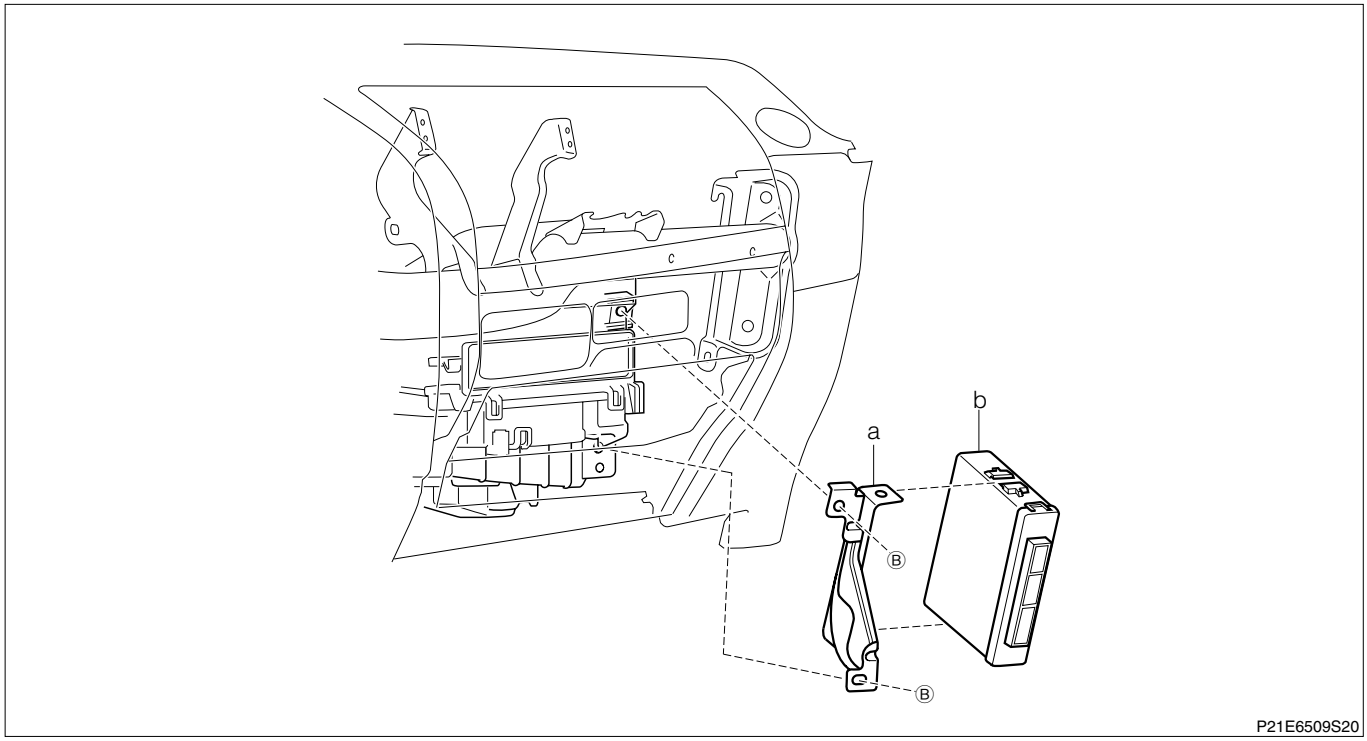
B8 ENGINE CONTROL SYSTEM

■ 3SZ
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.2 instrument panel under cover.
   Refer to Page I2-41.

3. Remove the glove compartment door Ay.
   Refer to Page I2-38.

4. Disconnect the connectors of the engine control computer.

1-1-2 REMOVAL AND INSTALLATION PROCEDURES
(1) **Components**



(2) **Removal and installation procedures**

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

1-1-3 OPERATION AFTER INSTALLATION
1. Connect the connectors of the engine control computer.
2. Attach the glove compartment door Ay.
   Refer to Page I2-38.

3. Attach the No.2 instrument panel under cover.
   Refer to Page I2-41.

4. Connect the negative terminal of the battery.

2 ENGINE REVOLUTION SENSOR

2-1 REMOVAL AND INSTALLATION

2-1-1 ARTICLES TO BE PREPARED

Lubricants,bonds,others

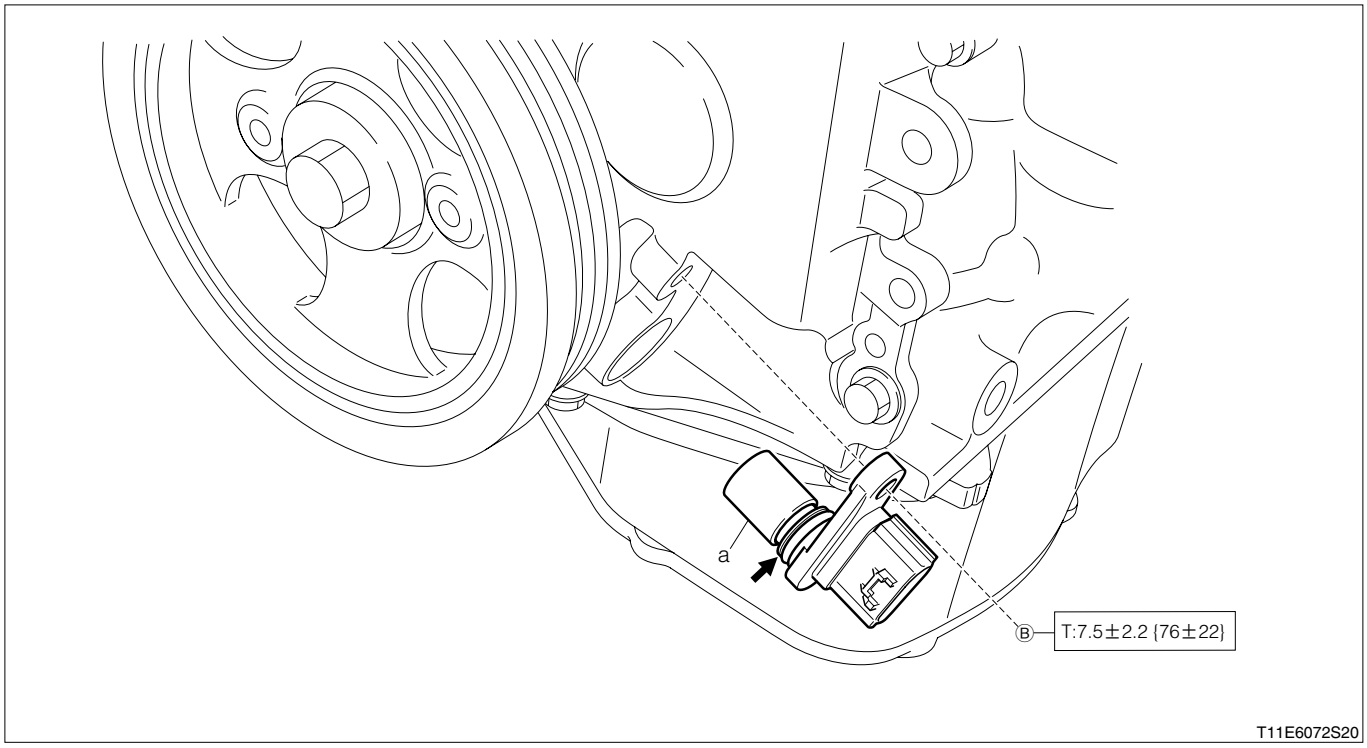
Engine oil

2-1-2 OPERATION BEFORE REMOVAL

1. Disconnect the negative terminal of the battery.
2. Disconnect 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) Removal 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. Install the negative terminal of the battery.

