faulty ECM	<i>“Inspection of ECM and Its Circuits”</i>
	Excessive combustion chamber deposits	<i>“Cylinder Head Inspection in Section 1D in related manual” and “Pistons, Piston Rings, Connecting Rods and Cylinders Inspection and Cleaning in Section 1D in related manual”</i>
	Fuel pressure out of specification – Dirty fuel filter – Dirty or clogged fuel hose or pipe – Faulty fuel pressure regulator – Faulty fuel pump	<i>Refer to “Fuel Pressure Check”.</i>
Engine has no power	Faulty spark plug	<i>“Spark Plug Inspection in Section 1H in related manual”</i>
	Faulty ignition coil with ignitor	<i>“Ignition Coil Assembly (Including Ignitor) Inspection in Section 1H in related manual”</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	<i>Check air intake system.</i>
	Engine overheating	<i>Condition “Engine overheating”</i>
	Poor performance of ECT sensor or MAF sensor	<i>“Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C in related manual” or “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection in Section 1C in related manual”</i>
	Faulty electric throttle body assembly	<i>“Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C in related manual”</i>
	Faulty APP sensor assembly	<i>“Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C in related manual”</i>
	Faulty fuel injector(s)	<i>“Fuel Injector Circuit Check”</i>
	Faulty ECM	<i>“Inspection of ECM and Its Circuits”</i>
	Dragging brakes	<i>“Brakes Symptom Diagnosis in Section 4A”</i>
	Slipping clutch (M/T model)	<i>“Clutch System Symptom Diagnosis in Section 5C in related manual”</i>
	Low compression	<i>“Compression Check in Section 1D in related manual”</i>
	Faulty IMT valve actuator	<i>“IMT Valve Actuator Inspection in Section 1C in related manual”</i>

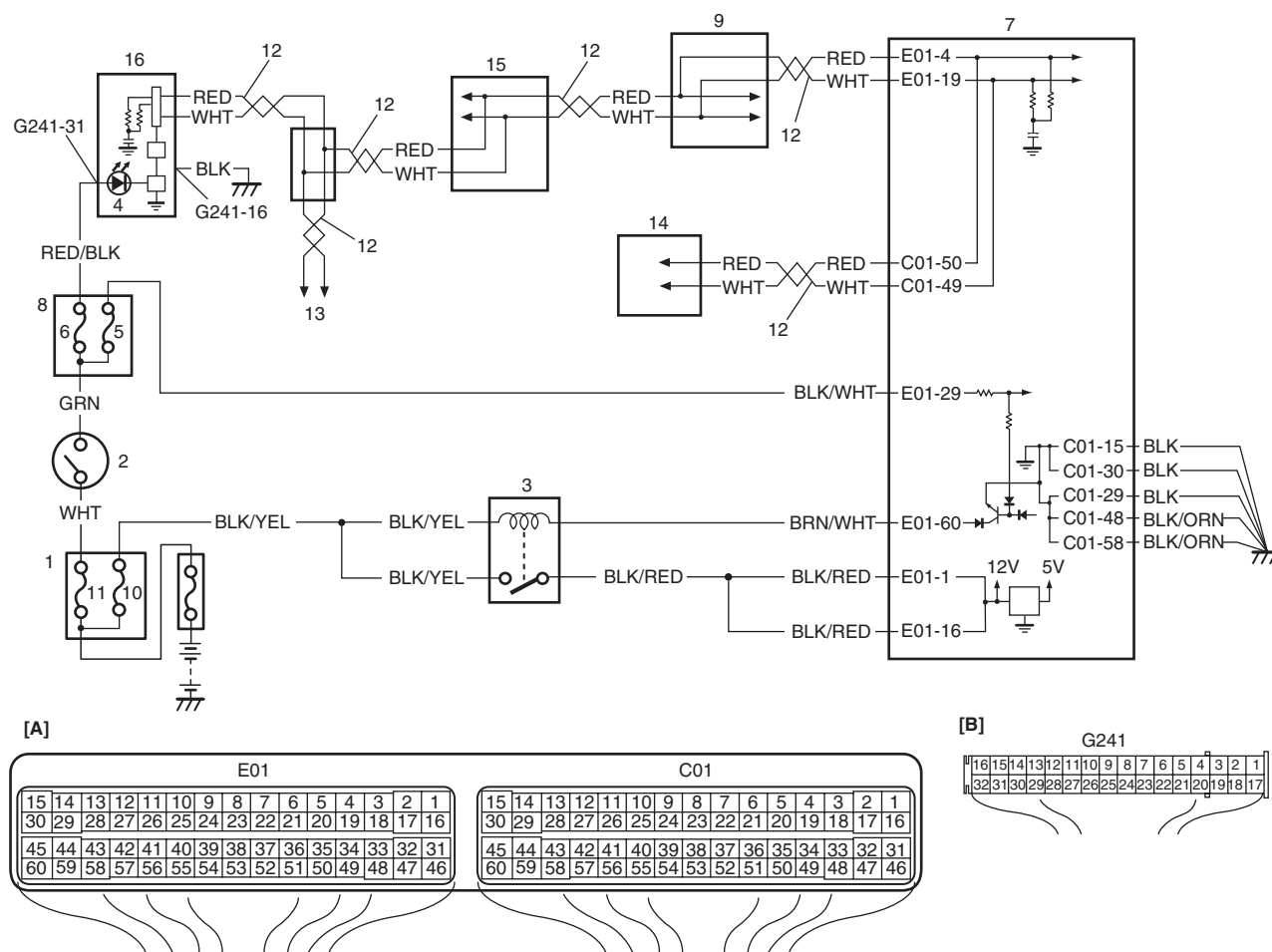
1A-54 Engine General Information and Diagnosis:

Condition	Possible cause	Correction / Reference Item
<i>Improper engine idling or engine fails to idle</i>	Faulty spark plug	<i>"Spark Plug Inspection in Section 1H in related manual"</i>
	Faulty ignition coil with ignitor	<i>"Ignition Coil Assembly (Including Ignitor) Inspection in Section 1H in related manual"</i>
	Fuel pressure out of specification	<i>"Fuel Pressure Check"</i>
	Leaky manifold, throttle body, or cylinder head gasket	<i>Check air intake system.</i>
	Faulty evaporative emission control system	<i>"EVAP Canister Purge Inspection in Section 1B in related manual"</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 in related manual" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection in Section 1C in related manual"</i>
	Faulty electric throttle body assembly	<i>"Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C in related manual"</i>
	Faulty APP sensor assembly	<i>"Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C in related manual"</i>
	Faulty ECM	<i>"Inspection of ECM and Its Circuits"</i>
	Loose connection or disconnection of vacuum hoses	<i>Check connection or disconnection of vacuum.</i>
	Malfunctioning PCV valve	<i>"PCV Valve Inspection in Section 1B in related manual"</i>
	Engine overheating	<i>Condition "Engine overheating"</i>
	Low compression	<i>"Compression Check in Section 1D in related manual"</i>
	Faulty electric load parts (headlight, blower motor and/or rear defogger)	<i>"Electric Load Signal Circuit Check"</i>
	Faulty electric load current sensor and/or its circuit	<i>"Electric Load Current Sensor On-Vehicle Inspection in Section 1C"</i>
	Faulty generator and/or its circuit	<i>"Generator Test (Undercharged Battery Check) in Section 1J in related manual"</i>
	Faulty idle air flow malfunction	<i>"Idle Speed and IAC Throttle Valve Opening Inspection"</i>

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

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

S6RW0H1104012

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. Fuse box No.2	7. ECM	13. To other control module and sensor connected CAN
2. Ignition switch	8. Junction block	14. TCM
3. Main relay	9. ABS / ESP® 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 Section9C 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.

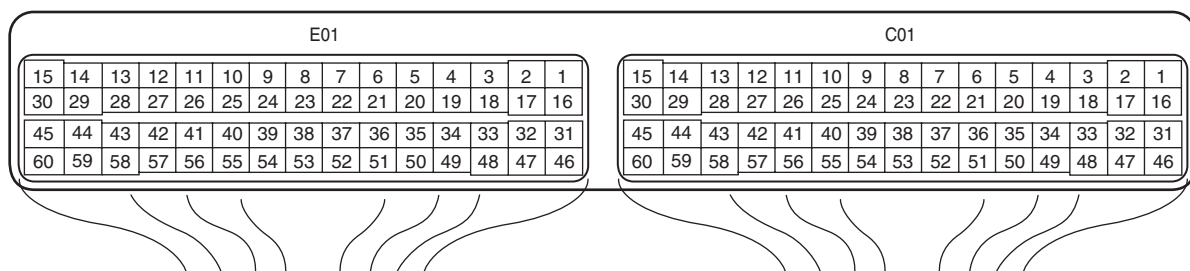
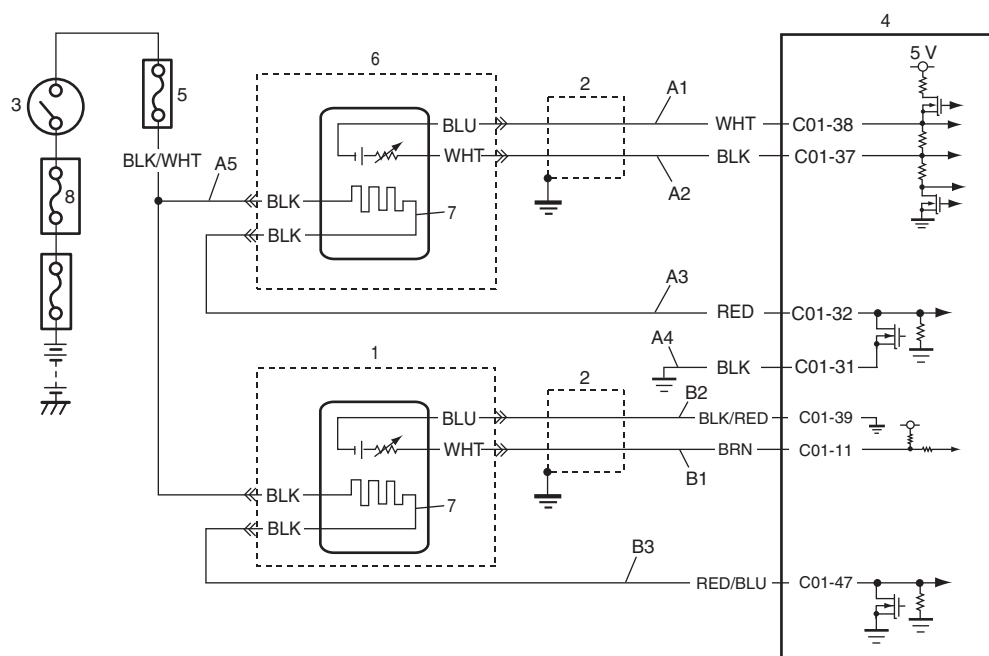
Troubleshooting**NOTE**

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 in related manual".	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 P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1, Bank-1)

S6RW0H1104015

Wiring Diagram

I7RW01110088-02

A1: Signal (+) circuit of A/F sensor	B2: Ground circuit of HO2S	5. "IG COIL" fuse
A2: Signal (-) circuit of A/F sensor	B3: Control circuit of HO2S heater	6. A/F sensor
A3: Control circuit of A/F sensor heater	1. HO2S	7. Sensor heater
A4: Control ground circuit of A/F sensor heater	2. Shield wire	8. "IGN" fuse
A5: Power supply circuit of A/F sensor heater and HO2S heater	3. Ignition switch	
B1: Signal circuit of HO2S	4. ECM	

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 specification for more than specified time even though control duty ratio of A/F sensor heater is less than 90% with engine running. (Heater control duty pulse is not detected in its circuit of ECM) (2 driving cycle detection logic) P0032: Heater control circuit voltage of A/F sensor is higher than specification for more than specified time even though control duty ratio of A/F sensor heater is more than 10% with engine running. (Heater control duty pulse is not detected in its circuit of ECM) (2 driving cycle detection logic)	<ul style="list-style-type: none">• 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 "Power supply circuit of A/F sensor heater" 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. <ul style="list-style-type: none"> • Circuit voltage between "Control circuit of A/F sensor heater" 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.
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. <ul style="list-style-type: none"> • Insulation resistance of wire harness is infinity between "Control circuit of A/F sensor heater" terminal and each other terminal at A/F sensor connector. • Wiring harness resistance of "Control circuit of A/F sensor heater" and "Control ground circuit of A/F sensor heater" is less than 1 Ω. • Insulation resistance between "Control circuit of A/F sensor heater" and "Control ground circuit of A/F sensor heater" 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 in related manual". <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, Bank-1)

S6RW0H1104016

Wiring Diagram

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

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0037: HO2S circuit voltage is lower than specification for specified time even though control duty ratio of HO2S heater is less than 75% with engine running. (Heater control duty pulse is not detected in its monitor signal) (2 driving cycle detection logic) P0038: HO2S circuit voltage is higher than specification for specified time even though control duty ratio of HO2S heater is more than 25% with engine running. (Heater control duty pulse is not detected in its monitor signal) (2 driving cycle detection logic)	<ul style="list-style-type: none">• HO2S heater and/or its circuit• ECM

DTC Confirmation Procedure

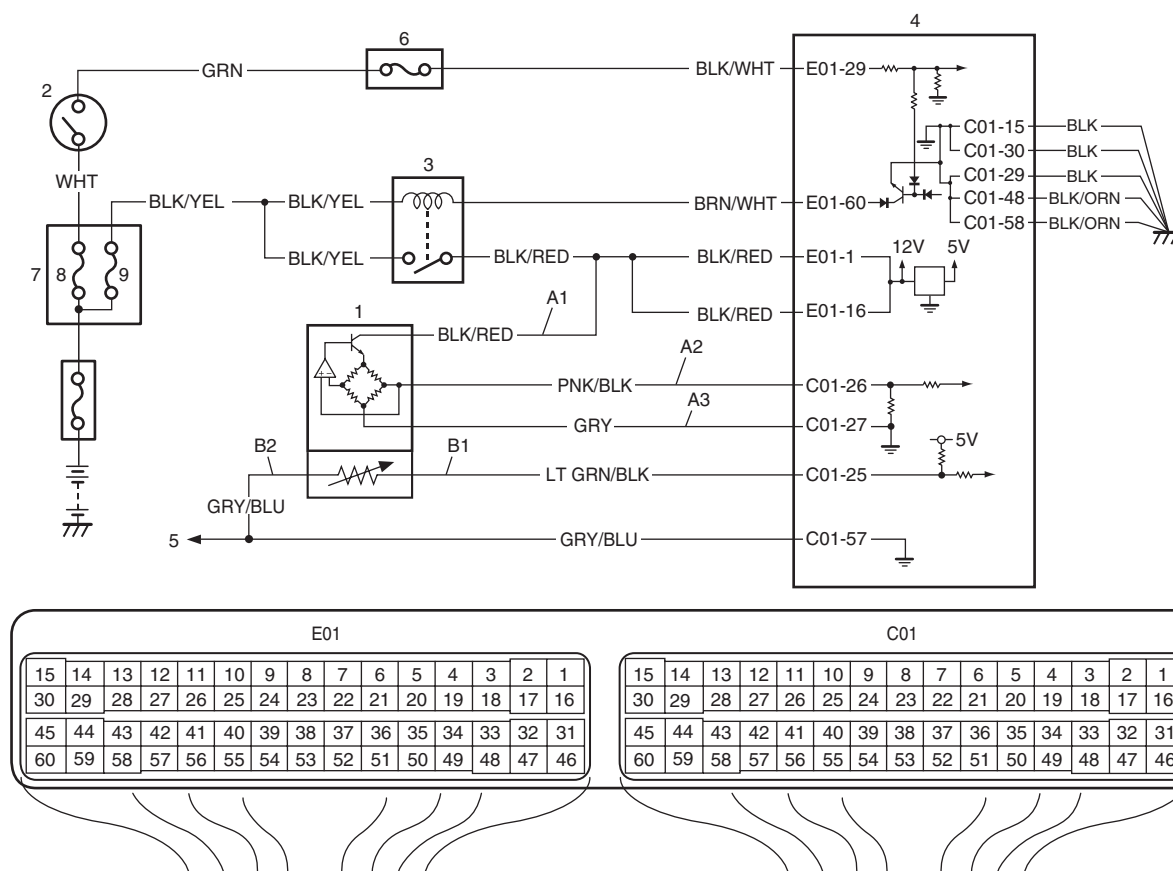
- 1) With ignition switch turned OFF, connect scan tool to DLC.
- 2) Turn ON ignition switch and clear DTC.
- 3) Start engine and warm up to normal operating temperature.
- 4) Run engine at idle speed for 1 min. or more.
- 5) Check DTC and pending DTC.

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	HO2S heater and its circuit check 1) Disconnect connector from HO2S with ignition switch turned OFF. 2) Check for proper terminal connection to HO2S connector. 3) If connections are OK, check that HO2S heater power supply circuit is as follows. <ul style="list-style-type: none"> • Circuit voltage between "Power supply circuit of HO2S heater" and vehicle body ground is battery voltage with ignition switch turned ON. Is it in good condition?	Go to Step 3.	Repair or replace defective wiring harness / connector.
3	HO2S heater circuit check 1) Check that HO2S heater control circuit is as follows. <ul style="list-style-type: none"> • Circuit voltage between "Control circuit of HO2S heater" and vehicle body ground is 0 V with ignition switch turned ON. Is it good condition?	Go to Step 4.	Repair or replace defective wiring harness / connector.
4	HO2S heater circuit check 1) Disconnect connectors from ECM and check for proper terminal connection to ECM connector. 2) If connections are OK, check that HO2S heater circuit is as follows. <ul style="list-style-type: none"> • Insulation resistance of wire harness is infinity between "Control circuit of HO2S heater" terminal and each other terminal at HO2S connector. • Wiring harness resistance of "Control circuit of HO2S heater" is less than 1 Ω. • Insulation resistance between "Control circuit of HO2S heater" and vehicle body ground is infinity. Is it in good condition?	Go to Step 5.	Repair or replace defective wiring harness / connector.
5	HO2S heater check 1) Check heater resistance of HO2S referring to "Heated Oxygen Sensor (HO2S) Heater On-Vehicle Inspection in Section 1C in related manual". Is HO2S heater in good condition?	Substitute a known-good ECM and recheck.	Replace HO2S.

DTC P0102 / P0103: Mass or Volume Air Flow Circuit Low / High Input

S6RW0H1104018

Wiring Diagram

I7RW01110046-03

A1: MAF sensor power supply circuit	B2: IAT sensor ground circuit	4. ECM	8. "IGN" fuse
A2: MAF sensor signal circuit	1. MAF and IAT sensor	5. To other sensors	9. "FI" fuse
A3: MAF sensor ground circuit	2. Ignition switch	6. "IG COIL" fuse	
B1: IAT sensor signal circuit	3. Main relay	7. Fuse box No.2	

DTC Detecting Condition and Trouble Area

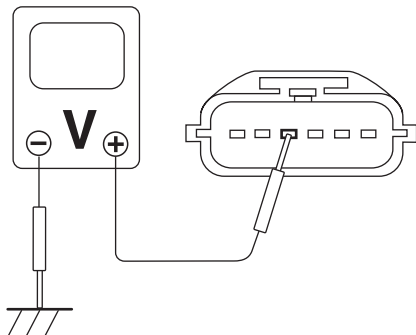
DTC detecting condition	Trouble area
DTC P0102: Output voltage of MAF sensor is lower than 0.15 V for specified time. (1 driving cycle detection logic)	<ul style="list-style-type: none"> MAF sensor and/or its circuit ECM
DTC P0103: Output voltage of MAF sensor is higher than 4.85 V for specified time. (1 driving cycle detection logic)	

DTC Confirmation Procedure

- 1) With ignition switch OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Turn ignition switch to ON position.
- 4) Check 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".

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 sensor with ignition switch turned OFF. 2) Check for proper terminal connection to MAF sensor and ECM connectors. 3) If connections are OK, turn ignition switch to ON position. 4) Check that MAF sensor power supply voltage is battery voltage.  I7RW01110047-01 <i>Is it in good condition?</i>	Go to Step 4.	Repair or replace MAF sensor power supply circuit.
4	Wire harness check 1) Turn ignition switch OFF position. 2) Disconnect connector from ECM. 3) Check that MAF sensor circuit is as follows. <ul style="list-style-type: none"> • Wiring harness resistance of each MAF sensor signal circuit and ground circuit is less than 3 Ω. • Insulation resistance between MAF sensor signal circuit and vehicle body ground is Infinity. • Insulation resistance of wire harness is infinity between MAF sensor signal terminal and each other terminal at MAF and IAT sensor connector. • Circuit voltage of each MAF sensor signal circuit and ground circuit is 0 – 1 V with ignition switch turned ON. <i>Are they in good condition?</i>	Go to Step 5.	Repair or replace defective wire harness.
5	MAF sensor signal check 1) Turn ignition switch OFF position. 2) Connect connectors to MAF sensor and ECM. 3) Check MAF sensor signal voltage referring to "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection in Section 1C in related manual". <i>Is each value within specified range?</i>	Substitute a known-good ECM and recheck.	Replace MAF and IAT sensor.

DTC P0112 / P0113: Intake Air Temperature Sensor Circuit Low / High Input

S6RW0H1104020

Wiring Diagram

Refer to "DTC P0102 / P0103: Mass or Volume Air Flow Circuit Low / High Input".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0112: Circuit voltage of IAT sensor is lower than 0.15 V for specified time. (1 driving cycle detection logic)	<ul style="list-style-type: none"> IAT sensor and/or its circuit ECM
P0113: Circuit voltage of IAT sensor is higher than 4.85 V for specified time. (1 driving cycle detection logic)	

DTC Confirmation Procedure

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

DTC Troubleshooting**NOTE**

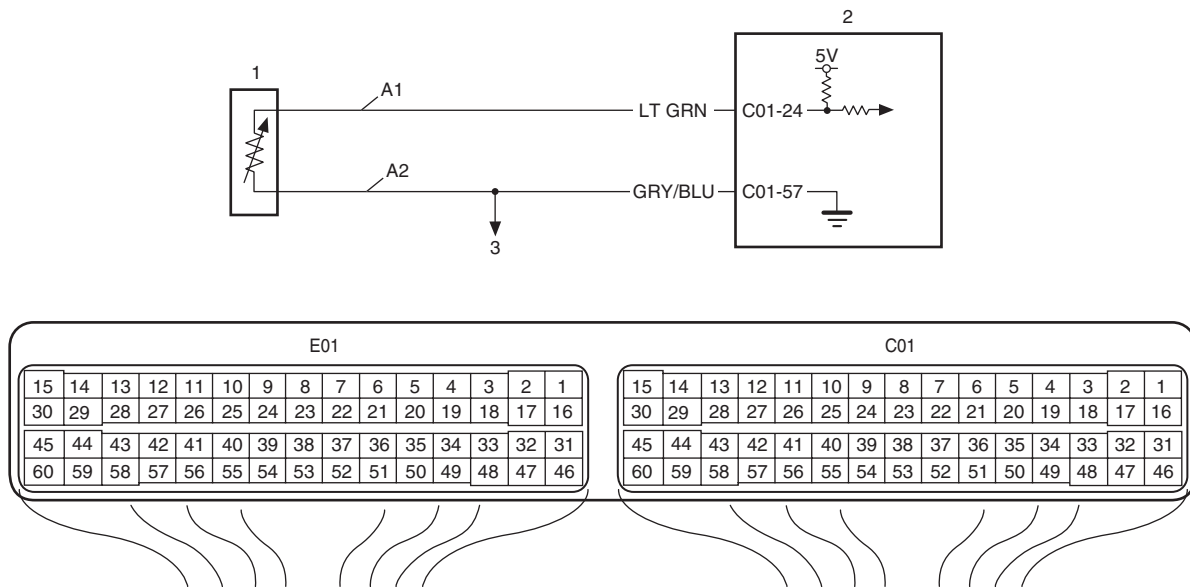
When DTC P0113 and P0118 are indicated together, it is possible that IAT sensor ground is open.

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 harness check <ol style="list-style-type: none"> 1) Turn ignition switch OFF position. 2) Disconnect connectors from IAT sensor and ECM. 3) Check for proper terminal connection to IAT sensor and ECM connectors. 4) If connections are OK, check that IAT sensor circuit is as follows. <ul style="list-style-type: none"> • Wiring harness resistance of each IAT sensor signal and ground circuit is less than 3 Ω. • Insulation resistance of IAT sensor signal circuit is infinity between IAT sensor connector and vehicle body ground. • Insulation resistance of wire harness is infinity between IAT sensor signal terminal and each other terminal at MAF and IAT sensor connector. • Circuit voltage of each IAT sensor signal and ground circuit is 0 – 1 V with ignition switch turned ON. Are they in good condition?	Go to Step 3.	Repair or replace defective wire harness.
3	IAT sensor reference voltage check <ol style="list-style-type: none"> 1) Connect connectors to ECM. 2) Turn ignition switch to ON position. 3) Check that IAT sensor signal voltage is 5 V between IAT sensor connector and vehicle body ground. Is it in good condition?	Go to Step 4.	Substitute a known-good ECM and recheck.

Step	Action	Yes	No
4	IAT sensor check 1) Check IAT sensor for performance referring to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection in Section 1C in related manual”. <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Replace MAF and IAT sensor.

DTC P0117 / P0118: Engine Coolant Temperature Circuit Low / High

S6RW0H1104022

Wiring Diagram

I7RW01110049-03

A1: ECT sensor signal circuit	1. ECT sensor	3. To other sensors
A2: ECT sensor ground circuit	2. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0117: Circuit voltage of ECT sensor is lower than 0.15 V for specified time. (1 driving cycle detection logic)	<ul style="list-style-type: none"> ECT sensor and/or its circuit ECM
P0118: Circuit voltage of ECT sensor is higher than 4.85 V for specified time. (1 driving cycle detection logic)	

DTC Confirmation Procedure

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

DTC Troubleshooting**NOTE**

When DTC P0118 and P0113 are indicated together, it is possible that ECT sensor ground circuit is open.

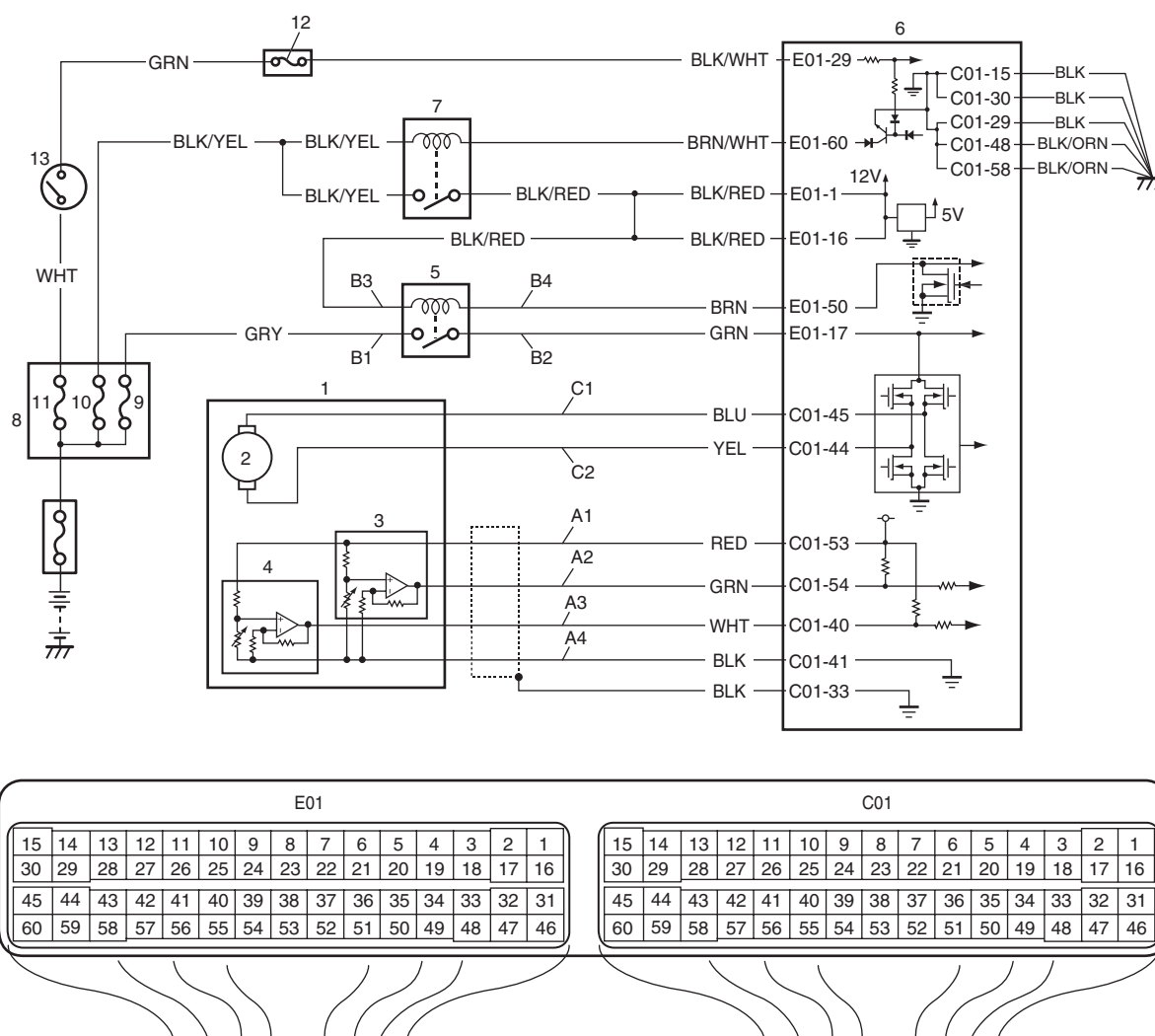
1A-68 Engine General Information and Diagnosis:

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	Wire harness check 1) Turn ignition switch OFF position. 2) Disconnect connectors from ECT sensor and ECM. 3) Check for proper terminal connection to ECT sensor and ECM connectors. 4) If connections are OK, check that ECT sensor circuit is as follows. <ul style="list-style-type: none">• Wiring harness resistance of each ECT sensor signal and ground circuit is less than 3 Ω.• Insulation resistance of ECT sensor signal circuit is infinity between ECT sensor connector and vehicle body ground.• Insulation resistance of wire harness is infinity between ECT sensor signal terminal and each other terminal at ECT sensor connector.• Circuit voltage of each ECT sensor signal and ground circuit is 0 – 1 V with ignition switch turned ON. <i>Are they in good condition?</i>	Go to Step 3.	Repair or replace defective wire harness.
3	ECT sensor reference voltage check 1) Connect connectors to ECM. 2) Turn ignition switch to ON position. 3) Check that ECT sensor signal voltage is 5 V between ECT sensor connector and vehicle body ground. <i>Is it in good condition?</i>	Go to Step 4.	Substitute a known-good ECM and recheck.
4	ECT sensor check 1) Check ECT sensor for performance referring to "Engine Coolant Temperature (ECT) Sensor Inspection in Section 1C in related manual". <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Replace ECT sensor.

DTC P0122 / P0123: Throttle / Pedal Position Sensor / Switch "A" Circuit Low / High

S6RW0H1104023

Wiring Diagram



I7RW01110050-03

A1: TP sensor power supply circuit	C1: Control circuit of throttle actuator (+)	7. Main relay
A2: TP sensor (main) signal circuit	C2: Control circuit of throttle actuator (-)	8. Fuse Box No.2
A3: TP sensor (sub) signal circuit	1. Electric throttle body assembly	9. "THR MOT" fuse
A4: TP sensor ground circuit	2. Throttle actuator	10. "FI" fuse
B1: Power supply circuit of throttle actuator control relay (switch side)	3. TP sensor (main)	11. "IGN" fuse
B2: Control circuit of throttle actuator control relay (switch side)	4. TP sensor (sub)	12. "IG COIL" fuse
B3: Power supply circuit of throttle actuator control relay (coil side)	5. Throttle actuator control relay	13. Ignition switch
B4: Control circuit of throttle actuator control relay (coil side)	6. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0122: Output voltage of TP sensor (main) is lower than 0.3 V. (1 driving cycle detection logic)	<ul style="list-style-type: none"> Electric throttle body assembly TP sensor main circuit ECM
P0123: Output voltage of TP sensor (main) is higher than 4.6 V. (1 driving cycle detection logic)	

DTC Confirmation Procedure

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

DTC Troubleshooting**NOTE**

- When DTC P0122 and P0222 are indicated together, it is possible that TP sensor power supply circuit is open.
- When DTC P0123 and P0223 are indicated together, it is possible that TP sensor power supply circuit is shorted to power circuit and/or TP sensor ground circuit is open.

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	TP sensor and its circuit check <ol style="list-style-type: none">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 released and depressed fully. <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	Wire harness check <ol style="list-style-type: none">1) Turn ignition switch OFF position.2) Disconnect connectors from TP sensor and ECM.3) Check for proper terminal connection to electric throttle body assembly and ECM connectors.4) If connections are OK, check that TP sensor (main) circuit is as follows.<ul style="list-style-type: none">• Wiring harness resistance of each TP sensor (main) signal, power supply and ground circuit is less than 3 Ω.• Insulation resistance of each TP sensor (main) signal and power supply circuit is infinity between TP sensor connector and vehicle body ground.• Insulation resistance of wire harness is infinity between TP sensor (main) signal terminal and each other terminal at TP sensor connector.• Circuit voltage of each TP sensor (main) signal, power supply and ground circuit is 0 – 1 V with ignition switch turned ON. <i>Are they in good condition?</i>	Go to Step 4.	Repair or replace defective wire harness.

Step	Action	Yes	No
4	TP sensor circuit voltage check 1) Connect connectors to ECM. 2) Turn ignition switch ON position. 3) Check that TP sensor circuit voltage is as follows. <ul style="list-style-type: none"> Between TP sensor power supply terminal and TP sensor ground terminal is 5 V. Between TP sensor (main) signal terminal and TP sensor ground terminal is 5 V. <i>Is it in good condition?</i>	Go to Step 5.	Substitute a known-good ECM and recheck.
5	TP sensor check 1) Check TP sensor for performance referring to “Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C in related manual”. <i>Is it in good condition?</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, Bank-1)

S6RW0H1104024

Wiring Diagram

Refer to “DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1, Bank-1)”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0131: A/F sensor terminal voltage is lower than 1.8 V or A/F sensor output current is lower than -5 mA for specified time. with engine running. (2 driving cycle detection logic) DTC P0132: A/F sensor terminal voltage is higher than 3.8 V or A/F sensor output current is higher than 5 mA for specified time. with engine running. (2 driving cycle detection logic)	<ul style="list-style-type: none"> 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). <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 4.
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. <ul style="list-style-type: none"> Resistance of each sensing circuit wire of A/F sensor between A/F sensor connector and ECM connector is less than 2 Ω Resistance between sensing circuit wires of A/F sensor connector are infinity Resistance between each sensing circuit wire of A/F sensor connector and vehicle body ground is infinity Voltage of between each sensing circuit wire 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, Bank-1)

S6RW0H1104026

Wiring Diagram

Refer to "DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1, Bank-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 500 Ω for 2 sec. even though A/F sensor heater is turned ON for specified time with engine running. (2 driving cycle detection logic)	<ul style="list-style-type: none"> 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 <ol style="list-style-type: none"> 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. <p>Does A/F sensor output current between -0.2 mA and 0.2 mA?</p>	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 <ol style="list-style-type: none"> 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. <ul style="list-style-type: none"> • Wiring harness resistance of each “Signal (+) circuit of A/F sensor”, “Signal (–) circuit of A/F sensor”, “Control circuit of A/F sensor heater” and “Control ground circuit of A/F sensor heater” is less than $1\ \Omega$. <p>Are they in good condition?</p>	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, Bank-1)

S6RW0H1104028

Wiring Diagram

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

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of HO2S is higher than 4.5 V for 0.5 sec. (2 driving cycle detection logic)	<ul style="list-style-type: none"> HO2S 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 HO2S heater**

- 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) 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	Wire harness check <ol style="list-style-type: none"> 1) Disconnect connector from HO2S and ECM with ignition switch turned OFF. 2) Check for proper connection of each HO2S circuit terminal to HO2S connector and to ECM connector. 3) If connections are OK, check HO2S circuit for the following. <ul style="list-style-type: none"> • Wiring harness resistance of each "Signal circuit of HO2S" and "Ground circuit of HO2S" is less than 1 Ω. • Insulation resistance between "Signal circuit of HO2S" and vehicle body ground is infinity. • Insulation resistance of wire harness is infinity between "Signal circuit of HO2S" terminal and each other terminal at HO2S connector. • Circuit voltage between "Signal circuit of HO2S" and vehicle body ground is 0 V with ignition switch turned ON. Are they in good condition?	Go to Step 3.	Repair or replace defective wiring harness / connector.
3	HO2S heater circuit check <ol style="list-style-type: none"> 1) Check HO2S heater circuit referring to Step 2 to 4 of "DTC P0037 / P0038: HO2S Heater Control Circuit Low / High (Sensor-2, Bank-1)". Is circuit in good condition?	Replace HO2S and recheck. If this DTC is detected again, substitute a known-good ECM.	Repair or replace defective wiring harness / connector.

DTC P0171 / P0172: System Too Lean / Too Rich (Sensor-1, Bank-1)

S6RW0H1104029

Wiring Diagram

Refer to "DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1, Bank-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 range for 10 sec. specified times. (2 driving cycle detection logic)	<ul style="list-style-type: none"> • Vacuum leakage • Exhaust gas leakage • Fuel pressure out of specification • Fuel injector • A/F sensor • MAF sensor • ECT sensor • ECM
DTC P0172: Total fuel trim (short term fuel trim + long term fuel trim) is lower than specified range for 10 sec. specified times. (2 driving cycle detection logic)	

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, 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

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 1) Check intake system and exhaust system for leakage. <i>Are intake system and exhaust system in good condition?</i>	Go to Step 4.	Repair or replace defective parts.
4	Fuel pressure check 1) Check fuel pressure referring to "Fuel Pressure Check". <i>Is check result satisfactory?</i>	Go to Step 5.	Repair or replace defective parts.
5	Fuel injectors and its circuit check 1) Check fuel injectors referring to "Fuel Injector Inspection in Section 1G in related manual". <i>Is check result satisfactory?</i>	Go to Step 6.	Faulty injection(s) or its circuit.
6	MAF sensor 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. <i>Are they in good condition?</i>	Go to Step 7.	Repair or replace defective part.
7	MAF sensor for performance check 1) With ignition switch turned OFF, connect scan tool to DLC. 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.). <i>Is each value within specified range?</i>	Go to Step 8.	Go to "DTC P0102 / P0103: Mass or Volume Air Flow Circuit Low / High Input".
8	ECT sensor for performance check 1) Check ECT value using scan tool (Refer to "Scan Tool Data" for normal value.). <i>Is each value within specified range?</i>	Go to Step 9.	Go to "DTC P0117 / P0118: Engine Coolant Temperature Circuit Low / High".
9	A/F sensor for performance check 1) Check A/F sensor referring to Step 3 and 4 of "DTC P0131 / P0132: O2 Sensor Circuit Low Voltage / High Voltage (Sensor-1, Bank-1)". <i>Is check result satisfactory?</i>	Replace A/F sensor and recheck. If this DTC is detected again, substitute a known-good ECM.	Repair or replace defective circuit.

DTC P0222 / P0223: Throttle Position Sensor (Sub) Circuit Low / High

S6RW0H1104030

Wiring Diagram

Refer to “DTC P0122 / P0123: Throttle / Pedal Position Sensor / Switch “A” Circuit Low / High”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DCT P0222: Output voltage of TP sensor (sub) is lower than 0.74 V. (1 driving cycle detection logic)	<ul style="list-style-type: none">• TP sensor (sub) circuit• Electric throttle body assembly• ECM
DCT P0223: Output voltage of TP sensor (sub) is higher than 4.74 V. (1 driving cycle detection logic)	

DTC Confirmation Procedure

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

DTC Troubleshooting

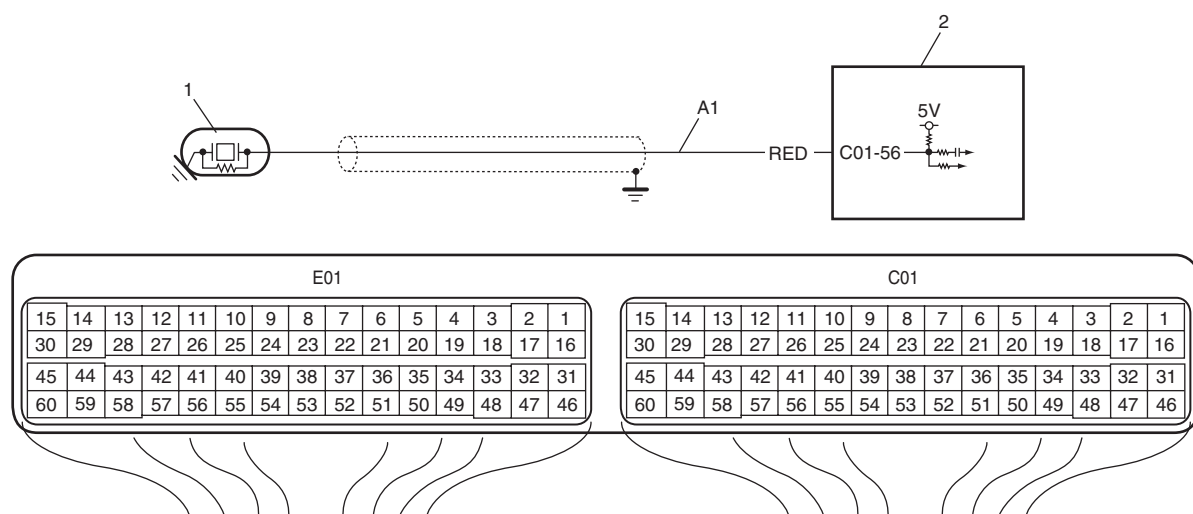
NOTE

- When DTC P0122 and P0222 are indicated together, it is possible that TP sensor power supply circuit is open.
- When DTC P0123 and P0223 are indicated together, it is possible that TP sensor power supply circuit is shorted to power circuit and/or TP sensor ground circuit is open.

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	TP 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 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	Wire harness check 1) Turn ignition switch OFF position. 2) Disconnect connectors from TP sensor and ECM. 3) Check for proper terminal connection to electric throttle body assembly and ECM connectors. 4) If connections are OK, check that TP sensor (sub) circuit is as follows. <ul style="list-style-type: none"> • Wiring harness resistance of each TP sensor (sub) signal, power supply and ground circuit is less than 3 Ω. • Insulation resistance of each TP sensor (sub) signal and power supply circuit is infinity between TP sensor connector and vehicle body ground. • Insulation resistance of wire harness is infinity between TP sensor (sub) signal terminal and each other terminal at TP sensor connector. • Circuit voltage of each TP sensor (sub) signal, power supply and ground circuit is 0 – 1 V with ignition switch turned ON. <i>Are they in good condition?</i>	Go to Step 4.	Repair or replace defective wire harness.
4	TP sensor power supply voltage check 1) Connect connectors to ECM. 2) Turn ignition switch ON position. 3) Check that TP sensor power supply circuit voltage is 5 V between TP sensor power supply terminal and TP sensor ground terminal of TP sensor connector. <i>Is it in good condition?</i>	Go to Step 5.	Repair or replace TP sensor power supply circuit. If circuit is OK, substitute a known-good ECM and recheck.
5	TP sensor check 1) Check TP sensor for performance referring to "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C in related manual". <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P0327 / P0328: Knock Sensor Circuit Low / High

S6RW0H1104032

Wiring Diagram

I7RW01110055-02

A1: Knock sensor signal circuit

1. Knock sensor

2. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0327: Output voltage of knock sensor is lower than 1.23 V for specified time. (1 driving cycle detection logic)	<ul style="list-style-type: none"> Knock sensor and/or its circuit ECM
DTC P0328: Output voltage of knock sensor is higher than 3.91 V for specified time. (1 driving cycle detection logic)	

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 1 minute.
- 4) Check 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	Knock sensor circuit voltage check 1) Turn ignition switch OFF position. 2) Disconnect connector from knock sensor. 3) Check for proper terminal connection to knock sensor and ECM connectors. 4) If connections are OK, turn ignition switch to ON position. 5) Check that circuit voltage is 5 V between knock sensor signal circuit of knock sensor connector and vehicle body ground. Is it in good condition?	Replace knock sensor.	Go to Step 3.

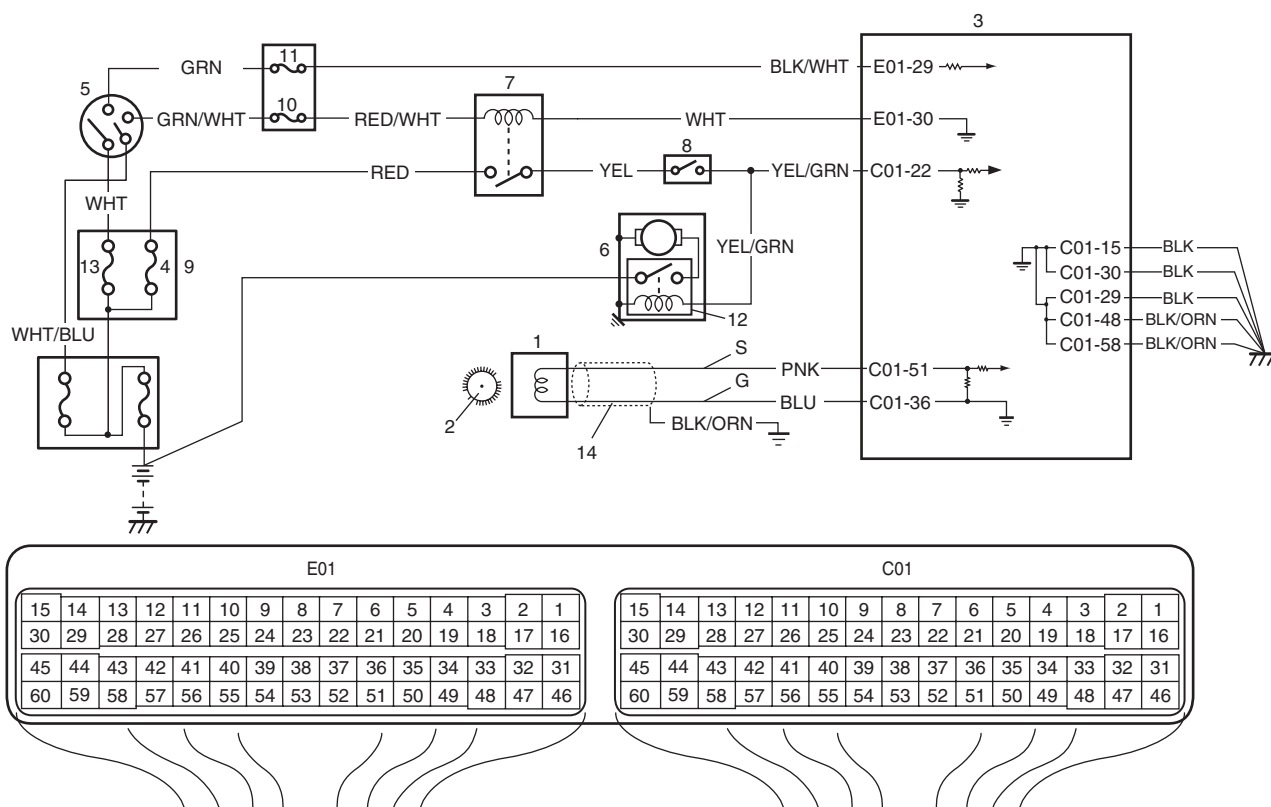
1A-80 Engine General Information and Diagnosis:

Step	Action	Yes	No
3	Wire harness check <ol style="list-style-type: none"> 1) Disconnect connector from ECM with ignition switch turned OFF. 2) Check that knock sensor signal circuit is as follows. <ul style="list-style-type: none"> • Wiring harness resistance of knock sensor signal circuit is less than 3 Ω. • Insulation resistance of knock sensor signal circuit is infinity between knock sensor connector and vehicle body ground. • Circuit voltage of knock sensor signal circuit is 0 – 1 V with ignition switch turned ON. <p><i>Are they in good condition?</i></p>	Substitute a known-good ECM and recheck.	Repair or replace defective wire harness.

DTC P0335: Crankshaft Position Sensor “A” Circuit

S6RW0H1104033

Wiring Diagram



I6RW0H110011-01

S: CKP sensor signal circuit	5. Ignition switch	11. "IG COIL" fuse
G: CKP sensor ground circuit	6. Starting motor	12. Starting motor magnet clutch
1. CKP sensor	7. Starting motor control relay	13. "IGN" fuse
2. Sensor plate on crankshaft	8. Transmission range switch (A/T model)	14. Shield wire
3. ECM	9. Fuse box No.2	
4. "ST" fuse	10. "ST SIG" fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
CKP sensor signal is not detected for 2 sec. even though starter is operated. (1 driving cycle detection logic)	<ul style="list-style-type: none"> • CKP sensor and/or its circuit • Sensor plate teeth damaged • ECM • Engine start signal circuit

DTC Confirmation Procedure

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

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	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 check <ol style="list-style-type: none"> 1) Turn ignition switch OFF position. 2) Disconnect connector from ECM. 3) Check that CKP sensor circuit is as follows. <ul style="list-style-type: none"> • Wiring harness resistance of CKP sensor signal circuit is less than 3 Ω. • Insulation resistance of each CKP sensor signal and ground circuit between CKP sensor connector and vehicle body ground is infinity. • Insulation resistance of wire harness is infinity between CKP sensor signal terminal and each other terminal at CKP sensor connector. • Circuit voltage of each CKP sensor signal circuit and ground circuit is 0 – 1 V with ignition switch turned ON. <i>Are they in good condition?</i>	Go to Step 4.	Repair or replace defective wire harness.
4	Engine start signal check <ol style="list-style-type: none"> 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. <ul style="list-style-type: none"> • 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 5.	Repair or replace start signal circuit.
5	CKP sensor check <ol style="list-style-type: none"> 1) Check CKP sensor and sensor rotor referring to "Crankshaft Position (CKP) Sensor Inspection in Section 1C in related manual". <i>Are they in good condition?</i>	Substitute a known-good ECM and recheck.	Replace CKP sensor and/or sensor rotor.

I6RW0C110013-01

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 CKP sensor

- 1) With ignition switch OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Crank engine for 5 sec.
- 4) Check 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	CMP sensor and connector for proper installation check <i>Is CMP sensor installed properly and connector connected securely?</i>	Go to Step 3.	Correct.
3	CMP sensor power supply voltage check 1) Disconnect connector from CMP sensor with ignition switch turned OFF. 2) Check for proper terminal connection to CMP sensor and ECM connectors. 3) If connections are OK, turn ignition switch to ON position. 4) Check that CMP sensor power supply voltage is battery voltage between CMP sensor connector and vehicle body ground. <i>Is it in good condition?</i>	Go to Step 4.	CMP sensor power supply circuit is open or shorted to ground.
4	Wire harness check 1) Turn ignition switch OFF position. 2) Disconnect connector from ECM. 3) Check that CMP sensor circuit is as follows. <ul style="list-style-type: none"> • Wiring harness resistance of CMP sensor signal circuit is less than 3 Ω. • Insulation resistance of each CMP sensor signal and ground circuit between CMP sensor connector and vehicle body ground is infinity. • Insulation resistance of wire harness is infinity between CMP sensor signal terminal and each other terminal at CMP sensor connector. • Circuit voltage of each CMP sensor signal circuit and ground circuit is 0 – 1 V with ignition switch turned ON. <i>Are they in good condition?</i>	Go to Step 5.	Repair or replace defective wire harness.
5	CMP sensor signal circuit voltage check 1) Check that CMP sensor signal circuit voltage is 5 V between CMP sensor connector and vehicle body ground. <i>Is it in good condition?</i>	Go to Step 6.	Substitute a known-good ECM and recheck.

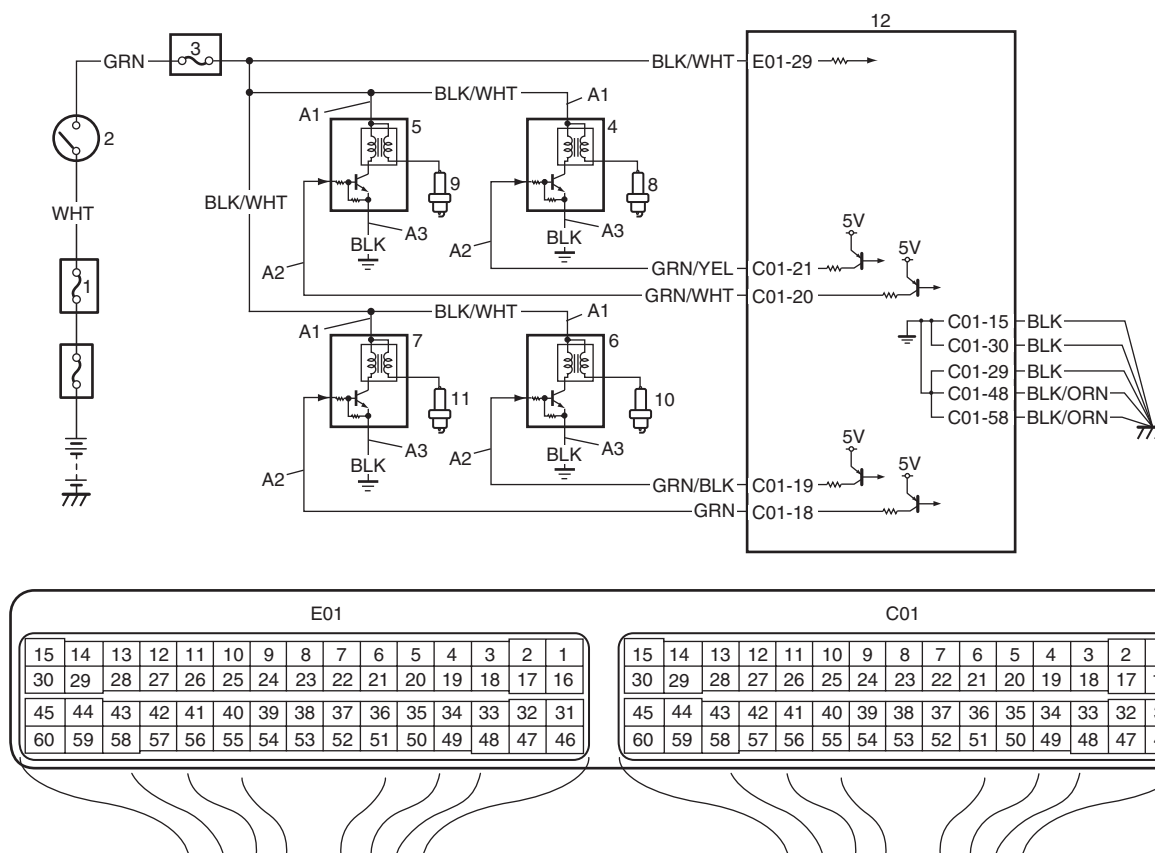
1A-84 Engine General Information and Diagnosis:

Step	Action	Yes	No
6	CMP sensor check 1) Check CMP sensor and sensor rotor referring to "Camshaft Position (CMP) Sensor Inspection in Section 1C in related manual". <i>Are they in good condition?</i>	Substitute a known-good ECM and recheck.	Replace CMP sensor and/or sensor rotor.

