TO INDEX

B8 ENGINE CONTROL SYSTEM

■ 1KR

1 ENGINE CONTROL COMPUTER

1-1 REMOVAL AND INSTALLATION

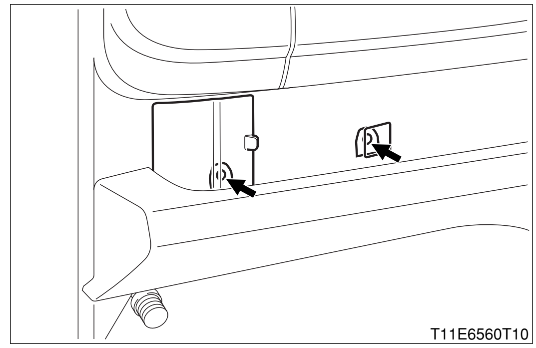
1-1-1 OPERATION BEFORE REMOVAL

1. Disconnect the negative (-) terminal of the battery.
2. Remove the No.1 instrument panel under cover.
3. Remove the fuse box opening cover and lower instrument cover.

NOTE

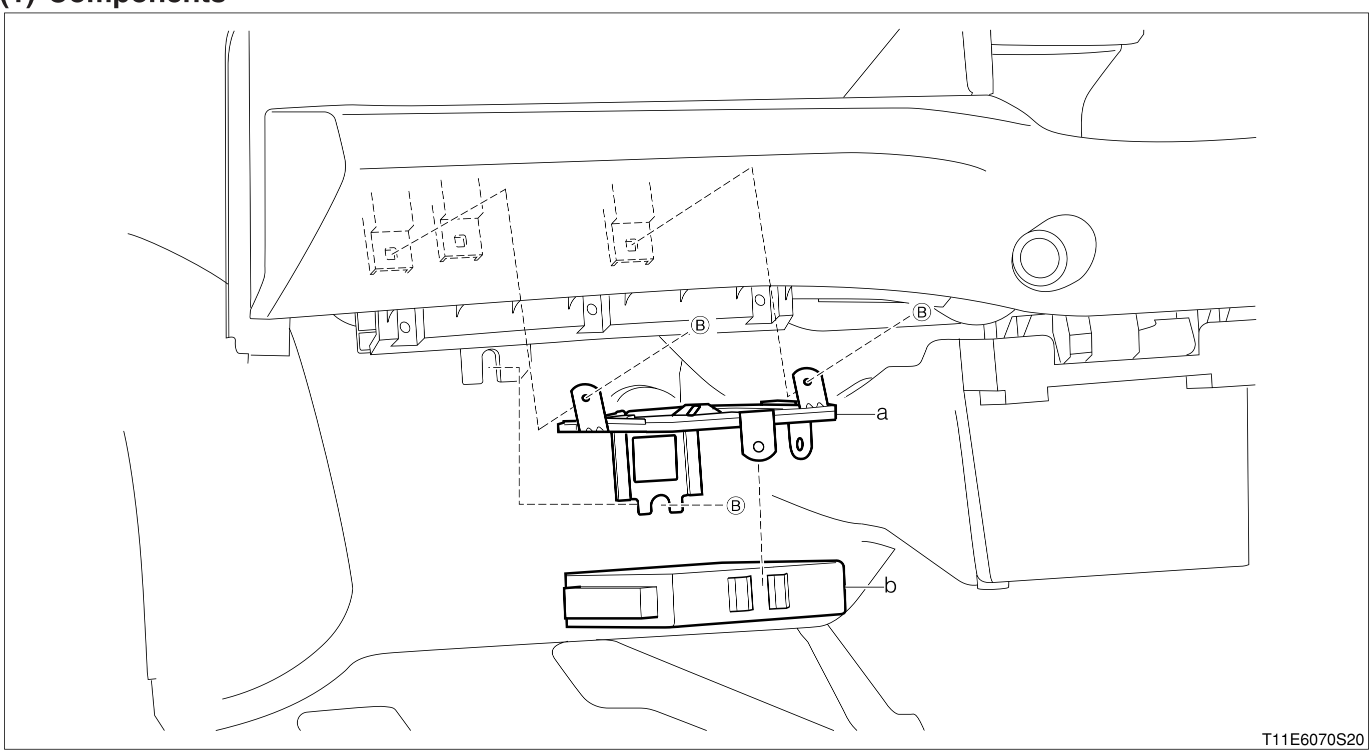
- There are bolts fixing the EFI ECU in the back of the removed cover.

4. Remove the connector of the fuel injection computer Ay.



1-1-2 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



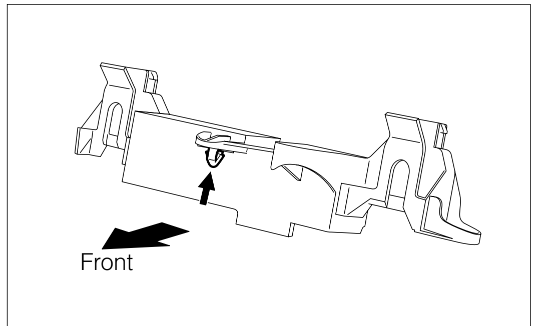
(2) Removeal and installation procedures

	1	a	Bracket, computer
▲	2	b	Computer Ay, fuel injection

1-1-3 POINTS OF INSTALLATION

(1) Computer Ay, fuel injection

1. Decide the installation position of the fuel injection computer Ay with the temporary maintaining clip on the vehicle side and install the bolts.



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1-1-4 OPERATION AFTER INSTALLATION

1. Connect the connector to the fuel injection computer Ay.
2. Install the fuse box opening cover and lower instrument cover.
3. Install the No.1 instrument panel under cover.
4. Connect the negative (-) terminal of the battery.

2 ENGINE REVOLUTION SENSOR

2-1 REMOVAL AND INSTALLATION

2-1-1 ARTICLES TO BE PREPARED

Instrument

Torque wrench

Lubricant,adhesive,others

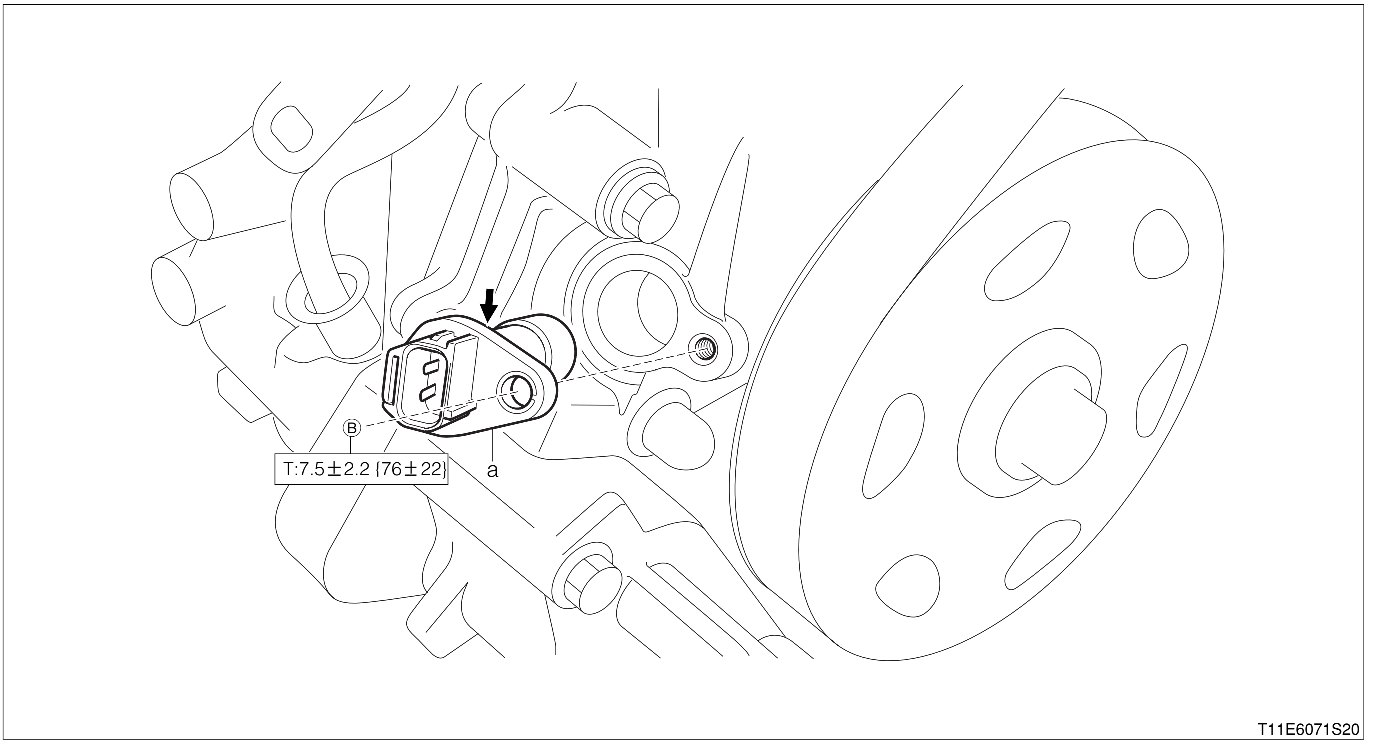
Engine oil

2-1-2 OPERATION BEFORE REMOVAL

1.Disconnect the negative (-) terminal of the battery.
2.Remove the connector of the crank position sensor Ay.

2-1-3 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



➡:Engine oil
Unit: N·m{kgf·cm}

(2) Removeal and installation procedures

▲ 1 a Sensor Ay, crank position

2-1-4 POINTS OF INSTALLATION

(1) Sensor Ay, crank position

1.Apply engine oil to the O-ring of the sensor Ay.
LUBRICANT: Engine oil

2-1-5 OPERATION AFTER INSTALLATION

1.Connect the connector of the crank position sensor Ay.
2.Connect the negative (-) terminal of the battery.

3 CAMSHAFT POSITION SENSOR
3-1 REMOVAL AND INSTALLATION
3-1-1 ARTICLES TO BE PREPARED
Instrument

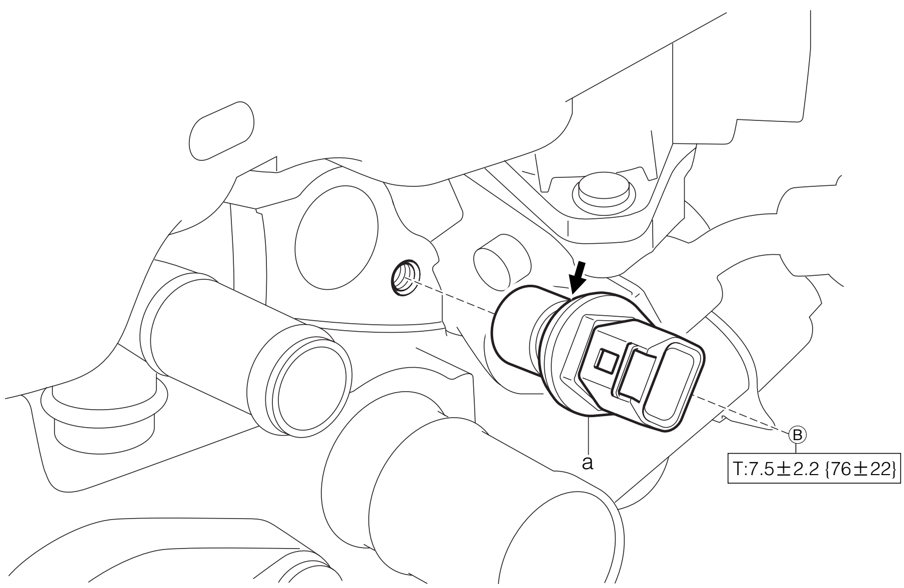
Torque wrench

Lubricant,adhesive,others

Engine oil

3-1-2 OPERATION BEFORE REMOVAL
1.Disconnect the negative (-) terminal of the battery.
2.Remove the connector of the cam position sensor Ay.

3-1-3 REMOVAL AND INSTALLATION PROCEDURES
(1) Components



T11E6073S20

➡:Engine oil
Unit: N·m{kgf·cm}

(2) Removeal and installation procedures
▲ 1 a Sensor Ay, cam position

3-1-4 POINTS OF INSTALLATION
(1) Sensor Ay, cam position
1.Apply engine oil to the O-ring of the sensor Ay.
LUBRICANT: Engine oil

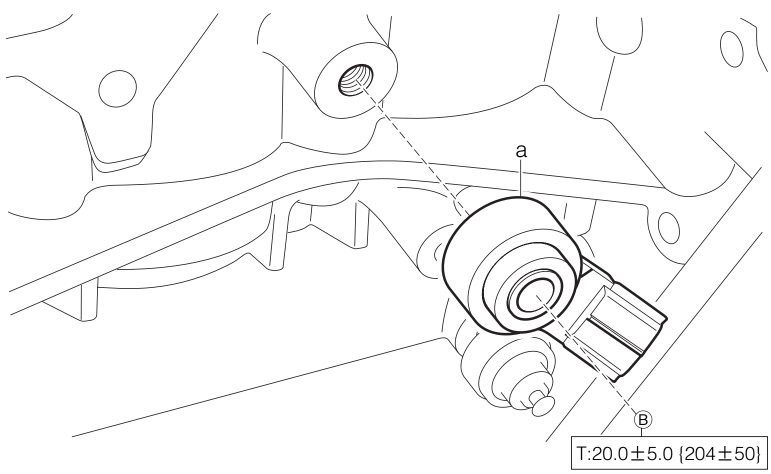
3-1-5 OPERATION AFTER INSTALLATION
1.Connect the connector of the cam position sensor Ay.
2.Connect the negative (-) terminal of the battery.

4 KNOCK SENSOR
4-1 REMOVAL AND INSTALLATION
4-1-1 ARTICLES TO BE PREPARED
Instrument

Torque wrench

4-1-2 OPERATION BEFORE REMOVAL
1.Disconnect the negative (-) terminal of the battery.
2.Remove the intake manifold Ay.
Refer to Page B3-5.

3.Remove the knock control sensor.
4-1-3 REMOVAL AND INSTALLATION PROCEDURES
(1) Components



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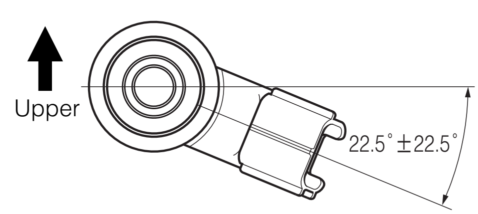
Unit:N·m{kgf·cm}

(2) Removeal and installation procedures

▲ 1 a Sensor, knock control

4-1-4 POINTS OF INSTALLATION
(1) Sensor, knock control

1.When installing the sensor to the engine Ay, install within the position shown in the figure.



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4-1-5 OPERATION AFTER INSTALLATION

1. Connect the connector of the knock control sensor.
2. Install the intake manifold Ay.
   Refer to Page B3-5.
3. Connect the negative (-) terminal of the battery.

5 ENGINE COOLANT TEMPERATURE SENSOR

5-1 REMOVAL AND INSTALLATION

5-1-1 ARTICLES TO BE PREPARED

Instrument

Torque wrench

5-1-2 OPERATION BEFORE REMOVAL

1.Disconnect the negative (-) terminal of the battery.

2.Drain the cooling water.

NOTE

- Drain some amount of coolant from the water inlet so that it would not leak.

3.Remove the No.1 radiator hose (Engine side).

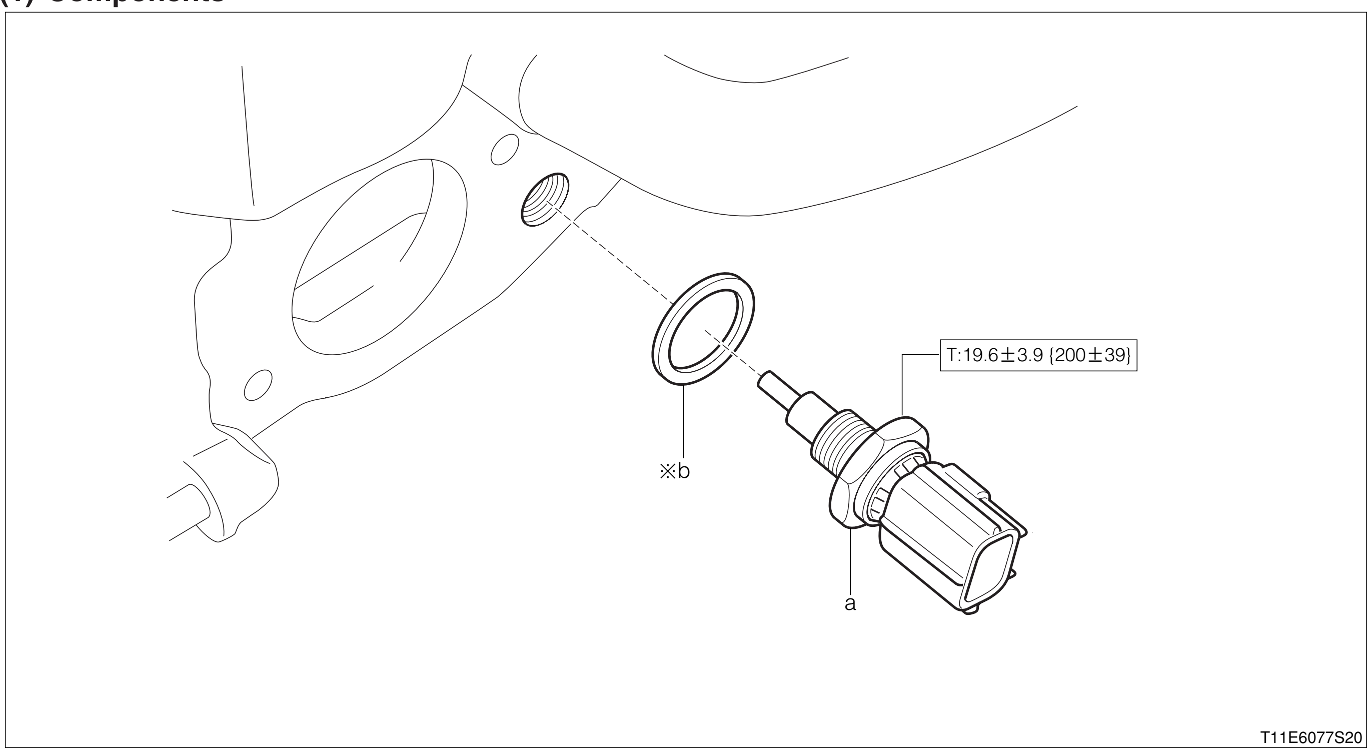
4.Remove water inlet.

Refer to Page B6-1.

5.Remove the connector of the water temperature sensor.

5-1-3 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



※: Non-reusable parts

Unit: N·m {kgf·cm}

(2) Removeal and installation procedures

1 a Sensor, water temperature

2 b Gasket

5-1-4 OPERATION AFTER INSTALLATION

1.Connect the connector of the water temperature sensor.
2.Install the No.1 radiator hose (Engine side).
3.Install the water inlet.
Refer to Page B6-1.

4.Fill cooling water.
5.Connect the negative (-) terminal of the battery.
6.Start the engine and perform air-bleeding of the coolant.
7.Stop the engine and check for coolant leakage.

6 OIL CONTROL VALVE
6-1 REMOVAL AND INSTALLATION
6-1-1 ARTICLES TO BE PREPARED
Instrument

Torque wrench

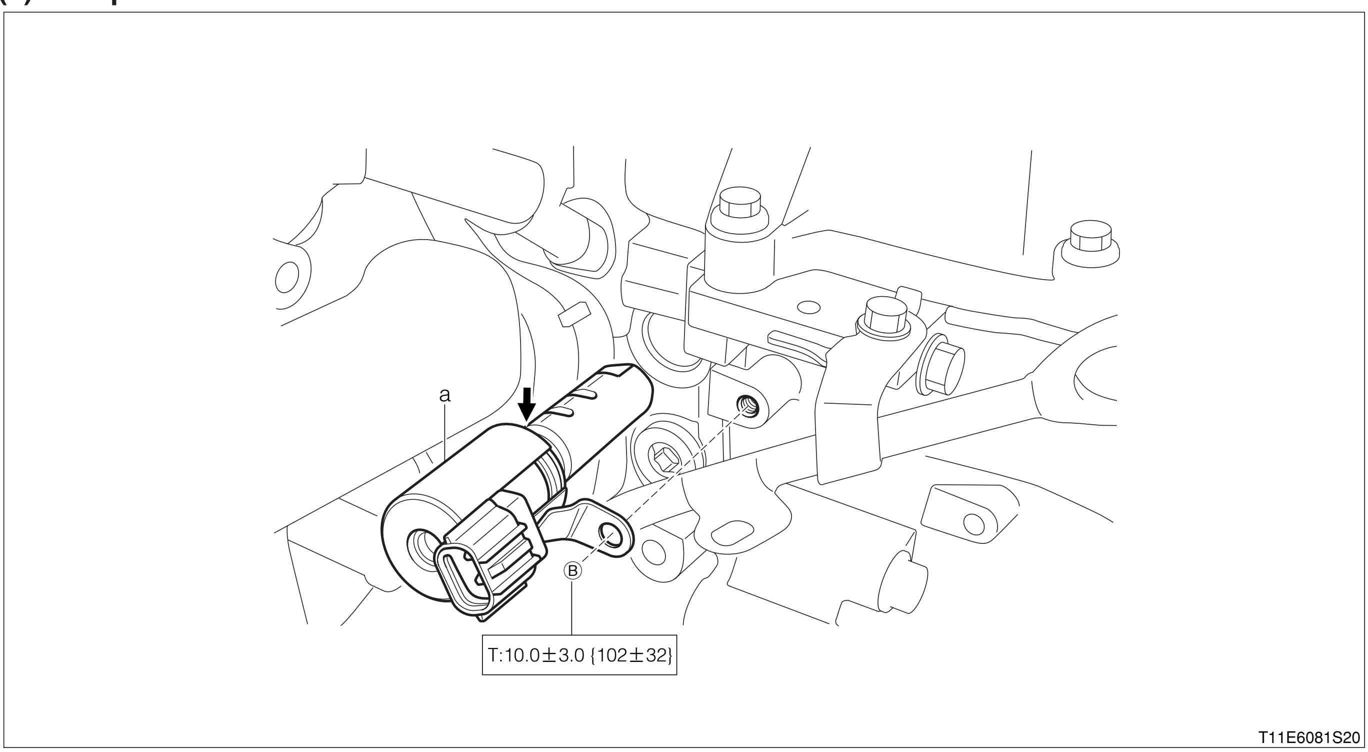
Lubricant,adhesive,others

Engine oil

6-1-2 OPERATION BEFORE REMOVAL
1.Disconnect the negative (-) terminal of the battery.
2.Remove the air cleaner case S/A.
Refer to Page B3-1.

3.Remove the ventilation hose Ay.
4.Remove the connector of the cam timing oil control valve Ay.

6-1-3 REMOVAL AND INSTALLATION PROCEDURES
(1) Components



➡:Engine oil
Unit: N·m{kgf·cm}

(2) Removeal and installation procedures

▲ 1 a Cam timing oil control valve Ay

6-1-4 POINTS OF INSTALLATION
(1) Cam timing oil control valve Ay
1.Apply engine oil to the O-ring of the valve Ay.
LUBRICANT: Engine oil

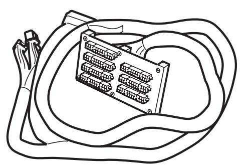
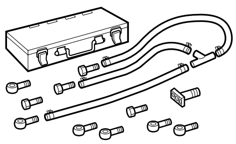
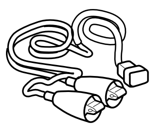
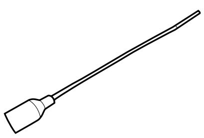
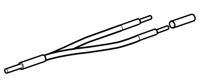
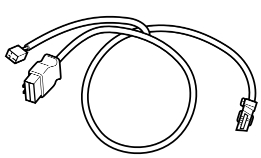
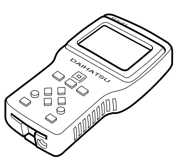
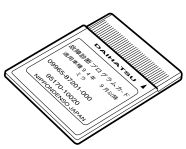
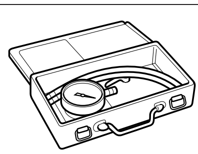
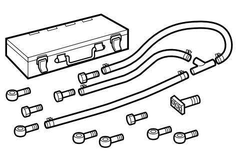
6-1-5 OPERATION AFTER INSTALLATION

1. Connect the connector of the cam timing oil control valve Ay.
2. Install the ventilation hose Ay.
3. Install the air cleaner case S/A.
   Refer to Page B3-1.
4. Connect the negative (-) terminal of the battery.

7 ENGINE CONTROL SYSTEM

7-1 ARTICLES TO BE PREPARED

SST

Shape	Part No.	Part name
	09842-97209-000	Sub-harness,EFI computer check
	09268-41047-000 (09268-41045-000)	Tool set,injection measuring
	09842-30070-000	Wire,EFI inspection
	09991-87402-000	Wire,tacho-pulse pick up
	09991-87403-000	Wire,diagnosis check
	09991-87404-000 (09991-87401-000)	Wire,engine control system inspection
	09991-87301-000	Set,Diagnosis tester
	09965-97230-000 (09965-97207-000)	Trouble-Shooting program card
	09268-87701-000	Gauge,EFI fuel pressure
	09268-87702-000	Tool set,measuring

Instrument

Tachometer,Timing light,Compression gauge,Sound scope,Electrical Tester,Oscillo scope

WARNING

- If the vehicle is driven with the SST (EFI computer check sub harness, etc.) connected there is a possibility of causing malfunction and may be very dangerous. Therefore, remove it without fail before running.

7-2 HANDLING INSTRUCTIONS OF CONTROL SYSTEM

7-2-1 INSTRUCTIONS ON USE OF THIS SERVICE MANUAL

1.This service manual has been compiled in such a way that the manual may be used both in regions where the type certification is implemented based on the EU exhaust emission approval, and other regions.

2.Hence, with regard to the assignment, reading, erasing of diagnostic trouble codes and those steps of checks, repairs and confirmation, the service manual contains the procedures for both cases: One is a procedure that uses the diagnosis tester (DS-21/DS-Ⅱ) or the OBD Ⅱ generic scan tool, and the other is a procedure that does not use this tester or tool.
Therefore, the following instructions given below must be observed.

3.About Use of diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ Generic Scan Tool
(1) Regions where type certification is implemented based on EC exhaust emission approval: Make sure to use the diagnosis tester (DS-21/DS-Ⅱ) or the OBD Ⅱ generic scan tool.
(2) Other regions: You may use or not use the diagnosis tester (DS-21/DS-Ⅱ) or the OBD Ⅱ generic scan tool. You may perform the operation, employing whichever method that will be easier to you.

4.Instructions to be followed concerning Diagnosis Trouble Codes
Diagnosis trouble codes, such as P0105/31 (Four-digit code/two-digit code) are posted additionally.
(1) Regions where type certification is implemented based on EC exhaust emission approval
Make sure to use only four-digit trouble codes (E.G.P0105) whose have been assigned according to the ISO regulations.
(2) Other regions:
You may perform the operation using the four-digit code, employing the diagnosis tester (DS-21/DS-Ⅱ) or the OBD Ⅱ generic scan tool. Or you may perform the operation using the two-digit codes (E.G.31), without the use of the tester or tool. You may perform the operation, employing whichever method that will be easier to you.
Or you may perform the operation using the two-digit codes (E.G.31), without the use of the tester or tool.
You may perform the operation, employing whichever method that will be easier to you.

NOTE

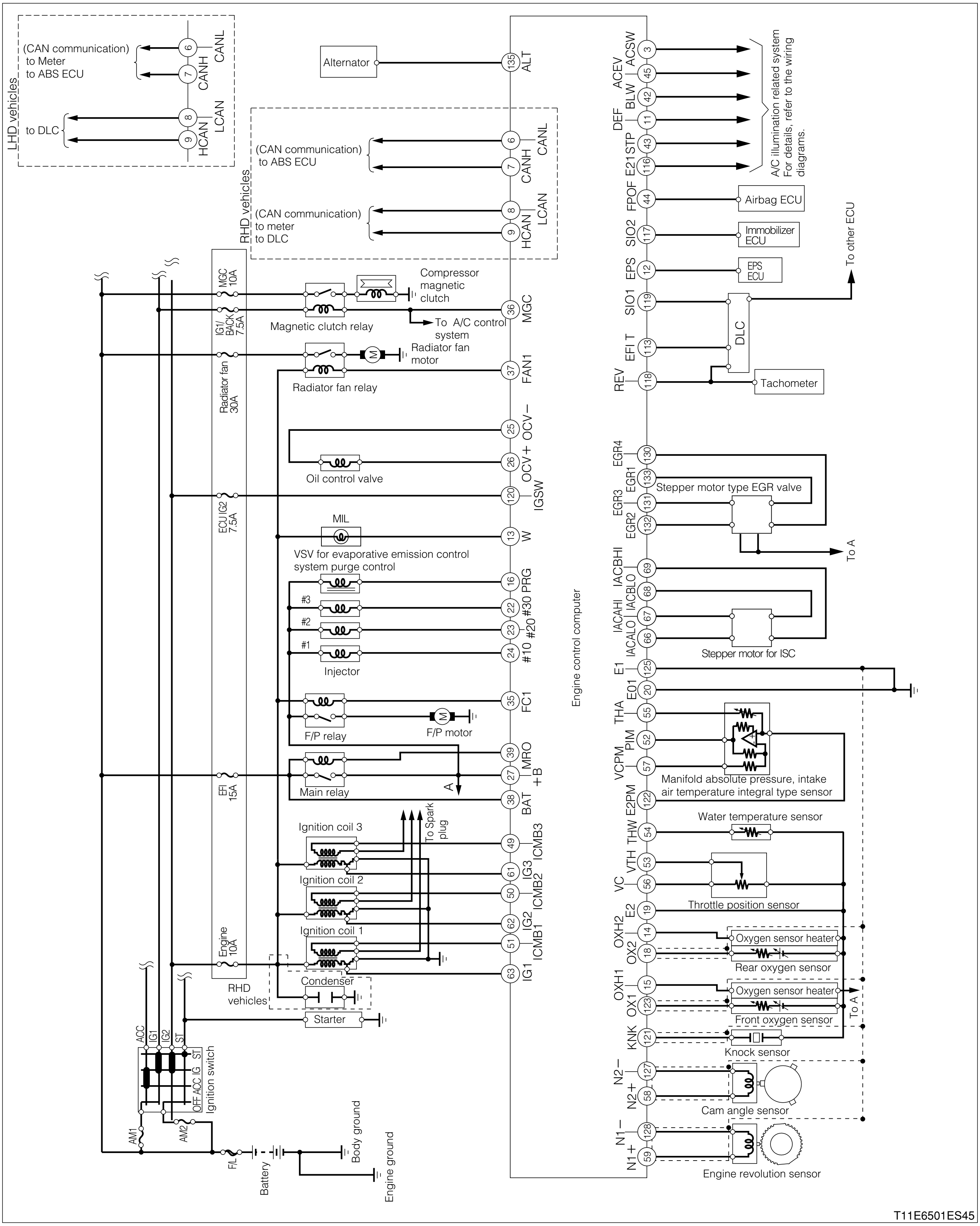
- The OBD Ⅱ generic scan tool means a scan tool complying with the ISO 14230 (KWP2000) format.
- In cases where the OBD Ⅱ generic scan tool is employed, not all diagnostic trouble codes (Four-digit codes) can be read out. It should be noted that only those diagnostic trouble codes in which "zero" follows after "P", for example, P0XXX, can be read out.
- The accuracy of the two-digit codes in diagnosing malfunctioning components is slightly inferior to that of the four-digit codes.
- Hereinafter, those regions where the type certification is implemented based on the EU exhaust emission approval, is referred to as the "EU specifications".

7-2-2 PRECAUTIONARY MEASURES DURING TROUBLE-SHOOTING

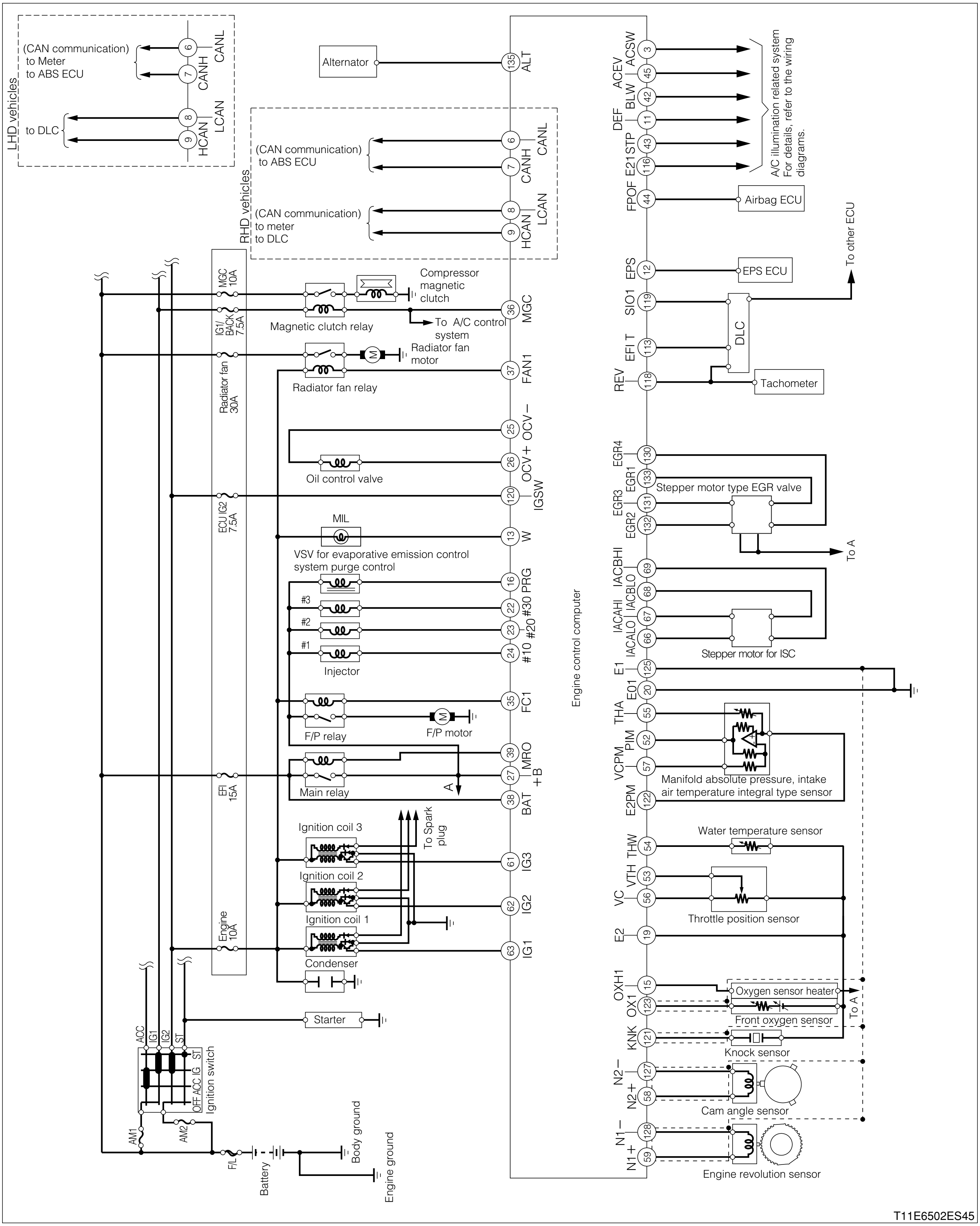
1. Before the diagnosis information memorized in the EFI ECU memory is confirmed, never disconnect the connector from the EFI ECU, the battery negative (-) terminal, the EFI ECU earth wire from the engine, or the main fuse.
2. The diagnosis information memorized in the EFI ECU memory can be erased by using the diagnosis tester (DS-21/DS-Ⅱ) or the OBD-II generic scan tool in the same way as the check. Therefore, before using the tester, read its instruction manual so as to understand the functions furnished and how to use it.
3. Priority in trouble-shooting
   (1) If the priority in trouble-shooting for a number of diagnostic trouble codes is given in the concerned DTC flow chart, make sure to follow the priority.
   (2) If not given, follow the priority given below and perform the trouble-shooting for each diagnostic trouble code (DTC).
   (1) DTC other than DTC P0171/25, DTC P0172/26 (Too lean/too rich in fuel system), and DTC 0300/17, DTC P0301-P0303/17 (Misfire found)
   (2) DTC P0171/25, DTC P0172/26 (Too lean/too rich in fuel system)
   (3) DTC 0300/17, DTC P0301-P0304/17 (Misfire found)

7-3 SYSTEM WIRING DIAGRAM

7-3-1 FOR EU SPECIFICATIONS

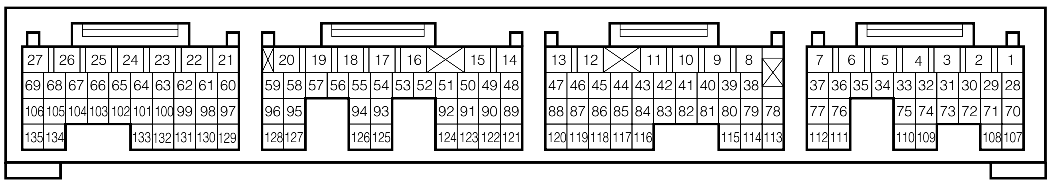


7-3-2 FOR GENERAL SPECIFICATIONS



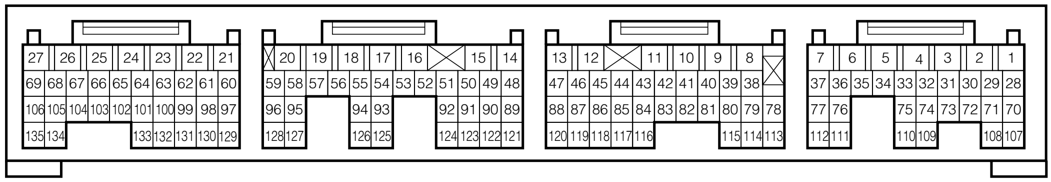
7-4 ARRANGEMENT OF VEHICLE HARNESS SIDE CONNECTOR TERMINALS

(1) For EU specifications



H11E6091S10

Terminal No.	Terminal code	Terminal name	Terminal No.	Terminal code	Terminal name
1	–	–	31	–	–
2	–	–	32	PBSW	Brake negative pressure switch
3	ACSW	Air conditioner switch	33	–	–
4	–	–	34	–	–
5	–	–	35	FC1	Fuel pump relay driving
6	CANL	CAN communication LO (1)	36	MGC	Magnetic clutch relay driving
7	CANH	CAN communication HI (1)	37	FAN1	Radiator fan relay driving
8	LCAN	CAN communication LO (2)	38	BAT	Backup power supply
9	HCAN	CAN communication HI (2)	39	MRO	Main relay driving
10	–	–	40	–	–
11	DEF	Defogger signal	41	–	–
12	EPS	EPS ECU	42	BLW	Heater blower signal
13	W	Engine check lamp	43	STP	Stop lamp signal
14	OXH2	Rear oxygen sensor heater	44	FPOF	Airbag fuel pump OFF request signal
15	OXH1	Front oxygen sensor heater	45	ACEV	Air conditioner evaporator temperature sensor
16	PRG	VSV for evaporative emission control system purge control	46	–	–
17	–	–	47	–	–
18	OX2	Rear oxygen sensor signal	48	–	–
19	E2	Sensor system earth	49	ICMB3	Ion current combustion control signal (#3)
20	E01	Power system earth	50	ICMB2	Ion current combustion control signal (#2)
21	–	–	51	ICMB1	Ion current combustion control signal (#1)
22	#30	Injector (#3)	52	PIM	Manifold absolute pressure sensor
23	#20	Injector (#2)	53	VTH	Throttle position sensor
24	#10	Injector (#1)	54	THW	Engine water temperature sensor
25	OCV−	Oil control valve driving (+)	55	THA	Intake air temperature sensor
26	OCV+	Oil control valve driving (+)	56	VC	Sensor power supply
27	+B	EFI ECU power supply	57	VCPM	Sensor power supply (Exclusively for manifold absolute pressure sensor)
28	–	–	58	N2+	Cam angle sensor(+)
29	–	–	59	N1+	Engine revolution sensor(+)
30	–	–	60	–	–



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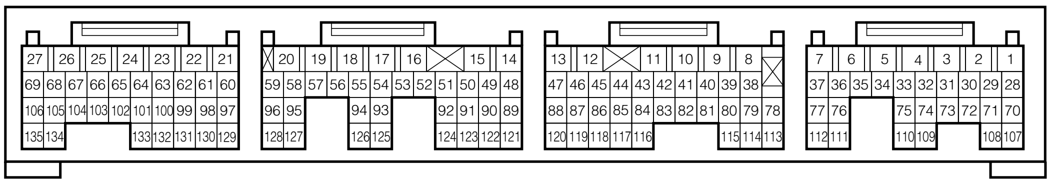
Terminal No.	Terminal code	Terminal name	Terminal No.	Terminal code	Terminal name
61	IG3	Ignition coil (#3)	99	–	–
62	IG2	Ignition coil (#2)	100	–	–
63	IG1	Ignition coil (#1)	101	–	–
64	–	–	102	–	–
65	–	–	103	–	–
66	IACALO	Stepper motor 1 for ISC	104	–	–
67	IACAHI	Stepper motor 2 for ISC	105	–	–
68	IACBLO	Stepper motor 3 for ISC	106	–	–
69	IACBHI	Stepper motor 4 for ISC	107	STSW	Starter switch
70	–	–	108	–	–
71	–	–	109	–	–
72	–	–	110	–	–
73	–	–	111	–	–
74	–	–	112	–	–
75	–	–	113	EFI T	EFI-T check terminal
76	–	–	114	–	–
77	–	–	115	–	–
78	–	–	116	E21	Body sensor earth
79	–	–	117	SIO2	Immobilizer communication
80	–	–	118	REV	DLC (REV terminal)
81	–	–	119	SIO1	DLC (Diagnostic device)
82	–	–	120	IGSW	Ignition switch
83	–	–	121	KNK	Knock sensor
84	–	–	122	E2PM	Sensor earth (Exclusively for manifold absolute pressure sensor)
85	–	–	123	OX1	Front oxygen sensor
86	–	–	124	–	–
87	–	–	125	E1	Calculation system earth
88	–	–	126	–	–
89	–	–	127	N2–	Cam angle sensor(–)
90	–	–	128	N1–	Engine revolution sensor(–)
91	–	–	129	–	–
92	–	–	130	EGR4	Stepper motor type EGR valve 4
93	–	–	131	EGR3	Stepper motor type EGR valve 3
94	–	–	132	EGR2	Stepper motor type EGR valve 2
95	–	–	133	EGR1	Stepper motor type EGR valve 1
96	–	–	134	ALTC	Alternator voltage control output
97	–	–	135	ALT	Alternator cut control output
98	–	–			

(2) For general specifications



H11E6091S10

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12	EPS	EPS ECU	42	BLW	Heater blower signal
13	W	Engine check lamp	43	STP	Stop lamp signal
14	–	–	44	FPOF	Airbag fuel pump OFF request signal
15	OXH1	Front oxygen sensor heater	45	ACEV	Air conditioner evaporator temperature sensor
16	PRG	VSV for evaporative emission control system purge control	46	–	–
17	–	–	47	–	–
18	–	–	48	–	–
19	E2	Sensor system earth	49	–	–
20	E01	Power system earth	50	–	–
21	–	–	51	–	–
22	#30	Injector (#3)	52	PIM	Manifold absolute pressure sensor
23	#20	Injector (#2)	53	VTH	Throttle position sensor
24	#10	Injector (#1)	54	THW	Engine water temperature sensor
25	OCV–	Oil control valve driving (–)	55	THA	Intake air temperature sensor
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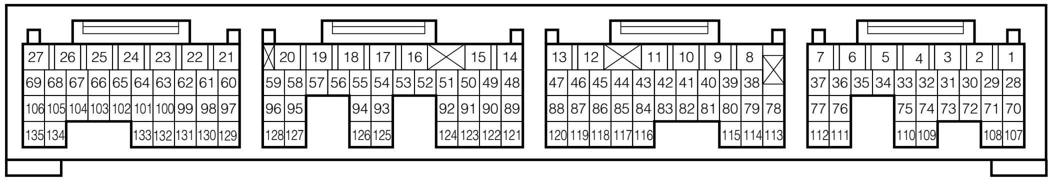
28	–	–	58	N2+	Cam angle sensor(+)
29	–	–	59	N1+	Engine revolution sensor(+)
30	–	–	60	–	–



H11E6091S10

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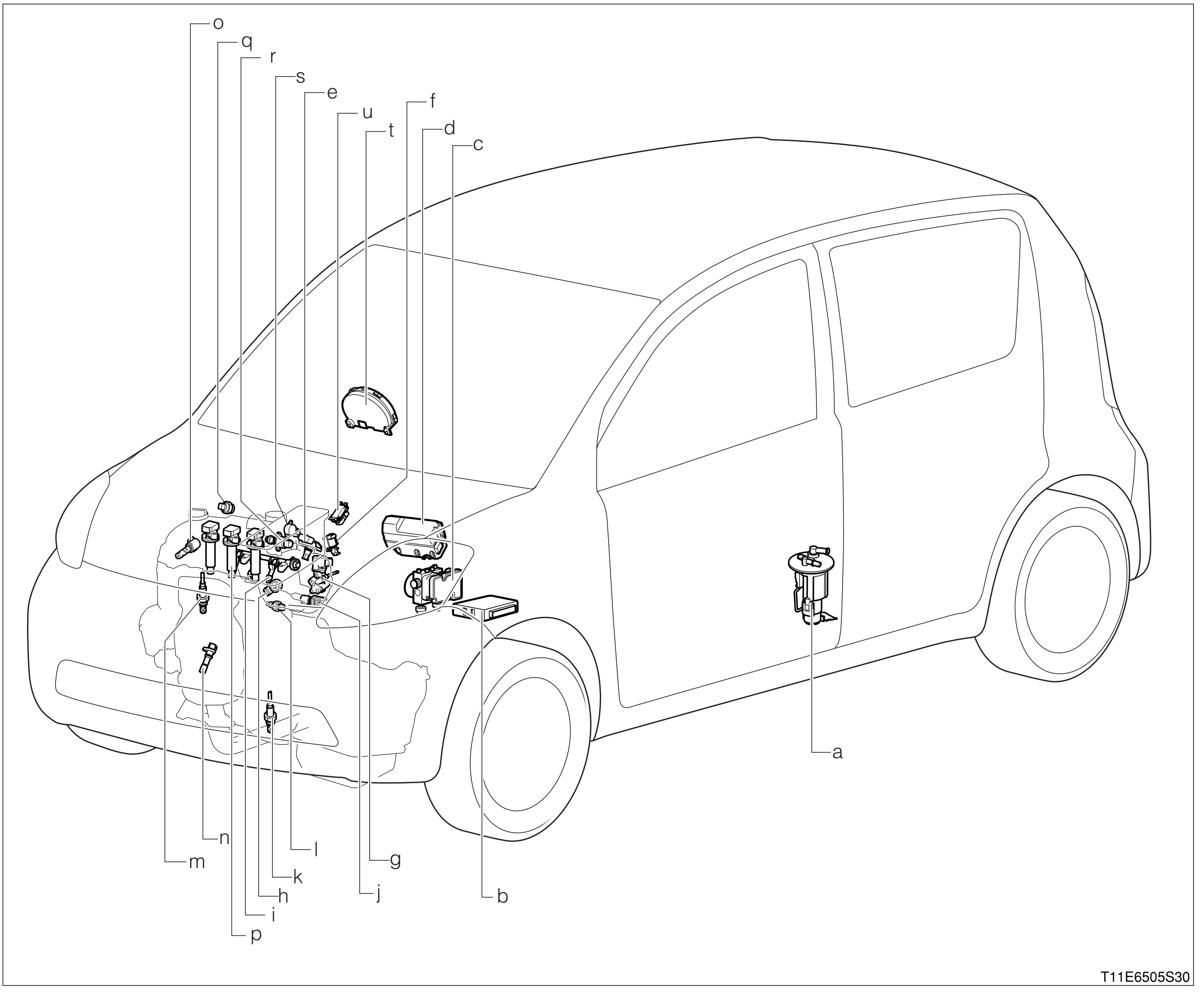
63	IG1	Ignition coil (#1)	101	–	–
64	–	–	102	–	–
65	–	–	103	–	–
66	IACALO	Stepper motor 1 for ISC	104	–	–
67	IACAHI	Stepper motor 2 for ISC	105	–	–
68	IACBLO	Stepper motor 3 for ISC	106	–	–
69	IACBHI	Stepper motor 4 for ISC	107	STSW	Starter switch
70	–	–	108	–	–
71	–	–	109	–	–
72	–	–	110	–	–
73	–	–	111	–	–
74	–	–	112	–	–
75	–	–	113	EFI T	EFI-T check terminal
76	–	–	114	–	–
77	–	–	115	–	–
78	–	–	116	E21	Body sensor earth
79	–	–	117	SIO2	Immobilizer communication
80	–	–	118	REV	DLC (REV terminal)
81	–	–	119	SIO1	DLC (Diagnostic device)
82	–	–	120	IGSW	Ignition switch
83	–	–	121	KNK	Knock sensor
84	–	–	122	E2PM	Sensor earth (Exclusively for manifold absolute pressure sensor)
85	–	–	123	OX1	Oxygen sensor
86	–	–	124	PST	Hydraulic power steering switch
87	–	–	125	E1	Calculation system earth
88	–	–	126	–	–
89	–	–	127	N2–	Cam angle sensor(–)
90	–	–	128	N1–	Engine revolution sensor(–)
91	–	–	129	–	–
92	–	–	130	EGR4	Stepper motor type EGR valve 4
93	–	–	131	EGR3	Stepper motor type EGR valve 3
94	–	–	132	EGR2	Stepper motor type EGR valve 2
95	–	–	133	EGR1	Stepper motor type EGR valve 1
96	–	–	134	ALTC	Alternator voltage control output
97	–	–	135	ALT	Alternator cut control output
98	–	–			

7-5 LOCATION OF COMPONENTS



	Part name
a	Fuel pump
b	Engine control computer
c	ABS actuator
d	Relay block
e	Manifold absolute pressure/ intake air temperature integral type sensor
f	VSV for evaporative emission control system purge control
g	Stepper motor type EGR valve
h	Knock sensor
i	Injector
j	Cam angle sensor
k	Rear oxygen sensor
l	Engine water temperature sensor
m	Oxygen sensor
n	Engine revolution sensor
o	Oil control valve
p	Ignition coil
q	Brake negative pressure switch
r	Stepper motor for ISC
s	Throttle position sensor
t	Combination meter
u	DLC

7-6 HOW TO PROCEED WITH TROUBLE SHOOTING

7-6-1 GENERAL INFORMATION

1.The engine and engine control system of this vehicle are controlled by the EFI ECU. Furthermore, the vehicle is provided with the on-board diagnosis system.
Therefore, when any abnormality takes place in the input/output systems (Sensors, actuators, harnesses, connectors, etc.) of the engine control system, the EFI ECU memorizes the system concerned and informs the driver by making the malfunction indicator lamp (MIL) illuminate or flash.

2.Also the malfunction is informed to the operator by means of the malfunction indicator lamp (MIL). When trouble-shooting the engine, it is imperative for you to get the general idea of the onboard diagnostic system, and fully understand the precautionary measures in trouble-shooting, the items diagnostic system, and fully understand the precautionary measures in trouble-shooting, the items to be observed and how to use testers.

3.Then, conduct the trouble-shooting following the flow chart that indicates the correct procedure for the engine troubleshooting.

(1) On-board diagnostic system of vehicles for EU specifications

1.The vehicles for Europe have the following functions that comply with the 1999/102/EC (Generally called Euro-OBD) standards.

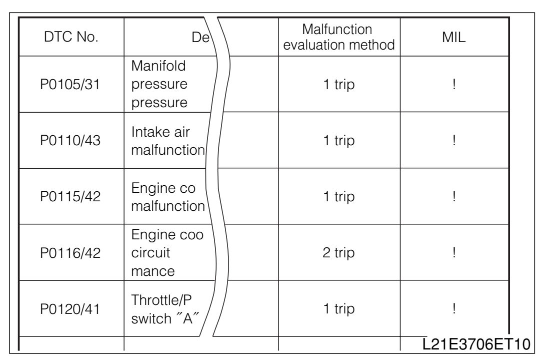
2.When the ignition switch is turned "ON", the malfunction indicator lamp (MIL) goes on. When no malfunction has been detected, the lamp will go out after the engine has started. (Check for a blown bulb)

3.While the engine is running, if the EFI ECU detects any malfunction in the emission control system/components that will affect the emissions from the vehicle, or in the power train control components, or if any malfunction is detected in the EFI ECU itself, the EFI ECU illuminates or flashes the MIL (Only when misfire is detected which will damage the catalyst). Then, the EFI ECU memorizes the malfunction area. (DTC by ISO15031-6/SAEJ2012)

4. If that malfunction will not occur in three successive running, the MIL is automatically turned off. However, the DTC will be recorded in the EFI ECU memory.

NOTE

- **The MIL is illuminated only by the malfunction that affects the emissions from the vehicle. (Only items bearing a circle ("○" mark) in the MIL column.)**



DTC No.	De	Malfunction evaluation method	MIL
P0105/31	Manifold pressure pressure	1 trip	!
P0110/43	Intake air malfunction	1 trip	!
P0115/42	Engine co malfunction	1 trip	!
P0116/42	Engine coo circuit mance	2 trip	!
P0120/41	Throttle/P switch "A"	1 trip	!

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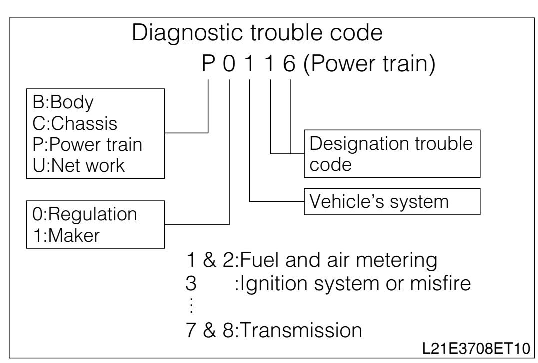
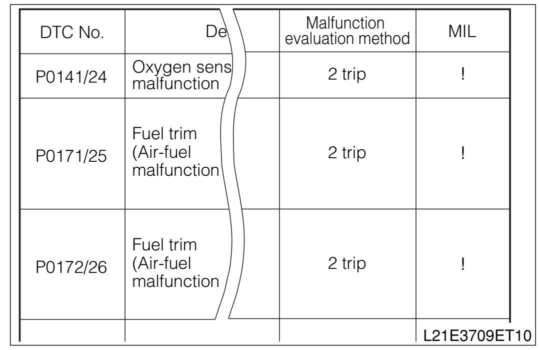
5.It is possible to read out various data from the engine ECU by connecting the OBD Ⅱ generic scan tool which complies with the ISO 14230 format or diagnosis tester (DS-21/DS-Ⅱ) to the DLC of the vehicle. You can perform trouble-shooting efficiently by checking these data (DTC, freeze-frame data, current data, oxygen sensor monitor data, etc.).

6.The DTC is composed of the ISO standard code (Specified by ISO 15031-6) and the manufacturer's designation code. The ISO standard code should be set pursuant to the ISO. On the other hand, the manufacturer's designation code can be freely set forth by the manufacturer within a specified limit.



7.Many DTC have a two trip detection logic which assures avoidance of wrong detection and functions only when a malfunction is surely occurring. However, another diagnosis mode is provided, in which only a one-time final confirmation test is necessary for a service mechanic to confirm that the malfunction has been completely remedied after the repair.



DTC No.	De	Malfunction evaluation method	MIL
P0141/24	Oxygen sens malfunction	2 trip	!
P0171/25	Fuel trim (Air-fuel malfunction	2 trip	!
P0172/26	Fuel trim (Air-fuel malfunction	2 trip	!

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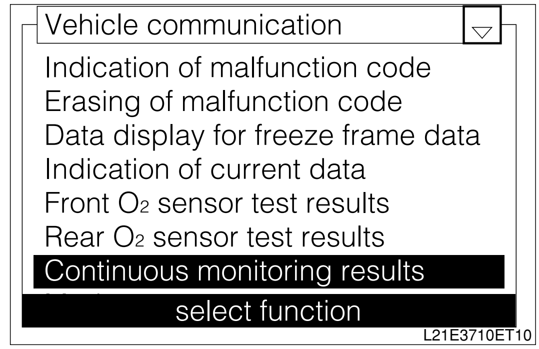
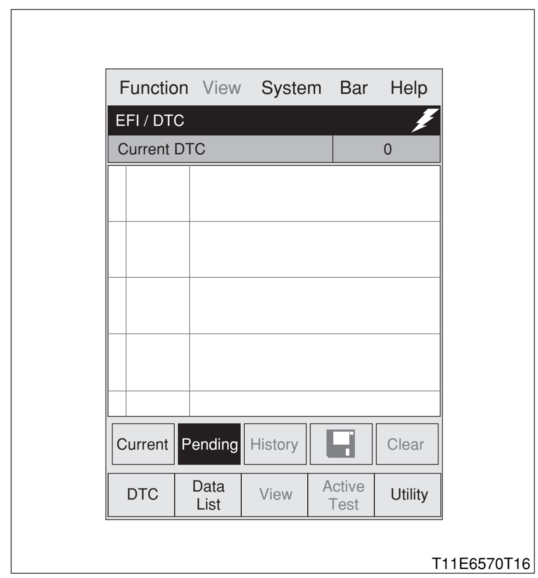
(1) In case DS-21 or OBD Ⅱ generic scan tool, the "Continuous monitoring results" of "Vehicle communication in CARB mode" must be selected.



L21E3710ET10

(2) In the case of the DS-II diagnosis tester, select the "Pending"of "DTC" in CARB mode.



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8.When a malfunction is detected, the engine and running conditions at that moment are memorized as a freeze-frame data in the EFI ECU memory.

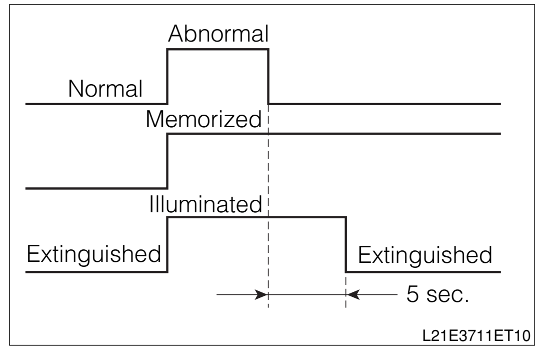
9.Two trip detection logic

When a malfunction is detected for the first time, that malfunction is temporarily memorized in the engine ECU memory. (First running). If the same malfunction is detected again during the second running, the MIL is illuminated and the DTC is determined. (Second running).
(However, the ignition switch should be turned off between the first running and the second running.)

(2) On-board diagnostic system of vehicles for other regions

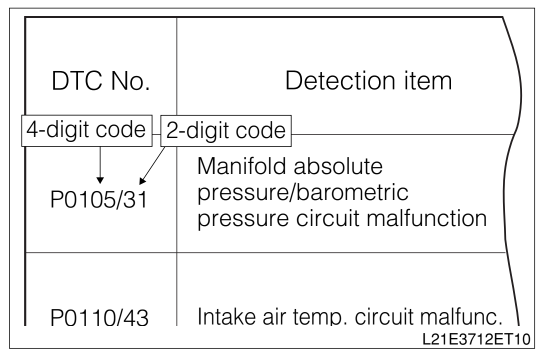
1.When the ignition switch is turned "ON", the MIL goes on. When no malfunction has been detected, the lamp will go out after the engine has started. (Check for a blown bulb)
While the engine is running, if the ECU detects any malfunction in the engine control system/components, or if any malfunction is detected in the EFI ECU itself, the EFI ECU illuminates the MIL.

2.In addition to the illumination of the MIL, the corresponding diagnostic trouble code (DTC) is memorized in the engine ECU memory. When the malfunction has been remedied or the system returns to its normal state, the MIL automatically goes out. However, the DTC remains memorized in the engine ECU memory.

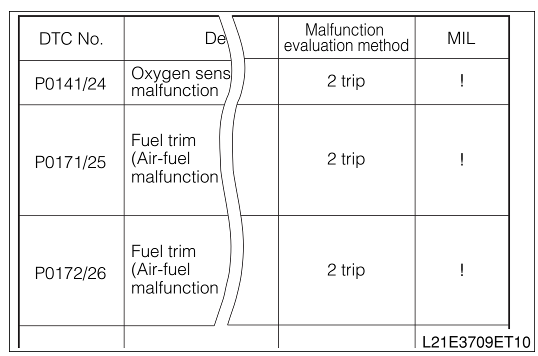


3.It is possible to read out various data from the engine ECU by connecting the diagnosis tester (DS-21/DS-Ⅱ) to the DLC of the vehicle. You can perform trouble-shooting accurately and efficiently by checking these data (DTC, freeze-frame data, current data, oxygen sensor monitor data, etc). Only when diagnosis tester (DS-21/DS-Ⅱ) is used.

4.The DTC (Diagnostic trouble code) is set to a four-digit code in accordance with ISO standard. Furthermore, the conventional two-digit code is also provided. The four-digit code can be read out by the diagnosis tester (DS-21/DS-Ⅱ). The two-digit code has been set forth by the DMC itself. This code can be read by observing the flashing pattern of the MIL.



5.Some DTC have a two trip detection logic which assures avoidance of wrong detection and functions only when a malfunction is surely taking place.



6.When a malfunction is detected, the engine and running conditions at that moment are memorized as a freeze-frame data in the EFI ECU memory.

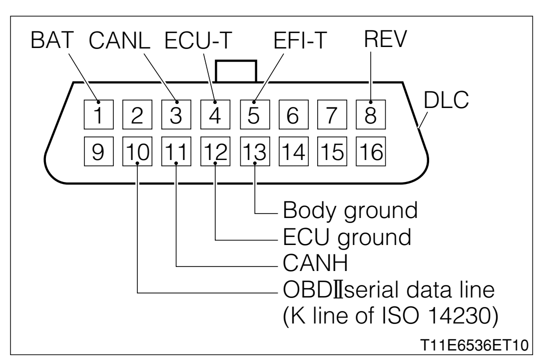
7.Two trip detection logic

When a malfunction is initially detected, that malfunction is temporarily memorized in the engine ECU memory. (First running) If the same malfunction is detected again during the second running, the MIL is illuminated and the DTC is determined. (Second running)

(However, the ignition switch should be turned off between the first running and the second running.)

7-6-2 DLC, COMMON DESTINATIONS

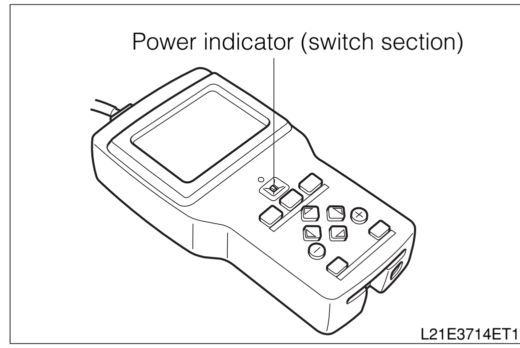
1.The vehicle engine ECU uses the ISO14230 (Euro-OBD) protocol. As regards the position, connector shape and pin arrangement, the DLC is in accordance with the ISO 15031-3 (SAEJ1962) and has complied with the ISO14230 format. The OBD Ⅱ serial data line (K line of ISO14230) is used for the OBD Ⅱ generic scan tool or the diagnosis tester (DS-21/DS-Ⅱ) in order to communicate with the ECU.



NOTE

- With the cable of the diagnosis tester (DS-21/DS-Ⅱ) connected to the DLC through the SST, turn "ON" the ignition switch. If the power indicator of the tester will not go on, conduct the following checks and repair any malfunctioning parts.

SST: 09991-87404-000

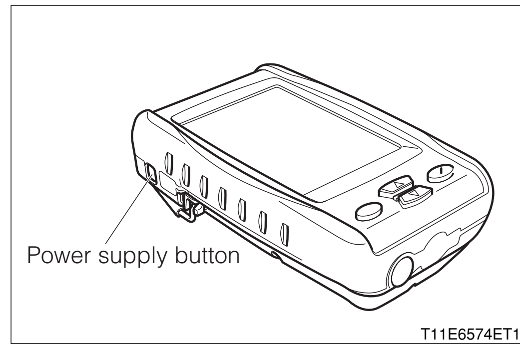


NOTE

- With the cable of the DS-Ⅱ diagnosis tester connected to the DLC, turn ON the IG switch. If the tester does not function, perform the following checks and repair the faulty parts.

(1) Connect the diagnosis tester (DS-21/DS-Ⅱ) to another vehicle.

(2) Turn "ON" the ignition switch.



7-6-3 CONNECTING PROCEDURE FOR SST (EFI COMPUTER CHECK SUB-HARNESS)

1. When the EFI ECU terminal voltage is measured with the EFI ECU connector connected to the engine ECU, connect the SST, following the procedure given below.

NOTE

- The terminal number of the SST connector is the same as the EFI ECU connector.

2. Turn "LOCK" the ignition switch. Disconnect the battery negative (-) terminal with the ignition switch turned "LOCK".

NOTE

- Be sure to memorize the diagnostic trouble code before disconnecting the battery negative (-) terminal. Otherwise, the diagnostic trouble code(s) will be erased by disconnecting the battery negative (-) terminal.

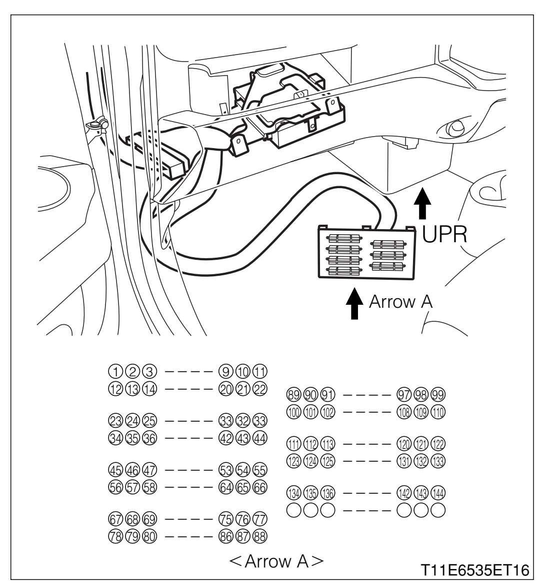
3. Remove the No.1 instrument panel under cover.
4. Remove the fuse box opening cover and lower instrument cover.
5. Connect the following SST between the wire harness connectors and the EFI ECU connectors.

SST: 09842-97209-000

6. Reconnect the battery negative (-) terminal.

CAUTION

- When disconnecting or reconnecting the EFI ECU connectors, be sure to disconnect the battery negative (-) terminal with the ignition switch and all accessory switches in the off state.
- When installing a new battery, care must be exercised not to mistake the battery polarity. Failure to observe this caution could cause EFI ECU malfunction.
- Before using the SST, be sure to check to see if short circuit or open wire exists between the terminals of the SST.



7-6-4 TROUBLE-SHOOTING PROCEDURE

(1) Discription

1. The engine control system is equipped with diagnosis functions whose are capable of diagnosing malfunctioning sections. These functions give important clues in trouble-shooting. The flow chart on the next page shows how to proceed with trouble-shooting by using these diagnosis functions.
   The flow chart shows how the diagnostic trouble code check can be used effectively. Moreover, when its results are fully reviewed, you can determine whether you are going to do the trouble-shooting according to diagnostic trouble codes or the trouble-shooting according to malfunctioning phenomena.
   The diagnosis of this system is equipped with a battery back-up function (A function which supplies power for diagnosis memory even if the ignition switch is turned "LOCK".)

NOTE

- When no diagnosis tester (DS-21/DS-Ⅱ) or OBD-II generic scan tool is used, the DTC or freeze-frame data in the flow chart can not be read out.

⪢1. Bringing malfunctioning vehicle in garage

▼Go to ⪢2.

⪢2. Diagnosis through interview

1.Thoroughly obtain information from the customer concerning the conditions, environment and phenomena in which the malfunction took place.

▼Go to ⪢0.

⪢3. Normal operation confirmation of diagnosis code indication of LCD in meter.

1.Short-circuit the terminals 4(ECU-T) and 13(E) of the DLC, using SST.

SST: 09991-87403-000
09991-87404-000

2.Ensure that the LCD in the meter indicates the diagnosis codes (Including the normal codes).

SPECIFIED VALUE: Will indicate

NOTE

- It is also fine when codes other than the CAN related ones are outputted.

▼If it is OK, proceed to ⪢4.

▼When it is NG, perform the following checks for the meter and if there is no problem, replace the meter.

(1) Check of harness for meter - DLC and DLC - body earth

(2) Meter power supply system and earth system check

⪢4. Confirmation of diagnosis code of LCD in meter (CAN-related)

1.Ensure that the CAN related diagnosis code (Code 0051 - 0053) is not indicated in the LCD in the meter.

SPECIFIED VALUE: Code 0051- 0053 are not indicated.

▼If it is OK, proceed to ⪢5.

▼When it is NG, refer to the section of CAN communication system.

Refer to Page L2-1.

⪢5. Confirmation and record of engine check lamp condition

1.Confirm and record the lighting of the engine check lamp when turning "ON" the IG switch and after starting the engine.

	When IG switch is "ON"	After starting the engine	Judgment
Engine check lamp	Illuminated	Extinguished	a
	Illuminated	Illuminated	b
	Extinguished	Extinguished	c

▼In case of a, go to ⪢6.

▼In case of b, go to ⪢6.

▼In case of c, perform the following operations and if there is no problem, replace the meter.

(1) Harness and connector check between battery and meter

(2) Harness and connector check between meter and EFI ECU

(3) EFI ECU power supply system and earth system check

⊳6. Confirmation and recording of diagnosis code

1.Short-circuit the terminals 5(EFI-T) and 13(E) of DLC, using the SST.

SST: 09991-87403-000
09991-87404-000

2.Confirm and record the diagnosis code outputted from the engine check lamp in the meter.

NOTE

- If the data during malfunctioning may be confirmed by the diagnosis system, record the data during malfunctioning before canceling the diagnosis code.

▼Go to ⊳7.

⊳7. Malfunction phenomena confirmation

1.Confirm the malfunction phenomena and confirm the abnormal situation.

▼Go to ⊳8.

⊳8. Erasure of diagnosis code

1.Erase the diagnosis code.

▼Go to ⊳9.

⊳9. Confirmation of reproduction of malfunction phenomena

1.Confirm whether the malfunction phenomena can be reproduced.

▼If the malfunction phenomena can be reproduced, proceed to ⊳10.

▼If the malfunction phenomena cannot be reproduced, proceed to ⊳11.

⊳10. Reconfirmation of diagnosis code

1.Perform reconfirmation of the diagnosis code.

▼If an abnormality code is outputted, proceed to ⊳12.

▼If a normal code is outputted, proceed to ⊳11.

⊳11. Basic check

1.Perform basic checks.

Refer to Page B8-40.

▼Go to ⊳13.

⊳12. Trouble-shooting check according to diagnosis code

1.Perform trouble-shooting concerning the diagnosis code outputted.

Refer to Page B8-63.

▼Go to ⊳14.

⊳13. Trouble-shooting according to malfunction phenomena.

1.Estimate the cause for the malfunction phenomenon and perform trouble-shooting.

Refer to Page B8-58.

▼Go to ⊳14.

⊳14. Canceling method of diagnosis

1.Cancel the diagnosis code.

▼Go to ⊳15.

⪢15. Confirmation and recording of diagnosis code

1.Confirm and record the diagnosis code.

▼If a normal code is outputted, proceed to ⪢16.

▼If an abnormal code is outputted, go back to ⪢7 and perform the checks again.

⪢16. Confirmation test

1.Ensure that the malfunction phenomena claimed by the customer concerning the vehicle has been completely solved and that it has been recovered to the normal.

▼If it is OK, finish the trouble shooting.

▼If it is NG, go back to ⪢3 and perform the checks again.

7-7 INQUIRY

1. In your attempt to remove the causes for a malfunction of the vehicle, you will not able to remove the causes unless you actually confirm the malfunctioning phenomenon. No matter how long you continue operations, the vehicle may not resume the normal state unless you confirm the malfunctioning phenomenon. The inquiry with the customer is a vital information collecting activity which is to be conducted previous to the confirmation of malfunctioning phenomenon.
2. This inquiry will provide you with an important clue in an effort to reproduce the malfunctioning phenomenon. Furthermore, the information obtained by the inquiry can be referred to during the trouble-shooting. Hence, instead of making general questions, it is necessary to focus your questions on the items related to the malfunction.
3. The main points of the inquiry given below are the most important points in analyzing the malfunction. In some cases, the information about malfunctions whose took place in the past and about the history of previous repairs, which seem to have nothing to do with the current malfunction, may prove to be helpful in solving the malfunction.
   Hence, it is important to obtain as much information as possible and keep them accurately in mind as reference information when trouble-shooting the malfunctioning phenomenon.

7-7-1 DIAGNOSIS BY INTERVIEW SHEET FOR ENGINE CONTROL SYSTEM

[INQUIRY SHEET]

Inquiry sheet					
Name of customer		Vehicle model		Engine - N/A, T/C, S/C, carburetor, EFI, LPG	Transmission - 4M/T, 5M/T, 2WD, 4WD 2A/T, 3A/T, 4A/T
Details of vehicle	Frame No.	Registration date · ·		Date of malfunction · ·	Running distance km
	Equipment:				
	[Sex] of customer (driver) Male Female	[Age] Approx.	[Occupation]	[Places where vehicle is mainly used] Urban district/suburb/seacoast/mountain/others	[Parking place] Outdoor/indoor

Symptom	Poor starting	• No initial explosion takes place. • Explosion is incomplete although initial explosion takes place • Hard starting (cold engine, hot engine, always) • No cranking takes place. • Other ( )
	Faulty idling	• Fast idling ineffective • Idling speed too low • Idling speed too high • Idling unstable (cold engine, hot engine, always) • Other ( )
	Poor drive-ability	• Hesitation (during start, during acceleration, during deceleration, during a certain period) • Knocking • Backfire • Lack of power • Poor acceleration • Poor blow • Other ( )
	Engine stall	• During idling (during warming up, after warming up) • At time of starting • During running ( ) • Immediately after vehicle stops (Re-start possible, Re-start impossible) • Under loaded state (Air conditioner, electric load, power steering) • Other ( )
From when malfunction has started?		• Since vehicle was purchased as a new car • Recently (since what year/ month)
Frequency of occurrence		• At all times • Under a certain condition ( ) • Sometimes
Meteorological conditions		• At all times
	Weather	• Fine • Cloudy • Rain • Snow • Other ( )
	Temperature	• Temperature (about ˚C) (Spring, summer, autumn, winter)
Engine condition		• When cold • After warming-up • During warming-up (Water temperature about °C)
Road		• Urban district • Suburb • Highway • Mountainous road (Uphill, downhill)
Driving conditions		• No relation • During racing under no load • During running (Vehicle speed: km/h, Engine speed: rpm, MT Which gear?) • During turn (right curve, left curve)
Other situations		

State of malfunction indicator lamp (MIL)		• Illuminated or flashing at all times • Illuminated or flashing sometimes • Will not go on.
Indication of DTC • Reading out by using OBDⅡ generic scan tool or DS-21 diagnosis tester • Reading-out of MIL flashing pattern by shorting terminal T	During checking	• Normal • Malfunction code ( )
	2nd time	• Normal • Malfunction code ( )

L21E3717ES40

7-8 CONFIRMATION, RECORD AND ERASURE OF DIAGNOSIS CODE

7-8-1 CHECKING METHOD OF DIAGNOSIS

1.Prior to the check, check the malfunction indicator lamp (MIL), following the procedure given below.

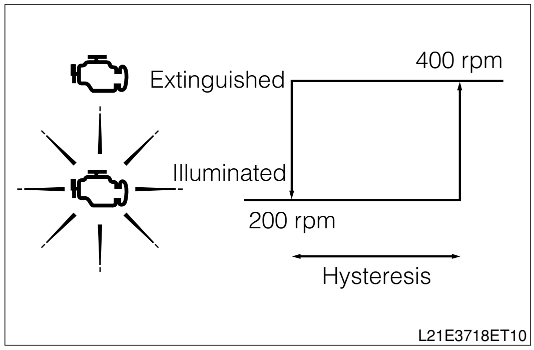
2. Check of malfunction indicator lamp

(1) Ensure that the malfunction indicator lamp goes on when the ignition switch is turned "ON", but with the engine not running.

NOTE

- If the malfunction indicator lamp (MIL) fails to go on, perform the trouble-shooting for the combination meter.

(2) Ensure that the malfunction indicator lamp goes out when the engine starts. If the lamp remains illuminated or is flashing, the diagnosis system is detecting a malfunction. Therefore, a DTC is memorized in the EFI ECU. If no DTC is memorized in the EFI ECU, perform the trouble-shooting for the malfunction indicator lamp circuit.



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(1) Check of DTC, using DS-21 diagnosis tester:

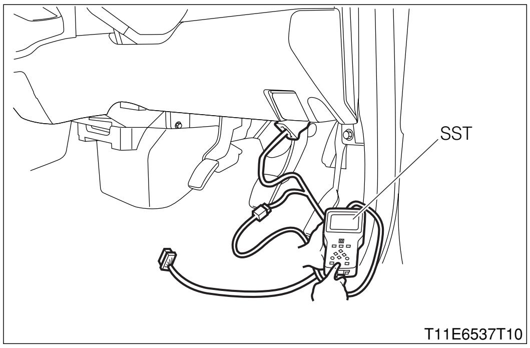
1.Prepare the DS-21 diagnosis tester.

2.Connect the DS-21 diagnosis tester to the DLC located at the lower section of the instrument panel on the driver's seat side. At this time, the DS-21 tester should be connected to the DLC with the following SST interposed.

SST: 09991-87404-000

NOTE

- When DS-21 diagnosis tester is used, refer the instruction manual for tester.



T11E6537T10

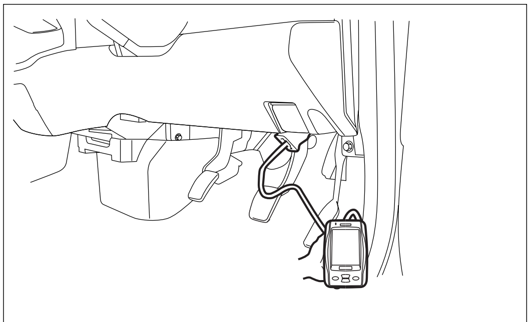
(2) Check of DTC, using DS-Ⅱ diagnosis tester or OBD Ⅱ generic scan tool

1.Prepare the DS-Ⅱ diagnosis tester or OBD Ⅱ generic scan tool.

2.Connect the DS-Ⅱ diagnosis tester or the OBD Ⅱ generic tester directly to the DLC located at the lower section of the instrument panel on the driver's seat side.

NOTE

- When DS-Ⅱ diagnosis tester or OBD-Ⅱ generic scan tool is used, refer the instruction manual for each tester.

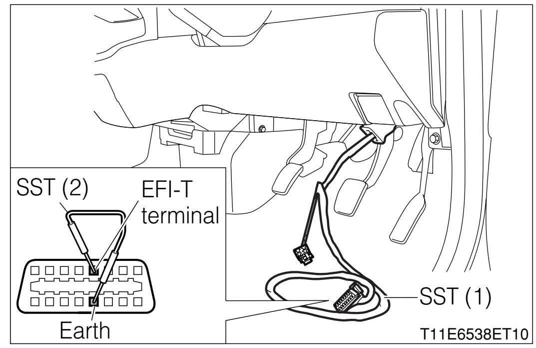


T11E6573T10

(3) Check of DTC without using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool

1.With the ignition switch turned "LOCK", connect the following SST to the DLC located at the lower section of the instrument panel on the driver's seat side.

SST: 09991-87404-000(1)

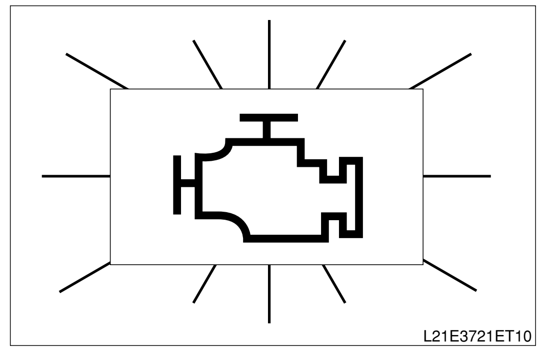


2.Short circuit the DLC terminals 5 (EFI-T) and 13 (E), using the SST.

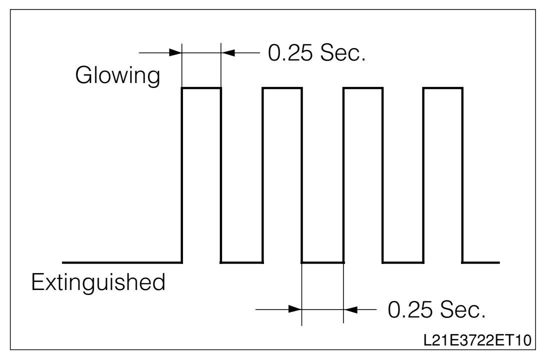
SST: 09991-87403-000(2)

3.Turn the ignition switch to the "ON" position. At this time, be careful not to start the engine.

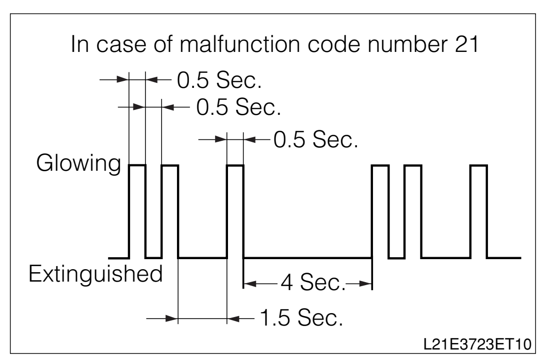
4.Read out the diagnostic trouble code (DTC) by observing the flashing number of the malfunction indicator lamp.



5.The illustration shows an example of the flashing pattern of the normal code. The malfunction indicator lamp glows for 0.25 second, right after the ignition switch has been turned "ON". After a lapse of 0.25 second, the malfunction indicator lamp again glows for 0.25 second. Then, this pattern will be repeated.

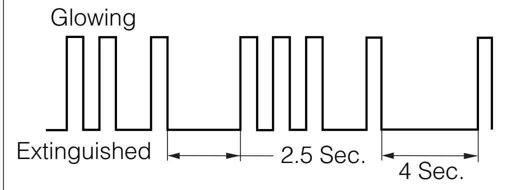


6.The illustration shows an example of the flashing pattern of the code No. 21. The diagnostic trouble code is composed of two digits. These two numbers are indicated by blinking of the malfunction indicator lamp. Four seconds after the ignition switch has been turned "ON", the malfunction indicator lamp indicates first the number of the tens digit of the diagnostic trouble code by glowing the same times as the number. The lamp glows for 0.5 second each time and then it is extinguished for 0.5 second. After a pause of 1.5 seconds, the lamp indicates the number of the units digit of the diagnostic trouble code by glowing the same times as the number. The lamp glows for 0.5 second each time and then it is extinguished for 0.5 second. Then, this pattern will be repeated after a pause of 4 seconds.



7.The illustration shows an example of the flashing pattern of the codes No. 21 and 31. In cases where plural malfunction codes have been detected, the two-digit diagnostic trouble codes are indicated in the sequence of the code number, starting from a smaller number. Each diagnostic trouble code is indicated in the above described pattern. A pause of 2.5 seconds occurs between the outputs of respective diagnostic trouble codes, thus separating one from the others. After all of the plural diagnostic trouble codes that have been detected are indicated, the malfunction indicator lamp is extinguished for four seconds. Then, the detected plural diagnostic trouble codes will be indicated again.

In case of malfunction code number 21 and 31



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8.For the details of malfunctions, refer to the diagnosis code chart.

9.After completion of the check, disconnect the jump wire and turn "LOCK" the ignition switch. Then, disconnect the SST from the DLC.

NOTE

- In cases where plural malfunction codes have been detected, the indication will be made progressively, starting from the smaller number to the larger number.
- In cases where the diagnosis tester (DS-21/DS-Ⅱ) or the OBD Ⅱ generic scan tool is not used, it is impossible to take a reading of unidentified two-trip DTC from the SST connector.
- When malfunctioning phenomena are to be reproduced without using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool, follow the procedure given below to detect the DTC.

(1) It is assumed that two trip detection logic is used for the DTC detection.

(2) Therefore, after a malfunctioning phenomenon is first reproduced, turn "LOCK" the ignition switch.

(3) Then, repeat the same reproduction procedure once again.

(4) When the malfunction is reproduced again, the malfunction indicator lamp goes on and the DTC is memorized in the engine ECU.

NOTE

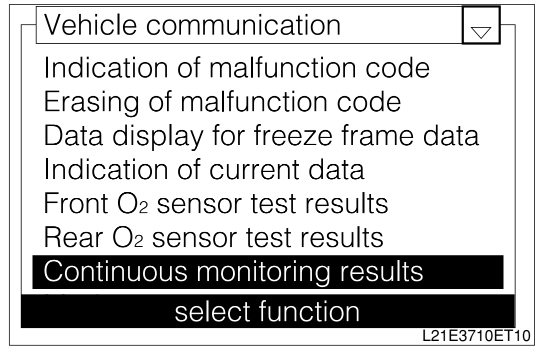
- The diagnosis codes are for reading out use.

NOTE

- When malfunctioning phenomena are to be reproduced with the DS-21 diagnosis tester or OBD Ⅱ generic scan tool connected to the DLC, the "Continuous monitoring results" function can be used. (In the case of the diagnosis tester (DS-21/DS-Ⅱ), select the "Continuous monitoring results" of the "Vehicle communication" in CARB mode.) This function makes it possible to indicate the DTC when the malfunctioning phenomenon is first reproduced. (Request of onboard monitoring test results of ISO 15031-5 Continuous monitoring system.)

NOTE

- In the case of the DS-Ⅱ diagnosis tester, select the "Pending"of "DTC" in CARB mode.



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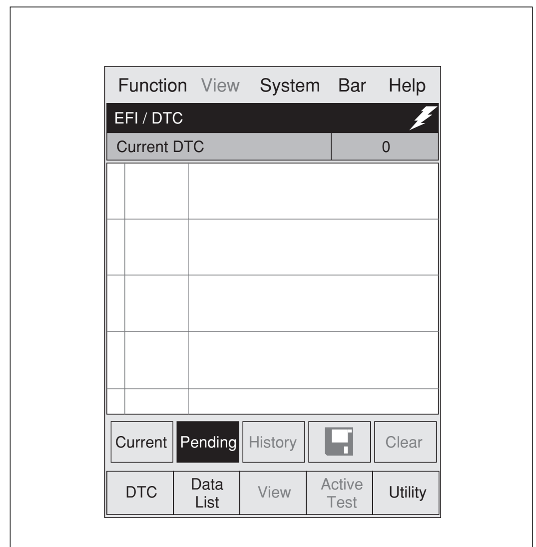


T11E6570T16

7-8-2 CANCELING METHOD OF DIAGNOSIS

1.The DTC and freeze-frame data can be erased through the following methods.

(1) The diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool is used to erase the DTC. (For the operating procedure, refer to the instruction manual.)

(2) The power supply to the EFI ECU is shut off to erase the DTC without using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. (Disconnect the battery negative (-) terminal or detach the EFI fuse.)

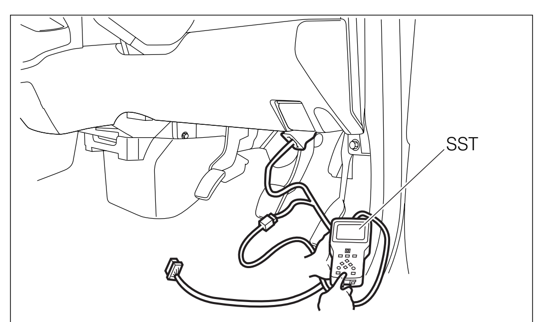
(1) When DS-21 diagnosis is used:

1.In the same way as the check of DTC, connect the diagnosis tester (DS-21/DS-Ⅱ) to the DLC with the following SST interposed.

SST: 09991-87404-000

NOTE

- When DS-21 diagnosis tester is used, refer the instruction manual for tester.



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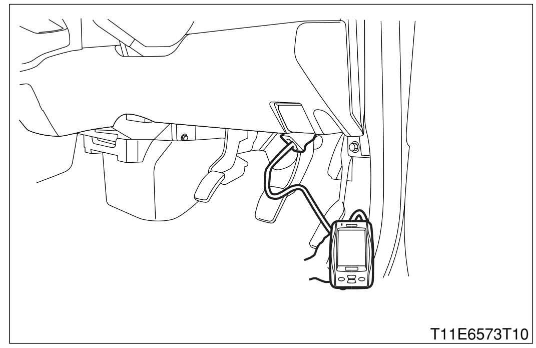
(2) When DS-21 diagnosis tester or OBD Ⅱ generic scan tool is used:

1.In the same way as the check of DTC, connect the DS-Ⅱ diagnosis tester or the OBD Ⅱ generic scan tool directly to the DLC.

NOTE

- When DS-Ⅱ diagnosis tester or OBD Ⅱ generic scan tool is used, refer the instruction manual for each tester.



T11E6573T10

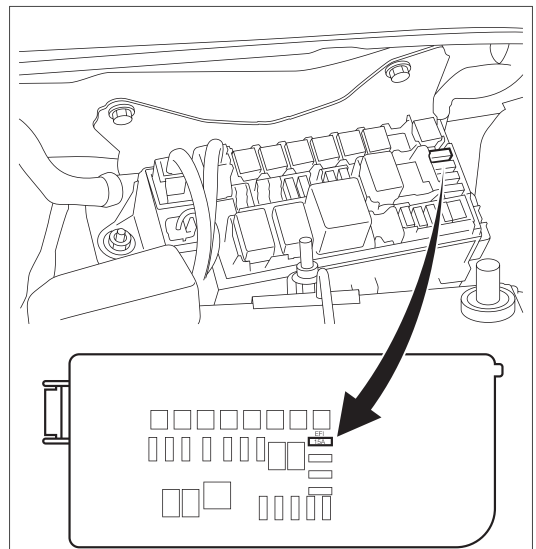
(3) When diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool is not used:

1.Erasure by disconnecting EFI fuse

To erase the diagnostic trouble codes (DTC) memorized in the ECU after malfunctions have been repaired, disconnect the EFI fuse from the relay block for at least 60 seconds with the ignition switch turned "LOCK". (When ambient temperature is about 20°C.)

NOTE

- It is possible to complete this erasing for approximately 60 seconds. In some cases, however, it may take longer. Furthermore, the erasing can be made by disconnecting the circuit, such as the battery power supply and fusible link. In cases where the battery negative (-) terminal is to be disconnected, record the radio channels in advance. After completion of the operation, set the radio channels the same as before.
- In cases where the same malfunction (DTC) cannot be detected again during the 40 cycles of the engine warming-up, the DTC and freeze-frame data will be automatically erased from the ECU memory. (Only in the case of vehicles with EU specifications)
- Warming-up cycle
- The warming-up cycle refers to a driving cycle that sufficiently allows the water temperature to rise by at least 22°C above the temperature at the time of engine starting and to reach at least 70°C.
- Driving cycle
- The driving cycle consists of the engine starting and engine stopping.



T11E6540T16

7-9 SYMPTOM CONFIRMATION

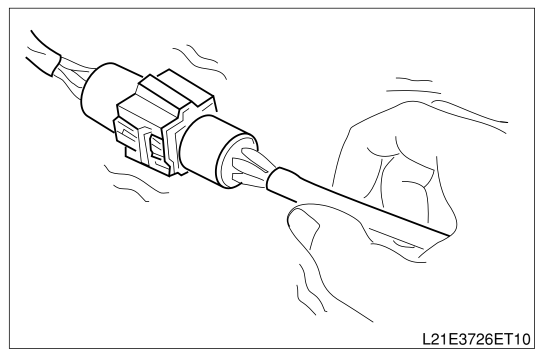
7-9-1 CONFIRMATION OF REPRODUCTION OF MALFUNCTIONING PHENOMENA

1. In the course of trouble-shooting, the operator can not pinpoint the cause for the malfunction unless he confirms the phenomenon. For this purpose, it is indispensable to reproduce the malfunctioning phenomenon by creating conditions and environments that are similar to those customer.
2. As for phenomena whose can not be reproduced easily, it is necessary to produce running conditions that are similar to those when the malfunction occurred (Road surface condition, weather condition, driving condition). For this end, it is of great importance to try to reproduce the conditions that are similar to those when the malfunction occurred (Road surface condition, weather relays by hand), heat (applying hot air) and water (Applying moisture).
3. Vibration, heat or moisture can constitute causes for malfunction that are difficult to reproduce.
4. Therefore, with the vehicle in a stationary state, you can perform the following malfunction reproduction simulation tests given below.
   Moreover, if you presume a section (Part) which can cause a malfunction and connect a tester, etc. to that section so as to confirm the malfunctioning phenomenon, you can also achieve a function to that section so as to confirm the malfunctioning phenomenon, you can also achieve a function evaluation of that section (Part).

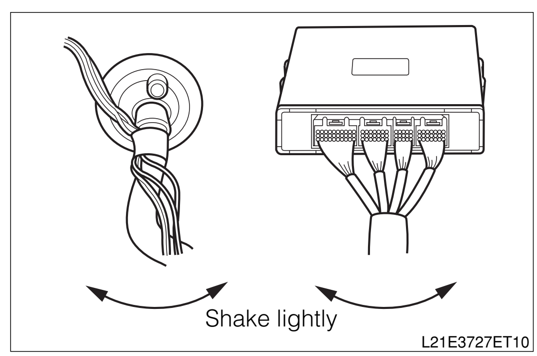
(1) Malfunction reproduction simulation test methods

① Vibration method:

1. When vibration is thought to be the main cause
   (1) Connector
   Lightly shake the connector vertically and laterally.



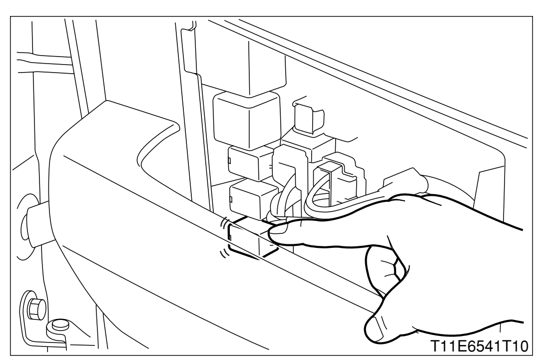
(2) Wire harness
Lightly shake the wire harness vertically and laterally. The points to be checked are connector joints, the vibrating point and the section where the wire harness is passing through the body.



(3) Parts, sensors
With your finger, apply light vibrations to a part of the sensor which is presumed to be the cause for the malfunction. Check to see if the malfunction is reproduced.

NOTE

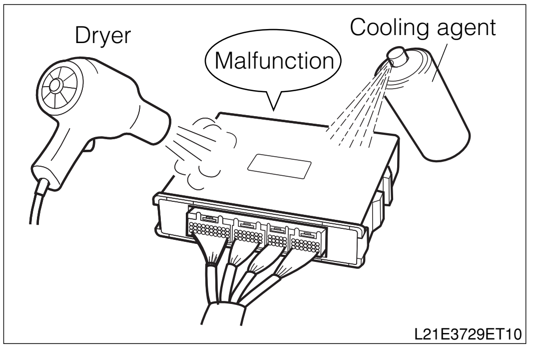
- Be careful not to apply too strong vibration to a relay, for it can cause an open wire in the relay.



② **Cool/hot method:**

1.When a suspected section is likely causing the malfunction when it is cold or hot.

(1) Heat a component which is presumed to be causing the malfunction by using a dryer or the like. Check to see if the malfunction occurs.



CAUTION

- Do not heat the section beyond 60℃. (Temperature limit to assure that no damage be made to the component.)
- Do not directly heat the parts inside the ECU.

③ **Water applying method:**

1.When the malfunction is believed to occur on rainy days or under humid conditions. Apply water to the vehicle. Check to see if the malfunction occurs.

NOTE

- Never apply water directly to the engine compartment. By applying water to the front of the radiator, you can indirectly change the temperature and humidity.
- Never apply water directly to the electronic parts.
- If rain leaks into the vehicle compartment, rain may get into the inside of the ECU through the wire harnesses. If the vehicle has experienced any rain leakage before, utmost attention must be paid in respect to this point.

7-9-2 RECHECK AND MAKING RECORD OF DTC/FREEZE-FRAME DATA

1.By checking the DTC/freeze-frame data after confirming the reproduction of the malfunctioning phenomenon, it is possible to judge whether the system related to the DTC that was indicated before confirmation of the reproduction is now functioning properly or not. Then, you are to proceed to one of the following three steps.

(1) When a DTC was indicated at the time of checking the DTC and the same DTC is indicated after the confirmation of reproduction of the malfunction, it indicates that the malfunction is still persisting in the diagnosis circuit. Proceed to the trouble-shooting according codes.

(2) When no abnormal code is indicated, although the occurrence of malfunction was observed during the confirmation of reproduction of malfunction, a malfunction other than those related to the diagnosis system is likely taking place. Proceed to the trouble-shooting according to malfunctioning phenomena.

(3) When no malfunction is observed during the confirmation of reproduction of malfunction, and the normal code is indicated at the check of the DTC, it is presumed that an abnormality, such as poor contacts at the harnesses and connectors, occurred in the past, but now they are functioning properly. Check the harnesses and connectors of those systems related to the DTC that was indicated before the confirmation of reproduction of the malfunctioning phenomenon.

7-10 BASIC CHECK

7-10-1 BASIC ENGINE CHECK FLOW CHART

1. When the ECU is detecting no DTC during the reproduction test of malfunctioning phenomena and when no abnormality is found by the visual inspection, it is necessary to progressively perform the trouble-shooting for circuits which are most likely causing the malfunctions.
2. In many cases, sections causing malfunctions can be narrowed down quickly and effectively by performing the basic engine check indicated in the following flow chart. Therefore, it is very important to perform this check for the engine trouble-shooting.

(1) Basic engine check

⊳1. Check the battery voltage.

1. Is the battery voltage 11 V or more with the engine in a stopped state?
   ▼If it is OK, go to ⊳2.
   ▼If it is NG, charge the battery or replace it.

⊳2. Check the engine cranking.

1. Does the engine crank?
   ▼If it is OK, go to ⊳3.
   ▼If it is NG, go to "Matrix Table for Trouble-Shooting According to Malfunctioning Phenomena".
   Refer to Page B8-58.

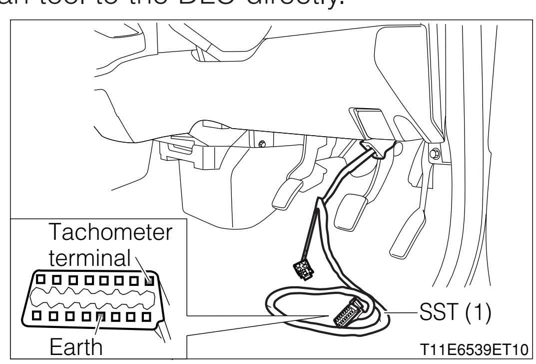
⊳3. Check the engine starting.

1. Does the engine start?
   ▼If it is OK, go to ⊳4.
   ▼If it is NG, go to ⊳6.

⊳4. Check the engine idle speed.

1. Warm up the engine, until the engine water temperature reaches 90℃ or more.
2. Turn "LOCK" all electric load switches (Including A/C switch).
3. Set the transmission to neutral.
4. When the DS-21 diagnosis tester is used:
   (1) Connect the DS-21 tester to the DLC with the SST interposed.
   SST: 09991-87404-000

5. When the DS-Ⅱ diagnosis tester or OBD Ⅱ generic scan tool is used:
   (1) Connect the DS-Ⅱ diagnosis tester or OBD Ⅱ generic scan tool to the DLC directly.
6. Check the engine idle speed.



7.When the diagnosis tester (DS-21/DS-Ⅱ) or general-purpose tester is not used, connect a tachometer to the Tachometer terminal.

(1) Install an engine tachometer to the terminal "REV" of the DLC, using the SST.

SST: 09991-87402-000
09991-87404-000

NOTE

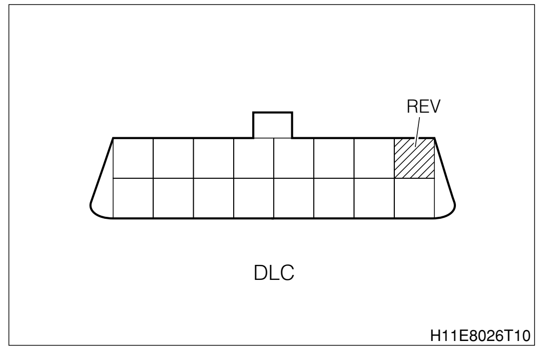
- The SST 09991-87404-000 is a harness for extension use. This does not have to be used.

SPECIFIED VALUE: 800^{+100}_{-50} rpm

▼<u>If it is OK, go to ⊳5.</u>

▼<u>If it is NG, go to "Matrix Table for Trouble-Shooting According to Malfunctioning Phenomena".</u>

Refer to Page B8-58.

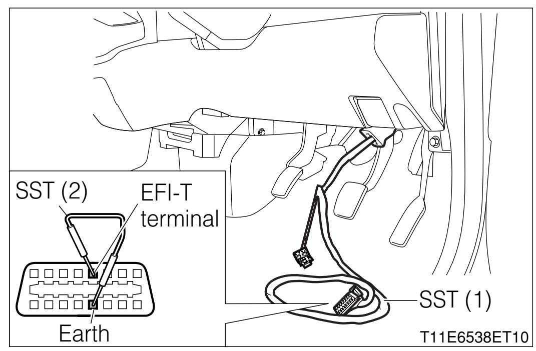


⊳5. Check the ignition timing.

1.When the diagnosis tester (DS-21/DS-Ⅱ) is not used:

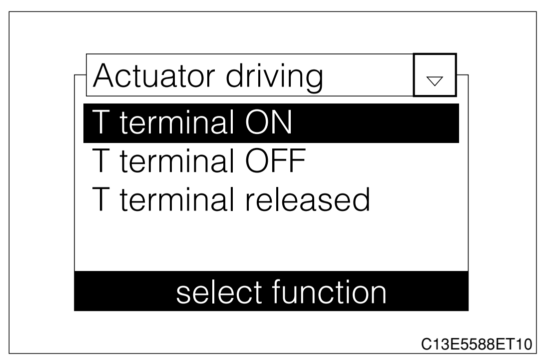
(1) Connect the terminal T of the SST connector to the earth terminal, using a jump wire.

SST: 09991-87404-000(1)
09991-87403-000(2)



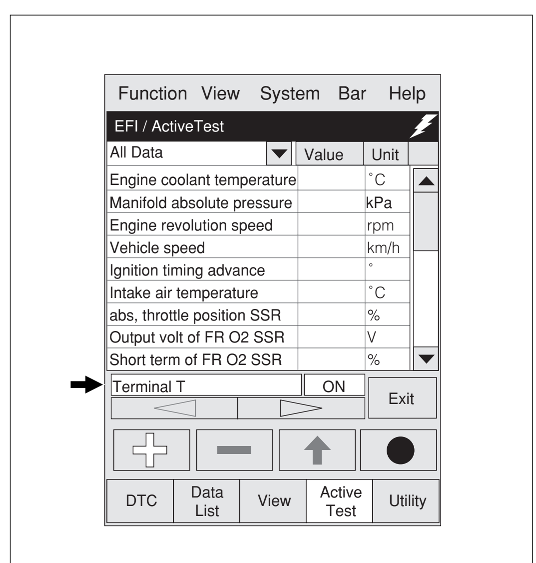
2.When the DS-21 diagnosis tester is used:

(1) Select the "Engine adjustment" on the course menu so as to connect the EFI- T terminal.

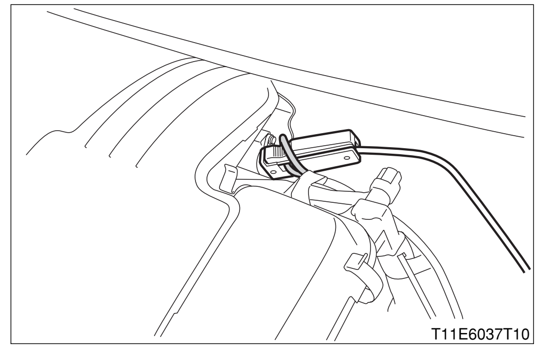


3.When the DS-Ⅱ diagnosis tester is used:

(1) Select the "Terminal T" of "Active Test" so as to connect the EFI-T terminal.



4.Attach the clip of the timing light to the wire harness for timing light connection wire.



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5.Is the timing mark of the crankshaft within a range of the indicator for ignition timing check provided on the timing chain cover?

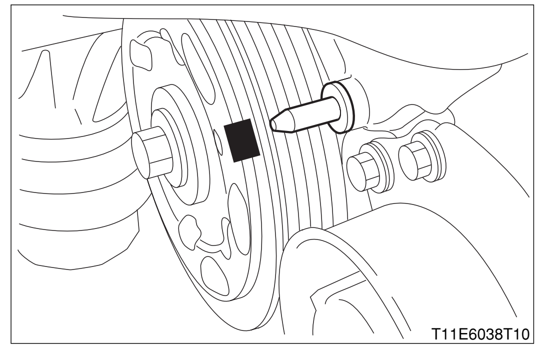
SPECIFIED VALUE: 10 degrees±2 degrees (BTDC)

6.Are the check results OK?

▼If it is OK, go to "Matrix Table for Trouble-Shooting According to Malfunctioning Phenomena".

Refer to Page B8-58.

▼If it is NG, check the timing chain for wrong assembling. Also, check the plunger protruding amount of the tensioner.



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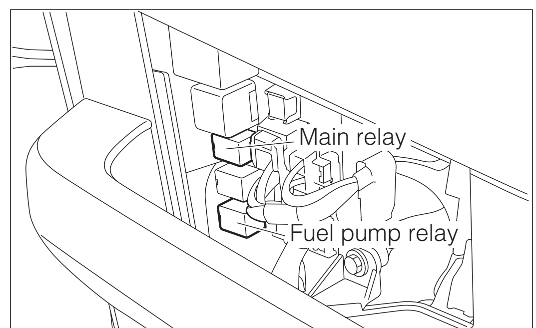
6. Fuel pressure check (Simple check).

1.When DS-21 diagnosis tester or DS-Ⅱdiagnosis tester is not used:

(1) Ensure that the fuel tank is filled with sufficient fuel.



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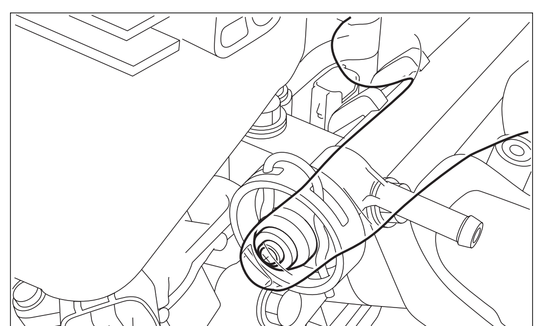
(2) Remove the fuel pump relay and connect a jump wire, as indicated in the illustration.

SST: 09991-87403-000

(3) Ensure that the IG switch is turned "ON" and the pulsation damper exhibits pulsation.



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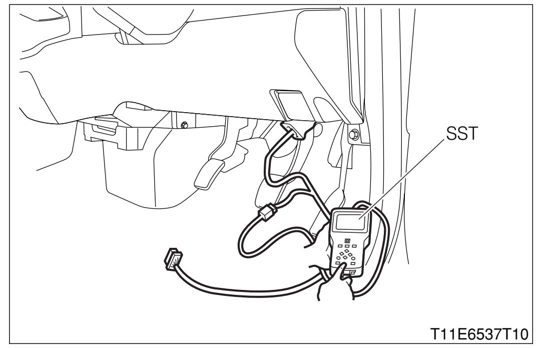
2.When DS-21 diagnosis tester is used:

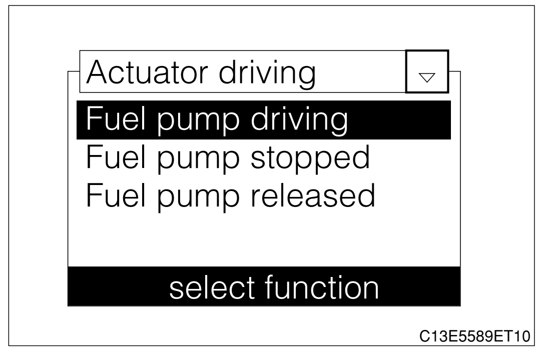
(1) Connect the DS-21 diagnosis tester to the DLC with the SST interposed.

SST: 09991-87404-000

(2) Turn "ON" the ignition switch. Then, select the "Fuel pump" of the "Actuator driving" among the individual functions so as to drive the fuel pump.

(3) Does the pulsation damper exhibit pulsation?





3.When DS-Ⅱ diagnosis tester is used:

(1) Connect the DS-II diagnosis tester to the DLC.

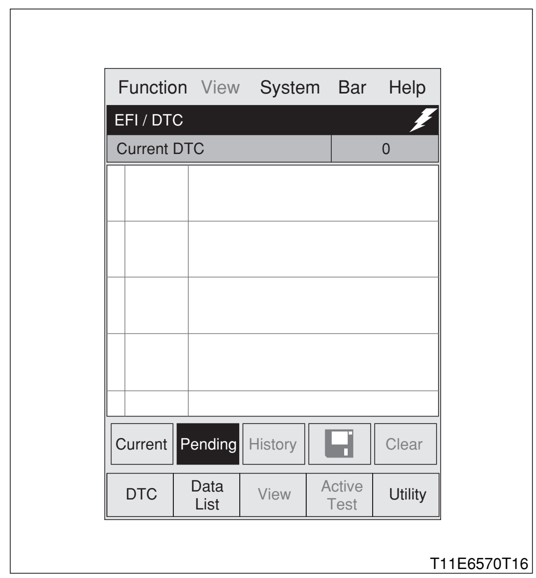
(2) Turn "ON" the ignition switch. Then, select the "Fuel Pump" of the "Actuator driving" so as to drive the fuel pump.

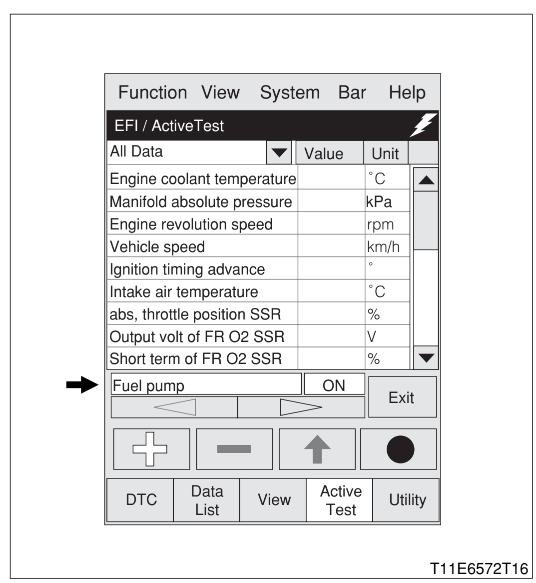
(3) Does the pulsation damper exhibit pulsation?

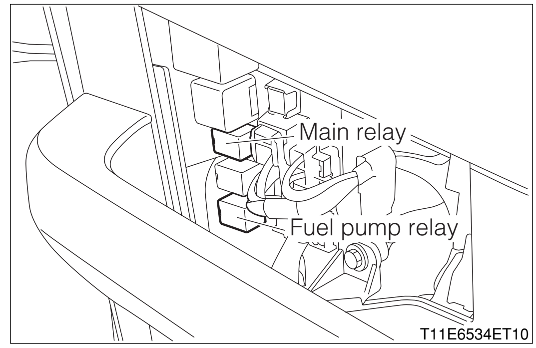
▼If it is OK, go to ▷7.

▼If it is NG, go to "Check of Fuel Pump and F/P Regulator".

Refer to Page B8-202.







⊳7. Spark check.

1.Remove the fuel pump relay from the relay block.
2.Remove the ignition coils and spark plugs (All cylinders #1, 2, 3).
3.Disconnect the fuel pump relay
4.Disconnect the connector of the injector.

CAUTION

- Stop the fuel injection by the operations at Steps 3 and 4 above so as to prevent the catalyst from being damaged by unburnt gas, etc.
- When there is no fuel, the injector injection must be avoided wherever possible, as this may damage the injector.

5.Install the spark plug to the ignition coil. Connect the ignition coil connector to the ignition coil.
6.Ground the spark plug.
7.Crank the engine. At this time, check to see if each spark plug sparks.
8.Are sparks jumping?

▼If it is OK, go to ⊳8.
▼If it is NG, go to Check of ignition System.

⊳8. Confirmation of operation of fuel injector.

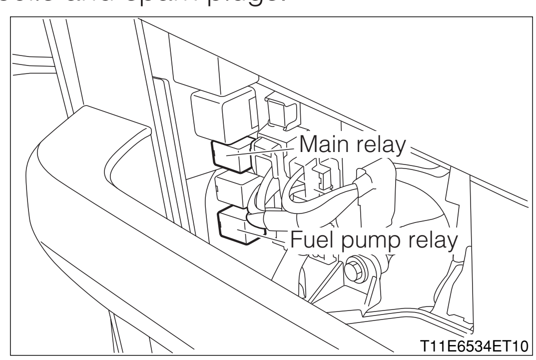
1.Install the spark plugs, ignition coils and fuel pump relay. Connect the connector of the ignition coil.
2.Using a sound scope, check each injector for operation sound while the engine is being cranked or idling.
3.Can you hear operator sound of all injectors?

▼If it is OK, go to ⊳9.
▼If it is NG, go to "Check of Fuel Injector Circuit".

Refer to Page B8-202.

⊳9. Inspection of compression pressure.

1.Warm up the engine.
2.With the IG switch turned "LOCK", remove all of the ignition coils and spark plugs.
3.Temporarily remove the main relay and fuel pump relay.
4.Insert a compression gauge into the spark plug hole.
5.Depress the accelerator pedal fully.
6.While cranking the engine, measure the compression pressure.
7.Repeat the steps 4, 5 and 6 to perform the measurement for all cylinders.



NOTE

- Be sure to use a fully-charged battery. Also the measurement should be performed in the shortest possible length of time.

8.Are the check results OK?

▼If it is OK, go to ⊳10.
▼If it is NG, perform the checks, referring to the section ENGINE MECHANICAL.

▷10. Inspection of idle CO and HC concentrations.

1.Warm up the engine completely.

NOTE

- Warm up the engine, until the fan motor starts to operate.

2.Measure CO and HC concentrations at idle speed.

SPECIFIED VALUE:

CO concentration	Not to exceed 0.2 %
HC concentration	Not to exceed 200 ppm

3.Are the check results OK?

▼If it is OK, go to "Matrix Table for Trouble-Shooting According to Malfunctioning Phenomena".
Refer to Page B8-58.

▼If it is NG, perform the checks, referring to the section ENGINE MECHANICAL.

(2) Check of wire harnesses and connectors

1.Check of open wire

This is caused by detached wire harness, poor contact inside the connector, detached connector terminal, and so forth.

NOTE

- The wires are rarely cut at the center. In most cases, an open wire occurs at the connectors. Particularly, the connectors of the sensor and actuator should be checked very carefully.
- Poor contact is caused by rust formation at the connector terminal, foreign substances adhered to the terminal, or drop in the contact pressure between the male and female terminals of the connector.
- Simply disconnect the connector once, and then, reconnect it. It may change the contacting condition, thus returning to the normal operation. Hence, if no abnormality was found when the wire harness and connector were checked during the trouble-shooting, and if the malfunction ceases to exist after completion of the checks, then the wire harness or connector was most likely causing the malfunction.

2.Check of short circuit

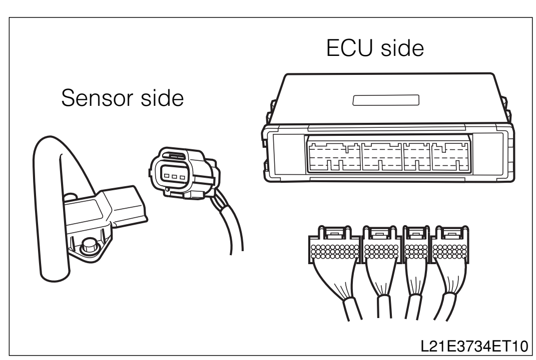
This is caused by a short circuit between the wire harness and the body ground or by an internal short circuit of the switches, etc.

NOTE

- If a short circuit is present between the wire harness and the body ground, thoroughly check to see if the wire harness is caught in the body, if the wire is rubbed and the insulator section is ruptured, thus contacting other parts, and if the wire is clamped properly.

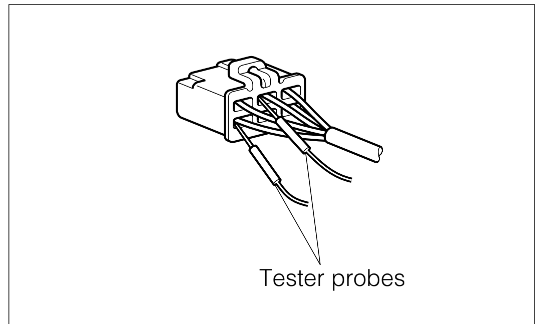
3.Continuity check (Check for open wire)

(1) Disconnect the connector on both sides of the EFI ECU and sensor.



(2) Measure the resistance between the relevant terminals of the connector.

SPECIFIED VALUE: Resistance: 1 Ω or less



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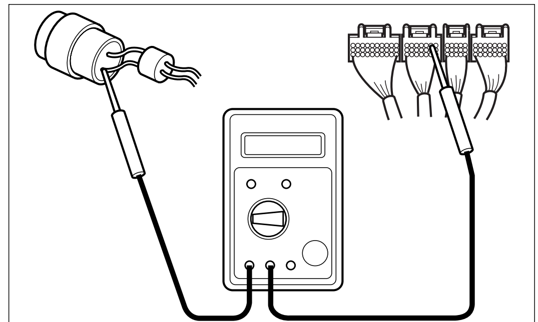
NOTE

- Lightly shake the wire harness in a longitudinal direction as well as in a horizontal direction when the resistance is measured.
- In the case of non-waterproof connectors, the test probe should be inserted into the connector from each wire harness side.
- In cases where the waterproof connector is checked without removing the waterproof rubber, be very careful not to deform the connector terminal when applying the test probes.



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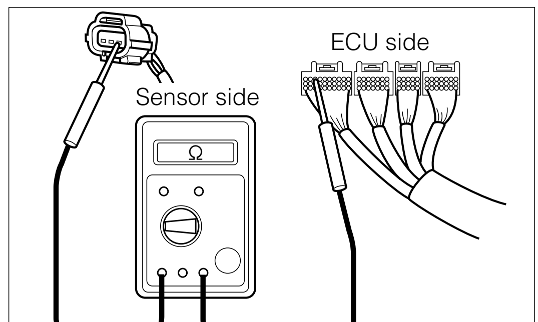
4.Continuity check (Check for short circuit)

(1) Disconnect the connector on both sides.

(2) Measure the resistance between the relevant terminal of the connector and the body ground. Moreover, be sure to check for the connectors on both sides.

SPECIFIED VALUE: Resistance:1 MΩ or more



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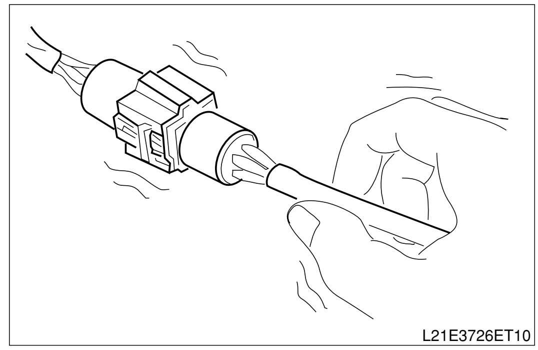
NOTE

- Lightly shake the wire harness in a longitudinal direction as well as in a horizontal direction when the resistance is measured.



5.Check of EFI ECU and its circuit

(1) The EFI ECU and its circuit can be checked by measuring the voltage and resistance at the EFI ECU connector. In order to narrow down the cause further after the cause has been decided to a certain system, it is imperative to measure the voltage and resistance of the external route of the EFI ECU.

(2) The measurement of the voltage and resistance is conducted during the system check, following the procedure given below.

CAUTION

- The EFI ECU cannot be checked by itself. Never connect a voltmeter or an ohmmeter to the EFI ECU with the connector disconnected from the EFI ECU.
- When conducting the continuity test or measuring the resistance, turn "LOCK" the ignition switch once. Then, disconnect the connector at the EFI ECU.

6.Voltage check

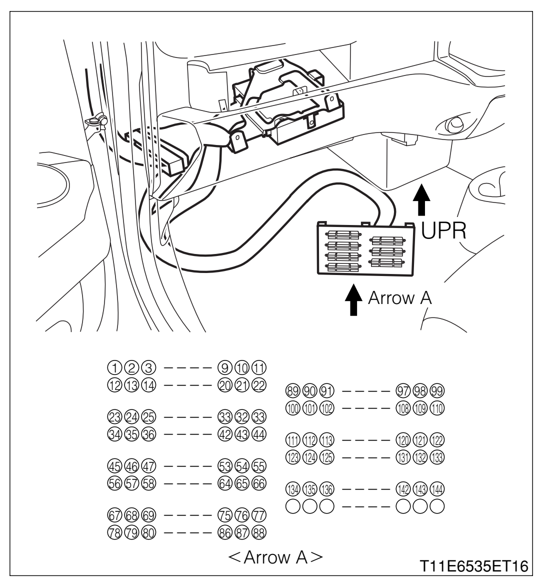
(1) Installation of SST

First, install the SST between the engine ECU and the vehicle harness.

For the installation procedure, refer to the section under.

(2) Measure the voltages between the respective terminals of the SST connectors.

(3) Check to see if the measured values conform to the specification in accordance with the following table "Characteristics of ECU Output".



NOTE

- Make sure that the battery voltage is 11 V or more with the ignition switch turned "ON", for each terminal voltage is affected by the battery voltage.

7.Resistance check

(1) Installation of SST

First, install the SST between the engine ECU and the vehicle harness. However, the SST connector at the ECU side should not be connected.

For the installation procedure, refer to the section under "Connecting Procedure for SST".

(2) Measure the resistances between the respective terminals.

(3) Check to see if the measured resistances conform to the specification in accordance with the following table "Standard Resistances".

NOTE

- Make sure that the ignition switch is turned "LOCK" during the measurement.
- The following table shows the resistance at the time when the temperature of parts is 20°C.

STANDARD RESISTANCES

System to be checked	Terminals	Circuit	Standard resistance
Front oxygen sensor system	15 (OXH1) - 27 (+B)	Front oxygen sensor and main relay	6.7 - 7.7Ω
Rear oxygen sensor system	14 (OXH2) - 27 (+B)	Rear oxygen sensor and main relay	11.7 - 14.5Ω
Engine revolution sensor system	59 (N1+) - 128 (N1−)	Engine revolution sensor system	1850 - 2450Ω
Camshaft position sensor system	58(N2+) - 127(N2−)	Camshaft position sensor system	1850 - 2450Ω
Injector system	24 (#10) - 27 (+B)	No.1 - 3 fuel injector	11.6 - 12.4Ω
	23 (#20) - 27 (+B)		
	22 (#30) - 27 (+B)		
VSV for evaporative emission control system purge control system	16 (PRG) - 27 (+B)	Evaporative emission purge control valve	30 - 34Ω
Ground system	125 (E1) - Body ground	Ground	10Ω or less
	19 (E2) - Body ground		
	122 (E2PM) - Body ground		
	116 (E21) - Body ground		

7-10-2 CHECK AND REPAIR BY CHART ACCORDING TO DTC

(1) Scan tool data (ECU DATA)

1. The following data values given below are representative values obtained under the "normal condition".

However, there are cases where the system is functioning normally even if the measured value is different from the values listed here. Therefore, no judgment as to whether any malfunction is occurring or not should be made only on the basis of these data under the "normal condition".

NOTE

- The data monitor value may vary significantly, depending on slight difference in the measurement, difference in the measurement environment, deterioration due to passage of time in the vehicle, and so forth. Therefore, it is difficult to indicate the definite reference values. Hence, there are cases where malfunctions are occurring even when the measured value is within the reference value.
- With regard to minor phenomenon, such as hesitation and rough idling, it is necessary to make total evaluation, based on all the data monitor items, by sampling the data of the vehicle of the same type under the same conditions and comparing them.
- In the case of the OBD Ⅱ generic scan tool, it is possible to take a reading of the values with an ※ mark in the following table.
- When checking the data under a condition where the engine is "idling" or "racing", the shift lever should be placed in the "neutral", the A/C switch should be turned "OFF", and all accessory switches should be turned "OFF".

Items specified by CARB

	DS-21 diagnosis tester display	Signal name	Vehicle condition	Reference values under normal condition
※1	FUEL SYSTEM	FSYS	At idle speed after warming up	O2
※2	CALC LOAD	LOAD	At idle speed after warming up	1.7 - 2.2 %
			At 2500 rpm with no load after warming up	5.0 - 6.3 %
※3	COOLANT TEMP	ECT	Cold start - Warming up running	Value should be rising gradually
			When engine has warmed up completely	80 - 102°C
			During fail-safe function (At time of starting)	20°C
			During fail-safe function (After starting)	80°C
※4	SHORT FT	SHRT	At idle speed after warming up	−20 - 20 %
※5	LONG FT	LONG	At idle speed after warming up	−16 - +16 %
※6	ENGINE SPEED	RPM	When engine is running at constant speed	There should be no remarkable variation
			At idle speed after warming up	750 - 900 rpm
※7	VEHICLE SPEED	VS	During running (Compared with speedometer)	There should be no remarkable variation
※8	IGN ADVANCE	ITA	At idle speed after warming up	−5 - 15°
			When idle switch is "OFF"	Changes should be made according to running conditions
※9	INTAKE AIR TEMP	IAT	When engine is running	Changes should be made according to running conditions
※10	MAIN ABS PRESS	MAP	When ignition switch is "ON"	80 - 110 kPa
			At idle speed after warming up	21 - 48 kPa
			During fail-safe function	34 - 72 kPa
※11	THROTTLE POS	TP	When acceleration pedal is operate	Changes should be made according to pedal operation
※12	OXYGEN SENSOR S1	O_2FP	At idle speed after warming up	−5 - +5 %
		O_2FV		0.0 - 1.0 V
※13	OXYGEN SENSOR S2	O_2RP	When engine is running at 2000 rpm, for 3 minutes or longer after warming up.	20 - 77 %
		O_2RV		0.1 - 0.9 V
※14	MIL ON RUN DIST	DWM	When there is no DTC	0 km

Items specified by DMC

	diagnosis tester (DS-21/DS-Ⅱ) display	Signal name	Vehicle condition	Reference values under normal condition
1	BATTERY VOLTAGE	BAT	When engine is running at 5000 rpm (25˚C)	Approx. 14 V
2	ELECTRIC LOAD	DSW	When light, heater blower, defogger or radiator fan is "ON"	OFF→ON
3	AIR CONDITIONING	AC	When air conditioner switch is set to "ON"	OFF→ON
4	CTP SWITCH	IDL	When throttle valve is switched from fully closed state to opened state	ON→OFF
5	INJ PULSE WIDTH	TAU	Cold start - Warming up running	Value should be decreasing gradually
			At idle speed after warming up	1.2 - 1.8 ms
6	ISC DUTY RATIO	ISC	When ignition switch is "ON"	0%
			Cold start - Warming up running	Value should be decreasing gradually
			At idle speed after warming up	5 - 15 %
			When air conditioner switch is set to "ON"	20 - 60 %
			When light, heater blower or defogger is "ON"	7 - 19 %
			At idle speed after warming up	2 - 14%
7	ACTUAL DIS ANGLE OF IN CAM	VT	During vehicle running	The value changes, depending on driving conditions.
			At idle speed after warming up	0℃A
8	TARGET DISP ANGLE OF IN CAM	VTT	During vehicle running	The value changes, depending on driving conditions.

NOTE

- The items with a (※) mark is provided only for the EU specifications. Therefore, in the case of the non-EU specification vehicles, no indication will be made.

(2) DTC chart specifications

1.The parameters indicated in the table may vary, depending upon the system types and specifications. This applies to vehicles for all destinations.
For details of the checking of each code, refer to the DTC chart for each code.

Codes specified by ISO/SAE

DTC No.	Diagnosis Items	Diagnosis contents	Malfunction evaluation method	Warning indication
P0105/31	Manifold absolute pressure/barometric pressure circuit malfunction	When abnormality takes place in the signal from the intake manifold pressure/intake temperature integrated sensor (Manifold absolute pressure sensor section) circuit: ·Malfunction of the sensor, or open wire or short circuit in the intake manifold pressure/intake temperature integrated sensor (Manifold absolute pressure sensor section) circuit.	1 trip	○
P0110/43	Intake air temperature sensor circuit malfunction	When malfunction takes place in the signal from the intake manifold pressure/intake temperature integrated sensor (Intake air temperature sensor section): ·Malfunction of the sensor, or open wire or short circuit in intake manifold pressure/intake temperature integrated sensor (Intake air temperature sensor section) circuit.	1 trip	○
P0115/42	Engine coolant temperature sensor circuit malfunction	When abnormality takes place in the signal from the engine coolant temperature sensor: ·Malfunction of the sensor, or open wire or short circuit in engine coolant temperature sensor circuit.	1 trip	○
P0120/41	Throttle/pedal position sensor/switch	When abnormality takes place in the signal from throttle/pedal position sensor: ·Malfunction of the sensor, or open wire or short circuit in throttle/pedal position sensor/switch circuit.	1 trip	○
P0130/21	Oxygen sensor circuit malfunction (Bank 1 sensor 1)	When abnormalities take place two times consecutively in the signal from the oxygen sensor: ·Malfunction of the sensor, or open wire or short circuit in oxygen sensor circuit.	2 trip	○
P0135/23※1	Oxygen sensor heater circuit malfunction (Bank1 sensor1).	When abnormalities take place in the signal from the oxygen sensor heater: ·Open wire or short circuit in oxygen sensor heater circuit.	2 trip	○
P0136/22	Rear oxygen sensor circuit malfunction (Bank 1 sensor 2)	When abnormalities take place two times consecutively in the signal from the rear oxygen sensor: ·Malfunction of the sensor, or open wire or short in the rear oxygen sensor circuit.	2 trip	○
P0141/24※1	Oxygen sensor heater circuit malfunction (Bank 1 sensor 2)	When abnormalities take place in the signal from the oxygen sensor heater: ·Open wire or short circuit in oxygen sensor heater circuit.	2 trip	○
P0171/25	Fuel trim system too lean (Air-fuel ratio lean malfunction, bank 1)	When the air-to-fuel ratio deviates two times consecutively to the lean side due to abnormality of the fuel trim system: ·Abnormal combustion pressure, malfunctioning injector or oxygen sensor	2 trip	○

DTC No.	Diagnosis Items	Diagnosis contents	Malfunction evaluation method	Warning indication
P0172/26	Fuel trim system too rich (Air-fuel ratio rich malfunction, bank 1)	When the air-to-fuel ratio deviates two times consecutively to the rich side due to abnormality of the fuel trim system: ·Abnormal combustion pressure, malfunctioning injector or oxygen sensor	2 trip	○
P0350/16[※2]	Ignition system circuit malfunction	When the ignition signal is not inputted continually.	1trip	○
P0300/17[※1]	Random/multiple cylinder misfire detected	When malfunction takes place in the signal from the Ion current combustion control system	2 trip	MIL flashing during misfire detection.
P0301/17[※1] P0302/17[※1] P0303/17[※1]	Misfire detected Cylinder 1 Cylinder 2 Cylinder 3			○
P0325/18	Knock sensor 1 circuit malfunction	When malfunction takes place in the signal from the knock sensor: ·Malfunction of the sensor, or open wire or short circuit in the signal system	1 trip	–
P0335/13	Engine revolution sensor circuit malfunction	When malfunction takes place in the signal from the engine revolution sensor: ·Malfunction of the sensor, or open wire or short circuit in engine revolution sensor circuit.	1 trip	○
P0340/14	Camshaft position sensor circuit malfunction	When malfunction takes place in the signal from the camshaft position sensor. ·Malfunction of the sensor, or open wire or short-circuit in the sensor circuit.	1 trip	○
P0401/79	Stepper motor type EGR valve system malfunction (Function)	When abnormalities take place in the flow rate of EGR gas:	2 trip	○
P0403/79	Stepper motor type EGR valve system malfunction (Open wire)	When abnormalities take place in the stepper motor type EGR valve detection signal: ·Open wire or short circuit in the signal system	2 trip	○
P0443/76	Evaporative emission control system purge control valve circuit malfunction	When malfunction takes place in the detection signal of the evaporative emission control system purge control valve: ·Open wire or short circuit in evaporative emission control system purge control circuit.	2 trip	○
P500/52	Vehicle speed sensor circuit malfunction	When malfunction takes place in the signal from the vehicle speed sensor. ·Sensor malfunction, open wire or short circuit of the signal system	1 trip	○
P0505/71	Idle control system malfunction	When malfunction takes in the signal from the valve for ISC. ·Open wire or short in valve for ISC circuit	1 trip	○

NOTE

- 1 trip: 1 trip detection logic
- 2 trip: 2 trip detection logic
- MIL: Malfunction indicator lamp
- When the "O" mark is shown in the MIL column, the lamp will go on for that DTC number, but when the "－" mark is shown, the lamp will not go on for that DTC number. Therefore, it is possible to read out the DTC number by using the diagnosis tester (DS-21/DS-Ⅱ). As for the DTC number bearing the mark, the MIL will go on except the EU specifications.
- DTC number with ※1 mark: For EU specifications
- DTC number with ※2 mark: For general specifications

Codes specified by DMC

DTC No.	Diagnosis Items	Diagnosis contents	Malfunction evaluation method	Warning indication
P0535/44	A/C evaporator temperature sensor circuit malfunction	When malfunction takes place in the signal from the A/C evaporator temperature sensor. ·Malfunction of the sensor, or open wire or short circuit in A/C evaporator temperature sensor circuit.	1 trip	–
P1105/32※1	Atmospheric pressure sensor circuit malfunction	When the signals from the atmospheric pressure sensor are not outputted continuously over a certain length of time after starting.	1 trip	○
P1300/36※1	Ion current combustion control system malfunction	When malfunction takes place in the signal from Ion current combustion control system.	2 trip	○
P1346/75	Variable valve timing control system (valve timing)	When abnormalities take place two times consecutively in the valve timing control. ·Deviation of camshaft drive and driven gears	1 trip	○
P1349/73	Variable valve timing control system (advanced timing/retarded timing)	When abnormalities take place two times consecutively in the valve timing control. ·Oil control valve abnormality, admission of foreign matters in the oil passage	1 trip	○
P1510/54	Starter signal system malfunction	When abnormalities take place in the signal from the starter. ·Open wire or short circuit in the signal system	1 trip	○
P1600/83	Immobilizer signal circuit malfunction	When abnormality occur in the wring and reading-out of the rolling codes into/from the immobilizer ECU during immobilizer communication.	1 trip	–
P1601/81	Immobilizer signal malfunction	When the rolling codes can not be exchanged between the EFI ECU and the immobilizer ECU or the rolling codes are not matched.	1 trip	–
P1656/74	Oil control valve control system malfunction	When malfunction takes place in the control voltage for the oil control valve.	1 trip	○
U0121/86	ABS communication failure	When the communication signal from the ABS actuator cannot be received: ·Open wire or short circuit between EFI ECU and ABS actuator.	1 trip	○
U0156/87	Combination meter communication failure	When the communication signal from the combination meter cannot be received: ·Open wire or short circuit between EFI ECU and combination meter	1 trip	○
U1002/88	Communication history error	When there is no communication establishment history with all the CAN communication making-up ECU. ·Open wire, etc. in the wiring of the CAN communication terminal of the EFI ECU.	1 trip	○

NOTE

- 1 trip: 1 trip detection logic
- 2 trip: 2 trip detection logic
- MIL: Malfunction indicator lamp
- When the "O" mark is shown in the MIL column, the lamp will go on for that DTC number, but when the "—" mark is shown, the lamp will not go on for that DTC No. Therefore, it is possible to read out the DTC No. by using the diagnosis tester (DS-21/DS-II). As for the DTC No. bearing the mark, the MIL will go on except the EU specifications.
- DTC No. with ※1 mark: For EU specifications

(3) Fail-safe function

1. When any of the following DTC has been detected, the EFI ECU enters the fail-safe mode in order to make it possible for the vehicle to drive for evacuation and to ensure safety. When the malfunction is remedied to a normal condition, the fail-safe control will be released.
2. However, the diagnosis results will remain memorized. Hence, it is necessary to determine whether the malfunction still persists or not.

Fail-safe specifications

Detected item	Fail-safe operation	Fail-specifications
Manifold absolute pressure sensor signal system	When abnormality takes place in the signal from the intake manifold pressure/intake temperature integrated sensor (Intake manifold pressure section) :	·The pressure estimated by the throttle opening and engine revolution speed is set as the intake manifold pressure. If the signal from the throttle position sensor is also faulty, the signal from the intake manifold pressure/intake temperature integrated sensor is set at a constant value. ·If both the throttle opening angle and engine revolution speed exceed their set values, the fuel is cut.
Ignition system	When malfunction takes place in the ignition signal:	The fuel injection of the cylinder in which abnormality is taking place in the ignition signal is cut.
Water temperature sensor signal system	When malfunction takes place in the signal from the water temperature sensor:	The signal from the water temperature sensor is set to a constant value.
Throttle position sensor signal system	When malfunction takes place in the signal from the throttle position sensor:	The signal from the throttle position sensor is set to a constant value.
A/C evaporator temperature sensor signal system	When malfunction takes place in the signal from the A/C evaporator temperature sensor.	The air conditioner will be cut.
Atmospheric pressure sensor circuit malfunction	When malfunction takes place in the signal from the atmospheric pressure sensor:	The signal from the atmospheric pressure sensor is set to a constant value.
Knock sensor system	When abnormality takes place in the signal from the knock sensor circuit	The ignition timing is retarded.
Intake air temperature sensor signal system	When malfunction takes place in the signal from the intake manifold pressure/intake temperature integrated sensor (Intake air temperature sennsor section):	The signal from the intake manifold pressure/intake temperature integrated sensor (Intake temperature sensor) is set to a constant value.
Stepper motor system for ISC	When malfunction signal takes place in the stepper motor for ISC:	·The energizing control to the stepper motor for ISC is cut off. ·The fuel injection is cut off.
Oil control valve system	When malfunction takes place in the oil control valve control voltage.	Oil control valve energizing control is prohibited.
Rear oxygen sensor system	When malfunction takes place in the signal from the rear oxygen sensor:	The feedback control is turned to open control.
Stepper motor type EGR valve system	When malfunction takes place in the flow rate of EGR gas. ·When the wiring to the stepper motor for EGR is disconnected or shorted.	The energizing control of the stepper motor for EGR is cancelled after the EGR valve is brought to a fully shut condition.
Immobilizer signal circuit malfunction	·When abnormality occur in the wring and reading-out of the rolling codes into/from the immobilizer ECU during immobilizer communication. ·When the rolling codes can not be exchanged between the EFI ECU and immobilizer ECU or rolling codes are not mached.	Prohibition of fuel injection and ignition.

7-11 TROUBLE SHOOTING ACCORDING TO MALFUNCTION PHENOMENA

7-11-1 DESCRIPTION

1. Here, checking procedures when there is no abnormal code indication of the diagnosis but there is a malfunction taking place are described.
2. As for the trouble shooting according to the malfunction phenomena, first organize the contents of the diagnosis by interview, basic check and EFI ECU circuit check results. Then, narrow down and decide the check priority of the possible causes by cross-checking it with the list of possible causes according to malfunction phenomena. On that basis, perform trouble shooting sequentially for each system and parts by following the directions provided in the list.

WARNING

- If the vehicle is driven with the SST (EFI computer check sub harness, etc.) connected, there is a possibility of causing malfunction and may be very dangerous. Therefore, remove it without fail.

NOTE

- When performing checks for each component, make sure to check the harness and connectors that are connected to it.
- As for the reason why no malfunction is detected by diagnosis even when the malfunction phenomena is reproduced, it is possible that there is a malfunction taking place out of the range of the code output conditions of the diagnosis, or there is a malfunction taking place out of the diagnosis circuit.

7-11-2 LIST OF POSSIBLE CAUSES ACCORDING TO MALFUNCTION PHENOMENA

(1) Poor startability

Malfunction phenomena		Possible causes		
		System	Components	Malfunction mode
No initial explosion		Power supply system	EFI ECU power supply circuit	Open wire and short circuit
			Ignition switch	Will not turn "ON"
			Main relay	
		Engine earth system	Engine earth※	Open wire, defective earth
		Fuel system	Fuel pump relay	Will not turn "ON"
			Fuel line, Fuel filter	Clogging
			Injector	Will not inject, constant injection
			Fuel pump	Will not operate
		Ignition system	Engine fuse※	Fuse melt down
			Ignition coil	Will not generate sparks
			Spark plug	
			Ignition timing	Deviated
		Control system	Engine revolution sensor	"NE signal" is not outputted.
			Camshaft position sensor	Defective output signal
There is initial explosion but no complete explosion.		Fuel system	Fuel pump relay	Will not turn "ON"
			Fuel line, Fuel filter	Clogging
			Injector	Leakage, Will not inject, constant injection
			Fuel pump	Will not operate
		Ignition system	Spark plug	Misfire
		Intake system	Air hoses, etc.	Leakage
		Control system	Intake manifold pressure/intake temperature integrated sensor	Characteristics deviated, open wire, short circuit
			Water temperature sensor	
			Engine revolution sensor	Defective output signal
			Camshaft position sensor	
			Oil control valve	Malfunction
			Stepper motor type EGR valve	Defective closing
Hard to start	During cold period	Intake system	Throttle body	Defective opening, does not open
		Control system	Water temperature sensor	Characteristics deviated, open wire, short circuit
	During hot period	Fuel system	Injector	Leakage
		Intake system	Stepper motor for ISC	Defective opening, will not open
	At all times	Fuel system	Fuel pump relay	Will not turn "ON"
			Fuel line, Fuel filter	Clogging
			Injector	Leakage
		Ignition system	Spark plug	No smoldering
		Intake system	Stepper motor for ISC	Defective opening
		Control system	Stepper motor type EGR valve	Defective closing

※: If the IG switch is turned "ON" under the condition of defective grounding of the engine earth connection (Between the 125 (E1) connection earth and the engine block), the "ENGINE fuse (10A)" can melt down.

(2) Idling malfunction

Malfunction phenomena	Possible causes		
	System	Components	Malfunction mode
Fast idle not working	Intake system	Stepper motor for ISC	Defective opening, will not open
	Control system	Water temperature sensor	Open wire and short circuit
Idling speed is high.	Intake system	Air hoses, etc.	Leakage
		Throttle body	Defective closing
		Stepper motor for ISC	Constantly open
	Control system	Intake manifold pressure/intake temperature integrated sensor	Characteristics deviated, open wire, short circuit
		Water temperature sensor	
		Throttle position sensor	Characteristics deviated
		Defogger switch	Constantly "ON"
		Stop lamp switch	
		Heater blower signal	
Idling speed is low.	Intake system	Air hoses, etc.	Clogging
		Throttle body	
	Control system	Intake manifold pressure/intake temperature integrated sensor	Characteristics deviated
		Water temperature sensor	
		Defogger switch	Will not turn "ON"
		Stop lamp switch	
		Heater blower signal	
When idling hunting takes place.	Intake system	Air hoses, etc.	Leakage
		Throttle body	
		Stepper motor for ISC	Constantly open
	Control system	Intake manifold pressure/intake temperature integrated sensor	Characteristics deviated
		Camshaft position sensor	Defective output signal
		Oil control valve	Malfunction
Unstable idling	Fuel system	Injector	Leakage, Will not inject
		Fuel pump	Malfunction
	Intake system	Throttle body	Suction
	Ignition system	Ignition coil	Poor connection
		Spark plug	Misfire
	Control system	Intake manifold pressure/intake temperature integrated sensor	Malfunction, poor connection
		Oxygen sensor	Malfunction, poor connection
		Stepper motor type EGR valve	Defective closing

(3) Engine stall

Malfunction phenomena	Possible causes		
	System	Components	Malfunction mode
The engine stalls after a while from starting.	Fuel system	Fuel pump relay	Will not turn "ON"
		Fuel line, fuel filter	Clogging
		Fuel pump	Will not operate
	Control system	Water temperature sensor	Characteristics deviated
		Camshaft position sensor	Defective output signal
		Oil control valve	Malfunction
		Stepper motor type EGR valve	Defective closing
The engine stalls when pressing on the accelerator.	Control system	Intake manifold pressure/intake temperature integrated sensor	Characteristics deviated
		Water temperature sensor	
		Camshaft position sensor	Defective output signal
		Oil control valve	
The engine stalls when releasing the accelerator.	Intake system	Throttle body	Malfunction
	Control system	Intake manifold pressure/intake temperature integrated sensor	Characteristics deviated
		Stepper motor type EGR valve	Defective closing
When the air conditioner is turned "ON"	Intake system	Stepper motor for ISC	Constantly closed
The engine stalls but can be restarted.	Power supply system	EFI ECU power supply circuit	Poor connection
		Ignition switch	
		Main relay	
	Intake system	Stepper motor for ISC	Constantly closed
	Ignition system	Ignition coil	Poor connection
	Control system	Intake manifold pressure/intake temperature integrated sensor	Poor connection
		Engine revolution sensor	
		Stepper motor type EGR valve	Malfunction

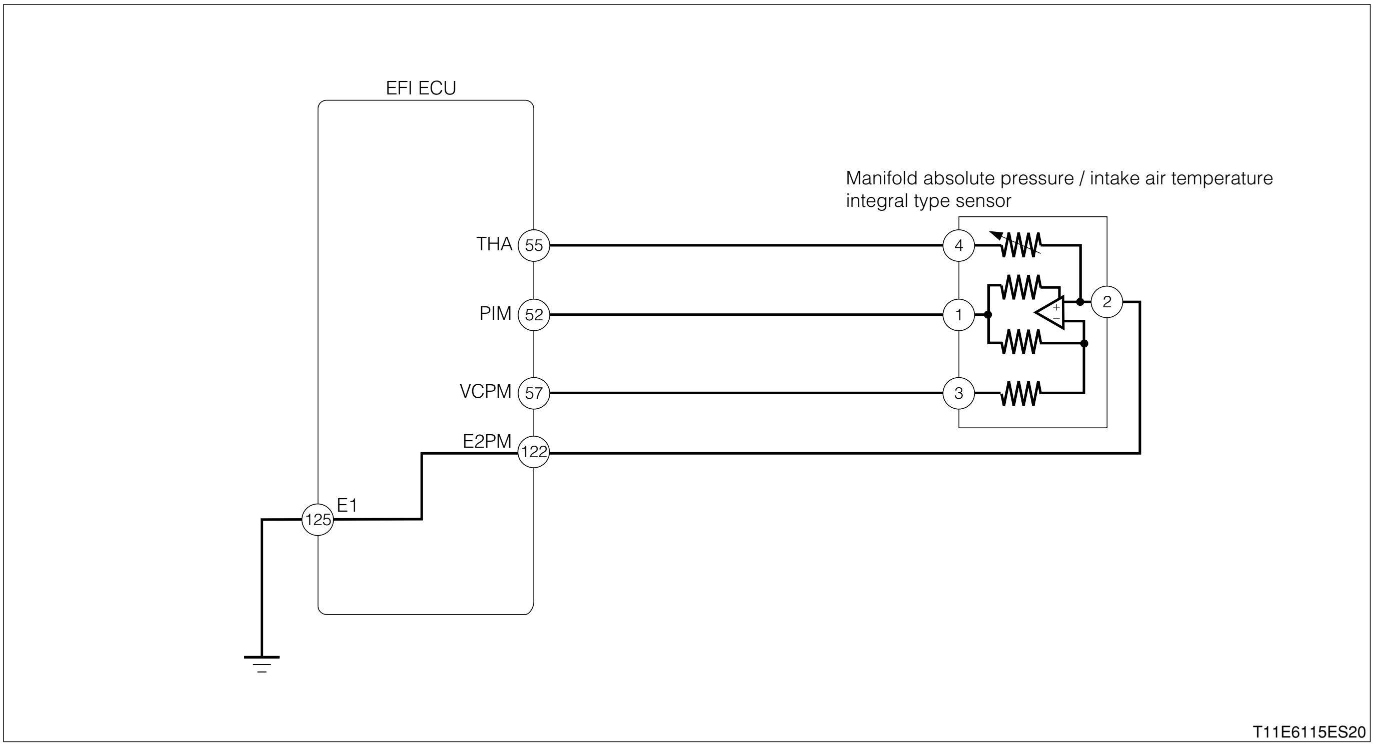
(4) Defective running

Malfunction phenomena	Possible causes: System	Possible causes: Components	Possible causes: Malfunction mode
Hesitation takes place when accelerating.	Fuel system	Fuel line, fuel filter	Clogging
		Injector	Flow rate decrease
		Fuel pump	
	Ignition system	Ignition coil	Ignition missing
		Spark plug	Misfire
		Ignition timing	Deviated
	Control system	Intake manifold pressure/intake temperature integrated sensor	Characteristics deviated, open wire, short circuit
		Water temperature sensor	
		Throttle position sensor	
		Knock sensor	Open wire and short circuit
		Stepper motor type EGR valve	Malfunction
Back fire, after fire	Fuel system	Injector	Flow rate decrease
	Ignition system	Ignition coil	Poor connection
		Spark plug	Misfire
		Ignition timing	Deviated
	Control system	Intake manifold pressure/intake temperature integrated sensor	Malfunction
		Water temperature sensor	Characteristics deviated
		Camshaft position sensor	Defective output signal
		Oil control valve	Malfunction
		Stepper motor type EGR valve	
Insufficient output	Fuel system	Fuel line, fuel filter	Fuel pressure will not rise.
		Injector	Flow rate decrease
		Fuel pump	Fuel pressure will not rise.
	Ignition system	Spark plug	Misfire
	Control system	Intake manifold pressure/intake temperature integrated sensor	Characteristics deviated, open wire, short circuit
		Water temperature sensor	
		Throttle position sensor	Characteristics deviated
		Camshaft position sensor	Defective output signal
		Oil control valve	Malfunction
		Stepper motor type EGR valve	
Emits black smoke.	Fuel system	Injector	Constant injection
	Control system	Intake manifold pressure/intake temperature integrated sensor	Characteristics deviated, open wire, short circuit
		Water temperature sensor	Characteristics deviated
		Throttle position sensor	
Hunting takes place while running.	Fuel system	Fuel line, fuel filter	Clogging
		Injector	Malfunction
	Ignition system	Ignition coil	Poor connection
	Control system	Throttle position sensor	Characteristics deviated
		Camshaft position sensor	Defective output signal
		Oil control valve	Malfunction
Abnormal knocking takes place.	Control system	Intake manifold pressure/intake temperature integrated sensor	Characteristics deviated, open wire, short circuit
		Throttle position sensor	Characteristics deviated
		Knock sensor	Characteristics deviated, open wire, short circuit
		Stepper motor type EGR valve	Malfunction

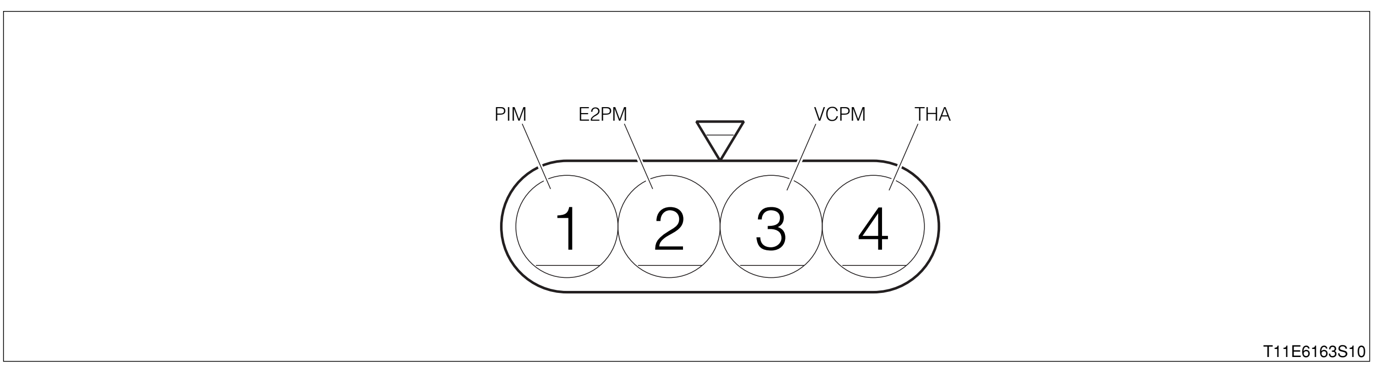
7-12 TROUBLE SHOOTING ACCORDING TO DIAGNOSIS CODE

7-12-1 DTC NO.P0105/31 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT MALFUNCTION

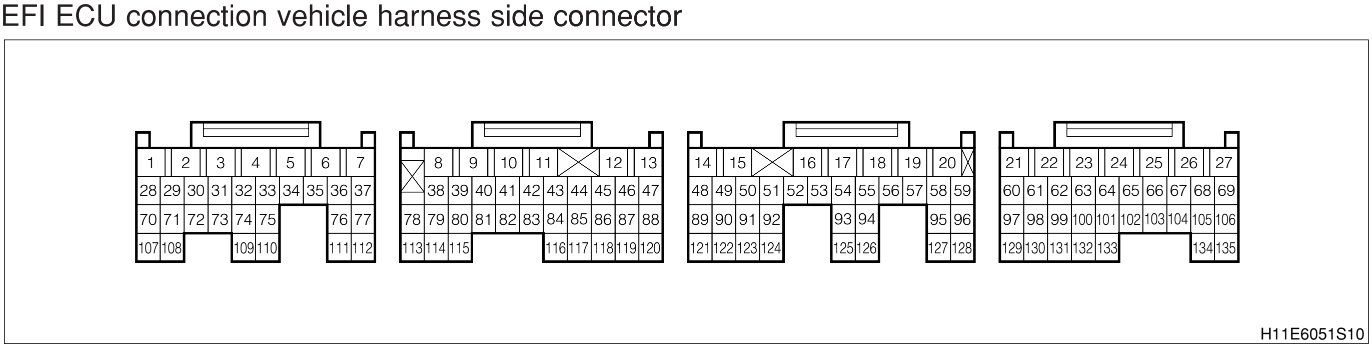
(1) System diagram



Manifold absolute pressure/intake air temperature integral type sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1.The manifold absolute pressure sensor detects the intake manifold pressure as a voltage.

2.Since the Manifold absolute pressure, intake air temperature integral type sensor (Manifold absolute pressure sensor section) does not use the atmospheric pressure as a criterion, but senses the absolute pressure inside the intake manifold (The pressure in proportion to the present absolute vacuum 0), it is not influenced by fluctuations in the atmospheric pressure due to high altitude and other factors. This permits it to control the air-fuel ratio at the proper level under all conditions.

(3) Diagnosis code output conditions

1.When the signals from the manifold absolute pressure/intake air temperature integral type sensor (Manifold absolute pressure sensor section) are not outputted continuously over a certain length of time:

NOTE

- After confirming DTC P0105/31, use the OBD Ⅱ generic scan tool or diagnosis tester (DS-21/DS-Ⅱ) to confirm the "Manifold abs. pressure" from "CURRENT DATA".
- If the ECU detects DTC P0105/31, it operates the fail-safe function, keeping the ignition timing and injection volume constant and making it possible to drive the vehicle.

(4) Trouble area

1.Open wire or short circuit in manifold absolute pressure sensor circuit

2.Manifold absolute pressure, intake air temperature integral type sensor (Manifold absolute pressure section) sensor

3.EFI ECU

(5) Checking points

1.Are the signals from the manifold absolute pressure/intake air temperature integral type sensor (Manifold absolute pressure sensor section) inputted to the EFI?

2.Is the harness between the manifold absolute pressure/intake air temperature integral type sensor (Manifold absolute pressure sensor section) and the EFI ECU normal?

3.Is the power supply voltage of the manifold absolute pressure/intake air temperature integral type sensor (Manifold absolute pressure sensor section) normal?

4.Is the output of the manifold absolute pressure/intake air temperature integral type sensor (Manifold absolute pressure sensor section) normal?

(6) Inspection procedure

① When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

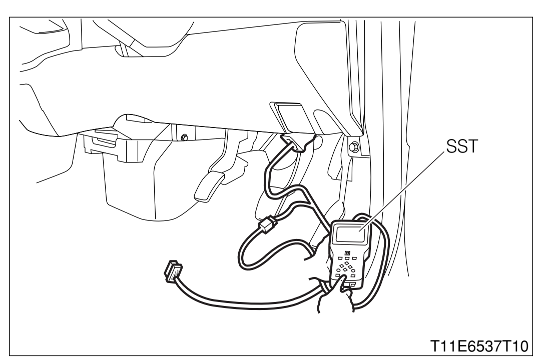
ⅮD1. Check of output value of sensor.

1.The IG switch turned "LOCK".

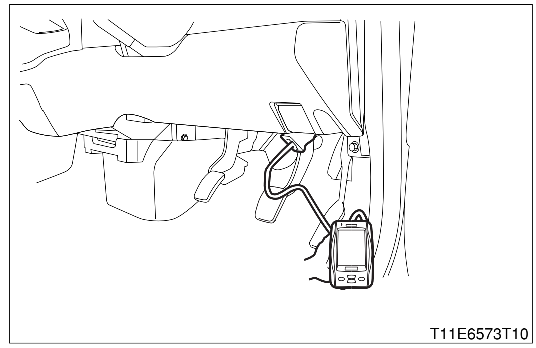
2.Diagnosis tester connect the DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



3.After turning "ON" the IG switch, turn "ON" the main switch of the tester.
4.Read the "Manifold abs. pressure" value of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.
SPECIFIED VALUE: Atmospheric pressure (Approx. 100 kPa)

▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, go to ⊳2.