3 CAMSHAFT POSITION SENSOR

3-1 REMOVAL AND INSTALLATION

3-1-1 ARTICLES TO BE PREPARED

Lubricants,bonds,others

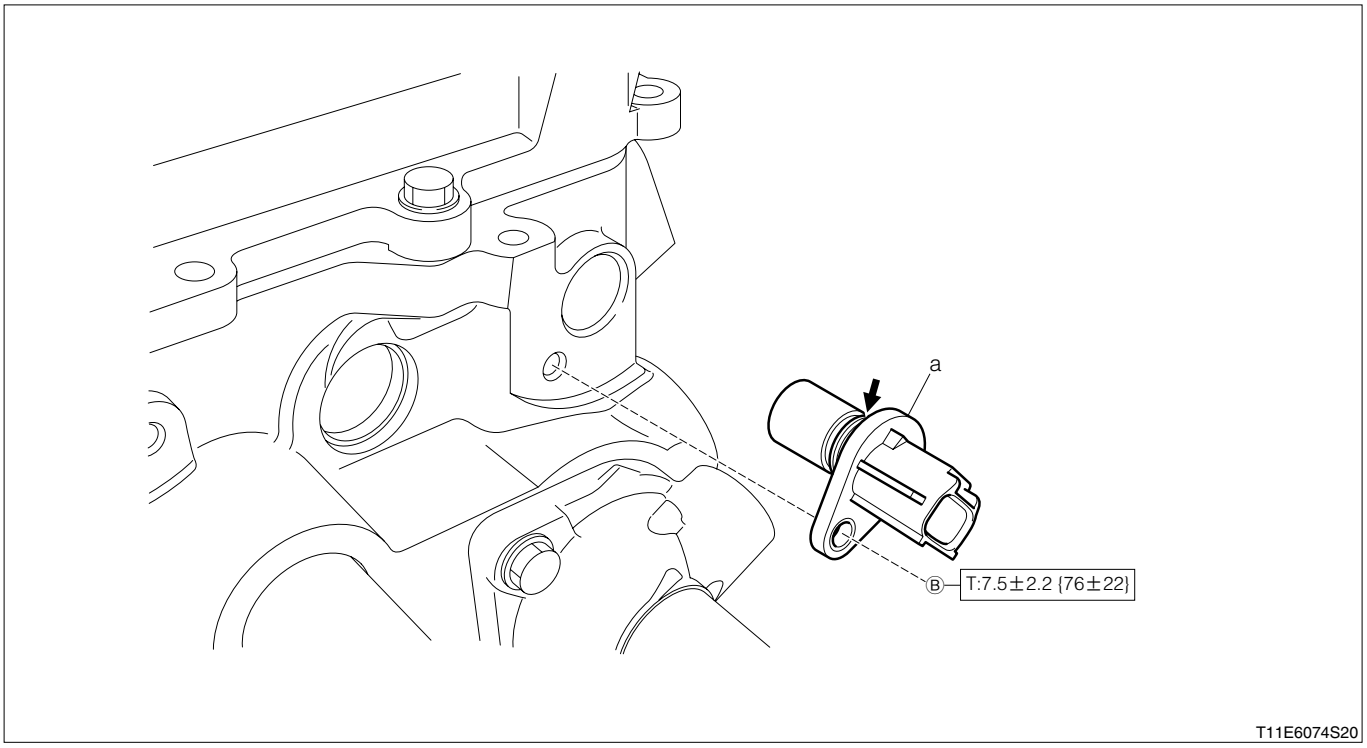
Engine oil

3-1-2 OPERATION BEFORE REMOVAL

1. Disconnect the negative terminal of the battery.
2. Disconnect the connector of the cam position sensor Ay.

3-1-3 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



➡: Engine oil

Unit N·m {kgf·cm}

(2) Removal 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. Install the negative terminal of the battery.

4 KNOCK SENSOR

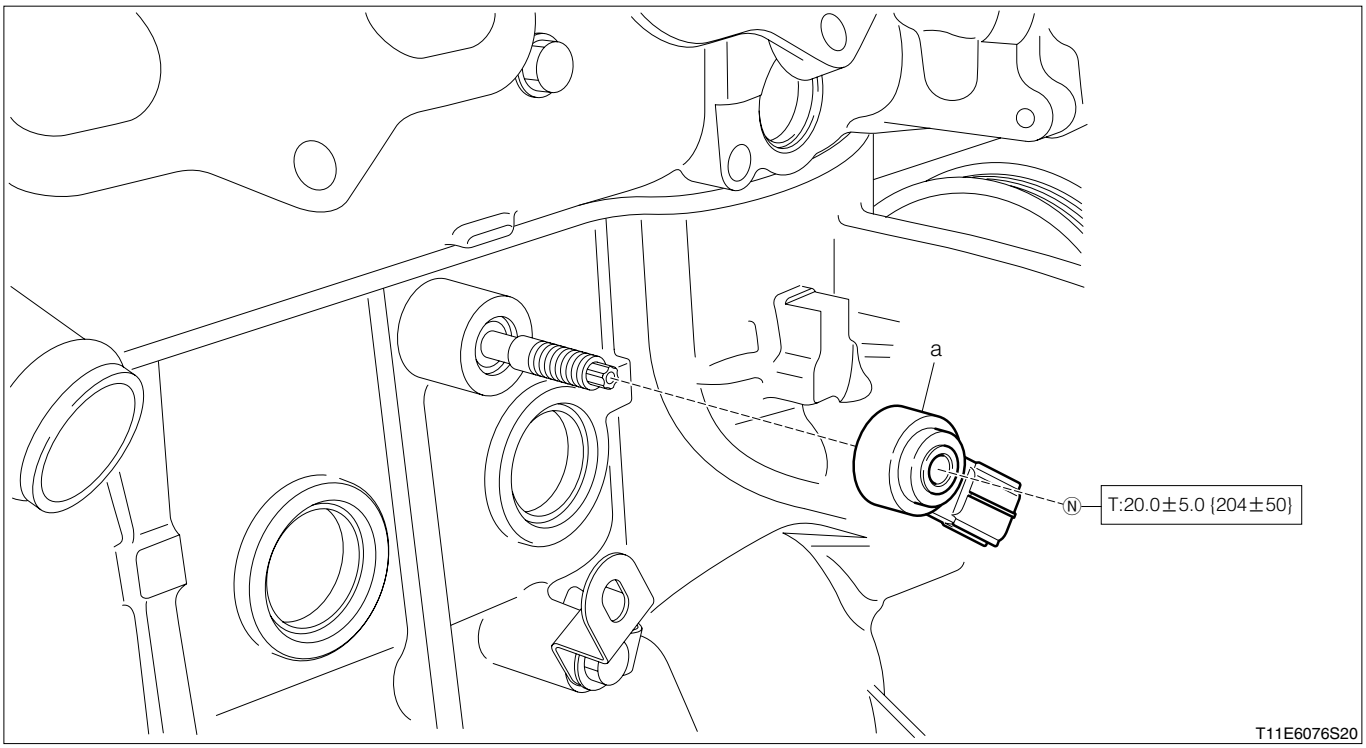
4-1 REMOVAL AND INSTALLATION

4-1-1 OPERATION BEFORE REMOVAL

1. Disconnect the negative terminal of the battery.
2. Remove the intake manifold Ay.
   Refer to Page B3-10.
3. Disconnect the connector of the knock control sensor.

4-1-2 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



Unit: N·m {kgf·cm}

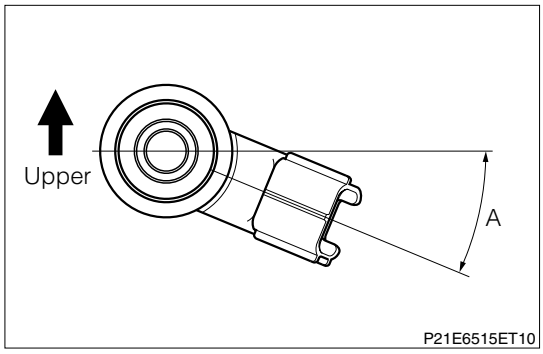
(2) Removal and installation procedures

▲ 1 a Sensor, knock control

4-1-3 POINTS OF INSTALLATION

(1) Sensor, knock control

1. When attaching the sensor to the engine Ay, attach it within the range shown in figure A.
   SPECIFIED VALUE: A: 20±15 degrees



4-1-4 OPERATION AFTER INSTALLATION

1. Connect the connector of the knock control sensor.
2. Install the intake manifold Ay.
   Refer to Page B3-10.
3. Install the negative terminal of the battery.