DTC P0350: Ignition Coil Primary / Secondary Circuit

S6RW0H1104075

Wiring Diagram



I6RW0H110012-01

A1: Ignition coil assembly power supply circuit	3. "IG COIL" fuse	8. No.1 spark plug
A2: Ignition coil assembly output circuit	4. Ignition coil assembly No.1	9. No.2 spark plug
A3: Ignition coil assembly ground circuit	5. Ignition coil assembly No.2	10. No.3 spark plug
1. "IGN" fuse	6. Ignition coil assembly No.3	11. No.4 spark plug
2. Ignition switch	7. Ignition coil assembly No.4	12. ECM

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)	<ul style="list-style-type: none"> Ignition coil assembly and/or its circuit ECM

DTC Confirmation Procedure

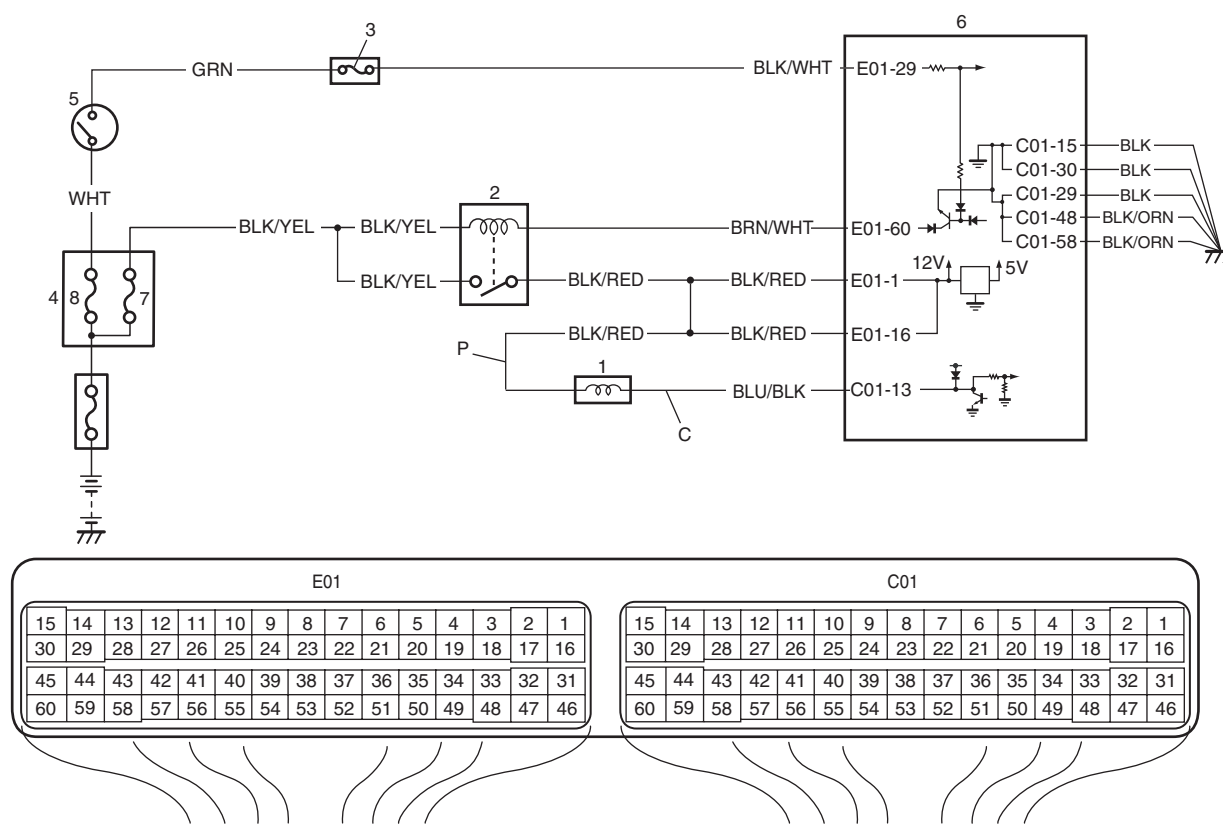
- 1) With ignition switch turned OFF, connect scan tool to DLC.
- 2) Turn ON ignition switch and clear DTC.
- 3) Crank engine for 3 – 5 sec.
- 4) Check DTC.

DTC Troubleshooting

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 in related manual". <i>Is check result satisfactory?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".	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. <ul style="list-style-type: none"> • Circuit voltage of ignition coil assembly power supply circuit is 10 – 14 V with ignition switch turned ON. • Circuit voltage of ignition coil assembly output circuit is 4 – 6 V with ignition switch turned ON. • Resistance between ignition coil assembly ground circuit and vehicle body ground is less than 2 Ω. <i>Are they in good condition?</i>	Go to Step 4.	Repair or replace defective wire.
4	Ignition coil assembly check 1) Replace ignition coil assembly for No.1, No.2, No.3 and No.4 spark plugs. 2) Check spark plug for spark as the same manner as Step 2. <i>Is the cylinder found as faulty in good condition now?</i>	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. <ul style="list-style-type: none"> • Wiring harness resistance of ignition coil assembly output circuit is less than 2 Ω. • Insulation resistance between ignition coil assembly output circuit and vehicle body ground is infinity. <i>Are they in good condition?</i>	Substitute a known-good ECM and recheck.	Repair or replace defective wire.

DTC P0443: EVAP Emission System Purge Control Valve Circuit

S6RW0H1104036

Wiring Diagram

I6RW0C110014-01

P: EVAP canister purge valve power supply circuit	2. Main relay	5. Ignition switch	8. "IGN" fuse
C: EVAP canister purge valve control circuit	3. "IG COIL" fuse	6. ECM	
1. EVAP canister purge valve	4. Fuse box No.2	7. "FI" fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
<ul style="list-style-type: none"> Monitor signal of EVAP canister purge valve is not varied for 5 sec. even though EVAP canister purge valve control duty is between 10% and 90%. Monitor signal of EVAP canister purge valve is lower than specified voltage for 5 sec. even though EVAP canister purge valve control duty is 0%. (2 driving cycle detection logic)	<ul style="list-style-type: none"> EVAP canister purge valve and/or its 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 with 2 persons, a driver and a tester, on a level road.

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

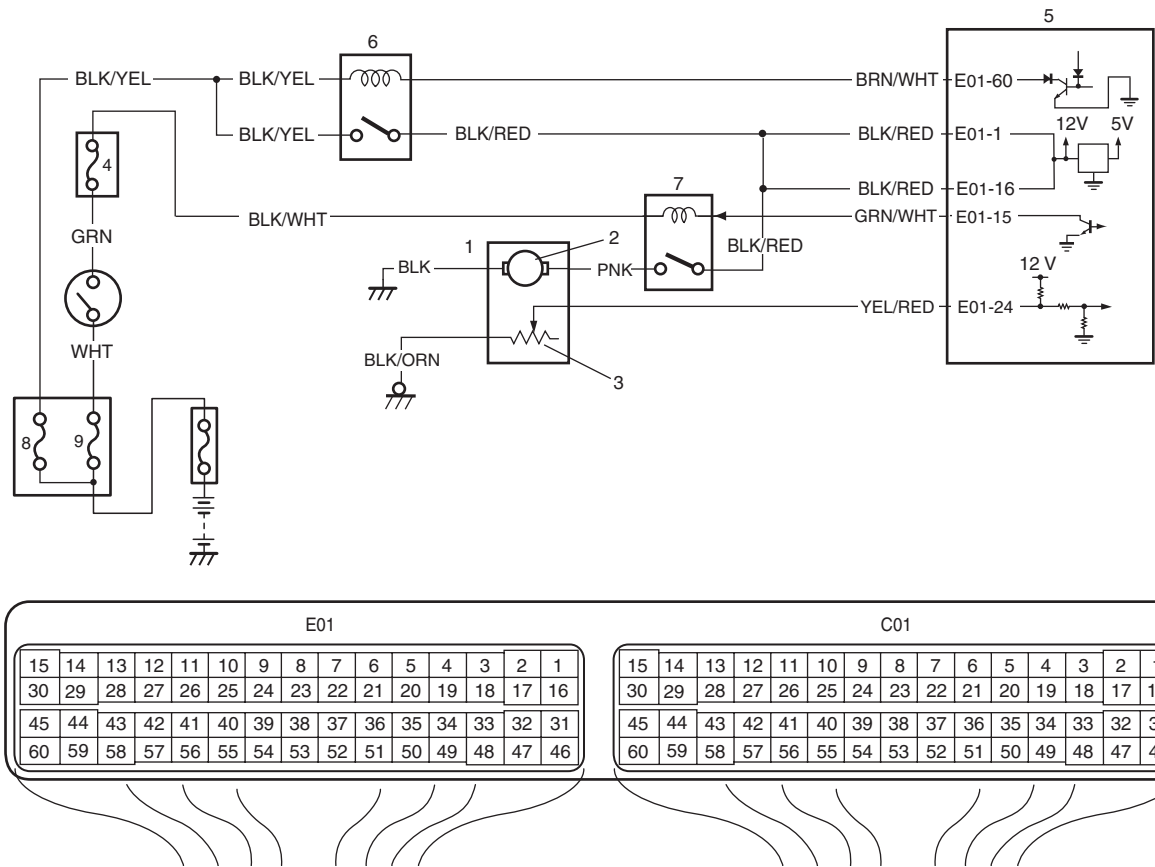
DTC Troubleshooting

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	EVAP canister purge valve power supply voltage check 1) Disconnect connector from EVAP canister purge valve with ignition switch turned OFF. 2) Check for proper terminal connection to EVAP canister purge valve and ECM connectors. 3) If connections are OK, check that EVAP canister purge valve power supply voltage is battery voltage between EVAP canister purge valve connector and vehicle body ground with ignition switch turned ON. <i>Is it in good condition?</i>	Go to Step 3.	Repair or replace EVAP canister purge valve power supply circuit.
3	Wire harness check 1) Disconnect connector from ECM with ignition switch turned OFF. 2) Check that EVAP canister purge valve circuit is as follows. <ul style="list-style-type: none"> • Wiring harness resistance of EVAP canister purge valve control circuit is less than 3 Ω. • Insulation resistance of EVAP canister purge valve control circuit is infinity between EVAP canister purge valve connector and vehicle body ground. • Circuit voltage of EVAP canister purge valve control circuit is 0 – 1 V with ignition switch turned ON. <i>Are they in good condition?</i>	Go to Step 4.	Repair or replace defective wire harness.
4	EVAP canister purge valve check 1) Check EVAP canister purge valve coil resistance referring to "EVAP Canister Purge Valve Inspection in Section 1B in related manual". <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Replace EVAP canister purge valve.

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

S6RW0H1104037

Wiring Diagram



I6RW0C110023-01

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

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0462: Circuit voltage of fuel level sensor is lower than 0.45 V for 3 sec. with engine running. (1 driving cycle detection logic but MIL does not light up)	<ul style="list-style-type: none">Fuel level sensor and/or its circuitECM
DTC P0463: Circuit voltage of fuel level sensor is higher than 4.94 V for 30 sec. with engine running. (1 driving cycle detection logic but MIL does not light up)	

DTC Confirmation Procedure

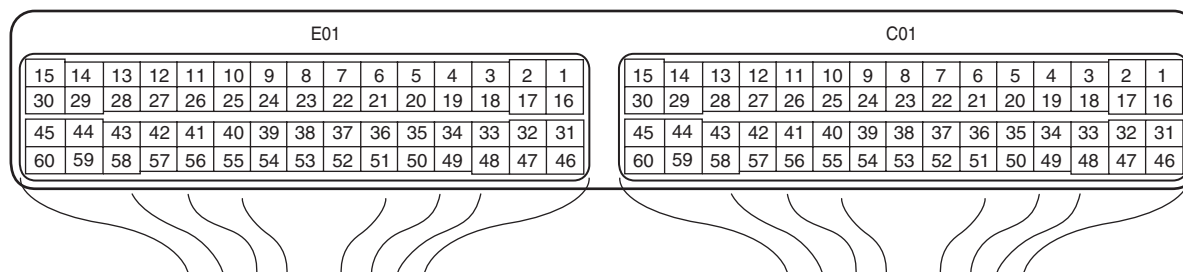
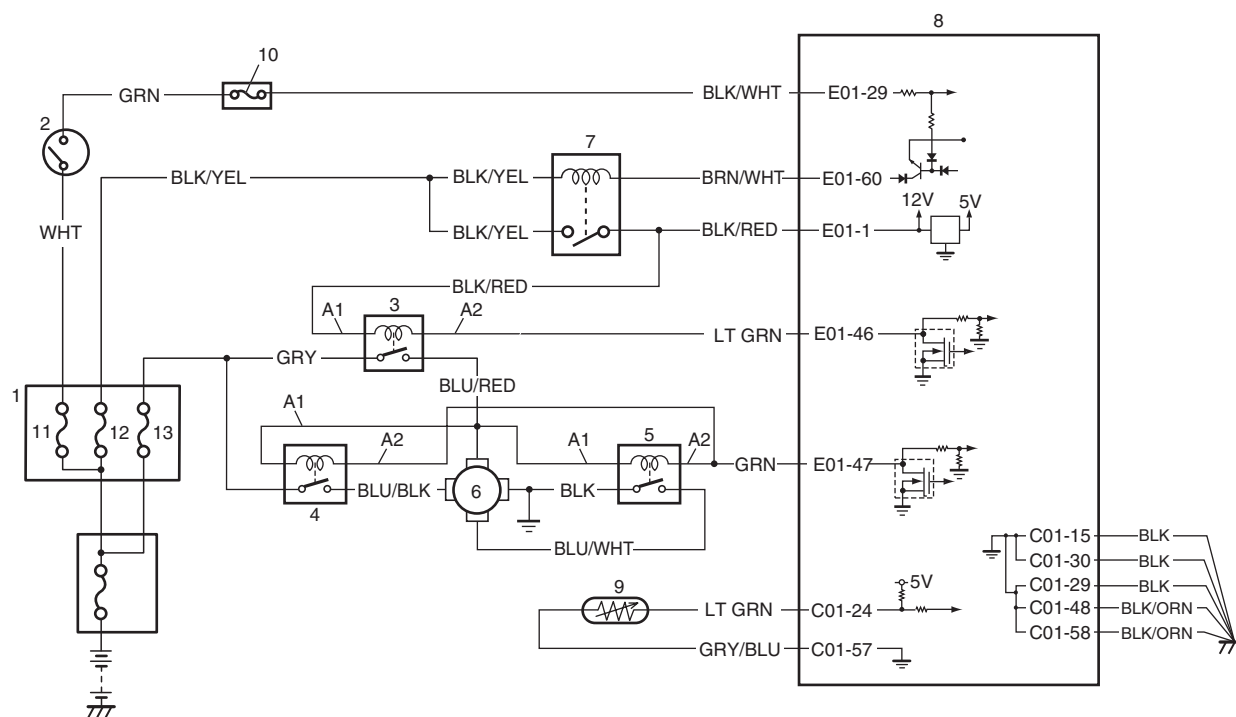
- 1) With ignition switch OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Start engine and run it for 10 sec.
- 4) Check DTC and pending DTC.

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	Fuel level sensor performance check 1) Check fuel level sensor for performance referring to "Fuel Level Sensor Inspection in Section 9C in related manual". Is it in good condition?	Go to Step 3.	Replace fuel level sensor.
3	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper terminal connection to fuel level sensor and ECM connectors. 3) If connections are OK, check that fuel level sensor circuit is as follows. <ul style="list-style-type: none"> • Wiring harness resistance of fuel level sensor circuit is less than 3Ω. • Insulation resistance of fuel level sensor circuit is infinity between fuel level sensor connector and vehicle body ground. • Insulation resistance of wire harness is infinity between fuel level sensor terminal and each other terminal at fuel level sensor connector. • Circuit voltage of fuel level sensor circuit is 0 – 1 V with ignition switch turned ON. Are they in good condition?	Substitute a known-good ECM and recheck.	Repair or replace defective wire harness.

DTC P0480: Fan 1 Control Circuit

S6RW0H1104038

Wiring Diagram

I6RW0C110015-01

A1: Radiator cooling fan relay power supply circuit	4. Radiator cooling fan relay No.2	9. ECT sensor
A2: Radiator cooling fan relay control circuit	5. Radiator cooling fan relay No.3	10. "IG COIL" fuse
1. Fuse Box No.2	6. Radiator cooling fan motor	11. "IGN" fuse
2. Ignition switch	7. Main relay	12. "FI" fuse
3. Radiator cooling fan relay No.1	8. ECM	13. "RDTR" fuse

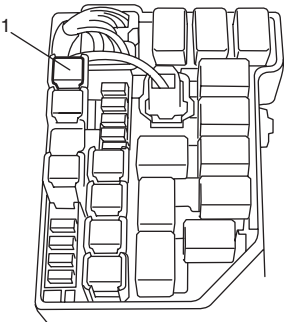
DTC Detecting Condition and Trouble Area

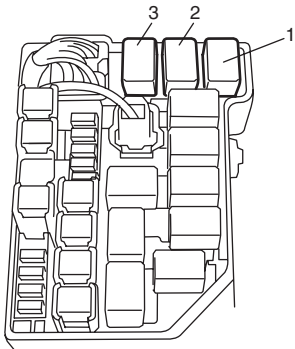
DTC detecting condition	Trouble area
Monitor signal of radiator cooling fan relay No.1 is lower than specified voltage for 5 sec. even though radiator cooling fan relay No.1 is OFF. (1 driving cycle detection logic)	<ul style="list-style-type: none"> Radiator cooling fan relay No.1 and/or its circuit ECM

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Start engine and warm up to normal operating temperature.
- 4) Keep engine at idle speed until engine coolant temperature reaches 102 °C (216 °F) or more.
- 5) Check DTC.

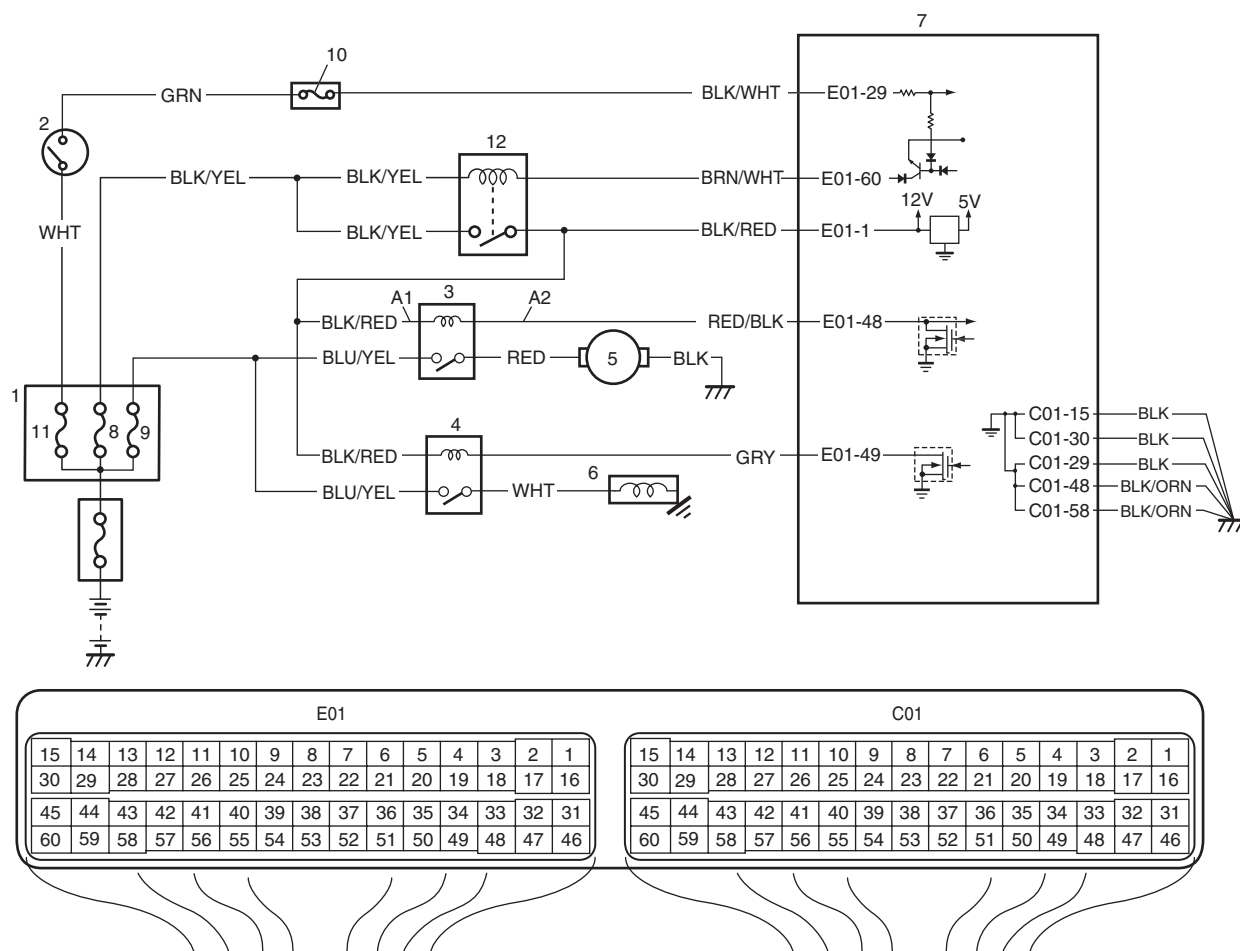
DTC Troubleshooting

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	Wire harness check 1) Turn ignition switch to OFF position. 2) Check for proper terminal connection to radiator cooling fan relay (No.1, No.2 or No.3) and ECM connectors. 3) If connections are OK, recheck DTC. <i>Is DTC P0480 detected again?</i>	Go to Step 3.	Intermittent trouble.
3	Circuit fuse check 1) Check "RDTR" fuse (1) in fuse box No.2 with ignition switch turned OFF.  I7RW01110065-01 <i>Is "RDTR" fuse in good condition?</i>	Go to Step 4.	Check for short in circuits connected to this fuse.
4	Radiator cooling fan control circuit voltage check 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Turn ignition switch ON position. 4) Check that radiator cooling fan relay (No.1, No.2 or No.3) control circuit voltage is battery voltage between ECM connector and vehicle body ground. <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Go to Step 5.

Step	Action	Yes	No
5	Radiator cooling fan control circuit voltage check <ol style="list-style-type: none"> 1) Turn ignition switch to OFF position. 2) Remove radiator cooling fan relay No.1 (1), No.2 (2) or No.3 (3). 3) Turn ignition switch ON position. 4) Check that radiator cooling fan relay (No.1, No.2 or No.3) power supply voltage is battery voltage between radiator cooling fan relay (No.1, No.2 or No.3) connector and vehicle body ground.  <p>I7RW01110066-01</p> <p><i>Is it in good condition?</i></p>	Go to Step 6.	Repair or replace power supply circuit of radiator cooling fan relay (No.1, No.2 or No.3).
6	Radiator cooling fan relay check <ol style="list-style-type: none"> 1) Check radiator cooling fan relay No.1, No.2 or No.3 for operation referring to "Radiator Cooling Fan Relay Inspection in Section 1F in related manual". <p><i>Is it in good condition?</i></p>	Repair or replace control circuit of radiator cooling fan relay (No.1, No.2 or No.3). If circuit is OK, substitute a known-good ECM and recheck.	Replace radiator cooling fan relay No.1, No.2 or No.3.

DTC P0481: Fan 2 Control Circuit

S6RW0H1104039

Wiring Diagram

I6RW0C110016-01

A1: A/C condenser cooling fan relay power supply circuit	4. A/C compressor relay	9. "A/C" fuse
A2: A/C condenser cooling fan relay control circuit	5. A/C condenser cooling fan motor	10. "IG COIL" fuse
1. Fuse Box No.2	6. A/C compressor	11. "IGN" fuse
2. Ignition switch	7. ECM	12. Main relay
3. A/C condenser cooling fan relay	8. "FI" fuse	

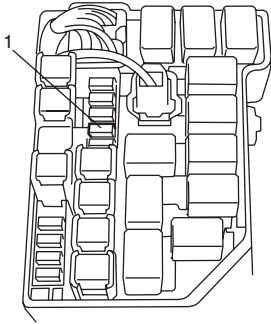
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of A/C condenser cooling fan relay is lower than specified voltage for 5 sec. even though A/C switch is ON and A/C condenser fan is OFF. (2 driving cycle detection logic)	<ul style="list-style-type: none"> A/C condenser cooling fan relay and/or its circuit ECM

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Start engine and run it at idle speed.
- 4) Select blower selector at 1st position or more.
- 5) Turn on A/C switch.
- 6) Wait until A/C condenser fan stops.
- 7) Check DTC and pending DTC.

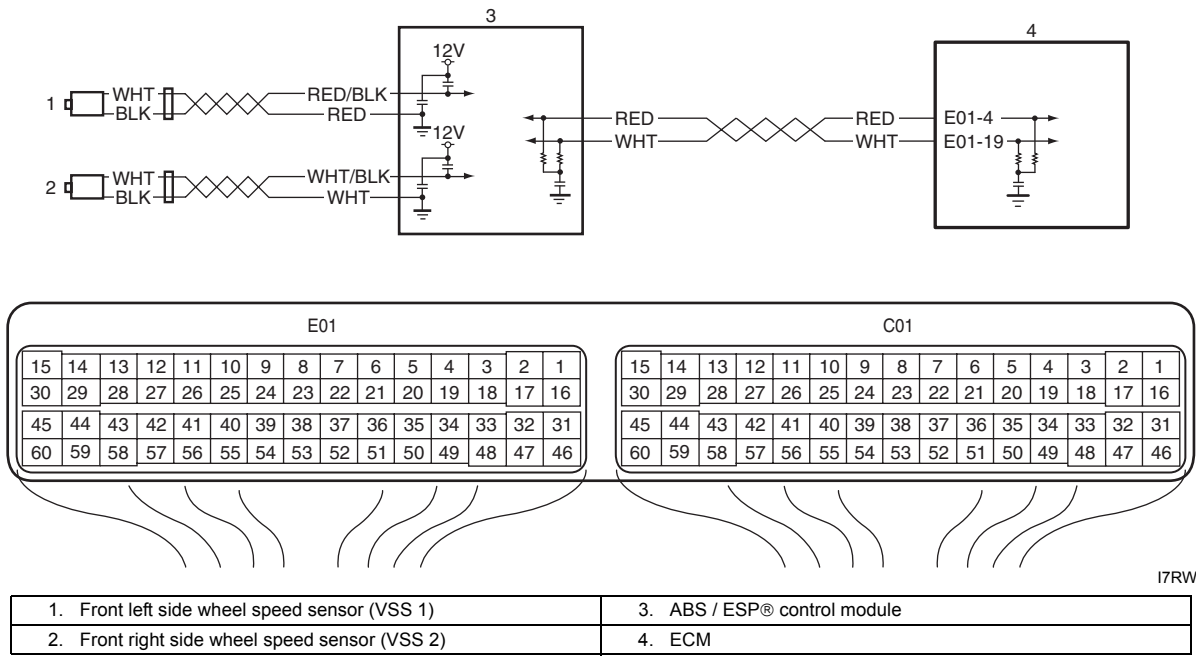
DTC Troubleshooting

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	Wire harness check 1) Turn ignition switch to OFF position. 2) Check for proper terminal connection to A/C condenser cooling fan relay and ECM connectors. 3) If connections are OK, recheck DTC. Is DTC P0481 detected again?	Go to Step 3.	Intermittent trouble.
3	Circuit fuse check 1) Check "A/C" fuse (1) in fuse box No.2 with ignition switch turned OFF.  Is "A/C" fuse in good condition?	Go to Step 4.	Check for short in circuits connected to this fuse.
4	A/C condenser fan control circuit voltage check 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Turn ignition switch ON position. 4) Check that A/C condenser cooling fan relay control circuit voltage is battery voltage between ECM connector and vehicle body ground. Is it in good condition?	Substitute a known-good ECM and recheck.	Go to Step 5.
5	A/C condenser fan control circuit voltage check 1) Turn ignition switch to OFF position. 2) Remove A/C condenser cooling fan relay. 3) Turn ignition switch ON position. 4) Check that A/C condenser cooling fan relay power supply voltage is battery voltage between A/C condenser cooling fan relay connector and vehicle body ground. Is it in good condition?	Go to Step 6.	Repair or replace power supply circuit of A/C condenser cooling fan relay.
6	A/C condenser fan relay check 1) Check A/C condenser cooling fan relay for operation referring to "A/C System Relay Inspection: Manual Type in Section 7B in related manual". Is it in good condition?	Repair or replace control circuit of A/C condenser cooling fan relay. If circuit is OK, substitute a known-good ECM and recheck.	Replace A/C condenser cooling fan relay.

DTC P0500: Vehicle Speed Sensor “A”

S6RW0H1104040

Wiring Diagram



I7RW01110069-01

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Vehicle speed signal is not input for 10 sec. while fuel shuts off at deceleration below 3,600 rpm. (2 driving cycle detection logic)	<ul style="list-style-type: none">Wheel speed sensor (VSS) and/or its circuitABS / ESP® control moduleECM

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.

- With ignition switch turned OFF, connect scan tool.
- Turn ON ignition switch and clear DTC using scan tool.
- Warm up engine to normal operating temperature.
- Drive vehicle at 4,000 rpm (engine speed) with 3rd gear (M/T model) or “3” range (A/T model).
- Release accelerator pedal and with engine brake applied, keep vehicle coasting for 20 sec. or more (fuel cut condition for 10 sec. or more) and stop vehicle.
- Check DTC and pending DTC.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0532: Output voltage of A/C refrigerant pressure sensor is lower than 0.2 V for specified time. (1 driving cycle detection logic but MIL does not light up)	<ul style="list-style-type: none"> • A/C refrigerant pressure sensor and/or its circuit • ECM
DTC P0533: Output voltage of A/C refrigerant pressure sensor is higher than 4.93 V for specified time. (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 by using scan tool.
- 3) Check 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/C refrigerant pressure sensor and its circuit check 1) Check A/C refrigerant pressure sensor and its circuit for condition referring to "A/C Refrigerant Pressure Sensor and Its Circuit Inspection: Manual Type in Section 7B in related manual". Is it in good condition?	Substitute a known-good ECM and recheck.	Repair or replace defective parts.

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

S6RW0H1104043

System Description

Internal control module is installed in ECM.

DTC Detecting Condition and Trouble Area**NOTE**

After reprogramming of ECM is executed, if the DTC P0601 and/or P0602 are indicated, it is possible that the reprogramming of ECM is not completed correctly.

DTC detecting condition	Trouble area
DTC P0601: Data write error or check sum error. (1 driving cycle detection logic, monitoring once per driving cycle)	<ul style="list-style-type: none"> ECM power supply circuit and or ground circuit ECM
DTC P0602: Data programming error. (1 driving cycle detection logic but MIL does not light up)	
DTC P0607: ECM internal processor error. (1 driving cycle detection logic)	

DTC Confirmation Procedure

- 1) With ignition switch OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Start engine and run it at idle if possible.
- 4) Check DTC.

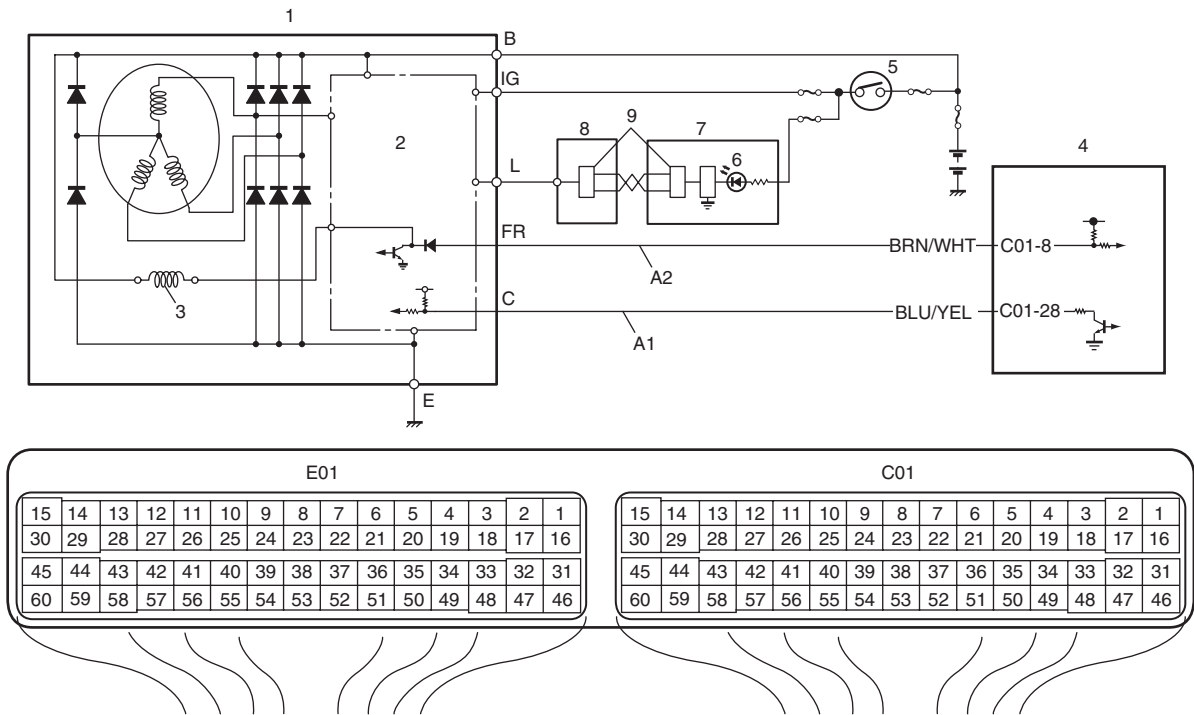
DTC Troubleshooting

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 checking results OK?</i>	Substitute a known-good ECM and recheck.	Repair ECM power or ground circuit.

DTC P0620: Generator Control Circuit

S6RW0H1104076

System and Wiring Diagram



A1: Generator control signal output circuit	3. Field coil	7. Combination meter
A2: Generator field coil monitor signal circuit	4. ECM	8. BCM
1. Generator	5. Ignition switch	9. CAN driver
2. IC regulator	6. Charge lamp	

I6RW0H110013-01

A1: Generator control signal output circuit	3. Field coil	7. Combination meter
A2: Generator field coil monitor signal circuit	4. ECM	8. BCM
1. Generator	5. Ignition switch	9. CAN driver
2. IC regulator	6. Charge lamp	

Generator Control System Description

Refer to “Generator Control System Description”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
<ul style="list-style-type: none"> 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 16 A. <p>(1 driving cycle detection logic but MIL does not light up)</p>	<ul style="list-style-type: none"> 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	<i>Was “Engine and Emission Control System Check” performed?</i>	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 and Generator Drive Belt On-Vehicle Inspection in Section 1F in related manual”. <i>Is check result satisfactory?</i>	Go to Step 3.	Adjust or replace generator drive belt.
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. <ul style="list-style-type: none"> • Wiring harness resistance of generator control signal output circuit is less than 1 Ω. • Insulation resistance between generator control signal output circuit and vehicle body ground is Infinity. • Circuit voltage of generator control signal output circuit is 0 V with ignition switch turned ON. <i>Are they in good condition?</i>	Go to Step 3.	Repair or replace defective wire.

Step	Action	Yes	No
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

S6RW0H1104077

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)	<ul style="list-style-type: none"> • 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 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 following accessory switches.
 - 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

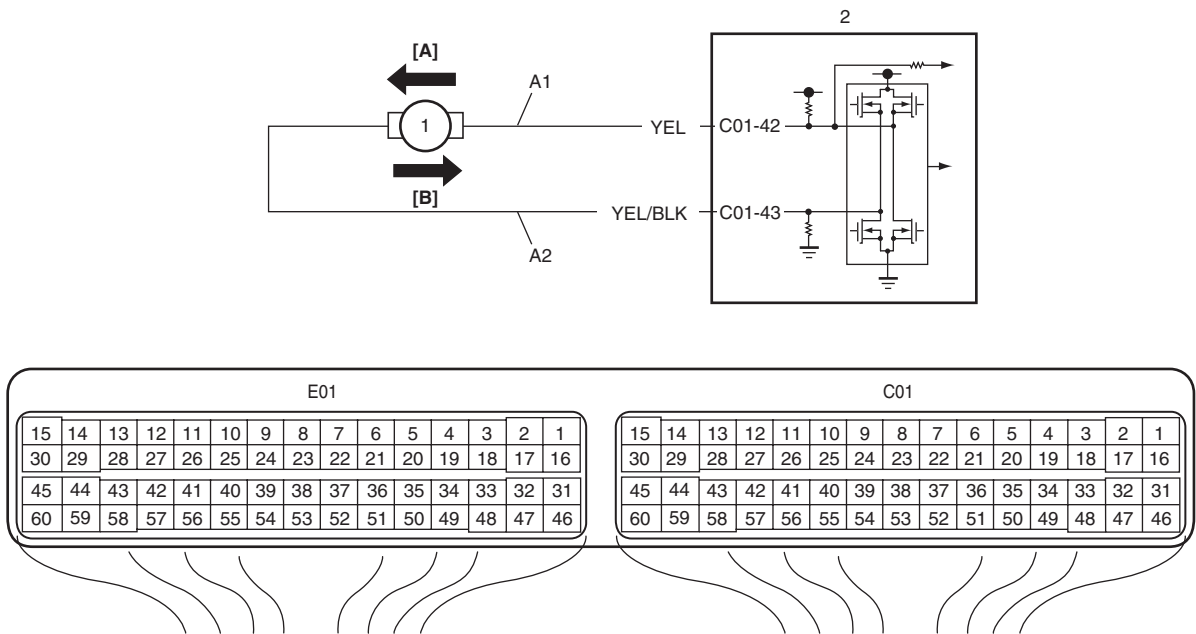
Before this troubleshooting is performed, read the precautions for DTC troubleshooting referring to "Precautions for DTC Troubleshooting".

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. <ul style="list-style-type: none"> • Wiring harness resistance of each generator control signal output circuit and field coil monitor signal circuit is less than 1 Ω. • Insulation resistance between generator control signal output circuit and field coil monitor signal circuit is Infinity. • Insulation resistance of each generator control signal output circuit and field coil monitor signal circuit is infinity between generator connector and vehicle body ground. • Circuit voltage of each generator control signal output circuit, field coil monitor signal circuit and vehicle body ground is 0 V with ignition switch turned ON. 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 P0660 / P0662: Intake Manifold Tuning Valve Control Circuit Open / High

S6RW0H1104045

Wiring Diagram



I7RW01110073-04

[A]: Open	A1: IMT valve control circuit (+)	1. IMT valve
[B]: Close	A2: IMT valve control circuit (-)	2. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0660: Monitor signal of IMT valve is different from command signal for 5 sec. (1 driving cycle detection logic but MIL does not light up)	<ul style="list-style-type: none">IMT valve and/or its circuitECM
DTC P0662: Circuit voltage of IMT valve is higher than specification for 5 sec. when engine revolution is 3,000 rpm or less. (1 driving cycle detection logic but MIL does not light up)	

DTC Confirmation Procedure

NOTE

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

- The following DTC is not detected (when DTC P0660 is detected): DTC P0662

- With ignition switch turned OFF, connect scan tool.
- Turn ON ignition switch and clear DTC by using scan tool.
- Start engine and run it for 10 sec.
- Check 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	IMT valve control circuit check 1) Disconnect connectors from IMT valve and ECM with ignition switch turned OFF. 2) Check for proper terminal connection to IMT valve and ECM connectors. 3) If connection are OK, check that IMT valve circuit is as follows. <ul style="list-style-type: none"> • Wiring harness resistance of IMT valve control circuit is less than 3 Ω. • Insulation resistance of IMT valve control circuit is infinity between IMT valve connector and vehicle body ground. • Insulation resistance of wire harness is infinity between IMT valve control terminal and each other terminal at IMT valve connector. • Circuit voltage of IMT vacuum solenoid valve control circuit is 0 – 1 V with ignition switch turned ON. Are they in good condition?	Go to Step 3.	Repair or replace IMT valve control circuit.
3	IMT vacuum solenoid valve check 1) Check IMT valve referring to "IMT Valve Actuator Inspection in Section 1C in related manual". Is it in good condition?	Substitute a known-good ECM and recheck.	Replace IMT valve.

DTC Troubleshooting

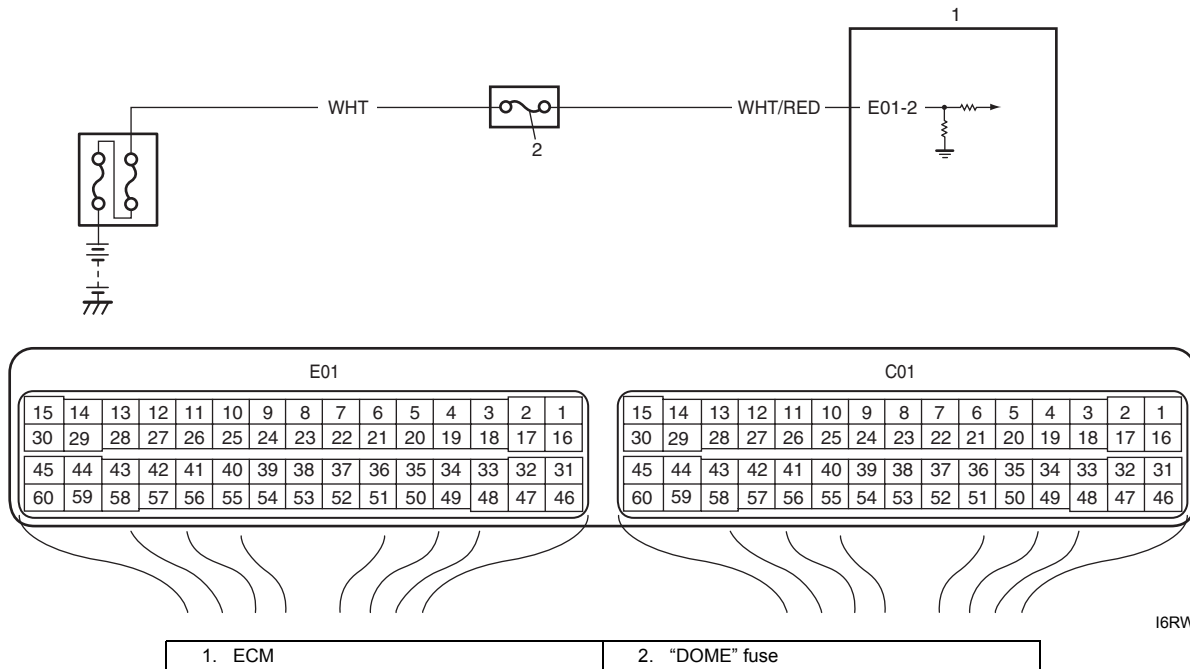
NOTE

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. <ul style="list-style-type: none"> • Circuit voltage of electric load current sensor power supply circuit is 10 – 14 V with ignition switch turned ON. • Wiring harness resistance between electric load current sensor ground circuit 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. <ul style="list-style-type: none"> • Wiring harness resistance of electric load current sensor signal circuit is less than 2 Ω. • Insulation resistance between electric load current sensor signal circuit and vehicle body ground is Infinity. • Circuit voltage of electric load current sensor signal circuit is 0 V 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

S6RW0H1104046

Wiring Diagram

I6RW0H110015-01

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
Backup power voltage of internal circuit is lower than specified voltage for 5 sec. (1 driving cycle detection logic)	<ul style="list-style-type: none"> Battery voltage supply circuit ECM

DTC Confirmation Procedure

- 1) With ignition switch OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Run engine at idle speed for 1 min.
- 4) Check 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	Battery voltage supply circuit check <ol style="list-style-type: none"> 1) Turn ignition switch to OFF position. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure ECM back-up power supply voltage between ECM connector and vehicle body ground. Is voltage 10 – 14 V?	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.	ECM back-up power supply circuit is open or short.

DTC P2101: Throttle Actuator Control Motor Circuit Range / Performance

S6RW0H1104047

Wiring Diagram

Refer to "DTC P0122 / P0123: Throttle / Pedal Position Sensor / Switch "A" Circuit Low / High".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Throttle actuator control circuit is higher than specified current or temperature for 0.5 sec. (1 driving cycle detection logic)	<ul style="list-style-type: none"> • Throttle actuator control 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 by using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 sec.
- 4) Keep the accelerator pedal at fully depressed position for 2 sec.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check 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	DTC check 1) Check DTC. Is any DTC(s) detected?	Go to applicable DTC diag. flow.	Go to Step 3.
3	Throttle actuator circuit check 1) Disconnect connectors from electric throttle body assembly and ECM with ignition switch turned OFF. 2) Check for proper terminal connection to electric throttle body assembly and ECM connectors. 3) If connections are OK, check that throttle actuator control circuit is as follows. <ul style="list-style-type: none"> • Wiring harness resistance of each throttle actuator control circuit (+) and (–) is less than 3 Ω • Insulation resistance between throttle actuator control circuit (+) or (–) and vehicle body ground is Infinity • Insulation resistance of wire harness is infinity between throttle actuator control circuit (+) and each other terminal at electric throttle body connector • Circuit voltage of throttle actuator control circuit (+) and (–) is 0 – 1 V with ignition switch turned ON Are they in good condition?	Go to Step 4.	Repair or replace.
4	Electric throttle body assembly check 1) Check electric throttle body for performance referring to "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C in related manual". Is it in good condition?	Substitute a known-good ECM and recheck.	Repair or replace electric throttle body assembly.

DTC P2102: Throttle Actuator Control Motor Circuit Low**Wiring Diagram**

Refer to "DTC P0122 / P0123: Throttle / Pedal Position Sensor / Switch "A" Circuit Low / High".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Power supply voltage of throttle actuator control relay is lower than 5 V for 0.5 sec. even though throttle actuator control relay turned ON. (1 driving cycle detection logic)	<ul style="list-style-type: none"> • Throttle actuator control relay and/or its circuit • ECM

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Keep ignition switch is at ON position for 5 sec. or longer.
- 4) Check 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	Throttle actuator control relay circuit check <ol style="list-style-type: none"> 1) Remove throttle actuator control relay with ignition switch turned OFF. 2) Check for proper terminal connection to throttle actuator control relay and ECM connectors. 3) If connections are OK, turn ignition switch to ON position. 4) Check that circuit voltage of throttle actuator control relay (coil side and switch side) power supply circuit is battery voltage. Is it in good condition?	Go to Step 3.	Repair or replace power supply circuit of throttle actuator control relay (coil side and/or switch side).
3	Throttle actuator control relay check <ol style="list-style-type: none"> 1) Check throttle actuator control relay for operation referring to "Engine and Emission Control System Relay Inspection in Section 1C in related manual". Is it in good condition?	Go to Step 4.	Replace throttle actuator control relay.

1A-110 Engine General Information and Diagnosis:

Step	Action	Yes	No
4	Wire harness check 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check that throttle actuator control relay (coil side and switch side) circuit is as follows. <ul style="list-style-type: none"> • Wiring harness resistance of throttle actuator control relay (coil side and switch side) control circuit is less than 3 Ω • Insulation resistance between throttle actuator control relay (coil side and switch side) control circuit and vehicle body ground is Infinity • Insulation resistance of wire harness is infinity between throttle actuator control relay (coil side) terminal and each other terminal at throttle actuator control relay connector • Circuit voltage of throttle actuator control relay (coil side and switch side) control circuit is 0 – 1 V with ignition switch turned ON <i>Are they in good condition?</i>	Substitute a known-good ECM and recheck.	Repair or replace control circuit of throttle actuator control relay (coil side and/or switch side) is open, short or high resistance.

DTC P2103: Throttle Actuator Control Motor Circuit High

S6RW0H1104049

Wiring Diagram

Refer to “DTC P0122 / P0123: Throttle / Pedal Position Sensor / Switch “A” Circuit Low / High”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Power supply voltage of throttle actuator control relay is higher than 5 V for 0.6 sec. even though throttle actuator control relay is turned OFF. (1 driving detection logic)	<ul style="list-style-type: none"> • Throttle actuator control relay and/or its circuit • ECM

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Keep ignition switch is at ON position for 5 sec. or longer.
- 4) Check DTC.

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 actuator control relay circuit check 1) Check throttle actuator control relay circuit referring to step 4 of “DTC P2102: Throttle Actuator Control Motor Circuit Low”. <i>Are they in good condition?</i>	Go to Step 3.	Repair or replace control circuit of throttle actuator control relay.
3	Electric throttle body assembly check 1) Check electric throttle body for performance referring to “Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C in related manual”. <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Repair or replace electric throttle body assembly.

DTC P2111: Throttle Actuator Control System - Stuck Open

S6RW0H1104050

Wiring Diagram

Refer to "DTC P0122 / P0123: Throttle / Pedal Position Sensor / Switch "A" Circuit Low / High".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Throttle position does not change by 2° during diagnosing throttle valve at ignition switch turned OFF. (1 driving detection logic)	<ul style="list-style-type: none"> 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

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 check 1) Check electric throttle body for operation and condition referring to "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C in related manual". Is it in good condition?	Substitute a known-good ECM and recheck.	Repair or replace electric throttle body assembly.

DTC P2119: Throttle Actuator Control Throttle Body Range / Performance

S6RW0H1104051

Wiring Diagram

Refer to "DTC P0122 / P0123: Throttle / Pedal Position Sensor / Switch "A" Circuit Low / High".

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 more than specification for specified time. (1 driving detection logic)	<ul style="list-style-type: none"> Throttle actuator control circuit Electric throttle body assembly ECM

DTC Confirmation Procedure

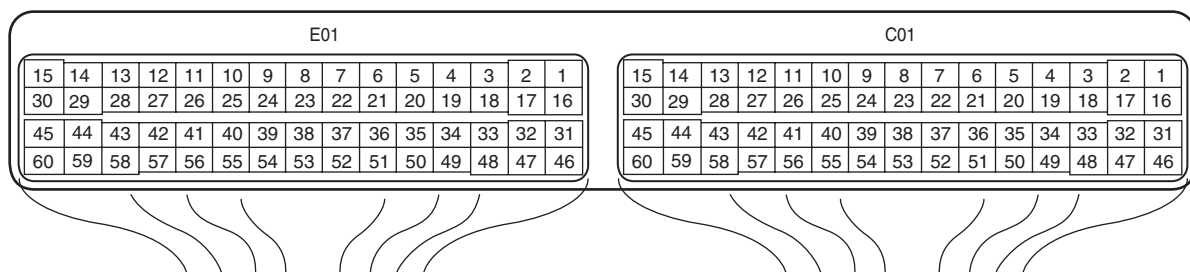
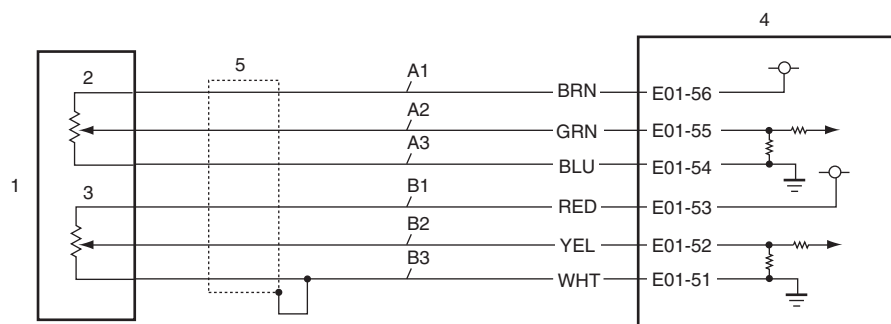
- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 sec.
- 4) Keep the accelerator pedal at fully depressed position for 2 sec.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check 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	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. <i>Is displayed each 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	Wire harness check 1) Disconnect connectors from electric throttle body assembly and ECM with ignition switch turned OFF. 2) Check for proper terminal connection to electric throttle body assembly connector and ECM. 3) If connection are OK, check that throttle actuator control circuit is as follows. <ul style="list-style-type: none"> Wiring harness resistance of throttle actuator control circuit (+) and (–) is less than 3 Ω Insulation resistance between throttle actuator control circuit (+) and (–) and vehicle body ground is Infinity Insulation resistance between throttle actuator control circuit (+) and (–) is infinity Circuit voltage of throttle actuator control circuit (+) and (–) is 0 – 1 V with ignition switch turned ON <i>Are they in good condition?</i>	Go to Step 4.	Repair or replace control circuit of throttle actuator (+) and/or (–) is open, short or high resistance.
4	Electric throttle body assembly check 1) Check electric throttle body for operation and condition referring to "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C in related manual". <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Repair or replace electric throttle body assembly.

DTC P2122 / P2123: Throttle / Pedal Position Sensor / Switch “D” Circuit Low / High

S6RW0H1104052

Wiring Diagram

I7RW01110083-02

A1: APP sensor (main) power supply circuit	B2: APP sensor (sub) signal circuit	3. APP sensor (sub)
A2: APP sensor (main) signal circuit	B3: APP sensor (sub) ground circuit	4. ECM
A3: APP sensor (main) ground circuit	1. APP sensor assembly	5. Ground of APP sensor for shield wire
B1: APP sensor (sub) power supply circuit	2. APP sensor (main)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P2122: Output voltage of APP sensor (main) is lower than 0.45 V for 0.5 sec. (1 driving cycle detection logic)	<ul style="list-style-type: none"> APP sensor (main) and/or its circuit ECM
DTC P2123: Output voltage of APP sensor (main) is higher than 4.8 V for 0.5 sec. (1 driving cycle detection logic)	

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 sec.
- 4) Keep the accelerator pedal at fully depressed position for 2 sec.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check 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	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 in good condition?</i>	Go to Step 3.	Reinstall APP sensor assembly properly referring to "Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation in Section 1C in related manual".
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 when accelerator pedal is released and fully depressed. <i>Is displayed APP 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 4.
4	Wire harness check 1) Turn ignition switch OFF position. 2) Disconnect connectors from APP sensor and ECM. 3) Check for proper terminal connection to APP sensor and ECM connectors. 4) If connections are OK, check that APP sensor (main) circuit is as follows. <ul style="list-style-type: none"> • Wiring harness resistance of each APP sensor (main) power supply, signal and ground circuit is less than 3 Ω • Insulation resistance of each APP sensor (main) power supply and signal circuit is infinity between APP sensor connector and vehicle body ground • Insulation resistance of wire harness is infinity between APP sensor (main) power supply terminal and each other terminal at APP sensor connector • Circuit voltage of each APP sensor (main) power supply, signal and ground circuit is 0 – 1 V with ignition switch turned ON <i>Are they in good condition?</i>	Go to Step 5.	Repair or replace APP sensor (main) power supply, signal and/or ground circuit(s).
5	APP sensor power supply voltage check 1) Connect connectors to ECM. 2) Turn ignition switch ON position. 3) Check that circuit voltage is 5 V between APP sensor (main) power supply terminal and vehicle body ground. <i>Is it in good condition?</i>	Go to Step 6.	Substitute a known-good ECM and recheck.
6	APP sensor check 1) Check APP sensor for performance referring to "Accelerator Pedal Position (APP) Sensor Assembly Inspection in Section 1C in related manual". <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Replace APP sensor assembly.

DTC P2127 / P2128: Throttle / Pedal Position Sensor / Switch “E” Circuit Low / High Input

S6RW0H1104053

Wiring Diagram

Refer to “DTC P2122 / P2123: Throttle / Pedal Position Sensor / Switch “D” Circuit Low / High”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P2127: Output voltage of APP sensor (sub) is lower than 0.23 V for 0.5 sec. (1 driving cycle detection logic)	<ul style="list-style-type: none"> • APP sensor (sub) and/or its circuit • ECM
DTC P2128: Output voltage of APP sensor (sub) is higher than 2.4 V for 0.5 sec. (1 driving cycle detection logic)	

DTC Confirmation Procedure

- 1) With ignition switch turned OFF, connect scan tool.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 sec.
- 4) Keep the accelerator pedal at fully depressed position for 2 sec.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check 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	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 in good condition?</i>	Go to Step 3.	Reinstall APP sensor assembly properly referring to “Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation in Section 1C in related manual”.
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 when accelerator pedal is idle position and fully depressed. <i>Is displayed APP 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 4.

1A-116 Engine General Information and Diagnosis:

Step	Action	Yes	No
4	Wire harness check 1) Turn ignition switch OFF position. 2) Disconnect connectors from APP sensor and ECM. 3) Check for proper terminal connection to APP sensor and ECM connectors. 4) If connections are OK, check that APP sensor (sub) circuit is as follows. <ul style="list-style-type: none">• Wiring harness resistance of each APP sensor (sub) power supply, signal and ground circuit is less than 3 Ω• Insulation resistance of each APP sensor (sub) power supply and signal circuit is infinity between APP sensor connector and vehicle body ground• Insulation resistance of wire harness is infinity between APP sensor (sub) power supply terminal and each other terminal at APP sensor connector• Circuit voltage of each APP sensor (sub) power supply, signal and ground circuit is 0 – 1 V with ignition switch turned ON <i>Are they in good condition?</i>	Go to Step 5.	Repair or replace APP sensor (sub) power supply, signal and/or ground circuit(s).
5	APP sensor power supply voltage check 1) Connect connectors to ECM. 2) Turn ignition switch ON position. 3) Check that circuit voltage is 5 V between APP sensor (sub) power supply terminal and vehicle body ground. <i>Is it in good condition?</i>	Go to Step 6.	Substitute a known-good ECM and recheck.
6	APP sensor check 1) Check APP sensor for performance referring to “Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection in Section 1C in related manual”. <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Replace APP sensor assembly.