⊳2. Check of voltage of manifold absolute pressure/intake air temperature integral type sensor
1.Remove the manifold absolute pressure/intake air temperature integral type sensor connector.
2.With the IG switch turned "ON", measure the voltage between the following terminals given below.
(1) Between the sensor connection vehicle harness side connector 3 (VCPM) and the sensor connection vehicle harness side connector 2 (E2PM)
SPECIFIED VALUE: 4.5 - 5.5V

NOTE
- If no voltage appears, check the EFI ECU power supply circuit.

▼If it is OK, go to ⊳3.
▼If it is NG, check the EFI ECU circuit.

⊳3. Check of manifold absolute pressure/intake air temperature integral type sensor unit
1.Check the manifold absolute pressure/intake air temperature integral type sensor unit.
Refer to Page B8-220.

2.Are the check result OK?
▼If it is OK, go to ⊳4.
▼If it is NG, replace the manifold absolute pressure/intake air temperature integral type sensor

▷4. Check of wire harness continuity

1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.

2.Check the continuity between the following terminals given below.

(1) Between the sensor connection vehicle harness side connector 1 (PIM) and the EFI ECU connection vehicle harness side connector 52 (PIM)

(2) Between the sensor connection vehicle harness side connector 2 (E2PM) and the EFI ECU connection vehicle harness side connector 122 (E2PM)

(3) Between the sensor connection vehicle harness side connector 3 (VCPM) and the EFI ECU connection vehicle harness side connector 57 (VCPM)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, replace the Manifold absolute pressure, intake air temperature integral type sensor.

▼If it is NG, repair or replace the harness or connector.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. EFI ECU signal check

1.Connect the SST.
SST: 09842-97209-000

2.Perform voltage measurements between the following terminals when the IG switch is "ON".
(1) Between SST 52 (PIM) - 122 (E2PM)
SPECIFIED VALUE: 3.1 - 4.1 V(Room temperature)

▼If it is OK, check the EFI ECU circuit.
▼If it is NG, proceed to ⊳2.

⊳2. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.
(1) Between sensor connection vehicle harness side connector 1 (PIM) - ECU connection vehicle harness side connector 52 (PIM)
(2) Between sensor connection vehicle harness side connector 2 (E2PM) - ECU connection vehicle harness side connector 122 (E2PM)
(3) Between sensor connection vehicle harness side connector 3 (VCPM) - ECU connection vehicle harness side connector 57 (VCPM)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳3.
▼If it is NG, repair the harness and connectors.

⊳3. Intake manifold pressure/intake temperature integrated sensor voltage check

1.Remove the connector of the intake manifold pressure/intake temperature integrated sensor.
2.Perform voltage measurement between the following terminals when the IG switch is "ON".
(1) Between sensor connection vehicle harness side connector 3 (VCPM) - sensor connection vehicle harness side connector 2 (E2PM)
SPECIFIED VALUE: 4.5 - 5.5V

▼If it is OK, proceed to ⊳4.
▼If it is NG, check the EFI ECU circuit.
Refer to Page A1-24.

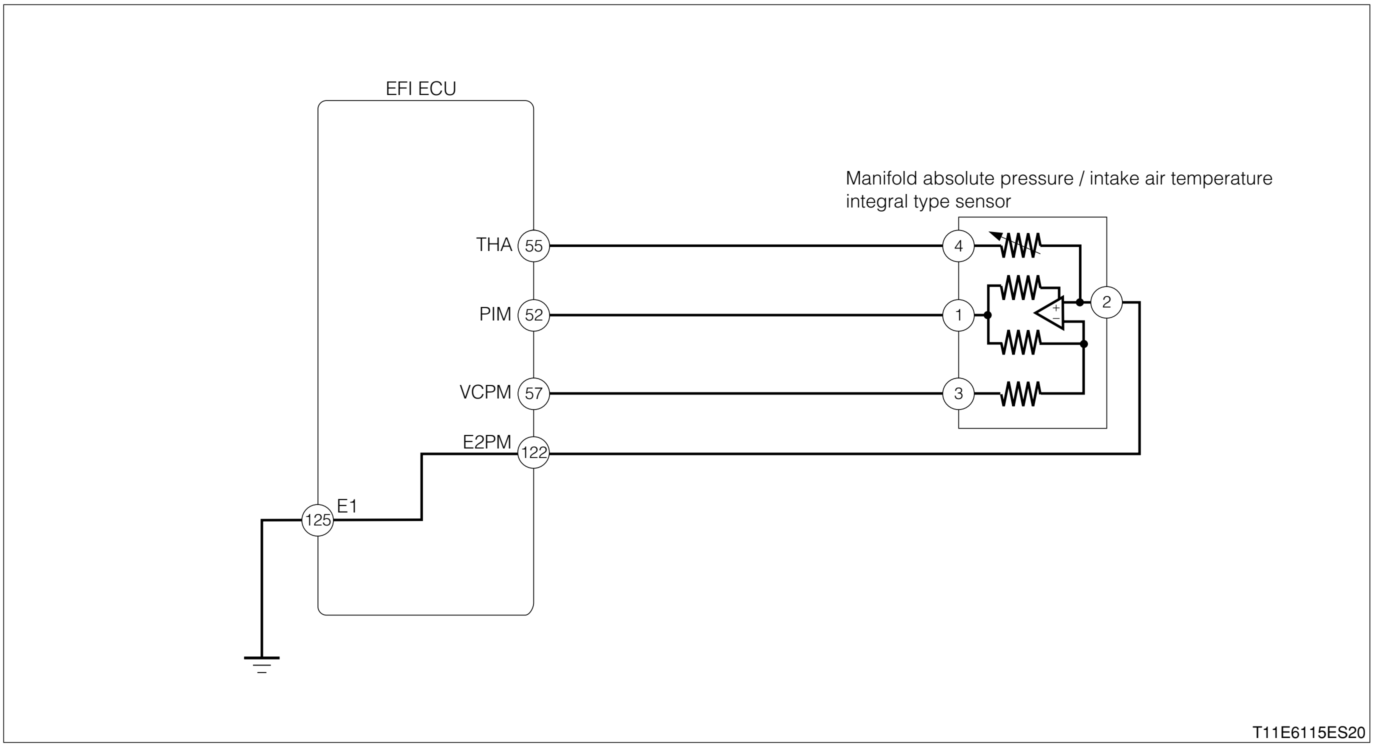
⊳4. Intake manifold pressure/intake temperature integrated sensor unit check

1.Perform unit check of the intake manifold pressure/intake temperature integrated sensor.
Refer to Page B8-220.

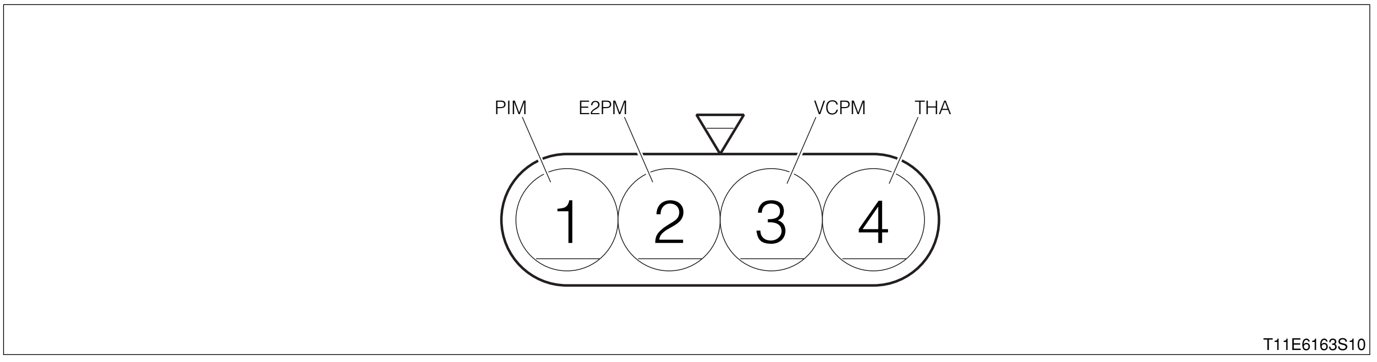
2.Are the check result OK?
▼If it is OK, check the connecting condition of each connector.
▼If it is NG, replace the intake manifold pressure/intake temperature integrated sensor.

7-12-2 DTC NO.P0110/43 INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT MALFUNCTION

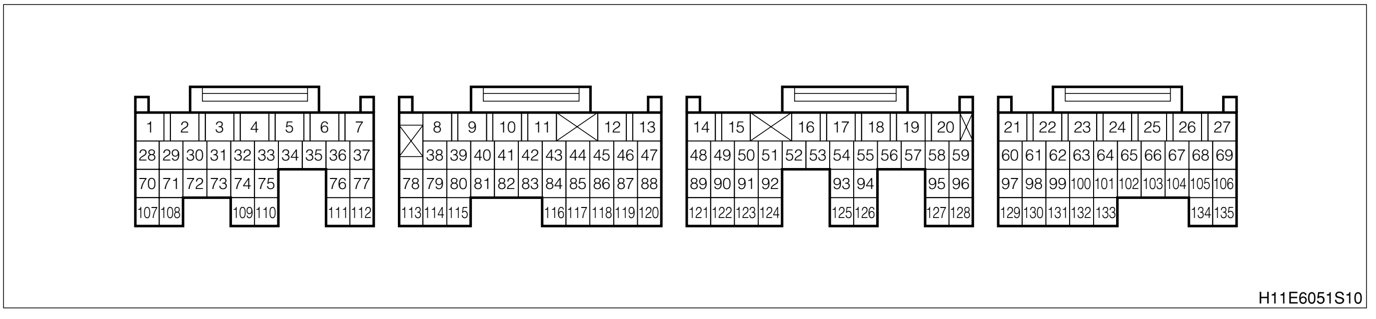
(1) System diagram



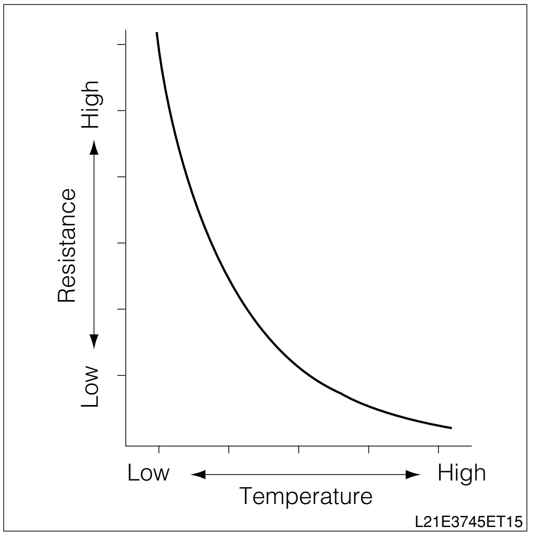
Manifold absolute pressure/intake air temperature integral type sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description



1. The Manifold absolute pressure, intake air temperature integral type sensor (Intake air temperature sensor section), which detects the intake air temperature, is located at the intake manifold. A thermistor built in the sensor changes the resistance value according to the intake air temperature. The lower the intake air temperature, the greater the thermistor resistance value, and the higher the manifold absolute pressure, intake air temperature integral type sensor (Intake air temperature sensor section), the lower the thermistor resistance value. When the resistance value of the manifold absolute pressure, intake air temperature integral type sensor (Intake air temperature sensor section) changes in accordance with changes in the intake air temperature, the potential at terminal THA also changes. Based on this signal, the EFI ECU increases the fuel injection volume to improve driveability during cold engine operation.

(3) Diagnosis code output conditions

1. When the signals from the manifold absolute pressure/intake air temperature integral type sensor (Intake air temperature sensor section) are not outputted continuously after starting over a certain length of time:

(4) Trouble area

1. Open wire or short circuit in the Manifold absolute pressure, intake air temperature integral type sensor (Intake air temperature sensor section) circuit
2. Manifold absolute pressure, intake air temperature integral type sensor (Intake air temperature sensor section)
3. EFI ECU

(5) Checking points

1. Are the signals from the intake manifold pressure/intake air temperature integral type sensor (Intake air temperature sensor section) inputted to the EFI ECU?
2. Is the harness between the manifold absolute pressure/intake air temperature integral type sensor (Manifold absolute pressure sensor section) and the EFI ECU normal?
3. Is the output of the manifold absolute pressure/intake air temperature integral type sensor (Intake air temperature sensor section) normal?

(6) Inspection procedure

① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

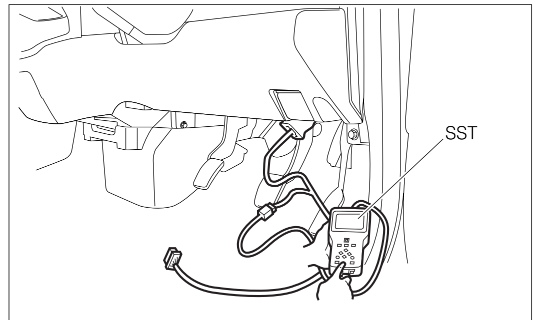
⌦1. Check of sensor output value.

1.The IG switch turned "LOCK".

2.Connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

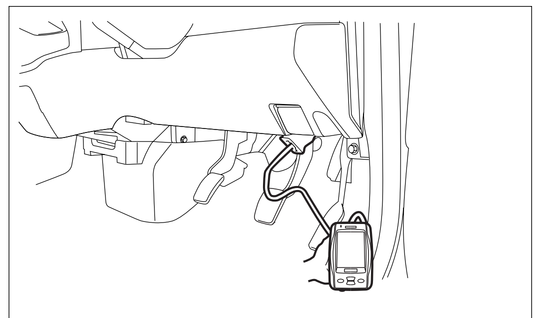
SST: 09991-87404-000



T11E6537T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



T11E6573T10

3.After turning "ON" the IG switch, Turn "ON" the main switch of the tester.

4.Read the "Intake air temperature" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.

SPECIFIED VALUE: Measured ambient temperature

▼If it is OK, check the EFI ECU circuit.

Refer to Page A1-24.

▼If it is NG, go to ⌦2.

⌦2. Confirmation of IAT sensor output value.

1.Read the "Intake air temperature" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.

▼When −40°C, go to ⌦3.

▼When 140°C or above, go to ⌦5.

⌦3. Check of open wire in harness or inside EFI ECU (1).

1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.

2.Remove the manifold absolute pressure/intake air temperature integral type sensor connector.

3.Short circuit between the following terminals given below, using SST.

SST: 09991-87103-000

(1) Between the sensor connection vehicle harness side connector 4 (THA) and the sensor connection vehicle harness side connector 2 (E2PM)

4.After turning "ON" the IG switch, turn "ON" the main switch of the tester. Read the "Intake air temperature" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.

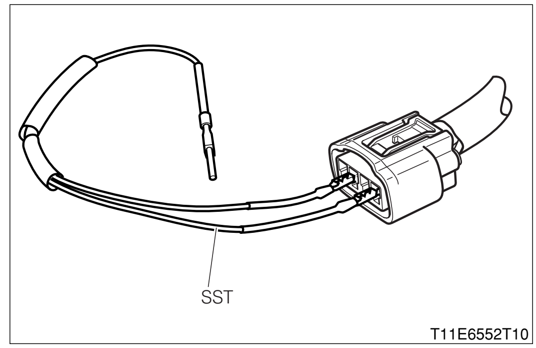
SPECIFIED VALUE: 140°C or above

▼If it is OK, carry out the following operations given below.

(1) Check the connector or the connection state of the terminal of the manifold absolute pressure/intake air temperature integral type sensor.

(2) If there is no abnormality, replace the manifold absolute pressure/intake air temperature integral type sensor.

▼If it is NG, go to ⊳4.



⊳4. Check of open wire in harness or inside EFI ECU (2).

1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.

2.Set the SST (Sub-harness).

SST: 09842-97209-000

3.Release the short circuit of the connector of the manifold absolute pressure/intake air temperature integral type sensor.

4.Short circuit between the following terminals given below.

(1) Between SST 55 (THA) and 122 (E2PM)

5.After turning "ON" the IG switch, turn "ON" the main switch of the tester. Read the "Intake air temperature" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.

SPECIFIED VALUE: 140°C or above

▼If it is OK, the harness between the manifold absolute pressure, intake air temperature integral type sensor (Intake air temperature sensor section) and the EFI ECU is open. Repair or replace the harness.

▼If it is NG, check the ECU connector or terminal for connecting condition. If they are satisfactory, replace the EFI ECU.

Refer to Page B8-1.

⊳5. Check of short in harness or inside EFI ECU (1).

1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.

2.Disconnect the connector of the manifold absolute pressure, intake air temperature integral type sensor.

3.After turning "ON" the IG switch, turn "ON" the main switch of the tester.

4.Read the "Intake air temperature " of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.

SPECIFIED VALUE: −40°C

▼If it is OK, replace the manifold absolute pressure, intake air temperature integral type sensor.

▼If it is NG, go to ⊳6.

⊳6. Check of short in harness or inside EFI ECU (2).

1.Perform continuity check between each of the following terminals.

(1) Between sensor connection vehicle harness side connector 2 (E2PM) - ECU connection vehicle harness side connector 122 (E2PM)

(2) Between sensor connection vehicle harness side connector 4 (THA) - ECU connection vehicle harness side connector 55 (THA)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, repair or replace the harness or connector.

▼If it is NG, check or replace the EFI ECU.

② When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

⊳1. EFI ECU voltage check

1.Connect the SST.
SST: 09842-97209-000

2.Perform voltage measurement between the following terminals when the IG switch is "ON".
(1) Between SST 55 (THA) - 122 (E2PM)
SPECIFIED VALUE: 0.15 V - 4.85 V (Changes according to the intake temperature)

▼If it is OK, check the EFI ECU circuit.
▼If it is NG, proceed to ⊳2.

⊳2. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.
(1) Between sensor connection vehicle harness side connector 2 (E2PM) - ECU connection vehicle harness side connector 122 (E2PM)
(2) Between sensor connection vehicle harness side connector 4 (THA) - ECU connection vehicle harness side connector 55 (THA)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳3.
▼If it is NG, repair the harness and connectors.

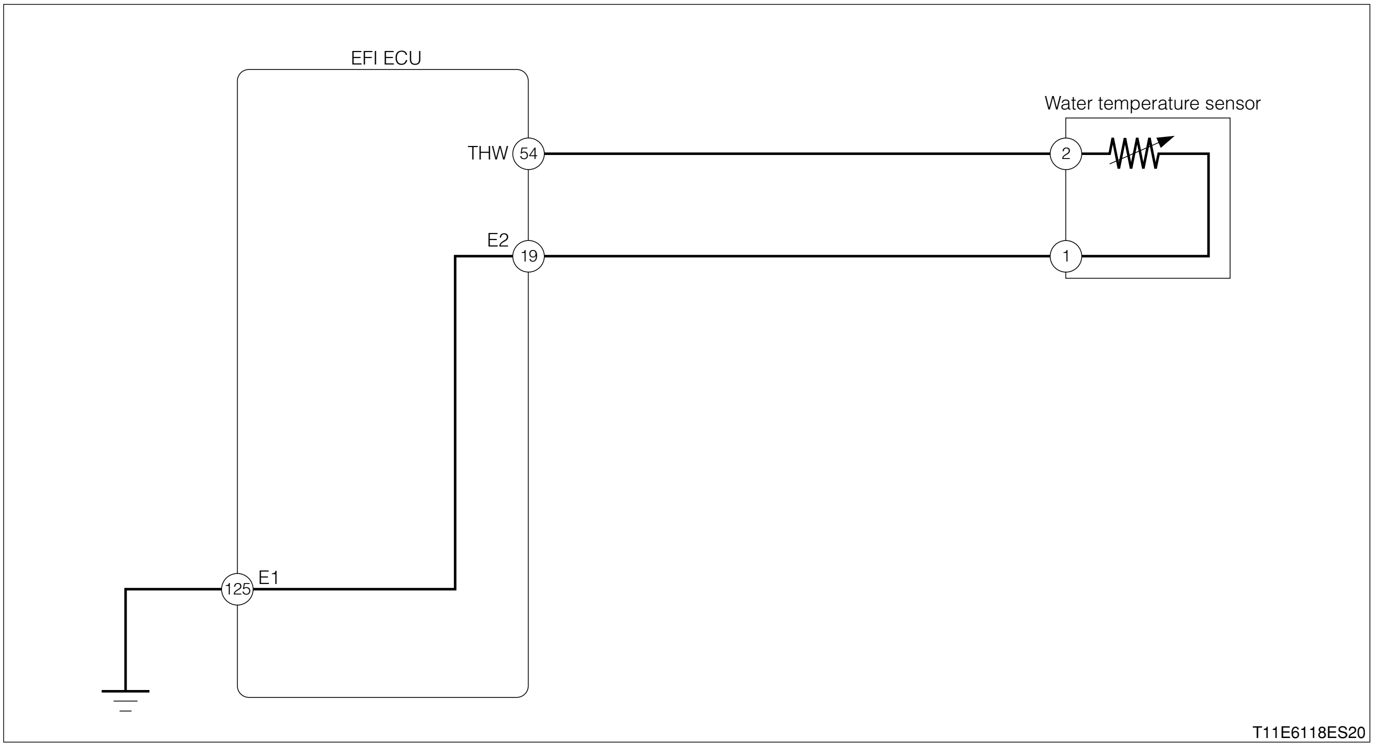
⊳3. Intake manifold pressure/intake temperature integrated sensor unit check

1.Perform unit check of the intake manifold pressure/intake temperature integrated sensor.
Refer to Page B8-220.

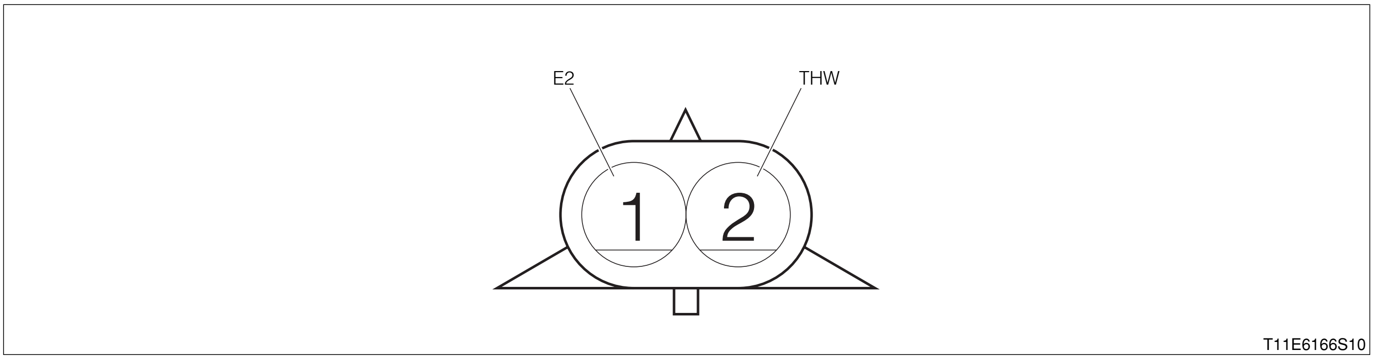
2.Are the check result OK?
▼If it is OK, check the connecting condition of each connector.
▼If it is NG, replace the intake manifold pressure/intake temperature integrated sensor.

7-12-3 DTC NO.P0115/42 ENGINE COOLANT TEMPERATURE SENSOR (ECT) CIRCUIT MALFUNCTION

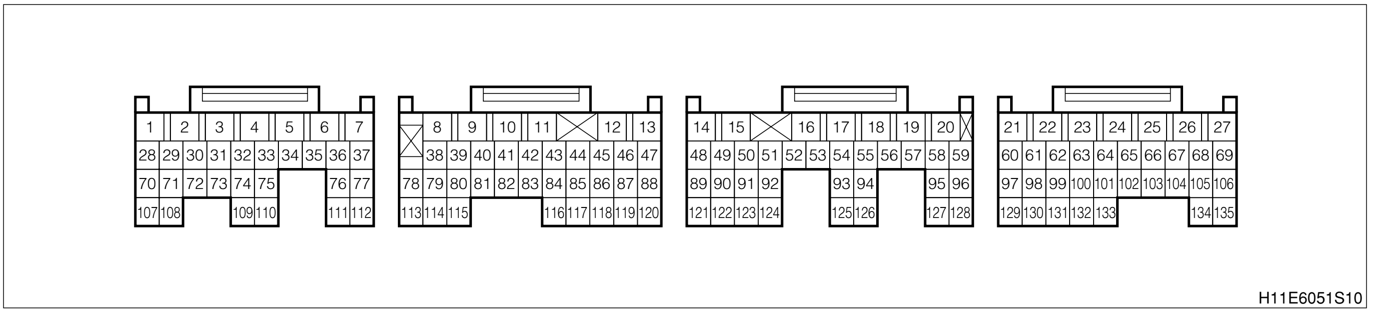
(1) System diagram



Water temperature sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1. A thermistor built into the engine coolant temperature sensor changes the resistance valve according to the engine coolant temperature. The structure of the sensor and connection to the EFI ECU is the same as in the DTC P0110/43 (Intake air temparature sensor circuit malfunction).

(3) Diagnosis code output conditions

1. When the signals from the water temperature sensor are not outputted continuously after starting over a certain length of time:

(4) Trouble area

1.Open wire or short circuit in the engine coolant temperature sensor circuit
2.Engine coolant temperature sensor
3.EFI ECU

(5) Checking points

1.Are the signals from the water temperature sensor inputted to the EFI ECU?
2.Is the harness between the water temperature sensor and the EFI ECU normal?
3.Is the output of the water temperature sensor normal?

(6) Inspection procedure

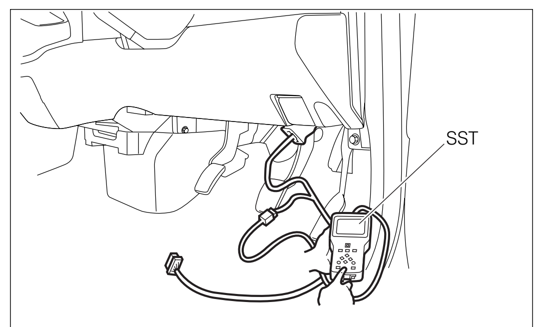
① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

▷1. Check of output value of sensor.

1.The IG switch turned "LOCK".
2.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000



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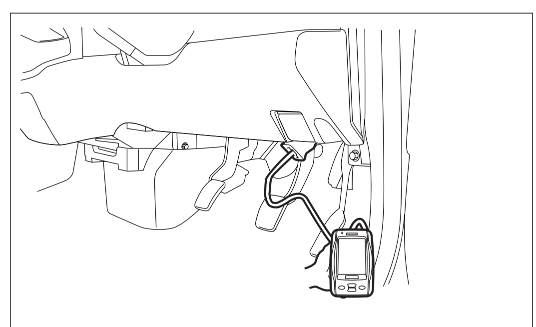
(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.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3.After turning "ON" the IG switch, turn "ON" the main switch of the tester.
4.Read the "Engine coolant temperature" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.
SPECIFIED VALUE: The same as the actual engine cooling water temperature

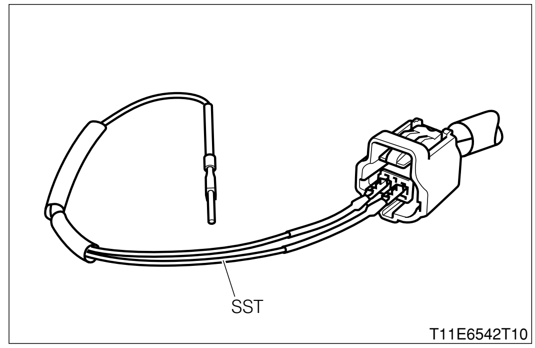
▼If it is OK, check the EFI ECU circuit.
▼If it is NG, go to ▷2.

▷2. Confirmation of sensor output value.

1.Read the "Engine coolant temperature" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.
▼When −40°C, go to ▷3.
▼When 140°C or above, go to ▷5.

⊳3. Check of open wire in harness or inside EFI ECU (1).

1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.
2.Disconnect the connector of the engine coolant temperature sensor.
3.Short circuit between the following terminals given below, using SST.
(1) Between the water temperature sensor connection vehicle harness side connector 1 (E2) and the water temperature sensor connection vehicle harness side connector 2 (THW)
SST: 09991-87103-000



4.After turning "ON" the IG switch, turn "ON" the main switch of the tester.
5.Read the "Engine coolant temperature" of the diagnosis tester (DS-21/DS-II) or OBD II generic scan tool.
SPECIFIED VALUE: 140°C or above.
▼If it is OK, check the engine coolant temperature sensor sensor connector or terminal for connecting condition. If they are satisfactory, replace the engine coolant temperature sensor sensor.
Refer to Page B8-7.

▼If it is NG, go to ⊳4.

⊳4. Check of open wire in harness or inside EFI ECU (2).

1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.
2.Set the SST (Sub-harness).
SST: 09842-97209-000

3.Disconnect the jump wire from the engine coolant temperature sensor sensor connector.
4.Short circuit between the following terminals given below.
(1) Between SST 54 (THW) and 19 (E2)
5.After turning "ON" the IG switch, turn "ON" the main switch of the tester.
6.Read the "Engine coolant temperature" of the diagnosis tester (DS-21/DS-II) or OBD II generic scan tool.
SPECIFIED VALUE: 140°C or above?

▼If it is OK, the harness between the engine coolant temperature sensor sensor and the EFI ECU is open. Repair or replace the harness.
▼If it is NG, check the EFI ECU connector and terminal for connecting condition. If they are satisfactory, replace the EFI ECU.
Refer to Page B8-1.

⊳5. Check of short in harness or inside EFI ECU (1).

1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.
2.Disconnect the connector of the engine coolant temperature sensor sensor.
3.After turning "ON" the IG switch, turn "ON" the main switch of the tester.
4.Read the "Engine coolant temperature" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.

SPECIFIED VALUE: −40°C

▼If it is OK, replace the engine coolant temperature sensor.
Refer to Page B8-7.

▼If it is NG, go to ⊳6.

⊳6. Check of short in harness or inside EFI ECU (2).

1.Perform continuity check between each of the following terminals.
(1) Between sensor connection vehicle harness side connector 1 (E2) - ECU connection vehicle harness side connector 19 (E2)
(2) Between sensor connection vehicle harness side connector 2 (THW) - ECU connection vehicle harness side connector 54 (THW)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, repair or replace the harness or connector.
▼If it is NG, check or replace the EFI ECU.

② When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

⊳1. EFI ECU signal check

1.Connect the SST.

SST: 09842-97209-000

2.Perform voltage measurement between the following terminals when the IG switch is "ON".
(1) Between SST 54 (THW) - 19 (E2)

SPECIFIED VALUE: 0.15 V - 4.85 V(Changes according to the water temperature)

▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, proceed to ⊳2.

⊳2. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.
(1) Between sensor connection vehicle harness side connector 1 (E2) - ECU connection vehicle harness side connector 19 (E2)
(2) Between sensor connection vehicle harness side connector 2 (THW) - ECU connection vehicle harness side connector 54 (THW)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳3.
▼If it is NG, repair the harness and connectors.

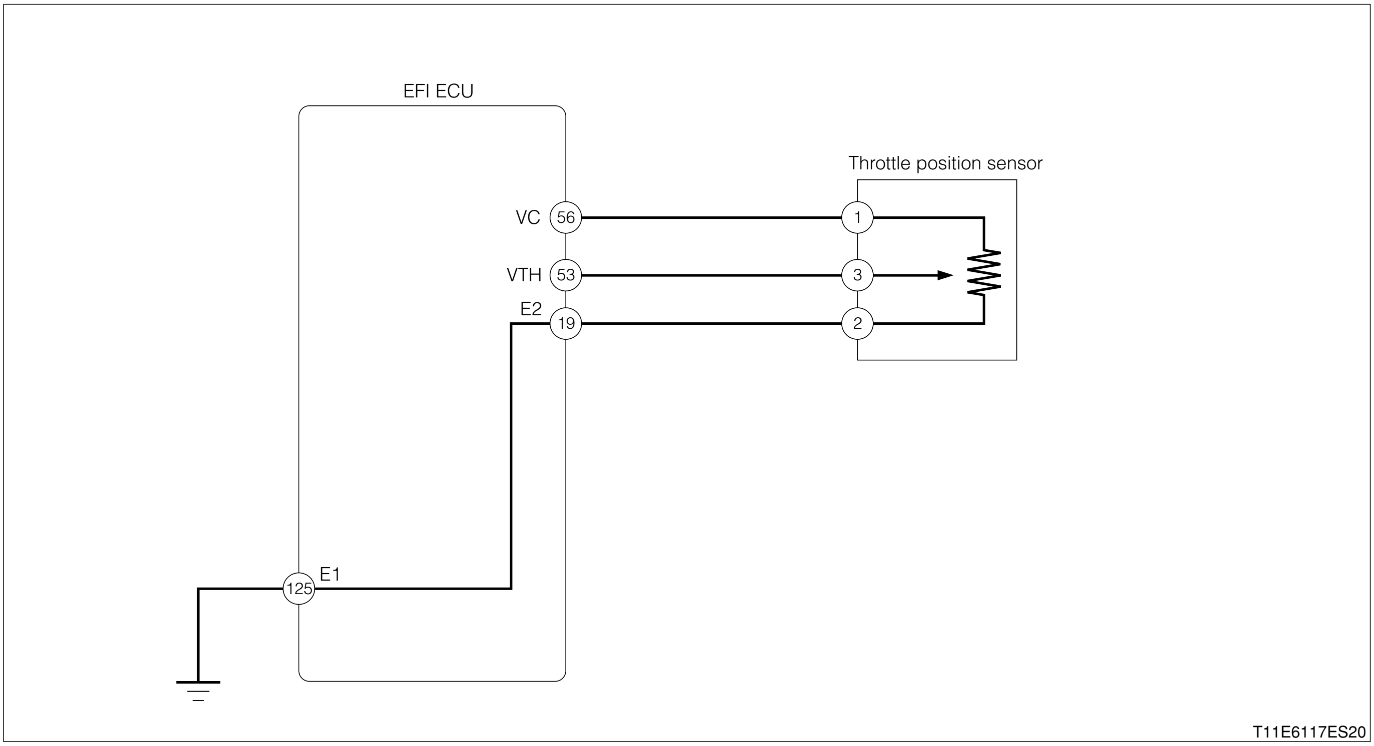
▷3. Water temperature sensor unit check

1.Perform unit check of the water temperature sensor.
Refer to Page B8-221.

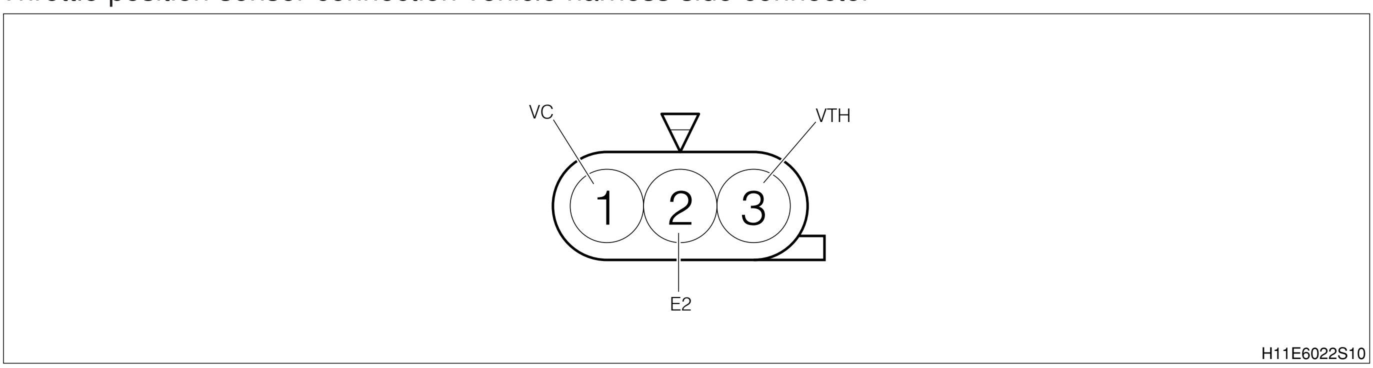
2.Are the check result OK?
▼<u>If it is OK, check the connecting condition of each connector.</u>
▼<u>If it is NG, replace the water temperature sensor.</u>
Refer to Page B8-7.

7-12-4 DTC NO.P0120/41 THROTTLE/PEDAL POSITION SENSOR

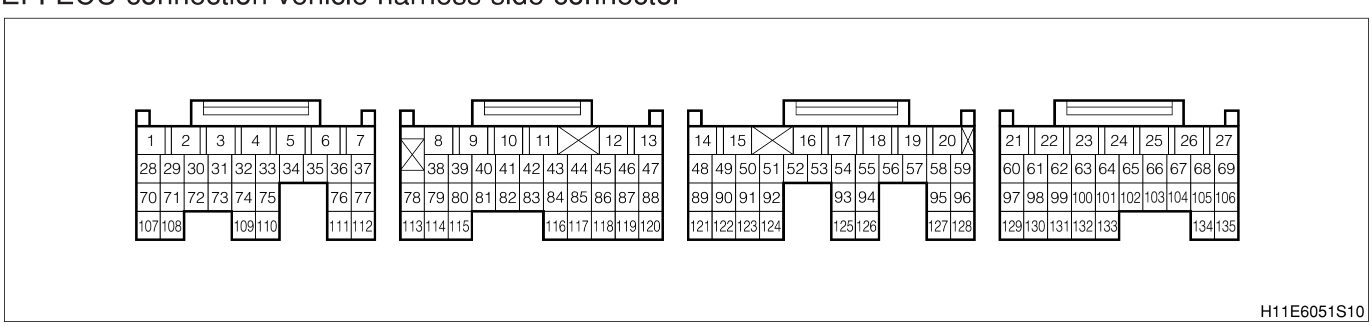
(1) System diagram



Throttle position sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1. The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, a voltage of approximately 0.4 - 0.8 V is applied to terminal VTH of the EFI ECU. The voltage applied to the terminals VTH of the EFI ECU increases in proportion to the opening angle of the throttle valve and becomes approximately 3.5 - 5.0 V when the throttle valve is fully opened. The EFI ECU judges the vehicle driving conditions from these signals input from terminal VTH, uses them as one of the conditions for deciding the air-fuel ratio correction, power increase correction and fuel-cut control etc.

(3) Diagnosis code output conditions

1.When the signals from the throttle position are not outputted continuously after starting over a certain length of time.

(4) Trouble area

1.Open wire or short circuit in the throttle position sensor circuit.
2.Throttle position sensor
3.EFI ECU

(5) Checking points

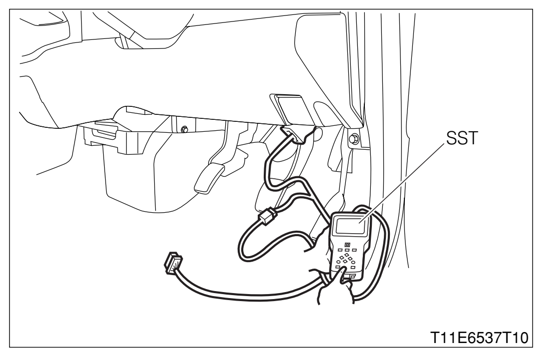
1.Are the signals from the throttle position sensor inputted to the EFI ECU?
2.Is the harness between the throttle position sensor and the EFI ECU normal?
3.Is the power supply voltage of the throttle position sensor normal?
4.Is the output of the throttle position sensor normal?

(6) Inspection procedure

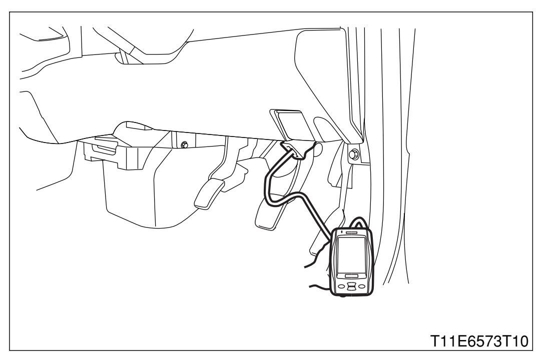
① When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

▷1. Check of output value of sensor.

1.The IG switch turned "LOCK".
2.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



3.After turning "ON" the IG switch, turn "ON" the main switch of the tester.
4.Read the "Abs. throttle position SSR" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.

Throttle valve	Throttle valve opening [%]
Fully closed	0.0
Fully open	100.0

5.Are the check results OK?
▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, go to ▷2.

⊳2. Check of power supply voltage.

1.After turning "OFF" the main switch of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool, turn "LOCK" the IG switch.
2.Disconnect the connector of the throttle position sensor.
3.With the IG switch turned "ON", measure the voltage between the following terminals given below.
(1) Between the throttle position sensor connection vehicle harness side connector 1 (VC) and the body earth

SPECIFIED VALUE: 4.5 - 5.5V

4.Is the voltage within the specified value?
▼If it is OK, go to ⊳3.
▼If it is NG, go to ⊳5.

⊳3. Check of linear throttle sensor.

Refer to Page B8-222.

1.Are the check results OK?
▼If it is OK, go to ⊳4.
▼If it is NG, replace the throttle body Ay.
Refer to Page B3-3.

⊳4. Check of input signal.

1.Set the SST (Sub-harness).
SST: 09842-97209-000

2.The IG switch turned "ON".
3.Measure the voltage between the SST connector 53 (VTH) and 19 (E2) under the following condition given below.

Throttle valve	Specified value [V]
Fully closed	0.4 - 0.8
Fully open	3.2 - 5.0

4.Is the measured value within the specified value?
▼If it is OK, check or replace the EFI ECU.
▼If it is NG, check between the following terminals for open wire or short.
(1) Between the EFI ECU and the throttle position sensor (VTH line)

⊳5. Check of power supply voltage ECU side.

1.Turn "LOCK" the IG switch.
2.Set the SST (Sub-harness).
SST: 09842-97209-000

3.The IG switch turned "ON".
4.Check the voltage between the following terminals given below.
(1) Between SST 56 (VC) and 19 (E2)
SPECIFIED VALUE: 4.5 - 5.5V

5.Is the measured value within the specified value?

NOTE

- If no voltage appears, check the EFI ECU power supply circuit.

▼If it is OK, check between the following terminals for open wire or short.
(1) Between the EFI ECU and the throttle position sensor (VC line)
▼If it is NG, check or replace the EFI ECU.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

ᐅ1. EFI ECU signal check

1.Connect the SST.
SST: 09842-97209-000

2.Turn the IG switch to the "ON" position.
3.Perform voltage measurements between the following terminals.
(1) Between SST 56(VC) - 19 (E2)
(2) Between SST 53(VTH) - 19 (E2)
SPECIFIED VALUE:

Measuring terminals	Specified value
56(VC) - 19(E2)	4.5 - 5.5V
53(VTH) - 19(E2)	It increases in proportion to the throttle opening in the range of 0.2V - 4.8V when the throttle lever is fully opened from the fully closed state.

▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, proceed to ᐅ2.

ᐅ2. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.
(1) Between sensor connection vehicle harness side connector 1 (VC) - ECU connection vehicle harness side connector 56 (VC)
(2) Between sensor connection vehicle harness side connector 2 (E2) - ECU connection vehicle harness side connector 19 (E2)
(3) Between sensor connection vehicle harness side connector 3 (VTH) - ECU connection vehicle harness side connector 53 (VTH)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ᐅ3.
▼If it is NG, repair the harness and connectors.

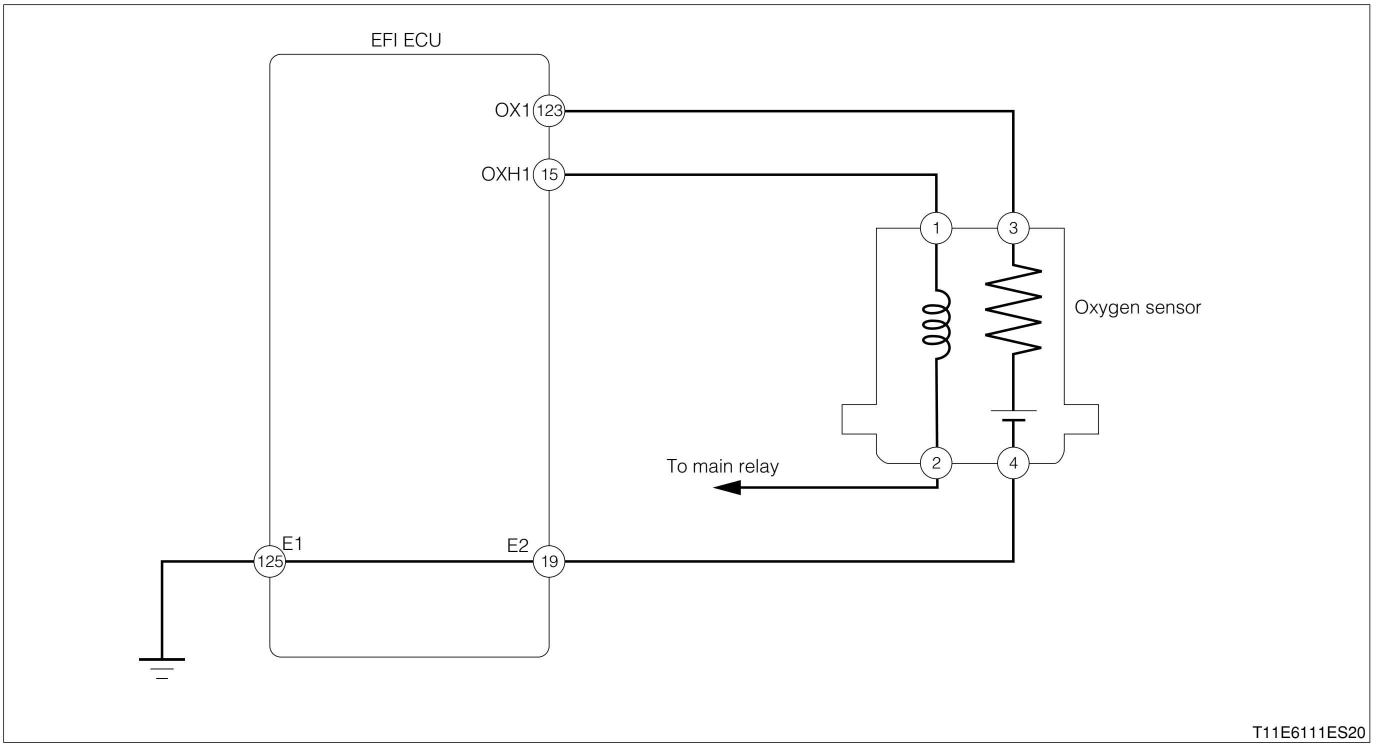
ᐅ3. Throttle position sensor unit check

1.Perform unit check of the throttle position sensor.
Refer to Page B8-222.

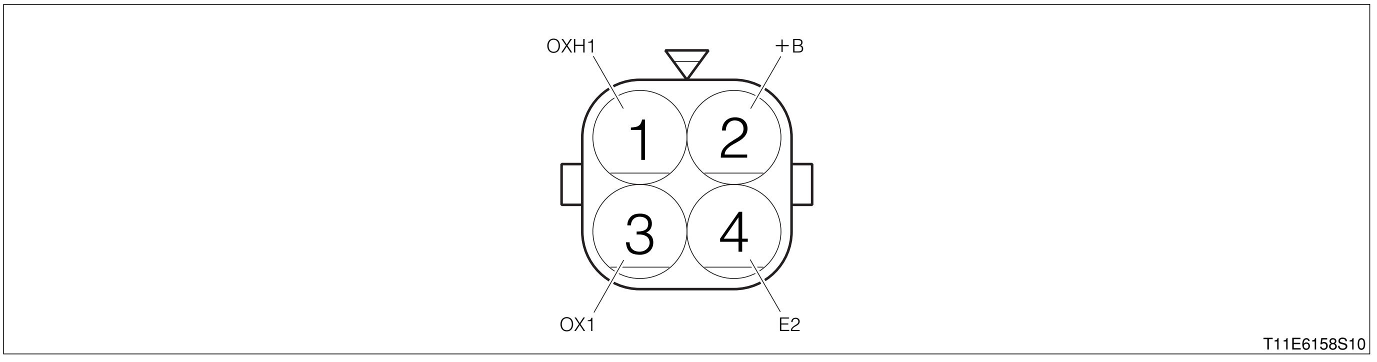
2.Are the check result OK?
▼If it is OK, check the connecting condition of each connector.
▼If it is NG, replace the throttle body Ay.
Refer to Page B3-3.

7-12-5 DTC NO.P0130/21 OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 1)

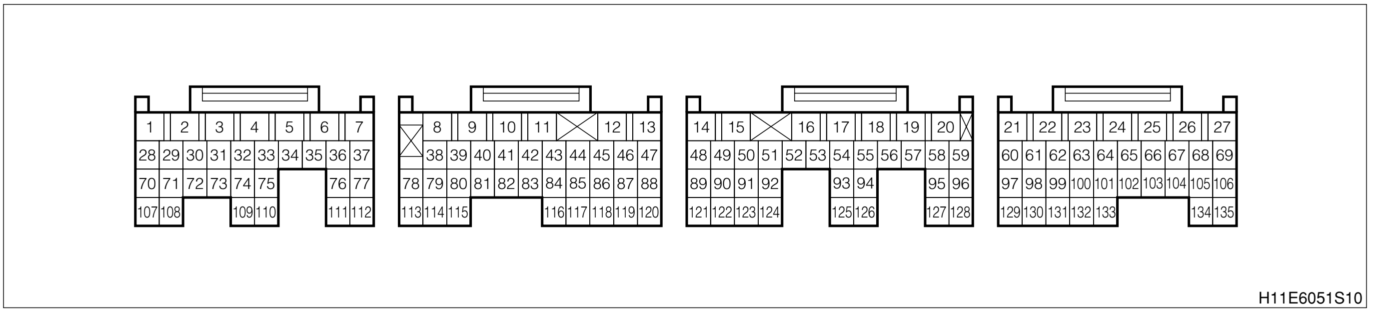
(1) System diagram



Oxygen sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1. The front oxygen sensor (Bank 1, sensor 1) detects the concentration of oxygen contained in the exhaust gas according to the magnitude of the electromotive force that is being generated in itself. When the air-to-fuel ratio becomes richer than the stoichiometric ratio, a greater electromotive force (Approx. 1 volt) is applied to the EFI ECU. Conversely, when the ratio becomes leaner than the stoichiometric ratio, a smaller electromotive force (Approx. 0 volt) is applied to the EFI ECU. In this way, the EFI ECU determines whether the air-to-fuel ratio is rich or lean. Based on this evaluation, the injection time is controlled.

(3) Diagnosis code output conditions

1. When no rich signal is sent even once from the oxygen sensor even if the condition continues in which the engine revolution speed is more than 3000 rpm and the power increase compensation is continued over the specified value after the engine warming-up

(4) Trouble area

1. Air induction system
2. Fuel pressure
3. Injector
4. Open wire or short circuit in the oxygen sensor circuit
5. Oxygen sensor
6. EFI ECU

(5) Checking points

NOTE

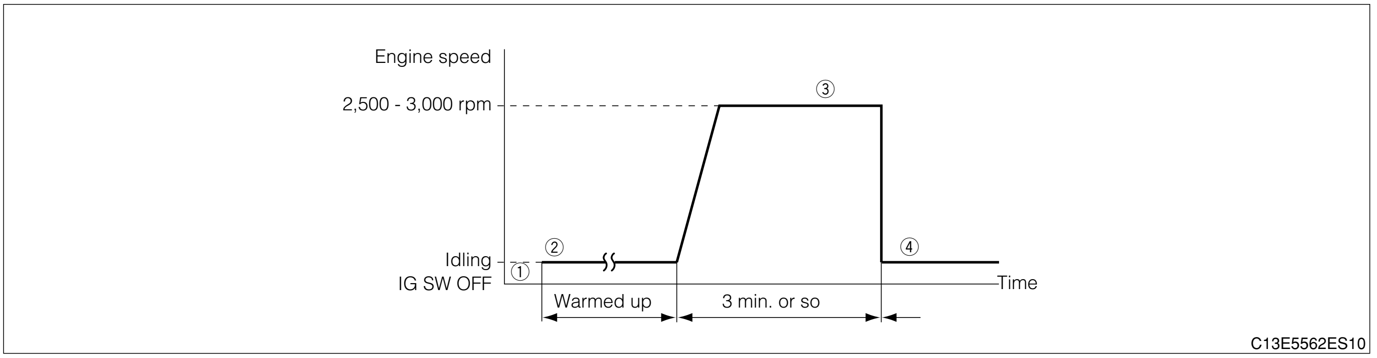
- When this code is outputted concurrently with another code, carry out the check for that code first.

1. Is the signal from the oxygen sensor inputted to the EFI ECU?
2. Is the harness between the oxygen sensor and the EFI ECU normal?
3. Is the output of the oxygen sensor correct? (If there are no causes for "Lean A/F" (The oxygen concentration in the exhaust gas is too high), the oxygen sensor is judged as defective.)
4. Check the oxygen sensor heater system for open wire or short.

NOTE

- Sensor 1 means a sensor which is located near the engine block.
- Using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool, confirm the output voltage of the oxygen sensor (Bank 1, sensor 1) from the current data. If the output voltage of the oxygen sensor (Bank 1, sensor 1) is 0.1 V or less, most likely the circuit of the oxygen sensor (Bank 1, sensor 1) is open or shorted.

Confirmation engine racing pattern (For EU specifications)



(1) Step ①; Using the DS-21, with the IG switch turned "LOCK", connect the DS-21 diagnosis tester to DLC through the SST. Turn "ON" the IG switch and the main switch of the tester. Set the tester to the "Continuous monitoring results" of the CARB mode.

SST: 09991-87404-000

(2) Step ①; Using DS-II, with the IG switch turned "LOCK", connect the DS-II diagnosis tester to DLC. Turn "ON" the IG switch and the main switch of the tester. Set the tester to the "Continuous monitoring results" of the CARB mode.

(3) Step ②; Start the engine. Keep on warming the engine for more than five minutes until the engine cooling water temperature reaches 90°C or above.

(4) Step ③; Race the engine for about three minutes at 2500 to 3000 rpm.

(5) Step ④; After one minute of idling, press the F1 key of the tester. Check to see if the DTC P0130/21 is outputted.

NOTE

- If the condition in this test is not strictly followed, detection of the malfunction will not be possible.
- If you do not have the diagnosis tester (DS-21/DS-II), turn the ignition switch "LOCK" after performing steps ② to ④, then perform steps ② to ④ again.

(6) Inspection procedure

① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⊳1. Check of DTC.

1.Check other codes (Those other than DTC P0130/21) outputted?

▼If an output is made, proceed to the trouble shooting for the outputted code concerned.

▼If no output is made, proceed to ⊳2.

⊳2. Wiring harness check

1.With the IG switch turned "LOCK", set the SST (Sub-harness). However, the SST connectors at the EFI ECU side should remain disconnected.

SST: 09842-97209-000

2.Disconnect the oxygen sensor connector.

3.Check the harness and connector between the following terminals for open wire and short.

(1) Between the sensor connection vehicle harness side connector 3 (OX1) and SST 123 (OX1)

SPECIFIED VALUE: Continuity exists.

(2) Between the sensor connection vehicle harness side connector 3 (OX1) and the body earth

SPECIFIED VALUE: No continuity exists

4.Are the check results for open wire and short OK?

▼If it is OK, go to ⊳3.

▼If it is NG, repair or replace the harness or connector.

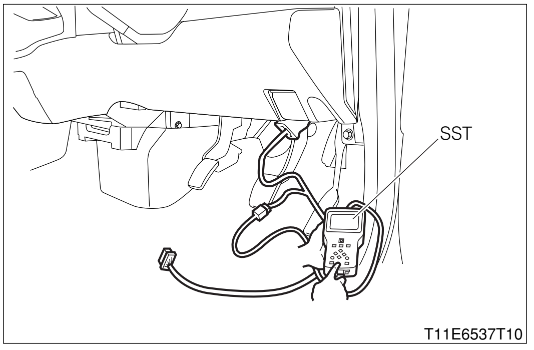
⊳3. Check of output voltage of sensor.

1.Connect the oxygen sensor and SST connectors, respectively.

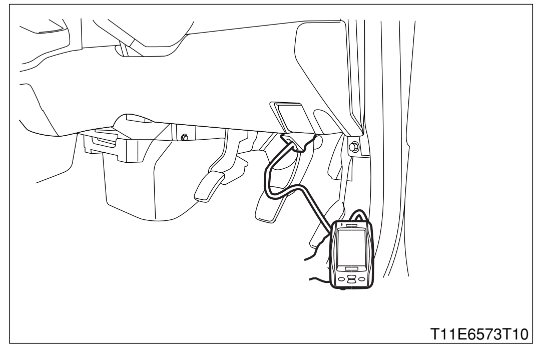
2.Connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

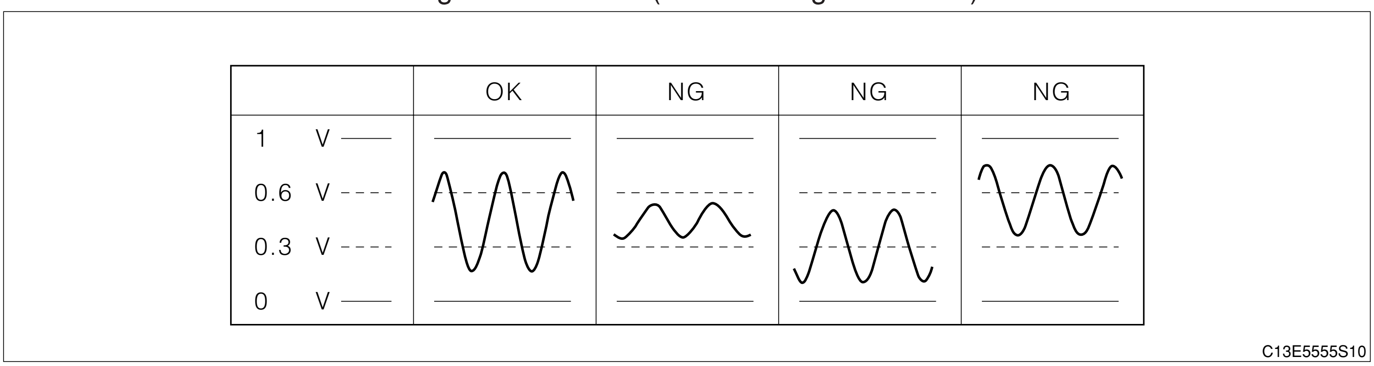
SST: 09991-87404-000



(2) In case of DS-II, connect the DS-II diagnosis tester directly to DLC.
(3) In case of the OBD II generic scan tool, connect the OBD II generic scan tool directly to DLC.



3.Turn "ON" the main switch of the tester.
4.Warm up the engine at 2500 rpm for about 90 seconds.
5.Check the output voltage of oxygen sensor during idling.
SPECIFIED VALUE: The voltage varies repeatedly between a range from a voltage below 0.3 V and to a voltage above 0.6 V. (See the diagram below.)



6.Are the check results OK?
▼If it is OK, in the case of the EU specification vehicles, go to ⊳10.
▼If it is OK, in the case of the general specification vehicles, go to ⊳11.
▼If it is NG, in the case of the EU specification vehicles, proceed to ⊳4.
▼If it is NG, in the case of the general specification vehicles, proceed to ⊳5.

⊳4. Check of misfire.
1.Check to see if any misfire is occurring by monitoring the DTC and data list.
2.Are the check results OK?
▼If it is OK, go to ⊳5.
▼If it is NG, perform troubleshooting for misfire. (Go to troubleshooting of DTC P0300/17, P0301 - 0304/17.)
Refer to Page B8-161.

⊳5. Check of air induction system.
1.Check the following items given below:
(1) Check of the engine oil level gauge, oil filler cap and PCV hose for disconnection.
(2) Check of parts of the air induction system between the cylinder head and the throttle body for disconnection, looseness, or cracks.
2.Are the check results OK?
▼If it is OK, go to ⊳6.
▼If it is NG, repair or replace the induction system.

▷6. Check of fuel pressure.

1.Check the fuel pressure.
Refer to Page B8-219.

2.Are the check results OK?
▼If it is OK, go to ▷7.
▼If it is NG, check and repair fuel pump, fuel pipe line and filter.

▷7. Check of injector injection.

1.Check the injector unit.
Refer to Page B8-224.

2.Are the check results OK?
▼If it is OK, go to ▷8.
▼If it is NG, replace the injector.
Refer to Page B7-11.

▷8. Check of gas leakage of exhaust system.

1.Check that there is no gas leakage in the exhaust gas-related system.
Refer to Page B1-10.

2.Are the check results OK?
▼If it is OK, go to ▷9.
▼If it is NG, repair or replace the defective point.

▷9. Check of output voltage of sensor.

1.Warm up engine completely.
2.Disconnect the connector of the oxygen sensor with IG switch turned "LOCK".
3.Disconnect the oxygen sensor connector.
4.Connect a voltmeter to the connector terminal of oxygen sensor.
5.Hold the engine racing speed for 3 minutes at 2000 rpm. At this time, ensure that the reading of the volt meter is within the specified value.
SPECIFIED VALUE: The voltmeter exhibits an output voltage of 0.2 V or more at least one time.

6.Are the check results OK?
▼If it is OK, check or replace the EFI ECU.
▼If it is NG, replace the oxygen sensor. (Bank 1, sensor 1)
Refer to Page B4-1.

▷10. Perform confirmation engine racing pattern.

1.Again conduct the check of engine racing pattern.
2.Confirm whether Code No. P0133/21has been outputted again.
▼If it is OK, check or replace the EFI ECU.
▼If it is NG, go to ▷11.

⊳11. The past situation of vehicles operation is investigated.

1.Confirm the past vehicle running situation.

2.Did the vehicle run out of fuel in the past?

▼<u>If it is YES, DTC P0130/21 is caused by running out of fuel.</u>

▼<u>If it is NO, check the EFI ECU circuit.</u>

Refer to Page A1-24.

② **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⧐1. Oxygen sensor feedback control check

1.Start the engine.

2.Activate the oxygen sensor by maintaining the engine at 3000rpm for four minutes.

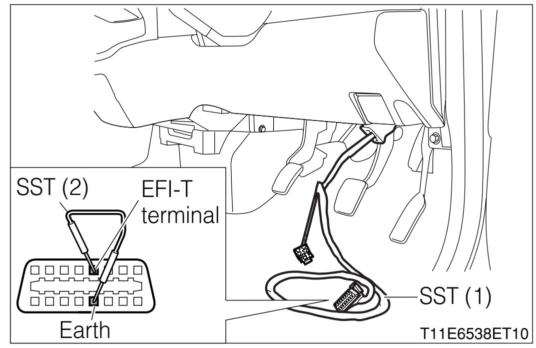
3.Connect the SST and short- circuit the EFI-T terminal.

SST: 09991-87404-000(1)
09991-87403-000(2)

4.Maintain the engine revolution speed at 2000rpm or more and step on the brake pedal.

5.Check if the engine check lamp in the meter blinks.

SPECIFIED VALUE: It blinks.



NOTE

- The blinking interval will change by the condition of activation of the oxygen sensor.

▼If it is OK, the oxygen sensor system is normal.

▼If it is NG, proceed to ⧐2.

⧐2. Oxygen sensor signal check

1.Connect the SST.

SST: 09842-97209-000

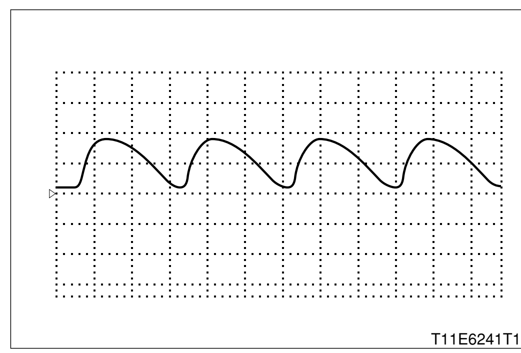
2.Activate the oxygen sensor by maintaining the engine at 3000rpm for four minutes.

3.Perform output check between the following terminals using an oscilloscope.

(1) Between SST 123 (OX1) - SST 125 (E1)

Time axis	200ms / DIV
Voltage axis	500mV / DIV
Measuring condition	Air conditioner "OFF", no electric load, maintaining 3000rpm

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".



NOTE

- The waveform cannot be specified, but ensure that a waveform as in the right figure (One such example) shows up.

4.Confirm the following points.

(1) The waveform is showing up with the oxygen sensor activated.

(2) The waveform 0 ⇄ 1V is showing up.

NOTE

- As for the oxygen sensor signal, the correct output cannot be confirmed without using the oscilloscope.

▼If it is OK, proceed to ⧐3.

▼If it is NG, replace the oxygen sensor.

Refer to Page B4-1.

⊳3. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.

(1) Between sensor connection vehicle side connector 3 (OX1) - ECU connection vehicle harness connection side connector 123 (OX1)

(2) Between sensor connection vehicle side connector 4 (E2) - ECU connection vehicle harness connection side connector 19 (E2)

▼If it is OK, replace the EFI ECU.

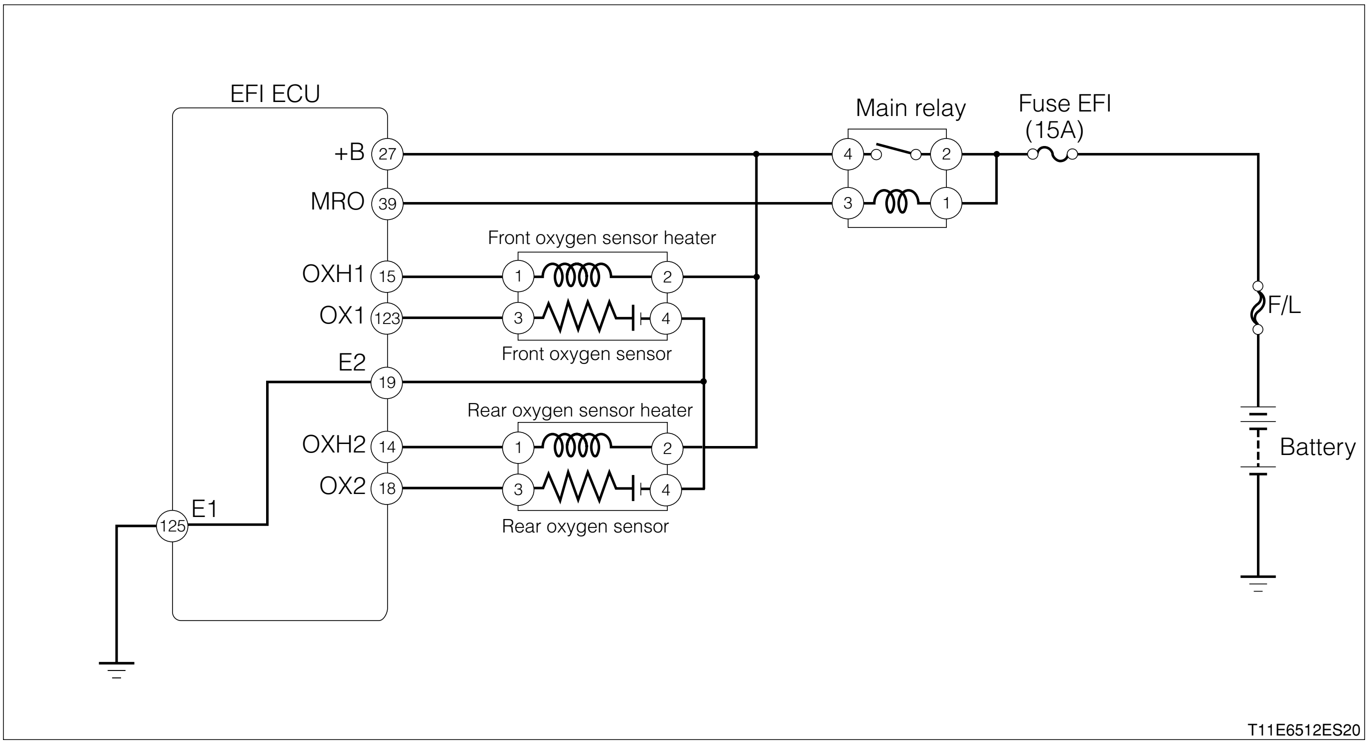
Refer to Page B8-1.

▼If it is NG, perform checking or repairing of the harness of the defective sections.

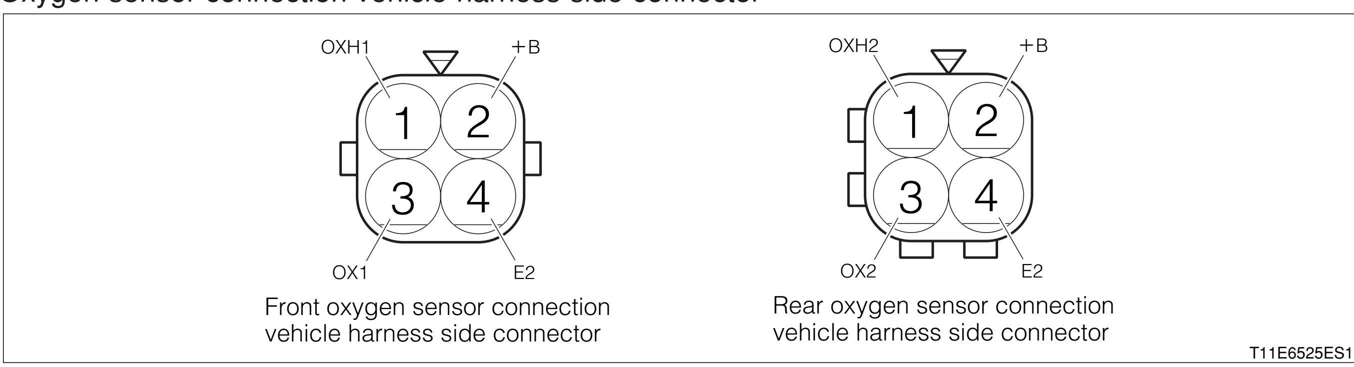
7-12-6 DTC NO.P0135/23 OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION
DTC NO.P0141/24 REAR OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION

(1) System diagram

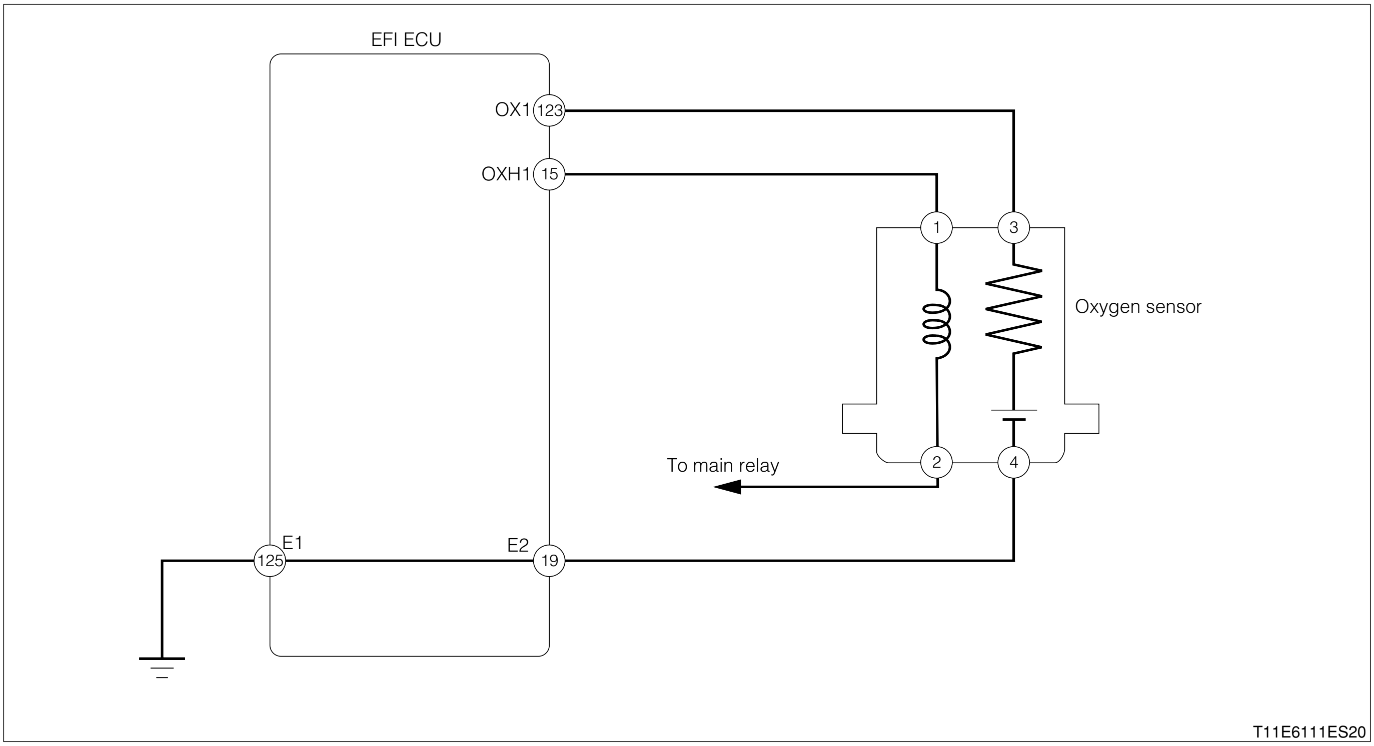
① For EU specifications



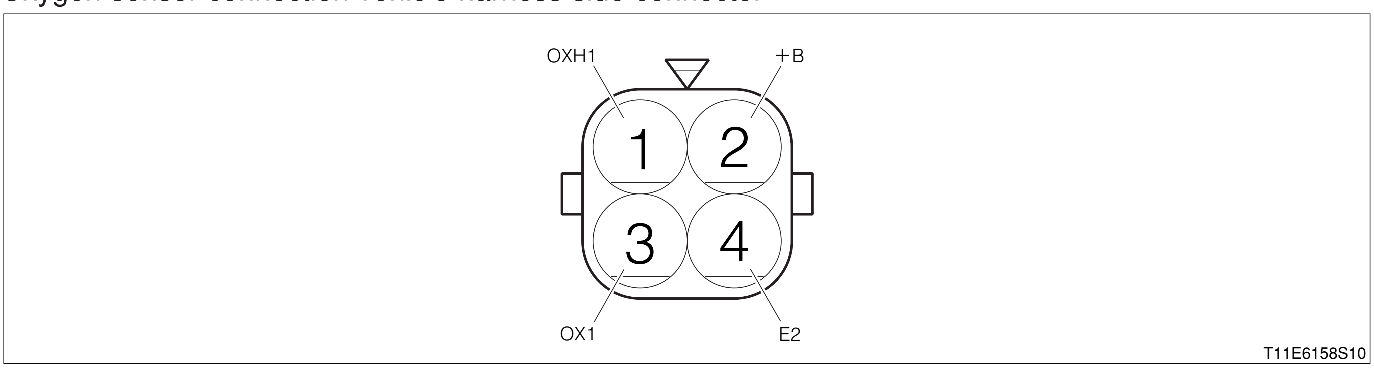
Oxygen sensor connection vehicle harness side connector



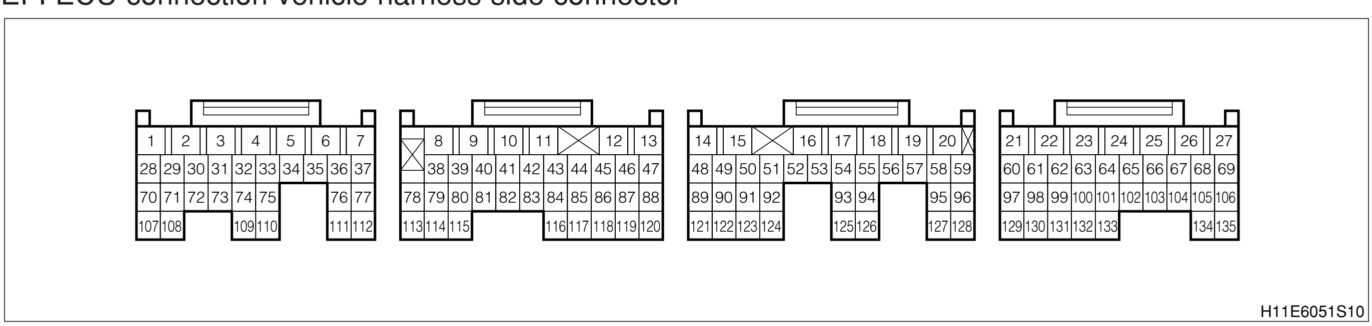
② **For general specifications**



Oxygen sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Diagnosis code output conditions

1.When an open wire or short is present in the oxygen sensor heater system,

(3) Trouble area

1.Open wire or short circuit for the oxygen sensor heater circuit
2.Oxygen sensor heater
3.EFI ECU

(4) Checking points

NOTE

- When this code is outputted concurrently with another code, carry out the check for that code first.

1. Is the signal from the oxygen sensor inputted to the EFI ECU?
2. Is the harness between the oxygen sensor and the EFI ECU normal?
3. Is the output of the oxygen sensor correct? (If there are no causes for "Lean A/F" (The oxygen concentration in the exhaust gas is too high), the oxygen sensor is judged as defective.)
4. Check the oxygen sensor heater system for open wire or short.

(5) Inspection procedure

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⊳1. Check of output voltage of ECU.

1. Set the SST (Sub-harness).
   SST: 09842-97209-000

2. Conduct the voltage measurement between the next terminals under the following conditions given below.
   (1) Between SST 15 (OXH1) and the body earth
   (2) Between SST 14 (OXH2) and the body earth

	Measurement conditions	
	IG switch "ON"	After engine started
Front Oxygen sensor heater	Battery voltage	Below 1.0 V/ Immediately after
Rear Oxygen sensor heater.	Battery voltage	Below 1.0 V/After more than 3 minutes

3. Are the check results OK?
   ▼If it is OK, check or replace the EFI ECU.
   ▼If it is NG, go to ⊳2.

⊳2. Unit check of oxygen sensor.

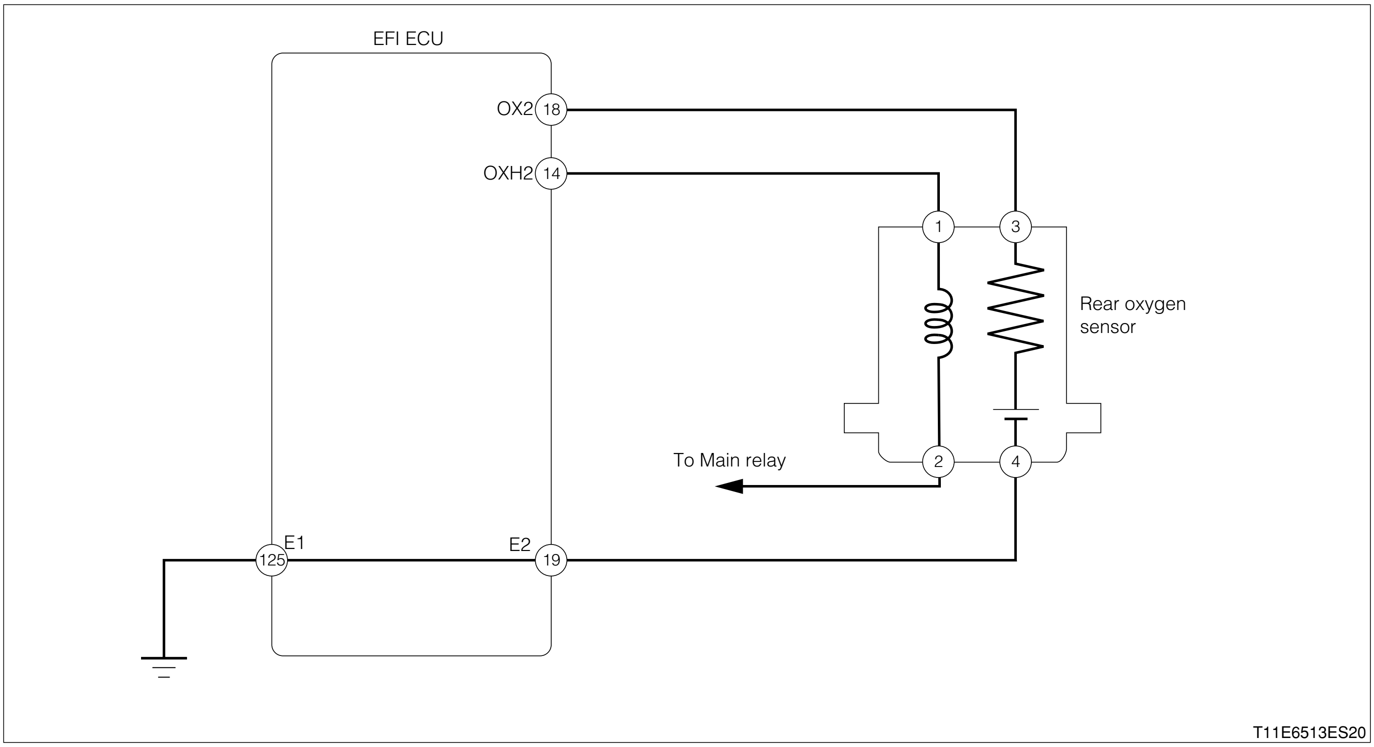
1. Check the front and rear oxygen sensor heater units.
   (1) Front oxygen sensor
   Refer to Page B8-221.

   (2) Rear oxygen sensor
   Refer to Page B8-222.

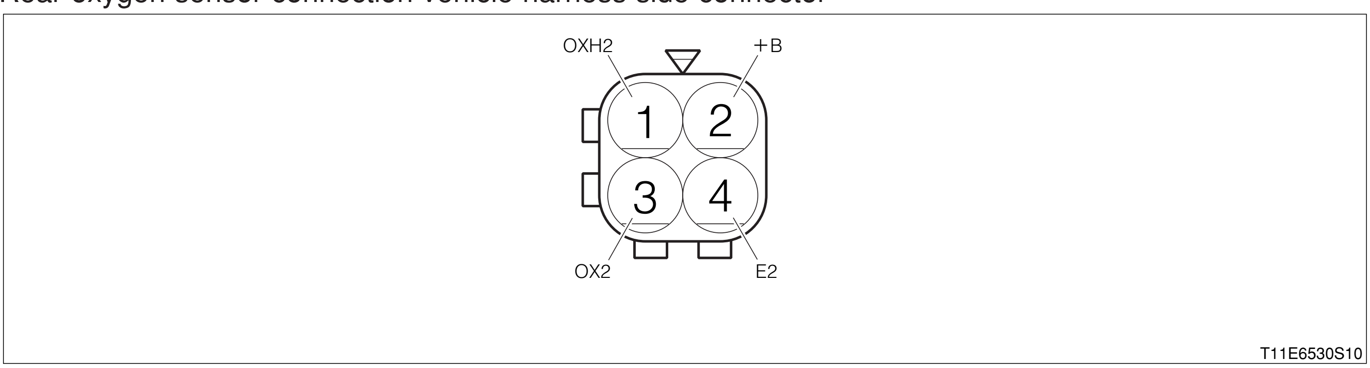
2. Are the unit check results OK?
   ▼If it is OK, check the harness and connector between the following terminals for open wire and short.
   (1) Between the main relay and the EFI ECU
   (2) Between the front oxygen sensor and the EFI ECU
   (3) Between the rear oxygen sensor and the EFI ECU
   ▼If it is NG, replace the defective oxygen sensor.

7-12-7 DTC NO.P0136/22 REAR OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

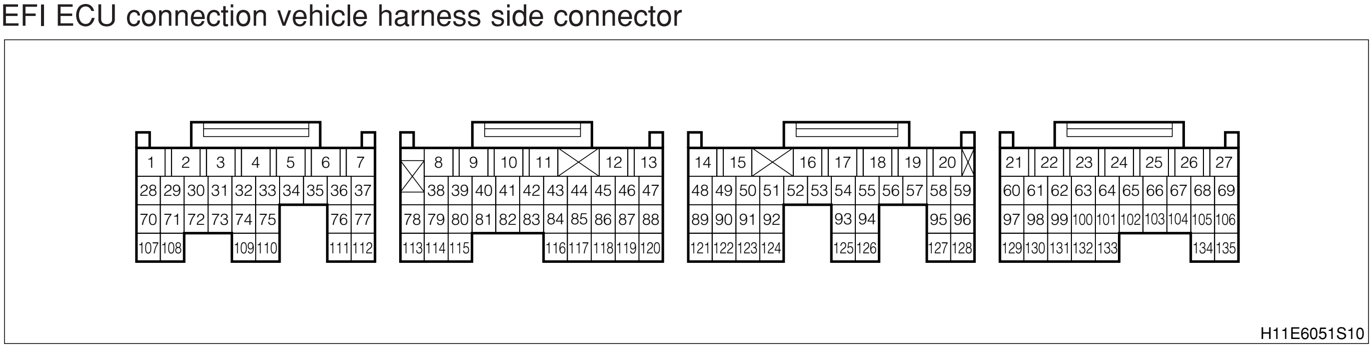
(1) System diagram



Rear oxygen sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1.Refer to DTC P0130/21 (Oxygen sensor circuit malfunction (Bank 1 sensor 1)).

(3) Trouble area

1.Open wire or short circuit in the rear oxygen sensor circuit
2.Rear oxygen sensor
3.EFI ECU

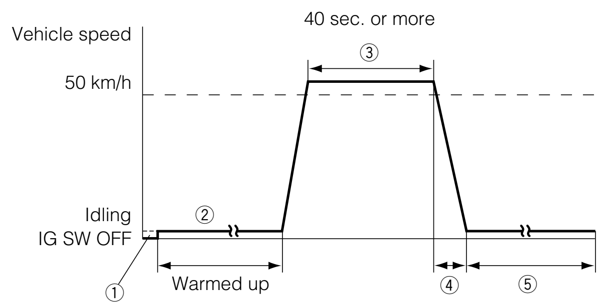
(4) Checking points

NOTE

- When this code is outputted concurrently with another code, carry out the check for that code first.

1.Is the signal from the rear oxygen sensor inputted to the EFI ECU?
2.Is the harness between the rear oxygen sensor and the EFI ECU normal?
3.Is the output of the rear oxygen sensor normal?

Confirmation driving pattern



(1) Step ①; Using DS-21, with the IG switch turned "LOCK", connect the DS-21 diagnosis tester to DLC through the SST. Turn "ON" the IG switch and the main switch of the tester. Set the tester to the "Continuous monitoring results" of the CARB mode.

SST: 09991-87404-000

(2) Step ①; Using DS-Ⅱ, with the IG switch turned "LOCK", connect the DS-Ⅱ diagnosis tester to DLC. Turn "ON" the IG switch and the main switch of the tester. Set the tester to the "Continuous monitoring results" of the CARB mode.

(3) Step ②; Start the engine. With all switch turned "OFF", keep on warming the engine for more than five minutes until the engine coolant temperature reaches 90℃ or above.

(4) Step ③; Accelerate the vehicle until the vehicle speed reaches 50 km/h or more in the 1st → 2nd gear. Keep on running the vehicle at that speed for at least 40 seconds.

(5) Step ④; Under this condition, release the foot off from the accelerator pedal so as to decelerate the vehicle. Maintain the idling state.

(6) Step ⑤; After one minute of idling, press the F1 key of the tester. Check to see if the DTC P0130/21 is outputted.

NOTE

- If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.
- If you do not have diagnosis tester (DS-21/DS-Ⅱ), turn the ignition switch "LOCK" after performing steps ② to ④, then perform steps ② to ④ again.

(5) Inspection procedure

① When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⊳1. Check of DTC.

1.Are other codes (Those other than DTC P0136/22) outputted?

▼If the output is made, proceed to the Item of the relevant diagnosis code.

▼If no output is made, proceed to ⊳2.

⊳2. Wiring harness check

1.The IG switch turned "LOCK".

2.Set the SST (Sub-harness). However, the SST connectors at the ECU side should remain disconnected.

SST: 09842-97209-000

3.Disconnect the oxygen sensor connector.

4.Check the harness and connector for open wire or short.

(1) Between the oxygen sensor connection vehicle harness side connector1 (OX2) and SST 18 (OX2)

SPECIFIED VALUE: Continuity exists.

(2) Between the oxygen sensor connection vehicle harness side connector1 (OX2) and the body earth

SPECIFIED VALUE: No continuity exists

5.Are the check results for open wire and short OK?

▼If it is OK, go to ⊳3.

▼If it is NG, repair or replace the harness or connector.

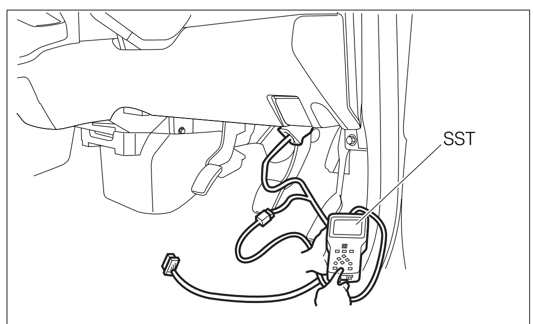
⊳3. Check of output voltage of sensor.

1.Connect the rear oxygen sensor and SST connectors, respectively.

2.Connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

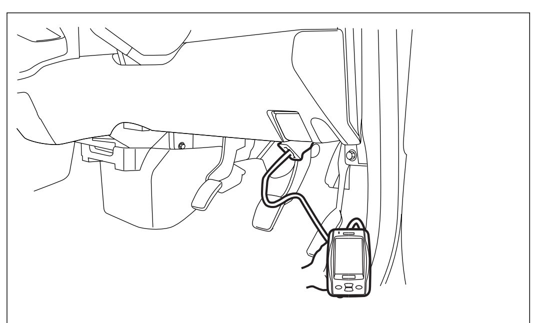
SST: 09991-87404-000



T11E6537T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



T11E6573T10

3.Warm up the engine.
4.Turn "ON" the main switch of the tester.
5.Race the engine at 4000 rpm for three minutes by depressing the accelerator pedal.
6.Under the condition of step 5, release the foot off from the accelerator pedal so as to allow the engine to idle.
7.Read the output voltage of the oxygen sensor between Steps 5 to 6.
SPECIFIED VALUE: The voltage should become 0.4 V or below and 0.55 V or more, respectively, at least one time.

8.Are the check results OK?
▼If it is OK, check the EFI ECU circuit.
▼If it is NG, go to ⊳4.

⊳4. Check of output voltage of sensor.
1.Warm up engine completely.
2.IG switch turned "LOCK".
3.Disconnect the connector of the rear oxygen sensor.
4.Connect a voltmeter to the connector terminal of oxygen sensor.
5.Hold the engine racing speed for 5 minutes at 2000 rpm. At this time, ensure that the reading of the volt meter is within the specified value.
SPECIFIED VALUE: The voltmeter exhibits an output voltage of 0.2 V or more at least one time?

6.Are the check results OK?
▼If it is OK, check or replace the EFI ECU.
▼If it is NG, replace the oxygen sensor. (Bank 1, sensor 2)

② When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:
⊳1. Check of wire harness continuity
1.Perform continuity check between each of the following terminals.
(1) Between sensor connection vehicle harness side connector 1 (OX2) - ECU connection vehicle harness side connector 18 (OX2)
(2) Between sensor connection vehicle harness side connector 2 (E2) - ECU connection vehicle harness side connector 19 (E2)
▼If it is OK, proceed to ⊳2.
▼If it is NG, repair the harness and connectors.

⊳2. Rear oxygen sensor continuity check
1.Perform continuity check between each of the following terminals.
(1) Between rear oxygen sensor side connector 1 (OX2) - rear oxygen sensor body
(2) Between rear oxygen sensor side connector 2 (E2) - rear oxygen sensor body
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳3.
▼If it is NG, replace the rear oxygen sensor.
Refer to Page B4-3.

⊳3. Rear oxygen sensor signal check

1.Stop the vehicle.
2.Continue racing of 2000rpm or above for about five minutes from the state in which the rear oxygen sensor is cooled.
3.Perform output voltage measurements of the rear oxygen sensor during this time (Between the rear oxygen sensor side terminals).
SPECIFIED VALUE: It becomes 0 V(During cold period) → 0.65 V or above (When detecting rich state after warm-up).

4.Stop the engine and perform the output voltage measurements between the following terminals.
(1) Between rear oxygen sensor side connector 1 (OX2) - rear oxygen sensor side connector 2 (E2)
SPECIFIED VALUE: 0.55V or less.

NOTE

- Measure them under the condition in which the rear oxygen sensor is detecting oxygen (Lean condition).

▼If it is OK, proceed to ⊳4.
▼If it is NG, replace the rear oxygen sensor.
Refer to Page B4-3.

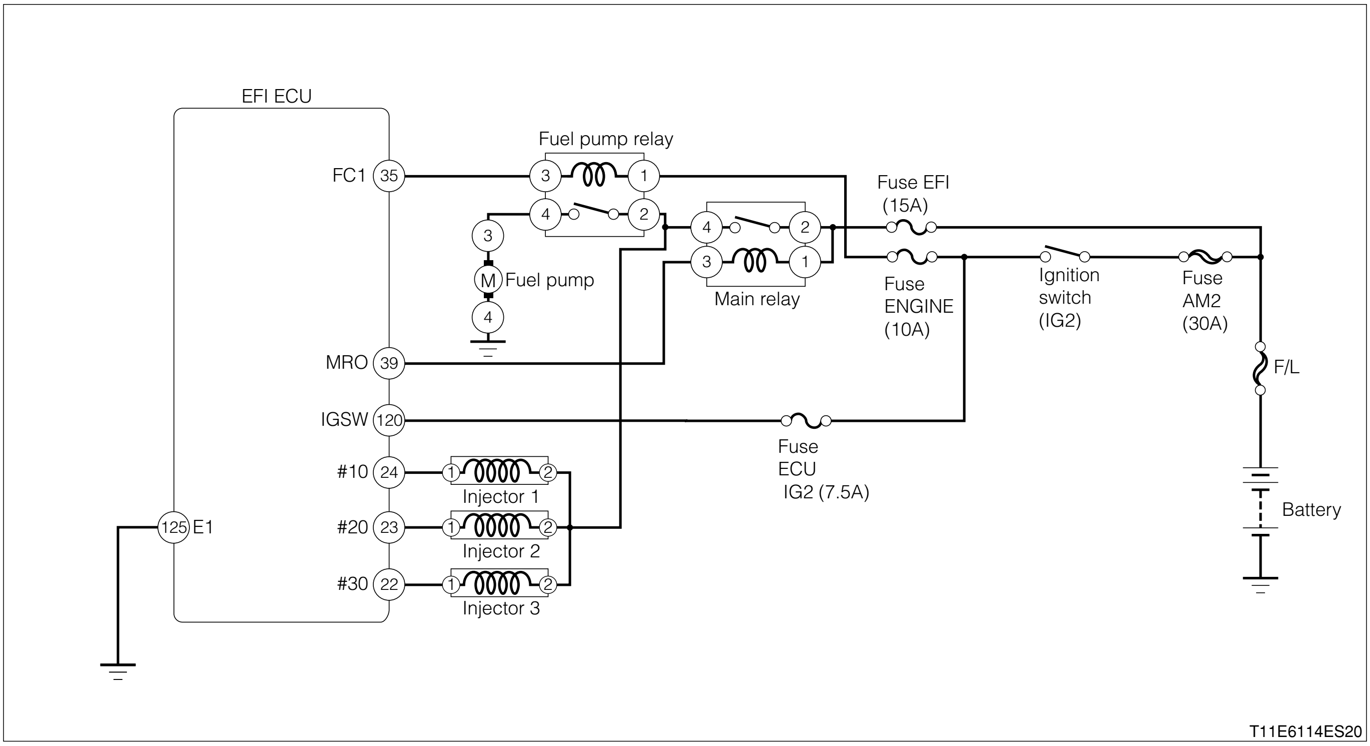
⊳4. Rear oxygen sensor unit check

1.Perform unit check of the rear oxygen sensor.
Refer to Page B8-222.

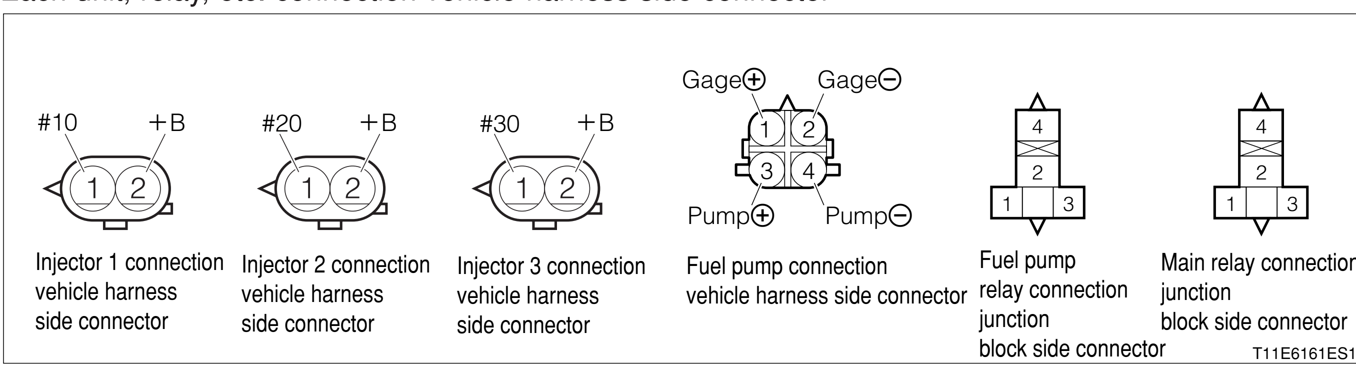
▼If it is OK, check the oxygen sensor system.
▼If it is NG, replace the rear oxygen sensor.
Refer to Page B4-3.

7-12-8 DTC NO.P0171/25 FUEL TRIM SYSTEM TOO LEAN (AIR-FUEL RATIO LEAN MALFUNCTION, BANK 1) DTC NO.P0172/26 FUEL TRIM SYSTEM TOO RICH (AIR-FUEL RATIO RICH MALFUNCTION, BANK 1)

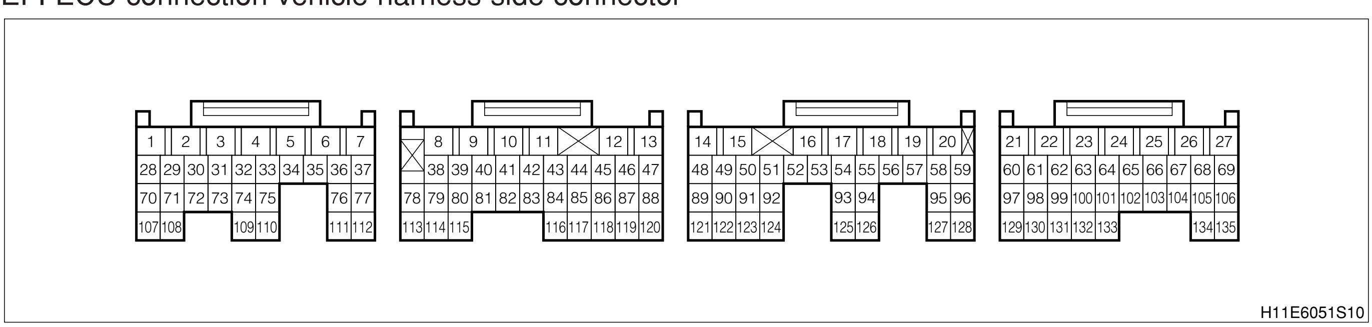
(1) System diagram



Each unit, relay, etc. connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1.The fuel trim means the feedback compensation value that will compensate the basic injection time. The fuel trim comes in two kinds: the short-term fuel trim and the long-term fuel trim.

2.The short-term fuel trim is a short-term fuel compensation to be carried out to maintain the air-to-fuel ratio at the stoichiometric air-to-fuel ratio. The signal from the oxygen sensor indicates whether the current air-to-fuel ratio is rich or lean than the stoichiometric air-to-fuel ratio. Hence, if the air-to-fuel ratio is rich, the fuel injection amount will be reduced. Conversely, if the air-to-fuel ratio is lean, the fuel injection amount will be increased.

3.The long-term fuel trim is overall fuel compensation over a long period of time in order to compensate a continues deviation of the short-term fuel trim from the central value, which will be caused by the engines inherent characteristics, the wear due to operation over a long period of time and the change in operational environment.

(3) Diagnosis code No.P0171/25 output conditions

1.The correction coefficient is stuck to the one side (Lean state of air fuel ratio) during the air fuel ratio feedback period

(4) Diagnosis code No.P0172/26 output conditions

1.The correction coefficient is stuck to the one side (Rich state of air fuel ratio) during the air fuel ratio feedback period

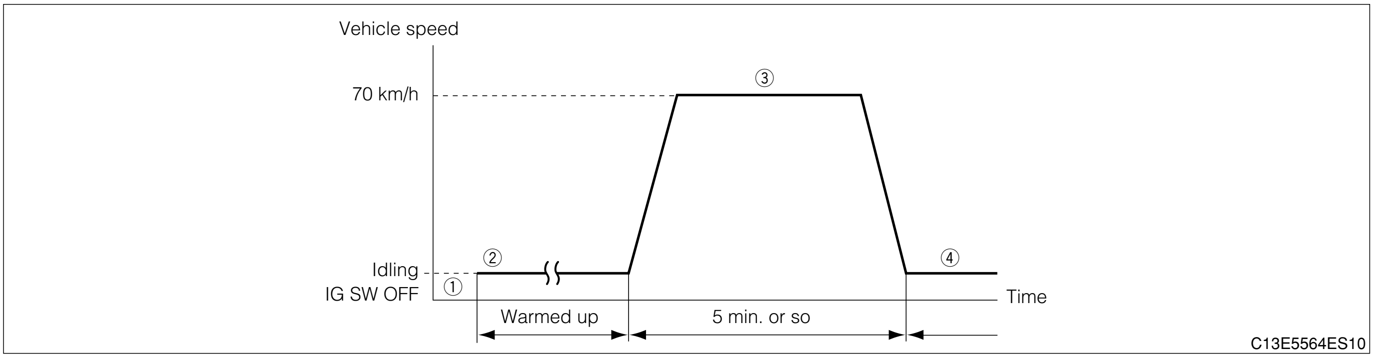
(5) Trouble area

1.Open wire or short circuit in the oxygen sensor circuit
2.Oxygen sensor
3.Engine coolant temperature sensor sensor
4.Evaporative emission purge VSV
5.EFI ECU

(6) Checking points

1.Is the fuel pressure normal?
2.Is the injector normal?
3.Is the oxygen sensor normal?

Confirmation driving pattern (For EU specifications)



(1) Step ①; Using DS-21, with the IG switch turned "LOCK", connect the DS-21 diagnosis tester to DLC through the SST. Turn "ON" the IG switch and the main switch of the tester. Set the tester to the "Continuous monitoring results" of the CARB mode.

SST: 09991-87404-000

(2) Step ①; Using DS-Ⅱ, with the IG switch turned "LOCK", connect the DS-Ⅱ diagnosis tester to DLC through the SST. Turn "ON" the IG switch and the main switch of the tester. Set the tester to the "Continuous monitoring results" of the CARB mode.

(3) Step ②; Start the engine. Keep on warming the engine for more than five minutes until the engine cooling water temperature reaches 90°C or above.

(4) Step ③; Run the vehicle for more than five minutes at a speed of 70 km/h with the gear selected to the 5th gear.

(5) Step ④; After one minute of idling, press the F1 key of the tester. Check to see if the DTC P0171/0172 is detected.

NOTE

- If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.
- If you do not have diagnosis tester (DS-21/DS-Ⅱ), turn the ignition switch "LOCK" after performing steps ② to ④, then perform steps ② to ④ again.

(7) Inspection procedure

① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⊳1. Check of DTC.

1.Check other codes (Those other than DTC P0171/25 or P0172/26) outputted?

▼If the output is made, proceed to the Item of the relevant diagnosis code.

▼If no output is made, proceed to ⊳2.

ᐅ2. Check of air induction system.

1.Check the following items given below.

(1) Check of the engine oil level gauge, oil filler cap and PCV hose for disconnection.

(2) Check of parts of the air induction system between the cylinder head and the throttle body for disconnection, looseness, or cracks.

▼If it is OK, go to ᐅ3.

▼If it is NG, repair or replace the induction system.

ᐅ3. Check of injector injection.

1.Check the injector unit.

Refer to Page B8-224.

2.Are the check results OK?

▼If it is OK, go to ᐅ4.

▼If it is NG, replace the injector.

Refer to Page B7-11.

ᐅ4. Check of purge VSV for EVAP.

1.Perform the unit check of the VSV for evaporative emission purge.

Refer to Page B8-225.

2.Are the check results OK?

▼If it is OK, go to ᐅ5.

▼If it is NG, replace the purge VSV for EVAP.

ᐅ5. Check of engine cooling coolant temperature sensor.

1.Perform the unit check of the water temperature sensor.

Refer to Page B8-221.

2.Are the check results OK?

▼If it is OK, go to ᐅ6.

▼If it is NG, replace the engine cooling coolant temperature sensor.

Refer to Page B8-7.

ᐅ6. Manifold absolute pressure/intake air temperature integral type sensor unit check

1.Perform the unit check of the manifold absolute pressure/intake air temperature integral type sensor (Intake manifold pressure sensor section).

Refer to Page B8-220.

2.Are the check results OK?

▼If it is OK, go to ᐅ7.

▼If it is NG, replace the manifold absolute pressure/intake air temperature integral type sensor.

ᐅ7. Check of fuel pressure.

1.Check the fuel pressure.

Refer to Page B8-229.

2.Are the check results OK?

▼If it is OK, go to ᐅ8.

▼If it is NG, check and repair fuel pump, fuel pipe line and filter.

⊳8. Check of gas leakage of exhaust system.

1.Check the exhaust gas leakage.
Refer to Page B1-10.

2.Are the check results OK?
▼If it is OK, go to ⊳9.
▼If it is NG, repair or replace the defective point.

⊳9. Wiring harness check

1.IG switch turned "LOCK".
2.Set the SST (Sub-harness). However, the SST connectors at the ECU side should remain disconnected.
SST: 09842-97209-000

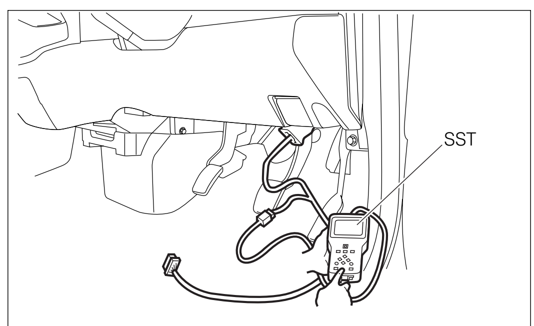
3.Disconnect the oxygen sensor connector.
4.Check the harness and connector for open wire or short.
(1) Between the oxygen sensor connection vehicle harness side connector3 (OX1) and SST 123 (OX1)
SPECIFIED VALUE: Continuity exists.

(2) Between the oxygen sensor connection vehicle harness side connector 3 (OX1) and the body earth
SPECIFIED VALUE: No continuity exists

5.Are the check results for open wire and short OK?
▼If it is OK, go to ⊳10.
▼If it is NG, repair or replace the harness or connector.

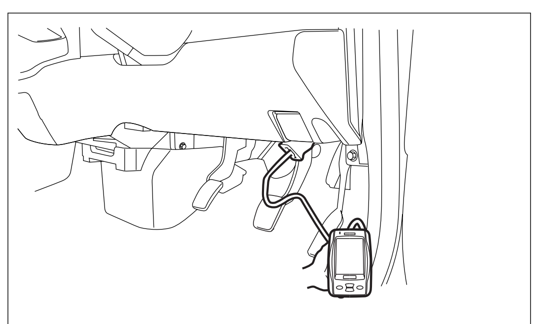
⊳10. Check of output voltage of sensor.

1.Connect the oxygen sensor and SST connectors, respectively.
2.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000

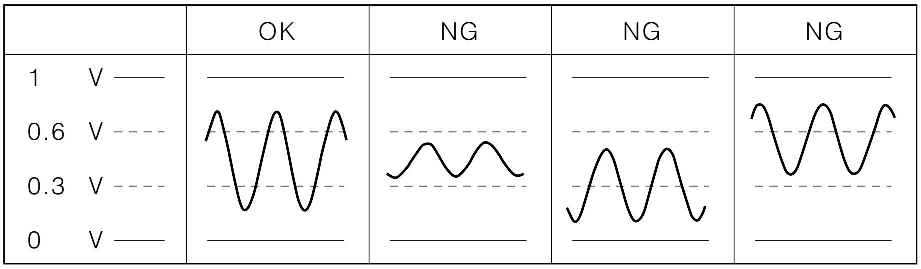


T11E6537T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.


T11E6573T10

3.Warm up the engine at 2500 rpm for about 90 seconds.
4.Turn "ON" the main switch of the tester.
5.Read the output voltage of oxygen sensor during idling.
SPECIFIED VALUE: The voltage varies repeatedly between a range from a voltage below 0.3 V and to a voltage above 0.6 V. (See the diagram below.)



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6.Are the check results OK?
▼<u>If it is OK, go to ▷12.</u>
▼<u>If it is NG, go to ▷11.</u>

▷11. Check of output voltage of sensor.

1.Warm up engine completely.
2.IG switch turned "LOCK".
3.Disconnect the connector of the oxygen sensor.
4.Connect a voltmeter to the connector terminal of oxygen sensor.
5.Hold the engine racing speed for 3 minutes at 2000 rpm.
6.At this time, ensure that the reading of the volt meter is within the specified value.
SPECIFIED VALUE: The voltmeter exhibits an output voltage of 0.2 V or more at least one time?

7.Are the check results OK?
▼<u>If it is OK, check or replace the EFI ECU.</u>
▼<u>If it is NG, replace the oxygen sensor. (Bank 1, sensor 1)</u>

▷12. Perform confirmation driving pattern.

1.Perform the confirmation running pattern.
2.Is there DTC P0171/25 or P0172/26 being output again?
▼<u>If the output is made, check or replace the EFI ECU.</u>
▼<u>If the output is made, proceed to ▷13.</u>

▷13. The past situation of vehicles operation is investigated.

1.Did the vehicle run out of fuel in the past?
▼<u>If erected, the diagnosis code No.P0171/25 is caused by running out of fuel.</u>
▼<u>If not erected, check the EFI ECU circuit.</u>

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

ᐅ1. Oxygen sensor system check

1.Perform checking of the oxygen sensor system.
Refer to Page B8-84.

▼If it is OK, proceed to ᐅ2.
▼If it is NG, repair the oxygen sensor system.

ᐅ2. Fuel pressure check

1.Perform fuel pressure check.
Refer to Page B8-219.

▼If it is OK, proceed to ᐅ3.
▼If it is NG, check and repair the following portions.
(1) Fuel pump system
(2) Fuel line

ᐅ3. Injector system check

1.Perform checking of the injector system.
Refer to Page B8-209.

▼If it is OK, proceed to ᐅ4.
▼If it is NG, repair the injector system.

ᐅ4. Spark plug unit check

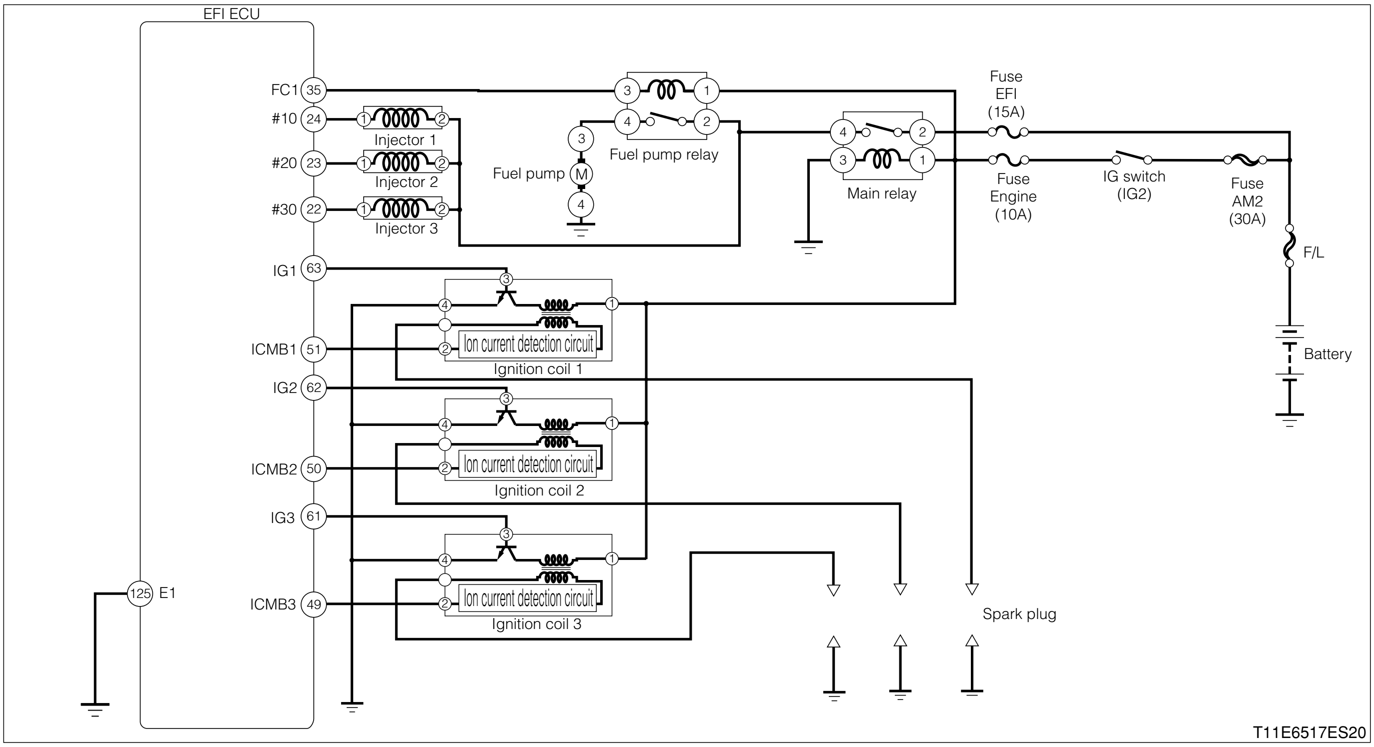
1.Perform unit check of the spark plug.
Refer to Page B8-223.

▼If it is OK, replace the EFI ECU.
Refer to Page B8-1.

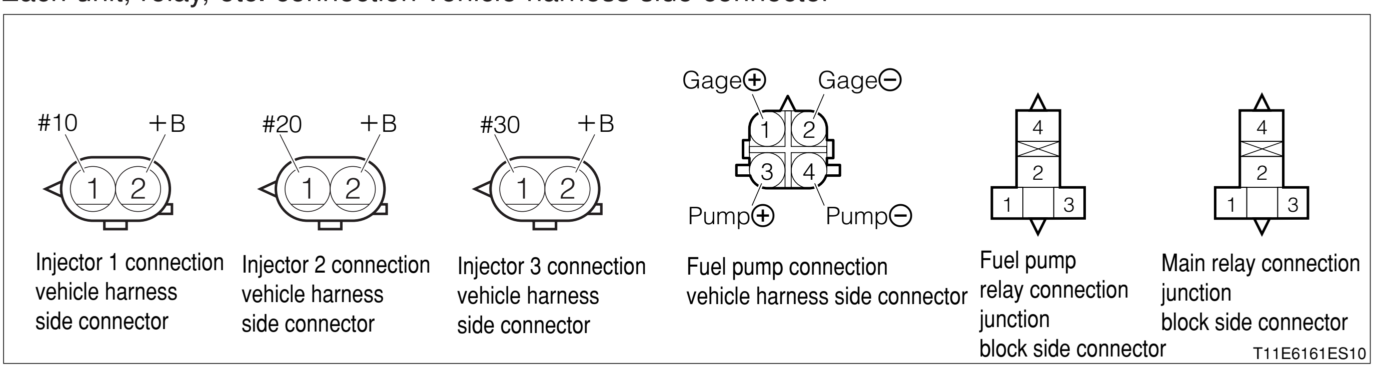
▼If it is NG, replace the spark plug.
Refer to Page B10-2.

7-12-9 DTC NO.P0300/17 RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED
DTC NO.P0301/17 MISFIRE DETECTED (CYLINDER 1)
DTC NO.P0302/17 MISFIRE DETECTED (CYLINDER 2)
DTC NO.P0303/17 MISFIRE DETECTED (CYLINDER 3)

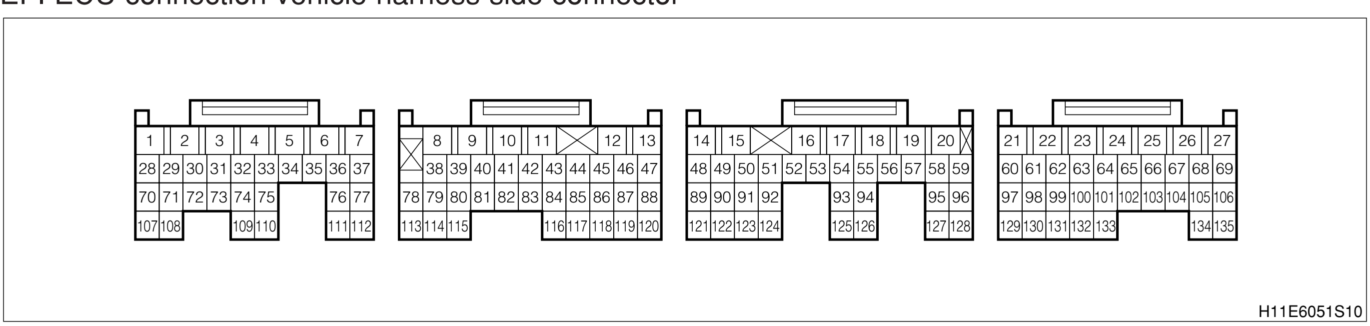
(1) System diagram



Each unit, relay, etc. connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

① **Misfire:**

1.The igniter unit detects the ion current that flows in proportion to the combustion pressure. This ion current is converted into a voltage, which will be inputted to the ECU. If the voltage value is below a certain value, the EFI ECU evaluate it as a misfire and counts its occurrence numbers.

2.When the misfire rate becomes or exceeds a number that indicates deteriorated engine conditions, this state will cause the malfunction indicator lamp (MIL) to be illuminated. If such a misfire is occurring whose misfire rate is high enough that the driving condition will most likely cause the catalyst to be overheated, the malfunction indicator lamp (MIL) will flash.

(3) Diagnosis code output conditions

① **P0300/17:**

1.Misfiring of random/multiple cylinders is detected during any particular 400 or 2000 ignitions.

② **P0301/17, P0302/17, P0303/17:**

1.For any particular 400 ignitions for engine, misfire is detected which can cause catalyst overheating. (This causes MIL to blink.)

2.For any particular 2000 ignitions for engine, misfire is detected which can cause deterioration in emissions.

NOTE

- When the 2 or more codes for a misfiring cylinder are recorded repeatedly but no random/multiply cylinder misfire code is recorded, it indicates that the misfire were detected and recorded at different times.

(4) Trouble area

1.Open wire/short circuit for the ignition system circuit
2.Open wire/short circuit for the ion system circuit
3.Injector
4.Fuel pressure
5.Combustion pressure
6.Manifold absolute pressure/ intake air temperature integral type sensor
7.Engine coolant temperature sensor
8.EFI ECU

(5) Points Of Inspection

1.Is the signal from the ignition coils (Igniter section) inputted to the ECU proper ?
2.Does the ignition coils (Igniter) operate proper ?
3.Is the harness between the injector and the ECU proper ?
4.Does the injector operate proper ?
5.Is the harness between the engine coolant temperature sensor sensor and the ECU proper ?
6.Is the output of the water temperature sensor normal?

(6) Inspection procedure

NOTE

- In order to memorize DTC of misfire, it is necessary to drive around MISFIRE RPM, MISFIRE LOAD in the data list for the following period of time.

Confirmation driving pattern

Engine speed	Time
Idling	3 minutes 30 seconds or more
1000 rpm	3 minutes or more
2000 rpm	1 minutes 30 seconds or more
3000 rpm	1 minutes or more

NOTE

- If it is the case that any DTC besides misfire is memorized simultaneously, first perform the troubleshooting for them.

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.
- When the vehicle is brought to the workshop and the misfire is not occurred, misfire can be confirmed by reproducing the condition of freeze frame data. Also, after finishing the repair, confirm that there is no misfire. (See the confirmation driving pattern)

① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

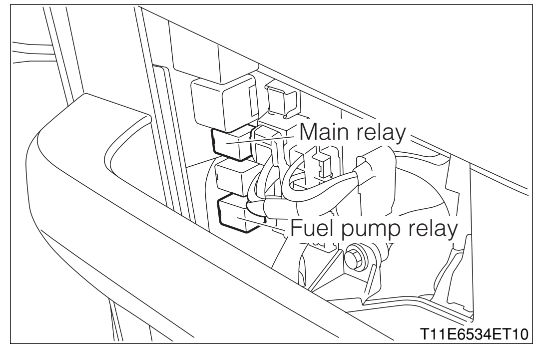
⊳1. Visual check of inside of engine compartment.

1.Check the connecting conditions of the wire harnesses and connectors.
2.Check the vacuum hoses, purge hoses, fuel hoses and pipes for disconnection and breakage.
3.Are the check results OK?

▼<u>If it is OK, go to ⊳2.</u>

▼<u>If it is NG, repair or replace the defective point. Ensure that there is no misfiring. (Refer to the confirmation of the running pattern.)</u>

⊳2. Check of spark plug and spark of misfiring cylinder.



1.Warm up the engine.
2.Turn the IG switch to "LOCK".
3.Remove the fuel pump relay.
4.Let the engine idle and wait until it stops by itself.
5.Turn the IG switch to "LOCK".
6.Remove the connector of the injector.

CAUTION

- Stop the fuel injection through the above operation and prevent damaging the catalyst by the unburned gas.

7.Remove the ignition coils and spark plugs (Misfire cylinders).
8.Install the spark plug to the ignition coil.
9.Ground the spark plug.
10.Crank the engine at this time, check to see if the spark plug sparks.
11.Are sparks jumping?

▼If it is OK, go to ⊳3.
▼If it is NG, perform the following operation.
(1) Replace the spark plug
(2) Check the ignition system and ion system.

CAUTION

- Do not use any spark plugs other than those designated.

⊳3. Check of output signal of injector of misfiring cylinder.

1.With the IG switch turned "LOCK", perform restoration.
2.Set the SST.
SST: 09842-97209-000

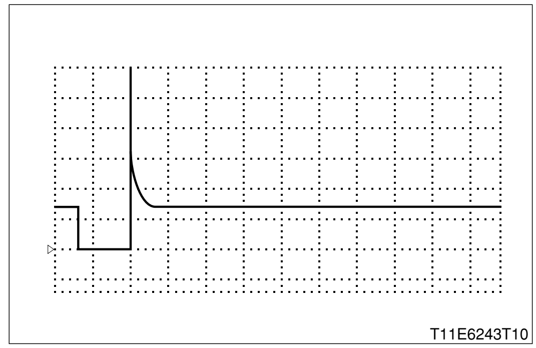
3.IG switch turned "ON".
4.As for the harness between the following terminals, measure the injector voltage of the cylinder where the misfiring is occurring.
(1) Between SST 24 (#10) and the body earth
(2) Between SST 23 (#20) and the body earth
(3) Between SST 22 (#30) and the body earth
SPECIFIED VALUE: Battery voltage

5.Observation of injector waveform with oscilloscope (Reference).
6.As for the harness between the following terminals, check the respective oscillographic waveform during the idling.
(1) Between SST 24 (#10) and SST 125 (E1)
(2) Between SST 23 (#20) and SST 125 (E1)
(3) Between SST 22 (#30) and SST 125 (E1)

7.As an example, in case of the following measuring range and measuring conditions, it will be as in the right figure.

Time axis	2ms / DIV
Voltage axis	10V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".



NOTE

- The waveform cannot be specified, but confirm that a waveform as in the right figure (One such example) shows up

8.Confirm the following points.

(1) The voltage changes from the battery voltage to 0V while fuel injection.

9.Are the check results OK?

▼If it is OK, go to ⊳6.

▼If it is NG, go to ⊳4.

⊳4. Unit check of injector of misfiring cylinder.

1.Turn "LOCK" the IG switch.

2.Disconnect the injector connector of the misfiring cylinder.

3.Measure the resistance between the injector terminals (Injector side).

SPECIFIED VALUE: 12 Ω at 20°C

4.Are the unit check results OK?

▼If it is OK, go to ⊳5.

▼If it is NG, replace the injector.

⊳5. Wiring harness check

1.IG switch turned "LOCK".

2.Disconnect the SST connectors from the EFI ECU.

3.Check the harness and connector for open wire.

(1) Between the injector 1 connection vehicle harness side connector 1 (#10) and the EFI ECU connection vehicle harness side connector 24 (#10)

(2) Between the injector 2 connection vehicle harness side connector 1 (#20) and the EFI ECU connection vehicle harness side connector 23 (#20)

(3) Between the injector 3 connection vehicle harness side connector 1 (#30) and the EFI ECU connection vehicle harness side connector 22 (#30)

SPECIFIED VALUE: Continuity exists.

4.Check the harness and connector for short.

(1) Between the injector 1 connection vehicle harness side connector 1 (#10) and the body earth

(2) Between the injector 2 connection vehicle harness side connector 1 (#20) and the body earth

(3) Between the injector 3 connection vehicle harness side connector 1 (#30) and the body earth

SPECIFIED VALUE: No continuity exists

5.Are the check results for open wire and short OK?

▼If it is OK, check the EFI ECU circuit.

▼If it is NG, repair or replace the harness or connector.

⊳6. Check of ion system.

1.Perform the trouble shooting for the code No.P1300/36.
Refer to Page B8-161.

2.Are the check results OK?
▼If it is OK, go to ⊳7.
▼If it is NG, repair or replace the defective point.

⊳7. Check of fuel pressure.

1.Check the fuel pressure.
Refer to Page B8-219.

2.Are the check results OK?
▼If it is OK, go to ⊳8.
▼If it is NG, Check and repair the fuel pump, pressure regulator, fuel pipe line and filter.

⊳8. Check of injector injection.

1.Check the injector unit.
Refer to Page B8-224.

2.Are the check results OK?
▼If it is OK, go to ⊳9.
▼If it is NG, replace the injector.

⊳9. Manifold absolute pressure/intake air temperature integral type sensor unit check

1.Perform the unit check of the manifold absolute pressure/intake air temperature integral type sensor (Manifold absolute pressure sensor section).
Refer to Page B8-220.

2.Are the check results OK?
▼If it is OK, go to ⊳10.
▼If it is NG, replace the manifold absolute pressure, intake air temperature integral type sensor.

⊳10. Water temperature sensor unit check

1.Perform the unit check of the water temperature sensor.
Refer to Page B8-221.

2.Are the check results OK?
▼If it is OK, perform the following checks given below.
(1) Compression pressure
Refer to Page B1-7.

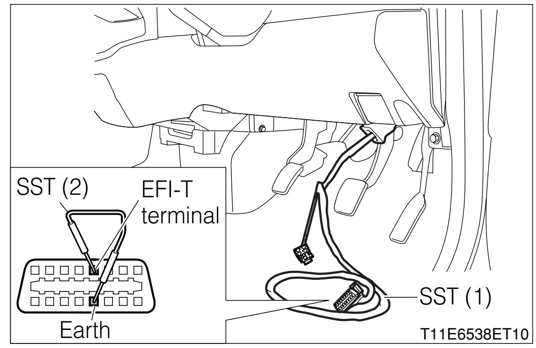
(2) Valve clearance
Refer to Page B1-6.

▼If it is NG, replace the engine coolant temperature sensor.
Refer to Page B8-7.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Diagnosis code check

1.Use the SST to short-circuit DLC terminals between 5(EFI-T) - 13(E).
SST: 09991-87404-000(1)
09991-87403-000(2)



2.Check whether the diagnosis code other than Code No.36 is outputted or not.
SPECIFIED VALUE: No output.
▼If it is OK, go to ⊳2.
▼In the case of NG, first check and repair a condition that caused the diagnosis code output.

⊳2. Unit check of spark plug

1.Check whether the designated spark plug is used. (See Engine Turning-up section for spark plug specifications.)
Refer to Page B1-4.

2.Perform the unit check of the spark plug
Refer to Page B8-223.

▼If it is OK, go to ⊳3.
▼If it is NG, clean or replace the spark plug. If a designated spark plug is not used, replace the spark plug with the designated spark plug.

⊳3. Spark check

WARNING

- There is a hazard potential for sparks are generated. Do not place combustible materials in the vicinity.

1.Warm up the engine.
2.Set the IG switch to "LOCK".
3.Remove the fuel pump relay.
4.Idle the engine and wait until the engine stops by itself.
5.Set the IG switch to "LOCK".
6.Remove all the connectors from the injector.

CAUTION

- Operations described above will stop fuel injection, thus preventing damage to the catalyst due to non-burned gas etc.

7.Remove the spark plug and install it to the ignition coil to earth the plug.
8.Check whether the spark plug generates sparks during cranking.
SPECIFIED VALUE: Sparks are generated.

▼If it is OK, go to ⊳8.
▼If it is NG, go to ⊳4.

⊳4. EFI ECU signal check (1)

1.Connect the SST.

SST: 09842-97209-000

2.Completely warm up the engine.

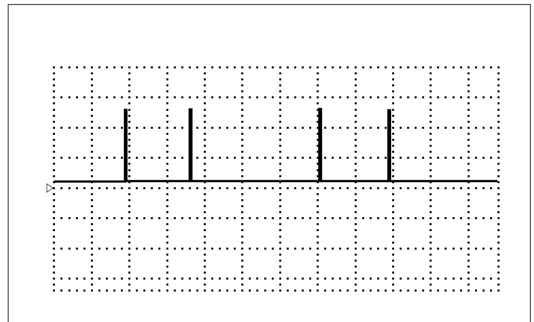
3.When the engine is in the starting condition, check an output waveform of an ignition signal between the following terminals using an oscilloscope.

(1) Between SST 63 (IG1) - SST 125 (E1)

(2) Between SST 62 (IG2) - SST 125 (E1)

(3) Between SST 61 (IG3) - SST 125 (E1)

Time axis	100ms / DIV
Voltage axis	2V / DIV
Condition	Air-conditioner "OFF", no electrical load, idling



Air-conditioner "OFF": Set the air-conditioner switch (ACSW), blower switch (BLW), and magnet clutch (MGC) to "OFF".

NOTE

- Check that the waveform shown in the figure [Example] is displayed.

4.Check the following points.

(1) The pulse of 0 ⇄ 5V is generated.

(2) The waveform cycle is shortened as the engine speed increases.

NOTE

- The ignition signal can not be judged correctly if an oscilloscope is not used.

▼If it is OK, go to ⊳5.

▼If it is NG, check the EFI ECU circuit.

Refer to Page A1-24.

⊳5. Wire harness continuity check (1)

1.Check continuity between the following terminals.

(1) Between ignition coil 1connection vehicle harness side connector 3(IG1) - ECU connection vehicle harness side connector 63(IG1)

(2) Between ignition coil 2 connection vehicle harness side connector 3(IG2) - ECU connection vehicle harness side connector 62(IG2)

(3) Between ignition coil 3 connection vehicle harness side connector 3(IG3) - ECU connection vehicle harness side connector 61(IG3)

SPECIFIED VALUE: Continuity exists

▼If it is OK, go to ⊳6.

▼If it is NG, repair or replace the faulty harness.

⊳6. Ignition coil voltage check

1.Measure the voltage between the following terminals when the IG switch is "ON".

(1) Between each ignition coil connection vehicle harness side connector 1(+B) - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, go to ⊳7.

▼In the case of NG, repair or replace the harness between the following terminals.

(2) Each ignition coil - battery

⊳7. Wire harness continuity check (2)

1.Check continuity between the following terminals.

(1) Between each ignition coil connection vehicle harness side connector 4(E1) - ECU connection vehicle harness side connector 125(E1)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, replace the ignition coil.

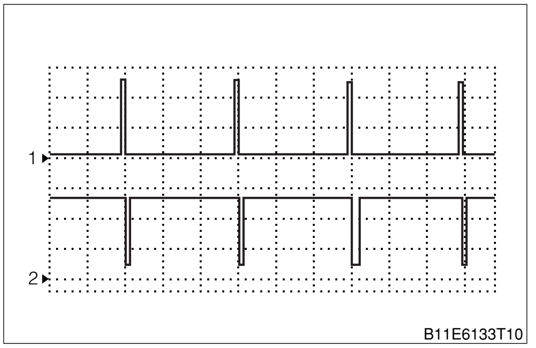
Refer to Page B10-2.

▼In the case of NG, repair or replace the faulty harness.

⊳8. EFI ECU signal check (2)

1.Completely warm up the engine.

2.While idling, check each cylinder for output waveforms of the ignition signal (1▶) and ion current combustion control signal (2▶), using an oscilloscope, respectively.



	Channel	+ side measuring terminal	− side measuring terminal
Cylinder No.1	1▶	63 (IG1)	125 (E1)
	2▶	51 (ICMB1)	125 (E1)
Cylinder No.2	1▶	62 (IG2)	125 (E1)
	2▶	50 (ICMB2)	125 (E1)
Cylinder No.3	1▶	61 (IG3)	125 (E1)
	2▶	49 (ICMB3)	125 (E1)

Time axis	50ms / DIV
Voltage axis	2V / DIV
Condition	Water temperature is 80℃ or more: air conditioner is "ON": Electric load exists: during air conditioner idle up rotation

Air conditioner is "ON": Condition where all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "ON".

Electric load exists: Conditions where the headlight (H/L) and Defogger (DEF) are both "ON".

Air conditioner idle up rotation:950^{+50}_{-150} rpm

NOTE

- **Check that waveforms like those in the figure (One example) is produced.**

3.Check the following points.

(1) According to the output waveform of the ignition signal (Channel 1▶), the output waveform of the ion current combustion control signal (Channel 2▶) has been produced.

(2) The waveform of 5 ⇄ 0V has been produced.

NOTE

- **Correct evaluation cannot be made for the ignition signals and ion current combustion control signals, unless you use an oscilloscope.**

	Waveform (Channel 2▶) state
a	Normal
b	Clamped at 0V.
c	Clamped at 5V.
d	Clamped to the battery voltage.
e	Waveform is unstable※.

※: According to the output waveform of the ignition signal (Channel 1▶), the output waveform of the ion current combustion control signal (Channel 2▶) has not been produced.

▼In the case of "a", go to ⊳9.

▼In the case of "b" go to ⊳11.

▼In the case of "c" go to ⊳13.

▼In the case of "d" go to ⊳12.

▼In the case of "e" go to ⊳16.

⋝9. EFI ECU signal check (3)

1.Retain the measurement conditions in ⋝8.

2.Under the following conditions, check each cylinder for output waveforms of the ion current combustion control signal, using an oscilloscope.

(1) Raise the engine revolution speed slowly from the idle state to 4000 rpm. Then, close the throttle opening quickly.

SPECIFIED VALUE: No waveform is outputted while fuel is cut.

▼If it is OK, replace the EFI ECU.

Refer to Page B8-1z.

▼If it is NG, go to ⋝10.

⋝10. Fuel cut operation check

1.Check the output state between the following terminals using an oscilloscope.

(1) Between SST 24 (#10) - SST 125 (E1)

(2) Between SST 23(#20) - SST 125(E1)

(3) Between SST 22(#30) - SST 125(E1)

2.Check the operating sound of the injector using a sound scope when the fuel cut is active.

NOTE

- Check operating sound, while checking the output waveform to the injector using an oscilloscope.

SPECIFIED VALUE: The operating sound of the injector stops when the fuel cut is active.

▼If it is OK, replace the ignition coil.

Refer to Page B10-2.

▼In the case of NG, perform unit check of the injector.

Refer to Page B8-224.

⋝11. Check of wire harness for short-circuit (1)

1.Check continuity of the cylinder whose waveform is clamped at 0V.

(1) Between ignition coil 1 connection vehicle harness side connector 2(ICMB1) - body earth

(2) Between ignition coil 2 connection vehicle harness side connector 2(ICMB2) - body earth

(3) Between ignition coil 3 connection vehicle harness side connector 2(ICMB3) - body earth

SPECIFIED VALUE: No continuity exists

▼If it is OK, replace the ignition coil.

Refer to Page B10-2.

▼In the case of NG, repair the faulty section.

⌦12. Check of wire harness for short-circuit (2)

1.Check continuity of the cylinder whose waveform is clamped to the battery voltage.

(1) Between ignition coil 1 connection vehicle harness side connector 2 (ICMB1) - battery positive (+) terminal

(2) Between ignition coil 2 connection vehicle harness side connector 2 (ICMB2) - battery positive (+) terminal

(3) Between ignition coil 3 connection vehicle harness side connector 2 (ICMB3) - battery positive (+) terminal

SPECIFIED VALUE: No continuity exists

▼If it is OK, replace the ignition coil.

Refer to Page B10-2.

▼In the case of NG, repair or replace the faulty component.

⌦13. Check of wire harness for open wire

1.Check continuity of the cylinder whose waveform is clamped at 5V.

(1) Between ignition coil 1connection vehicle harness side connector 2 (ICMB1) - EFI ECU connection vehicle harness side connector 51 (ICMB1)

(2) Between ignition coil 2 connection vehicle harness side connector 2 (ICMB2) - EFI ECU connection vehicle harness side connector 50 (ICMB2)

(3) Between ignition coil 3 connection vehicle harness side connector 2 (ICMB3) - EFI ECU connection vehicle harness side connector 49 (ICMB3)

SPECIFIED VALUE: Continuity exists

▼If it is OK, go to ⌦14.

▼In the case of NG, repair or replace the faulty component.

⌦14. Check of short-circuit between the wire harnesses

1.Check whether the cylinder, whose waveform is clamped at 5V, is short-circuited to the power wire of the sensor system.

NOTE

- The power supply for the sensor system is 5V.

(1) Between ignition coil 1 connection vehicle harness side connector 2 (ICMB1) - body earth

(2) Between ignition coil 2 connection vehicle harness side connector 2 (ICMB2) - body earth

(3) Between ignition coil 3 connection vehicle harness side connector 2 (ICMB3) - body earth

SPECIFIED VALUE: 0V

▼If it is OK, replace the ignition coil and go to ⌦15.

Refer to Page B10-2.

▼In the case of NG, repair or replace the faulty component.

⊳15. EFI ECU signal recheck (1)

1.Recheck the cylinder, whose waveform is clamped at 5V, under the ⊳8) conditions.

2.Check that the output waveform of the ion current combustion control signal (Channel 2▶) is not clamped at 5V.

SPECIFIED VALUE: The output waveform (Channel 2▶) is not clamped at 5V.

▼If it is OK, finish the troubleshooting.

▼In the case of NG, misfire may have occurred. Identify the cause of the misfire and repair.

⊳16. Harness, connector check

1.When the following actions are taken to the cylinder whose waveform is unstable , check whether the waveform will change or not.

(1) Lightly shake the connector vertically and laterally.

(2) Lightly shake the wire harness vertically and laterally.

SPECIFIED VALUE: There is no change in the waveform.

2.Perform the following checks.

(1) Connector fitting condition

(2) Loose connection of the connector and the terminal.

SPECIFIED VALUE: No fault.

▼If it is OK, replace the ignition coil and go to ⊳17.

Refer to Page B10-2.

▼In the case of NG, repair or replace the faulty component.

⊳17. EFI ECU signal recheck (2)

1.Recheck the cylinder, whose waveform is unstable, under the ⊳8) conditions.

2.Check that the output waveform of the ion current combustion control signal (Channel 2▶) is outputted stably.

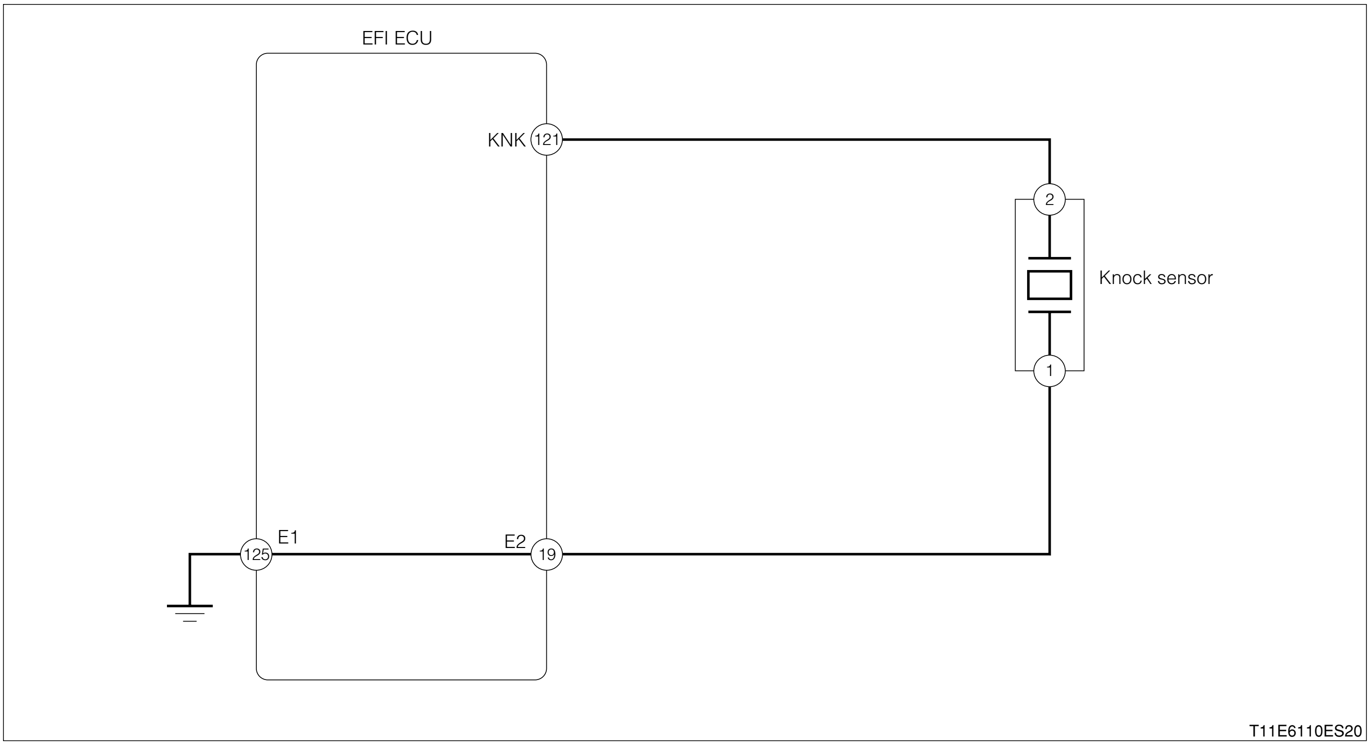
SPECIFIED VALUE: The output waveform (Channel 2▶) is outputted stably.

▼If it is OK, finish the troubleshooting.

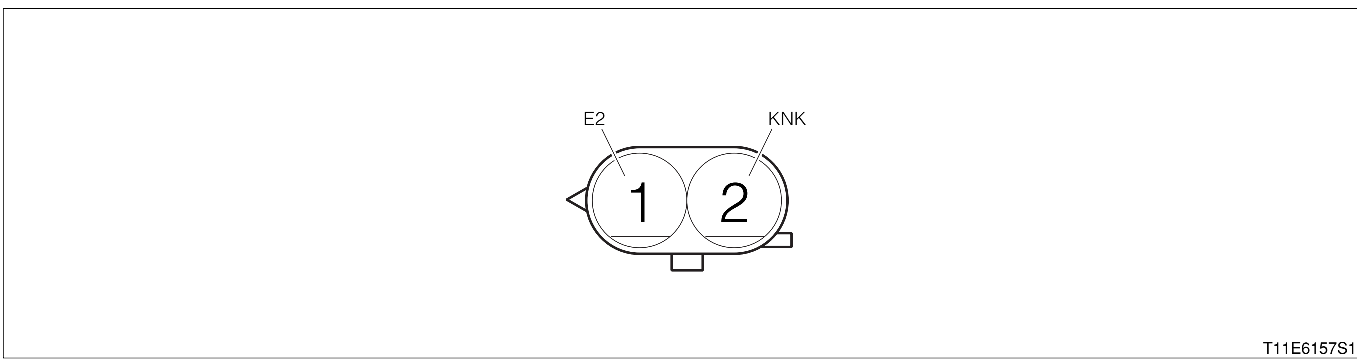
▼In the case of NG, combustion instability may have occurred. Identify the cause of the combustion instability and repair.

7-12-10 DTC NO.P0325/18 KNOCK SENSOR 1 CIRCUIT MALFUNCTION

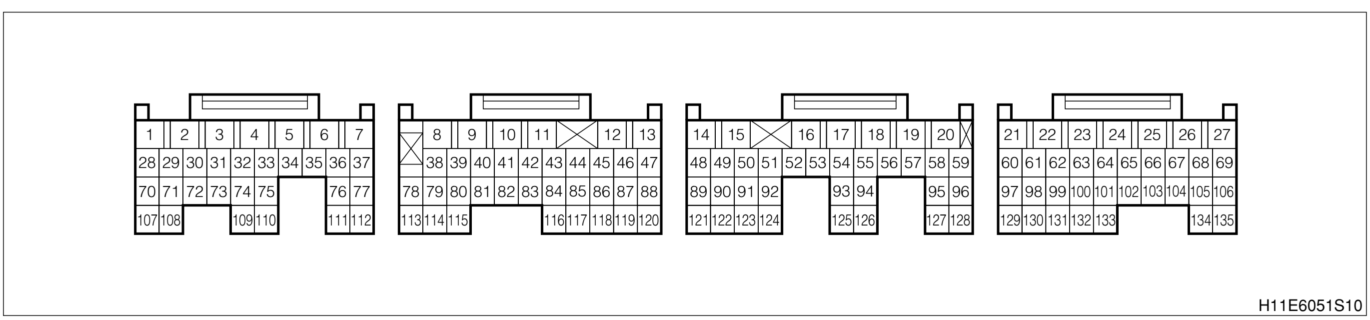
(1) System diagram



Knock sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1. The knock sensor is installed at the cylinder block. The knock sensor detects the occurrence of knocking indirectly from the cylinder block vibration that is caused by the knocking.
2. The knock sensor incorporates a piezo element, whereby the vibration inside the cylinder block is converted to an electric signal.

(3) Diagnosis code output conditions

1. When the signals from the knock sensor are not outputted continuously after starting over a certain length of time.

(4) Trouble area

1.Open wire or short circuit for knock sensor system circuit
2.Knock sensor
3.EFI ECU

(5) Checking points

1.Is the signal from the knock sensor inputted to the EFI ECU?
2.Is the harness between the knock sensor and the EFI ECU normal?
3.Is the output of the knock sensor normal?

(6) Inspection procedure

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⊳1. Check of continuity of knock sensor circuit.

1.IG switch turned "LOCK".
2.Set the SST (Sub-harness). However, the SST connector should remain disconnected from the EFI ECU connector.
SST: 09842-97209-000

3.Measure the resistance between the following terminals.
(1) Between SST 121 (KNK) and 19 (E2)
SPECIFIED VALUE: 200±80kΩ

4.Are the unit check results OK?
▼<u>If it is OK, go to ⊳2.</u>
▼<u>If it is NG, replace the knock sensor.</u>

⊳2. EFI ECU signal check

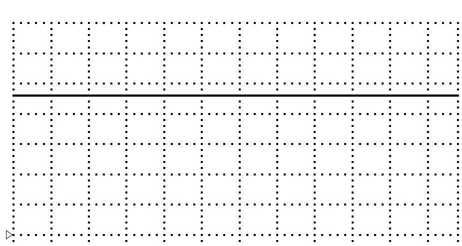
1.Connect the EFI ECU side SST connector.
2.Start the engine
3.Perform output check between the following terminals using an oscilloscope.
(1) Between SST 121 (KNK) and 19 (E2)

Time axis	50μs / DIV
Voltage axis	500mV / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while racing

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".

NOTE

- The waveform cannot be specified, but ensure that a waveform as in the right figure (One such example) shows up.


T11E6239T10

Time axis	50μs / DIV
Voltage axis	500mV / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while racing

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".

NOTE

- The waveform cannot be specified, but ensure that a waveform as in the right figure (One such example) shows up.

4.Is each of the waveform outputted when idling and when racing?

▼If it is OK, check the EFI ECU circuit.

▼If it is NG, proceed to ⊳3.

⊳3. Wiring harness check

1.Check the harness and connector between the EFI ECU and the knock sensor for open wire or short.

(1) Between the knock sensor connection vehicle harness side connector 2 (KNK) and the EFI ECU connection vehicle harness side connector 121 (KNK)

(2) Between the knock sensor connection vehicle harness side connector 1 (E2) and the EFI ECU connection vehicle harness side connector 19 (E2)

SPECIFIED VALUE: Continuity exists.

(3) Between the knock sensor connection vehicle harness side connector 2 (KNK) and the body earth

(4) Between the knock sensor connection vehicle harness side connector 1 (E2) and the body earth

SPECIFIED VALUE: No continuity exists

2.Are the check results for open wire and short OK?

▼If it is OK, go to ⊳4.

▼If it is NG, repair or replace the harness or connector.

⊳4. Unit check the knock sensor.

1.Perform the unit check of the knock sensor.

Refer to Page B8-222.

▼If it is OK, go to ⊳4.

▼If it is NG, check the EFI ECU circuit.

Refer to Page A1-24.

⊳5. Check the installation of the knock sensor.

1.Check the knock sensor for installing condition (E.G. looseness, installation angle).

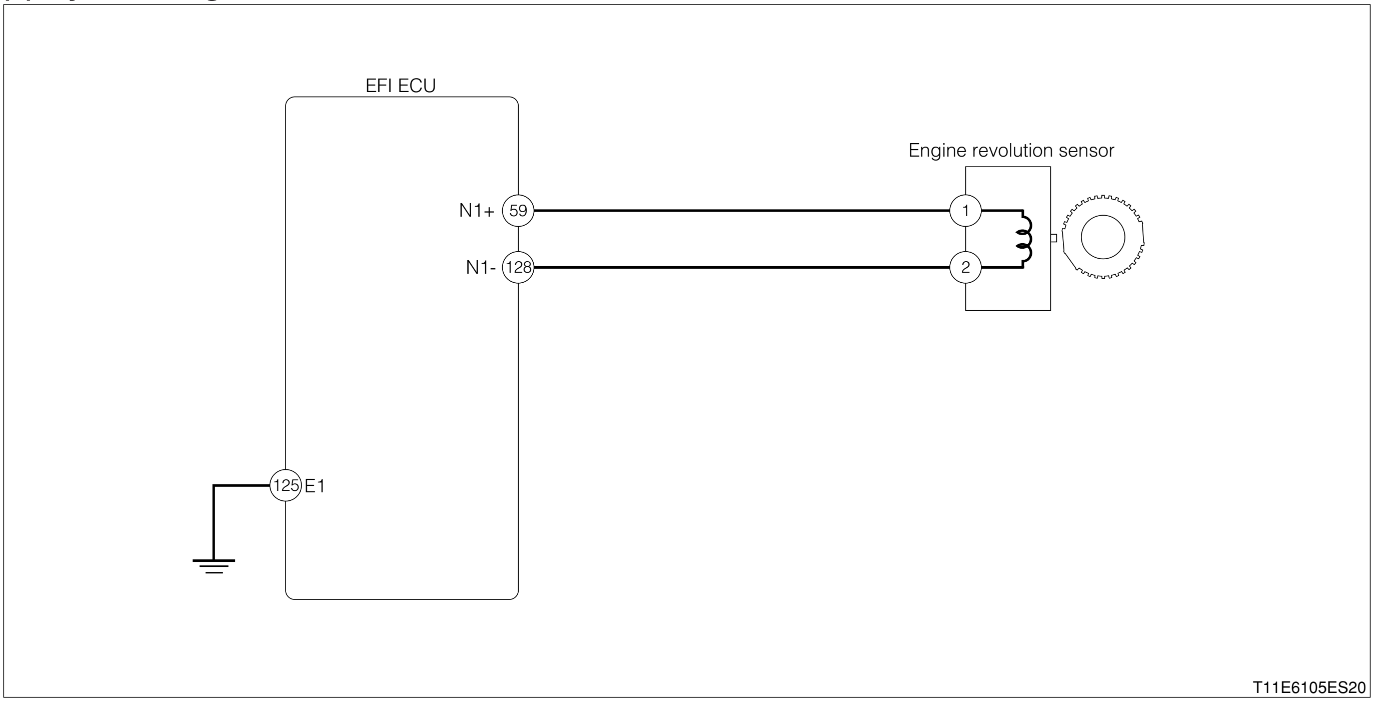
2.Are the check results OK?

▼If it is OK, check or replace the EFI ECU.

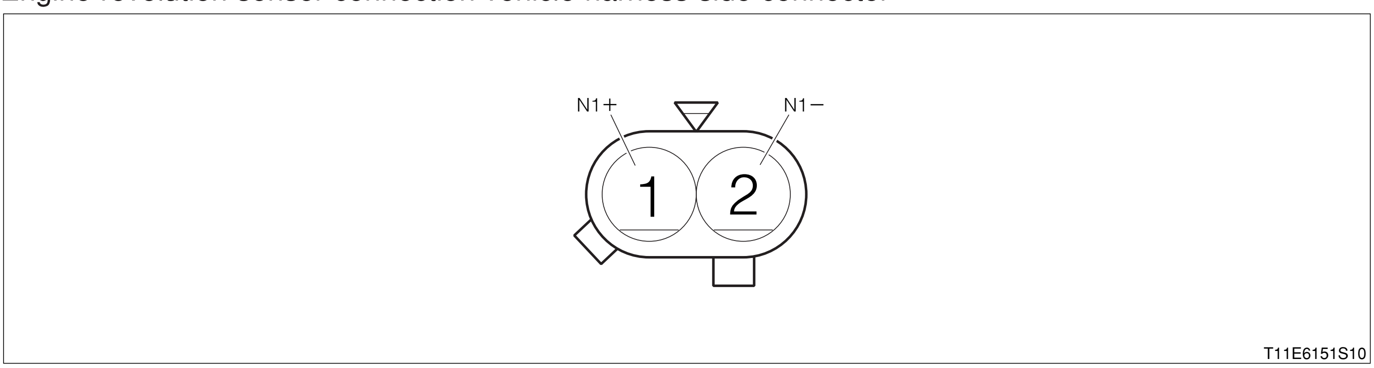
▼If it is NG, tighten the knock sensor.

7-12-11 DTC NO.P0335/13 ENGINE REVOLUTION SENSOR CIRCUIT MALFUNCTION

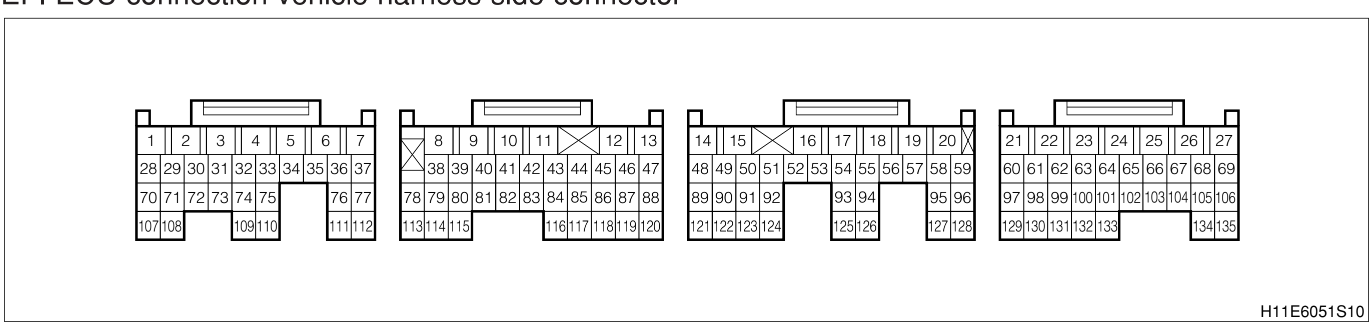
(1) System diagram



Engine revolution sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1.The signal rotor is installed at the front side of the crankshaft so as to detect the crank angle.Furthermore, a pickup coil (Engine revolution sensor) is provided in relation to the projection of this signal rotor.

2.When the crankshaft turns, the air gap between the signal rotor projection and the engine revolution sensor varies and pulses are generated. The engine revolution is calculated based on the intervals of these pulses.

(3) Diagnosis code output conditions

1.No revolution signal is inputted, even once, while the cranking is continued for several seconds.

(4) Trouble area

1.Open wire or short circuit for engine revolution sensor system circuit
2.Engine revolution sensor
3.EFI ECU

(5) Checking points

1.Is the signal from the engine revolution sensor inputted to the EFI ECU?
2.Is the harness between the engine revolution sensor and the EFI ECU normal?
3.Is the output of the engine revolution sensor normal?

(6) Inspection procedure

NOTE

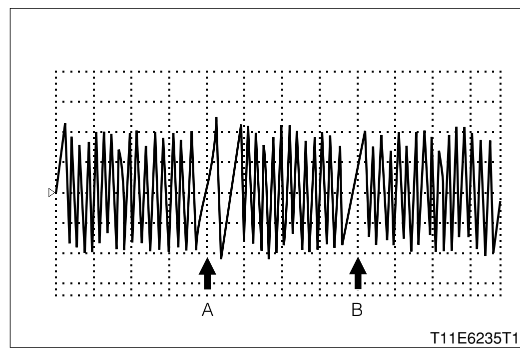
- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⊳1. EFI ECU signal check

1.Connect the SST.
SST: 09842-97209-000

2.Perform the output check between the following terminals using an oscilloscope.
(1) Between SST 59 (N1＋) - 128 (N1－)
SPECIFIED VALUE:

Time axis	10ms /DIV
Voltage axis	2V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling



When air conditioner is "OFF" with no electric load and while idling

NOTE

- The waveform cannot be specified, but ensure that a waveform as in the right figure (One such example) shows up.

3.Confirm the following points.
(1) Each of the cylinder distinguishing signals (A) and (B) is coming out.
(2) The wave period becomes shorter as the engine revolution speed rises.

▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, proceed to ⊳2.

⊳2. Check of wire harness continuity

1.Perform continuity checks between each of the following terminals.

(1) Between sensor connection vehicle harness side connector 1 (N1＋) - ECU connection vehicle harness side connector 59 (N－)

(2) Between sensor connection vehicle harness side connector 2 (N1－) - ECU connection vehicle harness side connector 128 (N－)

SPECIFIED VALUE: Continuity exists.

▼<u>If it is OK, proceed to ⊳3.</u>

▼<u>If it is NG, repair the harness and connectors.</u>

⊳3. Engine rev sensor unit check

1.Perform unit check of the engine rev sensor.

Refer to Page B8-220.