5 ENGINE WATER TEMPERATURE SENSOR

5-1 REMOVAL AND INSTALLATION

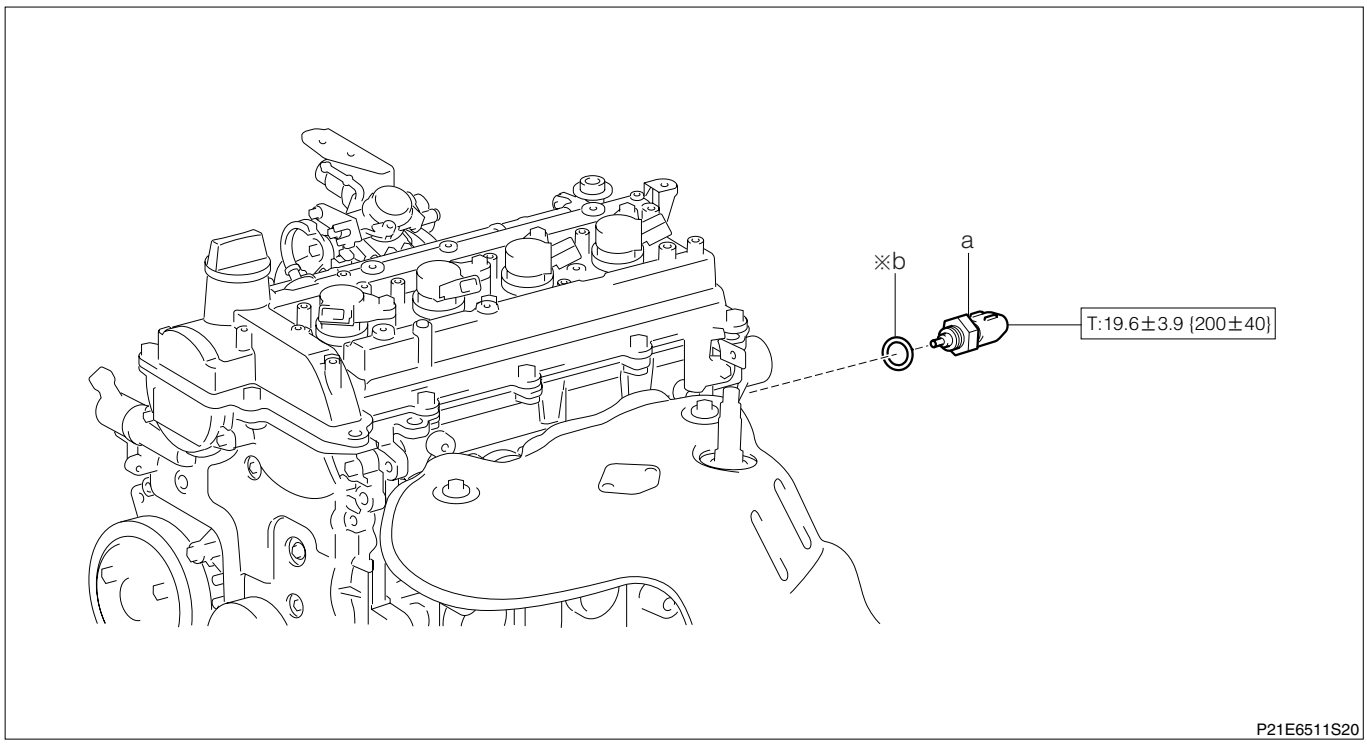
5-1-1 OPERATION BEFORE REMOVAL

1. Disconnect the negative terminal of the battery.
2. Drain the cooling water.
   Refer to Page B1-10.

3. Remove the engine Ay.
   Refer to Page B2-23.

5-1-2 REMOVAL AND INSTALLATION PROCEDURES

(1) **Components**



※: Non-reusable parts
Unit: N·m {kgf·cm}

(2) **Removal and installation procedures**

1 a Sensor, water temperature
2 b Gasket

5-1-3 OPERATION AFTER INSTALLATION

1. Install the engine Ay.
   Refer to Page B2-23.

2. Fill cooling water.
   Refer to Page B1-10.

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

6 INTAKE AIR TEMPERATURE SENSOR

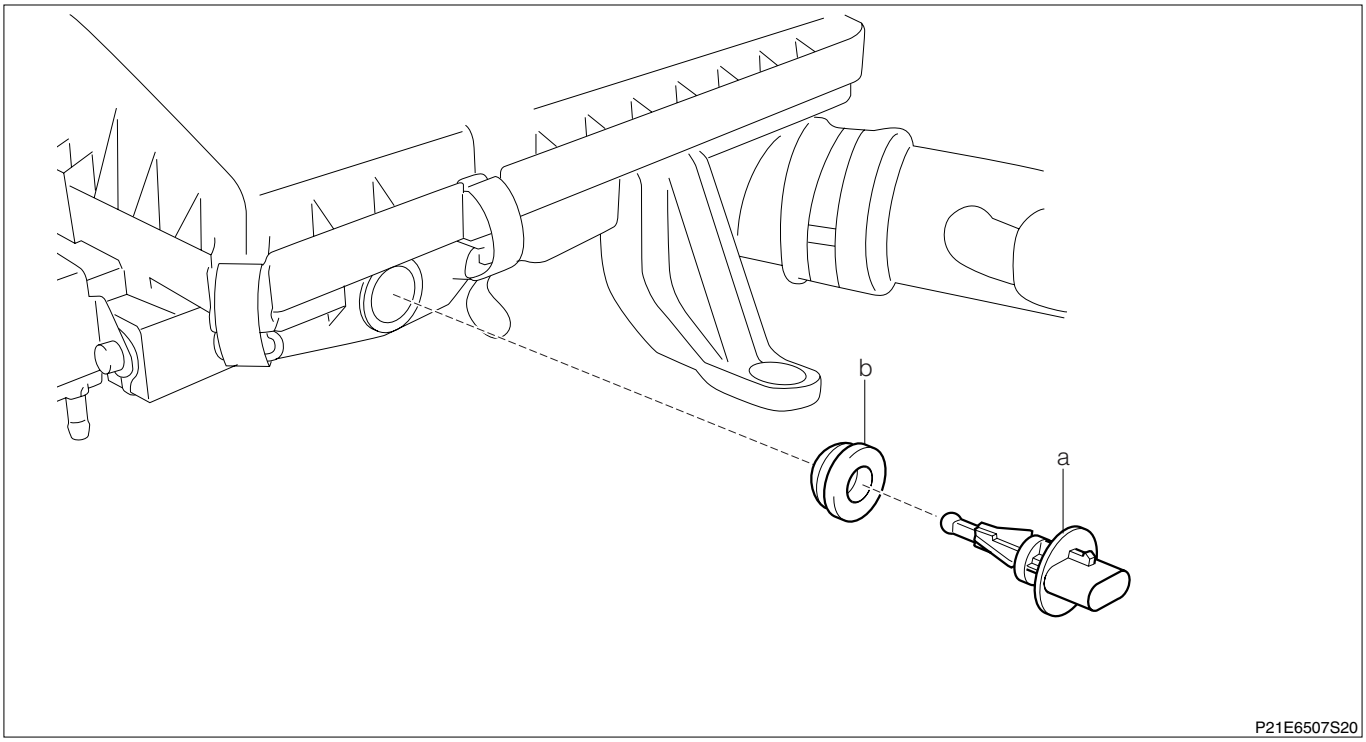
6-1 REMOVAL AND INSTALLATION

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) **Removal 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