DTC P2135: Throttle / Pedal Position Sensor / Switch “A” / “B” Voltage Correction

S6RW0H1104054

Wiring Diagram

Refer to “DTC P0122 / P0123: Throttle / Pedal Position Sensor / Switch “A” Circuit Low / High”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference between the opening angle based on TP sensor (main) and the opening angle based on TP sensor (sub) is more than specification for 0.2 sec. (1 driving cycle detection logic)	<ul style="list-style-type: none"> TP sensor and/or its 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 by using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 sec.
- 4) Keep the accelerator pedal at fully depressed position for 2 sec.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check 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	TP 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” and “TP Sensor 2 Volt” displayed on scan tool when accelerator pedal is released 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	TP sensor check 1) Check TP sensor for performance referring to “Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C in related manual”. <i>Is it in good condition?</i>	Go to Step 4.	Replace electric throttle body assembly.
4	Wire harness check 1) Check TP sensor (main and sub) circuit for condition. For TP sensor (main) circuit, refer to Step 3 of “DTC P0122 / P0123: Throttle / Pedal Position Sensor / Switch “A” Circuit Low / High”. For TP sensor (sub) circuit, refer to Step 3 of “DTC P0222 / P0223: Throttle Position Sensor (Sub) Circuit Low / High”. <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Repair or replace.

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

S6RW0H1104055

Wiring Diagram

Refer to "DTC P0122 / P0123: Throttle / Pedal Position Sensor / Switch "A" Circuit Low / High".

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 more than specification for 0.5 sec. (1 driving detection logic)	<ul style="list-style-type: none"> • APP sensor (main) and/or its 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 by using scan tool.
- 3) Keep the accelerator pedal at idle position for 2 sec.
- 4) Keep the accelerator pedal at fully depressed position for 2 sec.
- 5) Repeat Step 3) and 4) for 3 times.
- 6) Check 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	TP sensor 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" and "APP Sensor 2 Volt" displayed on scan tool when accelerator pedal is idle position and fully depressed. <i>Is displayed each APP 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	APP sensor check 1) Check APP sensor for performance referring to "Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection in Section 1C in related manual". <i>Is it in good condition?</i>	Go to Step 4.	Replace APP sensor assembly.
4	Wire harness check 1) Check APP sensor (main and sub) circuit for condition. For APP sensor (main) circuit, refer to Step 4 of "DTC P2122 / P2123: Throttle / Pedal Position Sensor / Switch "D" Circuit Low / High". For TP sensor (sub) circuit, refer to Step 4 of "DTC P2127 / P2128: Throttle / Pedal Position Sensor / Switch "E" Circuit Low / High Input". <i>Is it in good condition?</i>	Substitute a known-good ECM and recheck.	Repair or replace.

DTC P2228 / P2229: Barometric Pressure Circuit Low / High

S6RW0H1104057

System Description

Barometric pressure sensor is installed in ECM.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P2228: Output signal of barometric pressure sensor is higher than 4.7 V for 0.5 sec. (1 driving cycle detection logic)	<ul style="list-style-type: none"> Barometric pressure sensor in ECM
DTC P2229: Output signal of barometric pressure sensor is lower than 1.95 V for 0.5 sec. (1 driving cycle detection logic)	

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch and clear DTC and freeze frame data by using scan tool and warm up engine to normal operating temperature.
- 3) 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 Description".
2	DTC check Is there any DTC(s) other than P2228 and P2229?	Go to applicable DTC diag. flow.	Substitute a known good ECM and recheck.

DTC U0073: Control Module Communication Bus Off

S6RW0H1104058

Refer to "Troubleshooting for CAN-DTC".

DTC U0101: Lost Communication with TCM

S6RW0H1104059

Refer to "Troubleshooting for CAN-DTC".

DTC U0121: Lost Communication with ABS / ESP® Control Module

S6RW0H1104060

Refer to "Troubleshooting for CAN-DTC".

DTC U0140: Lost Communication with Body Control Module

S6RW0H1104061

Refer to "Troubleshooting for CAN-DTC".

Troubleshooting for CAN-DTC

S6RW0H1104062

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	<ul style="list-style-type: none"> • All connected control modules/sensors (communicated by CAN) are displayed and its back ground color is “White”.
Abnormal	<ul style="list-style-type: none"> • 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
 - ESP[®] 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

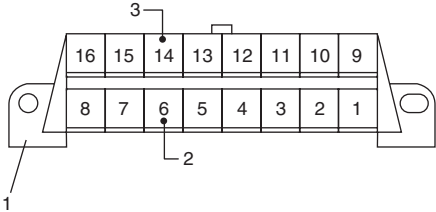
Refer to “Troubleshooting for Communication Error with Scan Tool Using CAN”.

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. <ul style="list-style-type: none"> • ECM • TCM • BCM • ESP® control module • 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 / sensor connectors. <ul style="list-style-type: none"> • Control modules communicated by CAN <ul style="list-style-type: none"> – ECM – TCM – ABS / ESP® control module – BCM – Combination meter – Keyless start control module – 4WD control module • Sensors communicated by CAN <ul style="list-style-type: none"> – Steering angle sensor (ESP® model) – Yaw rate / G sensor (ESP® model) 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 / sensor 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”.

1A-122 Engine General Information and Diagnosis:

Step	Action	Yes	No
3	CAN line check 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control module / sensor 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. <ul style="list-style-type: none"> • Between BCM connector and DLC • Between BCM connector and ABS / ESP® control module connector • Between ABS / ESP® 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 • Between BCM connector and yaw rate / G sensor connector • Between combination meter connector and steering angle sensor 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 / ESP® control module and combination meter 1) Check power and ground circuits the following control module. <ul style="list-style-type: none"> • 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". • ABS / ESP® 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 / ESP® control module and combination meter 1) Turn ignition switch to OFF position. 2) Connect BCM, ECM 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 / ESP® control module and combination meter normally displayed?</i>	Go to Step 12.	Go to Step 6.

Step	Action	Yes	No
6	Terminating resistance check in ECM and combination meter <ol style="list-style-type: none"> 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).  <p style="text-align: right;">I7RW01110098-01</p> <p><i>If resistance 57 – 67 Ω?</i></p>	Go to Step 7.	Go to Step 8.
7	Substitute ECM and recheck <ol style="list-style-type: none"> 1) Substitute a known-good ECM and recheck. <p><i>Is it in good condition?</i></p>	End.	Substitute a known-good combination meter and recheck. If NG, go to Step 11.
8	Terminating resistance check in ECM <ol style="list-style-type: none"> 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. <p><i>Is resistance 114 – 134 Ω?</i></p>	Substitute a known-good combination meter.	Go to Step 9.
9	Internal circuit check in BCM <ol style="list-style-type: none"> 1) Make sure that ignition switch is OFF position and battery negative (–) cable is disconnected. 2) Disconnect ABS / ESP® control module connector. 3) Measure resistance between the followings <ul style="list-style-type: none"> • Between CAN high terminal on DLC and “E08-2” terminal on ABS / ESP® control module connector • Between CAN low terminal on DLC and “E08-13” terminal on ABS / ESP® control module connector <p><i>Is each resistance 0 – 1 Ω?</i></p>	Go to Step 10.	Substitute a known-good BCM.
10	Internal circuit check in ABS control module <ol style="list-style-type: none"> 1) Make sure that ignition switch is OFF position and battery negative (–) cable is disconnected. 2) Connect ABS / ESP® control module connector and disconnect ECM connector. 3) Measure resistance between the followings <ul style="list-style-type: none"> • Between CAN High terminal on DLC and “E01-4” terminal on ECM connector • Between CAN Low terminal on DLC and “E01-19” terminal on ECM connector <p><i>If each resistance 0 – 1 Ω?</i></p>	Substitute a known-good ECM and recheck. If NG, go to Step 11.	Substitute a known-good ABS / ESP® control module.
11	Substitute BCM and recheck <ol style="list-style-type: none"> 1) Substitute a known-good BCM and recheck. <p><i>Is it in good condition?</i></p>	End.	Substitute a known-good ABS / ESP® control module.

1A-124 Engine General Information and Diagnosis:

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 / ESP® 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 in related manual". 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 / ESP® control module, yaw rate / G sensor, 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 StartControl Module Power and Ground Circuit Check in Section 10E in related manual". If OK, substitute a known-good keyless start control module.
14	CAN communication check of yaw rate / G sensor (ESP® model) 1) Turn ignition switch to OFF position. 2) Connect yaw rate / G sensor connector. 3) Perform "Communication Bus Check" under "Bus Check" using SUZUKI-SDT with ignition switch turned ON. <i>Are all of BCM, ECM, ABS / ESP® control module, combination meter, TCM, keyless start control module and yaw rate / G sensor normally displayed?</i>	Go to Step 15.	Check power and ground circuit of yaw rate / G sensor referring to "Step 3" to "Step 5" under "DTC C1034 / C1039: Yaw Rate / G Sensor Power Supply Failure / Internal Failure in Section 4F". If OK, substitute a known-good yaw rate / G sensor.
15	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 / ESP® control module, combination meter, TCM, keyless start control module, yaw rate / G sensor and 4WD control module normally displayed?</i>	Go to Step 16.	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.
16	CAN communication check of steering angle sensor (ESP® model) 1) Turn ignition switch to OFF position. 2) Connect steering angle sensor. 3) Perform "Communication Bus Check" under "Bus Check" using SUZUKI-SDT with ignition switch turned ON. <i>Are all of BCM, ECM, ABS / ESP® control module, combination meter, TCM, keyless start control module, yaw rate / G sensor, 4WD control module and steering angle sensor normally displayed?</i>	Recheck DTC.	Check power and ground circuit of steering angle sensor referring to "Step 4" and "Step 5" under "DTC C1037: Steering Angle Sensor Power Supply Failure in Section 4F". If OK, substitute a known-good Steering angle sensor.

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 in related manual".
- 2) Connect special tool between ECM and ECM connectors securely.

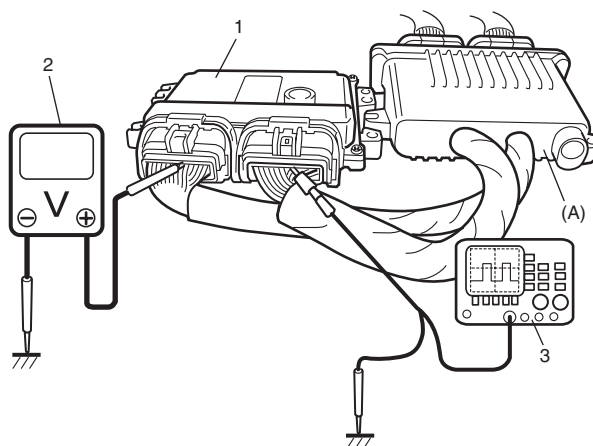
Special tool

(A): 09933-06320

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

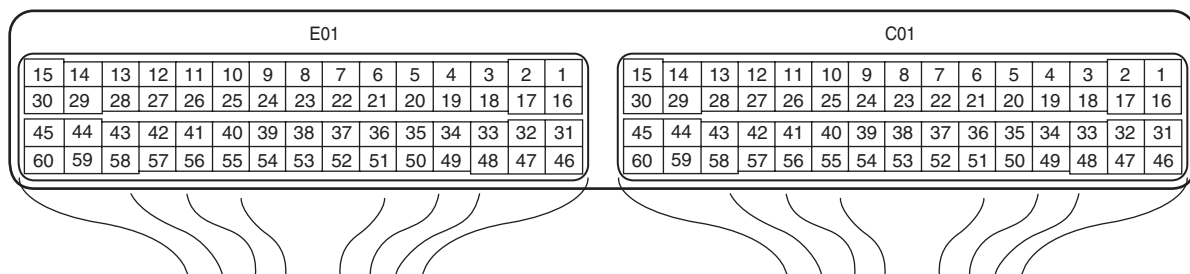
NOTE

- 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 performed this inspection, be sure to read the "Precautions of ECM Circuit Inspection".



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Viewed from harness side



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1A-126 Engine General Information and Diagnosis:

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.24: ”)	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	—	—	—	—	—
C01-4	—	—	—	—	—
C01-5	—	—	—	—	—
C01-6	—	—	—	—	—
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.28: ”)	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.	
C01-10	—	—	—	—	—
C01-11	BRN	Oxygen signal of HO2S	4 – 5 V	IG switch: ON	—
			*Approx. 0.7 V (“Reference waveform No.4: ” and “Reference waveform No.5: ”)	Engine: Idle speed after warming up	

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
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.6: ")	EVAP canister purge valve: 52% (using scan tool)	Output signal is active low duty pulse. Duty ratio varies depending on vehicle condition.
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.7: ")	Engine: Idle speed after warming up	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
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.8: ")	Engine: Idle speed after warming up	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C01-18	GRN	Ignition coil No.4	0 – 0.6 V	IG switch: ON	—
			*0 – 0.6 V ↑↓ 4 – 6 V ("Reference waveform No.9: " and "Reference waveform No.10: ")	Engine: Idle speed after warming up	Output signal is active high pulse. Pulse frequency varies depending on engine speed.

1A-128 Engine General Information and Diagnosis:

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C01-19	GRN/ BLK	Ignition coil No.3	0 – 0.6 V	IG switch: ON	—
			*0 – 0.6 V ↑↓ 4 – 6 V ("Reference waveform No.9: " and "Reference waveform No.11: ")	Engine: Idle speed after warming up	Output signal is active high pulse. Pulse frequency varies depending on engine speed.
C01-20	GRN/ WHT	Ignition coil No.2	0 – 0.6 V	IG switch: ON	—
			*0 – 0.6 V ↑↓ 4 – 6 V ("Reference waveform No.9: " and "Reference waveform No.12: ")	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.1	0 – 0.6 V	IG switch: ON	—
			*0 – 0.6 V ↑↓ 4 – 6 V ("Reference waveform No.9: " and "Reference waveform No.13: ")	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	—
			8 – 14 V	IG switch: ST (engine cranking)	
C01-23	—	—	—	—	—
C01-24	LT GRN	ECT sensor signal	3.3 – 3.8 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	—
			1.0 – 1.5 V ("Reference waveform No.14: ")	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 – 1 V↑↓4 – 6 V ("Reference waveform No.29: ")	Engine: Stop IG switch: ON Engine: Idle speed after warming up	—
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	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C01-32	RED	Heater output of A/F sensor	10 – 14 V	IG switch: ON	—
			*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.15: ")	Engine: Idle speed after warming up	Output signal is active low duty pulse. Duty ratio varies depending on engine condition.
C01-33	BLK	Shield ground for TP sensor circuit	Below 0.3 V	IG switch: ON	—
C01-34	—	—	—	—	—
C01-35	—	—	—	—	—
C01-36	BLU	CKP sensor (–)	0 – 1 V	IG switch: ON	—
			*4 – 6 V ↑↓ –4 – –6 V ("Reference waveform No.17: " and "Reference waveform No.18: ")	Engine: Idle speed after warming up	Output signal is sinusoidal waveform. Waveform frequency varies depending on engine speed. (30 (36 – 6) pulses are generated per 1 crankshaft revolution.)
C01-37	BLK	A/F sensor signal (–)	2.35 – 2.55 V ("Reference waveform No.15: ")	Engine: Idle speed after warming up	—
C01-38	WHT	A/F sensor signal (+)	2.7 – 2.9 V ("Reference waveform No.15: ")	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	1.33 – 1.63 V	IG switch: ON Engine: After warmed up Accelerator pedal: Released	—
			3.88 – 4.46 V	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	YEL	IMT valve actuator (+)	2 – 4 V	Engine: Stop IG switch: ON	Output signal is duty pulse. Duty ratio varies depending on IMT valve operation.
			0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.16: ")	Engine: Idle speed after warming up	
C01-43	YEL/BLK	IMT valve actuator (–)	2 – 4 V	Engine: Stop IG switch: ON	Output signal is duty pulse. Duty ratio varies depending on IMT valve operation.
			0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.16: ")	Engine: Idle speed after warming up	

1A-130 Engine General Information and Diagnosis:

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
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.19: " and "Reference waveform No.20: ")	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.19: " and "Reference waveform No.20: ")	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	Output signal is active low duty pulse. Duty ratio varies depending on engine condition.
			*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No.4: " and "Reference waveform No.5: ")	Engine: Idle speed after warming up	
C01-48	BLK/ ORN	Ground for ECM	Below 0.3 V	IG switch: ON	—
C01-49	WHT	CAN (low) communication line (active low signal) to TCM	1.5 – 2.5 V ("Reference waveform No.25: ")	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.25: ")	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 (+)	0 – 1 V	IG switch: ON	Output signal is sinusoidal waveform. Waveform frequency varies depending on engine speed. (30 (36 – 6) pulses are generated per 1 crankshaft revolution.)
			*4 – 6 V ↑↓ –4 – –6 V ("Reference waveform No.17: " and "Reference waveform No.18: ")	Engine: Idle speed after warming up	

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
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.17: " and "Reference waveform No.18: ")	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	0.45 – 0.75 V	IG switch: ON Engine: After warmed up Accelerator pedal: Released	—
			3.67 – 4.25 V	IG switch: ON Engine: After warmed up Accelerator pedal: Depressed fully	
C01-55	—	—	—	—	—
C01-56	RED	Knock sensor signal	2 – 3 V ("Reference waveform No.21: " and "Reference waveform No.22: ")	Engine: Running at 4000 r/min. after warmed up	—
C01-57	GRY/ BLU	Ground for sensors	Below 0.3 V	IG switch: ON	—
C01-58	BLK/ ORN	Ground for ECM	Below 0.3 V	IG switch: ON	—
C01-59	—	—	—	—	—
C01-60	—	—	—	—	—

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 / ESP® 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	PNK/ BLU	Diagnosis switch terminal	10 – 14 V	IG switch: ON	—
E01-13	YEL/ RED	Clock signal for immobilizer coil antenna	10 – 14 V	IG switch: ON	—

1A-132 Engine General Information and Diagnosis:

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
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 / ESP® control module	*0.5 – 2.5 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.
E01-20	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 < 3rd position (Manual A/C model)	—
				IG switch: ON Blower selector < 2nd position (Auto A/C model)	
			0 – 1 V	IG switch: ON Blower selector > 2nd position	—
E01-36	ORN	Ground for sensors	Below 0.3 V	IG switch: ON	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
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 – 1 V ↑↓ 8 – 14 V ("Reference waveform No.26: " and "Reference waveform No.27: ")	While engine running.	Output signal is pulse. Pulse frequency varies depending on engine speed. (2 pulses are generated per 1 crankshaft revolution.) (3000 r/min. = 100 Hz)
E01-45	—	—	—	—	—
E01-46	LT GRN	Radiator cooling fan relay No.1 output	10 – 14 V	IG switch: ON ECT < 97 °C (206 °F) A/C refrigerant pressure < 1500 kPa (215 psi) A/C switch: ON Engine: Running	—
			0 – 2 V	IG switch: ON ECT > 97 °C (206 °F) A/C refrigerant pressure > 1500 kPa (215 psi) A/C switch: ON Engine: Running	
E01-47	GRN	Radiator cooling fan relay No.2 and No.3 output	10 – 14 V	IG switch: ON ECT < 102 °C (216 °F) A/C refrigerant pressure < 1800 kPa (258 psi) A/C switch: ON Engine: Running	—
			0 – 2 V	IG switch: ON ECT > 102 °C (216 °F) A/C refrigerant pressure > 1800 kPa (258 psi) A/C switch: ON Engine: Running	
E01-48	RED/ BLK	A/C condenser cooling fan relay	0 – 1 V	Blower selector > OFF A/C switch: ON Defroster switch: ON Engine: Running ECT > 110 °C (230 °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	

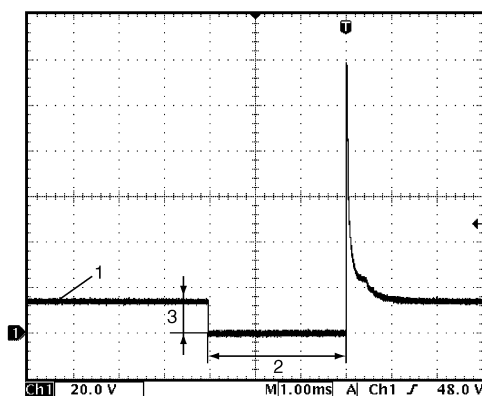
1A-134 Engine General Information and Diagnosis:

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
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	0.30 – 0.44 V	IG switch: ON Engine: After warmed up Accelerator pedal: Released	—
			1.74 – 2.17 V	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	0.65 – 0.82 V	IG switch: ON Engine: After warmed up Accelerator pedal: Released	—
			3.50 – 4.27 V	IG switch: ON Engine: After warmed up Accelerator pedal: Depressed fully	
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: "C01-1" (No.1), "C01-2" (No.2), "C01-16" (No.3) or "C01-17" (No.4) to "C01-58"
Oscilloscope setting	CH1: 20 V/DIV TIME: 1 ms/DIV
Measurement condition	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed



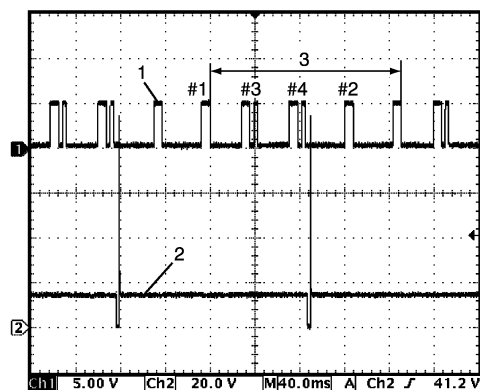
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- | |
|--|
| 2. Fuel injection pulse width: 2-4 msec. |
| 3. 10 – 14 V |

Reference waveform No.2

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

Measurement terminal	CH1: "C01-52" 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	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed



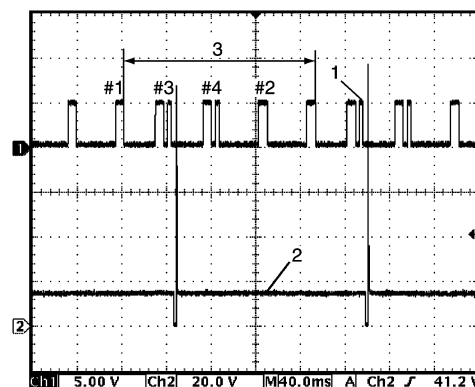
I5JB0A110075-01

- | |
|---|
| 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: "C01-52" 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	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed



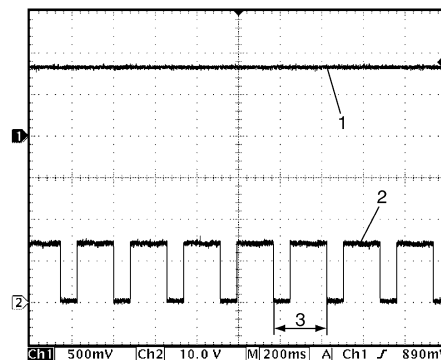
I5JB0A110076-01

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

Reference waveform No.4

HO2S signal (1) 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: 200 ms/DIV
Measurement condition	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed



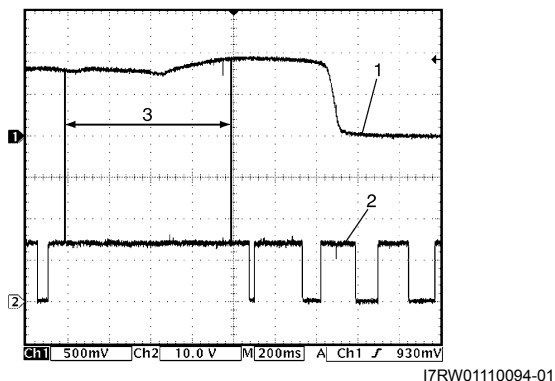
I7RW01110093-01

- | | |
|-----------------------|-------------------|
| 2. HO2S heater signal | 3. One duty cycle |
|-----------------------|-------------------|

Reference waveform No.5

HO2S signal (1) with engine racing

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: 200 ms/DIV
Measurement condition	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine racing

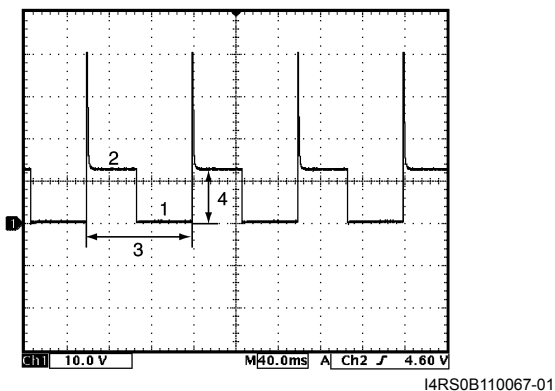


2. HO2S heater signal 3. Engine racing

Reference waveform No.6

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	<ul style="list-style-type: none"> After warmed up to normal operating temperature Set EVAP canister purge valve at 52% by using "Active Test" of scan tool

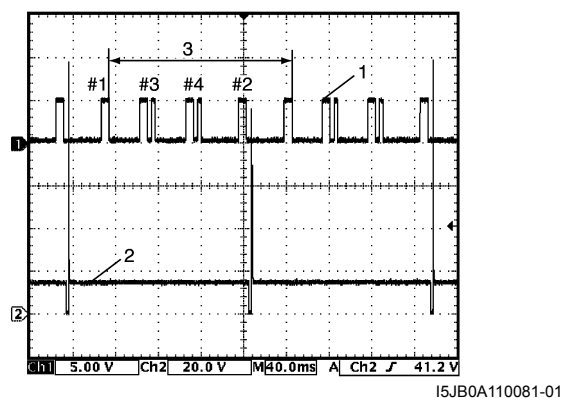


1. ON signal 3. One duty cycle
2. OFF signal 4. 10 – 14 V

Reference waveform No.7

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	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed

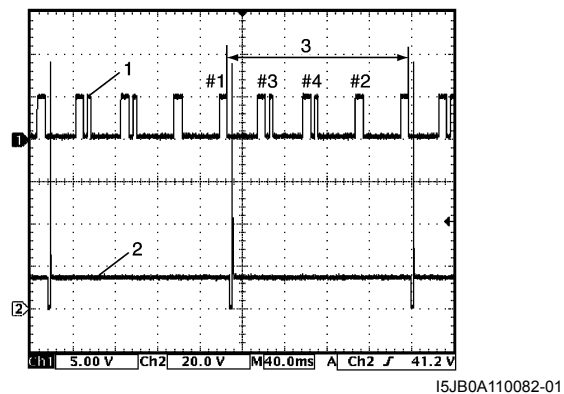


1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.8

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	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed

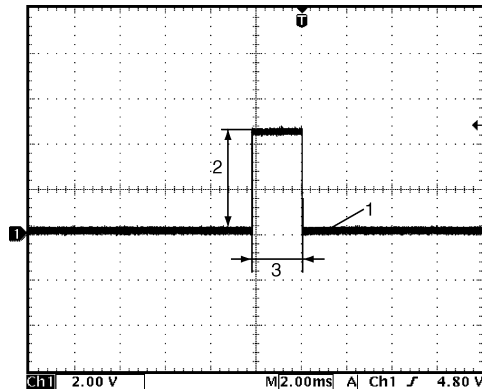


1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.9

Ignition coil signal (1) with engine idling

Measurement terminal	CH1: "C01-18", "C01-19", "C01-20" or "C01-21" to "C01-58"
Oscilloscope setting	CH1: 2 V/DIV TIME: 2 ms/DIV
Measurement condition	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed



I7RW01110017-01

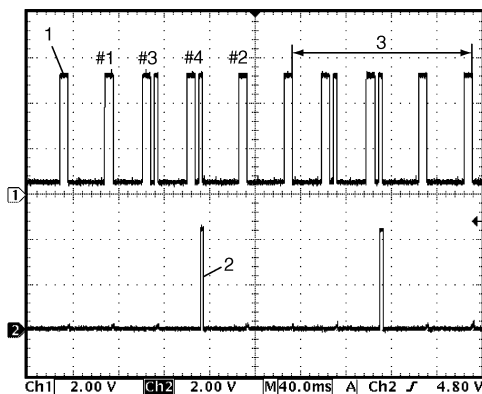
2. 4 – 6 V

3. Ignition coil pulse width

Reference waveform No.10

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

Measurement terminal	CH1: "C01-52" to "C01-58" CH2: "C01-18" to "C01-58"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 40 ms/DIV
Measurement condition	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed



I5JB0A110084-01

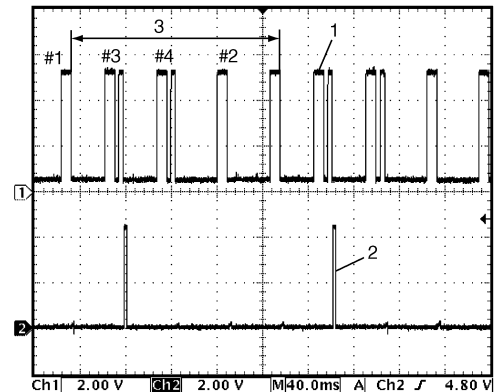
1. Cylinder reference signal (CMP reference signal)

3. 720° crank angle

Reference waveform No.11

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

Measurement terminal	CH1: "C01-52" to "C01-58" CH2: "C01-19" to "C01-58"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 40 ms/DIV
Measurement condition	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed



I5JB0A110085-01

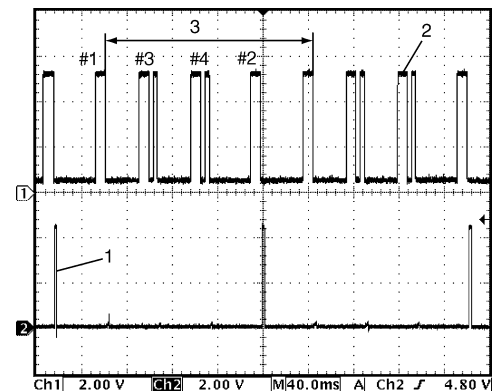
1. Cylinder reference signal (CMP reference signal)

3. 720° crank angle

Reference waveform No.12

Ignition coil No.2 signal (1) 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	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed



I7RW01110018-01

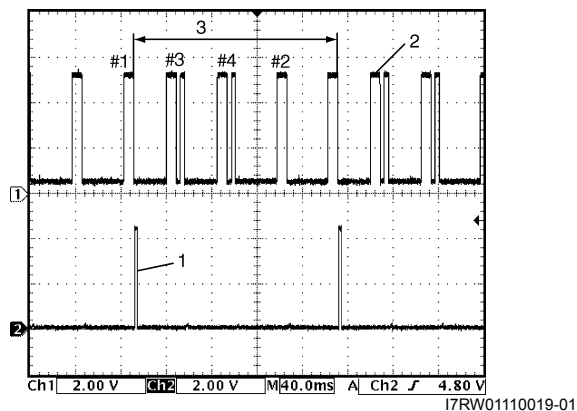
2. Cylinder reference signal (CMP reference signal)

3. 720° crank angle

Reference waveform No.13

Ignition coil No.1 signal (1) 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	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed

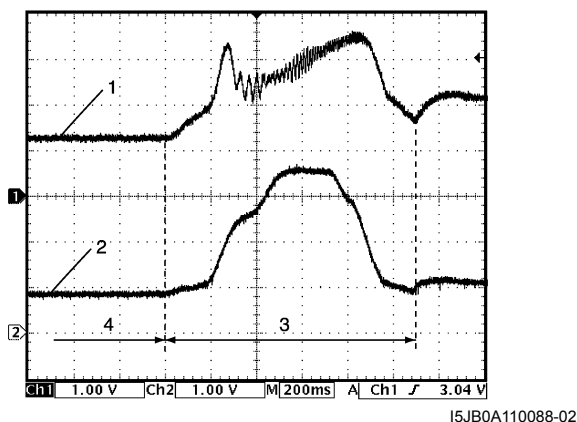


- | |
|---|
| 2. Cylinder reference signal (CMP reference signal) |
| 3. 720° crank angle |

Reference waveform No.14

MAF sensor signal (1) with engine racing

Measurement terminal	CH1: "C01-26" to "C01-27" CH2: "C01-54" to "C01-41"
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 200 ms/DIV
Measurement condition	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine racing

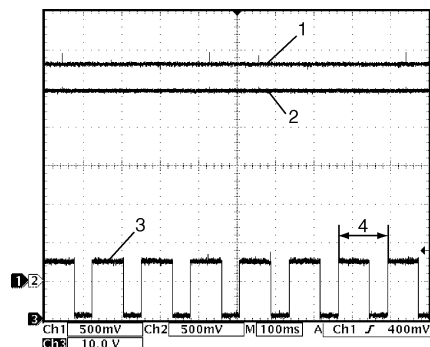


- | | |
|----------------------------|---------|
| 2. TP sensor (main) signal | 4. Idle |
| 3. Racing | |

Reference waveform No.15

A/F sensor signal with engine idling

Measurement terminal	CH1: "C01-38" to "C01-58" CH2: "C01-37" to "C01-58" CH3: "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	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed

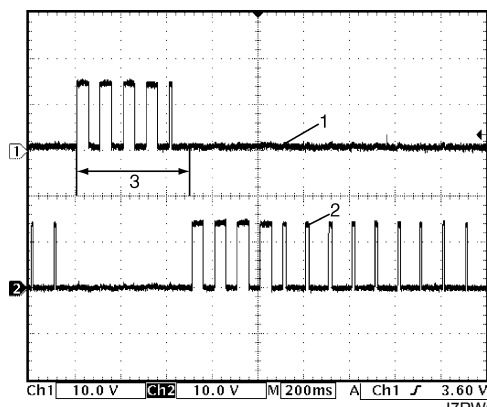


- | | |
|--------------------------|-----------------------------|
| 1. A/F sensor signal (+) | 3. A/F sensor heater signal |
| 2. A/F sensor signal (-) | 4. One duty cycle |

Reference waveform No.16

IMT valve actuator signal with engine racing

Measurement terminal	CH1: "C01-42" to "C01-58" CH2: "C01-43" to "C01-58"
Oscilloscope setting	CH1: 10 V/DIV, CH2: 10 V/DIV TIME: 200 ms/DIV
Measurement condition	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine racing

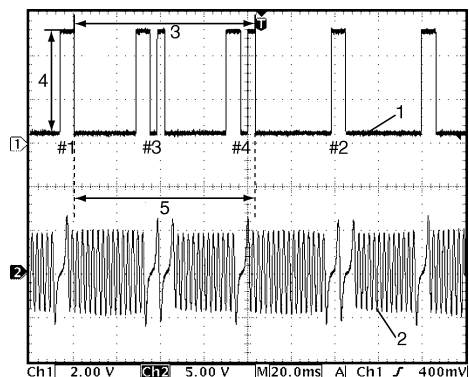


- | | |
|----------------------------------|-------------------|
| 1. IMT valve actuator signal (+) | 3. IMT valve open |
| 2. IMT valve actuator signal (-) | |

Reference waveform No.17

CMP sensor signal with engine idling

Measurement terminal	CH1: "C01-52" to "C01-58" CH2: "C01-51" to "C01-36"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 5 V/DIV TIME: 20 ms/DIV
Measurement condition	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed



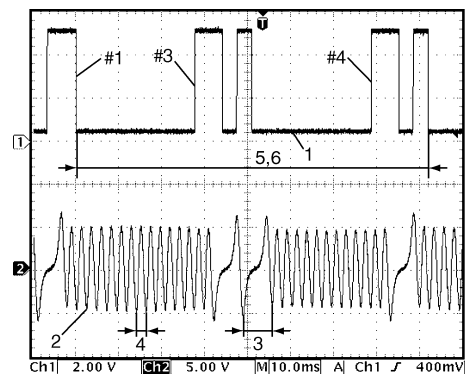
I7RW01110023-01

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.18

CMP sensor signal with engine idling

Measurement terminal	CH1: "C01-52" to "C01-58" CH2: "C01-51" to "C01-36"
Oscilloscope setting	CH1: 2 V/DIV, CH2: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed



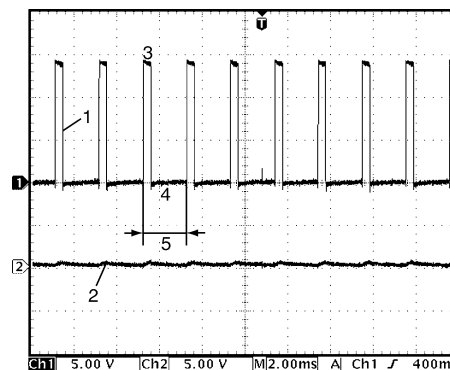
I7RW01110024-01

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.19

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	<ul style="list-style-type: none"> After warmed up to normal operating temperature Ignition switch turned ON and accelerator pedal at idle position



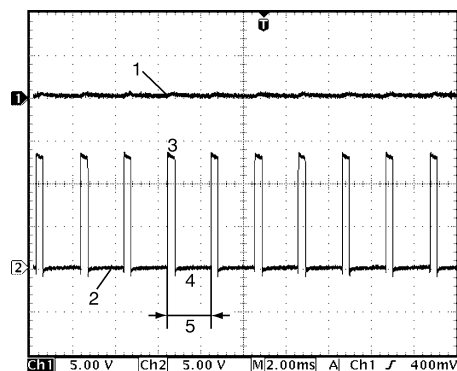
I7RW01110025-01

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.20

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	<ul style="list-style-type: none"> After warmed up to normal operating temperature Ignition switch turned ON and accelerator pedal at full depressed position



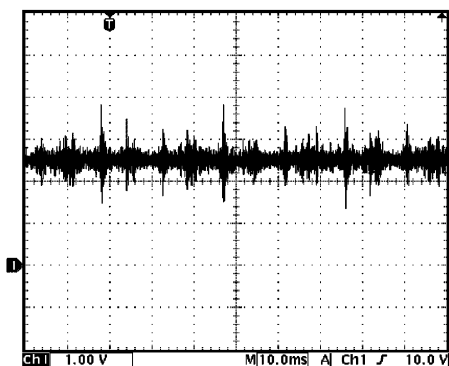
I7RW01110027-01

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.21

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	<ul style="list-style-type: none"> After warmed up to normal operating temperature Run engine at 4000 r/min.

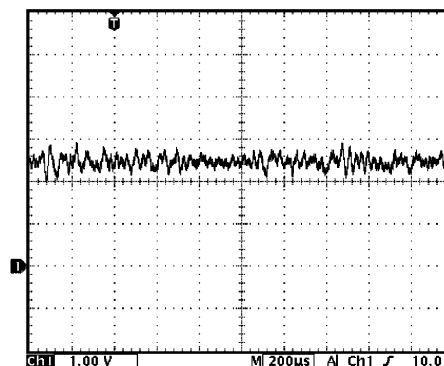


I4RS0B110072-01

Reference waveform No.22

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	<ul style="list-style-type: none"> After warmed up to normal operating temperature Run engine at 4000 r/min.

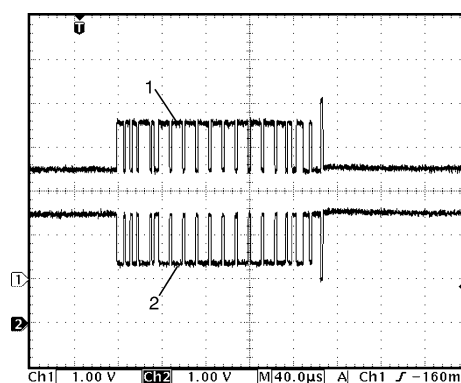


I4RS0B110073-01

Reference waveform No.23

CAN communication line signal from ABS / ESP® control module with ignition switch turned ON

Measurement terminal	CH1: "E01-4" to "C01-58" CH2: "E01-19" 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 communication data)



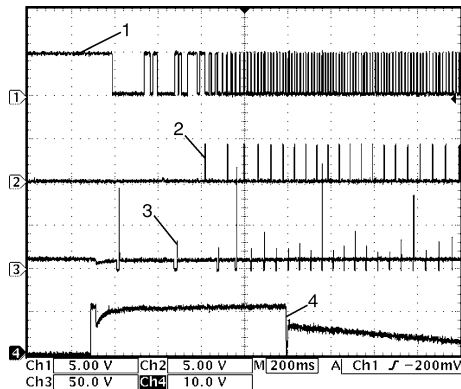
I7RW01110028-01

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

Reference waveform No.24

Ignition coil signal and fuel injector signal with engine cranking

Measurement terminal	CH1: "C01-52" to "C01-58" CH2: "C01-21" to "C01-58" CH3: "C01-1" to "C01-58" CH4: "C01-22" 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	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at cranking



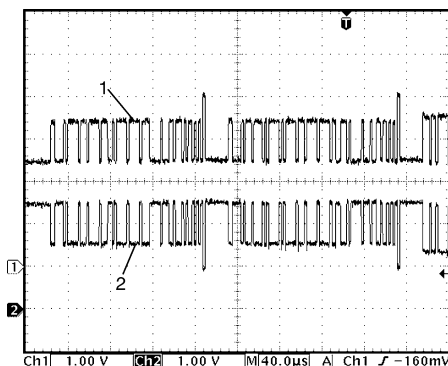
I7RW01110029-01

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

Reference waveform No.25

CAN communication line signal from TCM with ignition switch turned ON

Measurement terminal	CH1: "C01-50" 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 communication data)



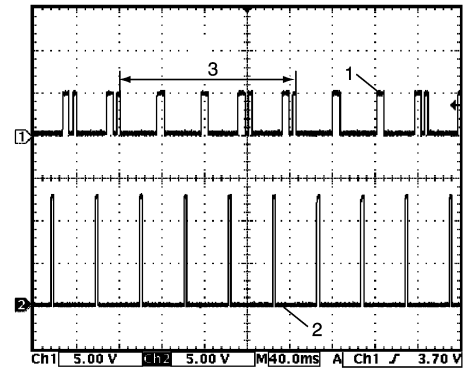
I7RW01110030-01

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

Reference waveform No.26

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	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed



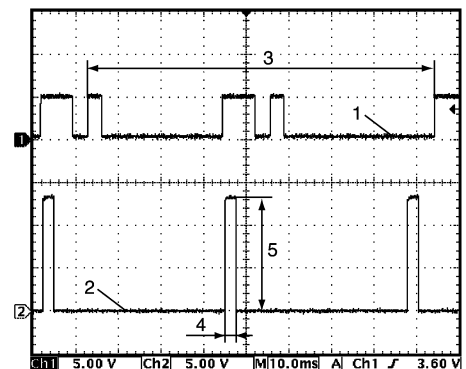
I7RW01110089-01

- | |
|---|
| 1. Cylinder reference signal (CMP reference signal) |
| 2. Ignition pulse (engine revolution) signal |
| 3. 720° crank angle |

Reference waveform No.27

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	<ul style="list-style-type: none"> After warmed up to normal operating temperature Engine at specified idle speed



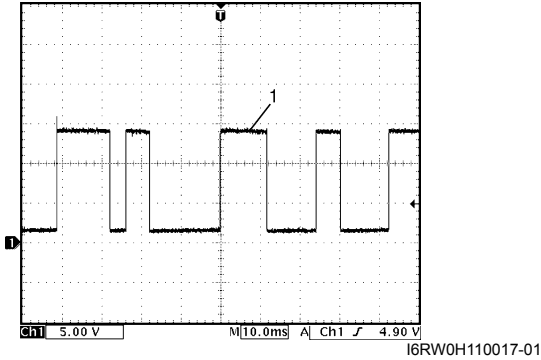
I7RW01110090-01

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

Reference waveform No.28

Generator field coil monitor signal (1) at engine idling

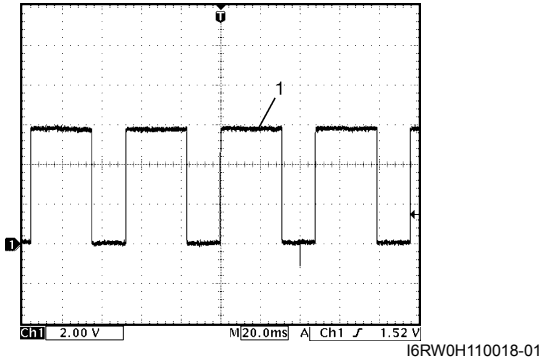
Measurement terminal	CH1: "C01-8" to "C01-58"
Oscilloscope setting	CH1: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	<ul style="list-style-type: none">• After warmed up to normal operating temperature• Headlight switch turned ON (clearance light)



Reference waveform No.29

Generator output control signal (1) at engine idling

Measurement terminal	CH1: "C01-28" to "C01-58"
Oscilloscope setting	CH1: 2 V/DIV TIME: 20 ms/DIV
Measurement condition	<ul style="list-style-type: none">• After warmed up to normal operating temperature• Headlight switch turned ON



Resistance Check

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

⚠ 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.

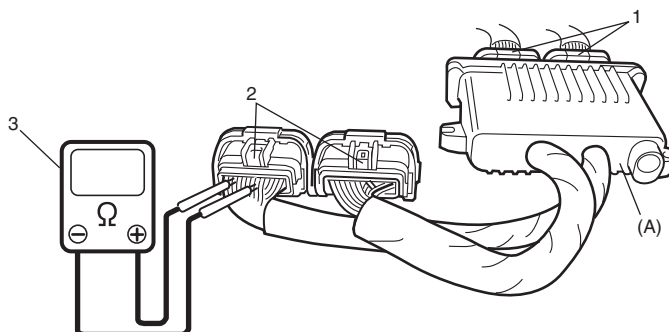
Special tool

(A): 09933-06320

- 3) Check resistance between each pair of terminals of special tool connectors (2) 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).**



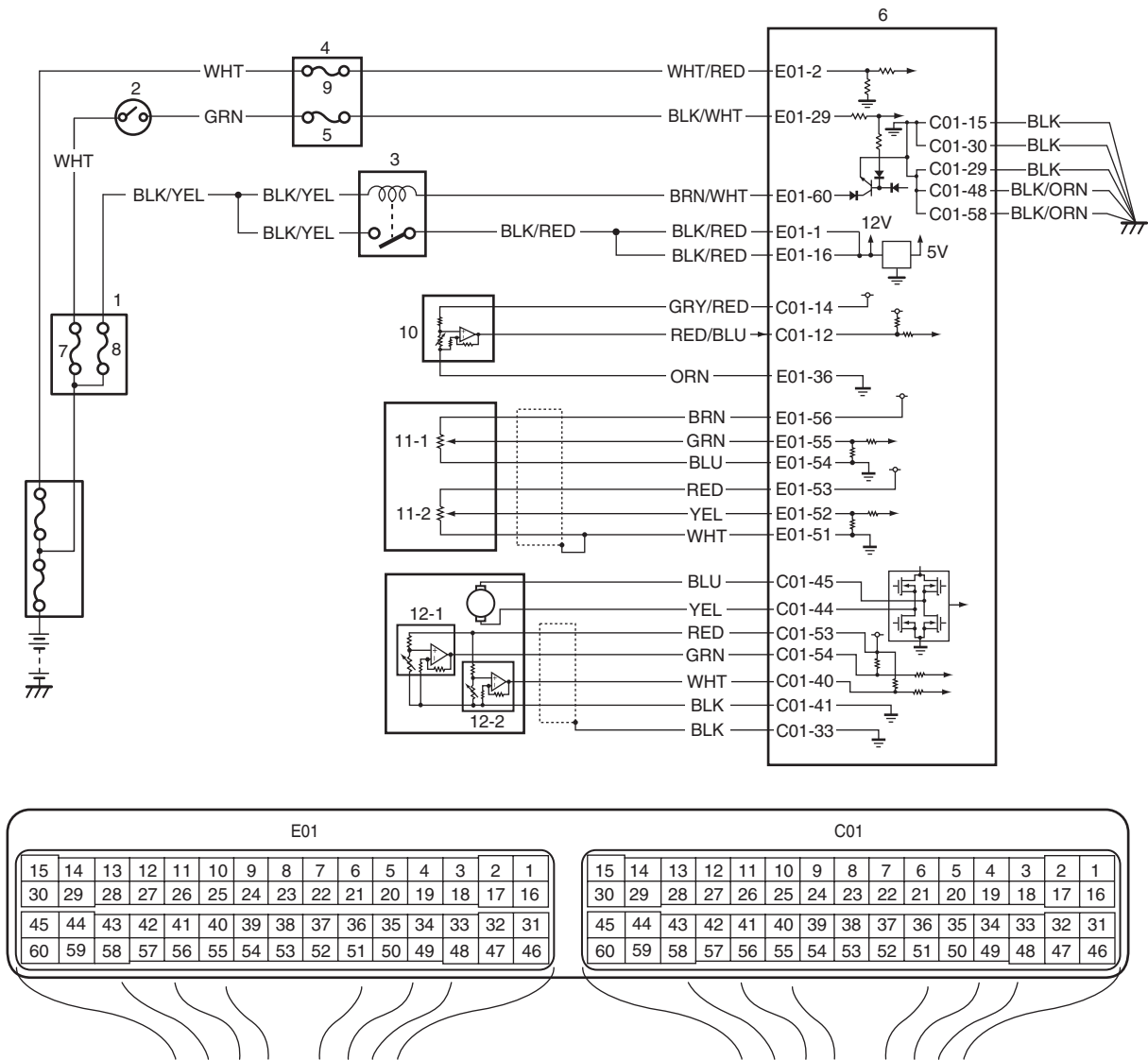
I7RW01110032-02

Terminals	Circuit	Standard resistance	Condition
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		
C01-13 to E01-1/16	EVAP canister purge valve	22 – 26 Ω	—
C01-2 to E01-1/16	No.2 fuel injector	10.8 – 18.2 Ω	—
C01-1 to E01-1/16	No.1 fuel injector	10.8 – 18.2 Ω	—
E01-50 to E01-1/16	Throttle actuator control relay	160 – 240 Ω	—

ECM Power and Ground Circuit Check

S6RW0H1104064

Wiring Diagram



I6RW0C110019-01

1. Fuse box No.2	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)	
4. Junction block	8. "FI" fuse	11-2. APP sensor (sub)	

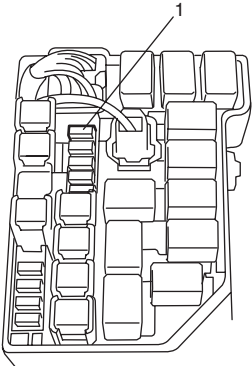
Circuit Description

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, 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.

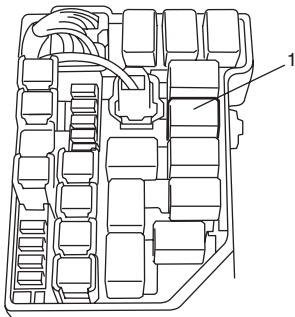
Troubleshooting**NOTE**

- 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.  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.

I7RW01110034-01

1A-146 Engine General Information and Diagnosis:

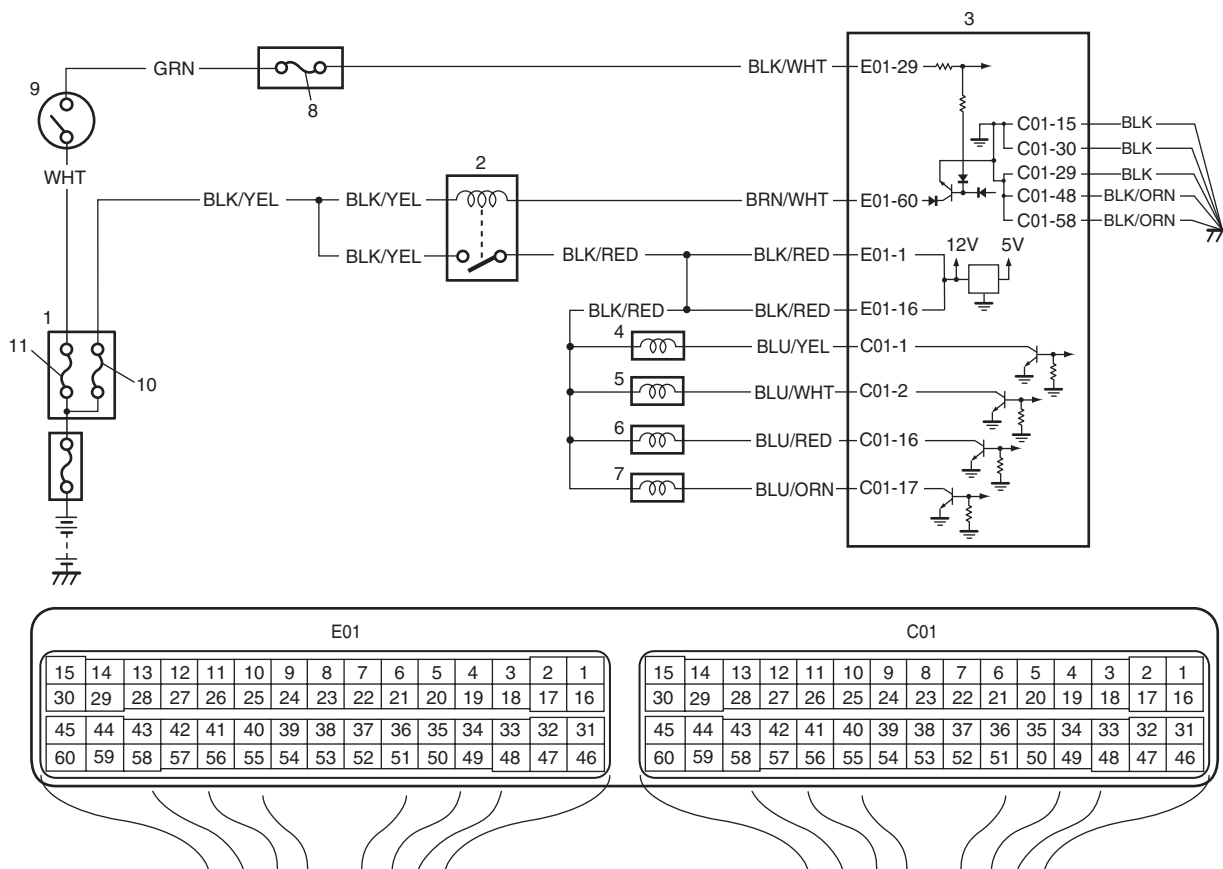
Step	Action	Yes	No
5	Main relay circuit check 1) Connect connectors to ECM with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Measure voltage between "E01-60" terminal of ECM connector and body ground. <i>Is voltage 0 – 1 V?</i>	Go to Step 7.	Go to Step 6.
6	ECM ground circuit 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 fuse box No.2.  <small>I7RW01110035-01</small> 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.

Step	Action	Yes	No
10	Main relay check 1) Check main relay referring to “Engine and Emission Control System Relay Inspection in Section 1C in related manual”. <i>Is main relay in good condition?</i>	“BRN/WHT” wire is open or high resistance circuit.	Replace main relay.
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, 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

S6RW0H1104065

Wiring Diagram



I7RW01110036-01

1. Fuse box No.2	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".

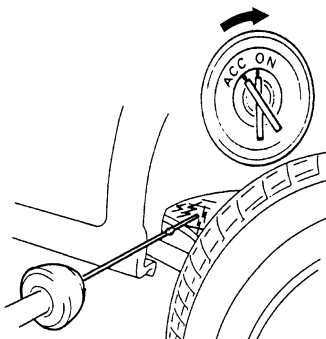
Step	Action	Yes	No
1	Fuel injector check for operating sound 1) Using sound scope, check each injector for operating sound at engine cranking. <i>Do all 4 injector make operating sound?</i>	Fuel injectors circuit is in good condition.	Go to Step 2.
2	Fuel injector resistance check 1) Disconnect connectors 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.

Step	Action	Yes	No
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.