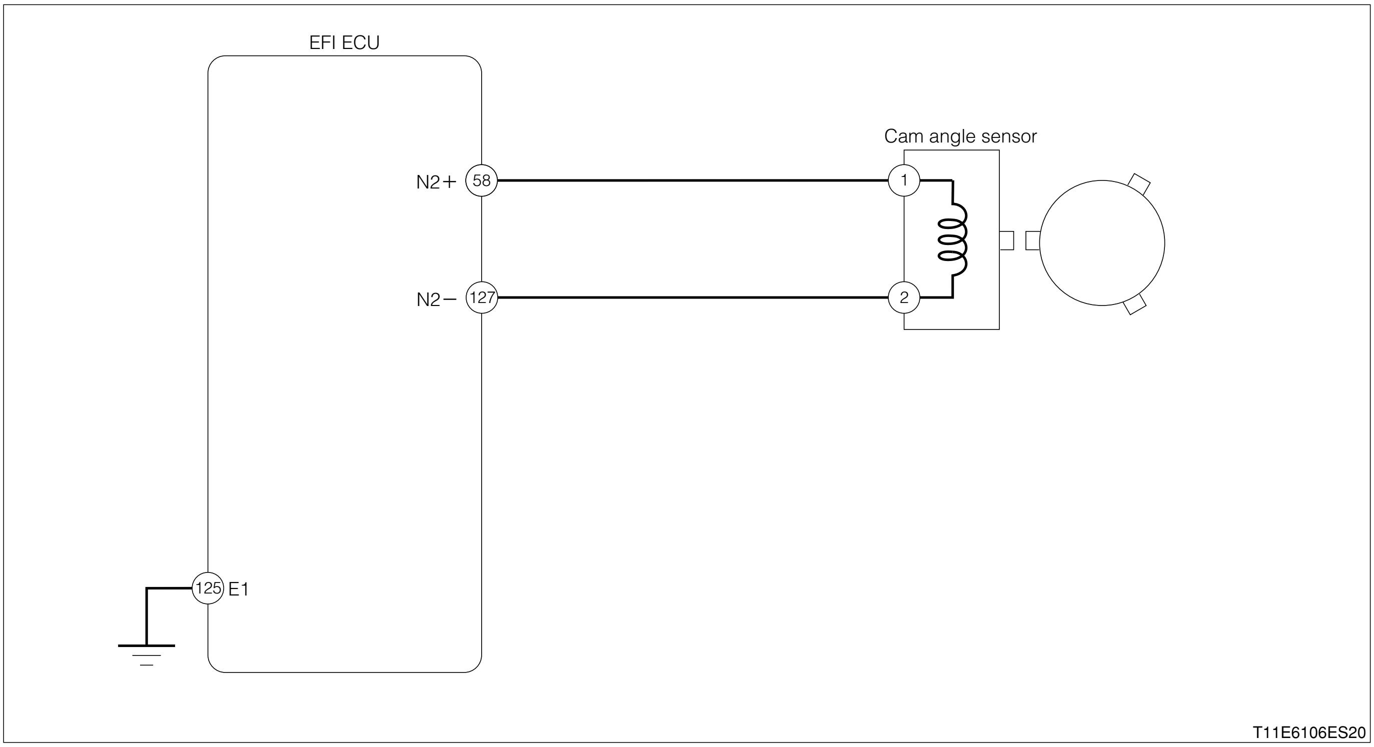
▼<u>If it is OK, check the connecting condition of each connector.</u>

▼<u>If it is NG, replace the engine rev sensor.</u>

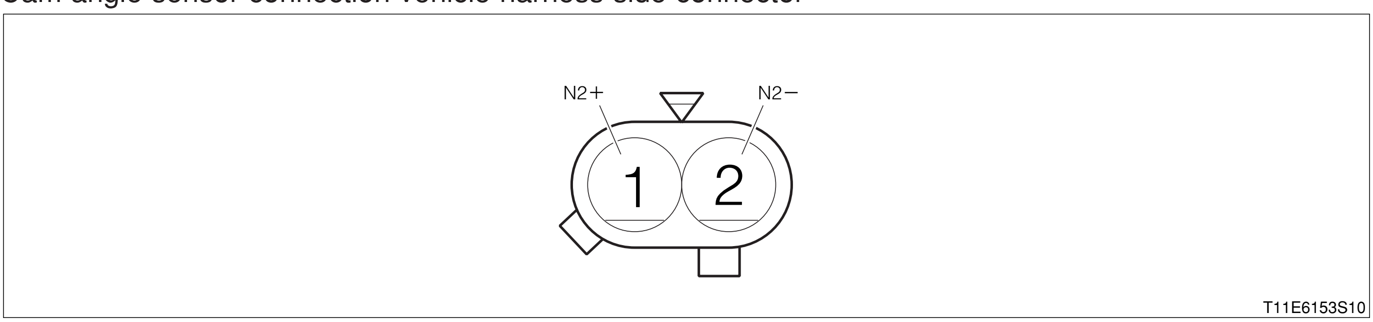
Refer to Page B8-3.

7-12-12 DTC NO.P0340/14 CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION

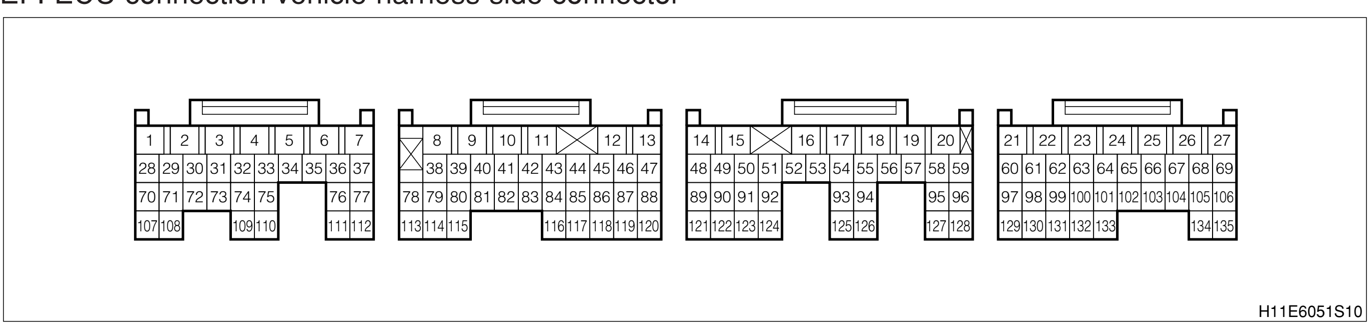
(1) System diagram



Cam angle sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1. The cam angle sensor consists of a signal rotor and a pickup coil. The signal rotor is mounted to the intake side camshaft, using three teeth. As for the NE signal, three signals are outputted per one revolution of the engine. The phases of the camshaft and crankshaft are detected based on the signal from the cam angle sensor and the signal from the engine revolution sensor. Based on these phases, the variable valve timing is controlled.

(3) Diagnosis code output conditions

1. When the signal from the cam angle sensor is not outputted over a certain length of time after the starting,

(4) Trouble area

1.Open wire or short circuit for Camshaft angle sensor system circuit
2.Camshaft angle sensor
3.EFI ECU

(5) Checking points

1.Is the signal from the cam angle sensor inputted to the EFI ECU?
2.Is the harness between the cam angle sensor and the EFI ECU normal?
3.Is the output of the cam angle sensor normal?

(6) Inspection procedure

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

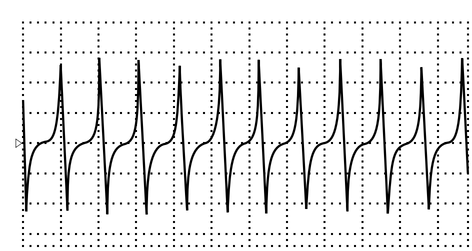
⊳1. EFI ECU signal check

1.Connect the SST.
SST: 09842-97209-000

2.Perform output check between the following terminals using an oscilloscope.
(1) Between SST 58 (N2＋) - 127 (N2－)
SPECIFIED VALUE:

Time axis	50ms /DIV
Voltage axis	1V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".



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NOTE

- The waveform cannot be specified, but ensure that a waveform as in the right figure (one such example) shows up.

3.Confirm the following points.
(1) Periodic wave is showing up.
(2) The wave period becomes shorter as the engine revolution speed rises.

▼<u>If it is OK, check the EFI ECU circuit.</u>
Refer to Page A1-24.

▼<u>If it is NG, proceed to ⊳2.</u>

⊳2. Check of wire harness continuity

1.Perform continuity checks between each of the terminals.
(1) Between sensor connection vehicle harness side connector 1 (N2＋) - ECU connection vehicle harness side connector 58 (N2＋)
(2) Between sensor connection vehicle harness side connector 2 (N2－) - ECU connection vehicle harness side connector 127 (N2－)
SPECIFIED VALUE: Continuity exists.

▼<u>If it is OK, proceed to ⊳3.</u>
▼<u>If it is NG, repair the harness and connectors.</u>

⊳3. Camshaft position sensor unit check

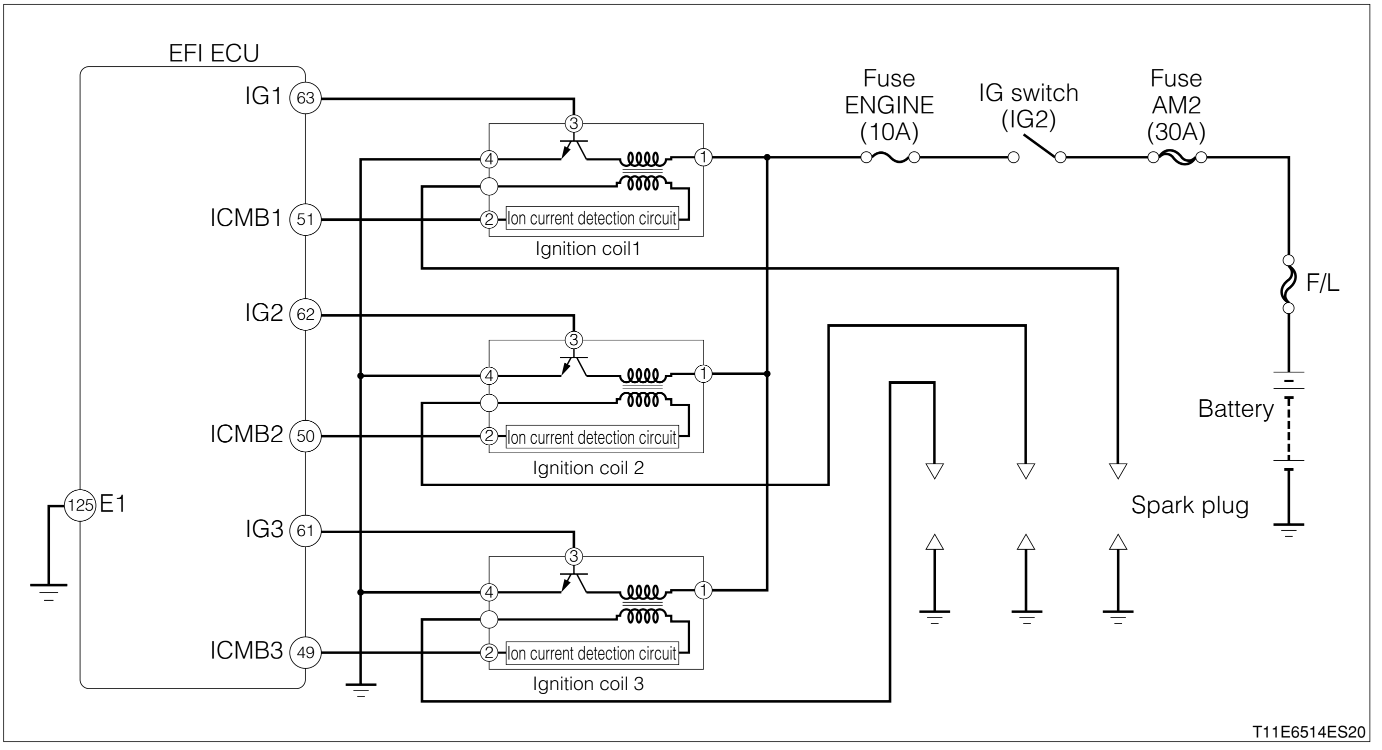
1.Perform unit check of the camshaft position sensor.
Refer to Page B8-220.

▼If it is OK, check the connecting condition of each connector.
▼If it is NG, replace the camshaft position sensor.
Refer to Page B8-4.

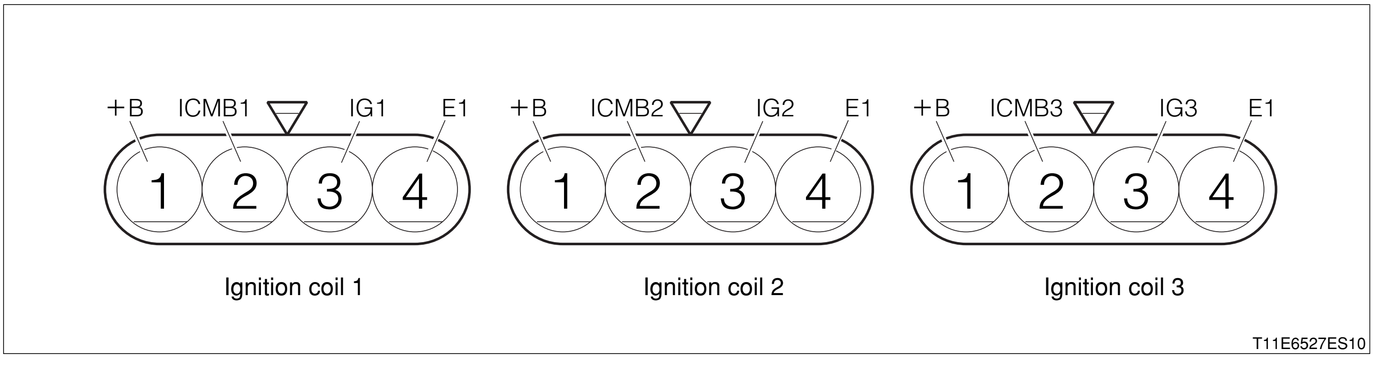
7-12-13 DTC NO.P0350/16 IGNITION SYSTEM CIRCUIT MALFUNCTION

(1) System diagram

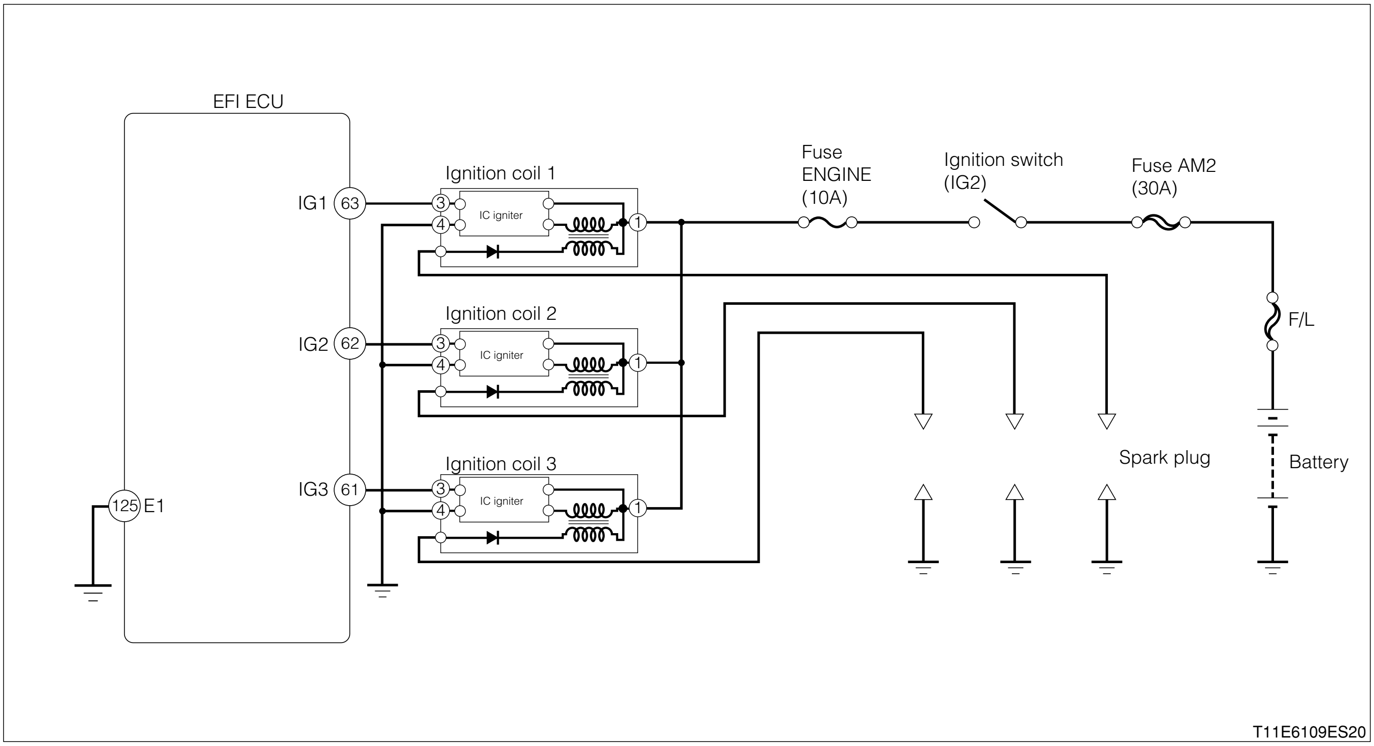
① **For EU specifications**



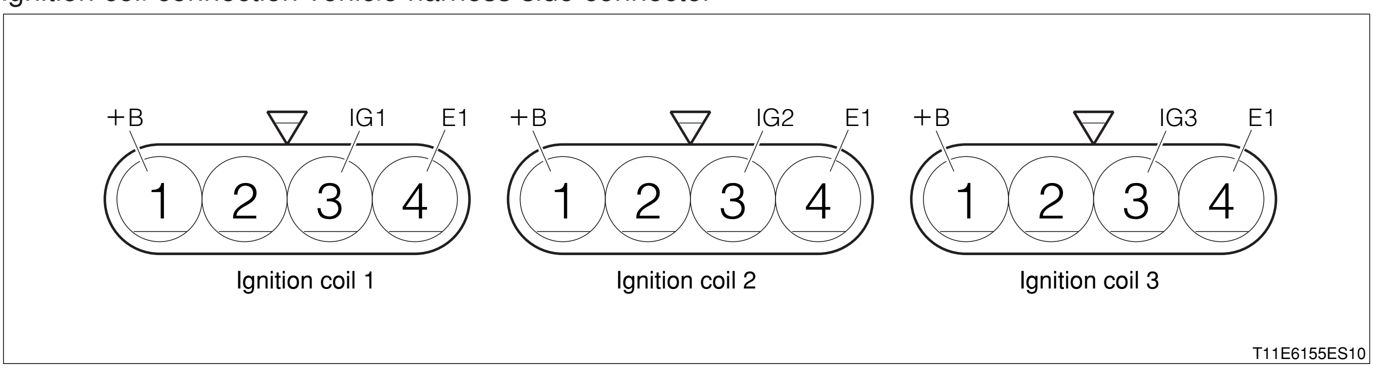
Ignition coil connection vehicle harness side connector



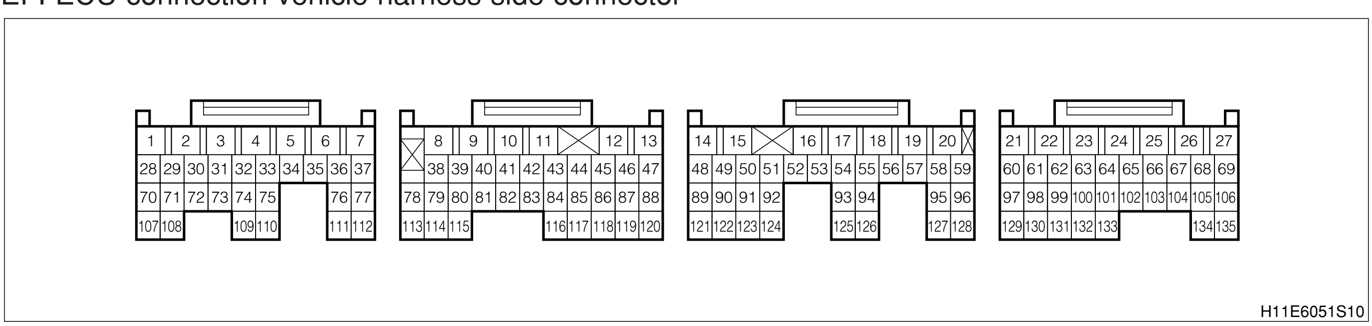
② **For general specifications**



Ignition coil connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1. A DLI (DistributorLess Ignition) system has been employed.
2. The DLI system has no distributor. Furthermore, the ignition coil is located just above the spark plug. Consequently, there is no ignition energy loss due to the electricity distribution, thus making it possible to directly furnish the electric energy induced at the coil. Therefore, an optimum ignition condition can be obtained at all times.

(3) Diagnosis code output conditions

1. When the ignition signal is not outputted consistently for a certain length of time after starting:

(4) Trouble area

1.Open wire/short circuit for the ignition system circuit
2.Ignition coil
3.Battery
4.EFI ECU

(5) Checking points

1.Is the power supply voltage of the ignition coil normal?
2.Is the harness between the ignition coil and EFI ECU normal?
3.Is the sparks of the spark plug proper?

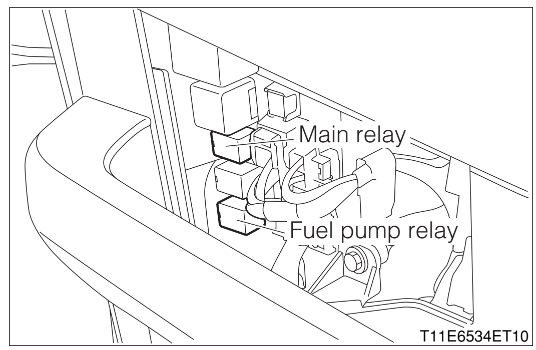
(6) Inspection procedure

⊳1. Spark check

1.Warm up the engine.
2.Turn the IG switch to "LOCK".
3.Remove the fuel pump relay.
4.Let the engine idle and wait until it stops by itself.
5.Turn the IG switch to "LOCK".
6.Remove the connector of the injector.

CAUTION

- **Stop the fuel injection through the above operation and prevent damaging the catalyst by the unburned gas.**



7.Remove the spark plug and earth it by attaching it to the ignition coil.
8.When cranking, check if the sparks are flying in the spark plugs.

SPECIFIED VALUE: The sparks are generated.

▼If it is OK, the ignition system is normal.
▼If it is NG, proceed to ⊳2.

⊳2. EFI ECU signal check

1.Connect the SST.

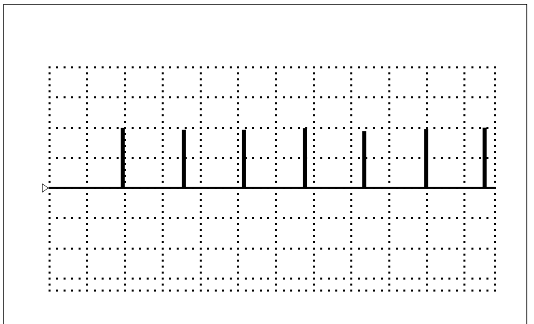
SST: 09842-97209-000

2.With the engine started, check the output waveform of the ignition signal between each of the following terminals using an oscilloscope.

(1) Between SST 63 (IG1) - SST 125 (E1)
(2) Between SST 62 (IG2) - SST 125 (E1)

(3) Between SST 61 (IG3) - SST 125 (E1)

Time axis	100ms / DIV
Voltage axis	2V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling



Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".

NOTE

- **The waveform cannot be specified, but ensure that a waveform as in the right figure (One such example) shows up.**

3.Confirm the following points.

(1) The pulse 0 ⇄ 4V is generated.

(2) The wave period becomes shorter as the engine revolution speed rises.

NOTE

- **Correct judgment cannot be made concerning the ignition signal without using the oscilloscope.**

▼If it is OK, proceed to ⊳3.

▼If it is NG, check the EFI ECU circuit.

Refer to Page A1-24.

⊳3. Ignition coil voltage check

1.Measure the voltage between the following terminals when the IG switch is "ON".

(1) Between each ignition coil connection vehicle harness side connector 1 (+B) - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳4.

▼If it is NG, repair or replace the harness between the following terminals.

(2) Between each ignition coil - battery

⊳4. Wire harness continuity check (1)

1.Perform continuity checks between each of the following terminals.

(1) Between ignition coil 1 connection vehicle harness side connector 3 (IG1) - ECU connection vehicle harness side connector 63 (IG1)

(2) Between ignition coil 2 connection vehicle harness side connector 3 (IG2) - ECU connection vehicle harness side connector 62 (IG2)

(3) Between ignition coil 3 connection vehicle harness side connector 3 (IG3) - ECU connection vehicle harness side connector 61 (IG3)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳5.

▼If it is NG, repair or replace the harness of the defective sections.

⊳5. Check of wire harness continuity (2)

1.Perform continuity checks for each of the following terminals

(1) Between each ignition coil connection vehicle harness side connector 4 (E1) - ECU connection vehicle harness side connector 125 (E1)

SPECIFIED VALUE: Continuity exists.

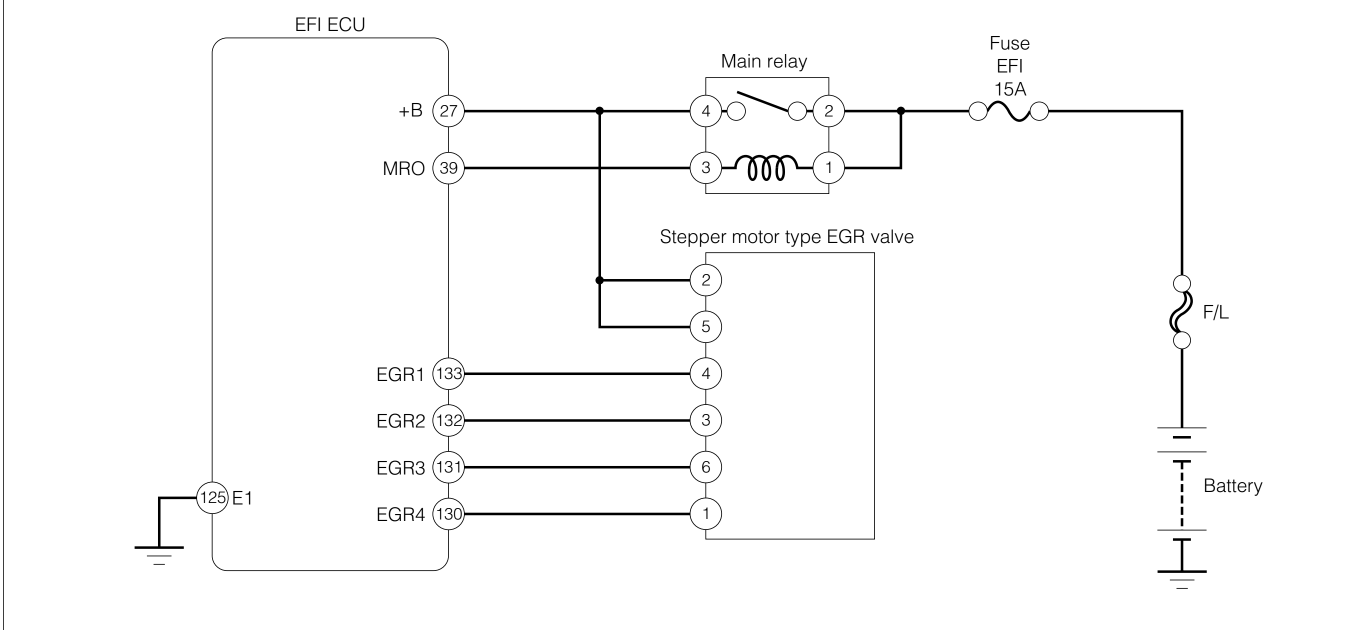
▼<u>If it is OK, replace the ignition coil.</u>

Refer to Page B10-2.

▼<u>If it is NG, repair or replace the harness of the defective sections.</u>

7-12-14 DTC NO.P0401/79 STEPPER MOTOR TYPE EGR VALVE SYSTEM MALFUNCTION (FUNCTION)DTC NO.P0401/79 STEPPER MOTOR TYPE EGR VALVE SYSTEM MALFUNCTION (OPEN WIRE)

(1) System diagram



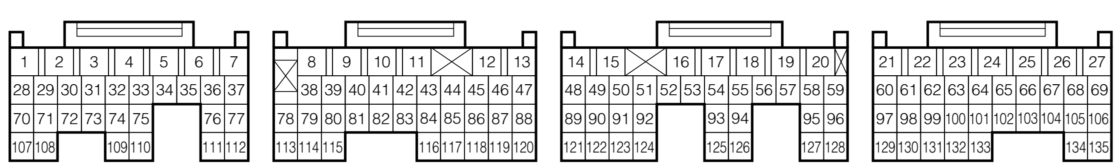
Stepper motor type EGR valve connection vehicle harness side connector

Main relay connection junction block side connector

Stepper motor type EGR valve connection vehicle harness side connector

T11E6177ES10

EFI ECU connection vehicle harness side connector



H11E6051S10

(2) Circuit description

1. According to the engine revolution speed and signals from the throttle position sensor, manifold absolute pressure/intake air temperature integral type sensor (The manifold absolute pressure sensor section) and water temperature sensor, the EFI ECU drives the stepper motor for EGR to determine the optimum quantity of EGR by controlling the opening of the EGR valve.

(3) No.0401/79 output conditions

1.When a flow rate abnormality of EGR gas occurs after starting
2.When an abnormality occurs in the EGR gas flow rate

(4) No.0403/79 output conditions

1.When open wire or shot occurs in the stepper motor for EGR

(5) Checking points

1.Is the stepper motor for EGR operating normally?
2.Is the harness between the stepper motor for EGR and the EFI ECU normal?

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⊳1. EGR piping check

1.Check the piping for EGR for any crack, damage or deformation.
SPECIFIED VALUE: There are no cracks and damages.

▼If it is OK, proceed to ⊳2.
▼If it is NG, repair or replace the defective sections.

⊳2. Assembling check of stepper motor type EGR valve

1.Check if any EGR gas is leaking from the joint of the stepper motor type EGR valve and the cylinder head.
SPECIFIED VALUE: There are no leakage.

▼If it is OK, proceed to ⊳3.
▼If it is NG, repair or replace the defective sections.

⊳3. Stepper motor for EGR operation check

1.Remove the fuel pump relay.
2.Remove the connector of the injector.

CAUTION

- Stop the fuel injection through the above operations 1 and 2 and prevent damaging the catalyst by the unburned gas.

3.Crank the engine.
4.Confirm whether the stepper motor for EGR is operating using a sound scope or a long screwdriver.
SPECIFIED VALUE: It is operating.

▼If it is OK, proceed to ⊳8.
▼If it is NG, proceed to ⊳4.

⊳4. Connection condition check of each connector

1.Check the connecting conditions of each connector.
SPECIFIED VALUE: There are none that is half fit or pulled out.

▼If it is OK, proceed to ⊳5.
▼If it is NG, repair the connector of the defective section.

⊳5. Stepper motor for EGR voltage check

1.Remove the connector of the stepper motor for EGR.

2.Perform voltage measurement between the following terminals when the IG switch is "ON".

(1) Between stepper motor for EGR connection vehicle harness side connector 2 (B2) - body earth

(2) Between stepper motor for EGR connection vehicle harness side connector 5 (B1) - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳6.

▼If it is NG, perform checking or repairing of the harness and relay between the following terminals.

(3) Between battery - stepper motor for EGR

⊳6. Wire harness continuity check

1.Perform continuity check between each of the following terminals.

(1) Between ECU connection vehicle harness side connector 133 (EGR1) - stepper motor for EGR connection vehicle harness side connector 4 (EGR1)

(2) Between ECU connection vehicle harness side connector 132 (EGR2) - stepper motor for EGR connection vehicle harness side connector 3 (EGR2)

(3) Between ECU connection vehicle harness side connector 131 (EGR3) - stepper motor for EGR connection vehicle harness side connector 6 (EGR3)

(4) Between ECU connection vehicle harness side connector 130 (EGR4) - stepper motor for EGR connection vehicle harness side connector 1 (EGR4)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳7.

▼If it is NG, repair or replace the harness and the connectors.

⊳7. Stepper motor type EGR valve unit check (1)

1.Perform unit check for the stepper motor section of the stepper motor type EGR valve.

Refer to Page B8-226.

▼If it is OK, proceed to ⊳8.

▼If it is NG, replace the stepper motor type EGR valve.

Refer to Page B3-5.

⊳8. EGR gas passage check

1.Check the passageway of the EGR gas for clogging.

SPECIFIED VALUE: There is no clogging.

▼If it is OK, proceed to ⊳9.

▼If it is NG, repair the defective section of the EGR gas passage.

⊳9. Stepper motor type EGR valve unit check (2)

1.Perform unit check for the valve section of the stepper motor type EGR valve.

Refer to Page B8-226.

▼If it is OK, proceed to ⊳10.

▼If it is NG, replace the stepper motor type EGR valve.

Refer to Page B3-5.

⊳10. EGR valve removal and installation check

1.Remove the stepper motor type EGR valve and the intake manifold No.1 insulator.
Refer to Page B3-5.

2.Check the EGR valve and the intake manifold No.1 insulator for any clogging and damages.

CAUTION

- Be careful not to touch the valve section by tools when removing any foreign matters.

NOTE

- Especially check the passage of the EGR gas.

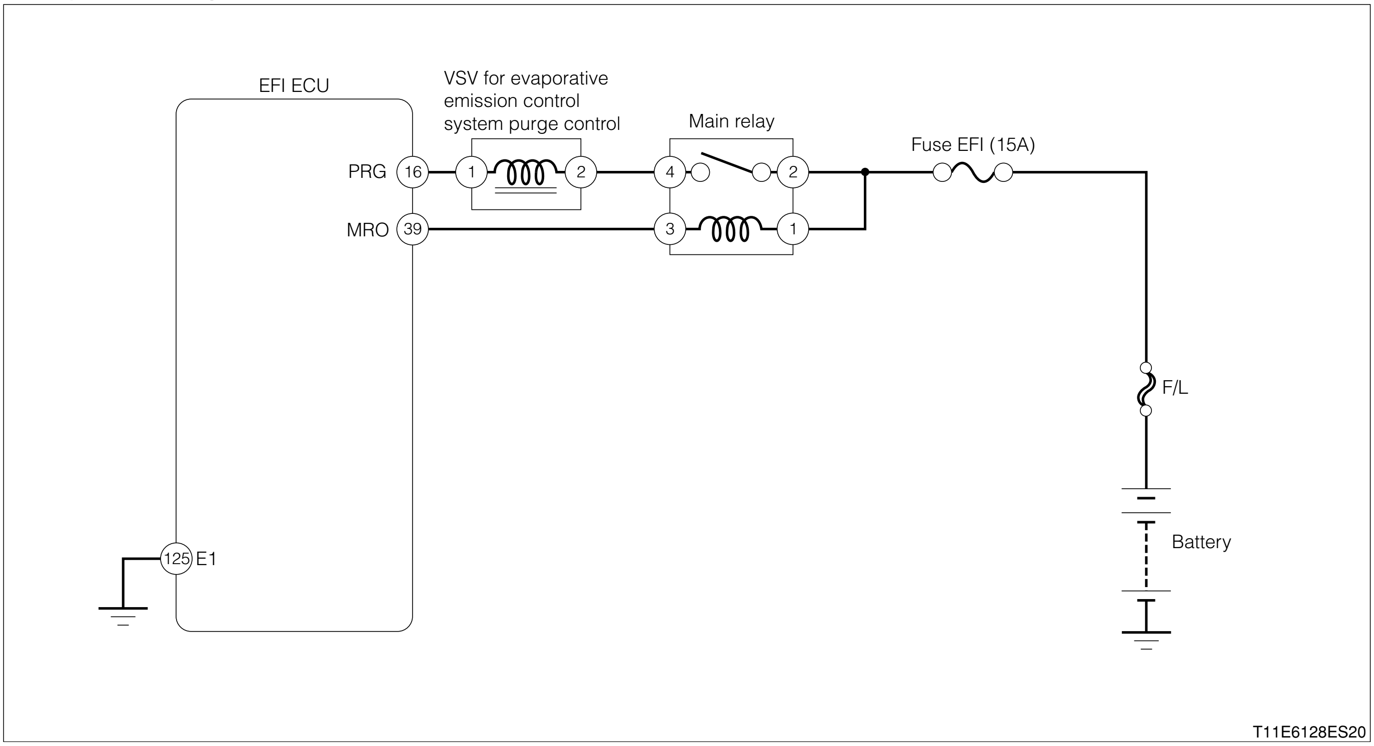
SPECIFIED VALUE: There are no clogging and damage.

▼If it is OK, perform checking of the EFI ECU circuit.
Refer to Page A1-24.

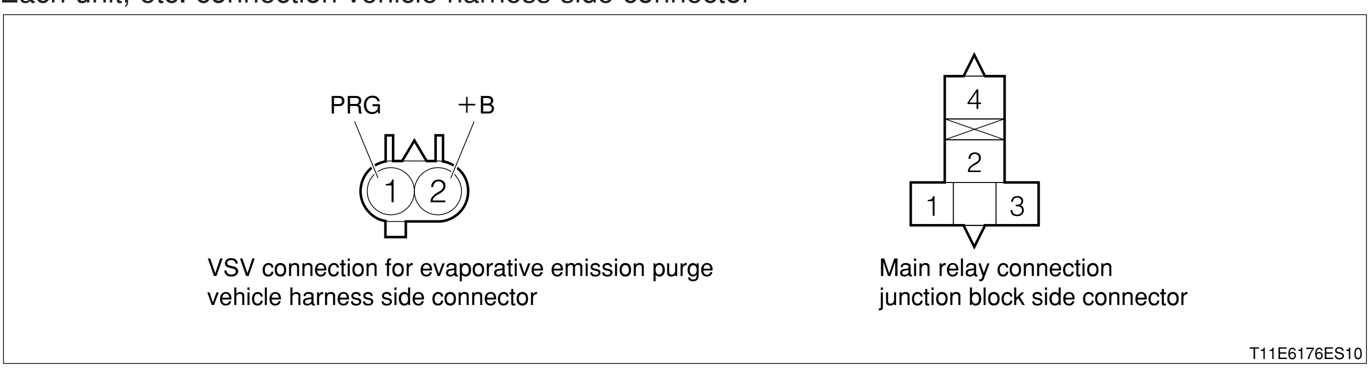
▼If it is NG, replace the defective sections.

7-12-15 DTC NO.P0443/76 VSV FOR EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL

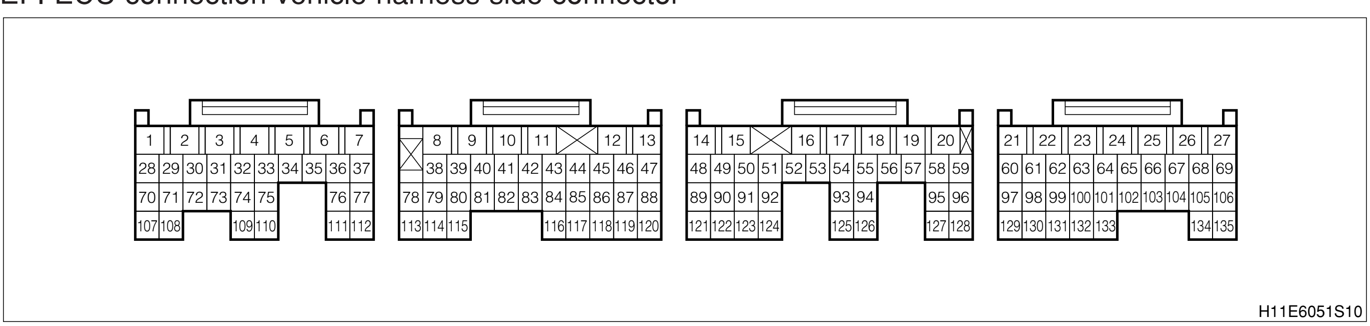
(1) System diagram



Each unit, etc. connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1. When the execution conditions for the evaporative emission purging are met, the EFI ECU performs the duty control for the VSV for evaporative emission purging and purges the evaporative emissions into the combustion chamber.

(3) Diagnosis code output conditions

1. When the detection signal of the VSV for evaporative emission purge is not turned "ON" or "OFF"

(4) Trouble area

1.VSV for evaporative emission control system purge control (Purge VSV for EVAP)
2.Open wire or short circuit for the evaporative emission purge VSV control system circuit
3.EFI ECU

(5) Checking points

1.Is the harness between the VSV for evaporative emission purge and the EFI ECU normal?
2.Is the control signal of the VSV for evaporative emission purge outputted from the EFI ECU normally?
3.Is the VSV for evaporative emission purge operating normally?

(6) Inspection procedure

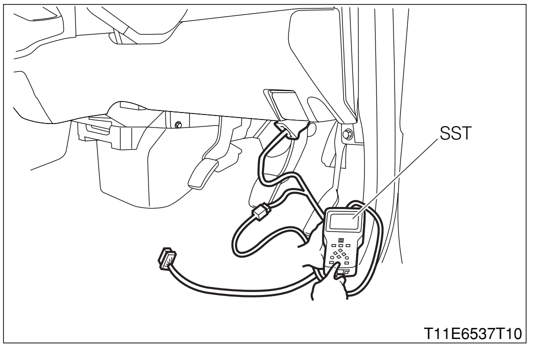
NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

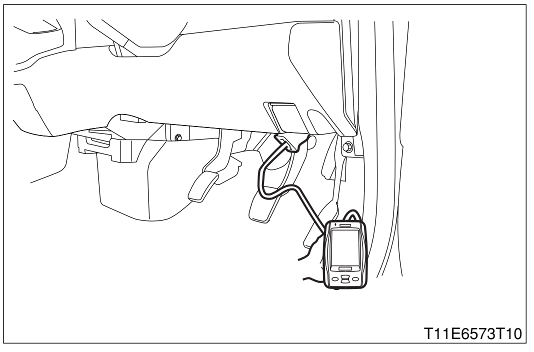
① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Operation check of Purge VSV for EVAP.

1.IG switch turned "LOCK".
2.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



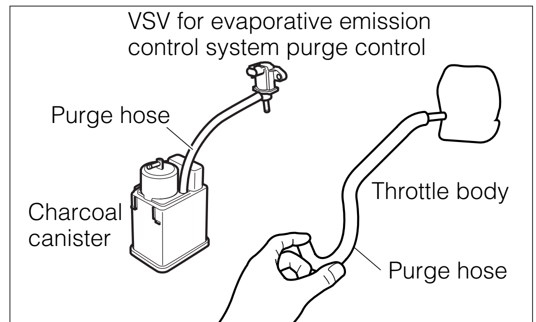
3.Disconnect the hose going to the purge VSV for EVAP from the charcoal canister.
4.Turn "ON" the IG switch, and turn "ON" the main switch of the tester.
5.Erase the DTC.
6.Confirmation of operation of the purge VSV for EVAP.
(1) DS-21: Select the "Purge VSV" of the "Actuator driving".
(2) DS-Ⅱ: Select the "Purge VSV" of the "Active test".

7.When executing "ON" and "OFF" check the operation of the VSV for purging.
SPECIFIED VALUE:

VSV "OFF"	No air continuity should exist when air is blown into the hose.
VSV "ON"	Air continuity should exist when air is blown into the hose.

8.Are the check results OK?
▼If it is OK, check the EFI ECU circuit.
▼If it is OK, go to ⌦2.

⌦2. Check of purge hose and passage.
1.Execute the "VSV "Release" so as to return the purge VSV for EVAP to the original operating state.
2.Start the engine and keep the engine racing.
3.Disconnect the hose going from the purge VSV for EVAP to the intake manifold.
4.Apply your finger to the disconnected hose. Ensure that a negative pressure is applied.
SPECIFIED VALUE: Negative pressure should be applied.
5.Check the hose for connecting state, leakage, restriction, bending and deterioration.
6.Are the check results OK?
▼If it is OK, go to ⌦3.
▼If it is NG, clean, repair or replace.



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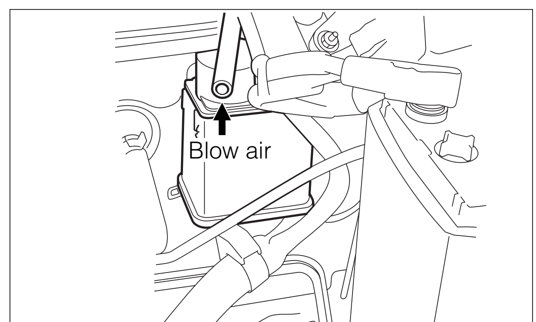


T11E6548ET10

⌦3. Check of power supply voltage of Purge VSV for EVAP.
1.Turn "OFF" the main switch of the tester. Turn "LOCK" the IG switch.
2.Disconnect the purge VSV for EVAP connector.
3.With the IG switch turned "ON", measure the voltage between the following terminals given below.
(1) Between the VSV for evaporative emission purge connection vehicle harness side connector 2 (+B) and the body earth
SPECIFIED VALUE: Battery voltage

4.Are the check results OK?
▼If it is OK, go to ⌦4.
▼If it is NG, check the harness and connector between the VSV for purging and the battery, and the main relay for open wire or short. Repair or replace, as required.

⌦4. Wiring harness check

1.IG switch turned "LOCK".

2.Check the harness and connector between the following terminals for open wire and short.

(1) Is the control signal of the VSV for evaporative emission purge outputted from the EFI ECU normally?

SPECIFIED VALUE: Continuity exists.

(2) Between the VSV for evaporative emission purge connection vehicle harness side connector 2 (PRG) and the body earth

SPECIFIED VALUE: No continuity exists

3.Are the check results for open wire and short OK?

▼<u>If it is OK, go to ⌦5.</u>

▼<u>If it is NG, repair or replace the harness or connector.</u>

⌦5. Unit check of purge VSV for EVAP.

1.Perform the unit check of the VSV for evaporative emission purge.

Refer to Page B8-225.

2.Are the unit check results OK?

▼<u>If it is OK, check the EFI ECU circuit.</u>

Refer to Page A1-24.

▼<u>If it is NG, replace the purge VSV for EVAP.</u>

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Evaporative emission purge hose check

1.Check if there are any evaporative emission purge hoses pulled out or damaged

SPECIFIED VALUE: There are none pulled out nor damaged.

▼<u>If it is OK, proceed to ⊳2.</u>

▼<u>If it is NG, repair or replace the hose.</u>

⊳2. VSV for evaporative emission control system purge control voltage check

1.Remove the connector of the VSV for evaporative emission control system purge control.

2.Perform voltage measurement between the following terminals when the IG switch is "ON".

(1) Between VSV for evaporative emission control system purge control vehicle harness side connector 2 (+B) - body earth

SPECIFIED VALUE: Battery voltage

▼<u>If it is OK, proceed to ⊳3.</u>

▼<u>If it is NG, perform checking or repairing of the harness and relay between the following terminals.</u>

(2) Between battery - VSV for evaporative emission control system purge control

⊳3. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.

(1) Between ECU connection vehicle harness side connector 16 (PRG) - VSV for evaporative emission control system purge control side connector 1 (PRG)

SPECIFIED VALUE: Continuity exists.

▼<u>If it is OK, proceed to ⊳4.</u>

▼<u>If it is NG, repair the harness and the connectors.</u>

⊳4. VSV for evaporative emission control system purge control unit check

1.Perform unit check of the VSV for evaporative emission control system purge control.

Refer to Page B8-225.

▼<u>If it is OK, proceed to ⊳5.</u>

▼<u>If it is NG, replace the VSV for evaporative emission control system purge control.</u>

⊳5. Connection condition check of each connector

1.Check the connecting conditions of each connector.

SPECIFIED VALUE: There are none that is half fit or pulled out.

▼<u>If it is OK, check the EFI ECU circuit.</u>

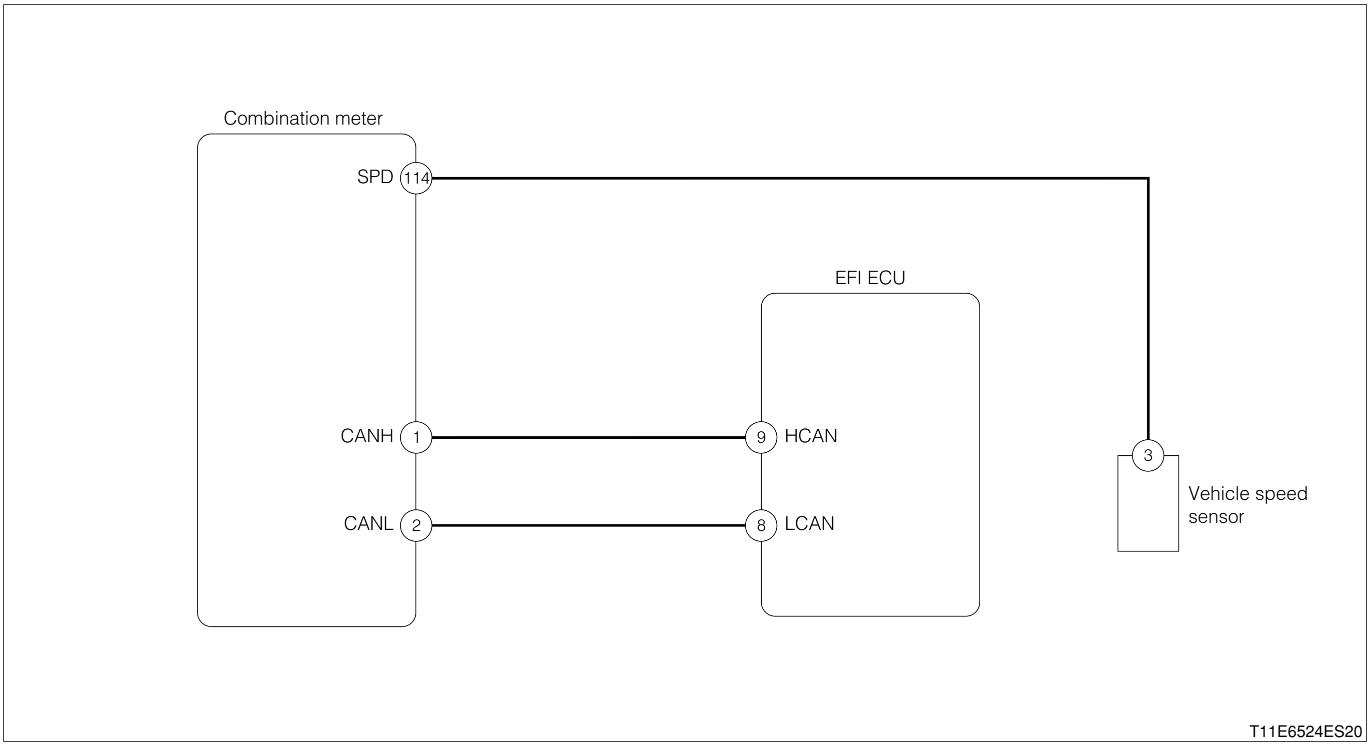
Refer to Page A1-24.

▼<u>If it is NG, repair the connector of the defective section.</u>

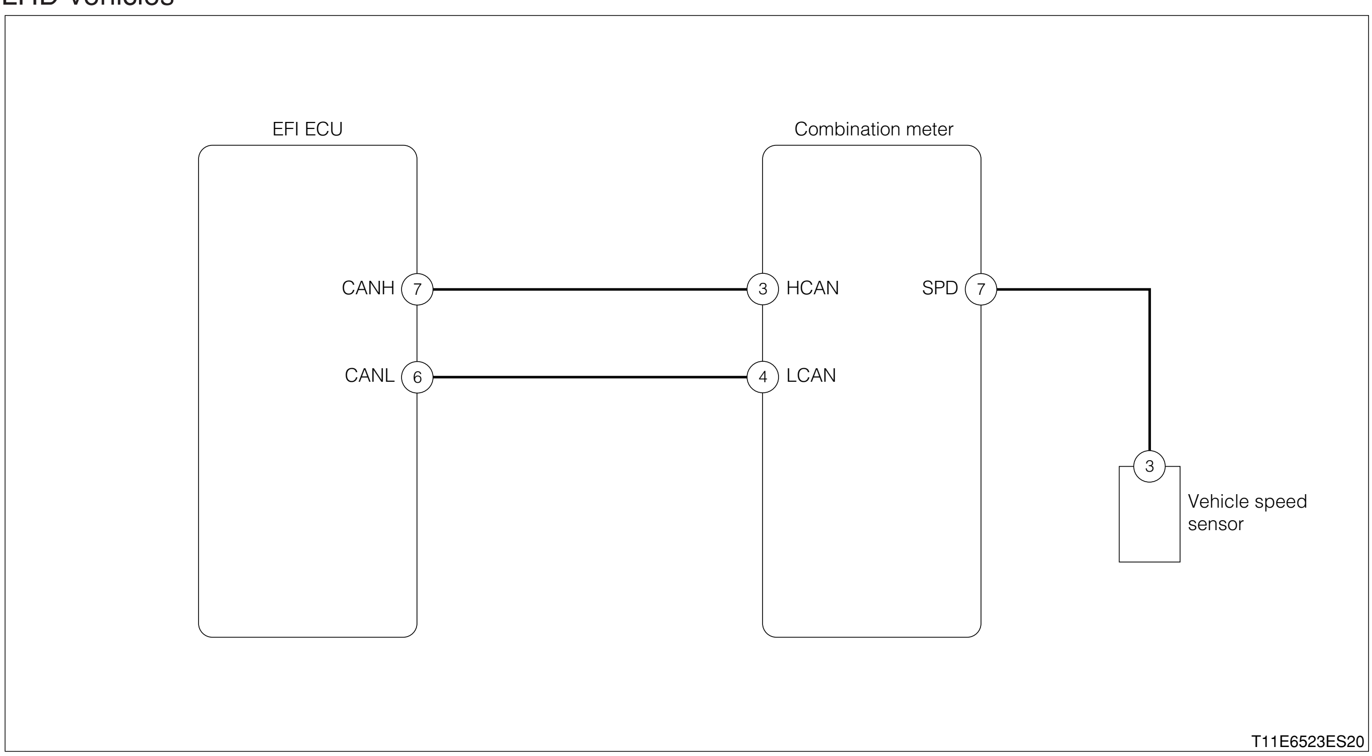
7-12-16 DTC NO.P0500/52 VEHICLE SPEED SENSOR CIRCUIT MALFUNCTION

(1) System diagram

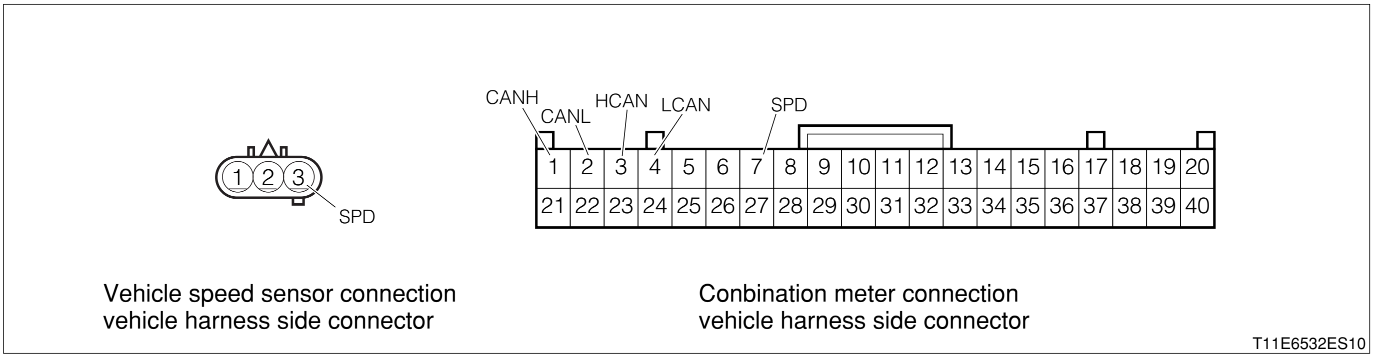
RHD vehicles



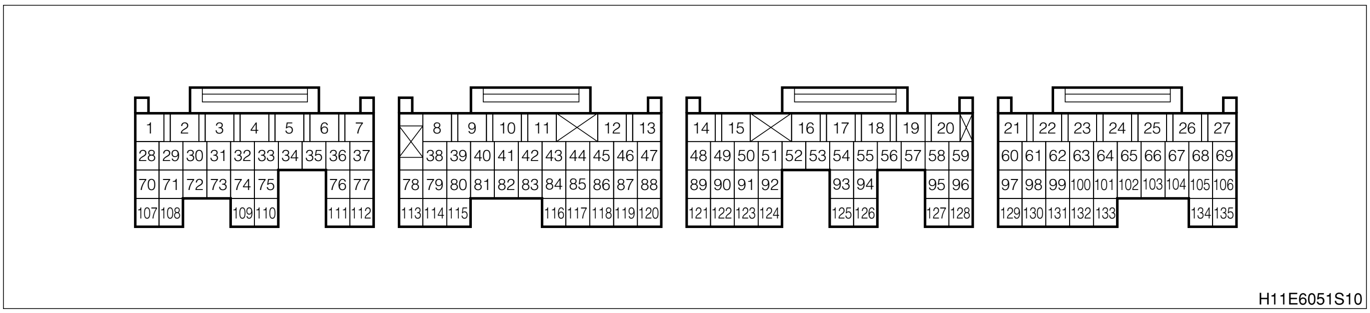
LHD vehicles



Each unit, relays connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Diagnosis code output conditions

1.When no vehicle speed signal is inputted from the combination meter

(3) Checking points

1.Is the vehicle speed signal inputted to the combination meter?
2.Is the combination meter normal?
3.Is the CAN line normal?
4.Is the harness between the vehicle speed sensor and the combination meter normal?
5.Is the vehicle speed sensor normal?

① When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

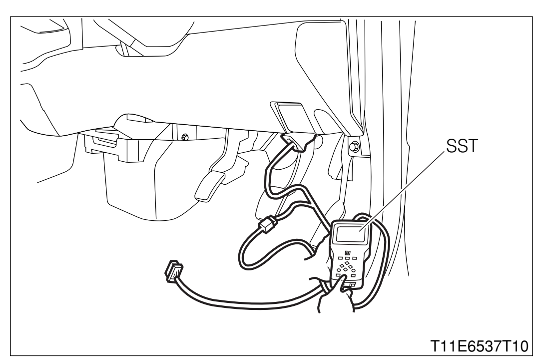
⊳1. CAN communication basic check

1.Perform basic check of the CAN communication.
Refer to Page L2-14.

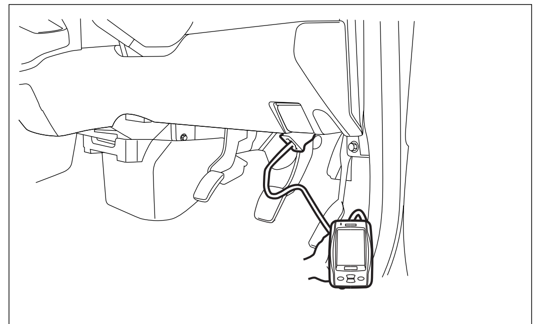
▼If it is OK, proceed to ⊳2.
▼If NG, repair the faulty section and go to ⊳2.

⊳2. Vehicle speed signal check

1.The IG switch turned "LOCK".
2.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



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3.After turning "ON" the IG switch, Turn "ON" the main switch of the tester.
4.Read the "Vehicle speed" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.
5.Check to see if the normal vehicle speed is indicated on the tool.
SPECIFIED VALUE: The normal vehicle speed is indicated.

▼If it is OK, proceed to ⌦3.
▼If it is NG and the vehicle is a RHD vehicle, go to ⌦4.
▼If it is NG and the vehicle is a LHD vehicle, go to ⌦6.

⌦3. Combination meter operation check

1.Check to see if the speedometer of the combination meter functions properly.
SPECIFIED VALUE: The normal vehicle speed is indicated.

▼If it is OK, perform the operations in the following order.
(1) Erase the diagnosis code and check the state for a while.
(2) If the diagnosis code is once again outputted, replace the EFI ECU.
▼If it is NG, proceed to ⌦8.

⌦4. CAN line open wire check (RHD vehicles)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU.
3.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 8 (LCAN) - EFI ECU connection vehicle harness side connector 9 (HCAN)
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⌦5.
▼If it is NG, repair the defective point.

⌦5. CAN line short circuit check check (RHD vehicles)

1.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 8 (LCAN) - battery positive terminal
(2) Between ABS actuator connection vehicle harness side connector 19 (LCAN) - battery positive terminal
(3) Between EFI ECU connection vehicle harness side connector 8 (LCAN) - body earth
(4) Between EFI ECU connection vehicle harness side connector 9 (HCAN) - body earth
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⌦8.
▼If it is NG, repair the defective point.

⊳6. CAN line open wire check (LHD vehicles)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU.
3.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - EFI ECU connection vehicle harness side connector 7 (CANH)
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳7.
▼If it is NG, repair the defective point.

⊳7. CAN line short circuit check check (LHD vehicles)

1.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - battery positive terminal
(2) Between ABS actuator connection vehicle harness side connector 7 (CANH) - battery positive terminal
(3) Between EFI ECU connection vehicle harness side connector 6 (CANL) - body earth
(4) Between EFI ECU connection vehicle harness side connector 7 (CANH) - body earth
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳8.
▼If it is NG, repair the defective point.

⊳8. Combination meter input signal check

1.Check the vehicle speed input signal to the combination meter.
Refer to Page J3-1.

▼If it is OK, replace the combination meter and go to ⊳2.
▼If it is NG, proceed to ⊳9.

⊳9. Check of wire harness continuity

1.Perform the continuity check between the following terminals.
(1) Combination meter vehicle harness side connector 7 (SPD) - Vehicle speed sensor vehicle harness side connector 3 (SPD)
▼If it is OK, replace the vehicle speed sensor.
▼If it is NG, repair the defective point.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. CAN communication basic check

1.Perform basic check of the CAN communication.
Refer to Page L2-14.

▼If it is OK, proceed to ⊳2.
▼If NG, repair the faulty section and go to ⊳2.

⊳2. Combination meter operation check

1.Check to see if the speedometer of the combination meter functions properly.
SPECIFIED VALUE: The normal vehicle speed is indicated.

▼If it is OK and the vehicle is a RHD vehicle, go to ⊳3.
▼If it is OK and the vehicle is a LHD vehicle, go to ⊳5.
▼If it is NG, proceed to ⊳7.

⊳3. CAN line open wire check (RHD vehicles)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU.
3.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 8 (LCAN) - EFI ECU connection vehicle harness side connector 9 (HCAN)
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳4.
▼If it is NG, repair the defective point.

⊳4. CAN line short circuit check check (RHD vehicles)

1.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 8 (LCAN) - battery positive terminal
(2) Between ABS actuator connection vehicle harness side connector 19 (LCAN) - battery positive terminal
(3) Between EFI ECU connection vehicle harness side connector 8 (LCAN) - body earth
(4) Between EFI ECU connection vehicle harness side connector 9 (HCAN) - body earth
SPECIFIED VALUE: No continuity exists.

▼If it is OK, perform the operations in the following order.
(1) Erase the diagnosis code and check the state for a while.
(2) If the diagnosis code is once again outputted, replace the EFI ECU.
▼If it is NG, repair the defective point.

⊳5. CAN line open wire check (LHD vehicles)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU.
3.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - EFI ECU connection vehicle harness side connector 7 (CANH)
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳6.
▼If it is NG, repair the defective point.

⊳6. CAN line short circuit check check (LHD vehicles)

1.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - battery positive terminal
(2) Between EFI ECU connection vehicle harness side connector 7 (CANH) - battery positive terminal
(3) Between EFI ECU connection vehicle harness side connector 6 (CANL) - body earth
(4) Between EFI ECU connection vehicle harness side connector 7 (CANH) - body earth
SPECIFIED VALUE: No continuity exists.

▼If it is OK, perform the operations in the following order.
(1) Erase the diagnosis code and check the state for a while.
(2) If the diagnosis code is once again outputted, replace the EFI ECU.
▼If it is NG, repair the defective point.

⊳7. Combination meter input signal check

1.Check the vehicle speed input signal to the combination meter.
Refer to Page J3-1.

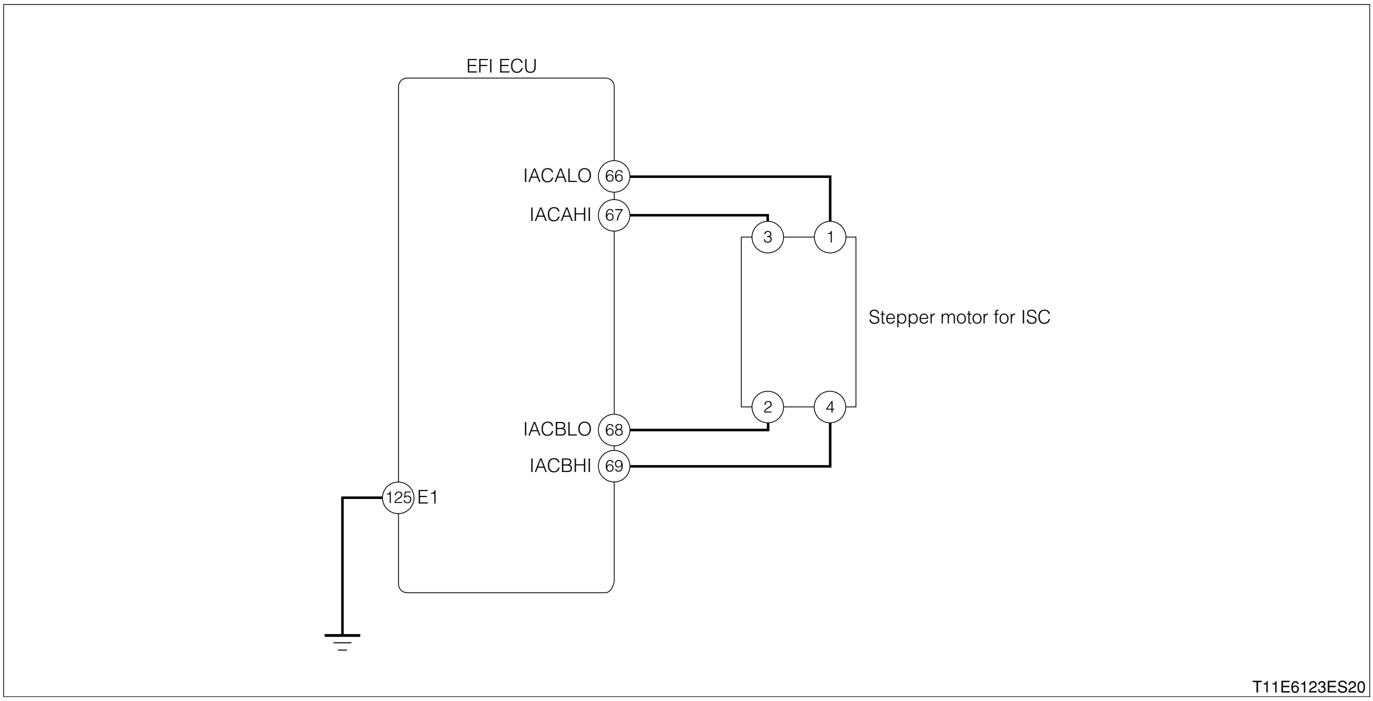
▼If it is OK, replace the combination meter and go to ⊳2.
▼If it is NG, proceed to ⊳8.

⊳8. Check of wire harness continuity

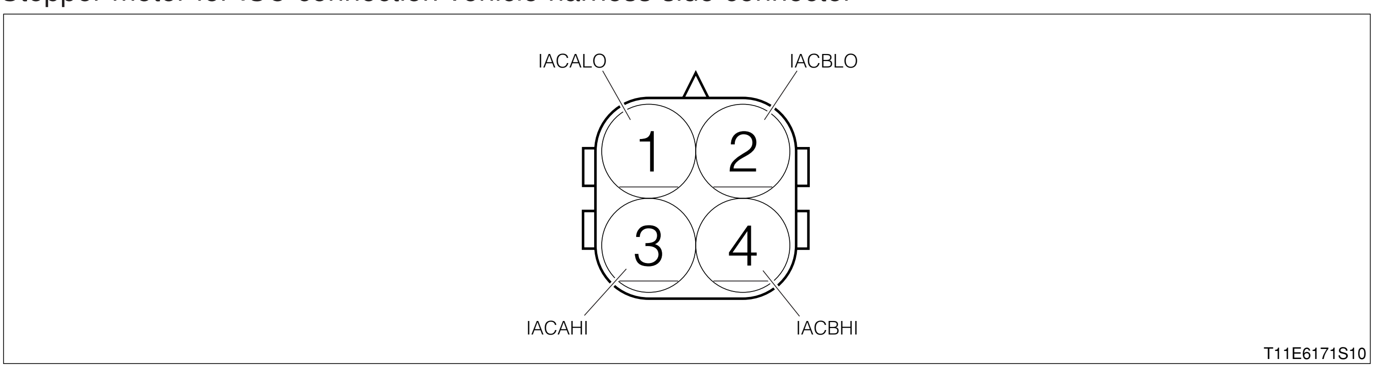
1.Perform the continuity check between the following terminals.
(1) Combination meter vehicle harness side connector 7 (SPD) - Vehicle speed sensor vehicle harness side connector 3 (SPD)
▼If it is OK, replace the vehicle speed sensor.
▼If it is NG, repair the defective point.

7-12-17 DTC NO.P0505/71 IDLE CONTROL SYSTEM MALFUNCTION

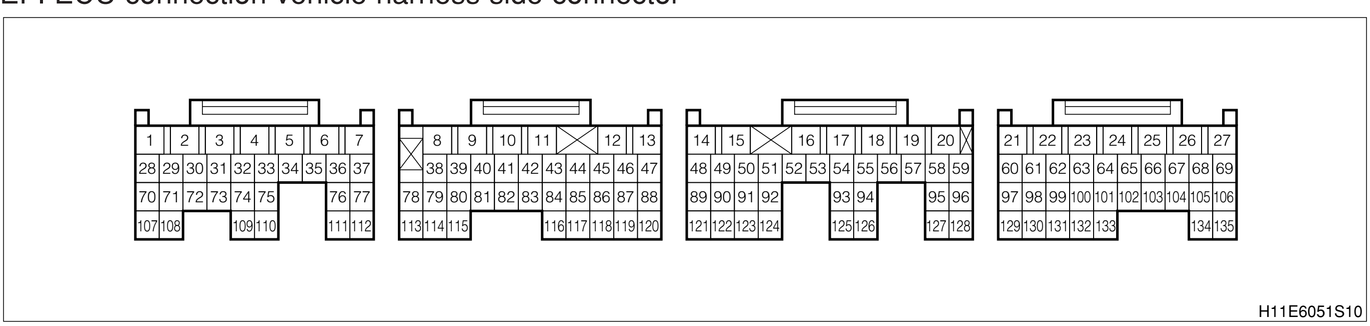
(1) System diagram



Stepper motor for ISC connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1. The EFI ECU drives the stepper motor for ISC, thereby changing the passage area that bypasses the main passage where the throttle valve exists. As a result, the air volume being sucked during the idling is controlled.
2. The stepper motor for ISC performs a driving over 200 steps from the fully-closed position to the fully-opened position. The bypass passage is opened in the reverse direction, while the bypass passage is closed in the forward direction.

(3) Diagnosis code output conditions

1. When the signals are deviated from the specified range continuously over a certain length of time,

(4) Trouble area

1.Open wire or short circuit for ISC system circuit
2.Stepper motor for ISC
3.EFI ECU

(5) Checking points

1.Is the harness between the stepper motor for ISC and the EFI ECU normal?
2.Is the stepper motor for ISC operating normally?

(6) Inspection procedure

① When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

ᐅ1. Check of idle speed

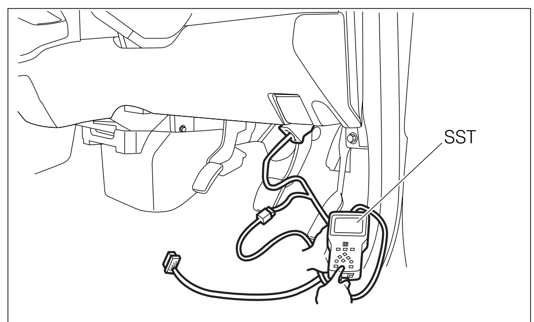
1.Is the engine revolution speed high during cold period and does it get lower as the warm-up proceeds and maintain idling speed?

SPECIFIED VALUE: 750^{+100}_{-50} rpm

▼If it is OK, proceed to ᐅ2.
▼If it is NG, proceed to ᐅ3.

ᐅ2. Re-confirmation of DTC.

1.The IG switch turned "LOCK".
2.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000



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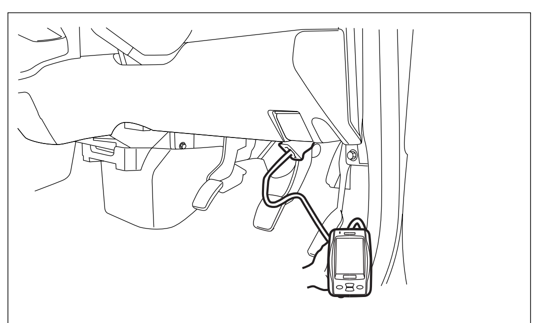
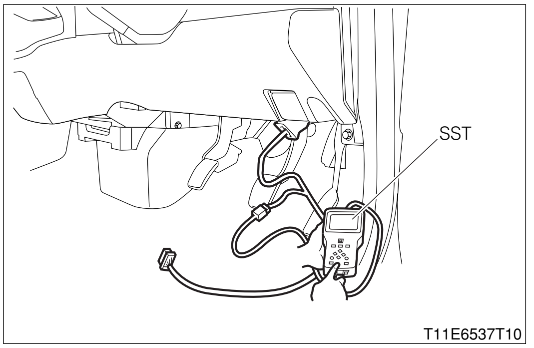
(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.


T11E6573T10

3.Turn "ON" the IG switch, and turn "ON" the main switch of the tester.
4.Erase the DTC. (As for the operation, follow the instruction manual of the diagnosis tester (DS-21/DS-Ⅱ).)
5.Turn "OFF" the main switch of the tester. Turn "LOCK" the IG switch.
6.Turn "ON" the IG switch. Turn "ON" the main switch of the tester.
7.Check the DTC.
▼If it is OK, the ISC system is normal.
▼If it is NG, check the EFI ECU circuit.
<RefCode=SA01_0041 file="EA01.txt">

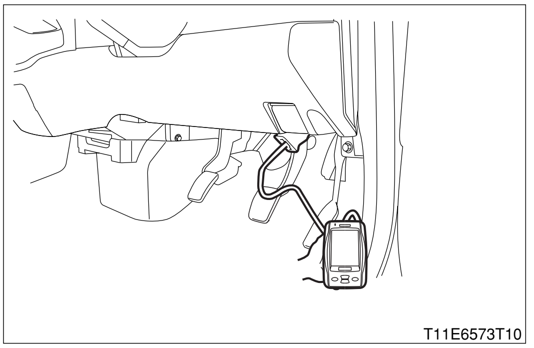
⊳3. Operation check of stepper motor for ISC.

1.IG switch turned "LOCK".
2.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000



T11E6537T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.


T11E6573T10

3.Warm up the engine fully.
4.Turn "ON" the main switch of the diagnosis tester (DS-21/DS-Ⅱ).
5.Drive the actuator during idling.
(1) DS-21: Select the "ISC" of the "Actuator driving".
Execute the "Open" and "Close" respectively.
(2) DS-Ⅱ: Select the "ISC" of the "Active test".
Execute the "Open" and "Close" respectively.
6.Ensure that the engine revolution speed rises when the "Open" is selected. Also ensure that the engine revolution speed drops when the "Close" is selected.
SPECIFIED VALUE: The engine revolution speed will change.

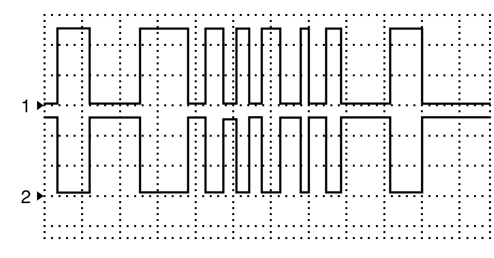
▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, go to ⊳4.

⊳4. Check of output signal of stepper motor for ISCof ECU.

1.Turn "OFF" the main switch of the tester. Turn "LOCK" the IG switch.
2.Connect the SST.
SST: 09842-97209-000

3.Warm up the engine.
4.Perform output check between the following terminals using an oscilloscope.
(1) Between SST 66 (IACALO) - SST 125 (E1) (Right figure 1▶)
(2) Between SST 67 (IACAHI) - SST 125 (E1) (Right figure 2▶)



T11E6246T10

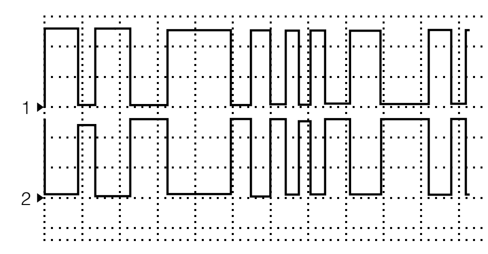
Time axis	1s / DIV
Voltage axis	5V / DIV
Measuring condition	When air conditioner is "ON" and while idling

Air conditioner "ON": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "ON".

NOTE

- The waveform cannot be specified, but confirm that a waveform as in the right figure (one such example) shows up.

(3) Between SST 68 (IACBLO) - SST 125 (E1) (Right figure 1▶)
(4) Between SST 69 (IACBHI) - SST 125 (E1) (Right figure 2▶)



T11E6247T10

Time axis	1s / DIV
Voltage axis	5V / DIV
Measuring condition	When air conditioner is "ON" and while idling

Air conditioner "ON": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "ON".

NOTE

- The waveform cannot be specified, but confirm that a waveform as in the right figure (One such example) shows up.

5.Confirm the following points.
(1) The pulse of 0V ⇄ battery voltage is generated.
(2) The "LO" and "HI" will form waveforms in opposite phase.

▼If it is OK, go to ⊳5.
▼If it is NG, replace the EFI ECU.
Refer to Page B8-1.

⊳5. Check of harness between valve for ISC and ECU.

1.Turn "OFF" the main switch of the tester. Turn "LOCK" the IG switch.
2.Disconnect the SST connector at the EFI ECU side.
3.Perform continuity check between each of the following terminals.
(1) Between stepper motor for ISC connection vehicle harness side connector 1 (IACALO) - ECU connection vehicle harness side connector 66 (IACALO)
(2) Between stepper motor for ISC connection vehicle harness side connector 2 (IACBLO) - ECU connection vehicle harness side connector 68 (IACBLO)
(3) Between stepper motor for ISC connection vehicle harness side connector 31 (IACAHI) - ECU connection vehicle harness side connector 67 (IACAHI)
(4) Between stepper motor for ISC connection vehicle harness side connector 4 (IACBHI) - ECU connection vehicle harness side connector 69 (IACBHI)

4.Are the check results for open wire and short OK?

▼If it is OK, replace the throttle body Ay.

Refer to Page B3-3.

▼If it is NG, repair or replace the harness or connector.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

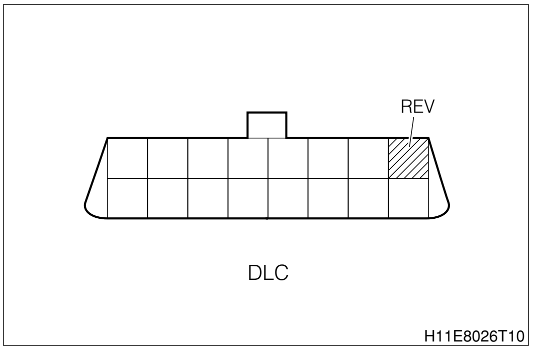
⊳1. Check of idle speed

1.Install an engine tachometer to the terminal "REV" of the DLC, using the SST.

SST: 09991-87402-000
09991-87404-000

NOTE

- The SST 09991-87404-000 is a harness for extension use. This does not have to be used.



2.Is the engine revolution speed high during cold period and does it get lower as the warm-up proceeds and maintain idling speed?

SPECIFIED VALUE: 750^{+100}_{-50} rpm

▼If it is OK, the ISC system is normal.

▼If it is NG, proceed to ⊳2.

⊳2. Stepper motor for ISC operation check

1.Confirm whether the stepper motor for ISC is making an operation sound right after the engine is stopped using a sound scope or a long screwdriver.

SPECIFIED VALUE: It is making operation sound.

▼If it is OK, proceed to ⊳4.

▼If it is NG, proceed to ⊳3.

⊳3. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.

(1) Between stepper motor for ISC connection vehicle harness side connector 1 (IACALO) - ECU connection vehicle harness side connector 66 (IACALO)

(2) Between stepper motor for ISC connection vehicle harness side connector 2 (IACBLO) - ECU connection vehicle harness side connector 68 (IACBLO)

(3) Between stepper motor for ISC connection vehicle harness side connector 31 (IACAHI) - ECU connection vehicle harness side connector 67 (IACAHI)

(4) Between stepper motor for ISC connection vehicle harness side connector 4 (IACBHI) - ECU connection vehicle harness side connector 69 (IACBHI)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳4.

▼If it is NG, repair the harness and connectors and recheck it.

⊳4. EFI ECU signal check

1.Connect the SST.

SST: 09842-97209-000

2.Perform output check between the following terminals using an oscilloscope.

(1) Between SST 66 (IACALO) - SST 125 (E1) (Right figure 1▶)

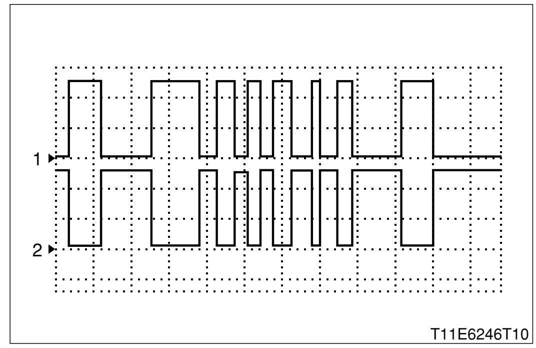
(2) Between SST 67 (IACAHI) - SST 125 (E1) (Right figure 2▶)

Time axis	1s / DIV
Voltage axis	5V / DIV
Measuring condition	When air conditioner is "ON" and while idling

Air conditioner "ON": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "ON".

NOTE

- The waveform cannot be specified, but confirm that a waveform as in the right figure (One such example) shows up.



(3) Between SST 68 (IACBLO) - SST 125 (E1) (Right figure 1▶)

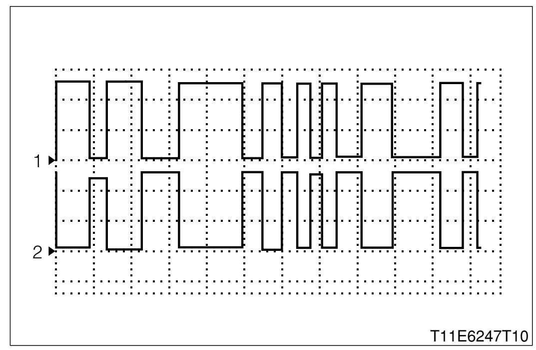
(4) Between SST 69 (IACBHI) - SST 125 (E1) (Right figure 2▶)

Time axis	1s / DIV
Voltage axis	5V / DIV
Measuring condition	When air conditioner is "ON" and while idling

Air conditioner "ON": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "ON".

NOTE

- The waveform cannot be specified, but confirm that a waveform as in the right figure (one such example) shows up.



3.Confirm the following points.

(1) The pulse of 0V ⇄ battery voltage is generated.

(2) The "LO" and "HI" will form waveforms in opposite phase.

▼If it is OK, replace the throttle body Ay.

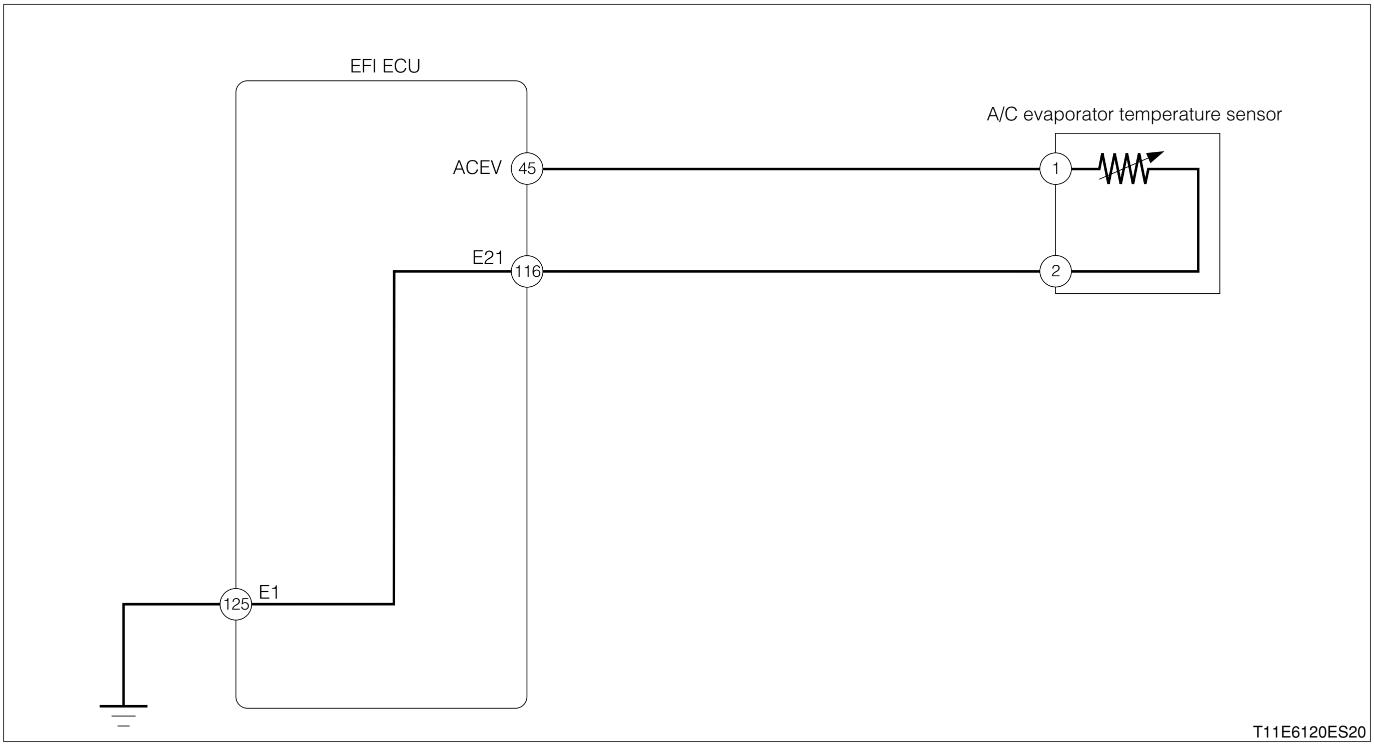
Refer to Page B3-3.

▼If it is NG, check the EFI ECU circuit.

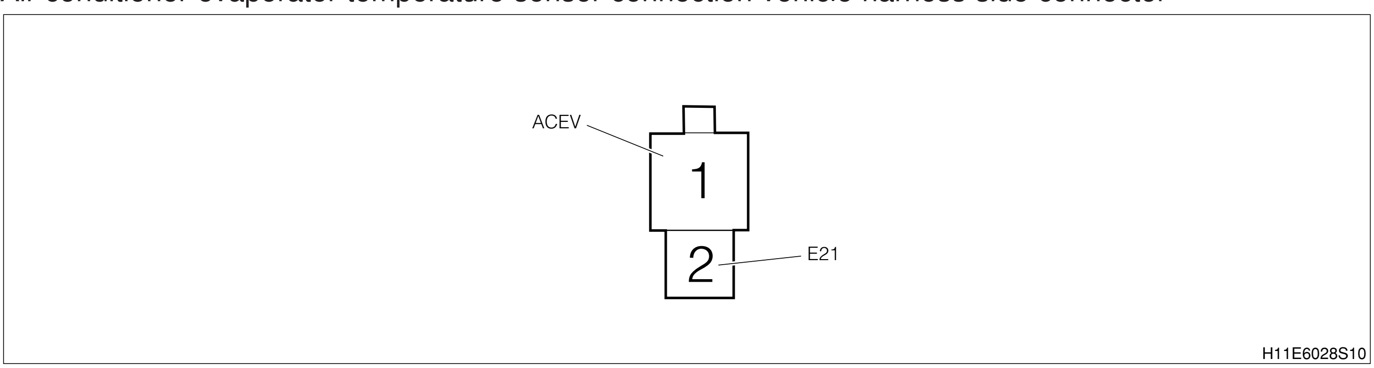
Refer to Page A1-24.

7-12-18 DTC NO.P0535/44 AIR CONDITIONER EVAPORATOR TEMPERATURE SENSOR CIRCUIT MALFUNCTION

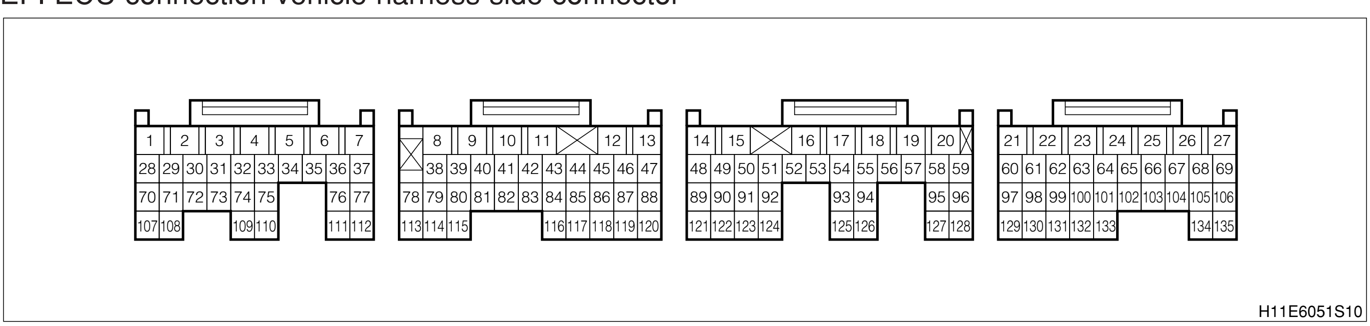
(1) System diagram



Air conditioner evaporator temperature sensor connection vehicle harness side connector

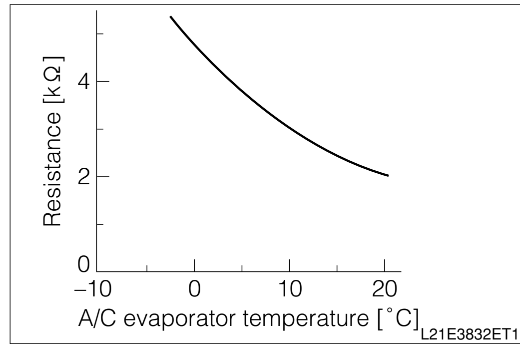


EFI ECU connection vehicle harness side connector



(2) Circuit description

1.This circuit, located at the rear of the evaporator of the air conditioner unit, detects the temperature of the air passing through the evaporator. A thermistor is incorporated in the sensor. This thermistor has characteristics that its resistance decreases as the temperature rise, while the resistance increases as the temperature drops. When the temperature becomes a constant value, the thermistor disengages the magnet clutch through the MGC relay, thus preventing frosting.



(3) Diagnosis code output conditions

1.When the signals from the air conditioner evaporator temperature sensor are not outputted continuously over a certain length of time after starting with the air conditioner switch turned "ON"

(4) Trouble area

1.Air conditioner (A/C) evaporator temperature sensor
2.Open wire or short circuit for the air conditioner evaporator temperature sensor
3.EFI ECU

(5) Checking points

1.Are the signals from the air conditioner evaporator temperature sensor inputted to the EFI ECU?
2.Is the harness between the air conditioner evaporator temperature sensor and the EFI ECU normal?
3.Is the output of the air conditioner evaporator temperature sensor normal?

(6) Inspection procedure

① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⊳1. Check of ECU output voltage.

1.Set the SST.
SST: 09842-97209-000

2.IG switch turned "ON"
3.Measure the voltage between the following terminals.
(1) Between SST 45 (ACEV) and 116 (E21)
SPECIFIED VALUE: 0.1 - 4.8 V (Varies, depending upon the temperature.)

4.Are the check results OK?
▼<u>If it is NG, go to ⊳2.</u>
▼<u>If it is NG, check the EFI ECU circuit.</u>
Refer to Page A1-24.

⊳2. Wiring harness check

1.With the IG switch turned "LOCK", disconnect the SST connector from the ECU.

2.Perform the continuity check between the following terminals.

(1) Harness side connector 1 (ACEV) of sensor - EFI ECU 45 (ACEV)

(2) Harness side connector 2 (E21) of sensor - EFI ECU 116 (E21)

SPECIFIED VALUE: Continuity exists

3.Are the check results for open wire and short OK?

▼If it is OK, go to ⊳3.

▼If it is NG, repair the defective point.

⊳3. Unit check of A/C evaporator temperature sensor.

1.Perform the unit check of the air conditioner evaporator temperature sensor.

Refer to Page B8-223.

2.Are the unit check results OK?

▼If it is OK, check or replace the EFI ECU.

▼If it is NG, replace the A/C evaporator temperature sensor

7-12-19 DTC NO.P1105/32 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION

(1) Circuit description

1.An atmospheric sensor is mounted in the ECU.

(2) Diagnosis code output conditions

1.When the signals from the atmospheric pressure sensor are not outputted continuously over a certain length of time after starting.

(3) Trouble area

1.EFI ECU

(4) Inspection procedure

① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

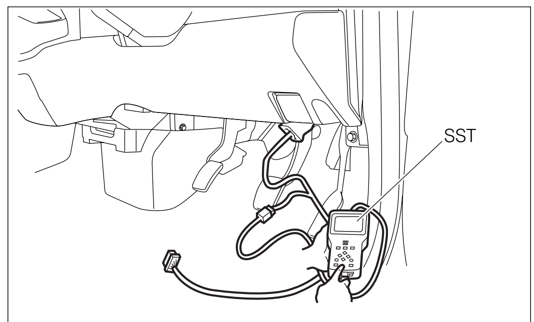
1. Erase the DTC

1.The IG switch turned "LOCK".

2.Connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

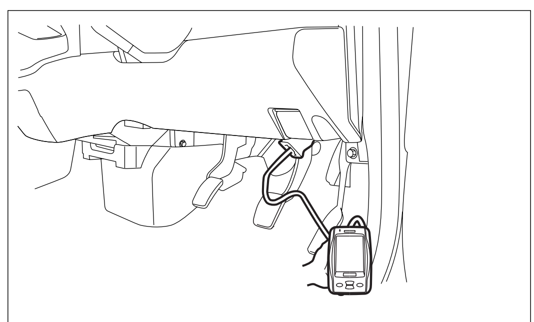
SST: 09991-87404-000



T11E6537T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



T11E6573T10

3.After turning "ON" the IG switch, Turn "ON" the main switch of the tester.

4.Cancel the diagnosis code.

5.Is No.P1105/32 indicated ?

▼<u>If the output is made, replace the EFI ECU.</u>

▼<u>If no output is made, check the EFI ECU circuit.</u>

Refer to Page A1-24.

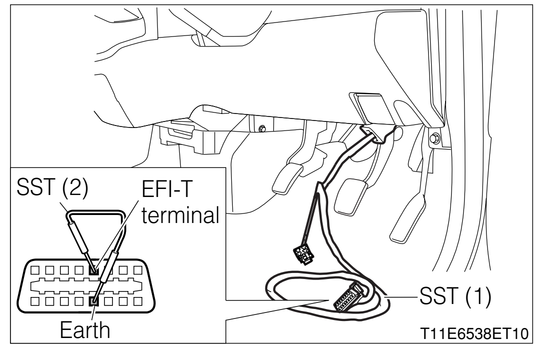
② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Erase the DTC

1.Remove the EFI fuse. Erase the DTC.
2.Set the EFI fuse to the original position.
3.Short circuit the DLC terminals 5 (EFI-T) and 13 (E), using the SST.
SST: 09991-87404-000(1)
09991-87403-000(2)
4.Turn "ON" the IG switch.
5.Check the DTC.
6.Is No.P1105/32 indicated ?

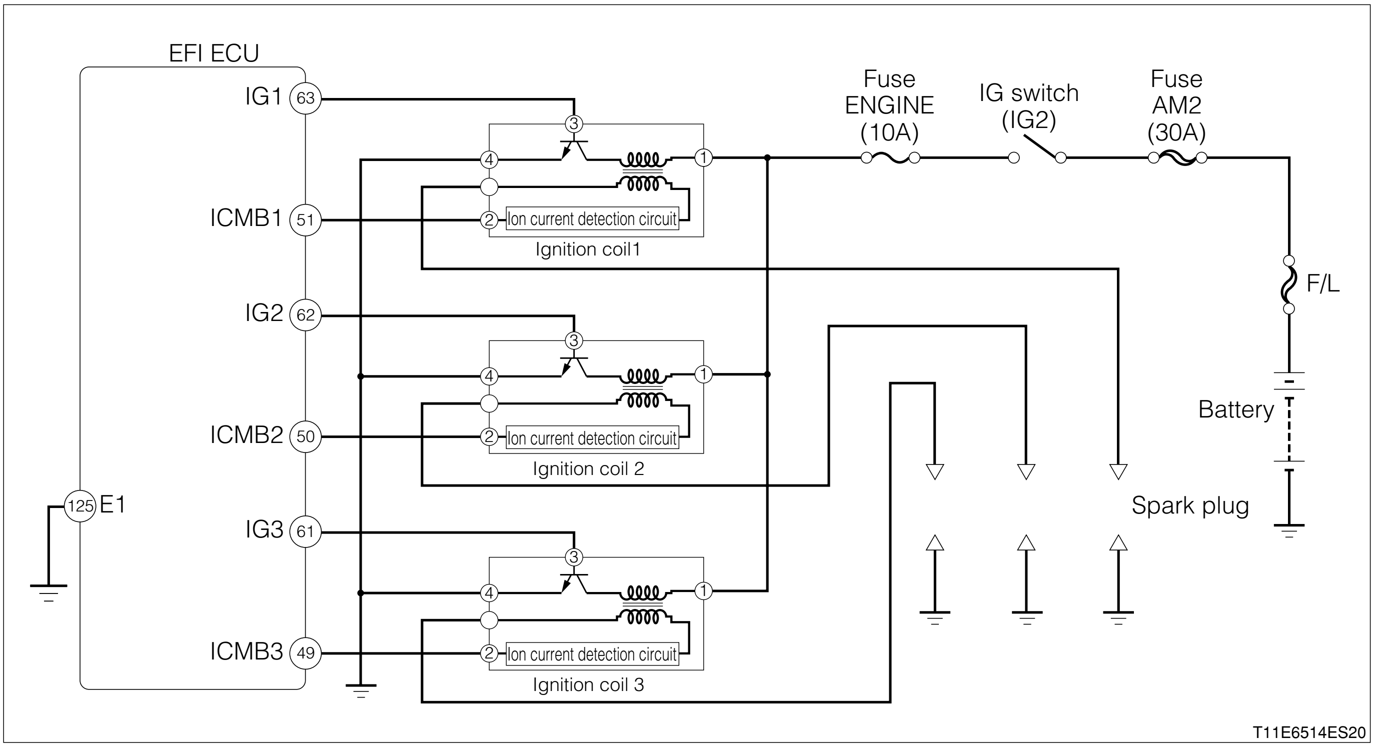
▼If the output is made, replace the EFI ECU.
Refer to Page B8-1.

▼If no output is made, check the EFI ECU circuit.
Refer to Page A1-24.

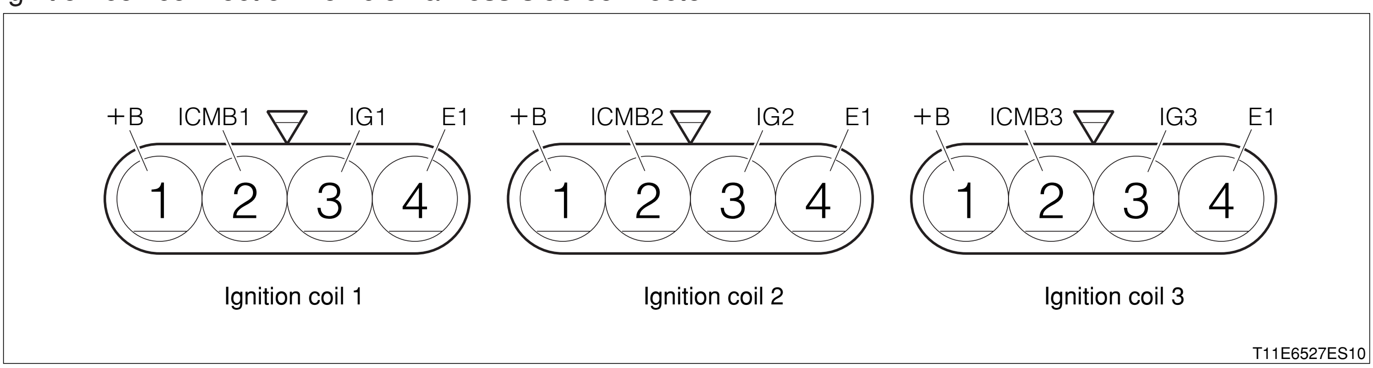


7-12-20 DTC NO.P1300/36 ION CURRENT COMBUSTION CONTROL SYSTEM

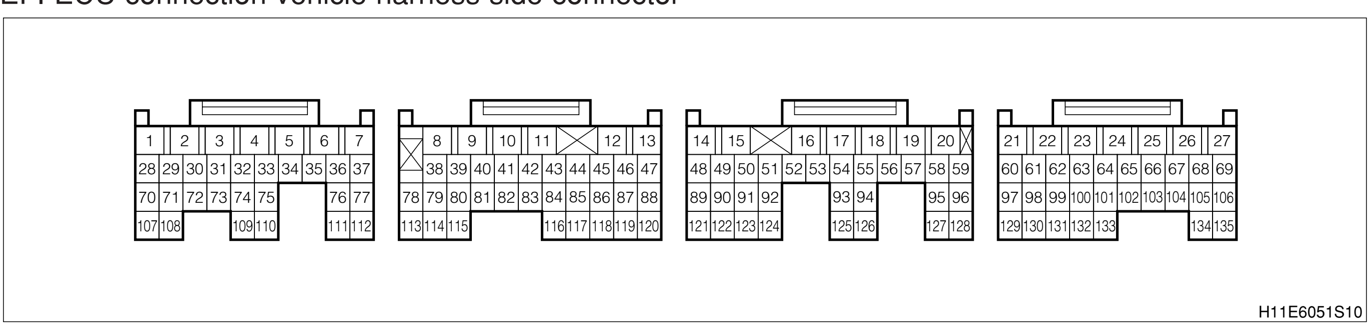
(1) System diagram



Ignition coil connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1. This system detects any misfire of the engine by using an ion current which has the same waveforms as those of the combustion pressure. When any misfire takes place, no ion current is produced. Therefore, if the input voltage at the ECU side is below a certain value, it is judged that a misfire took place. Since the detected ion current is very weak, it is amplified in the igniter unit.

(3) Diagnosis code output conditions

1. After the engine has been warmed up, when the signal from the ion current combustion control system is not inputted to the EFI ECU while the engine is running
2. After the engine has been warmed up, when the signal from the ion current combustion control system is inputted continuously to the EFI ECU while the engine is running
3. When the signal from the ion current combustion control system is inputted to the EFI ECU during the fuel-cut operation

(4) Trouble area

1. Open wire or short circuit for ion system circuit
2. Ignition coil
3. Spark plug
4. EFI ECU

(5) Checking points

1. Is the ignition system normal?
2. Is the signal from the ion current combustion control system normal?
3. Is the combustion system normal?
4. Is the harness between the ignition coil and the EFI ECU normal?
5. Is the ignition coil is normal?
6. Is the EFI ECU normal?

(6) Inspection procedure

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⌦1. Diagnosis code check

1. Use the SST to short-circuit DLC terminals between 5(EFI-T) - 13(E).
   SST: 09991-87404-000
   09991-87403-000

2. Check whether the diagnosis code other than Code No.36 is outputted or not.
   SPECIFIED VALUE: No output.

▼<u>If it is OK, go to ⌦2.</u>
▼<u>In the case of NG, first check and repair a condition that caused the diagnosis code output.</u>

⌦2. Unit check of spark plug

1. Check whether the designated spark plug is used. (See Engine Turning-up section for spark plug specifications.)
   Refer to Page B1-4.

2. Perform the unit check of the spark plug
   Refer to Page B8-223.

▼<u>If it is OK, go to ⌦3.</u>
▼<u>If it is NG, clean or replace the spark plug. If a designated spark plug is not used, replace the spark plug with the designated spark plug.</u>

⊳3. Spark check

WARNING

- There is a hazard potential for sparks are generated. Do not place combustible materials in the vicinity.

1.Warm up the engine.
2.Set the IG switch to "LOCK".
3.Remove the fuel pump relay.
4.Idle the engine and wait until the engine stops by itself.
5.Set the IG switch to "LOCK".
6.Remove all the connectors from the injector.

CAUTION

- Operations described above will stop fuel injection, thus preventing damage to the catalyst due to non-burned gas etc.

7.Remove the spark plug and install it to the ignition coil to earth the plug.
8.Check whether the spark plug generates sparks during cranking.

SPECIFIED VALUE: Sparks are generated.

▼If it is OK, go to ⊳8.
▼If it is NG, go to ⊳4.

⊳4. EFI ECU signal check (1)

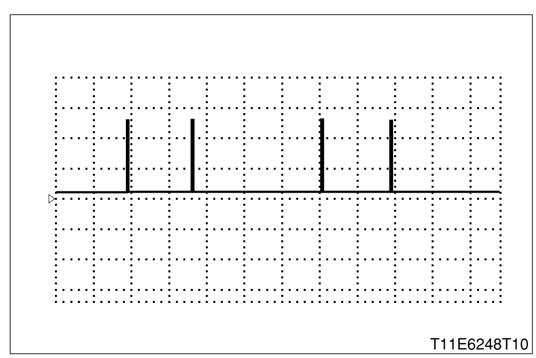
1.Connect the SST.

SST: 09842-97209-000

2.Completely warm up the engine.
3.When the engine is in the starting condition, check an output waveform of an ignition signal between the following terminals using an oscilloscope.
(1) Between SST 63(IG1) - SST 125 (E1)
(2) Between SST 62(IG2) - SST 125 (E1)
(3) Between SST 61(IG3) - SST 125 (E1)

Time axis	100ms / DIV
Voltage axis	2V / DIV
Condition	Air-conditioner "OFF", no electrical load, idling

Air-conditioner "OFF": Set the air-conditioner switch (ACSW), blower switch (BLW), and magnet clutch (MGC) to "OFF".



NOTE

- Check that the waveform shown in the figure [Example] is displayed.

4.Check the following points.
(1) The pulse of 0 ⇄ 5V is generated.
(2) The waveform cycle is shortened as the engine speed increases.

NOTE

- The ignition signal can not be judged correctly if an oscilloscope is not used.

▼If it is OK, go to ⊳5.
▼If it is NG, check the EFI ECU circuit.

Refer to Page A1-24.

⊳5. Wire harness continuity check (1)

1.Check continuity between the following terminals.

(1) Between ignition coil 1connection vehicle harness side connector 3 (IG1) - ECU connection vehicle harness side connector 63 (IG1)

(2) Between ignition coil 2 connection vehicle harness side connector 3 (IG2) - ECU connection vehicle harness side connector 62 (IG2)

(3) Between ignition coil 3 connection vehicle harness side connector 3 (IG3) - ECU connection vehicle harness side connector 61 (IG3)

SPECIFIED VALUE: Continuity exists

▼If it is OK, go to ⊳6.

▼If it is NG, repair or replace the faulty harness.

⊳6. Ignition coil voltage check

1.Measure the voltage between the following terminals when the IG switch is "ON".

(1) Between each ignition coil connection vehicle harness side connector 1 (+B) - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, go to ⊳7.

▼In the case of NG, repair or replace the harness between the following terminals.

(2) Each ignition coil - battery

⊳7. Wire harness continuity check (2)

1.Check continuity between the following terminals.

(1) Between each ignition coil connection vehicle harness side connector 4 (E1) - ECU connection vehicle harness side connector 125 (E1)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, replace the ignition coil.

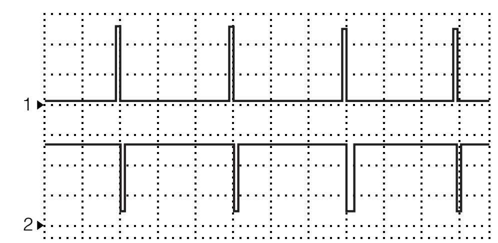
Refer to Page B10-2.

▼In the case of NG, repair or replace the faulty harness.

▷8. EFI ECU signal check (2)

1. Completely warm up the engine.
2. While idling, check each cylinder for output waveforms of the ignition signal (1▶) and ion current combustion control signal (2▶), using an oscilloscope, respectively.

	Channel	+ side measuring terminal	− side measuring terminal
Cylinder No.1	1▶	63 (IG1)	125 (E1)
	2▶	51 (ICMB1)	125 (E1)
Cylinder No.2	1▶	62 (IG2)	125 (E1)
	2▶	50 (ICMB2)	125 (E1)
Cylinder No.3	1▶	61 (IG3)	125 (E1)
	2▶	49 (ICMB3)	125 (E1)



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Time axis	50ms / DIV
Voltage axis	2V / DIV
Condition	Water temperature is 80℃ or more: air conditioner is "ON": Electric load exists: during air conditioner idle up rotation

Air conditioner is "ON": Condition where all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "ON".
Electric load exists: Conditions where the headlight (H/L) and Defogger (DEF) are both "ON".
Air conditioner idle up rotation: 950^{+50}_{-150} rpm

NOTE

- **Check that waveforms like those in the figure (One example) is produced.**

3. Check the following points.
   (1) According to the output waveform of the ignition signal (Channel 1 ▶), the output waveform of the ion current combustion control signal (Channel 2▶) has been produced.
   (2) The waveform of 5 ⇄ 0V has been produced.

NOTE

- **Correct evaluation cannot be made for the ignition signals and ion current combustion control signals, unless you use an oscilloscope.**

	Waveform (Channel 2▶) state
a	Normal
b	Clamped at 0V.
c	Clamped at 5V.
d	Clamped to the battery voltage.
e	Waveform is unstable※.

※: According to the output waveform of the ignition signal (Channel 1 ▶), the output waveform of the ion current combustion control signal (Channel 2▶) has not been produced.

▼<u>In the case of "a", go to ▷9.</u>
▼<u>In the case of "b" go to ▷11.</u>
▼<u>In the case of "c" go to ▷13.</u>
▼<u>In the case of "d" go to ▷12.</u>
▼<u>In the case of "e" go to ▷16.</u>

⊳9. EFI ECU signal check (3)

1.Retain the measurement conditions in ⊳8.

2.Under the following conditions, check each cylinder for output waveforms of the ion current combustion control signal, using an oscilloscope.

(1) Raise the engine revolution speed slowly from the idle state to 4000 rpm. Then, close the throttle opening quickly.

SPECIFIED VALUE: No waveform is outputted while fuel is cut.

▼If it is OK, replace the EFI ECU.

Refer to Page B8-1.

▼If it is NG, go to ⊳10.

⊳10. Fuel cut operation check

1.Check the output state between the following terminals using an oscilloscope.

(1) Between SST 24 (#10) - SST 125 (E1)
(2) Between SST 23(#20) - SST 125 (E1)
(3) Between SST 22(#30) - SST 125 (E1)

2.Check the operating sound of the injector using a sound scope when the fuel cut is active.

NOTE

- Check operating sound, while checking the output waveform to the injector using an oscilloscope.

SPECIFIED VALUE: The operating sound of the injector stops when the fuel cut is active.

▼If it is OK, replace the ignition coil.

Refer to Page B10-2.

▼In the case of NG, perform unit check of the injector.

Refer to Page B8-224.

⊳11. Check of wire harness for short-circuit (1)

1.Check continuity of the cylinder whose waveform is clamped at 0V.

(1) Between ignition coil 1 connection vehicle harness side connector 2 (ICMB1) - body earth
(2) Between ignition coil 2 connection vehicle harness side connector 2 (ICMB2) - body earth
(3) Between ignition coil 3 connection vehicle harness side connector 2 (ICMB3) - body earth

SPECIFIED VALUE: No continuity exists

▼If it is OK, replace the ignition coil.

Refer to Page B10-2.

▼In the case of NG, repair the faulty section.

⊳12. Check of wire harness for short-circuit (2)

1.Check continuity of the cylinder whose waveform is clamped to the battery voltage.

(1) Between ignition coil 1 connection vehicle harness side connector 2 (ICMB1) - battery positive (+) terminal

(2) Between ignition coil 2 connection vehicle harness side connector 2 (ICMB2) - battery positive (+) terminal

(3) Between ignition coil 3 connection vehicle harness side connector 2 (ICMB3) - battery positive (+) terminal

SPECIFIED VALUE: No continuity exists

▼<u>If it is OK, replace the ignition coil.</u>

Refer to Page B10-2.

▼<u>In the case of NG, repair or replace the faulty component.</u>

⊳13. Check of wire harness for open wire

1.Check continuity of the cylinder whose waveform is clamped at 5V.

(1) Between ignition coil 1connection vehicle harness side connector 2 (ICMB1) - EFI ECU connection vehicle harness side connector 51 (ICMB1)

(2) Between ignition coil 2 connection vehicle harness side connector 2 (ICMB2) - EFI ECU connection vehicle harness side connector 50 (ICMB2)

(3) Between ignition coil 3 connection vehicle harness side connector 2 (ICMB3) - EFI ECU connection vehicle harness side connector 49 (ICMB3)

SPECIFIED VALUE: Continuity exists

▼<u>If it is OK, go to ⊳14.</u>

▼<u>In the case of NG, repair or replace the faulty component.</u>

⊳14. Check of short-circuit between the wire harnesses

1.Check whether the cylinder, whose waveform is clamped at 5V, is short-circuited to the power wire of the sensor system.

NOTE

- The power supply for the sensor system is 5V.

(1) Between ignition coil 1 connection vehicle harness side connector 2 (ICMB1) - body earth

(2) Between ignition coil 2 connection vehicle harness side connector 2 (ICMB2) - body earth

(3) Between ignition coil 3 connection vehicle harness side connector 2 (ICMB3) - body earth

SPECIFIED VALUE: 0V

▼<u>If it is OK, replace the ignition coil and go to ⊳15.</u>

Refer to Page B10-2.

▼<u>In the case of NG, repair or replace the faulty component.</u>

⊳15. EFI ECU signal recheck (1)

1.Recheck the cylinder, whose waveform is clamped at 5V, under the ⊳8) conditions.
2.Check that the output waveform of the ion current combustion control signal (Channel 2▶) is not clamped at 5V.
SPECIFIED VALUE: The output waveform (Channel 2▶) is not clamped at 5V.

▼If it is OK, finish the troubleshooting.
▼In the case of NG, misfire may have occurred. Identify the cause of the misfire and repair.

⊳16. Harness, connector check

1.When the following actions are taken to the cylinder whose waveform is unstable , check whether the waveform will change or not.
(1) Lightly shake the connector vertically and laterally.
(2) Lightly shake the wire harness vertically and laterally.
SPECIFIED VALUE: There is no change in the waveform.

2.Perform the following checks.
(1) Connector fitting condition
(2) Loose connection of the connector and the terminal.
SPECIFIED VALUE: No fault.

▼If it is OK, replace the ignition coil and go to ⊳17.
Refer to Page B10-2.

▼In the case of NG, repair or replace the faulty component.

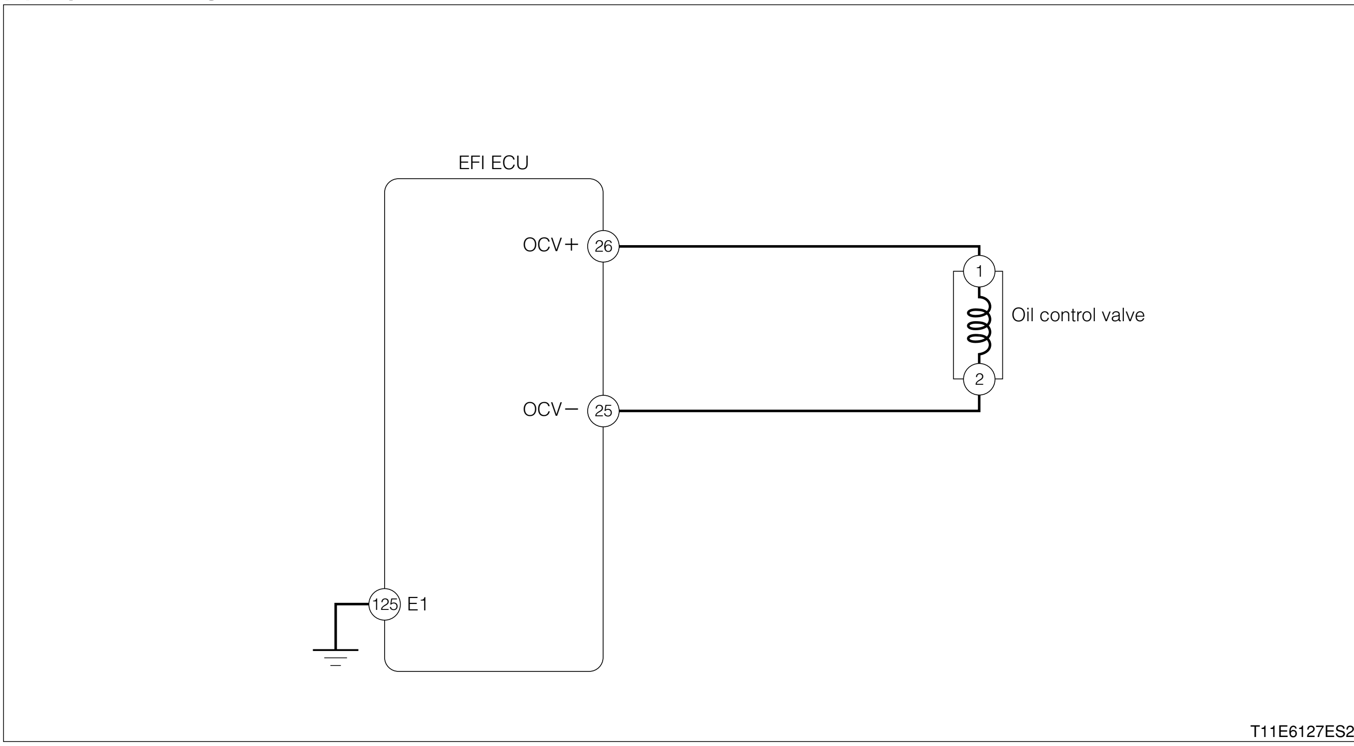
⊳17. EFI ECU signal recheck (2)

1.Recheck the cylinder, whose waveform is unstable, under the ⊳8) conditions.
2.Check that the output waveform of the ion current combustion control signal (Channel 2▶) is outputted stably.
SPECIFIED VALUE: The output waveform (Channel 2▶) is outputted stably.

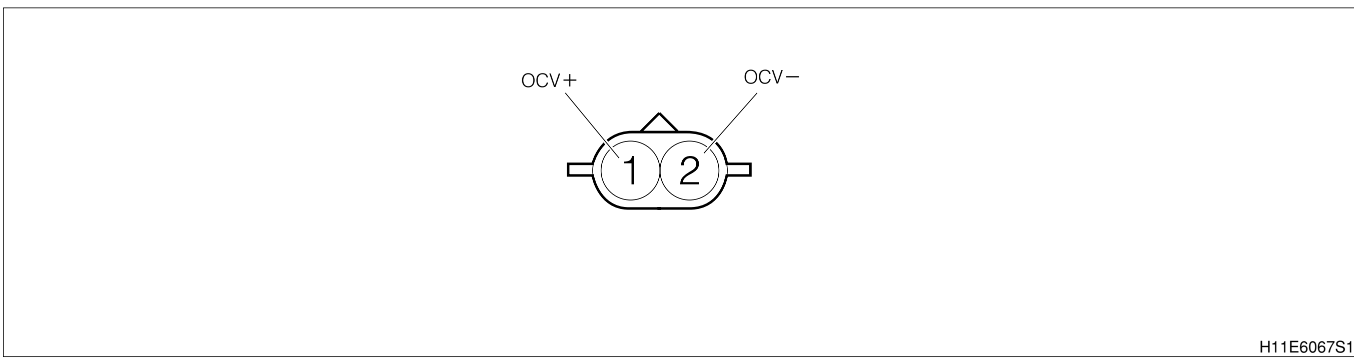
▼If it is OK, finish the troubleshooting.
▼In the case of NG, combustion instability may have occurred. Identify the cause of the combustion instability and repair.

7-12-21 DTC NO.P1346/75 VARIABLE VALVE TIMING CONTROL SYSTEM (VALVE TIMING)DTC NO.P1346/75 VARIABLE VALVE TIMING CONTROL SYSTEM (ADVANCED TIMING/RETARDED TIMING)

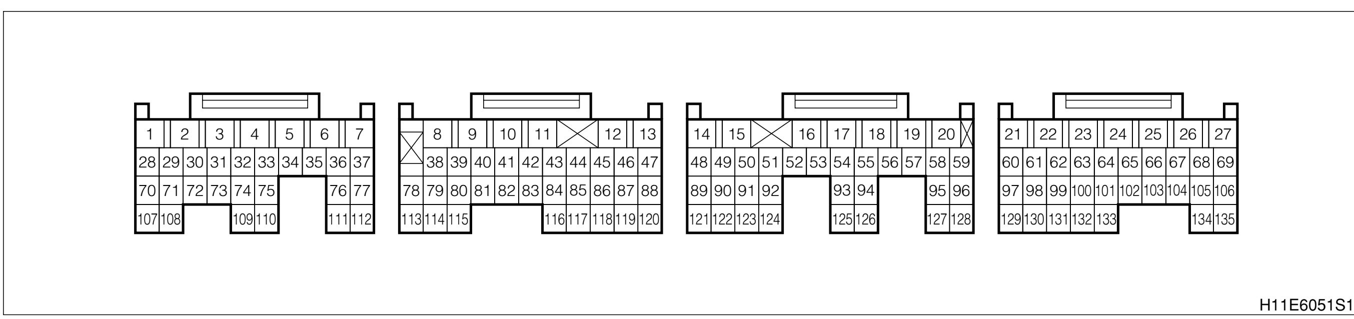
(1) System diagram



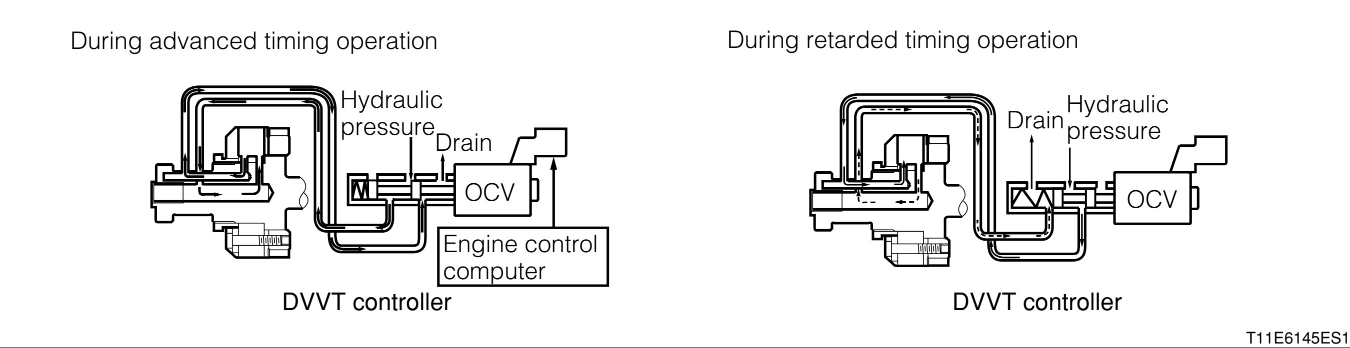
Oil control valve connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Variable valve timing control operation outline



1. The DVVT system controls the intake valve timing to proper timing in response to the driving conditions. The engine ECU controls the OCV (Oil Control Valve) to make the intake valve timing proper. The oil pressure controlled by the OCV is supplied to the DVVT controller, and then, the DVVT controller changes the relative position between the camshaft and the crankshaft.

(3) No.1346/75 output conditions

1. When a valve timing fail of the variable timing is detected

(4) No.P1349/73 output conditions

1. When a valve timing fail of the variable timing is detected

(5) Checking points

1. Is the variable valve timing controller operating normally?
2. Is the variable valve timing controller operating normally?
3. Is the timing deviated between the camshaft drive gear and the camshaft driven gear? (Are the mating marks matched?)

(6) Checking Method

NOTE

- Read the freeze frame data, using the DS-21 diagnosis tester or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

▷1. Oil control valve operation check

WARNING

- Do not put any flammable material around because sparks may be generated and is dangerous.
- Pay attention for safety since this is an operation during engine operation.

1. Remove the connector of the oil control valve.
2. Start the engine and perform idling.

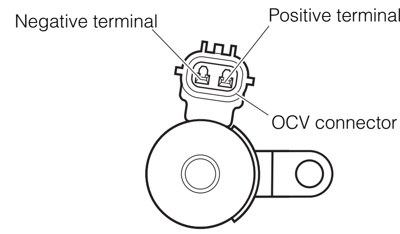
3.Apply the battery voltage to the connector of the oil control valve.

CAUTION

- Do not mistake the voltage polarity.
- Be careful of shorting while operating (As a precaution, install a fuse at the positive side).
- Set the energizing time at one minute or less.

NOTE

- Refer to the right figure for voltage polarity.



H11E6074ET10

4.Confirm the idling condition of the engine.

SPECIFIED VALUE: Rough idling or engine stall takes place.

▼If it is OK, proceed to ⊳2.

▼If it is NG, proceed to ⊳4.

⊳2. Check of wire harness continuity

1.Stop the engine.

2.Perform continuity check between each of the following terminals.

(1) Between oil control valve connection vehicle harness side connector 1 (OCV+) - ECU connection vehicle harness side connector 26 (OCV+)

(2) Between oil control valve connection vehicle harness side connector 2 OCV−) - ECU connection vehicle harness side connector 25 (OCV−)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳3.

▼If it is NG, repair the harness and the connectors.

⊳3. Camshaft gear deviation check

1.Check the deviation between the camshaft drive gear and the camshaft driven gear.

SPECIFIED VALUE: There is no deviation.

▼If it is OK, check the EFI ECU circuit.

Refer to Page A1-24.

▼If it is NG, reassemble the camshaft.

⊳4. Oil control valve unit check

1.Perform unit check of the oil control valve.

Refer to Page B8-224.

▼If it is OK, proceed to ⊳5.

▼If it is NG, replace the oil control valve.

Refer to Page B8-9.

⊳5. DVVT actuator unit check

1.Perform unit check of DVVT actuator.

Refer to Page B2-16.

▼If it is OK, proceed to ⊳6.

▼If it is NG, replace the camshaft No.2.

Refer to Page B2-12.

⊳6. Oil passage check

1.Check the passageway of the engine oil.
SPECIFIED VALUE: There is no clogging.

▼<u>If it is OK, proceed to ⊳7.</u>
▼<u>If it is NG, repair the defective section of the oil passage.</u>

⊳7. Camshaft gear deviation check

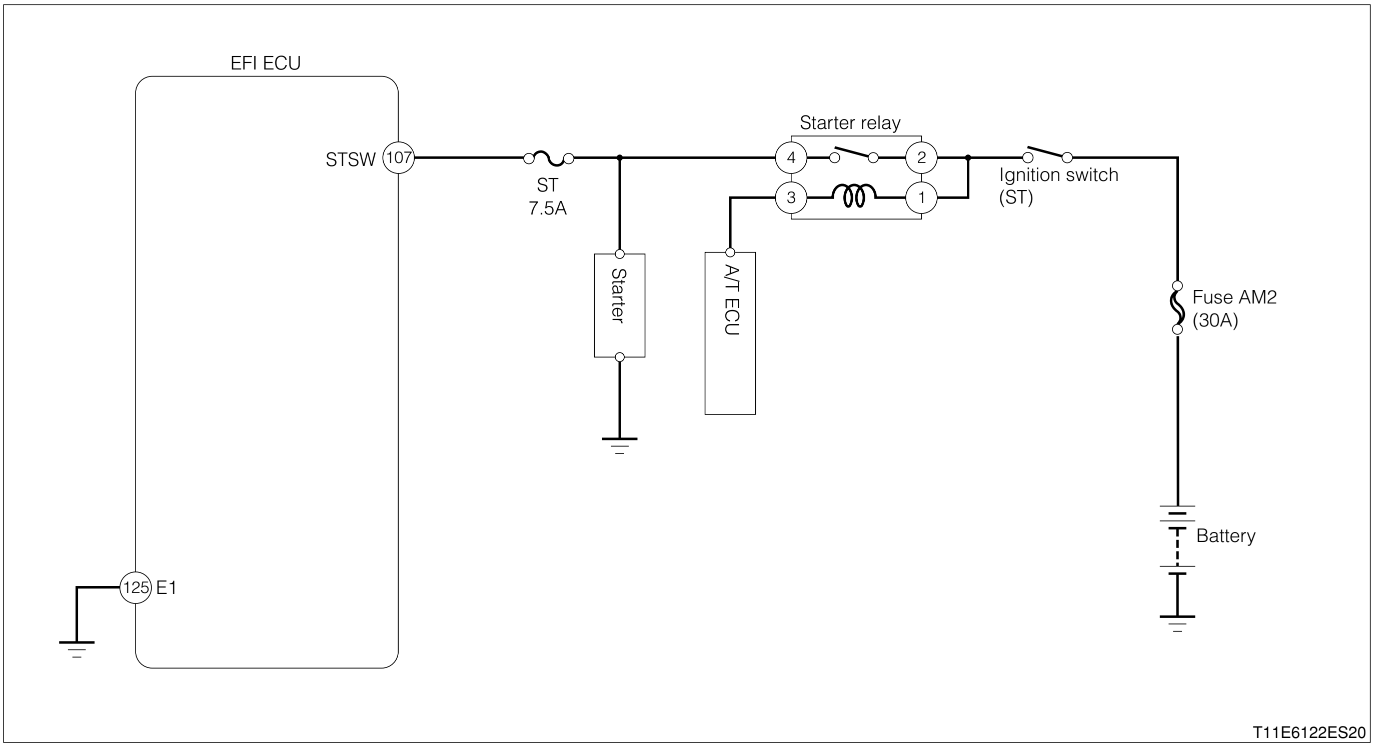
1.Check the deviation between the camshaft drive gear and the camshaft driven gear.
SPECIFIED VALUE: There is no deviation.

▼<u>If it is OK, check the EFI ECU circuit.</u>
Refer to Page A1-24.

▼<u>If it is NG, reassemble the camshaft.</u>

7-12-22 DTC NO.P1510/54 STARTER SIGNAL SYSTEM MALFUNCTION

(1) System diagram

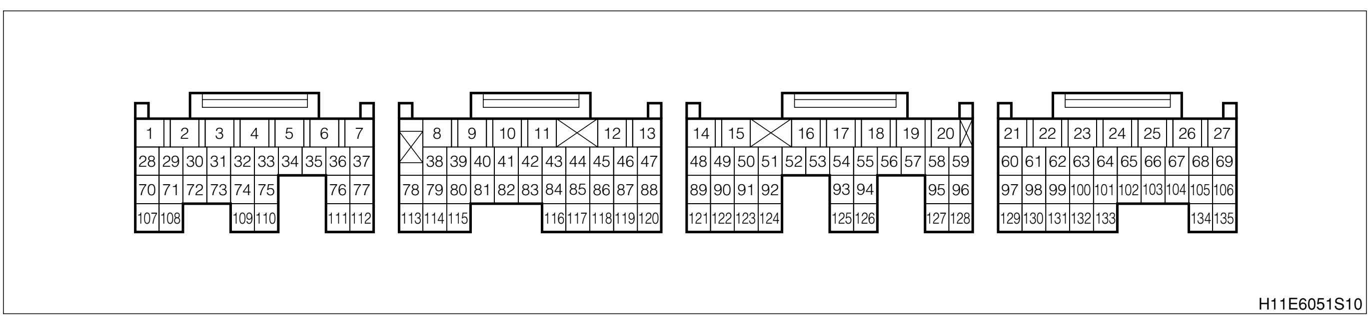


IG switch connection vehicle harness side connector

Starter relay connection junction block side connector

IG switch connection vehicle harness side connector

EFI ECU connection vehicle harness side connector



(2) Output conditions

1.When there is no "ON" signal even when the engine revolution speed reaches the set value or above when the vehicle speed is 0km/h:

(3) Checking points

1.Is the harness between the starter and EFI ECU normal?

(4) Checking method

⌦1. EFI ECU signal check

1.Connect the SST.

SST: 09842-97209-000

2.Perform voltage measurement between the following terminals during starting.

(1) Between SST 107 (STSW) - SST 125 (E1)

SPECIFIED VALUE: Battery voltage

▼If it is OK, check the EFI ECU circuit.

▼If it is NG, proceed to ⌦2.

⌦2. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.

(1) Between IG switch side connector 4 (ST) - ECU connection vehicle harness side connector 107 (STSW)

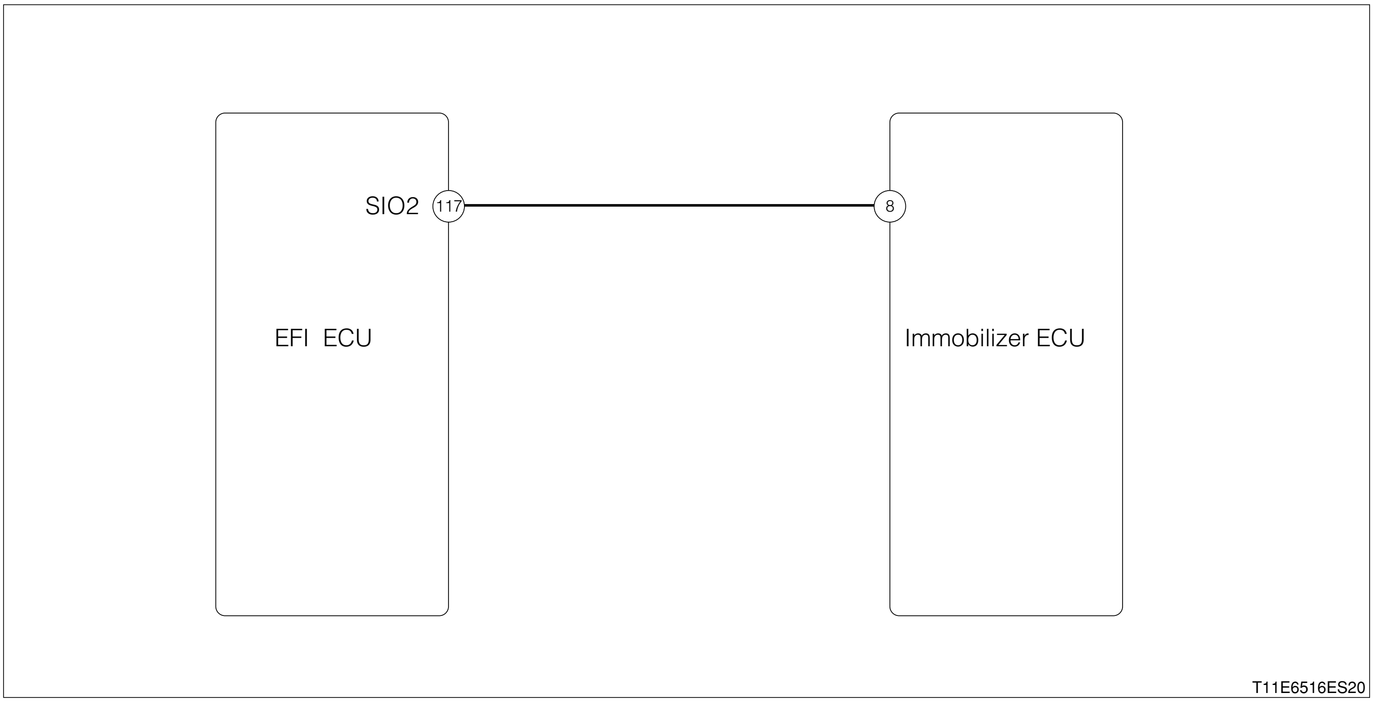
SPECIFIED VALUE: Continuity exists.

▼If it is OK, check the vehicle speed sensor system.

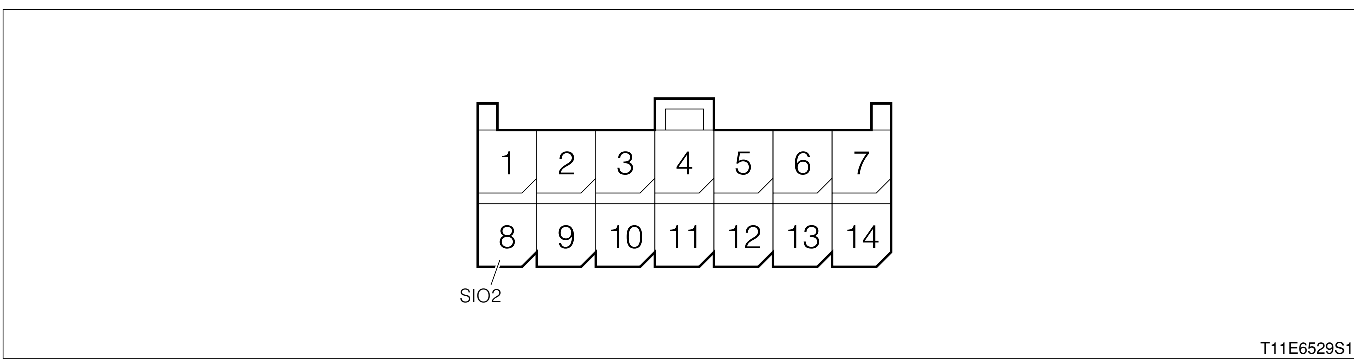
▼If it is NG, repair the harness and connectors.

7-12-23 DTC NO.P1600/83 IMMOBILIZER SIGNAL CIRCUIT MALFUNCTION

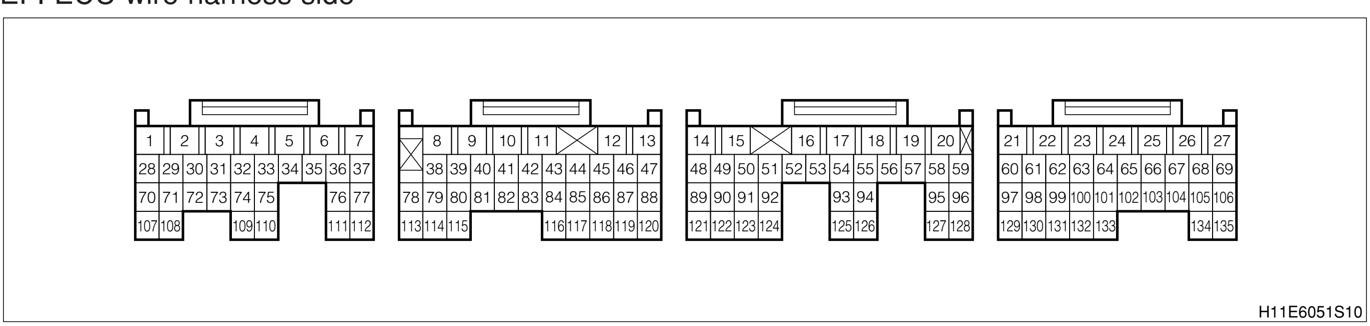
(1) System diagram



Immobilizer ECU wire harness side



EFI ECU wire harness side



(2) Circuit description

1. This circuit performs collation and updating of the rolling code in the communication between the immobilizer ECU and the EFI ECU. The engine can start only when the collation and updating of the rolling code can be done. The rolling code is collated and updated by reading out or writing to non volatile memory (E2PROM) of both ECUs.

(3) Diagnosis code output conditions

1. When the engine starts, the rolling code can not reading out or writing to the EFI ECU.

(4) Trouble area

1. EFI ECU

(5) Inspection procedure

① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

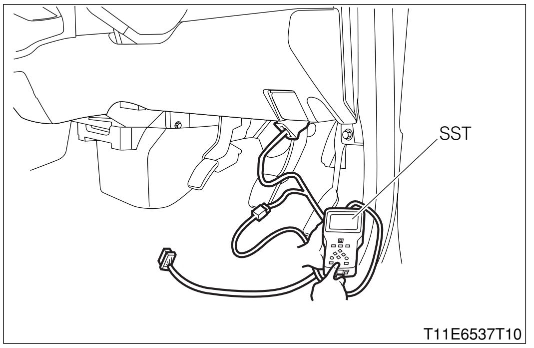
⊳1. Re-confirmation of DTC.

1.IG switch turned "LOCK".

2.Connect the diagnosis tester to DLC.

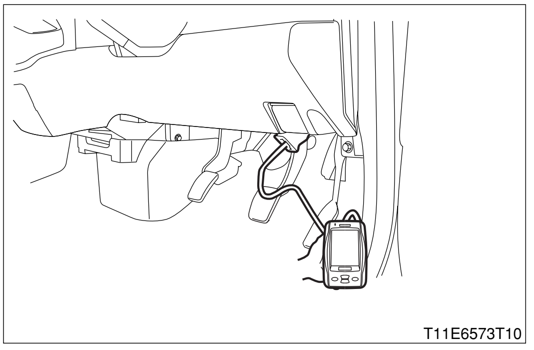
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



3.Turn "ON" the IG switch, and turn "ON" the main switch of the tester.

4.Erase the DTC. (As for the operation, follow the instruction manual of the diagnosis tester (DS-21/DS-Ⅱ).)

5.Turn "OFF" the main switch of the tester. Turn "LOCK" the IG switch.

6.Turn "ON" the IG switch. Turn "ON" the main switch of the tester.

7.Check the DTC.

8.Is P1600 indicated ?

▼<u>If the output is made, proceed to ⊳2.</u>

▼<u>If no output is made, proceed to ⊳3.</u>

⊳2. Wiring harness check

1.Turn "LOCK" the ignition switch.

2.Perform the continuity check between the following terminals.

(1) Between the EFI ECU connection vehicle harness side connector 117 (SIO2) and the immobilizer ECU connection vehicle harness side connector 8 (SIO2)

SPECIFIED VALUE: Continuity exists.

▼<u>If it is OK, go to ⊳3.</u>

▼<u>If it is NG, repair the defective point.</u>

▷3. Immobilizer side diagnosis code check

1.Turn "ON" the IG switch. Turn "ON" the main switch of the tester.

2.Check the immobilizer diagnosis code.

▼<u>If no output is made, replace the EFI ECU.</u>

Refer to Page B8-1.

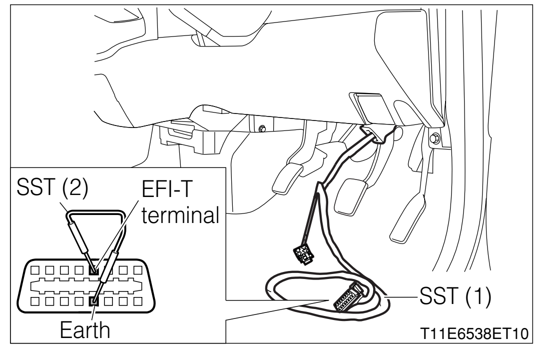
▼<u>If the output is made, check the immobilizer.</u>

Refer to Page I4-31.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Re-confirmation of DTC.

1.Remove the EFI fuse. Erase the DTC. (As for the erasing method.)
2.Set the EFI fuse to the original position.
3.Short circuit the DLC terminals 5 (EFI-T) and 13 (E), using the SST.
SST: 09991-87404-000(1)
09991-87403-000(2)
4.Turn "ON" the IG switch.
5.Check the DTC. (Read out the flashing pattern of the MIL.)
6.Is "P1600/83" indicated?
▼If the output is made, proceed to ⊳2.
▼If no output is made, proceed to ⊳3.



⊳2. Wiring harness check

1.Turn "LOCK" the ignition switch.
2.Perform the continuity check between the following terminals.
(1) Between the EFI ECU connection vehicle harness side connector 117 (SIO2) and the immobilizer ECU connection vehicle harness side connector
SPECIFIED VALUE: Continuity exists.

▼If it is OK, go to ⊳3.
▼If it is NG, repair the defective point.

⊳3. Immobilizer side diagnosis code check

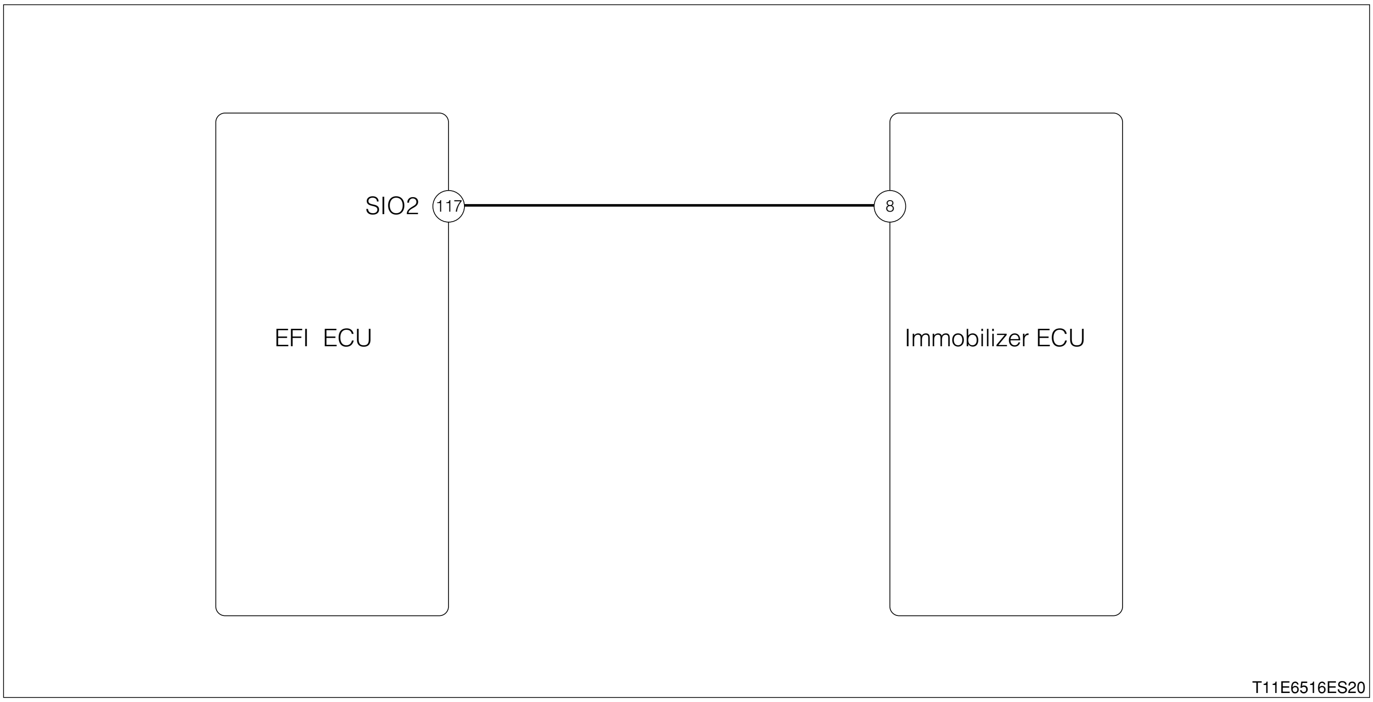
1.Short between the DLC terminals 4 (ECU-T) and 13 (E), using the SST.
SST: 09991-87404-000(1)
09991-87403-000(2)

2.Turn "ON" the IG switch.
3.Is the diagnosis code of the immobilizer outputted?
▼If no output is made, replace the EFI ECU.
Refer to Page B8-1.

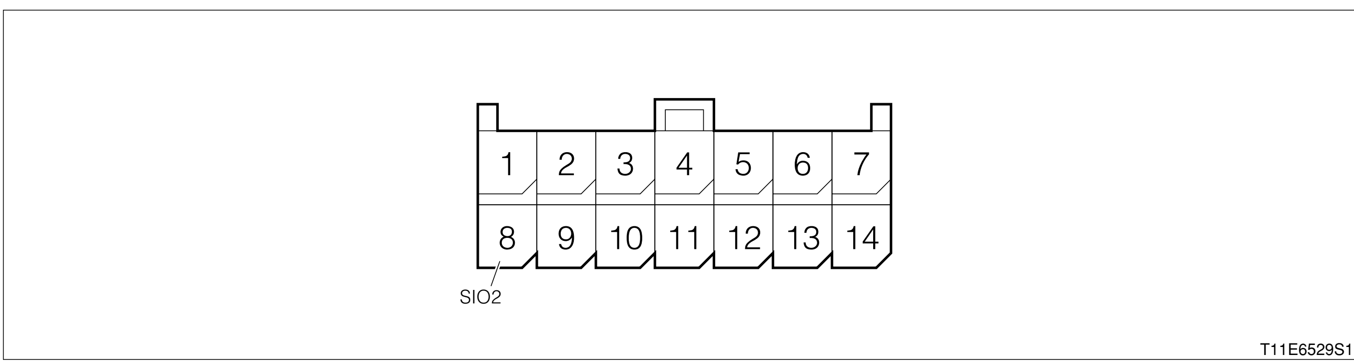
▼If the output is made, check the immobilizer.
Refer to Page I4-31.

7-12-24 DTC NO.P1601/81 IMMOBILIZER SIGNAL MALFUNCTION

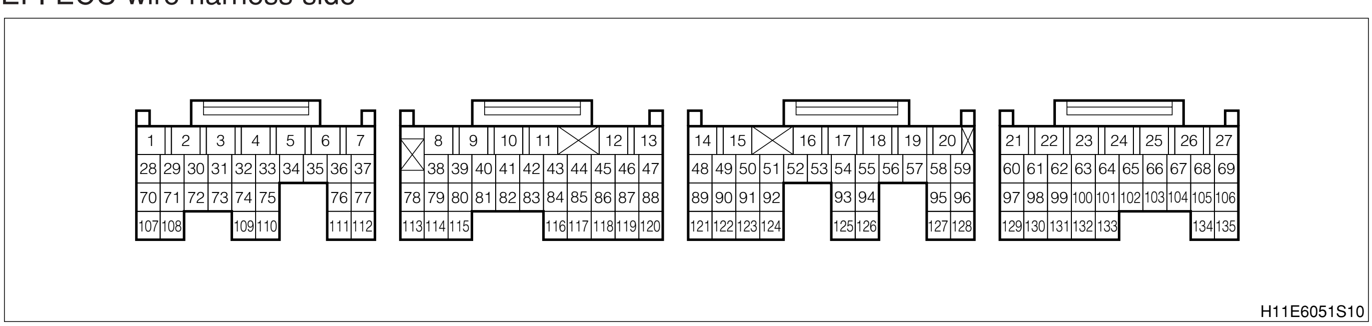
(1) System diagram



Immobilizer ECU wire harness side



EFI ECU wire harness side



(2) Circuit description

1.When the ignition switch is turned "ON", communication starts between the immobilizer ECU and EFI ECU. The engine can start only when the communication between the two ECU is possible and the rolling codes are matched. In order cases, fuel injection and ignition are prohibited, thus making engine starting impossible.

(3) Diagnosis code output conditions

1.When the engine starts, the rolling codes are not matched.

(4) Trouble area

1. Open wire or short circuit for the immobilizer system circuit
2. Immobilizer ECU
3. EFI ECU

(5) Inspection procedure

⊳1. Wiring harness check

1. Set the SST (Sub-harness). However, the SST connectors at the EFI ECU side should remain disconnected.
   SST: 09842-97209-000

2. Disconnect the immobilizer ECU connector.
3. Perform the continuity check between the following terminals with the IG switch set to the "LOCK" position.
   (1) Connector 8 (SIO1) at immobilizer ECU harness side - SST terminal 117 (SIO1).
   SPECIFIED VALUE: Continuity exists.

   ▼If it is OK, go to ⊳2.
   ▼If it is NG, repair or replace the harness or connector.

⊳2. Check of immobilizer system (1).

1. Connect the connector of the immobilizer ECU.
2. Replace the EFI ECU with a new one. Connect the SST connector to the EFI ECU.
3. Start the engine with the master key.
   SPECIFIED VALUE: The engine starts.

   ▼If it is OK, check or replace the EFI ECU.
   ▼If it is NG, go to ⊳3.

⊳3. Check of immobilizer system (2).

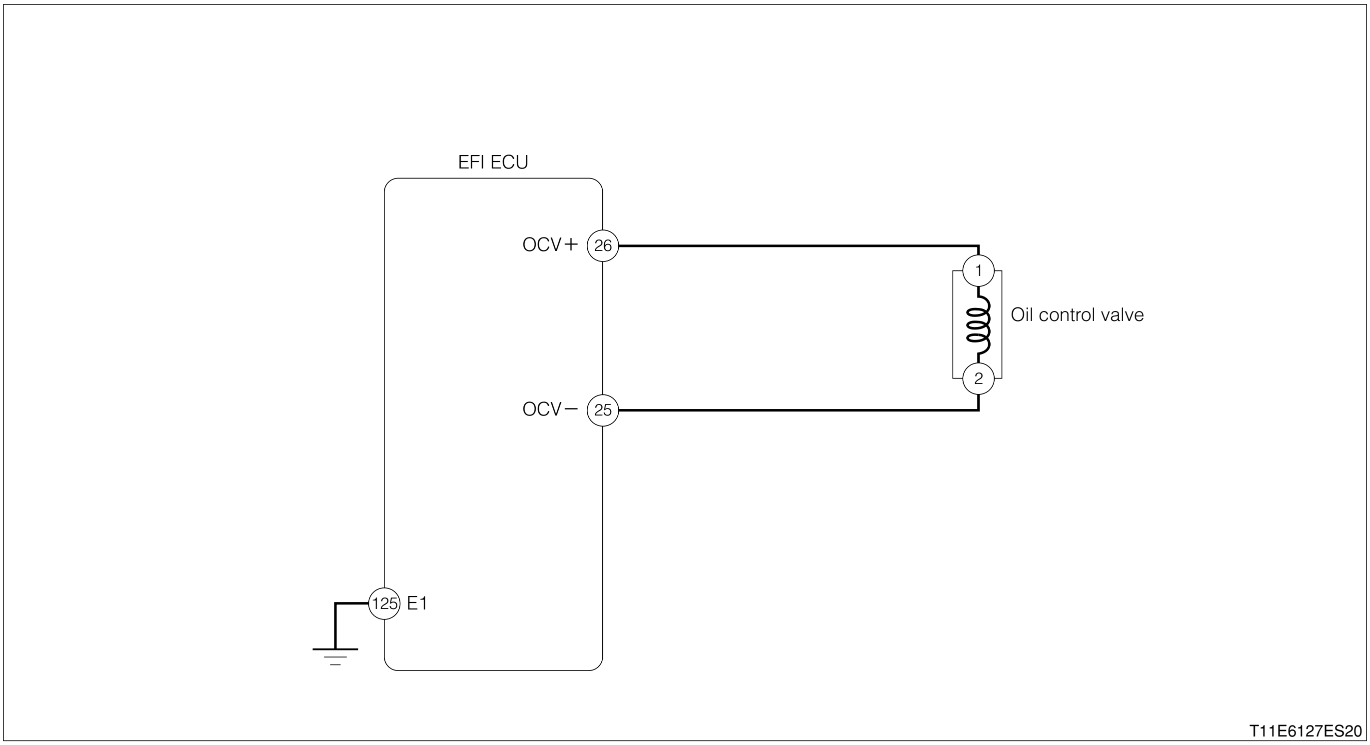
1. Replace the immobilizer ECU with a new one, with the IG switch turned "LOCK".
2. Start the engine with the master key.
   SPECIFIED VALUE: The engine starts.

   ▼If it is OK, check the IG key, antenna coil, etc. (Refer to section "BODY ELECTRICAL SYSTEM".)
   ▼If it is NG, check or replace the immobilizer ECU. (Refer to section "BODY ELECTRICAL SYSTEM".)

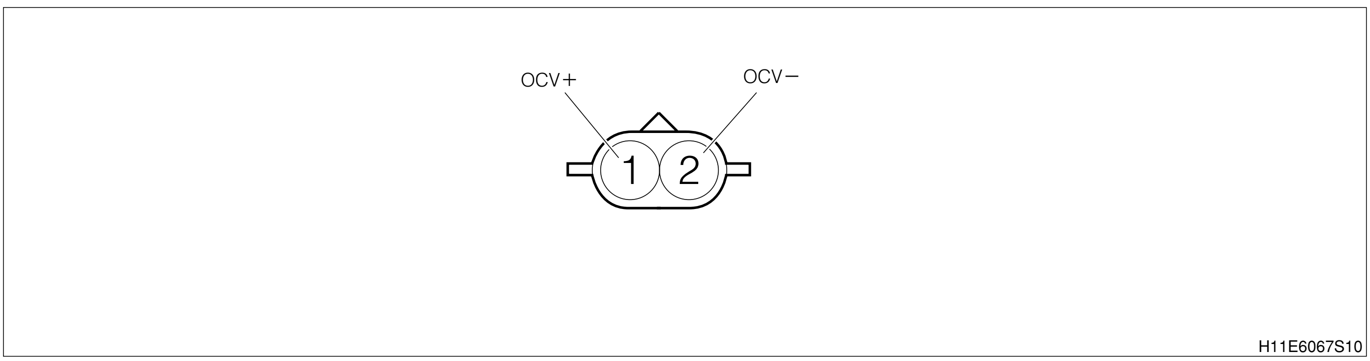
Refer to Page I4-29.