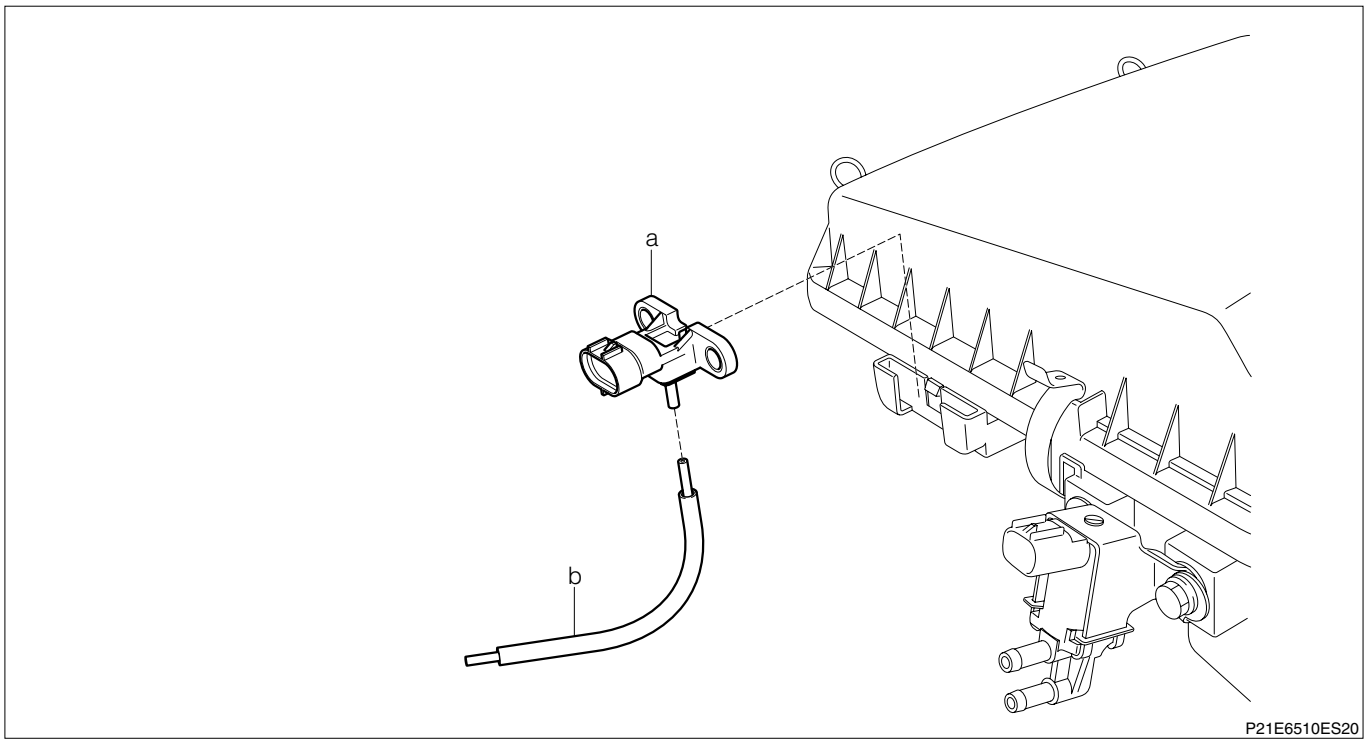
7-1 REMOVAL AND INSTALLATION

7-1-1 OPERATION BEFORE REMOVAL

1. Disconnect the negative terminal of the battery.
2. Remove the connectors of the vacuum sensor.
3. Remove the vacuum hose S/A from the intake manifold Ay.

7-1-2 REMOVAL AND INSTALLATION PROCEDURES

(1) **Components**

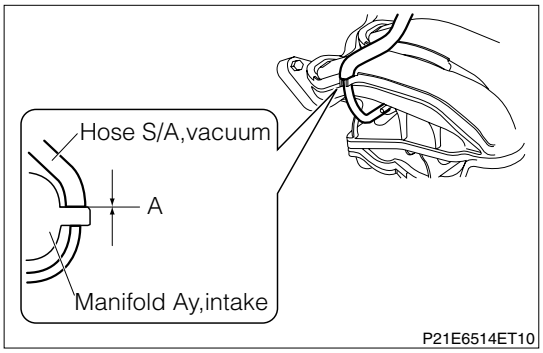


(2) **Removal and installation procedures**

1 a Sensor, vacuum
▲ 2 b Hose S/A, vacuum

7-1-3 POINTS OF INSTALLATION

1. Align the edge (surface) of the clamp with the edge (surface) of the protector, as shown in the illustration, and (then) connect the vacuum hose S/A to the intake manifold Ay.
   SPECIFIED VALUE: A: 0^{+7}_{-0}mm



7-1-4 OPERATION AFTER INSTALLATION

1. Connect the connectors of the vacuum sensor.
2. Connect the negative (-) terminal of the battery.

8 OIL CONTROL VALVE

8-1 REMOVAL AND INSTALLATION

8-1-1 ARTICLES TO BE PREPARED

Lubricant,adhesive,others

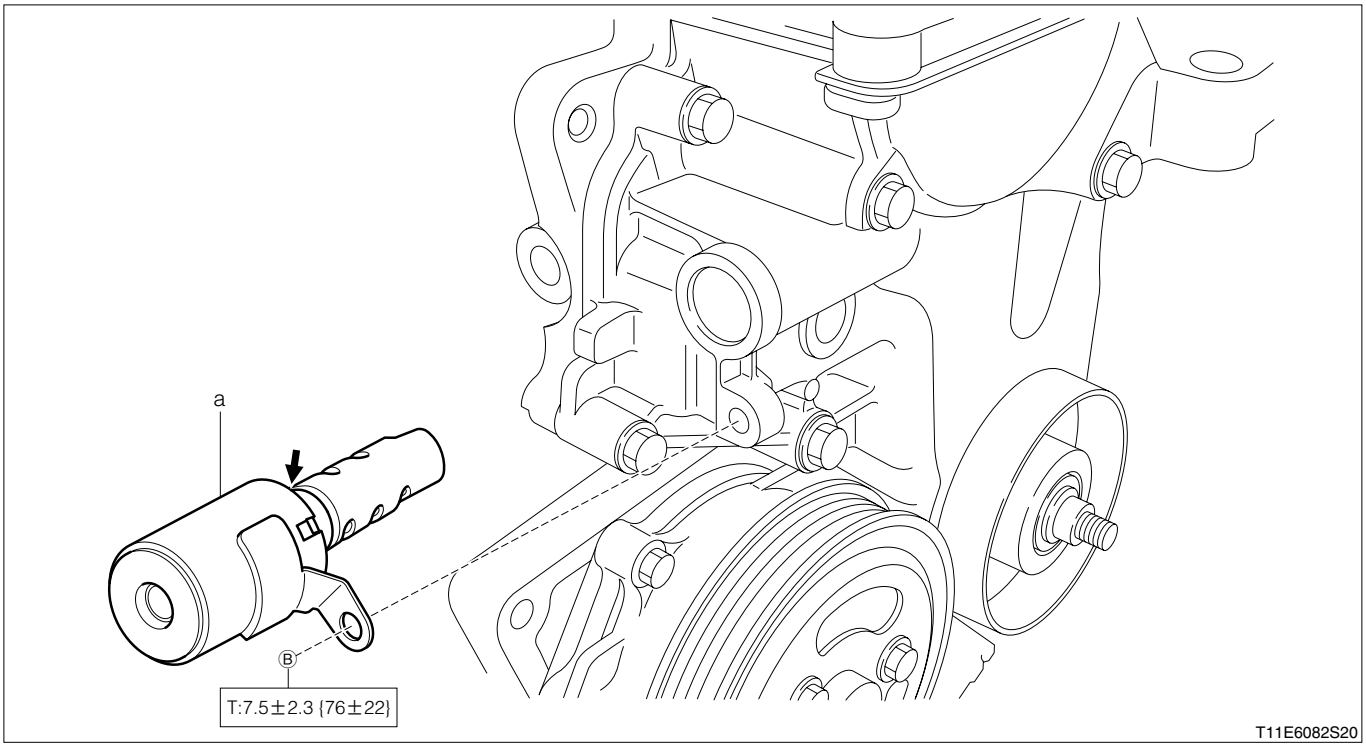
Engine oil

8-1-2 OPERATION BEFORE REMOVAL

1. Disconnect the negative terminal of the battery.
2. 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) **RemovalRemoval 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. Connect the negative (-) terminal of the battery.