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>  <small>I2RH01110132-01</small>	Fuel pump circuit is in good condition.	Go to Step 2.
2	Fuel pump relay power supply check 1) Disconnect fuel pump relay from fuse box No.2 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 in related manual”. <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-152 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 Section1G 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

S6RW0H1104067

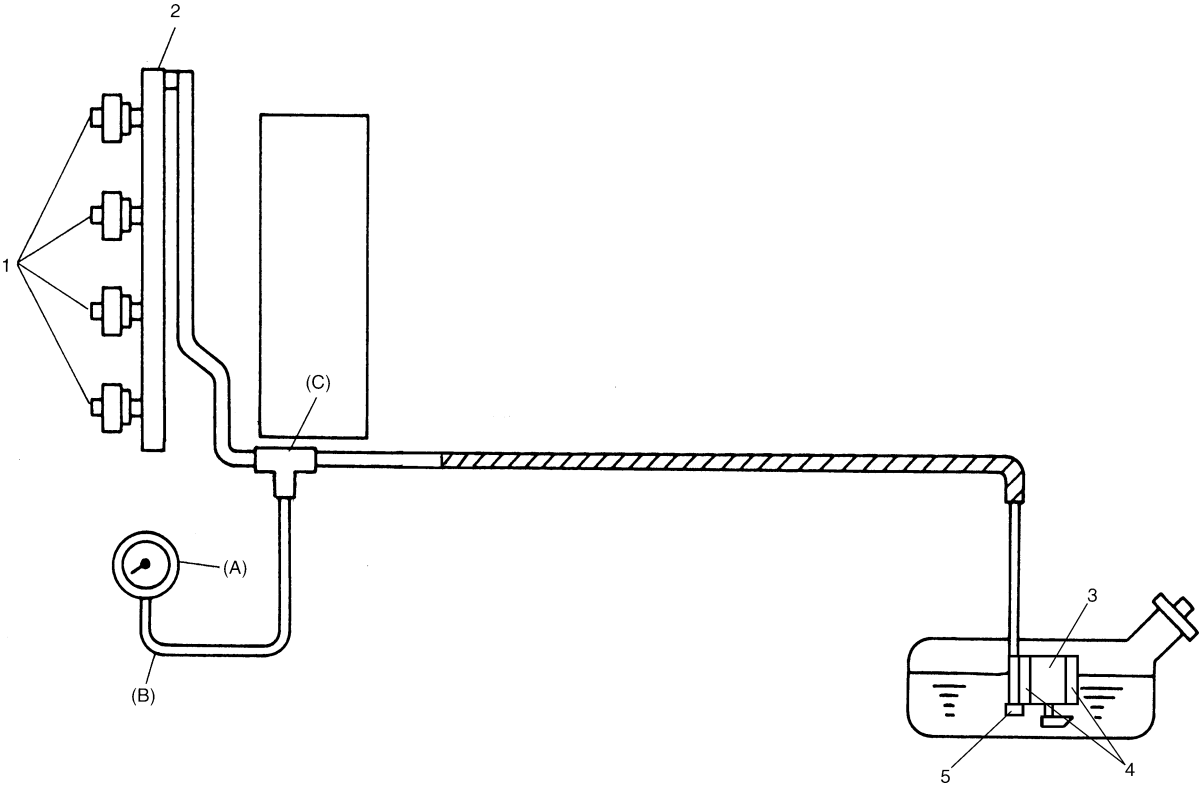
System Diagram

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
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Troubleshooting

NOTE

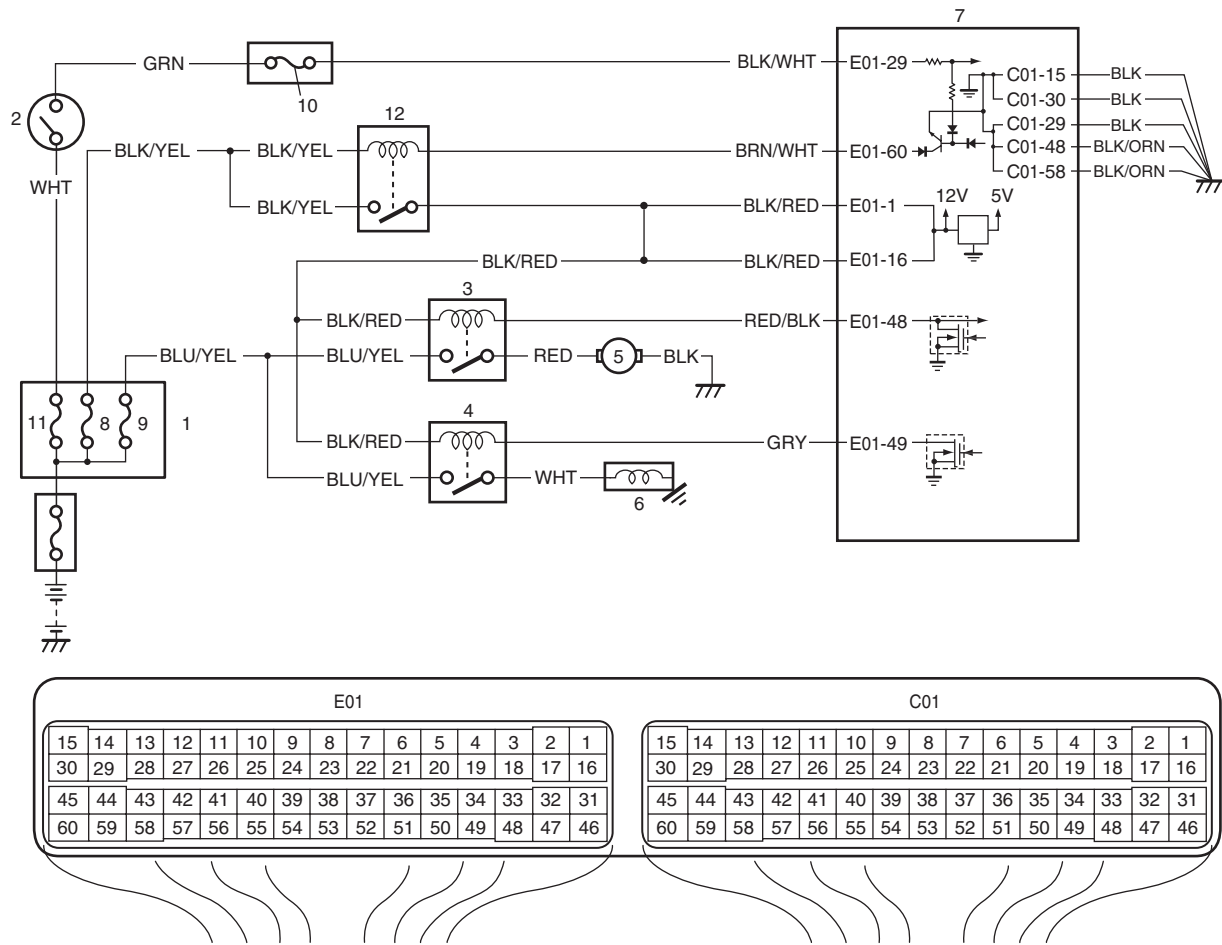
Before using the following flow chart, chart check to make sure that battery voltage is higher than 11 V. If battery voltage is low, pressure becomes lower than specification even if fuel pump and line are in good condition.

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.
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

S6RW0H1104068

Wiring Diagram



I6RW0C110020-01

1. Fuse box No.2	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: Fan 2 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.

1A-156 Engine General Information and Diagnosis:

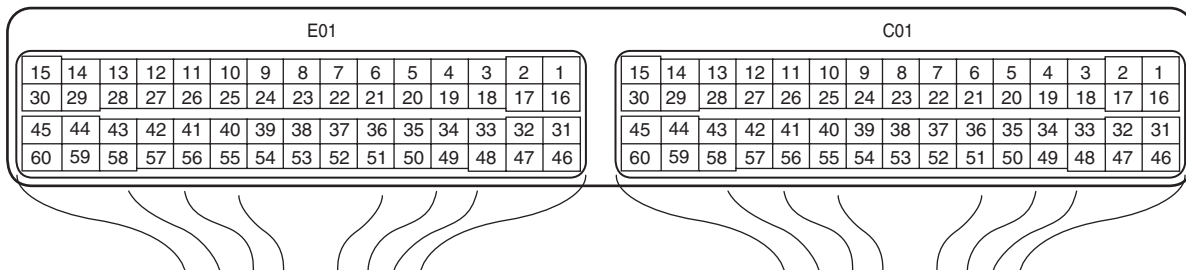
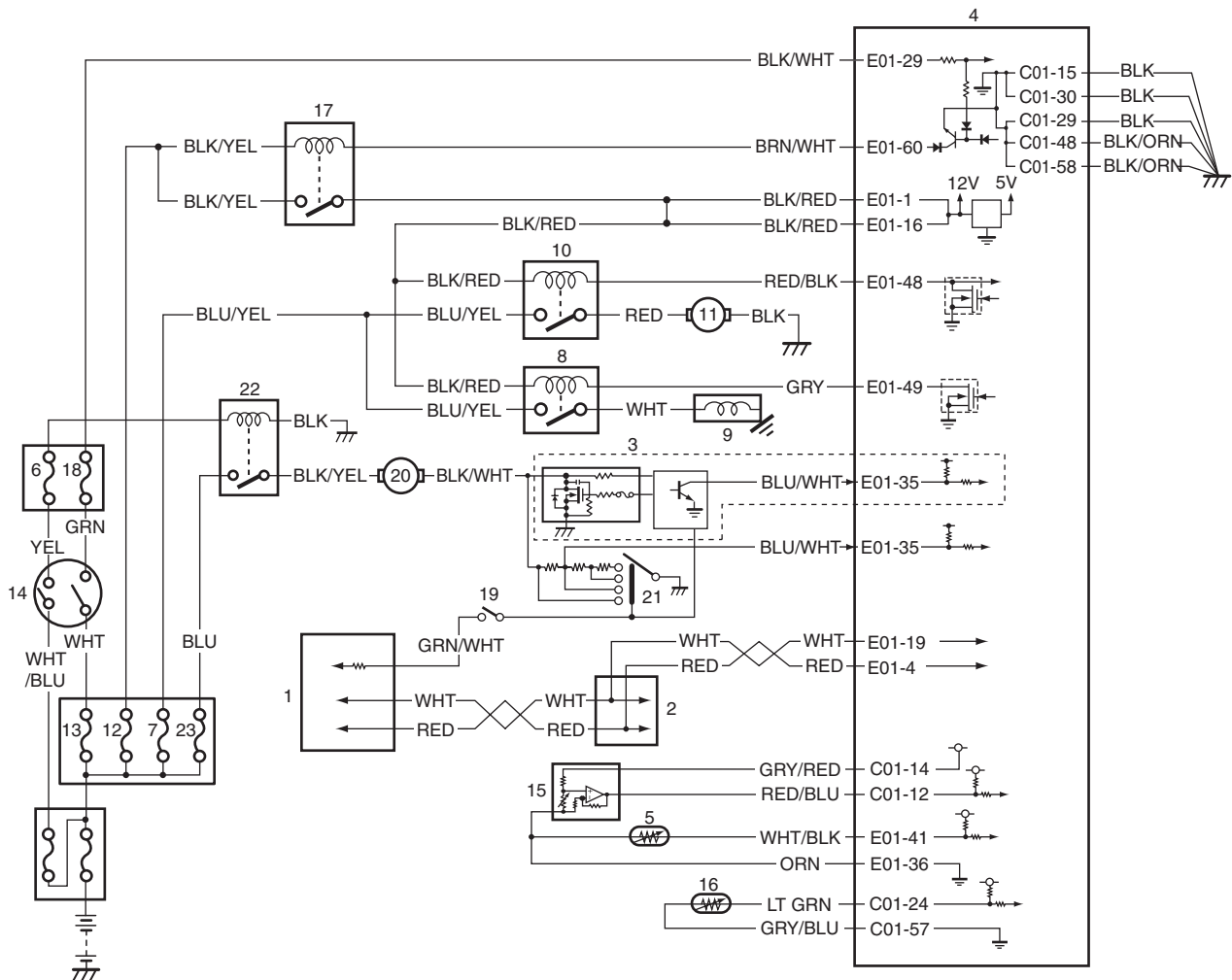
Step	Action	Yes	No
4	Check wire circuit 1) Disconnect A/C condenser cooling fan relay from fuse box No.2 with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLU/YEL" wire terminal of A/C condenser cooling fan relay connector. <i>Is voltage 10 – 14V?</i>	Go to Step 7.	Go to Step 5.
5	Check wire circuit 1) Disconnect A/C compressor relay from fuse box No.2 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.
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.

Step	Action	Yes	No
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

S6RW0H1104069

Wiring Diagram



I6RW0C110021-01

1. BCM	9. A/C compressor	17. Main relay
2. ABS / ESP® control module	10. A/C condenser cooling fan 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

1A-158 Engine General Information and Diagnosis:

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.

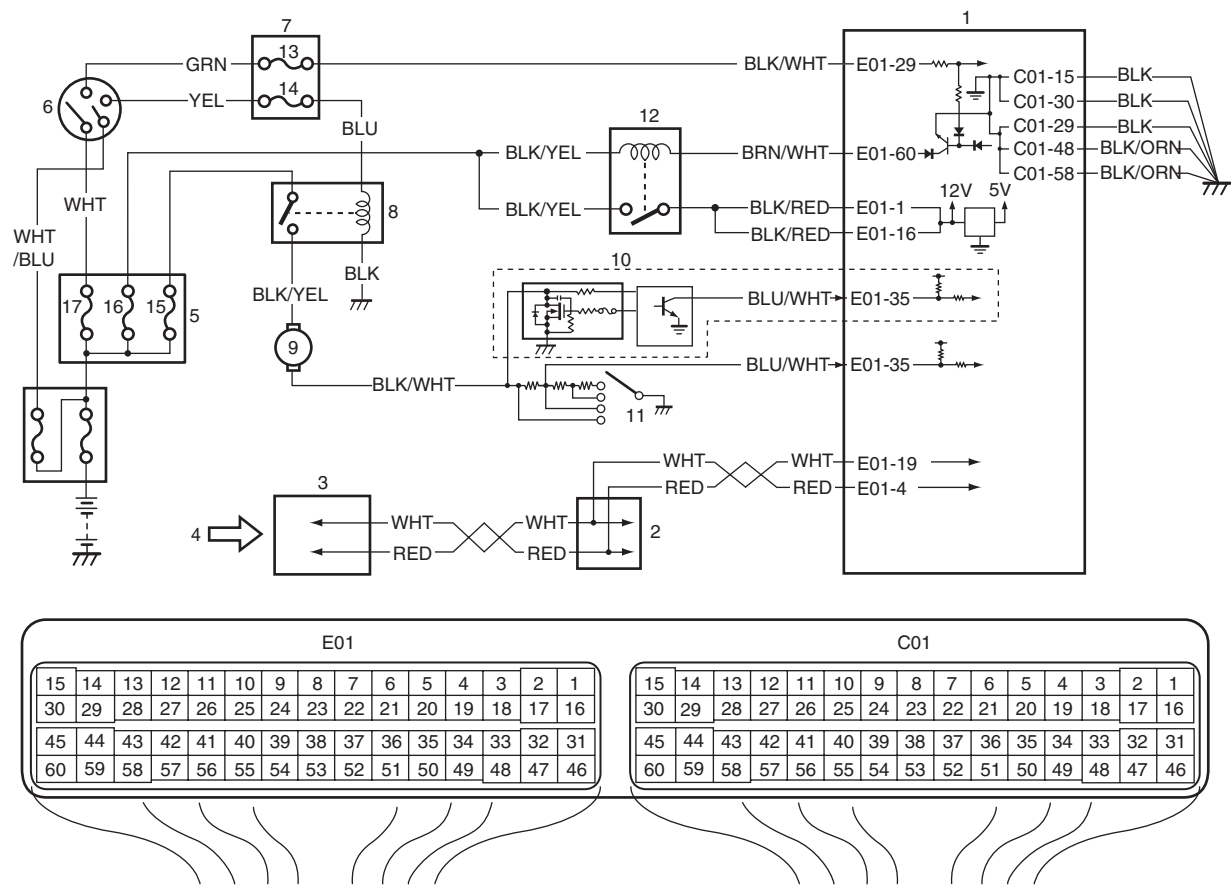
Step	Action	Yes	No
1	Reception data check from BCM 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check DTC for CAN-DTC. <i>Is there any CAN-DTC?</i>	Go to "Troubleshooting for CAN-DTC".	Go to Step 2.
2	DTC check of HVAC control module 1) Check HVAC control 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: Fan 2 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.

Step	Action	Yes	No
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.
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

S6RW0H1104070

Wiring Diagram



I6RW0C110022-01

1. ECM	7. Junction block	13. "IG COIL" fuse
2. ABS / ESP® 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. Fuse box No.2	11. Blower speed selector (Manual A/C model)	17. "IGN" fuse
6. Ignition switch	12. Main relay	

Troubleshooting

NOTE

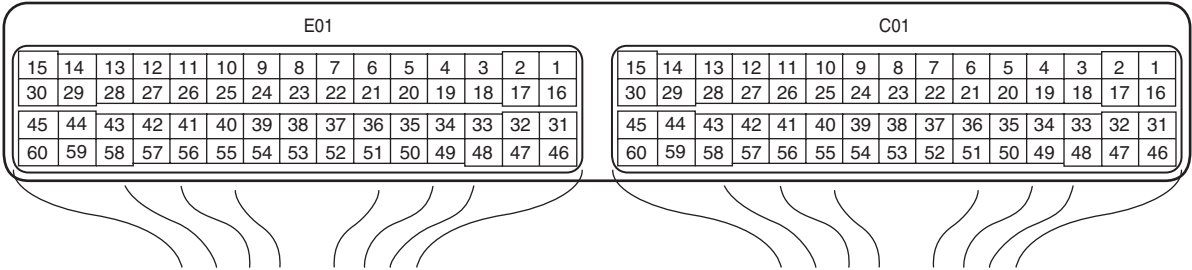
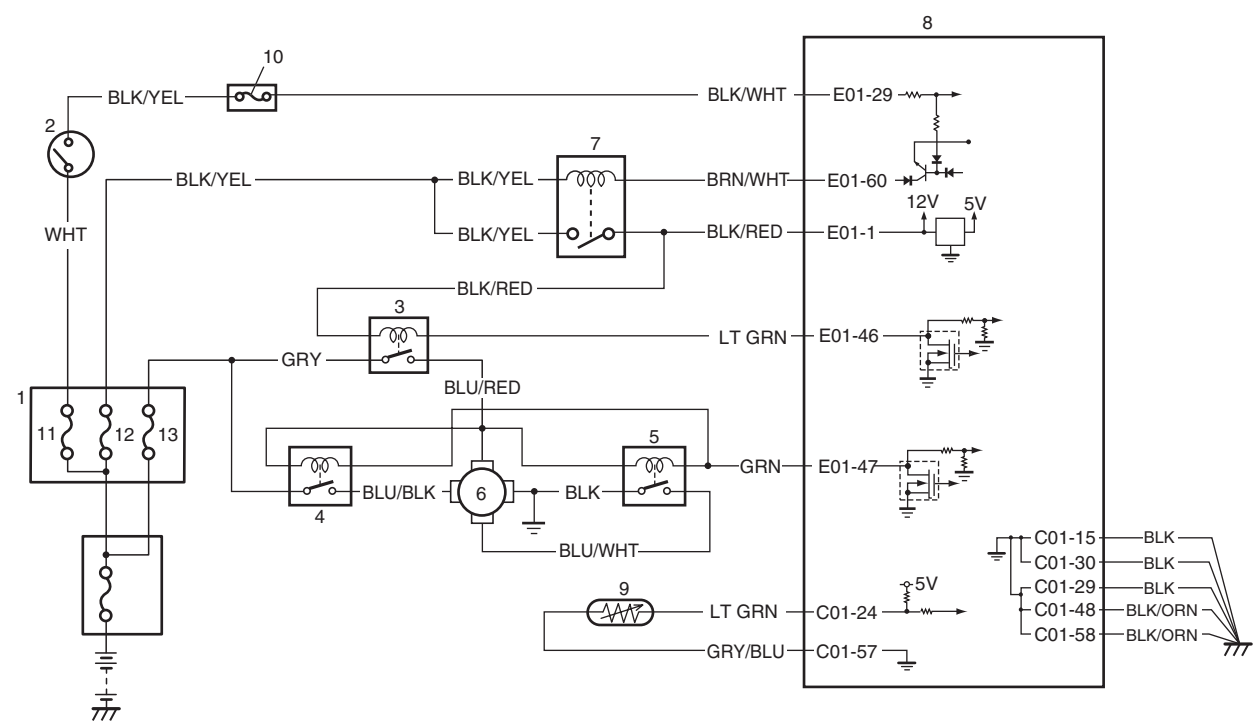
- Before performed troubleshooting, be sure to read the “Precautions of ECM Circuit Inspection”.
- When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits”.

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 97 °C (206 °F): OFF Engine coolant temperature is higher than 97 °C (206 °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.

Radiator Cooling Fan Low Speed Control System Check

S6RW0H1104071

Wiring Diagram



I7RW01110043-02

1. Fuse box No.2	5. Radiator cooling fan relay No. 3	9. ECT sensor	13. "RDTR" fuse
2. Ignition switch	6. Radiator cooling fan motor	10. "IG COIL" fuse	
3. Radiator cooling fan relay No. 1	7. Main relay	11. "IGN" fuse	
4. Radiator cooling fan relay No. 2	8. ECM	12. "FI" fuse	

Troubleshooting

▲ WARNING

Keep hands, tools, and clothing away from radiator cooling fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the ECT sensor with the ignition switch at the "ON" position.

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	Is there DTC(s) of ECT sensor circuit (DTC P0117 / P0118) and/or radiator cooling fan circuit (DTC P0480)?	Go to corresponding DTC flow.	Go to Step 2.
2	Low speed radiator cooling fan control circuit check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and select "Data List" mode on scan tool. 3) Warm up engine until coolant temp. is 97 °C, 206.6 °F or higher and A/C switch turns OFF. (If engine coolant temp. dose not rise, check engine cooling system or ECT sensor.) <i>Is radiator cooling fan started at low speed when engine coolant temp. reached above temp.?</i>	Radiator cooling fan low speed control system is in good condition.	Perform from Step 2 to Step 6 of "DTC P0480: Fan 1 Control Circuit". If OK, go to Step 3.
3	Radiator cooling fan control check 1) Disconnect radiator cooling fan relays No. 2 and No. 3 from fuse box No.2 with ignition switch turned OFF. 2) Run engine when ECT is over 97 °C, 206.6 °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 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.

Radiator Cooling Fan High Speed Control System Check

S6RW0H1104072

Wiring Diagram

Refer to "Radiator Cooling Fan Low Speed Control System Check".

Troubleshooting**▲ WARNING**

Keep hands, tools, and clothing away from radiator cooling fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the ECT sensor with the ignition switch at the "ON" position.

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	Low speed radiator cooling fan control circuit check 1) Check low speed radiator cooling fan control circuit referring to "Radiator Cooling Fan Low Speed Control System Check". <i>Is it in good condition?</i>	Go to Step 2.	Repair or replace faulty condition.
2	High speed radiator cooling fan control circuit check 1) Start engine and select "Data List" mode on scan tool. 2) Warm up engine until coolant temp. is 102.5 °C, 216.5 °F or higher and A/C switch turns OFF. (If engine coolant temp. dose not rise, check engine cooling system or ECT sensor.) <i>Is radiator cooling fan started at high speed when engine coolant temp. reached above temp?</i>	Radiator cooling fan control system is in good condition.	Perform from Step 2 to Step 6 of "DTC P0480: Fan 1 Control Circuit". If OK, Go to Step 3.
3	Radiator cooling fan check 1) Check radiator cooling fan referring to "Radiator Cooling Fan Assembly 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

S6RW0H1106001

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.
- There are no abnormal air drawn in from air intake system.
- There are no obstruction in PCV valve or its hoses.

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

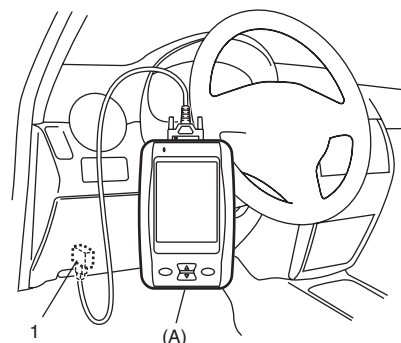
NOTE

Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T vehicle), and set parking brake and block drive wheels.

- 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".

If check result is out of specification, inspect the followings.

- EVAP canister purge control system referring to "EVAP Canister Purge Inspection in Section 1B in related manual".
- Electric load signal circuit referring to "Electric Load Signal Circuit Check".
- PCV system referring to "PCV Hose Inspection in Section 1B in related manual".
- Electric throttle body assembly referring to "Electric Throttle Body Assembly On-Vehicle Inspection in Section 1C in related manual".

Engine idle speed and IAC throttle opening

A/C OFF: 680 – 780 rpm, 10 – 20%








A/C ON: 750 – 850 rpm, 15 – 25%

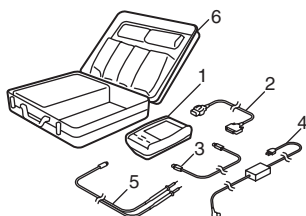
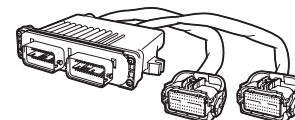
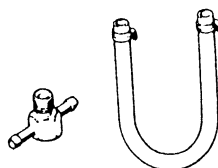
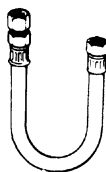
- 4) Check that specified engine idle speed is obtained with A/C turned ON if vehicle is equipped with A/C. If not, check A/C system referring to "A/C System Circuits Check".

Special Tools and Equipment

Special Tool

S6RW0H1108001

<p>09912-58432 Fuel pressure gauge hose This tool is included in fuel pressure gauge set (09912-58413). </p>	<p>09912-58442 Fuel pressure gauge This tool is included in fuel pressure gauge set (09912-58413). </p>
<p>09912-58490 3-way joint & hose </p>	<p>09933-06320 ECM check harness (120P)  / </p>
<p>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  / </p>	



Engine Electrical Devices

Repair Instructions

Electric Load Current Sensor On-Vehicle Inspection

S6RW0H1306022

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: 4.5 – 6.0 A

Ignition switch ON, headlight ON: 22.0 – 25.0 A

Ignition switch ON, headlight ON and blower motor switch is HI position: 30.0 – 33.0 A

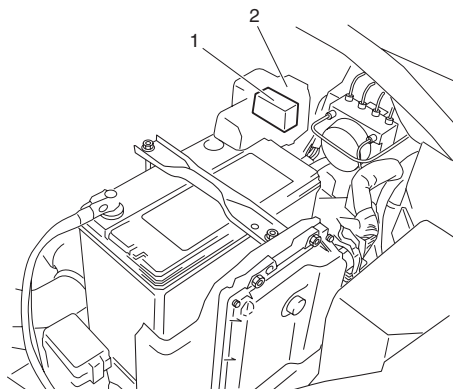
Engine running at idle speed, headlight ON, blower motor switch is HI position and rear defogger switch ON: 48.0 – 55.0 A

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.



2. Main fuse box

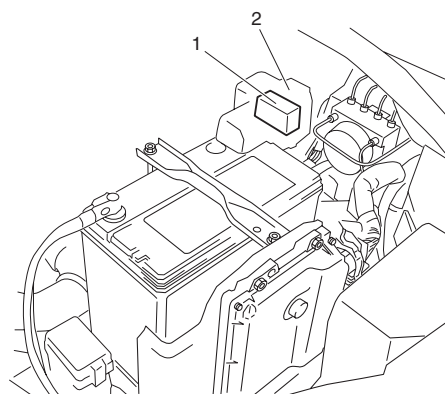
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Without Using SUZUKI Scan Tool

- 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.



2. Main fuse box

I6RW0E130006-01

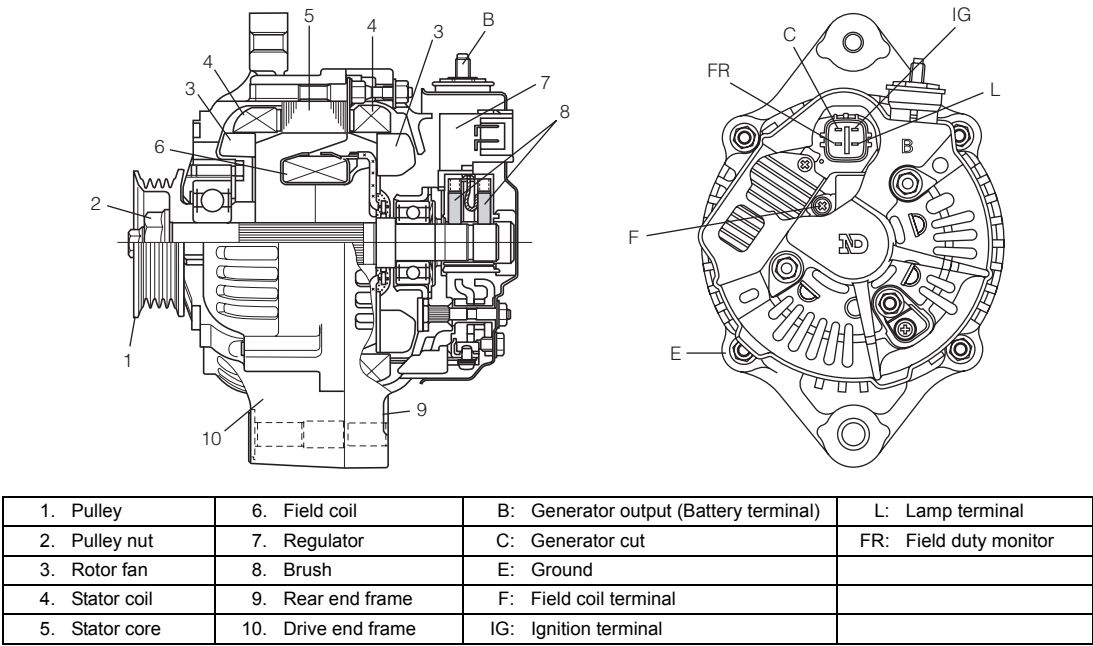
Charging System

General Description

Generator Description

S6RW0H1A01002

The basic charging system is the IC integral regulator charging system. The internal components are connected electrically as shown below.

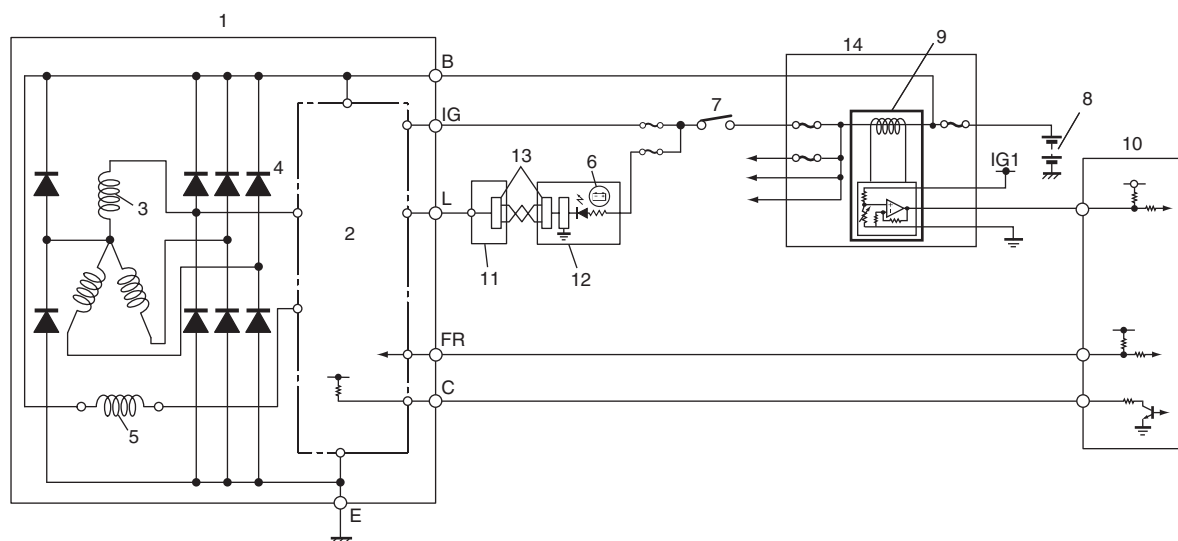


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Charging System Circuit

The generator features a solid state regulator that is mounted inside the generator. All regulator components are enclosed into a solid mold, and this unit along with the brush holder assembly is attached to the rear housing. The regulator voltage is being controlled by ECM under some conditions while driving. Refer to “Generator Control System Description in Section 1A”.

The generator rotor bearings contain enough grease to eliminate the need for periodic lubrication. Two brushes carry current through the two slip rings to the field coil mounted on the rotor, and under normal conditions will provide long period of attention-free service. The stator windings are assembled inside a laminated core that forms part of the generator frame. A rectifier bridge connected to the stator windings contains diodes, and electrically changes that stator AC. voltages to a D.C. voltage which appears at the generator output terminal.



I6RW0H1A0001-01

1. Generator with regulator assembly	5. Field coil (rotor coil)	9. Electric load current sensor	13. CAN driver
2. I.C. regulator	6. Charge indicator light	10. ECM	14. Main fuse box
3. Stator coil	7. Main switch	11. BCM	
4. Diode	8. Battery	12. Combination meter	

Section 2

Suspension

CONTENTS

Suspension General Diagnosis.....	2A-1	Wheels and Tires	2D-1
Specifications.....	2A-1	Specifications.....	2D-1
Wheel Alignment Specifications.....	2A-1	Wheels and Tires Specifications	2D-1
		Tightening Torque Specifications.....	2D-1

Suspension General Diagnosis

Specifications

Wheel Alignment Specifications

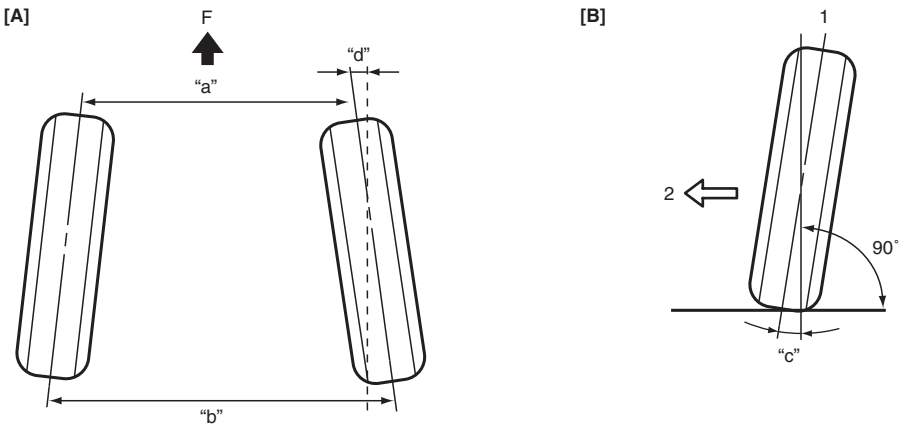
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Wheel alignment specifications

Item		Front	Rear
Toe ("b" – "a")		IN 1 ± 1 (mm) (IN 0.0393 ± 0.0393 (in.))	IN 5 ± 5 (mm) (IN 0.1969 ± 0.1969 (in.))
Toe "d" (degree) (Each wheel) *1		IN 7' ± 2'	IN 17' ± 17'
Camber "c"		-17' ± 1°	-1° ± 1°
Caster		3° 46' ± 2°	—
Side Slip (On one person)*1		0 to IN 3.0 (mm/m) 0 to IN 0.118 (in./3.3 ft)	—
Steering Angle (Turning Angle)	Inside	35° 42' ± 2°	—
	Outside *1	31° 54'	—

NOTE

- Toe value in the specification table was measured by using a toe-in gauge.
 - Rear toe, front camber, rear camber and front caster are not adjustable.
- *1: Reference information



[A]: Toe-in (Top view)	1. Center line of wheel	F. Forward
[B]: Camber (Front view)	2. Body center	

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Wheels and Tires

Specifications

Wheels and Tires Specifications

S6RW0H2407001

Tire size (Standard)
205/50 R17 89V

Wheel size (Standard)
17 x 6 1/2J


Tightening torque
Wheel nut: 85 N·m (8.5 kgf-m, 61.5 lb-ft)

NOTE

- Tire inflation pressure should be checked when tires are cool.
- Specified tire inflation pressure should be found on tire placard or in owner's manual which came with the vehicle.

Tightening Torque Specifications

S6RW0H2407002

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Wheel nut	85	8.5	61.5	

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A in related manual”.

Section 4

Brakes

CONTENTS

Brake Control System and Diagnosis ... 4A-1

General Description	4A-1
Front Brake Hose / Pipe Construction.....	4A-1
Diagnostic Information and Procedures	4A-2
Brakes Symptom Diagnosis	4A-2
Repair Instructions	4A-4
Master Cylinder Removal and Installation.....	4A-4
Specifications	4A-5
Tightening Torque Specifications.....	4A-5

Electronic Stability Program4F-1

Precautions	4F-1
Precautions in Diagnosing Troubles	4F-1
Precautions in On-Vehicle Service.....	4F-1
Precautions in Hydraulic Unit Operation	
Check	4F-1
Precautions in Sensor Calibration.....	4F-1
Precautions in Speedometer Test or Other	
Tests	4F-2
General Description	4F-2
Electronic Stability Program Description	4F-2
ESP® Hydraulic Unit / Control Module	
Assembly Description	4F-2
Warning Light, Indicator Light Description	4F-3
CAN Communication System Description.....	4F-4
Schematic and Routing Diagram	4F-5
Electronic Stability Program Schematic	4F-5
Electronic Stability Program Wiring Circuit	
Diagram	4F-6
Component Location	4F-7
Electronic Stability Program Component	
Location	4F-7
Diagnostic Information and Procedures	4F-9
Electronic Stability Program Check.....	4F-9
ESP® Warning Light Check.....	4F-11
ABS Warning Lamp Check	4F-11
EBD Warning Lamp (Brake Warning Lamp)	
Check	4F-11
DTC Check	4F-12
DTC Table.....	4F-12
DTC Clearance	4F-15
Fail-Safe Table.....	4F-16
Scan Tool Data	4F-18

ESP® Warning Light Does Not Come ON at	
Ignition Switch ON.....	4F-20
ESP® Warning Light Comes ON Steady	4F-21
ABS Warning Lamp Does Not Come ON at	
Ignition Switch ON.....	4F-22
ABS Warning Lamp Comes ON Steady.....	4F-22
EBD Warning Lamp (Brake Warning Lamp)	
Comes ON Steady	4F-23
Serial Data Link Circuit Check	4F-25
DTC C1016: Brake Light Switch	4F-27
DTC C1017 / C1023: Lateral G Sensor / Yaw	
Rate Sensor	4F-29
DTC C1020 / C1028: Master Cylinder	
Pressure Sensor Power Supply Failure /	
Circuit	4F-29
DTC C1021 / C1022 / C1025 / C1026 / C1031	
/ C1032 / C1035 / C1036: Wheel Speed	
Sensor Circuit / Sensor or Encoder.....	4F-30
DTC C1024: Steering Angle Sensor	4F-32
DTC C1027: ESP® OFF Switch	4F-32
DTC C1033: Wheel Speed Sensor Deviation ...	4F-33
DTC C1034 / C1039: Yaw Rate / G Sensor	
Power Supply Failure / Internal Failure	4F-35
DTC C1037: Steering Angle Sensor Power	
Supply Failure	4F-36
DTC C1038: Steering Angle Sensor Detect	
Rolling Counter	4F-37
DTC C1040: ESP® Continuous Operation	4F-38
DTC C1041 / C1042 / C1043 / C1044 / C1045	
/ C1046 / C1051 / C1052 / C1053 / C1054 /	
C1055 / C1056: Inlet / Outlet / Cut / Suction	
Solenoid	4F-38
DTC C1057: Power Supply Voltage Too High	
/ Too Low	4F-40
DTC C1061: Pump Motor Circuit	4F-41
DTC C1063: Solenoid Valve Power Supply	
Driver Circuit	4F-42
DTC C1071: Control Module Internal Defect	4F-43
DTC C1075: Steering Angle Sensor	
Calibration	4F-43
DTC C1091: CAN Invalid Data from ECM	4F-44
DTC C1096: Yaw Rate / G Sensor Message	
Counter Error	4F-44
DTC U0073: Control Module Communication	
Bus Off	4F-45

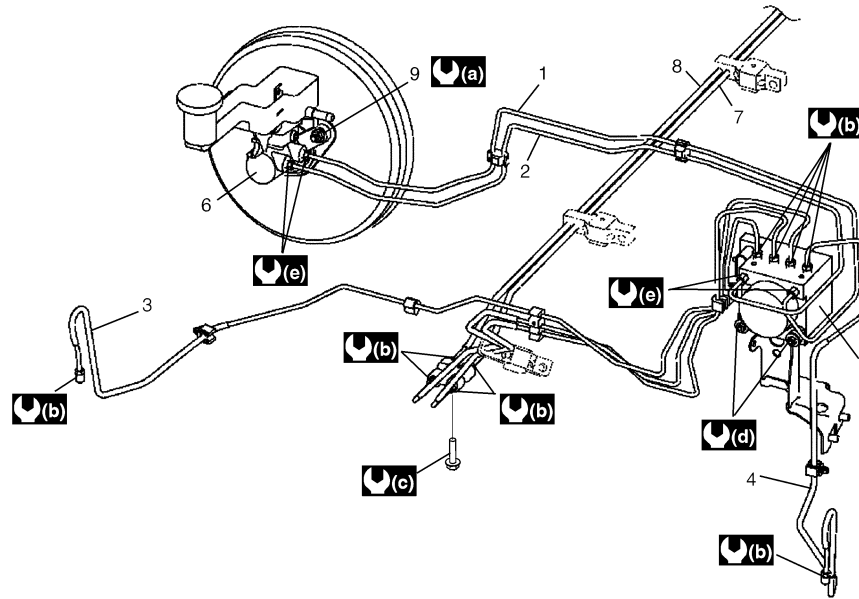
DTC U0100: Lost Communication with ECM / PCM	4F-45	Rear Wheel Speed Sensor Inspection	4F-50
DTC U0101 Lost Communication with TCM	4F-45	Front Wheel Speed Sensor Encoder On-Vehicle Inspection	4F-50
DTC U0114 Lost Communication with Four-Wheel Drive Clutch Control Module	4F-45	Front Wheel Speed Sensor Encoder Removal and Installation	4F-50
DTC U0123 Lost Communication with Yaw Rate Sensor Module	4F-45	Rear Wheel Speed Sensor Encoder On-Vehicle Inspection	4F-50
DTC U0126: Lost Communication with Steering Angle Sensor	4F-45	Rear Wheel Speed Sensor Encoder Removal and Installation	4F-50
ESP® Hydraulic Unit / Control Module Assembly Power and Ground Circuit Check ...	4F-45	Master Cylinder Pressure Sensor On-Vehicle Inspection	4F-51
Repair Instructions	4F-47	Yaw Rate / G Sensor On-Vehicle Inspection	4F-51
ESP® Hydraulic Unit Operation Check.....	4F-47	Yaw Rate / G Sensor Removal and Installation	4F-53
Sensor Calibration.....	4F-48	Yaw Rate / G Sensor Inspection	4F-53
ESP® Hydraulic Unit / Control Module Assembly On-Vehicle Inspection	4F-48	Steering Angle Sensor On-Vehicle Inspection ..	4F-53
ESP® Hydraulic Unit / Control Module Assembly Removal and Installation	4F-49	Steering Angle Sensor Removal and Installation	4F-54
Front Wheel Speed Sensor On-Vehicle Inspection.....	4F-50	Steering Angle Sensor Inspection	4F-55
Front Wheel Speed Sensor Removal and Installation	4F-50	ESP® OFF Switch Removal and Installation	4F-55
Front Wheel Speed Sensor Inspection	4F-50	ESP® OFF Switch Inspection	4F-55
Rear Wheel Speed Sensor On-Vehicle Inspection.....	4F-50	Specifications	4F-56
Rear Wheel Speed Sensor Removal and Installation	4F-50	Tightening Torque Specifications.....	4F-56
		Special Tools and Equipment	4F-56
		Special Tool	4F-56

Brake Control System and Diagnosis

General Description

Front Brake Hose / Pipe Construction

S6RW0H4101002



I6RW0H410001-01

1. From master cylinder primary to ESP® hydraulic unit	6. Master cylinder	(b) : 16 N·m (1.6 kgf-m, 12.0 lb-ft)
2. From master cylinder secondary to ESP® hydraulic unit	7. From ESP® hydraulic unit to left rear brake	(c) : 11 N·m (1.1 kgf-m, 8.0 lb-ft)
3. From ESP® hydraulic unit to right front brake	8. From ESP® hydraulic unit to right rear brake	(d) : 9 N·m (0.9 kgf-m, 6.5 lb-ft)
4. From ESP® hydraulic unit to left front brake	9. Master cylinder fixing nut	(e) : 19 N·m (1.9 kgf-m, 14.0 lb-ft)
5. ESP® hydraulic unit / control module assembly	(a) : 18 N·m (1.8 kgf-m, 13.0 lb-ft)	

Diagnostic Information and Procedures

Brakes Symptom Diagnosis

S6RW0H4104002

Condition	Possible cause	Correction / Reference Item
Not enough braking force	Brake oil leakage from brake lines	Locate leaking point and repair.
	Brake disc or pad stained with oil	Clean or replace.
	Overheated brakes	Determine cause and repair.
	Badly worn brake pad	Replace.
	Malfunctioning caliper assembly	Repair or replace.
	Malfunctioning brake booster	Check system and replace as necessary.
	Malfunctioning brake master cylinder	Check system and replace as necessary.
	Air in system	Bleed system.
	Malfunctioning ABS (ESP®)	Check system and replace as necessary.
Brake pull (Brakes not working in unison)	Brake pad and disc are wet with water or stained with oil in some brakes	Clean or replace.
	Disc is out of round in some brakes	Replace.
	Tires are inflated unequally	Inflate equally.
	Disturbed front wheel alignment	Adjust as prescribed.
	Unmatched tires on same axle	Tires with approximately the same amount of tread should be used on the same axle.
	Restricted brake pipes or hoses	Check for soft hoses and damaged lines. Replace with new hoses and new double-walled steel brake tubing.
	Malfunctioning caliper assembly	Caliper should slide. Check for stuck or sluggish pistons and proper lubrication of caliper slide pin.
	Loose suspension parts	Check all suspension mountings.
	Loose calipers	Check and torque bolts to specifications.
Noise (high pitched squeak without brake applied)	Contact wear indicator to brake disc	Replace brake pad.
	Worn brake pad	Replace brake pad.
Excessive pedal travel (Pedal stroke too large)	Partial brake system failure	Check brake systems and repair as necessary.
	Brake fluid leaking	Repair the leaking point, and bleed air.
	Air in system (soft / spongy pedal)	Bleed system.
	Rear brake system not adjusted (malfunctioning auto adjusting mechanism)	Adjust rear brakes. Repair auto adjusting mechanism.
Brake locked	Malfunctioning ABS (ESP®)	Check system referring to "ABS Check in Section 4E in related manual" or "Electronic Stability Program Check in Section 4F".
Dragging brakes (Without a very light drag is present in all brakes immediately after pedal is released)	Master cylinder pistons not returning correctly	Replace master cylinder.
	Restricted brake pipes or hoses	Check for soft hoses or damaged pipes and replace with new hoses and/or new brake piping.
	Incorrect parking brake adjustment on rear brakes	Check and adjust to correct specifications.
	Weakened or broken return springs in the rear brake caliper	Replace.
	Sluggish parking brake cables or linkage	Repair or replace.
	Wheel cylinder or caliper piston sticking	Repair as necessary.
	Badly worn piston seal in caliper	Replace piston seal.
	Improper brake pedal free height	Check brake pedal free height.
Pedal pulsation (Pedal pulsates when depressed for braking)	Damaged wheel bearings	Replace wheel bearings.
	Distorted steering knuckle or rear axle shaft	Replace knuckle or rear axle shaft.
	Excessive disc lateral runout	Check per instructions. If not within specifications, replace or machine disc.

Condition	Possible cause	Correction / Reference Item
Braking noise	Glazed brake pad	<i>Repair or replace brake pad.</i>
	Loose front wheel bearings	<i>Replace wheel hub.</i>
	Distorted backing plates or loose mounting bolts	<i>Replace or retighten securing bolts.</i>
	Contact wear indicator to brake disc	<i>Replace brake pads.</i>
Brake warning light lights after engine start	Parking brake applied	<i>Release parking brake and check that brake warning light turns off.</i>
	Insufficient amount of brake fluid	<i>Investigate leaky point, correct it and add brake fluid.</i>
	Brake fluid leaking	<i>Investigate leaky point, correct it and add brake fluid.</i>
	Brake warning light circuit faulty	<i>Repair circuit.</i>
	Malfunctioning EBD system	<i>Check system referring to "EBD Warning Light (Brake Warning Light) Comes ON Steady in Section 4E in related manual".</i>
Brake warning light turns on when brake is applied	Brake fluid leaking	<i>Investigate leaky point, correct it and add brake fluid.</i>
	Insufficient amount of brake fluid	<i>Investigate leaky point, correct it and add brake fluid.</i>
Brake warning light fails to turn on even when parking brake is applied	Brake warning light circuit faulty	<i>Replace bulb or repair circuit.</i>
ABS warning light or ESP® warning light turns on after engine start	Malfunctioning ABS (ESP®)	<i>Check system referring to "ABS Check in Section 4E in related manual" or "Electronic Stability Program Check in Section 4F".</i>
ABS warning light or ESP® warning light turns on when brake is applied	Malfunctioning ABS (ESP®)	<i>Check system referring to "ABS Check in Section 4E in related manual" or "Electronic Stability Program Check in Section 4F".</i>
ABS warning light or ESP® warning light does not turn on for 2 sec. after ignition switch has turned ON	Bulb burnt out	<i>Replace bulb.</i>
	Malfunctioning ABS (ESP®)	<i>Check system referring to "ABS Check in Section 4E in related manual" or "Electronic Stability Program Check in Section 4F".</i>
ABS warning light flashes	New ABS (ESP®) hydraulic unit / control module assembly installed.	<i>Perform "ABS Hydraulic Unit Operation Check in Section 4E in related manual" or "ESP® Hydraulic Unit Operation Check in Section 4F".</i>

Repair Instructions

Master Cylinder Removal and Installation

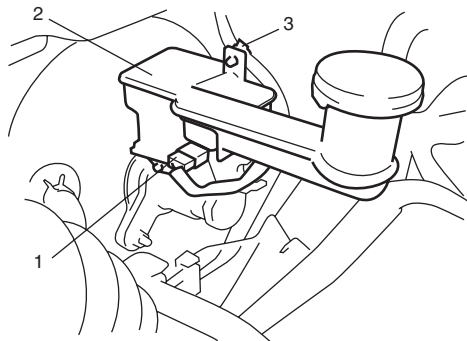
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Removal

⚠ CAUTION

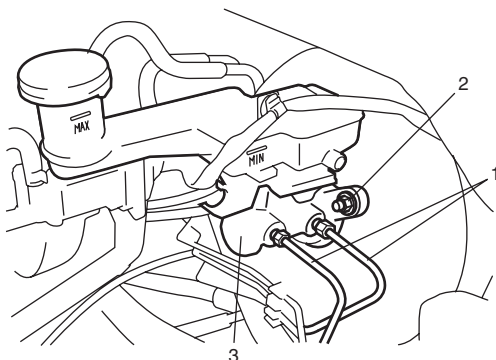
- **Never disassemble master cylinder since the master cylinder is supplied as assembly parts.**
If faulty condition is found, replace it with new one.
- **Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid, flush it with water immediately if any fluid is spilled.**

- 1) Clean outside of master cylinder.
- 2) Disconnect fluid level switch coupler (1) and clamp (3) from reservoir (2).



I7RW01410009-01

- 3) Drain brake fluid in reservoir.
- 4) Disconnect brake pipes (1) connected to master cylinder.
- 5) Remove master cylinder fixing nuts (2).
- 6) Remove master cylinder (3) and O-ring.



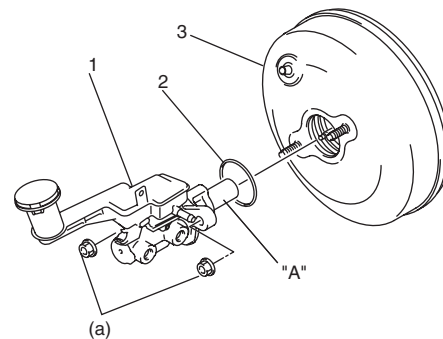
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Installation

- 1) Install new O-ring (2) to master cylinder assembly (1).
- 2) Apply grease to piston rod "A".
Use specified grease in spare to master cylinder or brake booster as supply parts.
- 3) Install master cylinder assembly (1) to brake booster (3) and tighten master cylinder fixing nuts to specified torque.

Tightening torque

Master cylinder fixing nut (a): 18 N·m (1.8 kgf-m, 13.0 lb-ft)

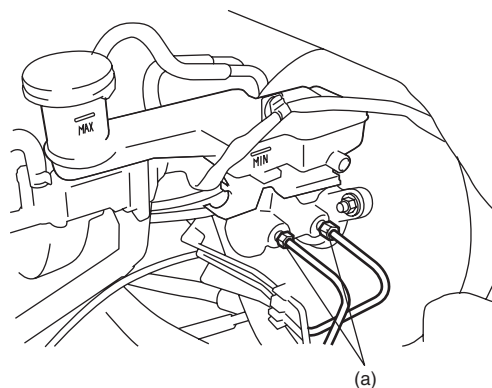


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- 4) Connect brake pipe to master cylinder and tighten flare nuts to specified torque.

Tightening torque

Brake pipe flare nut (a): 19 N·m (1.9 kgf-m, 14.0 lb-ft)



I7RW01410013-01

- 5) Connect fluid level switch connector and clamp.
- 6) Fill reservoir with specified brake fluid up to its MAX level.
- 7) After completing the work, bleed air from brake and clutch system referring to "Air Bleeding of Brake System in related manual".
- 8) Check each installed parts for fluid leakage.
- 9) Check brake pedal for play referring to "Brake Pedal Play Inspection in related manual".
- 10) Perform brake test and check fluid leakage.

Specifications

Tightening Torque Specifications

S6RW0H4107001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Master cylinder fixing nut	18	1.8	13.0	🔧
Brake pipe flare nut	19	1.9	14.0	🔧

NOTE

The specified tightening torque is also described in the following.
 “Front Brake Hose / Pipe Construction”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A in related manual”.

Electronic Stability Program

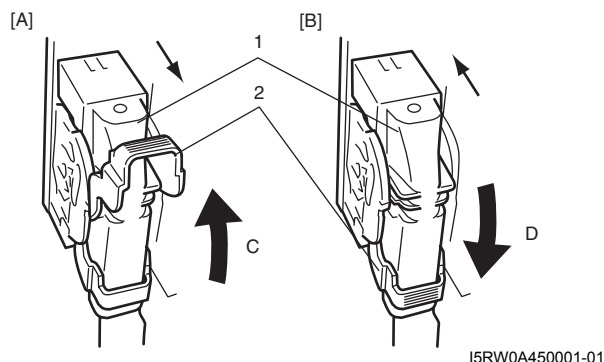
Precautions

Precautions in Diagnosing Troubles

S6RW0H4600001

To ensure that the trouble diagnosis is done accurately and smoothly, observe the following and follow "Electronic Stability Program Check".

- Diagnostic information stored in ESP® control module 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.
- If the vehicles was operated in any of the following ways, ESP® warning light may light momentarily but this does not indicate anything abnormal in ESP®.
 - The vehicle was driven with parking brake pulled.
 - The vehicle was driven with brake dragging.
 - The vehicle was stuck in mud, sand, etc.
 - Wheel spin occurred while driving.
 - Wheel(s) was rotated while the vehicle was jacked up.
- Be sure to use the trouble diagnosis procedure as described in "Electronic Stability Program Check". Failure to follow it may result in incorrect diagnosis. (Some other diagnosis trouble code may be stored by mistake in the memory of ESP® control module during inspection.)
- When disconnecting ESP® control module connector (1), pull up the lock lever (2) of connector. When connecting, set the connector on ESP® hydraulic unit / control module assembly and pull down the lock lever (2) until it locks.



I5RW0A450001-01

[A]: Disconnect	[C]: Pull up to disconnect
[B]: Connect	[D]: Pull down to connect

- Communication of ECM, TCM (A/T model), BCM, 4WD control module, combination meter, keyless start control module, ESP® control module, steering angle sensor, yaw rate / G sensor and DLC (data link connector) is established by CAN (Controller Area Network).

Therefore, be sure to read "Precautions for Installing Mobile Communication Equipment in Section 00 in related manual" before inspection and handling CAN communication line.

For CAN communication system, refer to description on "CAN Communication System Description in Section 1A".

Precautions in On-Vehicle Service

S6RW0H4600002

When connector is connected to ESP® hydraulic unit / control module assembly, do not disconnect connectors of sensors with ignition switch ON. Otherwise, DTC will be set in ESP® control module.

Precautions in Hydraulic Unit Operation Check

S6RW0H4600003

ESP® hydraulic unit / control module assembly function is checked by correct wheel lock / release condition when brake pressure is pressurized / depressurized using SUZUKI scan tool. The hydraulic unit operation check referring to "ESP® Hydraulic Unit Operation Check" should be performed to confirm the correct brake pipe connection in the following cases.

- ESP® hydraulic unit / control module assembly was replaced.
- Brake pipe and/or hose were replaced.

Precautions in Sensor Calibration

S6RW0H4600004

Steering angle sensor transmits the absolute steering angle value calculated with the steering neutral position (calibration point) required by ESP® control module. TCS and stability control system use this set of data. When the following operation is done, calibration should be performed since the original calibration points are deleted.

- Power is not supplied to steering angle sensor. (battery and/or fuse is removed.)
- Steering angle sensor is replaced.
- Power is not supplied to ESP® control module. (battery, fuse and/or connector is removed.)
- ESP® hydraulic unit / control module assembly is replaced.