7-12-25 DTC NO.P1656/74 OIL CONTROL VALVE CONTROL SYSTEM MALFUNCTION

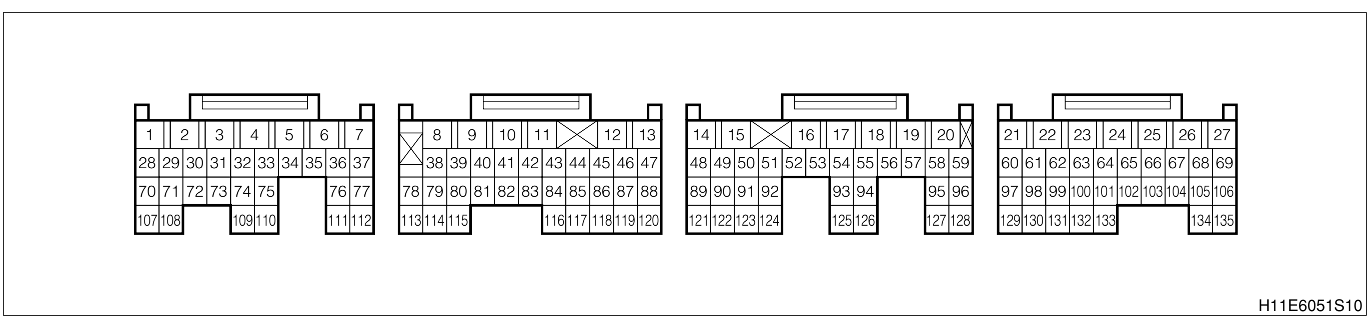
(1) System diagram



Oil control valve connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Diagnosis code output conditions

1.When, under a condition where the battery voltage is 12V or more, one of the following conditions is continued over a certain length of time

(1) When the output duty ratio is 99% or more and the oil control valve voltage is below the evaluation specified value

(2) When the output duty ratio is 0% and the oil control valve voltage is the evaluation specified value or more

(3) Checking points

1.Is the control signal of the oil control valve outputted normally from the EFI ECU?
2.Is the harness between the oil control valve and the EFI ECU normal?

(4) Checking Method

▷1. Oil control valve operation check

WARNING

- Do not put any combustible in the surrounding area, for sparks are occurring and there are fire potentials.
- This is an operation to be made while the engine is running. Special care must be exercised for the safety.

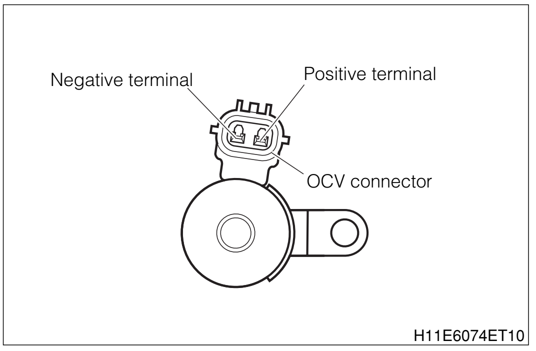
1.Disconnect the oil control valve connector.
2.Start the engine and perform an idling operation.
3.Apply the battery voltage to the oil control valve connector.

CAUTION

- Do not mistake the voltage polarity.
- Pay utmost attention as for a short during the operation. (Put a fuse at the plus side as a precautionary measure.)
- Make sure that the energizing time should be within one minute.

NOTE

- For the voltage polarity, refer to the right figure.



4.Confirm the engine idling condition.

SPECIFIED VALUE: Rough idling or engine stalling occurs.

▼<u>If it is YES, go to ▷2.</u>
▼<u>If it is NG, replace the oil control valve.</u>
Refer to Page B8-9.

▷2. Oil control valve voltage check

1.Stop the engine and set the IG switch to the "LOCK" position.
2.Connect the SST.

SST: 09842-97209-000

3.Turn "ON" the ignition switch.
4.Check the voltage between the following terminals.

(1) Between SST 25 (OCV－) and SST 26 (OCV＋)

SPECIFIED VALUE: Battery voltage

▼<u>If it is OK, go to ▷3.</u>
▼<u>If it is NG, check the EFI ECU circuit.</u>
Refer to Page A1-24.

⊳3. Check of wire harness continuity

1.With the IG switch turned "LOCK", disconnect the SST connector from the ECU.

2.Perform continuity check between the following terminals.

(1) Between the oil control valve connection vehicle harness side connector 1 (OCV+) and the ECU connection vehicle harness side connector 26 (OCV+)

(2) Between the oil control valve connection vehicle harness side connector 2 (OCV−) and the ECU connection vehicle harness side connector 25 (OCV−)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, check the EFI ECU circuit.

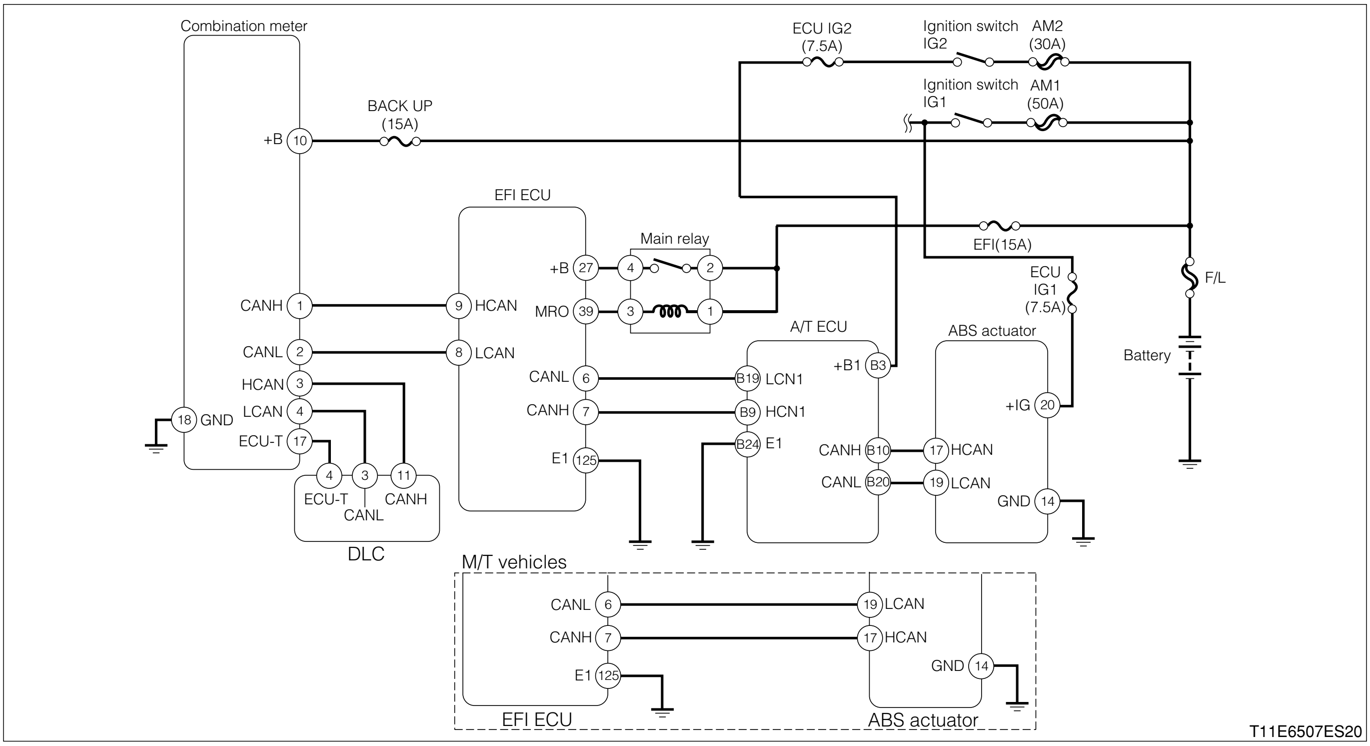
Refer to Page A1-24.

▼If it is NG, repair the harness and connector.

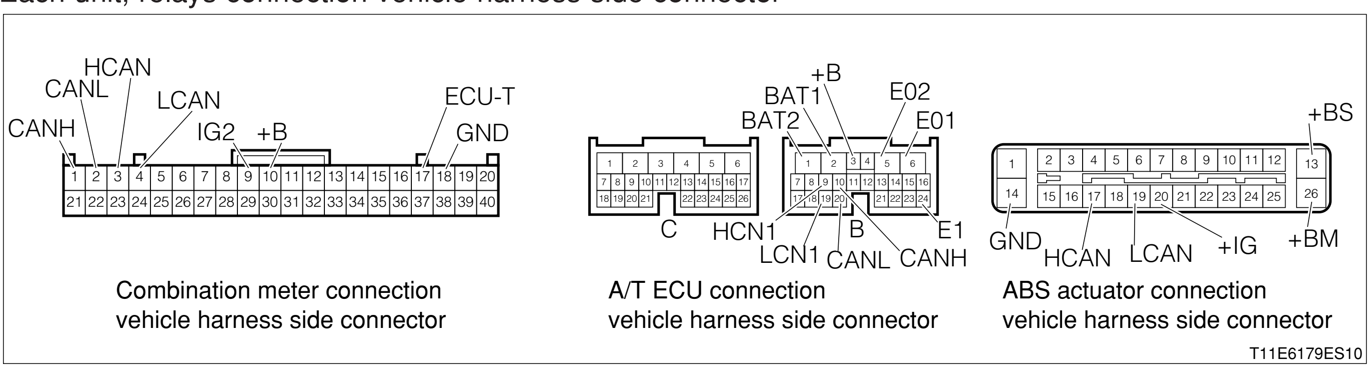
7-12-26 DTC NO.U0121/86 ABS COMMUNICATION FAILURE

(1) System diagram

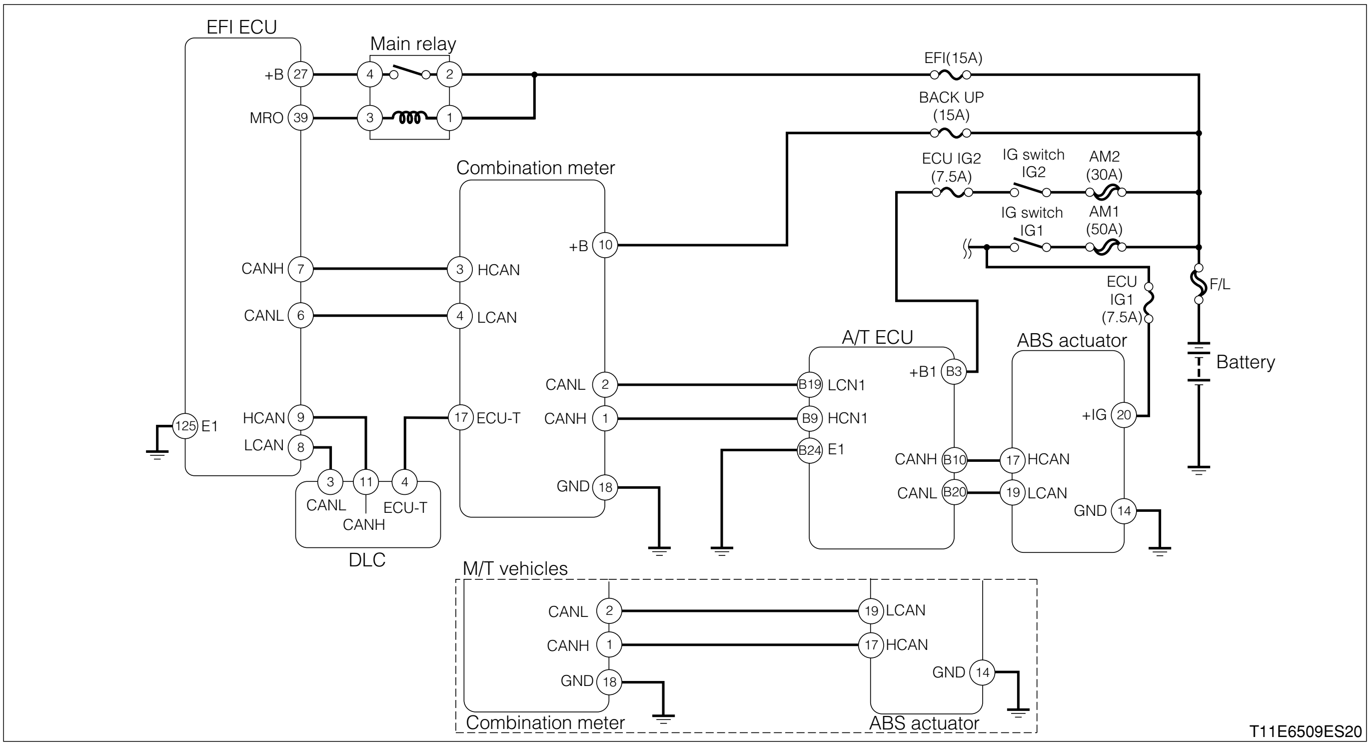
① RHD vehicles



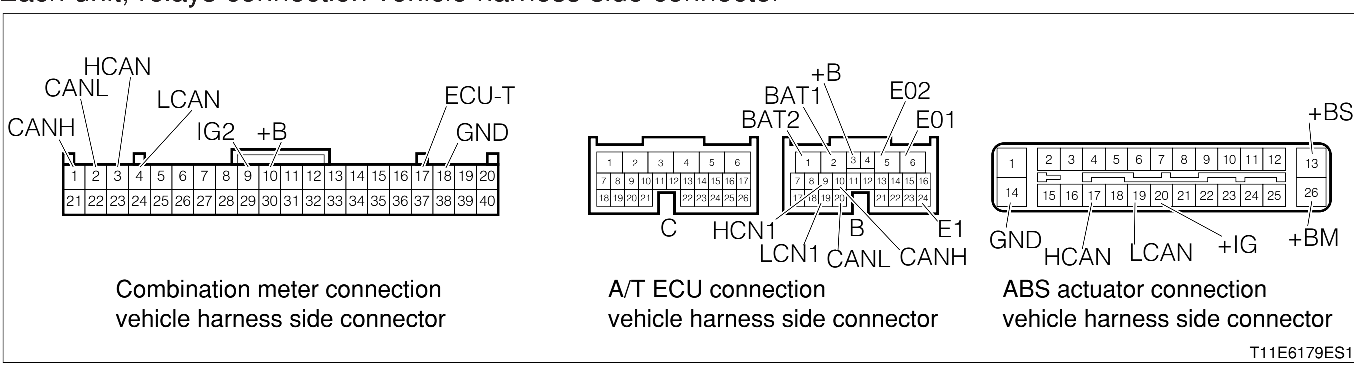
Each unit, relays connection vehicle harness side connector



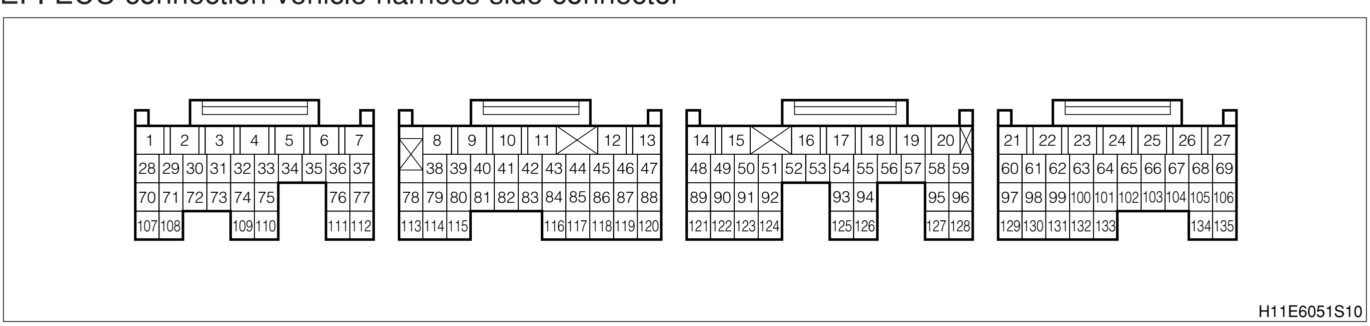
② **LHD vehicles**



Each unit, relays connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Diagnosis code output conditions

1.When communication signal cannot be received from ABS ECU

(3) Checking points

1.Is the harness between EFI ECU - ABS ECU normal?

2.Is the ABS actuator normal?

3.Check whether there is any poor contact at the connector section.

(4) Checking method

① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

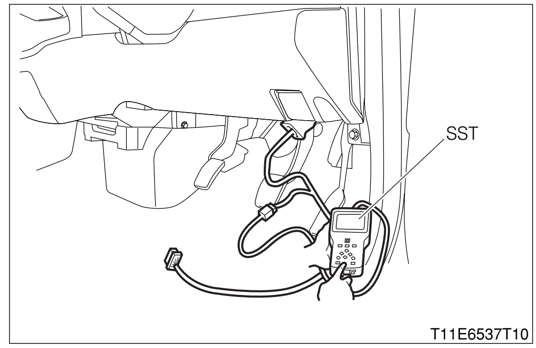
▷1. Diagnosis code confirmation (ABS related)

1.IG switch turned "LOCK".

2.Connect the diagnosis tester to DLC.

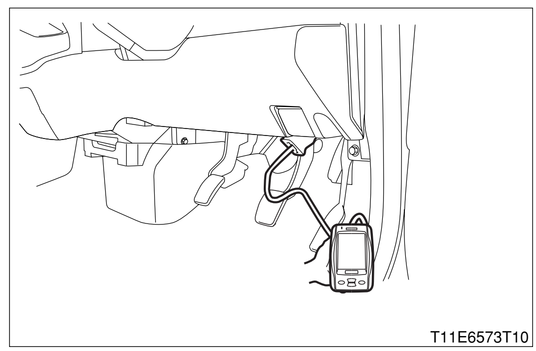
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



3.Check to see if the diagnosis code of the ABS is outputted (No.C0200/21 - No.C0215/24: short circuit or open wire of wheel speed sensor, No.C1235/25 - No.C1238/28: period abnormality of wheel speed sensor, No.C1237/29: Rotor tooth missing abnormality)

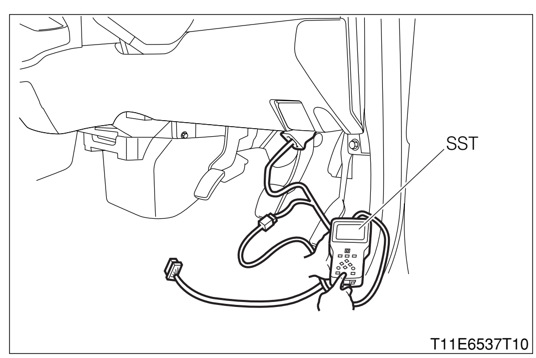
▼<u>If it is outputted, proceed to ▷2.</u>

▼<u>If it is not outputted, proceed to ▷4.</u>

▷2. Trouble shooting according to diagnosis code (ABS related)

1.Perform trouble shooting for the diagnosis code outputted in ▷1.

Refer to Page E3-26.



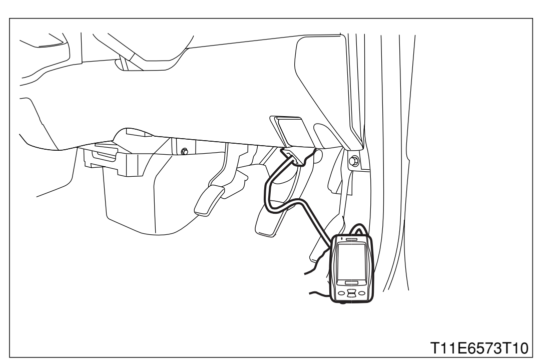
2.After completion of the repairs, connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



3.Confirm that the diagnosis code of ABS is not outputted.

▼If it is not outputted, proceed to ⋝3.

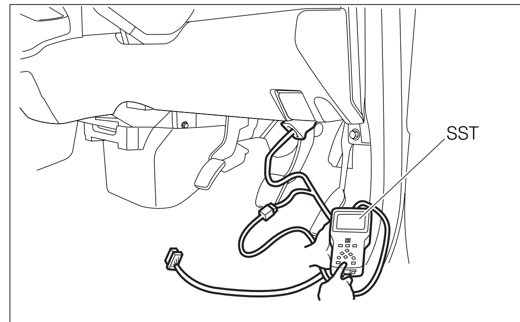
▼If it is outputted, perform recheck for the diagnosis code outputted.

⋝3. Diagnosis code reconfirmation (EFI related)

1.Connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

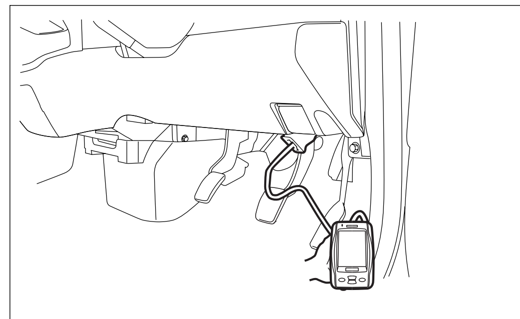
SST: 09991-87404-000



T11E6537T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



T11E6573T10

2.Cancel the diagnosis code of the EFI.

3.Check to see if the diagnosis code of EFI is outputted.

SPECIFIED VALUE: It is not outputted.

▼If it is OK, the EFI system is normal.

▼If it is NG, proceed to ⋝4.

⋝4. CAN communication basic check

1.Perform basic check of the CAN communication.

Refer to Page L2-14.

▼If it is OK, go to ⋝5 for RHD vehicles.

▼If it is OK, go to ⋝6 for LHD vehicles.

▼If it is NG, repair or replace the defective sections.

⋝5. CAN line open wire check (RHD vehicles)

1.Turn the IG switch to "LOCK".

2.Remove all connectors of the EFI ECUand ABS actuator.

3.Perform continuity check between each of the following terminals.

(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - EFI ECU connection vehicle harness side connector 7 (CANH)

(2) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - ABS actuator connection vehicle harness side connector 19 (LCAN)

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⋝7.

▼If it is NG, repair or replace the defective sections.

⊳6. CAN line open wire check (LHD vehicles)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU, combination meter and ABS actuator.
3.Perform continuity check between each of the following terminals.
(1) Between combination meter connection vehicle harness side connector 1 (CANH) - combination meter connection vehicle harness side connector 2 (CANL)
(2) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - ABS actuator connection vehicle harness side connector 19 (LCAN)

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳7.
▼If it is NG, repair or replace the defective sections.

⊳7. CAN line short circuit check

1.Perform continuity check between each of the following terminals.
(1) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - battery positive terminal
(2) Between ABS actuator connection vehicle harness side connector 19 (LCAN) - battery positive terminal
(3) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - body earth
(4) Between ABS actuator connection vehicle harness side connector 19 (LCAN) - body earth

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳8.
▼If it is NG, repair or replace the defective sections.

⊳8. EFI ECU internal resistance check

1.Remove all connectors of the EFI ECU.
2.Measure the resistance between the following terminals.
(1) Between EFI ECU side connector 6 (CANL) - EFI ECU side connector 7 (CANH)
(2) Between EFI ECU side connector 8 (LCAN) - EFI ECU side connector 9 (HCAN)

SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, proceed to ⊳9.
▼If it is NG, replace the EFI ECU.
Refer to Page B8-1.

⊳9. Combination meter internal resistance check

1.Remove the connectors of the combination meter.
2.Measure the resistance between the following terminals.
(1) Between combination meter side connector 1 (CANH) - combination meter side connector 2 (CANL)
(2) Between combination meter side connector 3 (HCAN) - combination meter side connector 4 (LCAN)

SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, proceed to ⊳10.
▼If it is NG, replace the combination meter.
Refer to Page J3-3.

▷10. ABS actuator internal circuit check

1.Remove the connectors of the ABS actuator.

2.Perform continuity check between each of the following terminals.

(1) Between ABS actuator side connector 17 (HCAN) - ABS actuator side connector 19 (LCAN)

SPECIFIED VALUE: Continuity exists. (Less than 1MΩ)

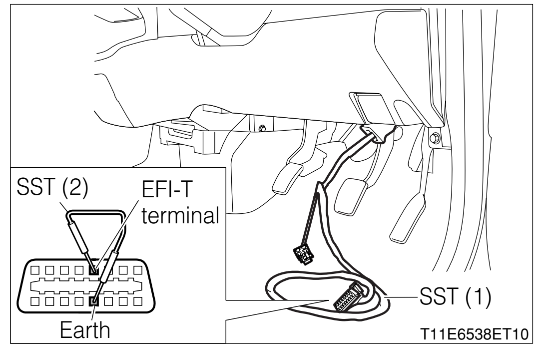
▼If everything is OK, perform the circuit check of the combination meter, EFI ECU and ABS actuator.

▼If it is NG, replace the ABS actuator.

Refer to Page E3-1.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Diagnosis code confirmation (ABS related)



1.Short-circuit the terminals 4 (ECU-T) and 13 (E) of the DLC, using the SST.
SST: 09991-87404-000(1)
09991-87403-000(2)

2.Check to see if the diagnosis code of the ABS is outputted (No.C0200/21 - No.C0215/24: short circuit or open wire of wheel speed sensor, No.C1235/25 - No.C1239/28: period abnormality of wheel speed sensor, No.C1237/29: Rotor tooth missing abnormality)

NOTE

- Refer to the diagnosis code output indication method of ABS.

Refer to Page E3-19.

▼If it is outputted, proceed to ⊳2.
▼If it is not outputted, proceed to ⊳4.

⊳2. Trouble shooting according to diagnosis code (ABS related)

1.Perform trouble shooting for the diagnosis code outputted in ⊳1.
Refer to Page E3-28.

2.After repairing, short-circuit the terminals 4 (ECU-T) and 13 (E) of the DLC, using the SST.
SST: 09991-87404-000(1)
09991-87403-000(2)

3.Confirm that the diagnosis code of ABS is not outputted.
▼If it is not outputted, proceed to ⊳3.
▼If it is outputted, perform recheck for the diagnosis code outputted.

⊳3. Diagnosis code reconfirmation (EFI related)

1.Cancel the diagnosis code of the EFI.
2.After canceling, short-circuit the terminals 5 (EFI-T) and 13 (E) of the DLC, using SST.
SST: 09991-87404-000(1)
09991-87403-000(2)

3.Check to see if the diagnosis code of EFI is outputted.
SPECIFIED VALUE: It is not outputted.

▼If it is OK, the EFI system is normal.
▼If it is NG, proceed to ⊳4.

⊳4. CAN communication basic check

1.Perform basic check of the CAN communication.
Refer to Page L2-14.

▼If it is OK, go to ⊳5 for RHD vehicles.
▼If it is OK, go to ⊳7 for LHD vehicles.
▼If it is NG, repair or replace the defective sections.

⊳5. CAN line open wire check (RHD vehicles)

1. Turn the IG switch to "LOCK".
2. Remove all connectors of the EFI ECU, combination meter and ABS actuator.
3. Perform continuity check between each of the following terminals.
   (1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - EFI ECU connection vehicle harness side connector 7 (CANH)
   (2) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - ABS actuator connection vehicle harness side connector 19 (LCAN)

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳7.
▼If it is NG, repair or replace the defective sections.

⊳6. CAN line open wire check (LHD vehicles)

1. Turn the IG switch to "LOCK".
2. Remove all connectors of the EFI ECU, combination meter and ABS actuator.
3. Perform continuity check between each of the following terminals.
   (1) Between combination meter connection vehicle harness side connector 6 (CANL) - combination meter connection vehicle harness side connector 7 (CANH)
   (2) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - ABS actuator connection vehicle harness side connector 19 (LCAN)

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳7.
▼If it is NG, repair or replace the defective sections.

⊳7. CAN line short circuit check

1. Perform continuity check between each of the following terminals.
   (1) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - battery positive terminal
   (2) Between ABS actuator connection vehicle harness side connector 19 (LCAN) - battery positive terminal
   (3) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - body earth
   (4) Between ABS actuator connection vehicle harness side connector 19 (LCAN) - body earth

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳8.
▼If it is NG, repair or replace the defective sections.

⊳8. EFI ECU internal resistance check

1. Remove all connectors of the EFI ECU.
2. Measure the resistance between the following terminals.
   (1) Between EFI ECU side connector 6 (CANL) - EFI ECU side connector 7 (CANH)
   (2) Between EFI ECU side connector 8 (LCAN) - EFI ECU side connector 9 (HCAN)

SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, proceed to ⊳9.
▼If it is NG, replace the EFI ECU.
Refer to Page B8-1.

⊳9. Combination meter internal resistance check

1.Remove the connectors of the combination meter.
2.Measure the resistance between the following terminals.
(1) Between combination meter side connector 1 (CANH) - combination meter side connector 2 (CANL)
(2) Between combination meter side connector 3 (HCAN) - combination meter side connector 4 (LCAN)
SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, proceed to ⊳10.
▼If it is NG, replace the combination meter.
Refer to Page J3-3.

⊳10. ABS actuator internal circuit check

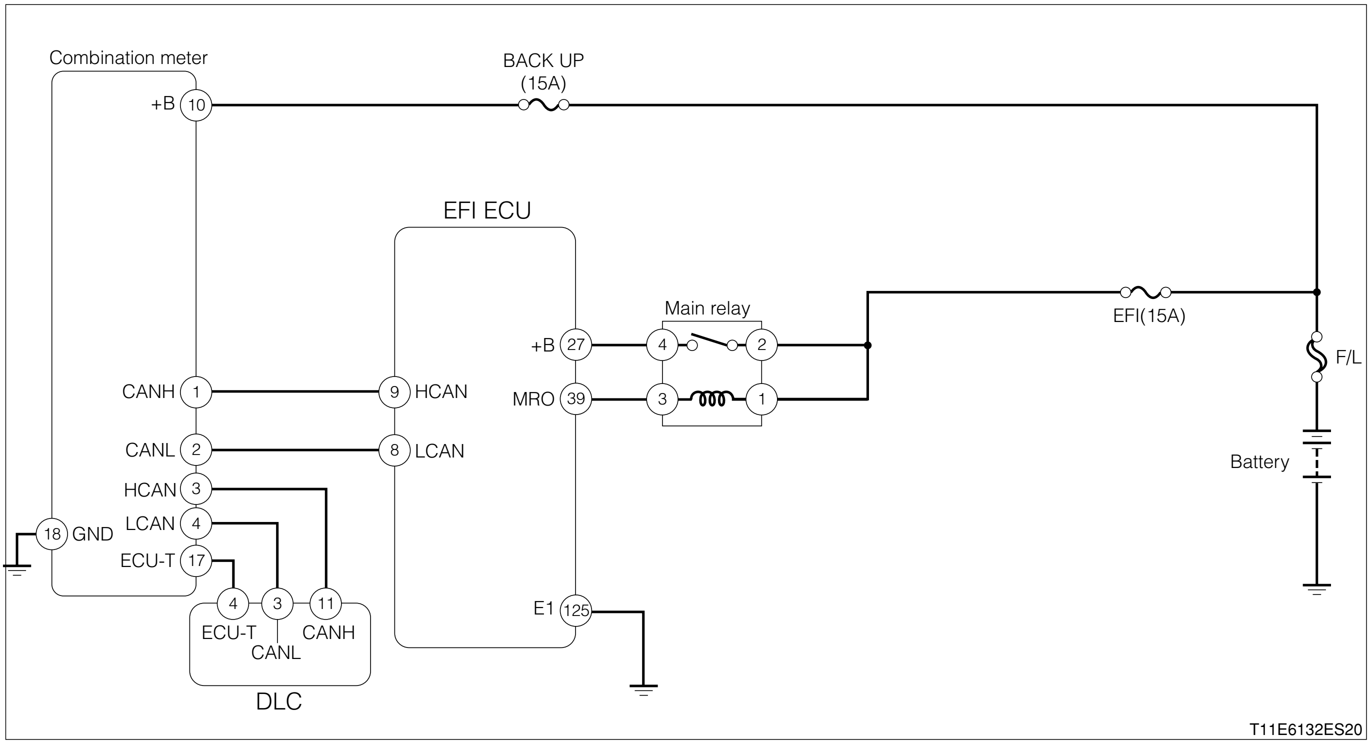
1.Remove the connectors of the ABS actuator.
2.Perform continuity check between each of the following terminals.
(1) Between ABS actuator side connector 17 (HCAN) - ABS actuator side connector 19 (LCAN)
SPECIFIED VALUE: Continuity exists. (less than 1MΩ)

▼If everything is OK, perform the circuit check of the combination meter, EFI ECU and ABS actuator.
▼If it is NG, replace the ABS actuator.
Refer to Page E3-1.

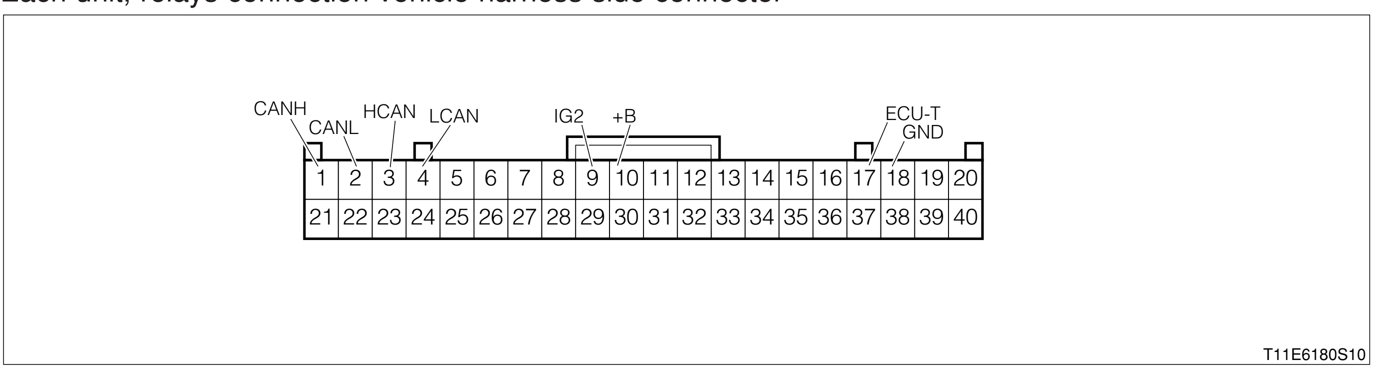
7-12-27 DTC NO.U0156/87 COMBINATION METER COMMUNICATION FAILURE

(1) System diagram

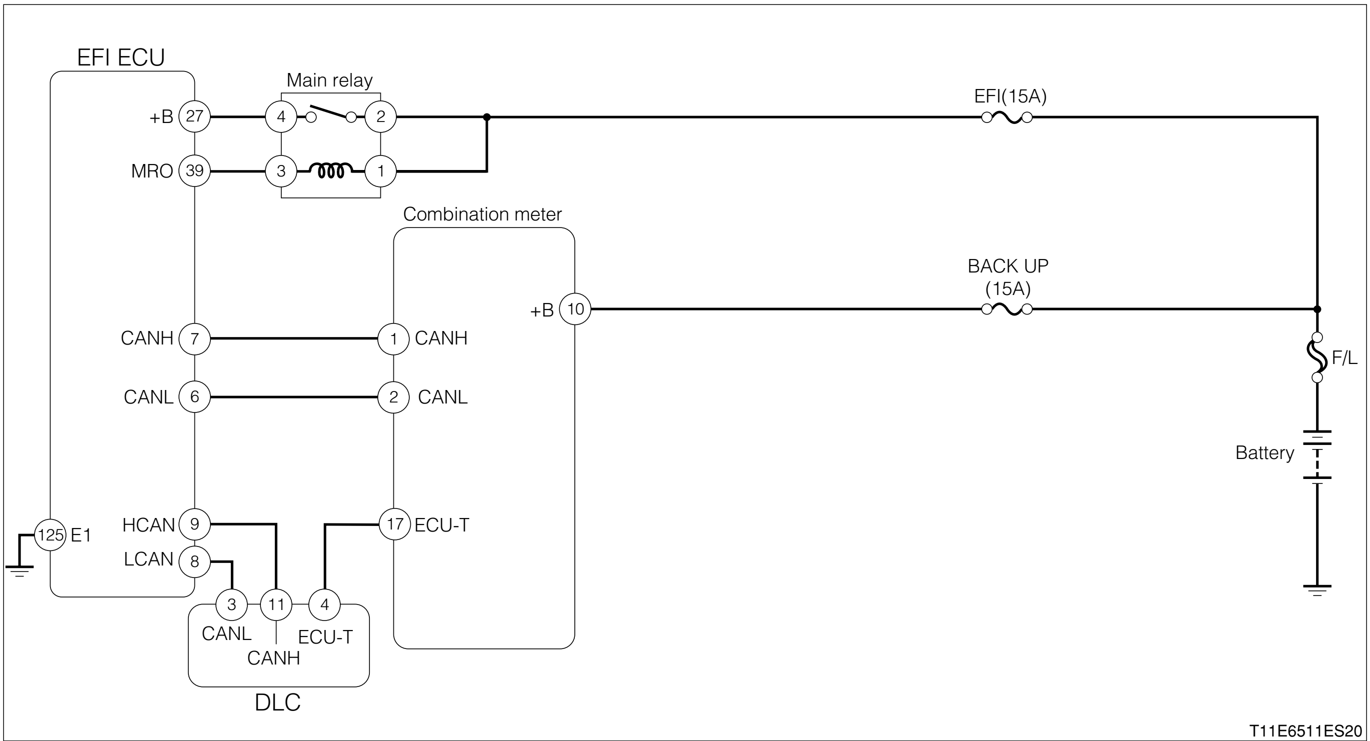
① RHD vehicles



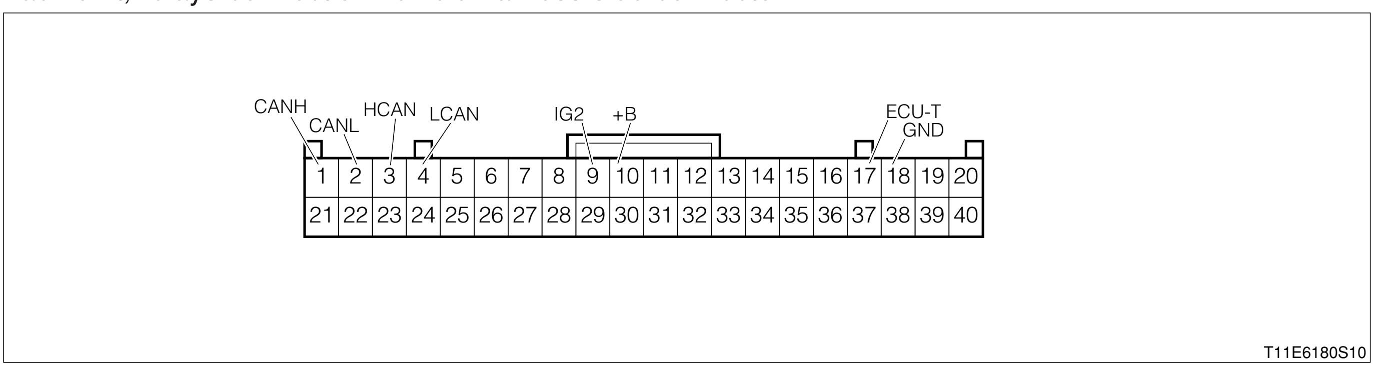
Each unit, relays connection vehicle harness side connector



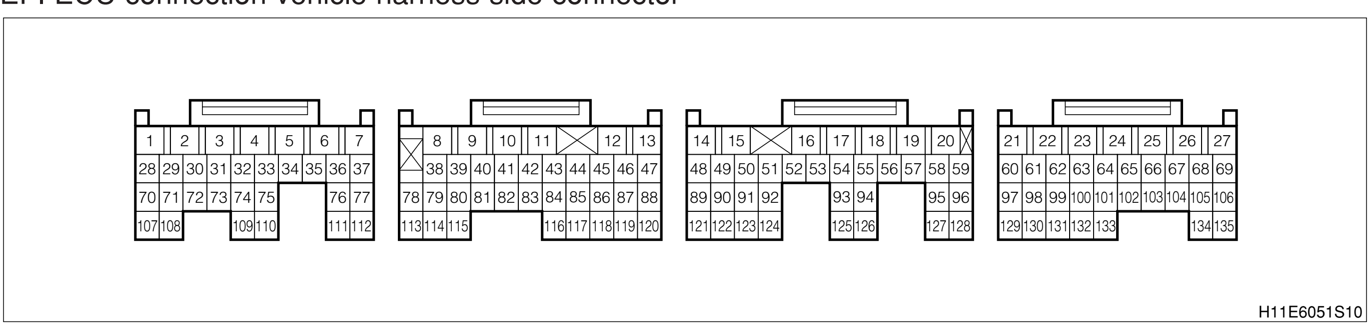
② **LHD vehicles**



Each unit, relays connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Diagnosis code output conditions

1.When communication signal cannot be received from combination meter

(3) Checking points

1.Is the harness between EFI ECU - combination meter normal?
2.Is the combination meter normal?
3.Check whether there is no poor contact at the connector section.

(4) Checking method

① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

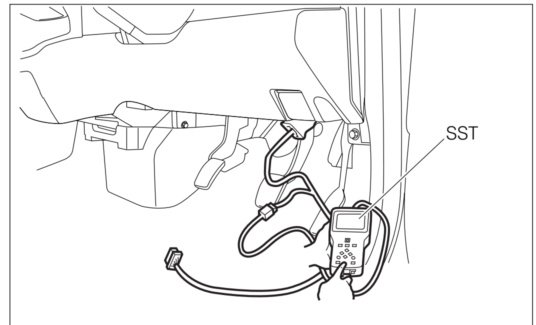
⋗1. Confirmation of the diagnosis codes (related to meter)

1.IG switch turned "LOCK".

2.Connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

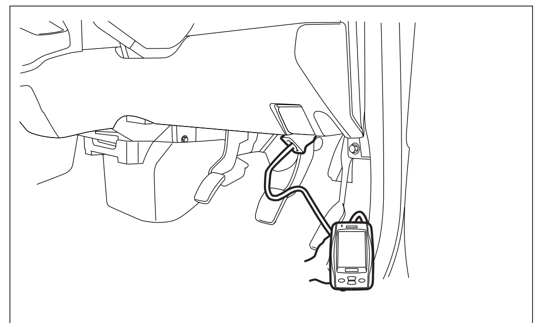
SST: 09991-87404-000



T11E6537T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.


T11E6573T10

3.Confirm whether any meter-related diagnosis code is outputted.

(No.0043: Failure to read out CAN system connection ECU information, No.0061: Abnormal low voltage)

Refer to Page J3-14.

▼If it is outputted, go to ⋗2.

▼If it is not outputted, go to ⋗4.

⋗2. Troubleshooting according to diagnosis code (Related to meters)

1.Perform the troubleshooting related to the diagnosis codes that have been outputted in ⋗1.

(1) No.43: Failure to read out CAN system connection ECU information

Refer to Page J3-20.

(2) No.61: Abnormal low voltage

Refer to Page J3-20.

2.After completion of the repairs, connect the diagnosis tester (DS-21/DS-Ⅱ) to toe DLC, using the SST.

SST: 09991-87404-000

3.Confirm whether any diagnosis code related to the meter is outputted.

▼If it is not outputted, go to ⋗3.

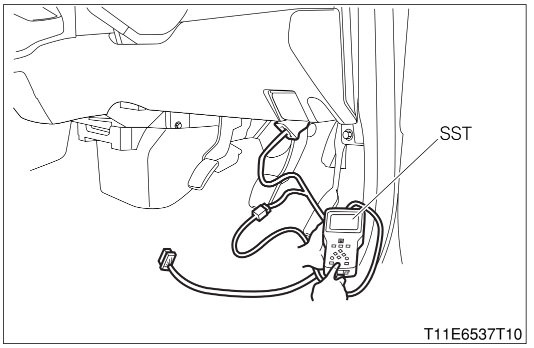
▼If it is output, perform the recheck of the diagnosis code that has been outputted.

⊳3. Reconfirmation of diagnosis code (Related to EFI)

1.Connect the diagnosis tester to DLC.

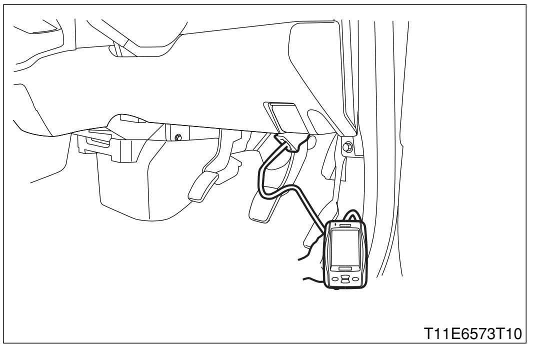
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



2.Erase the diagnosis code of the EFI.

3.Confirm whether the diagnosis code of the EFI is outputted.

SPECIFIED VALUE: It is not outputted.

▼If it is OK, the EFI system is normal.

▼If it is NG, go to ⊳4.

⊳4. Check of CAN line for open wire

1.Set the IG switch to the "LOCK" position.

2.Disconnect all of the EFI ECU connectors.

3.Perform continuity check between the following terminals.

(1) Between EFI ECU connection vehicle harness side connector 6(CANL) - EFI ECU connection vehicle harness side connector 7(CANH)

SPECIFIED VALUE: No continuity exists

▼If it is OK, go to ⊳5.

▼If it is NG, repair or replace malfunctioning sections.

⊳5. Check of EFI ECU internal resistance

1.Disconnect all of the EFI ECU connectors.

2.Measure the resistance between the following terminals.

(1) Between EFI ECU side connector 6(CANL) - EFI ECU side connector 7(CANH)

(2) Between EFI ECU side connector 8(LCAN) - EFI ECU side connector 9(HCAN)

SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, go to ⊳6.

▼If it is NG, replace the EFI ECU.

Refer to Page B8-1.

⊳6. Check of combination meter internal resistance

1.Disconnect the connector of the combination meter.

2.Measure the resistance between the following terminals.

(1) Between combination meter side connector 1(CANH) - combination meter side connector 2(CANL)

(2) Between combination meter side connector 3(HCAN) - combination meter side connector 4(LCAN)

SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, check the circuits of the combination meter and ECU.

▼If it is NG, replace the combination meter.

Refer to Page J3-3.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Diagnosis code confirmation (Meter-related)

1.Short-circuit the terminals 4 (ECU-T) and 13 (E) of the DLC, using the SST.
SST: 09991-87404-000(1)
09991-87403-000(2)

2.Check to see if the meter-related diagnosis code is outputted
(No.0043: CAN system connection ECU information readout not possible, No.0061: low voltage abnormality)

NOTE

- Refer to the diagnosis code output indication method of combination meter.

Refer to Page J3-14.

▼If it is outputted, proceed to ⊳2.
▼If it is not outputted, proceed to ⊳4.

⊳2. Trouble shooting according to diagnosis code (Meter-related)

1.Perform trouble shooting for the diagnosis code outputted in ⊳1.
(1) No.0043: CAN system connection ECU information readout not possible
Refer to Page J3-20.

(2) No.0061: Low voltage abnormality
Refer to Page J3-20.

2.After repairing, short-circuit the terminals 4 (ECU-T) and 13 (E) of the DLC, using the SST.
SST: 09991-87404-000(1)
09991-87403-000(2)

3.Confirm that the diagnosis code related to the meter is not outputted.
▼If it is not outputted, proceed to ⊳3.
▼If it is outputted, perform recheck for the diagnosis code outputted.

⊳3. Diagnosis code reconfirmation (EFI related)

1.Cancel the diagnosis code of the EFI.
2.After canceling, short-circuit the terminals 5 (EFI-T) and 13 (E) of the DLC, using SST.
SST: 09991-87404-000(1)
09991-87403-000(2)

3.Check to see if the diagnosis code of EFI is outputted.
SPECIFIED VALUE: It is not outputted.

▼If it is OK, the EFI system is normal.
▼If it is NG, proceed to ⊳4.

⊳4. CAN communication basic check

1.Perform basic check of the CAN communication.
Refer to Page L2-14.

▼If it is OK, proceed to ⊳5.
▼If it is NG, repair or replace the defective sections.

⊳5. CAN line open wire check

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU and A/T ECU.
3.Perform continuity check between each of the following terminals.
  (1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - EFI ECU connection vehicle harness side connector 7 (CANH)
  (2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - A/T ECU connection vehicle harness side connector B19 (LCN1)

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳6.
▼If it is NG, repair or replace the defective sections.

⊳6. EFI ECU internal resistance check

1.Remove all of the EFI ECU connectors.
2.Measure the resistance between the following terminals.
  (1) Between EFI ECU side connector 6 (CANL) - EFI ECU side connector 7 (CANH)
  (2) Between EFI ECU side connector 8 (LCAN) - EFI ECU side connector 9 (HCAN)

SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, proceed to ⊳7.
▼If it is NG, replace the EFI ECU.
Refer to Page B8-1.

⊳7. Combination meter internal resistance check

1.Remove all connectors of the combination meter.
2.Measure the resistance between the following terminals.
  (1) Between combination meter side connector 1 (CANH) - combination meter side connector 2 (CANL)
  (2) Between combination meter side connector 3 (HCAN) - combination meter side connector 4 (LCAN)

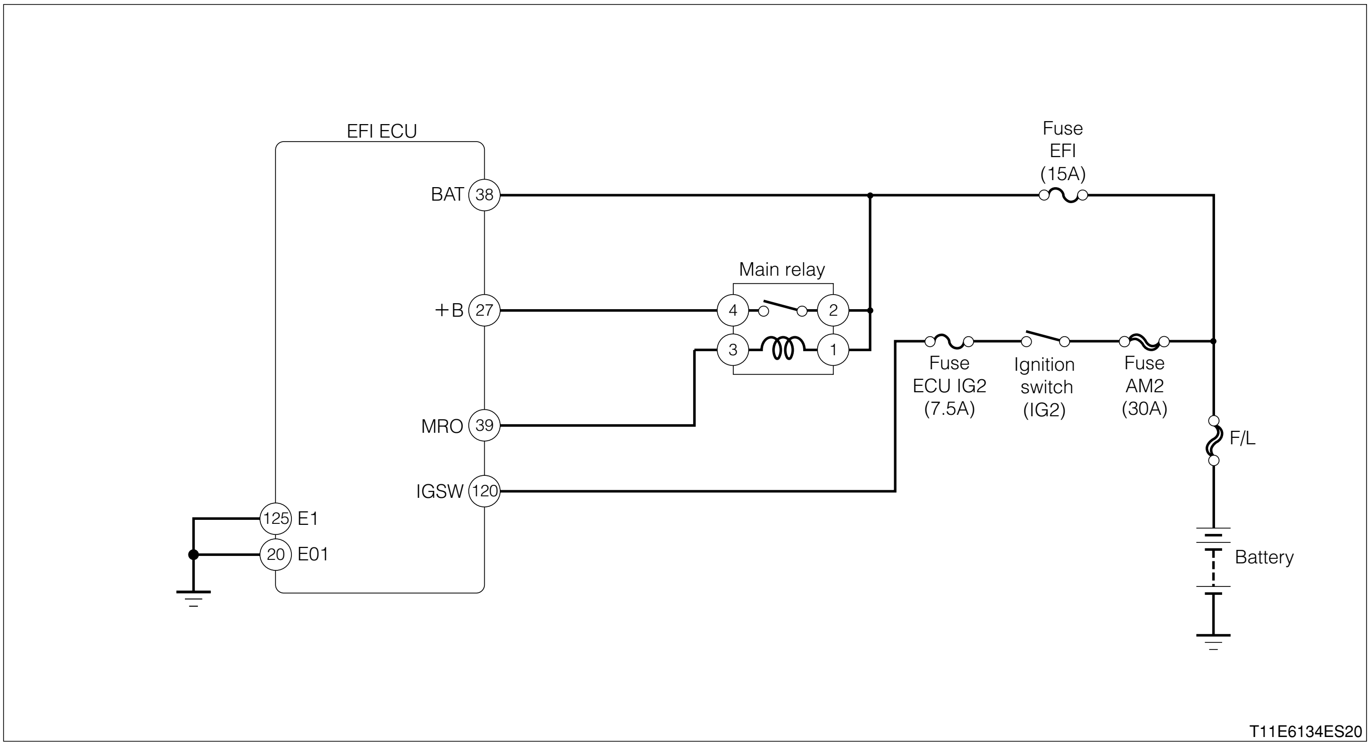
SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, perform circuit check of the combination meter and EFI ECU.
▼If it is NG, replace the combination meter.
Refer to Page J3-3.

7-13 TROUBLE SHOOTING ACCORDING TO SYSTEM

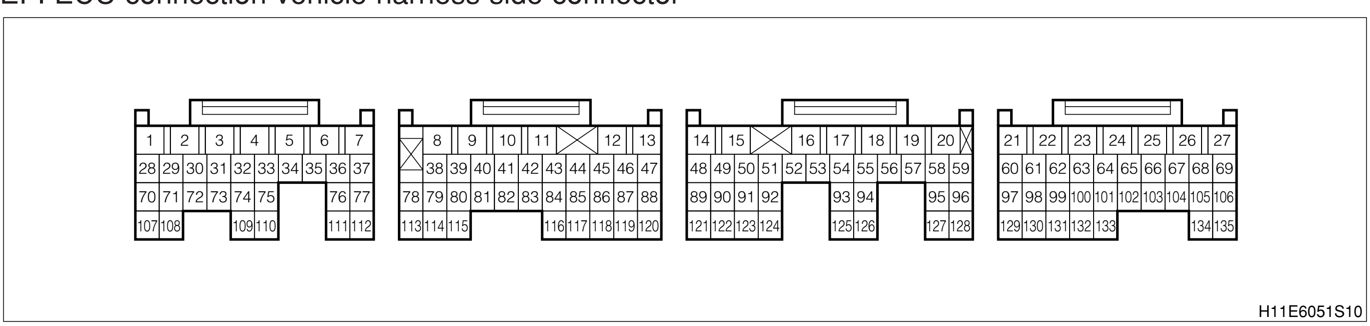
7-13-1 EFI ECU POWER SUPPLY SYSTEM CHECK

(1) System diagram



Each unit connection vehicle harness side connector

EFI ECU connection vehicle harness side connector



(2) Checking points

1. If the engine check lamp does not light up when the IG switch is "ON" or during diagnosis indication, it is possible that there is no power supplied to the EFI ECU.

(3) Checking method

ᐅ1. EFI ECU voltage check

1.Remove the connector on the EFI ECU side and perform voltage measurements for each of the terminals when the IG switch is "ON".

(1) ECU connection vehicle harness side connector 27 (+B) - ECU connection vehicle harness side connector 125 (E1)

(2) ECU connection vehicle harness side connector 38 (BAT) - ECU connection vehicle harness side connector 125 (E1)

SPECIFIED VALUE: Battery voltage

▼If it is OK, there is no abnormality in the EFI ECU power supply system.

▼If it is NG, proceed to ᐅ2.

ᐅ2. Check of wire harness continuity (1)

1.Perform continuity check between each of the following terminals.

(1) Between ECU connection vehicle harness side connector 27 (+B) - relay side connector 4

(2) Between ECU connection vehicle harness side connector 38 (BAT) - relay side connector 4

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ᐅ3.

▼If it is NG, repair the harness and the connectors.

ᐅ3. Main relay unit check

1.Perform unit check of the main relay.

Refer to Page B8-225.

▼If it is OK, proceed to ᐅ4.

▼If it is NG, replace the main relay.

ᐅ4. Main relay voltage check

1.Remove the main relay.

2.Perform voltage measurement between each terminal when the IG switch is "ON".

(1) Between relay side connector 1 (coil side) - body earth

(2) Between relay side connector 2 (switch side) - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, perform checking or repairing of the harness and connector for each of the following terminals.

(3) Between main relay - body earth

▼if the switch side is NG, perform checking or repairing of the harness and connector for each of the following terminals.

(1) Between main relay - battery

▼If the coil side is NG, proceed to ᐅ5.

ᐅ5. Check of wire harness continuity (2)

1.Perform continuity check between each of the following terminals.

(1) Between relay side connector 1 - IG switch side connector 6 (IG2)

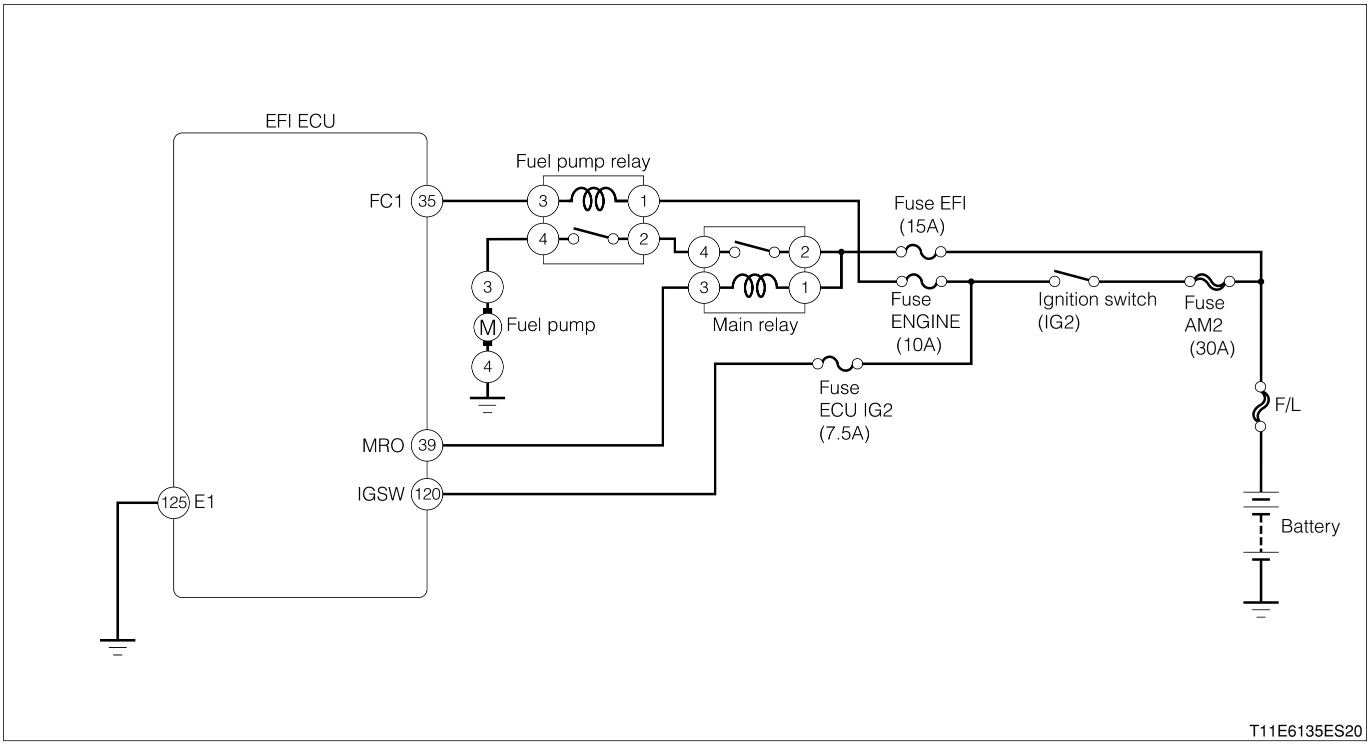
SPECIFIED VALUE: Continuity exists.

▼If it is OK, perform checking or repairing of the IG switch.

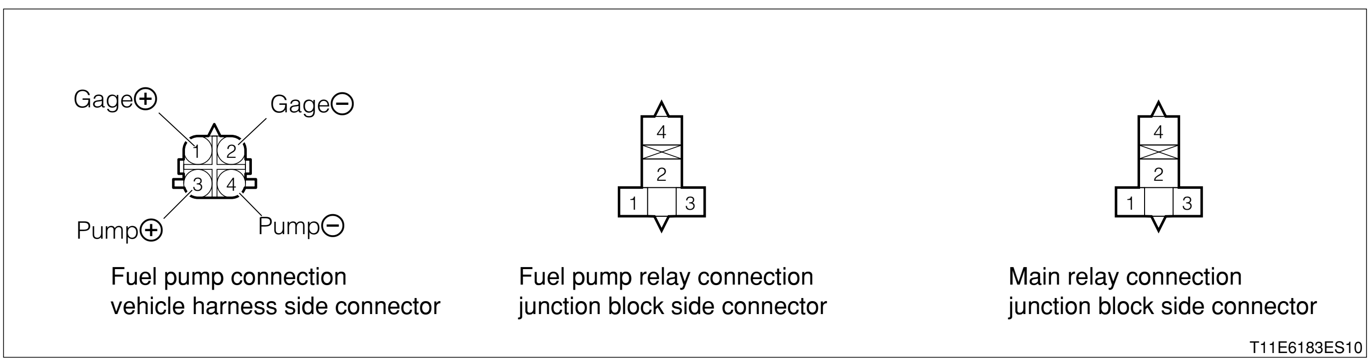
▼If it is NG, repair the harness and the connectors.

7-13-2 FUEL PUMP SYSTEM CHECK

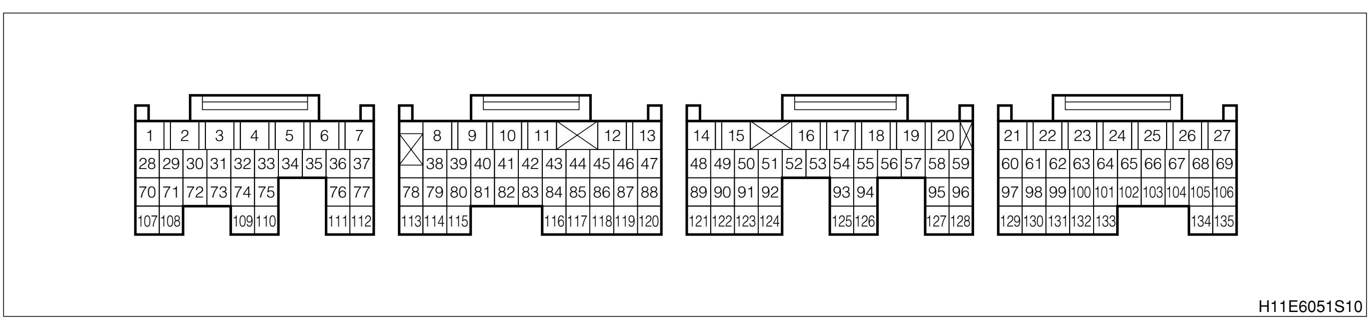
(1) System diagram



Each unit connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Checking points

1. Is the fuel pump relay power supply voltage normal?
2. Is the fuel pump relay operating correctly?
3. Is the fuel pump power supply voltage normal?
4. Is the fuel pump operating correctly?

(3) Checking method

① When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

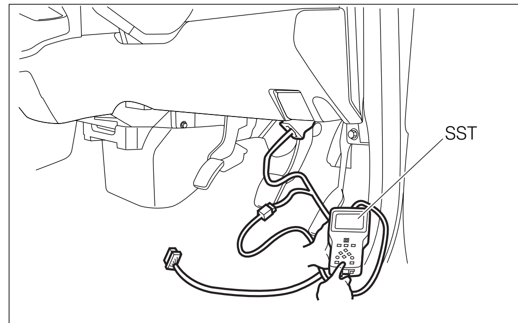
⊳1. Fuel pump operation check

1.IG switch turned "LOCK".

2.Connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000



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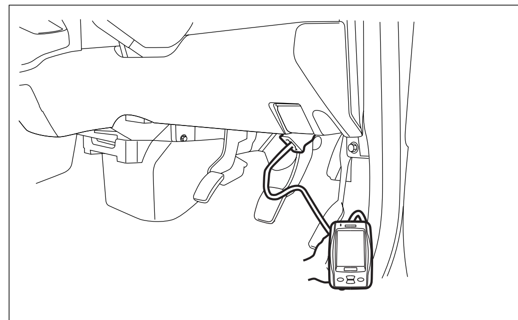
(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.

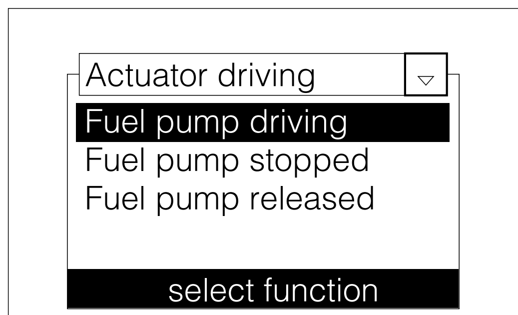


T11E6573T10

3.Turn "ON" the IG switch, and turn "ON" the main switch of the tester.

4.Confirmation of operation of the purge VSV for EVAP.

(1) DS-21: Select the "Fuel pump" of the "Actuator driving" so as to drive the fuel pump.



C13E5589ET10

(2) DS-Ⅱ: Select the "Fuel pump" of the "Active test" so as to drive the fuel pump.

5.At the time, check the operation sound of the fuel pump.

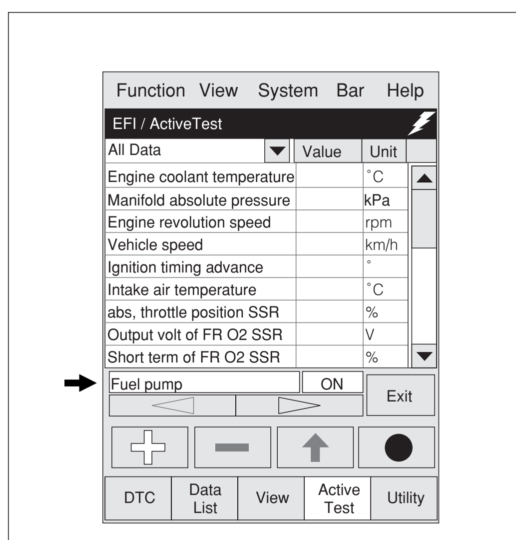
NOTE

- Confirm the operation sound from the fuel inlet side.

SPECIFIED VALUE: Operation sound is generated.

▼If it is OK, proceed to ⊳2.

▼If it is NG, proceed to ⊳3.



T11E6572T16

⊳2. Fuel pressure check

1.Perform fuel pressure check.
Refer to Page B8-219.

▼If it is OK, the fuel pump system is normal.
▼If it is NG, perform the following operations.
(1) Replacement of the fuel pump
Refer to Page B7-9.

(2) Repairing of the fuel line

⊳3. Fuel pump relay voltage check

1.Remove the fuel pump relay.
2.Perform voltage measurements between each of the following terminals when the IG switch is "ON".
(1) Between relay side connector 1 (coil side) - body earth
(2) Between relay side connector 2 (switch side) - body earth
SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳4.
▼If the switch side is NG, proceed to ⊳8.
▼If the coil side is NG, perform checking and repairing for the following portions.
(1) Harness and connectors between the fuel pump relay and battery
(2) Fuse
(3) Ignition switch

⊳4. Fuel pump relay unit check

1.Perform unit check of the fuel pump relay.
Refer to Page B8-219.

▼If it is OK, proceed to ⊳5.
▼If it is NG, replace the fuel pump relay.

⊳5. Check of wire harness continuity (1)

1.Perform continuity check between each of the following terminals.
(1) Between relay side connector 4 - pump side connector 3 (pump+)
(2) Between pump side connector 4 (pump−) - body earth
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳6.
▼If it is NG, repair the harness and the connectors of the defective sections.

⊳6. Fuel pump unit check

1.Perform unit check of the fuel pump.
Refer to Page B8-219.

▼If it is OK, proceed to ⊳7.
▼If it is NG, replace the fuel pump.

⫐7. Check of wire harness continuity (2)

1.Perform continuity check between each of the following terminals.

(1) Between relay side connector 3 - ECU connection vehicle harness side connector 35 (FC1)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, check the EFI ECU circuit.

▼If it is NG, repair the harness and the connectors.

⫐8. Check of wire harness continuity (3)

1.Perform continuity check between each of the following terminals.

(1) Between fuel pump relay side connector 2 - main relay side connector 4

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⫐9.

▼If it is NG, repair the harness and the connectors.

⫐9. Main relay unit check

1.Perform unit check of the main relay.

Refer to Page B8-225.

▼If it is OK, proceed to ⫐10.

▼If it is NG, replace the main relay.

⫐10. Main relay voltage check

1.Remove the main relay.

2.Perform voltage measurement between each terminal when the IG switch is "ON".

(1) Between relay side connector 1 (coil side) - body earth

(2) Between relay side connector 2 (switch side) - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, perform checking or repairing of the harness and connector for each of the following terminals.

(1) Between main relay - body earth

▼If the switch side is NG, perform checking or repairing of the following portions.

(1) Harness and connectors between the main relay side connector 2 and battery

(2) Fuse

▼If the coil side is NG, perform checking and repairing for the following portions.

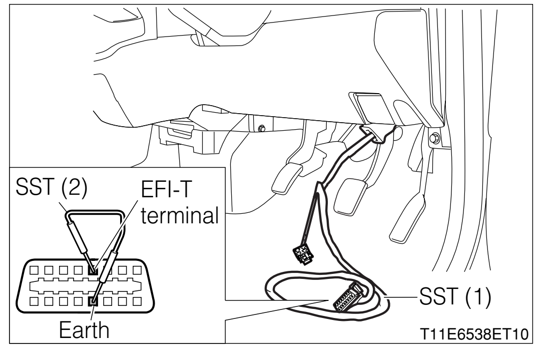
(1) Harness and connectors between main relay side connector 1 and battery

(2) Ignition switch

(3) Fuse

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⪢1. Fuel pump operation check



1.Check if there is the operation sound of the fuel pump by shorting the EFI-T terminal when the IG switch is "ON".

SST: 09991-87404-000(1)
09991-87403-000(2)

NOTE

- Confirm the operation sound from the fuel inlet side.

SPECIFIED VALUE: Operation sound is generated.

▼If it is OK, proceed to ⪢2.
▼If it is NG, proceed to ⪢3.

⪢2. Fuel pressure check

1.Perform fuel pressure check.
Refer to Page B8-219.

▼If it is OK, the fuel pump system is normal.
▼If it is NG, perform the following operations.

(1) Replacement of the fuel pump
Refer to Page B7-9.

(2) Repairing of the fuel line

⪢3. Fuel pump relay voltage check

1.Remove the fuel pump relay.
2.Perform voltage measurements between each of the following terminals when the IG switch is "ON".
(1) Between relay side connector 1 (coil side) - body earth
(2) Between relay side connector 2 (switch side) - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⪢4.
▼If the switch side is NG, proceed to ⪢8.
▼If the coil side is NG, perform checking and repairing for the following portions.
(1) Harness and connectors between the fuel pump relay and battery
(2) Fuse
(3) Ignition switch

⪢4. Fuel pump relay unit check

1.Perform unit check of the fuel pump relay.
Refer to Page B8-219.

▼If it is OK, proceed to ⪢5.
▼If it is NG, replace the fuel pump relay.

⌦5. Check of wire harness continuity (1)

1.Perform continuity check between each of the following terminals.
(1) Between relay side connector 4 - pump side connector 3 (pump＋)
(2) Between pump side connector 4 (pump－) - body earth
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⌦6.
▼If it is NG, repair the harness and the connectors of the defective sections.

⌦6. Fuel pump unit check

1.Perform unit check of the fuel pump.
Refer to Page B8-219.

▼If it is OK, proceed to ⌦7.
▼If it is NG, replace the fuel pump.

⌦7. Check of wire harness continuity (2)

1.Perform continuity check between each of the following terminals.
(1) Between relay side connector 3 - ECU connection vehicle harness side connector 35 (FC1)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, check the EFI ECU circuit.
▼If it is NG, repair the harness and the connectors.

⌦8. Check of wire harness continuity (3)

1.Perform continuity check between each of the following terminals.
(1) Between fuel pump relay side connector 2 - main relay side connector 4
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⌦9.
▼If it is NG, repair the harness and the connectors.

⌦9. Main relay unit check

1.Perform unit check of the main relay.
Refer to Page B8-225.

▼If it is OK, proceed to ⌦10.
▼If it is NG, replace the main relay.

⊳10. Main relay voltage check

1.Remove the main relay.

2.Perform voltage measurement between each terminal when the IG switch is "ON".

(1) Between relay side connector 1 (Coil side) - body earth

(2) Between relay side connector 2 (Switch side) - body earth

SPECIFIED VALUE: Battery voltage

▼<u>If it is OK, perform checking or repairing of the harness and connector for each of the following terminals.</u>

(1) Between main relay - body earth

▼<u>If the switch side is NG, perform checking or repairing of the following portions.</u>

(1) Harness and connectors between the main relay side connector 2 and battery

(2) Fuse

▼<u>If the coil side is NG, perform checking and repairing for the following portions.</u>

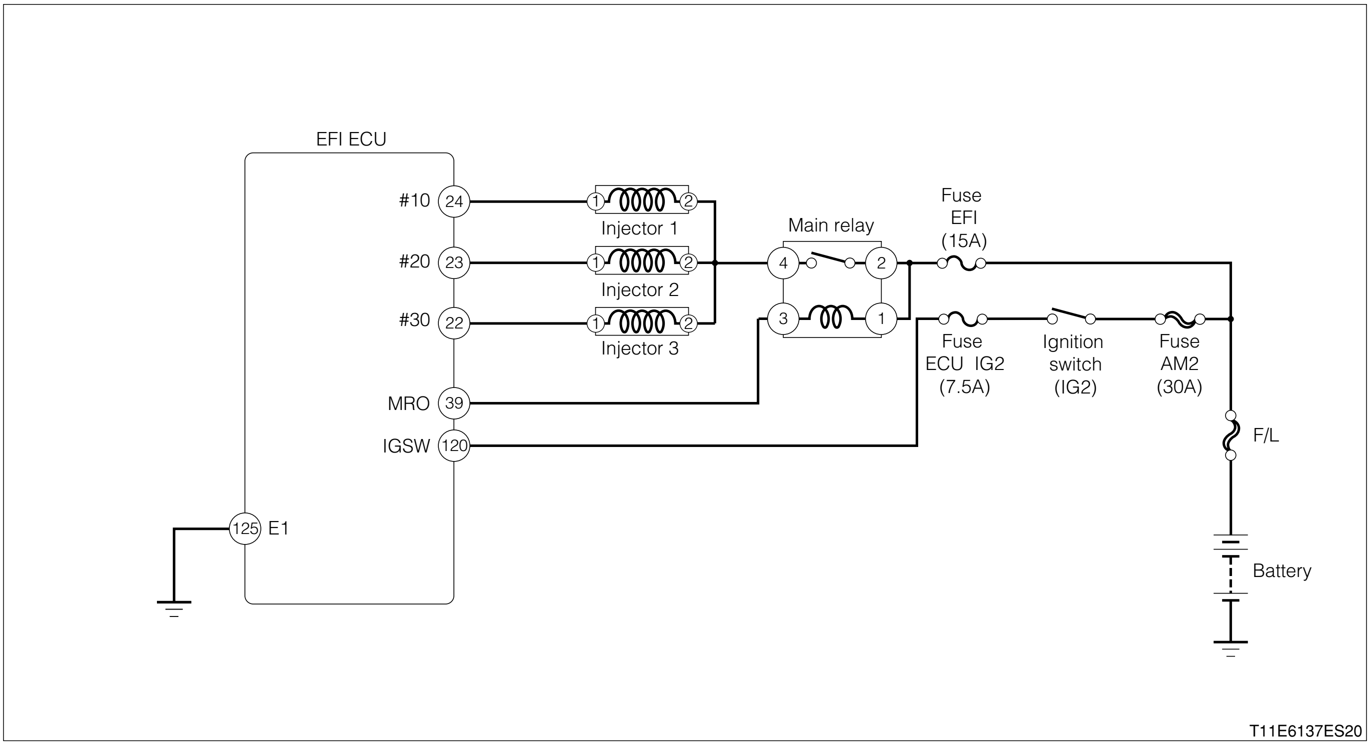
(1) Harness and connectors between main relay side connector 1 and battery

(2) Ignition switch

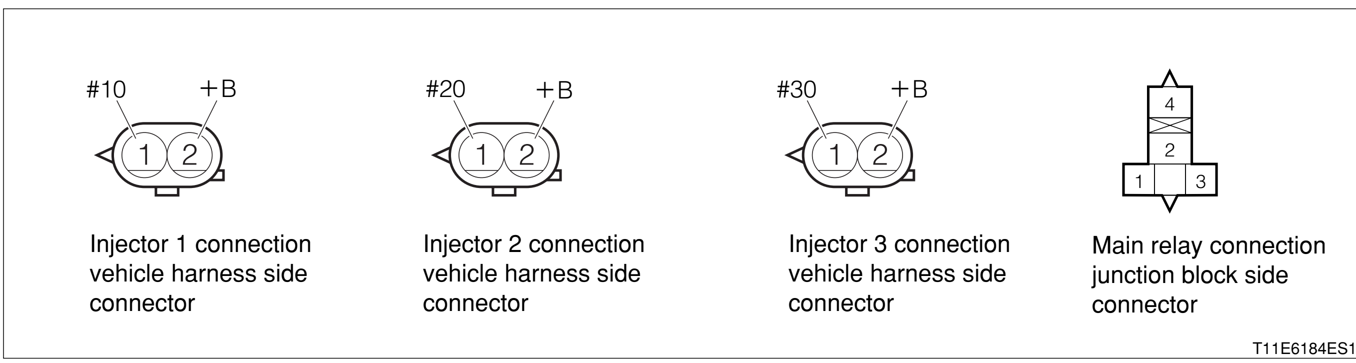
(3) Fuse

7-13-3 INJECTOR SYSTEM CHECK

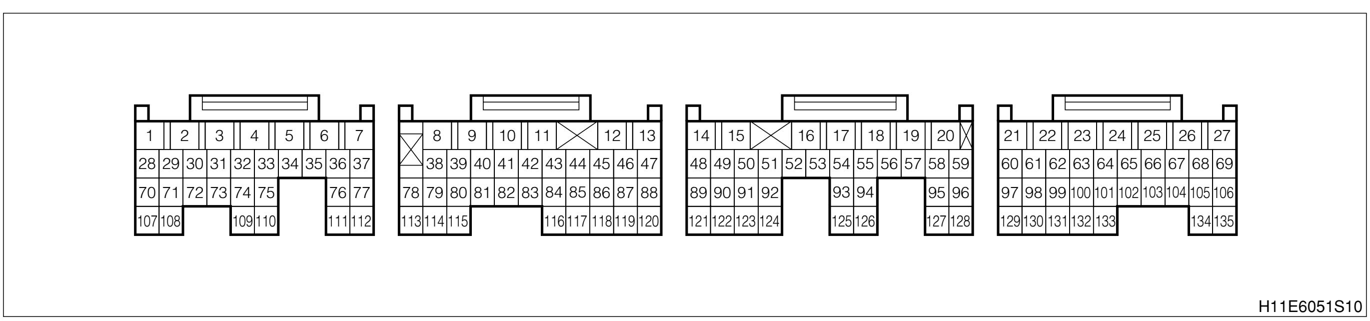
(1) System diagram



Each units connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Checking points

1.Is the injector control signal outputted correctly from the EFI ECU?
2.Is the injector power supply voltage normal?
3.Is the harness between the injector and EFI ECU normal?
4.Is the injection of the injector proper?

(3) Checking method

⊳1. Injector operation check

1.Check if there is the operation sound of the injector using a sound scope or a long screwdriver.

SPECIFIED VALUE: Operation sound is generated.

▼If it is OK, proceed to ⊳2.

▼If it is NG, proceed to ⊳3.

⊳2. Injector unit check (1)

1.Perform unit check of the injector.

Refer to Page B8-224.

▼If it is OK, the injector system is normal.

▼If it is NG, replace the injector.

Refer to Page B7-11.

⊳3. Injector voltage check

1.Remove all of the connectors on the injector side.

2.Perform voltage measurements between each of the following terminals when the IG switch is "ON".

(1) Each injector connection vehicle harness side connector 2 (+B) - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳4.

▼If it is NG, perform checking or repairing of the harness and relay between the following terminals.

(2) Between battery - injector

⊳4. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.

(1) Between ECU connection vehicle harness side connector 24 (#10) - injector 1 connection vehicle harness side connector 1 (#10)

(2) Between ECU connection vehicle harness side connector 23 (#20) - injector 2 connection vehicle harness side connector 1 (#20)

(3) Between ECU connection vehicle harness side connector 22 (#30) - injector 3 connection vehicle harness side connector 1 (#30)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳5.

▼If it NG, repair the harness and connectors of the defective sections.

⊳5. Injector unit check (2)

1.Perform unit check of the injector.

Refer to Page B8-224.

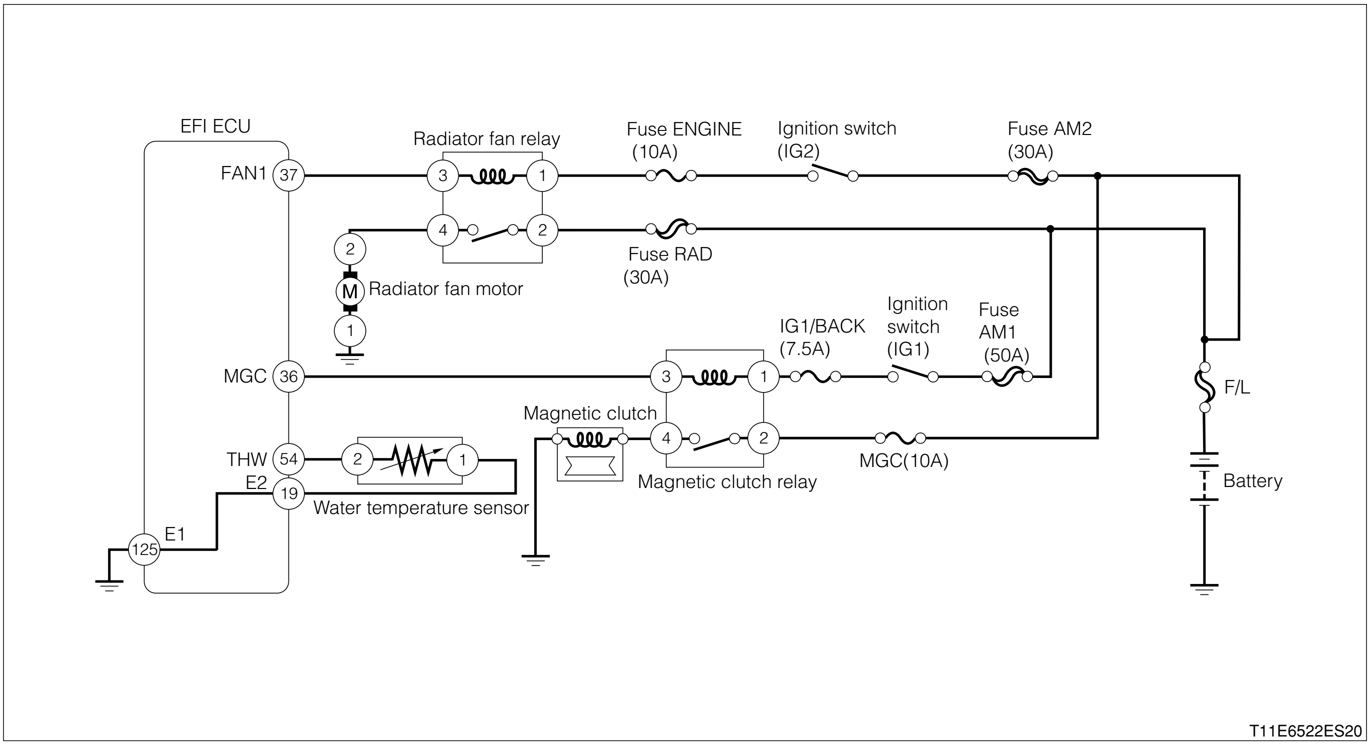
▼If it is OK, check the connecting condition of each connector.

▼If it is NG, replace the injector.

Refer to Page B7-11.

7-13-4 RADIATOR FAN SYSTEM CHECK

(1) System diagram



Each unit, relays connection vehicle harness side connector

Radiator fan relay connection junction block side connector

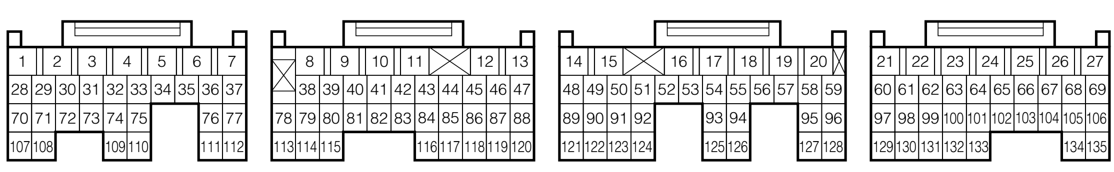
Radiator fan motor connection vehicle harness side connector

IG switch connection vehicle harness side connector

Water temperature sensor connection vehicle harness side connector

T11E6186ES10

EFI ECU connection vehicle harness side connector



H11E6051S10

(2) Checking points

1. Is the signal from the water temperature sensor inputted to the EFI ECU?
2. Is the harness between the water temperature sensor and EFI ECU normal?
3. Is the output of the water temperature sensor correct?
4. Is the signal from the magnet clutch relay inputted to the EFI ECU?
5. Is the harness between the magnet clutch relay and EFI ECU normal?
6. Is the harness between the radiator fan relay and EFI ECU normal?
7. Is the radiator fan motor normal?

(3) Checking method

① When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

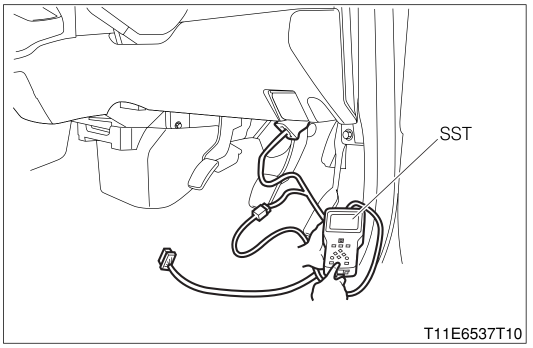
⪢1. Radiator fan operation check (1)

1.The IG switch turned "LOCK".

2.Connect the diagnosis tester to DLC.

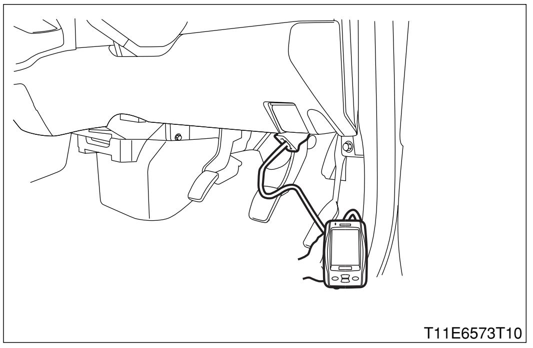
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



3.Turn "ON" the IG switch, and turn "ON" the main switch of the tester.

4.Confirmation of operation of the radiator fan.

(1) DS-21: Select the "Radiator fan 1st stage" of the "Actuator driving".

(2) DS-Ⅱ: Select the "Radiator fan 1st stage" of the "Active test".

5.Choose the "Radiator fan 1st stage ON" and "Radiator fan 1st stage OFF", respectively.

SPECIFIED VALUE: The fan rotates when "ON" is chosen. The fan stops when "OFF" is chosen.

▼If it is OK, proceed to ⪢2.

▼If it is NG, proceed to ⪢9.

⪢2. Radiator fan operation check (2)

1.Check if the fan does not operate during cold period, but operates after warm-up when warming up the engine.

2.Check if the fan operates when the air conditioner is turned "ON".

NOTE

- Air conditioner "ON" means that the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are all "ON".

SPECIFIED VALUE: The fan operates when the air conditioner is turned "ON".

▼If it is OK, the system is normal.

▼If it does not rotate after warm-up, perform checking the water temperature sensor system.

Refer to Page B8-74.

▼If it does not rotate when the air conditioner is "ON", proceed to ⪢3.

▼When it is rotating constantly, proceed to ⪢6.

▼If it does not rotate at all, proceed to ⪢9.

⊳3. Check of wire harness continuity (1)

1.Perform continuity check between each of the following terminals.

(1) Between relay side connector 3 - ECU connection vehicle harness side connector 36 (MGC)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳4.

▼If it is NG, repair or replace the defective sections.

⊳4. Magnet clutch relay voltage check

1.Perform voltage measurements between each of the following terminals when the IG switch is "ON".

(1) Between relay side connector 1 - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳5.

▼If it is NG, perform checking or repairing the harness and the connectors for the following terminals.

(2) Between magnet clutch relay - battery

⊳5. Magnet clutch relay unit check

1.Perform unit check of the magnet clutch relay.

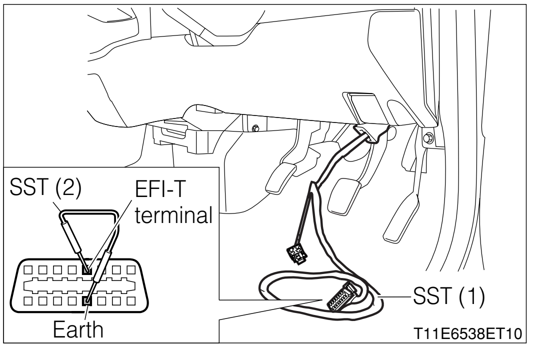
Refer to Page B8-225.

▼If it is OK, check the EFI ECU circuit.

Refer to Page A1-24.

▼If it is NG, replace the magnet clutch relay

⊳6. Diagnosis code check



1.Short-circuit the EFI-T terminals, using SST.

SST: 09991-87404-000

09991-87403-000

2.Is the normal code outputted when the IG switch is "ON"?

SPECIFIED VALUE: The normal code is outputted.

▼If it is OK, proceed to ⊳7.

▼If code No.42 is outputted, perform checking of the water temperature sensor system.

Refer to Page B8-74.

⊳7. Wire harness check (2)

1.Perform continuity check between each of the following terminals.

(1) Between relay side connector 3 - ECU connection vehicle harness side connector 37 (FAN1)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳8.

▼If it is NG, repair or replace the defective sections.

⊳8. Radiator fan relay unit check (1)

1.Perform unit check of the radiator fan relay.
Refer to Page B8-225.

▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, replace the radiator fan relay.

⊳9. EFI ECU voltage check

1.Connect the SST.
SST: 09842-97209-000

2.Perform voltage measurements between the following terminals when the air conditioner is turned "ON".

NOTE
- Air conditioner "ON" means that the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are all "ON".

(1) Between SST 37 (FAN1) - SST 125 (E1)
SPECIFIED VALUE:

Measuring condition	Specified value
When magnet clutch is "ON".	1V or less
When magnet clutch is "OFF".	Battery voltage

▼If it is OK, proceed to ⊳13.
▼If it is NG, proceed to ⊳10.

⊳10. Check of wire harness continuity (3)

1.Perform continuity check between each of the following terminals.
(1) Between relay side connector 3 - ECU connection vehicle harness side connector 37 (FAN1)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳11.
▼If it is NG, repair the harness and the connectors.

⊳11. Radiator fan relay coil side voltage check

1.Perform voltage measurements between each of the following terminals when the IG switch is "ON".
(1) Between relay side connector 1 - body earth
SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳12.
▼If it is NG, perform checking or repairing of the harness and connectors between the following terminals.
(1) Between radiator fan relay - battery

⊳12. Radiator fan relay unit check (2)

1.Perform unit check of radiator fan relay.

Refer to Page B8-225.

▼If it is OK, check the EFI ECU circuit.

Refer to Page A1-24.

▼If it is NG, replace the radiator fan relay.

⊳13. Radiator fan relay switch side voltage check

1.Perform voltage measurements between the following terminals when the IG switch is "ON".

(1) Between relay side connector 2 - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳13.

▼If it is NG, perform checking or repairing of the harness and connectors between the following terminals.

(1) Between radiator fan relay - battery

⊳14. Radiator fan relay unit check (3)

1.Perform unit check of radiator fan relay.

Refer to Page B8-225.

▼If it is OK, proceed to ⊳14.

▼If it is NG, replace the radiator fan relay.

⊳15. Check of wire harness continuity (4)

1.Perform continuity check between each of the following terminals.

(1) Between relay side connector 4 - motor side connector 2 (+)

(2) Between motor side connector 1 (−) - body earth

SPECIFIED VALUE: Continuity exists.

▼If it is OK, replace the radiator fan motor.

Refer to Page B6-5.

▼If it is NG, perform repairing and replacing of the defective sections.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Radiator fan operation check

1.Check if the fan does not operate during cold period, but operates after warm-up when warming up the engine.

2.Check if the fan operates when the air conditioner is turned "ON".

NOTE

- Air conditioner "ON" means that the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are all "ON".

SPECIFIED VALUE: The fan operates when the air conditioner is turned "ON".

▼If it is OK, the system is normal.
▼If it does not rotate after warm-up, perform checking the water temperature sensor system.
Refer to Page B8-74.

▼If it does not rotate when the air conditioner is "ON"
▼When it is rotating constantly, proceed to ⊳5.
▼If it does not rotate at all, proceed to ⊳8.

⊳2. Check of wire harness continuity (1)

1.Perform continuity check between each of the following terminals.
(1) Between relay side connector 3 - ECU connection vehicle harness side connector 36 (MGC)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳3.
▼If it is NG, repair or replace the defective sections.

⊳3. Magnet clutch relay voltage check

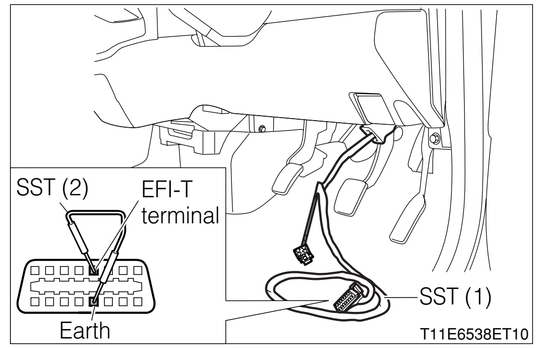
1.Perform voltage measurements between each of the following terminals when the IG switch is "ON".
(1) Between relay side connector 1 - body earth
SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳4.
▼If it is NG, perform checking or repairing the harness and the connectors for the following terminals.
(1) Between magnet clutch relay - battery

⊳4. Magnet clutch relay unit check

1.Perform unit check of the magnet clutch relay.
Refer to Page B8-225.

▼If it is OK, check the EFI ECU circuit.
▼If it is NG, replace the magnet clutch relay



⊳5. Diagnosis code check

1.Short-circuit the EFI-T terminals, using SST.
SST: 09991-87404-000(1)
09991-87403-000(2)

2.Is the normal code outputted when the IG switch is "ON"?
SPECIFIED VALUE: The normal code is outputted.

▼If it is OK, proceed to ⊳6.
▼If code No.42 is outputted, perform checking of the "water temperature sensor system".
Refer to Page B8-74.

⊳6. Wire harness check (2)

1.Perform continuity check between each of the following terminals.
(1) Between relay side connector 3 - ECU connection vehicle harness side connector 37 (FAN1)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳7.
▼If it is NG, repair or replace the defective sections.

⊳7. Radiator fan relay unit check (1)

1.Perform unit check of the radiator fan relay.
Refer to Page B8-225.

▼If it is OK, check the EFI ECU circuit.
▼If it is NG, replace the radiator fan relay.

⊳8. EFI ECU voltage check

1.Connect the SST.
SST: 09842-97209-000

2.Perform voltage measurements between the following terminals when the air conditioner is turned "ON".

NOTE

- Air conditioner "ON" means that the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are all "ON".

(1) Between SST 37 (FAN1) - SST 125 (E1)
SPECIFIED VALUE:

Measuring condition	Specified value
When magnet clutch is "ON".	1V or less
When magnet clutch is "OFF".	Battery voltage

▼If it is OK, proceed to ⊳2.
▼If it is NG, proceed to ⊳9.

ᐅ9. Check of wire harness continuity (3)

1.Perform continuity check between each of the following terminals.

(1) Between relay side connector 3 - ECU connection vehicle harness side connector 37 (FAN1)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ᐅ10.

▼If it is NG, repair the harness and the connectors.

ᐅ10. Radiator fan relay coil side voltage check

1.Perform voltage measurements between each of the following terminals when the IG switch is "ON".

(1) Between relay side connector 1 - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ᐅ11.

▼If it is NG, perform checking or repairing of the harness and connectors between the following terminals.

(1) Between radiator fan relay - battery

ᐅ11. Radiator fan relay unit check (2)

1.Perform unit check of radiator fan relay.

Refer to Page B8-225.

▼If it is OK, check the EFI ECU circuit.

▼If it is NG, replace the radiator fan relay.

ᐅ12. Radiator fan relay switch side voltage check

1.Perform voltage measurements between the following terminals when the IG switch is "ON".

(1) Between relay side connector 2 - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ᐅ13.

▼If it is NG, perform checking or repairing of the harness and connectors between the following terminals.

(1) Between radiator fan relay - battery

ᐅ13. Radiator fan relay unit check (3)

1.Perform unit check of radiator fan relay.

Refer to Page B8-225.

▼If it is OK, proceed to ᐅ14.

▼If it is NG, replace the radiator fan relay.

ᐅ14. Check of wire harness continuity (4)

1.Perform continuity check between each of the following terminals.

(1) Between relay side connector 4 - motor side connector 2 (+)

(2) Between motor side connector 1 (−) - body earth

SPECIFIED VALUE: Continuity exists.

▼If it is OK, replace the radiator fan motor.

▼If it is NG, perform repairing and replacing of the defective sections.

7-14 UNIT CHECK

WARNING

- If the vehicle is driven with the SST (EFI computer check sub harness, etc.) connected there is a possibility of causing malfunction and may be very dangerous. Therefore, remove it without fail before running.

7-14-1 FUEL PRESSURE CHECK

WARNING

- Fire is strictly forbidden while operation.
  Place cloth, etc. to prevent fuel from splashing.

1. Connect the SST.
   SST: 09842-97209-000
   09268-87701-000
   09268-87702-000

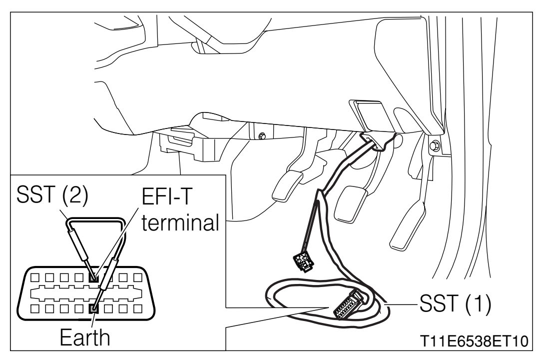
2. Turn the IG switch to the "ON" position.
3. Drive the fuel pump by shorting between SST 35 (FC1) - SST 125 (E1) and measure the fuel pressure at this point.
   SPECIFIED VALUE: 324±5kPa {3.3±0.05kgf/cm^2}
   There should be no large fluctuation.

7-14-2 FUEL PUMP

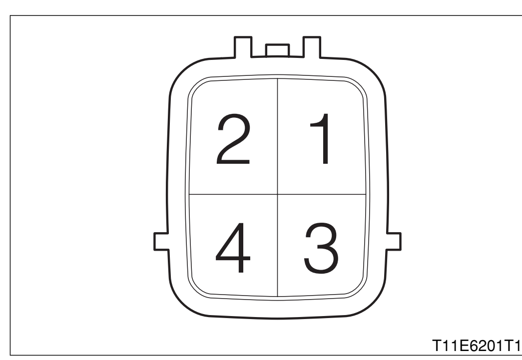
WARNING

- Fire is strictly forbidden while operation.

1. Turn the IG switch to the "ON" position.
2. Short-circuit the terminals 5 (EFI-T) and 13 (E) of the DLC, using the SST and confirm the operation sound of the fuel pump at this point.
   SST: 09991-87404-000(1)
   09991-87403-000(2)
3. Turn the IG switch to "LOCK".

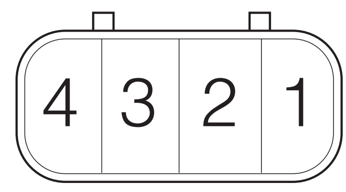


4. Pull out the pump connector on top of the fuel tank and measure the resistance between 3 (pump+) - 4 (pump−) of the fuel pump.
   SPECIFIED VALUE: 0.2 - 3.0Ω



7-14-3 INTAKE MANIFOLD PRESSURE/INTAKE TEMPERATURE INTEGRATED SENSOR

1.Connect the SST.
SST: 09842-97209-000



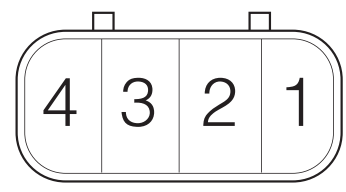
T11E6202T10

2.Perform voltage measurements between the following terminals when the IG switch is "ON".
(1) Between SST 57 (VCPM) - SST 122 (E2PM)
SPECIFIED VALUE: 4.5 - 5.5V

3.Perform voltage measurements between the following terminals when the IG switch is "ON".
(1) Between SST 52 (PIM) - SST 122 (E2PM)
SPECIFIED VALUE: 3.1 - 4.1V

4.Perform voltage measurements between the following terminals by cranking with the fuel pump relay removed.
(1) Between SST 52 (PIM) - SST 122 (E2PM)
SPECIFIED VALUE: The voltage value changes.

5.Measure the resistance between the following terminals.
(1) Between 4 (THA) - 2 (E2PM)



T11E6202T10

Intake air temperature sensor characteristics

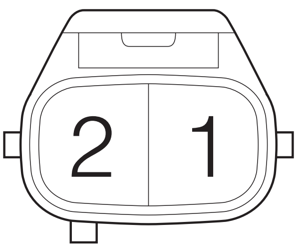
Temperature (°C)	−30	−20	20	80	120
Resistance (kΩ)	28.6	16.2	2.45	0.322	0.117

NOTE

- The reference value is indicated in the parentheses.

7-14-4 ENGINE REVOLUTION SENSOR

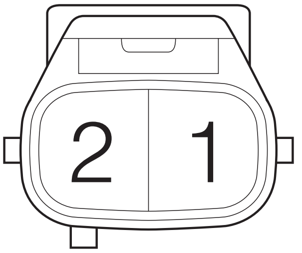
1.Measure the resistance between the following terminals.
(1) Between 1 (N1＋) - 2 (N1－)
SPECIFIED VALUE: 2150±300Ω (At 20°C)



T11E6205T10

7-14-5 CAMSHAFT POSITION SENSOR

1.Measure the resistance between the following terminals.
(1) Between 1 (N2＋) - 2 (N2－)
SPECIFIED VALUE: 2150±300Ω (At 20°C)



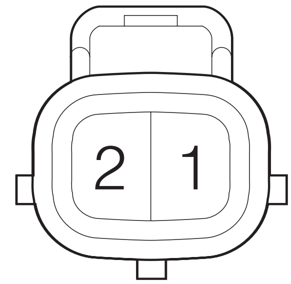
T11E6223T10

7-14-6 WATER TEMPERATURE SENSOR

1.Measure the resistance between the following terminals.

(1) Between 1 (E2) - 2 (THW)

Temperature (℃)	−20	20	80	110
Resistance (kΩ)	15.04	2.45	0.318	0.142



T11E6207T10

7-14-7 OXYGEN SENSOR

1.Measure the resistance between the following terminals.

(1) Between 1 (OXH1) - 2 (＋)

SPECIFIED VALUE: $7.0^{+1.4}_{0.7}$ Ω (20±1°C)

2.Confirm that there is no continuity between each of the following terminals.

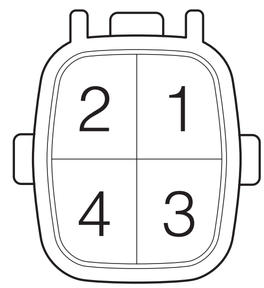
(1) Between oxygen sensor body - 3 (OX1)
(2) Between oxygen sensor body - 4 (E2)
(3) Between oxygen sensor body - 1 (OXH1)
(4) Between oxygen sensor body - 2 (＋B)
(5) Between 3 (OX1) - 1 (OXH1)
(6) Between 3 (OX1) - 2 (＋B)
(7) Between 4 (E2) - 1 (OXH1)
(8) Between4 (E2) - 2 (＋B)

SPECIFIED VALUE: No continuity exists

NOTE

- Other than the above unit check, perform checking for the oxygen sensor output voltage under the condition in which it is installed to the vehicle.
  (Refer to the page of the oxygen sensor system of the trouble shooting according to the systems.)

Refer to Page B8-96.

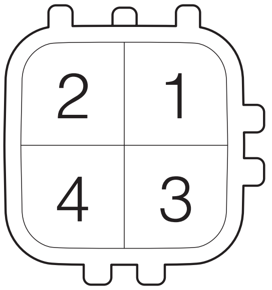


T11E6208T10

7-14-8 REAR OXYGEN SENSOR

1.Measure the resistance between the following terminals.
(1) Between 1 (OXH2) - 2 (+)
SPECIFIED VALUE: $13.0^{+2.5}_{-1.3}$ Ω(20±1°C)

2.Confirm that there is no continuity between each of the following terminals.
(1) Between rear oxygen sensor body - 3 (OX2)
(2) Between rear oxygen sensor body - 4 (E2)
(3) Between rear oxygen sensor body - 1 (OXH2)
(4) Between rear oxygen sensor body - 2 (+B)
(5) Between 3 (OX2) - 1 (OXH2)
(6) Between 3 (OX2) - 2 (+B)
(7) Between 4 (E2) - 1 (OXH2)
(8) Between 4 (E2) - 2 (+B)
SPECIFIED VALUE: No continuity exists.



T11E6209T10

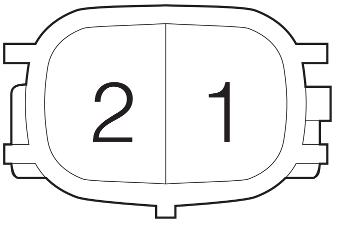
NOTE

- Other than the above unit check, perform checking for the rear oxygen sensor output voltage under the condition in which it is installed to the vehicle.
  (Refer to the page of the rear oxygen sensor system of the trouble shooting according to the systems.)

Refer to Page B8-223.

7-14-9 KNOCK SENSOR

1.Measure the resistance between the following terminals.
(1) Between 1 (E2) - 2 (KNK)
SPECIFIED VALUE: 200±80kΩ

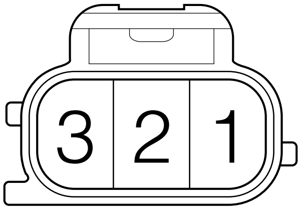


T11E6211T10

7-14-10 THROTTLE POSITION SENSOR

1.Measure the resistance between the following terminals.
(1) Between 1 (VC) - 2 (E2)
SPECIFIED VALUE: 2.5 - 6.0kΩ

2.Measure the resistance between the following terminals.
(1) Between 3 (VTH) - 2 (E2)
SPECIFIED VALUE: The resistance value will increase proportionally to the throttle lever opening.

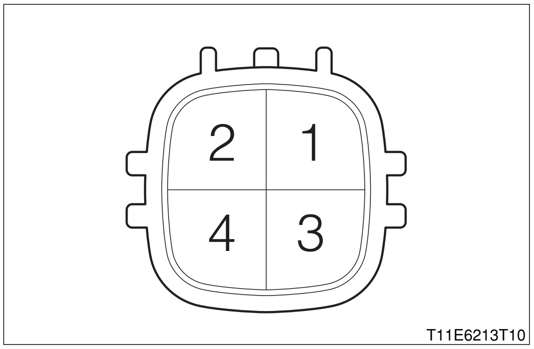


T11E6212T10

NOTE

- The resistance value when the throttle lever is fully closed is about 0.4kΩ.
- The resistance value when the throttle lever is fully opened is about 3.4kΩ.

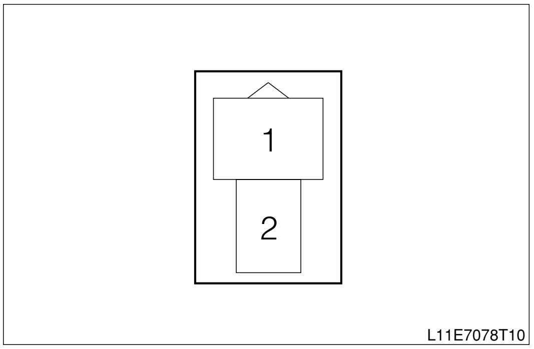
7-14-11 STEPPER MOTOR FOR ISC



T11E6213T10

1.Warm up the engine completely.
2.Confirm the engine revolution speed under the idling condition with no air conditioner and electric load applied.
SPECIFIED VALUE: It is at the regular idling speed. Idling speed 750^{+100}_{-50} rpm

7-14-12 AIR CONDITIONER EVAPORATOR TEMPERATURE SENSOR



L11E7078T10

1.Measure the resistance between the sensor side connector terminals.
2.Connect the connectors and leave it for five minutes with the air conditioner "ON".

NOTE
- Air conditioner "ON" means that the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are all "ON".

3.Turn the air conditioner "OFF" and measure the resistance value between the following terminals.

NOTE
- Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".

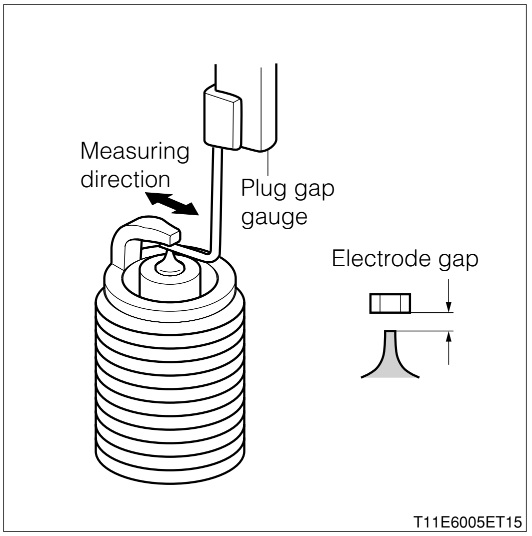
(1) Between 1 (ACEV) - 2 (E21)
SPECIFIED VALUE: The resistance value changes before and after the air conditioner operation.

NOTE
- The lower the temperature is the higher the resistance value will become.

7-14-13 SPARK PLUG

WARNING
- Be very careful not to burn yourself since the spark plugs are hot.

1.Check that the spark plugs exhibits no smoldering and the plugs are not burnt excessively.
2.Check the plug gaps using the plug gap gauge.
SPECIFIED VALUE: $1.1^{+0}_{-0.1}$ mm



T11E6005ET15

7-14-14 INJECTOR

WARNING

- Never use fire during the work.
- Put cloth, etc. to prevent fuel from splashing.

1.Remove the injector to be checked.

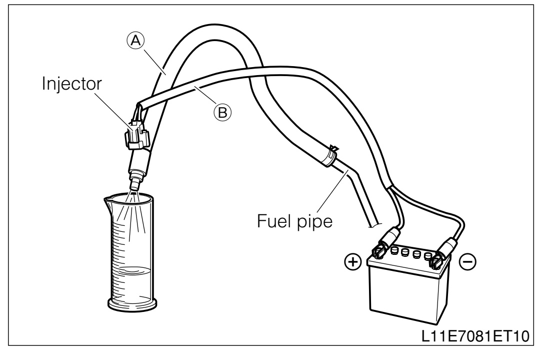
CAUTION

- After removing, install a substitute injector.

2.Remove the fuel hose between the fuel inlet pipe and fuel pipe.

3.Set the injector to be checked to the fuel hose, using SST (Sub harness, measuring tool, EFI inspection wire). (Refer to the right figure.)

SST: 09842-97209-000
09268-41047-000(A)
09842-30070-000(B)



4.With the IG switch "ON"

5.Confirm that the fuel is injected when the battery voltage is applied to the injector.

SPECIFIED VALUE: It is injected.

CAUTION

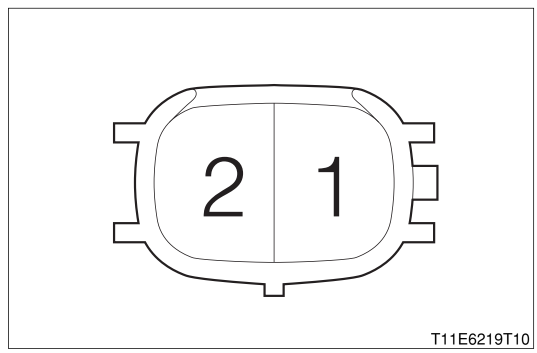
- Perform "ON" or "OFF" at the battery side.

6.Measure the amount leaking from the injector in one minute by removing the battery in the injection check condition.

SPECIFIED VALUE: One drop or less

7.Measure the resistance value between the injector terminals.

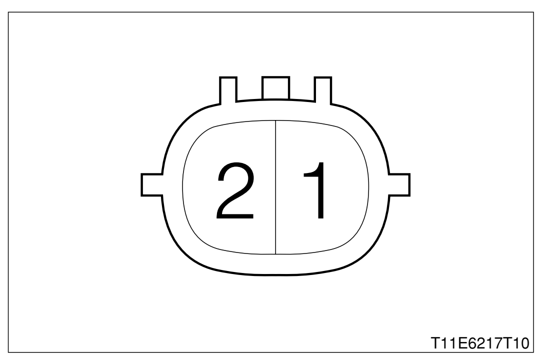
SPECIFIED VALUE: 12Ω (At 20°C)



7-14-15 OIL CONTROL VALVE

1.Visually confirm the operation of the valve when battery voltage is applied to between the connector terminals of the oil control valve.

	Connected to:
Battery positive terminal	1 (OCV+)
Battery negative (-) terminal	2 (OCV−)

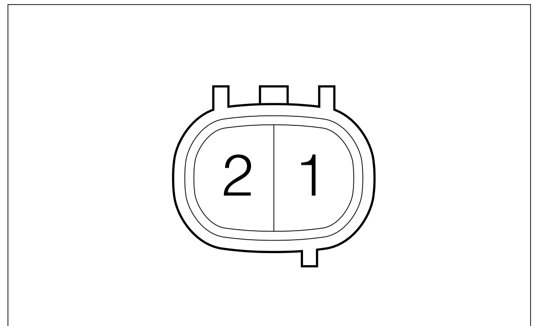


CAUTION

- The time while the battery voltage is applied should be kept within one minute.

SPECIFIED VALUE: The valve operates when the battery voltage is applied.

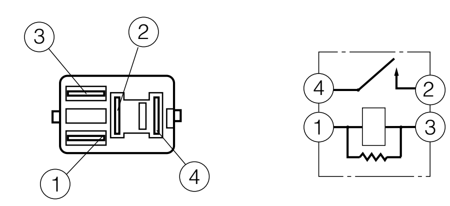
7-14-16 VSV FOR EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL



T11E6218T10

1. Perform air continuity check between the ports.
   SPECIFIED VALUE: No air continuity
2. Perform air continuity check between the ports when battery voltage is applied between the VSV for evaporative emission control system purge control connector terminals.
   SPECIFIED VALUE: Air continuity exists.
3. Measure the resistance value between the following terminals.
   (1) Between 1 (PRG) - 2 (+B)
   SPECIFIED VALUE: 30 - 34Ω (20°C)

7-14-17 MAIN RELAY (EFI), FUEL PUMP RELAY (FUEL PUMP), RADIATOR FAN RELAY (RAD), MAGNET CLUTCH RELAY (MGC)



W11E3059T10

1. Ensure that the relay is operating when the IG switch is "ON" by sound and vibration.

   WARNING
   - Do not touch the relay during operation since the relay may become hot while operating.
2. Measure the resistance between relay side terminals 1 and 3.
   SPECIFIED VALUE: 131 - 230Ω (At 20°C)

   NOTE
   - Measure after the temperature in the relay becomes the same with the ambient temperature (20°C). (Measure after leaving it for one hour or more in the ambient temperature 20°C with the relay "OFF".)
3. Ensure that there is no continuity between each terminal other than the relay side terminals 1 and 3.
4. Ensure that there is continuity between relay side terminals 2 and 4 when battery voltage is applied between the relay side terminal 1 and 3.

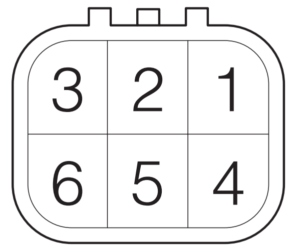
7-14-18 STEPPER MOTOR TYPE EGR VALVE

(1) Resistance value check

1. Measure the resistance value between the following terminals.
   (1) 1 (EGR4) - 2 (B2)
   (2) 3 (EGR2) - 2 (B2)
   (3) 4 (EGR1) - 5 (B1)
   (4) 6 (EGR3) - 5 (B1)

   SPECIFIED VALUE: 18 - 22Ω (At 20℃)

   NOTE
   - Measure after the temperature in the stepper motor type EGR valve becomes the same with the ambient temperature (20℃).
     (Measure after leaving it for one hour or more in the ambient temperature 20℃ with the engine stopped.)



T11E6222T10

(2) Visual check

1. Check that there are no clogging, damage or foreign matters in the passage of the EGR gas of the EGR valve.

   CAUTION
   - Be careful not to touch the valve section by tools when removing any foreign matters.

7-15 ECU INPUT/OUTPUT SIGNAL CHECK

7-15-1 CHECKING METHOD

7-15-2 SPECIFIED VALUE FOR INPUT/ OUTPUT SIGNAL

Check system	Terminal	Measuring condition	Specified value
Power supply system	27 (＋B) - 125 (E1)	When IG switch is "ON"	Battery voltage
	38 (BAT) - 125 (E1)	At all times	
Manifold absolute pressure sensor system	57 (VCPM) - 122 (E2PM)	When IG switch is "ON"	4.5 - 5.5V
	52 (PIM) - 122 (E2PM)	When the sensor is opened to the atmosphere	3.1 - 4.1V
		After starting the engine	Changes according to the opening of the accelerator
Throttle positionsensor system	56 (VC) - 19 (E2)	When IG switch is "ON"	4.5 - 5.5V
	53 (VTH) - 19 (E2)	When throttle valve is fully closed	0.4 - 0.8V
		When throttle valve is fully opened	3.2 - 5.0V
Water temperature sensor system	54 (THW) - 19 (E2)	When warmed up (water temperature 60 - 120℃)	0.3 - 1.3V
Intake air temperature sensor system	51 (THA) - 19 (E2)	When warmed up	0.5 - 4.3V
Knock sensor system	121 (KNK) - 19 (E2)	When idling, when racing	Pulse generation
Engine revolution sensor system	59 (N1＋) - 128 (N1－)	When idling	Pulse generation
Camshaft position sensor system	58 (N2＋) - 127 (N2－)	When idling	Pulse generation
Oxygen sensor system	123 (OX1) - 19 (E2)	After maintaining at 3000rpm for four minutes	Changes between 0.2 - 1.0V
Injector system	24 (#10) - 125 (E1)	When IG switch is "ON" When idling	Battery voltage Pulse generation
	23 (#20) - 125 (E1)		
	22 (#30) - 125 (E1)		
Ignition system	63 (IG1) - 125 (E1)	When IG switch is "ON" When idling	0 - 0.11V Pulse generation
	62 (IG2) - 125 (E1)		
	61 (IG3) - 125 (E1)		
Ion current combustion control system※	51 (ICMB1) - 125 (E1)	While idling	Pulse generation
	50 (ICMB2) - 125 (E1)		
	49 (ICMB3) - 125 (E1)		

※: Only vehicles with EU specifications

Check system	Terminal	Measuring condition	Specified value
ISC driving signal system	66 (IACALO) - 125 (E1)	When idling	Pulse generation
	67 (IACAHI) - 125 (E1)		
	68 (IACBLO) - 125 (E1)		
	69 (IACBHI) - 125 (E1)		
	12 (EPS) - 125 (E1)	When the steering wheel is turned with the vehicle stopped	0 - 1V
		When the steering wheel is not turned with the vehicle stopped	Battery voltage
Fuel pump system	35 (FC1) - 125 (E1)	Fuel pump stopped	Battery voltage
		When idling (or when cranking)	1.2V or less
Evaporative emission temperature sensor system	45 (ACEV) - 116 (E21)	When air conditioner is "ON"	0.15 - 4.8V
Air conditioner input signal system	3 (ACSW) - 125 (E1)	When air conditioner switch is "ON"	Battery voltage
		When air conditioner switch is "OFF"	0 - 0.5V
Air conditioner relay system	36 (MGC) - 125(E1)	When magnet clutch relay is "ON"	Around 0V
		When magnet clutch relay is "OFF"	Battery voltage
Stop lamp system	43 (STP) - 125 (E1)	When stop lamp is lighted	Battery voltage
		When stop lamp is not lighted	0 - 0.5V
Defogger system	11 (DEF) - 125 (E1)	When defogger switch is "ON"	Battery voltage
		When defogger switch is "OFF"	0 - 0.5V
Blower system	42 (BLW) - 125 (E1)	When heater blower switch is "ON"	0 - 0.5V
		When heater blower switch is "OFF"	Battery voltage
Radiator fan control system	37 (FAN1) - 125 (E1)	When magnet clutch is "ON"	1V or less
		When magnet clutch is "OFF"	Battery voltage
Variable valve timing control system	26 (OCV+) - 25 (OCV−)	When idling	Pulse generation
Engine revolution output system	118 (REV) - 125 (E1)	When idling	Pulse generation
Stepper motor type EGR valve control system	130 (EGR4) - 27 (+B)	When cranking	Pulse generation
	131 (EGR3) - 27 (+B)		
	132 (EGR2) - 27 (+B)		
	133 (EGR1) - 27 (+B)		
Earth system	Between 19 (E2) - body	At all times	Continuity exists.
	Between 20 (E01) - body		
	Between 116 (E21) - body		
	Between 125 (E1) - body		

7-15-3 OSCILLOSCOPE WAVEFORMS

(1) Injector

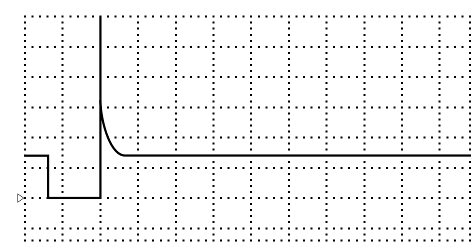
1.Connect the SST.
SST: 09842-97209-000

2.Perform output check between the following terminals using an oscilloscope.
(1) Between SST 24 (#10) - SST 125 (E1)
(2) Between SST 23 (#20) - SST 125 (E1)
(3) Between SST 22 (#30) - SST 125 (E1)

3.As an example, in case of the following measuring range and measuring conditions, it will be as in the right figure.

Time axis	2ms / DIV
Voltage axis	10V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".


T11E6243T10

NOTE

- **The waveform cannot be specified, but confirm that a waveform as in the right figure (one such example) shows up.**

4.Confirm the following points.
(1) The voltage changes from the battery voltage to 0V while fuel injection.

(2) Oil control valve

1.Connect the SST.
SST: 09842-97209-000

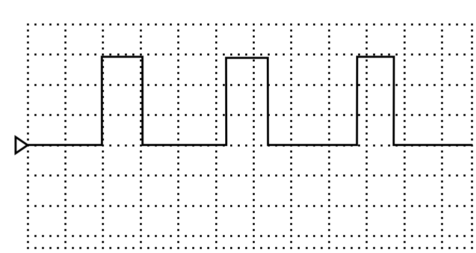
2.Completely warm up the engine.

3.Perform output check between the following terminals using an oscilloscope.
(1) SST 26 (OCV＋) - SST 25 (OCV－)

4.As an example, in case of the following measuring range and measuring conditions, it will be as in the right figure.

Time axis	1ms / DIV
Voltage axis	5V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".


H11E6127T10

NOTE

- **The waveform cannot be specified, but confirm that a waveform as in the right figure (One such example) shows up.**

5.Confirm the following points.
(1) The pulse of 0V ⇄ battery voltage is generated.

(3) Engine revolution output signal

1.Connect the SST.
SST: 09842-97209-000

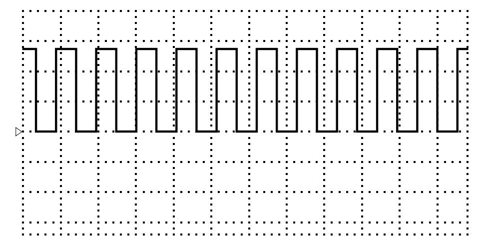
2.Perform output check between the following terminals using an oscilloscope.

3.Completely warm up the engine.
(1) SST 118 (REV) - SST 125 (E1)

4.As an example, in case of the following measuring range and measuring conditions, it will be as in the right figure.

Time axis	50ms / DIV
Voltage axis	5V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".



T11E6244T10

NOTE

- **The waveform cannot be specified, but confirm that a waveform as in the right figure (One such example) shows up.**

5.Confirm the following points.
(1) The pulse of 0V ⇄ battery voltage is generated.
(2) The wave period becomes shorter as the engine revolution speed rises.

■ K3

1 ENGINE CONTROL COMPUTER

1-1 REMOVAL AND INSTALLATION

Refer to Page B8-1.

2 ENGINE REVOLUTION SENSOR

2-1 REMOVAL AND INSTALLATION

2-1-1 ARTICLES TO BE PREPARED

Instrument

Torque wrench

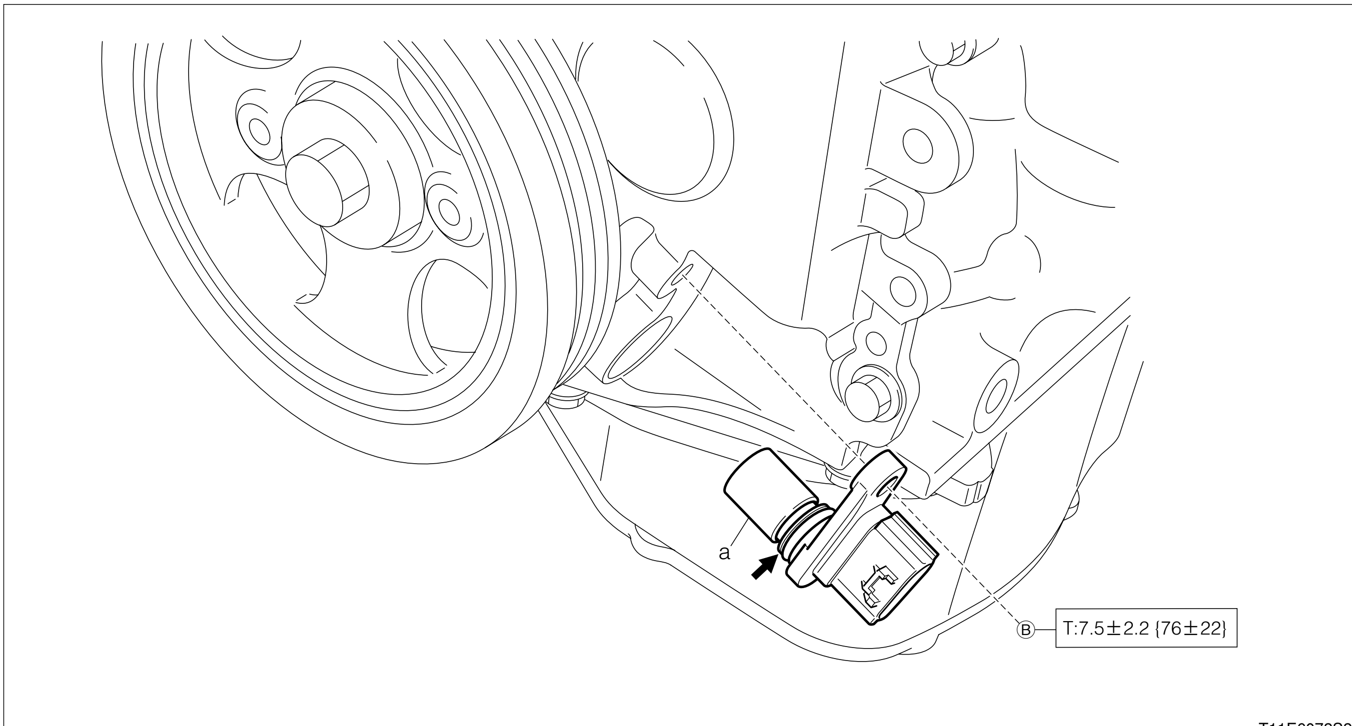
LUBRICANT: Engine oil

2-1-2 OPERATION BEFORE REMOVAL

1. Disconnect the negative (-) terminal of the battery.
2. Remove the connectors of the crank position sensor Ay.

2-1-3 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



➡:Engine oil
Unit: N·m{kgf·cm}

(2) Removeal and installation procedures

▲ 1 a Sensor Ay, crank position

2-1-4 POINTS OF INSTALLATION

(1) Sensor Ay, crank position

1. Apply engine oil to the O-ring of the sensor Ay.
   LUBRICANT: Engine oil

2-1-5 OPERATION AFTER INSTALLATION

1. Connect the connectors of the crank position sensor Ay.
2. Connect the negative (-) terminal of the battery.

3 CAMSHAFT POSITION SENSOR

3-1 REMOVAL AND INSTALLATION

3-1-1 ARTICLES TO BE PREPARED

Instrument

Torque wrench

Lubricant,adhesive,others

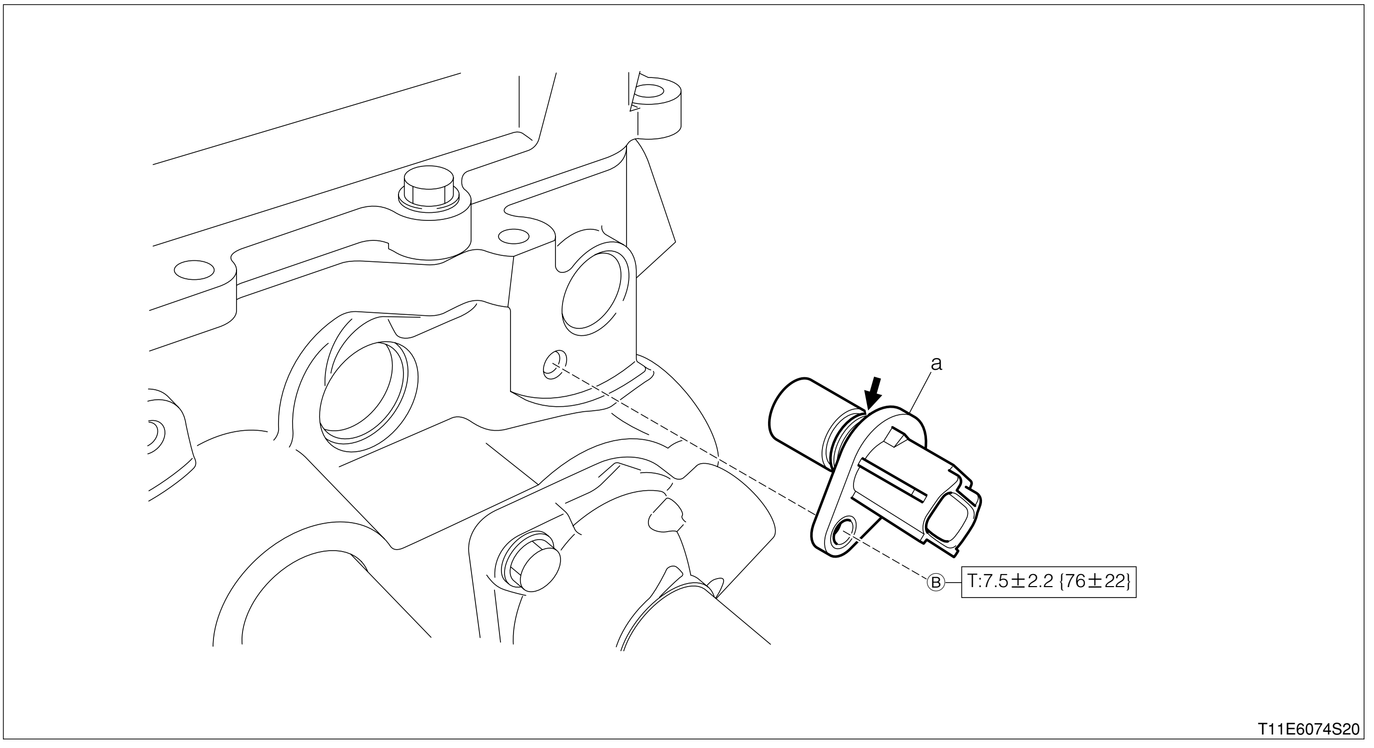
Engine oil

3-1-2 OPERATION BEFORE REMOVAL

1.Disconnect the negative (-) terminal of the battery.
2.Remove the connectors of the cam position sensor Ay.

3-1-3 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



➡:Engine oil
Unit: N·m{kgf·cm}

(2) Removeal and installation procedures

▲ 1 a Sensor Ay, cam position

3-1-4 POINTS OF INSTALLATION

(1) Sensor Ay, cam position

1.Apply engine oil to the O-ring of the sensor Ay.
LUBRICANT: Engine oil

3-1-5 OPERATION AFTER INSTALLATION

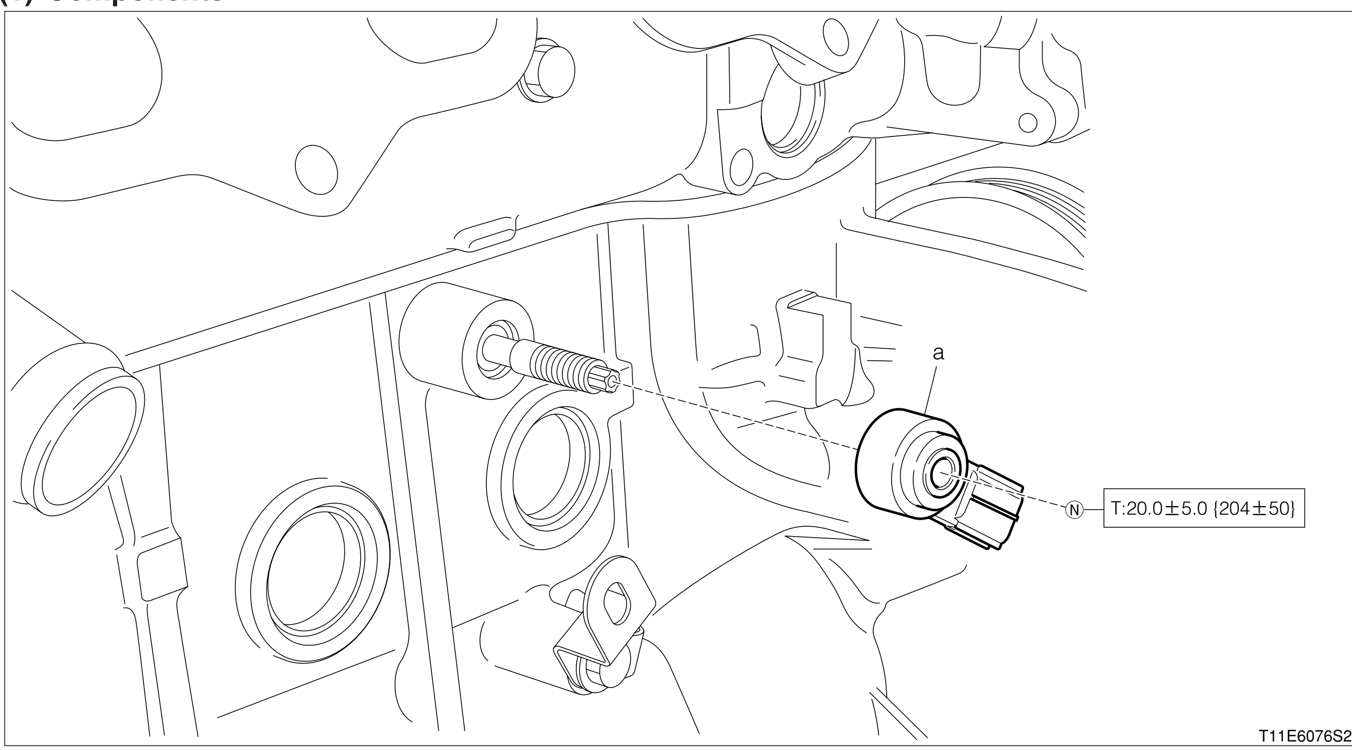
1.Connect the connectors of the cam position sensor Ay.
2.Connect the negative (-) terminal of the battery.

4 KNOCK SENSOR
4-1 REMOVAL AND INSTALLATION
4-1-1 ARTICLES TO BE PREPARED
Instrument

Torque wrench

4-1-2 OPERATION BEFORE REMOVAL
1. Disconnect the negative (-) terminal of the battery.
2. Remove the intake manifold Ay.
   Refer to Page B3-14.
3. Remove the connectors of the knock control sensor.

4-1-3 REMOVAL AND INSTALLATION PROCEDURES
(1) Components



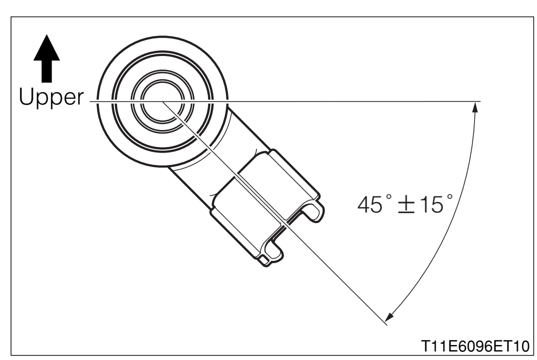
Unit:N·m{kgf·cm}

(2) Removeal and installation procedures

▲ 1 a Sensor, knock control

4-1-4 POINTS OF INSTALLATION
(1) Sensor, knock control

1. When installing the sensor to the engine Ay, install in the range shown in the figure.



4-1-5 OPERATION AFTER INSTALLATION

1. Connect the connectors of the knock control sensor.
2. Install the intake manifold Ay.
   Refer to Page B3-14.
3. Connect the negative (-) terminal of the battery.

5 ENGINE COOLANT TEMPERATURE SENSOR

5-1 REMOVAL AND INSTALLATION

5-1-1 ARTICLES TO BE PREPARED

Instrument

Torque wrench

5-1-2 OPERATION BEFORE REMOVAL

1.Disconnect the negative (-) terminal of the battery.
2.Drain the cooling water.

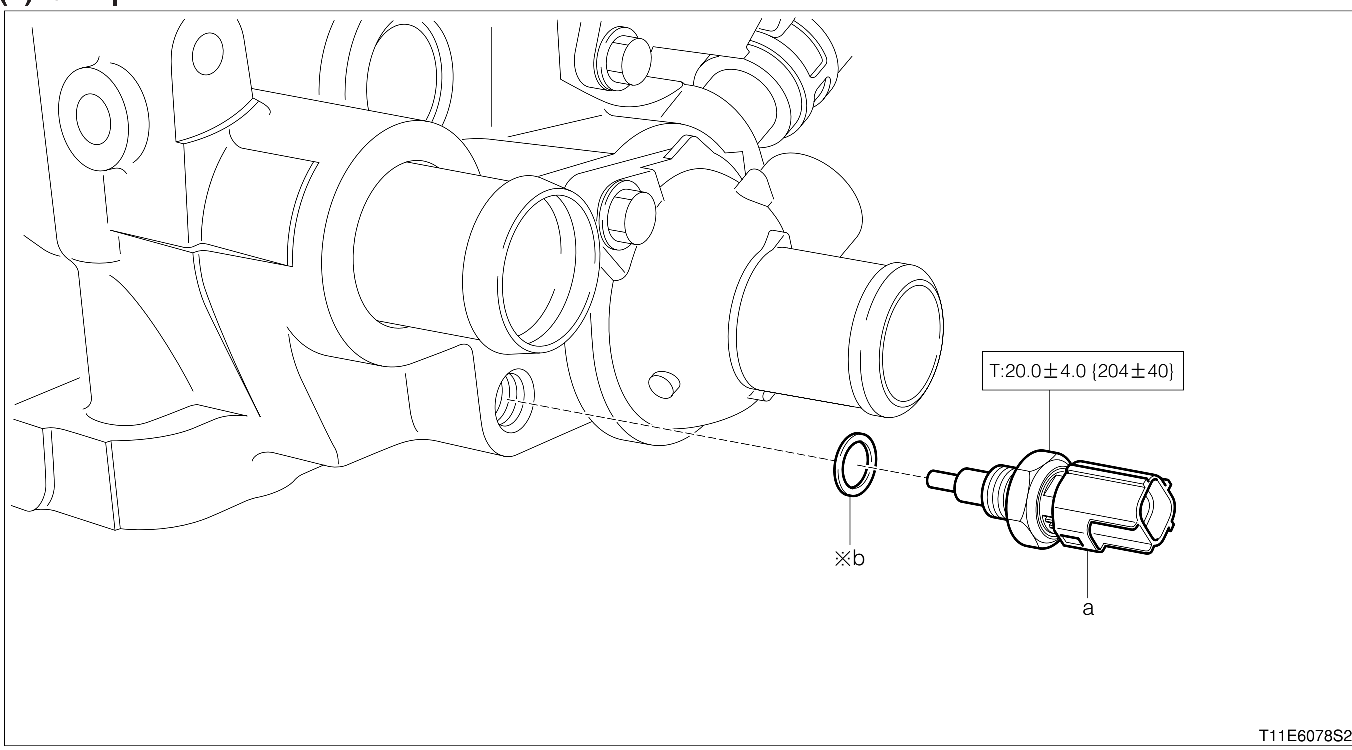
NOTE

- Drain a certain amount of the cooling water so that it would not leak from the No.1 radiator hose.

3.Remove the No.1 radiator hose (Engine side).
4.Remove the connectors of the water temperature sensor.

5-1-3 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



※: Non-reusable parts
Unit: N·m {kgf·cm}

(2) Removeal and installation procedures

1 a Sensor, water temperature
2 b Gasket

5-1-4 OPERATION AFTER INSTALLATION

1.Connect the connectors of the water temperature sensor.
2.Install the No.1 radiator hose (Engine side).
3.Fill cooling water.
4.Connect the negative (-) terminal of the battery.
5.Start the engine and perform air-bleeding of the cooling water.
6.Stop the engine and check for leakage of cooling water.

6 INTAKE AIR TEMPERATURE SENSOR

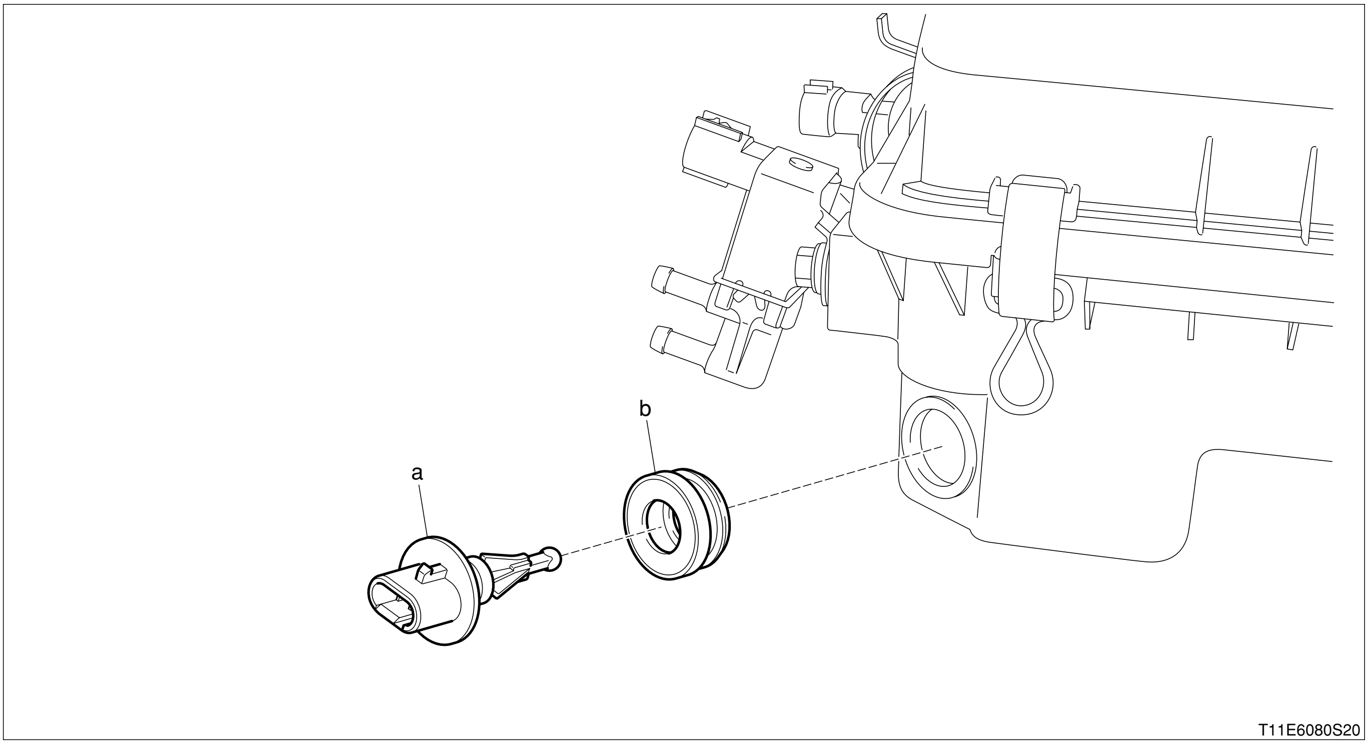
6-1 REMOVAL AND INSTALLATION

6-1-1 OPERATION BEFORE REMOVAL

1.Disconnect the negative (-) terminal of the battery.
2.Remove the connectors of the thermo sensor.

6-1-2 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



(2) Removeal and installation procedures

1 a Sensor, thermo
2 b Grommet

6-1-3 OPERATION AFTER INSTALLATION

1.Connect the connectors of the thermo sensor.
2.Connect the negative (-) terminal of the battery.

7 MANIFOLD ABSOLUTE PRESSURE SENSOR

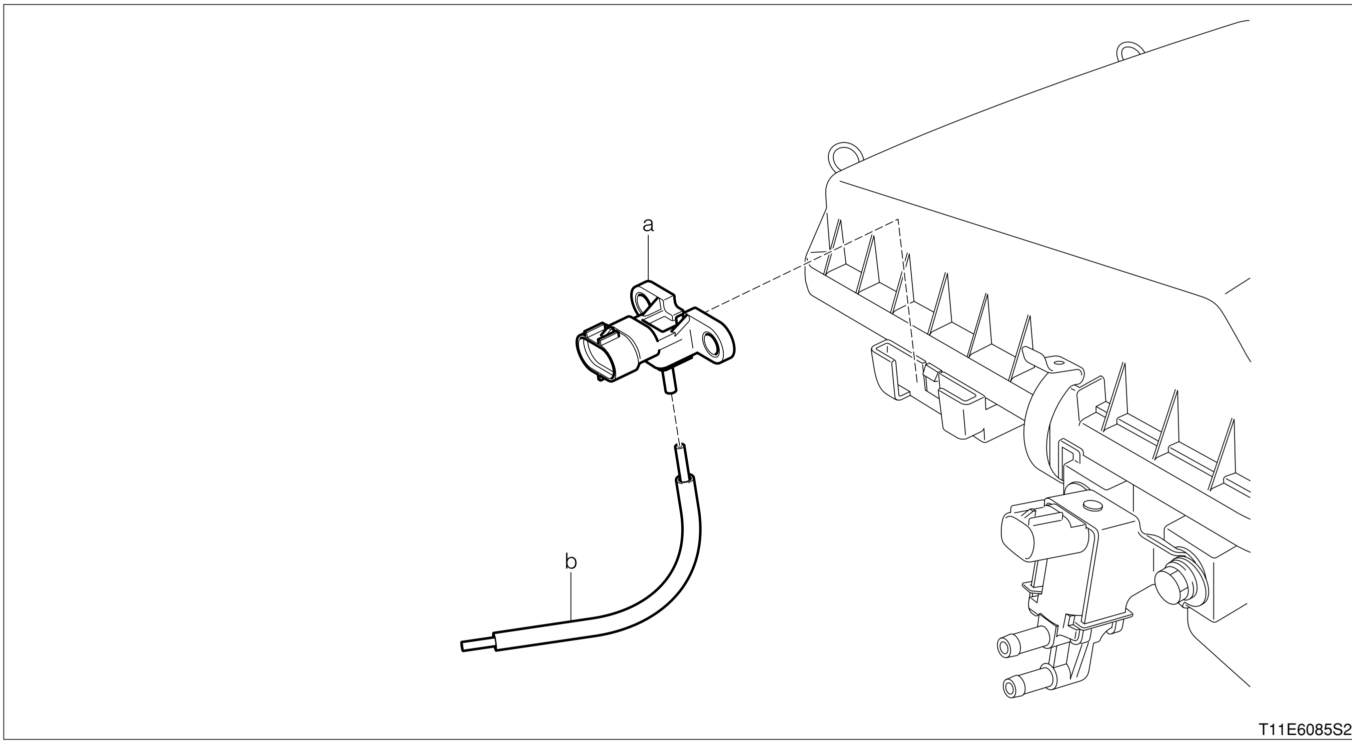
7-1 REMOVAL AND INSTALLATION

7-1-1 OPERATION BEFORE REMOVAL

1.Disconnect the negative (-) terminal of the battery.
2.Remove the vacuum hose S/A from the intake manifold Ay.
3.Remove the connectors of the vacuum sensor.

7-1-2 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



(2) Removeal and installation procedures

1 a Sensor, vacuum
2 b Hose S/A, vacuum

7-1-3 OPERATION AFTER INSTALLATION

1.Connect the connectors of the vacuum sensor.
2.Install the vacuum hose S/A to the intake manifold Ay.
3.Connect the negative (-) terminal of the battery.

8 OIL CONTROL VALVE

8-1 REMOVAL AND INSTALLATION

8-1-1 ARTICLES TO BE PREPARED

Instrument

Torque wrench

Lubricant,adhesive,others

Engine oil

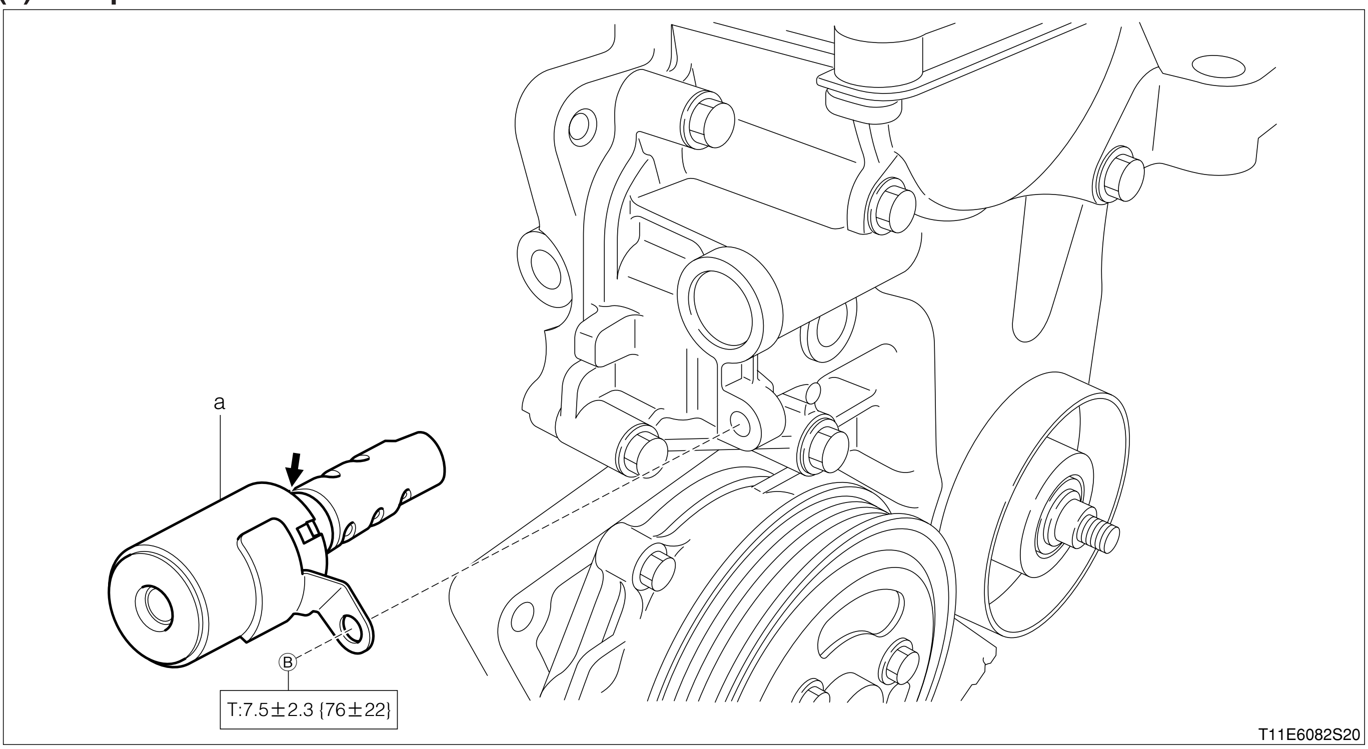
8-1-2 OPERATION BEFORE REMOVAL

1. Disconnect the negative (-) terminal of the battery.
2. Remove the No.1 air cleaner hose.
   Refer to Page B3-9.

3. Remove the connectors of the cam timing oil control valve Ay.

8-1-3 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



➡:Engine oil
Unit: N·m{kgf·cm}

(2) Removeal and installation procedures

▲ 1 a Valve Ay, cam timing oil control

8-1-4 POINTS OF INSTALLATION

(1) Valve Ay, cam timing oil control

1. Apply engine oil to the O-ring of the valve Ay.
   LUBRICANT: Engine oil

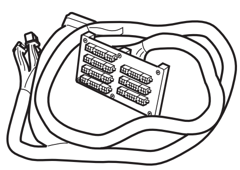
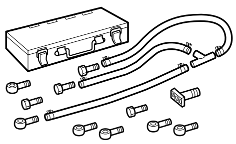
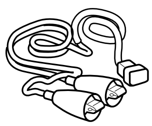
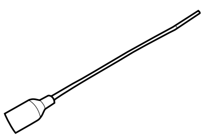
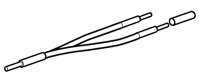
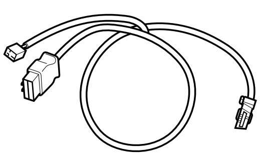
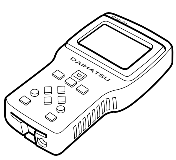
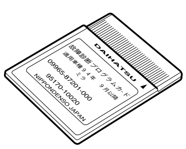
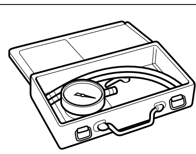
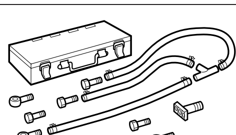
8-1-5 OPERATION AFTER INSTALLATION

1. Connect the connectors of the cam timing oil control valve Ay.
2. Install the No.1 air cleaner hose.
   Refer to Page B3-9.
3. Connect the negative (-) terminal of the battery.

9 ENGINE CONTROL SYSTEM

9-1 ARTICLES TO BE PREPARED

SST

Shape	Part No.	Part name
	09842-97209-000	Sub-harness,EFI computer check
	09268-41047-000 (09268-41045-000)	Tool set,injection measuring
	09842-30070-000	Wire,EFI inspection
	09991-87402-000	Wire,tacho-pulse pick up
	09991-87403-000	Wire,diagnosis check
	09991-87404-000 (09991-87401-000)	Wire,engine control system inspection
	09991-87301-000	Set,Diagnosis tester
	09965-97230-000 (09965-97207-000)	Trouble-Shooting program card
	09268-87701-000	Gauge,EFI fuel pressure
	09268-87702-000	Tool set,measuring

Instrument

Tachometer,Timing light,Compression gauge,Sound scope,Electrical Tester,Oscillo scope

WARNING

- If the vehicle is driven with the SST (EFI computer check sub harness, etc.) connected there is a possibility of causing malfunction and may be very dangerous. Therefore, remove it without fail before running.

9-2 HANDLING INSTRUCTIONS OF CONTROL SYSTEM

9-2-1 INSTRUCTIONS ON USE OF THIS SERVICE MANUAL

1.This service manual has been compiled in such a way that the manual may be used both in regions where the type certification is implemented based on the EU exhaust emission approval, and other regions.

2..Hence, with regard to the assignment, reading, erasing of diagnostic trouble codes and those steps of checks, repairs and confirmation, the service manual contains the procedures for both cases; One is a procedure that uses the DS-21 diagnosis tester or the OBD Ⅱ generic scan tool, and the other is a procedure that does not use this tester or tool.
Therefore, the following instructions given below must be observed.

3.About Use of DS-21 Diagnosis Tester or OBD Ⅱ Generic Scan Tool
(1) Regions where type certification is implemented based on EU exhaust emission approval; Make sure to use the DS-21 diagnosis tester or the OBD Ⅱ generic scan tool.
(2) Other regions; You may use or not use the DS-21 diagnosis tester or the OBD Ⅱ generic scan tool. You may perform the operation, employing whichever method that will be easier to you.

4.Instructions to be followed concerning Diagnosis Trouble Codes
Diagnosis trouble codes, such as P0105/31 (Four-digit code/two-digit code) are posted additionally.
(1) Regions where type certification is implemented based on EC exhaust emission approval
Make sure to use only four-digit trouble codes (E.G. P0105) whose have been assigned according to the ISO regulations.
(2) Other regions;
You may perform the operation using the four-digit code, employing the DS-21 diagnosis tester or the OBD Ⅱ generic scan tool. Or you may perform the operation using the two-digit codes (E.G. 31), without the use of the tester or tool. You may perform the operation, employing whichever method that will be easier to you.
Or you may perform the operation using the two-digit codes (E.G. 31), without the use of the tester or tool.
You may perform the operation, employing whichever method that will be easier to you.

NOTE

- The OBD Ⅱ generic scan tool means a scan tool complying with the ISO 14230 (KWP2000) format.
- In cases where the OBD Ⅱ generic scan tool is employed, not all diagnostic trouble codes (Four-digit codes) can be read out. It should be noted that only those diagnostic trouble codes in which "zero" follows after "P", for example, P0XXX, can be read out.
- The accuracy of the two-digit codes in diagnosing malfunctioning components is slightly inferior to that of the four-digit codes.
- Hereinafter, those regions where the type certification is implemented based on the EU exhaust emission approval, is referred to as the "EU specifications".

9-2-2 PRECAUTIONARY MEASURES DURING TROUBLE-SHOOTING

1.Before the diagnosis information memorized in the EFI ECU memory is confirmed, never disconnect the connector from the EFI ECU, the battery negative (-) terminal, the EFI ECU earth wire from the engine, or the main fuse.

2.The diagnosis information memorized in the EFI ECU memory can be erased by using the DS-21 diagnosis tester or the OBD-II generic scan tool in the same way as the check. Therefore, before using the tester, read its instruction manual so as to understand the functions furnished and how to use it.

3.Priority in trouble-shooting

(1) If the priority in trouble-shooting for a number of diagnostic trouble codes is given in the concerned DTC flow chart, make sure to follow the priority.

(2) If not given, follow the priority given below and perform the trouble-shooting for each diagnostic trouble code (DTC).