9 THROTTLE POSITION SENSOR

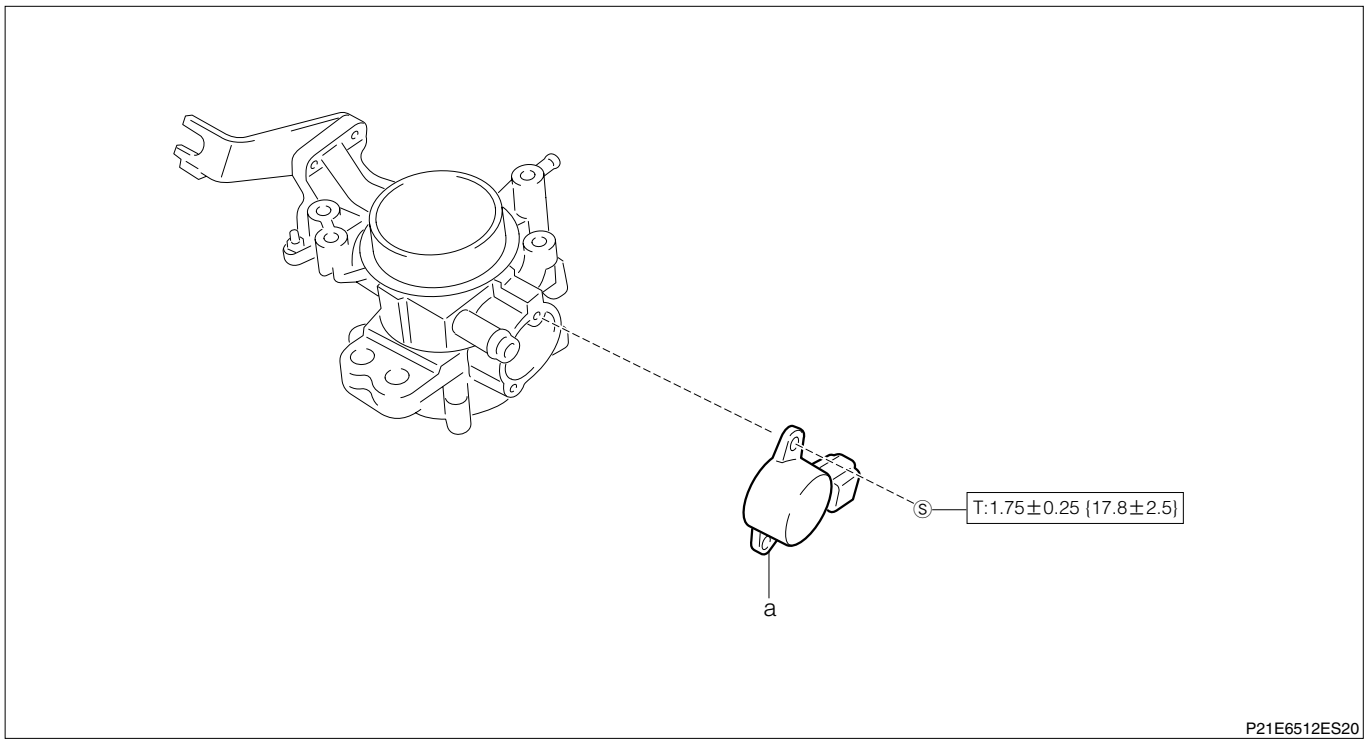
9-1 REMOVAL AND INSTALLATION

9-1-1 OPERATION BEFORE REMOVAL

1. Disconnect the negative terminal of the battery.
2. Remove the air cleaner case.
   Refer to Page B3-1.
3. Disconnect the connectors of the throttle position sensors.

9-1-2 REMOVAL AND INSTALLATION PROCEDURES

(1) **Components**



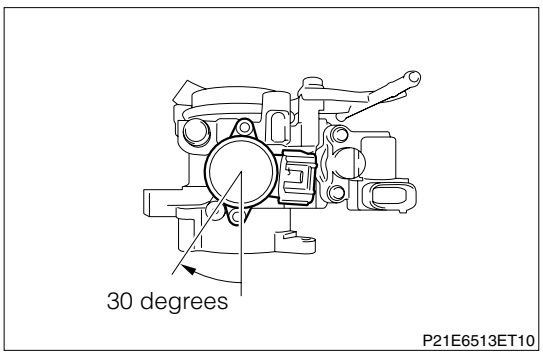
Unit: N·m{kgf·cm}

(2) **Removal and installation procedures**

▲ 1 a Sensor, throttle position

9-1-3 POINTS OF INSTALLATION

1. Confirm that the throttle valve is fully closed.
2. With the throttle valve turned 30 degrees to the left of the fully-closed position, attach the throttle position sensor to the throttle body.
3. Turn the throttle position sensor to the right, and attach it with the 2 screws.



9-1-4 **OPERATION AFTER INSTALLATION**

1. Connect the connectors of the throttle position sensors.
2. Install the air cleaner case.
   Refer to Page B3-1.
3. Connect the negative terminal of the battery.