Perform sensor calibration according to "Sensor Calibration".

Precautions in Speedometer Test or Other Tests

S6RW0H460005

When performing speedometer or other tests using speedometer tester or chassis dynamometer, ESP® function must be deactivated by ESP® OFF switch or using SUZUKI scan tool to complete the tests correctly.

When using SUZUKI scan tool, set to the "MISC. TEST" mode to stop the ESP® function. Refer to SUZUKI scan tool operator's manual for further details.

General Description

Electronic Stability Program Description

S6RW0H4601001

Electronic Stability Program (ESP®) main function is to control ABS / EBD, TCS and stability.

- **ABS / EBD**
ABS function is that four wheel brake forces are independently varied with referring each wheel slip condition.
EBD function is that front and rear wheel braking forces are varied with referring loading distribution of the vehicle.
ABS improves the vehicle stability, controllability and braking performance.
For the details, refer to "ABS Description in Section 4E in related manual".
- **TCS (Traction Control System)**
TCS function is that engine torque is controlled and brake is applied with referring wheel spin condition during vehicle starting and accelerating.
- **Stability control system**
Stability control system is that engine torque is controlled and brake is applied with referring vehicle condition (over steering, under steering) during cornering.

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ESP® Hydraulic Unit / Control Module Assembly Description

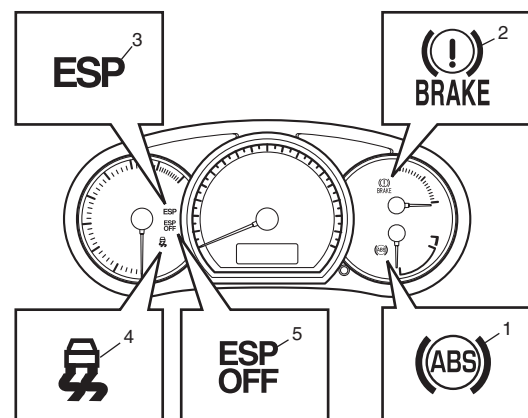
S6RW0H4601002

ESP® control module is a component of ESP® hydraulic unit / control module assembly and has the following functions.

Self-Diagnosis Function

ESP® control module monitors each input and output signals. When ESP® control module detects any malfunction, some of ABS warning lamp (1), EBD warning lamp (brake warning lamp) (2), ESP® warning lamp (3), SLIP indicator light (4), ESP® OFF light (5) are turned ON and indicate the abnormality to driver.

- When ignition switch is turned ON, ABS warning lamp, EBD warning lamp, ESP® warning light, SLIP indicator light and ESP® OFF light light for 2 seconds to check its circuit.
- When no abnormality is detected (the system is in good condition), ABS warning lamp, EBD warning lamp, ESP® warning light, SLIP indicator light and ESP® OFF light turn OFF after 2 seconds.
- When an abnormality in the system is detected, some of ABS warning lamp, EBD warning lamp, ESP® warning light, SLIP indicator light and/or ESP® OFF light are turned ON and the area where that abnormality lies is stored in the memory in ESP® control module.



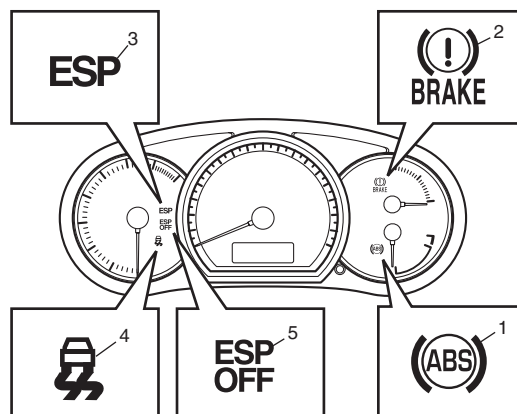
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Fail-Safe Mode

When ESP® control module detects abnormality, the system goes into fail-safe mode. And some of functions of ABS, TCS, stability control system are shut down. For details of fail safe mode, refer to "Fail-Safe Table".

Warning Light, Indicator Light Description

There are five types of warning light and indicator light in instrument cluster, which are controlled by ESP® control module. They give warning / indication to driver by changing the modes light ON / blinking / light OFF.



I7RW01460001-01

1. ABS warning lamp	4. SLIP indicator light
2. EBD warning lamp (brake warning lamp)	5. ESP® OFF light
3. ESP® warning light	

The followings are the condition and operation of warning lights and indicator lights.

Warning light / Indicator light	Condition and operation
ABS warning lamp	If ABS has abnormality, the light turns "ON".
EBD warning lamp (brake warning lamp)	<ul style="list-style-type: none"> If EBD system has abnormality, the light turns "ON". If brake fluid level in reservoir is minimum level, the light turns "ON". Parking brake switch is ON, the light turns "ON".
ESP® warning light	If ESP® systems has abnormality, the light turns "ON".
SLIP indicator light	<ul style="list-style-type: none"> If stability control system and traction control system is active, the light blinks at 5 Hz. If Steering angle sensor calibration is incompleted (DTC C1075 is detected) and/or steering angle sensor message data is missing from CAN communication (DTC U0126 is detected), the light blinks at 1 Hz.
ESP® OFF light	If ESP® OFF switch is turned "ON", the ESP® OFF light light up. When it is "ON", TCS and stability control system functions are controlled not to work.

CAN Communication System Description

S6RW0H4601004

Refer to “CAN Communication System Description in Section 1A” for CAN communication system description. ESP® control module communicates control data with each control module as follows.

ESP® Control Module Transmission Data

				ECM	4WD control module	Combination meter	Steering angle sensor
ESP® control module	Transmit	DATA	Torque down request	○			
			Wheel speed signal (front right)	○	○		
			Wheel speed signal (front left)	○	○		
			Wheel speed signal (rear right)	○	○		
			Wheel speed signal (rear left)	○	○		
			Clutch control request for A-4WD active		○		
			Clutch control request percent		○		
			ESP® status signal	○	○	○	
			ABS active	○	○		
			ABS indication			○	
			EBD indication			○	
			Steering angle neutral position				○

I6RW0H460017-01

ESP® Control Module Reception Data

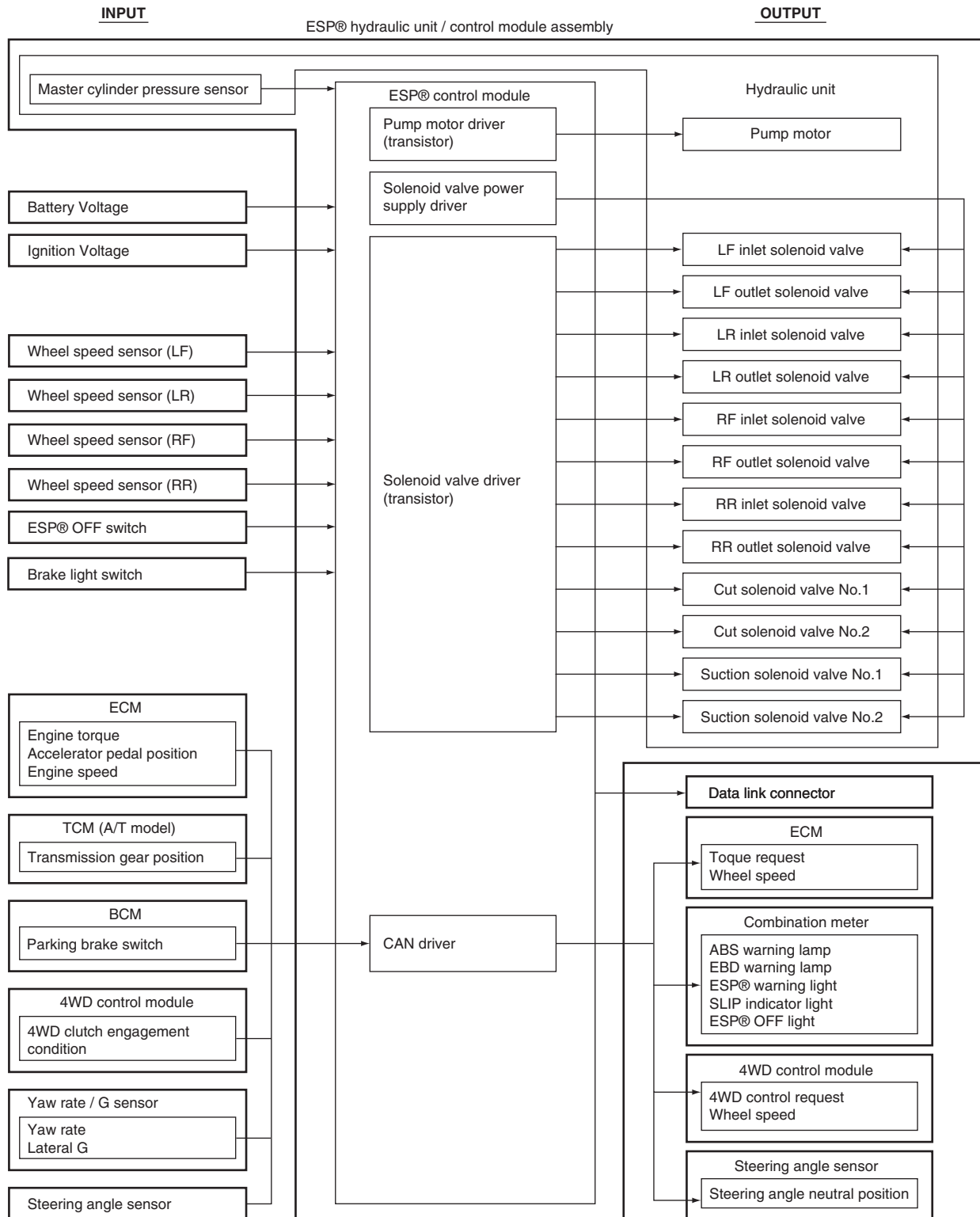
				ECM	TCM (A/T model)	BCM	4WD control module	Steering angle sensor	Yaw rate / G sensor
ESP® control module	Receive	DATA	Engine torque signal	○					
			Engine speed signal	○					
			Accelerator position	○					
			Transmission gear selector position		○				
			Transmission actual gear		○				
			Parking brake switch signal			○			
			A-4WD clutch control request impossibility				○		
			A-4WD clutch engagement percent				○		
			Steering angle signal					○	
			Steering angle sensor related malfunction					○	
			Vehicle yaw rate signal						○
			Vehicle lateral G signal						○
			Yaw rate / G sensor related malfunction						○

I6RW0H460018-01

Schematic and Routing Diagram

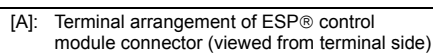
Electronic Stability Program Schematic

S6RW0H4602001



I6RW0A460003-01

I6RW0H460002-01



[A]: Terminal arrangement of ESP® control module connector (viewed from terminal side)	14. Brake fluid level switch	28. ECM
1. Battery	15. Parking brake switch	29. TCM (A/T model)
2. Main fuse box	16. Yaw rate / G sensor	30. Left-front wheel speed sensor
3. Ignition switch	17. Combination meter	31. Right-front wheel speed sensor

4F-7 Electronic Stability Program:

4. Junction block assembly	18. ABS warning lamp	32. Left-rear wheel speed sensor
5. Brake light switch	19. EBD warning lamp (brake warning lamp)	33. Right-rear wheel speed sensor
6. Brake light	20. ESP® warning light	34. ESP® hydraulic unit / control module assembly
7. To ECM and shift lock relay (A/T model)	21. SLIP indicator light	35. ESP® OFF switch
8. BCM (included in junction block assembly)	22. ESP® OFF light	36. Pump motor driver (transistor
9. CAN driver	23. Lamp driver module	37. Pump motor
10. Data link connector (DLC)	24. CAN junction connector	38. Solenoid valve power supply driver
11. To HVAC control module (auto A/C model) and 4WD control module	25. Keyless start control module	39. Solenoid valves
12. To SDM	26. 4WD control module	40. Solenoid valve driver (transistor)
13. To TCM (A/T model), P/S control module	27. Steering angle sensor	41. Master cylinder pressure sensor

Connector “E43” (ESP® Control Module Connector)

Terminal	Circuit
E43	1 CAN communication line (high) for ECM and TCM (A/T model)
	2 CAN communication line (high)
	3 —
	4 —
	5 —
	6 ESP® OFF switch input
	7 Brake light switch
	8 —
	9 Ignition switch
	10 Left-rear wheel speed sensor (–)
	11 Left-front wheel speed sensor (+)
	12 CAN communication line (low) for ECM and TCM (A/T model)
	13 CAN communication line (low)
	14 —
	15 —
	16 Serial communication line of data link connector
	17 Right-front wheel speed sensor (–)
	18 Right-front wheel speed sensor (+)
	19 Right-rear wheel speed sensor (–)
	20 Right-rear wheel speed sensor (+)
	21 Left-rear wheel speed sensor (+)
	22 Left-front wheel speed sensor (–)
	23 Ground
	24 Power supply for solenoid valve
	25 Power supply for pump motor
	26 Ground for pump motor

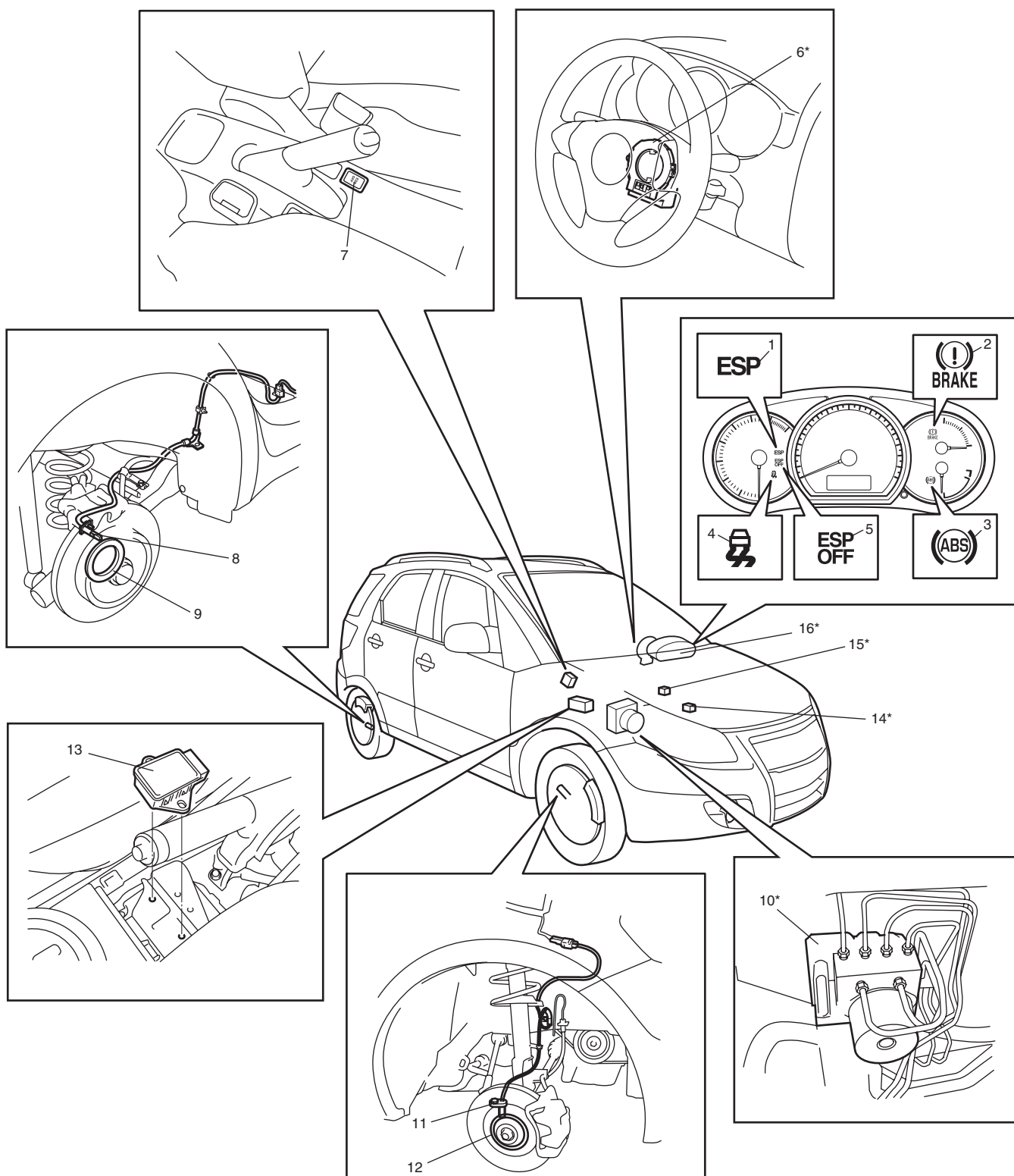
Component Location

Electronic Stability Program Component Location

S6RW0H4603001

NOTE

The figure shows left-hand steering vehicle. For right-hand steering vehicle, parts with (*) are installed at the opposite side.



I6RW0A460005-02

1. ESP® warning light	7. ESP® OFF switch	13. Yaw rate / G sensor
2. EBD warning lamp (brake warning lamp)	8. Rear wheel speed sensor	14. Data link connector
3. ABS warning lamp	9. Rear wheel encoder	15. Brake light switch
4. SLIP indicator light	10. ESP® hydraulic unit / control module assembly	16. Combination meter
5. ESP® OFF light	11. Front wheel speed sensor	
6. Steering angle sensor	12. Front wheel encoder	

Diagnostic Information and Procedures

Electronic Stability Program Check

S6RW0H4604001

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

Step	Action	Yes	No
1	🔧 Malfunction analysis 1) Perform "Customer complaint analysis: ". 2) Perform "Problem symptom confirmation: ". 3) Perform "DTC check, record and clearance: " and recheck DTC. <i>Is there any malfunction DTC?</i>	Go to Step 4.	Go to Step 2.
2	🔧 Driving test 1) Perform "Step 2: Driving Test: ". <i>Is trouble symptom identified?</i>	Go to Step 3.	Go to Step 6.
3	🔧 DTC check 1) Perform "DTC Check". <i>Is it malfunction code?</i>	Go to Step 4.	Go to Step 5.
4	🔧 ESP® check 1) Inspect and repair referring to applicable DTC flow. <i>Does trouble recur?</i>	Go to Step 5.	Go to Step 7.
5	🔧 Brakes diagnosis 1) Inspect and repair referring to "Brakes Symptom Diagnosis in Section 4A". <i>Does trouble recur?</i>	Go to Step 3.	Go to Step 7.
6	🔧 Intermittent problem check 1) Check intermittent troubles referring to "Intermittent and Poor Connection Inspection in Section 00 in related manual" and related circuit of trouble code recorded in Step 1. <i>Does trouble recur?</i>	Go to Step 4.	Go to Step 7.
7	🔧 Final confirmation test 1) Perform "Step 7: Final Confirmation Test: ". <i>Does trouble recur?</i>	Go to Step 3.	End.

Step 1: Malfunction Analysis**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 a questionnaire form as shown in the following will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer questionnaire (Example)

Customer's name:	Model:	VIN:	
Date of issue:	Date of Reg:	Date of problem:	Mileage:

Problem Symptoms	<ul style="list-style-type: none"> • ESP® warning lamp abnormal: fails to turn on / fails to turn off • ABS warning lamp abnormal: fails to turn on / fails to turn off • EBD warning lamp abnormal: fails to turn on / fails to turn off • Abnormal noise while vehicle is running: from motor, from valve, other_____ • Wheel is locked at braking: • Wheel is skidded at turning. • Pump motor does not stop (running): • Braking does not work: • Other:
Frequency of occurrence	<ul style="list-style-type: none"> • Continuous/Intermittent (_____ times a day, a month)/ other_____
Conditions for Occurrence of Problem	<ul style="list-style-type: none"> • Vehicle at stop & ignition switch ON: • When starting: at initial start only/at every start/Other_____ • Vehicle speed: while accelerating/while decelerating/at stop/ while turning/while running at constant speed/ other_____ • Road surface condition: Paved road/rough road/snow-covered road/ other_____ • Chain equipment:
Environmental Condition	<ul style="list-style-type: none"> • Weather: fair/cloudy/rain/snow/other_____ • Temperature: °F (_____ °C)
Diagnostic Trouble Code	<ul style="list-style-type: none"> • First check: _____ Normal code/malfunction code (_____) • Second check after test drive: Normal code/malfunction code (_____)

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Problem symptom confirmation

If symptom in "Customer Questionnaire" is found or reproduced in the vehicle, confirm the symptom is problem or not. (This step should be done with the customer if possible.) Check warning lights related to brake system referring to "EBD Warning Lamp (Brake Warning Lamp) Check", "ABS Warning Lamp Check" and "ESP® Warning Light Check".

DTC check, record and clearance

Perform "DTC Check" procedure, record it and then clear it referring to "DTC Clearance".

Recheck DTC referring to "DTC Check".

When DTC which is recorded at DTC check procedure is detected again after performing DTC clearance, go to "Step 4: ESP® Check: " to proceed the diagnosis.

When DTC which is recorded at DTC check procedure is not indicated anymore after performing DTC clearance, ESP® control module does not perform the system diagnosis, or temporary abnormality may occur, therefore go to "Step 2: Driving Test: " to proceed the diagnosis.

Step 2: Driving Test

Test the vehicle at 40 km/h for more than a minute including left and right turns and check if any trouble symptom (such as ESP® warning light and/or ABS warning lamp) exists.

If the malfunction DTC is confirmed at ignition switch ON, proceed to Step 3.

If the malfunction DTC is not confirmed at ignition switch ON, proceed to Step 6.

Step 3: DTC Check

Recheck DTC referring to “DTC Check”.

Step 4: ESP® Check

According to ESP® Check for the DTC confirmation in Step 3, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator assembly or other part and repair or replace faulty parts.

Step 5: Brakes Diagnosis

Check the parts or system suspected as a possible cause referring to “Brakes Symptom Diagnosis in Section 4A” and based on symptoms appearing on the vehicle (symptom obtained through Steps 1 and 2 and repair or replace faulty parts, if any).

Step 6: Intermittent Problem 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 trouble code recorded in Step 1 to 3.

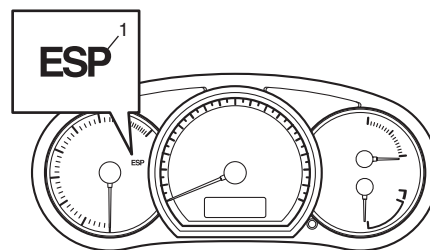
Step 7: Final Confirmation Test

Confirm that the problem symptom has gone and the ESP® is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, clear the DTC once referring to “DTC Clearance” and perform test driving and confirm that no DTC is indicated.

ESP® Warning Light Check

S6RW0H4604002

- 1) Turn ignition switch ON.
- 2) Check that ESP® warning light (1) comes ON for about 2 seconds and then goes off.
If any faulty condition is found, advance to “ESP® Warning Light Does Not Come ON at Ignition Switch ON” or “ESP® Warning Light Comes ON Steady”.

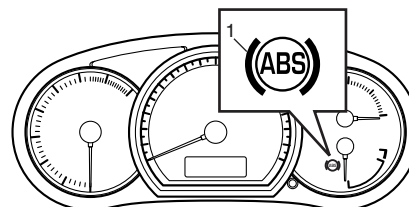


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ABS Warning Lamp Check

S6RW0H4604041

- 1) Turn ignition switch ON.
- 2) Check that ABS warning lamp (1) comes ON for about 2 seconds and then goes off.
If any faulty condition is found, advance to “ABS Warning Lamp Does Not Come ON at Ignition Switch ON” or “ESP® Warning Light Comes ON Steady”.



I4RS0A450007-01

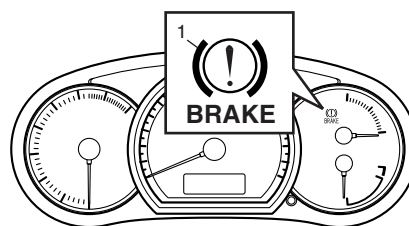
EBD Warning Lamp (Brake Warning Lamp) Check

S6RW0H4604042

NOTE

Perform this check on a level place.

- 1) Turn ignition switch ON with parking brake applied.
- 2) Check that EBD warning lamp (brake warning lamp) (1) is turned ON.
- 3) Release parking brake with ignition switch ON and check that EBD warning lamp (brake warning lamp) goes off.
If it doesn't go off, go to “EBD Warning Lamp (Brake Warning Lamp) Check”.

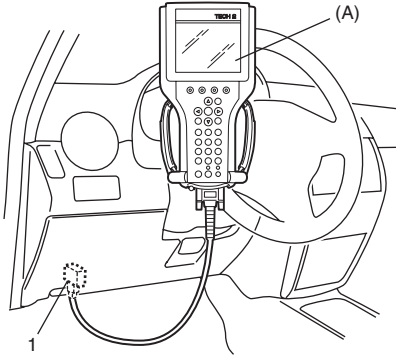


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DTC Check

S6RW0H4604005

- 1) Turn ignition switch to OFF position.
- 2) Connect SUZUKI scan tool to data link connector (1).

Special tool**(A): SUZUKI scan tool**

I5RW0A320008-01

- 3) Turn ignition switch to ON position.
- 4) Read DTC according to instructions displayed on SUZUKI scan tool and print it or write it down. Refer to SUZUKI scan tool operator's manual for further details.

NOTE

If SUZUKI scan tool can not communicate ESP® control module, perform “Serial Data Link Circuit Check”.

- 5) After completing the check, turn ignition switch off and disconnect SUZUKI scan tool from DLC.

DTC Table

S6RW0H4604006

⚠ CAUTION

Be sure to perform “Electronic Stability Program Check” before starting diagnosis.

DTC (displayed on SUZUKI scan tool)	Diagnostic Items		Detecting condition (DTC will be set when detecting)	ABS warning lamp	EBD warning lamp	ESP® warning light
NO DTC	Normal		—	—	—	—
☞ C1016	Brake light switch		<ul style="list-style-type: none"> Master cylinder pressure value and brake light switch signal is disagreed for specified time. Brake light switch signal voltage becomes wrong value for specified time. 	○	—	○
☞ C1017	Lateral G sensor		<ul style="list-style-type: none"> Lateral G sensor signal is out of specified range. Vehicle behavior and lateral G sensor signal is disagreed. 	—	—	○
☞ C1020	Master cylinder pressure sensor power supply failure		Power supply voltage to master cylinder pressure sensor is too high or low in ESP® hydraulic unit / control module assembly.	○	—	○
☞ C1021	RF	Wheel speed sensor circuit	Wheel speed sensor circuit is opened, shorted to power, ground and/or each other circuit.	○	*1	○
☞ C1025	LF					
☞ C1031	RR					
☞ C1035	LR					
☞ C1022	RF	Wheel speed sensor or encoder	<ul style="list-style-type: none"> Wheel speed is different from other wheel speed (vehicle speed) for more than specified time. Abnormal wheel speed sensor signal is detected for more than specified time. 	○	*1	○
☞ C1026	LF					
☞ C1032	RR					
☞ C1036	LR					

4F-13 Electronic Stability Program:

DTC (displayed on SUZUKI scan tool)	Diagnostic Items	Detecting condition (DTC will be set when detecting)	ABS warning lamp	EBD warning lamp	ESP® warning light
☞ C1023	Yaw rate sensor	<ul style="list-style-type: none"> Yaw rate sensor signal is out of range. Vehicle behavior and yaw rate signal is disagreed. 	—	—	○
☞ C1024	Steering angle sensor	<ul style="list-style-type: none"> Steering angle sensor internal defect is detected. Steering angle sensor signal is out of specified range. Vehicle behavior and steering angle sensor signal is disagreed. 	—	—	○
☞ C1027	ESP® OFF switch	<ul style="list-style-type: none"> ESP® OFF switch keeps ON for specified time. ESP® OFF switch circuit is shorted to ground. 	—	—	—
☞ C1028	Master cylinder pressure sensor circuit	<ul style="list-style-type: none"> Master cylinder pressure sensor circuit is opened, shorted to power or ground circuit in ESP® control module. Master cylinder pressure sensor signal is out of specified range in ESP® control module. 	○	—	○
☞ C1033	Wheel speed sensor deviation	<ul style="list-style-type: none"> Two or more wheel speed sensor signals seem to be effected by temporary failure suspicion at the same time. 	○	—	○
		<ul style="list-style-type: none"> Three or more wheel speed sensor signals seem to be effected by temporary failure suspicion at the same time. 	○	○	○
		<ul style="list-style-type: none"> Two wheels or more are controlled by ABS for more than specified time. 	○	○	○
☞ C1034	Yaw rate / G sensor power supply failure	Power supply voltage to yaw rate / G sensor is too high or low.	—	—	○
☞ C1037	Steering angle sensor power supply failure	Power supply voltage to steering angle sensor is too low.	—	—	—
☞ C1038	Steering angle sensor detect rolling counter	ESP® control module rolling counter failure is detected by steering angle sensor.	—	—	○
☞ C1039	Yaw rate / G sensor internal failure	<ul style="list-style-type: none"> Yaw rate / G sensor internal failure is detected. Abnormal signal from yaw rate / G sensor is detected. 	—	—	○
☞ C1040	ESP® continuous operation	<ul style="list-style-type: none"> ESP® control is active for more than specified time. ESP® control module requested pressure reduction or keeping all wheel speed sensor for more than specified time. 	○	—	○

DTC (displayed onSUZUKI scan tool)	Diagnostic Items		Detecting condition (DTC will be set when detecting)	ABS warning lamp	EBD warning lamp	ESP® warning light				
🔧 C1041	RF	Inlet solenoid	<ul style="list-style-type: none">Solenoid valve circuit is opened, shorted to power, ground and/or each valve in ESP® hydraulic unit / control module assembly.Mismatching solenoid output and solenoid monitor is detected.	○	○	○				
🔧 C1045	LF									
🔧 C1051	RR									
🔧 C1055	LR									
🔧 C1042	RF	Outlet solenoid								
🔧 C1046	LF									
🔧 C1052	RR									
🔧 C1056	LR									
🔧 C1043	Cut solenoid	No.1								
🔧 C1044		No.2								
🔧 C1053	Suction solenoid	No.1								
🔧 C1054		No.2								
🔧 C1057	Power supply voltage too high / too low						ESP® control module power supply voltage becomes 7.6 – 9.6 V.	○	—	○
							ESP® control module power supply voltage is lower than 7.6 V.	○	○	○
			ESP® control module power supply voltage is upper than 16.8 V.							
🔧 C1061	Pump motor circuit		<ul style="list-style-type: none">Defective pump motor and/or motor power supply voltage is too low.Pump motor circuit in ESP® control module is opened, shorted to power or ground circuit.	○	○	○				
🔧 C1063	Solenoid valve power supply driver circuit		<ul style="list-style-type: none">Solenoid valve power supply driver circuit is shorted to power circuit in ESP® control module.Solenoid valve power supply driver is stuck to ON position.Output circuit from control unit is opened in ESP® control module.	○	—	○				
			<ul style="list-style-type: none">Solenoid valve power supply driver circuit is opened, shorted to ground circuit in ESP® control module.Solenoid valve power supply voltage is too low.Solenoid valve power supply driver is stuck to OFF position.Output circuit from control unit is shorted in ESP® control module.Mismatching solenoid output and solenoid monitor is detected.	○	○	○				
🔧 C1071	Control module internal defect		ESP® control module internal defect is detected.	*2	*2	*2				
🔧 C1075	Steering angle sensor calibration *3		Missing steering angle sensor calibration point data is detected.	—	—	—				
🔧 C1091	CAN invalid data from ECM		ECM sent invalid signal to ESP® control module.	—	—	○				
🔧 C1096	Yaw rate / G sensor message counter error		Yaw rate / G sensor assembly message counter error is detected by ESP® control module.	—	—	○				

DTC (displayed on SUZUKI scan tool)	Diagnostic Items	Detecting condition (DTC will be set when detecting)	ABS warning lamp	EBD warning lamp	ESP® warning light
U0073	Control module communication bus off	<ul style="list-style-type: none"> Communication is not available with all control modules connected by CAN. CAN communication line is shorted to power, ground and/or each other circuit. 	—	—	○
U0100	Lost communication with ECM / PCM	ECM message data is missing from CAN communication.	—	—	○
U0101	Lost communication with TCM	TCM message data is missing from CAN communication.			
U0114	Lost communication with four-wheel drive clutch control module	4WD control module message data is missing from CAN communication.			
U0123	Lost communication with yaw rate sensor module	Yaw rate / G sensor message data is missing from CAN communication.			
U0126	Lost communication with steering angle sensor module *3	Steering angle sensor message data is missing from CAN communication.			

NOTE

- “○” in ABS warning lamp, EBD warning lamp and ESP® warning lamp column of the above table means warning light is lit when DTC is detected.
- *1: If three or more wheel speed sensor are defective, EBD warning lamp are lit.
- *2: It is irregular whether warning lights can be lit by ESP® control module.
- *3: SLIP indicator light flashes continuously at intervals of 1 Hz.

DTC Clearance

S6RW0H4604007

▲ 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 or using SUZUKI 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 to ON position.
- 3) Erase DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further details.

NOTE

For DTC C1022, C1026, C1032, C1036 and C1061, confirm that ABS warning lamp turns off after performing Step 2 of “Test Driving” under “Electronic Stability Program Check”, and then clear the DTCs.











- 4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector.
- 5) Perform “Driving Test” (Step 2 of “Electronic Stability Program Check”) and “DTC Check” and confirm that NO DTC is displayed on scan tool.

Fail-Safe Table

When any of the following DTC(s) is detected, ESP® system is in fail-safe mode per its DTC and ABS, EBD, TCS / stability functions are deactivated until the resolution is applied.

DTC No.	Fail-safe operation			Fail-safe condition resolvable
	ABS	EBD	TCS / stability	
☞ C1016	X	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
☞ C1017	○	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
☞ C1020	X	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
☞ C1021	X	*1	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
☞ C1025				
☞ C1031				
☞ C1035				
☞ C1022	X	*1	X	When ESP® control module detects the system as normal. And estimated vehicle speed exceeds 14 km/h (9 mile/h), after ignition switch turned OFF to ON.
☞ C1026				
☞ C1032				
☞ C1036				
☞ C1023	○	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
☞ C1024	○	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
☞ C1027 *3	○	○	○	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON. (ESP® OFF switch becomes effective.)
☞ C1028	X	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
☞ C1033	X	*2	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
☞ C1034	○	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
☞ C1037	○	○	○	—
☞ C1038	○	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
☞ C1039	○	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
☞ C1040 *4	X	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
☞ C1041	X	X	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
☞ C1042				
☞ C1043				
☞ C1044				
☞ C1045				
☞ C1046				
☞ C1051				
☞ C1052				
☞ C1053				
☞ C1054				
☞ C1055				
☞ C1056				
☞ C1057	X	*5	X	When ESP® control module detects the system as normal.
☞ C1061	X	○	X	When ESP® control module detects the system as normal. And estimated vehicle speed exceeds 14 km/h (9 mile/h), after ignition switch turned OFF to ON.
☞ C1063	X	*6	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.

4F-17 Electronic Stability Program:

DTC No.	Fail-safe operation			Fail-safe condition resolute
	ABS	EBD	TCS / stability	
 C1071	X	X	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
 C1075	○	○	X	Steering angle sensor calibration completed.
 C1091	○	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
 C1096	○	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
 U0073	○	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
 U0100	○	○	X	When ESP® control module detects the system as normal, after ignition switch turned OFF to ON.
 U0101				
 U0114				
 U0123				
 U0126				

NOTE

- ○: Activated
- X: Deactivated
- *1: If one wheel speed sensor is defective, EBD control function is activated. If two or more wheel speed sensor are defective, EBD control function is deactivated.
- *2: If one or two wheel speed sensor is defective, EBD control function is activated. If three or more wheel speed sensor are defective, EBD control function is deactivated.
- *3: ESP® OFF mode is cancelled and all control functions are activated.
- *4: If the control module requests pressure-decrease or pressure-hold for specified time or longer for all wheels, the state is judged failure, and the emergency brake is applied. The state returns to be normal after stop of the vehicle, if any other failures are not found.
- *5: EBD control function is activated only power supply circuit becomes 7.6 – 9.6 V malfunction.
- *6: EBD control function is activated only solenoid valve power supply driver circuit is shorted to power circuit and/or output circuit from control unit is opened malfunction.

Scan Tool Data

The parameter data below are values measured with the scan tool when the normally operating vehicle is under the following conditions. When taking measurements for comparison by using the scan tool, be sure to check that the vehicle is under the following conditions.

- Apply parking brake and block wheels.
- Ignition switch ON.
- Turn OFF air conditioning (if equipped).
- Set the wheel in straight-ahead position and hands off steering wheel.
- Turn OFF all electric loads (except ignition).
- Check that there is no DTC.

Scan Tool Data		Standards	Condition
🔧 Battery voltage		10.0 – 16.0 V	Ignition switch ON
🔧 RF Wheel speed		0 km/h, 0.0 MPH	Vehicle is in stationary condition
🔧 LF Wheel speed		0 km/h, 0.0 MPH	Vehicle is in stationary condition
🔧 RR Wheel speed		0 km/h, 0.0 MPH	Vehicle is in stationary condition
🔧 LR Wheel speed		0 km/h, 0.0 MPH	Vehicle is in stationary condition
🔧 Brake switch		ON	Brake pedal is depressed
		OFF	Brake pedal is released
🔧 Valve power driver		ON	Ignition switch ON
🔧 Master Cyl Press		0 ± 0.8 MPa	Brake pedal is released
🔧 G sensor (lateral)		0 ± 0.1 G	Vehicle is on the level
🔧 Yaw rate sensor		0 ± 4 deg/s	Vehicle is on the level
🔧 Steering angle Sen		0 ± 3°	Front wheels are in straight-ahead position
🔧 Steering angle Sen		Neutral	Front wheels are in straight-ahead position
🔧 ESP® off state (cont)		ESP® ON	ESP® OFF switch is OFF condition
		ESP® OFF	ESP® OFF switch is ON condition
🔧 Engine speed		0 RPM	Engine at stop with ignition switch turned ON
🔧 Pump motor driver		OFF	Vehicle is in stationary condition
🔧 Inlet solenoid	RF	OFF	Vehicle is in stationary condition
	LF		
	RR		
	LR		
🔧 Outlet solenoid	RF	OFF	Vehicle is in stationary condition
	LF		
	RR		
	LR		
🔧 Cut solenoid	No.1	OFF	Vehicle is in stationary condition
	No.2		
🔧 Suction solenoid	No.1	OFF	Vehicle is in stationary condition
	No.2		
🔧 Brake fluid level		enough	Brake fluid level is filled
		NOT enough	Brake fluid level is lower than minimum level

Scan Tool Data Definition**Battery volt (V)**

Battery Voltage is an analog input signal read by the ESP® control module. Certain ESP® control module functions will be modified if the battery voltage falls below or rises above programmed thresholds.

RF Wheel speed, LF Wheel speed, RR Wheel speed and LR Wheel speed (km/h, MPH)

Wheel speed is ESP® control module internal parameter. It is computed by reference pulses from the wheel speed sensor.

Brake switch (ON, OFF)

This switch signal informs the ESP® control module whether the brake is active or not.

Valve power driver (ON, OFF)

ESP® control module monitor the supply voltage to solenoid valve power supply driver. If the voltage is supplied, ON is displayed. Beside, OFF is displayed.

Master Cyl Press (MPa)

Brake fluid pressure from brake master cylinder.

G sensor (lateral) (G)

Lateral acceleration is measured by yaw rate / G sensor and output to ESP® control module.

Right acceleration is displayed by “-”, Left acceleration is displayed by “+”.

Yaw rate sensor (Deg/s)

Yaw rate sensor is measured by yaw rate / G sensor and output to ESP® control module.

Right turn is displayed by “-”, Left turn is displayed by “+”.

Steering angle Sen (°)

Steering wheel rotation angle is measured by steering angle sensor and output to ESP® control module.

Right turn is displayed by “-”, Left turn is displayed by “+”.

Steering angle Sen (Neutral, Non neutral)

This indicates steering wheel angle measured by steering angle sensor is in straight-ahead or not.

ESP, off state (cont) (ESP, ON, ESP, OFF)

State of ESP® OFF switch.

Engine speed (RPM)

Engine speed computed by reference pulses from ECM.

Pump motor driver (ON, OFF)

This parameter indicates the operational condition of the pump motor driver (transistor).

Inlet solenoid RF, Inlet solenoid LF, Inlet solenoid RR, Inlet solenoid LR (ON, OFF)

This parameter indicates the operational condition of the inlet solenoid valve.

Outlet solenoid RF, Outlet solenoid LF, Outlet solenoid RR, Outlet solenoid LR (ON, OFF)

This parameter indicates the operational condition of the outlet solenoid valve.

Cut solenoid No. 1, Cut solenoid No. 2 (ON, OFF)

This parameter indicates the operational condition of left-front or right-rear commutation solenoid valve (No.1), or right-front or left-rear commutation solenoid valve (No.2).

Suction solenoid No. 1, Suction solenoid No. 2 (ON, OFF)

This parameter indicates the operational condition of left-front or right-rear high pressure switching solenoid valve (No.1), or right-front or left-rear high pressure switching solenoid valve (No.2).

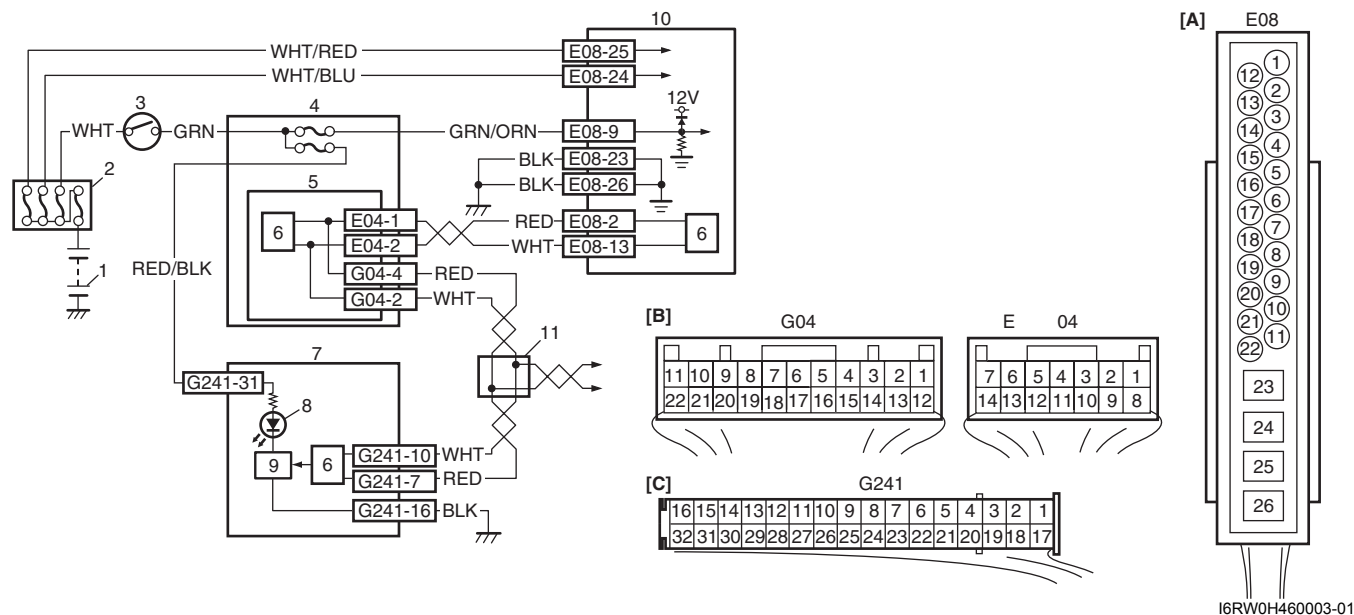
Brake Fluid Level (enough, NOT enough)

This parameter indicates brake fluid level is enough or not by brake fluid level switch.

ESP® Warning Light Does Not Come ON at Ignition Switch ON

S6RW0H4604010

Wiring Diagram



[A]: ESP® control module connector (viewed from terminal side)	3. Ignition switch	8. ESP® warning light
[B]: BCM connector (viewed from harness side)	4. Junction block assembly	9. Lamp driver module
[C]: Combination meter connector (viewed from harness side)	5. BCM (included in junction block assembly)	10. ESP® hydraulic unit / control module assembly
1. Battery	6. CAN driver	11. CAN junction connector
2. Main fuse box	7. Combination meter	

Circuit Description

Operation (ON/OFF) of ESP® warning light is controlled by ESP® control module through light driver module in combination meter.

If ESP® system is in good condition, ESP® control module turns ESP® warning light ON at the ignition switch ON, keeps it ON for 2 seconds and then turns it OFF. If an abnormality in the system is detected, ESP® warning light is turned ON continuously by ESP® control module. Also, it is turned ON continuously by light driver module when the connector of ESP® control module is disconnected.

Troubleshooting

Step	Action	Yes	No
1	Warning light check 1) Turn ignition switch to ON position. <i>Do other warning lights come ON?</i>	Substitute a known-good combination meter and recheck. If warning light remains OFF, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Go to Step 2.
2	Fuse check <i>Is circuit fuse for combination meter in good condition?</i>	Go to Step 3.	Replace fuse and check for short circuit to ground.

4F-21 Electronic Stability Program:

Step	Action	Yes	No
3	Combination meter power source circuit check 1) Remove combination meter with ignition switch turned OFF. 2) Check for proper connection to G241-31 and G241-16 wire of combination meter connector. 3) If OK then turn ON ignition switch and measure voltage at G241-31 wire of combination meter connector and vehicle body ground. <i>Is it 10 – 14 V?</i>	Go to Step 4.	Repair power source circuit for combination meter.
4	Combination meter ground circuit check 1) Measure resistance between G241-16 wire of combination meter connector and vehicle body ground. <i>Is resistance less than 2 Ω?</i>	Substitute a known-good combination meter and recheck.	“BLK” circuit open or high resistance.

ESP® Warning Light Comes ON Steady

S6RW0H4604043

Wiring Diagram

Refer to “Wiring Diagram” under “ESP® Warning Light Does Not Come ON at Ignition Switch ON”.

Circuit Description

Refer to “Circuit Description” under “ESP® Warning Light Does Not Come ON at Ignition Switch ON”.

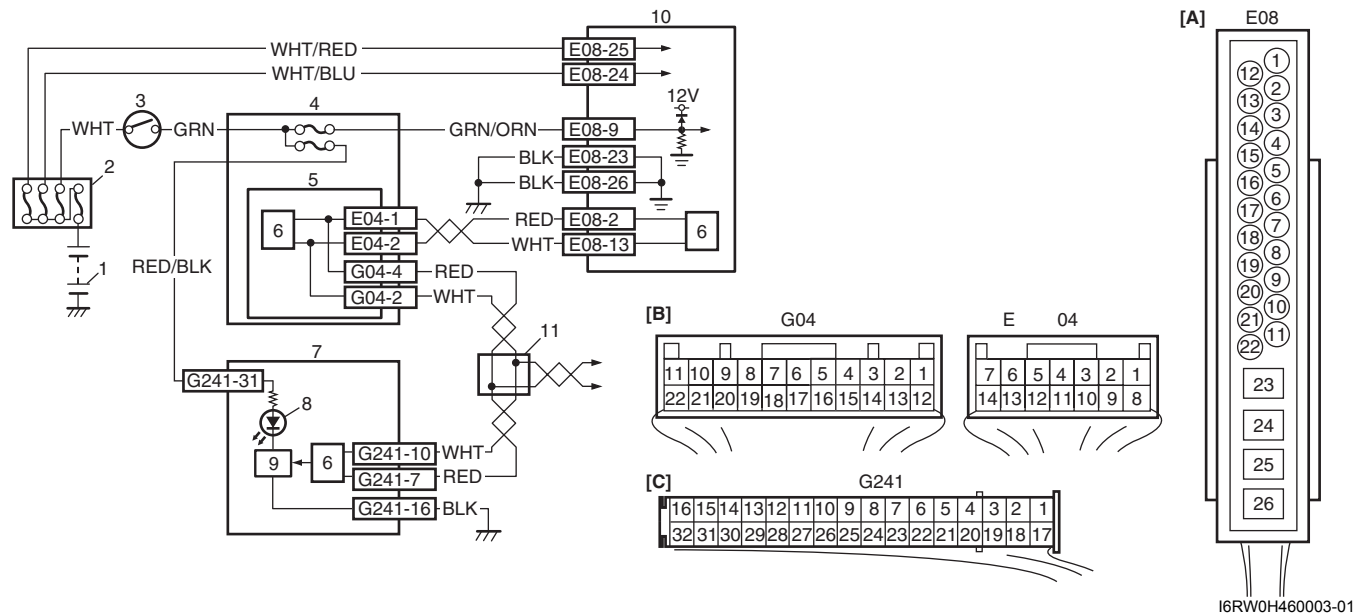
Troubleshooting

Step	Action	Yes	No
1	DTC check 1) Perform diagnostic trouble code check. <i>Is there any DTC(s)?</i>	Go to “Electronic Stability Program Check”.	Go to Step 2.
2	ESP® hydraulic unit / control module assembly power and ground circuit check 1) Check that ESP® hydraulic unit / control module assembly power supply circuit and ground circuit is in good condition referring to “ESP® Hydraulic Unit / Control Module Assembly Power and Ground Circuit Check”. <i>Are check results OK?</i>	Go to Step 3.	Repair ESP® hydraulic unit / control module assembly power or ground circuit.
3	CAN communication line circuit check 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check for proper connection to CAN communication line wire. 4) If OK then check CAN communication line circuit between control modules for open, short and high resistance. <i>Is each CAN communication line circuit in good condition?</i>	Substitute a known-good combination meter and recheck. If warning light remains ON, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Repair circuit and recheck.

ABS Warning Lamp Does Not Come ON at Ignition Switch ON

S6RW0H4604044

Wiring Diagram



[A]: ESP® control module connector (viewed from terminal side)	3. Ignition switch	8. ABS warning lamp
[B]: BCM connector (viewed from harness side)	4. Junction block assembly	9. Lamp driver module
[C]: Combination meter connector (viewed from harness side)	5. BCM (included in junction block assembly)	10. ESP® hydraulic unit / control module assembly
1. Battery	6. CAN driver	11. CAN junction connector
2. Main fuse box	7. Combination meter	

Circuit Description

Operation (ON/OFF) of ABS warning lamp is controlled by ESP® control module through lamp driver module in combination meter.

If ABS is in good condition, ESP® control module turns ABS warning lamp ON at the ignition switch ON, keeps it ON for 2 seconds and then turns it OFF. If an abnormality in the system is detected, ABS warning lamp is turned ON continuously by ESP® control module. Also, it is turned ON continuously by lamp driver module when the connector of ESP® control module is disconnected.

Troubleshooting

Refer to “Troubleshooting” under “ESP® Warning Light Does Not Come ON at Ignition Switch ON”.

ABS Warning Lamp Comes ON Steady

S6RW0H4604045

Wiring Diagram

Refer to “Wiring Diagram” under “ABS Warning Lamp Does Not Come ON at Ignition Switch ON”.

Circuit Description

Refer to “Circuit Description” under “ABS Warning Lamp Does Not Come ON at Ignition Switch ON”.

Troubleshooting

Refer to “Troubleshooting” under “ESP® Warning Light Comes ON Steady”.

The information of parking brake switch and brake fluid level are transmitted from BCM to lamp driver module in combination meter through CAN communication line.

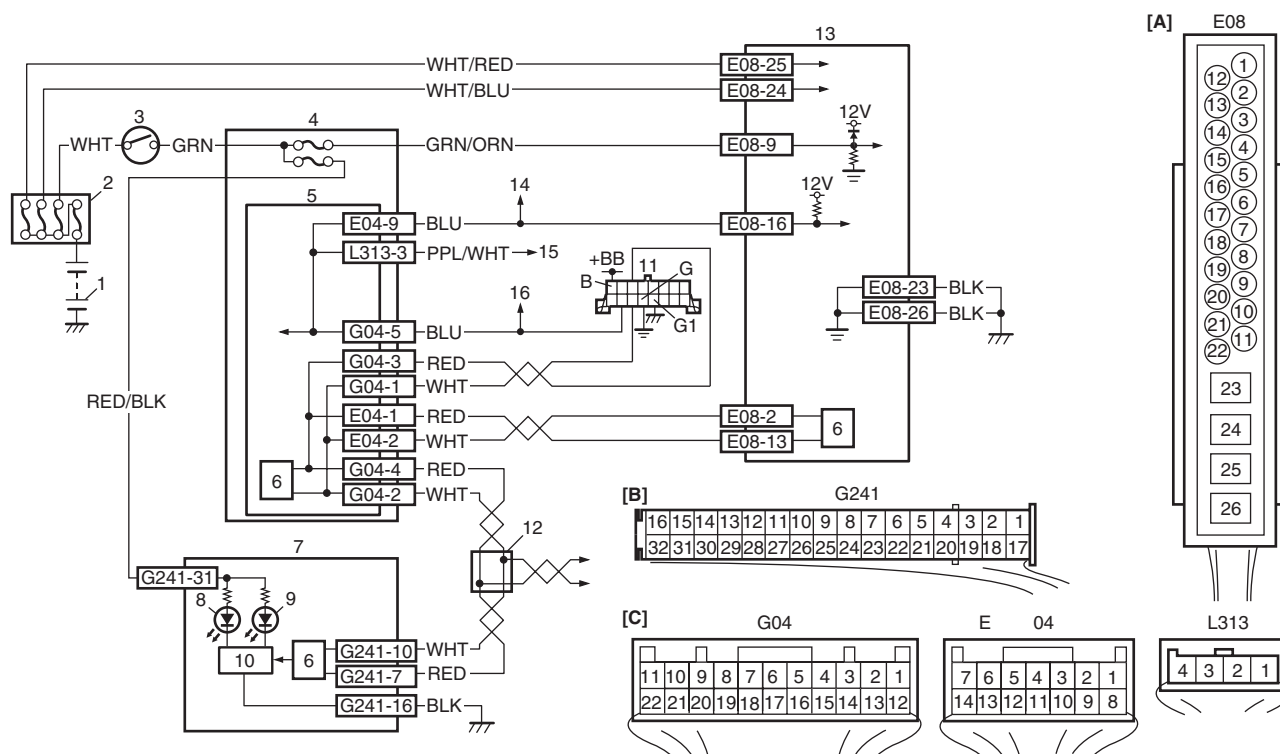
Troubleshooting

Step	Action	Yes	No
1	Parking brake and brake fluid level check 1) Make sure that: <ul style="list-style-type: none"> • Parking brake is completely released. • Brake fluid level is upper than the minimum level. <i>Are the check results OK?</i>	Go to Step 2.	Release parking brake completely and/or replenish brake fluid.
2	ABS warning lamp operation check 1) Turn ignition switch to ON position. <i>Does ABS warning lamp come on steady?</i>	Perform "ABS Warning Lamp Comes ON Steady" previously outlined.	Go to Step 3.
3	Parking brake switch circuit and brake fluid level switch circuit check 1) Release parking brake completely, and replenish brake fluid. 2) Disconnect BCM connectors with ignition switch turned OFF. 3) Measure resistance between each terminal of "E04-5", "L01-6" and vehicle body ground. <i>Are resistance $\infty\Omega$?</i>	Go to Step 4.	Check each applicable circuit for short to vehicle body ground. If OK then check parking brake switch and/or brake fluid level switch.
4	DTC check of BCM 1) Connect scan tool to data link connector with ignition switch turned OFF. 2) Turn ignition switch to ON position and check DTC of BCM. <i>Is there DTC U0073?</i>	Go to "DTC U0073 (No. 0073): Control Module Communication Bus Off in Section 10B in related manual".	Go to Step 5.
5	CAN communication line circuit check 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check for proper connection to CAN communication line wire. 4) If OK then check CAN communication line circuit between control modules for open, short and high resistance. <i>Is each CAN communication line circuit in good condition?</i>	Substitute a known-good combination meter and recheck. If EBD warning lamp remains OFF, substitute a known-good BCM and/or ESP® hydraulic unit / control module assembly and recheck.	Repair CAN communication line circuit.