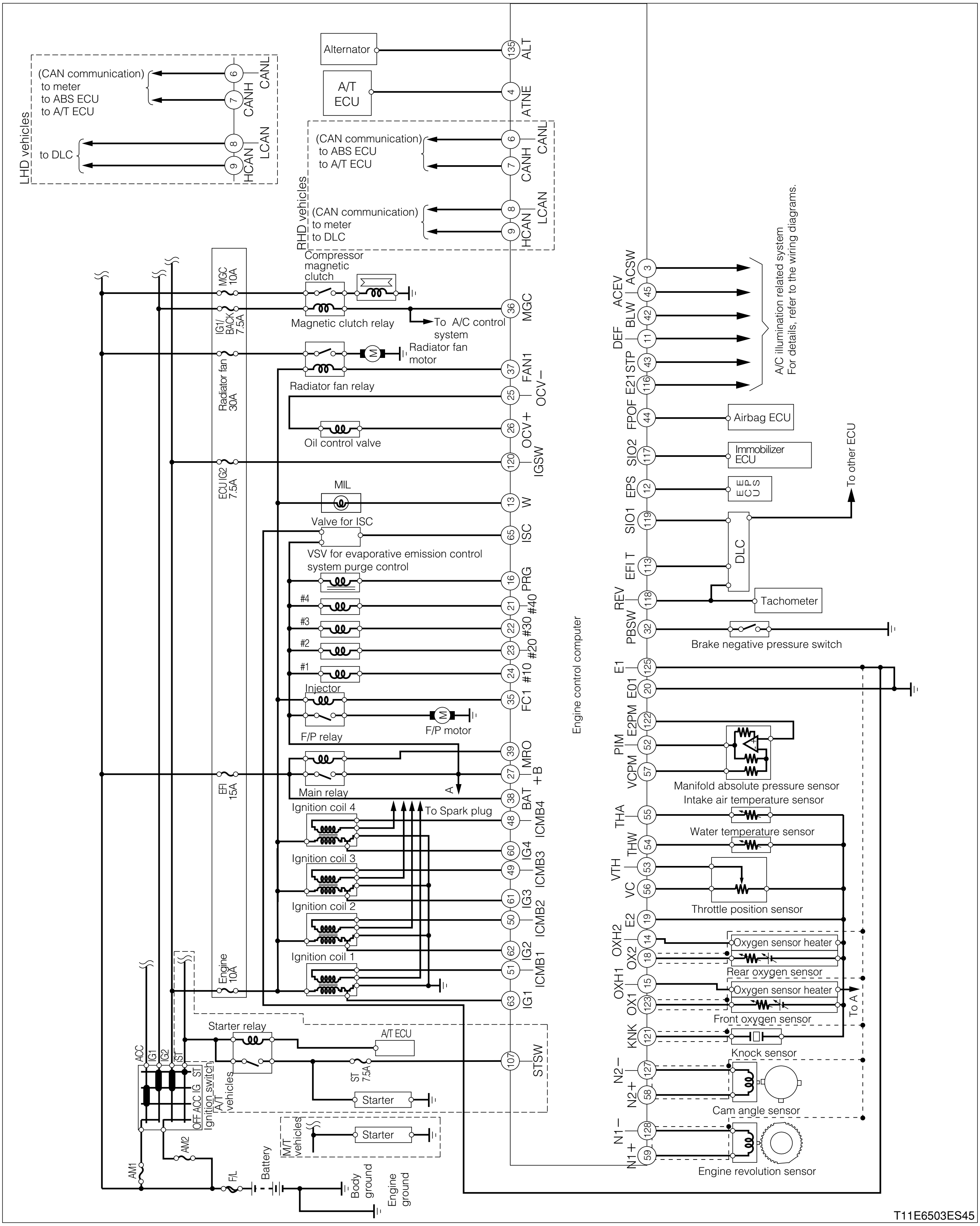
(1) DTC other than DTC P0171/25, DTC P0172/26 (Too lean/too rich in fuel system), and DTC 0300/17, DTC P0301-P0304/17 (Misfire found)

(2) DTC P0171/25, DTC P0172/26 (Too lean/too rich in fuel system)

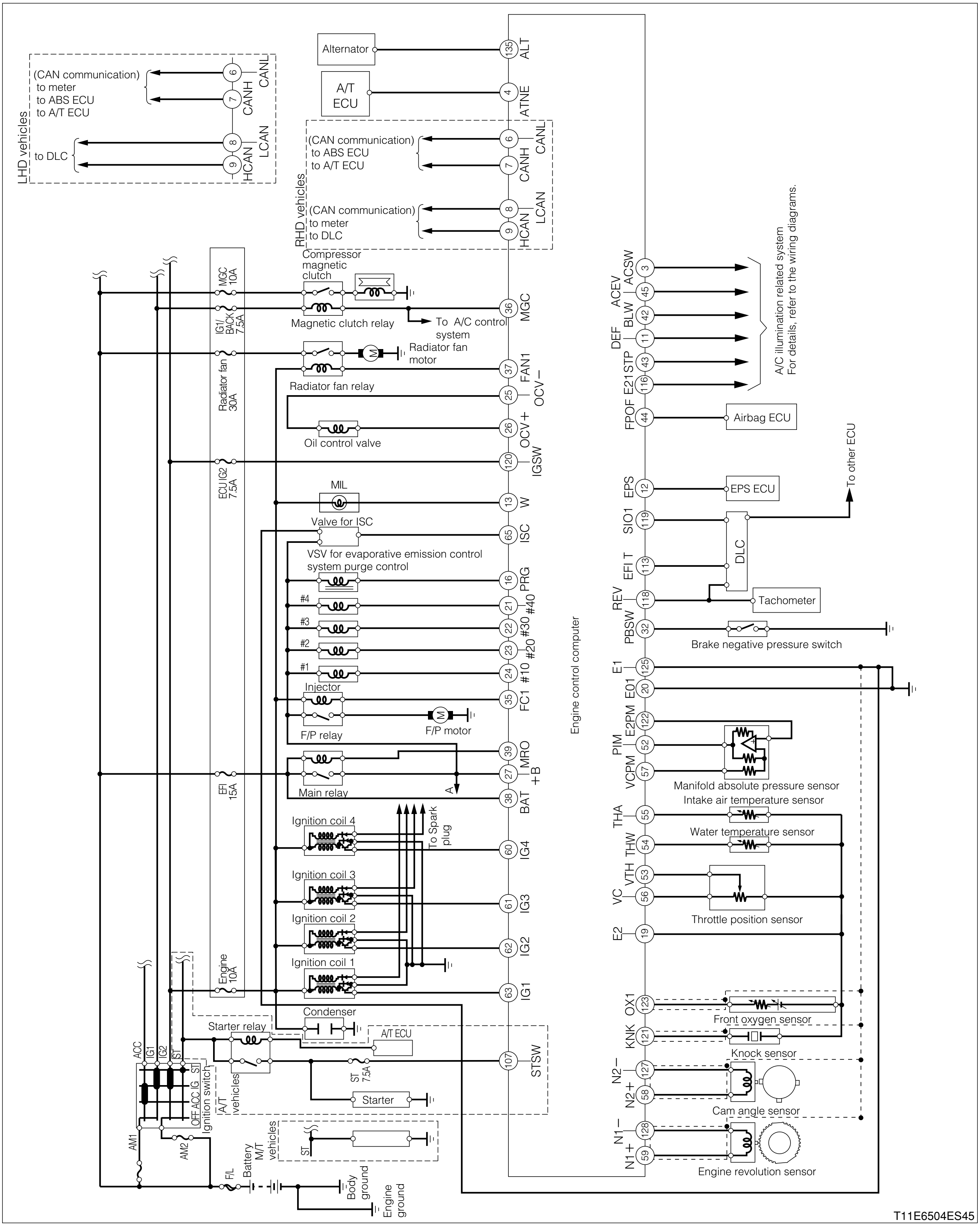
(3) DTC 0300/17, DTC P0301-P0304/17 (Misfire found)

9-3 SYSTEM WIRING DIAGRAM

9-3-1 FOR EU SPECIFICATIONS

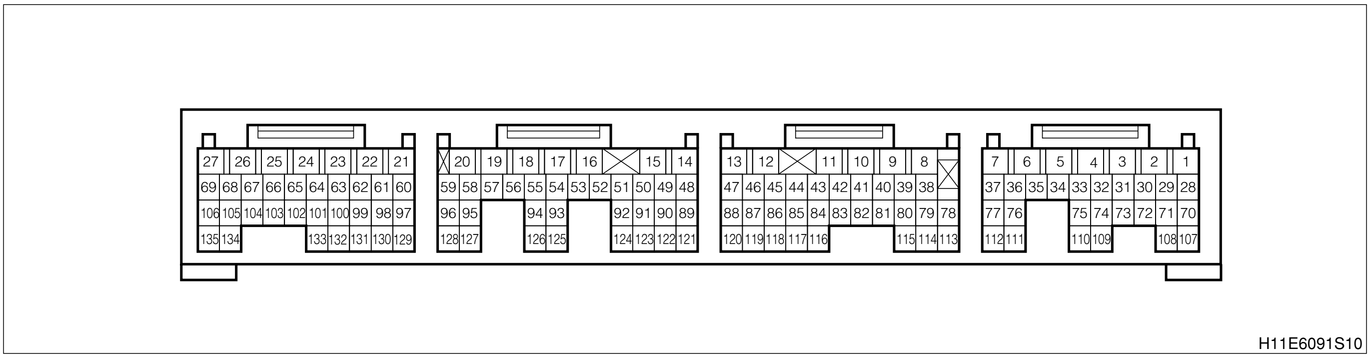


9-3-2 FOR GENERAL SPECIFICATIONS

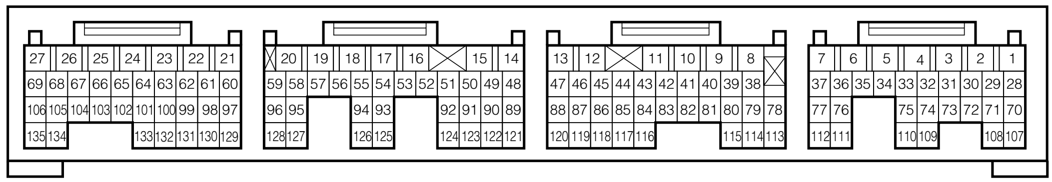


9-4 ARRANGEMENT OF VEHICLE HARNESS SIDE CONNECTOR TERMINALS

(1) For EU specifications



Terminal No.	Terminal code	Terminal name	Terminal No.	Terminal code	Terminal name
1	–	–	31	–	–
2	–	–	32	PBSW	Brake negative pressure switch
3	ACSW	Air conditioner switch	33	–	–
4	ATNE	Engine revolution signal for AT	34	–	–
5	–	–	35	FC1	Fuel pump relay driving
6	CANL	CAN communication LO (1)	36	MGC	Magnetic clutch relay driving
7	CANH	CAN communication HI (1)	37	FAN1	Radiator fan relay driving
8	LCAN	CAN communication LO (2)	38	BAT	Backup power supply
9	HCAN	CAN communication HI (2)	39	MRO	Main relay driving
10	–	–	40	–	–
11	DEF	defogger signal	41	–	–
12	EPS	EPS ECU	42	BLW	Heater blower signal
13	W	Engine check lamp	43	STP	Stop lamp signal
14	OXH2	Rear oxygen sensor heater	44	FPOF	Airbag fuel pump "OFF" request signal
15	OXH1	Front oxygen sensor heater	45	–	–
16	PRG	VSV for evaporative emission control system purge control	46	–	–
17	–	–	47	–	–
18	OX2	Rear oxygen sensor signal	48	ICMB4	Ion current combustion control signal (#4)
19	E2	Sensor system earth	49	ICMB3	Ion current combustion control signal (#3)
20	E01	Power system earth	50	ICMB2	Ion current combustion control signal (#2)
21	#40	Injector (#4)	51	ICMB1	Ion current combustion control signal (#1)
22	#30	Injector (#3)	52	PIM	Manifold absolute pressure sensor
23	#20	Injector (#2)	53	VTH	Throttle position sensor
24	#10	Injector (#1)	54	THW	Engine water temperature sensor
25	OCV–	Oil control valve driving (–)	55	THA	Intake air temperature sensor
26	OCV+	Oil control valve driving (+)	56	VC	Sensor power supply
27	+B	EFI ECU power supply	57	VCPM	Sensor power supply (Exclusively for manifold absolute pressure sensor)
28	–	–	58	N2+	Cam angle sensor(+)
29	–	–	59	N1+	Engine revolution sensor(+)
30	–	–			



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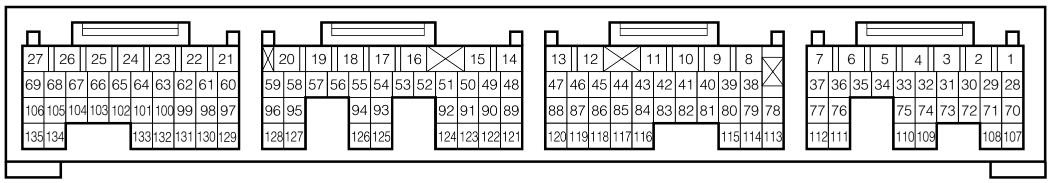
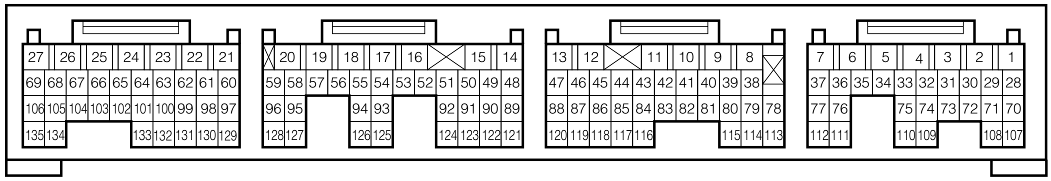
Terminal No.	Terminal code	Terminal name	Terminal No.	Terminal code	Terminal name
60	IG4	Igniter (#4)	98	–	–
61	IG3	Igniter (#3)	99	–	–
62	IG2	Igniter (#2)	100	–	–
63	IG1	Igniter (#1)	101	–	–
64	–	–	102	–	–
65	ISC	Valve for ISC	103	–	–
66	–	–	104	–	–
67	–	–	105	–	–
68	–	–	106	–	–
69	–	–	107	STSW	Starter switch
70	–	–	108	–	–
71	–	–	109	–	–
72	–	–	110	–	–
73	–	–	111	–	–
74	–	–	112	–	–
75	–	–	113	EFIT	EFI-T check terminal
76	–	–	114	–	–
77	–	–	115	–	–
78	–	–	116	E21	Body sensor earth
79	–	–	117	SIO2	Immobilizer communication
80	–	–	118	REV	DLC (REV terminal)
81	–	–	119	SIO1	DLC (Diagnostic device)
82	–	–	120	IGSW	Ignition switch
83	–	–	121	KNK	Knock sensor
84	–	–	122	E2PM	Sensor earth (Exclusively for manifold absolute pressure sensor)
85	–	–	123	–	–
86	–	–	124	–	–
87	–	–	125	E1	Calculation system earth
88	–	–	126	–	–
89	–	–	127	N2–	Cam angle sensor(–)
90	–	–	128	N1–	Engine revolution sensor(–)
91	–	–	129	–	–
92	–	–	130	–	–
93	–	–	131	–	–
94	–	–	132	–	–
95	–	–	133	–	–
96	–	–	134	ALTC	Alternator voltage control output
97	–	–	135	ALT	Alternator cut control output

(2) For general specifications



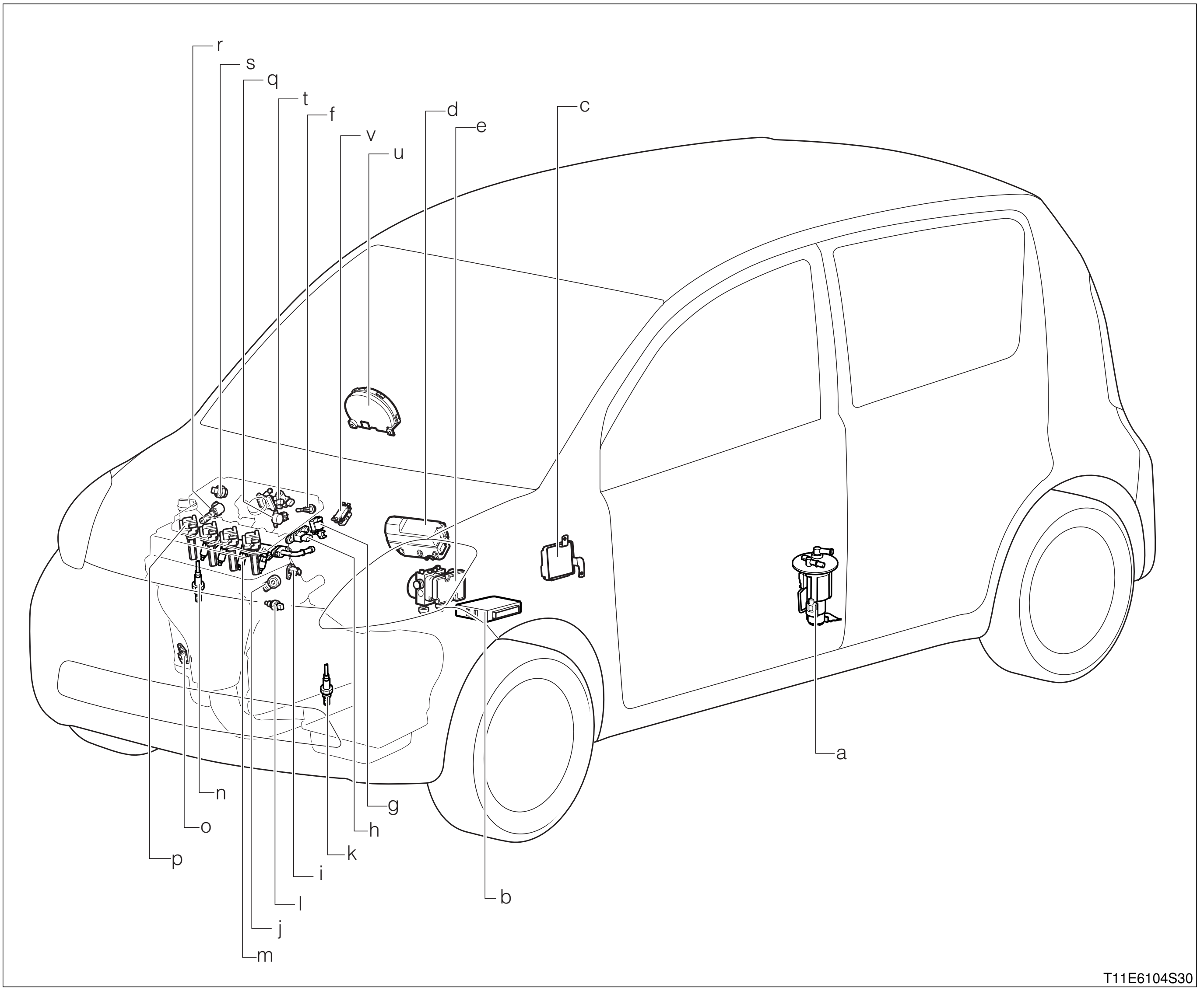
Terminal No.	Terminal code	Terminal name	Terminal No.	Terminal code	Terminal name
1	–	–	31	–	–
2	–	–	32	PBSW	Brake negative pressure switch
3	ACSW	Air conditioner switch	33	–	–
4	ATNE	Engine revolution signal for AT	34	–	–
5	–	–	35	FC1	Fuel pump relay driving
6	CANL	CAN communication LO (1)	36	MGC	Magnetic clutch relay driving
7	CANH	CAN communication HI (1)	37	FAN1	Radiator fan relay driving
8	LCAN	CAN communication HI (2)	38	BAT	Backup power supply
9	HCAN	CAN communication HI (2)	39	MRO	Main relay driving
10	–	–	40	–	–
11	DEF	defogger signal	41	–	–
12	EPS	EPS ECU	42	BLW	Heater blower signal
13	W	Engine check lamp	43	STP	Stop lamp signal
14	–	–	44	FPOF	Airbag fuel pump "OFF" request signal
15	–	–	45	ACEV	Air conditioner evaporator temperature sensor
16	PRG	VSV for evaporative emission control system purge control	46	–	–
17	–	–	47	–	–
18	–	–	48	–	–
19	E2	Sensor system earth	49	–	–
20	E01	Power system earth	50	–	–
21	#40	Injector (#4)	51	–	–
22	#30	Injector (#3)	52	PIM	Manifold absolute pressure sensor
23	#20	Injector (#2)	53	VTH	Throttle position sensor
24	#10	Injector (#1)	54	THW	Engine water temperature sensor
25	OCV–	Oil control valve driving (–)	55	THA	Intake air temperature sensor
26	OCV+	Oil control valve driving (+)	56	VC	Sensor power supply
27	+B	EFI ECU power supply	57	VCPM	Sensor power supply (Exclusively for manifold absolute pressure sensor)
28	–	–	58	N2+	Cam angle sensor(+)
29	–	–	59	N1+	Engine revolution sensor(+)
30	–	–			



H11E6091S10

Terminal No.	Terminal code	Terminal name	Terminal No.	Terminal code	Terminal name
60	IG4	Ignition coil (#4)	98	—	—
61	IG3	Ignition coil (#3)	99	—	—
62	IG2	Ignition coil (#2)	100	—	—
63	IG1	Ignition coil (#1)	101	—	—
64	—	—	102	—	—
65	ISC	Valve for ISC	103	—	—
66	—	—	104	—	—
67	—	—	105	—	—
68	—	—	106	—	—
69	—	—	107	STSW	Starter switch
70	—	—	108	—	—
71	—	—	109	—	—
72	—	—	110	—	—
73	—	—	111	—	—
74	—	—	112	—	—
75	—	—	113	EFIT	EFI-T check terminal
76	—	—	114	—	—
77	—	—	115	—	—
78	—	—	116	E21	Body sensor earth
79	—	—	117	SIO2	Immobilizer communication
80	—	—	118	REV	DLC (REV terminal)
81	—	—	119	SIO1	DLC (Diagnostic device)
82	—	—	120	IGSW	Ignition switch
83	—	—	121	KNK	Knock sensor
84	—	—	122	E2PM	Sensor earth (Exclusively for manifold absolute pressure sensor)
85	—	—	123	OX1	Front oxygen sensor
86	—	—	124	—	—
87	—	—	125	E1	Calculation system earth
88	—	—	126	—	—
89	—	—	127	N2—	Cam angle sensor(—)
90	—	—	128	N1—	Engine revolution sensor(—)
91	—	—	129	—	—
92	—	—	130	—	—
93	—	—	131	—	—
94	—	—	132	—	—
95	—	—	133	—	—
96	—	—	134	ALTC	Alternator voltage control output
97	—	—	135	ALT	Alternator cut control output

9-5 LOCATION OF COMPONENTS



	Part name
a	Fuel pump
b	Engine control computer
c	Transmission control computer (A/T vehicle)
d	Relay block
e	ABS actuator (ABS-equipped vehicles)
f	Intake air temperature sensor
g	VSV for evaporative emission control system purge control
h	Manifold absolute pressure sensor
i	Camshaft position sensor
j	Knock sensor
k	Rear oxygen sensor
l	Water temperature sensor
m	Injector
n	Oxygen sensor
o	Engine revolution sensor
p	Ignition coil
q	Throttle position sensor
r	Oil control valve
s	Brake negative pressure switch
t	Valve for ISC
u	Combination meter
v	DLC

9-6 HOW TO PROCEED WITH TROUBLE SHOOTING

9-6-1 GENERAL INFORMATION

1.The engine and engine control system of this vehicle are controlled by the EFI ECU. Furthermore, the vehicle is provided with the on-board diagnosis system.
Therefore, when any abnormality takes place in the input/output systems (Sensors, actuators, harnesses, connectors, etc.) of the engine control system, the EFI ECU memorizes the system concerned and informs the driver by making the malfunction indicator lamp (MIL) illuminate or flash.

2.Also the malfunction is informed to the operator by means of the malfunction indicator lamp (MIL). When trouble-shooting the engine, it is imperative for you to get the general idea of the onboard diagnostic system, and fully understand the precautionary measures in trouble-shooting, the items diagnostic system, and fully understand the precautionary measures in trouble-shooting, the items to be observed and how to use testers.

3.Then, conduct the trouble-shooting following the flow chart that indicates the correct procedure for the engine troubleshooting.

(1) On-board diagnostic system of vehicles for EU specifications

1.The vehicles for Europe have the following functions that comply with the 1999/102/EC (Generally called Euro-OBD) standards.

2.When the ignition switch is turned "ON", the malfunction indicator lamp (MIL) goes on. When no malfunction has been detected, the lamp will go out after the engine has started. (Check for a blown bulb)

3.While the engine is running, if the EFI ECU detects any malfunction in the emission control system/components that will affect the emissions from the vehicle, or in the power train control components, or if any malfunction is detected in the EFI ECU itself, the EFI ECU illuminates or flashes the MIL (Only when misfire is detected which will damage the catalyst). Then, the EFI ECU memorizes the malfunction area. (DTC by ISO15031-6/SAEJ2012)

4.If that malfunction will not occur in three successive running, the MIL is automatically turned off. However, the DTC will be recorded in the EFI ECU memory.

NOTE

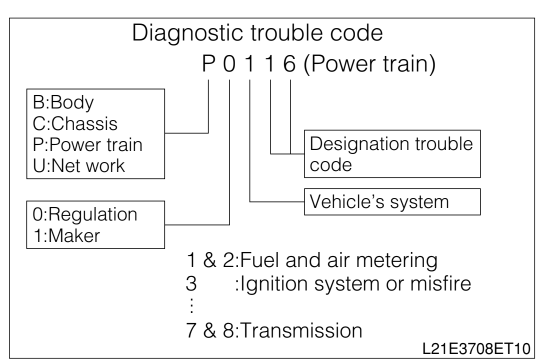
- **The MIL is illuminated only by the malfunction that affects the emissions from the vehicle. (Only items bearing a circle ("○" mark) in the MIL column.)**

DTC No.	De	Malfunction evaluation method	MIL
P0105/31	Manifold pressure pressure	1 trip	!
P0110/43	Intake air malfunction	1 trip	!
P0115/42	Engine co malfunction	1 trip	!
P0116/42	Engine coo circuit mance	2 trip	!
P0120/41	Throttle/P switch "A"	1 trip	!

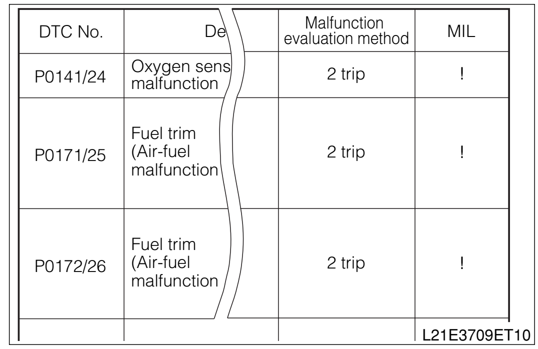
L21E3706ET10

5.It is possible to read out various data from the engine ECU by connecting the OBD Ⅱ generic scan tool which complies with the ISO 14230 format or DS-21 diagnosis tester to the DLC of the vehicle. You can perform trouble-shooting efficiently by checking these data (DTC, freeze-frame data, current data, oxygen sensor monitor data, etc.).

6.The DTC is composed of the ISO standard code (Specified by ISO 15031-6) and the manufacturer's designation code. The ISO standard code should be set pursuant to the ISO. On the other hand, the manufacturer's designation code can be freely set forth by the manufacturer within a specified limit.



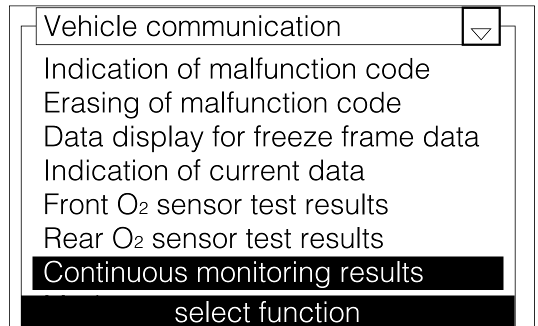
7.Many DTC have a two trip detection logic which assures avoidance of wrong detection and functions only when a malfunction is surely occurring. However, another diagnosis mode is provided, in which only a one-time final confirmation test is necessary for a service mechanic to confirm that the malfunction has been completely remedied after the repair.



DTC No.	De	Malfunction evaluation method	MIL
P0141/24	Oxygen sens malfunction	2 trip	!
P0171/25	Fuel trim (Air-fuel malfunction	2 trip	!
P0172/26	Fuel trim (Air-fuel malfunction	2 trip	!

L21E3709ET10

(1) In case DS-21 or OBD Ⅱ generic scan tool, the "Continuous monitoring results" of "Vehicle communication in CARB mode" must be selected.

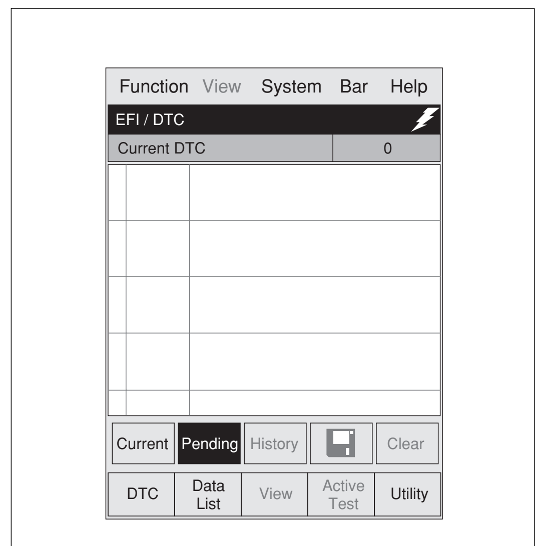


L21E3710ET10

(2) In the case of the DS-II diagnosis tester, select the "Pending"of "DTC" in CARB mode.

8.When a malfunction is detected, the engine and running conditions at that moment are memorized as a freeze-frame data in the EFI ECU memory.

9.Two trip detection logic
When a malfunction is detected for the first time, that malfunction is temporarily memorized in the engine ECU memory. (First running). If the same malfunction is detected again during the second running, the MIL is illuminated and the DTC is determined. (Second running).
(However, the ignition switch should be turned off between the first running and the second running.)

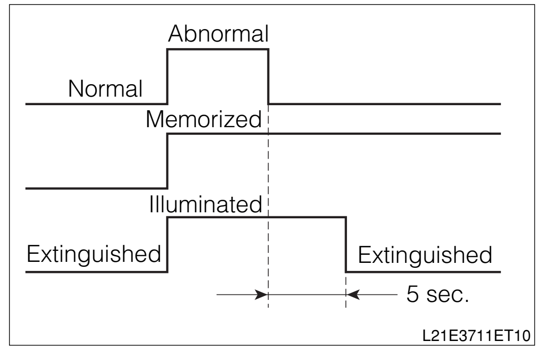


T11E6570T16

(2) On-board diagnostic system of vehicles for other regions

1.When the ignition switch is turned "ON", the MIL goes on. When no malfunction has been detected, the lamp will go out after the engine has started. (Check for a blown bulb)
While the engine is running, if the ECU detects any malfunction in the engine control system/components, or if any malfunction is detected in the EFI ECU itself, the EFI ECU illuminates the MIL.

2.In addition to the illumination of the MIL, the corresponding diagnostic trouble code (DTC) is memorized in the engine ECU memory. When the malfunction has been remedied or the system returns to its normal state, the MIL automatically goes out. However, the DTC remains memorized in the engine ECU memory.



L21E3711ET10

3.It is possible to read out various data from the engine ECU by connecting the DS-21diagnosis tester to the DLC of the vehicle. You can perform trouble-shooting accurately and efficiently by checking these data (DTC, freeze-frame data, current data, oxygen sensor monitor data, etc.). (Only when DS-21 diagnosis tester is used)

4.The DTC (Diagnostic trouble code) is set to a four-digit code in accordance with ISO standard. Furthermore, the conventional two-digit code is also provided. The four-digit code can be read out by the DS-21 diagnosis tester. The two-digit code has been set forth by the DMC itself. This code can be read by observing the flashing pattern of the MIL.

DTC No.	Detection item
4-digit code / 2-digit code	
P0105/31	Manifold absolute pressure/barometric pressure circuit malfunction
P0110/43	Intake air temp. circuit malfunc.

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5.Some DTC have a two trip detection logic which assures avoidance of wrong detection and functions only when a malfunction is surely taking place.

6.When a malfunction is detected, the engine and running conditions at that moment are memorized as a freeze-frame data in the EFI ECU memory.

7.Two trip detection logic

When a malfunction is initially detected, that malfunction is temporarily memorized in the engine ECU memory. (First running) If the same malfunction is detected again during the second running, the MIL is illuminated and the DTC is determined. (Second running)

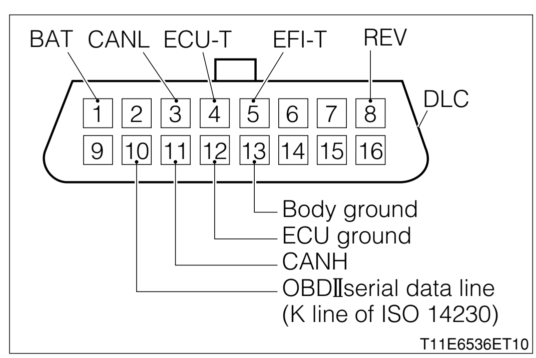
(However, the ignition switch should be turned off between the first running and the second running.)

DTC No.	De	Malfunction evaluation method	MIL
P0141/24	Oxygen sens malfunction	2 trip	!
P0171/25	Fuel trim (Air-fuel malfunction	2 trip	!
P0172/26	Fuel trim (Air-fuel malfunction	2 trip	!

L21E3709ET10

9-6-2 DLC, COMMON DESTINATIONS

1.The vehicle engine ECU uses the ISO14230 (Euro-OBD) protocol. As regards the position, connector shape and pin arrangement, the DLC is in accordance with the ISO 15031-3 (SAEJ1962) and has complied with the ISO14230 format. The OBD Ⅱ serial data line (K line of ISO14230) is used for the OBD Ⅱ generic scan tool or the diagnosis tester (DS-21/DS-Ⅱ) in order to communicate with the ECU.



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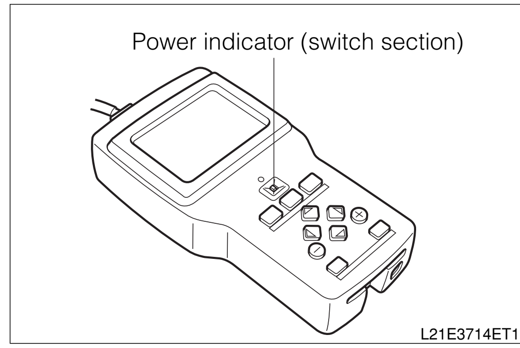
NOTE

- With the cable of the DS-21 diagnosis tester connected to the DLC through the SST, turn "ON" the ignition switch. If the power indicator of the tester will not go on, conduct the following checks and repair any malfunctioning parts.

SST: 09991-87404-000

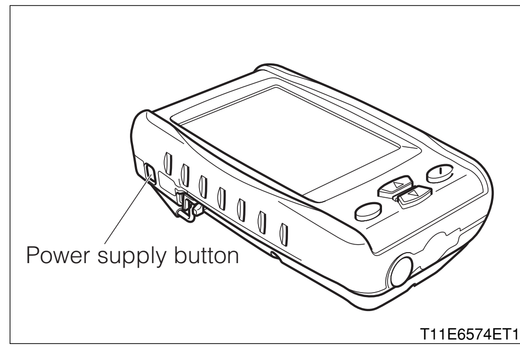


NOTE

- With the cable of the DS-Ⅱ diagnosis tester connected to the DLC, turn ON the IG switch. If the tester does not function, perform the following checks and repair the faulty parts.

(1) Connect the diagnosis tester (DS-21/DS-Ⅱ) to another vehicle.

(2) Turn "ON" the ignition switch.



9-6-3 CONNECTING PROCEDURE FOR SST (EFI COMPUTER CHECK SUB-HARNESS)

1.When the EFI ECU terminal voltage is measured with the EFI ECU connector connected to the engine ECU, connect the SST, following the procedure given below.

NOTE

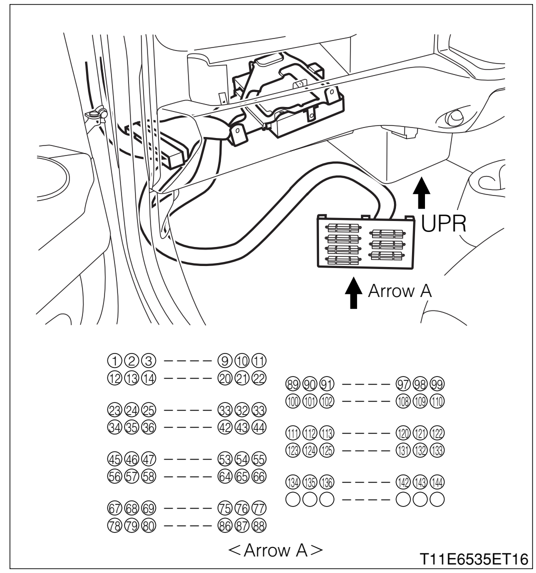
- The terminal number of the SST connector is the same as the EFI ECU connector.

2.Turn "LOCK" the ignition switch. Disconnect the battery negative (-) terminal with the ignition switch turned "LOCK".

NOTE

- Be sure to memorize the diagnostic trouble code before disconnecting the battery negative (-) terminal. Otherwise, the diagnostic trouble code(s) will be erased by disconnecting the battery negative (-) terminal.

3.Remove the glove compartment sub assembly.
4.Remove the No.1 instrument panel under cover.
5.Remove the fuse box opening cover and lower instrument cover.
6.Connect the following SST between the wire harness connectors and the EFI ECU connectors.
SST: 09842-97209-000
7.Reconnect the battery negative (-) terminal.



CAUTION

- When disconnecting or reconnecting the EFI ECU connectors, be sure to disconnect the battery negative (-) terminal with the ignition switch and all accessory switches in the off state.
- When installing a new battery, care must be exercised not to mistake the battery polarity. Failure to observe this caution could cause EFI ECU malfunction.
- Before using the SST, be sure to check to see if short circuit or open wire exists between the terminals of the SST.

9-6-4 TROUBLE-SHOOTING PROCEDURE

(1) Discription

1.The engine control system is equipped with diagnosis functions whose are capable of diagnosing malfunctioning sections. These functions give important clues in trouble-shooting. The flow chart on the next page shows how to proceed with trouble-shooting by using these diagnosis functions.
The flow chart shows how the diagnostic trouble code check can be used effectively. Moreover, when its results are fully reviewed, you can determine whether you are going to do the trouble-shooting according to diagnostic trouble codes or the trouble-shooting according to malfunctioning phenomena.
The diagnosis of this system is equipped with a battery back-up function (A function which supplies power for diagnosis memory even if the ignition switch is turned "LOCK".)

NOTE

- When no DS-21 diagnosis tester or OBD-II generic scan tool is used, the DTC or freeze-frame data in the flow chart can not be read out.

⊳1. Bringing malfunctioning vehicle in garage

▼Go to ⊳2.

⊳2. Diagnosis through interview

1.Thoroughly obtain information from the customer concerning the conditions, environment and phenomena in which the malfunction took place.

▼Go to ⊳3.

⊳3. Normal operation confirmation of diagnosis code indication of LCD in meter.

1.Short-circuit the terminals 4 (ECU-T) and 13 (E) of the DLC, using SST.

SST: 09991-87403-000

2.Ensure that the LCD in the meter indicate the diagnosis codes (Including the normal codes).

SPECIFIED VALUE: Will indicate

NOTE

- It is also fine when codes other than the CAN related ones are outputted.

▼If it is OK, proceed to ⊳4.

▼When it is NG, perform the following checks for the meter and if there is no problem, replace the meter.

(1) Check of harness for meter - DLC and DLC - body earth

(2) Meter power supply system and earth system check

⊳4. Confirmation of diagnosis code of LCD in meter (CAN-related)

1.Ensure that the CAN related diagnosis code (Code 0051 - 0053) is not indicated in the LCD in the meter.

SPECIFIED VALUE: Code 0051 - 0053 are not indicated.

▼If it is OK, proceed to ⊳5.

▼When it is NG, refer to the section of CAN communication system.

Refer to Page L2-1.

⊳5. Confirmation and record of engine check lamp condition

1.Confirm and record the lighting of the engine check lamp when turning "ON" the IG switch and after starting the engine.

	When IG switch is "ON"	After starting the engine	Judgment
Engine check lamp	Illuminated	Extinguished	a
	Illuminated	Illuminated	b
	Extinguished	Extinguished	c

▼In case of a, go to ⊳6.

▼In case of b, go to ⊳6.

▼In case of c, perform the following operations and if there is no problem, replace the meter.

(1) Harness and connector check between battery and meter

(2) Harness and connector check between meter and EFI ECU

(3) EFI ECU power supply system and earth system check

⊳6. Confirmation and recording of diagnosis code

1.Short-circuit the terminals 5 (EFI-T) and 13 (E) of DLC, using the SST.
SST: 09991-87403-000
09991-87404-000

2.Confirm and record the diagnosis code outputted from the engine check lamp in the meter.

NOTE

- If the data during malfunctioning may be confirmed by the diagnosis system, record the data during malfunctioning before canceling the diagnosis code.

▼Go to ⊳7.

⊳7. Malfunction phenomena confirmation

1.Confirm the malfunction phenomena and confirm the abnormal situation.
▼Go to ⊳8.

⊳8. Erasure of diagnosis code

1.Erase the diagnosis code.
▼Go to ⊳9.

⊳9. Confirmation of reproduction of malfunction phenomena

1.Confirm whether the malfunction phenomena can be reproduced.
▼If the malfunction phenomena can be reproduced, proceed to ⊳10.
▼If the malfunction phenomena cannot be reproduced, proceed to ⊳11.

⊳10. Reconfirmation of diagnosis code

1.Perform reconfirmation of the diagnosis code.
▼If an abnormality code is outputted, proceed to ⊳12.
▼If a normal code is outputted, proceed to ⊳11.

⊳11. Basic check

1.Perform basic checks.
Refer to Page B8-270.

▼Go to ⊳13.

⊳12. Trouble-shooting check according to diagnosis code

1.Perform trouble-shooting concerning the diagnosis code outputted.
Refer to Page B8-292.

▼After repairing, go to ⊳14.

⊳13. Trouble-shooting according to malfunction phenomena.

1.Estimate the cause for the malfunction phenomenon and perform trouble-shooting.
Refer to Page B8-287.

▼After repairing, go to ⊳14.

⊳14. Canceling method of diagnosis

1.Cancel the diagnosis code.
▼Go to ⊳15.

ᐅ15. Confirmation and recording of diagnosis code

1.Confirm and record the diagnosis code.

▼<u>If a normal code is outputted, proceed to ᐅ16.</u>

▼<u>If an abnormal code is outputted, go back to ᐅ7 and perform the checks again.</u>

ᐅ16. Confirmation test

1.Ensure that the malfunction phenomena claimed by the customer concerning the vehicle has been completely solved and that it has been recovered to the normal.

▼<u>If it is OK, finish the trouble shooting.</u>

▼<u>If it is NG, go back to ᐅ3 and perform the checks again.</u>

9-7 INQUIRY

1. In your attempt to remove the causes for a malfunction of the vehicle, you will not able to remove the causes unless you actually confirm the malfunctioning phenomenon. No matter how long you continue operations, the vehicle may not resume the normal state unless you confirm the malfunctioning phenomenon. The inquiry with the customer is a vital information collecting activity which is to be conducted previous to the confirmation of malfunctioning phenomenon.
2. This inquiry will provide you with an important clue in an effort to reproduce the malfunctioning phenomenon. Furthermore, the information obtained by the inquiry can be referred to during the trouble-shooting. Hence, instead of making general questions, it is necessary to focus your questions on the items related to the malfunction.
3. The main points of the inquiry given below are the most important points in analyzing the malfunction. In some cases, the information about malfunctions whose took place in the past and about the history of previous repairs, which seem to have nothing to do with the current malfunction, may prove to be helpful in solving the malfunction.
   Hence, it is important to obtain as much information as possible and keep them accurately in mind as reference information when trouble-shooting the malfunctioning phenomenon.

9-7-1 DIAGNOSIS BY INTERVIEW SHEET FOR ENGINE CONTROL SYSTEM

[INQUIRY SHEET]

Inquiry sheet				
Name of customer		Vehicle model	Engine - N/A, T/C, S/C, carburetor, EFI, LPG	Transmission - 4M/T, 5M/T, 2A/T, 3A/T, 4A/T, 2WD, 4WD
Details of vehicle	Frame No.	Registration date · ·	Date of malfunction · ·	Running distance km
	Equipment:			
	[Sex] of customer (driver) Male Female	[Age] Approx.	[Occupation]	[Places where vehicle is mainly used] Urban district/suburb/seacoast/mountain/others; [Parking place] Outdoor/indoor

Symptom	Poor starting	• No initial explosion takes place. • Explosion is incomplete although initial explosion takes place • Hard starting (cold engine, hot engine, always) • No cranking takes place. • Other ( )
	Faulty idling	• Fast idling ineffective • Idling speed too low • Idling speed too high • Idling unstable (cold engine, hot engine, always) • Other ( )
	Poor drive-ability	• Hesitation (during start, during acceleration, during deceleration, during a certain period) • Knocking • Backfire • Lack of power • Poor acceleration • Poor blow • Other ( )
	Engine stall	• During idling (during warming up, after warming up) • At time of starting • During running ( ) • Immediately after vehicle stops (Re-start possible, Re-start impossible) • Under loaded state (Air conditioner, electric load, power steering) • Other ( )
From when malfunction has started?		• Since vehicle was purchased as a new car • Recently (since what year/ month)
Frequency of occurrence		• At all times • Under a certain condition ( ) • Sometimes
Meteorological conditions		• At all times
	Weather	• Fine • Cloudy • Rain • Snow • Other ( )
	Temperature	• Temperature (about ˚C) (Spring, summer, autumn, winter)
Engine condition		• When cold • After warming-up • During warming-up (Water temperature about °C)
Road		• Urban district • Suburb • Highway • Mountainous road (Uphill, downhill)
Driving conditions		• No relation • During racing under no load • During running (Vehicle speed: km/h, Engine speed: rpm, MT Which gear?) • During turn (right curve, left curve)
Other situations		

State of malfunction indicator lamp (MIL)		• Illuminated or flashing at all times • Illuminated or flashing sometimes • Will not go on.
Indication of DTC • Reading out by using OBDⅡ generic scan tool or DS-21 diagnosis tester • Reading-out of MIL flashing pattern by shorting terminal T	During checking	• Normal • Malfunction code ( )
	2nd time	• Normal • Malfunction code ( )

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9-8 CONFIRMATION, RECORD AND ERASURE OF DIAGNOSIS CODE

9-8-1 CHECKING METHOD OF DIAGNOSIS

1.Prior to the check, check the malfunction indicator lamp (MIL), following the procedure given below.

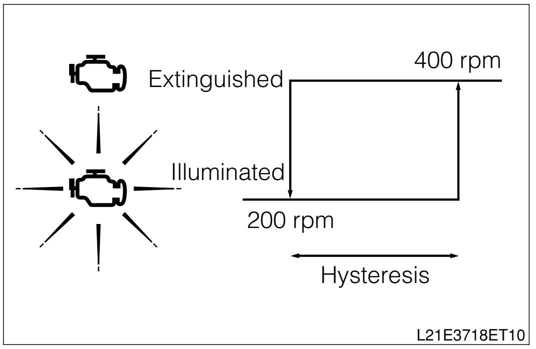
2. Check of malfunction indicator lamp

(1) Ensure that the malfunction indicator lamp goes on when the ignition switch is turned "ON", but with the engine not running.

NOTE

- If the malfunction indicator lamp (MIL) fails to go on, perform the trouble-shooting for the combination meter.

(2) Ensure that the malfunction indicator lamp goes out when the engine starts. If the lamp remains illuminated or is flashing, the diagnosis system is detecting a malfunction. Therefore, a DTC is memorized in the EFI ECU. If no DTC is memorized in the EFI ECU, perform the trouble-shooting for the malfunction indicator lamp circuit.



(1) Check of DTC, using DS-21 diagnosis tester:

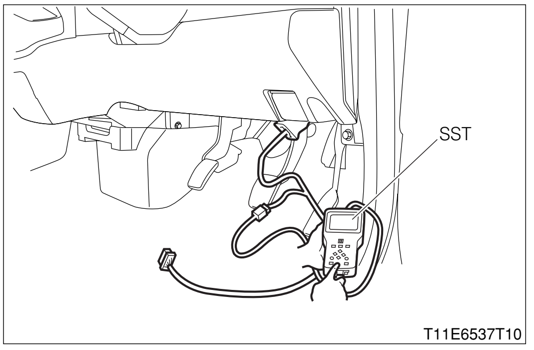
1.Prepare the DS-21 diagnosis tester.

2.Connect the DS-21 diagnosis tester to the DLC located at the lower section of the instrument panel on the driver's seat side. At this time, the DS-21 tester should be connected to the DLC with the following SST interposed.

SST: 09991-87404-000

NOTE

- When DS-21 diagnosis tester is used, refer the instruction manual for tester.



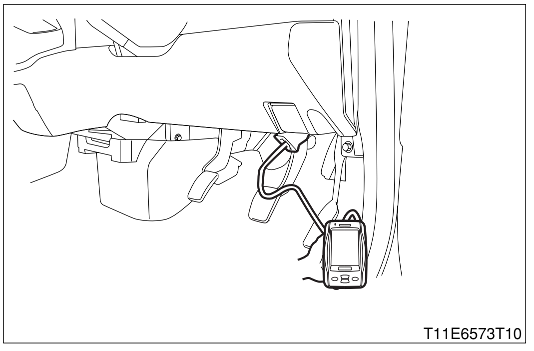
(2) Check of DTC, using DS-Ⅱ diagnosis tester or OBD Ⅱ generic scan tool:

1.Prepare the DS-Ⅱ diagnosis tester or OBD Ⅱ generic scan tool.

2.Connect the DS-Ⅱ diagnosis tester or the OBD Ⅱ generic tester directly to the DLC located at the lower section of the instrument panel on the driver's seat side.

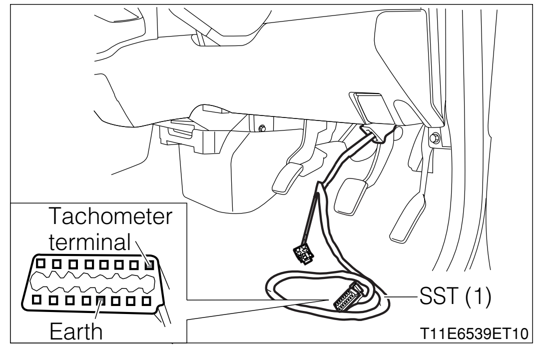
NOTE

- When DS-Ⅱ diagnosis tester or OBD-Ⅱ generic scan tool is used, refer the instruction manual for each tester.



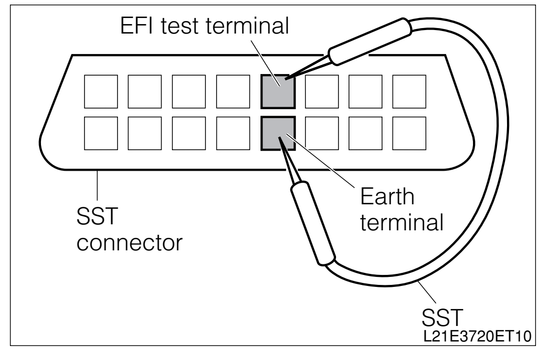
(3) Check of DTC without using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

1.With the ignition switch turned "LOCK", connect the following SST to the DLC located at the lower section of the instrument panel on the driver's seat side.
SST: 09991-87404-000(1)

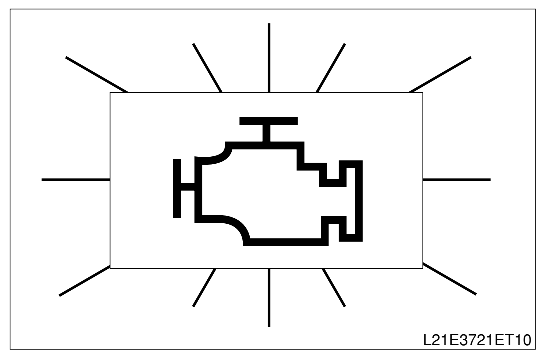


2.Short circuit the DLC terminals 5 (EFI-T) and 13 (E), using the SST.
SST: 09991-87403-000

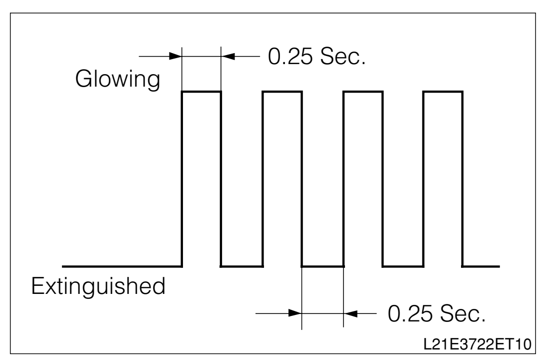
3.Turn the ignition switch to the "ON" position. At this time, be careful not to start the engine.



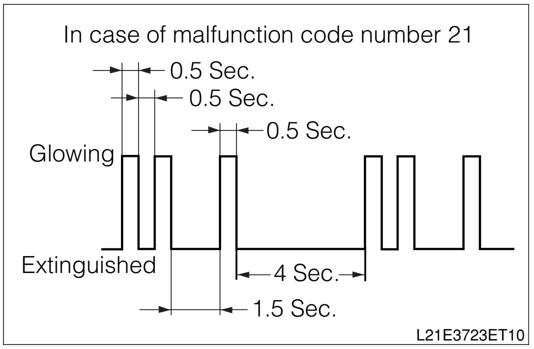
4.Read out the diagnostic trouble code (DTC) by observing the flashing number of the malfunction indicator lamp.



5.The illustration shows an example of the flashing pattern of the normal code. The malfunction indicator lamp glows for 0.25 second, right after the ignition switch has been turned "ON". After a lapse of 0.25 second, the malfunction indicator lamp again glows for 0.25 second. Then, this pattern will be repeated.



6.The illustration shows an example of the flashing pattern of the code No. 21. The diagnostic trouble code is composed of two digits. These two numbers are indicated by blinking of the malfunction indicator lamp. Four seconds after the ignition switch has been turned "ON", the malfunction indicator lamp indicates first the number of the tens digit of the diagnostic trouble code by glowing the same times as the number. The lamp glows for 0.5 second each time and then it is extinguished for 0.5 second. After a pause of 1.5 seconds, the lamp indicates the number of the units digit of the diagnostic trouble code by glowing the same times as the number. The lamp glows for 0.5 second each time and then it is extinguished for 0.5 second. Then, this pattern will be repeated after a pause of 4 seconds.



7.The illustration shows an example of the flashing pattern of the codes No. 21 and 31. In cases where plural malfunction codes have been detected, the two-digit diagnostic trouble codes are indicated in the sequence of the code number, starting from a smaller number. Each diagnostic trouble code is indicated in the above described pattern. A pause of 2.5 seconds occurs between the outputs of respective diagnostic trouble codes, thus separating one from the others. After all of the plural diagnostic trouble codes that have been detected are indicated, the malfunction indicator lamp is extinguished for four seconds. Then, the detected plural diagnostic trouble codes will be indicated again.

8.For the details of malfunctions, refer to the DTC chart.

9.After completion of the check, disconnect the jump wire and turn "LOCK" the ignition switch. Then, disconnect the SST from the DLC.

NOTE

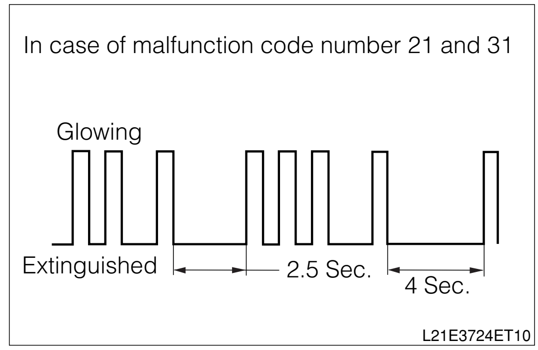
- **In cases where plural malfunction codes have been detected, the indication will be made progressively, starting from the smaller number to the larger number.**
- **In cases where the diagnosis tester (DS-21/DS-Ⅱ) or the OBD Ⅱ generic scan tool is not used, it is impossible to take a reading of unidentified two-trip DTC from the SST connector.**
- **When malfunctioning phenomena are to be reproduced without using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool, follow the procedure given below to detect the DTC.**

(1) It is assumed that two trip detection logic is used for the DTC detection.

(2) Therefore, after a malfunctioning phenomenon is first reproduced, turn "LOCK" the ignition switch.

(3) Then, repeat the same reproduction procedure once again.

(4) When the malfunction is reproduced again, the malfunction indicator lamp goes on and the DTC is memorized in the engine ECU. For reading out of the DTC.

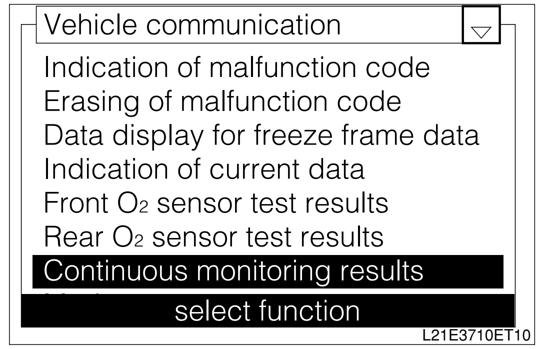


NOTE

- When malfunctioning phenomena are to be reproduced with the DS-21 diagnosis tester or OBD Ⅱ generic scan tool connected to the DLC, the "Continuous monitoring results" function can be used. (In the case of the DS-21 diagnosis tester, select the "Continuous monitoring results" of the "Vehicle communication" in CARB mode.) This function makes it possible to indicate the DTC when the malfunctioning phenomenon is first reproduced. (Request of onboard monitoring test results of ISO 15031-5 Continuous monitoring system.)

NOTE

- In the case of the DS-Ⅱ diagnosis tester, select the "Pending"of "DTC" in CARB mode.



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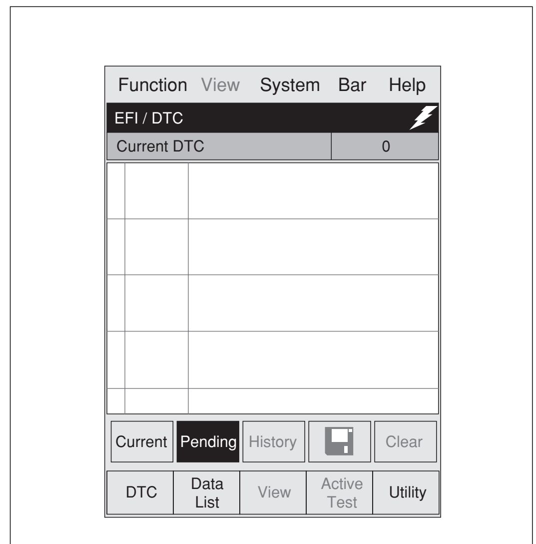

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9-8-2 CANCELING METHOD OF DIAGNOSIS

1.The DTC and freeze-frame data can be erased through the following methods.

(1) The diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool is used to erase the DTC. (For the operating procedure, refer to the instruction manual.)

(2) The power supply to the EFI ECU is shut off to erase the DTC without using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. (Disconnect the battery negative (-) terminal or detach the EFI fuse.)

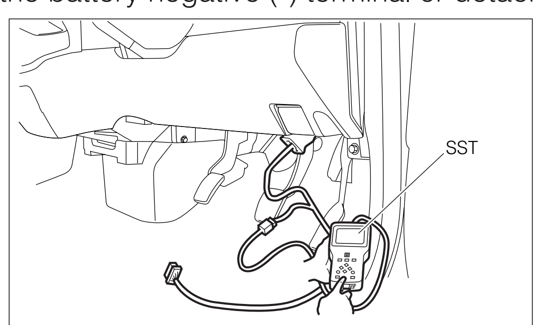
(1) When DS-21 diagnosis is used:

1.In the same way as the check of DTC, connect the diagnosis tester (DS-21/DS-Ⅱ) to the DLC with the following SST interposed.

SST: 09991-87404-000

NOTE

- When DS-21 diagnosis tester is used, refer the instruction manual for tester.



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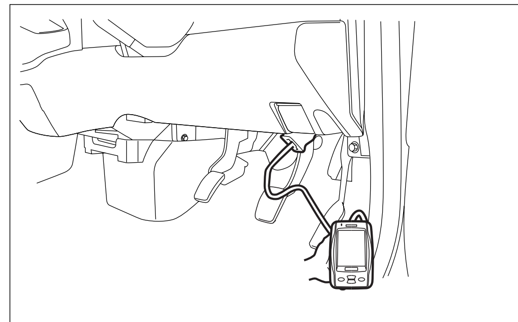
(2) When DS-21 diagnosis tester or OBD Ⅱ generic scan tool is used

1.In the same way as the check of DTC, connect the DS-Ⅱ diagnosis tester or the OBD Ⅱ generic scan tool directly to the DLC.

NOTE

- When DS-Ⅱ diagnosis tester or OBD Ⅱ generic scan tool is used, refer the instruction manual for each tester.



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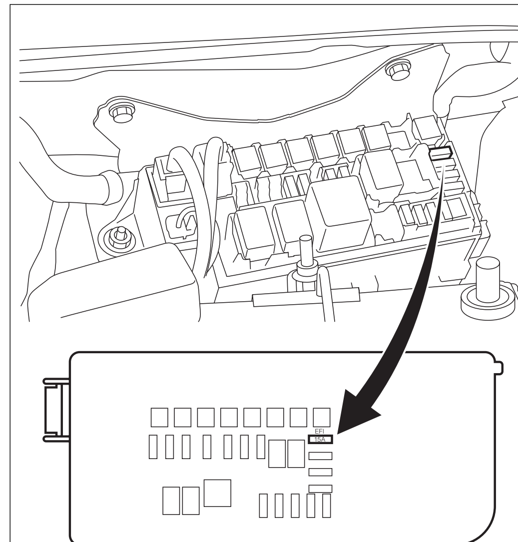
(3) When diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool is not used:

1.Erasure by disconnecting EFI fuse

To erase the diagnostic trouble codes (DTC) memorized in the ECU after malfunctions have been repaired, disconnect the EFI fuse from the relay block for at least 60 seconds with the ignition switch turned "LOCK". (When ambient temperature is about 20°C.)

NOTE

- It is possible to complete this erasing for approximately 60 seconds. In some cases, however, it may take longer. Furthermore, the erasing can be made by disconnecting the circuit, such as the battery power supply and fusible link. In cases where the battery negative (-) terminal is to be disconnected, record the radio channels in advance. After completion of the operation, set the radio channels the same as before.
- In cases where the same malfunction (DTC) cannot be detected again during the 40 cycles of the engine warming-up, the DTC and freeze-frame data will be automatically erased from the ECU memory. (Only in the case of vehicles with EU specifications)
- Warming-up cycle
- The warming-up cycle refers to a driving cycle that sufficiently allows the water temperature to rise by at least 22°C above the temperature at the time of engine starting and to reach at least 70°C.
- Driving cycle
- The driving cycle consists of the engine starting and engine stopping.



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9-9 SYMPTOM CONFIRMATION

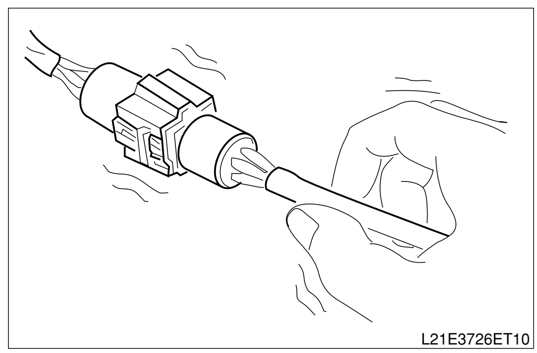
9-9-1 CONFIRMATION OF REPRODUCTION OF MALFUNCTIONING PHENOMENA

1. In the course of trouble-shooting, the operator can not pinpoint the cause for the malfunction unless he confirms the phenomenon. For this purpose, it is indispensable to reproduce the malfunctioning phenomenon by creating conditions and environments that are similar to those customer.
2. As for phenomena whose can not be reproduced easily, it is necessary to produce running conditions that are similar to those when the malfunction occurred (Road surface condition, weather condition, driving condition). For this end, it is of great importance to try to reproduce the conditions that are similar to those when the malfunction occurred (Road surface condition, weather relays by hand), heat (Applying hot air) and water (Applying moisture).
3. Vibration, heat or moisture can constitute causes for malfunction that are difficult to reproduce.
4. Therefore, with the vehicle in a stationary state, you can perform the following malfunction reproduction simulation tests given below.
   Moreover, if you presume a section (Part) which can cause a malfunction and connect a tester, etc. to that section so as to confirm the malfunctioning phenomenon, you can also achieve a function to that section so as to confirm the malfunctioning phenomenon, you can also achieve a function evaluation of that section (Part).

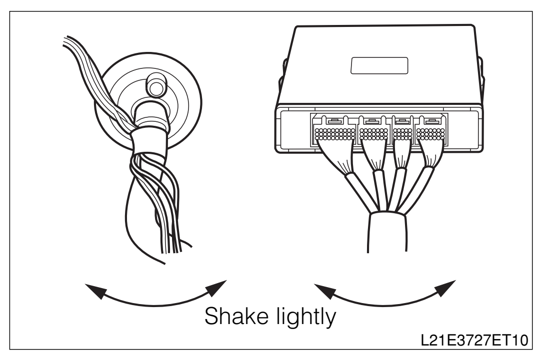
(1) Malfunction reproduction simulation test methods

① Vibration method:

1. When vibration is thought to be the main cause
   (1) Connector
   Lightly shake the connector vertically and laterally.



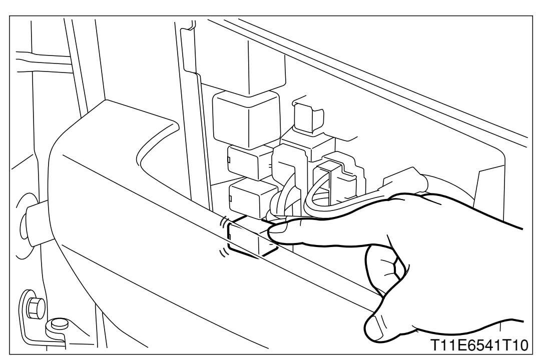
   (2) Wire harness
   Lightly shake the wire harness vertically and laterally. The points to be checked are connector joints, the vibrating point and the section where the wire harness is passing through the body.



   (3) Parts, sensors
   With your finger, apply light vibrations to a part of the sensor which is presumed to be the cause for the malfunction. Check to see if the malfunction is reproduced.

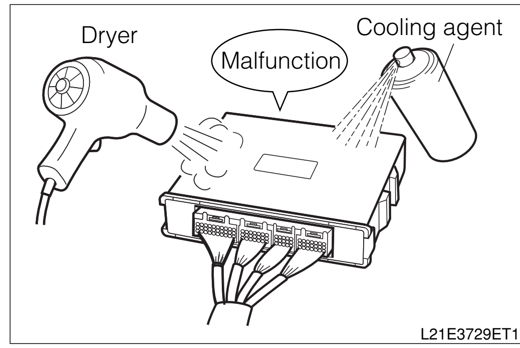
NOTE

- **Be careful not to apply too strong vibration to a relay, for it can cause an open wire in the relay.**



② **Cool/hot method:**

1. When a suspected section is likely causing the malfunction when it is cold or hot.
   (1) Heat a component which is presumed to be causing the malfunction by using a dryer or the like. Check to see if the malfunction occurs.



CAUTION

- Do not heat the section beyond 60°C. (Temperature limit to assure that no damage be made to the component.)
- Do not directly heat the parts inside the ECU.

③ **Water applying method:**

1. When the malfunction is believed to occur on rainy days or under humid conditions. Apply water to the vehicle. Check to see if the malfunction occurs.

NOTE

- Never apply water directly to the engine compartment. By applying water to the front of the radiator, you can indirectly change the temperature and humidity.
- Never apply water directly to the electronic parts.
- If rain leaks into the vehicle compartment, rain may get into the inside of the ECU through the wire harnesses. If the vehicle has experienced any rain leakage before, utmost attention must be paid in respect to this point.

9-9-2 RECHECK AND MAKING RECORD OF DTC/FREEZE-FRAME DATA

1. By checking the DTC/freeze-frame data after confirming the reproduction of the malfunctioning phenomenon, it is possible to judge whether the system related to the DTC that was indicated before confirmation of the reproduction is now functioning properly or not. Then, you are to proceed to one of the following three steps.
   (1) When a DTC was indicated at the time of checking the DTC and the same DTC is indicated after the confirmation of reproduction of the malfunction, it indicates that the malfunction is still persisting in the diagnosis circuit. Proceed to the trouble-shooting according codes.
   (2) When no abnormal code is indicated, although the occurrence of malfunction was observed during the confirmation of reproduction of malfunction, a malfunction other than those related to the diagnosis system is likely taking place. Proceed to the trouble-shooting according to malfunctioning phenomena.
   (3) When no malfunction is observed during the confirmation of reproduction of malfunction, and the normal code is indicated at the check of the DTC, it is presumed that an abnormality, such as poor contacts at the harnesses and connectors, occurred in the past, but now they are functioning properly. Check the harnesses and connectors of those systems related to the DTC that was indicated before the confirmation of reproduction of the malfunctioning phenomenon.

9-10 BASIC CHECK

9-10-1 BASIC ENGINE CHECK FLOW CHART

1.When the ECU is detecting no DTC during the reproduction test of malfunctioning phenomena and when no abnormality is found by the visual inspection, it is necessary to progressively perform the trouble-shooting for circuits which are most likely causing the malfunctions.
2.In many cases, sections causing malfunctions can be narrowed down quickly and effectively by performing the basic engine check indicated in the following flow chart. Therefore, it is very important to perform this check for the engine trouble-shooting.

(1) Basic engine check

ᐅ1. Check the battery voltage.

1.Is the battery voltage 11 V or more with the engine in a stopped state?
▼If it is OK, go to ᐅ2.
▼If it is NG, charge the battery or replace it.

ᐅ2. Check the engine cranking.

1.Does the engine crank?
▼If it is OK, go to ᐅ3.
▼If it is NG, go to "Matrix Table for Trouble-Shooting According to Malfunctioning Phenomena".
Refer to Page B8-287.

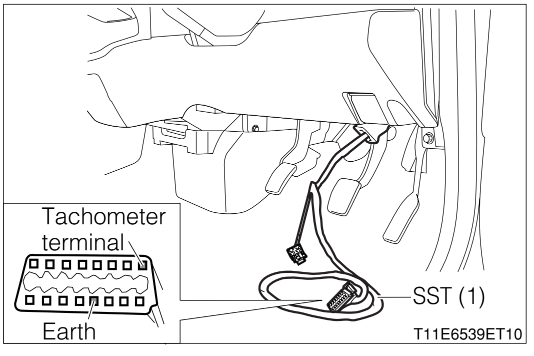
ᐅ3. Check the engine starting.

1.Does the engine start?
▼If it is OK, go to ᐅ4.
▼If it is NG, go to ᐅ6.

ᐅ4. Check the engine idle speed.

1.Warm up the engine, until the engine water temperature reaches 90℃ or more.
2.Turn "OFF" all electric load switches (Including A/C switch).
3.Set the transmission to neutral.
4.When the DS-21 diagnosis tester is used:
(1) Connect the DS-21 tester to the DLC with the SST interposed.
SST: 09991-87404-000

5.When the DS-Ⅱ diagnosis tester or OBD Ⅱ generic scan tool is used:
(1) Connect the DS-Ⅱ diagnosis tester or OBD Ⅱ generic scan tool to the DLC directly.
6.Check the engine idle speed.



7.When the diagnosis tester (DS-21/DS-Ⅱ) or general-purpose tester is not used, connect a tachometer to the Tachometer terminal.

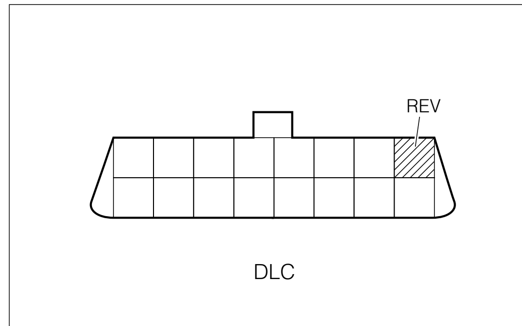
(1) Install an engine tachometer to the terminal "REV" of the DLC, using the SST.

SST: 09991-87402-000
09991-87404-000

NOTE

- The SST 09991-87404-000 is a harness for extension use. This does not have to be used.

SPECIFIED VALUE: 700^{+100}_{-50} rpm(A/T)
650^{+100}_{-50} rpm(M/T)



H11E8026T10

▼If it is OK, go to ⊳5.

▼If it is NG, go to "Matrix Table for Trouble-Shooting According to Malfunctioning Phenomena".

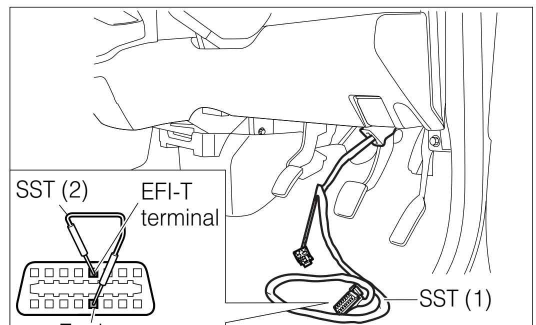
Refer to Page B8-287.

⊳5. Check the ignition timing.

1.When the diagnosis tester (DS-21/DS-Ⅱ) is not used:

2.Connect the terminal T of the SST connector to the earth terminal, using a jump wire.

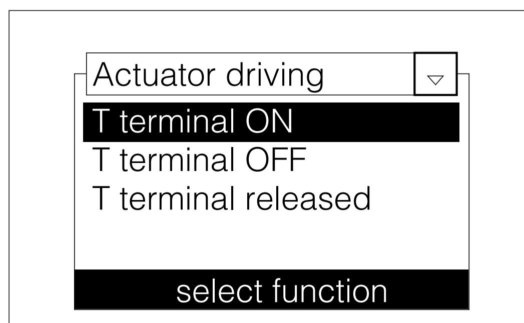
SST: 09991-87404-000(1)
09991-87403-000(2)



T11E6538ET10

3.When the DS-21 diagnosis tester is used:

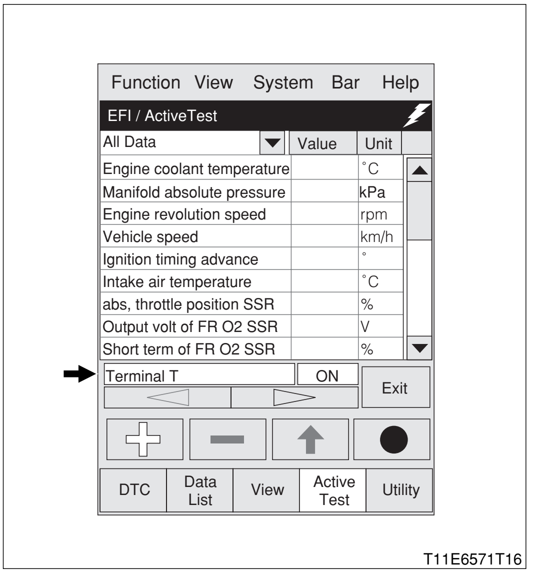
(1) Select the "Engine adjustment" on the course menu so as to connect the EFI- T terminal.



C13E5588ET10

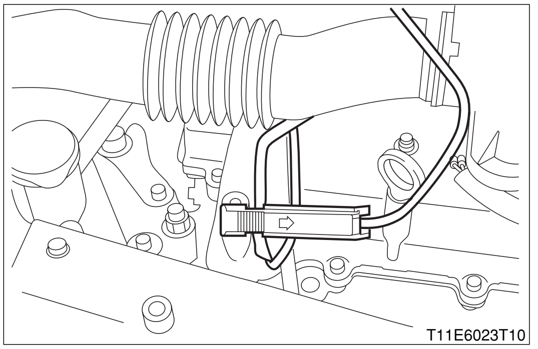
4.When the DS-Ⅱ diagnosis tester is used:

(1) Select the "Terminal T" of "Active Test" so as to connect the EFI-T terminal.



T11E6571T16

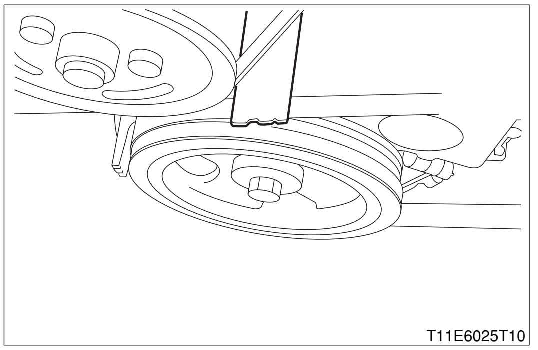
5.Attach the clip of the timing light to the wire harness for timing light connection wire.



T11E6023T10

6.Is the timing mark of the crankshaft within a range of the indicator for ignition timing check provided on the timing chain cover?

SPECIFIED VALUE: 6± 2 degrees (BTDC)



T11E6025T10

7.Are the check results OK?

▼If it is OK, go to "Matrix Table for Trouble-Shooting According to Malfunctioning Phenomena".

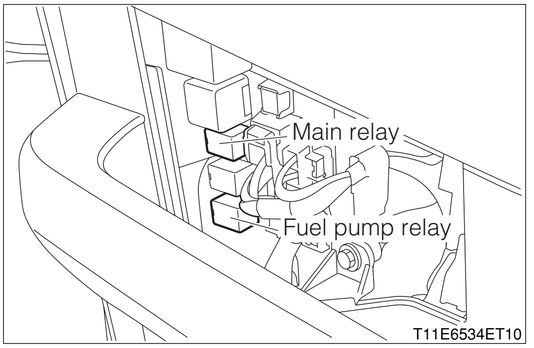
Refer to Page B8-287.

▼If it is NG, check the timing chain for wrong assembling. Also, check the plunger protruding amount of the tensioner.

6. Fuel pressure check (Simple check).

1.When DS-21 diagnosis tester is not used:

(1) Ensure that the fuel tank is filled with sufficient fuel.

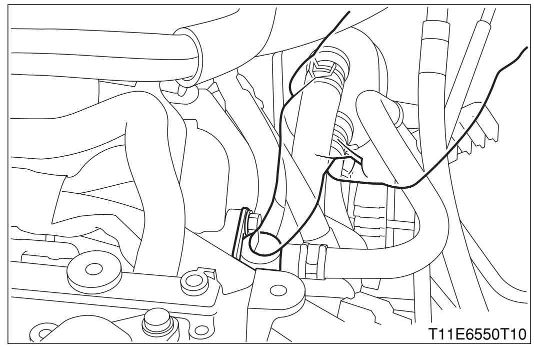


T11E6534ET10

(2) Remove the fuel pump relay and connect a jump wire, as indicated in the illustration.

SST: 09991-87403-000

(3) Ensure that the IG switch is turned "ON" and the pulsation damper exhibits pulsation.



T11E6550T10

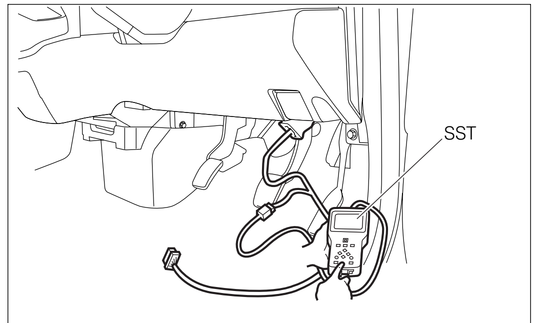
2.When DS-21 diagnosis tester is used:

(1) Connect the DS-21 diagnosis tester to the DLC with the SST interposed.

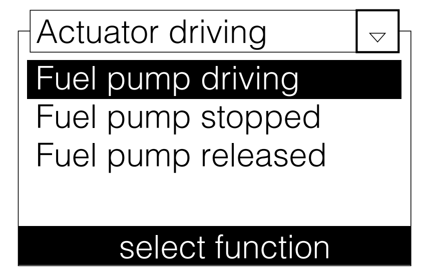
SST: 09991-87404-000

(2) Turn "ON" the ignition switch. Then, select the "Fuel pump" of the "Actuator driving" among the individual functions so as to drive the fuel pump.

(3) Does the pulsation damper exhibit pulsation?



T11E6537T10



C13E5589ET10

3.When DS-Ⅱ diagnosis tester is used:

(1) Connect the DS-II diagnosis tester to the DLC.

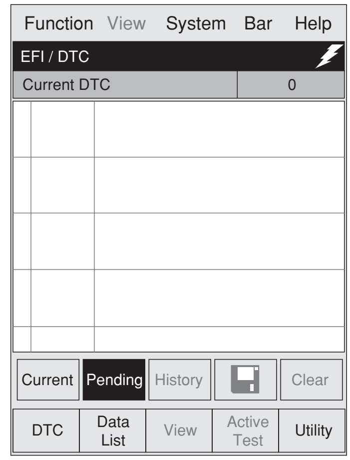
(2) Turn "ON" the ignition switch. Then, select the "Fuel Pump" of the "Actuator driving" so as to drive the fuel pump.

(3) Does the pulsation damper exhibit pulsation?

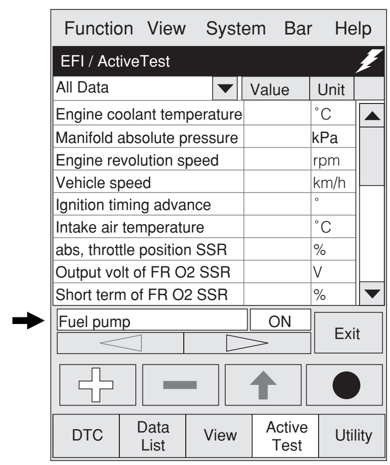
▼If it is OK, go to ▷7.

▼If it is NG, go to "Check of Fuel Pump and F/P Regulator".

Refer to Page B8-448.

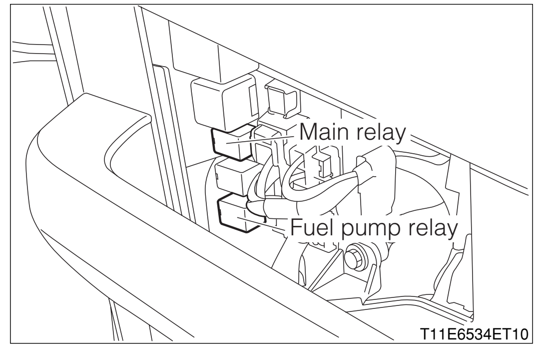


T11E6570T16



T11E6572T16

⊳7. Spark check.



1.Remove the fuel pump relay from the relay block.
2.Remove the ignition coils and spark plugs (All cylinders #1, 2, 3 and 4).
3.Disconnect the fuel pump relay
4.Disconnect the connector of the injector.

CAUTION

- Stop the fuel injection by the operations at Steps 3 and 4 above so as to prevent the catalyst from being damaged by unburnt gas, etc.
- When there is no fuel, the injector injection must be avoided wherever possible, as this may damage the injector.

5.Install the spark plug to the ignition coil. Connect the ignition coil connector to the ignition coil.
6.Ground the spark plug.
7.Crank the engine. At this time, check to see if each spark plug sparks.
8.Are sparks jumping?

▼<u>If it is OK, go to ⊳8.</u>
▼<u>If it is NG, go to Check of ignition System.</u>

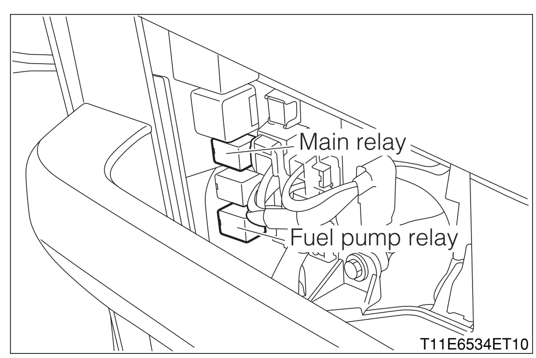
⊳8. Confirmation of operation of fuel injector.

1.Install the spark plugs, ignition coils and fuel pump relay. Connect the connector of the ignition coil.
2.Using a sound scope, check each injector for operation sound while the engine is being cranked or idling.
3.Can you hear operator sound of all injectors?

▼<u>If it is OK, go to ⊳9.</u>
▼<u>If it is NG, go to "Check of Fuel Injector Circuit".</u>
Refer to Page B8-455.

⊳9. Inspection of compression pressure.

1.Warm up the engine.
2.With the IG switch turned "LOCK", remove all of the ignition coils and spark plugs.



3.Temporarily remove the main relay and fuel pump relay.
4.Insert a compression gauge into the spark plug hole.
5.Depress the accelerator pedal fully.
6.While cranking the engine, measure the compression pressure.
7.Repeat the steps 4, 5 and 6 to perform the measurement for all cylinders.

NOTE

- Be sure to use a fully-charged battery. Also the measurement should be performed in the shortest possible length of time.

8.Are the check results OK?

▼<u>If it is OK, go to ⊳10.</u>
▼<u>If it is NG, perform the checks, referring to the section ENGINE MECHANICAL.</u>

▷10. Inspection of idle CO and HC concentrations.

1.Warm up the engine completely.

NOTE

- Warm up the engine, until the fan motor starts to operate.

2.Measure CO and HC concentrations at idle speed.

SPECIFIED VALUE:

CO concentration	Not to exceed 0.2 %
HC concentration	Not to exceed 200 ppm

3.Are the check results OK?

▼If it is OK, go to "Matrix Table for Trouble-Shooting According to Malfunctioning Phenomena".
Refer to Page B8-287.

▼If it is NG, perform the checks, referring to the section ENGINE MECHANICAL.

(2) Check of wire harnesses and connectors

1.Check of open wire

(1) Check of open wire

This is caused by detached wire harness, poor contact inside the connector, detached connector terminal, and so forth.

NOTE

- The wires are rarely cut at the center. In most cases, an open wire occurs at the connectors. Particularly, the connectors of the sensor and actuator should be checked very carefully.
- Poor contact is caused by rust formation at the connector terminal, foreign substances adhered to the terminal, or drop in the contact pressure between the male and female terminals of the connector.
- Simply disconnect the connector once, and then, reconnect it. It may change the contacting condition, thus returning to the normal operation. Hence, if no abnormality was found when the wire harness and connector were checked during the trouble-shooting, and if the malfunction ceases to exist after completion of the checks, then the wire harness or connector was most likely causing the malfunction.

2.Check of short circuit

(1) Check of short circuit

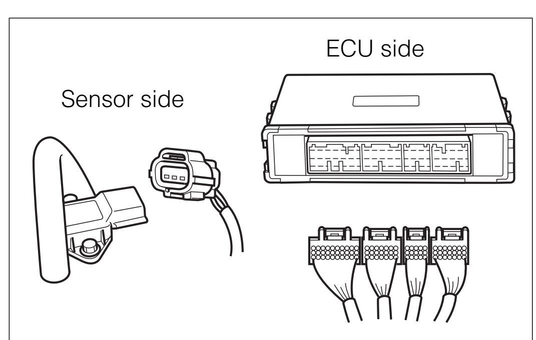
This is caused by a short circuit between the wire harness and the body ground or by an internal short circuit of the switches, etc.

NOTE

- If a short circuit is present between the wire harness and the body ground, thoroughly check to see if the wire harness is caught in the body, if the wire is rubbed and the insulator section is ruptured, thus contacting other parts, and if the wire is clamped properly.

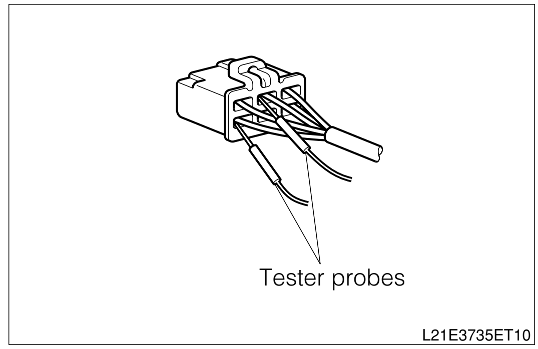
3.Continuity check (Check for open wire)

(1) Disconnect the connector on both sides of the EFI ECU and sensor.



(2) Measure the resistance between the relevant terminals of the connector.

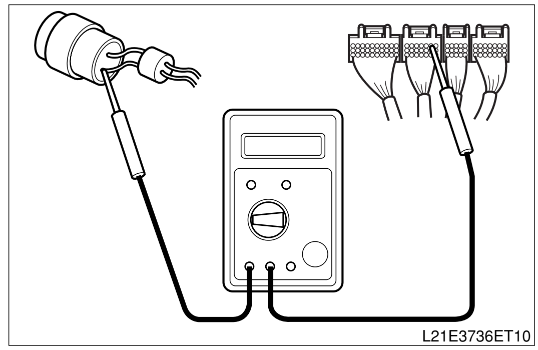
SPECIFIED VALUE: Resistance: 1Ω or less



L21E3735ET10

NOTE

- Lightly shake the wire harness in a longitudinal direction as well as in a horizontal direction when the resistance is measured.
- In the case of non-waterproof connectors, the test probe should be inserted into the connector from each wire harness side.
- In cases where the waterproof connector is checked without removing the waterproof rubber, be very careful not to deform the connector terminal when applying the test probes.



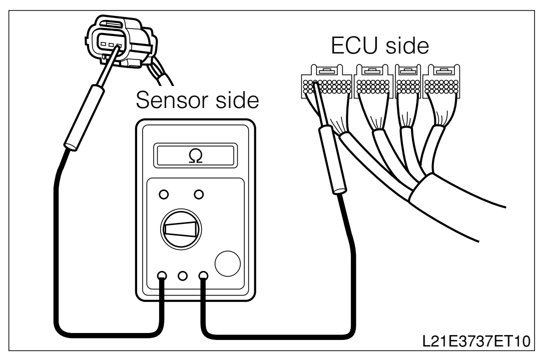
L21E3736ET10

4.Continuity check (Check for short circuit)

(1) Disconnect the connector on both sides.

(2) Measure the resistance between the relevant terminal of the connector and the body ground. Moreover, be sure to check for the connectors on both sides.

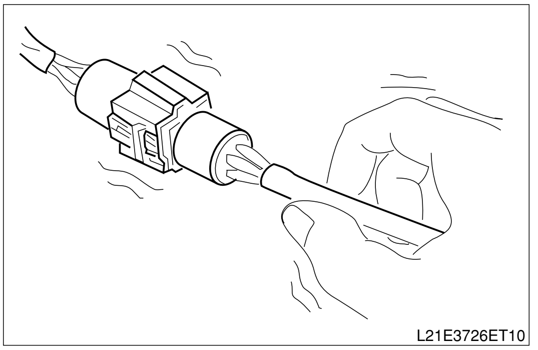
SPECIFIED VALUE: Resistance:1 MΩ or more



L21E3737ET10

NOTE

- Lightly shake the wire harness in a longitudinal direction as well as in a horizontal direction when the resistance is measured.



5.Check of EFI ECU and its circuit

(1) The EFI ECU and its circuit can be checked by measuring the voltage and resistance at the EFI ECU connector. In order to narrow down the cause further after the cause has been decided to a certain system, it is imperative to measure the voltage and resistance of the external route of the EFI ECU.

(2) The measurement of the voltage and resistance is conducted during the system check, following the procedure given below.

CAUTION

- The EFI ECU cannot be checked by itself. Never connect a voltmeter or an ohmmeter to the EFI ECU with the connector disconnected from the EFI ECU.
- When conducting the continuity test or measuring the resistance, turn "LOCK" the ignition switch once. Then, disconnect the connector at the EFI ECU.

6.Voltage check

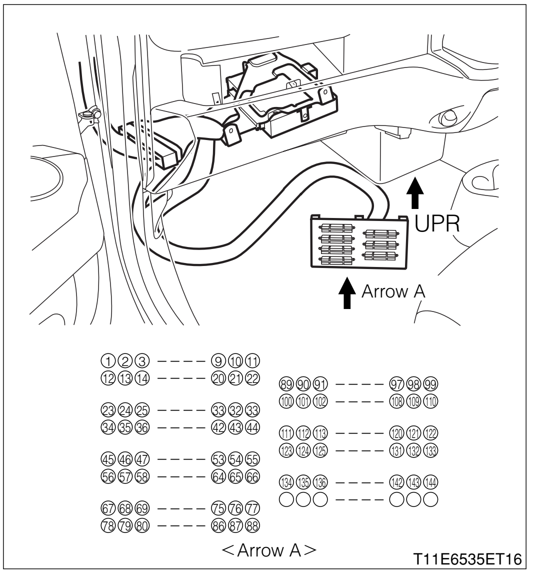
(1) Installation of SST

First, install the SST between the engine ECU and the vehicle harness.

For the installation procedure, refer to the section under.

(2) Measure the voltages between the respective terminals of the SST connectors.

(3) Check to see if the measured values conform to the specification in accordance with the following table "Characteristics of ECU Output".



NOTE

- Make sure that the battery voltage is 11 V or more with the ignition switch turned "ON", for each terminal voltage is affected by the battery voltage.

7.Resistance check

(1) Installation of SST

First, install the SST between the engine ECU and the vehicle harness. However, the SST connector at the ECU side should not be connected.

For the installation procedure, refer to the section under "Connecting Procedure for SST".

(2) Measure the resistances between the respective terminals.

(3) Check to see if the measured resistances conform to the specification in accordance with the following table "Standard Resistances".

NOTE

- Make sure that the ignition switch is turned "LOCK" during the measurement.
- The following table shows the resistance at the time when the temperature of parts is 20°C.

standard resistances

System to be checked	Terminals	Circuit	Standard resistance
Front oxygen sensor system	15 (OXH1) - 27 (+B)	Front oxygen sensor and main relay	4.7 - 6.1Ω
Rear oxygen sensor system	14 (OXH2) - 27 (+B)	Rear oxygen sensor and main relay	11.7 - 14.5Ω
Engine revolution sensor system	22 (N1+) - 52 (N1−)	Engine revolution sensor system	1850 - 2450Ω
Camshaft position sensor system	58(N2+) - 127(N2−)	Camshaft position sensor system	1850 - 2450Ω
Injector system	24 (#10) - 27 (+B)	No.1 - 4 fuel injector	11.6 - 12.4Ω
	23 (#20) - 27 (+B)		
	22 (#30) - 27 (+B)		
	21 (#40) - 27 (+B)		
VSV for evaporative emission control system purge control system	79 (PRG) - 7 (+B)	Evaporative emission purge control valve	30 - 34Ω
Ground system	125 (E1) - Body ground	Ground	10Ω or less
	19 (E2) - Body ground		
	122 (E2PM) - Body ground		
	116 (E21) - Body ground		

9-10-2 CHECK AND REPAIR BY CHART ACCORDING TO DTC

(1) Scan tool data (ECU DATA)

1. The following data values given below are representative values obtained under the "normal condition".

   However, there are cases where the system is functioning normally even if the measured value is different from the values listed here. Therefore, no judgment as to whether any malfunction is occurring or not should be made only on the basis of these data under the "normal condition".

NOTE

- The data monitor value may vary significantly, depending on slight difference in the measurement, difference in the measurement environment, deterioration due to passage of time in the vehicle, and so forth. Therefore, it is difficult to indicate the definite reference values. Hence, there are cases where malfunctions are occurring even when the measured value is within the reference value.
- With regard to minor phenomenon, such as hesitation and rough idling, it is necessary to make total evaluation, based on all the data monitor items, by sampling the data of the vehicle of the same type under the same conditions and comparing them.
- In the case of the OBD Ⅱ generic scan tool, it is possible to take a reading of the values with an ※ mark in the following table.
- When checking the data under a condition where the engine is "idling" or "racing", the shift lever should be placed in the "neutral", the A/C switch should be turned "OFF", and all accessory switches should be turned "OFF".

Items specified by CARB

	DS-21 diagnosis tester display	Signal name	Vehicle condition	Reference values under normal condition
※1	FUEL SYSTEM	FSYS	At idle speed after warming up	O2
※2	CALC LOAD	LOAD	At idle speed after warming up	1.7 - 2.2 %
			At 2500 rpm with no load after warming up	5.0 - 6.3 %
※3	COOLANT TEMP	ECT	Cold start - Warming up running	Value should be rising gradually
			When engine has warmed up completely	80 - 102˚C
			During fail-safe function (At time of starting)	20˚C
			During fail-safe function (After starting)	80˚C
※4	SHORT FT	SHRT	At idle speed after warming up	−20 - 20 %
※5	LONG FT	LONG	At idle speed after warming up	−16 - +16 %
※6	ENGINE SPEED	RPM	When engine is running at constant speed	There should be no remarkable variation
			At idle speed after warming up	600 - 750 rpm (M/T vehicles) 650 - 800 rpm (A/T vehicle)
※7	VEHICLE SPEED	VS	During running (Compared with speedometer)	There should be no remarkable variation
※8	IGN ADVANCE	ITA	At idle speed after warming up	0 - 15˚
			When idle switch is OFF	Changes should be made according to running conditions
※9	INTAKE AIR TEMP	IAT	When engine is running	Changes should be made according to running conditions
※10	MAIN ABS PRESS	MAP	When ignition switch is ON	70 - 104 kPa
			At idle speed after warming up	20 - 40 kPa
			During fail-safe function	34 - 72 kPa
※11	THROTTLE POS	TP	When acceleration pedal is operate	Changes should be made according to pedal operation
※12	OXYGEN SENSOR S1	O_2FP	At idle speed after warming up	−5 - +5 %
		O_2FV		0.0 - 1.0 V
※13	OXYGEN SENSOR S2	O_2RP	When engine is running at 2000 rpm, for 3 minutes or longer after warming up.	20 - 77 %
		O_2RV		0.10 - 0.95 V
※14	MIL ON RUN DIST	DWM	When there is no DTC	0 km

Items specified by DMC

	DS-21 diagnosis tester display	Signal name	Vehicle condition	Reference values under normal condition
1	BATTERY VOLTAGE	BAT	When engine is running at 5000 rpm (25˚C)	Approx. 14 V
2	ELECTRIC LOAD	DSW	When light, heater blower, defogger or radiator fan is ON	OFF→ON
3	AIR CONDITIONING	AC	When air conditioner switch is set to ON	OFF→ON
4	CTP SWITCH	IDL	When throttle valve is switched from fully closed state to opened state	ON→OFF
5	INJ PULSE WIDTH	TAU	Cold start - Warming up running	Value should be decreasing gradually
			At idle speed after warming up	1.4 - 1.8 ms
6	ISC DUTY RATIO	ISC	When ignition switch is ON	0%
			Cold start - Warming up running	Value should be decreasing gradually
			At idle speed after warming up	6 - 14 %
			When air conditioner switch is set to ON	20 - 60 %
			When light, heater blower or defogger is ON	7 - 19 %
			At idle speed after warming up	0 - 2˚CA
7	ACTUAL DIS ANGLE OF IN CAM	VT	During vehicle running	The value changes, depending on driving conditions.
			At idle speed after warming up	0˚CA
8	TARGET DISP ANGLE OF IN CAM	VTT	During vehicle running	The value changes, depending on driving conditions.

NOTE

- The items with a (※) mark is provided only for the EU specifications. Therefore, in the case of the non-EU specification vehicles, no indication will be made.

(2) DTC chart specifications

1.The parameters indicated in the table may vary, depending upon the system types and specifications. This applies to vehicles for all destinations.
For details of the checking of each code, refer to the DTC chart for each code.

Codes specified by ISO/SAE

DTC No.	Diagnosis Items	Diagnosis contents	Malfunction evaluation method	Warning indication
P0105/31	Manifold absolute pressure/barometric pressure circuit malfunction	When abnormality takes place in the signal from manifold absolute pressure/barometric pressure circuit: Malfunction of the sensor, or open wire or short circuit in the manifold absolute pressure/barometric pressure circuit.	1 trip	○
P0110/43	Intake air temperature sensor circuit malfunction	When malfunction takes place in the signal from the intake air temperature sensor: Malfunction of the sensor, or open wire or short circuit in intake air temperature sensor circuit.	1 trip	○
P0115/42	Engine coolant temperature sensor circuit malfunction	When abnormality takes place in the signal from the engine coolant temperature sensor: Malfunction of the sensor, or open wire or short circuit in engine coolant temperature sensor circuit.	1 trip	○
P0120/41	Throttle/pedal position sensor/switch malfunction	When abnormality takes place in the signal from throttle/pedal position sensor: ·Malfunction of the sensor, or open wire or short circuit in throttle/pedal position sensor/switch circuit.	1 trip	○
P0130/21	Oxygen sensor circuit malfunction (Bank 1 sensor 1)	When abnormalities take place two times consecutively in the signal from the oxygen sensor: ·Malfunction of the sensor, or open wire or short circuit in oxygen sensor circuit.	2 trip	○
P0135/23※1	Oxygen sensor heater circuit malfunction (Bank1 sensor1).	When abnormalities take place in the signal from the oxygen sensor heater: ·Open wire or short circuit in oxygen sensor heater circuit.	2 trip	○
P0136/22	Rear oxygen sensor circuit malfunction (Bank 1 sensor 2)	When abnormalities take place two times consecutively in the signal from the rear oxygen sensor: ·Malfunction of the sensor, or open wire or short in the rear oxygen sensor circuit.	2 trip	○
P0141/24※1	Oxygen sensor heater circuit malfunction (Bank 1 sensor 2)	When abnormalities take place in the signal from the oxygen sensor heater: ·Open wire or short circuit in oxygen sensor heater circuit.	2 trip	○
P0171/25	Fuel trim system too lean (Air-fuel ratio lean malfunction, bank 1)	When the air-to-fuel ratio deviates two times consecutively to the lean side due to abnormality of the fuel trim system: ·Abnormal combustion pressure, malfunctioning injector or oxygen sensor	2 trip	○

DTC No.	Diagnosis Items	Diagnosis contents	Malfunction evaluation method	Warning indication
P0172/26	Fuel trim system too rich (Air-fuel ratio rich malfunction, bank 1)	When the air-to-fuel ratio deviates two times consecutively to the rich side due to abnormality of the fuel trim system: ·Abnormal combustion pressure, malfunctioning injector or oxygen sensor	2 trip	○
P0350/16※2	Ignition system circuit malfunction	When the ignition signal is not inputted continually.	1trip	○
P0300/17※1	Random/multiple cylinder misfire detected	When malfunction takes place in the signal from the Ion current combustion control system	2 trip	MIL flashing during misfire detection.
P0301/17※1 P0302/17※1 P0303/17※1 P0304/17※1	Misfire detected Cylinder 1 Cylinder 2 Cylinder 3 Cylinder 4			○
P0325/18	Knock sensor 1 circuit malfunction	When malfunction takes place in the signal from the knock sensor: ·Malfunction of the sensor, or open wire or short circuit in the signal system	1 trip	–
P0335/13	Engine revolution sensor circuit malfunction	When malfunction takes place in the signal from the engine revolution sensor: ·Malfunction of the sensor, or open wire or short circuit in engine revolution sensor circuit.	1 trip	○
P0340/14	Camshaft position sensor circuit malfunction	When malfunction takes place in the signal from the camshaft position sensor. ·Malfunction of the sensor, or open wire or short-circuit in the sensor circuit.	1 trip	○
P0443/76	Evaporative emission control system purge control valve circuit malfunction	When malfunction takes place in the detection signal of the evaporative emission control system purge control valve: ·Open wire or short circuit in evaporative emission control system purge control circuit.	2 trip	○
P500/52	Vehicle speed sensor circuit malfunction	When malfunction takes place in the signal from the vehicle speed sensor. ·Sensor malfunction, open wire or short circuit of the signal system	1 trip	○
P0505/71	Idle control system malfunction	When malfunction takes in the signal from the valve for ISC. ·Open wire or short in valve for ISC circuit	1 trip	○

NOTE

- 1 trip: 1 trip detection logic
- 2 trip: 2 trip detection logic
- MIL; Malfunction indicator lamp
- When the "O" mark is shown in the MIL column, the lamp will go on for that DTC number, but when the "–" mark is shown, the lamp will not go on for that DTC number. Therefore, it is possible to read out the DTC number by using the diagnosis tester (DS-21/DS-Ⅱ). As for the DTC number bearing the mark, the MIL will go on except the EU specifications.
- DTC number with ※1 mark: For EU specifications
- DTC number with ※2 mark: For general specifications

Codes specified by DMC

DTC No.	Diagnosis Items	Diagnosis contents	Malfunction evaluation method	Warning indication
P0535/44	A/C evaporator temperature sensor circuit malfunction	When malfunction takes place in the signal from the A/C evaporator temperature sensor: ·Malfunction of the sensor, or open wire or short circuit in A/C evaporator temperature sensor circuit.	1 trip	–
P1105/32※1	Atmospheric pressure sensor circuit malfunction	When the signals from the atmospheric pressure sensor are not outputted continuously over a certain length of time after starting.	1 trip	○
P1300/36※1	Ion current combustion control system malfunction	When malfunction takes place in the signal from Ion current combustion control system	2 trip	○
P1346/75	Variable valve timing control system (valve timing)	When abnormalities take place two times consecutively in the valve timing control. ·Deviation of camshaft drive and driven gears	1 trip	○
P1349/73	Variable valve timing control system (advanced timing/retarded timing)	When abnormalities take place two times consecutively in the valve timing control. ·Oil control valve abnormality, admission of foreign matters in the oil passage	1 trip	○
P1510/54	Starter signal system malfunction	When abnormalities take place in the signal from the starter. ·Open wire or short circuit in the signal system	2 trip	○
P1600/83	Immobilizer signal circuit malfunction	When abnormality occur in the wring and reading-out of the rolling codes into/from the immobilizer ECU during immobilizer communication	1 trip	–
P1601/81	Immobilizer signal malfunction	When the rolling codes can not be exchanged between the EFI ECU and the immobilizer ECU or the rolling codes are not matched.	1 trip	–
P1656/74	Oil control valve control system malfunction	When malfunction takes place in the control voltage for the oil control valve.	1 trip	○
U0101/82	E-AT abnormal reception	When the communication signal from the A/T ECU cannot be received: Open wire or short circuit between EFI ECU and A/T ECU.	1 trip	○
No.U0121/86	ABS communication failure	When the communication signal from the ABS actuator cannot be received: ·Open wire or short circuit between EFI ECU and ABS actuator.	1 trip	○
U0156/87	Combination meter communication failure	When the communication signal from the combination meter cannot be received: ·Open wire or short circuit between EFI ECU and combination meter	1 trip	○
U1000/85	E-AT abnormal transmission	When the communication signal to the A/T ECU cannot be sent: ·Open wire or short circuit between EFI ECU and A/T ECU.	1 trip	○
U1002/88	Communication history error	When there is no communication establishment history with all the CAN communication making-up ECU. ·Open wire, etc. in the wiring of the CAN communication terminal of the EFI ECU.	1 trip	○

NOTE

- 1 trip: 1 trip detection logic
- 2 trip: 2 trip detection logic
- MIL; Malfunction indicator lamp
- When the "O" mark is shown in the MIL column, the lamp will go on for that DTC number, but when the "－" mark is shown, the lamp will not go on for that DTC No. Therefore, it is possible to read out the DTC No. by using the diagnosis tester (DS-21/DS-Ⅱ). As for the DTC No. bearing the mark, the MIL will go on except the EU specifications.
- DTC No. with ※1 mark: For EU specifications

(3) Fail-safe function

1.When any of the following DTC has been detected, the EFI ECU enters the fail-safe mode in order to make it possible for the vehicle to drive for evacuation and to ensure safety. When the malfunction is remedied to a normal condition, the fail-safe control will be released.
However, the diagnosis results will remain memorized. Hence, it is necessary to determine whether the malfunction still persists or not.

Fail-safe specifications

DTC No.	Fail-safe operation	Fail-specifications
Manifold absolute pressure sensor signal system	When abnormality takes place in the signal from the manifold absolute pressure/barometric pressure circuit	The signal from the intake manifold pressure sensor is set to the value determined from the throttle opening angle, engine speed and ISC opening angle. If both the throttle opening angle and engine speed exceed their set values, the fuel is cut.
Ignition system	When malfunction takes place in the ignition signal:	The fuel injection of the cylinder in which abnormality is taking place in the ignition signal is cut.
Water temperature sensor signal system	When malfunction takes place in the signal from the water temperature sensor:	The signal from the water temperature sensor is set to a constant value.
Throttle position sensor signal system	When malfunction takes place in the signal from the throttle position sensor:	The signal from the throttle position sensor is set to a constant value.
A/C evaporator temperature sensor signal system	When malfunction takes place in the signal from the A/C evaporator temperature sensor.	The air conditioner will be cut.
Atmospheric pressure sensor circuit malfunction	When malfunction takes place in the signal from the atmospheric pressure sensor:	The signal from the atmospheric pressure sensor is set to a constant value.
Knock sensor system	When abnormality takes place in the signal from the knock sensor circuit	The ignition timing is retarded.
Intake air temperature sensor signal system	When malfunction takes place in the signal from the intake air temperature sensor:	The signal from the intake air temperature sensor is set to a constant value.
Oil control valve system	When malfunction takes place in the oil control valve control voltage.	Oil control valve energizing control is prohibited.
Rear oxygen sensor system	When malfunction takes place in the signal from the rear oxygen sensor:	The feedback control is turned to open control.
Immobilizer signal circuit malfunction	When abnormality occur in the wring and reading-out of the rolling codes into/from the immobilizer ECU during immobilizer communication. When the rolling codes can not be exchanged between the EFI ECU and immobilizer ECU or rolling codes are not mached.	Prohibition of fuel injection and ignition.

9-11 TROUBLE SHOOTING ACCORDING TO MALFUNCTION PHENOMENA

9-11-1 DESCRIPTION

1. Here, checking procedures when there is no abnormal code indication of the diagnosis but there is a malfunction taking place are described.
2. As for the trouble shooting according to the malfunction phenomena, first organize the contents of the diagnosis by interview, basic check and EFI ECU circuit check results. Then, narrow down and decide the check priority of the possible causes by cross-checking it with the list of possible causes according to malfunction phenomena. On that basis, perform trouble shooting sequentially for each system and parts by following the directions provided in the list.

WARNING

- If the vehicle is driven with the SST (EFI computer check sub harness, etc.) connected, there is a possibility of causing malfunction and may be very dangerous. Therefore, remove it without fail.

NOTE

- When performing checks for each component, make sure to check the harness and connectors that are connected to it.
- As for the reason why no malfunction is detected by diagnosis even when the malfunction phenomena is reproduced, it is possible that there is a malfunction taking place out of the range of the code output conditions of the diagnosis, or there is a malfunction taking place out of the diagnosis circuit.

9-11-2 LIST OF POSSIBLE CAUSES ACCORDING TO MALFUNCTION PHENOMENA

(1) Poor startability

Malfunction phenomena		Possible causes		
		System	Components	Malfunction mode
No initial explosion		Power supply system	EFI ECU power supply circuit	Open wire and short circuit
			Ignition switch	Will not turn ON
			Main relay	
		Engine earth system	Engine earth※	Open wire, defective earth
		Fuel system	Fuel pump relay	Will not turn ON
			Fuel line, Fuel filter	Clogging
			Injector	Will not inject, constant injection
			Fuel pump	Will not operate
		Ignition system	Engine fuse※	Fuse melt down
			Ignition coil	Will not generate sparks
			Spark plug	
			Ignition timing	Deviated
		Control system	Engine revolution sensor	"NE signal" is not outputted.
			Camshaft position sensor	Defective output signal
There is initial explosion but no complete explosion.		Fuel system	Fuel pump relay	Will not turn ON
			Fuel line, Fuel filter	Clogging
			Injector	Leakage, Will not inject, constant injection
			Fuel pump	Will not operate
		Ignition system	Spark plug	Misfire
		Intake system	Air hoses, etc.	Leakage
		Control system	Manifold absolute pressure sensor	Characteristics deviated, open wire, short circuit
			Water temperature sensor	
			Engine revolution sensor	Defective output signal
			Camshaft position sensor	
			Oil control valve	Malfunction
Hard to start	During cold period	Intake system	Throttle body	Defective opening, does not open
		Control system	Water temperature sensor	Characteristics deviated, open wire, short circuit
	During hot period	Fuel system	Injector	Leakage
		Intake system	Valve for ISC	Defective opening, will not open
	At all times	Fuel system	Fuel pump relay	Will not turn ON
			Fuel line, Fuel filter	Clogging
			Injector	Leakage
		Ignition system	Spark plug	No smoldering
		Intake system	Valve for ISC	Defective opening

※: If the IG switch is turned "ON" under the condition of defective grounding of the engine earth connection (Between 125 (E1) connection earth and engine block), the "ENGINE fuse (10A)" can melt down.

(2) Idling malfunction

Malfunction phenomena	Possible causes		
	System	Components	Malfunction mode
Fast idle not working	Intake system	Valve for ISC	Defective opening, will not open
	Control system	Water temperature sensor	Open wire and short circuit
Idling speed is high.	Intake system	Air hoses, etc.	Leakage
		Throttle body	Defective closing
		Valve for ISC	Constantly open
	Control system	Manifold absolute pressure sensor	Characteristics deviated, open wire, short circuit
		Water temperature sensor	
		Throttle position sensor	Characteristics deviated
		Defogger switch	Constantly ON
		Stop lamp switch	
		Heater blower signal	
Idling speed is low.	Intake system	Air hoses, etc.	Clogging
		Throttle body	
	Control system	Manifold absolute pressure sensor	Characteristics deviated
		Water temperature sensor	
		Defogger switch	Will not turn ON
		Stop lamp switch	
		Heater blower signal	
When idling hunting takes place.	Intake system	Air hoses, etc.	Leakage
		Throttle body	
		Valve for ISC	Constantly open
	Control system	Manifold absolute pressure sensor	Characteristics deviated
		Camshaft position sensor	Defective output signal
		Oil control valve	Malfunction
Unstable idling	Fuel system	Injector	Leakage, Will not inject
		Fuel pump	Malfunction
	Intake system	Throttle body	Suction
	Ignition system	Ignition coil	Poor connection
		Spark plug	Misfire
	Control system	Manifold absolute pressure sensor	Malfunction, poor connection
		Oxygen sensor	Malfunction, poor connection

(3) Engine stall

Malfunction phenomena	Possible causes		
	System	Components	Malfunction mode
The engine stalls after a while from starting.	Fuel system	Fuel pump relay	Will not turn ON
		Fuel line, Fuel filter	Clogging
		Fuel pump	Will not operate
	Control system	Water temperature sensor	Characteristics deviated
		Camshaft position sensor	Defective output signal
		Oil control valve	Malfunction
The engine stalls when pressing on the accelerator.	Control system	Manifold absolute pressure sensor	Characteristics deviated
		Water temperature sensor	
		Camshaft position sensor	Defective output signal
		Oil control valve	Malfunction
The engine stalls when releasing the accelerator.	Intake system	Throttle body	Malfunction
	Control system	Manifold absolute pressure sensor	Characteristics deviated
When the air conditioner is turned ON	Intake system	Valve for ISC	Constantly closed
The engine stalls but can be restarted.	Power supply system	EFI ECU power supply circuit	Poor connection
		Ignition switch	
		Main relay	
	Intake system	Valve for ISC	Constantly closed
	Ignition system	Ignition coil	Poor connection
	Control system	Manifold absolute pressure sensor	Poor connection
		Engine revolution sensor	

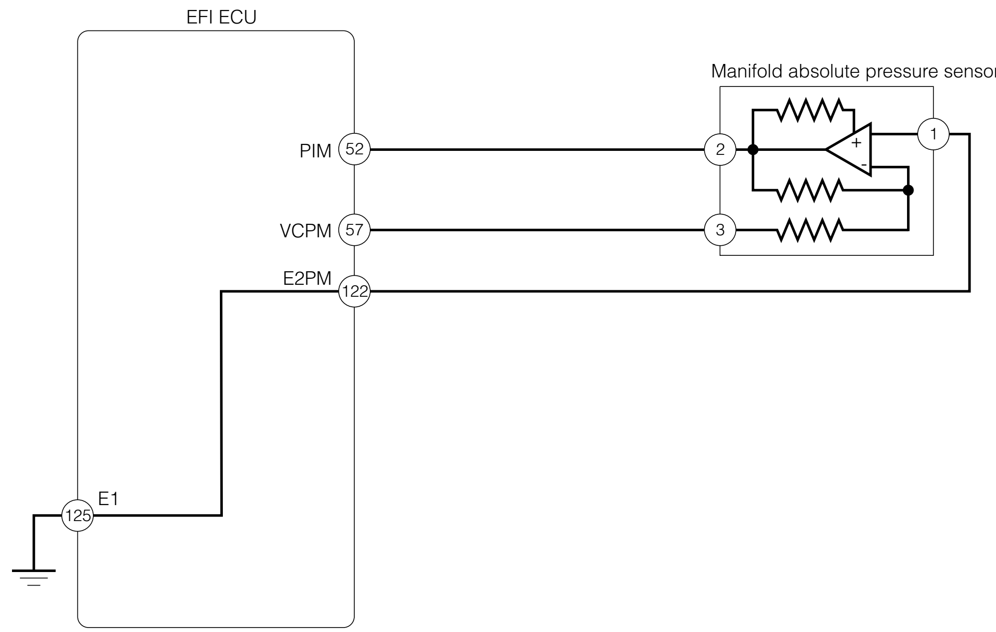
(4) Defective running

Malfunction phenomena	Possible causes: System	Possible causes: Components	Possible causes: Malfunction mode
Hesitation takes place when accelerating.	Fuel system	Fuel line, fuel filter	Clogging
		Injector	Flow rate decrease
		Fuel pump	
	Ignition system	Ignition coil	Ignition missing
		Spark plug	Misfire
		Ignition timing	Deviated
	Control system	Manifold absolute pressure sensor	Characteristics deviated, open wire, short circuit
		Water temperature sensor	
		Throttle position sensor	
		Knock sensor	Open wire and short circuit
Back fire, after fire	Fuel system	Injector	Flow rate decrease
	Ignition system	Ignition coil	Poor connection
		Spark plug	Misfire
		Ignition timing	Deviated
	Control system	Manifold absolute pressure sensor	Malfunction
		Intake air temperature sensor	Characteristics deviated
		Water temperature sensor	
		Camshaft position sensor	Defective output signal
		Oil control valve	Malfunction
Insufficient output	Fuel system	Fuel line, Fuel filter	Fuel pressure will not rise.
		Injector	Flow rate decrease
		Fuel pump	Fuel pressure will not rise.
	Ignition system	Spark plug	Misfire
	Control system	Manifold absolute pressure sensor	Characteristics deviated, open wire, short circuit
		Intake air temperature sensor	
		Water temperature sensor	
		Throttle position sensor	Characteristics deviated
		Camshaft position sensor	Defective output signal
		Oil control valve	Malfunction
Emits black smoke.	Fuel system	Injector	Constant injection
	Control system	Manifold absolute pressure sensor	Characteristics deviated, open wire, short circuit
		Intake air temperature sensor	Characteristics deviated
		Water temperature sensor	
		Throttle position sensor	
Hunting takes place while running.	Fuel system	Fuel line, fuel filter	Clogging
		Injector	Malfunction
	Ignition system	Ignition coil	Poor connection
	Control system	Throttle position sensor	Characteristics deviated
		Camshaft position sensor	Defective output signal
		Oil control valve	Malfunction
Abnormal knocking takes place.	Control system	Manifold absolute pressure sensor	Characteristics deviated, open wire, short circuit
		Throttle position sensor	Characteristics deviated
		Knock sensor	Characteristics deviated, open wire, short circuit

9-12 TROUBLE SHOOTING ACCORDING TO DIAGNOSIS CODE

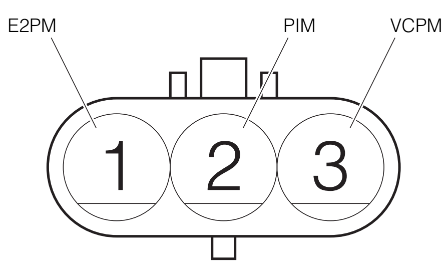
9-12-1 DTC NO.P0105/31 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT MALFUNCTION

(1) System diagram



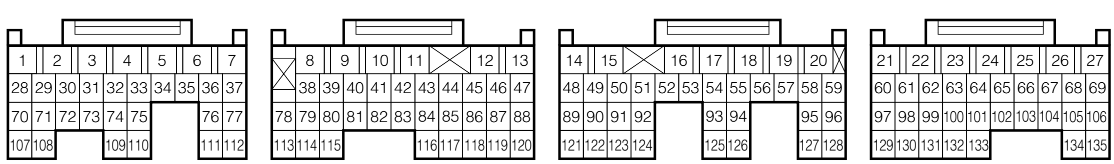
T11E6116ES20

Manifold absolute pressure sensor connection vehicle harness side connector



T11E6164S10

EFI ECU connection vehicle harness side connector



H11E6051S10

(2) Circuit description

1.The manifold absolute pressure sensor detects the intake manifold pressure as a voltage.

2.Since the Manifold absolute pressure, intake air temperature integral type sensor (Manifold absolute pressure sensor section) does not use the atmospheric pressure as a criterion, but senses the absolute pressure inside the intake manifold (The pressure in proportion to the present absolute vacuum 0), it is not influenced by fluctuations in the atmospheric pressure due to high altitude and other factors. This permits it to control the air-fuel ratio at the proper level under all conditions.

(3) Diagnosis code output conditions

1.When the signal from the manifold absolute pressure sensor is not outputted continuously over a certain length of time

NOTE

- After confirming DTC P0105/31, use the OBD Ⅱ generic scan tool or diagnosis tester (DS-21/DS-Ⅱ) to confirm the "Manifold abs. pressure" from "CURRENT DATA".
- If the ECU detects DTC P0105/31, it operates the fail-safe function, keeping the ignition timing and injection volume constant and making it possible to drive the vehicle.

(4) Trouble area

1.Open wire or short circuit in manifold absolute pressure sensor circuit
2.Manifold absolute pressure sensor
3.EFI ECU

(5) Checking points

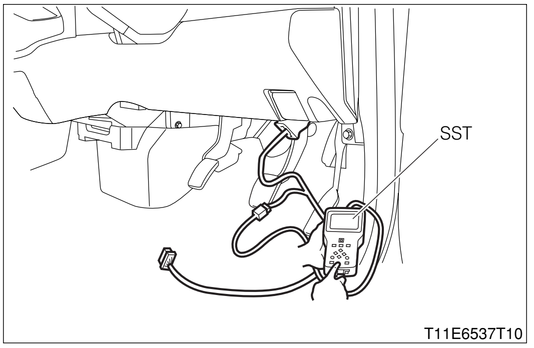
1.Is the signal from the manifold absolute pressure sensor inputted to the EFI ECU?
2.Is the harness between the manifold absolute pressure sensor section and the EFI ECU normal?
3.Is the power supply voltage of the manifold absolute pressure sensor section normal?
4.Is the output of the manifold absolute pressure sensor section normal?

(6) Inspection procedure

① When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

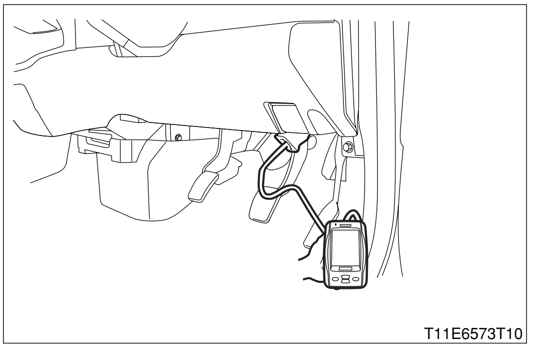
⊳1. Check of output value of sensor.

1.The IG switch turned "LOCK".
2.Diagnosis tester connect the DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000



T11E6537T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



T11E6573T10

3.After turning "ON" the IG switch, turn "ON" the main switch of the tester.
4.Read the "Manifold abs. pressure" value of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.
SPECIFIED VALUE: Atmospheric pressure (Approx. 100 kPa).

▼If it is OK, check the EFI ECU circuit.
Refer to Page BA1-24.

▼If it is NG, go to ⊳2.

⊳2. Check of manifold absolute pressure sensor voltage

1.Disconnect the connector of the manifold absolute pressure sensor

2.With the IG switch turned "ON", measure the voltage between the following terminals given below.

(1) Between the sensor connection vehicle harness side connector 3 (VCPM) and the sensor connection vehicle harness side connector 2 (E2PM)

SPECIFIED VALUE: 4.5 - 5.5V

3.Is the measured voltage the specified value?

NOTE

- If no voltage appears, check the EFI ECU power supply circuit.

▼If it is OK, go to ⊳3.

▼If it is NG, check or replace the EFI ECU.

⊳3. Manifold absolute pressure sensor unit check

1.Perform the unit check of the manifold absolute pressure sensor.

Refer to Page B8-468.

2.Are the check result OK?

▼If it is YES, go to ⊳2.

▼If it is NG, replace the manifold absolute pressure sensor.

Refer to Page B8-237.

⊳4. Check of wire harness continuity

1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.

2.Check the continuity between the following terminals given below.

(1) Between the sensor connection vehicle harness side connector 1(E2PM) and the EFI ECU connection vehicle harness side connector 122 (E2PM)

(2) Between the sensor connection vehicle harness side connector 2 (PIM) and the EFI ECU connection vehicle harness side connector 52 (PIM)

(3) Between the sensor connection vehicle harness side connector 3 (VCPM) and the EFI ECU connection vehicle harness side connector 57 (VCPM)

SPECIFIED VALUE: Continuity exists

3.Are the check results for open wire and short OK?

▼If it is OK, replace the Manifold absolute pressure, intake air temperature integral type sensor.

Refer to Page B8-237.

▼If it is NG, repair or replace the harness or connector.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. EFI ECU signal check

1.Connect the SST.
SST: 09842-97209-000

2.Remove the hose of the manifold absolute pressure sensor.
3.Perform voltage measurements between the following terminals when the IG switch is "ON".
(1) Between SST 52 (PIM) - SST 122 (E2PM)
SPECIFIED VALUE: 3.1 - 4.1 V (Room temperature)

▼If it is OK, check the EFI ECU circuit.
▼If it is NG, proceed to ⊳2.

⊳2. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.
(1) Between sensor connection vehicle harness side connector 2 (PIM) - ECU connection vehicle harness side connector 52 (PIM)
(2) Between sensor connection vehicle harness side connector 1 (E2PM) - ECU connection vehicle harness side connector 122 (E2PM)
(3) Between sensor connection vehicle harness side connector 3 (VCPM) - ECU connection vehicle harness side connector 57 (VCPM)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳3.
▼If it is NG, repair the harness and connectors.

⊳3. Manifold absolute pressure sensor voltage check

1.Remove the connector of the manifold absolute pressure sensor.
2.Perform voltage measurement between the following terminals when the IG switch is "ON".
(1) Between sensor connection vehicle harness side connector 3 (VCPM) - sensor connection vehicle harness side connector 2 (E2PM)
SPECIFIED VALUE: 4.5 - 5.5V

▼If it is OK, proceed to ⊳4.
▼If it is NG, check the EFI ECU circuit.
Refer to Page A1-24.

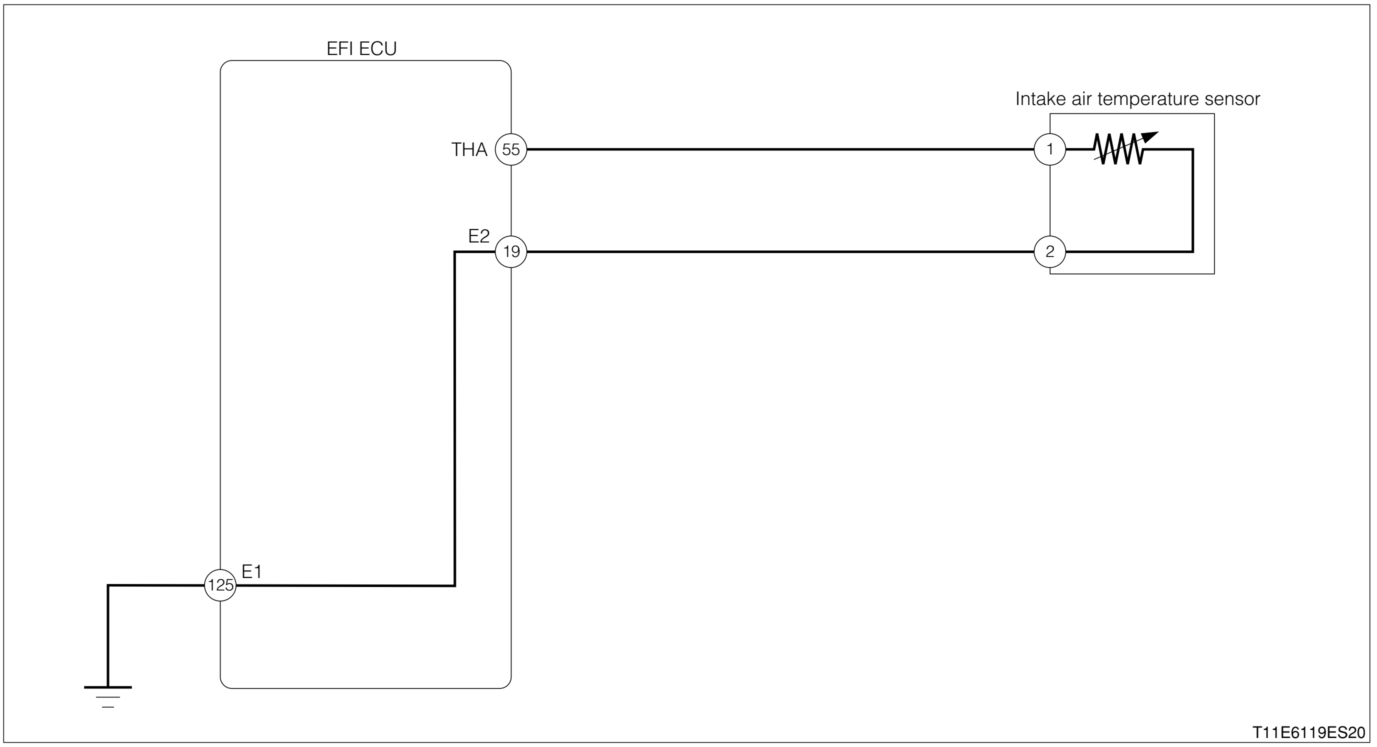
⊳4. Manifold absolute pressure sensor unit check

1.Perform unit check of the manifold absolute pressure sensor.
Refer to Page B8-468.

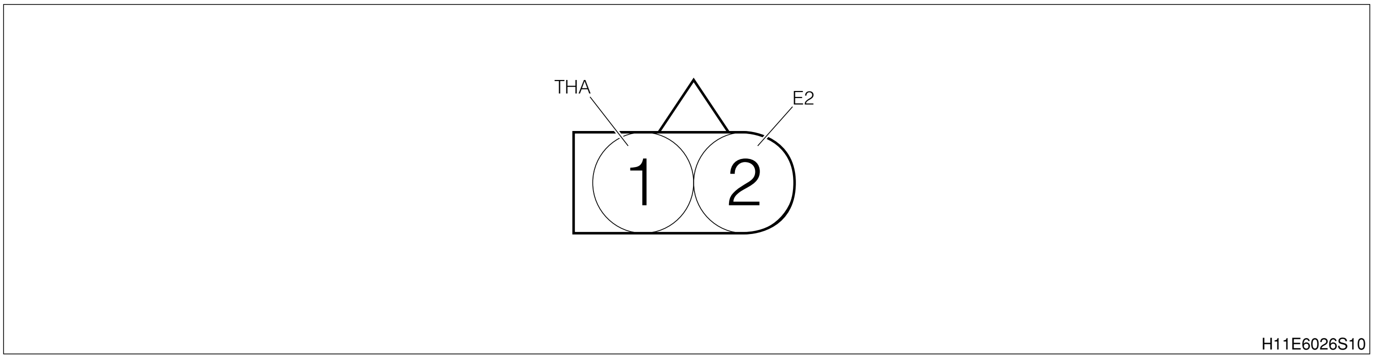
▼If it is OK, check the connecting condition of each connector.
▼If it is NG, replace the manifold absolute pressure sensor.
Refer to Page B8-237.

9-12-2 DTC NO.P0110/43 INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT MALFUNCTION

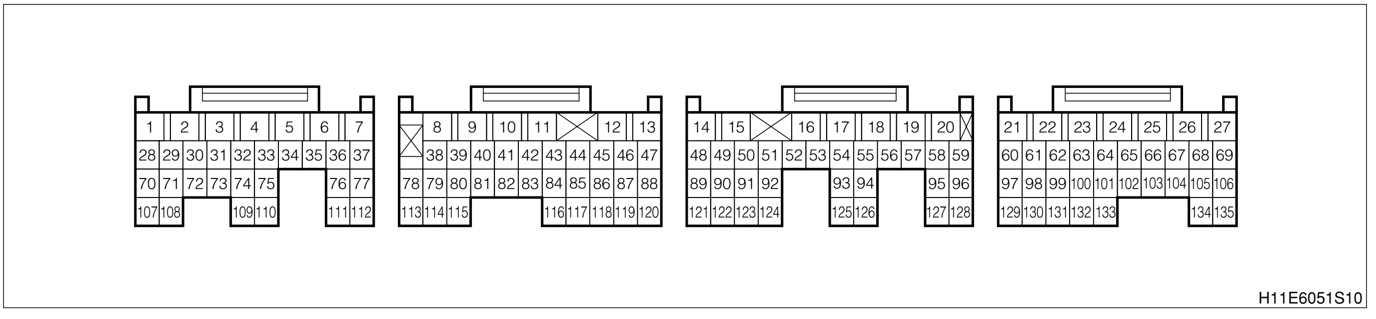
(1) System diagram



Intake air temperature sensor connection vehicle harness side connector

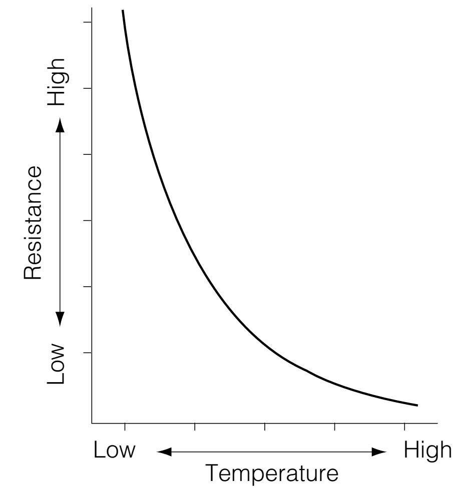


EFI ECU connection vehicle harness side connector



(2) Circuit description

1.The intake air temperature sensor is located at the intake manifold. A thermistor built in the sensor changes the resistance value according to the intake air temperature. The lower the intake air temperature, the greater the thermistor resistance value, and the higher the intake air temperature sensor lower the thermistor resistance value. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA also changes. Based on this signal, the EFI ECU increases the fuel injection volume to improve driveability during cold engine operation.



L21E3745ET15

(3) Diagnosis code output conditions

1.When the signal from the intake air temperature sensor is not outputted continuously over a certain length of time after starting

(4) Trouble area

1.Open wire or short circuit intake air temperature sensor circuit
2.Manifold absolute pressure, intake air temperature integral type sensor (Intake air temperature sensor section)
3.EFI ECU

(5) Checking points

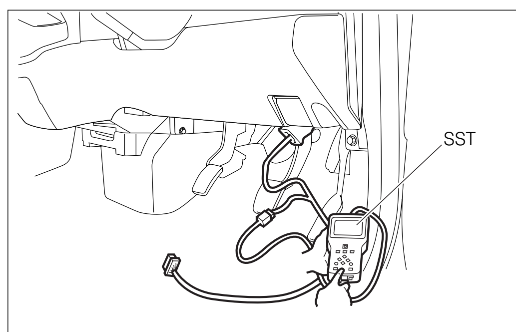
1.Is the signal from the intake air temperature sensor inputted to the EFI ECU?
2.Is the harness between the intake air temperature sensor section and the EFI ECU normal?
3.Is the output of the intake air temperature sensor normal?

(6) Inspection procedure

① When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

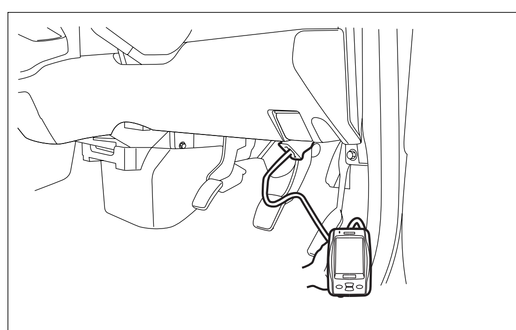
▷1. Check of sensor output value.

1.The IG switch turned "LOCK".
2.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000(1)
09991-87403-000(2)



T11E6537T10

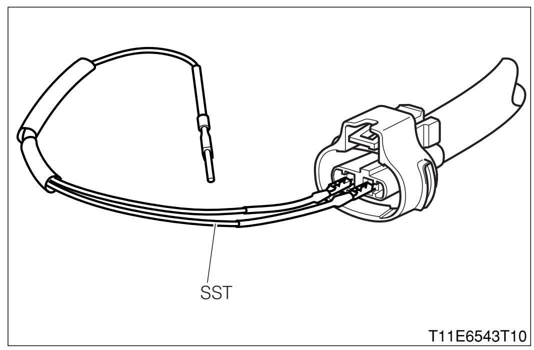
(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.


T11E6573T10

3.After turning "ON" the IG switch, Turn "ON" the main switch of the tester.
4.Read the "Intake air temperature" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.
SPECIFIED VALUE: Measured ambient temperature
▼If it is OK, check the EFI ECU circuit.
▼If it is NG, go to ⊳2.

⊳2. Confirmation of IAT sensor output value.
1.Read the "Intake air temperature" of the DS-21 diagnosis tester or OBD Ⅱ generic scan tool.
▼When −40°C, go to ⊳3.
▼When 140°C or above, go to ⊳5.

⊳3. Check of open wire in harness or inside EFI ECU (1)
1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.
2.Disconnect the connector of the intake air temperature sensor.
3.Short circuit between the following terminals given below.
4.Between the sensor connection vehicle harness side connector 1 (THA) and the sensor connection vehicle harness side connector 2 (E2)
5.After turning "ON" the IG switch, turn "ON" the main switch of the tester. Read the "Intake air temperature" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.
SPECIFIED VALUE: 140°C or above
▼If it is OK, carry out the following operations given below.
(1) Check the connector or the connection state of the terminal of the manifold absolute pressure/intake air temperature integral type sensor.
(2) If there is no abnormality, replace the manifold absolute pressure/intake air temperature integral type sensor.
▼If it is NG, go to ⊳4.



⊳4. Check of open wire in harness or inside EFI ECU (2)
1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.
2.Set the SST (Sub-harness).
SST: 09842-97209-000

3.Release the short circuit of the connector of the manifold absolute pressure/intake air temperature integral type sensor.
4.Short circuit between the following terminals given below.
(1) Between SST 55 (THA) - SST 19 (E2)
5.After turning "ON" the IG switch, turn "ON" the main switch of the tester. Read the "intake air temperature value" of the DS-21 diagnosis tester or OBD Ⅱ generic scan tool.
6.Is the measured value 140℃ or above?
▼If it is OK, the harness between the intake air temperature sensor section and the EFI ECU is open. Repair or replace the harness.
▼If it is NG, check the ECU connector or terminal for connecting condition. If they are satisfactory, replace the EFI ECU.

⊳5. Check of short in harness or inside EFI ECU (1)

1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.
2.Disconnect the connector of the intake air temperature sensor.
3.After turning "ON" the IG switch, turn "ON" the main switch of the tester.
4.Read the "Intake air temperature " of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.
SPECIFIED VALUE: −40°C

▼If it is OK, replace the intake air temperature sensor.
Refer to Page B8-236.

▼If it is NG, go to ⊳6.

⊳6. Check of short in harness or inside EFI ECU (2)

1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.
2.Perform continuity check between each of the following terminals.
(1) Between sensor connection vehicle harness side connector 1 (THA) - ECU connection vehicle harness side connector 55 (THA)
(2) Between sensor connection vehicle harness side connector 2 (E2) - ECU connection vehicle harness side connector 19 (E2)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, repair or replace the harness or connector.
▼If it is NG, check or replace the EFI ECU.

② When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

⊳1. EFI ECU signal check

1.Connect the SST.
SST: 09842-97209-000

2.Perform voltage measurement between the following terminals when the IG switch is "ON".
(1) Between SST 55 (THA) - SST 19 (E2)
SPECIFIED VALUE: 0.15 V - 4.85 V (Changes according to the intake temperature)

▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, proceed to ⊳2.

⊳2. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.
(1) Between sensor connection vehicle harness side connector 1 (THA) - ECU connection vehicle harness side connector 55 (THA)
(2) Between sensor connection vehicle harness side connector 2 (E2) - ECU connection vehicle harness side connector 19 (E2)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳3.
▼If it is NG, repair the harness and connectors.

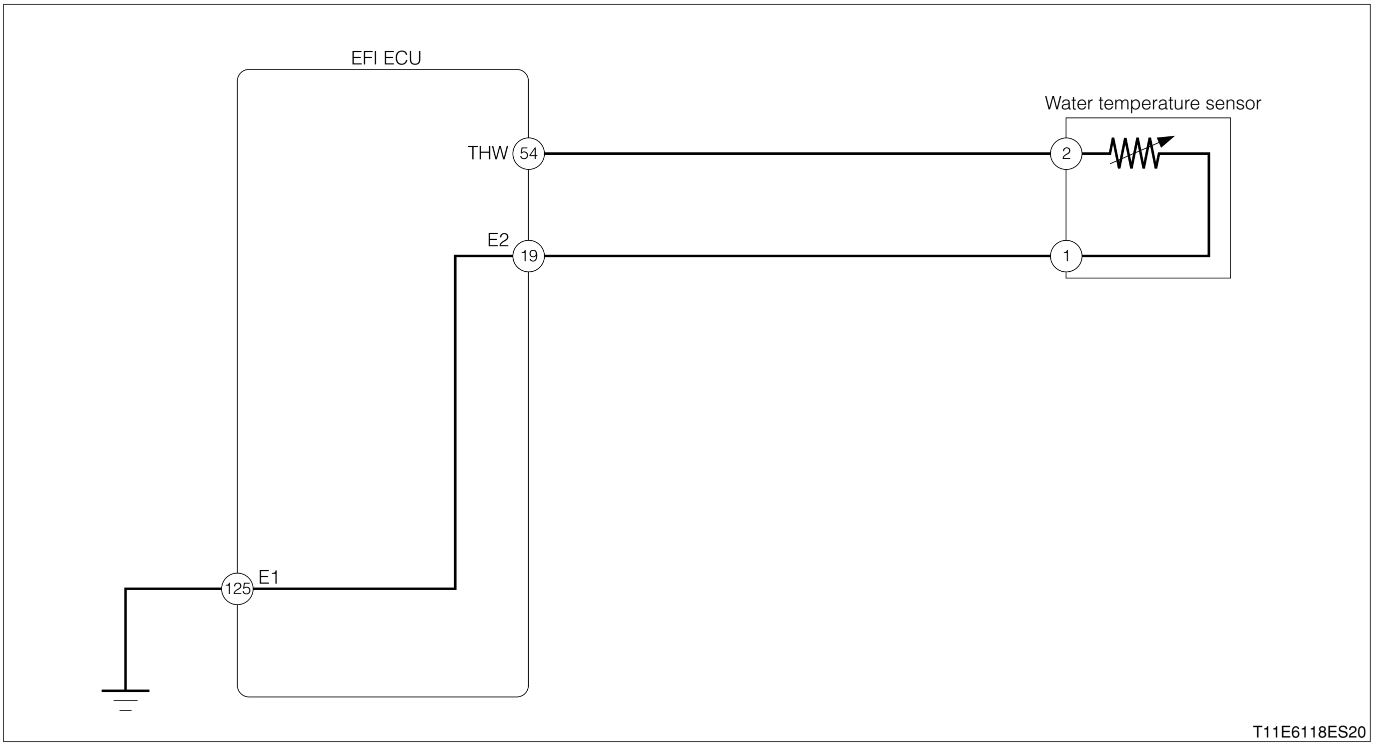
3. Intake air temperature sensor unit check

1. Perform unit check of the intake air temperature sensor.
Refer to Page B8-469.

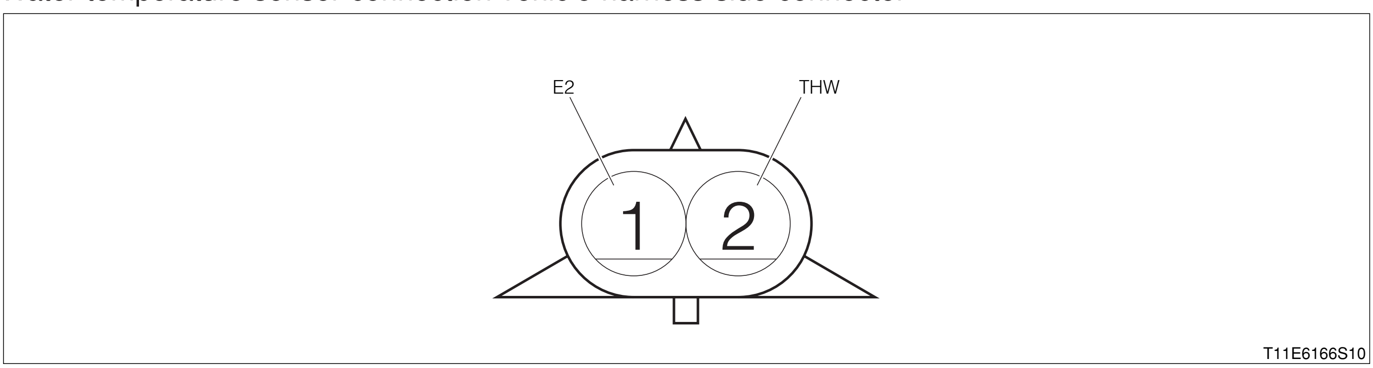
▼ If it is OK, check the connecting condition of each connector.
▼ If it is NG, replace the intake air temperature sensor.
Refer to Page B8-236.

9-12-3 DTC NO.P0115/42 ENGINE COOLANT TEMPERATURE SENSOR (ECT) CIRCUIT MALFUNCTION

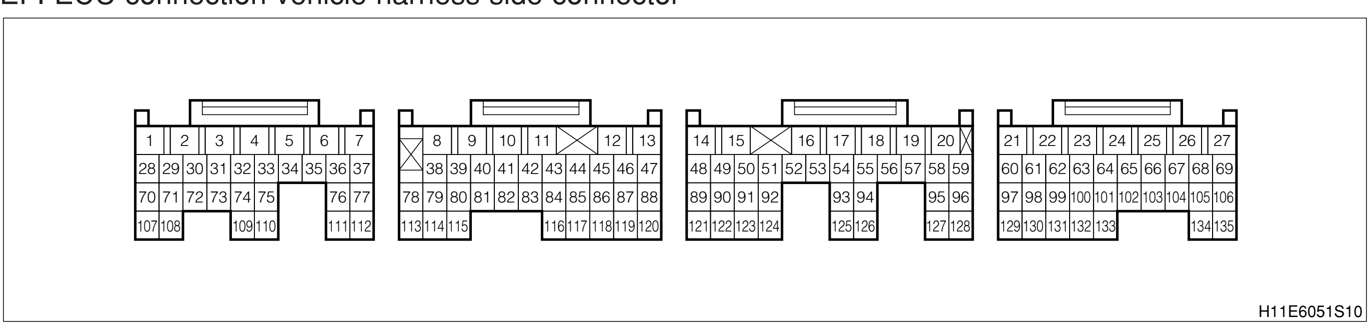
(1) System diagram



Water temperature sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1. A thermistor built into the engine coolant temperature sensor changes the resistance valve according to the engine coolant temperature. The structure of the sensor and connection to the EFI ECU is the same as in the DTC P0110/43 (IAT Sensor Circuit Malfunction).

(3) Diagnosis code output conditions

1. When the signals from the water temperature sensor are not outputted continuously after starting over a certain length of time:

(4) Trouble area

1.Open wire or short circuit in the engine coolant temperature sensor circuit
2.Engine coolant temperature sensor
3.EFI ECU

(5) Checking points

1.Are the signals from the water temperature sensor inputted to the EFI ECU?
2.Is the harness between the water temperature sensor and the EFI ECU normal?
3.Is the output of the water temperature sensor normal?

(6) Inspection procedure

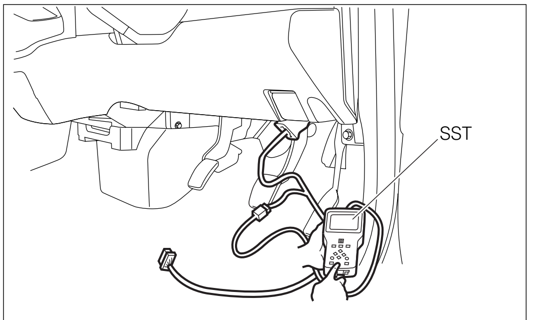
① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⊳1. Check of output value of sensor.

1.The IG switch turned "LOCK".
2.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000



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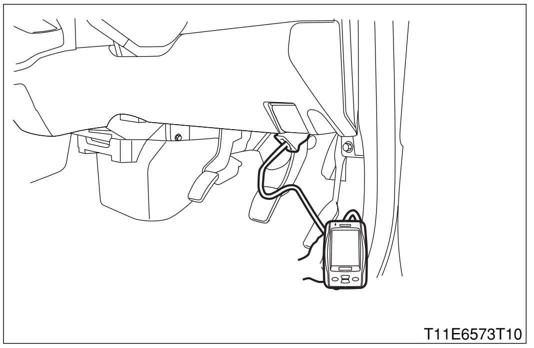
(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.


T11E6573T10

3.After turning "ON" the IG switch, turn "ON" the main switch of the tester.
4.Read the "Engine coolant temperature" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.
SPECIFIED VALUE: The same as the actual engine cooling water temperature

▼<u>If it is OK, check the EFI ECU circuit.</u>
Refer to Page A1-24.

▼<u>If it is NG, go to ⊳2.</u>

⊳2. Confirmation of sensor output value.

1.Read the "Engine coolant temperature" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.

▼When −40°C, go to ⊳3.

▼When 140°C or above, go to ⊳5.

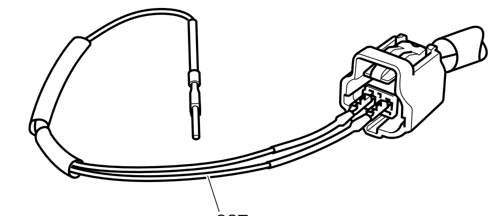
⊳3. Check of open wire in harness or inside EFI ECU (1).

1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.

2.Disconnect the connector of the engine coolant temperature sensor.

3.Short circuit between the following terminals given below.

(1) Between the water temperature sensor connection vehicle harness side connector 1 (E2) and the water temperature sensor connection vehicle harness side connector 2 (THW)



4.After turning "ON" the IG switch, turn "ON" the main switch of the tester.

5.Read the "Engine coolant temperature" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.

SPECIFIED VALUE: 140°C or above

▼If it is OK, check the ECT sensor connector or terminal for connecting condition. If they are satisfactory, replace the ECT sensor.

▼If it is NG, go to ⊳4.

⊳4. Check of open wire in harness or inside EFI ECU (2).

1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.

2.Set the SST (Sub-harness).

SST: 09842-97209-000

3.Disconnect the jump wire from the ECT sensor connector.

4.Short circuit between the following terminals given below.

(1) Between SST 54 (THW) and SST 19 (E2)

5.After turning "ON" the IG switch, turn "ON" the main switch of the tester.

6.Read the "Engine coolant temperature" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.

SPECIFIED VALUE: 140°C or above

▼If it is OK, the harness between the ECT sensor and the EFI ECU is open. Repair or replace the harness.

▼If it is NG, check the EFI ECU connector and terminal for connecting condition. If they are satisfactory, replace the EFI ECU.

⊳5. Check of short in harness or inside EFI ECU (1).

1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.
2.Disconnect the connector of the ECT sensor.
3.After turning "ON" the IG switch, turn "ON" the main switch of the tester.
4.Read the "Engine coolant temperature" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.

SPECIFIED VALUE: −40°C

▼If it is OK, replace the engine coolant temperature sensor.
Refer to Page B8-235.

▼If it is NG, go to ⊳6.

⊳6. Check of short in harness or inside EFI ECU (2).

1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.
2.Perform continuity check between each of the following terminals.
(1) Between sensor connection vehicle harness side connector 1 (E2) - ECU connection vehicle harness side connector 19 (E2)
(2) Between sensor connection vehicle harness side connector 2 (THW) - ECU connection vehicle harness side connector 54 (THW)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, repair or replace the harness or connector.
▼If it is NG, check or replace the EFI ECU.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. EFI ECU signal check

1.Connect the SST.

SST: 09842-97209-000

2.Perform voltage measurement between the following terminals when the IG switch is "ON".
(1) Between SST 54 (THW) - SST 19 (E2)

SPECIFIED VALUE: 0.15 V - 4.85 V (Changes according to the water temperature)

▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, proceed to ⊳2.

⊳2. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.
(1) Between sensor connection vehicle harness side connector 1 (E2) - ECU connection vehicle harness side connector 19 (E2)
(2) Between sensor connection vehicle harness side connector 2 (THW) - ECU connection vehicle harness side connector 54 (THW)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳3.
▼If it is NG, repair the harness and connectors.

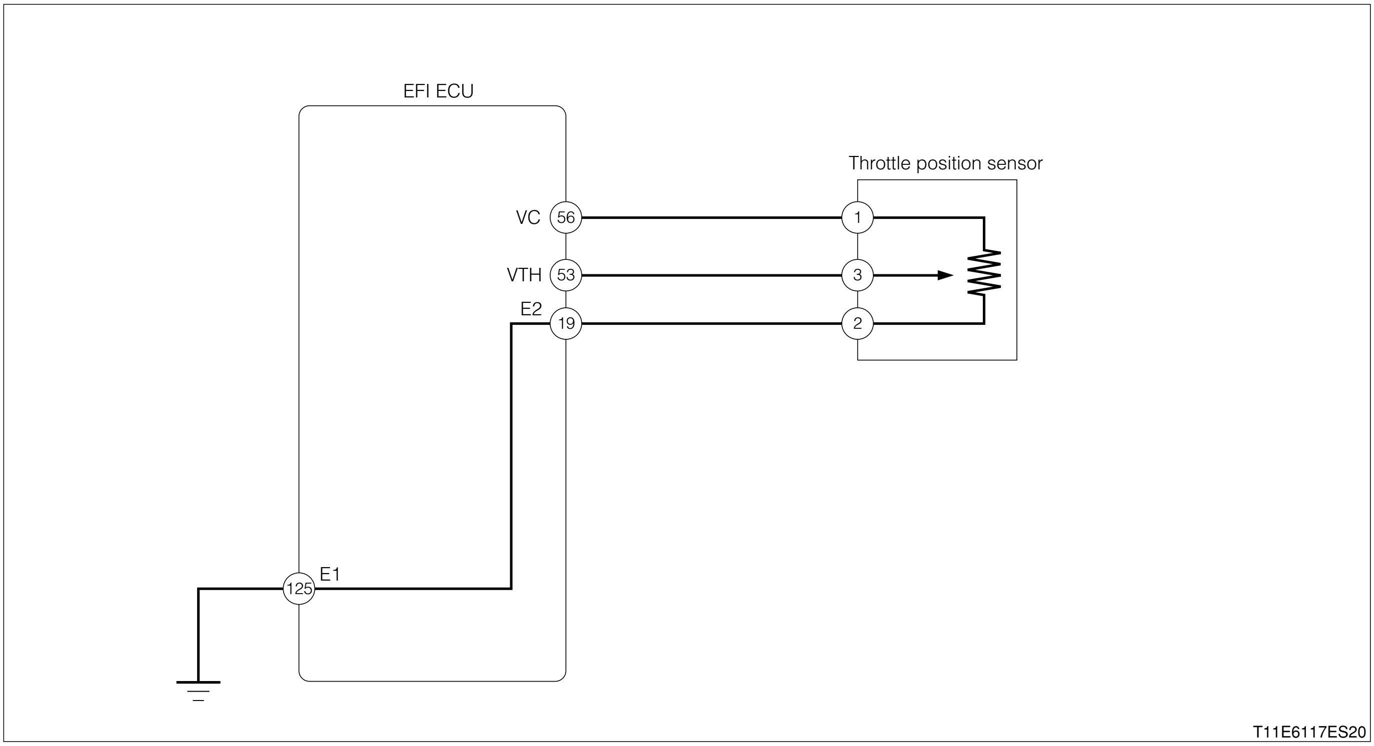
▷3. Water temperature sensor unit check

1.Perform unit check of the water temperature sensor.
Refer to Page B8-468.

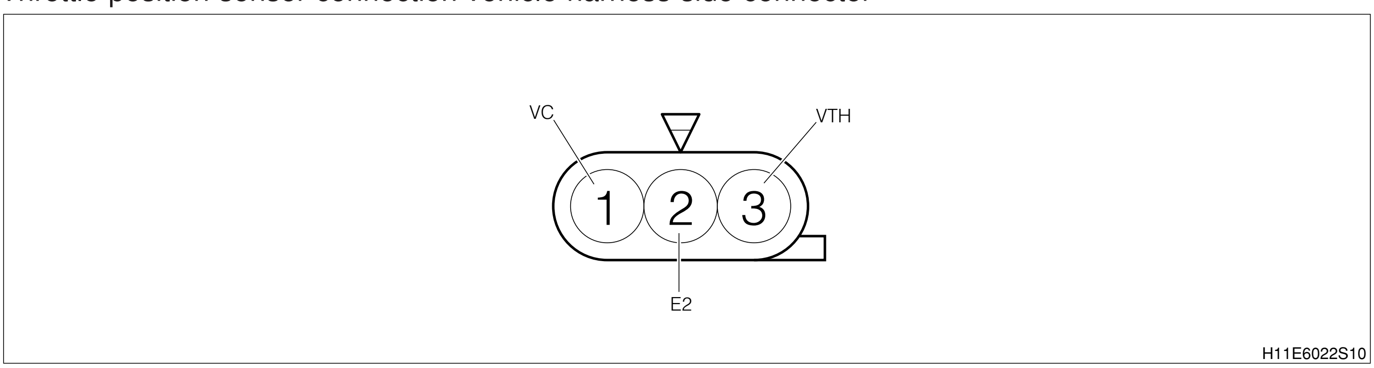
▼<u>If it is OK, check the connecting condition of each connector.</u>
▼<u>If it is NG, replace the water temperature sensor.</u>
Refer to Page B8-235.