10 IDLE SPEED CONTROL VALVE

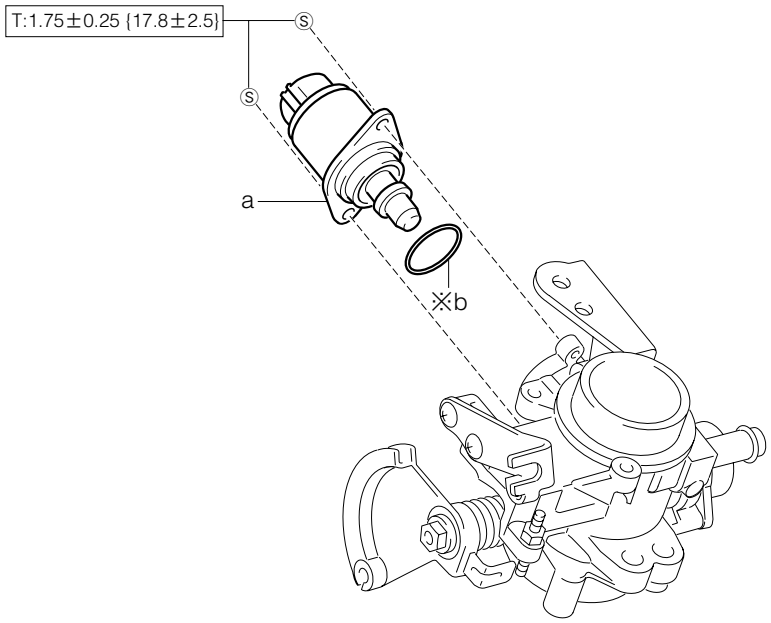
10-1 REMOVAL AND INSTALLATION

10-1-1 OPERATION BEFORE REMOVAL

1. Disconnect the negative terminal of the battery.
2. Disconnect the connectors of the idle speed control actuator Ay.

10-1-2 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



P21E6508ES20

※: Non-reusable parts
Unit: N·m{kgf·cm}

(2) Removal and installation procedures

1 a Actuator Ay, idle speed control
2 b Gascket, idle speed contorol valve

10-1-3 OPERATION AFTER INSTALLATION

1. Connect the connectors of the idle speed control actuator Ay.
2. Connect the negative terminal of the battery.

11 FRONT OXYGEN SENSOR

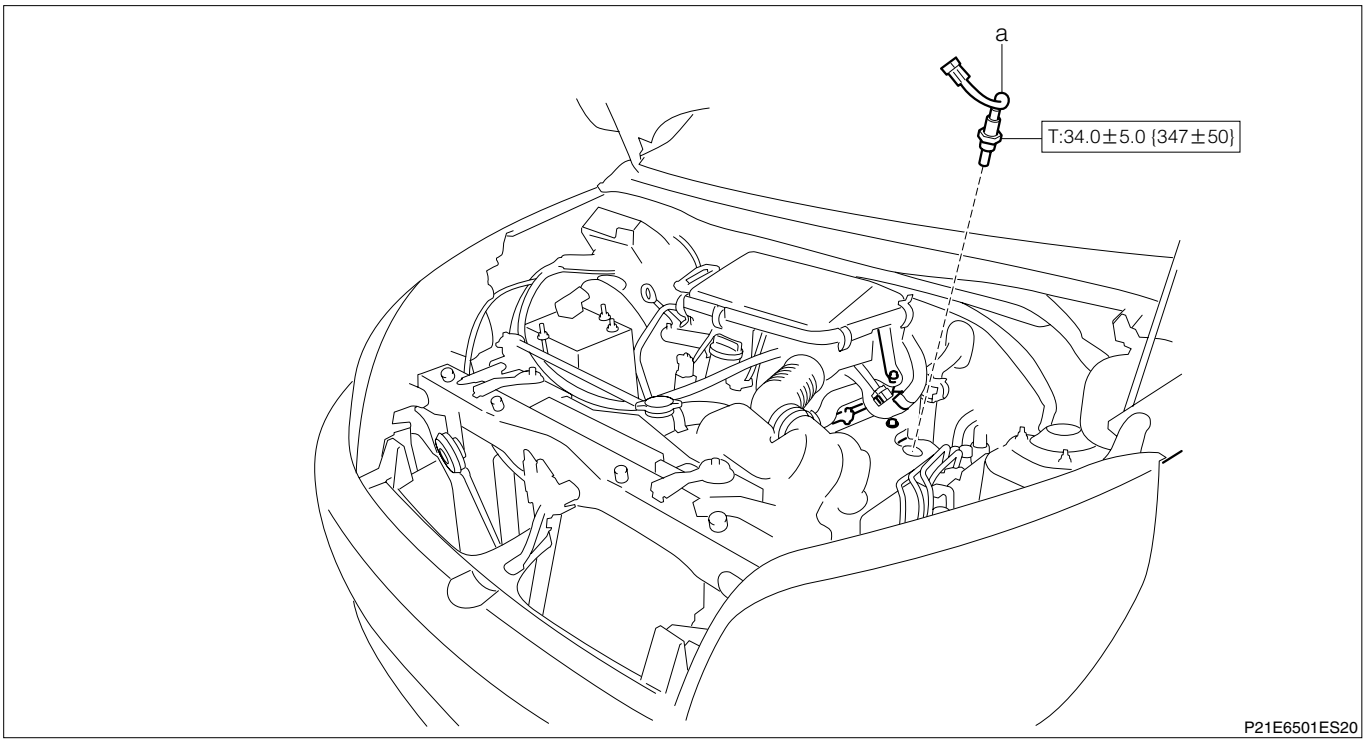
11-1 REMOVAL AND INSTALLATION

11-1-1 OPERATION BEFORE REMOVAL

1. Disconnect the negative terminal of the battery.
2. Disconnect the connector of the oxygen sensor.

11-1-2 REMOVAL AND INSTALLATION PROCEDURES

(1) **Components**



Unit N·m {kgf·cm}

(2) **Removal and installation procedures**

▼ ▲ 1 a Sensor, oxygen (front)

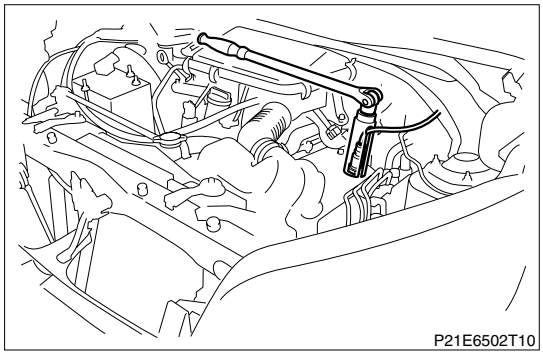
11-1-3 POINTS OF REMOVAL

(1) **Sensor, oxygen (front)**

1. Remove the sensor using the oxygen sensor socket.

CAUTION

- Use the tool for handling the connector harness to prevent it from being caught.



11-1-4 POINTS OF INSTALLATION

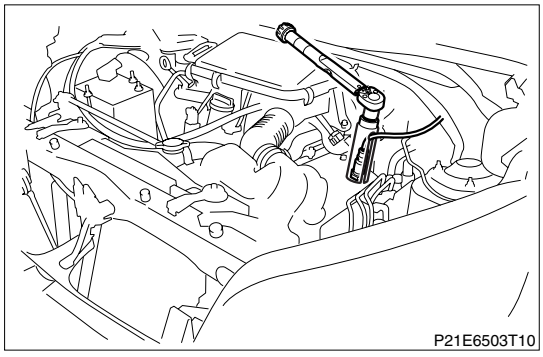
(1) **Sensor, oxygen (front)**

1. Tighten the sensor by using the oxygen sensor socket.

CAUTION

- Use the tool for handling the connector harness to prevent it from being caught.