Serial Data Link Circuit Check

S6RW0H4604047

Wiring Diagram



I6RW0H460005-01

[A]: ESP® control module connector (viewed from terminal side)	5. BCM (included in junction block assembly)	12. CAN junction connector
[B]: Combination meter connector (viewed from harness side)	6. CAN driver	13. ESP® hydraulic unit / control module assembly
[C]: BCM connector (viewed from harness side)	7. Combination meter	14. To TCM (A/T model), P/S control module
1. Battery	8. ESP® warning light	15. To SDM
2. Main fuse box	9. ABS warning lamp	16. To HVAC control module (auto A/C model) and 4WD control module
3. Ignition switch	10. Lamp driver module	
4. Junction block assembly	11. Data link connector (DLC)	

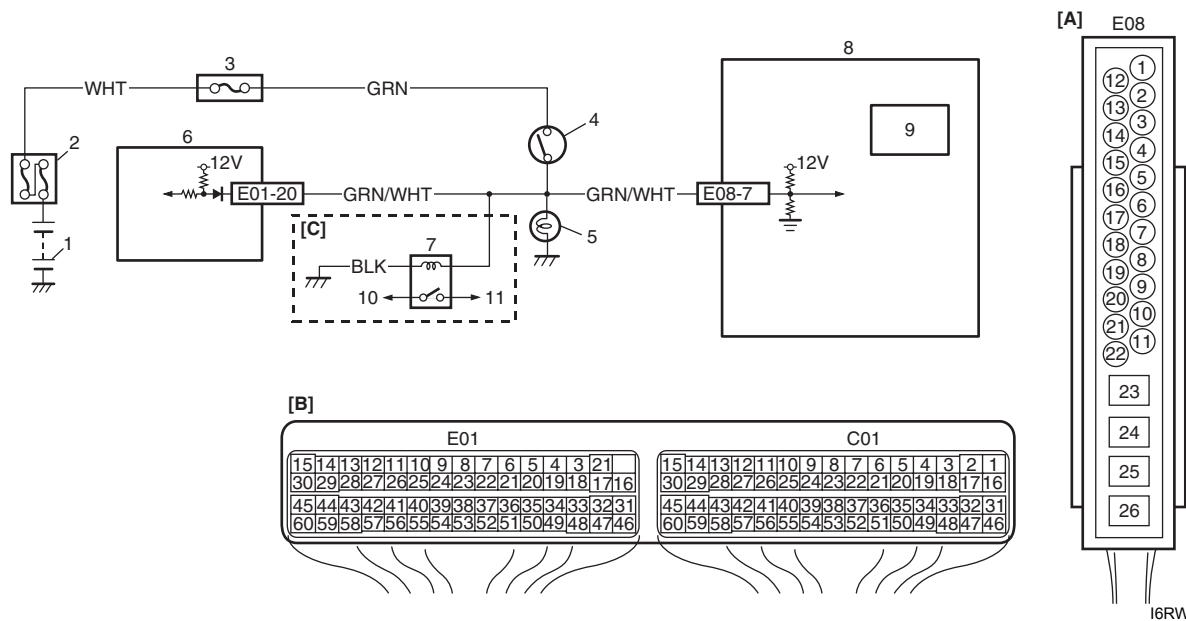
Troubleshooting

Step	Action	Yes	No
1	Scan tool communication check <i>Can scan tool communicate with BCM?</i>	Go to Step 2.	Go to Step 3.
2	ESP® hydraulic unit / control module assembly power and ground circuit check 1) Check that ESP® hydraulic unit / control module assembly power supply circuit and ground circuit is in good condition referring to "ESP® Hydraulic Unit / Control Module Assembly Power and Ground Circuit Check". <i>Are check results OK?</i>	Go to Step 3.	Repair ESP® hydraulic unit / control module assembly power or ground circuit.
3	Data link connector power source circuit check 1) Disconnect scan tool from data link connector. 2) Check for proper connection to scan tool. 3) If OK then turn ignition switch to ON position, and measure voltage between terminal B of data link connector and vehicle body ground. <i>Is voltage 10 – 12 V?</i>	Go to Step 4.	Terminal B circuit open or shorted to ground.
4	Data link connector ground circuit check 1) Turn ignition switch to OFF position, and measure resistance between the following terminals: • Terminal G of data link connector and vehicle body ground. • Terminal G1 of data link connector and vehicle body ground. <i>Are resistance less than 2Ω?</i>	Go to Step 5.	Terminal G and/or G1 wire circuit open or high resistance.
5	Serial communication circuit check 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by serial data circuit. 3) Check proper connection at serial data circuit terminals. 4) If OK, then check for high resistance, open or short to power circuit or ground in serial data circuit. <i>Is check result in good condition?</i>	Go to Step 6.	Repair serial data circuit and recheck.
6	CAN communication line circuit check 1) Disconnect connectors of all control modules communicating by means of CAN. 2) Check for proper connection to CAN communication line wire. 3) If OK then check CAN communication line circuit between control modules for open, short and high resistance. <i>Is each CAN communication line circuit in good condition?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly. If scan tool can not communicate still, substitute a known-good BCM and recheck.	Repair CAN communication line circuit and recheck.

DTC C1016: Brake Light Switch

S6RW0H4604016

Wiring Diagram



[A]: ESP® control module connector (viewed from terminal side)	3. Junction block assembly	8. ESP® hydraulic unit / control module assembly
[B]: ECM connector (viewed from harness side)	4. Brake light switch	9. Master cylinder pressure sensor
[C]: A/T model	5. Brake light	10. To shift lever
1. Battery	6. ECM	11. To transmission range sensor and TCM
2. Main fuse box	7. Shift lock relay (A/T model)	

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
<ul style="list-style-type: none"> Master cylinder pressure behavior and brake light switch signal is disagreed for specified time. Brake light switch signal voltage becomes 4.8 – 8.0 V for specified time. 	<ul style="list-style-type: none"> Brake light circuit Brake light switch ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	Was “Electronic Stability Program Check” performed?	Go to Step 2.	Go to “Electronic Stability Program Check”.
2	DTC check for ECM 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ECM. <i>Is DTC P0504 detected?</i>	Go to “DTC P0504: Brake Switch “A”/”B” Correlation in Section 1A in related manual”.	Go to Step 3.
3	Check brake light switch circuit 1) Check brake light, brake light (brake pedal) switch and their circuit referring to “Brake Light Symptom Diagnosis in Section 9B in related manual”. <i>Are they in good condition?</i>	Go to Step 4.	Repair or replace.
4	Check brake light switch circuit 1) Disconnect connectors from ECM and ESP® control module. 2) Remove shift lock relay. (A/T model) 3) Remove all of brake light bulb. 4) Check for proper connection to “E01-20” wire of ECM connector. 5) If connections are OK, check brake light switch circuit for the following. <ul style="list-style-type: none"> Resistance of “GRN/WHT” wire terminal of brake light switch between brake light switch connector and ECM connector is less than 1 Ω (continuity check) Resistance between “GRN/WHT” wire terminal of brake light switch connector and vehicle body ground is infinity (ground short check) Voltage of between “GRN/WHT” wire terminal of stop switch connector and vehicle body ground is 0 V with ignition switch tuned ON (power short check) <i>Are they in good condition?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck. If DTC C1016 is still detected, substitute a known-good ECM and/or check shift lock relay (A/T model).	Repair or replace defective wire.

DTC C1017 / C1023: Lateral G Sensor / Yaw Rate Sensor

S6RW0H4604017

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
C1017: <ul style="list-style-type: none"> Lateral G sensor signal is out of specified range. Vehicle behavior and lateral G sensor signal is disagreed. C1023: <ul style="list-style-type: none"> Yaw rate sensor signal is out of range. Vehicle behavior and yaw rate signal is disagreed. 	<ul style="list-style-type: none"> Yaw rate / G sensor ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	DTC check for ESP® 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. <i>Are DTC U0073 and/or U0123 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	Check yaw rate / G sensor 1) Check yaw rate / G sensor referring to "Yaw Rate / G Sensor On-Vehicle Inspection". <i>Is it good condition?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Substitute a known-good yaw rate / G sensor and recheck.

DTC C1020 / C1028: Master Cylinder Pressure Sensor Power Supply Failure / Circuit

S6RW0H4604018

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
DTC C1020: Power supply voltage to master cylinder pressure sensor is too high or low in ESP® hydraulic unit / control module assembly. DTC C1028: <ul style="list-style-type: none"> Master cylinder pressure sensor circuit is opened, shorted to power or ground circuit in ESP® control module. Master cylinder pressure sensor signal is out of specified range in ESP® control module. 	<ul style="list-style-type: none"> ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	Check ESP® hydraulic unit / control module assembly power and ground circuit 1) Check that ESP® hydraulic unit / control module assembly power supply circuit and ground circuit is in good condition referring to "ESP® Hydraulic Unit / Control Module Assembly Power and Ground Circuit Check". <i>Are check results OK?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Repair ESP® hydraulic unit / control module assembly power or ground circuit.

- The vehicle was driven with parking brake pulled.
- Wheel spin occurred while driving.
- Wheel(s) was turned while the vehicle was jacked up.
- The vehicle was stuck.

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	Check tire condition 1) Check that tire pressure is specifications. <i>Are they in good condition?</i>	Go to Step 3.	Replace tire or adjust tire pressure and recheck.
3	Wheel speed sensor circuit check 1) Disconnect ESP® hydraulic unit / control module connector and applicable wheel speed sensor connector with ignition switch turned OFF. 2) Check for proper connection to ESP® hydraulic unit / control module connector at applicable terminals and terminals of applicable wheel speed sensor. 3) If OK then check applicable wheel speed sensor circuit for open, short and high resistance. <i>Is each applicable wheel speed sensor circuit in good condition?</i>	Go to Step 4.	Repair circuit and recheck.
4	Wheel speed sensor check 1) Inspection applicable wheel speed sensor referring to "Front and Rear Wheel Speed Sensor Inspection in Section 4E in related manual". <i>Is it in good condition?</i>	Go to Step 5.	Clean or replace.
5	Wheel speed sensor encoder check 1) Inspection applicable wheel speed sensor encoder referring to "Front Wheel Speed Sensor Encoder On-Vehicle Inspection in Section 4E in related manual" and/or "Rear Wheel Speed Sensor Encoder On-Vehicle Inspection in Section 4E in related manual". <i>Is it in good condition?</i>	Go to Step 6.	Clean or replace wheel hub assembly.
6	Wheel speed sensor signal check 1) Inspection applicable wheel speed sensor referring to "Front and Rear Wheel Speed Sensor On-Vehicle Inspection in Section 4E in related manual". <i>Is it in good condition?</i>	Substitute a known-good wheel hub assembly and recheck. If DTC detected, substitute a known-good ESP® hydraulic unit / control module and recheck.	Replace wheel speed sensor and recheck.

DTC C1024: Steering Angle Sensor

S6RW0H4604020

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
<ul style="list-style-type: none">Steering angle sensor internal defect is detected.Steering angle sensor signal is out of specified range.Vehicle behavior and steering angle sensor signal is disagreed.	<ul style="list-style-type: none">CAN communication circuitSteering angle sensorESP® control module

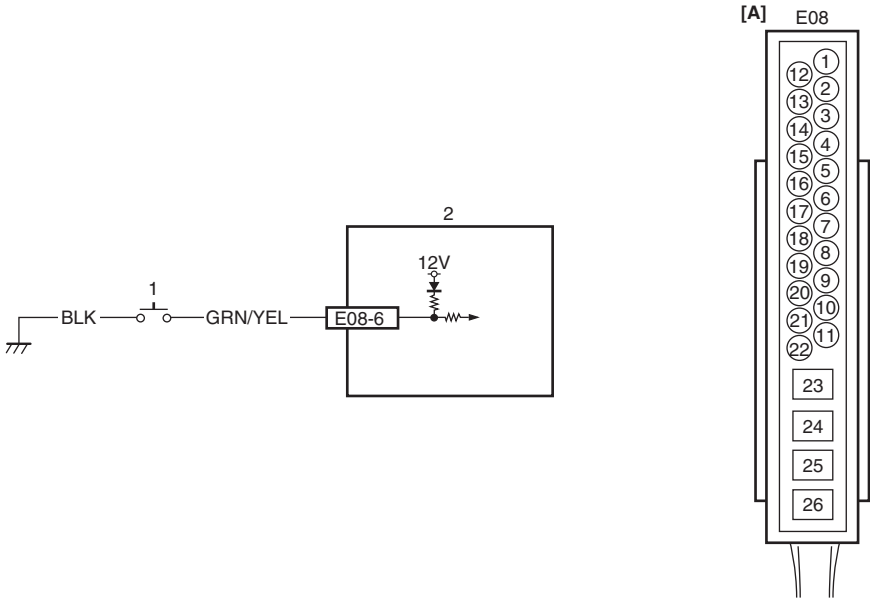
DTC Troubleshooting

Step	Action	Yes	No
1	Was “Electronic Stability Program Check” performed?	Go to Step 2.	Go to “Electronic Stability Program Check”.
2	DTC check for ESP® 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. <i>Are DTC U0073 and/or U0126 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	Check steering angle sensor 1) Check steering angle sensor referring to “Steering Angle Sensor On-Vehicle Inspection”. <i>Is it good condition?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Substitute a known-good steering angle sensor and recheck.

DTC C1027: ESP® OFF Switch

S6RW0H4604021

Wiring Diagram



I6RW0H460008-01

[A]: ESP® control module connector (viewed from terminal side)	1. ESP® OFF Switch	2. ESP® hydraulic unit control module assembly
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4F-33 Electronic Stability Program:

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
<ul style="list-style-type: none">• ESP® OFF switch keeps ON for 60 seconds.• ESP® OFF switch circuit is shorted to ground.	<ul style="list-style-type: none">• ESP® OFF switch• ESP® OFF switch circuit• ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	Check ESP® OFF switch 1) Turn ignition switch to OFF position. 2) Remove ESP® OFF switch referring to "ESP® OFF Switch Removal and Installation". 3) Check for proper connection at each terminal of ESP® OFF switch. 4) If OK, then check ESP® OFF switch referring to "ESP® OFF Switch Inspection". <i>Is it good condition?</i>	Go to Step 3.	Replace ESP® OFF switch.
3	Check ESP® OFF switch circuit 1) Disconnect ESP® control module connector. 2) Check for proper connection to ESP® control module connector at "E08-6" terminal. 3) If OK, then check resistance between connector terminal "E08-6" and vehicle body ground. <i>Is resistance infinity?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	"GRN/YEL" wire circuit is shorted to ground.

DTC C1033: Wheel Speed Sensor Deviation

S6RW0H4604022

Wiring Diagram

Refer to "DTC C1021 / C1022 / C1025 / C1026 / C1031 / C1032 / C1035 / C1036: Wheel Speed Sensor Circuit / Sensor or Encoder".

DTC Detecting Condition and Trouble Area

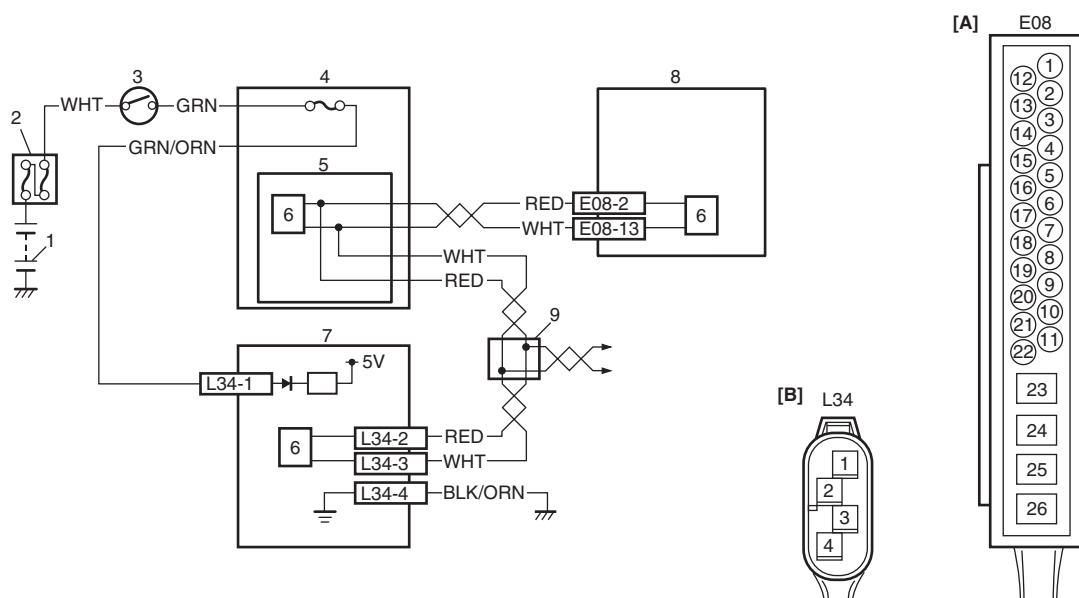
DTC Detecting Condition	Trouble Area
<ul style="list-style-type: none">• Two or more sensor signals seem to be effected by temporary failure suspicion at the same time.• Two wheels or more are controlled by ABS for more than specified time.	<ul style="list-style-type: none">• Wheel speed sensor• Wheel speed sensor circuit• Wheel encoder• ESP® control module• Tire (flat tire)

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	Check DTC for ESP® 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. <i>Is DTC C1021, C1022, C1025, C1026, C1031, C1032, C1035 and/or C1036 detected together?</i>	Go to "DTC C1021 / C1022 / C1025 / C1026 / C1031 / C1032 / C1035 / C1036: Wheel Speed Sensor Circuit / Sensor or Encoder" and recheck.	Go to Step 3.
3	Check tire condition 1) Check that tire pressure is specifications. <i>Are they in good condition?</i>	Go to Step 3.	Replace tire or adjust tire pressure and recheck.
4	Wheel speed sensor circuit check 1) Disconnect ESP® hydraulic unit / control module connector and all wheel speed sensor connectors with ignition switch turned OFF. 2) Check for proper connection to ESP® hydraulic unit / control module connector and terminals of wheel speed sensor. 3) If OK then check all wheel speed sensors circuit for open, short and high resistance. <i>Are wheel speed sensor circuits in good condition?</i>	Go to Step 5.	Repair circuit and recheck.
5	Wheel speed sensor check 1) Inspection all wheel speed sensors referring to "Front and Rear Wheel Speed Sensor Inspection in Section 4E in related manual". <i>Are they in good condition?</i>	Go to Step 6.	Clean or replace.
6	Wheel speed sensor encoder check 1) Inspection all wheel speed sensor encoders referring to "Front Wheel Speed Sensor Encoder On-Vehicle Inspection in Section 4E in related manual" and/or "Rear Wheel Speed Sensor Encoder On-Vehicle Inspection in Section 4E in related manual". <i>Are they in good condition?</i>	Go to Step 7.	Clean or replace wheel hub assembly.
7	Wheel speed sensor signal check 1) Inspection all wheel speed sensors referring to "Front and Rear Wheel Speed Sensor On-Vehicle Inspection in Section 4E in related manual". <i>Are they in good condition?</i>	Substitute a known-good wheel hub assembly and recheck. If DTC detected, substitute a known-good ESP® hydraulic unit / control module and recheck.	Replace wheel speed sensor and recheck.

DTC C1034 / C1039: Yaw Rate / G Sensor Power Supply Failure / Internal Failure

S6RW0H4604023

Wiring Diagram

I6RW0H460009-01

[A]: ESP® control module connector (viewed from terminal side)	3. Ignition switch	7. Yaw rate / G sensor
[B]: Yaw Rate / G Sensor connector (viewed from harness side)	4. Junction block assembly	8. ESP® hydraulic unit control module assembly
1. Battery	5. BCM (included in junction block assembly)	9. CAN junction connector
2. Main fuse box	6. CAN driver	

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
DTC C1034: Power supply voltage of yaw rate / G sensor is too high or low. DTC C1039: • Yaw rate / G sensor internal failure is detected. • Abnormal signal from yaw rate / G sensor is detected.	• Yaw Rate / G Sensor power supply circuit • Yaw Rate / G Sensor • ESP® control module

DTC Troubleshooting

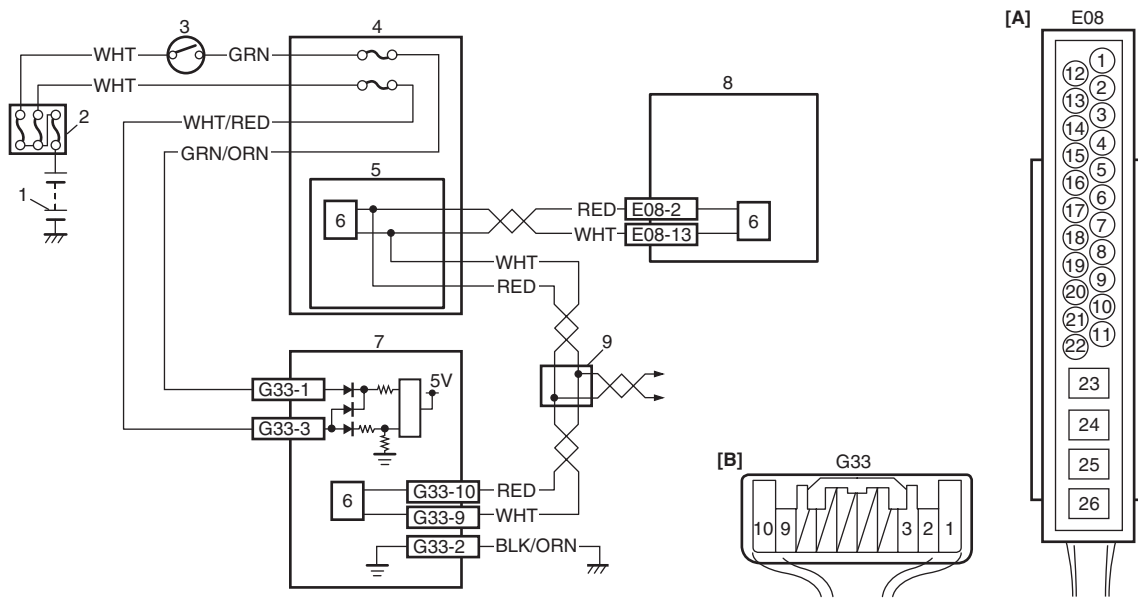
Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	DTC check for ESP® 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. Are DTC U0073 and/or U0123 detected?	Go to applicable DTC diag. flow.	Go to Step 3.
3	Check fuse Is circuit fuse for yaw rate / G sensor in good condition?	Go to Step 4.	Replace fuse and check for short circuit to ground.

Step	Action	Yes	No
4	Check yaw rate / G sensor power supply circuit 1) Turn ignition switch to OFF position. 2) Disconnect yaw rate / G sensor connector. 3) Check for proper connection to yaw rate / G sensor connector terminals at "L34-1" and "L34-4". 4) If OK, then measure voltage between connector terminal "L34-1" and vehicle body ground with ignition switch turned ON. <i>Is it 10 – 14 V?</i>	Go to Step 5.	"GRN/ORN" wire circuit open or high resistance.
5	Check yaw rate / G sensor ground circuit 1) Measure resistance between connector terminal "L34-4" and vehicle body ground with ignition switch turned OFF. <i>Is resistance less than 2 Ω?</i>	Substitute a known-good yaw rate / G sensor and recheck. If DTC C1034 and/or C1039 is still detected, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	"BLK/ORN" wire circuit open or high resistance.

DTC C1037: Steering Angle Sensor Power Supply Failure

S6RW0H4604024

Wiring Diagram



I6RW0H460010-01

[A]: ESP® control module connector (viewed from terminal side)	3. Ignition switch	7. Steering angle sensor
[B]: Steering angle sensor connector (viewed from harness side)	4. Junction block assembly	8. ESP® hydraulic unit / control module assembly
1. Battery	5. BCM (included in junction block assembly)	9. CAN junction connector
2. Main fuse box	6. CAN driver	

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Power supply voltage to steering angle sensor is too low.	<ul style="list-style-type: none"> Steering angle sensor power supply circuit Steering angle sensor ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	DTC check for ESP® 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. <i>Are DTC U0073 and/or U0126 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	Check fuse 1) Check circuit fuses for steering angle sensor and its circuit. <i>Is it good condition?</i>	Go to Step 4.	Replace fuse and check for short circuit to ground.
4	Check steering angle sensor power supply circuit 1) Turn ignition switch to OFF position. 2) Disconnect steering angle sensor connector. 3) Check for proper connection to steering angle sensor connector terminals at "G33-2" and "G33-3". 4) If OK, then measure voltage between connector terminal "G33-3" and vehicle body ground. <i>Is it 10 – 14 V?</i>	Go to Step 4.	"WHT/RED" wire circuit open.
5	Check steering angle sensor ground circuit 1) Turn ignition switch to OFF position. 2) Measure resistance between connector terminal "G33-2" and vehicle body ground. <i>Is resistance less than 2 Ω?</i>	Substitute a known-good Steering angle sensor and recheck. If DTC C1037 is still detected, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	"BLK/ORN" wire circuit open or high resistance.

DTC C1038: Steering Angle Sensor Detect Rolling Counter

S6RW0H4604025

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
ESP® control module rolling counter failure is detected by steering angle sensor.	<ul style="list-style-type: none"> CAN communication circuit Steering angle sensor ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	Check DTC for ESP® 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC. <i>Is there any DTC(s) other than C1038 and C1096?</i>	Go to applicable DTC diag. flow.	Substitute a known-good steering angle sensor and recheck. If DTC C1038 is still detected, substitute a known-good ESP® hydraulic unit control module assembly and recheck.

4F-39 Electronic Stability Program:

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
DTC C1041, C1042, C1043, C1044, C1045, C1046, C1051, C1052, C1053, C1054, C1055, C1056 <ul style="list-style-type: none">Solenoid valve circuit is opened, shorted to power, ground and/or each valve in ESP® hydraulic unit / control module assembly.Mismatching solenoid output and solenoid monitor is detected.	<ul style="list-style-type: none">ESP® control module

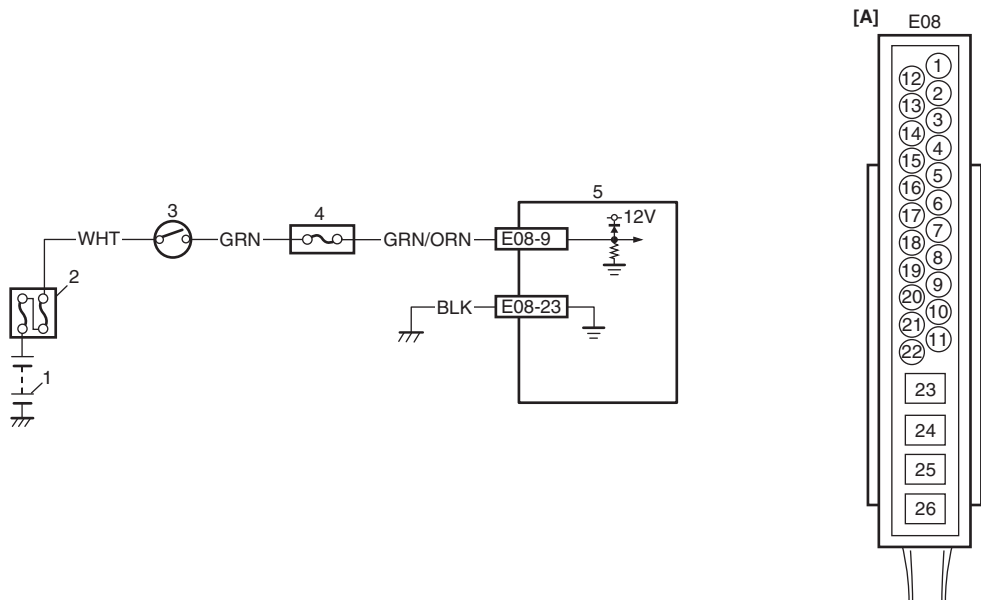
DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	ESP® hydraulic unit / control module power source circuit check 1) Turn ignition switch to OFF position. 2) Disconnect ESP® control module connector. 3) Check for proper connection to ESP® control module connector at terminal "E08-24" and "E08-23". 4) If OK, then measure voltage between terminal "E08-24" of module connector and "E08-23". <i>Is it 10 – 14 V?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	"WHT/BLU" or "BLK" circuit open or high resistance.

DTC C1057: Power Supply Voltage Too High / Too Low

S6RW0H4604048

Wiring Diagram



I6RW0H460012-01

[A]: ESP® control module connector (viewed from terminal side)	2. Main fuse box	4. Junction block assembly
1. Battery	3. Ignition switch	5. ESP® hydraulic unit / control module assembly

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
ESP® control module power supply voltage is too high or too low.	<ul style="list-style-type: none">ESP® control module power supply circuitESP® control module

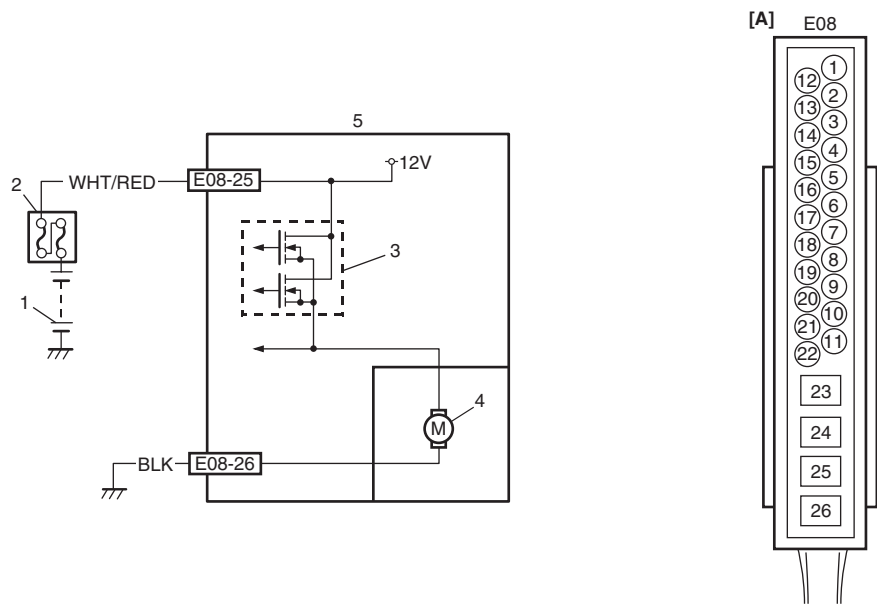
DTC Troubleshooting

Step	Action	Yes	No
1	Was “Electronic Stability Program Check” performed?	Go to Step 2.	Go to “Electronic Stability Program Check”.
2	Check ESP® hydraulic unit / control module assembly power and ground circuit 1) Check that ESP® hydraulic unit / control module assembly power supply circuit and ground circuit is in good condition referring to “ESP® Hydraulic Unit / Control Module Assembly Power and Ground Circuit Check”. <i>Are check results OK?</i>	Go to Step 3.	Repair ESP® hydraulic unit / control module assembly power or ground circuit.
3	ESP® hydraulic unit / control module power source voltage check 1) Measure battery voltage with engine running at 3000 rpm. <i>Is voltage 15 V or less?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Check charging system referring to “Generator Test (Overcharged Battery Check) in Section 1J in related manual”.

DTC C1061: Pump Motor Circuit

S6RW0H4604029

Wiring Diagram



I6RW0H460013-01

[A]: ESP® control module connector (viewed from terminal side)	2. Main fuse box	4. Pump motor
1. Battery	3. Pump motor driver (transistor)	5. ESP® hydraulic unit / control module assembly

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
<ul style="list-style-type: none">Defective pump motor and/or motor power supply voltage is too low.Pump motor circuit in ESP® control module is opened, shorted to power or ground circuit.	<ul style="list-style-type: none">Pump Motor and/or Motor Driver power supply circuitESP® control module

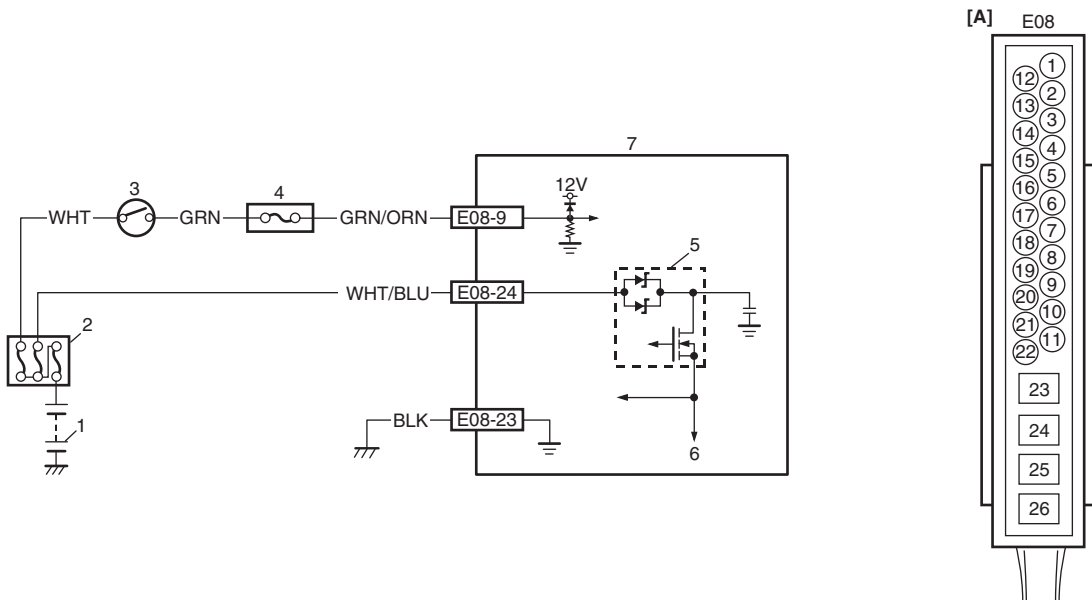
DTC Troubleshooting

Step	Action	Yes	No
1	Was “Electronic Stability Program Check” performed?	Go to Step 2.	Go to “Electronic Stability Program Check”.
2	Check ESP® hydraulic unit / control module assembly power and ground circuit 1) Check that ESP® hydraulic unit / control module assembly power supply circuit and ground circuit is in good condition referring to “ESP® Hydraulic Unit / Control Module Assembly Power and Ground Circuit Check”. Are check results OK?	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Repair ESP® hydraulic unit / control module assembly power or ground circuit.

DTC C1063: Solenoid Valve Power Supply Driver Circuit

S6RW0H4604030

Wiring Diagram



I6RW0H460014-01

[A]: ESP® control module connector (viewed from terminal side)	4. Junction block assembly
1. Battery	5. Solenoid valve power supply driver
2. Main fuse box	6. To solenoid valve
3. Ignition switch	7. ESP® hydraulic unit control module assembly

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
<ul style="list-style-type: none">Solenoid valve power supply driver circuit is opened, shorted to power and ground circuit in ESP® control module.Solenoid valve power supply voltage is too low.Solenoid valve power supply driver is stuck to ON or OFF position.Output circuit from control unit is opened or shorted in ESP® control module.Mismatching solenoid output and solenoid monitor is detected.	<ul style="list-style-type: none">Solenoid valve power supply circuitESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	Check ESP® hydraulic unit / control module assembly power and ground circuit 1) Check that ESP® hydraulic unit / control module assembly power supply circuit and ground circuit is in good condition referring to "ESP® Hydraulic Unit / Control Module Assembly Power and Ground Circuit Check". Are check results OK?	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Repair ESP® hydraulic unit / control module assembly power or ground circuit.

DTC C1071: Control Module Internal Defect

S6RW0H4604049

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
ESP® control module internal defect is detected.	• ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	Check ESP® hydraulic unit / control module assembly power and ground circuit 1) Check that ESP® hydraulic unit / control module assembly power supply circuit and ground circuit is in good condition referring to "ESP® Hydraulic Unit / Control Module Assembly Power and Ground Circuit Check". <i>Are check results OK?</i>	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Repair ESP® hydraulic unit / control module assembly power or ground circuit.

DTC C1075: Steering Angle Sensor Calibration

S6RW0H4604032

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
C1075: Missing steering angle sensor calibration point data is detected.	• Steering angle sensor • Steering angle sensor calibration is incomplected • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	DTC check for ESP® 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. <i>Is there any DTC(s) other than C1075?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	Check sensor calibration 1) Calibrate steering angle sensor referring to "Sensor Calibration". 2) Clear all DTC(s) and check DTC for ESP®. <i>Is DTC C1075 still detected?</i>	Substitute a known-good steering angle sensor and recheck. If DTC C1075 is still detected, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Calibration was incomplected.

DTC C1091: CAN Invalid Data from ECM

S6RW0H4604033

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
ECM sent invalid signal to ESP® control module.	<ul style="list-style-type: none"> • Engine control system • ECM • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	DTC check other control module than ESP® 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ECM. <i>Is there any DTC(s)?</i>	Go to applicable DTC diag. flow.	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.

DTC C1096: Yaw Rate / G Sensor Message Counter Error

S6RW0H4604034

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Yaw rate / G sensor message counter error is detected by ESP® control module.	<ul style="list-style-type: none"> • CAN communication circuit • Yaw rate / G sensor • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	Was "Electronic Stability Program Check" performed?	Go to Step 2.	Go to "Electronic Stability Program Check".
2	Check DTC 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC. <i>Is there any DTC(s) other than C1038 and C1096?</i>	Go to applicable DTC diag. flow.	Substitute a known-good yaw rate / G sensor and recheck. If DTC C1096 is still detected, substitute a known-good ESP® hydraulic unit control module assembly and recheck.

DTC U0073: Control Module Communication Bus Off

S6RW0H4604035

Refer to “Troubleshooting for CAN-DTC in Section 1A”.

DTC U0100: Lost Communication with ECM / PCM

S6RW0H4604036

Refer to “Troubleshooting for CAN-DTC in Section 1A”.

DTC U0101 Lost Communication with TCM

S6RW0H4604037

Refer to “Troubleshooting for CAN-DTC in Section 1A”.

DTC U0114 Lost Communication with Four-Wheel Drive Clutch Control Module

S6RW0H4604038

Refer to “Troubleshooting for CAN-DTC in Section 1A”.

DTC U0123 Lost Communication with Yaw Rate Sensor Module

S6RW0H4604039

Refer to “Troubleshooting for CAN-DTC in Section 1A”.

DTC U0126: Lost Communication with Steering Angle Sensor

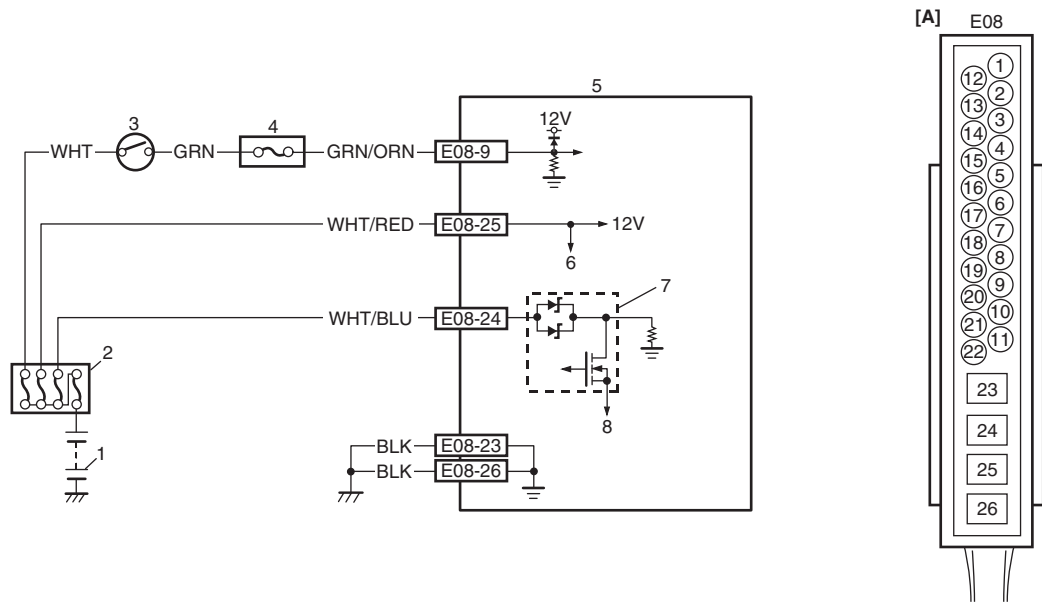
S6RW0H4604040

Refer to “Troubleshooting for CAN-DTC in Section 1A”.

ESP® Hydraulic Unit / Control Module Assembly Power and Ground Circuit Check

S6RW0H4604050

Wiring Diagram



I6RW0H460015-01

[A]: ESP® control module connector (viewed from terminal side)	5. ESP® hydraulic unit / control module assembly
1. Battery	6. To pump motor driver
2. Main fuse box	7. Solenoid valve power supply driver
3. Ignition switch	8. To solenoid valve
4. Junction block assembly	

Circuit Description

When the ignition switch is turned ON, power supply is supplied to ESP® control module. And, power supply is supplied to pump motor and solenoid valve in other line by the switching function in ESP® control module.

Troubleshooting

Step	Action	Yes	No
1	Check fuse <i>Are main fuses and circuit fuses for ESP® in good condition?</i>	Go to Step 2.	Replace fuse and check for short circuit to ground.
2	Check ESP® control module power supply circuit 1) Turn ignition switch to OFF position. 2) Disconnect ESP® control module connector. 3) Check for proper connection to ESP® control module connector at terminals "E08-9", "E08-23", "E08-24", "E08-25" and "E08-26". 4) If OK, then turn ignition switch to ON position and measure voltage between terminal "E08-9" and vehicle body ground. <i>Is it 10 – 14 V?</i>	Go to Step 3.	"GRN/ORN" circuit open.
3	Pump motor and solenoid valve power supply circuit 1) Turn ignition switch to OFF position. 2) Measure voltage between each terminal of "E08-24", "E08-25" and vehicle body ground. <i>Are they 10 – 14 V?</i>	Go to Step 4.	"WHT/BLU" and/or "WHT/RED" circuit open.
4	Check ESP® hydraulic unit / control module assembly ground circuit 1) Measure resistance between each terminal of "E08-23", "E08-26" and vehicle body ground. <i>Is resistance less than 2 Ω?</i>	ESP® hydraulic unit / control module assembly power and ground circuits are in good condition.	"BLK" circuit open or high resistance.

Repair Instructions

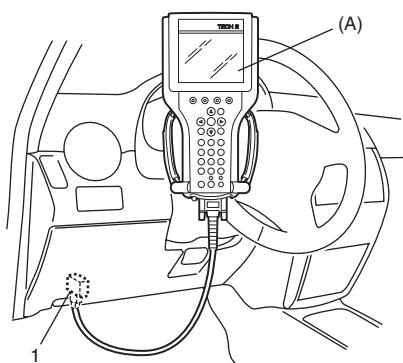
ESP® Hydraulic Unit Operation Check

S6RW0H4606001

- 1) Check that basic brake system other than ESP® is in good condition.
- 2) Check that battery voltage is 11 V or higher.
- 3) Lift up vehicle.
- 4) Set transmission to neutral and release parking brake.
- 5) Turn each wheel gradually by hand to check if braked ragging occurs. If it does, correct.
- 6) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool

(A): SUZUKI scan tool



I5RW0A320008-01

- 7) Turn ignition switch to ON position and select menu press / depress in "HYDRAULIC CONTROL TEST" under "miscellaneous test" ("MISC. TEST") mode of SUZUKI scan tool.

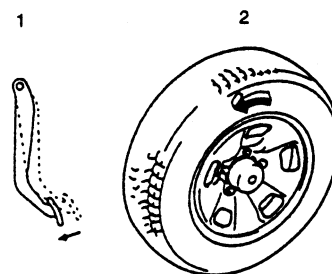
Refer to SUZUKI scan tool operator's manual for further details.

- 8) Perform the following checks with help of another person.

- Depressurization check
Step on brake pedal (1) and then select testing wheel by SUZUKI scan tool and the wheel (2) should be turned by another person's hand. At this time, check whether the wheel rotates freely due to brake depressurization.
- Pressurization check
Step off brake pedal (1) and then select testing wheel by SUZUKI scan tool and the wheel (2) should be turned by another person's hand. At this time, check whether the wheel locks due to brake pressurization.

NOTE

Pressurization / Depressurization by SUZUKI scan tool is available for 0.5 second.



I4RH01450021-01

- 9) Check for all 4-wheels condition respectively. If a faulty condition is found, replace hydraulic unit / control module assembly.
- 10) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

Sensor Calibration

S6RW0H4606002

⚠ CAUTION

If any DTC(s) other than C1075 are detected, sensor calibration can not be completed. Repair the detected DTC first.

NOTE

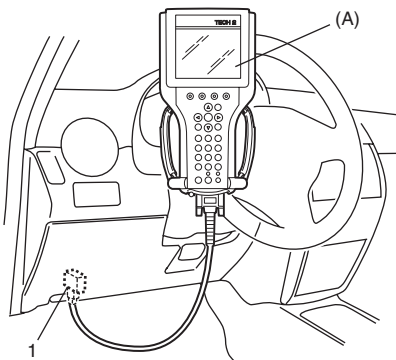
Steering angle sensor calibration is needed when battery, "DOME" fuse or the steering angle sensor is removed.
This sensor calibration can be done with/without SUZUKI Scan Tool.

Using SUZUKI Scan Tool

- 1) Set steering wheel in straight-ahead position.
- 2) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool

(A): SUZUKI scan tool



I5RW0A320008-01

- 3) Turn ignition switch to ON position and confirm that only any of DTC(s) C1075 is detected. If any other DTC are detected, repair the detected DTC.
- 4) Park and level the vehicle with parking brake, stop engine with ignition switch ON, set steering in straight and without stepping on the brake pedal.

⚠ CAUTION

Hold the above condition in Step 4) to calibrate sensor correctly until sensor calibration is completed.

- 5) Select menu "SENSOR CALIBRATION" under "MISC. TEST" mode of SUZUKI scan tool and calibrate sensor. Refer to scan tool operator's manual for further details.
- 6) After completing the calibration, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

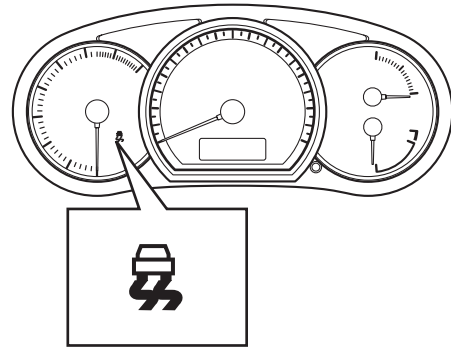
Not Using SUZUKI Scan Tool

- 1) Set steering wheel in straight-ahead position.
- 2) Confirm that battery terminals and/or related fuses securely installed (if removed).
- 3) Start engine.

⚠ CAUTION

When power is not supplied to the steering angle sensor by removing battery or fuse, DTC C1075 is detected and SLIP indicator light (1) flashes.

If DTC other than C1075 is detected, SLIP indicator light flashes and other indicator illuminate. In that case, repair the detected DTC first.



I7RW01460017-01

- 4) Drive straight for approximately 35 km/h (21.8 mph) or more and 10 seconds or more.

ESP® Hydraulic Unit / Control Module Assembly On-Vehicle Inspection

S6RW0H4606023

⚠ CAUTION

Never disassemble ESP® hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ESP® hydraulic unit / control module assembly.

Check hydraulic unit for fluid leakage.
If any, repair or replace.

ESP® Hydraulic Unit / Control Module Assembly Removal and Installation

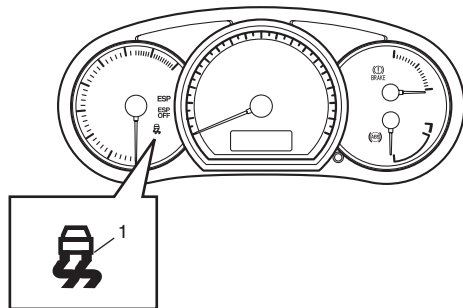
S6RW0H4606024

⚠ CAUTION

- Never disassemble ESP® hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ESP® hydraulic unit / control module assembly.
- Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid, flush it with water immediately if any fluid is spilled.
- Regarding ESP® hydraulic unit / control module assembly removal and installation, confirm specified torque and use hand tool to avoid damage.
- Use care not to allow dust to enter hydraulic unit.
- Do not place hydraulic unit on its side or upside down. Handling it in inappropriate way will affect its original performance.

NOTE

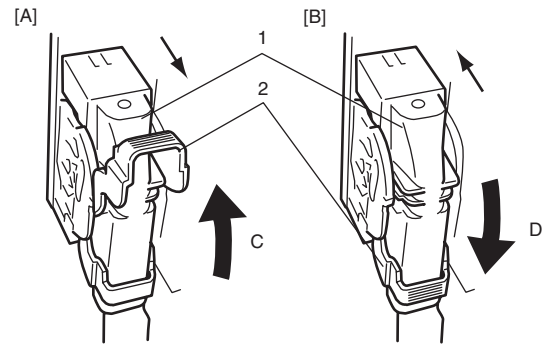
- Be sure to perform “Sensor Calibration” in this section before performing hydraulic unit operation check when ESP® hydraulic unit / control module is replaced.
- When ignition switch is turned to ON position after replacing ESP® hydraulic unit / control module, DTC C1075 is stored in ESP® control module and SLIP indicator light (1) flash. However, these are in normal operation. These DTCs are cleared and lights are turned off if the following operations are performed in order.
 1. “Sensor Calibration” in this section.
 2. “ESP® Hydraulic Unit Operation Check”.
 3. Ignition switch OFF and ON.



I7RW01450017-01

Removal

- 1) Disconnect negative (–) cable from battery.
- 2) Disconnect ESP® hydraulic unit / control module assembly connector (1) by pull up the lock (2).



I5RW0A450001-01

[A]: Disconnect	C: Pull up to disconnect
[B]: Connect	D: Pull down to connect

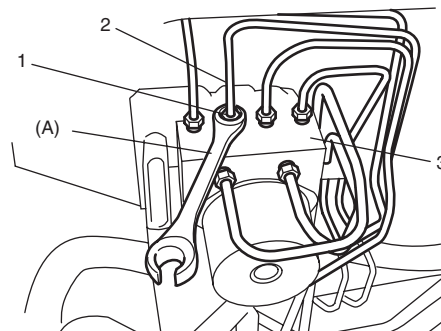
- 3) Using special tool, loosen flare nuts (1) and disconnect brake pipes (2) from ESP® hydraulic unit / control module assembly (3).

Special tool

(A): 09950-78220

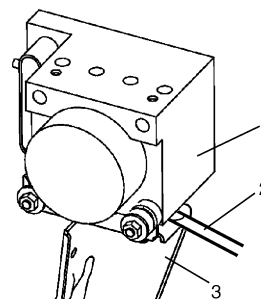
NOTE

Put bleeder plug cap or the like onto pipe to prevent fluid from spilling. Do not allow brake fluid to get on painted surfaces.



I5RW0A450020-01

- 4) Remove ESP® hydraulic unit / control module with bracket from vehicle by removing three bracket bolts.
- 5) Remove bolt and pull out ESP® hydraulic unit / control module assembly (1) from bracket (3) using flat end rod or the like (2).



I5RW0A450021-01

Installation

Install ESP® hydraulic unit / control module assembly (3) by reversing removal procedure, noting the following instructions.

- 1) Install hydraulic unit / control module assembly bracket bolt as follows.
 - a) Tighten bracket bolt (1) and (2) by hand.
 - b) Then tighten bracket bolt to specified torque.

Tightening order (1) → (2)

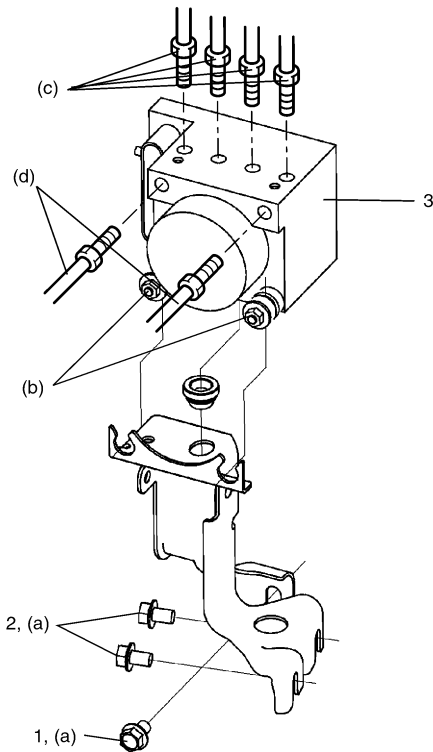
Tightening torque

Hydraulic unit / control module assembly bracket bolt (a): 26 N·m (2.6 kgf-m, 19.0 lb-ft)

Hydraulic unit / control module assembly bolt (b): 9 N·m (0.9 kgf-m, 6.5 lb-ft)

Brake pipe flare nut for M10 (c): 16 N·m (1.6 kgf-m, 11.5 lb-ft)

Brake pipe flare nut for M12 (d): 19 N·m (1.9 kgf-m, 14.0 lb-ft)



16RW0H460016-01

- 2) Bleed air from brake system referring to "Air Bleeding of Brake System in Section 4A in related manual".
- 3) Calibrate steering angle sensor referring to "Sensor Calibration".
- 4) Check each installed part for fluid leakage and perform "ESP® Hydraulic Unit Operation Check".
- 5) Turn ignition switch to OFF position once and then ON position. In this state, make sure that all indicator lights (related to ABS and ESP®) are turn off.
- 6) Check DTC(s) are not stored in hydraulic unit / control module.

Front Wheel Speed Sensor On-Vehicle**Inspection**

S6RW0H4606006

Refer to "Front and Rear Wheel Speed Sensor On-Vehicle Inspection in Section 4E in related manual".

Front Wheel Speed Sensor Removal and Installation

S6RW0H4606007

Refer to "Front Wheel Speed Sensor Removal and Installation in Section 4E in related manual".

Front Wheel Speed Sensor Inspection

S6RW0H4606008

Refer to "Front and Rear Wheel Speed Sensor Inspection in Section 4E in related manual".

Rear Wheel Speed Sensor On-Vehicle Inspection

S6RW0H4606025

Refer to "Front and Rear Wheel Speed Sensor On-Vehicle Inspection in Section 4E in related manual".

Rear Wheel Speed Sensor Removal and Installation

S6RW0H4606009

Refer to "Rear Wheel Speed Sensor Removal and Installation (4WD Model) in Section 4E in related manual".

Rear Wheel Speed Sensor Inspection

S6RW0H4606026

Refer to "Front and Rear Wheel Speed Sensor Inspection in Section 4E in related manual".

Front Wheel Speed Sensor Encoder On-Vehicle Inspection

S6RW0H4606010

Refer to "Front Wheel Speed Sensor Encoder On-Vehicle Inspection in Section 4E in related manual".

Front Wheel Speed Sensor Encoder Removal and Installation

S6RW0H4606011

Refer to "Front Wheel Speed Sensor Encoder Removal and Installation in Section 4E in related manual".

Rear Wheel Speed Sensor Encoder On-Vehicle Inspection

S6RW0H4606012

Refer to "Rear Wheel Speed Sensor Encoder On-vehicle Inspection in Section 4E in related manual".

Rear Wheel Speed Sensor Encoder Removal and Installation

S6RW0H4606013

Refer to "Rear Wheel Speed Sensor Encoder Removal and Installation in Section 4E in related manual".

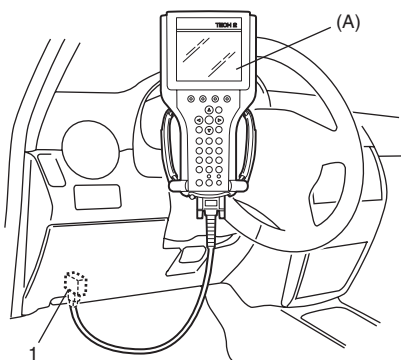
Master Cylinder Pressure Sensor On-Vehicle Inspection

S6RW0H4606014

- 1) Check that basic brake system other than ESP® refer to "Brakes Diagnosis Note in Section 4A in related manual".
- 2) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool

(A): SUZUKI scan tool



I5RW0A320008-01

- 3) Turn ignition switch to ON position and select menu "DATA LIST" mode of SUZUKI scan tool. Refer to scan tool operator's manual for further details.
- 4) When brake pedal is released, check "Master Cyl Press" under "DATA LIST" of SUZUKI scan tool. If pressure is out of specification, replace ESP® hydraulic unit / control module assembly.

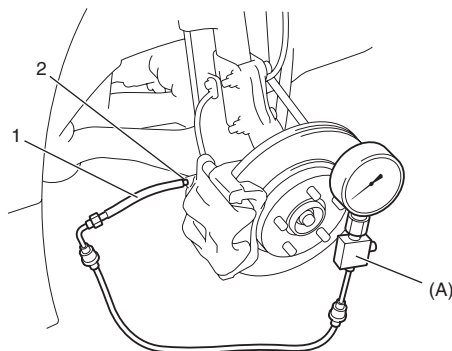
Master cylinder pressure specification

Brake pedal released: 0 ± 0.8 MPa (0 ± 8 kg/cm², 0 ± 113 psi)

- 5) Hoist vehicle and remove right-side front wheel.
- 6) Connect special tool with rubber hose (1) to Front brake caliper bleeder plug (2).