9-12-4 DTC NO.P0120/41 THROTTLE/PEDAL POSITION SENSOR

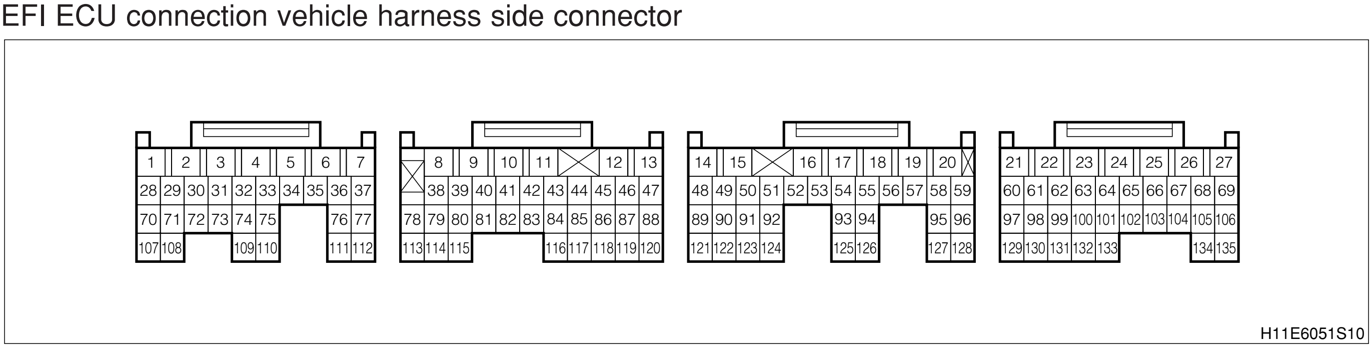
(1) System diagram



Throttle position sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1. The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, a voltage of approximately 0.4 - 0.8 V is applied to terminal VTH of the EFI ECU. The voltage applied to the terminals VTH of the EFI ECU increases in proportion to the opening angle of the throttle valve and becomes approximately 3.5 - 5.0 V when the throttle valve is fully opened. The EFI ECU judges the vehicle driving conditions from these signals input from terminal VTH, uses them as one of the conditions for deciding the air-fuel ratio correction, power increase correction and fuel-cut control etc.

(3) Diagnosis code output conditions

1.When the signals from the throttle position are not outputted continuously after starting over a certain length of time:

(4) Trouble area

1.Open wire or short circuit in the throttle position sensor circuit.
2.Throttle position sensor
3.EFI ECU

(5) Checking points

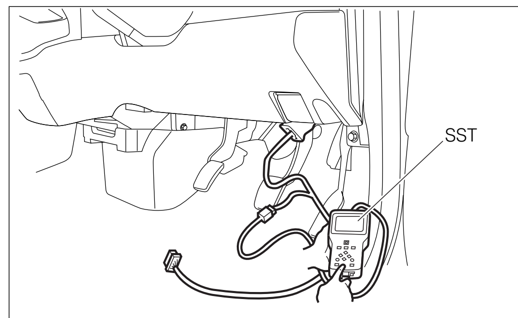
1.Are the signals from the throttle position sensor inputted to the EFI ECU?
2.Is the harness between the throttle position sensor and the EFI ECU normal?
3.Is the power supply voltage of the throttle position sensor normal?
4.Is the output of the throttle position sensor normal?

(6) Inspection procedure

① When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

⊳1. Check of output value of throttle position sensor.

1.The IG switch turned "ON".
2.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000



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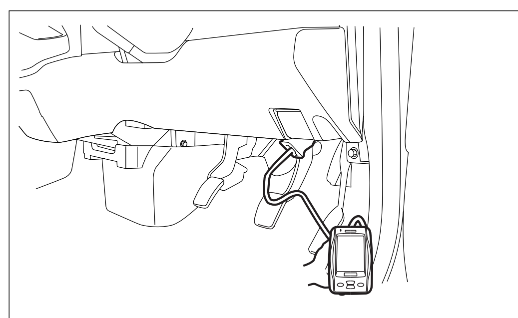
(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.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3.After turning "ON" the IG switch, turn "ON" the main switch of the tester.
4.Read the "Abs. throttle position SSR" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.

Throttle valve	Throttle valve opening [%]
Fully closed	0.0
Fully open	100.0

5.Are the check results OK?
▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, go to ⊳2.

⊳2. Check of power supply voltage.

1.After turning "OFF" the main switch of the tester, turn "LOCK" the IG switch.
2.Disconnect the connector of the throttle position sensor.
3.Measure the voltage between the following terminals, in which the IG switch is turned "ON".
(1) Between the throttle position sensor connection vehicle harness side connector 1 (VC) and the body earth

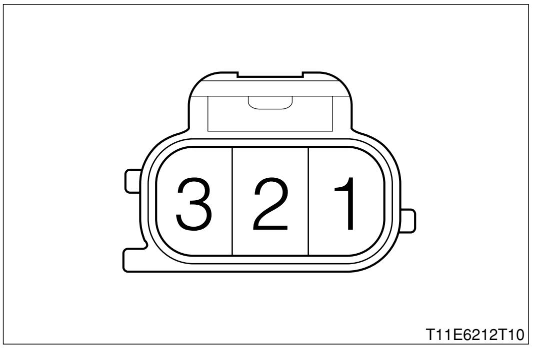
SPECIFIED VALUE: 4.5 - 5.5V

4.Is the voltage within the specified value?
▼If it is OK, go to ⊳3.
▼If it is NG, go to ⊳5.

⊳3. Check of linear throttle sensor.

1.Turn "LOCK" the IG switch.
2.Measure the resistance between the respective terminals.

Terminal	Condition	Standard value [kΩ]
1 (VC) - 2 (E2)	–	2.5 - 6.0
2 (E2) - 3 (VTH)	Throttle valve fully closed	0.1 - 1.3
	Throttle valve fully opened	1.7 - 4.2



3.Are the check results OK?
▼If it is OK, go to ⊳4.
▼If it is NG, replace the throttle body Ay.
Refer to Page B3-11.

⊳4. Check of input signal.

1.Set the SST (Sub-harness).
SST: 09842-97209-000

2.The IG switch turned "ON".
3.Measure the voltage between the SST connector 53 (VTH) and 19 (E2) under the following condition given below.

Throttle valve	Specified value [V]
Fully closed	0.4 - 0.8
Fully open	3.5 - 5.0

4.Is the measured value within the specified value?
▼If it is OK, check or replace the EFI ECU.
▼If it is NG, check between the following terminals for open wire or short.
(1) Between the EFI ECU and the throttle position sensor (VTH line)

▷5. Check of power supply voltage ECU side.

1.Turn "LOCK" the IG switch.
2.Set the SST (Sub-harness).
SST: 09842-97209-000

3.The IG switch turned "ON".
4.Check the voltage between the following terminals given below.
(1) Between SST 56 (VC) and SST 19 (E2)
SPECIFIED VALUE: 4.5 - 5.5V

5.Is the measured value within the specified value?

NOTE

- If no voltage appears, check the EFI ECU power supply circuit.

▼If it is OK, check between the following terminals for open wire or short.
(1) Between the EFI ECU and the throttle position sensor (VC line)
▼If it is NG, check or replace the EFI ECU.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. EFI ECU input signal check

1.Connect the SST.
SST: 09842-97209-000

2.Turn the IG switch to the "ON" position.
3.Perform voltage measurements between the following terminals.
(1) Between SST 56 (VC) - SST 19 (E2)
(2) Between SST 53 (VTH) - SST 19 (E2)
SPECIFIED VALUE:

Measuring terminals	Specified value
Between SST 56 (VC) - SST 19 (E2)	4.5 - 5.5V
53 (VTH) - 19 (E2)	It increases in proportion to the throttle opening in the range of 0.2V - 4.8V when the throttle lever is fully opened from the fully closed state.

▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, proceed to ⊳2.

⊳2. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.
(1) Between sensor connection vehicle harness side connector 1 (VC) - ECU connection vehicle harness side connector 56 (VC)
(2) Between sensor connection vehicle harness side connector 2 (E2) - ECU connection vehicle harness side connector 19 (E2)
(3) Between sensor connection vehicle harness side connector 3 (VTH) - ECU connection vehicle harness side connector 53 (VTH)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳3.
▼If it is NG, repair the harness and connectors.

⊳3. Throttle position sensor unit check

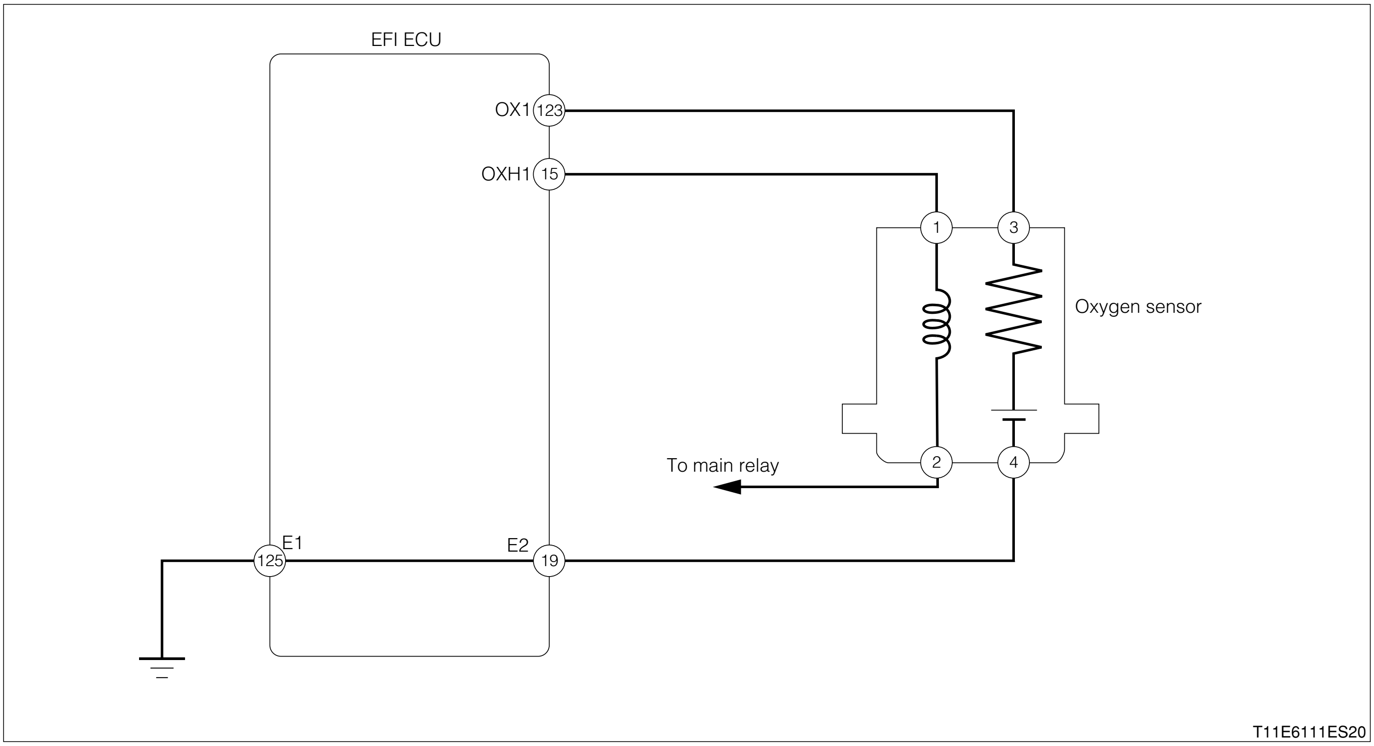
1.Perform unit check of the throttle position sensor.
Refer to Page B8–470.

▼If it is OK, check the connecting condition of each connector.
▼If it is NG, replace the throttle body Ay.
Refer to Page B3-11.

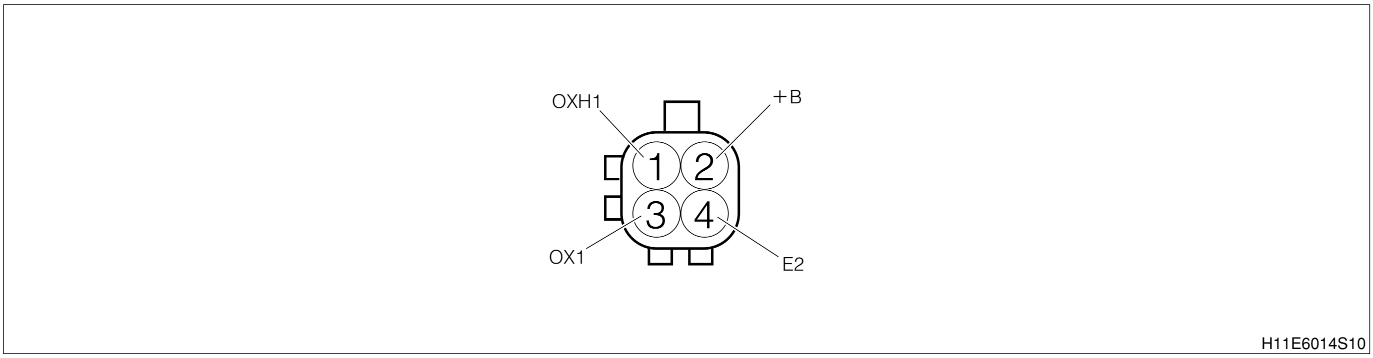
9-12-5 DTC NO.P0130/21 OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 1)

(1) System diagram

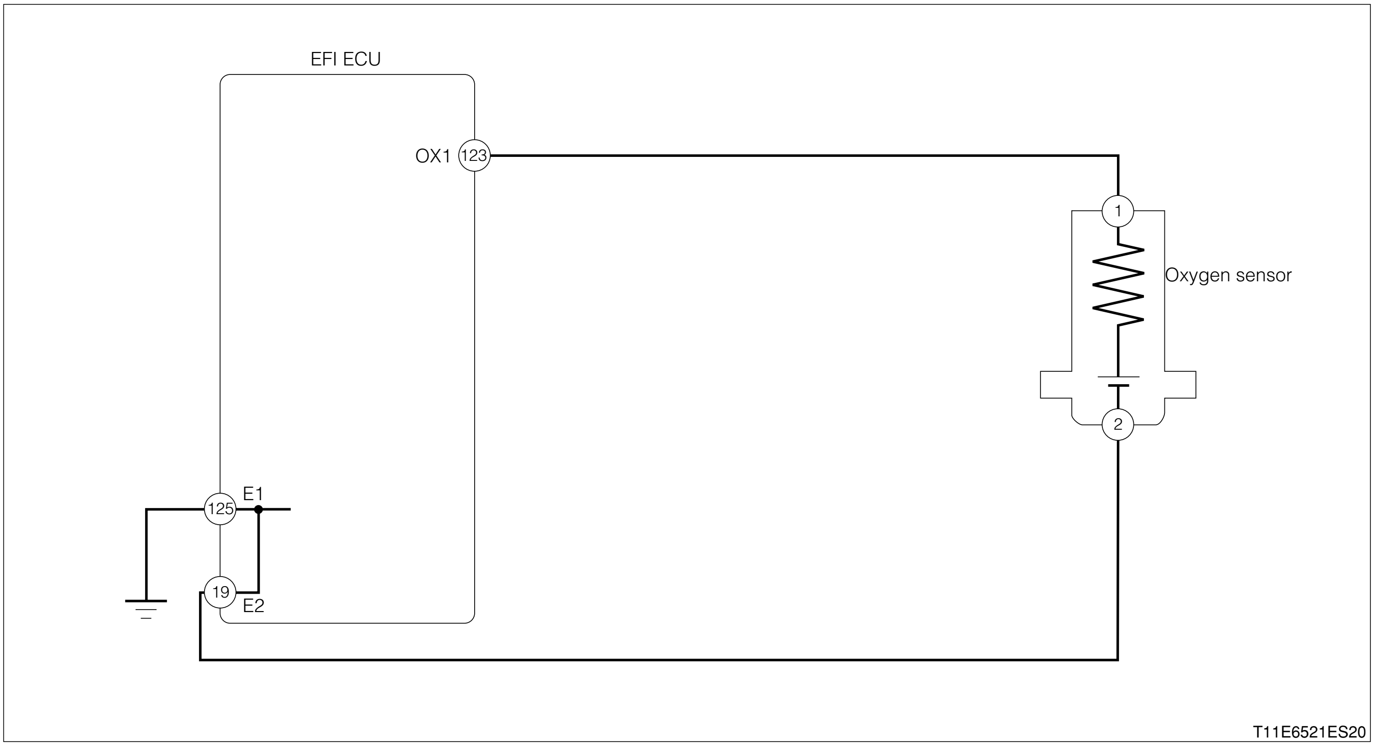
① For EU specifications



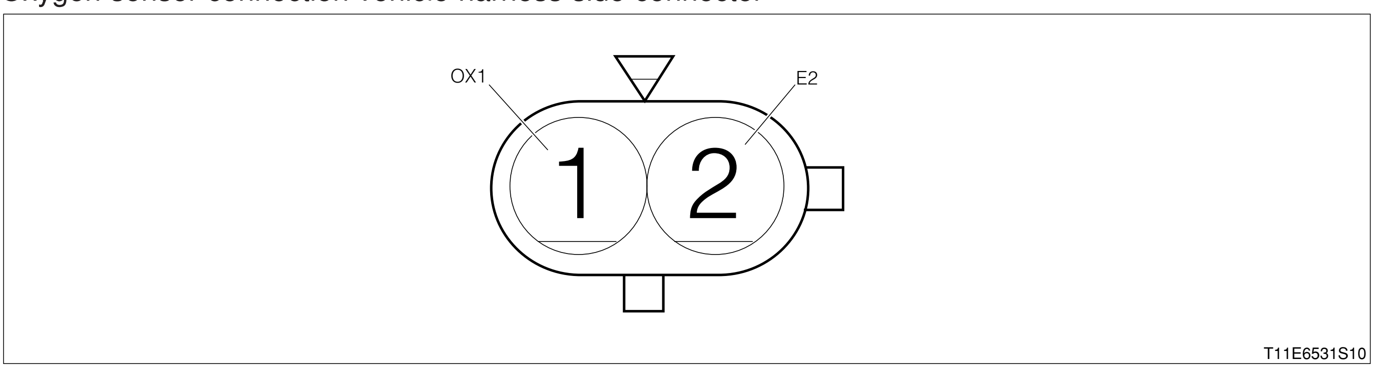
Oxygen sensor connection vehicle harness side connector



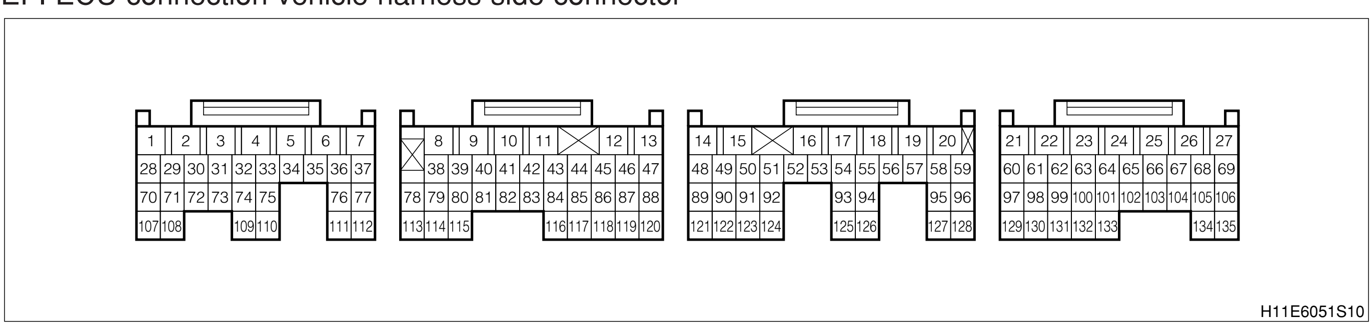
② **For general specifications**



Oxygen sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1.The front oxygen sensor (Bank 1, sensor 1) detects the concentration of oxygen contained in the exhaust gas according to the magnitude of the electromotive force that is being generated in itself. When the air-to-fuel ratio becomes richer than the stoichiometric ratio, a greater electromotive force (Approx. 1 volt) is applied to the EFI ECU. Conversely, when the ratio becomes leaner than the stoichiometric ratio, a smaller electromotive force (Approx. 0 volt) is applied to the EFI ECU. In this way, the EFI ECU determines whether the air-to-fuel ratio is rich or lean. Based on this evaluation, the injection time is controlled.

(3) Diagnosis code output conditions

1. When no rich signal is sent even once from the oxygen sensor even if the condition continues in which the engine revolution speed is more than 3000 rpm and the power increase compensation is continued over the specified value after the engine warming-up

(4) Trouble area

1. Air induction system
2. Fuel pressure
3. Injector
4. Open wire or short circuit in the oxygen sensor circuit
5. Oxygen sensor
6. EFI ECU

(5) Checking points

NOTE

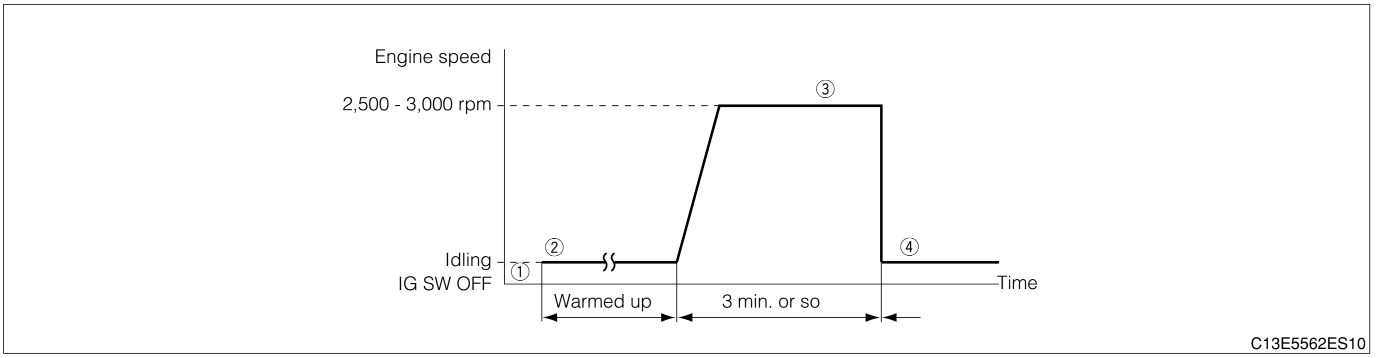
- When this code is outputted concurrently with another code, carry out the check for that code first.

1. Is the signal from the oxygen sensor inputted to the EFI ECU?
2. Is the harness between the oxygen sensor and the EFI ECU normal?
3. Is the output of the oxygen sensor correct? (If there are no causes for "Lean A/F" (The oxygen concentration in the exhaust gas is too high), the oxygen sensor is judged as defective.)
4. Check the oxygen sensor heater system for open wire or short.

NOTE

- Sensor 1 means a sensor which is located near the engine block.
- Using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool, confirm the output voltage of the oxygen sensor (Bank 1, sensor 1) from the current data. If the output voltage of the oxygen sensor (Bank 1, sensor 1) is 0.1 V or less, most likely the circuit of the oxygen sensor (Bank 1, sensor 1) is open or shorted.

Confirmation engine racing pattern (For EU specifications)



(1) Step ①; Using the DS-21, with the IG switch turned "LOCK", connect the DS-21 diagnosis tester to DLC through the SST. Turn "ON" the IG switch and the main switch of the tester. Set the tester to the "Continuous monitoring results" of the CARB mode.

SST: 09991-87404-000

(2) Step ①; Using DS-Ⅱ, with the IG switch turned "LOCK", connect the DS-Ⅱ diagnosis tester to DLC. Turn "ON" the IG switch and the main switch of the tester. Set the tester to the "Continuous monitoring results" of the CARB mode.

(3) Step ②; Start the engine. Keep on warming the engine for more than five minutes until the engine cooling water temperature reaches 90℃ or above.

(4) Step ③; Race the engine for about three minutes at 2500 to 3000 rpm.

(5) Step ④; After one minute of idling, press the F1 key of the tester. Check to see if the DTC P0130/21 is outputted.

NOTE

- If the condition in this test is not strictly followed, detection of the malfunction will not be possible.
- If you do not have the diagnosis tester (DS-21/DS-Ⅱ), turn the ignition switch "LOCK" after performing steps ② to ④, then perform steps ② to ④ again.

(6) Inspection procedure

① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⊳1. Check of DTC.

1.Check other codes (Those other than DTC P0130/21) outputted?

▼If an output is made, proceed to the trouble shooting for the outputted code concerned.
▼If no output is made, in the case of the EU specification vehicles, proceed to ⊳2.
▼If no output is made, in the case of the general specification vehicles, proceed to ⊳3.

⊳2. Wiring harness check (EU specification)

1.With the IG switch turned "LOCK", set the SST (Sub-harness). However, the SST connectors at the EFI ECU side should remain disconnected.
SST: 09842-97209-000

2.Disconnect the oxygen sensor connector.

3.Check the harness and connector between the following terminals for open wire and short.

(1) Between the sensor connection vehicle harness side connector 3 (OX1) and SST 123 (OX1)
SPECIFIED VALUE: Continuity exists.

(2) Between the sensor connection vehicle harness side connector 3 (OX1) and the body earth
SPECIFIED VALUE: No continuity exists

4.Are the check results for open wire and short OK?

▼If it is OK, go to ⊳4.
▼If it is NG, repair or replace the harness or connector.

⊳3. Wiring harness (General specification)

1.With the IG switch turned "LOCK", set the SST (Sub-harness). However, the SST connectors at the EFI ECU side should remain disconnected.
SST: 09842-97209-000

(1) Between the sensor connection vehicle harness side connector 1 (OX1) and SST 123 (OX1)
SPECIFIED VALUE: Continuity exists.

(2) Between the sensor connection vehicle harness side connector 1 (OX1) and the body earth
SPECIFIED VALUE: No continuity exists

2.Are the check results for open wire and short OK?

▼If it is OK, go to ⊳4.
▼If it is NG, repair or replace the harness or connector.

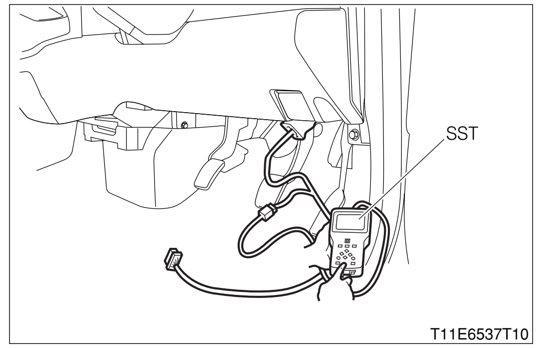
⊳4. Check of output voltage of sensor.

1.Connect the oxygen sensor and SST connectors, respectively.

2.Connect the diagnosis tester to DLC.

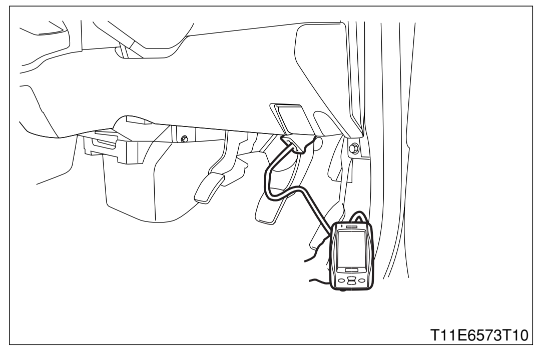
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.

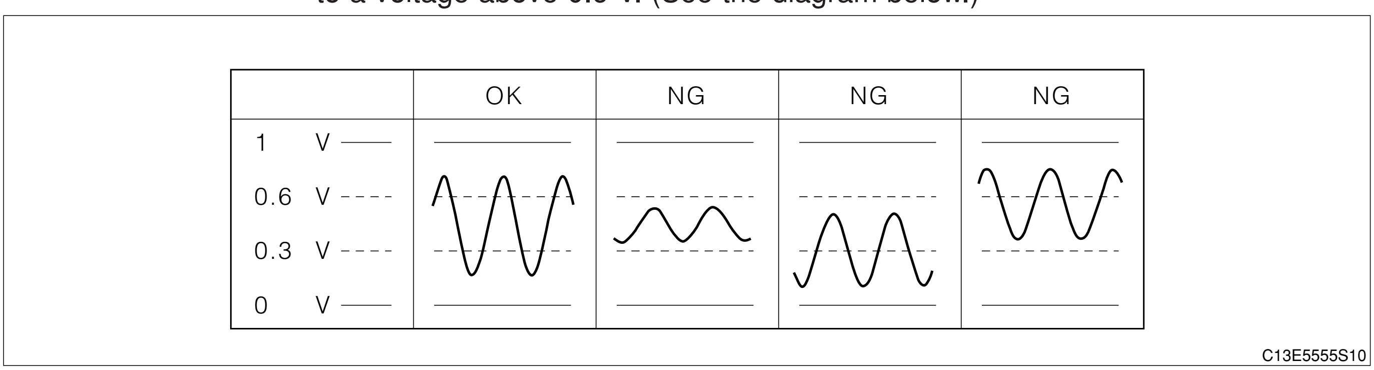


3.Turn "ON" the main switch of the tester.

4.Warm up the engine at 2500 rpm for about 90 seconds.

5.Check the output voltage of oxygen sensor during idling.

SPECIFIED VALUE: The voltage varies repeatedly between a range from a voltage below 0.3 V and to a voltage above 0.6 V. (See the diagram below.)



6.Are the check results OK?

▼<u>If it is OK, in the case of the EU specification vehicles, go to ▷11.</u>

▼<u>If it is OK, in the case of the general specification vehicles, go to ▷12.</u>

▼<u>If it is NG, in the case of the EU specification vehicles, proceed to ▷5.</u>

▼<u>If it is NG, in the case of the general specification vehicles, proceed to ▷6.</u>

▷5. Check of misfire.

1.Check to see if any misfire is occurring by monitoring the DTC and data list.

2.Are the check results OK?

▼<u>If it is OK, go to ▷6.</u>

▼<u>If it is NG, perform troubleshooting for misfire. (Go to troubleshooting of DTC P0300/17, P0301 - 0304/17.)</u>

Refer to Page B8-388.

▷6. Check of air induction system.

1.Check the following items given below:
(1) Check of the engine oil level gauge, oil filler cap and PCV hose for disconnection.
(2) Check of parts of the air induction system between the cylinder head and the throttle body for disconnection, looseness, or cracks.

2.Are the check results OK?
▼If it is OK, go to ▷7.
▼If it is NG, repair or replace the induction system.

▷7. Check of fuel pressure.

1.Check the fuel pressure.
Refer to Page B8-467.

2.Are the check results OK?
▼If it is OK, go to ▷8.
▼If it is NG, check and repair fuel pump, fuel pipe line and filter.

▷8. Check of injector injection.

1.Check the injector unit.
Refer to Page B7-23.

2.Are the check results OK?
▼If it is OK, go to ▷9.
▼If it is NG, replace the injector.
Refer to Page B7-23.

▷9. Check of gas leakage of exhaust system.

1.Check that there is no gas leakage in the exhaust gas-related system.
Refer to Page B1-26.

2.Are the check results OK?
▼If it is OK, go to ▷10.
▼If it is NG, repair or replace the defective point.

▷10. Check of output voltage of sensor.

1.Warm up engine completely.
2.Disconnect the connector of the oxygen sensor with IG switch turned "LOCK".
3.Disconnect the oxygen sensor connector.
4.Connect a voltmeter to the connector terminal of oxygen sensor.
5.Hold the engine racing speed for 4 minutes at 3000 rpm. At this time, ensure that the reading of the volt meter is within the specified value.
SPECIFIED VALUE: The voltmeter exhibits an output voltage of 0.2 V or more at least one time.

6.Are the check results OK?
▼If it is OK, check or replace the EFI ECU.
▼If it is NG, replace the oxygen sensor. (Bank 1, sensor 1)
Refer to Page B4-4.

⊳11. Perform confirmation engine racing pattern.

1. Again conduct the check of engine racing pattern.
2. Is there DTC P0130/21 being output again?
   - ▼ If the output is made, check or replace the EFI ECU.
   - ▼ If no output is made, proceed to ⊳11.

⊳12. The past situation of vehicles operation is investigated.

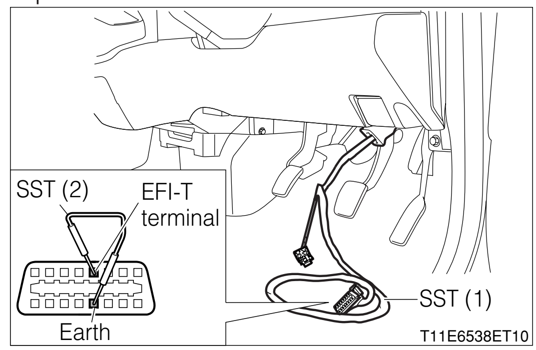
1. Confirm the past vehicle running situation.
2. Did the vehicle run out of fuel in the past?
   - ▼ If it is YES, DTC P0130/21 is caused by running out of fuel.
   - ▼ If it is NO, check the EFI ECU circuit.

Refer to Page A1-24.

② **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Oxygen sensor feedback control check

1.Start the engine.
2.Activate the oxygen sensor by maintaining the engine at 3000rpm for four minutes.
3.Connect the SST and short- circuit the EFI-T terminal.
SST: 09991-87404-000(1)
09991-87403-000(2)
4.Maintain the engine revolution speed at 2000rpm or more and step on the brake pedal.
5.Check if the engine check lamp in the meter blinks.
SPECIFIED VALUE: It blinks.



NOTE

- The blinking interval will change by the condition of activation of the oxygen sensor.

▼If it is OK, the oxygen sensor system is normal.
▼If it is NG, proceed to ⊳2.

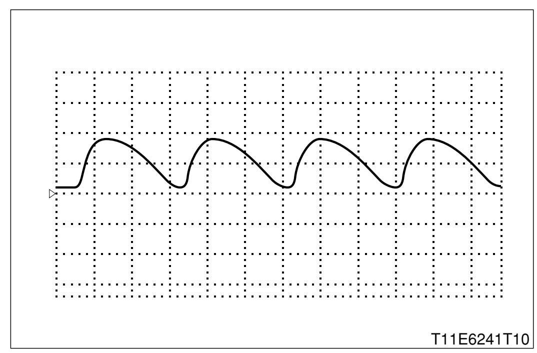
⊳2. Oxygen sensor signal check

1.Connect the SST.
SST: 09842-97209-000

2.Activate the oxygen sensor by maintaining the engine at 3000rpm for four minutes.
3.Perform output check between the following terminals using an oscilloscope.
(1) Between SST 123 (OX1) - SST 125 (E1)

Time axis	Time axis
Voltage axis	500mV / DIV
Measuring condition	Air conditioner "OFF", no electric load, maintaining 3000rpm

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".



NOTE

- The waveform cannot be specified, but ensure that a waveform as in the right figure (One such example) shows up

4.Confirm the following points.
(1) The waveform is showing up with the oxygen sensor activated.
(2) The waveform 0 ⇄ 1V is showing up.

NOTE

- As for the oxygen sensor signal, the correct output cannot be confirmed without using the oscilloscope.

▼If it is OK, proceed to ⊳3.
▼If it is NG, replace the oxygen sensor.
Refer to Page B4-4.

⊳3. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.

(1) Between sensor connection vehicle side connector 3 (OX1) - ECU connection vehicle harness connection side connector 123 (OX1)

(2) Between sensor connection vehicle side connector 3 (OX1) - ECU connection vehicle harness connection side connector 123 (OX1)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, replace the EFI ECU.

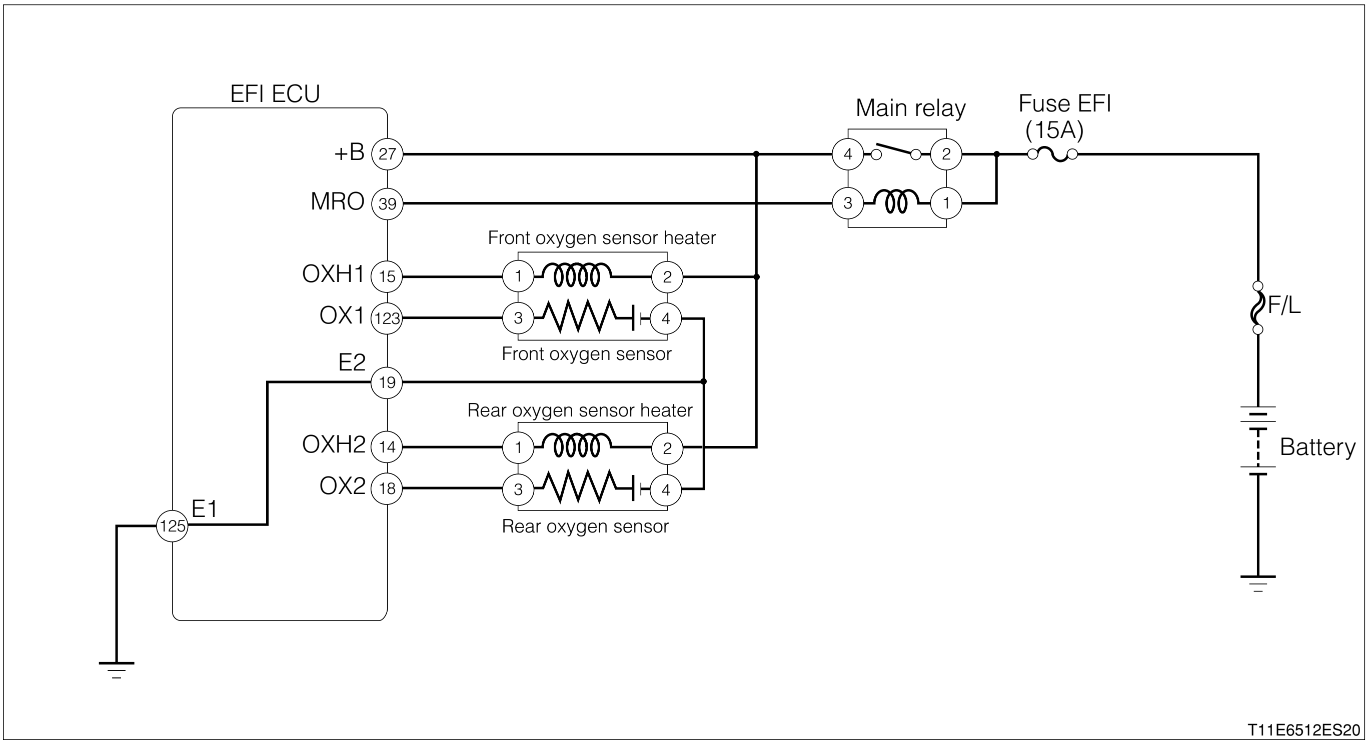
Refer to Page B8-1.

▼If it is NG, perform checking or repairing of the harness of the defective sections.

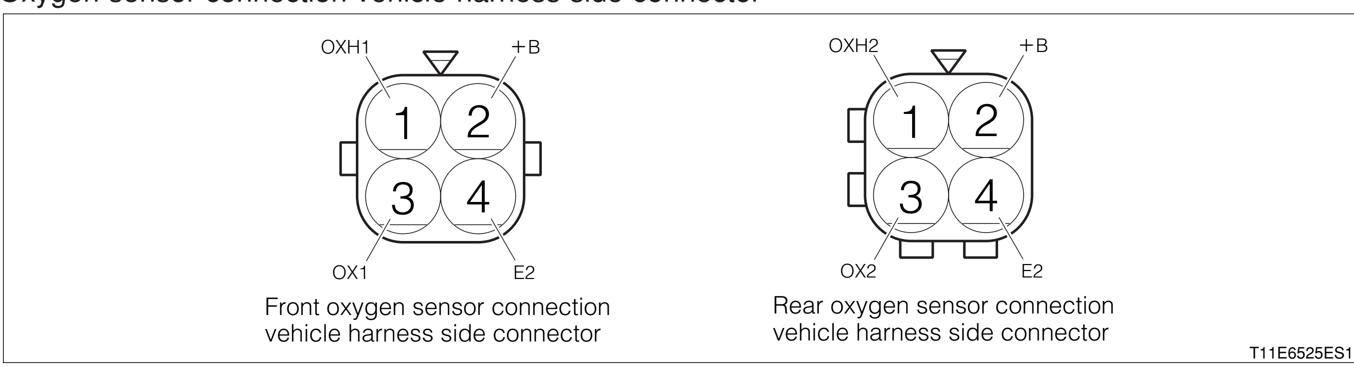
9-12-6 DTC NO.P0135/23 OXYGEN SENSOR HEATER CIRCUIT MALFUNCTIONDTC NO.P0141/24 REAR OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION

(1) System diagram

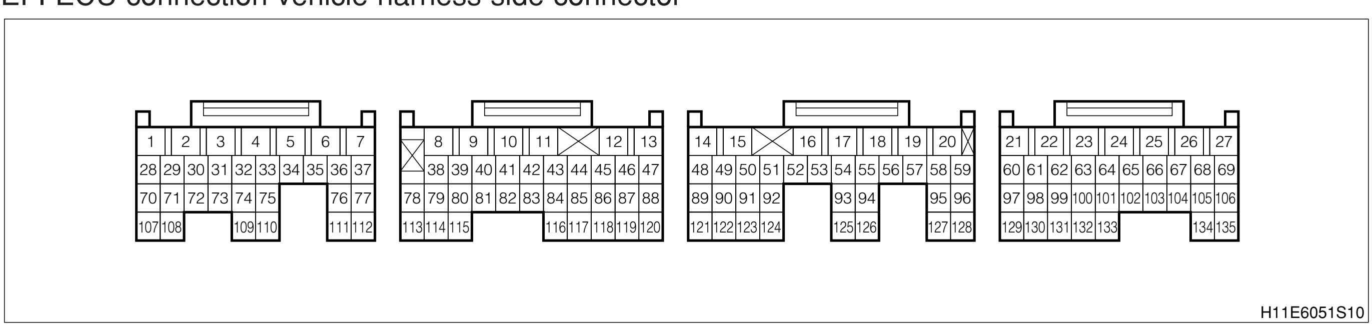
① **For EU specifications**



Oxygen sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Diagnosis code output conditions

1.When an open wire or short is present in the oxygen sensor heater system,

(3) Trouble area

1.Open wire or short circuit for the oxygen sensor heater circuit
2.Oxygen sensor heater
3.EFI ECU

(4) Checking points

NOTE

- When this code is outputted concurrently with another code, carry out the check for that code first.

1. Is the signal from the oxygen sensor inputted to the EFI ECU?
2. Is the harness between the oxygen sensor and the EFI ECU normal?
3. Is the output of the oxygen sensor correct? (If there are no causes for "Lean A/F" (The oxygen concentration in the exhaust gas is too high), the oxygen sensor is judged as defective.)
4. Check the oxygen sensor heater system for open wire or short.

(5) Inspection procedure

⊳1. Check of output voltage of ECU.

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

1. Set the SST (Sub-harness).
 SST: 09842-97209-000

2. Conduct the voltage measurement between the next terminals under the following conditions given below.
 (1) Between SST 15 (OXH1) and the body earth
 (2) Between SST 14 (OXH2) and the body earth

	Measurement conditions	
	IG switch "ON"	After engine started
Front Oxygen sensor heater	Battery voltage	Below 1.0 V/ Immediately after
Rear Oxygen sensor heater.	Battery voltage	Below 1.0 V/After more than 3 minutes

3. Are the check results OK?
 ▼If it is OK, check or replace the EFI ECU.
 ▼If it is NG, go to ⊳2.

⊳2. Unit check of oxygen sensor.

1. Check the front and rear oxygen sensor heater units.
 (1) Front oxygen sensor
 Refer to Page B8-469.

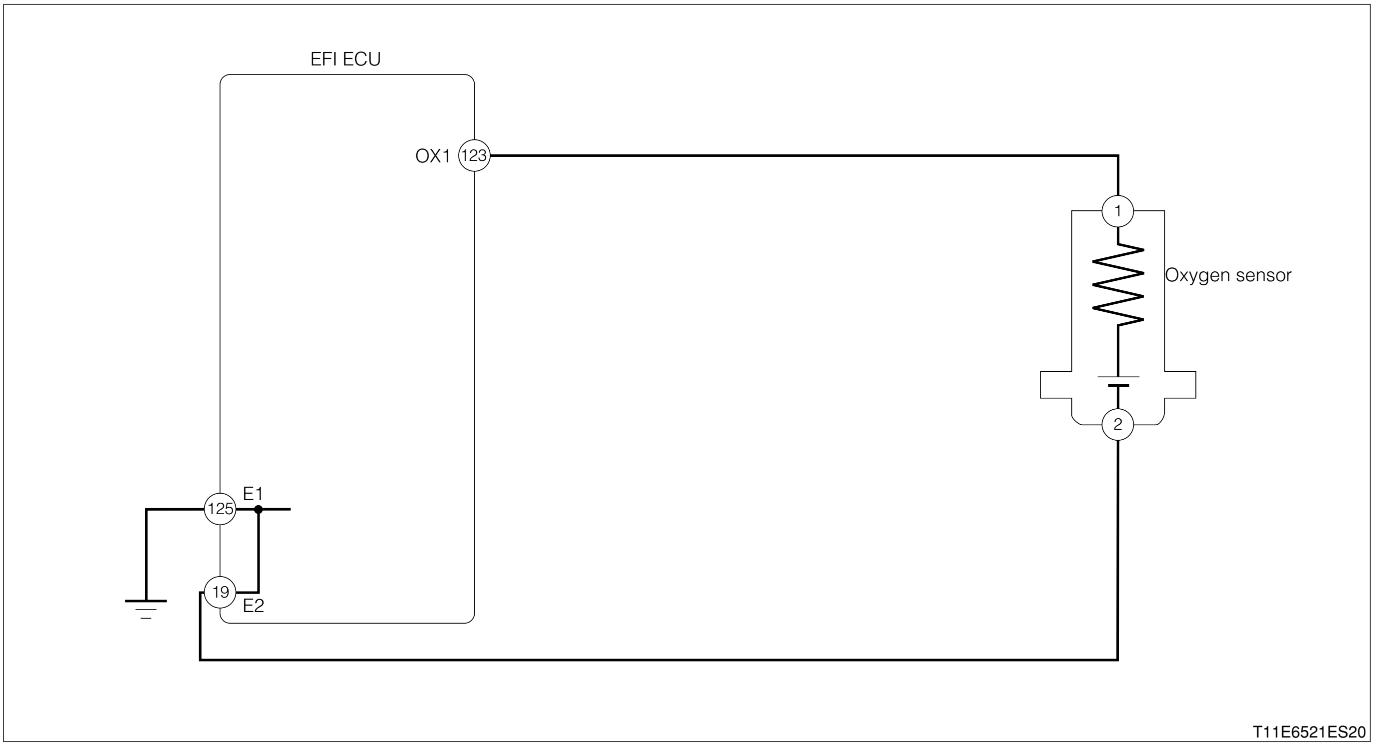
 (2) Rear oxygen sensor
 Refer to Page B8-470.

2. Are the unit check results OK?
 ▼If it is OK, check the harness and connector between the following terminals for open wire and short.
 (1) Between the main relay and the EFI ECU
 (2) Between the front oxygen sensor and the EFI ECU
 (3) Between the rear oxygen sensor and the EFI ECU
 ▼If it is NG, replace the defective oxygen sensor.

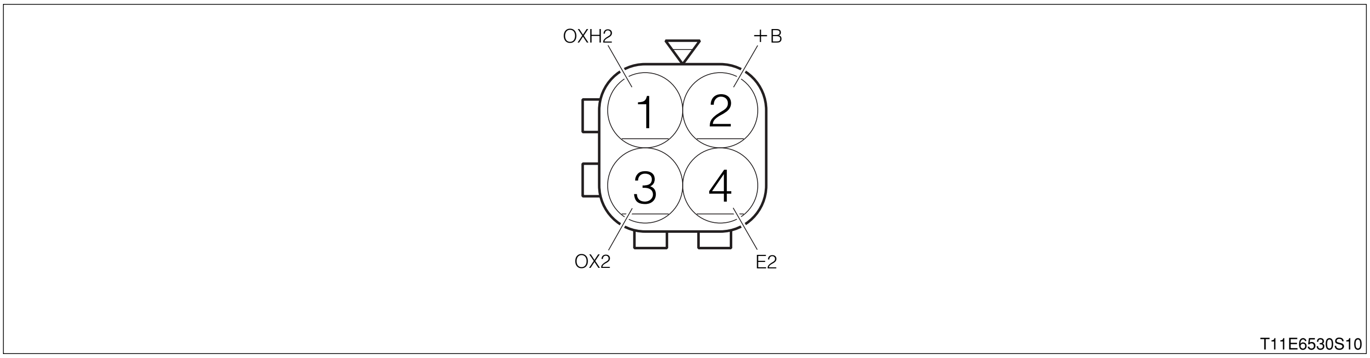
9-12-7 DTC NO.P0136/22 REAR OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 2)

(1) System diagram

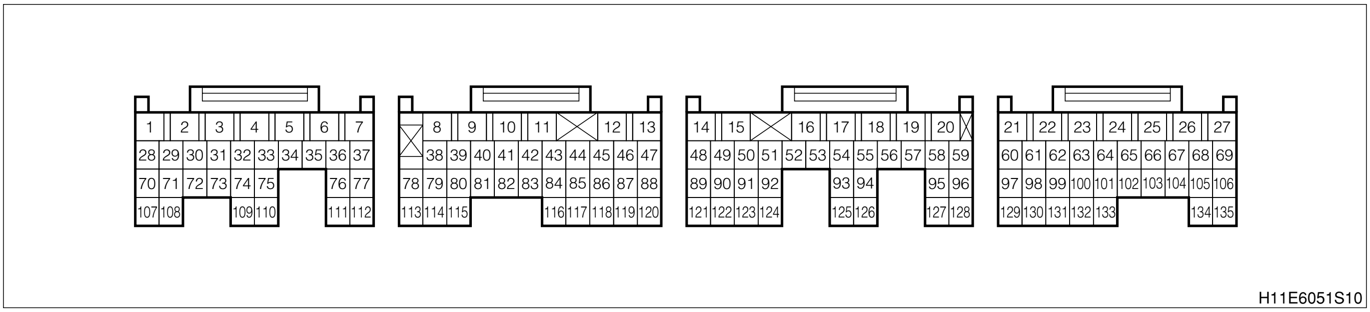
① For EU specifications



Rear oxygen sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1.Refer to DTC P0130/21 (Oxygen sensor circuit malfunction (Bank 1 sensor 1)).

(3) Trouble area

1.Open wire or short circuit in the rear oxygen sensor circuit
2.Rear oxygen sensor
3.EFI ECU

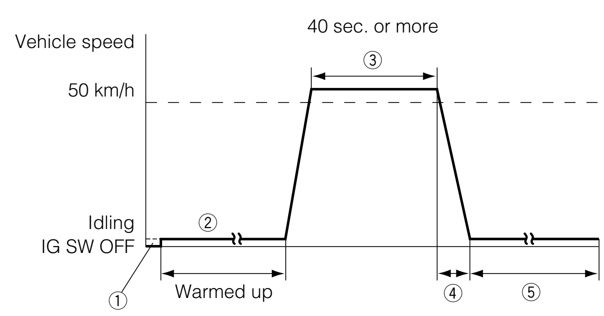
(4) Checking points

NOTE

- When this code is outputted concurrently with another code, carry out the check for that code first.

1. Is the signal from the rear oxygen sensor inputted to the EFI ECU?
2. Is the harness between the rear oxygen sensor and the EFI ECU normal?
3. Is the output of the rear oxygen sensor normal?

Confirmation driving pattern



(1) Step ①; Using DS-21, with the IG switch turned "LOCK", connect the DS-21 diagnosis tester to DLC through the SST. Turn "ON" the IG switch and the main switch of the tester. Set the tester to the "Continuous monitoring results" of the CARB mode.

SST: 09991-87404-000

(2) Step ①; Using DS-Ⅱ, with the IG switch turned "LOCK", connect the DS-Ⅱ diagnosis tester to DLC. Turn "ON" the IG switch and the main switch of the tester. Set the tester to the "Continuous monitoring results" of the CARB mode.

(3) Step ②; Start the engine. With all switch turned "OFF", keep on warming the engine for more than five minutes until the engine coolant temperature reaches 90℃ or above.

(4) Step ③; Accelerate the vehicle until the vehicle speed reaches 50 km/h or more in the 1st → 2nd gear. Keep on running the vehicle at that speed for at least 40 seconds.

(5) Step ④; Under this condition, release the foot off from the accelerator pedal so as to decelerate the vehicle. Maintain the idling state.

(6) Step ⑤; After one minute of idling, press the F1 key of the tester. Check to see if the DTC P0130/21 is outputted.

NOTE

- If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.
- If you do not have diagnosis tester (DS-21/DS-Ⅱ), turn the ignition switch "LOCK" after performing steps ② to ④, then perform steps ② to ④ again.

(5) Inspection procedure

① When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⊳1. Check of DTC.

1.Are other codes (Those other than DTC P0136/22) outputted?

▼<u>If the output is made, proceed to the Item of the relevant diagnosis code.</u>

▼<u>If no output is made, proceed to ⊳2.</u>

⊳2. Wiring harness check

1.The IG switch turned "LOCK".

2.Set the SST. However, the SST connectors at the ECU side should remain disconnected.

SST: 09842-97209-000

3.Disconnect the oxygen sensor connector.

4.Check the harness and connector for open wire or short.

(1) Between the oxygen sensor connection vehicle harness side connector 1 (OX2) and SST 18 (OX2)

SPECIFIED VALUE: Continuity exists.

(2) Between the oxygen sensor connection vehicle harness side connector 1 (OX2) and the body earth

SPECIFIED VALUE: No continuity exists

5.Are the check results for open wire and short OK?

▼<u>If it is OK, go to ⊳3.</u>

▼<u>If it is NG, repair or replace the harness or connector.</u>

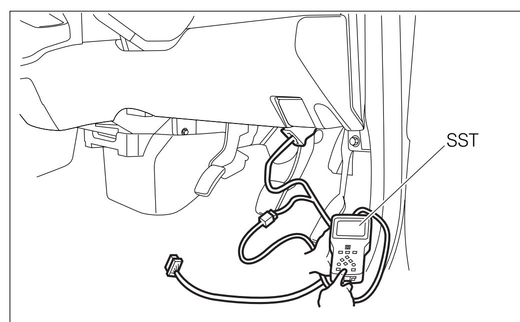
⊳3. Check of output voltage of sensor.

1.Connect the rear oxygen sensor and SST connectors, respectively.

2.Connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

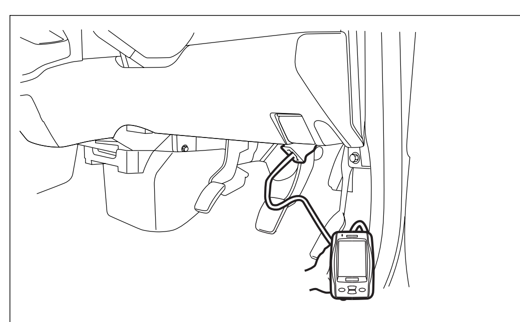
SST: 09991-87404-000



T11E6537T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.


T11E6573T10

3.Warm up the engine.
4.Turn "ON" the main switch of the tester.
5.Race the engine at 4000 rpm for three minutes by depressing the accelerator pedal.
6.Under the condition of step 4, release the foot off from the accelerator pedal so as to allow the engine to idle.
7.Read the output voltage of the oxygen sensor between Steps 4 to 5.

SPECIFIED VALUE: The voltage should become 0.4 V or below and 0.55 V or more, respectively, at least one time.

8.Are the check results OK?

▼<u>If it is OK, check the EFI ECU circuit.</u>

Refer to Page A1-24.

▼<u>If it is NG, go to ⌦4.</u>

⌦4. Check of output voltage of sensor.

1.Warm up engine completely.
2.IG switch turned "LOCK".
3.Disconnect the connector of the rear oxygen sensor.
4.Connect a voltmeter to the connector terminal of oxygen sensor.
5.Hold the engine racing speed for 3 minutes at 2000 rpm. At this time, ensure that the reading of the volt meter is within the specified value.

SPECIFIED VALUE: The voltmeter exhibits an output voltage of 0.2 V or more at least one time?

6.Are the check results OK?

▼<u>If it is OK, check or replace the EFI ECU.</u>

▼<u>If it is NG, replace the oxygen sensor. (Bank 1, sensor 2)</u>

Refer to Page B4-6.

② When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

⌦1. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.

(1) Between sensor connection vehicle harness side connector 1 (OX2) - ECU connection vehicle harness side connector 18 (OX2)

(2) Between sensor connection vehicle harness side connector 2 (E2) - ECU connection vehicle harness side connector 19 (E2)

SPECIFIED VALUE: Continuity exists.

▼<u>If it is OK, proceed to ⌦2.</u>

▼<u>If it is NG, repair the harness and connectors.</u>

⌦2. Rear oxygen sensor continuity check

1.Perform continuity check between each of the following terminals.

(1) Between rear oxygen sensor side connector 1 (OX2) - rear oxygen sensor body

(2) Between rear oxygen sensor side connector 2 (E2) - rear oxygen sensor body

SPECIFIED VALUE: No continuity exists

▼If it is OK, proceed to ⌦3.

▼If it is NG, replace the rear oxygen sensor.

Refer to Page B4-6.

⌦3. Rear oxygen sensor signal check

1.Stop the vehicle.

2.Continue racing of 2000rpm or above for about five minutes from the state in which the rear oxygen sensor is cooled.

3.Perform output voltage measurements of the rear oxygen sensor during this time (Between the rear oxygen sensor side terminals).

SPECIFIED VALUE: It becomes 0 V (During cold period) → 0.65 V or above (When detecting rich state after warm-up).

4.Stop the engine and perform the output voltage measurements between the following terminals.

(1) Between rear oxygen sensor side connector 1 (OX2) - rear oxygen sensor side connector 2 (E2)

SPECIFIED VALUE: 0.55V or less.

NOTE

- Measure them under the condition in which the rear oxygen sensor is detecting oxygen (Lean condition).

▼If it is OK, proceed to ⌦4.

▼If it is NG, replace the rear oxygen sensor.

Refer to Page B4-6.

⌦4. Rear oxygen sensor unit check

1.Perform unit check of the rear oxygen sensor.

Refer to Page B8-470.

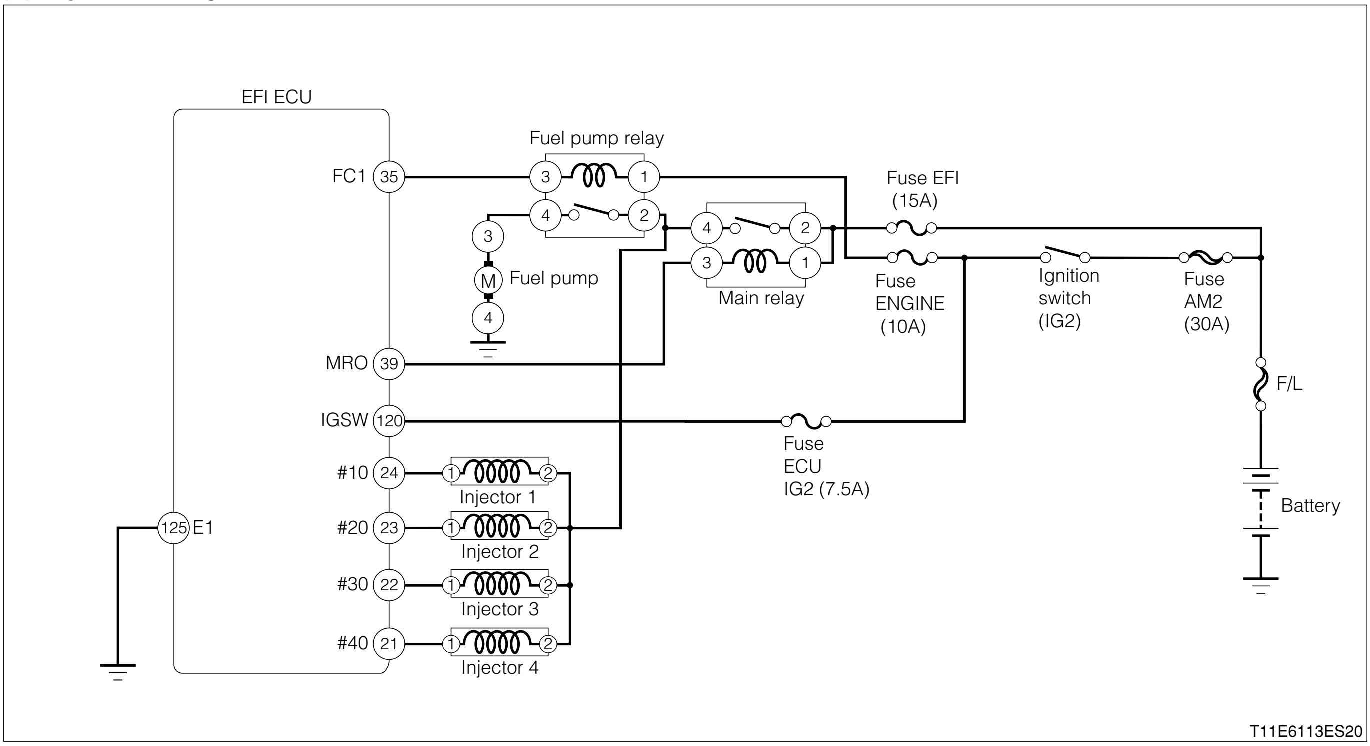
▼If it is OK, check the oxygen sensor system.

▼If it is NG, replace the rear oxygen sensor.

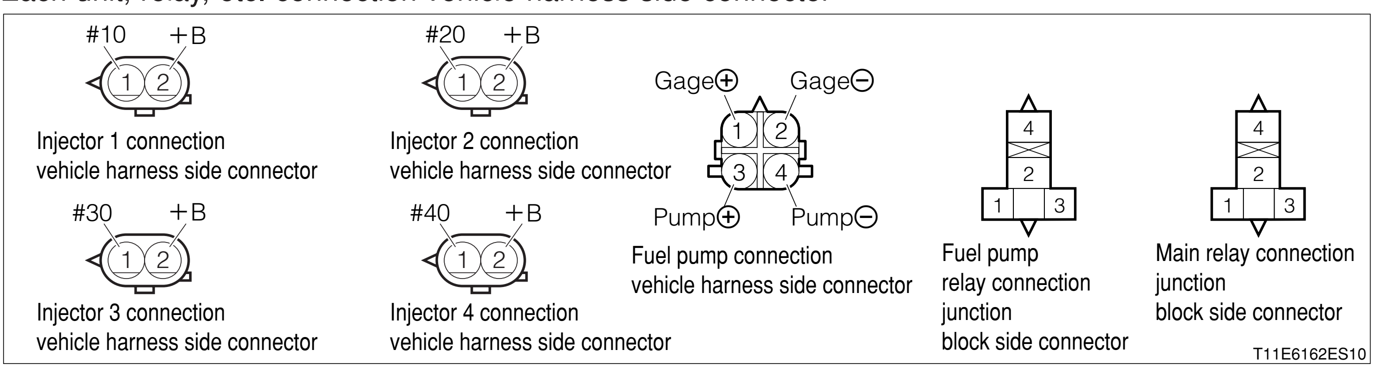
Refer to Page B4-6.

9-12-8 DTC NO.P0171/25 FUEL TRIM SYSTEM TOO LEAN (AIR-FUEL RATIO LEAN MALFUNCTION, BANK 1)DTC NO.P0172/26 FUEL TRIM SYSTEM TOO RICH (AIR-FUEL RATIO RICH MALFUNCTION, BANK 1)

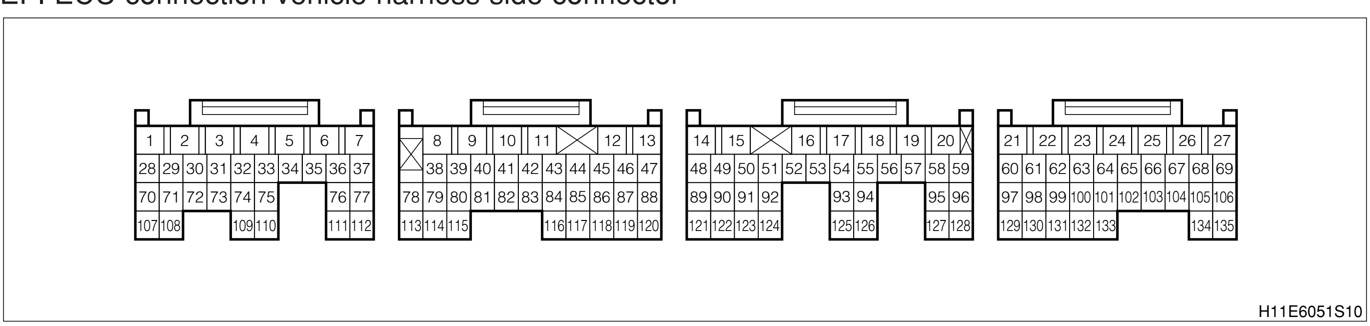
(1) System diagram



Each unit, relay, etc. connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1.The fuel trim means the feedback compensation value that will compensate the basic injection time. The fuel trim comes in two kinds: the short-term fuel trim and the long-term fuel trim.

2.The short-term fuel trim is a short-term fuel compensation to be carried out to maintain the air-to-fuel ratio at the stoichiometric air-to-fuel ratio. The signal from the oxygen sensor indicates whether the current air-to-fuel ratio is rich or lean than the stoichiometric air-to-fuel ratio. Hence, if the air-to-fuel ratio is rich, the fuel injection amount will be reduced. Conversely, if the air-to-fuel ratio is lean, the fuel injection amount will be increased.

3.The long-term fuel trim is overall fuel compensation over a long period of time in order to compensate a continues deviation of the short-term fuel trim from the central value, which will be caused by the engines inherent characteristics, the wear due to operation over a long period of time and the change in operational environment.

(3) Code No.P0171/25 output conditions

1.The correction coefficient is stuck to the one side (Lean state of air fuel ratio) during the air fuel ratio feedback period

(4) Code No.P0172/26 output conditions

1.The correction coefficient is stuck to the one side (Rich state of air fuel ratio) during the air fuel ratio feedback period

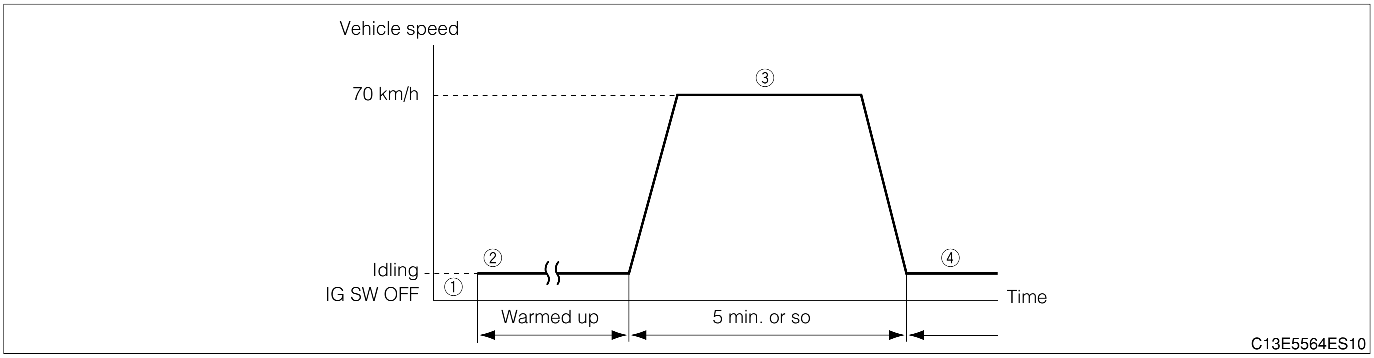
(5) Trouble area

1.Open wire or short circuit in the oxygen sensor circuit
2.Oxygen sensor
3.ECT sensor
4.Evaporative emission purge VSV
5.EFI ECU

(6) Checking points

1.Is the fuel pressure normal?
2.Is the injector normal?
3.Is the oxygen sensor normal?

Confirmation driving pattern (For only EU specification)



(1) Step ①; Using DS-21, with the IG switch turned "LOCK", connect the DS-21 diagnosis tester to DLC through the SST. Turn "ON" the IG switch and the main switch of the tester. Set the tester to the "Continuous monitoring results" of the CARB mode.

SST: 09991-87404-000

(2) Step ①; Using DS-Ⅱ, with the IG switch turned "LOCK", connect the DS-Ⅱ diagnosis tester to DLC through the SST. Turn "ON" the IG switch and the main switch of the tester. Set the tester to the "Continuous monitoring results" of the CARB mode.

(3) Step ②; Start the engine. Keep on warming the engine for more than five minutes until the engine cooling water temperature reaches 90℃ or above.

(4) Step ③; Run the vehicle for more than five minutes at a speed of 70 km/h with the gear selected to the 5th gear.

(5) Step ④; After one minute of idling, press the F1 key of the tester. Check to see if the DTC P0171/0172 is detected.

NOTE

- If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.
- If you do not have diagnosis tester (DS-21/DS-Ⅱ), turn the ignition switch "LOCK" after performing steps ② to ④, then perform steps ② to ④ again.

(7) Inspection procedure

① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⊳1. Check of DTC.

1.Check other codes (Those other than DTC P0171/25 or P0172/26) outputted?

▼<u>If the output is made, proceed to the Item of the relevant diagnosis code.</u>

▼<u>If no output is made, proceed to ⊳2.</u>

⊳2. Check of air induction system.

1.Check the following items given below.

(1) Check of the engine oil level gauge, oil filler cap and PCV hose for disconnection.

(2) Check of parts of the air induction system between the cylinder head and the throttle body for disconnection, looseness, or cracks.

▼If it is OK, go to ⊳3.

▼If it is NG, repair or replace the induction system.

⊳3. Check of injector injection.

1.Check the injector unit.

Refer to Page B8-472.

2.Are the check results OK?

▼If it is OK, go to ⊳4.

▼If it is NG, replace the injector.

Refer to Page B7-23.

⊳4. Check of purge VSV for EVAP.

1.Perform the unit check of the VSV for evaporative emission purge.

Refer to Page B8-473.

2.Are the check results OK?

▼If it is OK, go to ⊳5.

▼If it is NG, replace the purge VSV for EVAP.

⊳5. Check of engine cooling coolant temperature sensor.

1.Perform the unit check of the water temperature sensor.

Refer to Page B8-468.

2.Are the check results OK?

▼If it is OK, go to ⊳6.

▼If it is NG, replace the engine cooling coolant temperature sensor.

Refer to Page B8-235.

⊳6. Manifold absolute pressure sensor unit check

1.Perform the unit check of the manifold absolute pressure sensor.

Refer to Page B8-468.

2.Are the check results OK?

▼If it is OK, go to ⊳7.

▼If it is NG, replace the manifold absolute pressure sensor.

Refer to Page B8-237.

⊳7. Check of fuel pressure.

1.Check the fuel pressure.

Refer to Page B8-467.

2.Are the check results OK?

▼If it is OK, go to ⊳8.

▼If it is NG, check and repair fuel pump, fuel pipe line and filter.

▷8. Check of gas leakage of exhaust system.

1.Check the exhaust gas leakage.

Refer to Page B1-26.

2.Are the check results OK?

▼If it is OK, go to ▷9.

▼If it is NG, repair or replace the defective point.

▷9. Wiring harness check

1.IG switch turned "LOCK".

2. set the SST (Sub-harness). However, the SST connectors at the ECU side should remain disconnected.

SST: 09842-97209-000

3.Disconnect the oxygen sensor connector.

4.Check the harness and connector for open wire or short.

(1) Between the oxygen sensor connection vehicle harness side connector 3 (OX1) and SST 123 (OX1)

SPECIFIED VALUE: Continuity exists.

(2) Between the oxygen sensor connection vehicle harness side connector 3 (OX1) and the body earth

SPECIFIED VALUE: No continuity exists

5.Are the check results for open wire and short OK?

▼If it is OK, go to ▷10.

▼If it is NG, repair or replace the harness or connector.

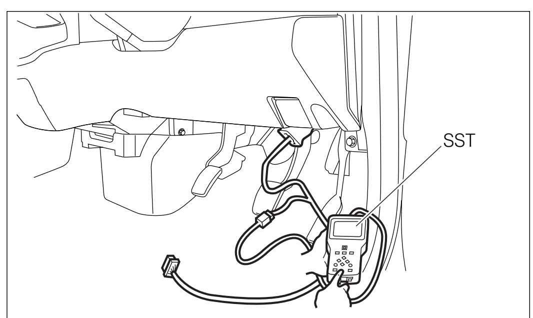
▷10. Check of output voltage of sensor.

1.Connect the oxygen sensor and SST connectors, respectively.

2.Connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000



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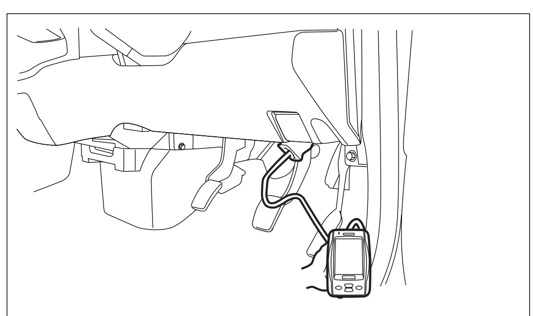
(2) In case of DS-II, connect the DS-II diagnosis tester directly to DLC.

(3) In case of the OBD II generic scan tool, connect the OBD II generic scan tool directly to DLC.



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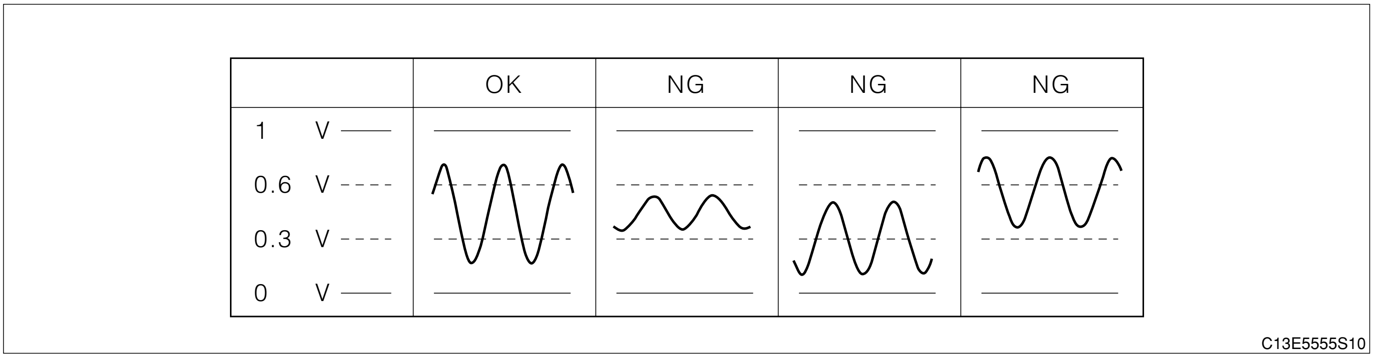
3.Warm up the engine at 2500 rpm for about 90 seconds.
4.Turn "ON" the main switch of the tester.
5.Read the output voltage of oxygen sensor during idling.
SPECIFIED VALUE: The voltage varies repeatedly between a range from a voltage below 0.3 V and to a voltage above 0.6 V. (See the diagram below.)



6.Are the check results OK?
▼If it is OK, go to ▷12.
▼If it is NG, go to ▷11.

▷11. Check of output voltage of sensor.

1.Warm up engine completely.
2.IG switch turned "LOCK".
3.Disconnect the connector of the oxygen sensor.
4.Connect a voltmeter to the connector terminal of oxygen sensor.
5.Hold the engine racing speed for 3 minutes at 2000 rpm.
6.At this time, ensure that the reading of the volt meter is within the specified value.
SPECIFIED VALUE: The voltmeter exhibits an output voltage of 0.2 V or more at least one time?

7.Are the check results OK?
▼If it is OK, check or replace the EFI ECU.
▼If it is NG, replace the oxygen sensor. (Bank 1, sensor 1)
Refer to Page B4-4.

▷12. Perform confirmation driving pattern.

1.Is there DTC P0171/25 or P0172/26 being output again?
▼If the output is made, check or replace the EFI ECU.
▼If the output is made, proceed to ▷13.

▷13. The past situation of vehicles operation is investigated.

1.Did the vehicle run out of fuel in the past?
▼If it is OK, DTC P0171/25 is caused by running out of fuel.
▼If it is NG, check the EFI ECU circuit.
Refer to Page A1-24.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Oxygen sensor system check

1.Perform checking of the oxygen sensor system.
Refer to Page B8-311.

▼If it is OK, proceed to ⊳2.
▼If it is NG, repair the oxygen sensor system.

⊳2. Fuel pressure check

1.Perform fuel pressure check.
Refer to Page B8-467.

▼If it is OK, proceed to ⊳3.
▼If it is NG, check and repair the following portions.
(1) Fuel pump system
(2) Fuel line

⊳3. Injector system check

1.Perform checking of the injector system.
Refer to Page B8-455.

▼If it is OK, proceed to ⊳4.
▼If it is NG, repair the injector system.

⊳4. Spark plug unit check

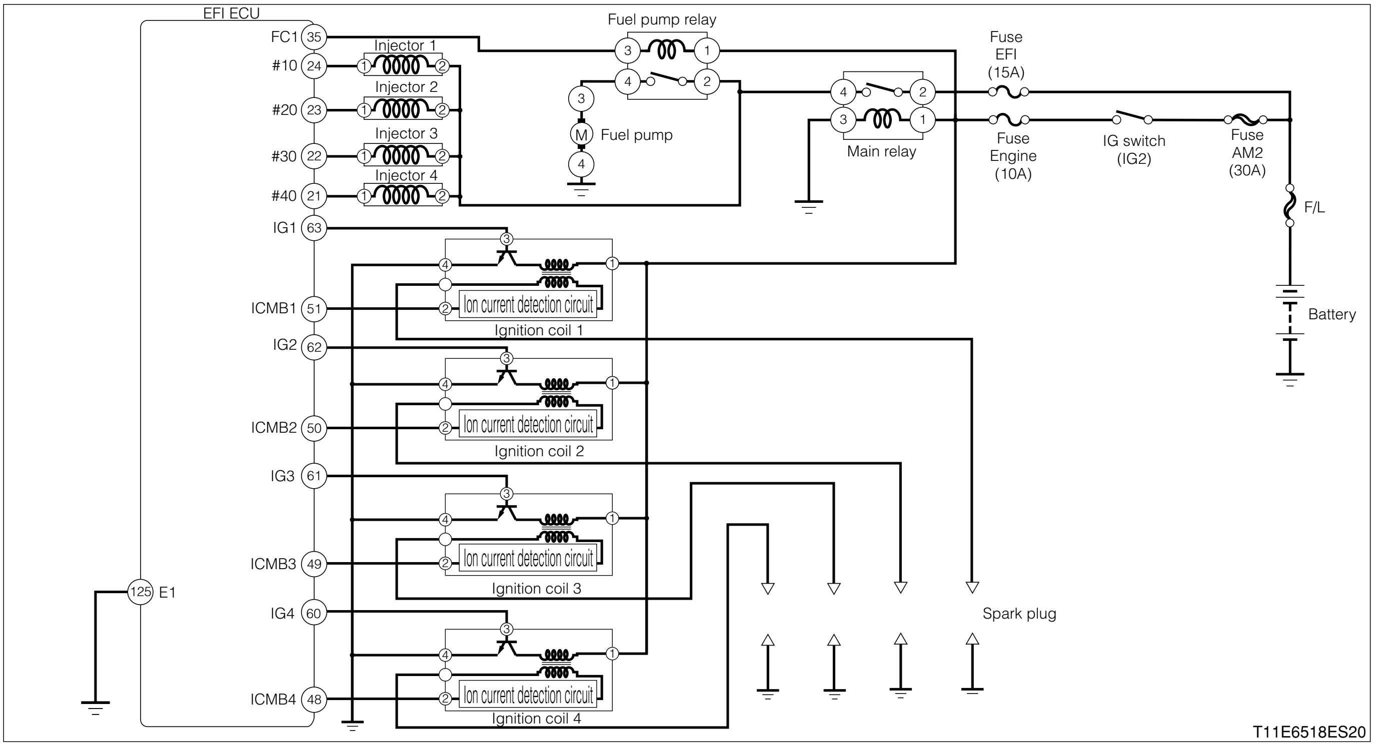
1.Perform unit check of the spark plug.
Refer to Page B8-472.

▼If it is OK, replace the EFI ECU.
Refer to Page B8-1.

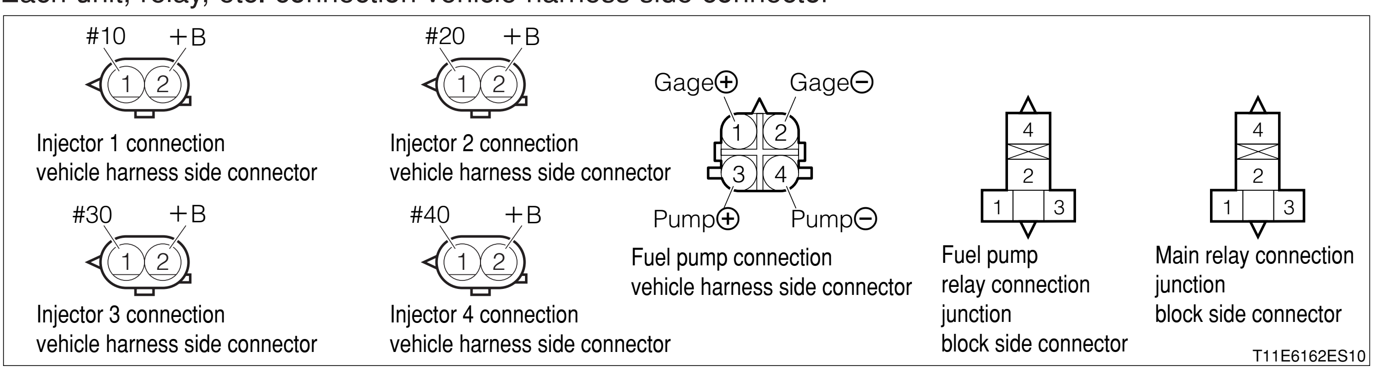
▼If it is NG, replace the spark plug.
Refer to Page B10-6.

9-12-9 DTC NO.P0300/17 RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED
DTC NO.P0301/17 MISFIRE DETECTED (CYLINDER 1)
DTC NO.P0302/17 MISFIRE DETECTED (CYLINDER 2)
DTC NO.P0303/17 MISFIRE DETECTED (CYLINDER 3)
DTC NO.P0304/17 MISFIRE DETECTED (CYLINDER 4)

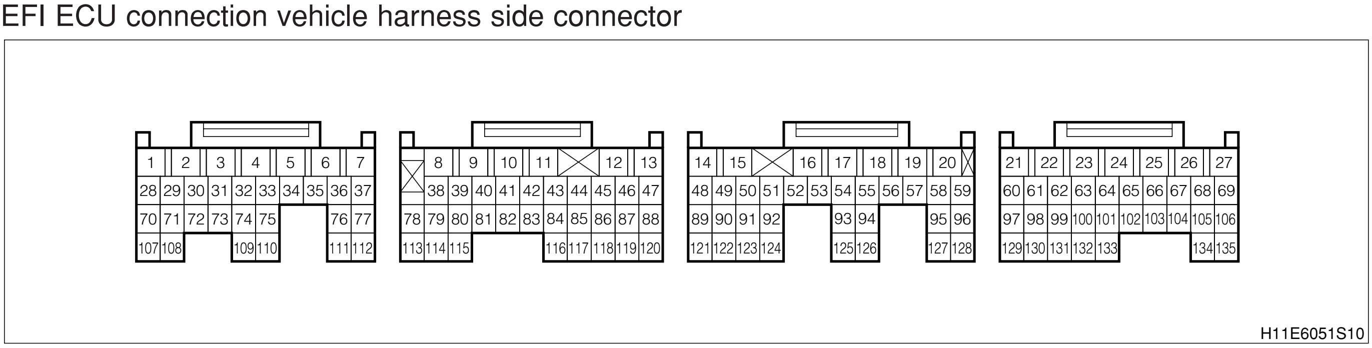
(1) System diagram



Each unit, relay, etc. connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

① **Misfire:**

1.The igniter unit detects the ion current that flows in proportion to the combustion pressure. This ion current is converted into a voltage, which will be inputted to the ECU. If the voltage value is below a certain value, the EFI ECU evaluate it as a misfire and counts its occurrence numbers.

2.When the misfire rate becomes or exceeds a number that indicates deteriorated engine conditions, this state will cause the malfunction indicator lamp (MIL) to be illuminated. If such a misfire is occurring whose misfire rate is high enough that the driving condition will most likely cause the catalyst to be overheated, the malfunction indicator lamp (MIL) will flash.

(3) Diagnosis code output conditions

① **P0300/17:**

1.Misfiring of random/multiple cylinders is detected during any particular 400 or 2000 ignitions.

② **P0301/17, P0302/17, P0303/17, P0304/17:**

1.For any particular 400 ignitions for engine, misfire is detected which can cause catalyst overheating. (This causes MIL to blink.)

2.For any particular 2000 ignitions for engine, misfire is detected which can cause deterioration in emissions.

NOTE

- When the 2 or more codes for a misfiring cylinder are recorded repeatedly but no random/multiply cylinder misfire code is recorded, it indicates that the misfire were detected and recorded at different times.

(4) Trouble area

1.Open wire/short circuit for the ignition system circuit
2.Open wire/short circuit for the ion system circuit
3.Injector
4.Fuel pressure
5.Combustion pressure
6.Manifold absolute pressure/ intake air temperature integral type sensor
7.Engine coolant temperature sensor
8.EFI ECU

(5) Points of inspection

1.Is the signal from the ignition coils (Igniter section) inputted to the ECU proper ?
2.Does the ignition coils (Igniter) operate proper ?
3.Is the harness between the injector and the ECU proper ?
4.Does the injector operate proper ?
5.Is the harness between the ECT sensor and the ECU proper ?
6.Is the output of the water temperature sensor normal?

(6) Inspection procedure

NOTE

- In order to memorize DTC of misfire, it is necessary to drive around MISFIRE RPM, MISFIRE LOAD in the data list for the following period of time.

Confirmation driving pattern

Engine speed	Time
Idling	3 minutes 30 seconds or more
1000 rpm	3 minutes or more
2000 rpm	1 minutes 30 seconds or more
3000 rpm	1 minutes or more

NOTE

- If it is the case that any DTC besides misfire is memorized simultaneously, first perform the troubleshooting for them.

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.
- When the vehicle is brought to the workshop and the misfire is not occurred, misfire can be confirmed by reproducing the condition of freeze frame data. Also, after finishing the repair, confirm that there is no misfire. (See the confirmation driving pattern)

① When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

Σ1. Visual check of inside of engine compartment.

1.Check the connecting conditions of the wire harnesses and connectors.

2.Check the vacuum hoses, purge hoses, fuel hoses and pipes for disconnection and breakage.

3.Are the check results OK?

▼<u>If it is OK, go to Σ2.</u>

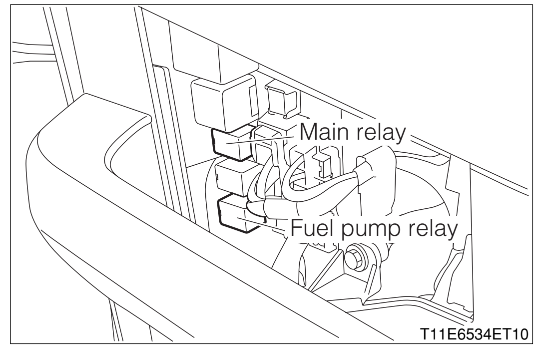
▼<u>If it is NG, repair or replace the defective point. Ensure that there is no misfiring. (Refer to the confirmation of the running pattern.)</u>

⊳2. Check of spark plug and spark of misfiring cylinder.

1.Warm up the engine.
2.Turn the IG switch to "LOCK".
3.Remove the fuel pump relay.
4.Let the engine idle and wait until it stops by itself.
5.Turn the IG switch to "LOCK".
6.Remove the connector of the injector.

CAUTION

- Stop the fuel injection through the above operation and prevent damaging the catalyst by the unburned gas.



7.Remove the ignition coils and spark plugs (Misfire cylinders).
8.Install the spark plug to the ignition coil.
9.Ground the spark plug.
10.Crank the engine at this time, check to see if the spark plug sparks.
11.Are sparks jumping?

▼If it is OK, go to ⊳3.

▼If it is NG, perform the following operation.

(1) Replace the spark plug
(2) Check the ignition system and ion system.

CAUTION

- Do not use any spark plugs other than those designated.

⊳3. Check of output signal of injector of misfiring cylinder.

1.With the IG switch turned "LOCK", perform restoration.
2.Set the SST (Sub-harness).

SST: 09842-97209-000

3.IG switch turned "ON".
4.As for the harness between the following terminals, measure the injector voltage of the cylinder where the misfiring is occurring.

(1) Between SST 24 (#10) and the body earth
(2) Between SST 23 (#20) and the body earth
(3) Between SST 22 (#30) and the body earth
(4) Between SST 21 (#40) and the body earth

SPECIFIED VALUE: Battery voltage

5.Observation of injector waveform with oscilloscope (Reference).
6.Check the oscillographic waveform between the following terminals during the idling.

(1) Between SST 24 (#10) and SST 125 (E1)
(2) Between SST 23 (#20) and SST 125 (E1)
(3) Between SST 22 (#30) and SST 125 (E1)
(4) Between SST 21 (#40) and SST 125 (E1)

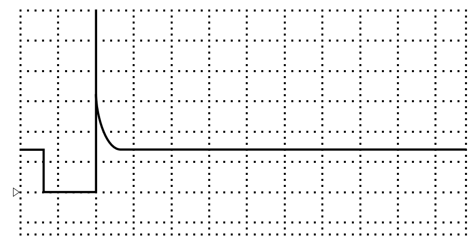
7.As an example, in case of the following measuring range and measuring conditions, it will be as in the right figure.

Time axis	2ms / DIV
Voltage axis	10V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".

NOTE

- The waveform cannot be specified, but confirm that a waveform as in the right figure (One such example) shows up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8.Confirm the following points.

(1) The voltage changes from the battery voltage to 0V while fuel injection.

9.Are the check results OK?

▼If it is OK, go to ⌦6.

▼If it is NG, go to ⌦4.

⌦4. Unit check of injector of misfiring cylinder.

1.Turn "LOCK" the IG switch.

2.Disconnect the injector connector of the misfiring cylinder.

3.Measure the resistance between the injector terminals (Injector side).

SPECIFIED VALUE: 12 Ω at 20°C

4.Are the unit check results OK?

▼If it is OK, go to ⌦5.

▼If it is NG, replace the injector.

Refer to Page B7-23.

⊳5. Wiring harness check

1.IG switch turned "LOCK".
2.Disconnect the SST connectors from the EFI ECU.
3.Check the harness and connector for open wire or short.
(1) Between the injector 1 connection vehicle harness side connector 1 (#10) and the EFI ECU connection vehicle harness side connector 24 (#10)
(2) Between the injector 2 connection vehicle harness side connector 1 (#20) and the EFI ECU connection vehicle harness side connector 23 (#20)
(3) Between the injector 3 connection vehicle harness side connector 1 (#30) and the EFI ECU connection vehicle harness side connector 22 (#30)
(4) Between the injector4 connection vehicle harness side connector1(#40) and the EFI ECU connection vehicle harness side connector21(#40)
SPECIFIED VALUE: Continuity exists.

(5) Between the injector 1 connection vehicle harness side connector 1 (#10) and the body earth
(6) Between the injector 2 connection vehicle harness side connector 1 (#20) and the body earth
(7) Between the injector 3 connection vehicle harness side connector 1 (#30) and the body earth
(8) Between the injector4 connection vehicle harness side connector1(#40) and the body earth
SPECIFIED VALUE: No continuity exists

4.Are the check results for open wire and short OK?
▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, repair or replace the harness or connector.

⊳6. Check of ion system.

1.Perform the trouble shooting for the code No.P1300/36.
Refer to Page B8-388.

2.Are the check results OK?
▼If it is OK, go to ⊳7.
▼If it is NG, repair or replace the defective point.

⊳7. Check of fuel pressure.

1.Check the fuel pressure.
Refer to Page B8-467.

2.Are the check results OK?
▼If it is OK, go to ⊳8.
▼If it is NG, check and repair the fuel pump, pressure regulator, fuel pipe line and filter.

⊳8. Check of injector injection.

1.Check the injector unit.
Refer to Page B8-472.

2.Are the check results OK?
▼If it is OK, go to ⊳9.
▼If it is NG, replace the injector.
Refer to Page B7-23.

⊳9. Manifold absolute pressure sensor unit check

1.Perform the unit check of the manifold absolute pressure sensor section.

Refer to Page B8-468.

2.Are the check results OK?

▼If it is OK, go to ⊳10.

▼If it is NG, replace the manifold absolute pressure sensor.

⊳10. Water temperature sensor unit check

1.Perform the unit check of the water temperature sensor.

Refer to Page B8-468.

2.Are the check results OK?

▼If it is OK, perform the following checks given below.

(1) Compression pressure

Refer to Page B1-24

(2) Valve clearance

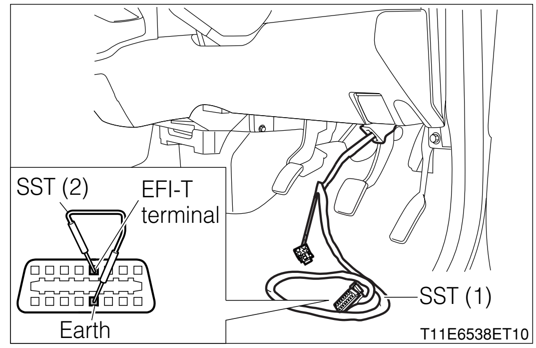
Refer to Page B1-22.

▼If it is NG, replace the engine coolant temperature sensor.

Refer to Page B8-235.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Diagnosis code check



1.Use the SST to short-circuit DLC terminals between 5 (EFI-T) - 13 (E).

SST: 09991-87404-000(1)
09991-87403-000(2)

2.Check whether the diagnosis code other than Code No.36 is outputted or not.

SPECIFIED VALUE: No output.

▼If it is OK, go to ⊳2.

▼In the case of NG, first check and repair a condition that caused the diagnosis code output.

⊳2. Unit check of spark plug

1.Check whether the designated spark plug is used. (See Engine Turning-up section for spark plug specifications.)

Refer to Page B1-20.

2.Perform the unit check of the spark plug

Refer to Page B8-472.

▼If it is OK, go to ⊳3.

▼If it is NG, clean or replace the spark plug. If a designated spark plug is not used, replace the spark plug with the designated spark plug.

⊳3. Spark check

WARNING

- There is a hazard potential for sparks are generated. Do not place combustible materials in the vicinity.

1.Warm up the engine.
2.Set the IG switch to "LOCK".
3.Remove the fuel pump relay.
4.Idle the engine and wait until the engine stops by itself.
5.Set the IG switch to "LOCK".
6.Remove all the connectors from the injector.

CAUTION

- Operations described above will stop fuel injection, thus preventing damage to the catalyst due to non-burned gas etc.

7.Remove the spark plug and install it to the ignition coil to earth the plug.
8.Check whether the spark plug generates sparks during cranking.

SPECIFIED VALUE: Sparks are generated.

▼If it is OK, go to ⊳8.

▼If it is NG, go to ⊳4.

⊳4. EFI ECU signal check (1)

1.Connect the SST.

SST: 09842-97209-000

2.Completely warm up the engine.

3.When the engine is in the starting condition, check an output waveform of an ignition signal between the following terminals using an oscilloscope.

(1) Between SST 63 (IG1) - SST 125 (E1)

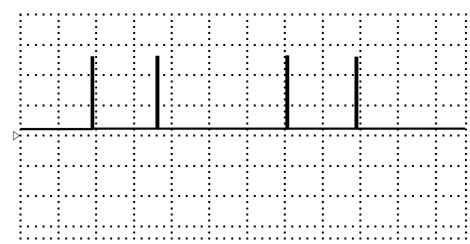
(2) Between SST 62 (IG2) - SST 125 (E1)

(3) Between SST 61 (IG3) - SST 125 (E1)

(4) Between SST 60 (IG4) - SST 125 (E1)

Time axis	100ms / DIV
Voltage axis	2V / DIV
Condition	Air-conditioner "OFF", no electrical load, idling

Air-conditioner "OFF": Set the air-conditioner switch (ACSW), blower switch (BLW), and magnet clutch (MGC) to "OFF".



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NOTE

- Check that the waveform shown in the figure [Example] is displayed.

4.Check the following points.

(1) The pulse of 0 ⇄ 5V is generated.

(2) The waveform cycle is shortened as the engine speed increases.

NOTE

- The ignition signal can not be judged correctly if an oscilloscope is not used.

▼<u>If it is OK, go to ⊳5.</u>

▼<u>If it is NG, check the EFI ECU circuit.</u>

Refer to Page A1-24.

⊳5. Wire harness continuity check (1)

1.Check continuity between the following terminals.

(1) Between ignition coil 1connection vehicle harness side connector 3 (IG1) - ECU connection vehicle harness side connector 63 (IG1)

(2) Between ignition coil 2 connection vehicle harness side connector 3 (IG2) - ECU connection vehicle harness side connector 62 (IG2)

(3) Between ignition coil 3 connection vehicle harness side connector 3 (IG3) - ECU connection vehicle harness side connector 61 (IG3)

(4) Between ignition coil 4 connection vehicle harness side connector 3 (IG4) - ECU connection vehicle harness side connector 60 (IG4)

SPECIFIED VALUE: Continuity exists

▼<u>If it is OK, go to ⊳6.</u>

▼<u>If it is NG, repair or replace the faulty harness.</u>

⊳6. Ignition coil voltage check

1.Measure the voltage between the following terminals when the IG switch is "ON".

(1) Between each ignition coil connection vehicle harness side connector 1 (+B) - body earth

SPECIFIED VALUE: Battery voltage

▼<u>If it is OK, go to ⊳7.</u>

▼<u>In the case of NG, repair or replace the harness between the following terminals.</u>

(2) Each ignition coil - battery

⊳7. Wire harness continuity check (2)

1.Check continuity between the following terminals.

(1) Between each ignition coil connection vehicle harness side connector 4 (E1) - ECU connection vehicle harness side connector 125 (E1)

SPECIFIED VALUE: Continuity exists.

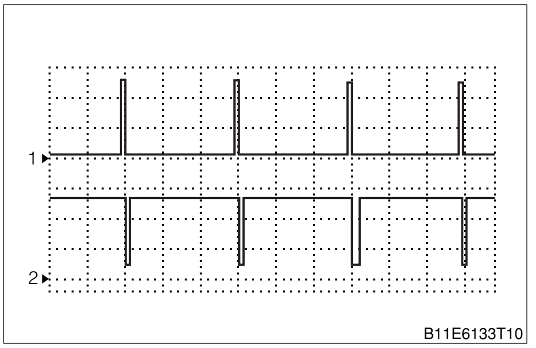
▼<u>If it is OK, replace the ignition coil.</u>

Refer to Page B10-6.

▼<u>In the case of NG, repair or replace the faulty harness.</u>

▷8. EFI ECU signal check (2)

1. Completely warm up the engine.
2. While idling, check each cylinder for output waveforms of the ignition signal (1▶) and ion current combustion control signal (2▶), using an oscilloscope, respectively.



	Channel	+ side measuring terminal	− side measuring terminal
Cylinder No.1	1▶	63 (IG1)	125 (E1)
	2▶	51 (ICMB1)	125 (E1)
Cylinder No.2	1▶	62 (IG2)	125 (E1)
	2▶	50 (ICMB2)	125 (E1)
Cylinder No.3	1▶	61 (IG3)	125 (E1)
	2▶	49 (ICMB3)	125 (E1)
Cylinder No.4	1▶	60 (IG4)	125 (E1)
	2▶	48 (ICMB3)	125 (E1)

Time axis	20ms / DIV
Voltage axis	2V / DIV
Condition	Water temperature is 80℃ or more; air conditioner is "ON"; electric load exists; during air conditioner idle up rotation

Air conditioner is "ON": Condition where all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "ON".
Electric load exists: Conditions where the headlight (H/L) and Defogger (DEF) are both "ON".
Air conditioner idle up rotation:950^{+100}_{-50} rpm(A/T vehicle), 850^{+100}_{-50} rpm(M/T vehicle),

NOTE

- **Check that waveforms like those in the figure (One example) is produced.**

3. Check the following points.
   (1) According to the output waveform of the ignition signal (Channel 1 ▶), the output waveform of the ion current combustion control signal (Channel 2▶) has been produced.
   (2) The waveform of 5 ⇄ 0V has been produced.

NOTE

- **Correct evaluation cannot be made for the ignition signals and ion current combustion control signals, unless you use an oscilloscope.**

	Waveform (Channel 2▶) state
a	Normal
b	Clamped at 0V.
c	Clamped at 5V.
d	Clamped to the battery voltage.
e	Waveform is unstable ※.

※: According to the output waveform of the ignition signal (Channel 1 ▶), the output waveform of the ion current combustion control signal (Channel 2▶) has not been produced.

▼<u>In the case of "a", go to ▷9.</u>
▼<u>In the case of "b", go to ▷11.</u>
▼<u>In the case of "c", go to ▷13.</u>
▼<u>In the case of "d", go to ▷12.</u>
▼<u>In the case of "e", go to ▷16.</u>

⋝9. EFI ECU signal check (3)

1.Retain the measurement conditions in ⋝8.

2.Under the following conditions, check each cylinder for output waveforms of the ion current combustion control signal, using an oscilloscope.

(1) Raise the engine revolution speed slowly from the idle state to 4000 rpm. Then, close the throttle opening quickly.

SPECIFIED VALUE: No waveform is outputted while fuel is cut.

▼If it is OK, replace the EFI ECU.

Refer to Page B8-1.

▼If it is NG, go to ⋝10.

⋝10. Fuel cut operation check

1.Check the output state between the following terminals using an oscilloscope.

(1) Between SST 24 (#10) - SST 125 (E1)
(2) Between SST 23 (#20) - SST 125 (E1)
(3) Between SST 22 (#30) - SST 125 (E1)
(4) Between SST 21 (#40) - SST 125 (E1)

2.Check the operating sound of the injector using a sound scope when the fuel cut is active.

NOTE

- Check operating sound, while checking the output waveform to the injector using an oscilloscope.

SPECIFIED VALUE: The operating sound of the injector stops when the fuel cut is active.

▼If it is OK, replace the ignition coil.

Refer to Page B10-6.

▼In the case of NG, perform unit check of the injector.

Refer to Page B8-472.

⋝11. Check of wire harness for short-circuit (1)

1.Check continuity of the cylinder whose waveform is clamped at 0V.

(1) Between ignition coil 1 connection vehicle harness side connector 2 (ICMB1) - body earth
(2) Between ignition coil 2 connection vehicle harness side connector 2 (ICMB2) - body earth
(3) Between ignition coil 3 connection vehicle harness side connector 2 (ICMB3) - body earth
(4) Between ignition coil 4 connection vehicle harness side connector 2 (ICMB4) - body earth

SPECIFIED VALUE: No continuity exists

▼If it is OK, replace the ignition coil.

Refer to Page B10-6.

▼In the case of NG, repair the faulty section.

ᐅ12. Check of wire harness for short-circuit (2)

1.Check continuity of the cylinder whose waveform is clamped to the battery voltage.
 (1) Between ignition coil 1 connection vehicle harness side connector 2 (ICMB1) - battery positive (+) terminal
 (2) Between ignition coil 2 connection vehicle harness side connector 2 (ICMB2) - battery positive (+) terminal
 (3) Between ignition coil 3 connection vehicle harness side connector 2 (ICMB3) - battery positive (+) terminal
 (4) Between ignition coil 4 connection vehicle harness side connector 2 (ICMB4) - battery positive (+) terminal

SPECIFIED VALUE: No continuity exists

▼<u>If it is OK, replace the ignition coil.</u>

Refer to Page B10-6.

▼<u>In the case of NG, repair or replace the faulty component.</u>

ᐅ13. Check of wire harness for open wire

1.Check continuity of the cylinder whose waveform is clamped at 5V.
 (1) Between ignition coil 1connection vehicle harness side connector 2 (ICMB1) - EFI ECU connection vehicle harness side connector 51 (ICMB1)
 (2) Between ignition coil 2 connection vehicle harness side connector 2(ICMB2) - EFI ECU connection vehicle harness side connector 50 (ICMB2)
 (3) Between ignition coil 3 connection vehicle harness side connector 2 (ICMB3) - EFI ECU connection vehicle harness side connector 49 (ICMB3)
 (4) Between ignition coil 4 connection vehicle harness side connector 2 (ICMB4) - EFI ECU connection vehicle harness side connector 48 (ICMB4)

SPECIFIED VALUE: Continuity exists

▼<u>If it is OK, go to ᐅ14.</u>
▼<u>In the case of NG, repair or replace the faulty component.</u>

ᐅ14. Check of short-circuit between the wire harnesses

1.Check whether the cylinder, whose waveform is clamped at 5V, is short-circuited to the power wire of the sensor system.

NOTE

- The power supply for the sensor system is 5V.

 (1) Between ignition coil 1 connection vehicle harness side connector 2 (ICMB1) - body earth
 (2) Between ignition coil 2 connection vehicle harness side connector 2 (ICMB2) - body earth
 (3) Between ignition coil 3 connection vehicle harness side connector 2 (ICMB3) - body earth
 (4) Between ignition coil 4 connection vehicle harness side connector 2 (ICMB4) - body earth

SPECIFIED VALUE: 0V

▼<u>If it is OK, replace the ignition coil and go to ᐅ15.</u>

Refer to Page B10-6.

▼<u>In the case of NG, repair or replace the faulty component.</u>

ᐅ15. EFI ECU signal recheck (1)

1.Recheck the cylinder, whose waveform is clamped at 5V, under the ᐅ8 conditions.

2.Check that the output waveform of the ion current combustion control signal (Channel 2▶) is not clamped at 5V.

SPECIFIED VALUE: The output waveform (Channel 2▶) is not clamped at 5V.

▼If it is OK, finish the troubleshooting.

▼In the case of NG, misfire may have occurred. Identify the cause of the misfire and repair.

ᐅ16. Harness, connector check

1.When the following actions are taken to the cylinder whose waveform is unstable , check whether the waveform will change or not.

(1) Lightly shake the connector vertically and laterally.

(2) Lightly shake the wire harness vertically and laterally.

SPECIFIED VALUE: There is no change in the waveform.

2.Perform the following checks.

(1) Connector fitting condition

(2) Loose connection of the connector and the terminal.

SPECIFIED VALUE: No fault.

▼If it is OK, replace the ignition coil and go to ᐅ17.

Refer to Page B10-6.

▼In the case of NG, repair or replace the faulty component.

ᐅ17. EFI ECU signal recheck (2)

1.Recheck the cylinder, whose waveform is unstable, under the ᐅ8 conditions.

2.Check that the output waveform of the ion current combustion control signal (Channel 2▶) is outputted stably.

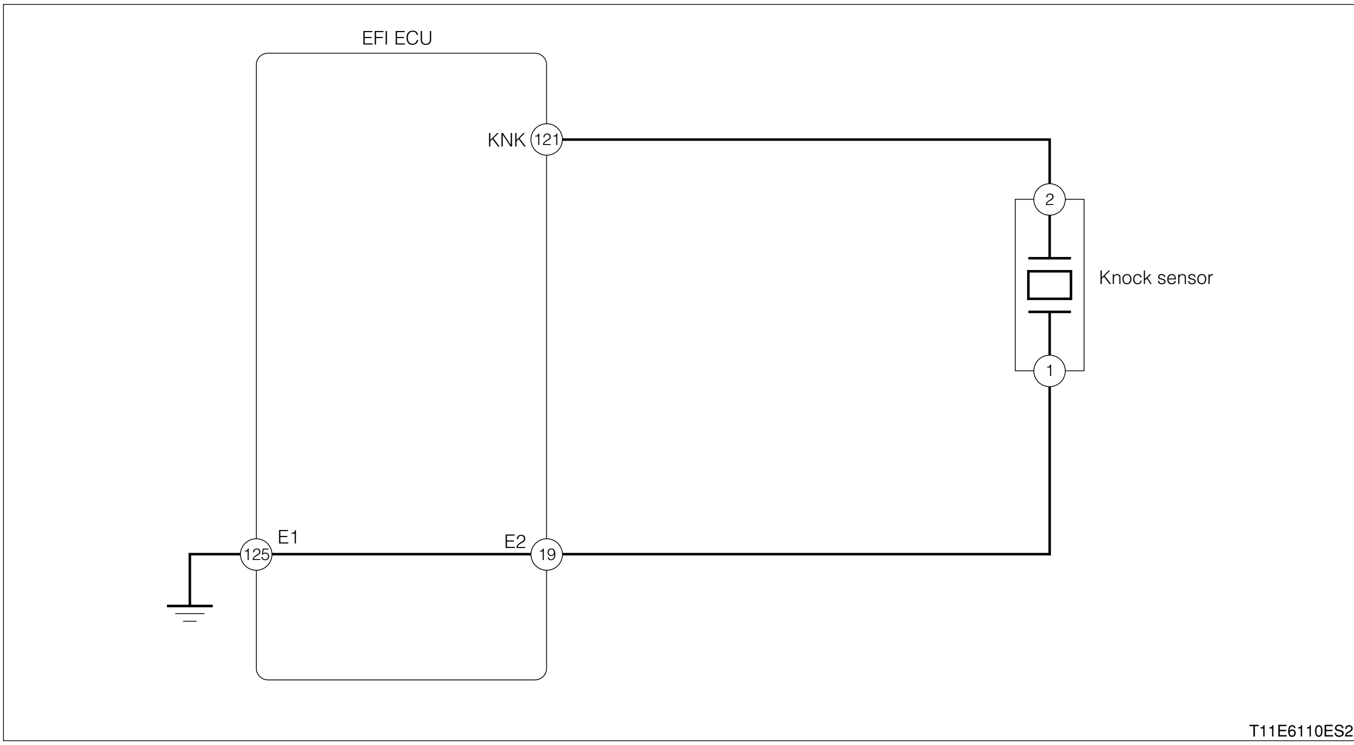
SPECIFIED VALUE: The output waveform (Channel 2▶) is outputted stably.

▼If it is OK, finish the troubleshooting.

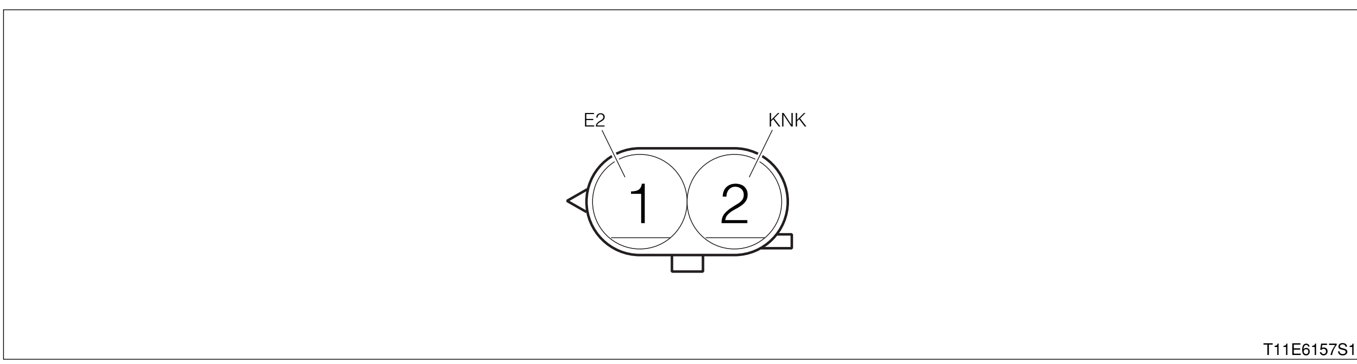
3.In the case of NG, combustion instability may have occurred. Identify the cause of the combustion instability and repair.

9-12-10 DTC NO.P0325/18 KNOCK SENSOR 1 CIRCUIT MALFUNCTION

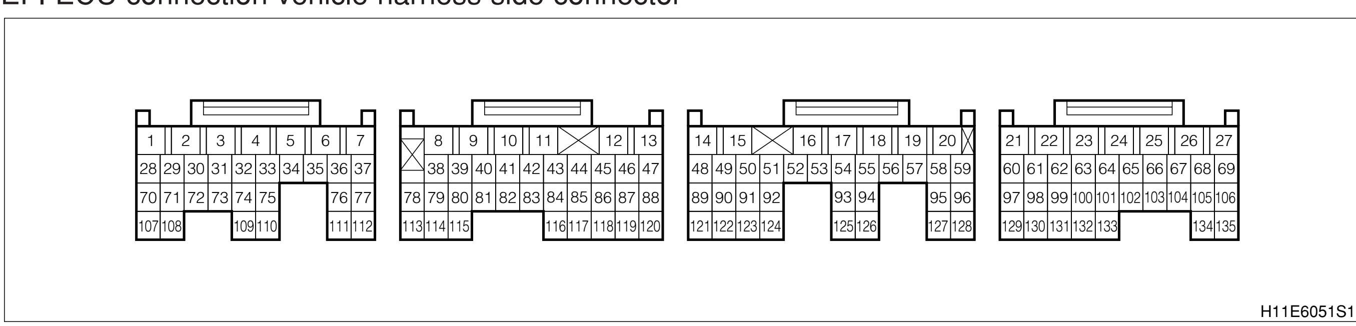
(1) System diagram



Knock sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1. The knock sensor is installed at the cylinder block. The knock sensor detects the occurrence of knocking indirectly from the cylinder block vibration that is caused by the knocking.
2. The knock sensor incorporates a piezo element, whereby the vibration inside the cylinder block is converted to an electric signal.

(3) Diagnosis code output conditions

1. When the signals from the knock sensor are not outputted continuously after starting over a certain length of time.

(4) Trouble area

1.Open wire or short circuit for knock sensor system circuit
2.Knock sensor
3.EFI ECU

(5) Checking points

1.Is the signal from the knock sensor inputted to the EFI ECU?
2.Is the harness between the knock sensor and the EFI ECU normal?
3.Is the output of the knock sensor normal?

(6) Inspection procedure

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⊳1. Check of continuity of knock sensor circuit.

1.IG switch turned "LOCK".
2.Set the SST (Sub-harness). However, the SST connector should remain disconnected from the ECU connector.
SST: 09842-97209-000

3.Measure the resistance between the following terminals.
(1) Between SST 121 (KNK) and 19 (E2)
SPECIFIED VALUE: 200±80kΩ

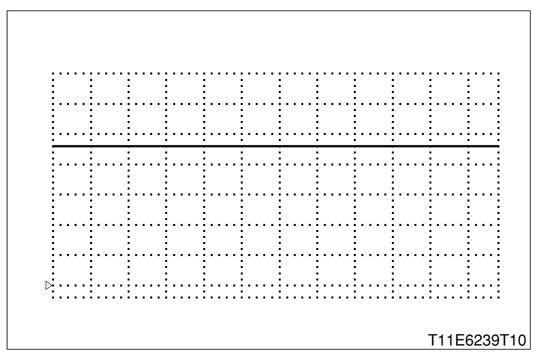
4.Are the unit check results OK?
▼<u>If it is OK, go to ⊳2.</u>
▼<u>If it is NG, replace the knock sensor.</u>

⊳2. EFI ECU signal check

1.Connect the SST connector at the EFI ECU side.
2.Start the engine.
3.Perform output check between the following terminals using an oscilloscope.
(1) Between SST 121 (KNK) - SST 19 (E2)

Time axis	50μs /DIV
Voltage axis	500mV / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling

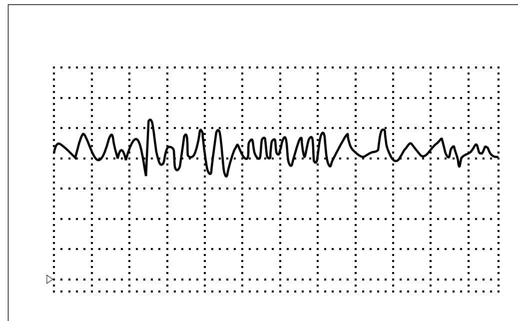
Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".



NOTE

- The waveform cannot be specified, but ensure that a waveform as in the right figure (One such example) shows up.

Time axis	50μs / DIV
Voltage axis	500mV / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while racing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Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".

NOTE

- The waveform cannot be specified, but ensure that a waveform as in the right figure (One such example) shows up.

4.Is each of the waveform outputted when idling and when racing?

▼If it is OK, check the EFI ECU circuit.

Refer to Page A1-24.

▼If it is NG, proceed to ⌦3.

⌦3. Wiring harness check

1.Check the harness and connector between the EFI ECU and the knock sensor for open wire or short.

(1) Between the knock sensor connection vehicle harness side connector 2 (KNK) and the EFI ECU connection vehicle harness side connector 121 (KNK)

(2) Between the knock sensor connection vehicle harness side connector 1 (E2) and the EFI ECU connection vehicle harness side connector 19 (E2)

SPECIFIED VALUE: Continuity exists.

(3) Between the knock sensor connection vehicle harness side connector 2 (KNK) and the body earth

(4) Between the knock sensor connection vehicle harness side connector 1 (E2) and the body earth

SPECIFIED VALUE: No continuity exists

2.Are the check results for open wire and short OK?

▼If it is OK, go to ⌦4.

▼If it is NG, repair or replace the harness or connector.

⌦4. Unit check the knock sensor.

1.Perform the unit check of the knock sensor.

Refer to Page B8-470.

▼If it is OK, go to ⌦5.

▼If it is NG, check the EFI ECU circuit.

Refer to Page A1-24.

⌦5. Check of knock sensor installation state

1.Check the knock sensor for installing condition (E.G. looseness, installation angle).

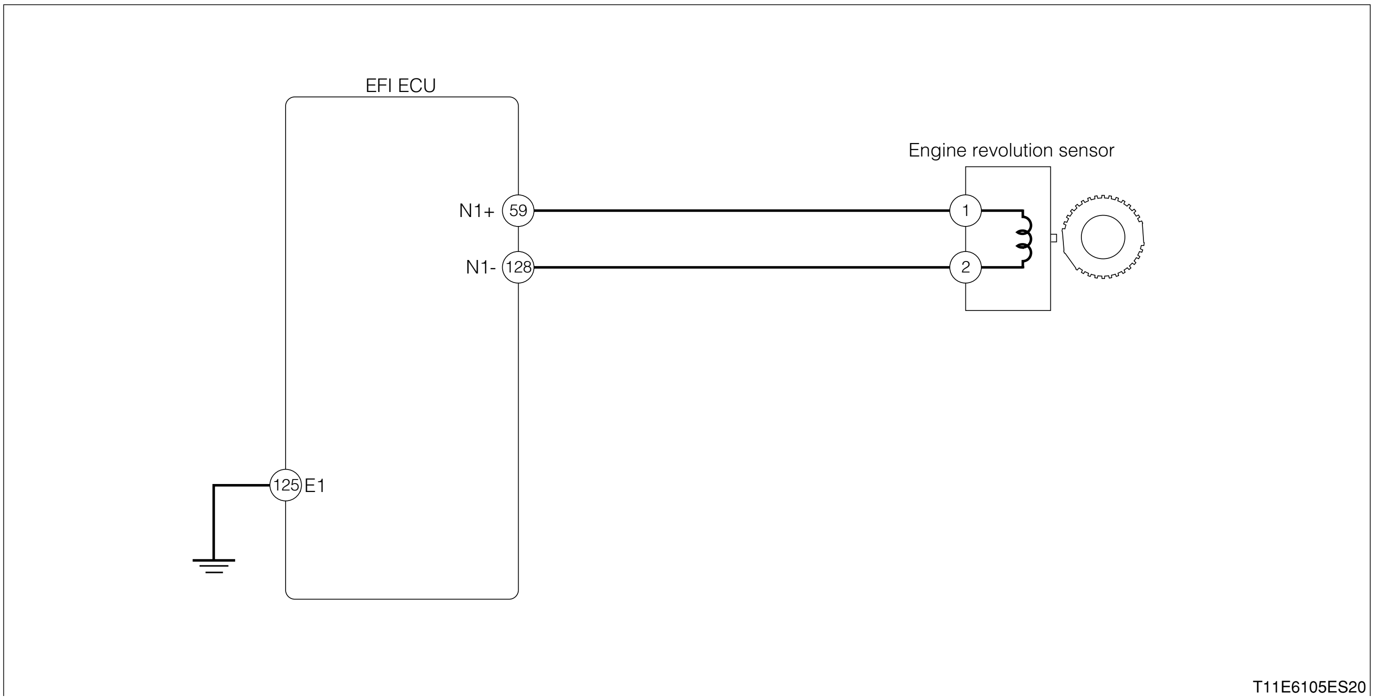
2.Are the check results OK?

▼If it is OK, check or replace the EFI ECU.

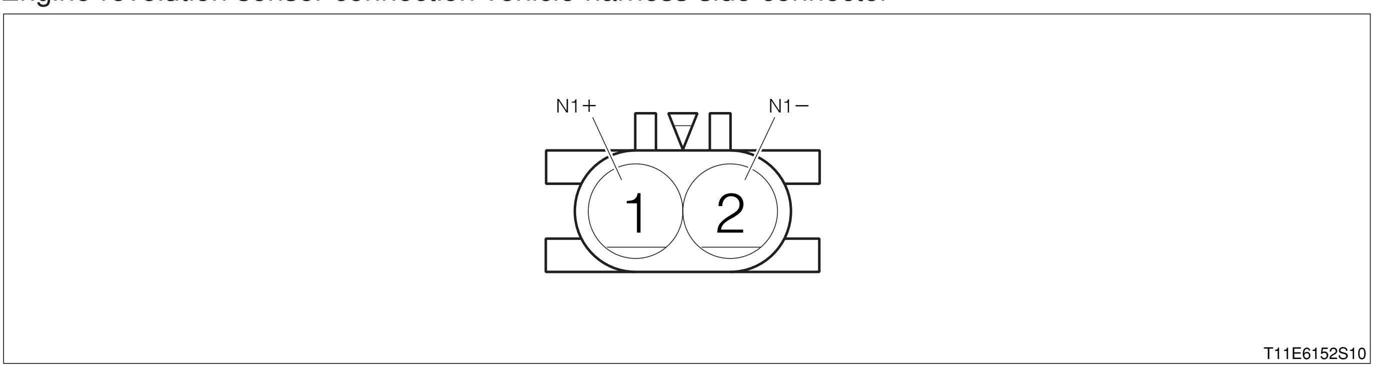
▼If it is NG, tighten the knock sensor.

9-12-11 DTC NO.P0335/13 ENGINE REVOLUTION SENSOR CIRCUIT MALFUNCTION

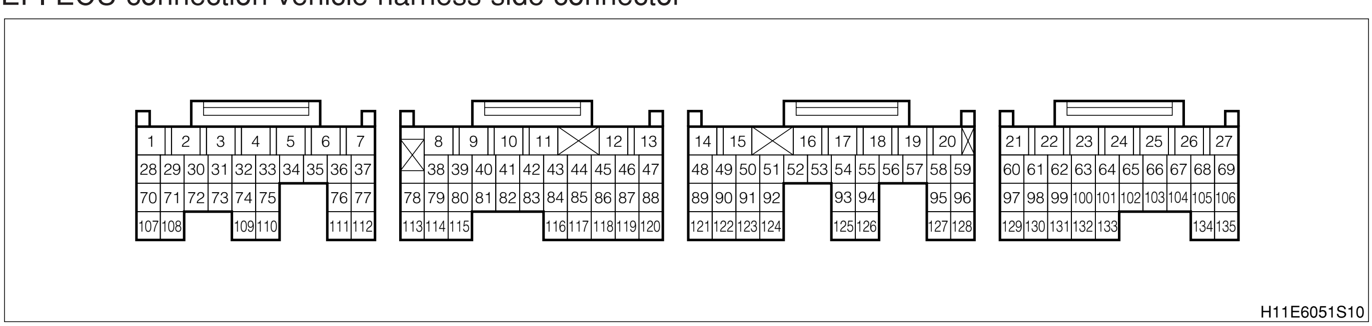
(1) System diagram



Engine revolution sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1.The signal rotor is installed at the front side of the crankshaft so as to detect the crank angle. Furthermore, a pickup coil (Engine revolution sensor) is provided in relation to the projection of this signal rotor.

2.When the crankshaft turns, the air gap between the signal rotor projection and the engine revolution sensor varies and pulses are generated. The engine revolution is calculated based on the intervals of these pulses.

(3) Diagnosis code output conditions

1.No revolution signal is inputted, even once, while the cranking is continued for several seconds.

(4) Trouble area

1.Open wire or short circuit for engine revolution sensor system circuit
2.Engine revolution sensor
3.EFI ECU

(5) Checking points

1.Is the signal from the engine revolution sensor inputted to the EFI ECU?
2.Is the harness between the engine revolution sensor and the EFI ECU normal?
3.Is the output of the engine revolution sensor normal?

(6) Inspection procedure

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

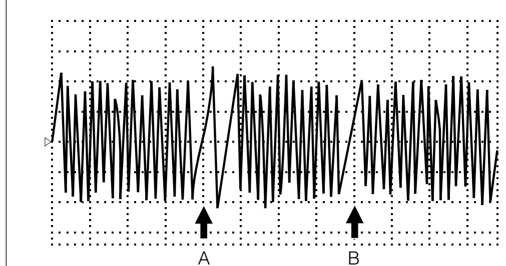
⊵1. EFI ECU signal check

1.Connect the SST.
SST: 09842-97209-000

2.Perform the output check between the following terminals using an oscilloscope.
(1) Between SST 59 (N1＋) - SST 128 (N1－)
SPECIFIED VALUE:

Time axis	10ms /DIV
Voltage axis	2V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling

When air conditioner is "OFF" with no electric load and while idling



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NOTE

- The waveform cannot be specified, but ensure that a waveform as in the right figure (One such example) shows up.

3.Confirm the following points.
(1) Each of the cylinder distinguishing signals (A) and (B) is coming out.
(2) The wave period becomes shorter as the engine revolution speed rises.

▼<u>If it is OK, check the EFI ECU circuit.</u>
Refer to Page A1-24.

▼<u>If it is NG, proceed to ⊵2.</u>

⊳2. Check of wire harness continuity

1.Perform continuity checks between each of the following terminals.

(1) Between sensor connection vehicle harness side connector 1 (N1＋) - ECU connection vehicle harness side connector 59 (N－)

(2) Between sensor connection vehicle harness side connector 2 (N1－) - ECU connection vehicle harness side connector 128 (N－)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳3.

▼If it is NG, repair the harness and connectors.

⊳3. Engine rev sensor unit check

1.Perform unit check of the engine rev sensor.

Refer to Page B8-468.

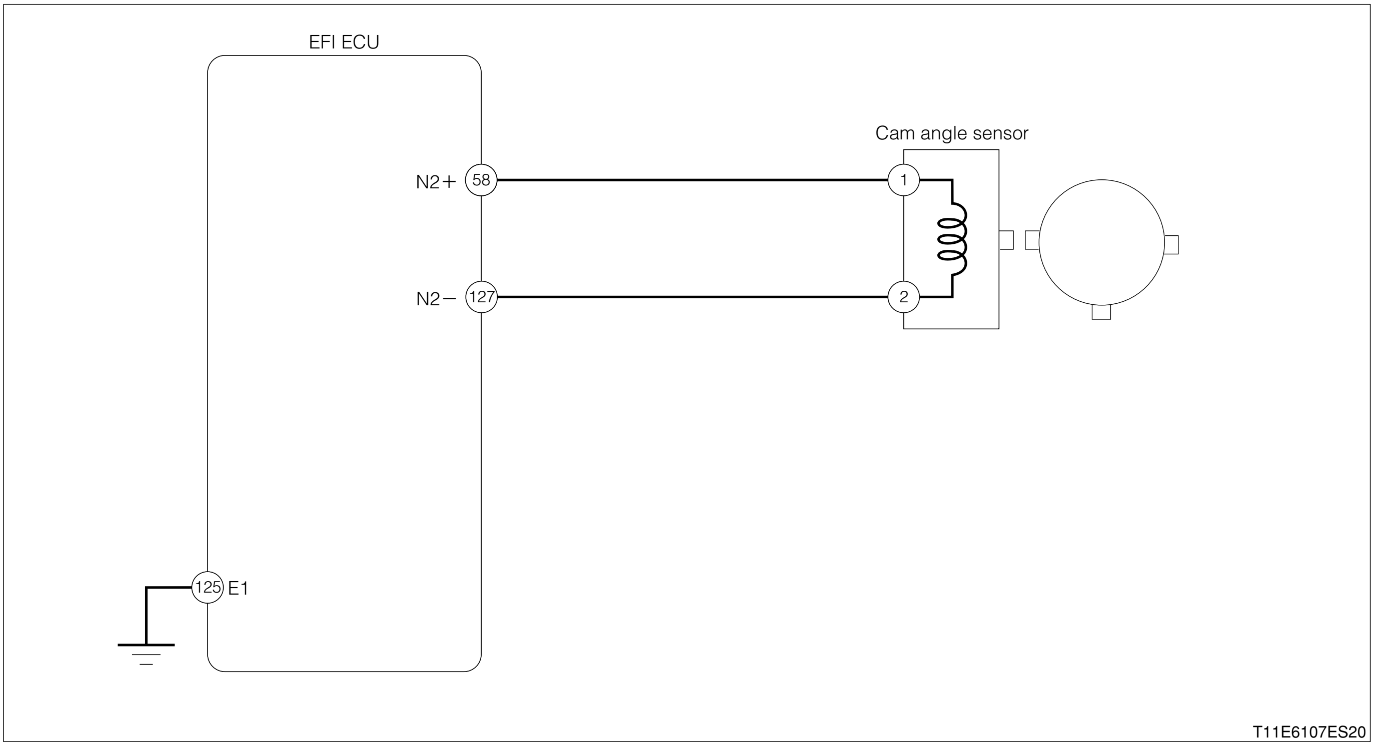
▼If it is OK, check the connecting condition of each connector.

▼If it is NG, replace the engine rev sensor.

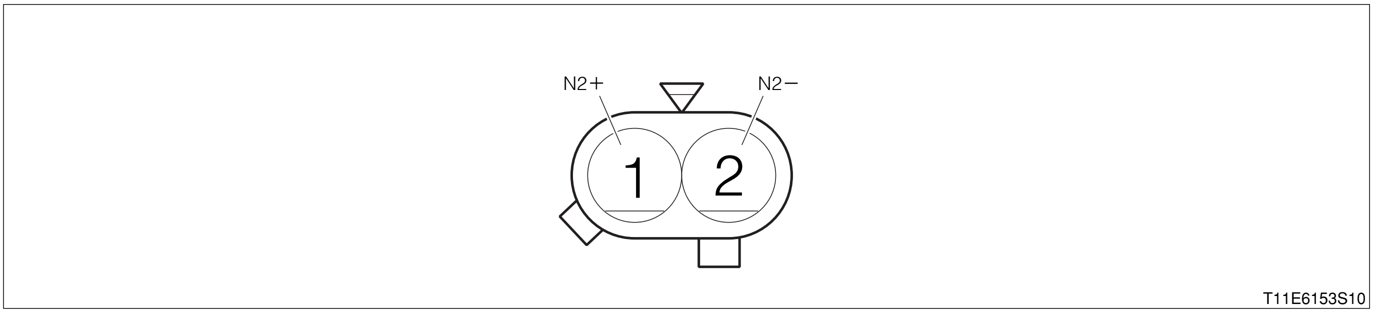
Refer to Page B8-3.

9-12-12 DTC NO.P0340/14 CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION

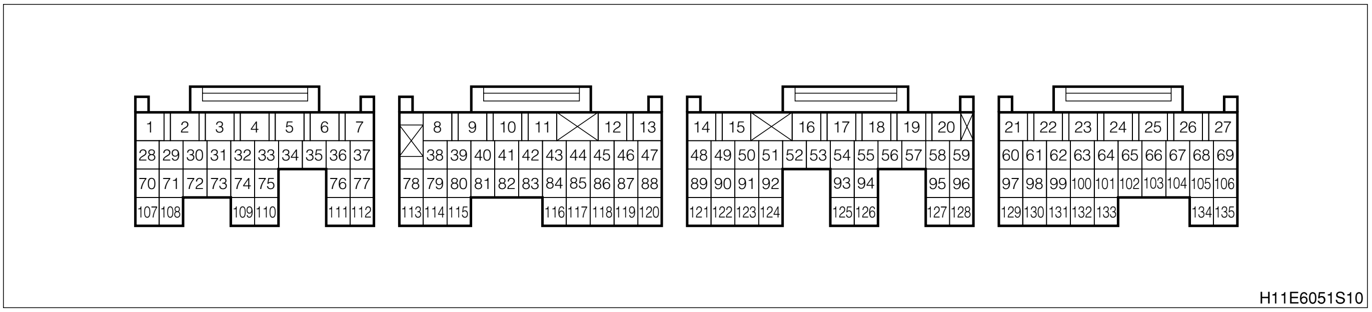
(1) System diagram



Cam angle sensor connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1.The cam angle sensor consists of a signal rotor and a pickup coil. The signal rotor is mounted to the intake side camshaft, using three teeth. As for the NE signal, three signals are outputted per one revolution of the engine. The phases of the camshaft and crankshaft are detected based on the signal from the cam angle sensor and the signal from the engine revolution sensor. Based on these phases, the variable valve timing is controlled.

(3) Diagnosis code output conditions

1.When the signal from the cam angle sensor is not outputted over a certain length of time after the starting,

(4) Trouble area

1.Open wire or short circuit for Camshaft angle sensor system circuit
2.Camshaft angle sensor
3.EFI ECU

(5) Checking points

1.Is the signal from the cam angle sensor inputted to the EFI ECU?
2.Is the harness between the cam angle sensor and the EFI ECU normal?
3.Is the output of the cam angle sensor normal?

(6) Inspection procedure

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

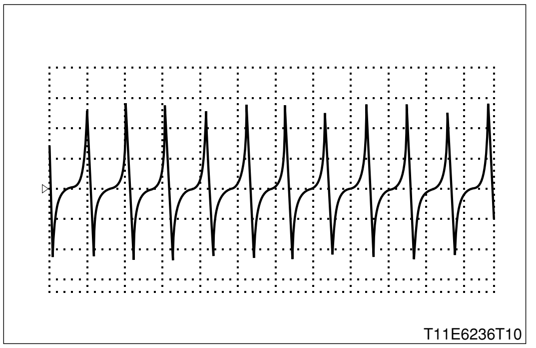
⊳1. EFI ECU signal check

1.Connect the SST.
SST: 09842-97209-000

2.Perform output check between the following terminals using an oscilloscope.
(1) Between SST 58 (N2＋) - SST 127 (N2－)
SPECIFIED VALUE:

Time axis	50ms /DIV
Voltage axis	1V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".



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NOTE

- The waveform cannot be specified, but ensure that a waveform as in the right figure (One such example) shows up.

3.Confirm the following points.
(1) Periodic wave is showing up.
(2) The wave period becomes shorter as the engine revolution speed rises.

▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, proceed to ⊳2.

⊳2. Check of wire harness continuity

1.Perform continuity checks between each of the terminals.
(1) Between sensor connection vehicle harness side connector 1 (N2＋) - ECU connection vehicle harness side connector 58 (N2＋)
(2) Between sensor connection vehicle harness side connector 2 (N2－) - ECU connection vehicle harness side connector 127 (N2－)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳3.
▼If it is NG, repair the harness and connectors.

⊳3. Camshaft position sensor unit check

1.Perform unit check of the camshaft position sensor.

Refer to Page B8-468.

▼<u>If it is OK, check the connecting condition of each connector.</u>

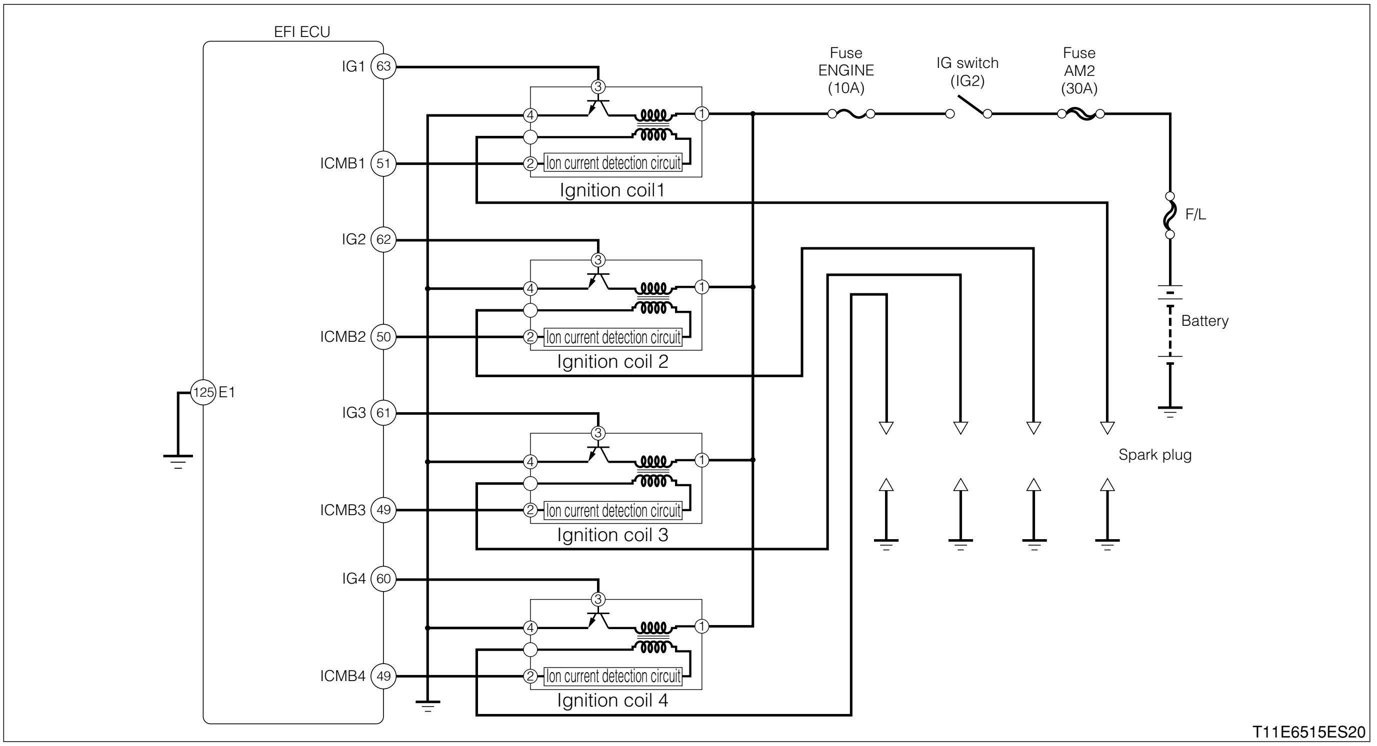
▼<u>If it is NG, replace the camshaft position sensor.</u>

Refer to Page B8-232

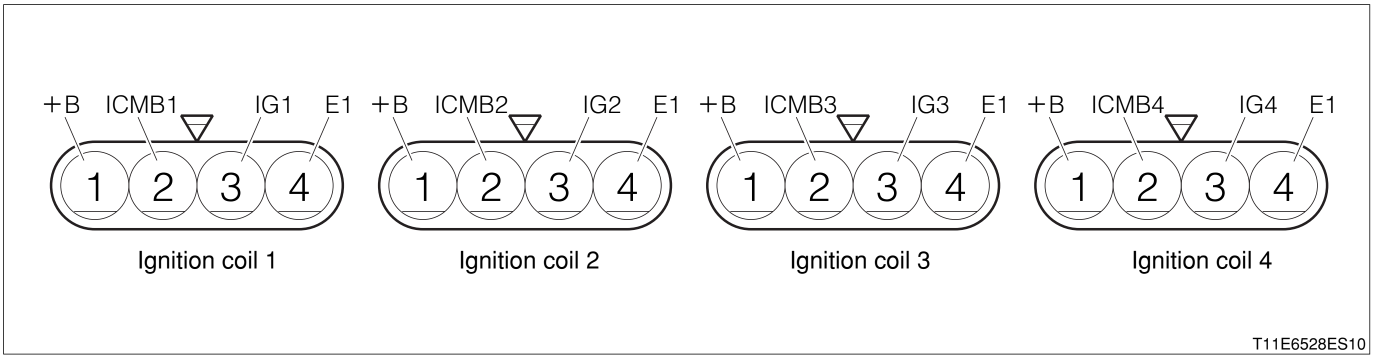
9-12-13 DTC NO.P0350/16 IGNITION SYSTEM CIRCUIT MALFUNCTION

(1) System diagram

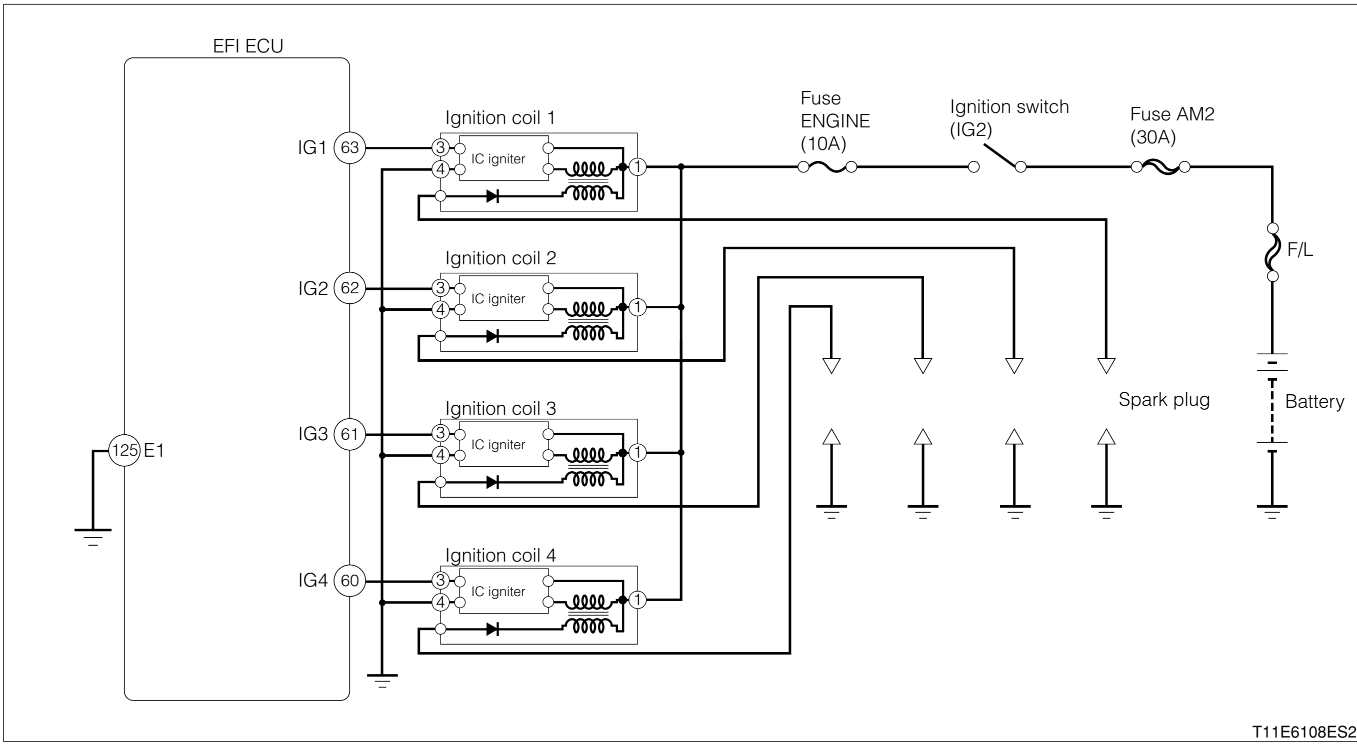
① For EU specifications



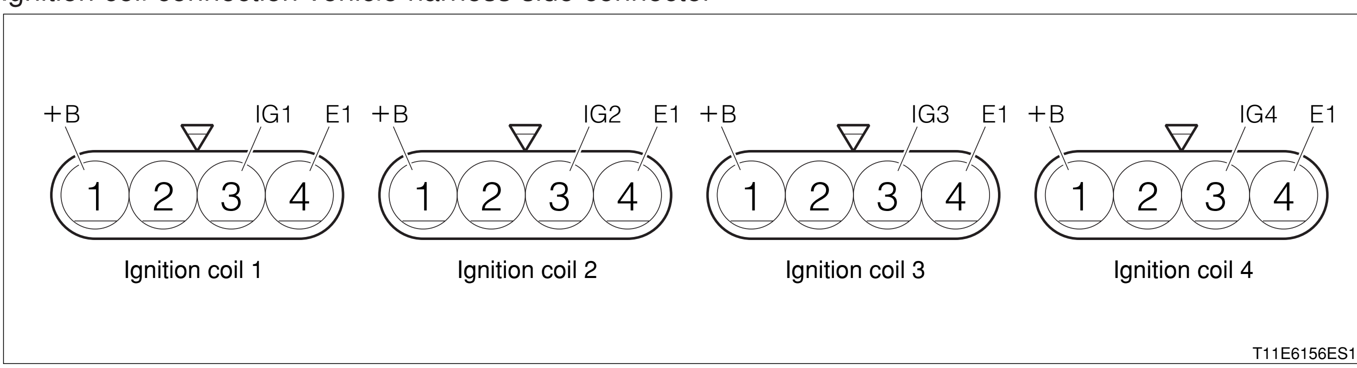
Ignition coil connection vehicle harness side connector



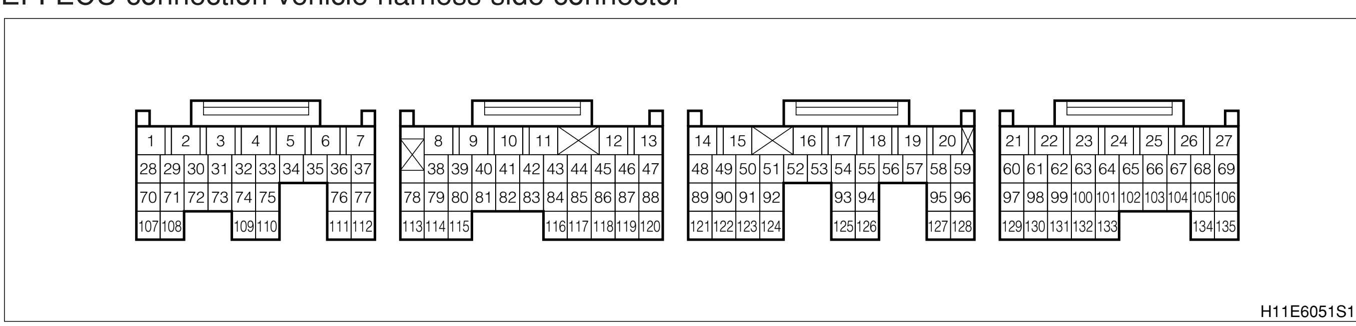
② **For general specifications**



Ignition coil connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1.A DLI (Distributorless Ignition) system has been employed.

2.The DLI system has no distributor. Furthermore, the ignition coil is located just above the spark plug. Consequently, there is no ignition energy loss due to the electricity distribution, thus making it possible to directly furnish the electric energy induced at the coil. Therefore, an optimum ignition condition can be obtained at all times.

(3) Diagnosis code output conditions

1.When the ignition signal is not outputted consistently for a certain length of time after starting:

(4) Trouble area

1.Open wire/short circuit for the ignition system circuit
2.Ignition coil
3.Battery
4.EFI ECU

(5) Checking points

1.Is the power supply voltage of the ignition coil normal?
2.Is the harness between the ignition coil and EFI ECU normal?
3.Is the sparks of the spark plug proper?

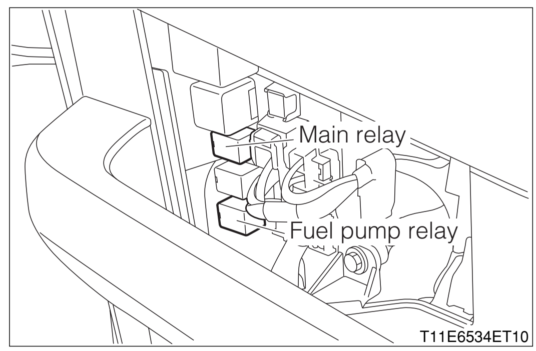
(6) Inspection procedure

⌦1. Spark check

1.Warm up the engine.
2.Turn the IG switch to "LOCK".
3.Remove the fuel pump relay.
4.Let the engine idle and wait until it stops by itself.
5.Turn the IG switch to "LOCK".
6.Remove the connector of the injector.

CAUTION

- Stop the fuel injection through the above operation and prevent damaging the catalyst by the unburned gas.



7.Remove the spark plug and earth it by attaching it to the ignition coil.
8.When cranking, check if the sparks are flying in the spark plugs.

SPECIFIED VALUE: The sparks are generated.

▼If it is OK, the ignition system is normal.
▼If it is NG, proceed to ⌦2.

⌦2. EFI ECU signal check

1.Connect the SST.

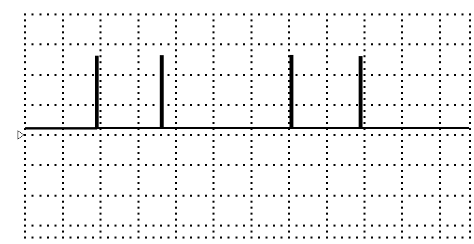
SST: 09842-97209-000

2.With the engine started, check the output waveform of the ignition signal between each of the following terminals using an oscilloscope.

(1) Between SST 63 (IG1) - SST 125 (E1)
(2) Between SST 62 (IG2) - SST 125 (E1)
(3) Between SST 61 (IG3) - SST 125 (E1)

(4) Between SST 60 (IG4) - SST 125 (E1)

Time axis	100ms / DIV
Voltage axis	2V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling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Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".

NOTE

- Ensure that a waveform as in the right figure (One such example) shows up.

3.Confirm the following points.

(1) The pulse of 0 ⇄ 5V battery voltage is generated.

(2) The wave period becomes shorter as the engine revolution speed rises.

NOTE

- Correct judgment cannot be made concerning the ignition signal without using the oscilloscope.

▼If it is OK, proceed to ⌦3.

▼If it is NG, check the EFI ECU circuit.

Refer to Page A1-24.

⌦3. Ignition coil voltage check

1.Measure the voltage between the following terminals when the IG switch is "ON".

(1) Between each ignition coil connection vehicle harness side connector 1 (+B) - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⌦4.

▼If it is NG, repair or replace the harness between the following terminals.

(1) Between each ignition coil - battery

⌦4. Wire harness continuity check (1)

1.Perform continuity checks between each of the following terminals.

(1) Between ignition coil 1 connection vehicle harness side connector 3 (IG1) - ECU connection vehicle harness side connector 63 (IG1)

(2) Between ignition coil 2 connection vehicle harness side connector 3 (IG2) - ECU connection vehicle harness side connector 62 (IG2)

(3) Between ignition coil 3 connection vehicle harness side connector 3 (IG3) - ECU connection vehicle harness side connector 61 (IG3)

(4) Between ignition coil 4 connection vehicle harness side connector 3 (IG4) - ECU connection vehicle harness side connector 60 (IG3)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⌦5.

▼If it is NG, repair or replace the harness of the defective sections.

⊳5. Check of wire harness continuity (2)

1.Perform continuity checks for each of the following terminals

(1) Between each ignition coil connection vehicle harness side connector 4 (E1) - ECU connection vehicle harness side connector 125 (E1)

SPECIFIED VALUE: Continuity exists.

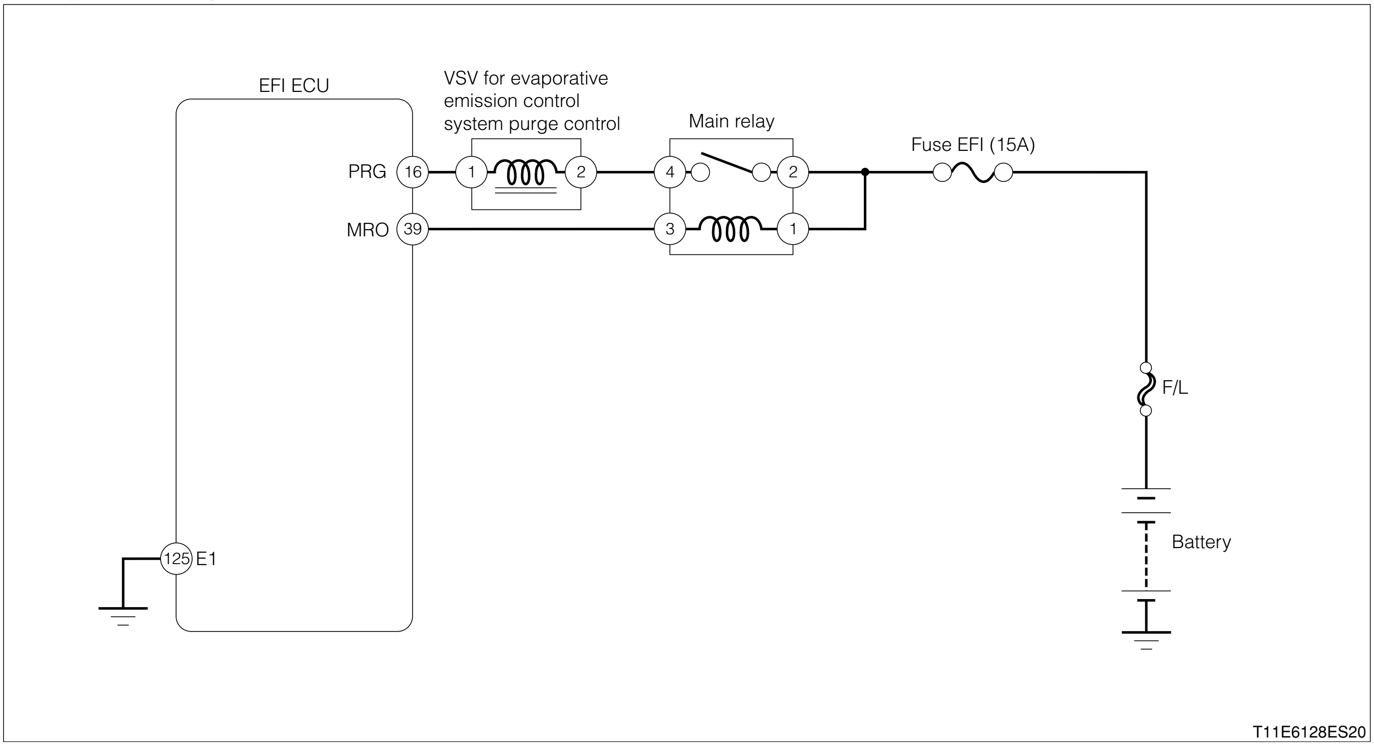
▼<u>If it is OK, replace the ignition coil.</u>

Refer to Page B10-6.

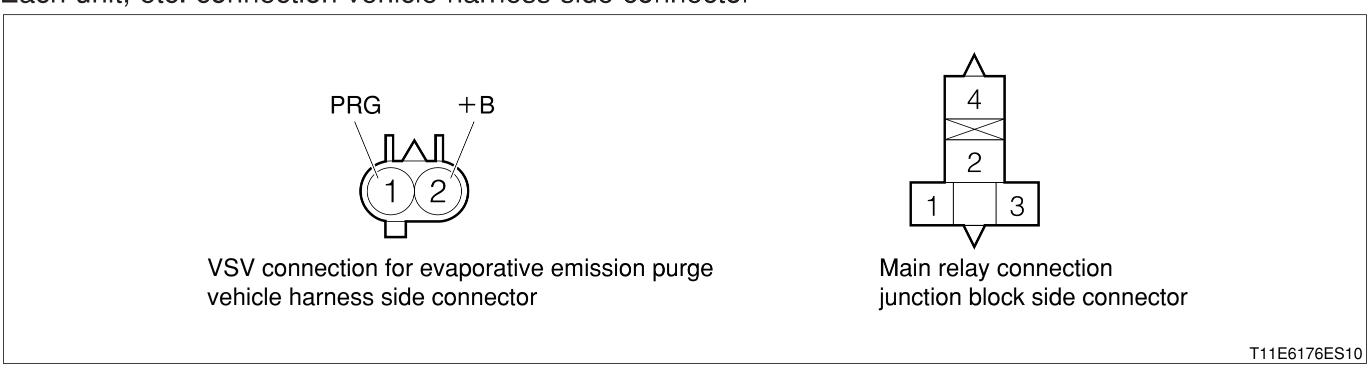
▼<u>If it is NG, repair or replace the harness of the defective sections.</u>

9-12-14 DTC NO.P0443/76 VSV FOR EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL

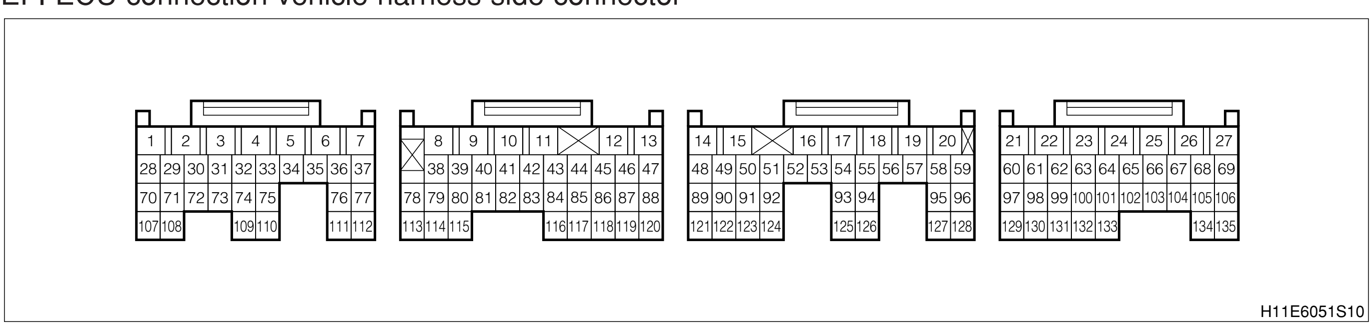
(1) System diagram



Each unit, etc. connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1. When the execution conditions for the evaporative emission purging are met, the EFI ECU performs the duty control for the VSV for evaporative emission purging and purges the evaporative emissions into the combustion chamber.