2. Attach the connector of the oxygen sensor.



11-1-5 OPERATION AFTER INSTALLATION

1. Install the negative terminal of the battery.

12 REAR OXYGEN SENSOR(REAR OXYGEN SENSOR EQUIPPED VEHICLES ONLY)

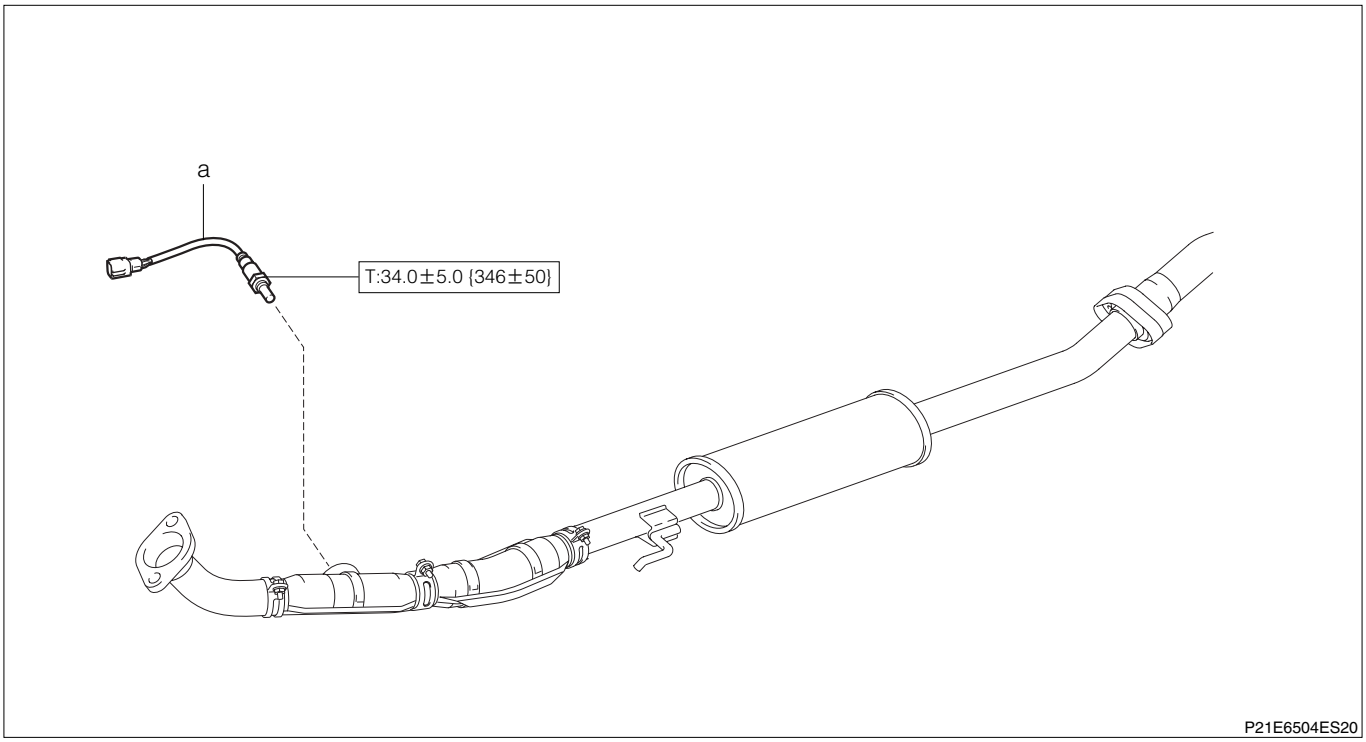
12-1 REMOVAL AND INSTALLATION

12-1-1 OPERATION BEFORE REMOVAL

1. Disconnect the negative terminal of the battery.
2. Lift up the vehicle.
3. Disconnect the connector of the oxygen sensor.

12-1-2 REMOVAL AND INSTALLATION PROCEDURES

(1) **Components**



Unit N·m {kgf·cm}

(2) **Removal and installation procedures**

▼ ▲ 1 a Sensor, oxygen (rear)

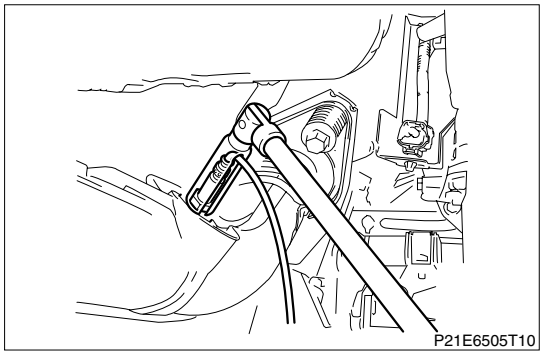
12-1-3 POINTS OF REMOVAL

(1) **Sensor, oxygen (rear)**

1. Remove the sensor by using the oxygen sensor socket.

CAUTION

- Use the tool for handling the connector harness to prevent it from being caught.



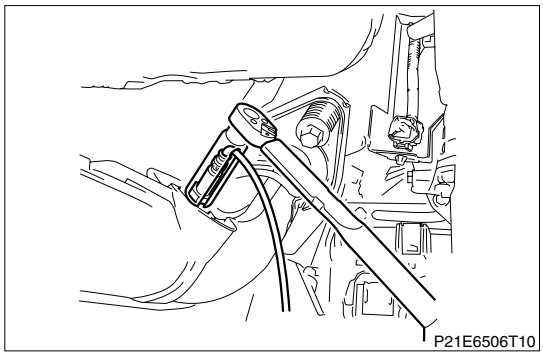
12-1-4 **POINTS OF INSTALLATION**

(1) **Sensor, oxygen (rear)**

1. Tighten the sensor by using the oxygen sensor socket.

CAUTION

- Use the tool for handling the connector harness to prevent it from being caught.



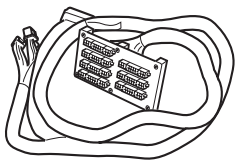
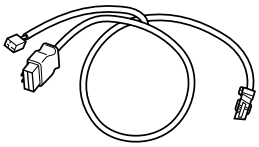
12-1-5 **OPERATION AFTER INSTALLATION**

1. Connect the connector of the oxygen sensor.
2. Lift down the vehicle.
3. Install the negative terminal of the battery.

13 ENGINE CONTROL SYSTEM

13-1 ARTICLES TO BE PREPARED

SST

Shape	Part No.	Part name
	09842-97209-000	Sub-harness, EFI computer check
	09991-87403-000	Wire, diagnosis check
	09842-30070-000	Wire, EFI inspection
	09991-87404-000 (09991-87401-000)	Wire, engine control system inspection
	09268-87701-000	Gauge, EFI fuel pressure

Instrument

Sound scope,Electrical tester,Oscilloscope,Diagnosis Tester

WARNING

- Driving a vehicle with SST (EFI computer check sub－harness, etc.) being connected might cause an error operation to occur, which is extremely dangerous. Make sure that SST has been disconnected before driving the vehicle.

13-2 HANDLING INSTRUCTIONS OF CONTROL SYSTEM

13-2-1 HOW TO USE THE SERVICE MANUAL.

1. The method used for assignment of the diagnostic trouble codes and for displaying / erasing the codes and the steps for checking are described together with the descriptions on the method of using the diagnosis tester or the OBD Ⅱ generic scan tool.
2. Carryout the troubleshooting by using a diagnosis tester or the OBD Ⅱ generic scan tool.
3. Diagnosis trouble codes are posted as both four－digit code and two－digit code, for example, like P0105/31.
   (1) When only the diagnosis tester or the OBD Ⅱ generic scan tool is to be used, only four－digit codes are displayed.
   (2) When the scan tool is not to be used, two-digit code (e.g. 31) will be displayed on the engine check lamp.