Special tool

(A): 09956-02311



I6JB01460025-01

- 7) When bleeder plug loosen and depress brake pedal to make special tool gauge reading 10 MPa (100 kg/cm², 1422 psi), check "Master Cyl Press" under "DATA LIST" of SUZUKI scan tool. If pressure displayed on SUZUKI scan tool is out of specification, replace ESP® hydraulic unit / control module assembly.

Master cylinder pressure specification

Brake pedal depressed 10 MPa (100 kg/cm², 1422 psi): 10 ± 1.2 MPa (100 ± 12 kg/cm², 1422 ± 170 psi)

- 8) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.
- 9) Tighten bleeder plug and bleed air from brake system, referring to "Air Bleeding of Brake System in Section 4A in related manual".

Yaw Rate / G Sensor On-Vehicle Inspection

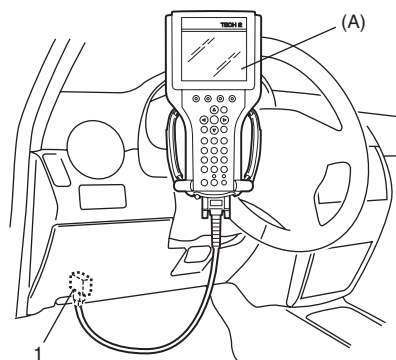
S6RW0H4606015

Lateral G Inspection

- 1) Park and level the vehicle with parking brake and fix wheels with chokes.
- 2) Check yaw rate / G sensor installation condition.
- 3) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool

(A): SUZUKI scan tool



I5RW0A320008-01

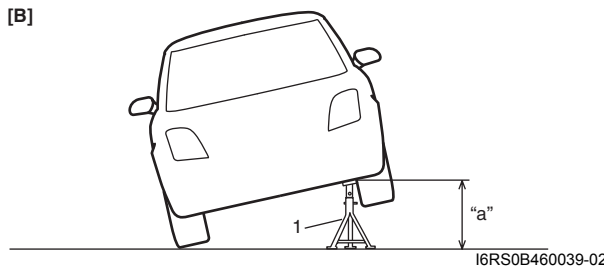
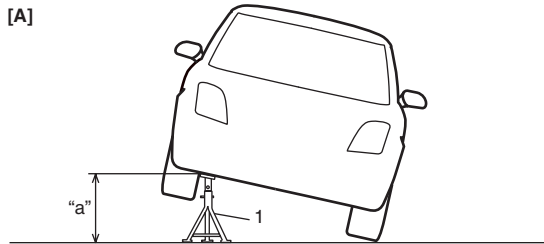
- 4) Turn ignition switch to ON position and select menu "DATA LIST" mode of SUZUKI scan tool. Refer to scan tool operator's manual for further details.
- 5) Check "G Sensor (lateral)" under "DATA LIST" of SUZUKI scan tool in the following vehicle conditions.

- Level condition
- Right-up condition
- Left-up condition

If Lateral G condition is out of specification, replace yaw rate / G sensor.

Lateral G specification

Vehicle condition	G Sensor (lateral)
Level condition	$0 \pm 0.1 \text{ G}$
Right-up condition	$0.1 \pm 0.1 \text{ G}$
Left-up condition	$-0.1 \pm 0.1 \text{ G}$



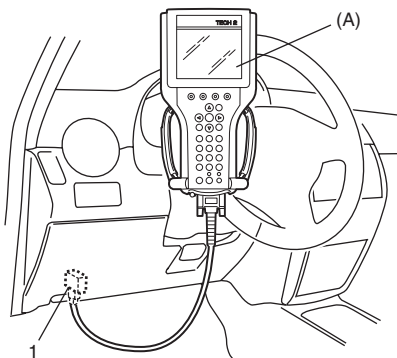
[A]: Right-up condition	"a": Approx 450 mm (17.7 in.)
[B]: Left-up condition	1. Safety stand

Yaw Rate Inspection

- 1) Check yaw rate / G sensor installation condition.
- 2) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool

(A): SUZUKI scan tool



- 3) Turn ignition switch to ON position and select menu "DATA LIST" mode of SUZUKI scan tool. Refer to scan tool operator's manual for further details.
- 4) Check "Yaw rate sensor" under "DATA LIST" of SUZUKI scan tool in the following vehicle conditions.

- Parking condition
- Drive vehicle in right turning condition with steering wheel fully turned
- Drive vehicle in left turning condition with steering wheel fully turned

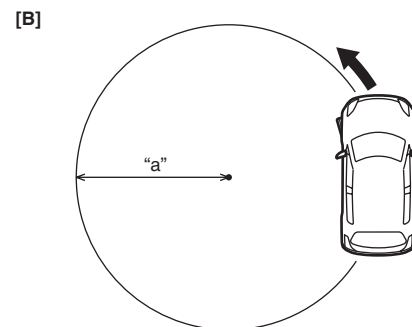
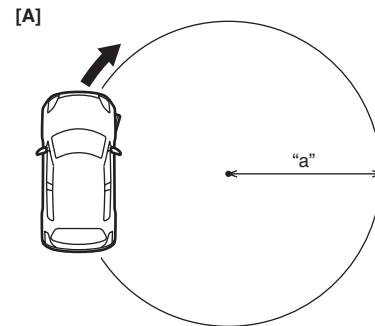
If yaw rate condition is out of specification, replace yaw rate / G sensor.

Yaw rate specification

Vehicle condition	Yaw rate
Parking	$0 \pm 4 \text{ deg/s}$
Right turning	$30 \pm 4 \text{ deg/s}$
Left turning	$-30 \pm 4 \text{ deg/s}$

NOTE

- Drive the vehicle on level ground and at 10 km/h (6.2 mph).
- Minimum turning radius is 5.3 m (17.4 ft).



[A]: Right turning	"a": Approx 5.3 m (17.4 ft.)
[B]: Left turning	

Yaw Rate / G Sensor Removal and Installation

S6RW0H4606016

⚠ CAUTION

- Regarding yaw rate / G sensor removal/ installation, confirm specified torque and never use impact wrench to avoid damage.
- When handling the yaw rate / G sensor, be careful not to drop it or apply an impact to it.
If an excessive impact was applied, never attempt disassembly or repair but replace it with a new one.

Removal

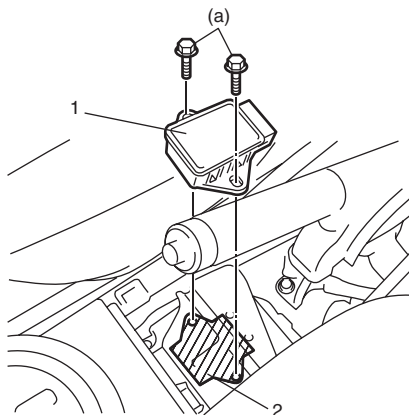
- 1) Disconnect negative (–) cable at battery.
- 2) Remove console box referring to “Console Box Components in Section 9H in related manual”.
- 3) Disconnect connector from yaw rate / G sensor.
- 4) Remove yaw rate / G sensor from sensor bracket.

Installation

- 1) Before installing yaw rate / G sensor (1), check installing condition as follows.
 - Deformations around sensor installation area (2) (in sensor bracket).
 - Foreign matters on mating surface between sensor and sensor bracket.
- 2) Install yaw rate / G sensor (1) to floor panel.

Tightening torque

Yaw rate / G sensor bolt (a): 6.5 N·m (0.65 kgf-m, 5.0 lb-ft)



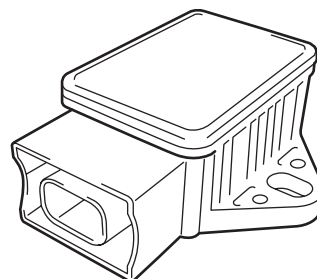
I7RW01460021-01

- 3) Connect connector to yaw rate / G sensor.
- 4) Install console box referring to “Console Box Components in Section 9H in related manual”.
- 5) Connect negative (–) cable to battery.

Yaw Rate / G Sensor Inspection

S6RW0H4606017

- Check sensor for dents, cracks or deformation.
- Check sensor connector (sensor side and harness side) and sensor connector lock mechanism for damage or crack.
- Check connector terminals for bend, corrosion or rust.
If it is found faulty, replace yaw rate / G sensor.



I7RW01460022-01

Steering Angle Sensor On-Vehicle Inspection

S6RW0H4606018

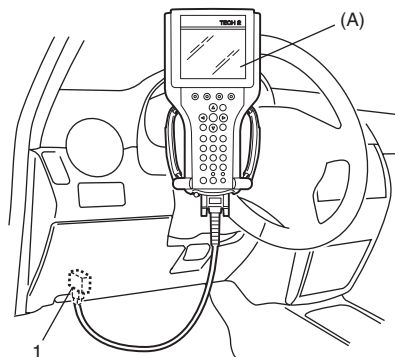
⚠ CAUTION

Before each inspection, confirm steering angle sensor calibration is completed.
If calibration is incompleted, calibrate sensor referring to “Sensor Calibration”.

- 1) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool

(A): SUZUKI scan tool

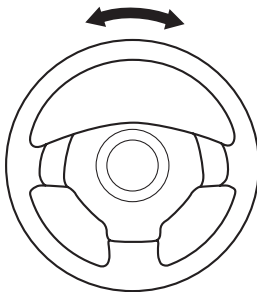


I5RW0A320008-01

- 2) Turn ignition switch to ON position and select menu "DATA LIST" mode of SUZUKI scan tool.
Refer to scan tool operator's manual for further details.
- 3) Check "Steering angle Sen" under "DATA LIST" of SUZUKI scan tool in the following steering wheel conditions.
 - Front wheels in straight-ahead position
 - Rotate steering wheel a round in clockwise (counter clockwise) from straight-ahead position
 If steering angle condition is out of specification, replace steering angle sensor.

Steering angle Specification

Vehicle condition	Steering angle
Front wheels in straight-ahead position	$0 \pm 3^\circ$
Rotate steering wheel a round in clockwise	$360 \pm 3^\circ$
Rotate steering wheel a round in counterclockwise	$-360 \pm 3^\circ$



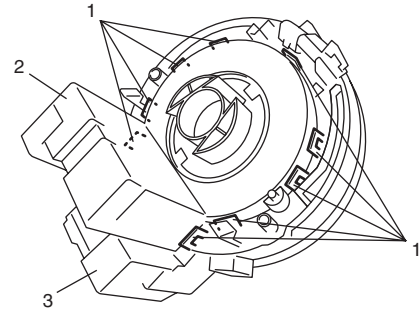
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Steering Angle Sensor Removal and Installation

S6RW0H4606019

Removal

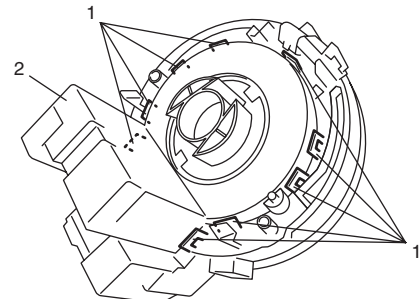
- 1) Remove steering wheel and contact coil cable assembly. Refer to "Steering Wheel Removal and Installation" and "Contact Coil Cable Assembly Removal and Installation".
- 2) Remove steering angle sensor (2) from contact coil cable assembly (3) while opening fitting parts (1) of contact coil cable assembly.



I6JB01620003-01

Installation

- 1) Install steering angle sensor (2) by fitting engagement parts (1) of contact coil cable assembly to claws of steering angle sensor as shown in figure.



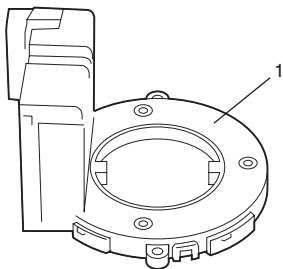
I6JB01620004-01

- 2) Install contact coil cable assembly and steering wheel. Refer to "Contact coil Cable Assembly Removal and Installation" and "Steering Wheel Removal and Installation".

Steering Angle Sensor Inspection

S6RW0H4606020

- Check sensor for dents, cracks or deformation.
- Check sensor connector (sensor side and harness side) and sensor connector lock mechanism for damage or crack.
- Check connector terminals for bend, corrosion or rust. If it is found faulty, replace steering angle sensor (1).



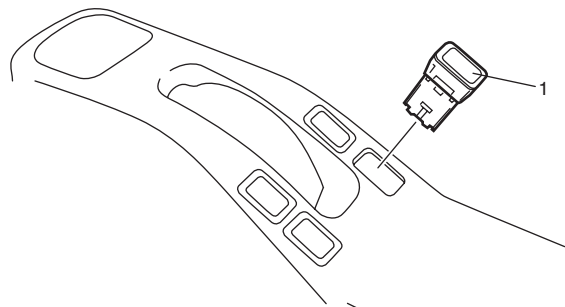
I6JB01460033-01

ESP® OFF Switch Removal and Installation

S6RW0H4606021

Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove rear console box referring to “Console Box Components in Section 9H in related manual”.
- 3) Disconnect ESP® OFF switch coupler.
- 4) Remove ESP® OFF switch (1) from rear console box (2).



I6RS0B460042-02

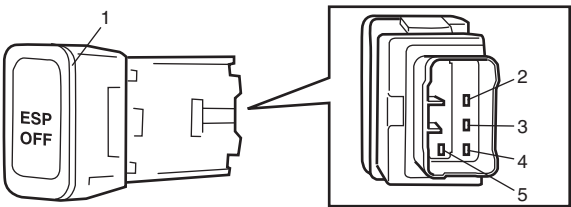
Installation

Reverse removal procedure.

ESP® OFF Switch Inspection

S6RW0H4606022

Check for continuity between terminals at each switch position.
If check result is not as specified, replace ESP® OFF switch (1).



	2	3	4	5
[A]			○	○
[B]	○	○	○	○

I6RS0B460043-02

[A]: Free	[B]: Push
-----------	-----------

Specifications

Tightening Torque Specifications

S6RW0H4607001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Hydraulic unit / control module assembly bracket bolt	26	2.6	19.0	🔩
Hydraulic unit / control module assembly bolt	9	0.9	6.5	🔩
Brake pipe flare nut for M10	16	1.6	11.5	🔩
Brake pipe flare nut for M12	19	1.9	14.0	🔩
Yaw rate / G sensor bolt	6.5	0.65	5.0	🔩


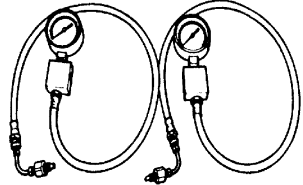
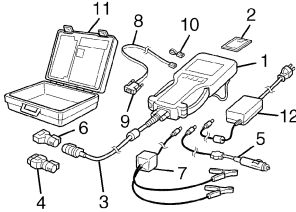
Reference:

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

S6RW0H4608001

09950-78220 Flare nut wrench (10 mm) 	09956-02311 Brake pressure gauge 
SUZUKI scan tool  This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. 🔩 / 🔩 / 🔩 / 🔩 / 🔩 / 🔩 / 🔩 / 🔩	

Section 8

Restraint

CONTENTS

Air Bag System	8B-1	Diagnostic Information and Procedures	8B-1
		DTC Table	8B-1

Air Bag System

Diagnostic Information and Procedures

DTC Table

S6RW0H8204003

NOTE

The DTCs (B1022 and B1023) shown with asterisk (*) below are meant to be recorded when External Scrapping Deployment Controller is operated by a Japanese authorized special scrapping trader. Therefore, normally these codes will not appear outside Japan. However, should these codes be detected, SDM must be replaced because the cause is due to SDM detection failure.

SDM DTC

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Trouble area
—	Normal	—	—
B1013	SDM internal failure	Malfunctioned SDM internal circuit, G sensor, memory or CPU.	<ul style="list-style-type: none"> SDM
B1014	"AIR BAG" warning light circuit	"AIR BAG" warning light circuit has been shorted to ground, shorted to power or opened for more than 4 sec.	<ul style="list-style-type: none"> "AIR BAG" warning light circuit Combination meter SDM
B1016	Power supply voltage too high	Power supply voltage is more than 21.4 V for more than 16 sec.	<ul style="list-style-type: none"> Charging system SDM
B1017	Power supply voltage too low	Power supply voltage is less than 7.2 V for more than 16 sec.	<ul style="list-style-type: none"> Charging system SDM
B1021	Front air bag deployment record	Deployment of front air bag has been recorded in SDM.	<p>If this DTC has been recorded even though air bag has not been deployed</p> <ul style="list-style-type: none"> SDM Driver and/or Passenger air bag module Those initiator circuit.
*B1022	Scrapping deployment controller activated	Scrapping deployment command has been input to SDM from external scrapping deployment controller	<ul style="list-style-type: none"> SDM
*B1023	Scrapping deployment record	Scrapping deployment execution has been recorded in SDM	<ul style="list-style-type: none"> SDM
B1024	Driver side-air bag deployment record	Deployment of driver side-air bag has been recorded in SDM.	<p>If this DTC has been recorded even though side-air bag has not been deployed</p> <ul style="list-style-type: none"> SDM Driver side-air bag module Its initiator circuit
B1025	Passenger side-air bag deployment record	Deployment of passenger side-air bag has been recorded in SDM.	<p>If this DTC has been recorded even though side-air bag has not been deployed</p> <ul style="list-style-type: none"> SDM Passenger side-air bag module Its initiator circuit

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Trouble area
B1026	Seat belt pretensioner activation record	Activation of seat belt pretensioner has been recorded in SDM.	<p>If this DTC has been recorded even though pretensioner has not been activated</p> <ul style="list-style-type: none"> • SDM • Driver and/or Passenger seat belt pretensioner • Those initiator circuit
B1027	Number of deployment times exceeded limit	Deployment of air bag and activation of seat belt pretensioner have been recorded in SDM 5 times or more.	<p>If this DTC has been recorded even though air bag (front and side) and pretensioner have not been deployed more than 4 place.</p> <ul style="list-style-type: none"> • SDM (internal fault or reused SDM) • Each of deployment and activation module • Those initiator circuit
B1031	Driver air bag circuit high resistance	Driver air bag circuit is more than 5.2 Ω for more than 4 sec.	<ul style="list-style-type: none"> • Driver air bag circuit • Contact coil assembly • Driver air bag module • SDM
B1032	Driver air bag circuit low resistance	Driver air bag circuit is less than 1.1 Ω for more than 4 sec.	
B1033	Driver air bag circuit shorted to ground	Driver air bag circuit has been shorted to ground for more than 4 sec.	<ul style="list-style-type: none"> • Driver air bag circuit • SDM
B1034	Driver air bag circuit shorted to power supply	Driver air bag circuit has been shorted to power supply for more than 4 sec.	
B1041	Passenger air bag circuit high resistance	Passenger air bag circuit is more than 4.0 Ω for more than 4 sec.	<ul style="list-style-type: none"> • Passenger air bag circuit • Passenger air bag module • SDM
B1042	Passenger air bag circuit low resistance	Passenger air bag circuit is less than 0.9 Ω for more than 4 sec.	
B1043	Passenger air bag circuit shorted to ground	Passenger air bag circuit has been shorted to ground for more than 4 sec.	<ul style="list-style-type: none"> • Passenger air bag circuit • SDM
B1044	Passenger air bag circuit shorted to power supply	Passenger air bag circuit has been shorted to power supply for more than 4 sec.	
B1051	Driver seat belt pretensioner circuit high resistance	Driver seat belt pretensioner circuit is more than 4.0 Ω for more than 4 sec.	<ul style="list-style-type: none"> • Driver seat belt pretensioner circuit • Driver seat belt pretensioner • SDM
B1052	Driver seat belt pretensioner circuit low resistance	Driver seat belt pretensioner circuit is less than 0.9 Ω for more than 4 sec.	
B1053	Driver seat belt pretensioner circuit shorted to ground	Driver seat belt pretensioner circuit has been shorted to ground for more than 4 sec.	<ul style="list-style-type: none"> • Driver seat belt pretensioner circuit • SDM
B1054	Driver seat belt pretensioner circuit shorted to power supply	Driver seat belt pretensioner circuit has been shorted to power supply for more than 4 sec.	
B1055	Passenger seat belt pretensioner circuit high resistance	Passenger seat belt pretensioner circuit is more than 4.0 Ω for more than 4 sec.	<ul style="list-style-type: none"> • Passenger seat belt pretensioner circuit • Passenger seat belt pretensioner • SDM
B1056	Passenger seat belt pretensioner circuit low resistance	Passenger seat belt pretensioner circuit is less than 0.9 Ω for more than 4 sec.	

8B-3 Air Bag System:

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Trouble area
B1057	Passenger seat belt pretensioner circuit shorted to ground	Passenger seat belt pretensioner circuit has been shorted to ground for more than 4 sec.	<ul style="list-style-type: none"> Passenger seat belt pretensioner circuit SDM
B1058	Passenger seat belt pretensioner circuit shorted to power supply	Passenger seat belt pretensioner circuit has been shorted to power circuit for more than 4 sec.	
B1061	Driver side-air bag circuit high resistance	Driver side-air bag circuit is more than 3.7 Ω for more than 4 sec.	<ul style="list-style-type: none"> Driver side-air bag circuit Driver side-air bag module SDM
B1062	Driver side-air bag circuit low resistance	Driver side-air bag circuit is less than 1.0 Ω for more than 4 sec.	
B1063	Driver side-air bag circuit shorted to ground	Driver side-air bag circuit has been shorted to ground for more than 4 sec.	<ul style="list-style-type: none"> Driver side-air bag circuit SDM
B1064	Driver side-air bag circuit shorted to power supply	Driver side-air bag circuit has been shorted to power supply for more than 4 sec.	
B1065	Passenger side-air bag circuit high resistance	Passenger side-air bag circuit is more than 3.7 Ω for more than 4 sec.	<ul style="list-style-type: none"> Passenger side-air bag circuit Driver side-air bag module SDM
B1066	Passenger side-air bag circuit low resistance	Passenger side-air bag circuit is less than 1.0 Ω for more than 4 sec.	
B1067	Passenger side-air bag circuit shorted to ground	Passenger side-air bag circuit has been shorted to ground for more than 4 sec.	<ul style="list-style-type: none"> Passenger side-air bag circuit SDM
B1068	Passenger side-air bag circuit shorted to power	Passenger side-air bag circuit has been shorted to power circuit for more than 4 sec.	
B1071	Driver forward impact-sensor communication data inconsistent	Driver forward impact-sensor has been communicated with no response or inconsistent ID code for more than 4 sec.	<ul style="list-style-type: none"> Driver forward impact-sensor Driver forward impact-sensor circuit SDM
B1072	Driver forward impact-sensor communication data invalid	Driver forward impact-sensor has been communicated with invalid data for more than 4 sec.	<ul style="list-style-type: none"> Driver forward impact-sensor SDM
B1073	Driver forward impact-sensor circuit shorted to ground	Driver forward impact-sensor circuit has been shorted to ground for more than 4 sec.	<ul style="list-style-type: none"> Driver forward impact-sensor Driver forward impact-sensor circuit SDM
B1074	Driver forward impact-sensor circuit open	Driver forward impact-sensor circuit has been shorted to power circuit or opened for more than 4 sec.	
B1081	Driver side impact-sensor no response	Driver side impact-sensor has been communicated with no response for more than 4 sec.	<ul style="list-style-type: none"> Driver side impact-sensor circuit Driver side impact-sensor SDM
B1082	Driver side impact-sensor communication data invalid	Driver side impact-sensor has been communicated with invalid data for more than 4 sec.	<ul style="list-style-type: none"> Driver side impact-sensor SDM
B1083	Driver side impact-sensor circuit shorted to ground	Driver side impact-sensor circuit has been shorted to ground for more than 4 sec.	<ul style="list-style-type: none"> Driver side impact-sensor circuit Driver side impact-sensor SDM
B1084	Driver side impact-sensor circuit open	Driver side impact-sensor circuit has been shorted to power circuit or opened for more than 4 sec.	

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Trouble area
B1085	Driver side impact-sensor communication data inconsistent	Driver side impact-sensor has been communicated with inconsistent ID code for more than 4 sec.	<ul style="list-style-type: none"> Driver side impact-sensor SDM
B1091	Passenger side impact-sensor no response	Communication with passenger side impact-sensor has been no response for more than 4 sec.	<ul style="list-style-type: none"> Passenger side impact-sensor circuit Passenger side impact-sensor SDM
B1092	Passenger side impact-sensor communication data invalid	Passenger side impact-sensor has been communicated with invalid data for more than 4 sec.	<ul style="list-style-type: none"> Passenger side impact-sensor circuit SDM
B1093	Passenger side impact-sensor circuit shorted to ground	Passenger side impact-sensor circuit has been shorted to ground for more than 4 sec.	<ul style="list-style-type: none"> Passenger side impact-sensor SDM
B1094	Passenger side impact-sensor circuit open	Passenger side impact-sensor circuit has been shorted to power circuit or opened for more than 4 sec.	
B1095	Passenger side impact-sensor communication data inconsistent	Passenger side impact-sensor has been communicated with inconsistent ID code for more than 4 sec.	<ul style="list-style-type: none"> Passenger side impact-sensor SDM
B1361	Driver curtain-air bag circuit high resistance	Driver curtain-air bag circuit is more than 3.8 Ω for more than 4 sec.	<ul style="list-style-type: none"> Driver curtain-air bag circuit Driver curtain-air bag module SDM
B1362	Driver curtain-air bag circuit low resistance	Driver curtain-air bag circuit is less than 1.0 Ω for more than 4 sec.	
B1363	Driver curtain-air bag circuit shorted to ground	Driver curtain-air bag circuit has been shorted to ground for more than 4 sec.	<ul style="list-style-type: none"> Driver curtain-air bag circuit SDM
B1364	Driver curtain-air bag circuit shorted to power	Driver curtain-air bag circuit has been shorted to power circuit for more than 4 sec.	
B1365	Passenger curtain-air bag circuit high resistance	Passenger curtain-air bag circuit is more than 3.8 Ω for more than 4 sec.	<ul style="list-style-type: none"> Passenger curtain-air bag circuit Passenger curtain-air bag module SDM
B1366	Passenger curtain-air bag circuit low resistance	Passenger curtain-air bag circuit is less than 1.0 Ω for more than 4 sec.	
B1367	Passenger curtain-air bag circuit shorted to ground	Passenger curtain-air bag circuit has been shorted to ground for more than 4 sec.	<ul style="list-style-type: none"> Passenger curtain-air bag circuit SDM
B1368	Passenger curtain-air bag circuit shorted to power	Passenger curtain-air bag circuit has been shorted to power circuit for more than 4 sec.	

Section 9

Body, Cab and Accessories

CONTENTS

Instrumentation / Driver Info. / Horn 9C-1	Power Door Mirror Actuator Inspection 9E-3
General Description 9C-1	Seats 9G-1
CAN Communication System Description 9C-1	Diagnostic Information and Procedures 9G-1
Schematic and Routing Diagram 9C-2	Front Seat Heater Symptom Diagnosis 9G-1
Combination Meter Circuit Diagram 9C-2	Repair Instructions 9G-2
Glass / Windows / Mirrors 9E-1	Front Seat Components 9G-2
Diagnostic Information and Procedures 9E-1	Front Seat Removal and Installation 9G-3
Deicer Symptom Diagnosis 9E-1	Front Seat Heater Switch (Driver and
Repair Instructions 9E-1	Passenger Side) Inspection 9G-3
Rear End Door Window Defogger Relay	Front Seat Heater Wire Inspection 9G-3
Inspection 9E-1	Rear Seat Components 9G-4
Deicer Switch Inspection 9E-1	Specifications 9G-5
Deicer Relay Inspection 9E-2	Tightening Torque Specifications 9G-5
Deicer Wire Inspection 9E-2	Special Tools and Equipment 9G-5
Deicer Wire Repair 9E-2	Recommended Service Material 9G-5
Power Door Mirror Switch Inspection 9E-2	

Instrumentation / Driver Info. / Horn

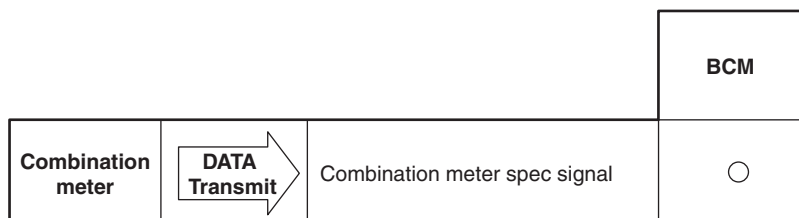
General Description

CAN Communication System Description

S6RW0H9301001

Refer to “CAN Communication System Description in Section 1A” for CAN communication system description.
Combination meter communicates control data with each control module as follows.

Combination Meter Transmission Data



I5RW0A930001-02

Combination Meter Reception Data

		ECM	TCM (A/T model)	BCM	ABS/ESP® Control Module	4WD Control Module (if equipped)	Keyless Start Control Module (if equipped)
Combination Meter	DATA Receive	Engine speed signal	○				
		Immobilizer indicator light control signal	○				
		Vehicle speed signal	○				
		Engine coolant temperature signal	○				
		Fuel level signal	○				
		Odometer signal	○				
		MIL control signal	○	○			
		Transmission range sensor signal		○			
		Transmission warning light signal		○			
		Diagnostic trouble code (DTC)	○	○			
		Brake fluid level switch signal (brake warning light control signal)		○			
		Driver side seat belt buckle switch signal (seat belt reminder light control signal)		○			
		Charging system warning light signal (charge warning light control signal)		○			
		Engine oil pressure switch signal (oil pressure warning light control signal)		○			
		Parking brake switch signal (brake warning light control signal)		○			
		Illumination ON signal		○			
		Door switch signal (open door warning light control signal)		○			
		ABS indication signal			○		
		EBD indication signal (brake warning light control signal)			○		
		ESP® status signal			○*		
		4WD mode indicator control signal				○	
		Key indicator light control signal					○

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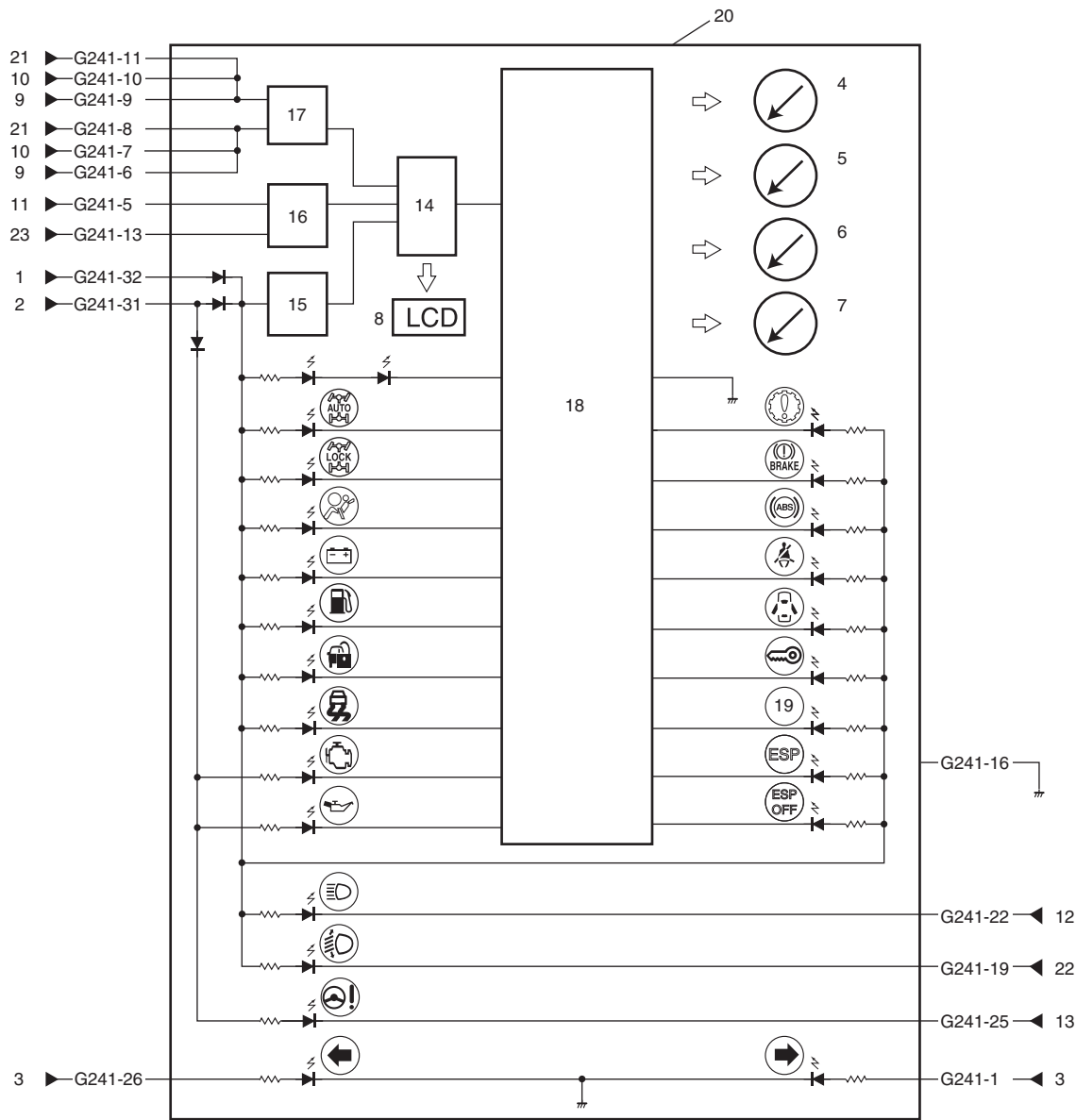
NOTE

*: ESP® model

Schematic and Routing Diagram

Combination Meter Circuit Diagram

S6RW0H9302001



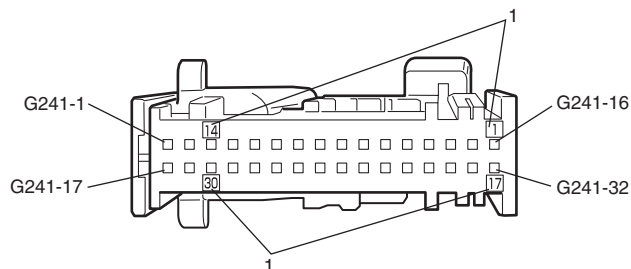
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1. DOME fuse	8. ODO-TRIP	15. Power supply
2. METER fuse	9. 4WD control module (if equipped)	16. Interface circuit
3. Combination switch	10. CAN junction connector	17. CAN driver
4. Tachometer	11. SDM	18. Stepper motor and LED output driver
5. Speedometer	12. Combination switch (high beam)	19. A/T shift position indicator ("P", "R", "N", "D", "3", "2" and "L")
6. Fuel meter	13. P/S control module	20. Combination meter
7. ECT meter	14. CPU	21. Steering angle sensor (if equipped)

Terminal arrangement of coupler viewed from terminal side

NOTE

Molded numbers (1) have no relation to the terminal numbers.



I7RW01930004-01

Terminal	Circuit	Terminal	Circuit
G241-1	To turn signal light switch (turn R)	G241-17	—
G241-2	—	G241-18	—
G241-3	—	G241-19	To headlight leveling control module (if equipped)
G241-4	—	G241-20	—
G241-5	To SDM (air bag warning light control signal)	G241-21	—
G241-6	CAN communication line (Active High Signal)	G241-22	To lighting switch (high beam)
G241-7	CAN communication line (Active High Signal)	G241-23	—
G241-8	CAN communication line (Active High Signal)	G241-24	—
G241-9	CAN communication line (Active Low Signal)	G241-25	To P/S control module (EPS warning light control signal)
G241-10	CAN communication line (Active Low Signal)	G241-26	To turn signal light switch (turn L)
G241-11	CAN communication line (Active Low Signal)	G241-27	—
G241-12	—	G241-28	—
G241-13	—	G241-29	—
G241-14	—	G241-30	—
G241-15	—	G241-31	To METER fuse
G241-16	GND	G241-32	To DOME fuse

Glass / Windows / Mirrors

Diagnostic Information and Procedures

Deicer Symptom Diagnosis

S6RW0H9504005

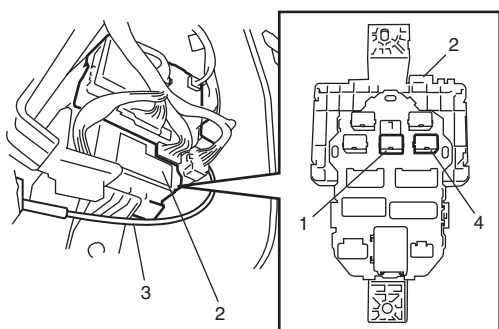
Condition	Possible cause	Correction / Reference Item
Deicer does not operate	Circuit fuse blown	Replace fuse and check for short circuit.
	Deicer switch faulty	Check deicer switch referring to "Deicer Switch Inspection".
	Deicer relay faulty	Check deicer relay referring to "Deicer Relay Inspection".
	Deicer wire faulty	Check deicer wire referring to "Deicer Wire Inspection".
	Wiring or grounding faulty	Repair circuit.
	BCM faulty	Replace after making sure that none of above parts is faulty.

Repair Instructions

Rear End Door Window Defogger Relay Inspection

S6RW0H9506018

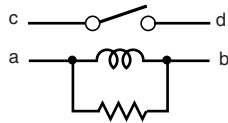
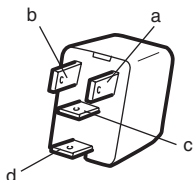
- 1) Disconnect negative (–) cable from battery.
- 2) Remove junction block for inspection of rear end door window defogger relay.
- 3) Remove rear end door window defogger relay (1) from junction block (2).



I6RW0H950001-01

- | |
|-----------------------------|
| 3. Hood latch release cable |
| 4. Deicer relay |

- 4) Check that there is no continuity between terminal "c" and "d". If there is continuity, replace relay.
- 5) Check that there is continuity between terminals "c" and "d" when a 12 V battery is connected to terminals "a" and "b".
If malfunction is found, replace it with a new one.

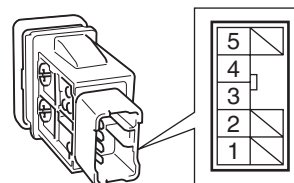


I4RS0A950028-01

Deicer Switch Inspection

S6RW0H9506029

- 1) Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



[B] \ [A]	1	2	3	4	5
[C]			○	⊗	○
[D]	○	⊗	○	⊗	○

I6RW0H950002-01

[A]: Terminal

[B]: Switch position

[C]: OFF

[D]: ON

Deicer Relay Inspection

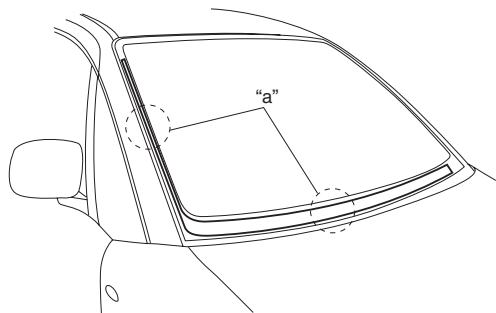
S6RW0H9506030

Check Deicer Relay referring to “Rear End Door Window Defogger Relay Inspection”.

Deicer Wire Inspection

S6RW0H9506031

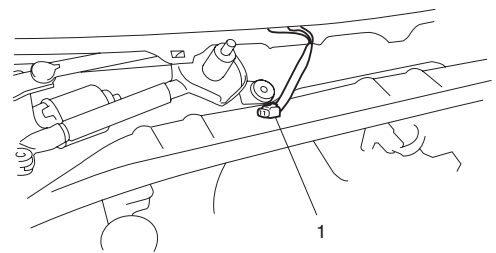
- 1) Start engine and then turn ON deicer switch.
- 2) Check that the position of “a” becomes warm.



I6RW0H950003-01

- 3) Disconnect deicer connector (1).
- 4) Check resistance between deicer connector (1) terminals. If check result is not as specified, repair deicer wire referring to “Deicer Wire Repair”.

Deicer wire resistance
1.7 – 2.4 Ω at 20 °C(68 °F)



I6RW0H950005-01

Deicer Wire Repair

S6RW0H9506032

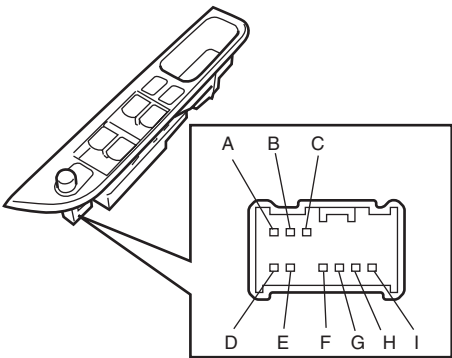
Refer to “Rear End Door Window Defogger Wire Repair in related manual” as repair procedures are basically the some.

Power Door Mirror Switch Inspection

S6RW0H9506025

- 1) Remove driver side door trim referring to step 1) to 3) of “Front Door Glass Removal and Installation in related manual”.
 - 2) Remove power window main switch from door trim.
 - 3) Check for continuity between terminals at each switch position.
- If check result is not as specified, replace door mirror switch.

L	A	C	D	E	G	H	I
R	B			F			
Up		○	○	○	○		
Down		○	○	○	○		
Left	○	○	○	○			
Right	○	○	○	○			
*Set		○	○	○	○	○	○
*Retract		○	○	○	○	○	○



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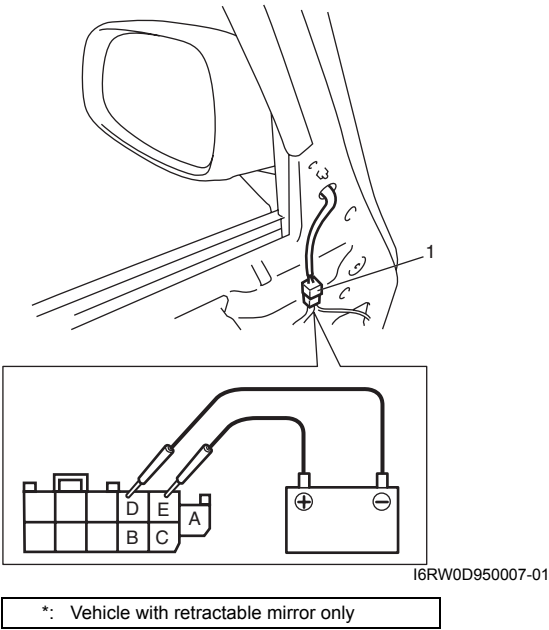
*: Vehicle with retractable mirror only

Power Door Mirror Actuator Inspection

S6RW0H9506026

- 1) Remove door trim referring to step 1) to 3) of “Front Door Glass Removal and Installation in related manual”.
- 2) Disconnect door mirror coupler (1).
- 3) Check that door mirror operates properly when battery voltage is applied to connector terminals.
- 4) Connect battery positive (+) and negative (–) terminal to the door mirror terminals as shown. If it does not follow the table's operation, replace door mirror assembly.

Terminal Operation	A	B	C	D	E
Up	⊕		⊖		
Down	⊖		⊕		
Left		⊕	⊖		
Right		⊖	⊕		
*Set				⊖	⊕
*Retract				⊕	⊖



Seats

Diagnostic Information and Procedures

Front Seat Heater Symptom Diagnosis

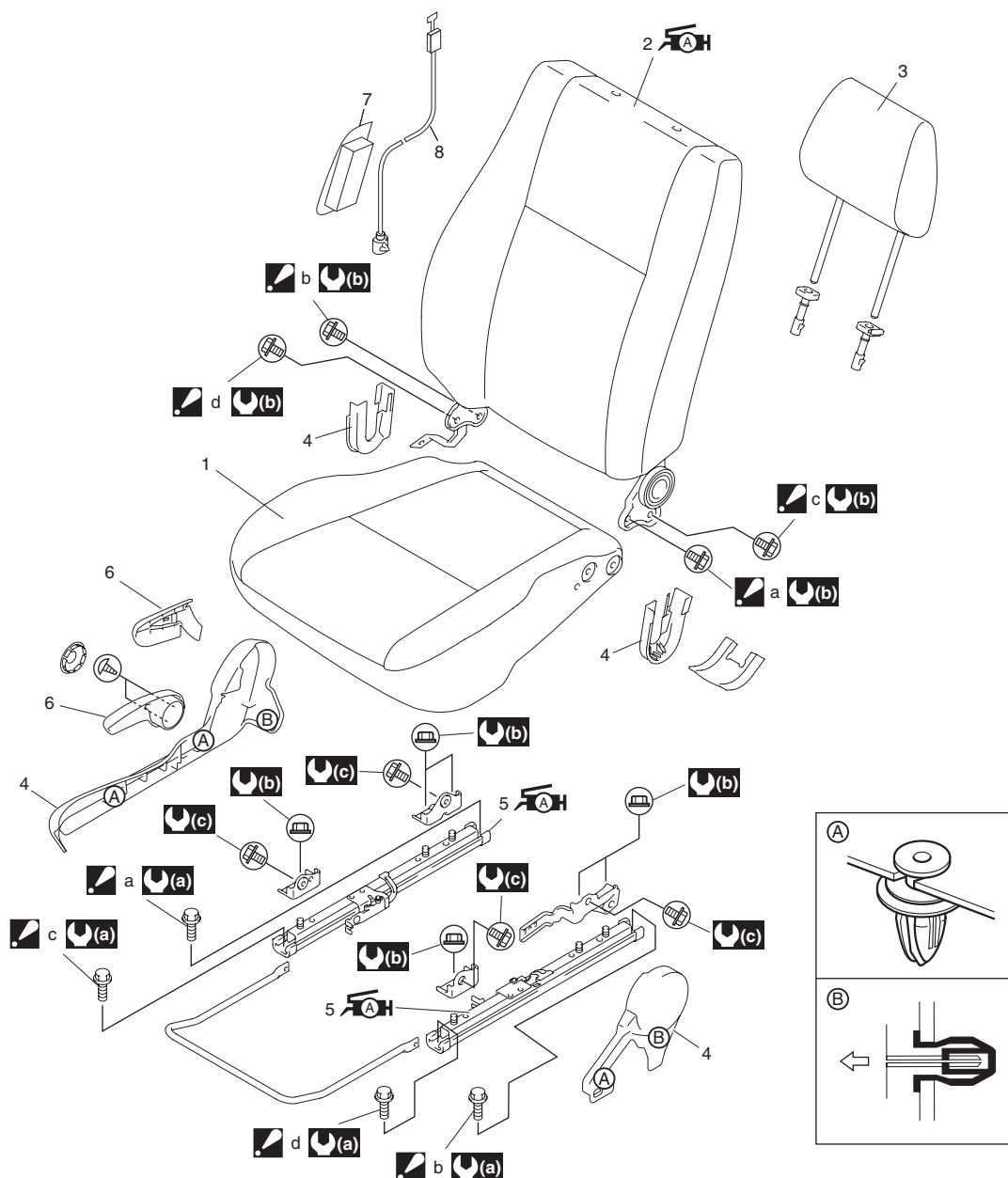
S6RW0H9704001

Condition	Possible cause	Correction / Reference Item
<i>Both seat back and cushion do not become hot although seat heater switch is ON position</i>	Wiring or grounding faulty	<i>Repair.</i>
	"SEAT HTR" fuse blown	<i>Replace fuse to check for short.</i>
	Seat heater switch faulty	<i>Replace switch.</i>
	Seat heater circuit in seat back and/or seat cushion faulty	<i>Replace heater front back and/or heater front cushion.</i>
<i>Only seat back does not become hot although seat heater switch is ON position</i>	Wiring faulty	<i>Repair.</i>
	Seat heater circuit in seat back and/or seat cushion faulty	<i>Replace heater front back and/or heater front cushion.</i>
<i>Only seat cushion does not become hot although seat heater switch is ON position</i>	Wiring faulty	<i>Repair.</i>
	Seat heater circuit in seat cushion faulty	<i>Replace heater front cushion.</i>

Repair Instructions

Front Seat Components

S6RW0H9706001



I6RW0H970001-01

1. Seat cushion	7. Side air bag module
2. Seat back : Apply lithium grease 99000-25011 to sliding part of reclining.	8. Side air bag harness
3. Headrest	(a) : 23 N·m (2.3 kgf·m, 17.0 lb·ft)
4. Cover	(b) : 35 N·m (3.5 kgf·m, 25.5 lb·ft)
5. Seat adjuster : Apply lithium grease 99000-25011 to seat adjuster inside.	(c) : 28 N·m (2.8 kgf·m, 20.5 lb·ft) (Seat lifter type) 35 N·m (3.5 kgf·m, 25.5 lb·ft) (Non seat lifter type)
6. Knob	a, b, c, d: Seat back mounting bolt Seat mounting bolt Tightening order: a → b → c → d

Front Seat Removal and Installation

S6RW0H9706002

Removal

- 1) Disable air bag system referring to "Disabling AirBag System in Section 8B in related manual".
- 2) Disconnect seat harness coupler and side air bag coupler.
- 3) Remove 4 mounting bolts to remove seat assembly.
- 4) Disassemble and repair seat as necessary.

Installation

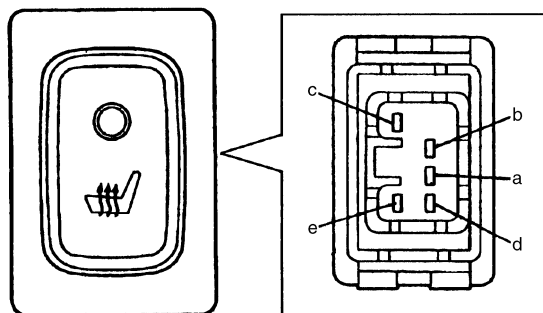
Reverse removal procedure to install front seat.

- Torque to specifications as shown in "Front Seat Components".
- Enable air bag system referring to "Enabling Air BagSystem in Section 8B in related manual".

Front Seat Heater Switch (Driver and Passenger Side) Inspection

S6RW0H9706005

- 1) Confirm that ignition switch is OFF position.
- 2) Remove console box.
- 3) Disconnect seat heater switch coupler and remove seat heater switch.
- 4) Check for continuity between terminals at each switch position as shown below. If check result is not as specified, replace.



TERMINAL POSITION	a	b	c	d	e
OFF		○—○	○—○	○—○	○—○
ON	○—○	○—○	○—○	○—○	○—○

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Front Seat Heater Wire Inspection

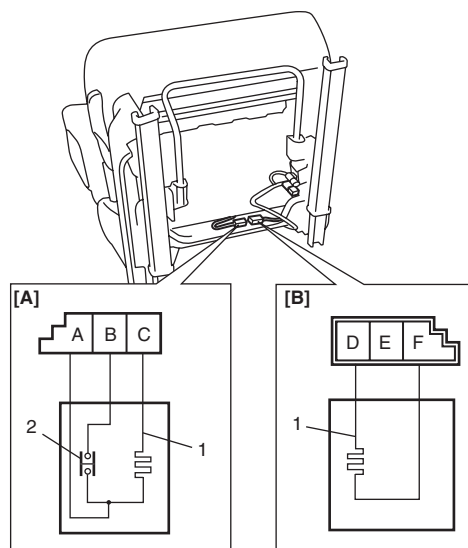
S6RW0H9706006

- 1) Confirm that seat heater switch is OFF position.
- 2) Disconnect coupler of seat heater under the seat cushion.
- 3) Measure resistance between terminals as shown below. If resistance is out of specification, replace faulty seat cushion and/or seat back including seat heater.

Seat heater circuit resistance

Seat cushion side [A] (between terminal "B" and "C", between terminal "A" and "C"): 4.7 – 5.7 Ω (at 20 °C, 68 °F)

Seat back side [B] (between terminal "F" and "D"): 10.7 – 13.1 Ω (at 20 °C, 68 °F)

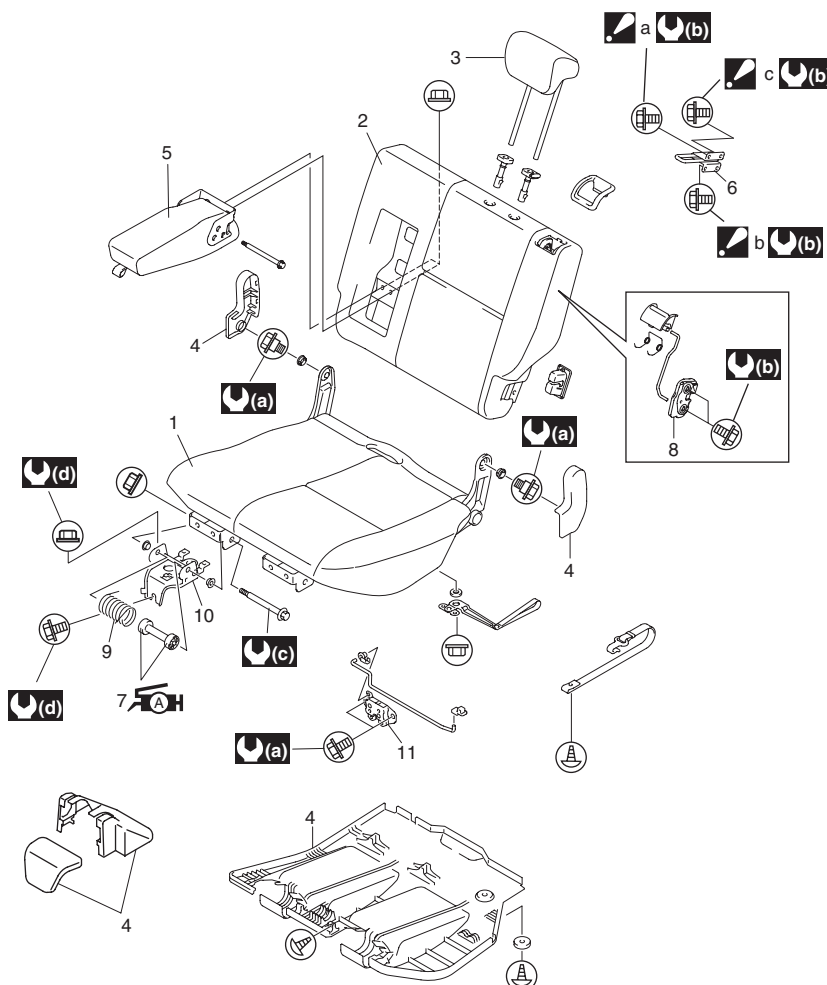


I5JB0A970002-01

1. Heater wire	[A]: Seat cushion side
2. Thermostat	[B]: Seat back side

Rear Seat Components

S6RW0H9706003



I6RW0H970002-01

1. Seat cushion	10. Cushion leg bracket
2. Seat back	11. Cushion lock
3. Head rest	: 35 N-m (3.5 kgf-m, 25.5 lb-ft)
4. Cover	: 23 N-m (2.3 kgf-m, 17.0 lb-ft)
5. Arm rest	: 25 N-m (2.5 kgf-m, 18.0 lb-ft)
6. Seat back striker	: 45 N-m (4.5 kgf-m, 33.0 lb-ft)
7. Spring collar : Apply lithium grease to 99000-25011 to cushion leg.	a, b, c: Seat back striker mounting bolt : Tightening order (Left side): a→b→c : Tightening order (Right side): b→a→c
8. Rear seat back lock	
9. Spring	

Specifications

Tightening Torque Specifications

S6RW0H9707001

NOTE

The specified tightening torque is also described in the following.
“Front Seat Components”
“Rear Seat 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

S6RW0H9708001

NOTE

Required service material is also described in the following.
“Front Seat Components”
“Rear Seat Components”

Section 10

Control Systems

CONTENTS

Body Electrical Control System	10B-1	Diagnostic Information and Procedures	10B-7
Precautions.....	10B-1	BCM Self-Diagnosis Function	10B-7
Precautions in Diagnosing Trouble	10B-1	Scan Tool Data	10B-9
General Description	10B-1	Inspection of BCM and Its Circuits	10B-11
BCM General Description	10B-1	Repair Instructions	10B-19
Security Alarm Description (If Equipped)	10B-1	Security Alarm Mode Selection Procedure (If	
Schematic and Routing Diagram.....	10B-2	Equipped).....	10B-19
Body Electrical Control System Wiring Circuit		Keyless Start System	10E-1
Diagram	10B-2	Schematic and Routing Diagram	10E-1
Connector Layout Diagram of BCM and		Keyless Start System Electric Wiring Circuit	
Junction Block.....	10B-5	Diagram.....	10E-1
Component Location	10B-6	Diagnostic Information and Procedures.....	10E-2
BCM and Related System Component		Precautions in Diagnosing Troubles	10E-2
Location	10B-6	Door Lock Operation (Keyless Start System) ...	10E-2

Body Electrical Control System

Precautions

Precautions in Diagnosing Trouble

S6RW0HA200001

- Diagnostic information stored in BCM 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.
- Communication of ECM, TCM (A/T model), ABS/ESP® control module, 4WD control module (if equipped), keyless start control module (if equipped), steering angle sensor (if equipped) combination meter and BCM is established by CAN (Controller Area Network). For detail of CAN communication for BCM, refer to "CAN Communication System Description in related manual". Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System in Section 00 in related manual".