(3) Diagnosis code output conditions

1. When the detection signal of the VSV for evaporative emission purge is not turned "ON" or "OFF"

(4) Trouble area

1.VSV for evaporative emission control system purge control (Purge VSV for EVAP)
2.Open wire or short circuit for the evaporative emission purge VSV control system circuit
3.EFI ECU

(5) Checking points

1.Is the harness between the VSV for evaporative emission purge and the EFI ECU normal?
2.Is the control signal of the VSV for evaporative emission purge outputted from the EFI ECU normally?
3.Is the VSV for evaporative emission purge operating normally?

(6) Inspection procedure

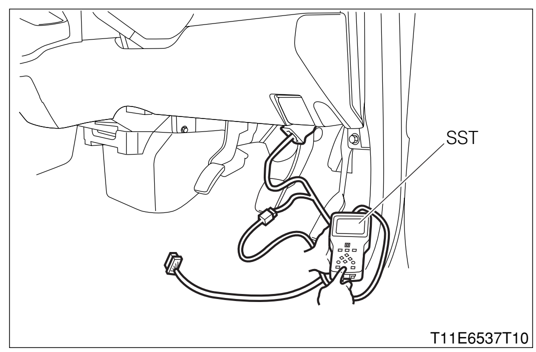
NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

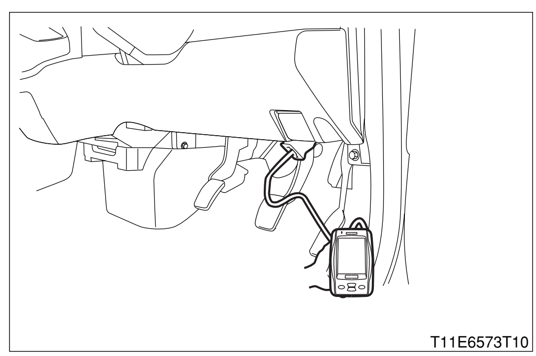
① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Operation check of Purge VSV for EVAP.

1.IG switch turned "LOCK".
2.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.

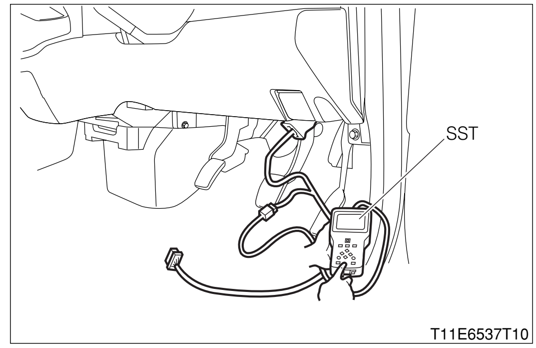


3.Disconnect the hose going to the purge VSV for EVAP from the charcoal canister.
4.Turn "ON" the IG switch, and turn "ON" the main switch of the tester.
5.Erase the DTC.
6.Confirmation of operation of the purge VSV for EVAP.
(1) DS-21: Select the "Purge VSV" of the "Actuator driving".
(2) DS-Ⅱ: Select the "Purge VSV" of the "Active test".

7.When executing "ON" and "OFF" check the operation of the VSV for purging.

SPECIFIED VALUE:

VSV "OFF"	No air continuity should exist when air is blown into the hose.
VSV "ON"	Air continuity should exist when air is blown into the hose.

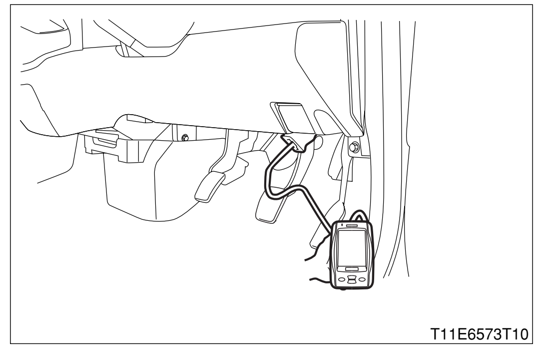


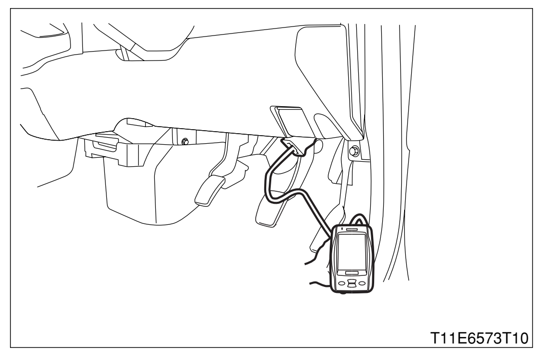
8.Are the check results OK?

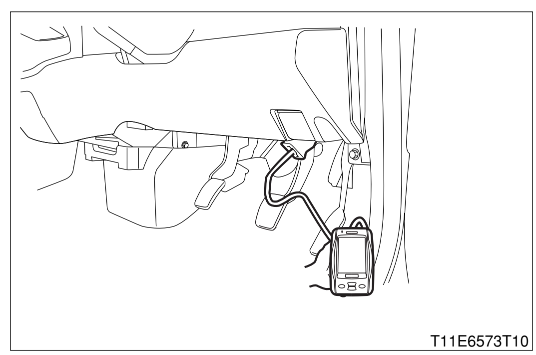
▼If it is OK, check the EFI ECU circuit.

Refer to Page A1-24.

▼If it is OK, go to ⊳2.







⊳2. Check of purge hose and passage.

1.Execute the "VSV "Release" so as to return the purge VSV for EVAP to the original operating state.

2.Start the engine and keep the engine racing.

3.Disconnect the hose going from the purge VSV for EVAP to the intake manifold.

4.Apply your finger to the disconnected hose. Ensure that a negative pressure is applied.

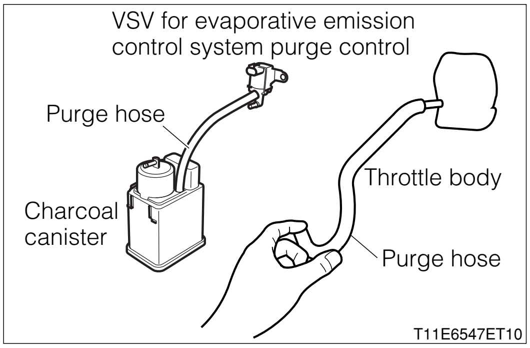
SPECIFIED VALUE: Negative pressure should be applied.

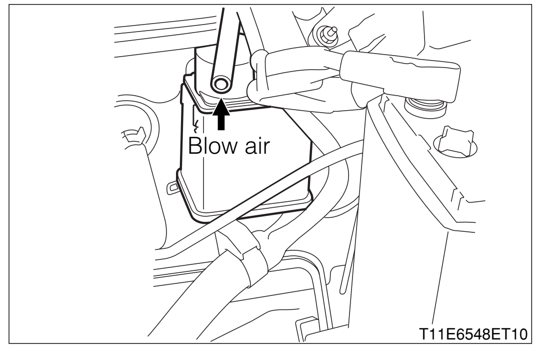
5.Check the hose for connecting state, leakage, restriction, bending and deterioration.

6.Are the check results OK?

▼If it is OK, go to ⊳3.

▼If it is NG, clean, repair or replace.





⊳3. Check of power supply voltage of Purge VSV for EVAP.

1.Turn "OFF" the main switch of the tester. Turn "OFF" the IG switch.

2.Disconnect the purge VSV for EVAP connector.

3.With the IG switch turned "ON", measure the voltage between the following terminals given below.

(1) Between the VSV for evaporative emission purge connection vehicle harness side connector 2 (＋B) and the body earth

SPECIFIED VALUE: Battery voltage

4.Are the check results OK?

▼If it is OK, go to ⊳4.

▼If it is NG, check the harness and connector between the VSV for purging and the battery, and the main relay for open wire or short. Repair or replace, as required.

⊳4. Wiring harness check

1.IG switch turned "LOCK".
2.Check the harness and connector between the following terminals for open wire and short.
(1) Is the control signal of the VSV for evaporative emission purge outputted from the EFI ECU normally?
SPECIFIED VALUE: Continuity exists.

(2) Between the VSV for evaporative emission purge connection vehicle harness side connector 2 (PRG) and the body earth
SPECIFIED VALUE: No continuity exists

3.Are the check results for open wire and short OK?
▼If it is OK, go to ⊳5.
▼If it is NG, repair or replace the harness or connector.

⊳5. Unit check of purge VSV for EVAP.

1.Perform the unit check of the VSV for evaporative emission purge.
Refer to Page B8-473.

2.Are the unit check results OK?
▼If it is OK, go to ⊳6.
▼If it is NG, replace the purge VSV for EVAP.

⊳6. Check of ECU output signal.

1.Connect the connector to VSV for purging.
2.Connect the hoses that have been disconnected to the original places.
3.Set the SST (Sub-harness).
SST: 09842-97209-000

4.Measure the voltage between the following terminals while the engine is cold and idling.
5.Between SST 16 (PRG) and SST 125 (E1)
SPECIFIED VALUE: Battery voltage

6.After warming up the engine (After the radiator fan has operated at least one time), measure the voltage, for more than two minutes with the accelerator pedal depressed.
7.Between SST 16 (PRG) and SST 125 (E1)
SPECIFIED VALUE: The voltage should become 0 to 1 V within the two minutes.

8.Are the check results OK?
▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, check or replace the ECU.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Evaporative emission purge hose check

1.Check if there are any evaporative emission purge hoses pulled out or damaged

SPECIFIED VALUE: There are none pulled out nor damaged.

▼If it is OK, proceed to ⊳2.

▼If it is NG, repair or replace the hose.

⊳2. EFI ECU signal check

1.Connect the SST.

SST: 09842-97209-000

2.Perform voltage measurements between the following terminals when idling (During cold period).

(1) Between SST 16 (PRG) - SST 125 (E1)

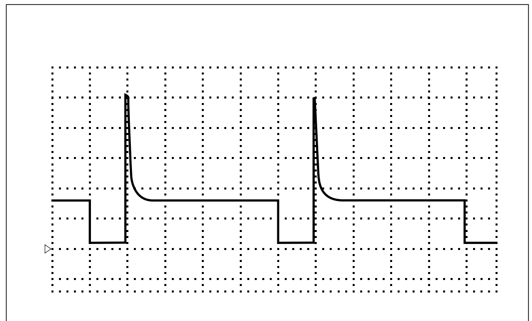
SPECIFIED VALUE: Battery voltage

3.Perform output check between the following terminals for more than two minutes using an oscilloscope with the accelerator depressed (Idle switch "OFF") after warming-up the engine (After the radiator fan has rotated at least once).

(1) Between SST 16 (PRG) - SST 125 (E1)

SPECIFIED VALUE:

Time axis	20ms / DIV
Voltage axis	10V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and keeping 2000 rpm



T11E6242T10

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".

NOTE

- The waveform cannot be specified, but ensure that a waveform as in the right figure (One such example) shows up.

4.Confirm the following points.

(1) The pulse of 0V ⇄ battery voltage is generated.

NOTE

- The VSV for evaporative emission control system purge control does not operate unless during air-fuel ratio feedback.

▼If it is OK, proceed to ⊳3.

▼If it is NG, check the EFI ECU circuit.

Refer to Page A1-24.

⊳3. Voltage check of VSV for evaporative emission control system purge control

1.Remove the connector of the VSV for evaporative emission control system purge control.

2.Perform voltage measurement between the following terminals when the IG switch is "ON".

(1) Between VSV for evaporative emission control system purge control vehicle harness side connector 2 (＋B) - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳4.

▼If it is NG, perform checking or repairing of the harness and relay between the following terminals.

(1) Between battery - VSV for evaporative emission control system purge control

⊳4. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.

(1) Between ECU connection vehicle harness side connector 15 (PRG) - VSV for evaporative emission control system purge control side connector 1 (PRG)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳5.

▼If it is NG, repair the harness and the connectors.

⊳5. VSV for evaporative emission control system purge control unit check

1.Perform unit check of the VSV for evaporative emission control system purge control.

Refer to Page B8-473.

▼If it is OK, proceed to ⊳6.

▼If it is NG, replace the VSV for evaporative emission control system purge control.

⊳6. Connection condition check of each connector

1.Check the connecting conditions of each connector.

SPECIFIED VALUE: There are none that is half fit or pulled out.

▼If it is OK, check the EFI ECU circuit.

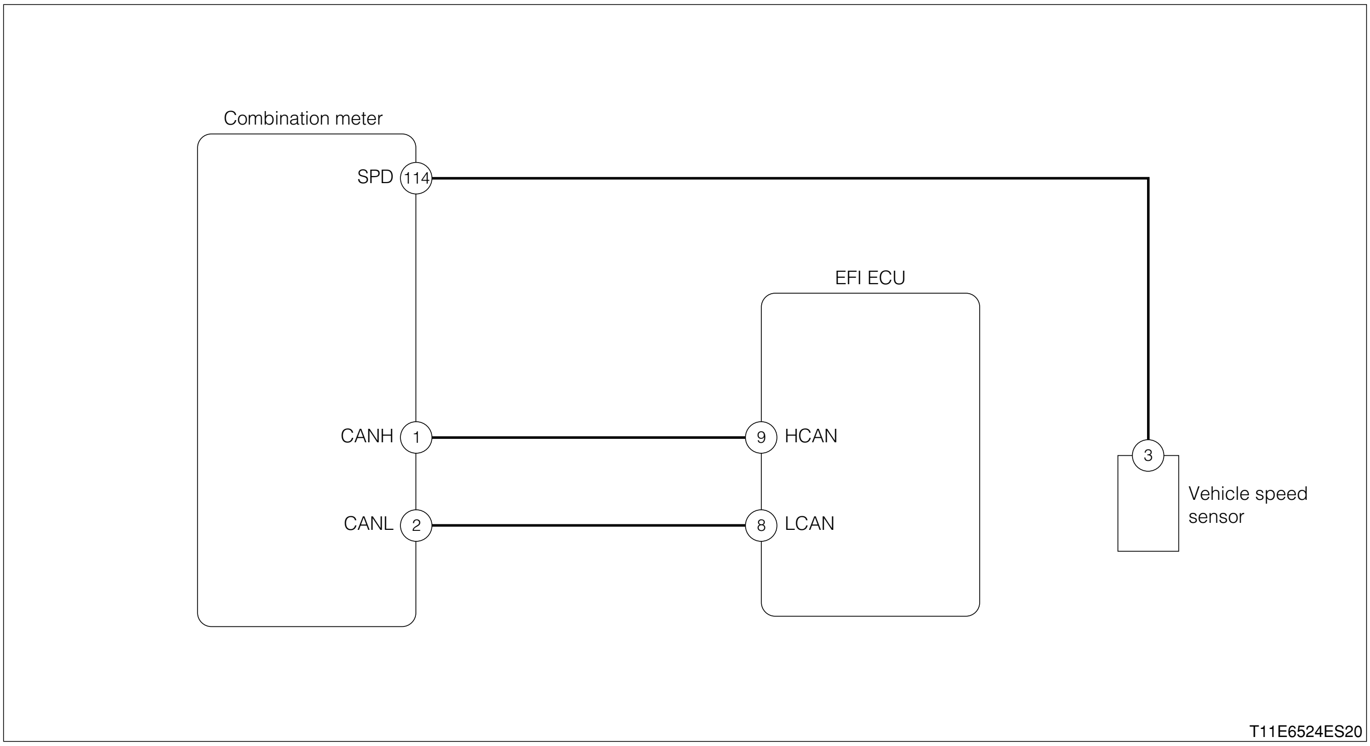
Refer to Page A1-24.

▼If it is NG, repair the connector of the defective section.

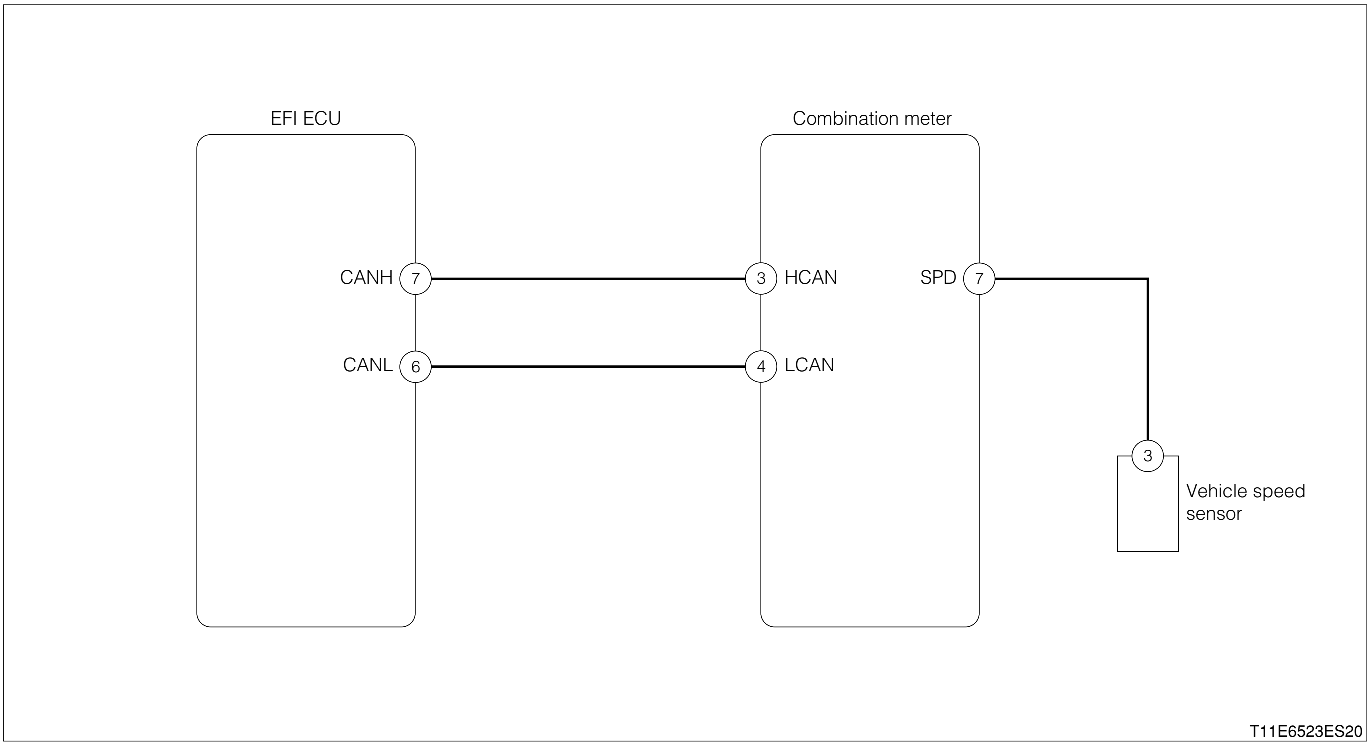
9-12-15 DTC NO.P0500/52 VEHICLE SPEED SENSOR CIRCUIT MALFUNCTION

(1) System diagram

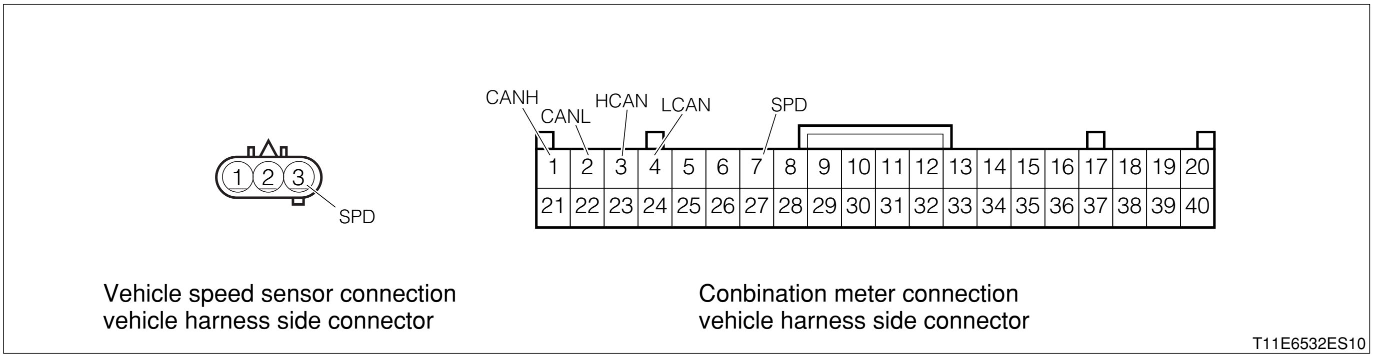
RHD vehicles



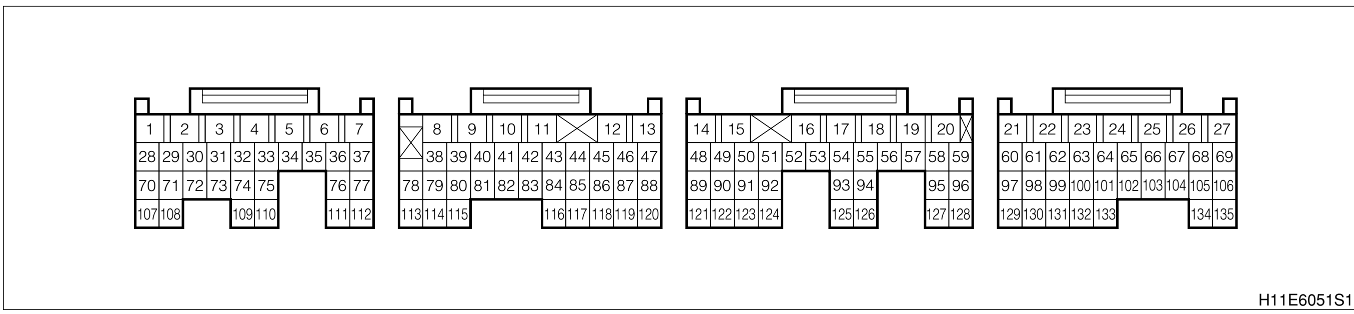
LHD vehicles



Each unit, relays connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Diagnosis code output conditions

1.When no vehicle speed signal is inputted from the combination meter

(3) Checking points

1.Is the vehicle speed signal inputted to the combination meter?
2.Is the combination meter normal?
3.Is the CAN line normal?
4.Is the harness between the vehicle speed sensor and the combination meter normal?
5.Is the vehicle speed sensor normal?

① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

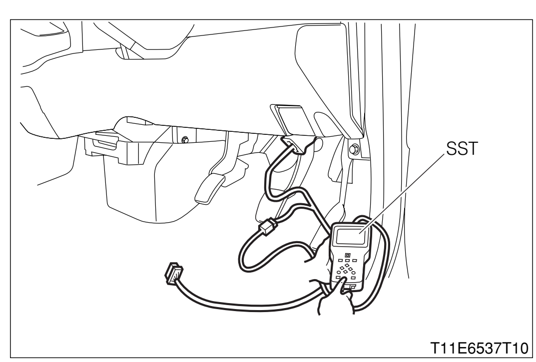
⋗1. CAN communication basic check

1.Perform basic check of the CAN communication.
Refer to Page L2-14.

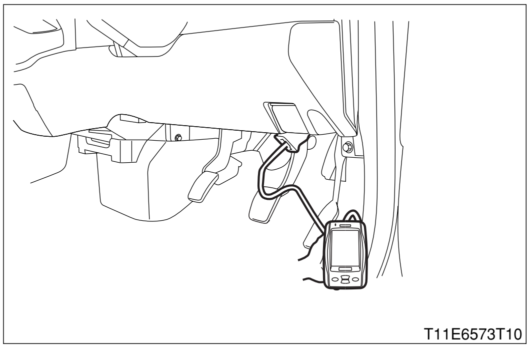
▼If it is OK, proceed to ⋗2.
▼If NG, repair the faulty section and go to ⋗2.

⋗2. Vehicle speed signal check

1.The IG switch turned "LOCK".
2.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.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3.After turning "ON" the IG switch, Turn "ON" the main switch of the tester.
4.Read the "Vehicle speed" of the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool.
5.Check to see if the normal vehicle speed is indicated on the tool.
SPECIFIED VALUE: The normal vehicle speed is indicated.

▼If it is OK, proceed to ⊳3.
▼If it is NG and the vehicle is a RHD vehicle, go to ⊳4.
▼If it is NG and the vehicle is a LHD vehicle, go to ⊳6.

⊳3. Combination meter operation check

1.Check to see if the speedometer of the combination meter functions properly.
SPECIFIED VALUE: The normal vehicle speed is indicated.

▼If it is OK, perform the operations in the following order.
(1) Erase the diagnosis code and check the state for a while.
(2) If the diagnosis code is once again outputted, replace the EFI ECU.
▼If it is NG, proceed to ⊳8.

⊳4. CAN line open wire check (RHD vehicles)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU.
3.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 8 (LCAN) - EFI ECU connection vehicle harness side connector 9 (HCAN)
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳5.
▼If it is NG, repair the defective point.

⊳5. CAN line short circuit check check (RHD vehicles)

1.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 8 (LCAN) - battery positive terminal
(2) Between ABS actuator connection vehicle harness side connector 19 (LCAN) - battery positive terminal
(3) Between EFI ECU connection vehicle harness side connector 8 (LCAN) - body earth
(4) Between EFI ECU connection vehicle harness side connector 9 (HCAN) - body earth
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳8.
▼If it is NG, repair the defective point.

⊳6. CAN line open wire check (LHD vehicles)

1.Turn the IG switch to "LOCK".

2.Remove all connectors of the EFI ECU.

3.Perform continuity check between each of the following terminals.

(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - EFI ECU connection vehicle harness side connector 7 (CANH)

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳7.

▼If it is NG, repair the defective point.

⊳7. CAN line short circuit check check (LHD vehicles)

1.Perform continuity check between each of the following terminals.

(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - battery positive terminal

(2) Between ABS actuator connection vehicle harness side connector 7 (CANH) - battery positive terminal

(3) Between EFI ECU connection vehicle harness side connector 6 (CANL) - body earth

(4) Between EFI ECU connection vehicle harness side connector 7 (CANH) - body earth

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳8.

▼If it is NG, repair the defective point.

⊳8. Combination meter input signal check

1.Check the vehicle speed input signal to the combination meter.

Refer to Page J3-1.

▼If it is OK, replace the combination meter and go to ⊳0.

▼If it is NG, proceed to ⊳9.

⊳9. Check of wire harness continuity

1.Perform the continuity check between the following terminals.

(1) Combination meter vehicle harness side connector 7 (SPD) - Vehicle speed sensor vehicle harness side connector 3 (SPD)

▼If it is OK, replace the vehicle speed sensor.

▼If it is NG, repair the defective point.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. CAN communication basic check

1.Perform basic check of the CAN communication.
Refer to Page L2-14.

▼<u>If it is OK, proceed to ⊳2.</u>
▼<u>If NG, repair the faulty section and go to ⊳2.</u>

⊳2. Combination meter operation check

1.Check to see if the speedometer of the combination meter functions properly.
SPECIFIED VALUE: The normal vehicle speed is indicated.

▼<u>If it is OK and the vehicle is a RHD vehicle, go to ⊳3.</u>
▼<u>If it is OK and the vehicle is a LHD vehicle, go to ⊳5.</u>
▼<u>If it is NG, proceed to ⊳7.</u>

⊳3. CAN line open wire check (RHD vehicles)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU.
3.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 8 (LCAN) - EFI ECU connection vehicle harness side connector 9 (HCAN)
SPECIFIED VALUE: No continuity exists.

▼<u>If it is OK, proceed to ⊳4.</u>
▼<u>If it is NG, repair the defective point.</u>

⊳4. CAN line short circuit check check (RHD vehicles)

1.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 8 (LCAN) - battery positive terminal
(2) Between ABS actuator connection vehicle harness side connector 19 (LCAN) - battery positive terminal
(3) Between EFI ECU connection vehicle harness side connector 8 (LCAN) - body earth
(4) Between EFI ECU connection vehicle harness side connector 9 (HCAN) - body earth
SPECIFIED VALUE: No continuity exists.

▼<u>If it is OK, perform the operations in the following order.</u>
(1) Erase the diagnosis code and check the state for a while.
(2) If the diagnosis code is once again outputted, replace the EFI ECU.
▼<u>If it is NG, repair the defective point.</u>

⊵5. CAN line open wire check (LHD vehicles)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU.
3.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - EFI ECU connection vehicle harness side connector 7 (CANH)
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊵6.
▼If it is NG, repair the defective point.

⊵6. CAN line short circuit check check (LHD vehicles)

1.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - battery positive terminal
(2) Between EFI ECU connection vehicle harness side connector 7 (CANH) - battery positive terminal
(3) Between EFI ECU connection vehicle harness side connector 6 (CANL) - body earth
(4) Between EFI ECU connection vehicle harness side connector 7 (CANH) - body earth
SPECIFIED VALUE: No continuity exists.

▼If it is OK, perform the operations in the following order.
(1) Erase the diagnosis code and check the state for a while.
(2) If the diagnosis code is once again outputted, replace the EFI ECU.
▼If it is NG, repair the defective point.

⊵7. Combination meter input signal check

1.Check the vehicle speed input signal to the combination meter.
Refer to Page J3-1.

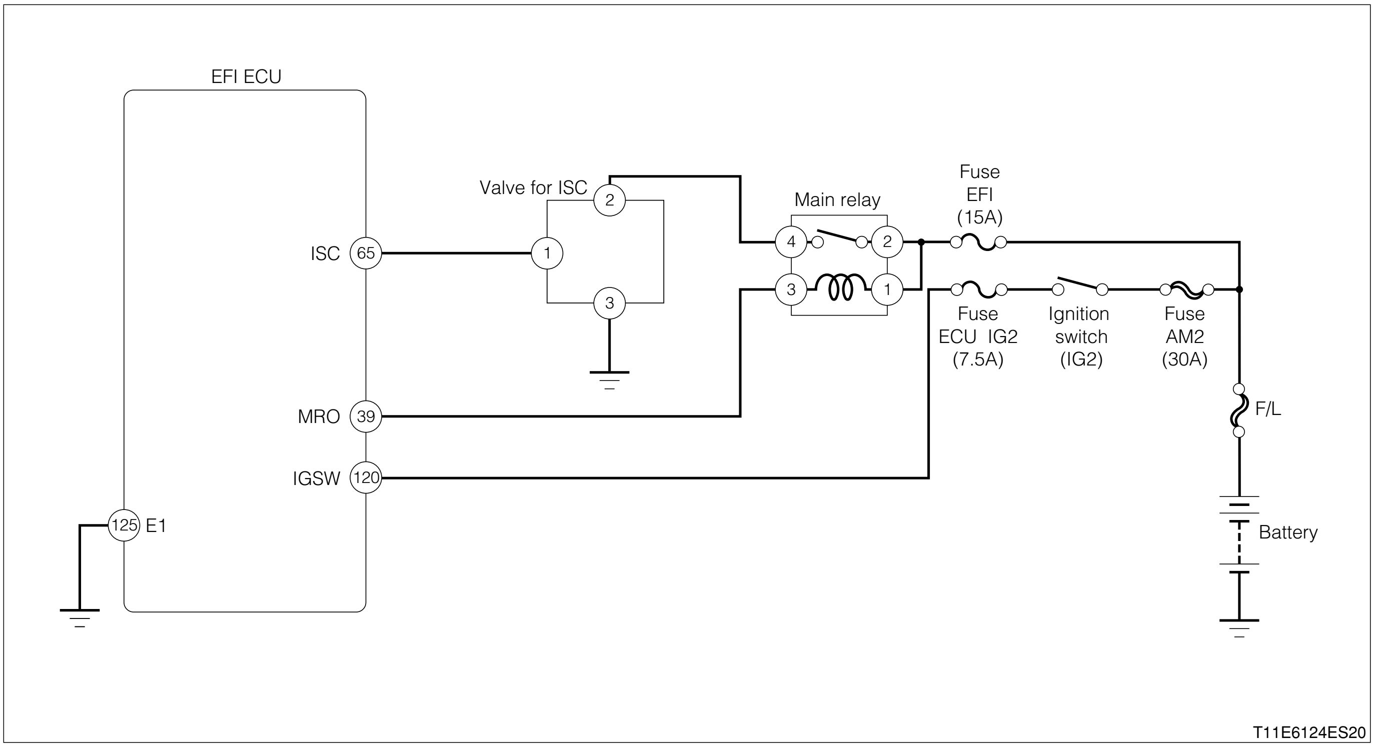
▼If it is OK, replace the combination meter and go to ⊵2.
▼If it is NG, proceed to ⊵8.

⊵8. Check of wire harness continuity

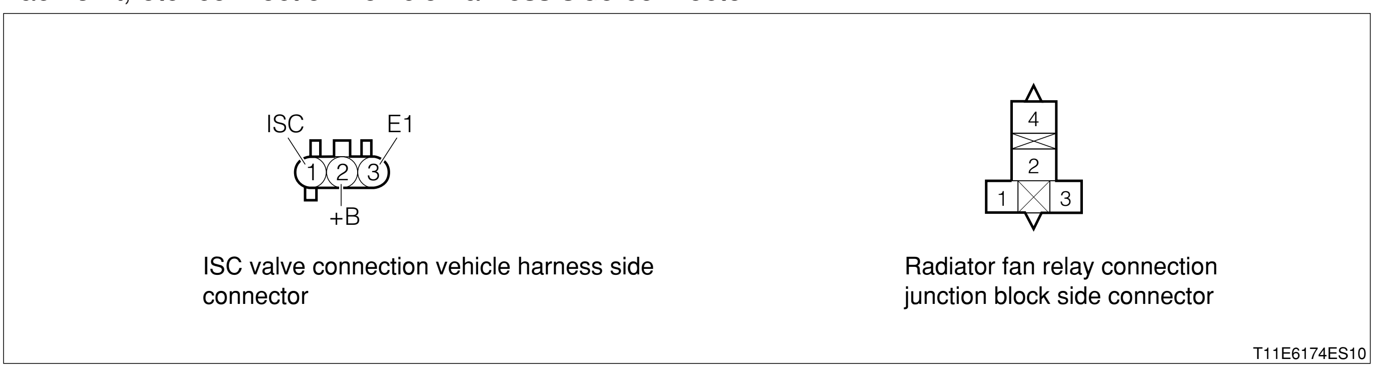
1.Perform the continuity check between the following terminals.
(1) Combination meter vehicle harness side connector 7 (SPD) - Vehicle speed sensor vehicle harness side connector 3 (SPD)
▼If it is OK, replace the vehicle speed sensor.
▼If it is NG, repair the defective point.

9-12-16 DTC NO.P0505/71 IDLE CONTROL SYSTEM MALFUNCTION

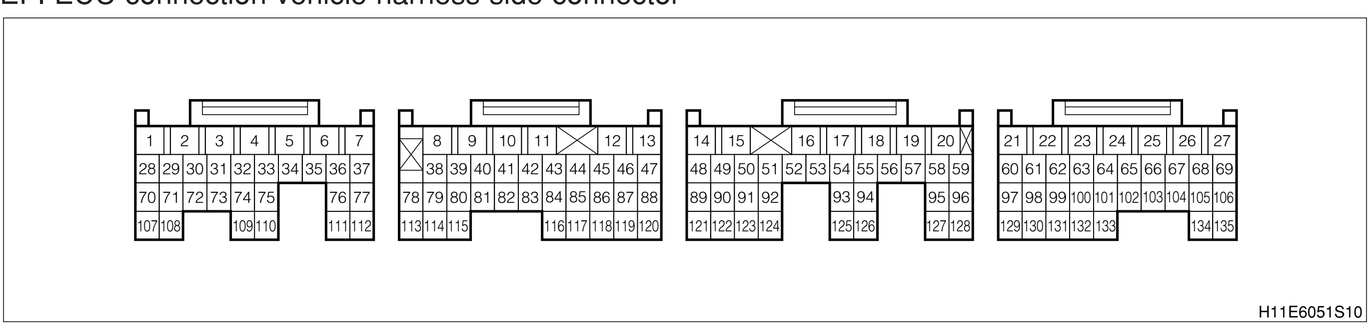
(1) System diagram



Each unit, etc. connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1. The rotary solenoid type valve for ISC is located in front of the intake manifold and the intake air bypassing the throttle valve is directed to the valve for ISC through a passage. In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed. The EFI ECU operates only the valve for ISC to perform idle-up and provide feedback for the target idling speed.

(3) Diagnosis code output conditions

1. When the valve detection signal for ISC is not turned "ON" or "OFF"

(4) Trouble area
1.Open wire or short circuit for ISC system circuit
2.Valve for ISC
3.EFI ECU

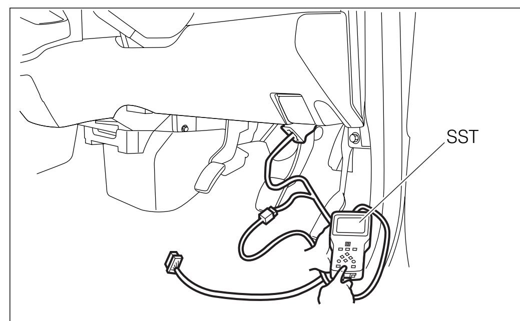
(5) Checking points
1.Is the harness between the valve for ISC and the EFI ECU normal?
2.Is the valve for ISC operating normally?

(6) Inspection procedure

① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

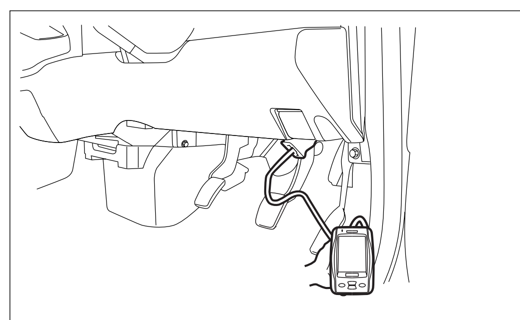
NOTE
- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⊳1. Operation check of valve for ISC.
1.IG switch turned "LOCK".
2.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000



T11E6537T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.


T11E6573T10

3.Warm up the engine fully.
4.Turn "ON" the main switch of the diagnosis tester (DS-21/DS-Ⅱ).
5.Drive the actuator during idling.
(1) DS-21: Select the "ISC" of the "Actuator driving".
Execute the "ISC 5% open" and "ISC 50% open" respectively.
(2) DS-Ⅱ: Select the "ISC" of the "Active test".
Execute the "5% " and "50%" respectively.
6.Ensure that the engine revolution speed rises when the "50%" is selected. Also ensure that the engine revolution speed drops when the "5%" is selected.
SPECIFIED VALUE: The engine revolution speed will change.

▼<u>If it is OK, check the EFI ECU circuit.</u>
▼<u>If it is NG, go to ⊳2.</u>

⊳2. Check of power supply voltage of valve for ISC.

1.Turn" OFF" the main switch of the tester. Turn "LOCK" the IG switch
2.Disconnect the connector of the valve for ISC.
3.Turn "ON" the ignition switch.
4.Measure the voltage between the following terminals.
(1) Between the ISC connection vehicle harness side 2 (+B) and the body earth
SPECIFIED VALUE: Battery voltage

5.Is the measured value the specified value?
▼If it is OK, go to ⊳3.
▼If it is NG, check the following points for open wire or short.
(1) Between the valve for ISC and the main relay
(2) Between the main relay and the battery

⊳3. Check of input signal of valve for ISC.

1.After warming up the engine fully, turn "ON" the main switch of the diagnosis tester (DS-21/DS-Ⅱ).
(1) DS-21: select the "ISC" in the "Actuator driving"
.Execute the "5% open" and "50 % open" respectively.
(2) DS-Ⅱ: select the "ISC" in the "Active test".
Execute the "5%" and "50 %" respectively.
2.With the connector connected, measure the voltage between the following terminals.
3.Between the ISC connection vehicle harness side connector 1 (ISC) and the ISC connection vehicle harness side connector 3 (E1)
4.Does the voltage increase or decrease in accordance with the change in the ISC duty ratio (5 %, 50 %)?
SPECIFIED VALUE: The voltage varies.

▼If it is OK, replace the throttle body Ay.
Refer to Page B3-11.

▼If it is NG, go to ⊳4.

⊳4. Check of output signal of ECU.

1.Turn "OFF" the main switch of the tester. Turn "LOCK" the IG switch.
2.Connect the SST between the EFI ECU connectors and the wire harness connectors.
SST: 09842-97209-000

3.Warm up the engine.
4.With the engine idling, select the "ISC" in the "Actuator driving".
5.Execute the "5% open" and "50 % open" respectively.
6.Measure the voltage between the following terminals.
(1) Between SST 54 (ISC) and SST 23 (E1)
7.Does the voltage increase or decrease in accordance with the change in the ISC duty ratio (5 %, 50 %)?
SPECIFIED VALUE: The voltage varies.

▼If it is OK, go to ⊳5.
▼If it is NG, check or replace the EFI ECU.

▷5. Wiring harness check

1.Turn "OFF" the main switch of the tester. Turn "LOCK" the IG switch.
2.Disconnect the SST connector at the EFI ECU side.
3.Perform the continuity check between the following terminals.
(1) Valve for ISC connector 1 (ISC) - SST terminal 54 (ISC)
(2) Valve for ISC connector 3 (E1) - SST terminal 23 (E1)
SPECIFIED VALUE: Continuity exists

4.Are the check results for open wire and short OK?

▼If it is OK, replace the throttle body Ay.

Refer to Page B3-11.

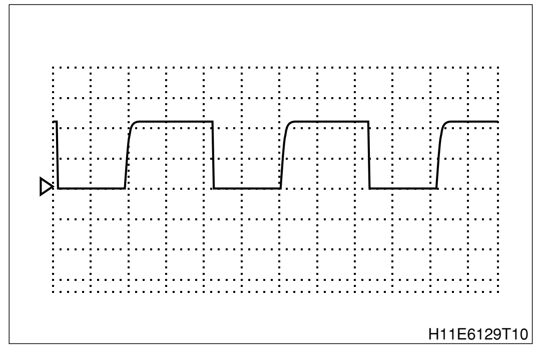
▼If it is NG, repair or replace the harness or connector.

② **Check by oscilloscope.**

1. When an oscilloscope is used, the ISC control signal becomes the waveform as indicated in the figure above.
   (1) Between SST65 (ISC) - SST 125 (E1)

Time axis	1ms / DIV
Voltage axis	5V / DIV
Measuring condition	When air conditioner is "ON" with electric load and while idling

Air conditioner "ON": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "ON".

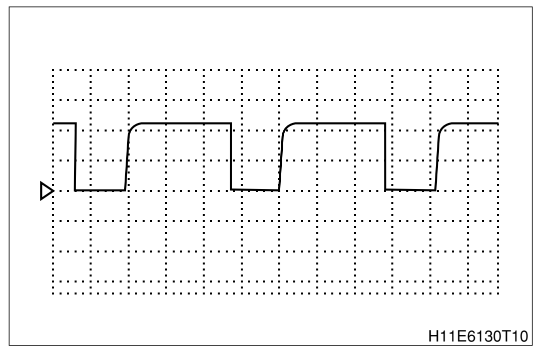


NOTE

- The waveform cannot be specified, but confirm that a waveform as in the right figure (One such example) shows up.

Time axis	1ms / DIV
Voltage axis	5V / DIV
Measuring condition	When air conditioner is "ON" with electric load and while idling

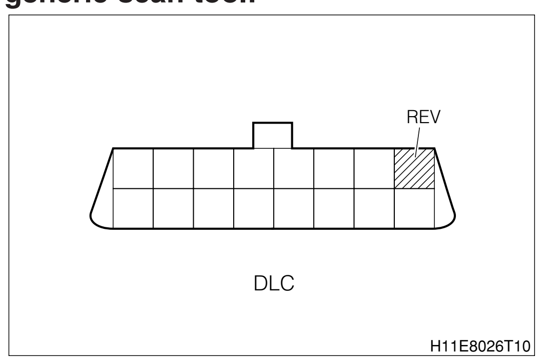
Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".



③ **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Check of idle speed

1. Install an engine tachometer to the terminal "REV" of the DLC, using the SST.
   SST: 09991-87402-000
   09991-87404-000



NOTE

- The SST 09991-87404-000 is a harness for extension use. This does not have to be used.

2. Is the engine revolution speed high during cold period and does it get lower as the warm-up proceeds and maintain idling speed?
   SPECIFIED VALUE: 700^{+100}_{-50} rpm(A/T vehicle)
   650^{+100}_{-50} rpm(M/T vehicle)

▼If it is OK, the ISC system is normal.

▼If it is NG, proceed to ⊳2.

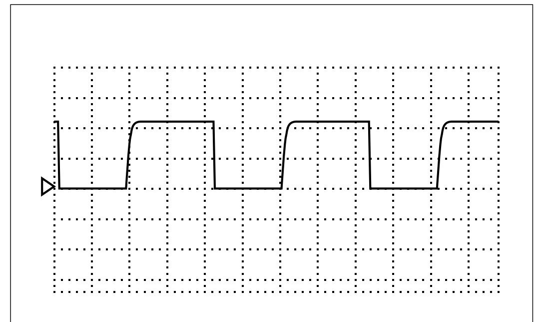
⊳2. EFI ECU signal check

1. Connect the SST.
   SST: 09842-97209-000

2.Perform output check between the following terminals using an oscilloscope.

(1) Between SST 65 (ISC) - SST 125 (E1)

Time axis	1ms / DIV
Voltage axis	5V / DIV
Measuring condition	When air conditioner is "ON" with electric load and while idling

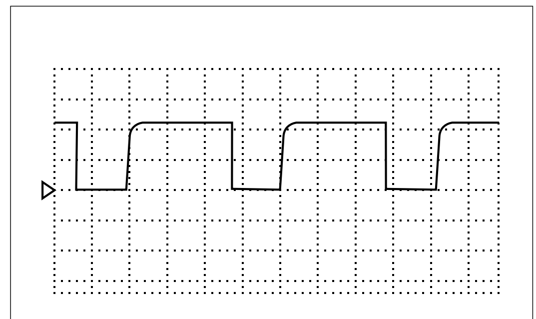

H11E6129T10

Air conditioner "ON": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "ON".

NOTE

- The waveform cannot be specified, but confirm that a waveform as in the right figure (One such example) shows up.

Time axis	1ms / DIV
Voltage axis	5V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling


H11E6130T10

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".

NOTE

- The waveform cannot be specified, but ensure that a waveform as in the right figure (One such example) shows up.

3.Confirm the following points.

(1) The pulse of 0V ⇄ battery voltage is generated.

(2) The duty ratio changes according to the electric load.

▼If it is OK, proceed to ⊳3.

▼If it is NG, check the EFI ECU circuit.

Refer to Page A1-24.

⊳3. Check of wire harness continuity

1.Check the harness between the EFI ECU and valve for ISC.

(1) Between the ECU connection vehicle harness side connector 65 (ISC) - Valve for ISC connection vehicle harness side connector 1 (ISC)

2.Check the earth of the valve for ISC.

(1) Between valve for ISC connection vehicle harness side connector 3 (E1) - body earth

▼If it is OK, proceed to ⊳4.

▼If it is NG, perform the following operations.

(1) Repairing of the harness and the connectors

⊳4. Check the power supply of the valve for ISC.

1.Remove the valve for ISC connector.

2.Perform voltage measurement between the following terminals when the IG switch is "ON".

(1) Between valve for ISC connection vehicle harness side connector 2 (+B) - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳5.

▼If it is NG, repair or replace the defective sections.

⊳5. Valve for ISC unit check

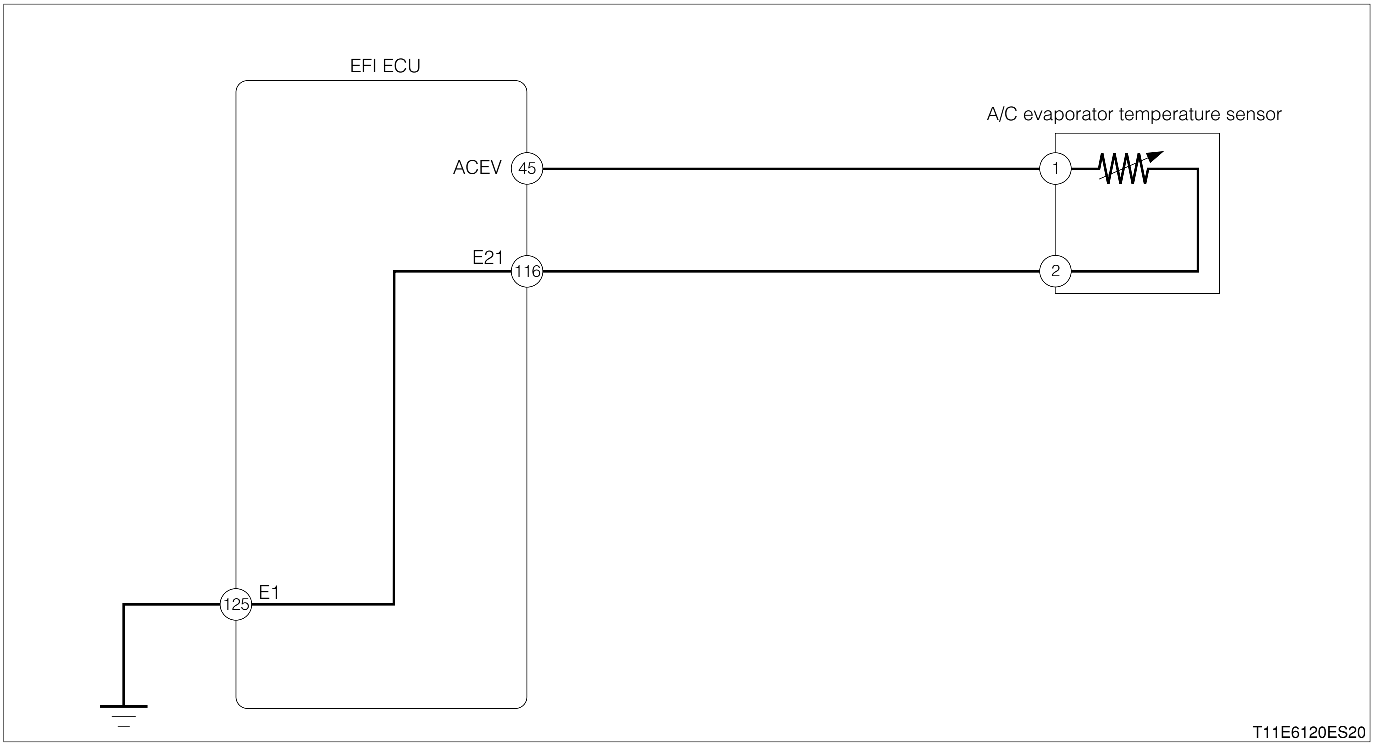
1.Perform unit check of the valve for ISC.
Refer to Page B8-471.

▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

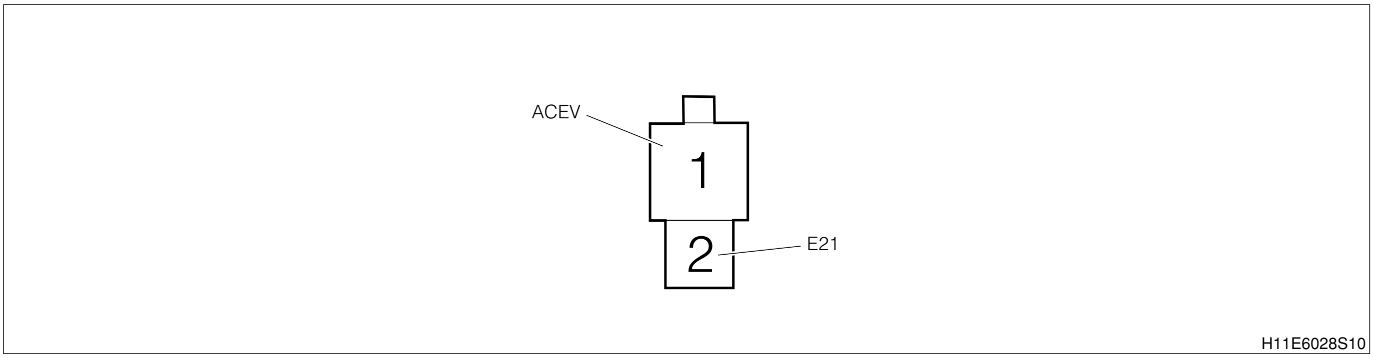
▼If it is NG, replace the throttle body Ay.
Refer to Page B3-11.

9-12-17 DTC NO.P0535/44 AIR CONDITIONER EVAPORATOR TEMPERATURE SENSOR CIRCUIT MALFUNCTION

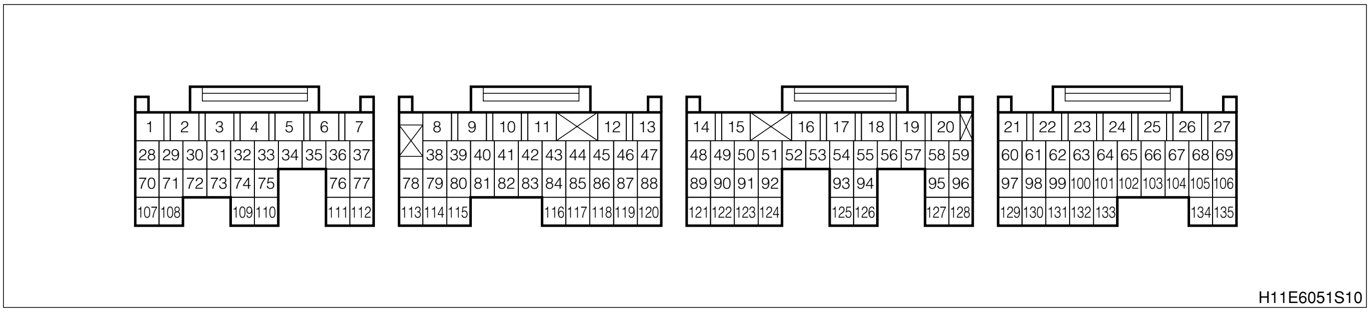
(1) System diagram



Air conditioner evaporator temperature sensor connection vehicle harness side connector

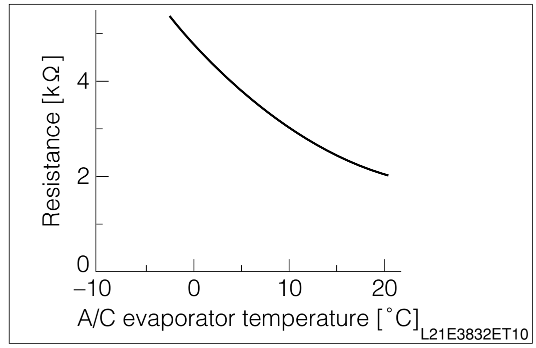


EFI ECU connection vehicle harness side connector



(2) Circuit description

1.This circuit, located at the rear of the evaporator of the air conditioner unit, detects the temperature of the air passing through the evaporator. A thermistor is incorporated in the sensor. This thermistor has characteristics that its resistance decreases as the temperature rise, while the resistance increases as the temperature drops. When the temperature becomes a constant value, the thermistor disengages the magnet clutch through the MGC relay, thus preventing frosting.



(3) Diagnosis code output conditions

1.When the signals from the air conditioner evaporator temperature sensor are not outputted continuously over a certain length of time after starting with the air conditioner switch turned "ON"

(4) Trouble area

1.Air conditioner (A/C) evaporator temperature sensor
2.Open wire or short circuit for the air conditioner evaporator temperature sensor
3.EFI ECU

(5) Checking points

1.Are the signals from the air conditioner evaporator temperature sensor inputted to the EFI ECU?
2.Is the harness between the air conditioner evaporator temperature sensor and the EFI ECU normal?
3.Is the output of the air conditioner evaporator temperature sensor normal?

(6) Inspection procedure

① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

⊳1. EFI ECU signal check

1.Connect the SST.
SST: 09842-97209-000

2.Perform voltage measurements between the following terminals when the IG switch is "ON".
(1) Between SST 45 (ACEV) - SST 116 (E21)
SPECIFIED VALUE: 0.1 - 4.85V (Changes according to the temperature)

▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, proceed to ⊳2.

⊳2. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.

(1) Between sensor connection vehicle harness side connector 1 (ACEV) - ECU connection vehicle harness side connector 45 (ACEV)

(2) Between sensor connection vehicle harness side connector 2 (E21) - ECU connection vehicle harness side connector 116 (E21)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳3.

▼If it is NG, repair the harness and connectors.

⊳3. Air conditioner evaporator temperature sensor unit check

1.Perform unit check of air conditioner evaporator temperature sensor.

Refer to Page B8-471.

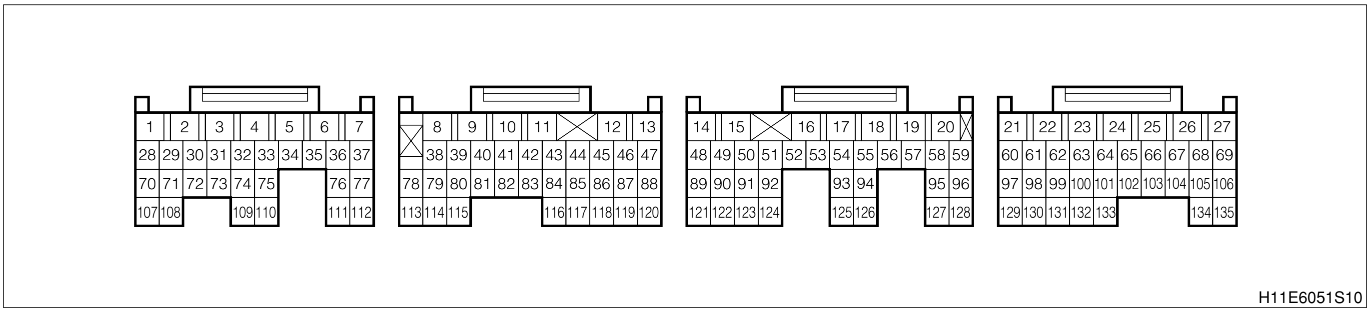
▼If it is OK, check the connecting condition of each connector.

▼If it is NG, replace the air conditioner evaporator temperature sensor.

9-12-18 DTC NO.P1105/32 BAROMETRIC PRESSURE SENSOR CIRCUIT MALFUNCTION

(1) System diagram

EFI ECU connection vehicle harness side connector



(2) Circuit description

1.An atmospheric sensor is mounted in the ECU.

(3) Diagnosis code output conditions

1.When the signals from the air atmospheric sensor are not outputted continuously over a certain length of time after starting.

(4) Trouble area

1.EFI ECU

(5) Inspection procedure

① **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

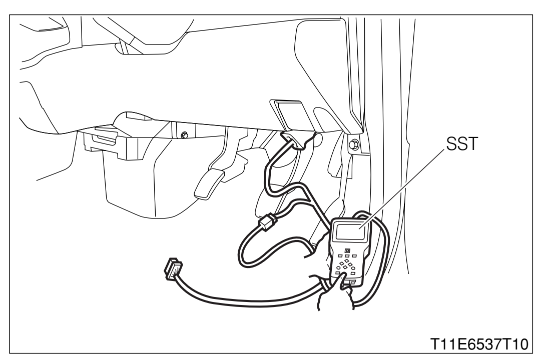
⊳1. Erase the DTC

1.The IG switch turned "LOCK".

2.Connect the diagnosis tester to DLC.

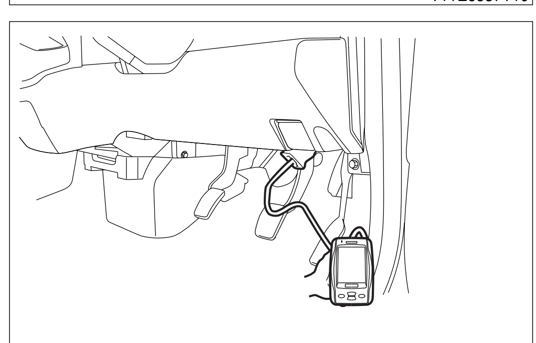
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000

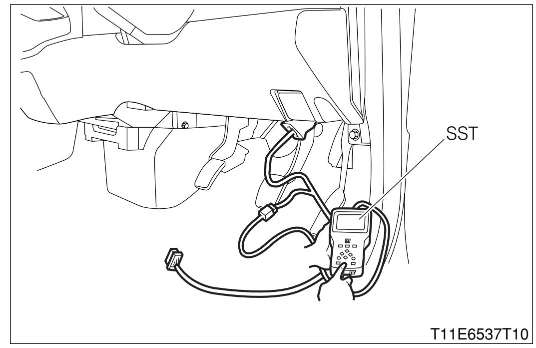


(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



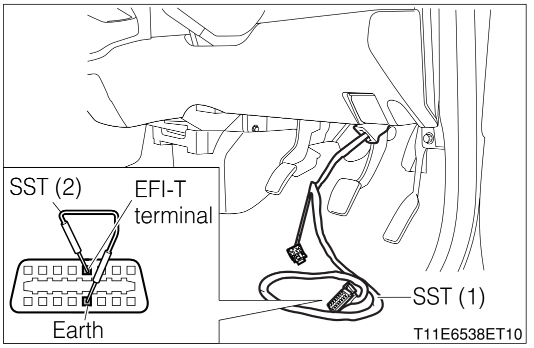
3.After turning "ON" the IG switch, Turn "ON" the main switch of the tester.
4.Cancel the diagnosis code.
5.Is No.P1105/32 indicated ?
▼If the output is made, replace the EFI ECU.
▼If no output is made, check the EFI ECU circuit.
Refer to Page A1-24.



② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Erase the DTC

1.Remove the EFI fuse. Erase the DTC.
2.Set the EFI fuse to the original position.
3.Short circuit the DLC terminals 5 (EFI-T) and 13 (E), using the SST.
SST: 09991-87404-000(1)
09991-87403-000(2)
4.Turn "ON" the IG switch.
5.Check the DTC.
6.Is No.P1105/32 indicated ?

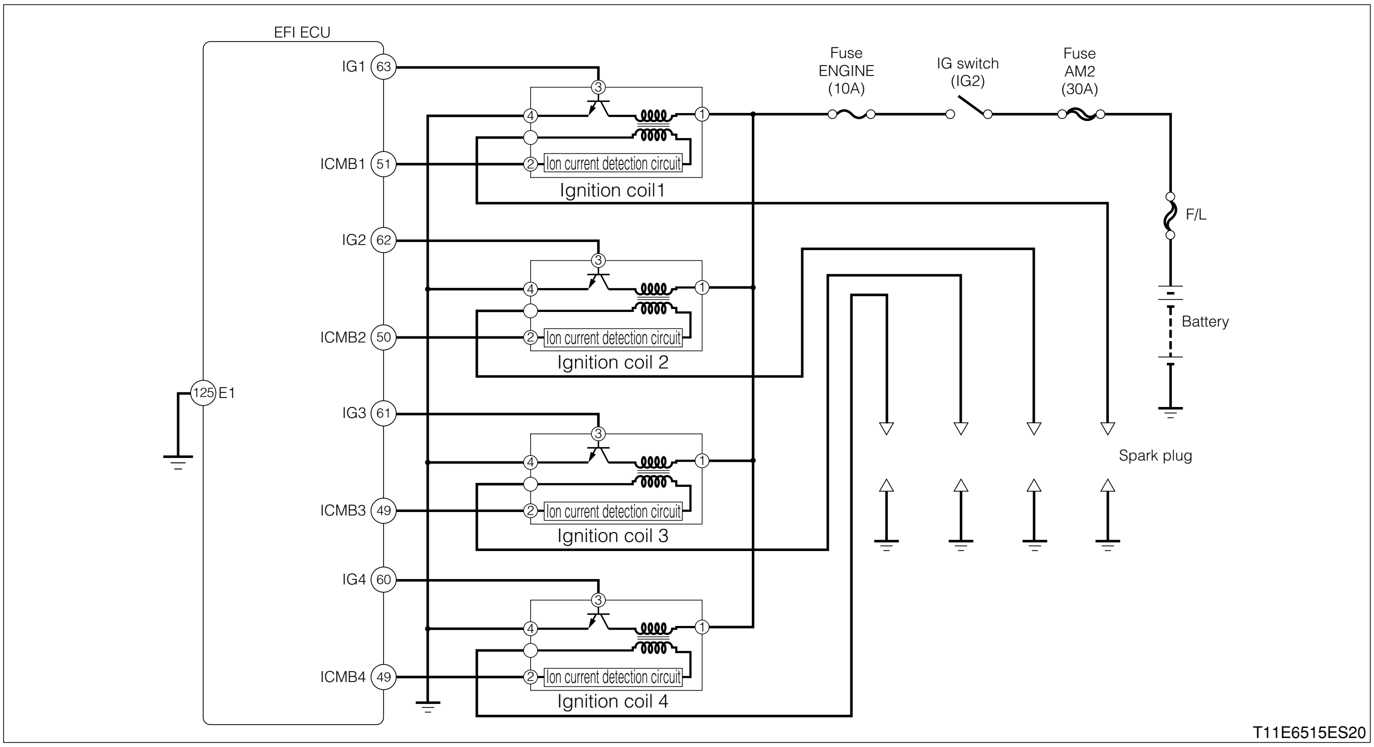


▼If the output is made, replace the EFI ECU.
Refer to Page B8-1.

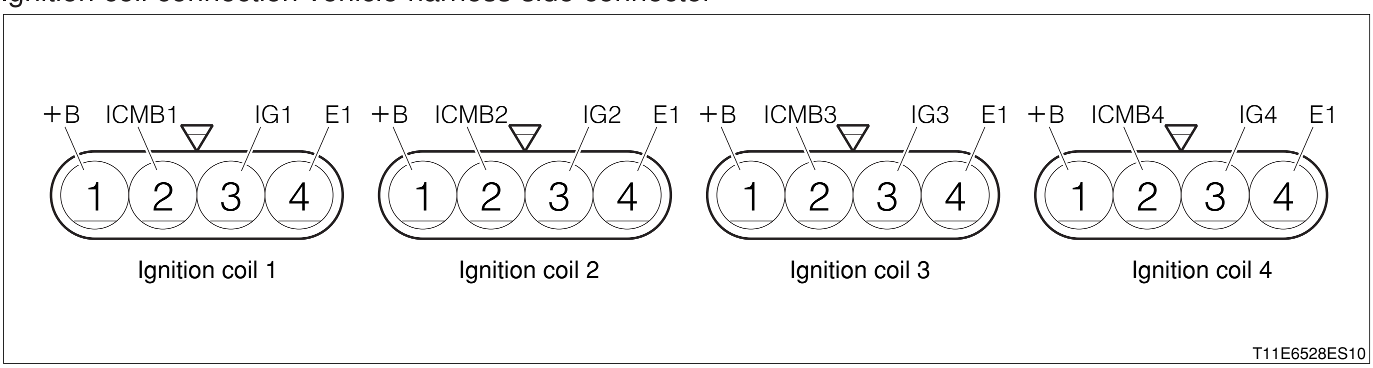
▼If no output is made, check the EFI ECU circuit.
Refer to Page A1-24.

9-12-19 DTC NO.P1300/36 ION CURRENT COMBUSTION CONTROL SYSTEM

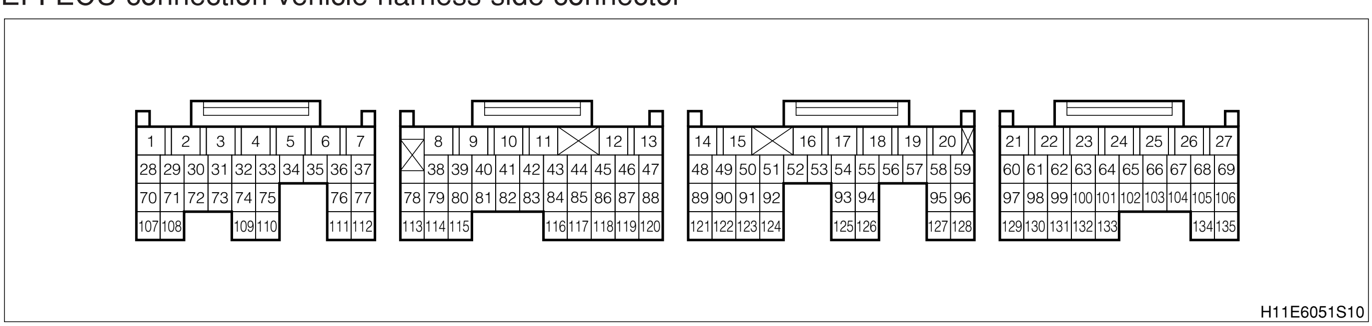
(1) System diagram



Ignition coil connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Circuit description

1. This system detects any misfire of the engine by using an ion current which has the same waveforms as those of the combustion pressure. When any misfire takes place, no ion current is produced. Therefore, if the input voltage at the ECU side is below a certain value, it is judged that a misfire took place. Since the detected ion current is very weak, it is amplified in the igniter unit.

(3) Diagnosis code output conditions

1.After the engine has been warmed up, when the signal from the ion current combustion control system is not inputted to the EFI ECU while the engine is running

2.After the engine has been warmed up, when the signal from the ion current combustion control system is inputted continuously to the EFI ECU while the engine is running

3.When the signal from the ion current combustion control system is inputted to the EFI ECU during the fuel-cut operation

(4) Trouble area

1.Is the ignition system normal?

2.Is the signal from ion current combustion control system normal?

3.Is the fuel system normal?

4.Is the harness between the ignition coil - the EFI ECU normal?

5.Is the ignition coil normal?

6.Is the EFI ECU normal?

(5) Checking points

1.Is the harness between the ignition coil and the EFI ECU normal?

2.Is the ignition coil is normal?

(6) Inspection procedure

NOTE

- Read the freeze frame data, using the diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

▷1. Diagnosis code check

1.Use the SST to short-circuit DLC terminals between 5 (EFI-T) - 13 (E).

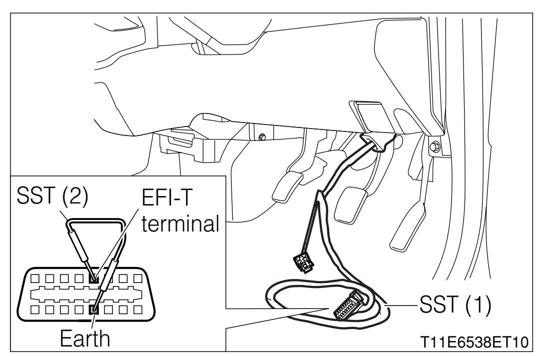
SST: 09991-87404-000(1)
09991-87403-000(2)

2.Check whether the diagnosis code other than Code No.36 is outputted or not.

SPECIFIED VALUE: No output.

▼<u>If it is OK, go to ▷2.</u>

▼<u>In the case of NG, first check and repair a condition that caused the diagnosis code output.</u>



▷2. Unit check of spark plug

1.Check whether the designated spark plug is used. (See Engine Turning-up section for spark plug specifications.)

Refer to Page B1-20.

2.Perform the unit check of the spark plug

Refer to Page B8-472.

▼<u>If it is OK, go to ▷3.</u>

▼<u>If it is NG, clean or replace the spark plug. If a designated spark plug is not used, replace the spark plug with the designated spark plug.</u>

⊳3. Spark check

WARNING

- There is a hazard potential for sparks are generated. Do not place combustible materials in the vicinity.

1.Warm up the engine.
2.Set the IG switch to "LOCK".
3.Remove the fuel pump relay.
4.Idle the engine and wait until the engine stops by itself.
5.Set the IG switch to "LOCK".
6.Remove all the connectors from the injector.

CAUTION

- Operations described above will stop fuel injection, thus preventing damage to the catalyst due to non-burned gas etc.

7.Remove the spark plug and install it to the ignition coil to earth the plug.
8.Check whether the spark plug generates sparks during cranking.

SPECIFIED VALUE: Sparks are generated.

▼If it is OK, go to ⊳8.
▼If it is NG, go to ⊳4.

⊳4. EFI ECU signal check (1)

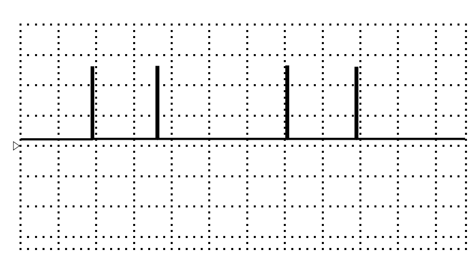
1.Connect the SST.

SST: 09842-97209-000

2.Completely warm up the engine.
3.When the engine is in the starting condition, check an output waveform of an ignition signal between the following terminals using an oscilloscope.
(1) Between SST 63 (IG1) - SST 125 (E1)
(2) Between SST 62 (IG2) - SST 125 (E1)
(3) Between SST 61 (IG3) - SST 125 (E1)
(4) Between SST 60 (IG4) - SST 125 (E1)

Time axis	100ms / DIV
Voltage axis	2V / DIV
Condition	Air-conditioner "OFF", no electrical load, idling

Air-conditioner "OFF": Set the air-conditioner switch (ACSW), blower switch (BLW), and magnet clutch (MGC) to "OFF".



T11E6248T10

NOTE

- Check that the waveform shown in the figure [Example] is displayed.

4.Check the following points.
(1) The pulse of 0 ⇄ 5V is generated.
(2) The waveform cycle is shortened as the engine speed increases.

NOTE

- The ignition signal can not be judged correctly if an oscilloscope is not used.

▼If it is OK, go to ⊳5.
▼If it is NG, check the EFI ECU circuit.

Refer to Page A1-24.

⌦5. Wire harness continuity check (1)

1.Check continuity between the following terminals.

(1) Between ignition coil 1connection vehicle harness side connector 3 (IG1) - ECU connection vehicle harness side connector 63 (IG1)

(2) Between ignition coil 2 connection vehicle harness side connector 3 (IG2) - ECU connection vehicle harness side connector 62 (IG2)

(3) Between ignition coil 3 connection vehicle harness side connector 3 (IG3) - ECU connection vehicle harness side connector 61 (IG3)

(4) Between ignition coil 4 connection vehicle harness side connector 3 (IG4) - ECU connection vehicle harness side connector 60 (IG4)

SPECIFIED VALUE: Continuity exists

▼<u>If it is OK, go to ⌦6.</u>

▼<u>If it is NG, repair or replace the faulty harness.</u>

⌦6. Ignition coil voltage check

1.Measure the voltage between the following terminals when the IG switch is "ON".

(1) Between each ignition coil connection vehicle harness side connector 1 (+B) - body earth

SPECIFIED VALUE: Battery voltage

▼<u>If it is OK, go to ⌦7.</u>

▼<u>In the case of NG, repair or replace the harness between the following terminals.</u>

(1) Each ignition coil - battery

⌦7. Wire harness continuity check (2)

1.Check continuity between the following terminals.

(1) Between each ignition coil connection vehicle harness side connector 4 (E1) - ECU connection vehicle harness side connector 125 (E1)

SPECIFIED VALUE: Continuity exists.

▼<u>If it is OK, replace the ignition coil.</u>

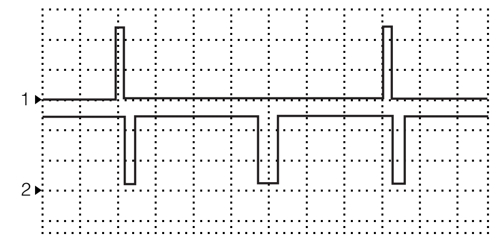
Refer to Page B10-6.

▼<u>In the case of NG, repair or replace the faulty harness.</u>

⊳8. EFI ECU signal check (2)

1.Completely warm up the engine.

2.While idling, check each cylinder for output waveforms of the ignition signal (1▶) and ion current combustion control signal (2▶), using an oscilloscope, respectively.



T11E6553T10

	Channel	+ side measuring terminal	− side measuring terminal
Cylinder No.1	1▶	63 (IG1)	125 (E1)
	2▶	51 (ICMB1)	125 (E1)
Cylinder No.2	1▶	62 (IG2)	125 (E1)
	2▶	50 (ICMB2)	125 (E1)
Cylinder No.3	1▶	61 (IG3)	125 (E1)
	2▶	49 (ICMB3)	125 (E1)
Cylinder No.4	1▶	60 (IG4)	125 (E1)
	2▶	48 (ICMB3)	125 (E1)

Time axis	20ms / DIV
Voltage axis	2V / DIV
Condition	Water temperature is 80℃ or more; air conditioner is "ON"; electric load exists; during air conditioner idle up rotation

Air conditioner is "ON": Condition where all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "ON".

Electric load exists: Conditions where the headlight (H/L) and Defogger (DEF) are both "ON".

Air conditioner idle up rotation:950^{+100}_{-50}

NOTE

- **Check that waveforms like those in the figure (One example) is produced.**

3.Check the following points.

(1) According to the output waveform of the ignition signal (Channel 1 ▶), the output waveform of the ion current combustion control signal (Channel 2▶) has been produced.

(2) The waveform of 5 ⇄ 0V has been produced.

NOTE

- **Correct evaluation cannot be made for the ignition signals and ion current combustion control signals, unless you use an oscilloscope.**

	Waveform (Channel 2▶) state
a	Normal
b	Clamped at 0V.
c	Clamped at 5V.
d	Clamped to the battery voltage.
e	Waveform is unstable ※.

※: According to the output waveform of the ignition signal (Channel 1 ▶), the output waveform of the ion current combustion control signal (Channel 2▶) has not been produced.

▼<u>In the case of "a", go to ⊳9.</u>

▼<u>In the case of "b", go to ⊳11.</u>

▼<u>In the case of "c", go to ⊳13.</u>

▼<u>In the case of "d", go to ⊳12.</u>

▼<u>In the case of "e", go to ⊳16.</u>

⊳9. EFI ECU signal check (3)

1.Retain the measurement conditions in ⊳8.

2.Under the following conditions, check each cylinder for output waveforms of the ion current combustion control signal, using an oscilloscope.

(1) Raise the engine revolution speed slowly from the idle state to 4000 rpm. Then, close the throttle opening quickly.

SPECIFIED VALUE: No waveform is outputted while fuel is cut.

▼If it is OK, replace the EFI ECU.

Refer to Page B8-1.

▼If it is NG, go to ⊳10.

⊳10. Fuel cut operation check

1.Check the output state between the following terminals using an oscilloscope.

(1) Between SST 24 (#10) - SST 125 (E1)
(2) Between SST 23 (#20) - SST 125 (E1)
(3) Between SST 22 (#30) - SST 125 (E1)
(4) Between SST 21 (#40) - SST 125 (E1)

2.Check the operating sound of the injector using a sound scope when the fuel cut is active.

NOTE

- Check operating sound, while checking the output waveform to the injector using an oscilloscope.

SPECIFIED VALUE: The operating sound of the injector stops when the fuel cut is active.

▼If it is OK, replace the ignition coil.

Refer to Page B10-6.

▼In the case of NG, perform unit check of the injector.

Refer to Page B8-472.

⊳11. Check of wire harness for short-circuit (1)

1.Check continuity of the cylinder whose waveform is clamped at 0V.

(1) Between ignition coil 1 connection vehicle harness side connector 2 (ICMB1) - body earth
(2) Between ignition coil 2 connection vehicle harness side connector 2 (ICMB2) - body earth
(3) Between ignition coil 3 connection vehicle harness side connector 2 (ICMB3) - body earth
(4) Between ignition coil 4 connection vehicle harness side connector 2 (ICMB4) - body earth

SPECIFIED VALUE: No continuity exists

▼If it is OK, replace the ignition coil.

Refer to Page B10-6.

▼In the case of NG, repair the faulty section.

⊳12. Check of wire harness for short-circuit (2)

1.Check continuity of the cylinder whose waveform is clamped to the battery voltage.

(1) Between ignition coil 1 connection vehicle harness side connector 2 (ICMB1) - battery positive (+) terminal

(2) Between ignition coil 2 connection vehicle harness side connector 2 (ICMB2) - battery positive (+) terminal

(3) Between ignition coil 3 connection vehicle harness side connector 2 (ICMB3) - battery positive (+) terminal

(4) Between ignition coil 4 connection vehicle harness side connector 2 (ICMB4) - battery positive (+) terminal

SPECIFIED VALUE: No continuity exists

▼If it is OK, replace the ignition coil.

Refer to Page B10-6.

▼In the case of NG, repair or replace the faulty component.

⊳13. Check of wire harness for open wire

1.Check continuity of the cylinder whose waveform is clamped at 5V.

(1) Between ignition coil 1connection vehicle harness side connector 2 (ICMB1) - EFI ECU connection vehicle harness side connector 51 (ICMB1)

(2) Between ignition coil 2 connection vehicle harness side connector 2 (ICMB2) - EFI ECU connection vehicle harness side connector 50 (ICMB2)

(3) Between ignition coil 3 connection vehicle harness side connector 2 (ICMB3) - EFI ECU connection vehicle harness side connector 49 (ICMB3)

(4) Between ignition coil 4 connection vehicle harness side connector 2 (ICMB4) - EFI ECU connection vehicle harness side connector 48 (ICMB4)

SPECIFIED VALUE: Continuity exists

▼If it is OK, go to ⊳14.

▼In the case of NG, repair or replace the faulty component.

⊳14. Check of short-circuit between the wire harnesses

1.Check whether the cylinder, whose waveform is clamped at 5V, is short-circuited to the power wire of the sensor system.

NOTE

- The power supply for the sensor system is 5V.

(1) Between ignition coil 1 connection vehicle harness side connector 2 (ICMB1) - body earth

(2) Between ignition coil 2 connection vehicle harness side connector 2 (ICMB2) - body earth

(3) Between ignition coil 3 connection vehicle harness side connector 2 (ICMB3) - body earth

(4) Between ignition coil 4 connection vehicle harness side connector 2 (ICMB4) - body earth

SPECIFIED VALUE: 0V

▼If it is OK, replace the ignition coil and go to ⊳15.

Refer to Page B10-6.

▼In the case of NG, repair or replace the faulty component.

⊳15. EFI ECU signal recheck (1)

1.Recheck the cylinder, whose waveform is clamped at 5V, under the ⊳8) conditions.
2.Check that the output waveform of the ion current combustion control signal (Channel 2▶) is not clamped at 5V.
SPECIFIED VALUE: The output waveform (Channel 2▶) is not clamped at 5V.

▼If it is OK, finish the troubleshooting.
▼In the case of NG, misfire may have occurred. Identify the cause of the misfire and repair.

⊳16. Harness, connector check

1.When the following actions are taken to the cylinder whose waveform is unstable , check whether the waveform will change or not.
(1) Lightly shake the connector vertically and laterally.
(2) Lightly shake the wire harness vertically and laterally.
SPECIFIED VALUE: There is no change in the waveform.

2.Perform the following checks.
(1) Connector fitting condition
(2) Loose connection of the connector and the terminal.
SPECIFIED VALUE: No fault.

▼If it is OK, replace the ignition coil and go to ⊳17.
Refer to Page B10-6.

▼In the case of NG, repair or replace the faulty component.

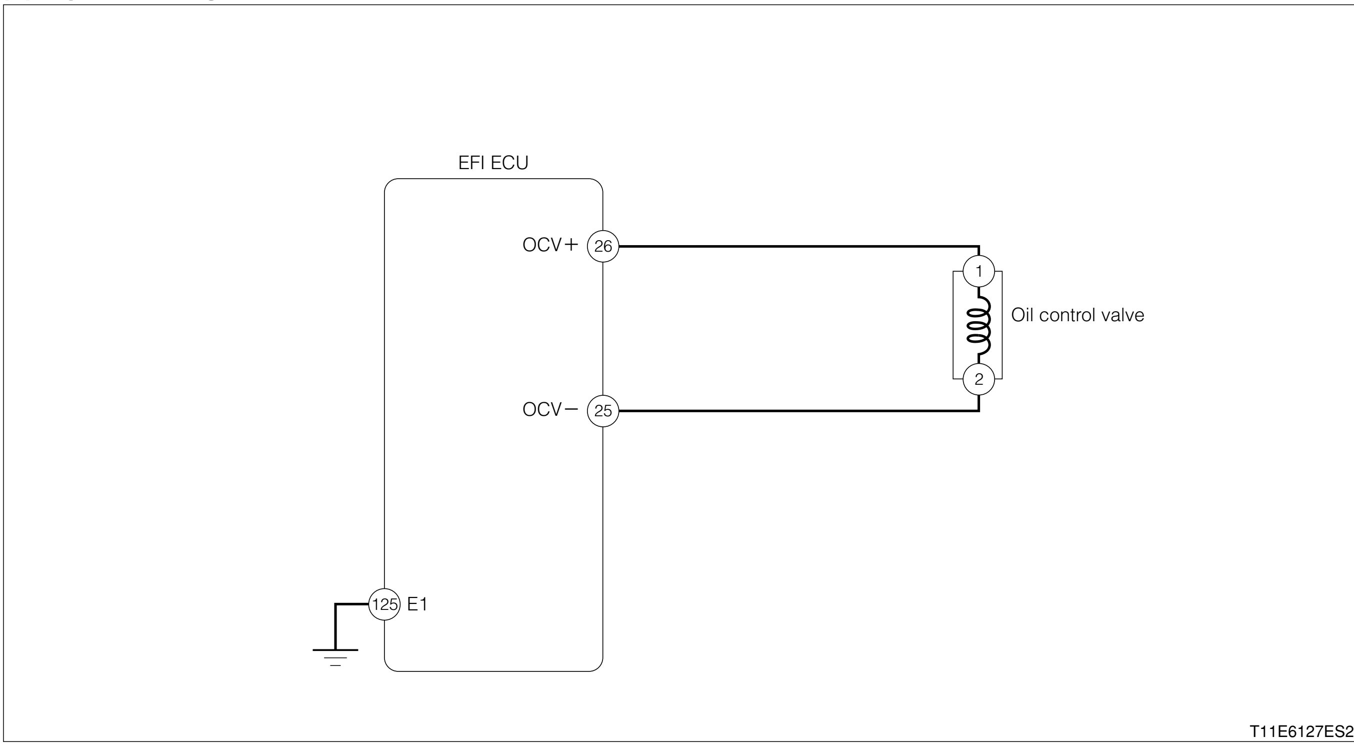
⊳17. EFI ECU signal recheck (2)

1.Recheck the cylinder, whose waveform is unstable, under the ⊳8) conditions.
2.Check that the output waveform of the ion current combustion control signal (Channel 2▶) is outputted stably.
SPECIFIED VALUE: The output waveform (Channel 2▶) is outputted stably.

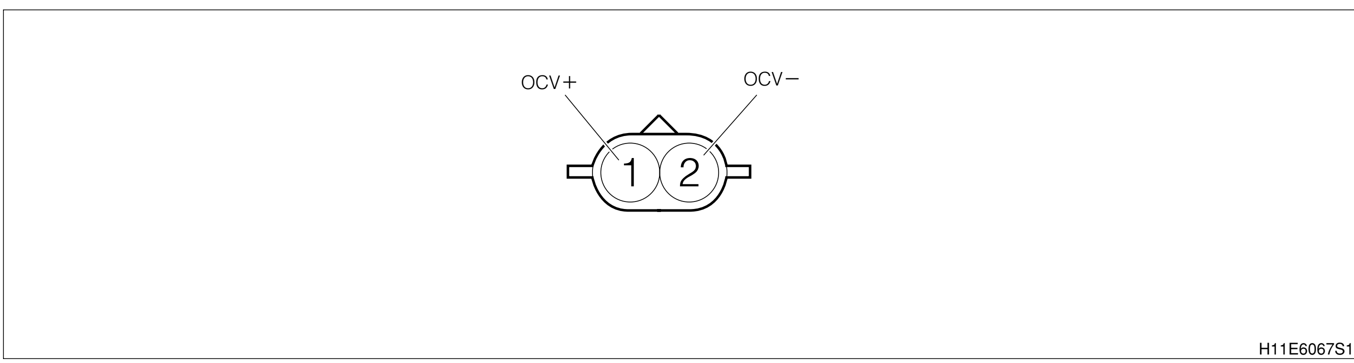
▼If it is OK, finish the troubleshooting.
3.In the case of NG, combustion instability may have occurred. Identify the cause of the combustion instability and repair.

9-12-20 DTC NO.P1346/75 VARIABLE VALVE TIMING CONTROL SYSTEM (VALVE TIMING)DTC NO.P1346/73 VARIABLE VALVE TIMING CONTROL SYSTEM (ADVANCED TIMING/RETARDED TIMING)

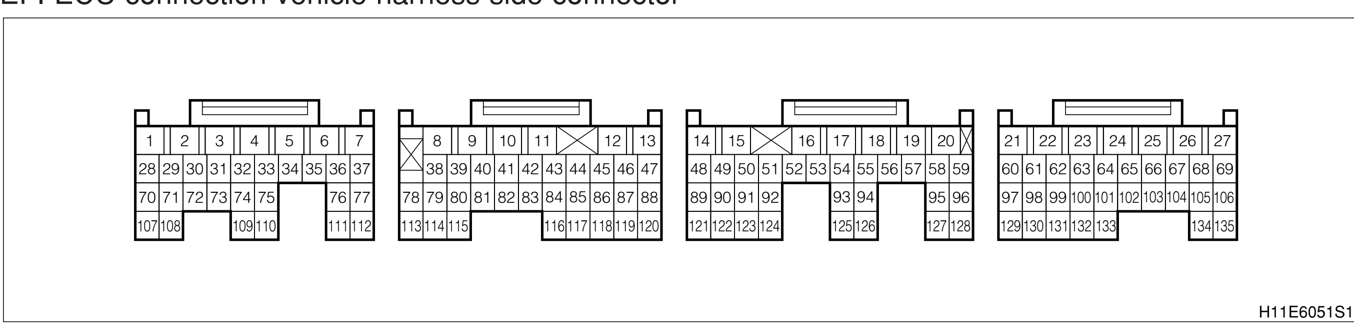
(1) System diagram



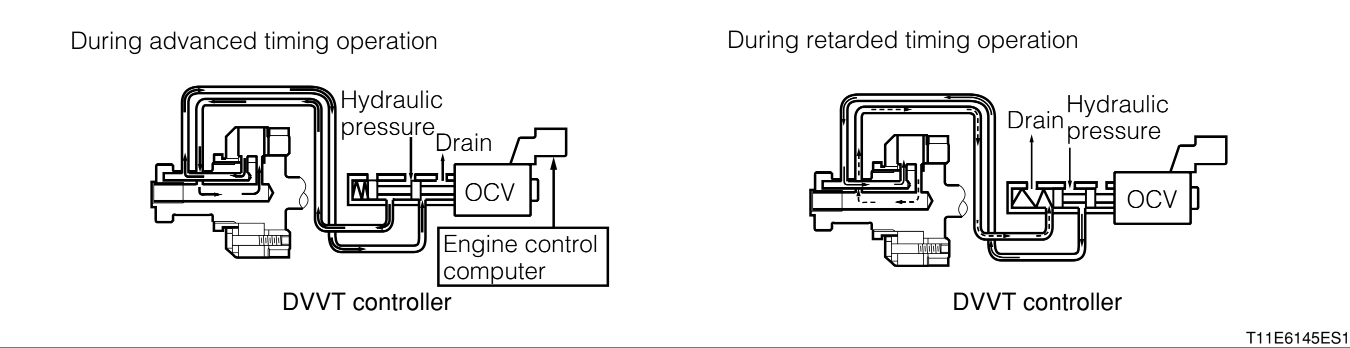
Oil control valve connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Variable valve timing control operation outline



1. The DVVT system controls the intake valve timing to proper timing in response to the driving conditions. The engine ECU controls the OCV (Oil Control Valve) to make the intake valve timing proper. The oil pressure controlled by the OCV is supplied to the DVVT controller, and then, the DVVT controller changes the relative position between the camshaft and the crankshaft.

(3) No.P1346/75 output conditions

1. When a valve timing fail of the variable timing is detected

(4) No.P1349/73 output conditions

1. Is the variable valve timing controller operating normally?

(5) Checking points

1. Is the variable valve timing controller operating normally?
2. Is the variable valve timing controller operating normally?
3. Is the timing deviated between the camshaft drive gear and the camshaft driven gear? (Are the mating marks matched?)

(6) Checking method

NOTE

- Read the freeze frame data, using the DS-21 diagnosis tester or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

▷1. Oil control valve operation check

WARNING

- Do not put any flammable material around because sparks may be generated and is dangerous.
- Pay attention for safety since this is an operation during engine operation.

1. Remove the connector of the oil control valve.
2. Start the engine and perform idling.

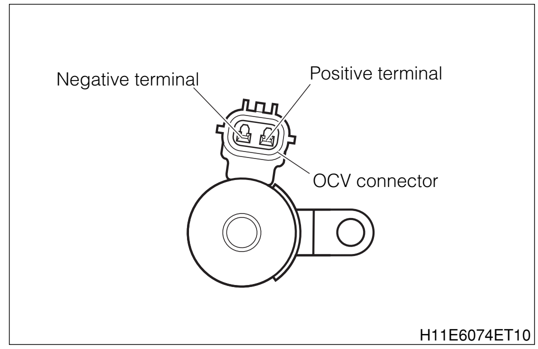
3.Apply the battery voltage to the connector of the oil control valve.

CAUTION

- Do not mistake the voltage polarity.
- Be careful of shorting while operating (As a precaution, install a fuse at the positive side).
- Set the energizing time at one minute or less.

NOTE

- Refer to the right figure for voltage polarity.



4.Confirm the idling condition of the engine.

SPECIFIED VALUE: Rough idling or engine stall takes place.

▼If it is OK, proceed to ▷2.

▼If it is NG, proceed to ▷4.

▷2. Check of wire harness continuity

1.Stop the engine.

2.Perform continuity check between each of the following terminals.

(1) Between oil control valve connection vehicle harness side connector 1 (OCV＋) - ECU connection vehicle harness side connector 26 (OCV＋)

(2) Between oil control valve connection vehicle harness side connector 2 (OCV－) - ECU connection vehicle harness side connector 25 (OCV－)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ▷3.

▼If it is NG, repair the harness and the connectors.

▷3. Camshaft gear deviation check

1.Check the deviation between the camshaft drive gear and the camshaft driven gear.

SPECIFIED VALUE: There is no deviation.

▼If it is OK, check the EFI ECU circuit.

Refer to Page A1-24.

▼If it is NG, reassemble the camshaft.

▷4. Oil control valve unit check

1.Perform unit check of the oil control valve.

Refer to Page B8-473.

▼If it is OK, proceed to ▷5.

▼If it is NG, replace the oil control valve.

Refer to Page B8-238.

▷5. DVVT actuator unit check

1.Perform unit check of DVVT actuator.

Refer to Page B2-45.

▼If it is OK, proceed to ▷6.

▼If it is NG, replace the camshaft No.2.

Refer to Page B2-41.

⊳6. Oil passage check

1.Check the passageway of the engine oil.
SPECIFIED VALUE: There is no clogging.

▼If it is OK, proceed to ⊳7.
▼If it is NG, repair the defective section of the oil passage.

⊳7. Camshaft gear deviation check

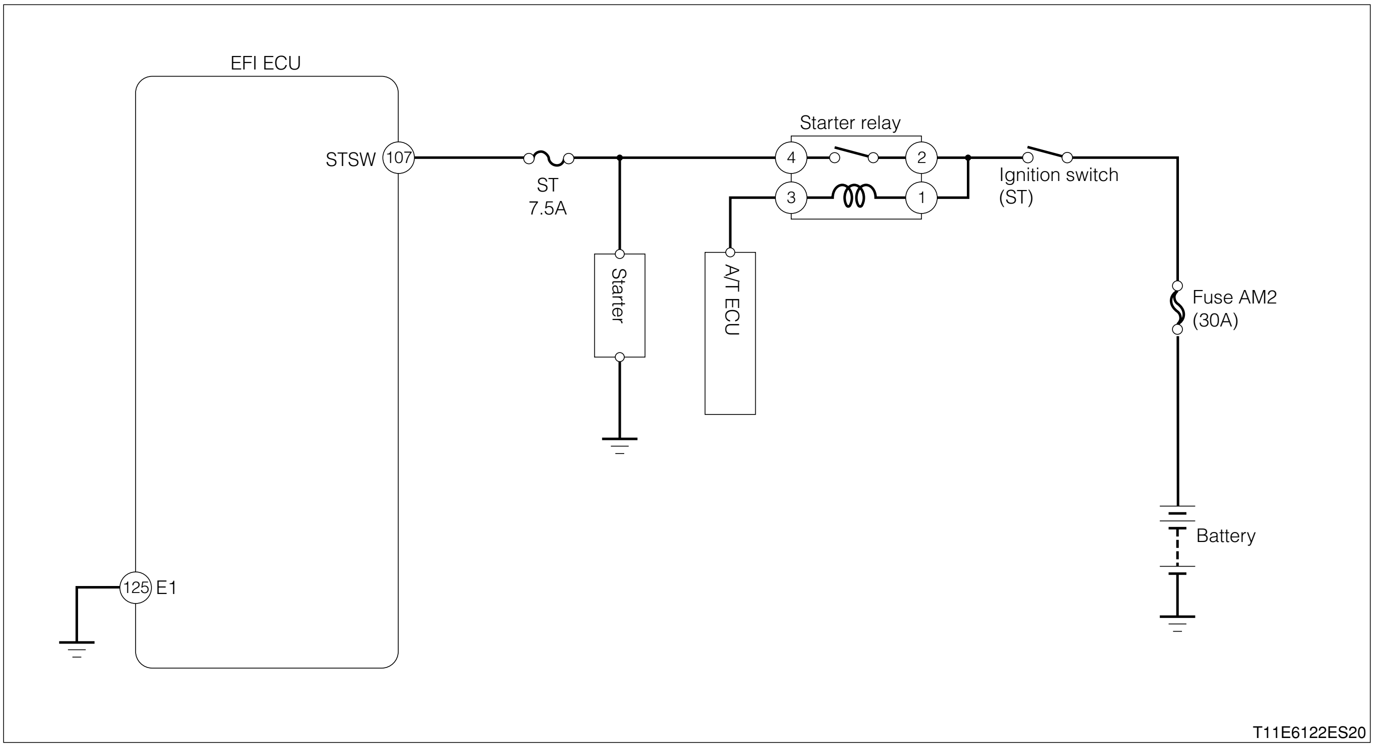
1.Check the deviation between the camshaft drive gear and the camshaft driven gear.
SPECIFIED VALUE: There is no deviation.

▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

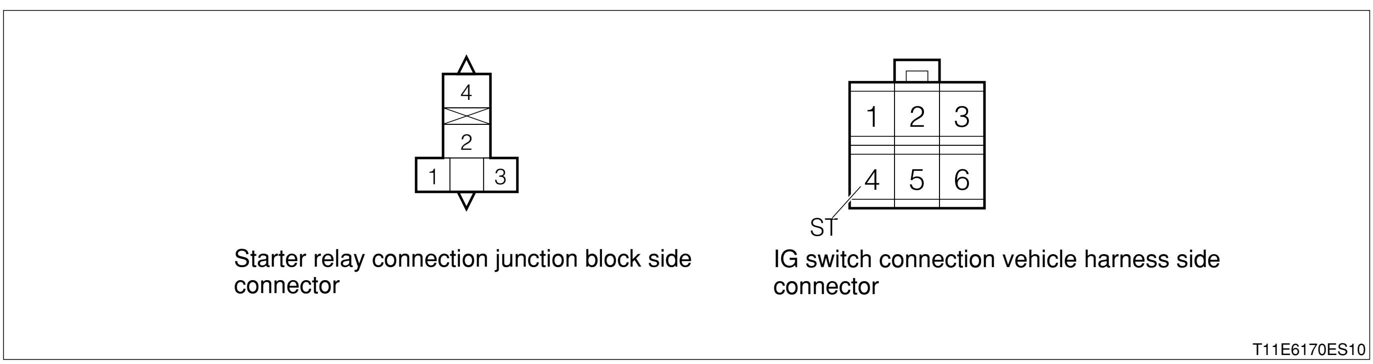
▼If it is NG, reassemble the camshaft.

9-12-21 DTC NO.P1510/54 STARTER RELAY OUTPUT SYSTEM

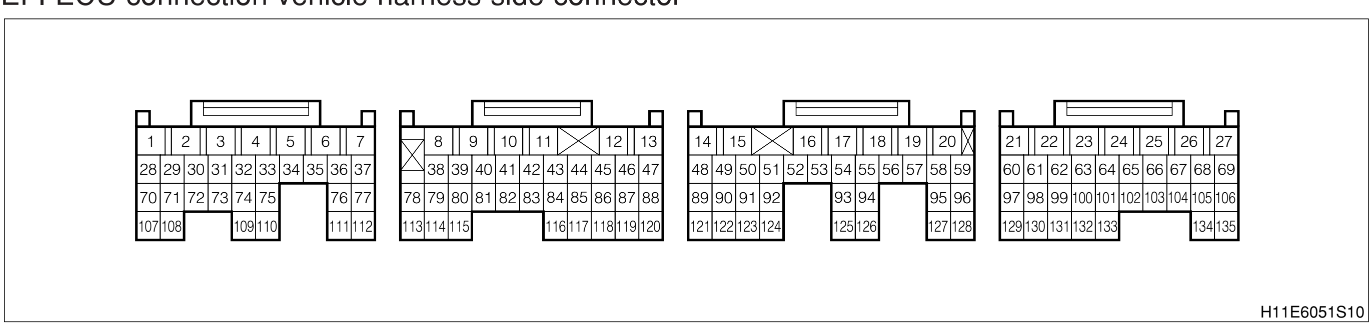
(1) System diagram



IG switch connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Diagnosis code output conditions

1. When no "ON" signal is made even if the engine revolution is more than the specified value with the vehicle speed set to 0 km/h

(3) Checking points

1. Is the harness between the starter and the EFI ECU normal?

(4) Checking method

⊳1. EFI ECU signal check

1.Connect the SST.

SST: 09842-97209-000

2.Perform voltage measurement between the following terminals during starting.

(1) Between SST 107 (STSW) - SST 125 (E1)

SPECIFIED VALUE: Battery voltage

▼If it is OK, check the EFI ECU circuit.

Refer to Page A1-24.

▼If it is NG, proceed to ⊳2.

⊳2. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.

(1) Between IG switch side connector 4 (ST) - ECU connection vehicle harness side connector 107 (STSW)

SPECIFIED VALUE: Continuity exists.

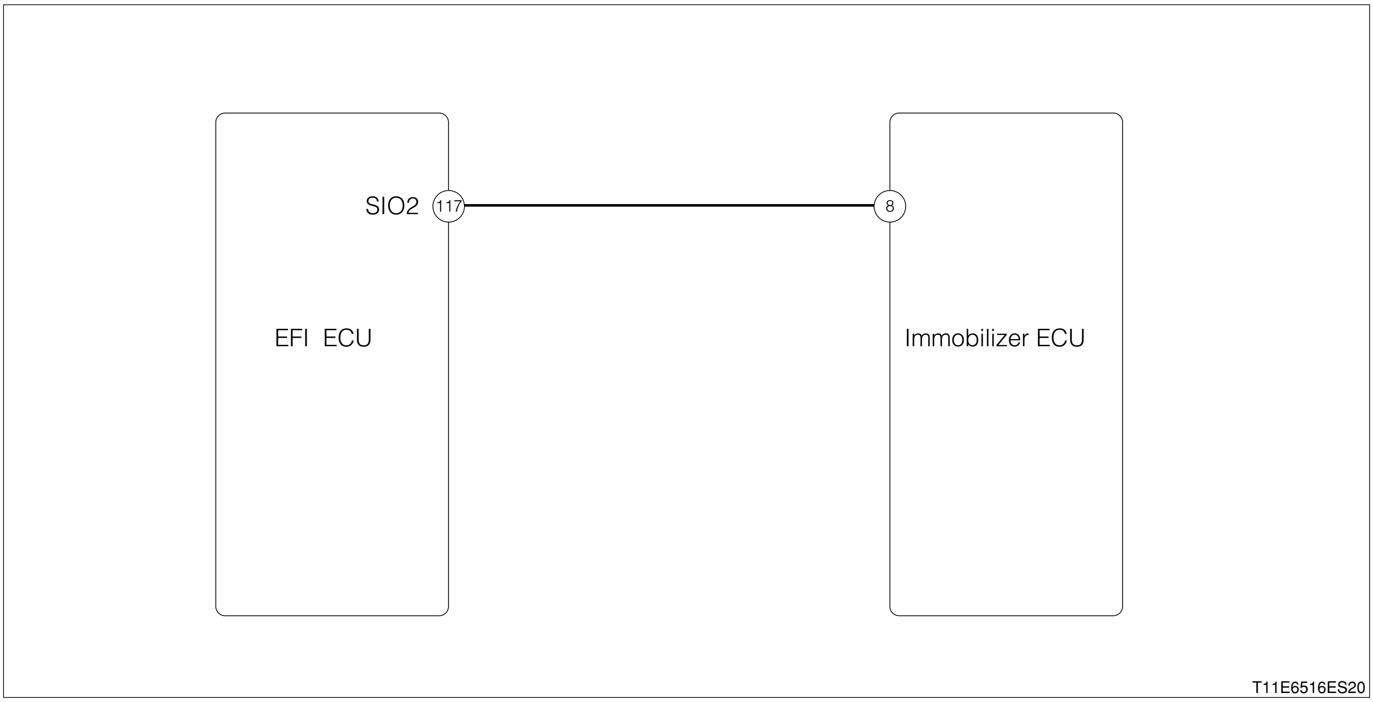
▼If it is OK, check the vehicle speed sensor system.

Refer to Page F5-53.

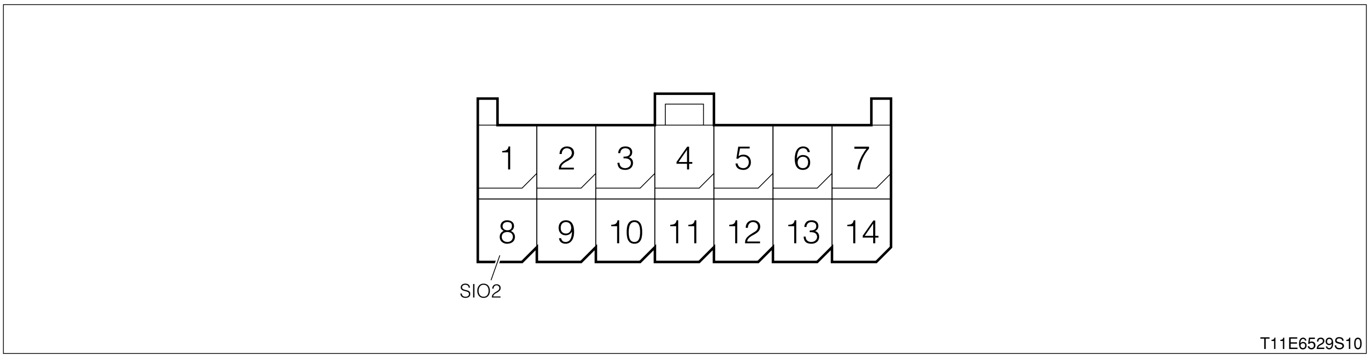
▼If it is NG, repair the harness and connectors.

9-12-22 DTC NO.P1600/83 IMMOBILIZER SIGNAL CIRCUIT MALFUNCTION

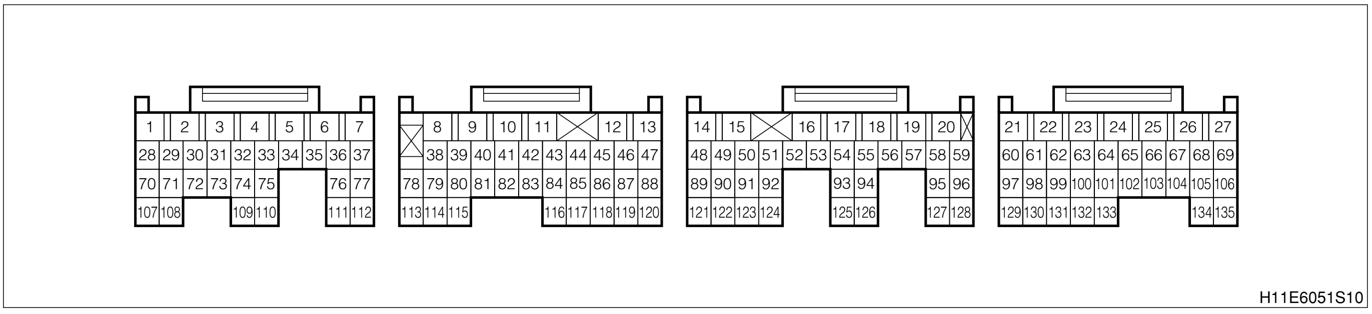
(1) System diagram



Immobilizer ECU wire harness side



EFI ECU wire harness side



(2) Circuit description

1.This circuit performs collation and updating of the rolling code in the communication between the immobilizer ECU and the EFI ECU. The engine can start only when the collation and updating of the rolling code can be done. The rolling code is collated and updated by reading out or writing to non volatile memory (E2PROM) of both ECUs.

(3) Diagnosis code output conditions

1.When the engine starts, the rolling code can not reading out or writing to the EFI ECU.

(4) Trouble area

1.EFI ECU

(5) Inspection procedure

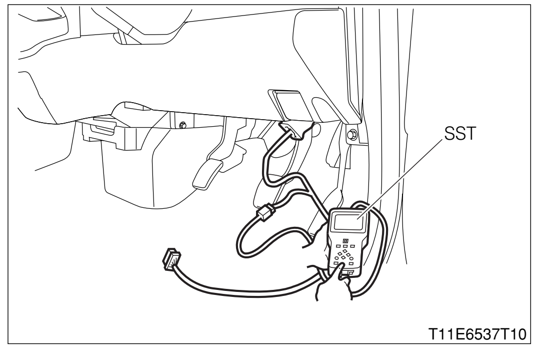
1 **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Re-confirmation of DTC.

1.IG switch turned "LOCK".

2.Connect the DS-21 diagnosis tester to the DLC through the SST.

SST: 09991-87404-000



3.Turn "ON" the IG switch, and turn "ON" the main switch of the tester.

4.Erase the DTC. (As for the operation, follow the instruction manual of the DS-21 diagnosis tester.)

5.Turn "OFF" the main switch of the tester. Turn "LOCK" the IG switch.

6.Turn "ON" the IG switch. Turn "ON" the main switch of the tester.

7.Check the DTC.

8.Is" P1600/83" indicated ?

▼If the output is made, proceed to ⊳2.

▼If no output is made, proceed to ⊳3.

⊳2. Wiring harness check

1.Turn "LOCK" the ignition switch.

2.Perform the continuity check between the following terminals.

(1) Between the EFI ECU connection vehicle harness side connector 117 (SIO2) and the immobilizer ECU connection vehicle harness side connector 8 (SIO2)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, go to ⊳3.

▼If it is NG, repair the defective point.

⊳3. Check of immobilizer side diagnosis code

1.Turn "ON" the IG switch. Turn "ON" the main switch of the tester.

2.Check the immobilizer diagnosis code.

▼If no output is made, replace the EFI ECU.

Refer to Page B8-7.

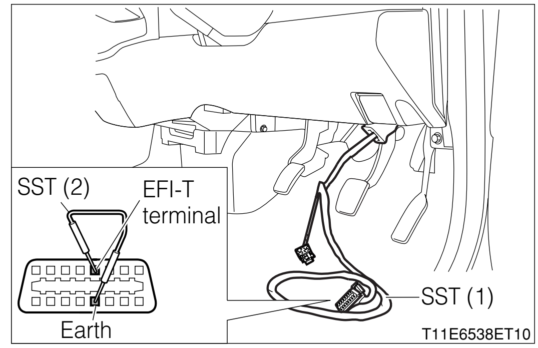
▼If the output is made, check the immobilizer.

Refer to Page I4-31.

2 **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Re-confirmation of DTC.

1.Remove the EFI fuse. Erase the DTC. (As for the erasing method.)
2.Set the EFI fuse to the original position.
3.Short circuit the DLC terminals 5 (EFI-T) and 13 (E), using the SST.
SST: 09991-87404-000 (1)
09991-87403-000 (2)
4.Turn "ON" the IG switch.
5.Check the DTC. (Read out the flashing pattern of the MIL.)
6.Is "83" indicated?
▼If the output is made, proceed to ⊳2.
▼If no output is made, proceed to ⊳3.



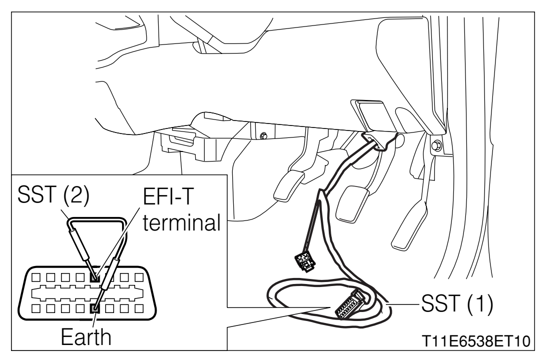
⊳2. Wiring harness check

1.Turn "LOCK" the ignition switch.
2.Perform the continuity check between the following terminals.
(1) Between the EFI ECU connection vehicle harness side connector 117 (SIO2) and the immobilizer ECU connection vehicle harness side connector 8 (SIO2)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, go to ⊳3.
▼If it is NG, repair the defective point.

⊳3. Check of immobilizer side diagnosis code

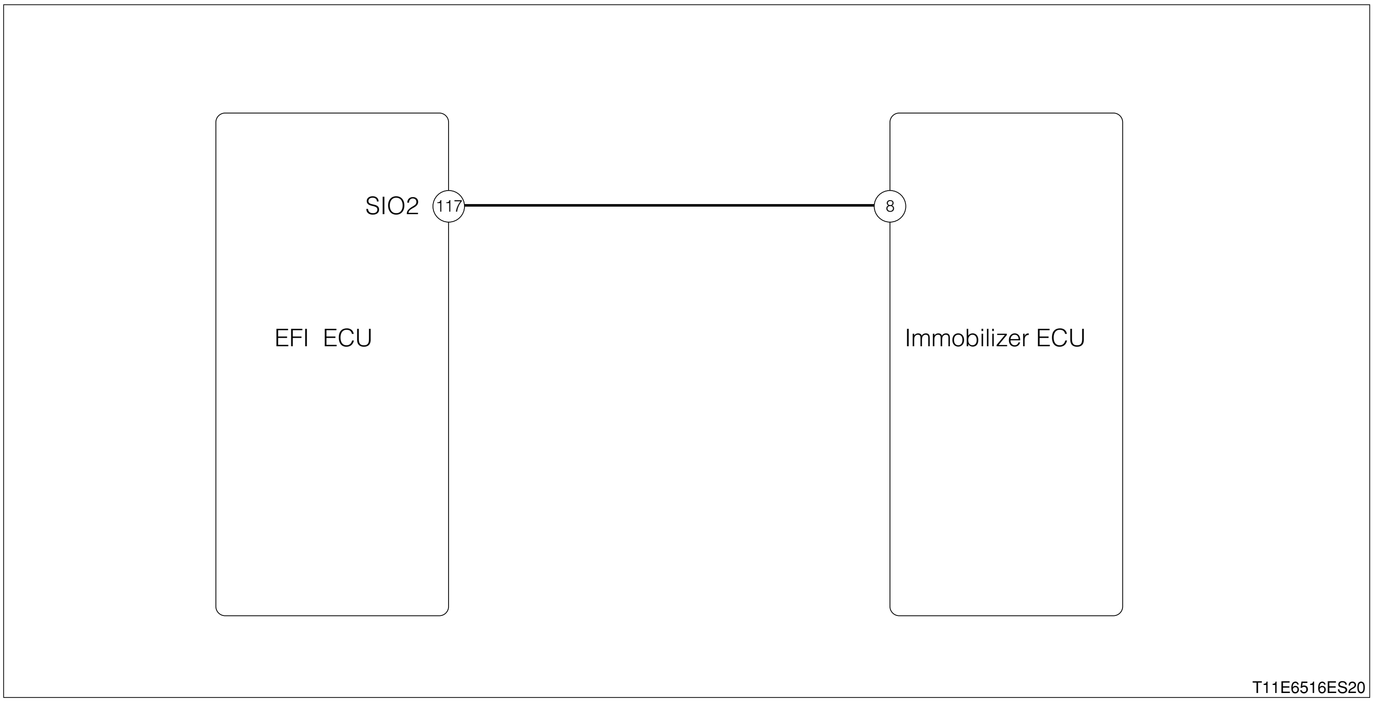
1.Short between the DLC terminals 4 (ECU-T) and 13 (E), using the SST.
SST: 09991-87404-000 (1)
09991-87403-000(2)
2.Turn "ON" the IG switch.
3.Is the diagnosis code of the immobilizer outputted?
▼If no output is made, replace the EFI ECU.
Refer to Page B8-1.



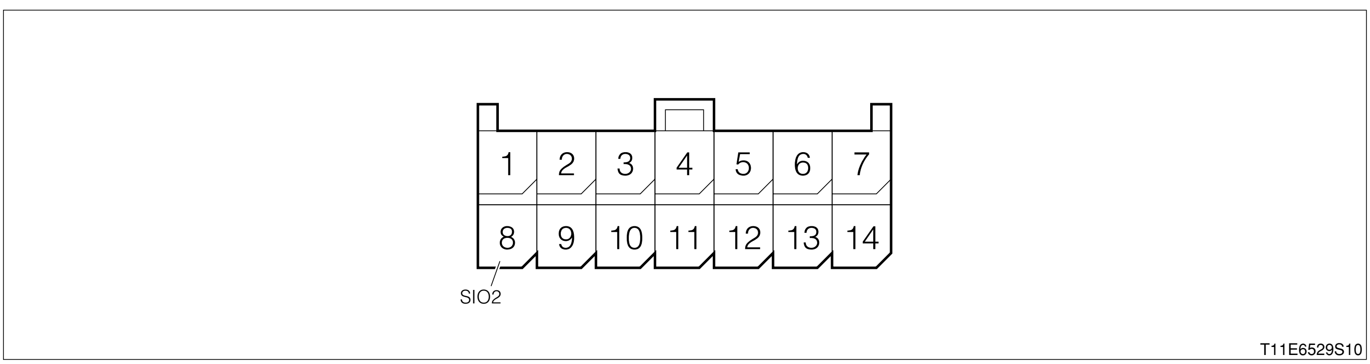
▼If the output is made, check the immobilizer.
Refer to Page I4-31.

9-12-23 DTC NO.P1601/81 IMMOBILIZER SIGNAL MALFUNCTION

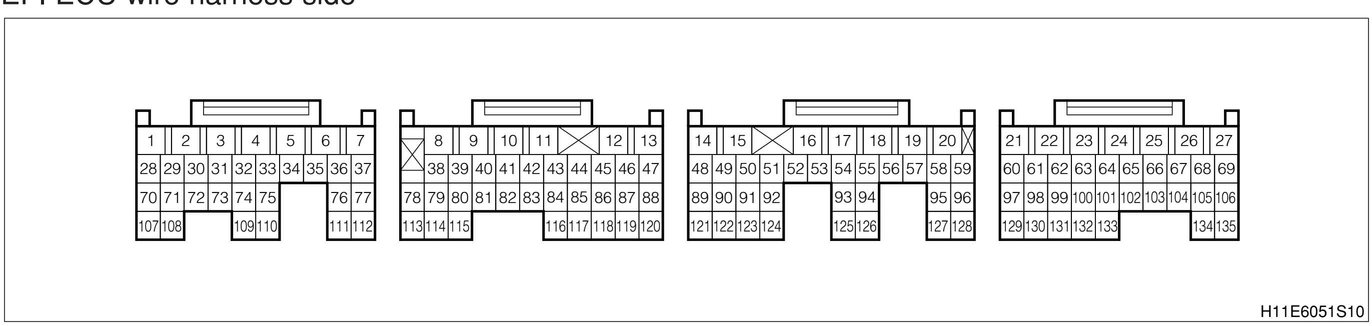
(1) System diagram



Immobilizer ECU wire harness side



EFI ECU wire harness side



(2) Circuit description

1.When the ignition switch is turned "ON", communication starts between the immobilizer ECU and EFI ECU. The engine can start only when the communication between the two ECU is possible and the rolling codes are matched. In order cases, fuel injection and ignition are prohibited, thus making engine starting impossible.

(3) DTC DETECTING CONDITION

1.When the engine starts, the rolling codes are not matched.

(4) Trouble area

1. Open wire or short circuit for the immobilizer system circuit
2. Immobilizer ECU
3. EFI ECU

(5) Inspection procedure

⊳1. Check of harness between immobilizer ECU and EFI ECU.

1. Set the SST (Sub-harness). However, the SST connectors at the EFI ECU side should remain disconnected.
   SST: 09842-97209-000

2. Disconnect the immobilizer ECU connector.
3. Perform the continuity check between the following terminals with the IG switch set to the "LOCK" position.
   (1) Connector 8 (SIO1) at immobilizer ECU harness side - SST terminal 117 (SIO1).
4. Are the check results for open wire and short OK?
   ▼<u>If it is OK, go to ⊳2.</u>
   ▼<u>If it is NG, repair or replace the harness or connector.</u>

⊳2. Check of immobilizer system (1).

1. Connect the connector of the immobilizer ECU.
2. Replace the EFI ECU with a new one. Connect the SST connector to the EFI ECU.
3. Start the engine with the master key.
4. Does the engine start?
   SPECIFIED VALUE: The engine starts.

   ▼<u>If it is OK, check or replace the EFI ECU.</u>
   ▼<u>If it is NG, go to ⊳3.</u>

⊳3. Check of immobilizer system (2).

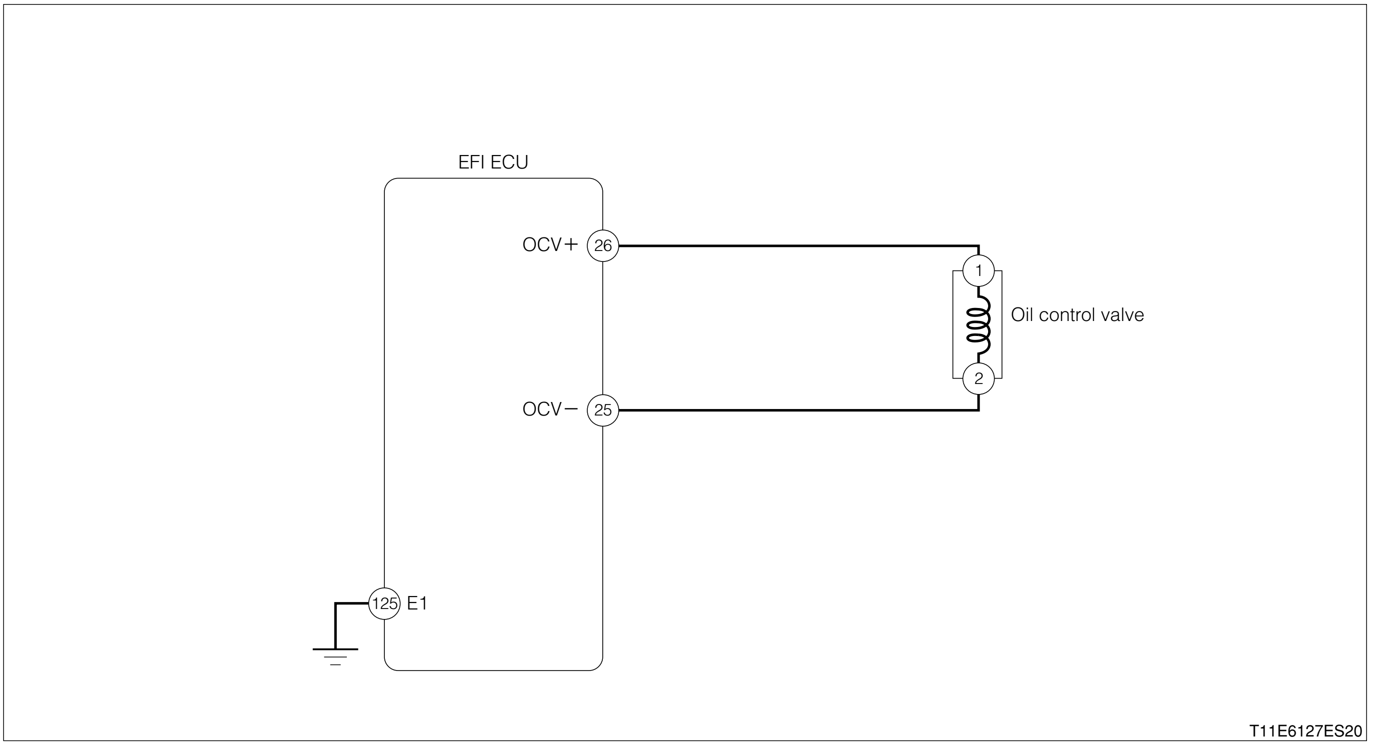
1. Replace the immobilizer ECU with a new one, with the IG switch turned "LOCK".
2. Start the engine with the master key.
3. Does the engine start?
   SPECIFIED VALUE: The engine starts.

   ▼<u>If it is OK, check the IG key, antenna coil, etc. (Refer to section "BODY ELECTRICAL SYSTEM".)</u>
   ▼<u>If it is NG, check or replace the immobilizer ECU.</u>

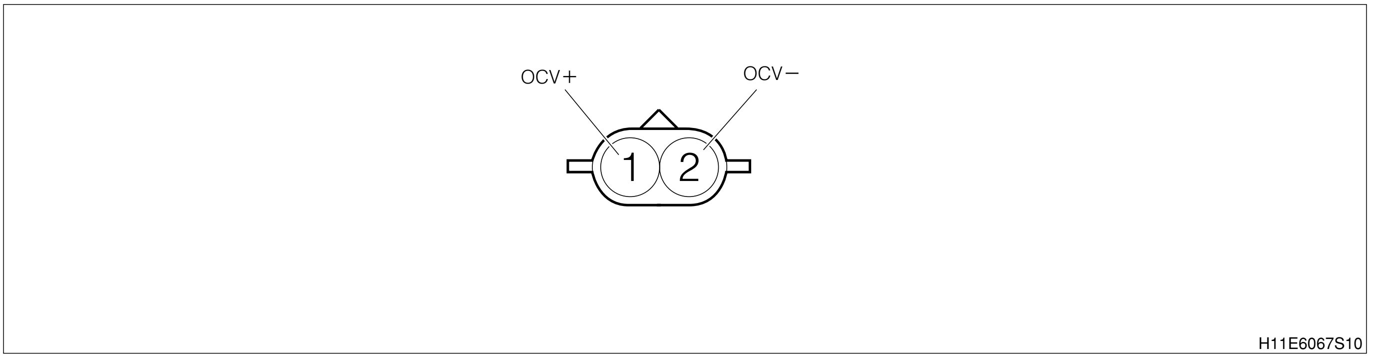
Refer to Page I4-29.

9-12-24 DTC NO.P1656/74 OIL CONTROL VALVE CONTROL SYSTEM MALFUNCTION

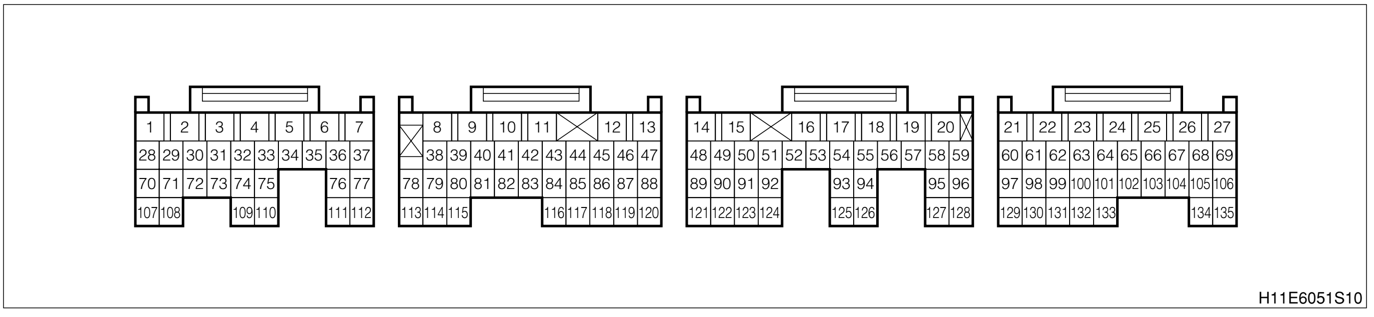
(1) System diagram



Oil control valve connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Diagnosis code output conditions

1. When, under a condition where the battery voltage is 12V or more, one of the following conditions is continued over a certain length of time
   (1) When the output duty ratio is 99% or more and the oil control valve voltage is below the evaluation specified value
   (2) When the output duty ratio is 0% and the oil control valve voltage is the evaluation specified value or more

(3) Checking points

1.Is the control signal of the oil control valve outputted normally from the EFI ECU?
2.Is the harness between the oil control valve and the EFI ECU normal?

⊳1. Oil control valve operation check

WARNING

- Do not put any combustible in the surrounding area, for sparks are occurring and there are fire potentials.
- This is an operation to be made while the engine is running. Special care must be exercised for the safety.

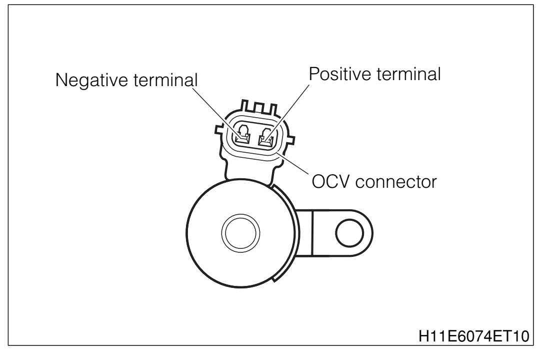
1.Disconnect the oil control valve connector.
2.Start the engine and perform an idling operation.
3.Apply the battery voltage to the oil control valve connector.

CAUTION

- Do not mistake the voltage polarity.
- Pay utmost attention as for a short during the operation. (Put a fuse at the plus side as a precautionary measure.)
- Make sure that the energizing time should be within one minute.

NOTE

- For the voltage polarity, refer to the right figure.



4.Confirm the engine idling condition.

SPECIFIED VALUE: Rough idling or engine stalling occurs.

▼If it is YES, go to ⊳2.
▼If it is NG, replace the oil control valve.
Refer to Page B8-238

⊳2. Oil control valve voltage check

1.Stop the engine and set the IG switch to the "LOCK" position.
2.Connect the SST.

SST: 09842-97209-000

3.Turn "ON" the ignition switch.
4.Check the voltage between the following terminals.

(1) Between SST 25 (OCV−) and SST 26 (OCV+)

SPECIFIED VALUE: Battery voltage

▼If it is OK, go to ⊳3.
▼If it is NG, check the EFI ECU circuit.
Refer to Page A1-24.

▷3. Check of wire harness continuity

1.With the IG switch turned "LOCK", disconnect the SST connector from the ECU.

2.Perform continuity check between the following terminals.

(1) Between the oil control valve connection vehicle harness side connector1 (OCV＋) and the ECU connection vehicle harness side connector 26 (OCV＋)

(2) Between the oil control valve connection vehicle harness side connector 2 (OCV－) and the ECU connection vehicle harness side connector 25 (OCV－)

SPECIFIED VALUE: Continuity exists.

▼<u>If it is OK, check the EFI ECU circuit.</u>

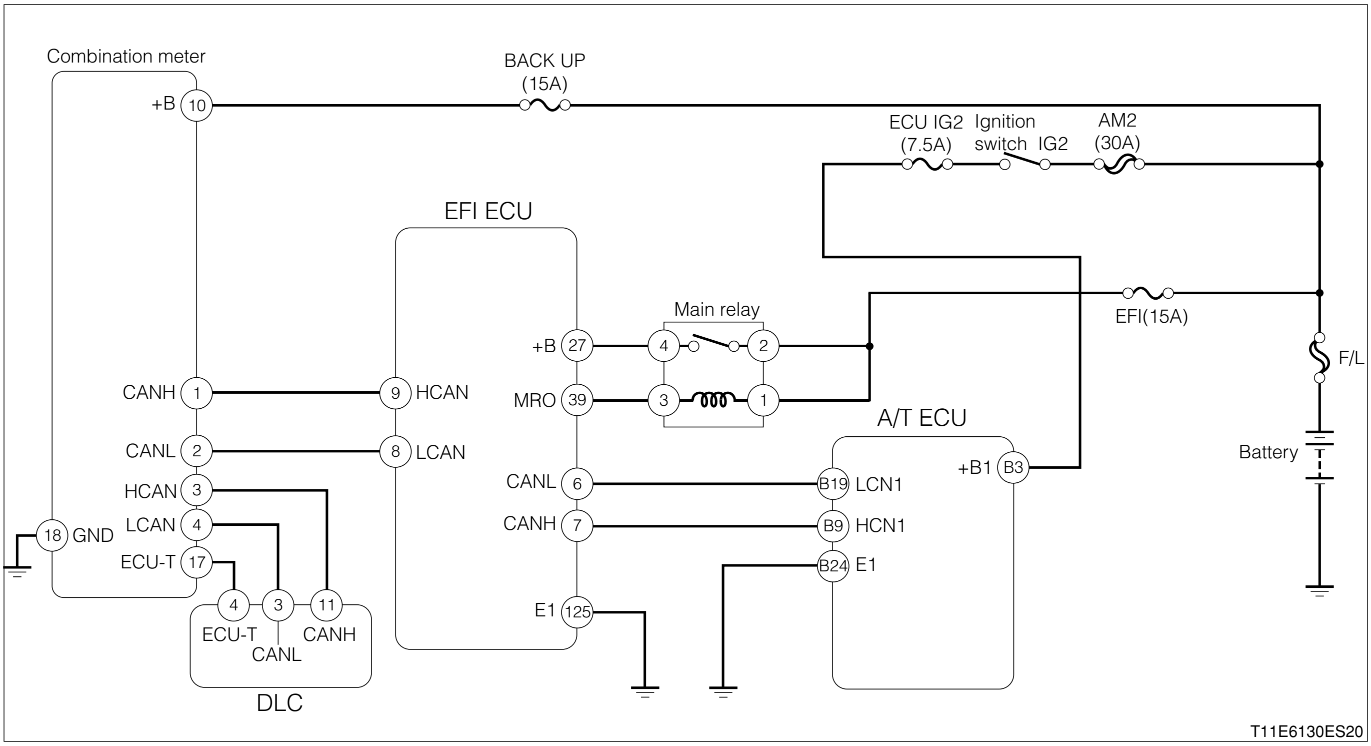
Refer to Page A1-24.

▼<u>If it is NG, repair the harness and connector.</u>

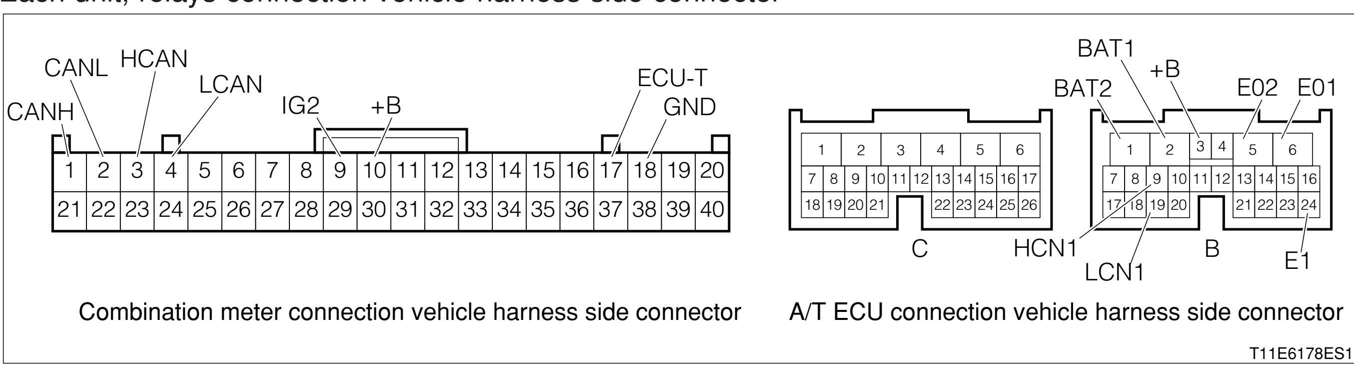
9-12-25 DTC NO. U101/82 E-AT ABNORMAL RECEPTION

(1) System diagram

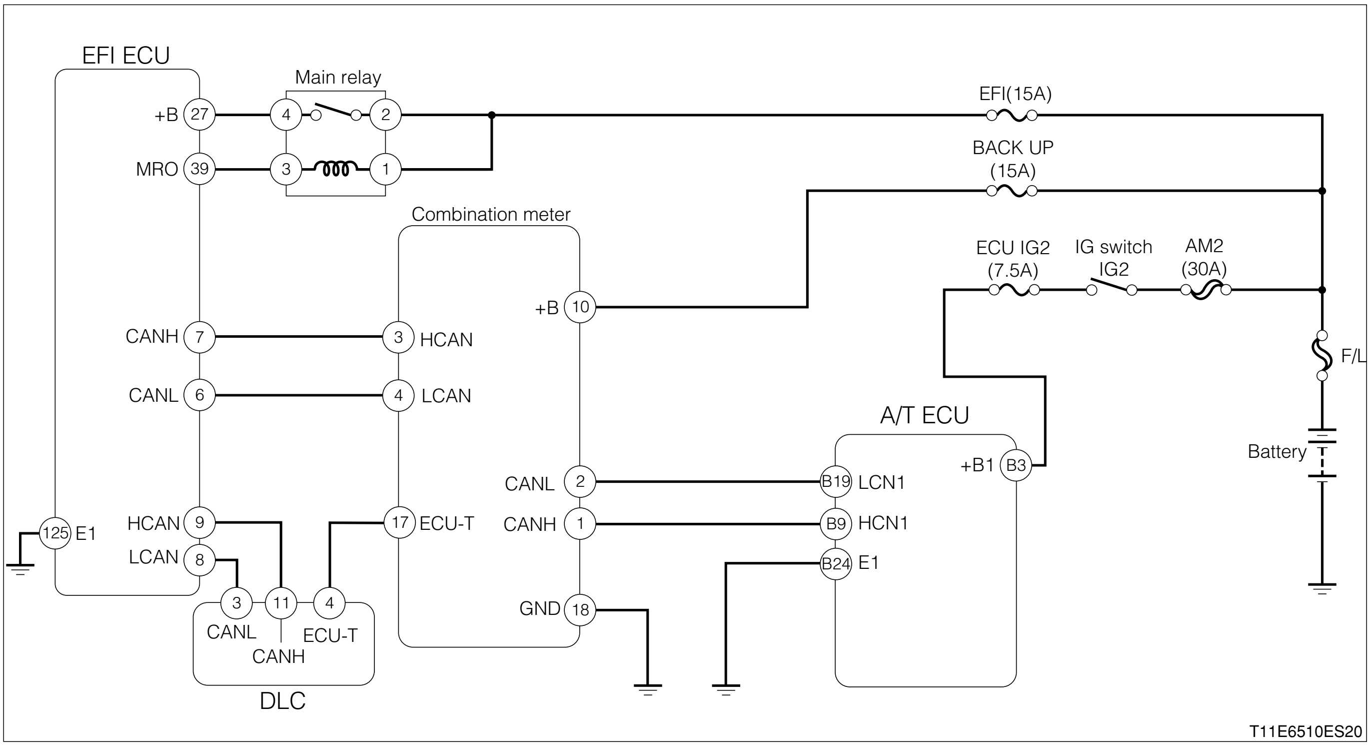
1 **RHD vehicles**



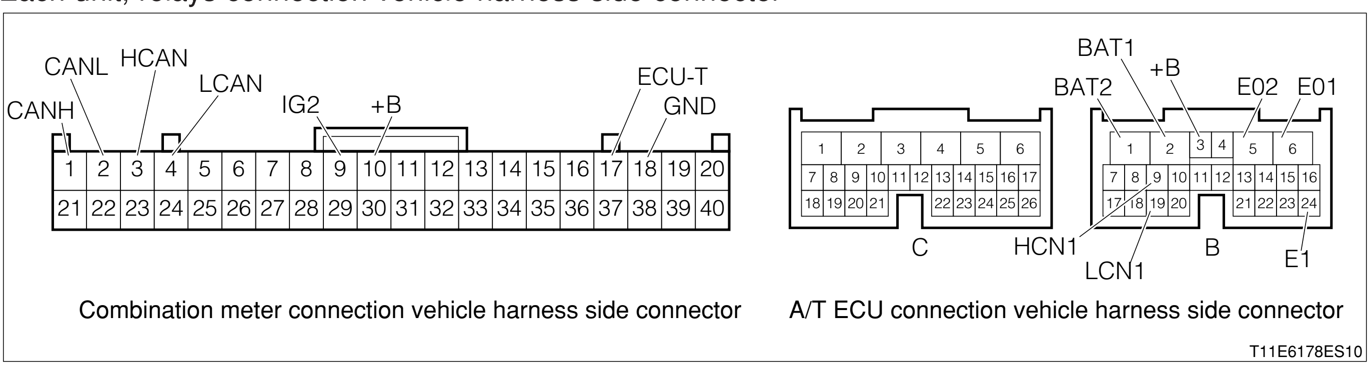
Each unit, relays connection vehicle harness side connector



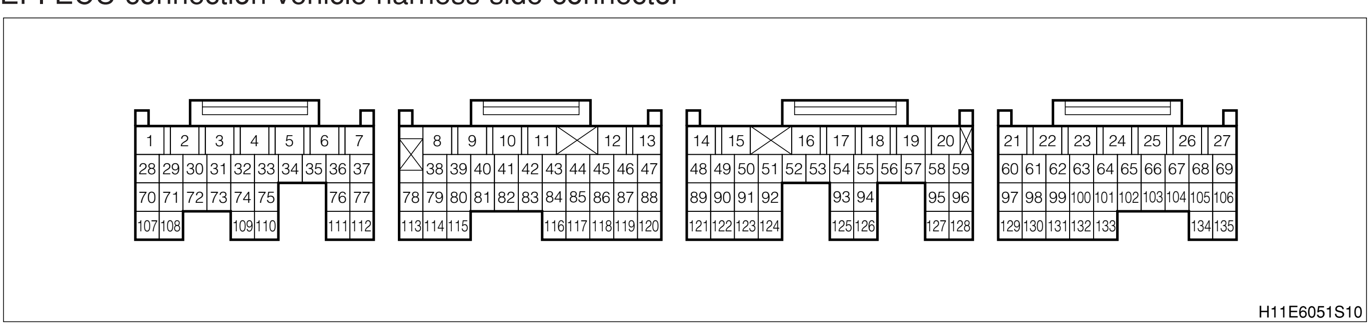
2 **LHD vehicles**



Each unit, relays connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Output conditions

1.When communication signal cannot be received from A/T ECU

(3) Checking points

1.Is the harness between EFI ECU - A/T ECU normal?

2.Is the A/T ECU normal?

3.Check whether there is any poor contact at the connector section.

(4) Checking method

1 **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

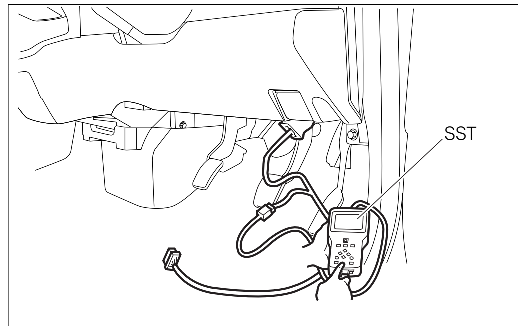
⊳1. Confirmation of the diagnosis codes (Related to A/T)

1.IG switch turned "LOCK".

2.Connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

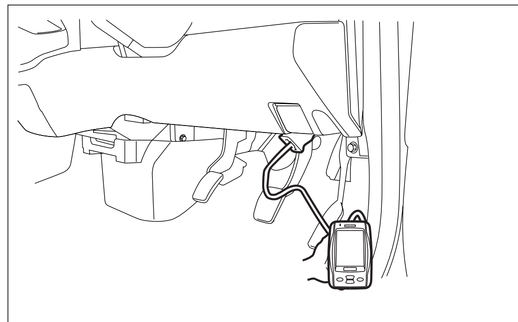
SST: 09991-87404-000



T11E6537T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



T11E6573T10

3.Confirm whether any A/T-related diagnosis code is outputted.

(No.P0705/55, No.P0705/56: Neutral start switch malfunctioning)

▼<u>If it is outputted, go to ⊳2.</u>

▼<u>If it is not outputted, go to ⊳4.</u>

⊳2. Troubleshooting according to diagnosis code (Related to A/T)

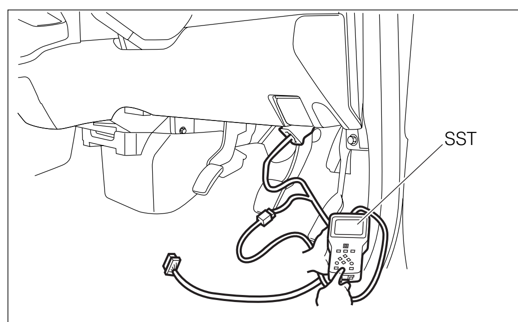
1.Perform the check and repair related to the diagnosis codes that have been outputted in ⊳1.

(1) No.P0705/55: No input to neutral start switch

Refer to Page F5-35.

(2) No.P0705/56: Duplicate input to neutral start switch

Refer to Page F5-37.



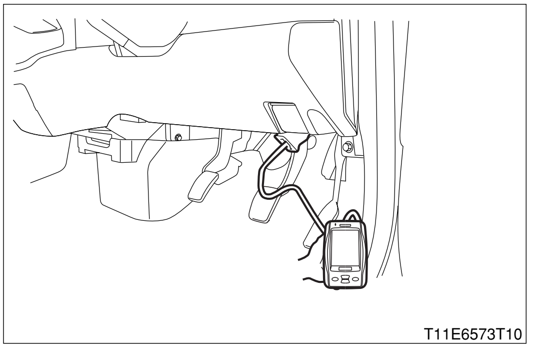
T11E6537T10

2.After completion of the repairs, connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000

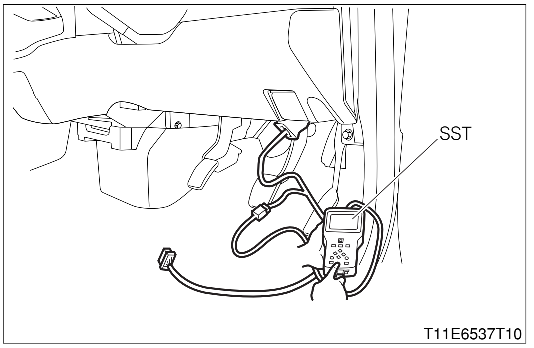
(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.


T11E6573T10

3.Confirm whether any diagnosis code related to the A/T is outputted.
▼If it is not outputted, go to ⊳3.
▼If it is outputted, perform the recheck of the diagnosis code that has been outputted.

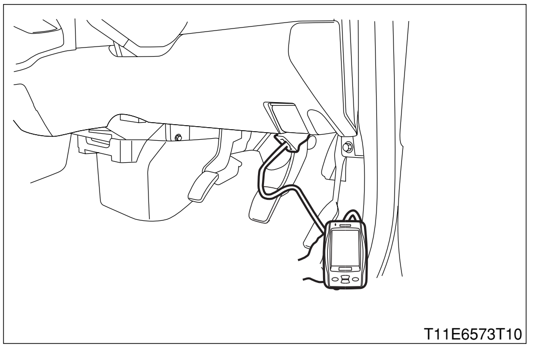
⊳3. Reconfirmation of diagnosis code (Related to EFI)

1.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000



T11E6537T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.


T11E6573T10

2.Erase the diagnosis code of the EFI.
3.Confirm whether the diagnosis code of the EFI is outputted or not.
SPECIFIED VALUE: It is not outputted.

▼If it is OK, the EFI system is normal.
▼If it is NG, go to ⊳4.

⊳4. CAN communication basic check

1.Perform the CAN communication basic check.
Refer to Page L2-14.

▼If it is OK, go to ⊳5 for RHD vehicles.
▼If it is OK, go to ⊳6 for LHD vehicles.
▼If it is NG, repair or replace malfunctioning sections.

⌦5. Check of CAN line for open wire (RHD vehicles)

1.Set the IG switch to the "LOCK" position.
2.Disconnect all of the connectors for the EFI ECU and A/T ECU.
3.Perform continuity check between the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - EFI ECU connection vehicle harness side connector 7 (CANH)
(2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - A/T ECU connection vehicle harness side connector B19 (LCN1)
SPECIFIED VALUE: No continuity exists

▼If it is OK, go to ⌦6.
▼If it is NG, repair or replace malfunctioning sections.

⌦6. Check of CAN line for open wire (LHD vehicles)

1.Set the IG switch to the "LOCK" position.
2.Disconnect all of the connectors for the EFI ECU and A/T ECU.
3.Perform continuity check between the following terminals.
(1) Between combination meter connection vehicle harness side connector 1 (CANH) - combination meter connection vehicle harness side connector 2 (CANL)
(2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - A/T ECU connection vehicle harness side connector B19 (LCN1)
SPECIFIED VALUE: No continuity exists

▼If it is OK, go to ⌦7.
▼If it is NG, repair or replace malfunctioning sections.

⌦7. Check of CAN line for short circuit

1.Perform continuity check between the following terminals.
(1) Between A/T ECU connection vehicle harness side connector B19 (LCN1) - battery positive (+) terminal
(2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - battery positive (+) terminal
(3) Between A/T ECU connection vehicle harness side connector B19 (LCN1) - body earth
(4) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - body earth
SPECIFIED VALUE: No continuity exists

▼If it is OK, go to ⌦8.
▼If it is NG, repair or replace malfunctioning sections.

⌦8. Check of EFI ECU internal resistance

1.Disconnect all of the EFI ECU connectors.
2.Measure the resistance between the following terminals.
(1) Between EFI ECU side connector 6 (CANL) - EFI ECU side connector 7 (CANH)
(2) Between EFI ECU side connector 8 (LCAN) - EFI ECU side connector 9 (HCAN)
SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, go to ⌦9.
▼If it is NG, replace the EFI ECU.
Refer to Page B8-1.

▷9. Check of combination meter internal resistance

1. Disconnect the connector of the combination meter.
2. Measure the resistance between the following terminals.
   (1) Between combination meter side connector 1 (CANH) - combination meter side connector 2 (CANL)
   (2) Between combination meter side connector 3 (HCAN) - combination meter side connector 4 (LCAN)

SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, go to ▷10.
▼If it is NG, replace the combination meter.
Refer to Page J3-3.

▷10. Check of A/T ECU internal circuit

1. Disconnect all of the A/T ECU connectors.
2. Perform continuity check between the following terminals.
   (1) Between A/T ECU side connector B9 (HCN1) - A/T ECU side connector B19 (LCN1)
   (2) Between A/T ECU side connector B10 (CANH) - A/T ECU side connector B20 (CANL)
   (3) Between A/T ECU side connector B9 (HCN1) - A/T ECU side connector B10 (CANH)
   (4) Between A/T ECU side connector B19 (LCN1) - A/T ECU side connector B20 (CANL)

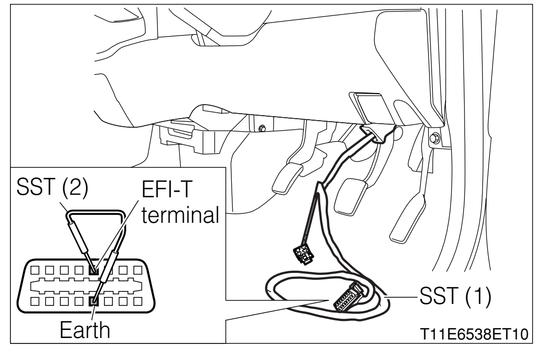
SPECIFIED VALUE:

Between the measuring terminals	Continuity
Between B9 (HCN1) - B19 (LCN1)	Continuity exists (less than 1MΩ).
Between B10 (CANH) - B20 (CANL)	
Between B9 (HCN1) - B10 (CANH)	Continuity exists (1MΩ or less).
Between B19 (LCN1) - B20 (CANL)	

▼If everything is OK, perform the circuit check of the combination meter as well as the EFI ECU and A/T ECU.
▼If any one is NG, replace the A/T ECU.
Refer to Page F5-2.

2 **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊵1. Diagnosis code confirmation (A/T related)



1.Short-circuit the terminals 4(ECU-T) and 13 (E) of the DLC, using the SST.
SST: 09991-87404-000 (1)
09991-87403-000 (2)
2.Check to see if the diagnosis code of the A/T is outputted (No.P0705/55, No.P0705/56: Neutral start switch failure)

NOTE

- Refer to the diagnosis code output indication method of A/T.

Refer to Page F5-23

▼If it is outputted, proceed to ⊵2.
▼If it is not outputted, proceed to ⊵4.

⊵2. Trouble shooting according to diagnosis codes (A/T related)

1.Perform checking and repairing for the diagnosis code outputted in ⊵1.
(1) No.P0705/55: No input of neutral start switch
Refer to Page F5-35.

(2) No.P0705/56: Multiple input of neutral start switch
Refer to Page F5-37.

2.After repairing, short-circuit the terminals 4 (ECU-T) and 13 (E) of the DLC, using the SST.
SST: 09991-87404-000 (1)
09991-87403-000 (2)

3.Confirm that the diagnosis code of A/T is not outputted.
▼If it is not outputted, proceed to ⊵3.
▼If it is outputted, perform recheck for the diagnosis code outputted.

⊵3. Diagnosis code reconfirmation (EFI related)

1.Cancel the diagnosis code of the EFI.
2.After canceling, short-circuit the terminals 5 (EFI-T) and 13 (E) of the DLC, using SST.
SST: 09991-87404-000 (1)
09991-87403-000 (2)

3.Check to see if the diagnosis code of EFI is outputted.
SPECIFIED VALUE: It is not outputted.

▼If it is OK, the EFI system is normal.
▼If it is NG, proceed to ⊵4.

⊵4. CAN communication basic check

1.Perform basic check of the CAN communication.
Refer to Page L2-14.

▼If it is OK, go to ⊵5 for RHD vehicles.
▼If it is OK, go to ⊵6 for LHD vehicles.
▼If it is NG, repair or replace the defective sections.

▷5. CAN line open wire check (RHD vehicle)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU and A/T ECU.
3.Perform continuity check between each of the following terminals.
  (1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - EFI ECU connection vehicle harness side connector 7 (CANH)
  (2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - A/T ECU connection vehicle harness side connector B19 (LCN1)

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ▷7.
▼If it is NG, repair or replace the defective sections.

▷6. CAN line open wire check (LHD vehicle)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU, combination meter and A/T ECU.
3.Perform continuity check between each of the following terminals.
  (1) Between combination meter connection vehicle harness side connector 1 (CANH) - combination meter connection vehicle harness side connector 2 (CANl)
  (2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - A/T ECU connection vehicle harness side connector B19 (LCN1)

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ▷7.
▼If it is NG, repair or replace the defective sections.

▷7. CAN line short circuit check

1.Perform continuity check between each of the following terminals.
  (1) Between A/T ECU connection vehicle harness side connector B19 (LCN1) - battery positive terminal
  (2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - battery positive terminal
  (3) Between A/T ECU connection vehicle harness side connector B19 (LCN1) - body earth
  (4) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - body earth

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ▷8.
▼If it is NG, repair or replace the defective sections.

▷8. EFI ECU internal resistance check

1.Remove all connectors of the EFI ECU.
2.Measure the resistance between the following terminals.
  (1) Between EFI ECU side connector 6 (CANL) - EFI ECU side connector 7 (CANH)
  (2) Between EFI ECU side connector 8 (LCAN) - EFI ECU side connector 9 (HCAN)

SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, proceed to ▷9.
▼If it is NG, replace the EFI ECU.

Refer to Page B8-1.

▷9. Combination meter internal resistance check

1.Remove the connectors of the combination meter.

2.Measure the resistance between the following terminals.

(1) Between combination meter side connector 1 (CANH) - combination meter side connector 2 (CANL)

(2) Between combination meter side connector 3 (HCAN) - combination meter side connector 4 (LCAN)

SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, proceed to ▷10.

▼If it is NG, replace the combination meter.

Refer to Page J3-3.

▷10. A/T ECU internal circuit check

1.Remove all the connectors of the A/T ECU.

2.Perform continuity check between each of the following terminals.

(1) Between A/T ECU side connector B9 (HCN1) - A/T ECU side connector B19 (LCN1)

(2) Between A/T ECU side connector B10 (CANH) - A/T ECU side connector B20 (CANL)

(3) Between A/T ECU side connector B9 (HCN1) - A/T ECU side connector B10 (CANH)

(4) Between A/T ECU side connector B19 (LCN1) - A/T ECU side connector B20 (CANL)

SPECIFIED VALUE:

<table>
<tr><th>Between terminals measured</th><th>Continuity</th></tr>
<tr><td>Between B9 (HCN1) - B19 (LCN1)</td><td rowspan="2">Continuity exists.
(less than 1MΩ)</td></tr>
<tr><td>Between B10 (CANH) - B20 (CANL)</td></tr>
<tr><td>Between B9 (HCN1) - B10 (CANH)</td><td rowspan="2">Continuity exists.
(1Ω or less)</td></tr>
<tr><td>Between B19 (LCN1) - B20 (CANL)</td></tr>
</table>

▼If everything is OK, perform the circuit check of the combination meter, EFI ECU and A/T ECU.

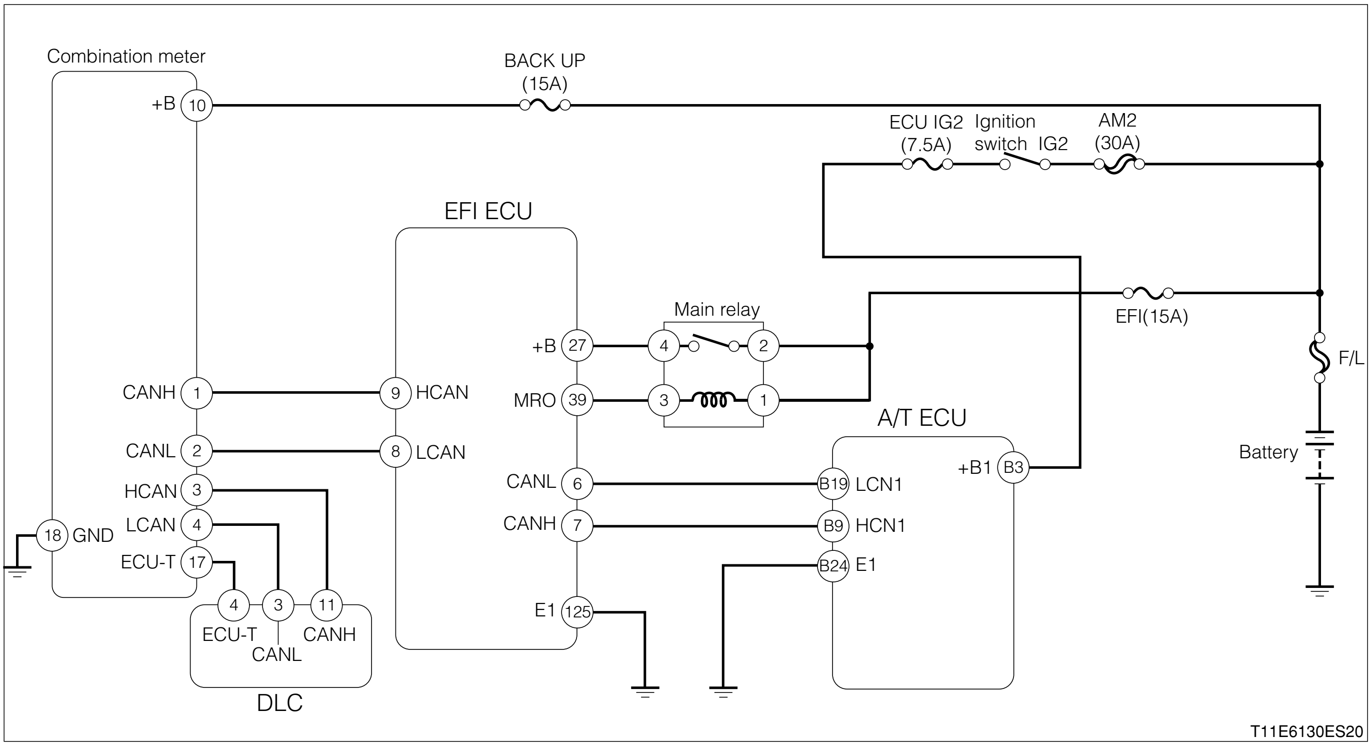
▼If even one of them is NG, replace the A/T ECU.