General Description

BCM General Description

S6RW0HA201001

The Body electrical Control Module (BCM) is incorporated in junction block. Do not attempt removal of BCM from junction block as it may cause contact failure.

The BCM incorporates relays and controllers which are used for the following systems and controls them.

- Power door lock (if equipped)
- Keyless entry (if equipped)
- Door lock function of keyless start system (if equipped)
- Rear wiper
- Combination meter
- Interior light
- Warning buzzer
- Rear end door window defogger and door mirror heater (if equipped)
- Deicer
- Rear end door opener (if equipped)
- Theft deterrent light

Also, the BCM has a function to cause the interior light and open door warning light in the combination meter to turn off when any door is left open for longer than 15 minutes to reduce wasteful battery consumption.

In addition, it is possible to check operation of actuator which is controlled by BCM by using the output test function of SUZUKI scan tool to operate actuator simulatively.

Security Alarm Description (If Equipped)

S6RW0HA201005

Operation

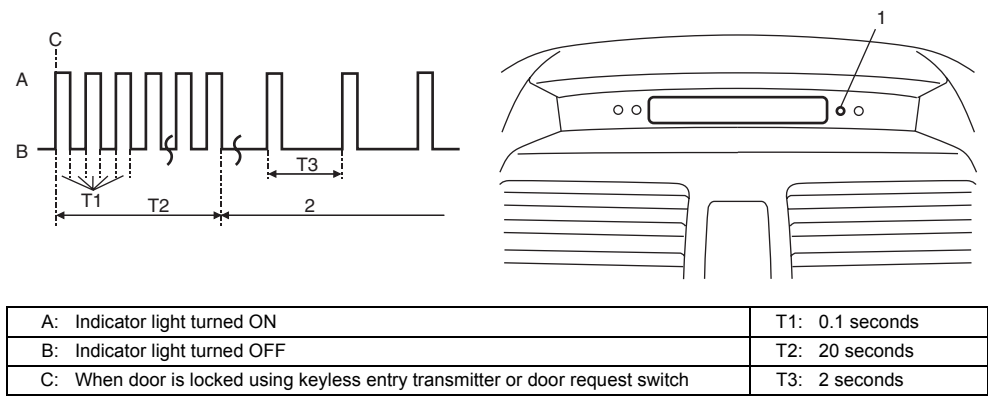
The security alarm system provides a warning of an abnormal condition to those who are around. Its operation is as follows. While the system is in the stand-by mode (when 20 seconds or more elapsed after the door is locked using a keyless entry transmitter or door request switch), BCM monitors door lock status, door switch status and battery power supply voltage. When it detects an abnormal condition (door is unlocked by some way other than using keyless entry transmitter or door request switch and opened or cut off BCM power supply voltage temporarily), it activates the warning buzzer (located in BCM), theft deterrent light, hazard warning relay and horn relay.

The security alarm system has 2 selectable modes.

- A mode: No operation
- B mode: Theft deterrent light blinks, hazard warning lights blink, warning buzzer (located in BCM) sounds and horn sounds

When “B” mode is selected and the door is locked using keyless entry transmitter or door request switch, the theft deterrent light (1) flashes at 0.1 second interval for 20 seconds and the security alarm system is set to the stand-by mode (2). Once it is set to the stand-by mode, the theft deterrent light blinks at 2 second intervals.

When the system is set to stand-by mode and the door is unlocked by some way other than using keyless entry transmitter or door request switch and opened or cut off BCM power supply voltage temporarily, the alarm devices operate according to the selected mode as described above.

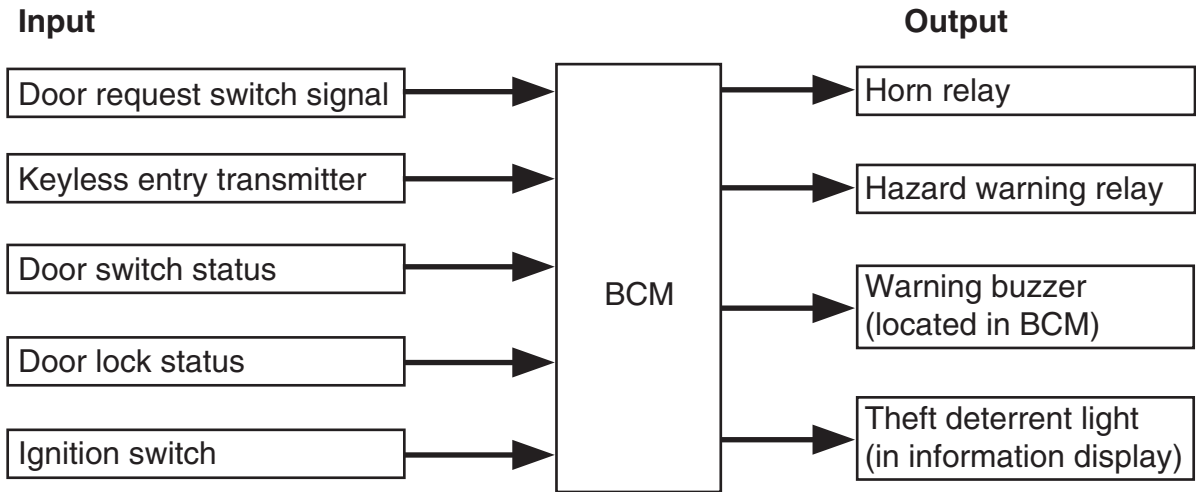


I7RW01A20015-01

The alarm stops under either of the following conditions.

- Ignition switch is turned ON
 - A certain time has elapsed since the alarm started
- For selection of the mode of the security alarm system, refer to “Security Alarm Mode Selection Procedure (If Equipped)”.

Input / Output Table



I5RS0CA20003-01

Schematic and Routing Diagram

Body Electrical Control System Wiring Circuit Diagram

S6RW0HA20001

NOTE

This wiring diagram shows circuits related to only BCM, not the entire circuits of BCM and junction block. Refer to “Power Supply Diagram in Section 9A in related manual” for wiring circuits other than the figure below.

10B-3 Body Electrical Control System:



I6RW0HA20001-02

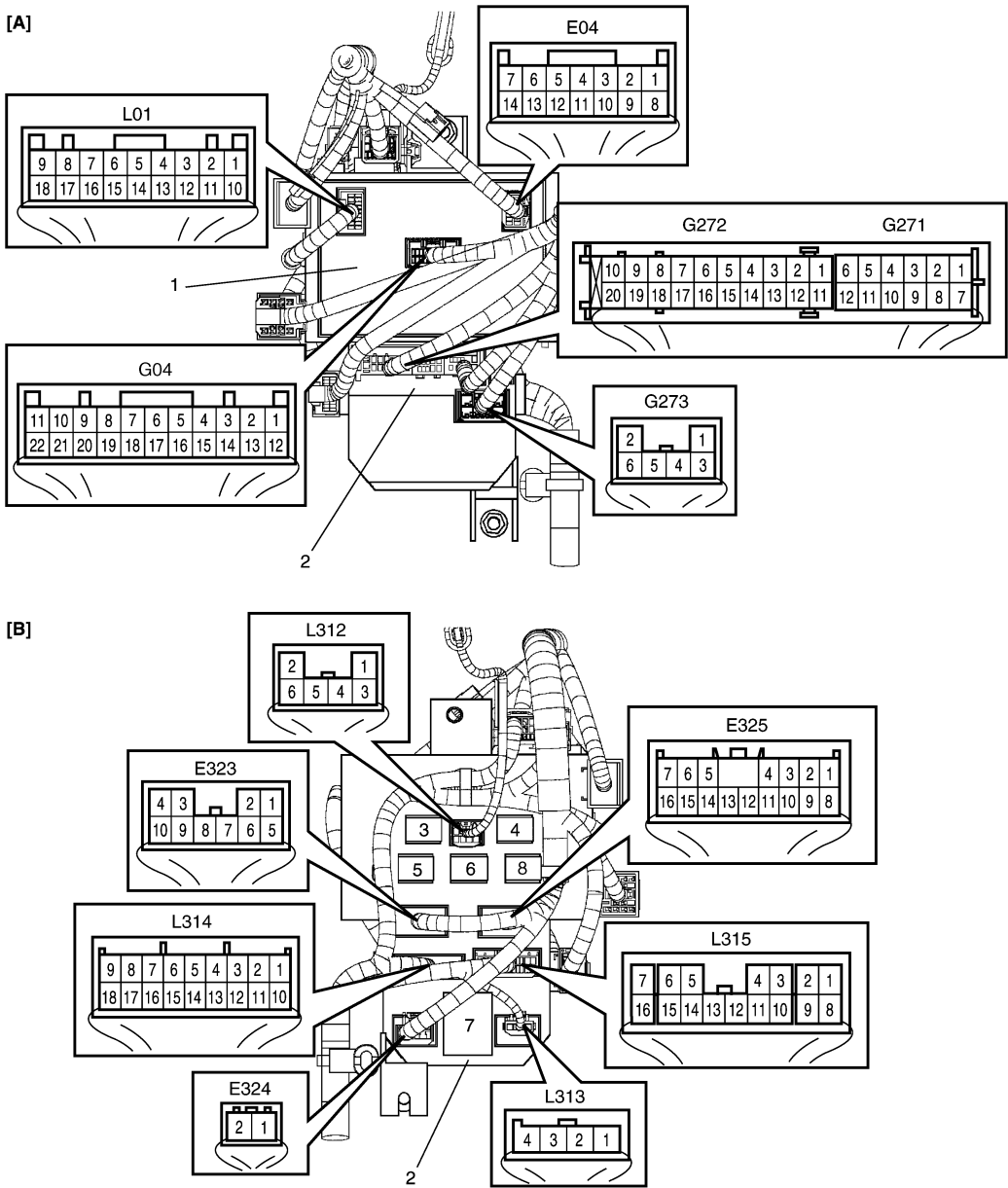
1. BCM	24. Parking brake switch	47. Hazard warning switch
2. Rear end door opener actuator (if equipped)	25. Door key cylinder switch (included in door lock actuator) (if equipped)	48. Turn signal and hazard warning relay
3. Rear end door opener relay (if equipped)	26. Manual door lock switch (if equipped)	49. To turn signal light

4. Rear washer motor	27. Rear end door opener switch (if equipped)	50. Interior light
5. Rear wiper and washer switch	28. A/C switch (if equipped)	51. Rear end door window defogger relay
6. Outside air temperature sensor (if equipped)	29. Rear end door window defogger switch	52. Right side door mirror heater (if equipped)
7. Key reminder switch	30. Rear wiper motor	53. Left side door mirror heater (if equipped)
8. Theft deterrent light	31. Rear wiper relay	54. Rear end door window defogger
9. Oil pressure switch	32. TCM (A/T model)	55. Rear end door window defogger indicator light
10. SDM	33. ECM	56. Horn relay
11. P/S control module	34. ABS/ESP® control module	57. Horn switch
12. Navigation (if equipped)	35. Keyless start control module (if equipped)	58. Horn
13. Audio unit (if equipped)	36. CAN junction connector	59. Lighting switch
14. Headlight leveling control module (if equipped)	37. Combination meter	60. Ignition switch
15. Generator	38. 4WD control module (if equipped)	61. Battery
16. Information display (if equipped)	39. DLC	62. Body ground
17. HVAC control module (if equipped)	40. To ABS control module and P/S control module	63. Engine ground
18. Keyless entry receiver (if equipped)	41. To SDM	64. Deicer switch
19. Driver side door switch	42. To HVAC control module (if equipped)	65. Deicer
20. Other than driver side door switch	43. Door lock actuator relay (if equipped)	66. Steering angle sensor
21. Rear end door switch	44. Driver side door lock actuator (if equipped)	67. Yaw rate / G sensor
22. Driver side seat belt switch	45. Passenger side door lock actuator (if equipped)	68. Deicer relay
23. Brake fluid level switch	46. Rear door lock actuator (if equipped)	

Connector Layout Diagram of BCM and Junction Block

S6RW0HA202002

BCM and Junction Block Connectors (Viewed from Harness Side)



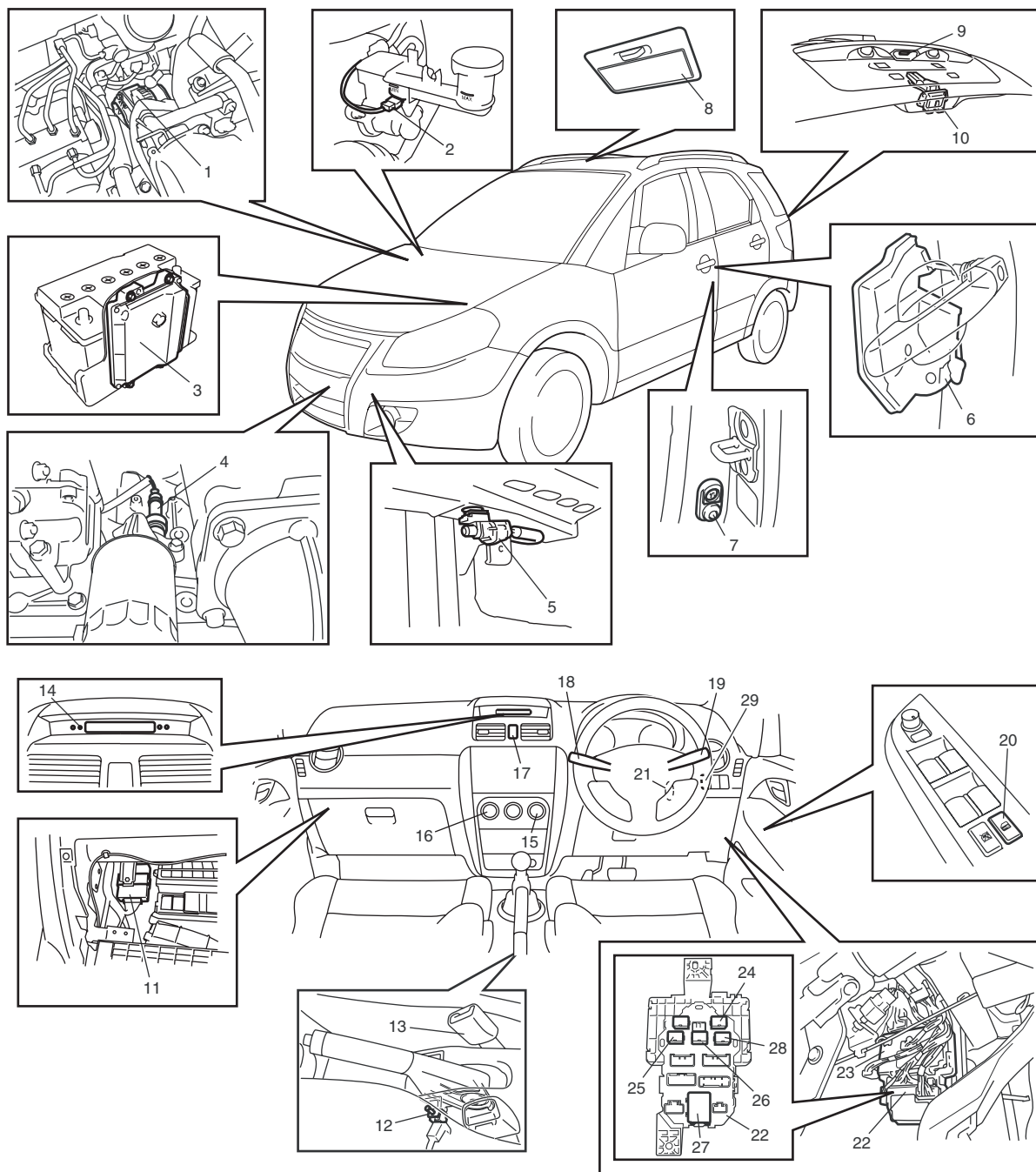
I6RW0HA20003-01

[A]: Junction block (viewed from BCM side)	3. Blower motor relay	7. Turn signal and hazard warning relay
[B]: Junction block (viewed from relay side)	4. Horn relay	8. Deicer relay
1. BCM	5. Rear wiper relay	
2. Junction block	6. Rear end door window defogger relay	

Component Location

BCM and Related System Component Location

S6RW0HA203001



I6RW0HA20004-02

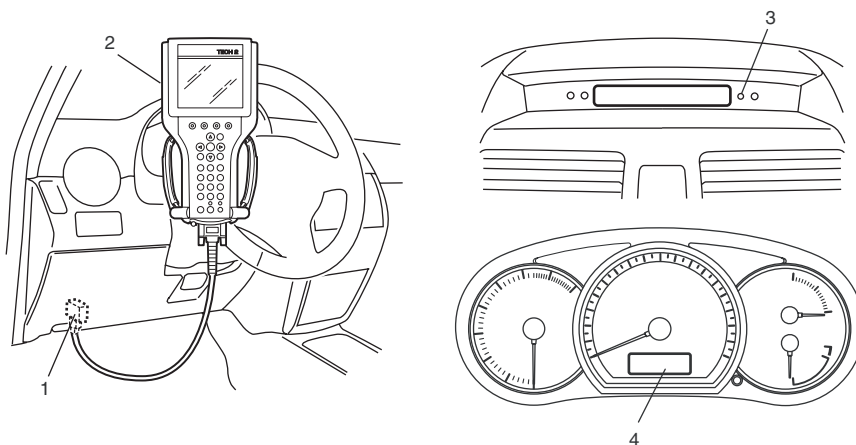
1. Generator	11. Keyless entry receiver or keyless start control module (if equipped)	21. Key reminder switch (included in ignition switch)
2. Brake fluid level switch	12. Parking brake switch	22. Junction block
3. ECM	13. Seat belt buckle switch	23. BCM
4. Oil pressure switch	14. Theft deterrent light	24. Horn relay
5. Outside air temperature sensor (if equipped)	15. Rear end door window defogger switch	25. Rear wiper relay
6. Door lock actuator (incorporated in key cylinder switch)	16. A/C switch (if equipped)	26. Rear end door window defogger relay
7. Door switch	17. Hazard warning switch	27. Turn signal and hazard warning relay
8. Interior light	18. Rear wiper switch	28. Deicer relay
9. Rear end door opener switch (if equipped)	19. Lighting switch	29. Deicer switch
10. Rear end door opener actuator (incorporated in door switch)	20. Manual door lock switch (if equipped)	

Diagnostic Information and Procedures

BCM Self-Diagnosis Function

S6RW0HA204001

- BCM monitors conditions of the system components and its circuit with ignition switch turned to ON position. When an abnormality in the system occurs, the area where that abnormality lies is stored in the memory of EEPROM in BCM.
- DTC can be checked in either one of following ways.
 - DTC can be checked by SUZUKI scan tool (2) connected to DLC (1).
 - DTC can be read from flashing pattern of Theft deterrent light (3). Also, DTC is displayed on combination meter (4) at the same time.


























I5RW0AA20007-01

BCM Input / Output Table

Control	Input	Output
Power door lock system	<ul style="list-style-type: none"> • Key cylinder switch • Manual door lock switch 	<ul style="list-style-type: none"> • Each door lock actuator
Keyless entry system	<ul style="list-style-type: none"> • Key reminder switch • Keyless entry receiver • Driver side door switch 	<ul style="list-style-type: none"> • Each door lock actuator • Turn signal and hazard warning relay • Interior light
Keyless start system (Door lock function)	<ul style="list-style-type: none"> • Keyless start control module 	<ul style="list-style-type: none"> • Each door lock actuator • Turn signal and hazard warning relay • Interior light
Rear wiper	<ul style="list-style-type: none"> • Rear wiper INT switch • Rear wiper LO switch 	<ul style="list-style-type: none"> • Rear wiper relay
Combination meter	<ul style="list-style-type: none"> • Tail light switch • Oil pressure switch • Parking brake switch • Driver side seat belt switch • Brake fluid level switch • Generator • Each door switch 	<ul style="list-style-type: none"> • Combination meter
Interior light	<ul style="list-style-type: none"> • Each door switch • Key reminder switch 	<ul style="list-style-type: none"> • Interior light
Warning buzzer	<ul style="list-style-type: none"> • Key reminder switch • Tail light switch • Driver side door switch • Keyless start control module (if equipped) • TCM (reverse signal) (if equipped) 	<ul style="list-style-type: none"> • Warning buzzer (located in BCM)
Deicer	<ul style="list-style-type: none"> • Deicer switch • Generator 	<ul style="list-style-type: none"> • Deicer relay
Rear end door window defogger	<ul style="list-style-type: none"> • Rear end door window defogger switch • Generator 	<ul style="list-style-type: none"> • Rear end door window defogger relay
Rear end door opener	<ul style="list-style-type: none"> • Manual door lock switch (unlock signal) • Key cylinder switch (unlock signal) • Keyless entry transmitter (unlock signal) • Rear end door opener switch 	<ul style="list-style-type: none"> • Rear end door opener relay
Door lock canceller	<ul style="list-style-type: none"> • SDM (air bag deployment signal) 	<ul style="list-style-type: none"> • Each door lock actuator
Theft deterrent light	<ul style="list-style-type: none"> • Key reminder switch 	<ul style="list-style-type: none"> • Theft deterrent light (located in information display or clock)

Scan Tool Data

Scan tool data	Condition	Normal condition / reference value
Vehicle Speed 	At stop with ignition switch turned ON	0 km/h
Outside air Temp 	Reference value is relative to outside air temperature	-40 °C – 70 °C (-40 °F – 158 °F)
Battery Voltage 	At specified idle speed after warming up	10 – 14 V
Coolant Temp 	At specified idle speed after warming up	80 °C – 100 °C (176 °F – 212 °F)
Engine Speed 	Engine idling with no load applied after warming up	Desired idle speed ± 50 rpm
Fuel Consumption 	At specified idle speed after warming up	0.0 km/l
Key Reminder Sw 	Ignition key inserted in ignition key cylinder	Key in
	Ignition key pulled out from ignition key cylinder	Pulled
Rear Wiper Sw 	Rear wiper switch at ON position and ignition switch turned ON	ON
	Rear wiper switch at INT position and ignition switch turned ON	INT
	Rear wiper switch at OFF position and ignition switch turned ON	OFF
Door key Sw 	Key cylinder switch of driver side door at lock position	LOCK
	Key cylinder switch of driver side door not turned	Neutral
	Key cylinder switch of driver side door at unlock position	Unlock
Door Lock Sw 	Lock side of manual door lock switch pressed	LOCK
	Manual door lock switch not pressed	Neutral
	Unlock side of manual door lock switch pressed	Unlock
Driv Door Sw 	Driver side door open	Open
	Driver side door closed	Close
Pass Door Sw 	Doors other than driver side door open	Open
	Doors other than driver side door closed	Close
Brake Fluid Level 	Brake fluid level at MIN level or higher	Normal
	Brake fluid level lower than MIN level	Low
Parking Brake Sw 	Parking brake lever pulled	ON
	Parking brake lever released	OFF
Rear Defogger Sw 	Rear end door window defogger switch pressed with engine running	ON
	Rear end door window defogger switch not pressed with engine running	OFF
Headlight Sw 	Lighting switch at HEAD position	ON
	Lighting switch at OFF position	OFF
Tail Light Sw 	Lighting switch at HEAD or CLEARANCE position	ON
	Lighting switch at OFF position	OFF
Front Fog Light Sw 	Lighting switch at HEAD position and front fog light switch at ON position	ON
	Lighting switch at HEAD position and front fog light switch at OFF position	OFF
Driv Seat belt Sw 	Driver side seat belt fastened	Fasten
	Driver side seat belt unfastened	Unfasten
Rear end door opener 	Rear end door opener switch pressed	ON
	Rear end door opener switch not pressed	OFF
Charge light 	Engine at stop with ignition switch turned ON	ON
	Engine running	OFF
Oil pressure switch 	Engine at stop with ignition switch turned ON	ON
	Engine running	OFF
A/C Switch 	A/C and ignition switch turned ON	ON
	A/C switch turned OFF	OFF

Scan Tool Data Definitions

Vehicle Speed (km/h, mph): This parameter indicates the vehicle speed computed by ECM.

Outside air Temp (°C, °F): It is detected by outside air temperature sensor.

Battery Voltage (V): This parameter indicates battery positive voltage inputted to BCM.

Coolant Temp (Engine coolant temperature) (°C, °F): It is detected by engine coolant temperature sensor.

Engine Speed (RPM): It is computed by reference pulse signals from CMP sensor.

Fuel Consumption (km/l): This parameter indicates the fuel consumption computed by ECM.

Key Reminder Sw (Key reminder switch) (Pulled / Key in): This parameter indicates the state of the key reminder switch.

Rear Wiper Sw (Rear wiper switch) (ON / INT / OFF): This parameter indicates the state of the rear wiper switch.

Door key Sw (Door key cylinder switch) (Lock / Neutral / Unlock): This parameter indicates the state of the door key cylinder switch.

Door Lock Sw (Manual door lock switch) (Lock / Neutral / Unlock): This parameter indicates the state of the manual door lock switch.

Driv Door Sw (Driver side door switch) (Open / Close): This parameter indicates the state of the driver side door switch.

Pass Door Sw (Other than driver side door switch) (Open / Close): This parameter indicates the state of the door switches other than driver side door switch.

Brake Fluid Level (Low / Normal): Low: Brake fluid level is lower than specified level.
Normal: Brake fluid level is higher than MIN level.

Parking Brake Sw (Parking brake switch) (ON / OFF): ON: Parking brake lever is pulled up.
OFF: Parking lever is released.

Rear Defogger Sw (Rear end door window defogger switch) (ON / OFF): This parameter indicates the state of the rear end door window defogger switch.

Headlight Sw (Headlight switch) (ON / OFF) (Junction block without BCM type): This parameter indicates the state of the lighting switch.

Tail Light Sw (Lighting switch) (ON / OFF): This parameter indicates the state of the lighting switch.

Front Fog Light Sw (Front fog light switch) (ON / OFF) (Junction block without BCM type): This parameter indicates the state of the front fog light switch.

Driv Seatbelt Sw (Driver seat belt switch) (Fasten / Unfasten): This parameter indicates the state of the driver side seat belt buckle switch.

Rear end door opener (Rear end door opener switch) (ON / OFF): This parameter indicates the state of the rear end door opener switch.

Charge light (ON / OFF): This parameter indicates the state of the charge system monitor switch.

Oil pressure switch (ON / OFF): This parameter indicates the state of the oil pressure switch.

A/C Switch (ON / OFF): This parameter indicates the state of the air conditioning switch.

Diagnosis Using Output Test Function of SUZUKI Scan Tool

SUZUKI scan tool has the output test function which can force operation of following actuators and relays of the system controlled by BCM. When a malfunction is found in the system controlled by BCM, execute the output test which enables easy judgment whether the malfunction is on the input side or output side of BCM. For detailed information on operation of SUZUKI scan tool, refer to "SUZUKI Scan Tool Operator's Manual".

Output Test Item	Controlled Parts
Hazard Warning Light	Turn signal and hazard warning relay
Interior (Dome) Light	Interior (Dome) light (when interior light switch is at DOOR position)
Tail Light* ¹	Tail light relay
Front Fog Light* ¹	Front fog light relay (when lighting switch is at HEAD position)
Rear defogger	Rear end door window defogger relay
Dead lock	Each door lock actuator
Rear end door open	Rear end door opener relay
Door	Each door lock actuator
Warning Buzzer	Warning buzzer (in BCM)
Rear wiper	Rear wiper relay
Alarm indicator	Theft deterrent light (in information display or clock)
Horn* ²	Horn relay

NOTE

*1: Junction block without BCM type

*2: With security alarm system

Inspection of BCM and Its Circuits

S6RW0HA204017

BCM and its circuits can be checked at BCM wiring couplers by measuring voltage and resistance.

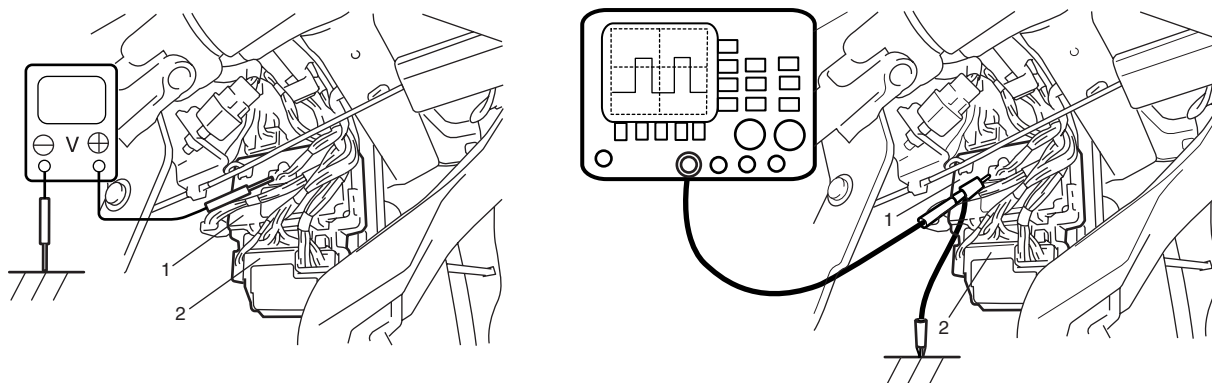
⚠ CAUTION

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

Voltage Check

- 1) Disconnect negative cable (–) at battery.
- 2) Remove BCM (included in junction block) referring to “BCM (Included in Junction Block) Removal and Installation in related manual”.
- 3) Connect connectors to BCM (1) and junction block (2).
- 4) Check voltage at each terminal number of couplers connected.

For connector and terminal number, refer to “Connector Layout Diagram of BCM and Junction Block”.



I4RS0AA20030-01

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 (*) can not be measured by voltmeter because it is pulse signal. Check it with oscilloscope if necessary.

BCM connector “L01”

Terminal	Circuit	Normal voltage	Condition
L01-1	—	—	—
L01-2	—	—	—
L01-3	Rear end door switch	10 – 14 V	Rear end door is closed
		0 V	Rear end door is opened
L01-4	Rear end door opener switch (if equipped)	10 – 14 V	Rear end door opener switch is not pushed
		0 V	Rear end door opener switch is pushed
L01-5	Manual door lock switch (Unlock) (if equipped)	10 – 14 V	Manual door lock switch is at any position other than unlock position
		0 V	Manual door lock switch is at unlock position
L01-6	Parking brake switch	*0 – 3 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 1: ”
		0 V	Ignition switch is at ON position and parking brake lever is pulled up
L01-7	Driver side door switch	10 – 14 V	Driver side door is closed
		0 V	Driver side door is opened
L01-8	—	—	—
L01-9	—	—	—
L01-10	—	—	—

Terminal	Circuit	Normal voltage	Condition
L01-11	Rear end door opener actuator control (if equipped)	0 V	Rear end door actuator motor is not in operation
		10 – 14 V	Rear end door actuator motor is in operation
L01-12	Manual door lock switch (Lock) (if equipped)	10 – 14 V	Manual door lock switch is at any position other than lock position
		0 V	Manual door lock switch is at lock position
L01-13	—	—	—
L01-14	Driver side seat belt switch	*0 – 3 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 2: ”
		0 V	Ignition switch is at ON position and driver side seat belt is unfastened
L01-15	Door switch (other than driver side door and rear end door)	10 – 14 V	Rear right and left side door and passenger side door are closed
		0 V	Any one of the door is opened (except driver side door and rear end door)
L01-16	Driver side door key cylinder switch (Lock) (if equipped)	10 – 14 V	Driver side door key cylinder switch is at any position other than lock position
		0 V	Driver side door key cylinder switch is at lock position
L01-17	Driver side door key cylinder switch (Unlock) (if equipped)	10 – 14 V	Driver side door key cylinder switch is at any position other than unlock position
		0 V	Driver side door key cylinder switch is at unlock position
L01-18	—	—	—

BCM connector “E04”

Terminal	Circuit	Normal voltage	Condition
E04-1	CAN communication line (high) for ABS / ESP® control module	*2.5 – 3.6 V	Refer to “Reference waveform No. 3: ”
E04-2	CAN communication line (low) for ABS / ESP® control module	*1.6 – 2.5 V	
E04-3	—	—	—
E04-4	Generator “L” terminal	10 – 14 V	Engine is running
		0 V	Ignition switch is at ON position
E04-5	Brake fluid level switch	*0 – 3 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 1: ”
		0 V	Ignition switch is at ON position, parking brake lever is released and brake fluid level is lower than MIN level
E04-6	—	—	—
E04-7	—	—	—
E04-8	Sensor ground for outside air temperature sensor (if equipped)	0 V	—
E04-9	Serial communication line of data link connector for ABS control module	7 – 12 V	Ignition switch is at ON position
E04-10	Outside air temperature sensor (if equipped)	About 1.5 V	Ignition switch is at ON position and outside air temperature approx. 20 °C (68 °F)
E04-11	Oil pressure switch	*3 – 14 V	Refer to “Reference waveform No. 4: ”
		0 V	Ignition switch is at ON position and engine is at stop
E04-12	—	—	—
E04-13	—	—	—
E04-14	—	—	—

10B-13 Body Electrical Control System:
BCM connector “G04”

Terminal	Circuit	Normal voltage	Condition
G04-1	CAN communication line (low) for DLC	*1.6 – 2.5 V	Refer to “Reference waveform No. 3: ”
G04-2	CAN communication line (low) for each control module	*1.6 – 2.5 V	
G04-3	CAN communication line (high) for DLC	*2.5 – 3.6 V	
G04-4	CAN communication line (high) for each control module	*2.5 – 3.6 V	
G04-5	Serial communication line of data link connector	7 – 12 V	Ignition switch is at ON position
G04-6	—	—	—
G04-7	—	—	—
G04-8	Theft deterrent light	10 – 14 V	Theft deterrent light is not lit up
		0 V	Theft deterrent light is lit up
G04-9	—	—	—
G04-10	—	—	—
G04-11	Serial communication line for information display and HVAC control module (if equipped)	*0 – 1 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 5: ”
G04-12	Ground for keyless entry receiver (if equipped)	0 V	—
G04-13	Power supply for keyless entry receiver (if equipped)	4 – 6 V	Ignition switch is at all positions
G04-14	Signal for keyless entry receiver (if equipped)	*0 – 1 V ↑↓ 4 – 6 V	Refer to “Reference waveform No. 6: ”
G04-15	Vehicle speed signal output	*0 – 1 V ↑↓ 4 – 6 V	Refer to “Reference waveform No. 7: ”
G04-16	Key reminder switch	10 – 14 V	Ignition key is inserted to ignition key cylinder
		0 V	Ignition key is pulled out from ignition key cylinder
G04-17	Rear end door window defogger switch	*3 – 14 V	Refer to “Reference waveform No. 8: ”
		0 V	Ignition switch is at ON position and rear end door window defogger switch is pushed
G04-18	A/C switch (if equipped)	*3 – 14 V	Refer to “Reference waveform No. 8: ”
		0 V	Ignition switch is at ON position, blower speed selector is at any position other than OFF position and A/C switch is at ON position
G04-19	Deicer switch	*0 – 1 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 11: ”
G04-20	—	—	—
G04-21	Rear wiper INT switch	*0 – 1 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 9: ”
		0 V	Ignition switch is at ON position and rear wiper switch is at INT position
G04-22	Rear wiper low switch	*0 – 1 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 9: ”
		0 V	Ignition switch is at ON position and rear wiper switch is at LOW position

Junction block connector “E324”

Terminal	Circuit	Normal voltage	Condition
E324-2	Backup power source	10 – 14 V	Ignition switch is at all positions

Junction block connector “E325”

Terminal	Circuit	Normal voltage	Condition
E325-3	Horn	10 – 14 V	Horn switch is at ON position
		0 V	Horn switch is at OFF position
E325-7	Deicer control	10 – 14 V	Deicer switch is at ON position
		0 V	Deicer switch is at OFF position

Junction block connector “G271”

Terminal	Circuit	Normal voltage	Condition
G271-3	Ground for BCM	0 V	Ignition switch is at all positions
G271-7	Rear end door window defogger indicator light	10 – 14 V	Engine is running and rear end door window defogger indicator light is lit up
		0 V	Engine is running and rear end door window defogger indicator light is not lit up

Junction block connector “G272”

Terminal	Circuit	Normal voltage	Condition
G272-3	Horn switch	10 – 14 V	Horn switch is not pushed
		0 V	Horn switch is pushed
G272-7	Lighting switch	10 – 14 V	Engine is running (with DRL model) or lighting switch is at any position other than OFF position
		0 V	Lighting switch is at OFF position
G272-9	Ground for BCM	0 V	Ignition switch is at all positions
G272-11	Hazard warning switch	10 – 14 V	Hazard warning switch is at OFF position
		0 V	Hazard warning switch is at ON position or lock or unlock button of keyless entry transmitter (answer back control) is pushed

Junction block connector “G273”

Terminal	Circuit	Normal voltage	Condition
G273-2	Power source (IG)	10 – 14 V	Ignition switch is at ON position
		0 V	Ignition switch is at any position other than ON position
G273-5	Power source (ACC)	10 – 14 V	Ignition switch is at ACC or ON position
		0 V	Ignition switch is at any position other than ACC or ON position

Junction block connector “L312”

Terminal	Circuit	Normal voltage	Condition
L312-4	Power supply for rear wiper motor	10 – 14 V	Ignition switch is at ON position
L312-5	Interior light	10 – 14 V	Interior light switch is at DOOR position and interior light is not lit up
		0 V	Interior light switch is at DOOR position and interior light is lit up

Junction block connector “L313”

Terminal	Circuit	Normal voltage	Condition
L313-2	Air bag communication line	*0 – 1 V ↑↓ 4 – 6 V	Refer to “Reference waveform No. 10: ”
L313-3	Serial communication line of data link connector for SDM	7 – 12 V	Ignition switch is at ON position

Junction block connector “L314”

Terminal	Circuit	Normal voltage	Condition
L314-4	Ground for BCM	0 V	Ignition switch is at all positions
L314-6	Right side door mirror heater (if equipped)	10 – 14 V	Engine is running and rear end door window defogger is in operation
		0 V	Engine is running and rear end door window defogger is not in operation
L314-7	Left side door mirror heater (if equipped)	10 – 14 V	Engine is running and rear end door window defogger is in operation
		0 V	Engine is running and rear end door window defogger is not in operation
L314-8	Rear end door window defogger wire	10 – 14 V	Engine is running and rear end door window defogger is in operation
		0 V	Engine is running and rear end door window defogger is not in operation
L314-9	Rear wiper control	10 – 14 V	Ignition switch is at ON position and rear wiper is not in operation
		0 V	Ignition switch is at ON position and rear wiper is in operation

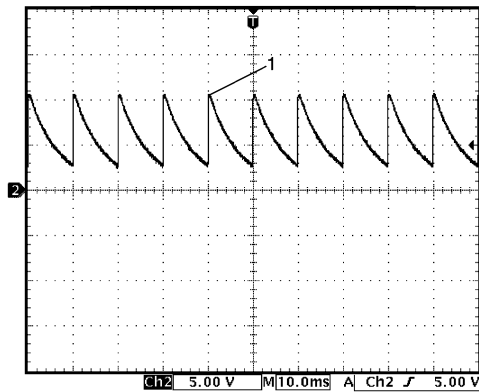
Junction block connector “L315”

Terminal	Circuit	Normal voltage	Condition
L315-9	Door lock actuator control (Unlock) (if equipped)	10 – 14 V	Unlock signal is output for all door lock actuators
		0 V	Unlock signal is not output for all door lock actuators
L315-10	Door lock actuator control (Lock) (if equipped)	10 – 14 V	Lock signal is output for all door lock actuators
		0 V	Lock signal is not output for all door lock actuators

Reference waveform No. 1

Parking brake or brake fluid level switch signal (1)

Measurement terminal	Parking brake switch CH2: "L01-6" to "G271-3" Brake fluid level switch CH2: "E04-5" to "G271-3"
Oscilloscope setting	CH1: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Parking brake switch: <ul style="list-style-type: none"> Ignition switch is at ON position, parking brake lever is released Brake fluid level switch <ul style="list-style-type: none"> Ignition switch is at ON position, brake fluid level is in normal

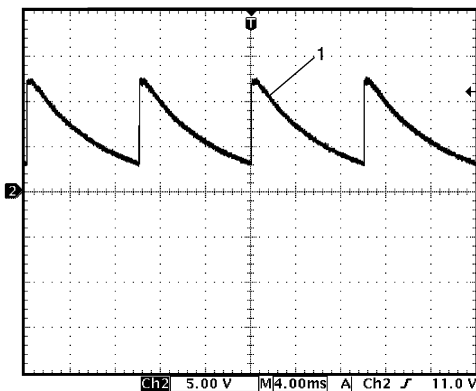


I4RS0AA20018-02

Reference waveform No. 2

Driver seat belt switch signal (1)

Measurement terminal	CH2: "L01-14" to "G271-3"
Oscilloscope setting	CH2: 5 V/DIV TIME: 4 ms/DIV
Measurement condition	Ignition switch is at ON position and driver side seat belt is fastened

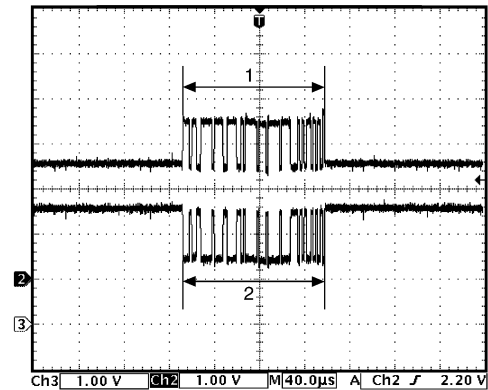


I4RS0AA20016-02

Reference waveform No. 3

CAN communication signal

Measurement terminal	CAN communication signal for ABS / ESP® control module CH2: "E04-1" to "G271-3" CH3: "E04-2" to "G271-3" CAN communication signal for DLC CH2: "G04-3" to "G271-3" CH3: "G04-1" to "G271-3" CAN communication signal for each control module CH2: "G04-4" to "G271-3" CH3: "G04-2" to "G271-3"
Oscilloscope setting	CH2: 1 V/DIV CH3: 1 V/DIV TIME: 40 μs/ DIV
Measurement condition	Ignition switch is at ON position



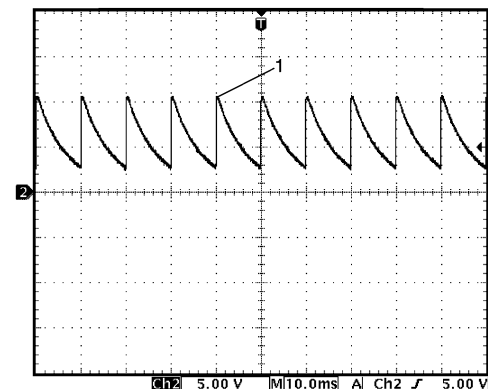
I4RS0AA20017-02

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

Reference waveform No. 4

Oil pressure switch signal (1)

Measurement terminal	CH2: "E04-11" to "G271-3"
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Engine is running and oil pressure is in normal condition

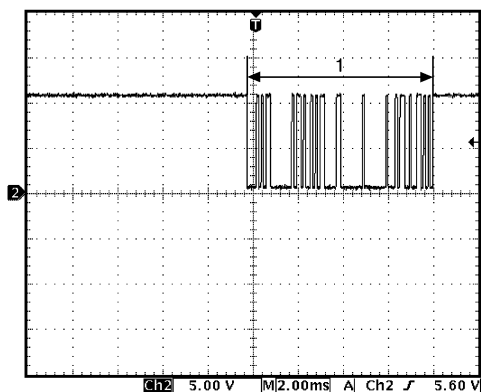


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Reference waveform No. 5

Information display and HVAC control module serial communication signal (1)

Measurement terminal	CH2: "G04-11" to "G271-3"
Oscilloscope setting	CH2: 5 V / DIV TIME: 2 ms / DIV
Measurement condition	Ignition switch is at ON position

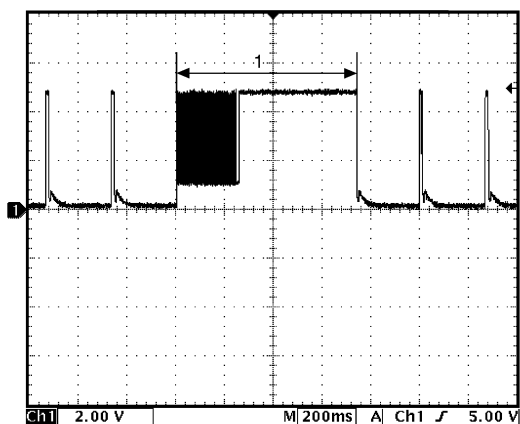


I4RS0AA20021-02

Reference waveform No. 6

Keyless entry receiver signal (1)

Measurement terminal	CH2: "G04-14" to "G271-3"
Oscilloscope setting	CH2: 2 V / DIV TIME: 200 ms / DIV
Measurement condition	Lock or unlock button of keyless entry transmitter is pushed

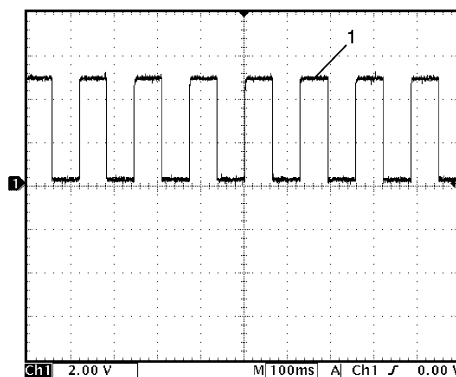


I4RS0AA20022-02

Reference waveform No. 7

Vehicle speed pulse output signal (1)

Measurement terminal	CH1: "G04-15" to "G271-3"
Oscilloscope setting	CH1: 2 V / DIV TIME: 100 ms / DIV
Measurement condition	Vehicle speed at 10 km/h (6 mph)

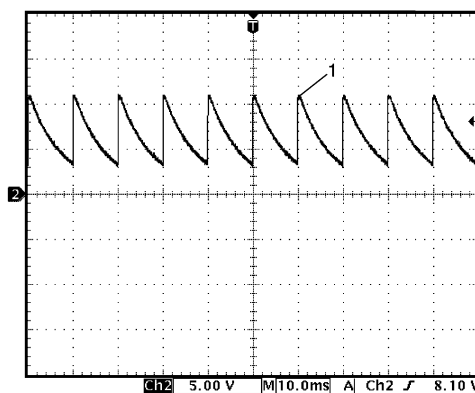


I5RW0AA20014-01

Reference waveform No. 8

A/C or rear end door window defogger switch signal (1)

Measurement terminal	Rear end door window defogger switch CH2: "G04-17" to "G271-3" A/C switch CH2: "G04-18" to "G271-3"
Oscilloscope setting	CH2: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	Rear end door window defogger switch: <ul style="list-style-type: none"> Ignition switch is at ON position and rear end door window defogger switch is not pushed A/C switch: <ul style="list-style-type: none"> Ignition switch is at ON position, A/C switch or blower speed selector is at OFF position

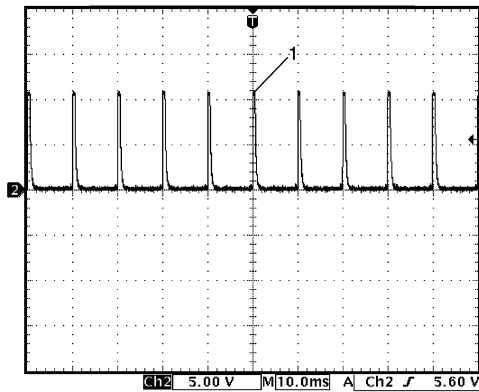


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Reference waveform No. 9

Rear wiper switch signal (1)

Measurement terminal	Rear wiper INT switch CH2: "G04-21" to "G271-3" Rear wiper LOW switch CH2: "G04-22" to "G271-3"
Oscilloscope setting	CH2: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	Rear wiper INT switch: <ul style="list-style-type: none"> Ignition switch is at ON position and rear wiper switch is at any position other than INT position Rear wiper LOW switch: <ul style="list-style-type: none"> Ignition switch is at ON position and rear wiper switch is at any position other than LOW position

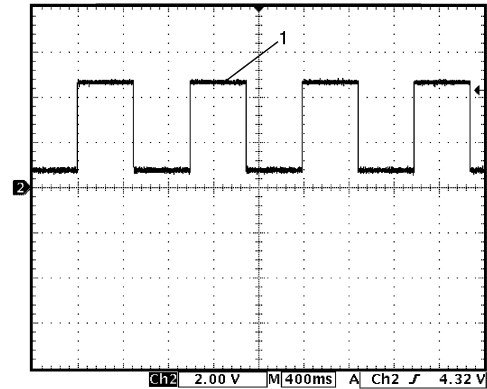


I4RS0AA20024-02

Reference waveform No. 10

SDM communication signal (1)

Measurement terminal	CH2: "L314-2" to "G271-3"
Oscilloscope setting	CH2: 2 V / DIV TIME: 400 ms / DIV
Measurement condition	Ignition switch is at ON position

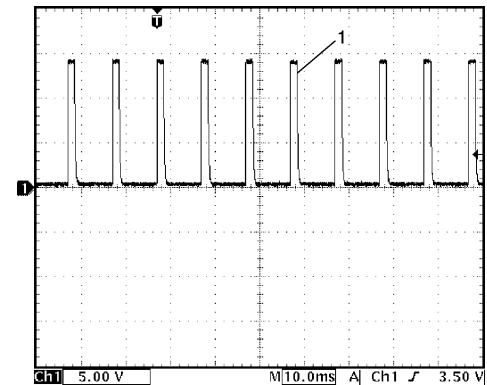


I4RS0AA20026-02

Reference waveform No. 11

Deicer switch signal (1)

Measurement terminal	CH1: "G04-19" to "G271-3"
Oscilloscope setting	CH1: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Ignition switch is at ON position and deicer switch is at OFF position



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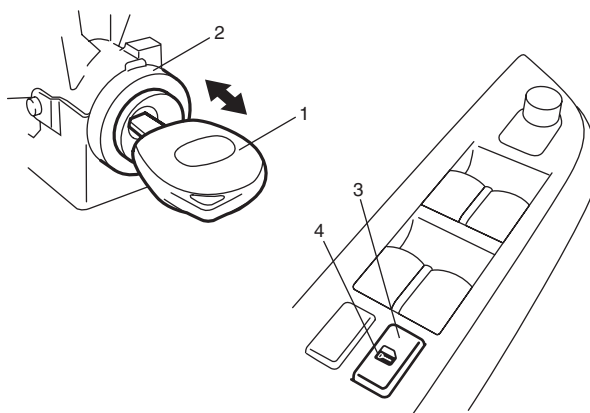
Repair Instructions

Security Alarm Mode Selection Procedure (If Equipped)

S6RW0HA206005

Security alarm mode can be selected by performing the following procedure.

- 1) Confirm that all doors are closed, all doors are unlocked and ignition key is inserted in ignition key cylinder.
- 2) Remove ignition key from ignition key cylinder.
- 3) Perform Step a) through e) described below within 15 seconds.
 - a) Insert ignition key (1) in ignition key cylinder (2).
 - b) Remove ignition key from ignition key cylinder.
 - c) Repeat Step a) and b) twice.
 - d) Insert ignition key in ignition key cylinder.
 - e) Push lock side (3) of driver side manual lock switch (4) 3 times.



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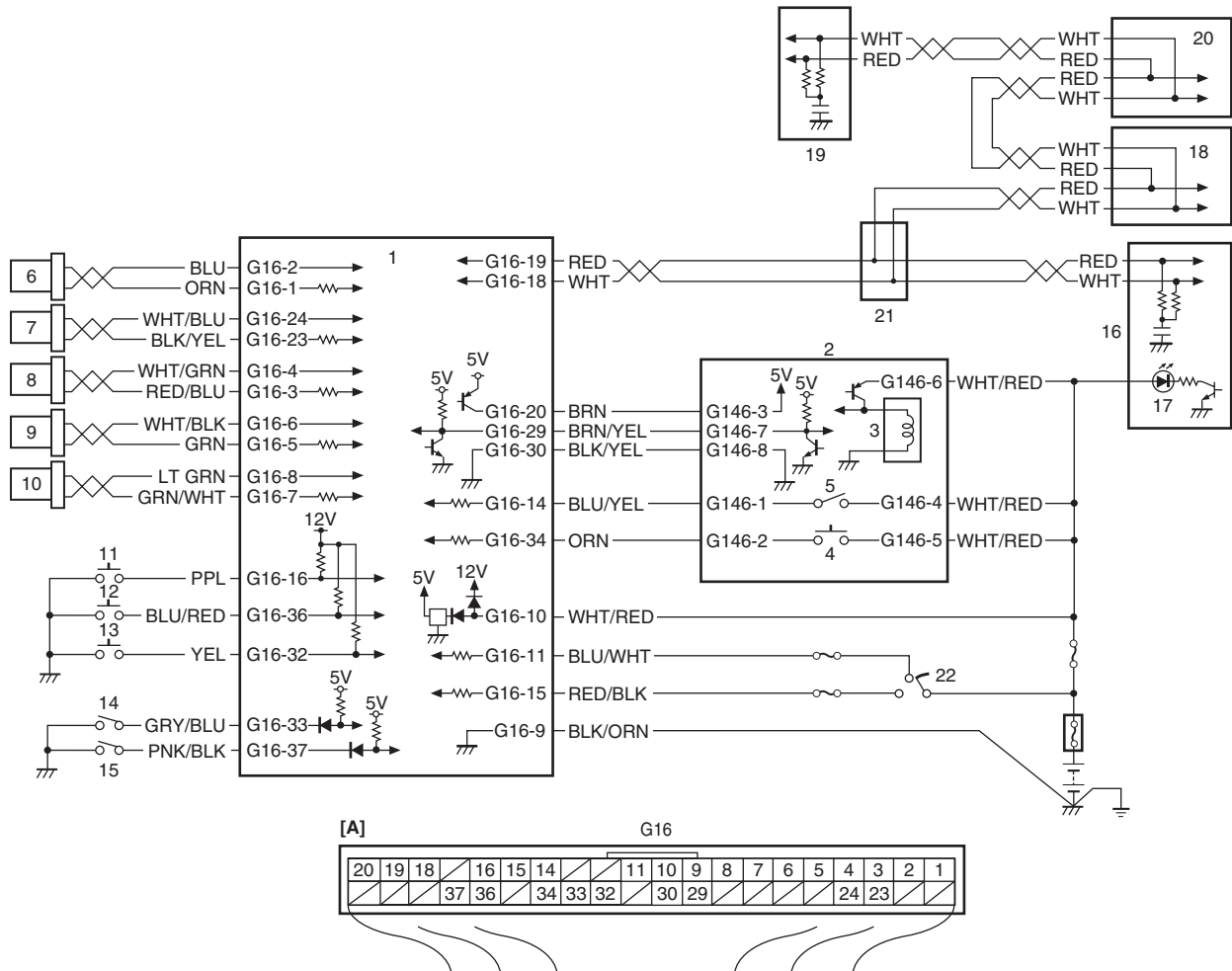
- 4) When Step 3) is completed, the mode changes to the next one automatically. The warning buzzer (located in BCM) sounds by the number of specified for each mode as follows.
 - Changed from A mode to B mode: Buzzer sounds 4 times
 - Changed from B mode to A mode: Buzzer sounds once

Keyless Start System

Schematic and Routing Diagram

Keyless Start System Electric Wiring Circuit Diagram

S6RW0HA502001



I6RW0HA50001-02

[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/ESP® 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

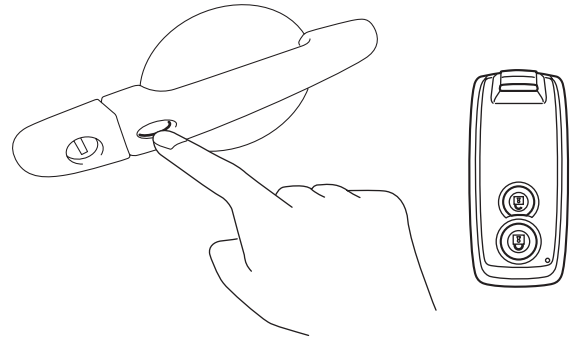
S6RW0HA504001

- 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 in related manual". 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/ESP® control module, 4WD control module (if equipped), steering angle sensor (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 in related manual"). 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 in related manual".
- 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 in related manual".
 - 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 in related manual".

Door Lock Operation (Keyless Start System)

S6RW0HA504012

- 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.



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SUZUKI MOTOR CORPORATION

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