Refer to Page F5-2.

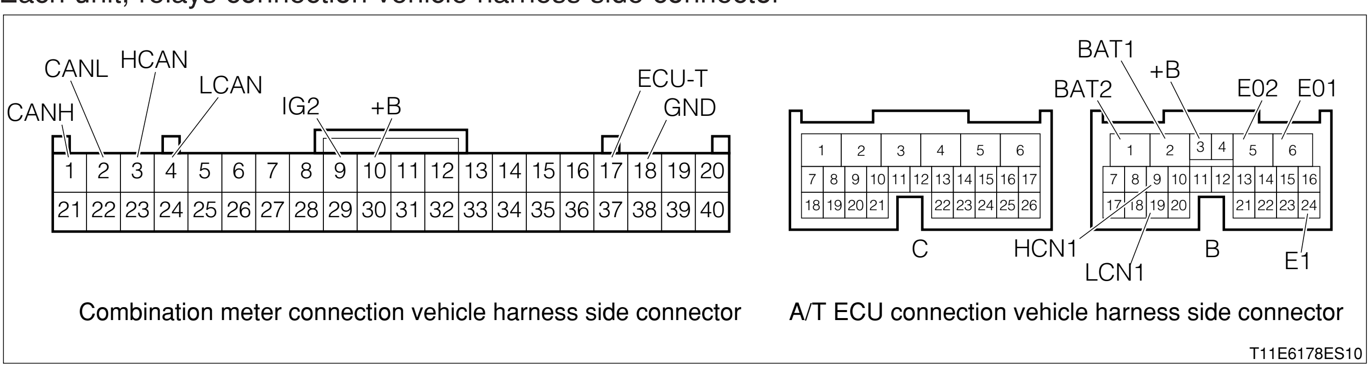
9-12-26 DTC NO. U1000/85 E-AT ABNORMAL TRANSMISSION

(1) System diagram

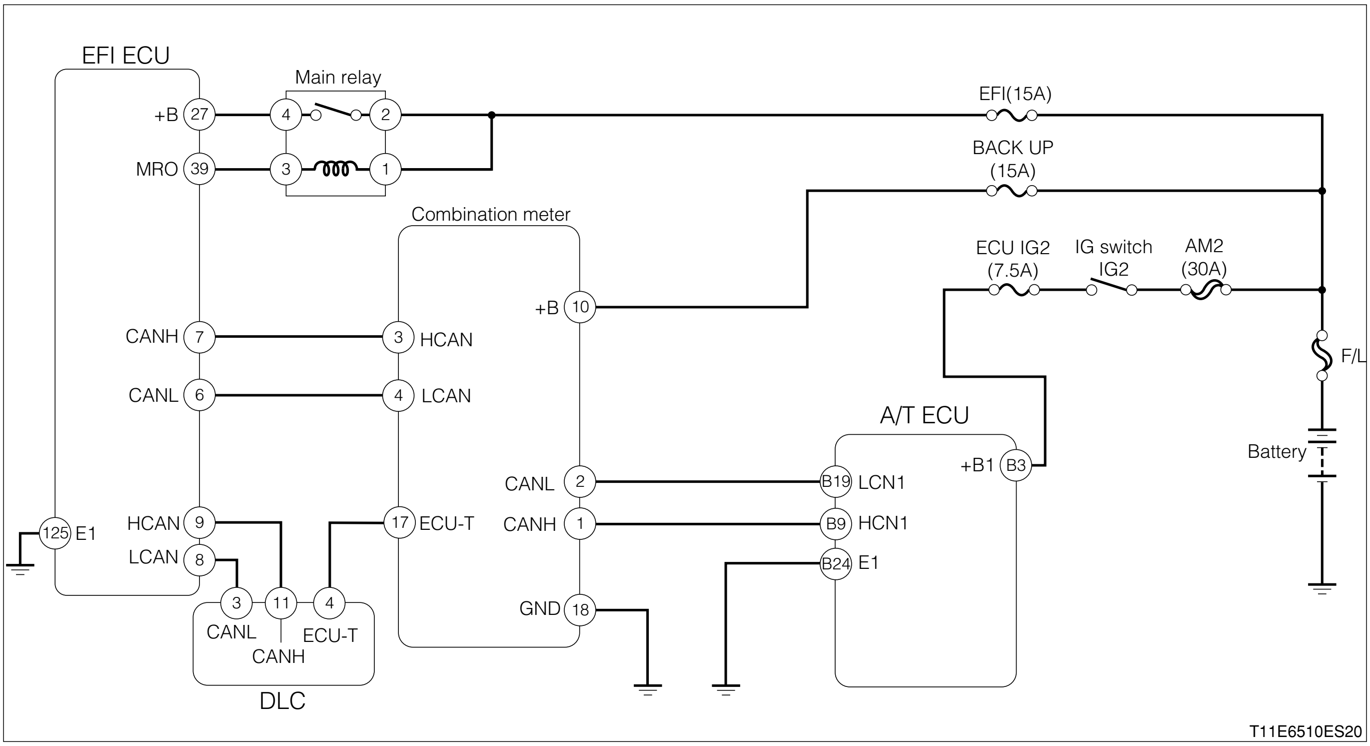
1 **RHD vehicles**



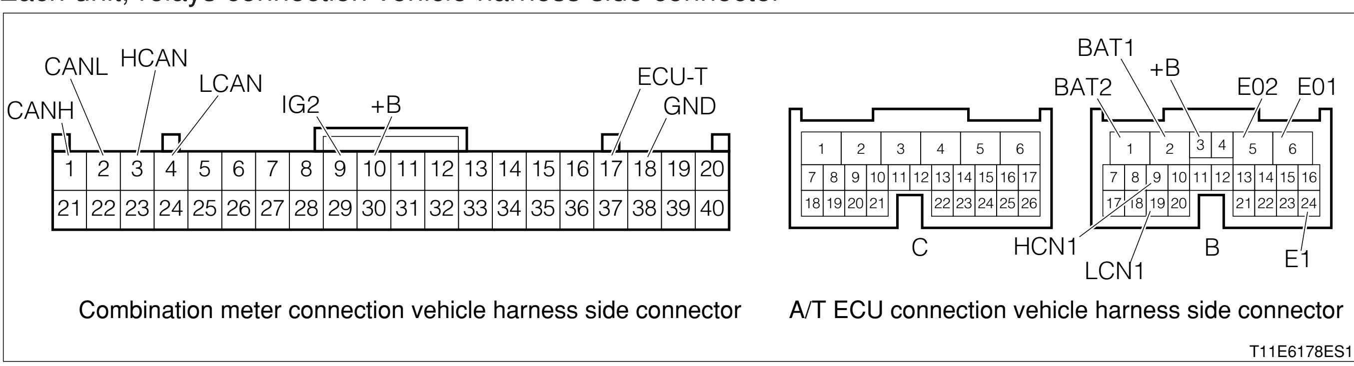
Each unit, relays connection vehicle harness side connector



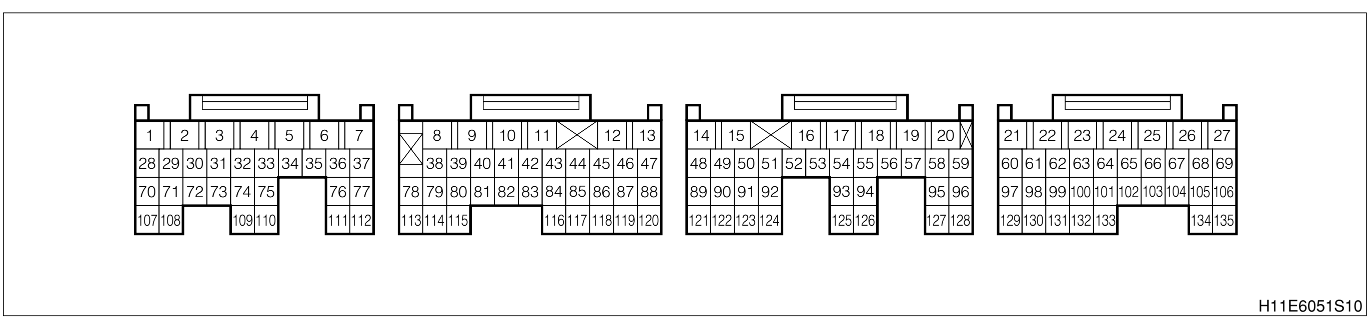
2 **LHD vehicles**



Each unit, relays connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Output conditions

1.When communication signal cannot be sent from EFI ECU to A/T ECU

(3) Checking points

1.Is the harness between EFI ECU - A/T ECU normal?

2.Is the A/T ECU normal?

3.Check whether there is any poor contact at the connector section.

(4) Checking method

1 **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

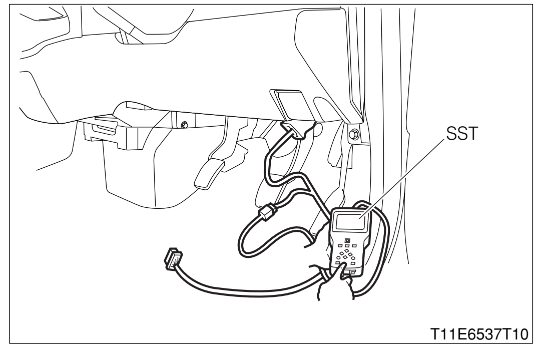
▷1. Confirmation of diagnosis code (Related to EFI)

1.IG switch turned "LOCK".

2.Connect the diagnosis tester to DLC.

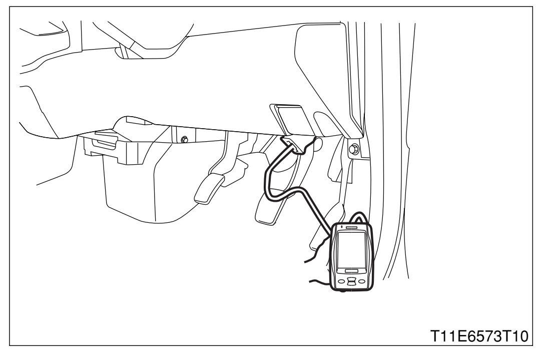
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



3.Check to see if the EFI related diagnosis code is outputted other than No.U1000/85.

▼<u>If it is outputted, proceed to ▷2.</u>

▼<u>If it is not outputted, proceed to ▷4.</u>

▷2. Troubleshooting according to diagnosis code (Related to EFI)

1.Perform the check and repair related to the diagnosis codes that have been outputted in ▷1.

Refer to Page B8-292.

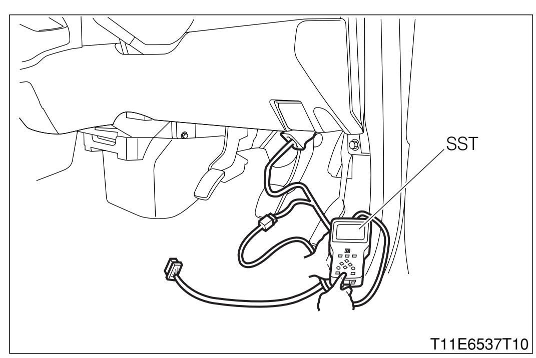
2.After completion of the repairs, connect the DS-21 diagnosis tester to toe DLC, using the SST.

SST: 09991-87404-000

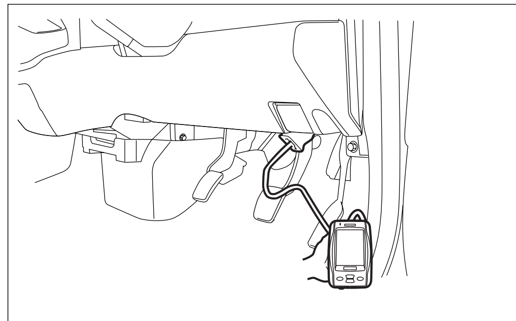
3.After completion of the repairs, connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.

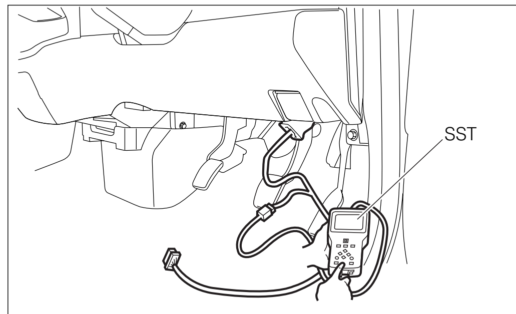

T11E6573T10

4.Confirm that the diagnosis code that has been outputted in ⊳1 is not outputted.
SPECIFIED VALUE: It is not outputted.

▼If it is OK, go to ⊳3.
▼If it is NG, perform the recheck of the diagnosis code that has been outputted.

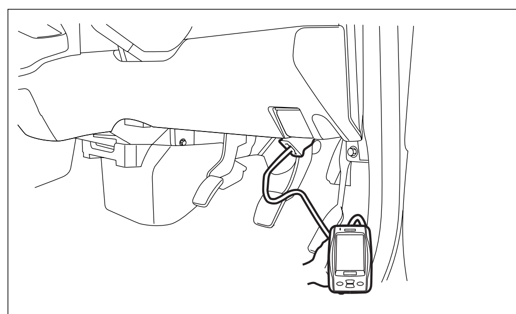
⊳3. Reconfirmation of diagnosis code (Related to EFI)

1.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000



T11E6537T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.


T11E6573T10

2.Erase the diagnosis code of the EFI.
3.Confirm whether the diagnosis code of the EFI is outputted.
SPECIFIED VALUE: It is not outputted.

▼If it is OK, the EFI system is normal.
▼If it is NG, go to ⊳4.

⊳4. CAN communication basic check

1.Perform the CAN communication basic check.
Refer to Page L2-14.

▼If it is OK, go to ⊳5 for RHD vehicles.
▼If it is OK, go to ⊳6 for LHD vehicles.
▼If it is NG, repair or replace malfunctioning sections.

⌦5. Check of CAN line for open wire

1.Set the IG switch to the "LOCK" position.
2.Disconnect all of the connectors for the EFI ECU and A/T ECU.
3.Perform continuity check between the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - EFI ECU connection vehicle harness side connector 7 (CANH)
(2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - A/T ECU connection vehicle harness side connector B19 (LCN1)
SPECIFIED VALUE: No continuity exists

▼If it is OK, go to ⌦6.
▼If it is NG, repair or replace malfunctioning sections.

⌦6. Check of CAN line for short circuit

1.Perform continuity check between the following terminals.
(1) Between A/T ECU connection vehicle harness side connector B19 (LCN1) - battery positive (+) terminal
(2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - battery positive (+) terminal
(3) Between A/T ECU connection vehicle harness side connector B19 (LCN1) - body earth
(4) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - body earth
SPECIFIED VALUE: No continuity exists

▼If it is OK, go to ⌦7.
▼If it is NG, repair or replace malfunctioning sections.

⌦7. Check of EFI ECU internal resistance

1.Disconnect all of the EFI ECU connectors.
2.Measure the resistance between the following terminals.
(1) Between EFI ECU side connector 6 (CANL) - EFI ECU side connector 7 (CANH)
(2) Between EFI ECU side connector 8 (LCAN) - EFI ECU side connector 9 (HCAN)
SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, go to ⌦8.
▼If it is NG, replace the EFI ECU.
Refer to Page B8-1.

⌦8. Check of combination meter internal resistance

1.Disconnect the connector of the combination meter.
2.Measure the resistance between the following terminals.
(1) Between combination meter side connector 1 (CANH) - combination meter side connector 2 (CANL)
(2) Between combination meter side connector 3 (HCAN) - combination meter side connector 4 (LCAN)
SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, go to ⌦9.
▼If it is NG, replace the combination meter.
Refer to Page J3-3.

▷9. Check of A/T ECU internal circuit

1.Disconnect the A/T ECU connectors.

2.Perform continuity check between the following terminals.

(1) Between A/T ECU side connector B9 (HCN1) - A/T ECU side connector B19 (LCN1)
(2) Between A/T ECU side connector B10 (CANH) - A/T ECU side connector B20 (CANL)
(3) Between A/T ECU side connector B9 (HCN1) - A/T ECU side connector B10 (CANH)
(4) Between A/T ECU side connector B19 (LCN1) - A/T ECU side connector B20 (CANL)

SPECIFIED VALUE:

Between the measuring terminals	Continuity
Between B9 (HCN1) - B19 (LCN1)	Continuity exists (less than 1MΩ).
Between B10 (CANH) - B20 (CANL)	
Between B9 (HCN1) - B10 (CANH)	Continuity exists (1MΩ or less).
Between B19 (LCN1) - B20 (CANL)	

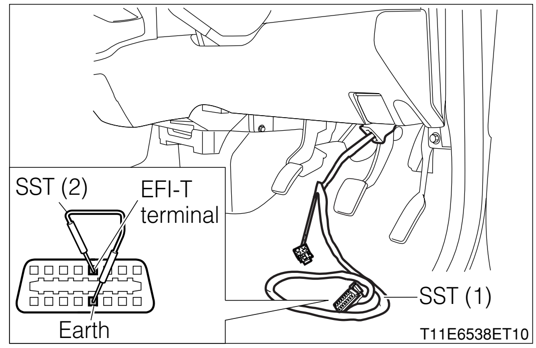
▼<u>If everything is OK, perform the circuit check of the combination meter as well as the EFI ECU and A/T ECU.</u>

▼<u>If any one is NG, replace the A/T ECU.</u>

Refer to Page F5-2.

2 **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Diagnosis code confirmation (EFI related)



1.Short-circuit the terminals 5 (EFI-T) and 13 (E) of the DLC, using the SST.
SST: 09991-87404-000 (1)
09991-87403-000 (2)

2.Check to see if the EFI related diagnosis code is outputted other than No.U1000/85.
▼If it is outputted, proceed to ⊳2.
▼If it is not outputted, proceed to ⊳4.

⊳2. Trouble shooting according to diagnosis code (EFI related)

1.Perform trouble shooting for the diagnosis code outputted in ⊳1.
Refer to Page B8-292.

2.After repairing, short-circuit the terminals 5 (EFI-T) and 13 (E) of the DLC, using the SST.
SST: 09991-87404-000 (1)
09991-87403-000 (2)

3.Confirm that the diagnosis code outputted in ⊳1) is not outputted.
SPECIFIED VALUE: It is not outputted.

▼If it is OK, proceed to ⊳3.
▼If it is NG, perform recheck for the diagnosis code outputted.

⊳3. Diagnosis code reconfirmation (EFI related)

1.Cancel the diagnosis code of the EFI.
2.After canceling, short-circuit the terminals 5 (EFI-T) and 13 (E) of the DLC, using the SST.
SST: 09991-87404-000 (1)
09991-87403-000 (2)

3.Confirm that the diagnosis code of the EFI is outputted.
SPECIFIED VALUE: It is not outputted.

▼If it is OK, the EFI system is normal.
▼If it is NG, proceed to ⊳4.

⊳4. CAN communication basic check

1.Perform basic check of the CAN communication.
Refer to Page L2-14.

▼If it is OK, go to ⊳5 for RHD vehicles.
▼If it is OK, go to ⊳6 for LHD vehicles.
▼If it is NG, repair or replace the defective sections.

⊳5. CAN line open wire check (RHD vehicle)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU and A/T ECU.
3.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - EFI ECU connection vehicle harness side connector 7 (CANH)
(2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - A/T ECU connection vehicle harness side connector B19 (LCN1)
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳7.
▼If it is NG, repair or replace the defective sections.

⊳6. CAN line open wire check (LHD vehicles)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the combination meter and A/T ECU.
3.Perform continuity check between each of the following terminals.
(1) Between combination meter connection vehicle harness side connector 1 (CANH) - combination meter connection vehicle harness side connector 2 (CANL)
(2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - A/T ECU connection vehicle harness side connector B19 (LCN1)
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳7.
▼If it is NG, repair or replace the defective sections.

⊳7. CAN line short circuit check

1.Perform continuity check between each of the following terminals.
(1) Between A/T ECU connection vehicle harness side connector B19 (LCN1) - battery positive terminal
(2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - battery positive terminal
(3) Between A/T ECU connection vehicle harness side connector B19 (LCN1) - body earth
(4) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - body earth
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳8.
▼If it is NG, repair or replace the defective sections.

⊳8. EFI ECU internal resistance check

1.Remove all connectors of the EFI ECU.
2.Measure the resistance between the following terminals.
(1) Between EFI ECU side connector 6 (CANL) - EFI ECU side connector 7 (CANH)
(2) Between EFI ECU side connector 8 (LCAN) - EFI ECU side connector 9 (HCAN)
SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, proceed to ⊳9.
▼If it is NG, replace the EFI ECU.
Refer to Page B8-1.

▷9. Combination meter internal resistance check

1.Remove the connectors of the combination meter.

2.Measure the resistance between the following terminals.

(1) Between combination meter side connector 1 (CANH) - combination meter side connector 2 (CANL)

(2) Between combination meter side connector 3 (HCAN) - combination meter side connector 4 (LCAN)

SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, proceed to ▷10.

▼If it is NG, replace the combination meter.

Refer to Page J3-3.

▷10. A/T ECU internal circuit check

1.Remove all the connectors of the A/T ECU.

2.Perform continuity check between each of the following terminals.

(1) Between A/T ECU side connector B9 (HCN1) - A/T ECU side connector B19 (LCN1)

(2) Between A/T ECU side connector B10 (CANH) - A/T ECU side connector B20 (CANL)

(3) Between A/T ECU side connector B9 (HCN1) - A/T ECU side connector B10 (CANH)

(4) Between A/T ECU side connector B19 (LCN1) - A/T ECU side connector B20 (CANL)

SPECIFIED VALUE:

Between terminals measured	Continuity
Between B9 (HCN1) - B19 (LCN1)	Continuity exists. (less than 1MΩ)
Between B10 (CANH) - B20 (CANL)	
Between B9 (HCN1) - B10 (CANH)	Continuity exists. (1Ω or less)
Between B19 (LCN1) - B20 (CANL)	

▼If everything is OK, perform the circuit check of the combination meter, EFI ECU and A/T ECU

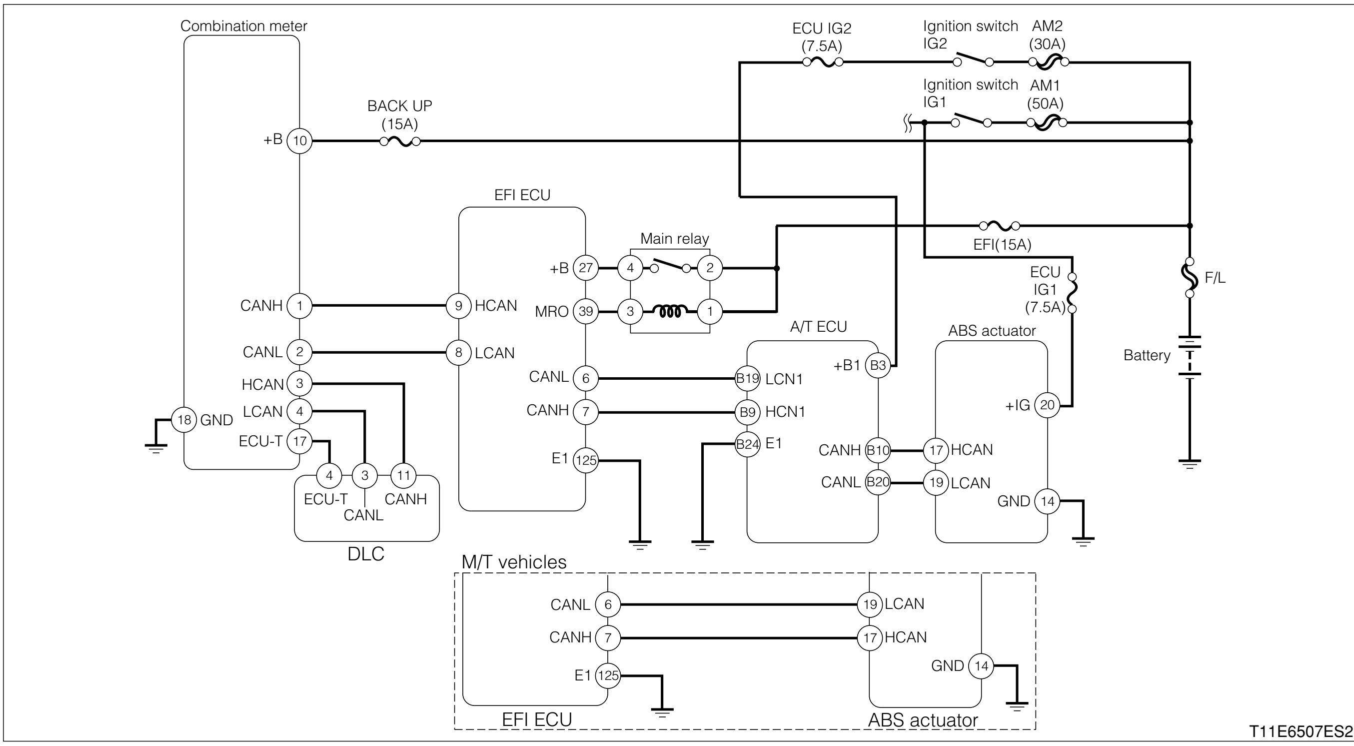
▼If even one of them is NG, replace the A/T ECU.

Refer to Page F5-2.

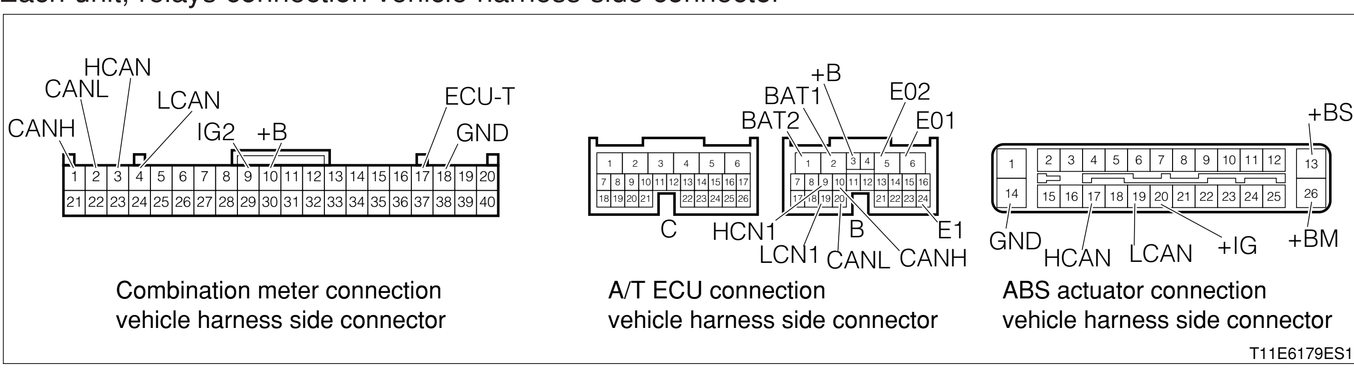
9-12-27 DTC NO.U0121/86 ABS COMMUNICATION FAILURE

(1) System diagram

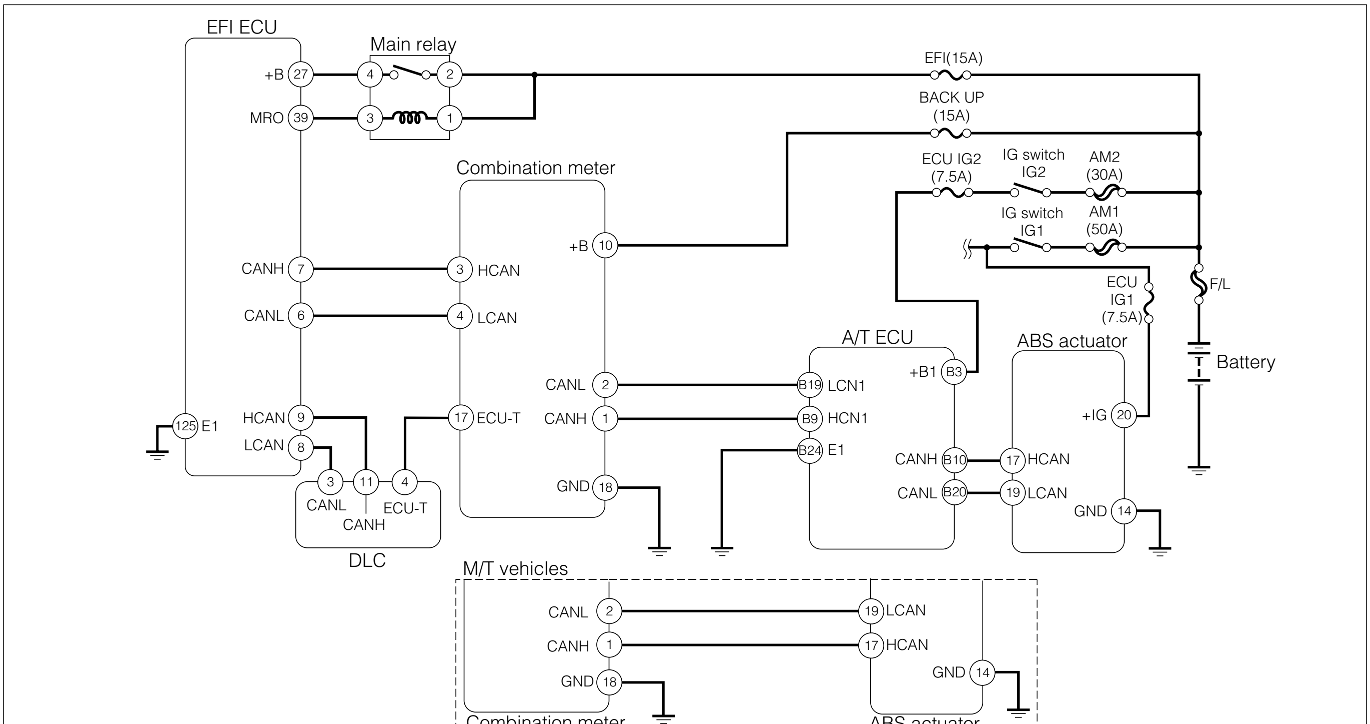
1 **RHD vehicles**



Each unit, relays connection vehicle harness side connector

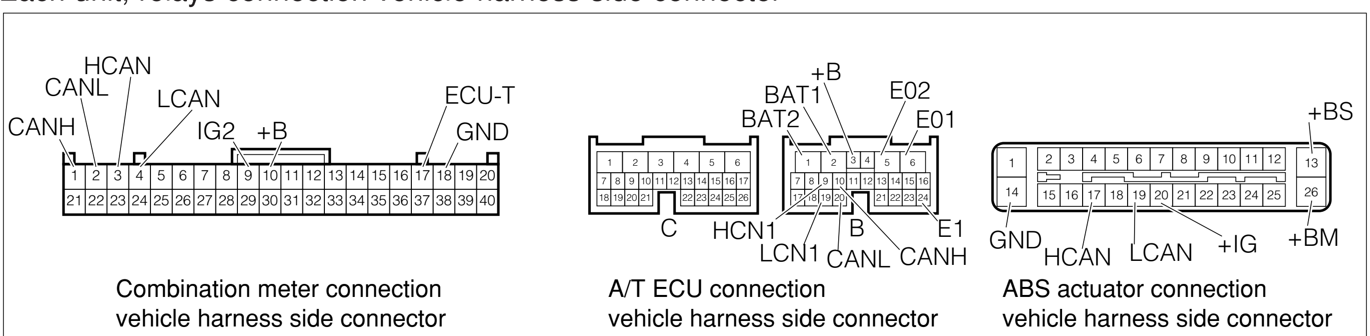


2 **LHD vehicles**



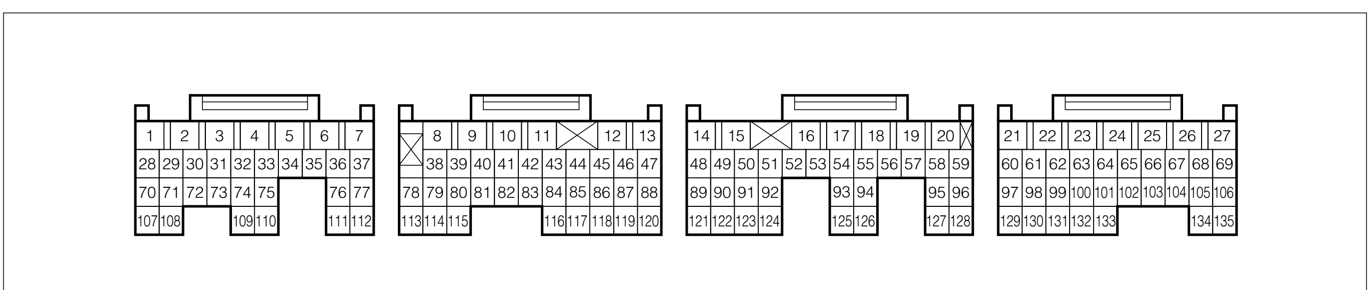
T11E6509ES20

Each unit, relays connection vehicle harness side connector



T11E6179ES10

EFI ECU connection vehicle harness side connector



H11E6051S10

(2) Output conditions

1.When communication signal cannot be received from ABS EFI ECU

(3) Checking points

1.Is the harness between EFI ECU - ABS ECU normal?

2.Is the ABS actuator normal?

3.Check whether there is any poor contact at the connector section.

(4) Checking method

1 **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

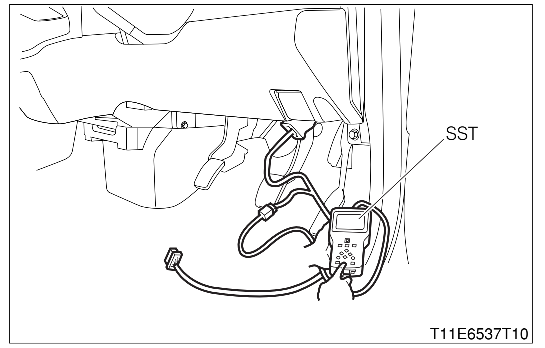
⊳1. Diagnosis code confirmation (ABS related)

1.IG switch turned "LOCK".

2.Connect the diagnosis tester to DLC.

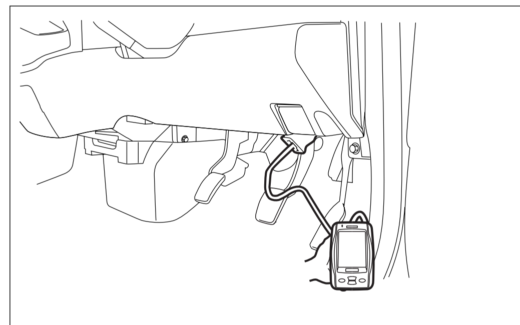
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



3.Check to see if the diagnosis code of the ABS is outputted.

(No.C0200/21 - No.C0215/24: short circuit or open wire of wheel speed sensor, No.C1235/25 - No.C1239/28: period abnormality of wheel speed sensor, No.C1237/29: Rotor tooth missing abnormality)

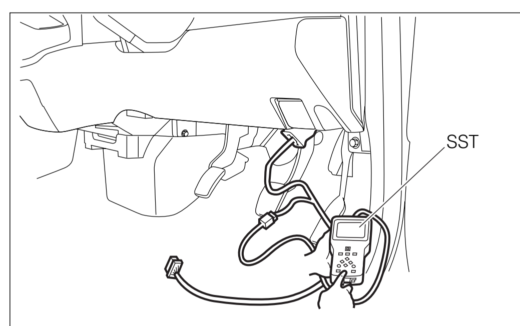
▼<u>If it is outputted, proceed to ⊳2.</u>

▼<u>If it is not outputted, proceed to ⊳4.</u>

⊳2. Trouble shooting according to diagnosis code (ABS related)

1.Perform trouble shooting for the diagnosis code outputted in ⊳1.

Refer to Page E3-28.



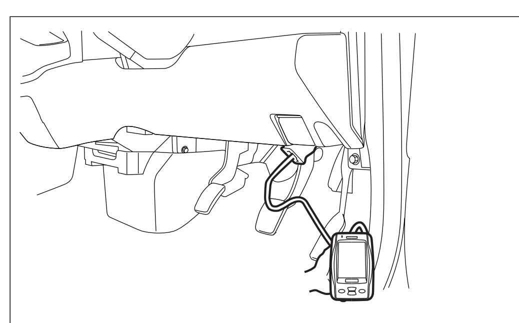
2.After completion of the repairs, connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

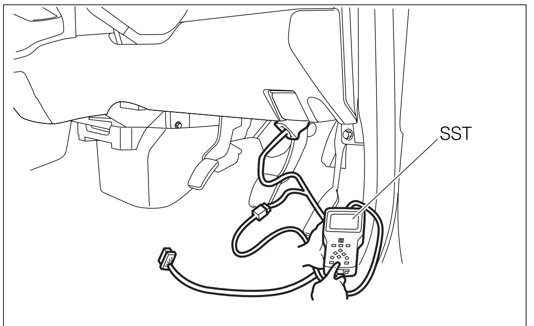
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



3.Confirm that the diagnosis code of ABS is not outputted.

▼If it is not outputted, proceed to ⊳3.

▼If it is outputted, perform recheck for the diagnosis code outputted.



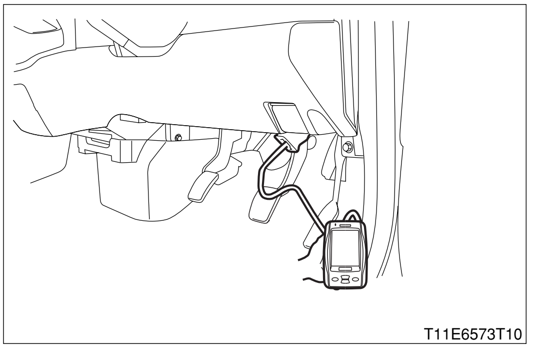
T11E6537T10

⊳3. Diagnosis code reconfirmation (EFI related)

1.Connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000



T11E6573T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.

2.Cancel the diagnosis code of the EFI.

3.Check to see if the diagnosis code of EFI is outputted.

SPECIFIED VALUE: Perform basic check of the CAN communication.

▼If it is OK, proceed to ⊳5.

▼If it is NG, repair or replace the defective sections.

⊳4. CAN communication basic check

1.Perform basic check of the CAN communication.

Refer to Page L2-14.

▼If it is OK, go to ⊳5 for RHD vehicles.

▼If it is OK, go to ⊳6 for LHD vehicles.

▼If it is NG, repair or replace the defective sections.

⊳5. CAN line open wire check (RHD vehicles)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU, A/T ECU and ABS actuator.
3.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - EFI ECU connection vehicle harness side connector 7 (CANH)
(2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - A/T ECU connection vehicle harness side connector B19 (LCN1)
(3) Between A/T ECU connection vehicle harness side connector B10 (CANH) - A/T ECU connection vehicle harness side connector B20 (CANL)
(4) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - ABS actuator connection vehicle harness side connector 19 (LCAN)
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳7.
▼If it is NG, repair or replace the defective sections.

⊳6. CAN line open wire check (LHD vehicles)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the combination meter, A/T ECU and ABS actuator.
3.Perform continuity check between each of the following terminals.
(1) Between combination meter connection vehicle harness side connector 1 (CANH) - combination meter connection vehicle harness side connector 2 (CANL)
(2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - A/T ECU connection vehicle harness side connector B19 (LCN1)
(3) Between A/T ECU connection vehicle harness side connector B10 (CANH) - A/T ECU connection vehicle harness side connector B20 (CANL)
(4) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - ABS actuator connection vehicle harness side connector 19 (LCAN)
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳7.
▼If it is NG, repair or replace the defective sections.

⊳7. CAN line short circuit check

1.Perform continuity check between each of the following terminals.
(1) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - battery positive terminal
(2) Between ABS actuator connection vehicle harness side connector 19 (LCAN) - battery positive terminal
(3) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - body earth
(4) Between ABS actuator connection vehicle harness side connector 19 (LCAN) - body earth
SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ⊳8.
▼If it is NG, repair or replace the defective sections.

⌲8. EFI ECU internal resistance check

1.Remove all connectors of the EFI ECU.

2.Measure the resistance between the following terminals.

(1) Between ABS actuator connection vehicle harness side connector 19 (LCAN) - battery positive terminal

(2) Between EFI ECU side connector 8 (LCAN) - EFI ECU side connector 9 (HCAN)

SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, proceed to ⌲9.

▼If it is NG, replace the EFI ECU.

Refer to Page B8-1.

⌲9. Combination meter internal resistance check

1.Remove the connectors of the combination meter.

2.Measure the resistance between the following terminals.

(1) Between combination meter side connector 1 (CANH) - combination meter side connector 2 (CANL)

(2) Between combination meter side connector 3 (HCAN) - combination meter side connector 4 (LCAN)

SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, proceed to ⌲10.

▼If it is NG, replace the combination meter.

Refer to Page J3-3.

⌲10. ABS actuator internal circuit check

1.Remove all the connectors of the ABS actuator.

2.Perform continuity check between each of the following terminals.

(1) Between ABS actuator side connector 17 (HCAN) - ABS actuator side connector 19 (LCAN)

SPECIFIED VALUE: Continuity exists. (Less than 1MΩ)

▼If it is OK, proceed to ⌲11.

▼If it is NG, replace the ABS actuator.

Refer to Page E3-1.

11. A/T ECU internal circuit check

1.Remove all the connectors of the A/T ECU.

2.Perform continuity check between each of the following terminals.

(1) Between A/T ECU side connector B9 (HCN1) - A/T ECU side connector B19 (LCN1)

(2) Between A/T ECU side connector B10 (CANH) - A/T ECU side connector B20 (CANL)

(3) Between A/T ECU side connector B9 (HCN1) - A/T ECU side connector B10 (CANH)

(4) Between A/T ECU side connector B19 (LCN1) - A/T ECU side connector B20 (CANL)

SPECIFIED VALUE:

Between terminals measured	Continuity
Between B9 (HCN1) - B19 (LCN1)	Continuity exists. (less than 1MΩ)
Between B10 (CANH) - B20 (CANL)	
Between B9 (HCN1) - B10 (CANH)	Continuity exists. (1Ω or less)
Between B19 (LCN1) - B20 (CANL)	

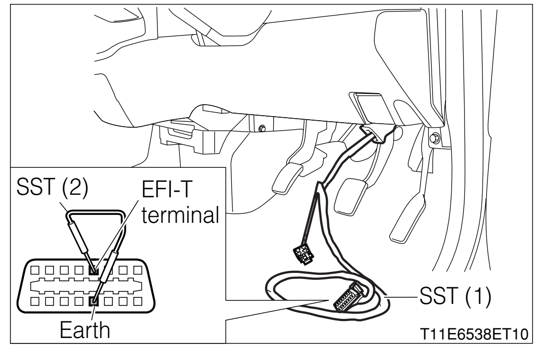
▼If everything is OK, perform the circuit check of the combination meter, EFI ECU and A/T ECU

▼If even one of them is NG, replace the A/T ECU.

Refer to Page F5-2.

2 **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Diagnosis code confirmation (ABS related)



1.Short-circuit the terminals 4 (ECU-T) and 13 (E) of the DLC, using the SST.
SST: 09991-87404-000 (1)
09991-87403-000 (2)

2.Check to see if the diagnosis code of the ABS is outputted (No.C0210/21 - No.C0215/24: short circuit or open wire of wheel speed sensor, No.C1235/25 - No.C1239/28: period abnormality of wheel speed sensor, No.C1237/29: Rotor tooth missing abnormality)

NOTE

- Refer to the diagnosis code output indication method of ABS.

Refer to Page E3-19.

▼If it is outputted, proceed to ⊳2.
▼If it is not outputted, proceed to ⊳4.

⊳2. Trouble shooting according to diagnosis code (ABS related)

1.Perform trouble shooting for the diagnosis code outputted in ⊳1.
Refer to Page E3-28.

2.After repairing, short-circuit the terminals 4 (ECU-T) and 13 (E) of the DLC, using the SST.
SST: 09991-87404-000 (1)
09991-87403-000 (2)

3.Confirm that the diagnosis code of ABS is not outputted.
▼If it is not outputted, proceed to ⊳3.
▼If it is outputted, perform recheck for the diagnosis code outputted.

⊳3. Diagnosis code reconfirmation (EFI related)

1.Cancel the diagnosis code of the EFI.
2.After canceling, short-circuit the terminals 5 (EFI-T) and 13 (E) of the DLC, using SST.
SST: 09991-87404-000 (1)
09991-87403-000 (2)

3.Check to see if the diagnosis code of EFI is outputted.
SPECIFIED VALUE: It is not outputted.

▼If it is OK, the EFI system is normal.
▼If it is NG, proceed to ⊳4.

⊳4. CAN communication basic check

1.Perform basic check of the CAN communication.
Refer to Page L2-14.

▼If it is OK, go to ⊳5 for RHD vehicles.
▼If it is OK, go to ⊳6 for LHD vehicles.
▼If it is NG, repair or replace the defective sections.

ᐅ5. CAN line open wire check (RHD vehicles)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU, A/T ECU and ABS actuator.
3.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - EFI ECU connection vehicle harness side connector 7 (CANH)
(2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - A/T ECU connection vehicle harness side connector B19 (LCN1)
(3) Between A/T ECU connection vehicle harness side connector B10 (CANH) - A/T ECU connection vehicle harness side connector B20 (CANL)
(4) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - ABS actuator connection vehicle harness side connector 19 (LCAN)

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ᐅ7.
▼If it is NG, repair or replace the defective sections.

ᐅ6. CAN line open wire check (LHD vehicles)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the combination meter, A/T ECU and ABS actuator.
3.Perform continuity check between each of the following terminals.
(1) Between combination meter connection vehicle harness side connector 1 (CANH) - vombination meter connection vehicle harness side connector 2 (CANL)
(2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - A/T ECU connection vehicle harness side connector B19 (LCN1)
(3) Between A/T ECU connection vehicle harness side connector B10 (CANH) - A/T ECU connection vehicle harness side connector B20 (CANL)
(4) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - ABS actuator connection vehicle harness side connector 19 (LCAN)

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ᐅ7.
▼If it is NG, repair or replace the defective sections.

ᐅ7. CAN line short circuit check

1.Perform continuity check between each of the following terminals.
(1) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - battery positive terminal
(2) Between ABS actuator connection vehicle harness side connector 19 (LCAN) - battery positive terminal
(3) Between ABS actuator connection vehicle harness side connector 17 (HCAN) - body earth
(4) Between ABS actuator connection vehicle harness side connector 19 (LCAN) - body earth

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ᐅ8.
▼If it is NG, repair or replace the defective sections.

▷8. EFI ECU internal resistance check

1.Remove all connectors of the EFI ECU.

2.Measure the resistance between the following terminals.

(1) Between EFI ECU side connector 6 (CANL) - EFI ECU side connector 7 (CANH)

(2) Between EFI ECU side connector 8 (LCAN) - EFI ECU side connector 9 (HCAN)

SPECIFIED VALUE: 110 - 130Ω

▼<u>If it is OK, proceed to ▷9.</u>

▼<u>If it is NG, replace the EFI ECU.</u>

Refer to Page B8-1.

▷9. Combination meter internal resistance check

1.Remove the connectors of the combination meter.

2.Measure the resistance between the following terminals.

(1) Between combination meter side connector 1 (CANH) - combination meter side connector 2 (CANL)

(2) Between combination meter side connector 3 (HCAN) - combination meter side connector 4 (LCAN)

SPECIFIED VALUE: 110 - 130Ω

▼<u>If it is OK, proceed to ▷10.</u>

▼<u>If it is NG, replace the combination meter.</u>

Refer to Page J3-3.

▷10. ABS actuator internal circuit check

1.Remove all the connectors of the ABS actuator.

2.Perform continuity check between each of the following terminals.

(1) Between ABS actuator side connector 17 (HCAN) - ABS actuator side connector 19 (LCAN)

SPECIFIED VALUE: Continuity exists. (less than 1MΩ)

▼<u>If it is OK, proceed to ▷11.</u>

▼<u>If it is NG, replace the ABS actuator.</u>

Refer to Page E3-1.

▷11. A/T ECU internal circuit check

1.Remove all the connectors of the A/T ECU.

2.Perform continuity check between each of the following terminals.

(1) Between A/T ECU side connector B9 (HCN1) - A/T ECU side connector B19 (LCN1)

(2) Between A/T ECU side connector B10 (CANH) - A/T ECU side connector B20 (CANL)

(3) Between A/T ECU side connector B9 (HCN1) - A/T ECU side connector B10 (CANH)

(4) Between A/T ECU side connector B19 (LCN1) - A/T ECU side connector B20 (CANL)

SPECIFIED VALUE:

Between terminals measured	Continuity
Between B9 (HCN1) - B19 (LCN1)	Continuity exists. (less than 1MΩ)
Between B10 (CANH) - B20 (CANL)	
Between B9 (HCN1) - B10 (CANH)	Continuity exists. (1Ω or less)
Between B19 (LCN1) - B20 (CANL)	

▼<u>If everything is OK, perform the circuit check of the combination meter, EFI ECU and A/T ECU</u>

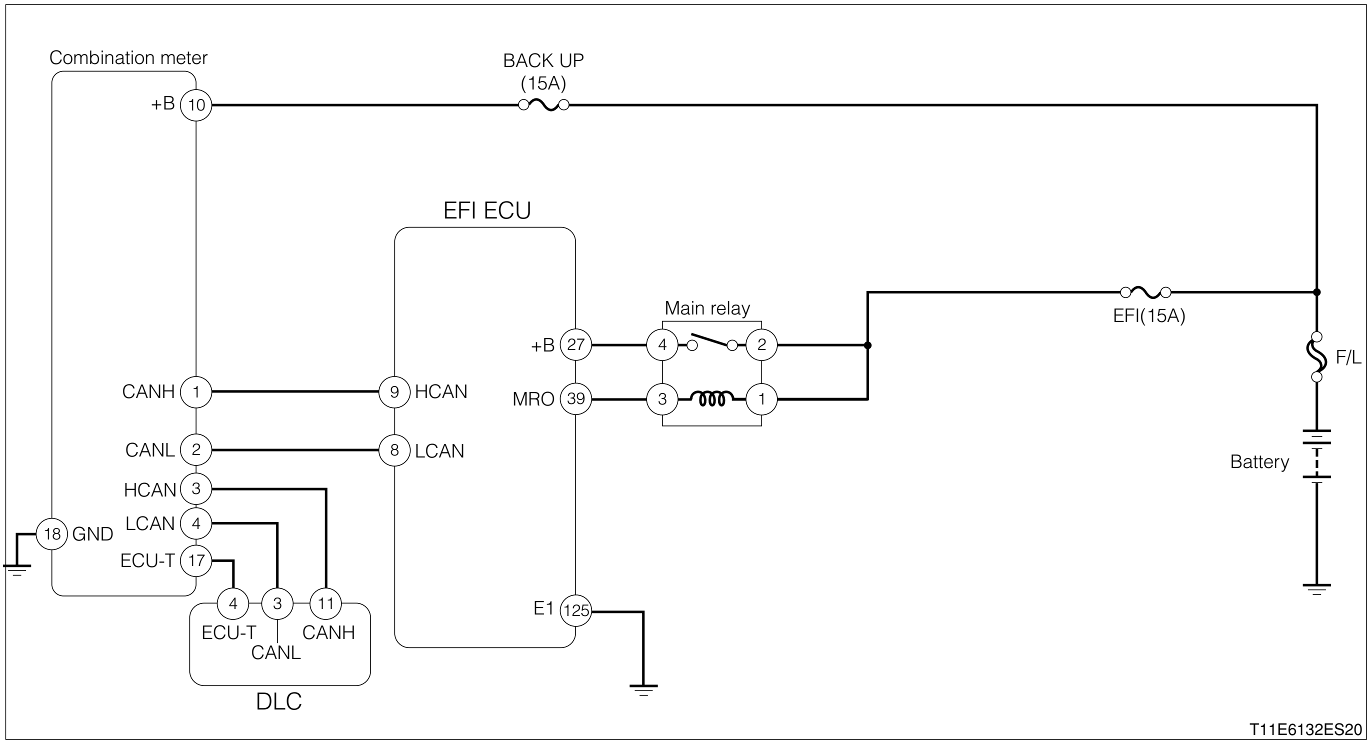
▼<u>If even one of them is NG, replace the A/T ECU.</u>

Refer to Page F5-2.

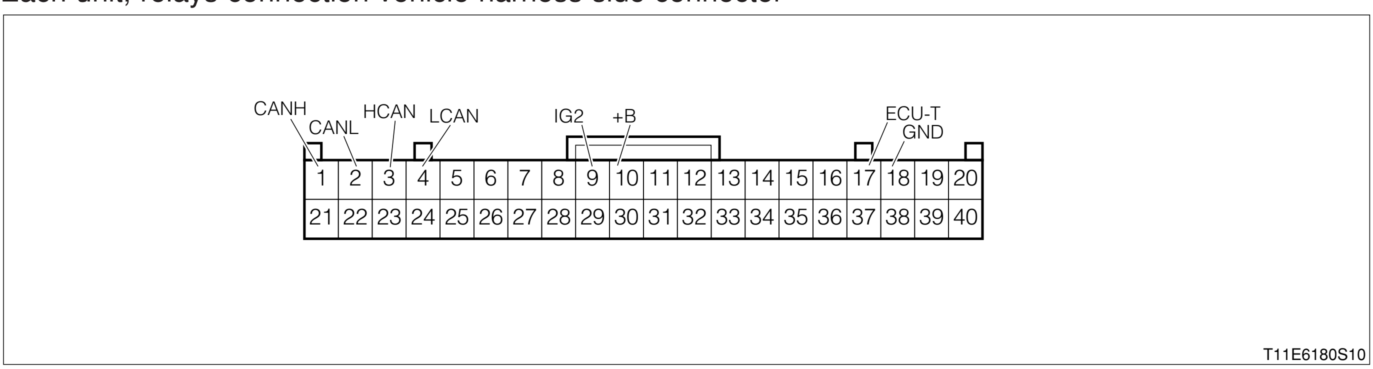
9-12-28 DTC NO.U0156/87 COMBINATION METER COMMUNICATION FAILURE

(1) System diagram

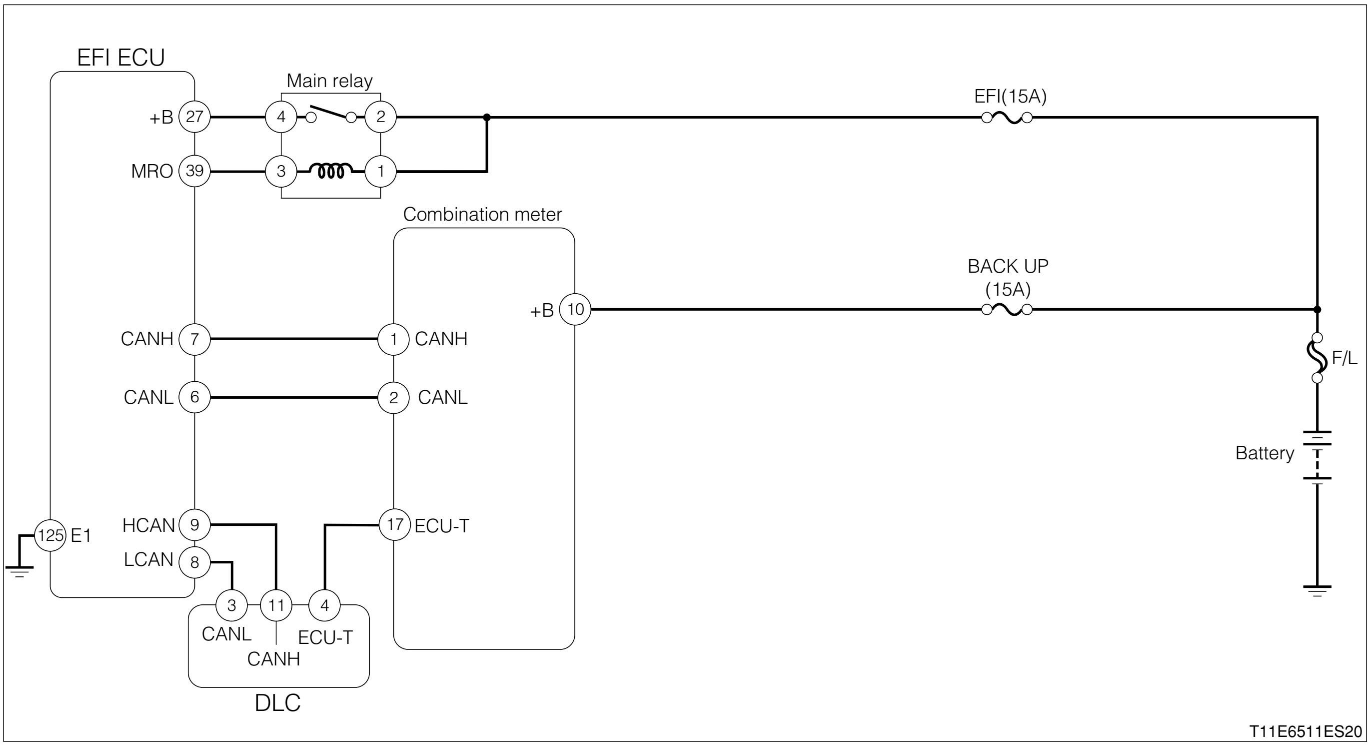
1 **RHD vehicles**



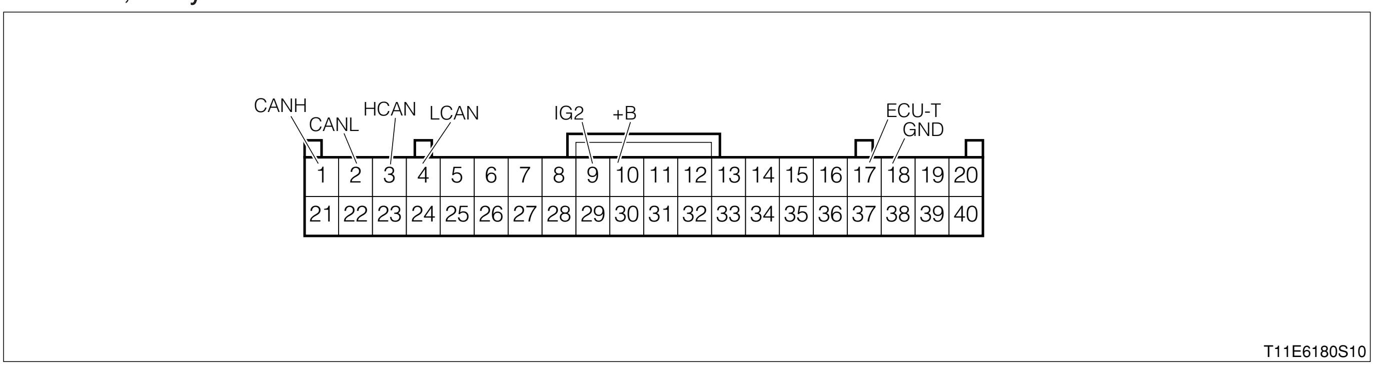
Each unit, relays connection vehicle harness side connector



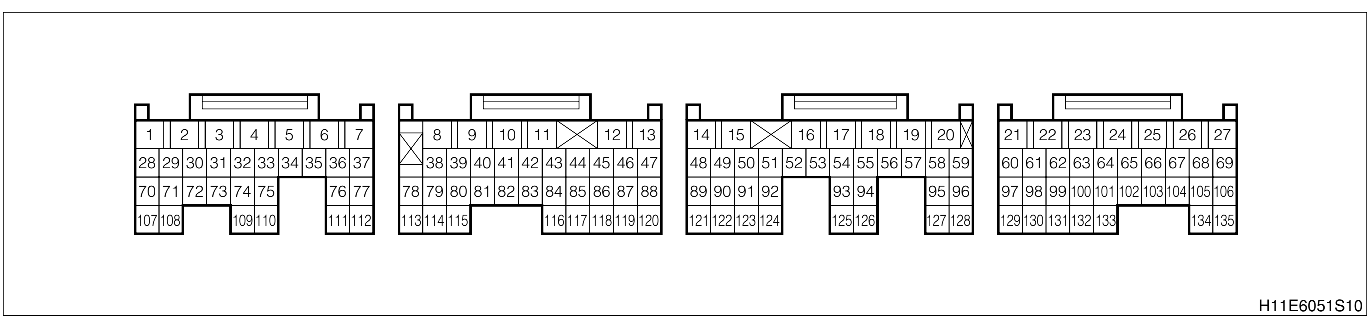
2 **LHD vehicles**



Each unit, relays connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Output conditions

1.When communication signal cannot be received from combination meter

(3) Checking points

1.Is the harness between EFI ECU - combination meter normal?

2.Is the combination meter normal?

3.Check whether there is no poor contact at the connector section.

(4) Checking method

1 **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

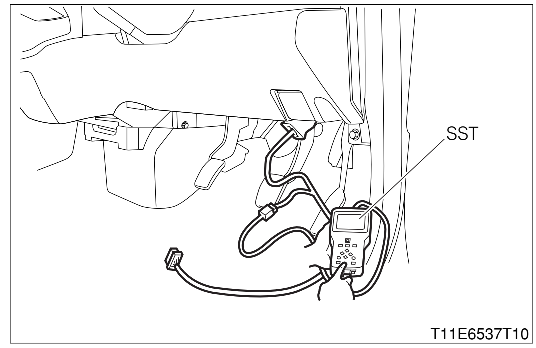
▷1. Confirmation of the diagnosis codes (Related to meter)

1.IG switch turned "LOCK".

2.Connect the diagnosis tester to DLC.

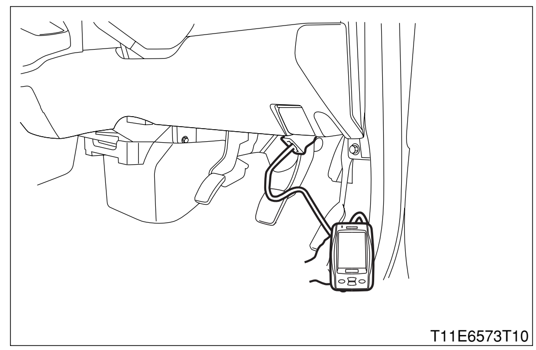
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



3.Confirm whether any meter-related diagnosis code is outputted.

(No.0043: Failure to read out CAN system connection ECU information, No.0061: Abnormal low voltage)

Refer to Page J3-14.

▼<u>If it is outputted, go to ▷2.</u>

▼<u>If it is not outputted, go to ▷4.</u>

▷2. Troubleshooting according to diagnosis code (Related to meters)

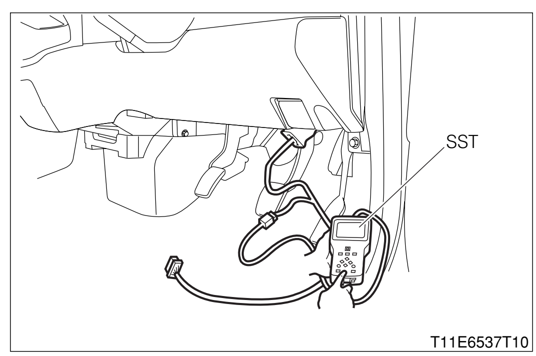
1.Perform the troubleshooting related to the diagnosis codes that have been outputted in ▷1.

(1) No.0043: Failure to read out CAN system connection ECU information

Refer to Page J3-20.

(2) No.0061: Abnormal low voltage

Refer to Page J3-20.

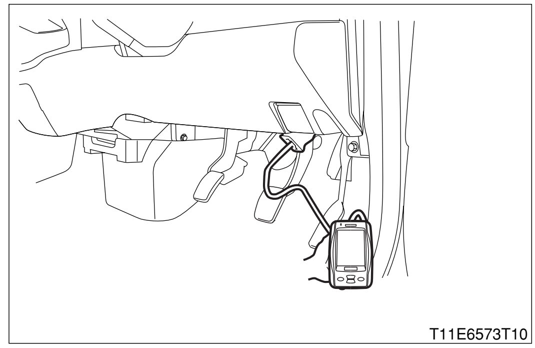


2.After completion of the repairs, connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

SST: 09991-87404-000

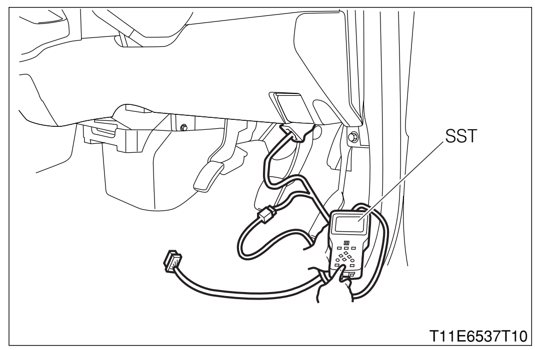
(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



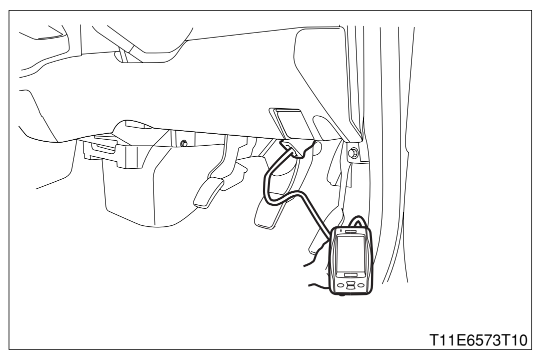
3.Confirm whether any diagnosis code related to the meter is outputted.
▼If it is not outputted, go to ⌦3.
▼If it is outputted, perform the recheck of the diagnosis code that has been output.

⌦3. Reconfirmation of diagnosis code (Related to EFI)

1.Connect the diagnosis tester to DLC.
(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.
SST: 09991-87404-000



(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



2.Erase the diagnosis code of the EFI.
3.Confirm whether the diagnosis code of the EFI is outputted.
SPECIFIED VALUE: It is not outputted.

▼If it is OK, the EFI system is normal.
▼If it is NG, go to ⌦4.

⌦4. Check of CAN line for open wire

1.Set the IG switch to the "LOCK" position.
2.Disconnect all of the EFI ECU connectors.
3.Perform continuity check between the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - EFI ECU connection vehicle harness side connector 7 (CANH)
SPECIFIED VALUE: No continuity exists

▼If it is OK, go to ⌦5.
▼If it is NG, repair or replace malfunctioning sections.

⊳5. Check of EFI ECU internal resistance

1.Disconnect all of the EFI ECU connectors.

2.Measure the resistance between the following terminals.

(1) Between EFI ECU side connector 6 (CANL) - EFI ECU side connector 7 (CANH)

(2) Between EFI ECU side connector 8 (LCAN) - EFI ECU side connector 9 (HCAN)

SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, go to ⊳6.

▼If it is NG, replace the EFI ECU.

Refer to Page B8-1.

⊳6. Check of combination meter internal resistance

1.Disconnect the connector of the combination meter.

2.Measure the resistance between the following terminals.

(1) Between combination meter side connector 1 (CANH) - combination meter side connector 2 (CANL)

(2) Between combination meter side connector 3 (HCAN) - combination meter side connector 4 (LCAN)

SPECIFIED VALUE: 110 - 130Ω

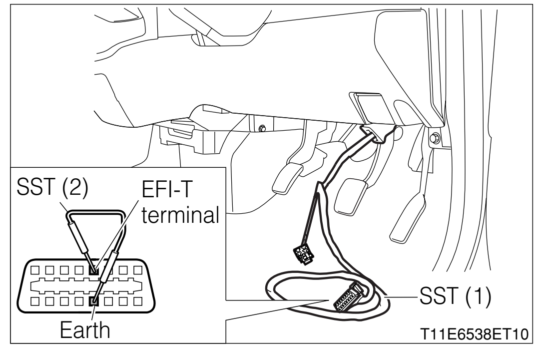
▼If it is OK, check the circuits of the combination meter and ECU.

▼If it is NG, replace the combination meter.

Refer to Page J3-3.

2 **When not using DS-21 diagnosis tester or OBD Ⅱ generic scan tool:**

⊳1. Diagnosis code confirmation (Related to Meter)



1.Short-circuit the terminals 4 (ECU-T) and 13 (E) of the DLC, using the SST.
SST: 09991-87404-000 (1)
09991-87403-000 (2)

2.Check to see if the meter-related diagnosis code is outputted.
(No.0043: CAN system connection ECU information readout not possible, No.0061: low voltage abnormality)

NOTE

- Refer to the diagnosis code output indication method of combination meter.

Refer to Page J3-14.

▼<u>If it is outputted, proceed to ⊳2.</u>
▼<u>If it is not outputted, proceed to ⊳4.</u>

⊳2. Trouble shooting according to diagnosis code (Related to Meter)

1.Perform trouble shooting for the diagnosis code outputted in ⊳1.
(1) No.0043: CAN system connection ECU information readout not possible
Refer to Page J3-20.

(2) No.0061: Low voltage abnormality
Refer to Page J3-20.

2.After repairing, short-circuit the terminals 4 (ECU-T) and 13 (E) of the DLC, using the SST.
SST: 09991-87404-000 (1)
09991-87403-000 (2)

3.Confirm that the diagnosis code related to the meter is not outputted.
▼<u>If it is not outputted, proceed to ⊳3.</u>
▼<u>If it is outputted, perform recheck for the diagnosis code outputted.</u>

⊳3. Diagnosis code reconfirmation (EFI related)

1.Cancel the diagnosis code of the EFI.
2.After canceling, short-circuit the terminals 5 (EFI-T) and 13 (E) of the DLC, using SST.
SST: 09991-87404-000 (1)
09991-87403-000 (2)

3.Check to see if the diagnosis code of EFI is outputted.
SPECIFIED VALUE: It is not outputted.

▼<u>If it is OK, the EFI system is normal.</u>
▼<u>If it is NG, proceed to ⊳4.</u>

▷4. CAN communication basic check

1.Perform basic check of the CAN communication.

Refer to Page L2-14.

▼If it is OK, go to ▷5 for RHD vehicles.
▼If it is OK, go to ▷6 for LHD vehicles.
▼If it is NG, repair or replace the defective sections.

▷5. CAN line open wire check (RHD vehicles)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU and A/T ECU.
3.Perform continuity check between each of the following terminals.
(1) Between EFI ECU connection vehicle harness side connector 6 (CANL) - EFI ECU connection vehicle harness side connector 7 (CANH)
(2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - A/T ECU connection vehicle harness side connector B19 (LCN1)

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ▷7.
▼If it is NG, repair or replace the defective sections.

▷6. CAN line open wire check (LHD vehicles)

1.Turn the IG switch to "LOCK".
2.Remove all connectors of the EFI ECU and A/T ECU.
3.Perform continuity check between each of the following terminals.
(1) Between combination meter connection vehicle harness side connector 1 (CANH) - combination meter connection vehicle harness side connector 2 (CANL)
(2) Between A/T ECU connection vehicle harness side connector B9 (HCN1) - A/T ECU connection vehicle harness side connector B19 (LCN1)

SPECIFIED VALUE: No continuity exists.

▼If it is OK, proceed to ▷7.
▼If it is NG, repair or replace the defective sections.

▷7. EFI ECU internal resistance check

1.Remove all of the EFI ECU connectors.
2.Measure the resistance between the following terminals.
(1) Between EFI ECU side connector 6 (CANL) - EFI ECU side connector 7 (CANH)
(2) Between EFI ECU side connector 8 (LCAN) - EFI ECU side connector 9 (HCAN)

SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, proceed to ▷7.
▼If it is NG, replace the EFI ECU.

Refer to Page B8-1.

▷8. Combination meter internal resistance check

1.Remove all connectors of the combination meter.

2.Measure the resistance between the following terminals.

(1) Between combination meter side connector 1 (CANH) - combination meter side connector 2 (CANL)

(2) Between combination meter side connector 3 (HCAN) - combination meter side connector 4 (LCAN)

SPECIFIED VALUE: 110 - 130Ω

▼If it is OK, perform circuit check of the combination meter and EFI ECU.

Refer to Page A1-24.

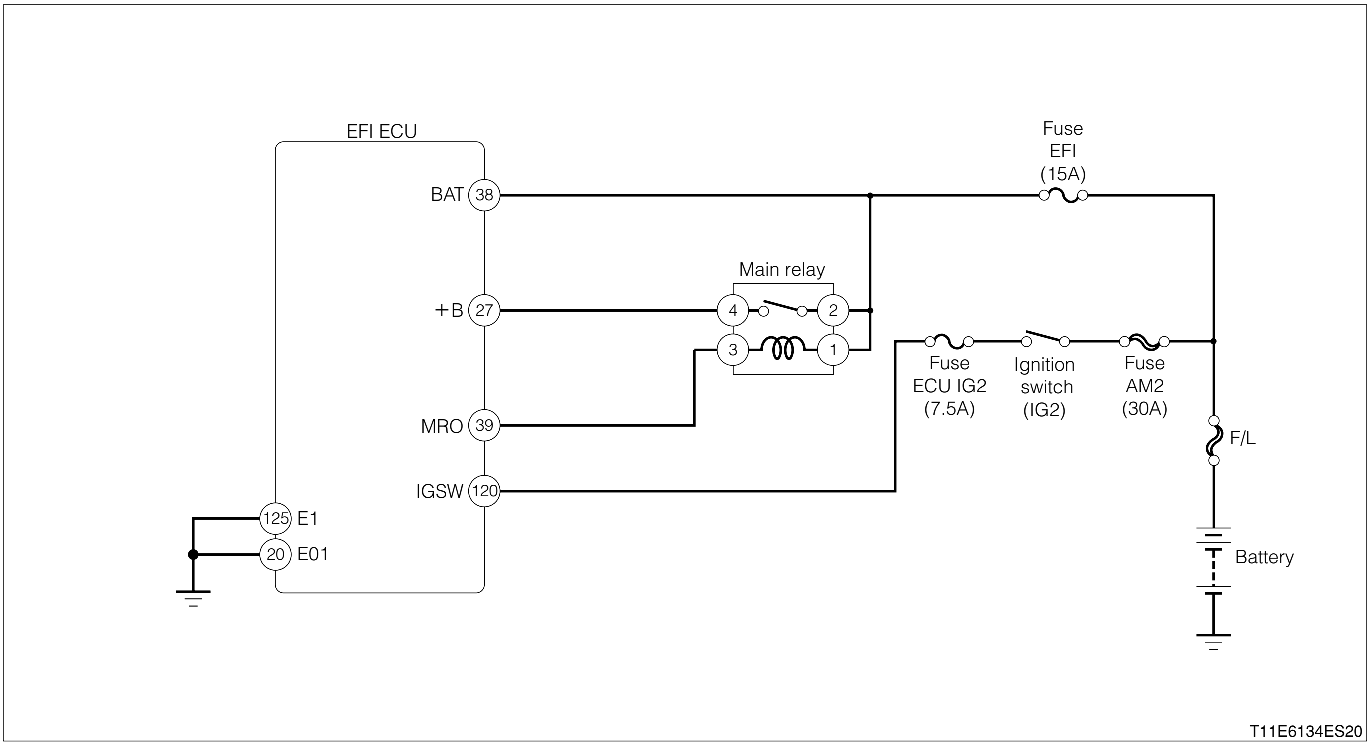
▼If it is NG, replace the combination meter.

Refer to Page J3-3.

9-13 TROUBLE SHOOTING ACCORDING TO SYSTEM

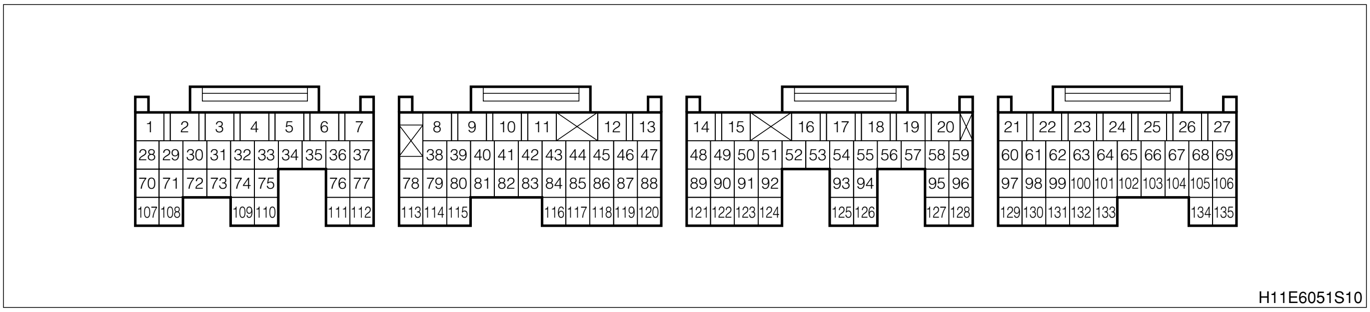
9-13-1 EFI ECU POWER SUPPLY SYSTEM CHECK

(1) System diagram



Each unit connection vehicle harness side connector

EFI ECU connection vehicle harness side connector



(2) Checking points

1. If the engine check lamp does not light up when the IG switch is "ON" or during diagnosis indication, it is possible that there is no power supplied to the EFI ECU.

(3) Checking method

⊳1. EFI ECU voltage check

1.Remove the connector on the EFI ECU side and perform voltage measurements for each of the terminals when the IG switch is "ON".
  (1) ECU connection vehicle harness side connector 27 (+B) - ECU connection vehicle harness side connector 125 (E1)
  (2) ECU connection vehicle harness side connector 38 (BAT) - ECU connection vehicle harness side connector 125 (E1)
 SPECIFIED VALUE: Battery voltage

▼If it is OK, there is no abnormality in the EFI ECU power supply system.
▼If it is NG, proceed to ⊳2.

⊳2. Check of wire harness continuity (1)

1.Perform continuity check between each of the following terminals.
  (1) Between ECU connection vehicle harness side connector 27 (+B) - relay side connector 4
  (2) Between ECU connection vehicle harness side connector 38 (BAT) - relay side connector 4
 SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳3.
▼If it is NG, repair the harness and the connectors.

⊳3. Main relay unit check

1.Perform unit check of the main relay.
 Refer to Page B8-474.

▼If it is OK, proceed to ⊳4.
▼If it is NG, replace the main relay.

⊳4. Main relay voltage check

1.Remove the main relay.
2.Perform voltage measurement between each terminal when the IG switch is "ON".
  (1) Between relay side connector 1 (Coil side) - body earth
  (2) Between relay side connector 2 (Switch side) - body earth
 SPECIFIED VALUE: Battery voltage

▼If it is OK, perform checking or repairing of the harness and connector for each of the following terminals.
  (1) Between main relay - body earth
▼if the switch side is NG, perform checking or repairing of the harness and connector for each of the following terminals.
  (1) Between main relay - battery
▼If the coil side is NG, proceed to ⊳5.

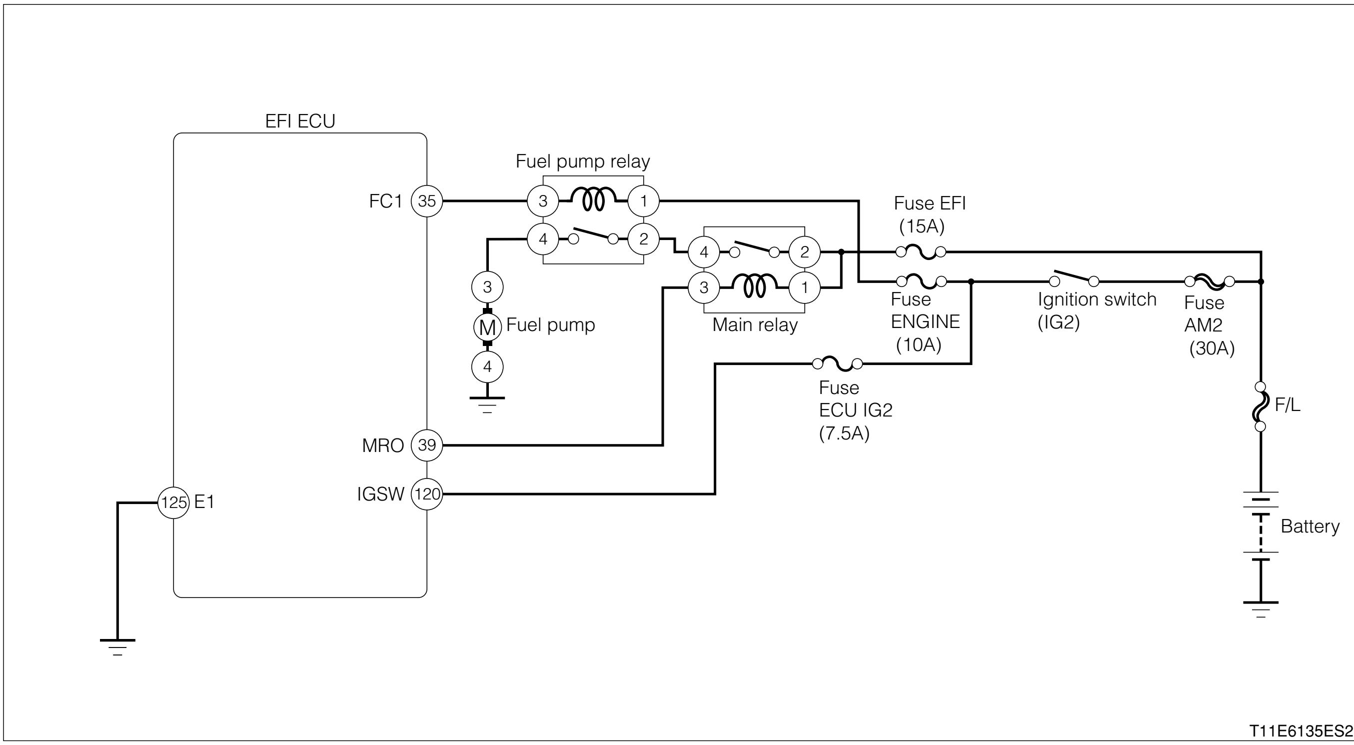
⊳5. Check of wire harness continuity (2)

1.Perform continuity check between each of the following terminals.
  (1) Between relay side connector 1 - IG switch side connector 6 (IG2)
 SPECIFIED VALUE: Continuity exists.

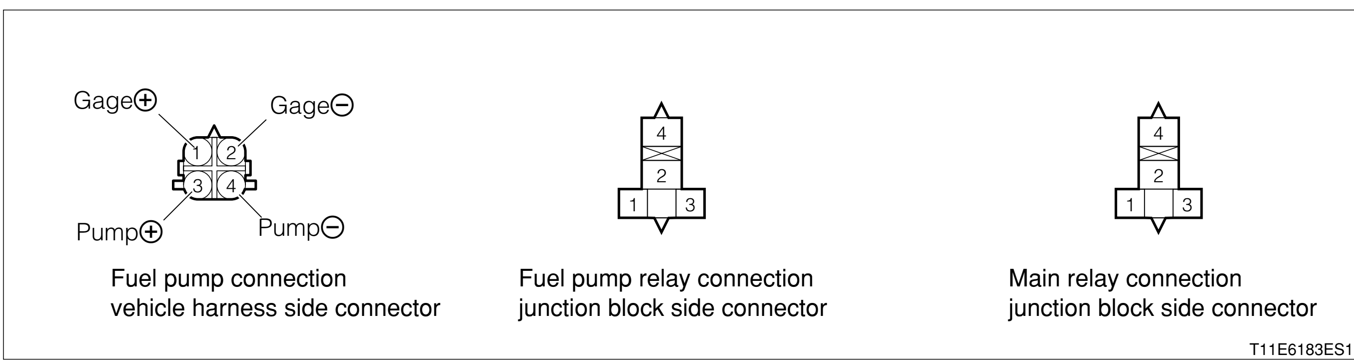
▼If it is OK, perform checking or repairing of the IG switch.
▼If it is NG, repair the harness and the connectors.

9-13-2 FUEL PUMP SYSTEM CHECK

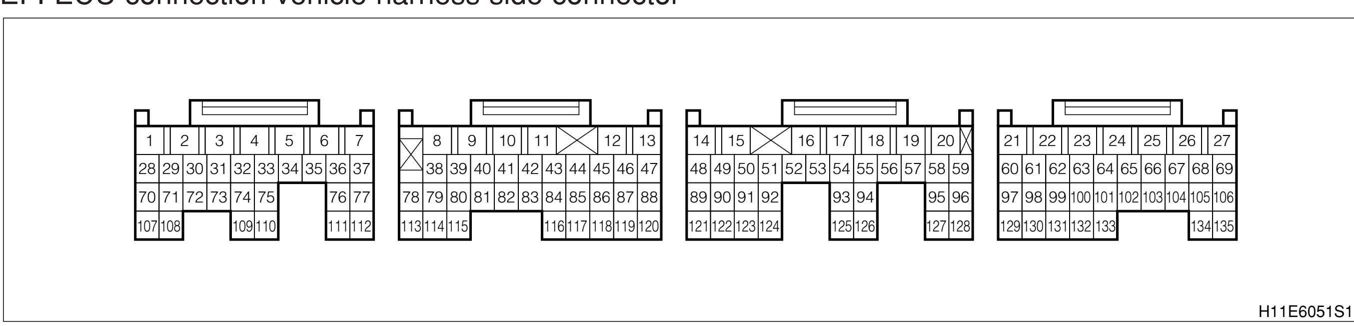
(1) System diagram



Each unit connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Checking points

1. Is the fuel pump relay power supply voltage normal?
2. Is the fuel pump relay operating correctly?
3. Is the fuel pump power supply voltage normal?
4. Is the fuel pump operating correctly?

(3) Checking method

1 **When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

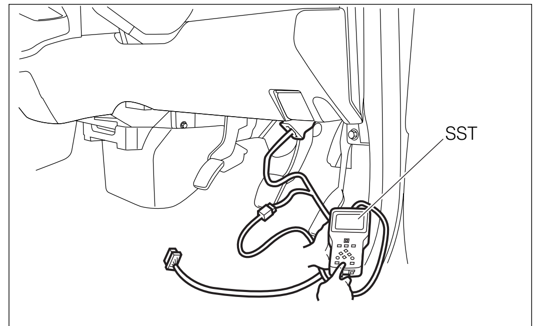
▷1. Fuel pump operation check

1.IG switch turned "LOCK".

2.Connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

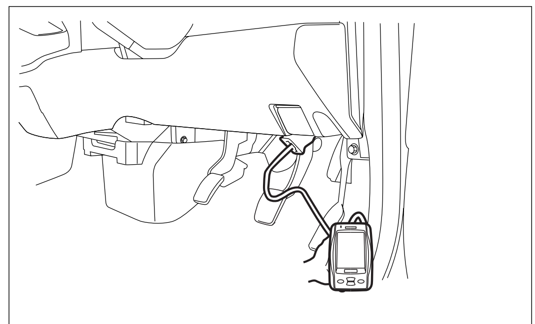
SST: 09991-87404-000



T11E6537T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

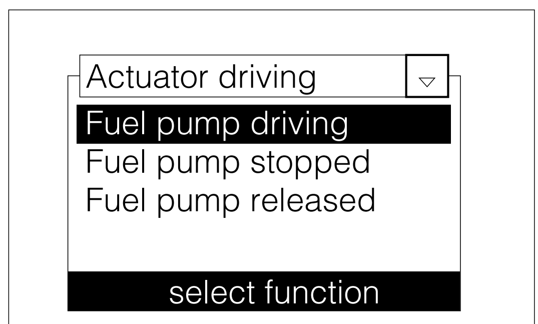
(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.


T11E6573T10

3.Turn "ON" the IG switch, and turn "ON" the main switch of the tester.

4.Confirmation of operation of the purge VSV for EVAP.

(1) DS-21: Select the "Fuel pump" of the "Actuator driving" so as to drive the fuel pump.



C13E5589ET10

(2) DS-Ⅱ: Select the "Fuel pump" of the "Active test" so as to drive the fuel pump.

5.At the time, check the operation sound of the fuel pump.

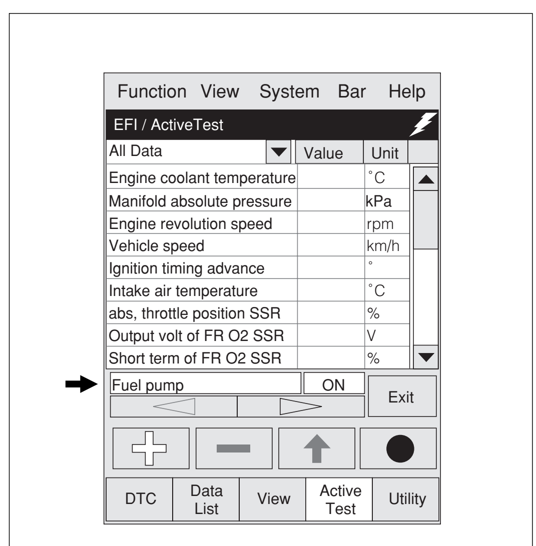
NOTE

- Confirm the operation sound from the fuel inlet side.

SPECIFIED VALUE: Operation sound is generated.

▼If it is OK, proceed to ▷2.

▼If it is NG, proceed to ▷3.



T11E6572T16

⊳2. Fuel pressure check

1.Perform fuel pressure check.
Refer to Page B8-467.

▼If it is OK, the fuel pump system is normal.
▼If it is NG, perform the following operations.
(1) Replacement of the fuel pump
Refer to Page B7-21.

(2) Repairing of the fuel line

⊳3. Fuel pump relay voltage check

1.Remove the fuel pump relay.
2.Perform voltage measurements between each of the following terminals when the IG switch is "ON".
(1) Between relay side connector 1 (Coil side) - body earth
(2) Between relay side connector 2 (Switch side) - body earth
SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳4.
▼If the switch side is NG, proceed to ⊳8.
▼If the coil side is NG, perform checking and repairing for the following portions.
(1) Harness and connectors between the fuel pump relay and battery
(2) Fuse
(3) Ignition switch

⊳4. Fuel pump relay unit check

1.Perform unit check of the fuel pump relay.
Refer to Page B8-474.

▼If it is OK, proceed to ⊳5.
▼If it is NG, replace the fuel pump relay.

⊳5. Check of wire harness continuity (1)

1.Perform continuity check between each of the following terminals.
(1) Between relay side connector 4 - pump side connector 3 (Pump+)
(2) Between pump side connector 4 (Pump−) - body earth
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳6.
▼If it is NG, repair the harness and the connectors of the defective sections.

⊳6. Fuel pump unit check

1.Perform unit check of the fuel pump.
Refer to Page B8-467.

▼If it is OK, proceed to ⊳7.
▼If it is NG, replace the fuel pump.

⊳7. Check of wire harness continuity (2)

1.Perform continuity check between each of the following terminals.

(1) Between relay side connector 3 - ECU connection vehicle harness side connector 35 (FC1)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, check the EFI ECU circuit.

▼If it is NG, repair the harness and the connectors.

⊳8. Check of wire harness continuity (3)

1.Perform continuity check between each of the following terminals.

(1) Between fuel pump relay side connector 2 - main relay side connector 4

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳9.

▼If it is NG, repair the harness and the connectors.

⊳9. Main relay unit check

1.Perform unit check of the main relay.

Refer to Page B8-474.

▼If it is OK, proceed to ⊳10.

▼If it is NG, replace the main relay.

⊳10. Main relay voltage check

1.Remove the main relay.

2.Perform voltage measurement between each terminal when the IG switch is "ON".

(1) Between relay side connector 1 (Coil side) - body earth

(2) Between relay side connector 2 (Switch side) - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, perform checking or repairing of the harness and connector for each of the following terminals.

(1) Between main relay - body earth

▼If the switch side is NG, perform checking or repairing of the following portions.

(1) Harness and connectors between the main relay side connector 2 and battery

(2) Fuse

▼If the coil side is NG, perform checking and repairing for the following portions.

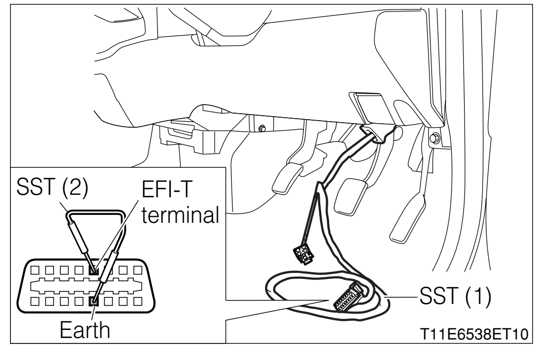
(1) Harness and connectors between main relay side connector 1 and battery

(2) Ignition switch

(3) Fuse

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Fuel pump operation check



1.Check if there is the operation sound of the fuel pump by shorting the EFI-T terminal when the IG switch is "ON".

SST: 09991-87404-000 (1)

09991-87403-000 (2)

NOTE

- Confirm the operation sound from the fuel inlet side.

SPECIFIED VALUE: Operation sound is generated.

▼If it is OK, proceed to ⊳2.

▼If it is NG, proceed to ⊳3.

⊳2. Fuel pressure check

1.Perform fuel pressure check.

Refer to Page B8-467.

▼If it is OK, the fuel pump system is normal.

▼If it is NG, perform the following operations.

(1) Replacement of the fuel pump

Refer to Page B7-21.

(2) Repairing of the fuel line

⊳3. Fuel pump relay voltage check

1.Remove the fuel pump relay.

2.Perform voltage measurements between each of the following terminals when the IG switch is "ON".

(1) Between relay side connector 1 (Coil side) - body earth

(2) Between relay side connector 2 (Switch side) - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳4.

▼If the switch side is NG, proceed to ⊳8.

▼If the coil side is NG, perform checking and repairing for the following portions.

(1) Harness and connectors between the fuel pump relay and battery

(2) Fuse

(3) Ignition switch

⊳4. Fuel pump relay unit check

1.Perform unit check of the fuel pump relay.

Refer to Page B8-474.

▼If it is OK, proceed to ⊳5.

▼If it is NG, replace the fuel pump relay.

⊳5. Check of wire harness continuity (1)

1.Perform continuity check between each of the following terminals.

(1) Between relay side connector 4 - pump side connector 3 (Pump＋)

(2) Between pump side connector 4 (Pump－) - body earth

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳6.

▼If it is NG, repair the harness and the connectors of the defective sections.

⊳6. Fuel pump unit check

1.Perform unit check of the fuel pump.

Refer to Page B8-467.

▼If it is OK, proceed to ⊳7.

▼If it is NG, replace the fuel pump.

Refer to Page B7-21.

⊳7. Check of wire harness continuity (2)

1.Perform continuity check between each of the following terminals.

(1) Between relay side connector 3 - ECU connection vehicle harness side connector 35 (FC1)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, check the EFI ECU circuit.

▼If it is NG, repair the harness and the connectors.

⊳8. Check of wire harness continuity (3)

1.Perform continuity check between each of the following terminals.

(1) Between fuel pump relay side connector 2 - main relay side connector 4

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳9.

▼If it is NG, repair the harness and the connectors.

⊳9. Main relay unit check

1.Perform unit check of the main relay.

Refer to Page B8-474.

▼If it is OK, proceed to ⊳10.

▼If it is NG, replace the main relay.

▷10. Main relay voltage check

1.Remove the main relay.

2.Perform voltage measurement between each terminal when the IG switch is "ON".

(1) Between relay side connector 1 (Coil side) - body earth

(2) Between relay side connector 2 (Switch side) - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, perform checking or repairing of the harness and connector for each of the following terminals.

(1) Between main relay - body earth

▼If the switch side is NG, perform checking or repairing of the following portions.

(1) Harness and connectors between the main relay side connector 2 and battery

(2) Fuse

▼If the coil side is NG, perform checking and repairing for the following portions.

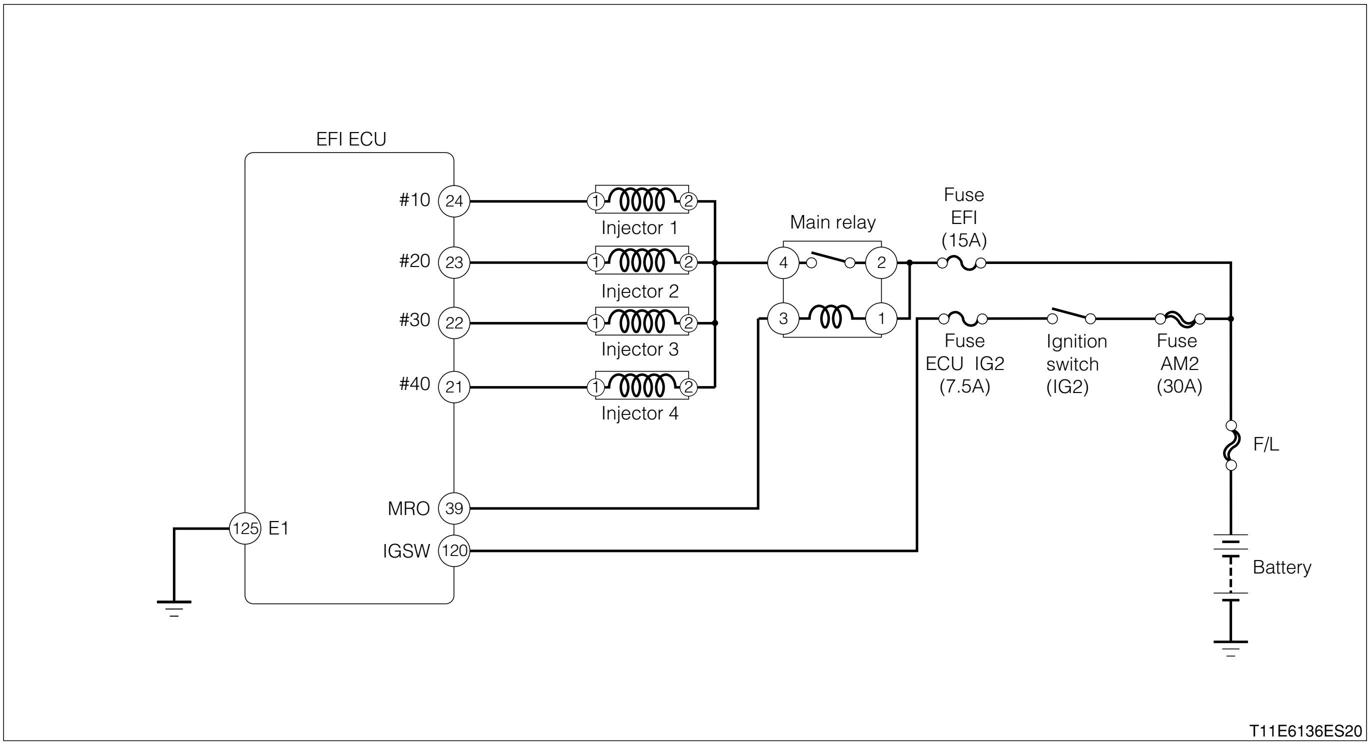
(1) Harness and connectors between main relay side connector 1 and battery

(2) Ignition switch

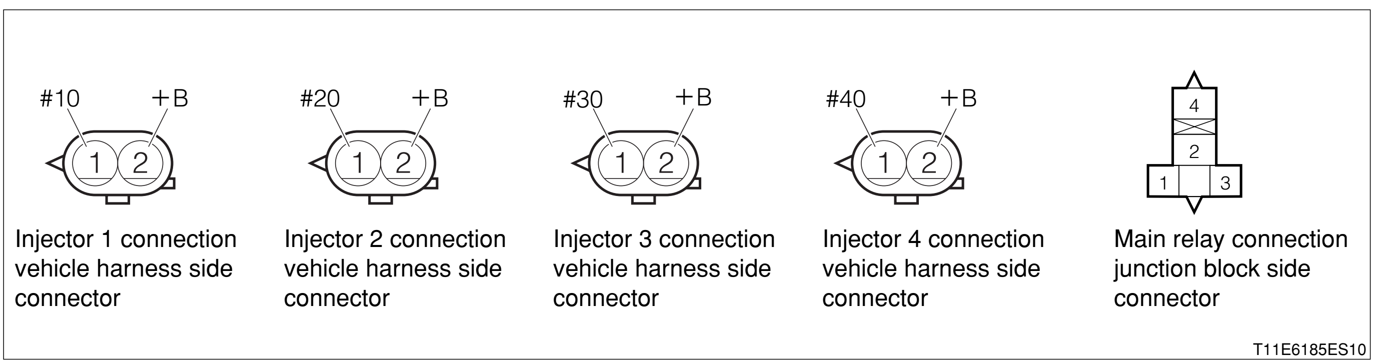
(3) Fuse

9-13-3 INJECTOR SYSTEM CHECK

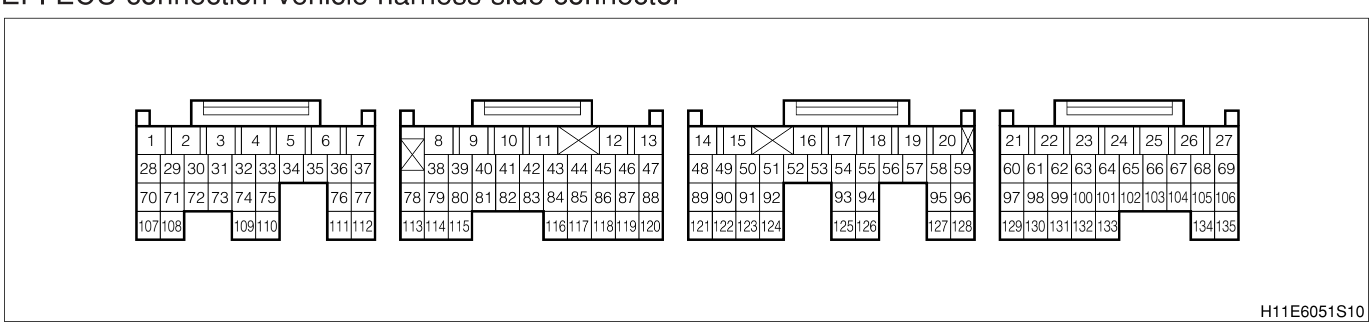
(1) System diagram



Each units connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Checking points

1. Is the injector control signal outputted correctly from the EFI ECU?
2. Is the injector power supply voltage normal?
3. Is the harness between the injector and EFI ECU normal?
4. Is the injection of the injector proper?

(3) Checking method

▷1. Injector operation check

1.Check if there is the operation sound of the injector using a sound scope or a long screwdriver.
SPECIFIED VALUE: Operation sound is generated.

▼If it is OK, proceed to ▷2.
▼If it is NG, proceed to ▷3.

▷2. Injector unit check (1)

1.Perform unit check of the injector.
Refer to Page B8-472.

▼If it is OK, the injector system is normal.
▼If it is NG, replace the injector.
Refer to Page B7-23.

▷3. Injector voltage check

1.Remove all of the connectors on the injector side.
2.Perform voltage measurements between each of the following terminals when the IG switch is "ON".
(1) Each injector connection vehicle harness side connector 1 (+B) - body earth
SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ▷4.
▼If it is NG, perform checking or repairing of the harness and relay between the following terminals.
(1) Between battery - injector

▷4. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.
(1) Between ECU connection vehicle harness side connector 24 (#10) - injector 1 connection vehicle harness side connector 2 (#10)
(2) Between ECU connection vehicle harness side connector 23 (#20) - injector 2 connection vehicle harness side connector 2 (#20)
(3) Between ECU connection vehicle harness side connector 22 (#30) - injector 3 connection vehicle harness side connector 2 (#30)
(4) Between ECU connection vehicle harness side connector 21 (#40) - injector 3 connection vehicle harness side connector 2 (#40)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ▷5.
▼If it NG, repair the harness and connectors of the defective sections.

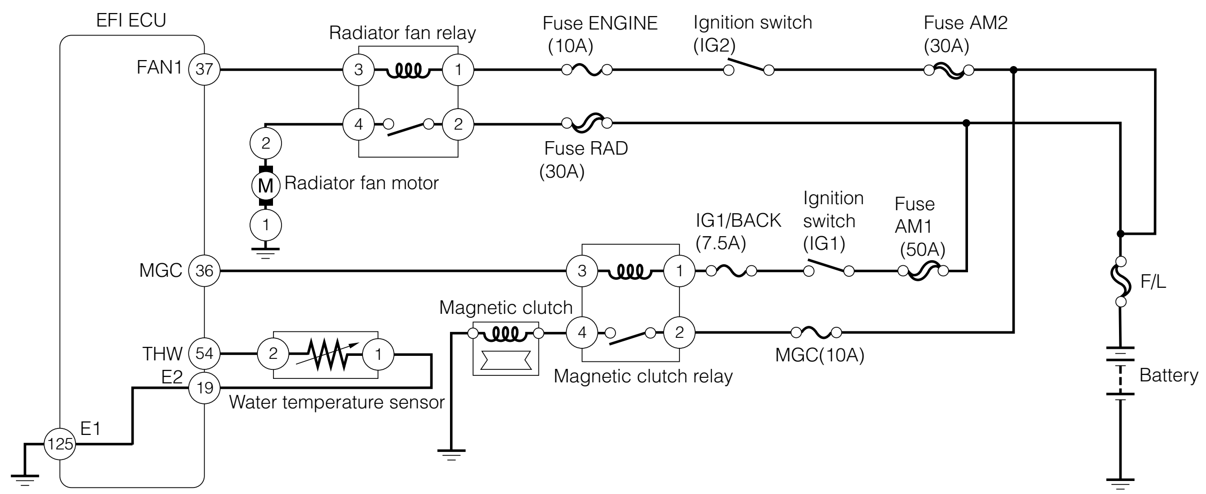
▷5. Injector unit check (2)

1.Perform unit check of the injector.
Refer to Page B8-472.

▼If it is OK, check the connecting condition of each connector.
▼If it is NG, replace the injector.
Refer to Page B7-23.

9-13-4 RADIATOR FAN SYSTEM CHECK

(1) System diagram



Each unit, relays connection vehicle harness side connector

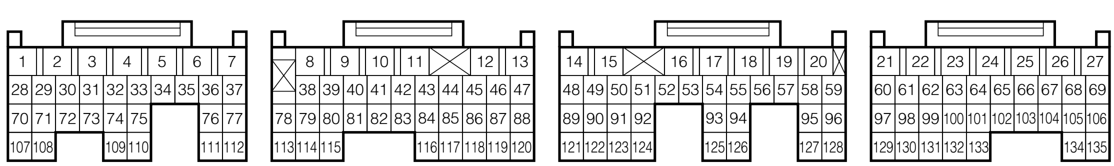
Radiator fan relay connection junction block side connector

Radiator fan motor connection vehicle harness side connector

IG switch connection vehicle harness side connector

Water temperature sensor connection vehicle harness side connector

EFI ECU connection vehicle harness side connector



(2) Checking points

1. Is the signal from the water temperature sensor inputted to the EFI ECU?
2. Is the harness between the water temperature sensor and EFI ECU normal?
3. Is the output of the water temperature sensor correct?
4. Is the signal from the magnet clutch relay inputted to the EFI ECU?
5. Is the harness between the magnet clutch relay and EFI ECU normal?
6. Is the harness between the radiator fan relay and EFI ECU normal?
7. Is the radiator fan motor normal?

(3) Checking method

① When using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:

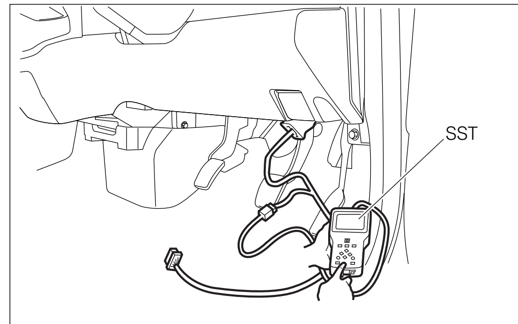
⋗1. Radiator fan operation check (1)

1.The IG switch turned "LOCK".

2.Connect the diagnosis tester to DLC.

(1) In case of DS-21, connect the DS-21 diagnosis tester to DLC through the SST.

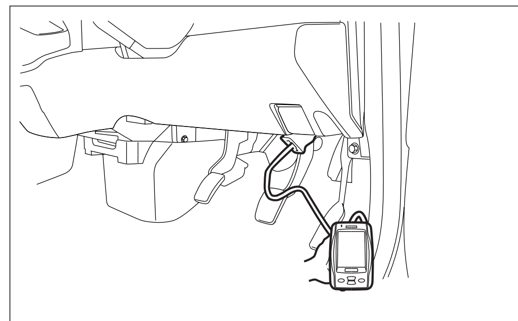
SST: 09991-87404-000



T11E6537T10

(2) In case of DS-Ⅱ, connect the DS-Ⅱ diagnosis tester directly to DLC.

(3) In case of the OBD Ⅱ generic scan tool, connect the OBD Ⅱ generic scan tool directly to DLC.



T11E6573T10

3.Turn "ON" the IG switch, and turn "ON" the main switch of the tester.

4.Confirmation of operation of the radiator fan.

(1) DS-21: Select the "Radiator fan 1st stage" of the "Actuator driving".

(2) DS-Ⅱ: Select the "Radiator fan 1st stage" of the "Active test".

5.Choose the "Radiator fan 1st stage ON" and "Radiator fan 1st stage OFF", respectively.

SPECIFIED VALUE: The fan rotates when "ON" is chosen. The fan stops when "OFF" is chosen.

▼If it is OK, proceed to ⋗2.

▼If it is NG, proceed to ⋗9.

⋗2. Radiator fan operation check (2)

1.Check if the fan does not operate during cold period, but operates after warm-up when warming up the engine.

2.Check if the fan operates when the air conditioner is turned "ON".

SPECIFIED VALUE: The fan operates when the air conditioner is turned "ON".

NOTE

- Air conditioner "ON" means that the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are all "ON".

▼If it is OK, the system is normal.

▼If it does not rotate after warm-up, perform checking the water temperature sensor system.

Refer to Page B8-301.

▼If it does not rotate when the air conditioner is "ON", proceed to ⋗3.

▼When it is rotating constantly, proceed to ⋗6.

▼If it does not rotate at all, proceed to ⋗9.

⊳3. Check of wire harness continuity (1)

1.Perform continuity check between each of the following terminals.

(1) Between relay side connector 3 - ECU connection vehicle harness side connector 36 (MGC)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳4.

▼If it is NG, repair or replace the defective sections.

⊳4. Magnet clutch relay voltage check

1.Perform voltage measurements between each of the following terminals when the IG switch is "ON".

(1) Between relay side connector 1 - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳5.

▼If it is NG, perform checking or repairing the harness and the connectors for the following terminals.

(1) Between magnet clutch relay - battery

⊳5. Magnet clutch relay unit check

1.Perform unit check of the magnet clutch relay.

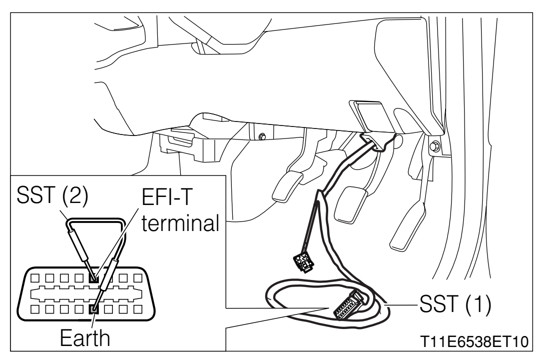
Refer to Page B8-474.

▼If it is OK, check the EFI ECU circuit.

Refer to Page A1-24.

▼If it is NG, replace the magnet clutch relay

⊳6. Diagnosis code check



1.Short-circuit the EFI-T terminals, using SST (Inspection harness).

SST: 09991-87404-000

SST: 09991-87403-000

2.Is the normal code outputted when the IG switch is "ON"?

SPECIFIED VALUE: The normal code is outputted.

▼If it is OK, proceed to ⊳7.

▼If code No.P0115/42 is outputted, perform checking of the water temperature sensor system.

Refer to Page B8-301.

⊳7. Wire harness check (2)

1.Perform continuity check between each of the following terminals.

(1) Between relay side connector 3 - ECU connection vehicle harness side connector 37 (FAN1)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳8.

▼If it is NG, repair or replace the defective sections.

⊳8. Radiator fan relay unit check (1)

1.Perform unit check of the radiator fan relay.
Refer to Page B8-474.

▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, replace the radiator fan relay.

⊳9. EFI ECU voltage check

1.Connect the SST.
SST: 09842-97209-000

2.Perform voltage measurements between the following terminals when the air conditioner is turned "ON".

NOTE

- Air conditioner "ON" means that the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are all "ON".

(1) Between SST 37 (FAN1) - SST 125 (E1)
SPECIFIED VALUE:

Measuring condition	Specified value
When magnet clutch is "ON".	1V or less
When magnet clutch is "OFF".	Battery voltage

▼If it is OK, proceed to ⊳13.
▼If it is NG, proceed to ⊳10.

⊳10. Check of wire harness continuity (3)

1.Perform continuity check between each of the following terminals.
(1) Between relay side connector 3 - ECU connection vehicle harness side connector 37 (FAN1)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳11.
▼If it is NG, repair the harness and the connectors.

⊳11. Radiator fan relay coil side voltage check

1.Perform voltage measurements between each of the following terminals when the IG switch is "ON".
(1) Between relay side connector 1 - body earth
SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳11.
▼If it is NG, perform checking or repairing of the harness and connectors between the following terminals.
(1) Between radiator fan relay - battery

⊳12. Radiator fan relay unit check (2)

1.Perform unit check of radiator fan relay.
Refer to Page B8-474.

▼If it is OK, check the EFI ECU circuit.
Refer to Page A1-24.

▼If it is NG, replace the radiator fan relay.

⊳13. Radiator fan relay switch side voltage check

1.Perform voltage measurements between the following terminals when the IG switch is "ON".
(1) Between relay side connector 2 - body earth
SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳13.
▼If it is NG, perform checking or repairing of the harness and connectors between the following terminals.
(1) Between radiator fan relay - battery

⊳14. Radiator fan relay unit check (3)

1.Perform unit check of radiator fan relay.
Refer to Page B8-474.

▼If it is OK, proceed to ⊳14.
▼If it is NG, replace the radiator fan relay.

⊳15. Check of wire harness continuity (4)

1.Perform continuity check between each of the following terminals.
(1) Between relay side connector 4 - motor side connector 2 (+)
(2) Between motor side connector 1 (−) - body earth
SPECIFIED VALUE: Continuity exists.

▼If it is OK, replace the radiator fan motor.
Refer to Page B6-13.

▼If it is NG, perform repairing and replacing of the defective sections.

② **When not using diagnosis tester (DS-21/DS-Ⅱ) or OBD Ⅱ generic scan tool:**

⊳1. Radiator fan operation check

1.Check if the fan does not operate during cold period, but operates after warm-up when warming up the engine.

2.Check if the fan operates when the air conditioner is turned "ON".

NOTE

- Air conditioner "ON" means that the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are all "ON".

SPECIFIED VALUE: The fan operates when the air conditioner is turned "ON".

▼If it is OK, the system is normal.

▼If it does not rotate after warm-up, perform checking the water temperature sensor system.

Refer to Page B8-74.

▼If it does not rotate when the air conditioner is "ON"

▼When it is rotating constantly, proceed to ⊳5.

▼If it does not rotate at all, proceed to ⊳8.

⊳2. Check of wire harness continuity (1)

1.Perform continuity check between each of the following terminals.

(1) Between relay side connector 3 - ECU connection vehicle harness side connector 36 (MGC)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳3.

▼If it is NG, repair or replace the defective sections.

⊳3. Magnet clutch relay voltage check

1.Perform voltage measurements between each of the following terminals when the IG switch is "ON".

(1) Between relay side connector 1 - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳4.

▼If it is NG, perform checking or repairing the harness and the connectors for the following terminals.

(1) Between magnet clutch relay - battery

⊳4. Magnet clutch relay unit check

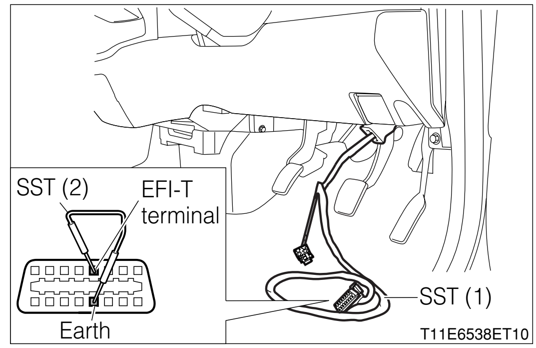
1.Perform unit check of the magnet clutch relay.

Refer to Page B8-225.

▼If it is OK, check the EFI ECU circuit.

▼If it is NG, replace the magnet clutch relay

▷5. Diagnosis code check



1.Short-circuit the EFI-T terminals, using SST.
SST: 09991-87404-000
09991-87403-000

2.Is the normal code outputted when the IG switch is "ON"?
SPECIFIED VALUE: The normal code is outputted.

▼If it is OK, proceed to ▷6.
▼If code No.42 is outputted, perform checking of the water temperature sensor system.
Refer to Page B8-74.

▷6. Wire harness check (2)

1.Perform continuity check between each of the following terminals.
(1) Between relay side connector 3 - ECU connection vehicle harness side connector 37 (FAN1)
SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ▷7.
▼If it is NG, repair or replace the defective sections.

▷7. Radiator fan relay unit check (1)

1.Perform unit check of the radiator fan relay.
Refer to Page B8-225.

▼If it is OK, check the EFI ECU circuit.
▼If it is NG, replace the radiator fan relay.

▷8. EFI ECU voltage check

1.Connect the SST.
SST: 09842-97209-000

2.Perform voltage measurements between the following terminals when the air conditioner is turned "ON".

NOTE
- Air conditioner "ON" means that the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are all "ON".

(1) Between SST37(FAN1) - 125(E1)
SPECIFIED VALUE:

Measuring condition	Specified value
When magnet clutch is "ON".	1V or less
When magnet clutch is "OFF".	Battery voltage

▼If it is OK, proceed to ▷2.
▼If it is NG, proceed to ▷9.

⊳9. Check of wire harness continuity (3)

1.Perform continuity check between each of the following terminals.

(1) Between relay side connector 3 - ECU connection vehicle harness side connector 37 (FAN1)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, proceed to ⊳10.

▼If it is NG, repair the harness and the connectors.

⊳10. Radiator fan relay coil side voltage check

1.Perform voltage measurements between each of the following terminals when the IG switch is "ON".

(1) Between relay side connector 1 - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳11.

▼If it is NG, perform checking or repairing of the harness and connectors between the following terminals.

(1) Between radiator fan relay - battery

⊳11. Radiator fan relay unit check (2)

1.Perform unit check of radiator fan relay.

Refer to Page B8-225.

▼If it is OK, check the EFI ECU circuit.

▼If it is NG, replace the radiator fan relay.

⊳12. Radiator fan relay switch side voltage check

1.Perform voltage measurements between the following terminals when the IG switch is "ON".

(1) Between relay side connector 2 - body earth

SPECIFIED VALUE: Battery voltage

▼If it is OK, proceed to ⊳13.

▼If it is NG, perform checking or repairing of the harness and connectors between the following terminals.

(1) Between radiator fan relay - battery

⊳13. Radiator fan relay unit check (3)

1.Perform unit check of radiator fan relay.

Refer to Page B8-225.

▼If it is OK, proceed to ⊳14.

▼If it is NG, replace the radiator fan relay.

⊳14. Check of wire harness continuity (4)

1.Perform continuity check between each of the following terminals.

(1) Between relay side connector 4 - motor side connector 2 (＋)

(2) Between motor side connector 1 (－) - body earth

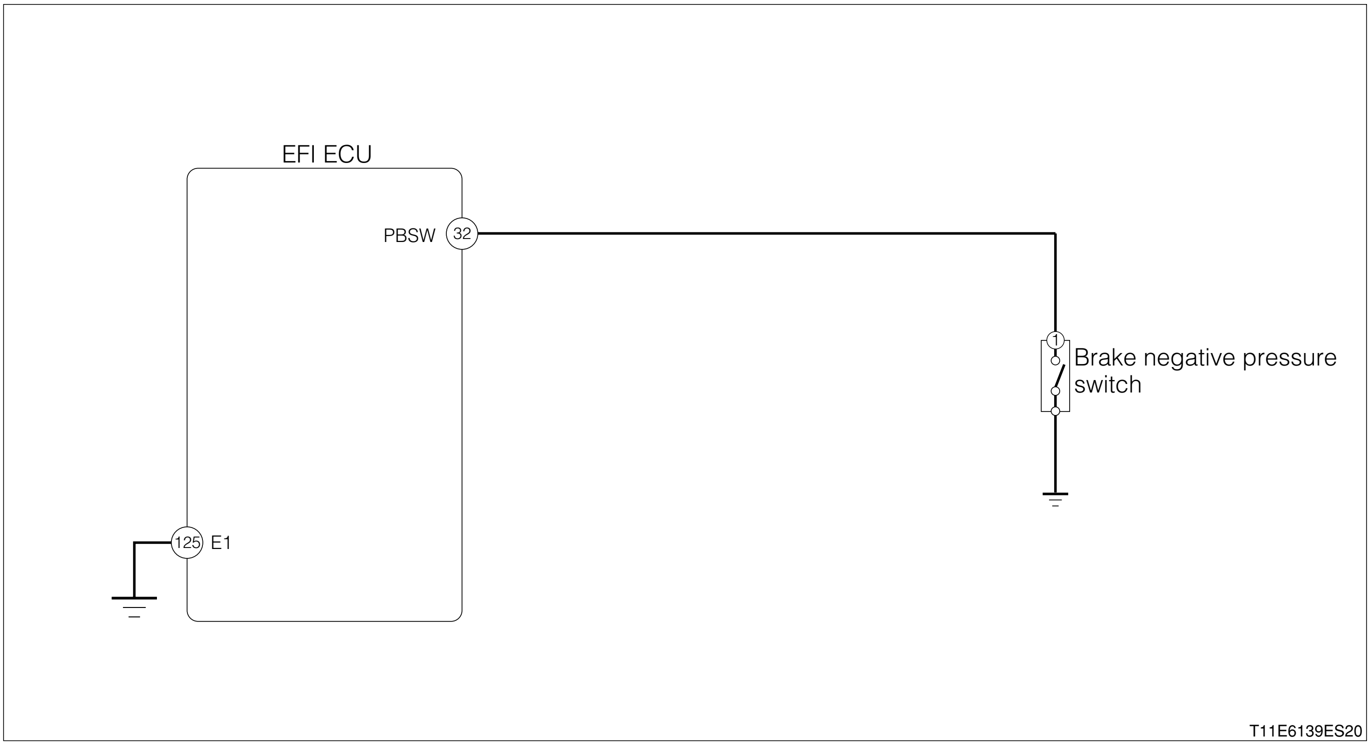
SPECIFIED VALUE: Continuity exists.

▼If it is OK, replace the radiator fan motor.

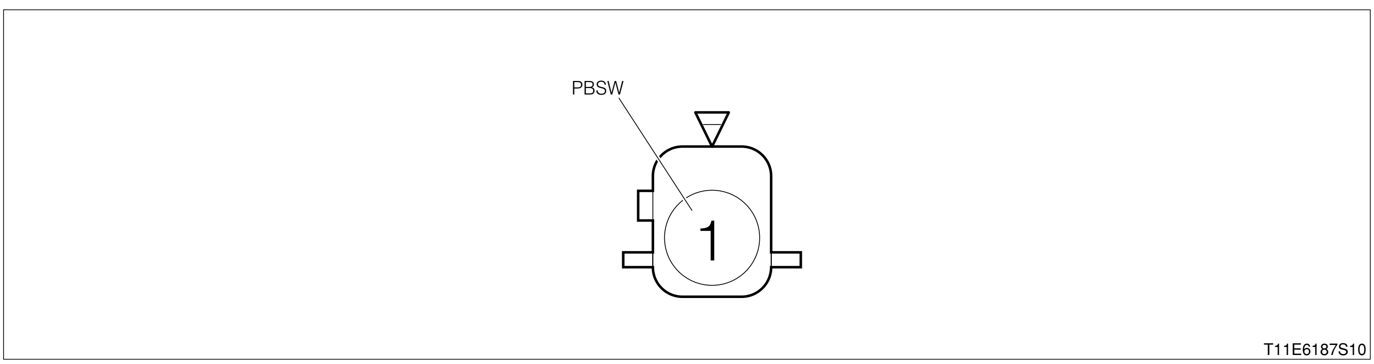
▼If it is NG, perform repairing and replacing of the defective sections.

9-13-5 BRAKE VACUUM SWITCH SYSTEM CHECK

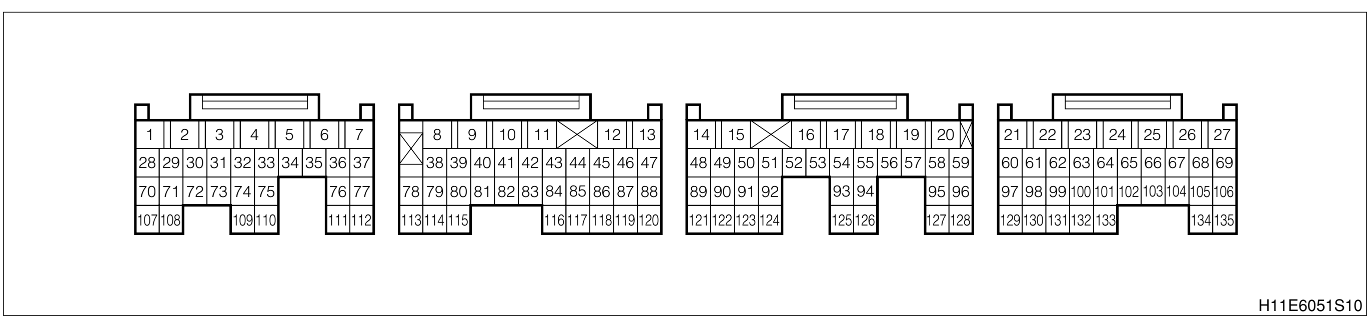
(1) System diagram



Brake vacuum switch connection vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Checking points

1.Is the brake vacuum switch operating normally?
2.Is the harness between the brake vacuum switch and EFI ECU normal?

(3) Checking method

⊳1. Air conditioner cut operation confirmation

1.Start the engine and wait until the negative pressure in the brake booster becomes high.

2.Turn air conditioner "ON" and confirm that the air conditioner is operating and that it is at the air conditioner idle up speed.

NOTE

- Air conditioner "ON" means that the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are all "ON".

3.Disconnect the brake booster hose from the brake booster and shut the lid down on both sides.

4.Raise the vehicle speed to about 20km/h with the vehicle lifted up and step on the brake pedal and decrease the vehicle speed to 5km/h.

SPECIFIED VALUE: The air conditioner is cut off.

NOTE

- As for the brake vacuum switch, the contact points will be closed when the negative pressure in the brake booster is more toward the atmospheric pressure side than −34.6±4kPa.

▼If it is OK, there is no abnormality.

▼If it is NG, proceed to ⊳2.

⊳2. EFI ECU signal check

1.Stop the engine and connect the SST.

SST: 09842-97209-000

2.Perform voltage measurements between each terminal when under the following conditions.

(1) Between SST 32 (PBSW) - SST 125 (E1)

SPECIFIED VALUE:

Measuring condition	Specified value
When the negative pressure in the brake booster is high after starting the engine:	Battery voltage
When the engine is stopped and the negative pressure in the brake booster is more toward the atmospheric side than −30.6 kPa (−230 mmHg) after stepping on the brake pedal several times:	Around 0V

▼If it is OK, proceed to ⊳3.

▼If it is NG, check the EFI ECU circuit.

⊳3. Check of wire harness continuity

1.Perform continuity check between each of the following terminals.

(1) Between ECU connection vehicle harness side connector 32 (PBSW) - brake vacuum switch side connector 1 (PBSW)

SPECIFIED VALUE: Continuity exists.

▼If it is OK, perform checking and repairing or replacing of the brake vacuum switch.

Refer to Page E1-36.

▼If it is NG, repair or replace the harness.

9-14 UNIT CHECK

WARNING

- If the vehicle is driven with the SST (EFI computer check sub harness, etc.) connected there is a possibility of causing malfunction and may be very dangerous. Therefore, remove it without fail before running.

9-14-1 FUEL PRESSURE CHECK

WARNING

- Fire is strictly forbidden while operation.
  Place cloth, etc. to prevent fuel from splashing.

1.Connect the SST.
SST: 09842-97209-000
09268-87701-000
09268-87702-000

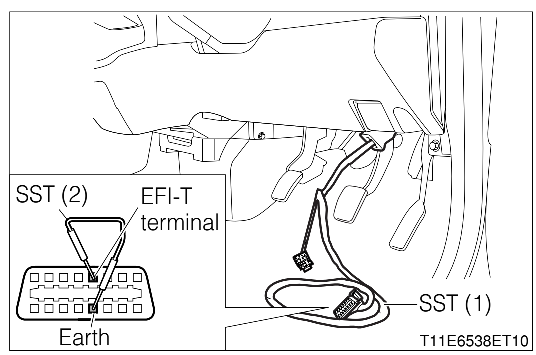
2.Turn the IG switch to the "ON" position.
3.Drive the fuel pump by shorting between SST 35 (FC1) -SST 125 (E1) and measure the fuel pressure at this point.
SPECIFIED VALUE: 324±5kPa {3.3±0.05kgf/cm^2}
There should be no large fluctuation.

9-14-2 FUEL PUMP

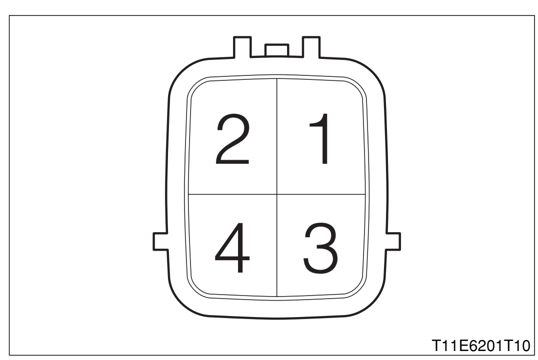
WARNING

- Fire is strictly forbidden while operation.

1.Turn the IG switch to the "ON" position.
2.Short-circuit the terminals 5 (EFI-T) and 13 (E) of the DLC, using the SST and confirm the operation sound of the fuel pump at this point.
SST: 09991-87404-000 (1)
09991-87403-000 (2)
3.Turn the IG switch to "LOCK".



4.Pull out the pump connector on top of the fuel tank and measure the resistance between 3 (Pump+) - 4 (pump−) of the fuel pump.
SPECIFIED VALUE: 0.2 - 3.0Ω



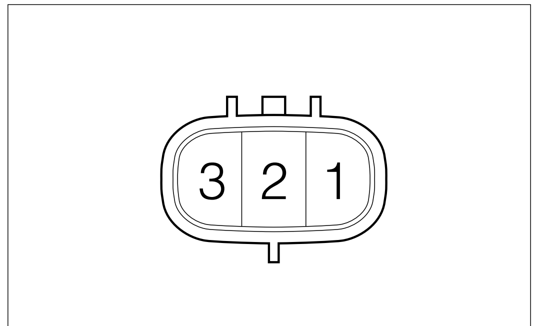
9-14-3 MANIFOLD ABSOLUTE PRESSURE SENSOR

1.Connect the SST.
SST: 09842-97209-000

2.Perform voltage measurements between the following terminals when the IG switch is "ON".
(1) Between SST57 (VCPM) - SST 122 (E2PM)
SPECIFIED VALUE: 4.5 - 5.5V

3.Perform voltage measurements between the following terminals when the IG switch is "ON".
(1) Between SST 52 (PIM) - SST 122 (E2PM)
SPECIFIED VALUE: 3.1 - 4.1V

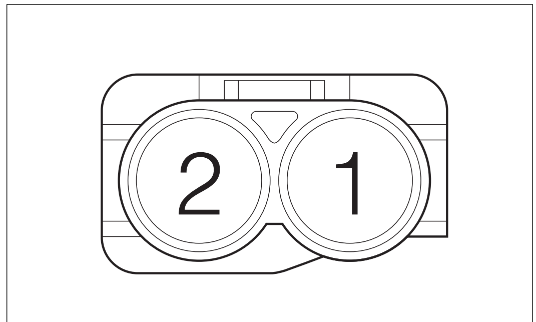
4.Perform voltage measurements between the following terminals by cranking with the fuel pump relay removed.
(1) Between SST 52 (PIM) -SST 122 (E2PM)
SPECIFIED VALUE: The voltage value changes.



T11E6203T10

9-14-4 ENGINE REVOLUTION SENSOR

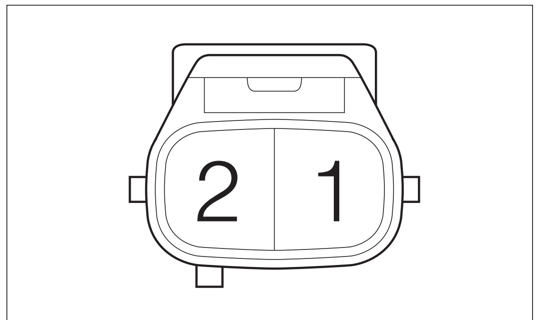
1.Measure the resistance between the following terminals.
(1) Between 1 (N1+) - 2 (N1−)
SPECIFIED VALUE: 2150±300Ω (At 20°C)



T11E6206T10

9-14-5 CAMSHAFT POSITION SENSOR

1.Measure the resistance between the following terminals.
(1) Between 1 (N2+) - 2 (N2−)
SPECIFIED VALUE: 2150±300Ω (At 20°C)

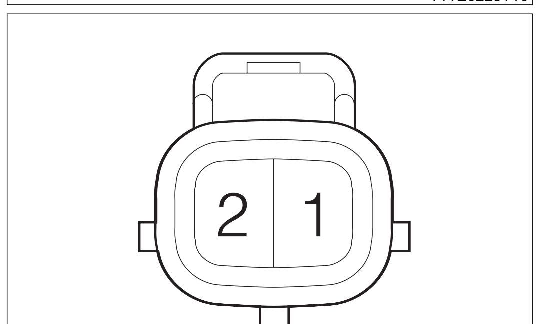


T11E6223T10

9-14-6 WATER TEMPERATURE SENSOR

1.Measure the resistance between the following terminals.
(1) Between 1 (E2) - 2 (THW)

Temperature (℃)	−20	20	80	110
Resistance (kΩ)	15.04	2.45	0.318	0.142



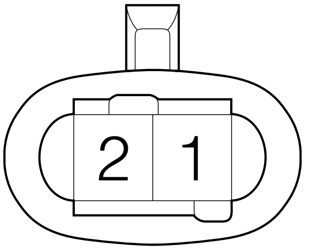
T11E6207T10

9-14-7 INTAKE AIR TEMPERATURE SENSOR

1. Measure the resistance value between the following terminals.
   (1) Between 1 (THA) - 2 (E2)

Intake air temperature sensor

Temperature (℃)	−30	−20	20	80	120
Resistance (kΩ)	28.6	16.2	2.45	0.322	0.117



T11E6204T10

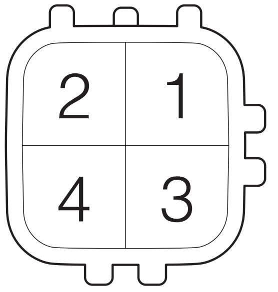
NOTE

- The reference value is indicated in the parentheses.

9-14-8 OXYGEN SENSOR

(1) For EU specifications

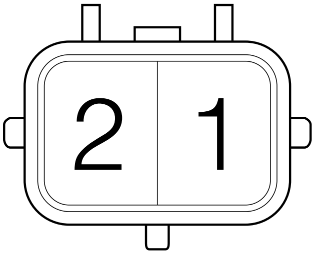
1. Measure the resistance between the following terminals.
   (1) Between 1 (OXH1) - 2 (+)
   SPECIFIED VALUE: $5.6^{+1.4}_{-0.6}$ Ω (At 20±1°C)
2. Confirm that there is no continuity between each of the following terminals.
   (1) Between oxygen sensor body - 3 (OX1)
   (2) Between oxygen sensor body - 4 (E2)
   (3) Between oxygen sensor body - 1 (OXH1)
   (4) Between oxygen sensor body - 2 (+B)
   (5) Between 3 (OX1) - 1 (OXH1)
   (6) Between 3 (OX1) - 2 (+B)
   (7) Between 4 (E2) - 1 (OXH1)
   (8) Between4 (E2) - 2 (+B)
   SPECIFIED VALUE: No continuity exists.



T11E6209T10

(2) For general specifications

1. Confirm that there is no continuity between the oxygen sensor body and each of the following terminals.
   (1) Between oxygen sensor body - 1 (OX1)
   (2) Betwee oxygen sensor body - 2 (E2)
   SPECIFIED VALUE: No continuity exists.



T11E6554T10

NOTE

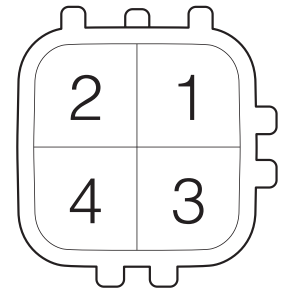
- Other than the above unit check, perform checking for the oxygen sensor output voltage under the condition in which it is installed to the vehicle.
  (Refer to the page of the oxygen sensor system of the trouble shooting according to the systems.)

Refer to Page B8-311.

9-14-9 REAR OXYGEN SENSOR

1.Measure the resistance between the following terminals.
(1) Between 1 (OXH2) - 2 (+)
SPECIFIED VALUE: $13.0^{+2.5}_{-1.3}$ Ω (At 20±1°C)

2.Confirm that there is no continuity between each of the following terminals.
(1) Between rear oxygen sensor body - 3 (OX2)
(2) Between rear oxygen sensor body - 4 (E2)
(3) Between rear oxygen sensor body - 1 (OXH2)
(4) Between rear oxygen sensor body - 2 (+B)
(5) Between 3 (OX2) - 1 (OXH2)
(6) Between 3 (OX2) - 2 (+B)
(7) Between 4 (E2) - 1 (OXH2)
(8) Between4 (E2) - 2 (+B)
SPECIFIED VALUE: No continuity exists.



T11E6209T10

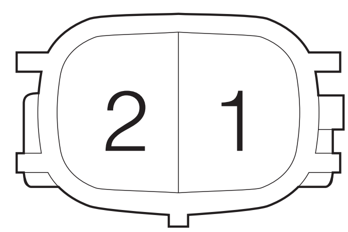
NOTE

- Other than the above unit check, perform checking for the rear oxygen sensor output voltage under the condition in which it is installed to the vehicle.
  (Refer to the page of the rear oxygen sensor system of the trouble shooting according to the systems.)

Refer to Page B8-323.

9-14-10 KNOCK SENSOR

1.Measure the resistance between the following terminals.
(1) Between 1 (E2) - 2 (KNK)
SPECIFIED VALUE: 200±80kΩ

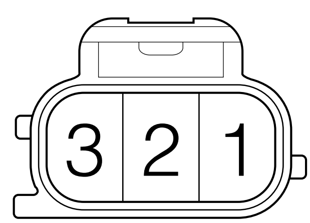


T11E6211T10

9-14-11 THROTTLE POSITION SENSOR

1.Measure the resistance between the following terminals.
(1) Between 1 (VC) - 2 (E2)
SPECIFIED VALUE: 2.5 - 5.0kΩ

2.Measure the resistance between the following terminals.
(1) Between 3 (VTH) - 2 (E2)
SPECIFIED VALUE: The resistance value will increase proportionally to the throttle lever opening.



T11E6212T10

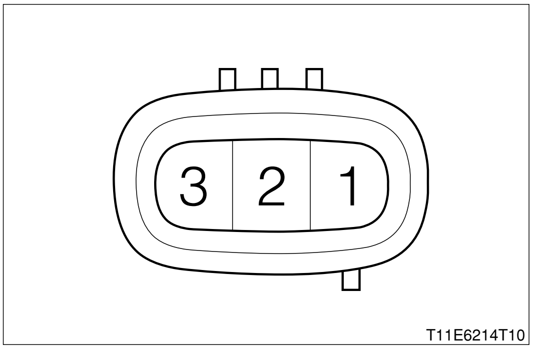
NOTE

- The resistance value when the throttle lever is fully closed is about 0.6kΩ.
- The resistance value when the throttle lever is fully opened is about 3.9kΩ.

9-14-12 VALVE FOR ISC

1. Warm up the engine completely.
2. Confirm the engine revolution speed under the idling condition with no air conditioner and electric load applied.

SPECIFIED VALUE: It is at the regular idling speed.
Idling speed 700^{+100}_{-50} rpm (A/T vehicle)
650^{+100}_{-50} rpm (M/T vehicle)



T11E6214T10

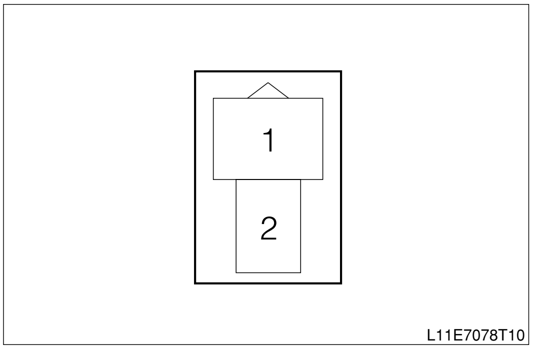
CAUTION

- Do not connect the battery power supply to 1 (ISC) and 3 (E1) of the valve for ISC. There is a possibility that the internal circuit be malfunctioning when connected.

NOTE

- The operation check is difficult by the coil resistance and as an unit, since the valve for ISC has an IC circuit built in and the duty signal from the ECU is transformed in the driving circuit.

9-14-13 AIR CONDITIONER EVAPORATOR TEMPERATURE SENSOR



L11E7078T10

1. Measure the resistance between the sensor side connector terminals.
2. Connect the connectors and leave it for five minutes with the air conditioner "ON".

NOTE

- Air conditioner "ON" means that the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are all "ON".

3. Turn the air conditioner "OFF" and measure the resistance value between the following terminals.

NOTE

- Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".

(1) Between 1 (ACEV) - 2 (E21)

SPECIFIED VALUE: The resistance value changes before and after the air conditioner operation.

NOTE

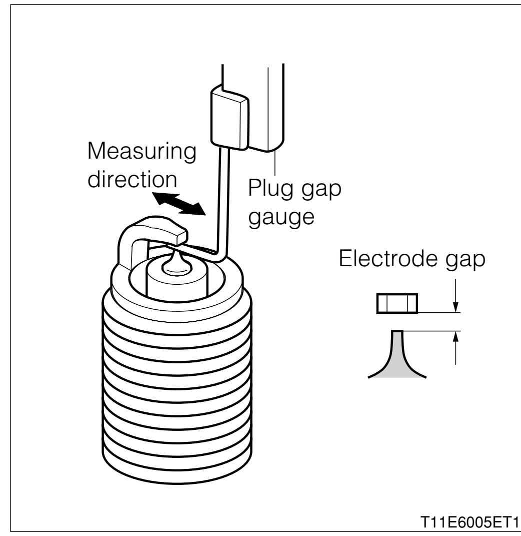
- The lower the temperature is the higher the resistance value will become.

9-14-14 SPARK PLUG

WARNING

- Be very careful not to burn yourself since the spark plugs are hot.

1. Check that the spark plugs exhibits no smoldering and the plugs are not burnt excessively.
2. Check the plug gaps using the plug gap gauge.
   SPECIFIED VALUE: $1.1^{+0}_{-0.1}$ mm



9-14-15 INJECTOR

WARNING

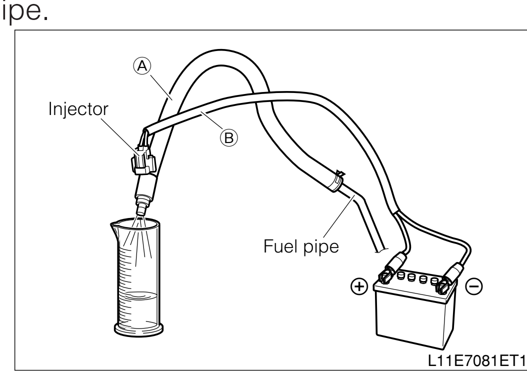
- Never use fire during the work.
- Put cloth, etc. to prevent fuel from splashing.

1. Remove the injector to be checked.

CAUTION

- After removing, install a substitute injector.

2. Remove the fuel hose between the fuel inlet pipe and fuel pipe.
3. Set the injector to be checked to the fuel hose, using SST (Sub harness, measuring tool, EFI inspection wire). (Refer to the right figure.)
   SST: 09842-97209-000
   09268-41047-000 (A)
   09842-30070-000 (B)

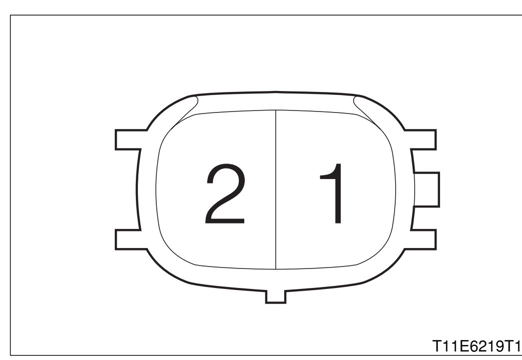


4. With the IG switch "ON"
5. Confirm that the fuel is injected when the battery voltage is applied to the injector.
   SPECIFIED VALUE: It is injected.

CAUTION

- Perform "ON" or "OFF" at the battery side.

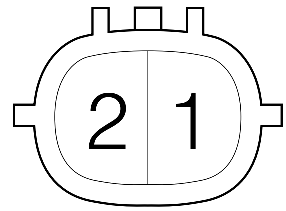
6. Measure the amount leaking from the injector in one minute by removing the battery in the injection check condition.
   SPECIFIED VALUE: One drop or less
7. Measure the resistance value between the injector terminals.
   SPECIFIED VALUE: 12Ω (At 20°C)



9-14-16 OIL CONTROL VALVE

1. Visually confirm the operation of the valve when battery voltage is applied to between the connector terminals of the oil control valve.

	Connected to:
Battery positive terminal	1 (OCV+)
Battery negative (-) terminal	2 (OCV−)



T11E6217T10

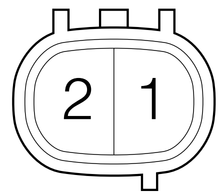
CAUTION

- The time while the battery voltage is applied should be kept within one minute.

SPECIFIED VALUE: The valve operates when the battery voltage is applied.

9-14-17 VSV FOR EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL

1. Perform air continuity check between the ports.
   SPECIFIED VALUE: No air continuity
2. Perform air continuity check between the ports when battery voltage is applied between the VSV for evaporative emission control system purge control connector terminals.
   SPECIFIED VALUE: Air continuity exists.
3. Measure the resistance value between the following terminals.
   (1) Between 1 (PRG) - 2 (+B)
   SPECIFIED VALUE: 30 - 34Ω (20°C)



T11E6218T10

9-14-18 BRAKE NEGATIVE PRESSURE SWITCH

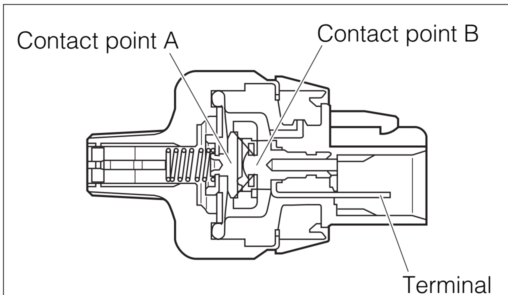
1. With the brake vacuum switch installed to the vehicle, install the pressure gauge (Negative pressure gauge) between the brake booster and the check valve.

NOTE

- The check valve is installed within the brake booster and engine intake pipe hose.

2. Start the engine and wait until the negative pressure in the brake booster becomes high.
3. Stop the engine and perform continuity check between the brake vacuum switch terminal and brake vacuum switch body when the negative pressure in the brake booster is changed by stepping on the brake several times.
   SPECIFIED VALUE:

Negative pressure in the brake booster	Continuity
It is higher than −38.6 kPa (−290 mmHg).	Not exists
It is lower than −30.6 kPa (−230 mmHg) (more toward the atmospheric pressure side).	Exists

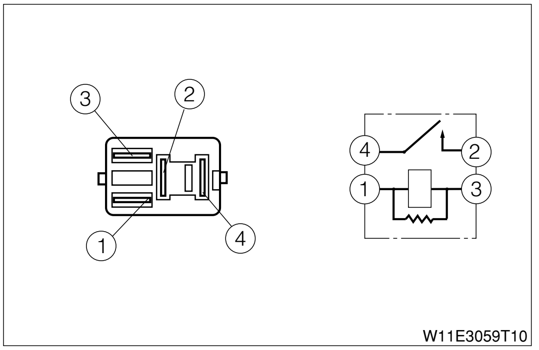


M21C3023ET10

NOTE

- The operation pressure of the brake vacuum switch is −34.6±4 kPa(−260±30 mmHg).

9-14-19 MAIN RELAY (EFI), FUEL PUMP RELAY (FUEL PUMP), RADIATOR FAN RELAY (RAD), MAGNET CLUTCH RELAY (MGC)



1. Ensure that the relay is operating when the IG switch is "ON" by sound and vibration.

WARNING

- Do not touch the relay during operation since the relay may become hot while operating.

2. Measure the resistance between relay side terminals 1 and 3.

SPECIFIED VALUE: 131 - 230Ω (At 20°C)

NOTE

- Measure after the temperature in the relay becomes the same with the ambient temperature (20°C). (Measure after leaving it for one hour or more in the ambient temperature 20°C with the relay "OFF".)

3. Ensure that there is no continuity between each terminal other than the relay side terminals 1 and 3.
4. Ensure that there is continuity between relay side terminals 2 and 4 when battery voltage is applied between the relay side terminal 1 and 3.

9-15 ECU INPUT/OUTPUT SIGNAL CHECK

9-15-1 CHECKING METHOD

9-15-2 SPECIFIED VALUE FOR INPUT/ OUTPUT SIGNAL

Check system	Terminal	Measuring condition	Specified value
Power supply system	27 (+B) - 125 (E1)	When IG switch is "ON"	Battery voltage
	38 (BAT) - 125 (E1)	At all times	
Manifold absolute pressure sensor system	57 (VCPM) - 122 (E2PM)	When IG switch is "ON"	4.5 - 5.5V
	52 (PIM) - 122 (E2PM)	When the sensor is opened to the atmosphere	3.1 - 4.1V
		After starting the engine	Changes according to the opening of the accelerator
Throttle position sensor system	56 (VC) - 19 (E2)	When IG switch is "ON"	4.5 - 5.5V
	53 (VTH) - 19 (E2)	When throttle valve is fully closed	0.4 - 0.8V
		When throttle valve is fully opened	3.2 - 5.0V
Water temperature sensor system	54 (THW) - 19 (E2)	When warmed up (Water temperature 60 - 120°C)	0.3 - 1.3V
Intake air temperature sensor system	51 (THA) - 19 (E2)	When warmed up	0.5 - 4.3V
Knock sensor system	121 (KNK) - 19 (E2)	When idling, when racing	Pulse generation
Engine revolution sensor system	59 (N1+) - 128 (N1−)	When idling	Pulse generation
Camshaft position sensor system	58 (N2+) - 127 (N2−)	When idling	Pulse generation
Oxygen sensor system	123 (OX1) - 19 (E2)	After maintaining at 3000rpm for four minutes	Changes between 0.2 - 1.0V
Injector system	24 (#10) - 125 (E1)	When IG switch is "ON"	Battery voltage
	23 (#20) - 125 (E1)		
	22 (#30) - 125 (E1)	When idling	Pulse generation
	21 (#40) - 125 (E1)		
Ignition system	63 (IG1) - 125 (E1)	When IG switch is "ON"	0 - 0.11V
	62 (IG2) - 125 (E1)		
	61 (IG3) - 125 (E1)	When idling	Pulse generation
	60 (IG4) - 125 (E1)		

Check system	Terminal	Measuring condition	Specified value
Ion current combustion control system ※1	51 (ICMB1) - 125 (E1)	While idling	Pulse generation
	50 (ICMB2) - 125 (E1)		
	49 (ICMB3) - 125 (E1)		
	48 (ICMB4) - 125 (E1)		
ISC driving signal system	65 (ISC) - 125 (E1)	When idling	Pulse generation
	12 (EPS) - 125 (E1)	When the steering wheel is turned with the vehicle stopped	0 - 1V
		When the steering wheel is not turned with the vehicle stopped	Battery voltage
Brake vacuum switch signal system	32 (PBSW) - 125 (E1)	When brake vacuum switch is "ON"	1V or less
		When brake vacuum switch is "OFF"	Battery voltage
Fuel pump system	35 (FC1) - 125 (E1)	Fuel pump stopped	Battery voltage
		When idling (Or when cranking)	1.2V or less
Starter switch signal system※2	107 (STSW) - 125 (E1)	When starter switch is "ON"	Battery voltage
		When starter switch is "OFF"	Around 0V
Evaporative emission temperature sensor system	45 (ACEV) - 116 (E21)	When air conditioner is "ON"	0.15 - 4.8V
Air conditioner input signal system	3 (ACSW) - 125 (E1)	When air conditioner is operating	Battery voltage
		When air conditioner is not operating	0 - 0.5V
Air conditioner relay system	36 (MGC) - 125 (E1)	When air conditioner relay is "ON"	Around 0V
		When air conditioner relay is "OFF"	Battery voltage
Stop lamp system	43 (STP) - 125 (E1)	When stop lamp is lighted	Battery voltage
		When stop lamp is not lighted	0 - 0.5V
Defogger system	11 (DEF) - 125 (E1)	When defogger switch is "ON"	Battery voltage
		When defogger switch is "OFF"	0 - 0.5V
Blower system	42 (BLW) - 125 (E1)	When heater blower switch is "ON"	0 - 0.5V
		When heater blower switch is "OFF"	Battery voltage
Radiator fan control system	37 (FAN1) - 125 (E1)	When magnet clutch is "ON"	1V or less
		When magnet clutch is "OFF"	Battery voltage
Variable valve timing control system	26 (OCV＋) - 25 (OCV－)	When idling	Pulse generation
Engine revolution output system	118 (REV) - 125 (E1)	When idling	Pulse generation
Earth system	Between 19 (E2) - body	At all times	Continuity exists.
	Between 20 (E01) - body		
	Between 116 (E21) - body		
	Between 125 (E1) - body		

※1: Only vehicles with EU specifications
※2: A/T vehicles only

9-15-3 OSCILLOSCOPE WAVEFORMS

(1) Injector

1.Connect the SST.
SST: 09842-97209-000

2.Perform output check between the following terminals using an oscilloscope.
(1) Between SST 24 (#10) - SST 125 (E1)
(2) Between SST 23 (#20) - SST 125 (E1)
(3) Between SST 22 (#30) - SST 125 (E1)
(4) Between SST 21 (#40) - SST 125 (E1)

3.As an example, in case of the following measuring range and measuring conditions, it will be as in the right figure.

Time axis	2ms / DIV
Voltage axis	10V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".


T11E6243T10

NOTE

- **The waveform cannot be specified, but confirm that a waveform as in the right figure (One such example) shows up.**

4.Confirm the following points.
(1) The voltage changes from the battery voltage to 0V while fuel injection.

(2) Oil control valve

1.Connect the SST.
SST: 09842-97209-000

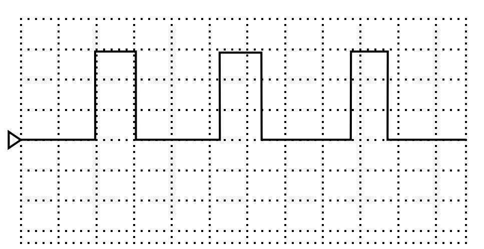
2.Completely warm up the engine.

3.Perform output check between the following terminals using an oscilloscope.
(1) SST 26 (OCV＋) - SST 25 (OCV－)

4.As an example, in case of the following measuring range and measuring conditions, it will be as in the right figure.

Time axis	1ms / DIV
Voltage axis	5V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".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NOTE

- **The waveform cannot be specified, but confirm that a waveform as in the right figure (One such example) shows up.**

5.Confirm the following points.
(1) The pulse of 0V ⇄ battery voltage is generated.

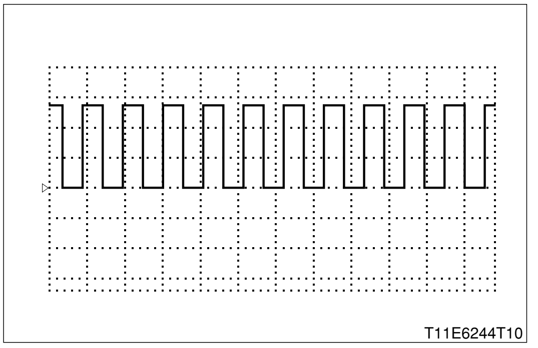
(3) Engine revolution output signal

1.Connect the SST.
SST: 09842-97209-000

2.Perform output check between the following terminals using an oscilloscope.
3.Completely warm up the engine.
(1) SST 118 (REV) - SST 125 (E1)
4.As an example, in case of the following measuring range and measuring conditions, it will be as in the right figure.

Time axis	50ms / DIV
Voltage axis	5V / DIV
Measuring condition	When air conditioner is "OFF" with no electric load and while idling

Air conditioner "OFF": Conditions in which all of the air conditioner switch (ACSW), blower switch (BLW) and magnet clutch (MGC) are "OFF".



NOTE

- The waveform cannot be specified, but confirm that a waveform as in the right figure (One such example) shows up.

5.Confirm the following points.
(1) The pulse of 0V ⇄ battery voltage is generated.
(2) The wave period becomes shorter as the engine revolution speed rises.