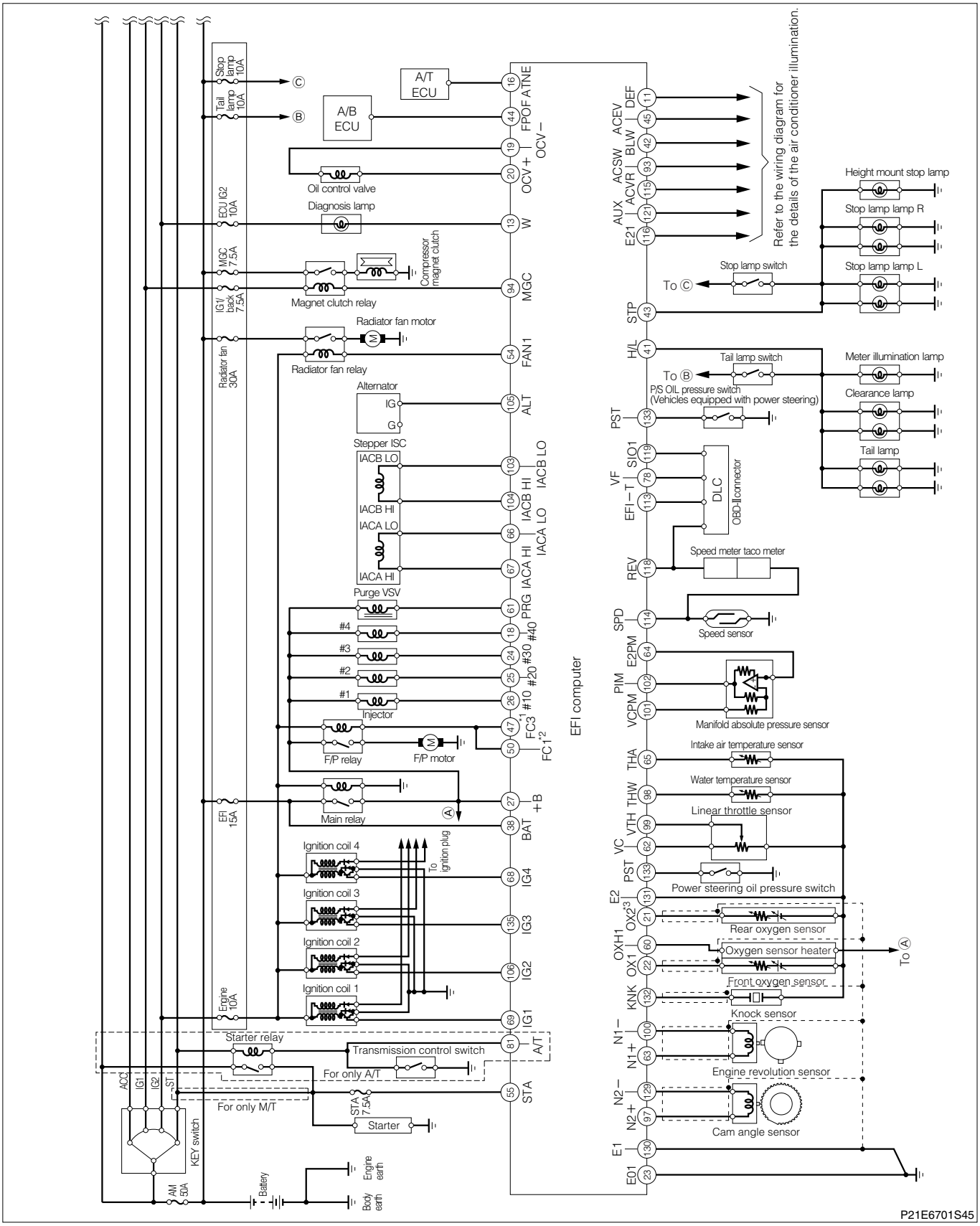
NOTE

- The OBD Ⅱ generic scan tool means a scan tool complying with the ISO 15765 format.
- When the OBD Ⅱ generic scan tool is used, all malfunction codes (4-digit code) cannot be read out. In this case, only the code which has zero 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.

13-2-2 CAUTION WHEN CARRIED OUT A TROUBLESHOOTING

1. Do not disconnect the connector of EFI ECU, the battery cable from the battery, the ECU earth wire from the engine, or the main fuse before the diagnosis information memorized in the ECU memory is confirmed.
2. The diagnosis information memorized in the ECU memory can be erased by using the diagnosis tester or the OBD Ⅱ generic scan tool in the same way as for checking of diagnosis trouble codes. Therefore, before using the tester, carefully read its instruction manual to understand and familiarize yourself with the functions provided and the method of using these functions.
3. Priority in troubleshooting
   (1) If the priority in troubleshooting for a number of diagnostic trouble codes is given in the diagnosis code flow chart, be sure to carry out the troubleshooting by following the priority indicated.
   (2) If the priority is not given, follow the priority given below and perform the troubleshooting for each diagnostic trouble code.
   (1) In the case of diagnosis trouble codes other than No. P0171/25, No. P0172/26 (too rich /too lean in the fuel system).
   (2) In the case of diagnosis trouble codes of No. P0171/25, No. P0172/26 (too rich /too lean in the fuel system).

13-3 SYSTEM WIRING DIAGRAM

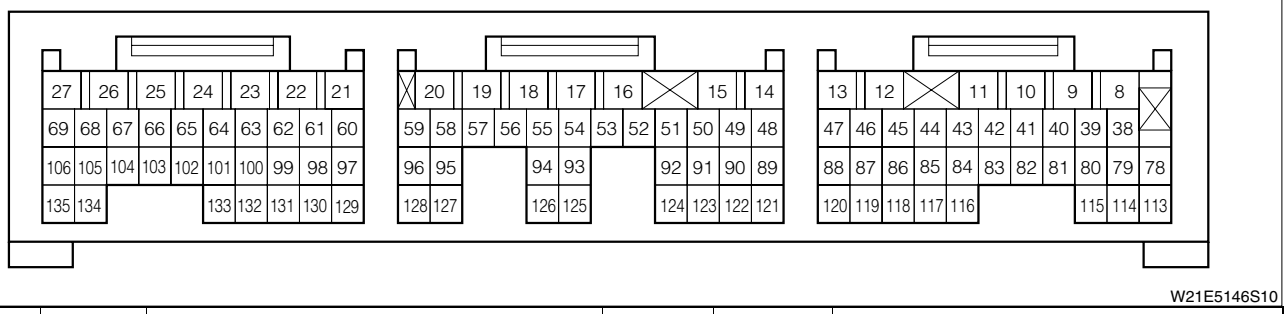


*1: Immobilizer equipped vehicles

*2: Immobilizer non-equipped vehicles

*3: Rear oxygen sensor equipped vehicles

13-4 ARRANGEMENT OF ECU TERMINAL



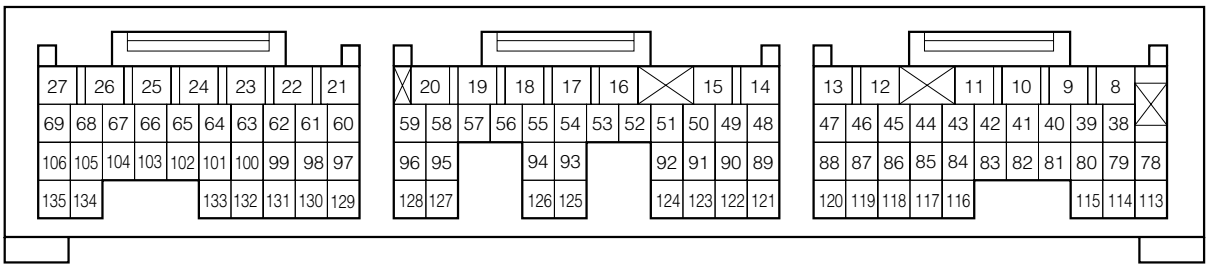
W21E5146S10

Terminal number	Terminal signal	Terminal name	Terminal number	Terminal signal	Terminal name
8	—	—	53	—	—
9	—	—	54	FAN1	Radiator fan relay drive
10	—	—	55	STA	Starter signal
11	DEF	defo gger signal	56	—	—
12	—	—	57	—	—
13	W	Engine check lamp	58	—	—
14	—	—	59	—	—
15	—	—	60	OXH1	Front oxygen sensor heater
16	ATNE		61	PRG	Evaporative purge VSV
17	—	—	62	VC	Sensor power supply
18	#40	Injector (#4)	63	N1+	Engine speed sensor (+)
19	OCV−	Oil control valve drive (−)	64	E2PM	Sensor earth (Exclusively used for manifold pressure sensor)
20	OCV+	Oil control valve drive (+)	65	THA	Intake air temperature sensor
21	OX1*1	Rear oxygen sensor	66	IACALO	ISC stepper motor 1
22	OX1	Front oxygen sensor	67	IACAHI	ISC stepper motor 2
23	E01	Power ground	68	IG4	Ignition coil (#4)
24	#30	Injector (#3)	69	IG1	Ignition coil (#1)
25	#20	Injector (#2)	78	VF	DLC (VF terminal)
26	#10	Injector (#1)	79	—	—
27	+B1	EFI ECU power supply	80	—	—
38	BAT	Backup power supply	81	A/T	Park/neutral position switch signal
39	—	—	82	—	—
40	—	—	83	—	—
41	H/L	Tail lamp signal	84	—	—
42	BLW	Heater blower signal	85	—	—
43	STP	Stop lamp signal	86	—	—
44	FPOF	Airbag fuel pump "OFF" request shignal	87	—	—
45	ACEV	Air conditioner evaporator temperature sensor	88	—	—
46	—	—	89	—	—
47	FC3*2	Fuel pump relay drive	90	—	—
48	—	—	91	—	—
49	—	—	92	—	—
50	FC1*3	Fuel pump relay drive	93	ACSW	Air conditioner switch
51	—	—	94	MGC	Magnetic clutch relay drive
52	—	—	95	—	—

*1: Rear oxygen sensor equipped vehicles

*2: Immobilizer equipped vehicles

*3: Immobilizer non-equipped vehicles

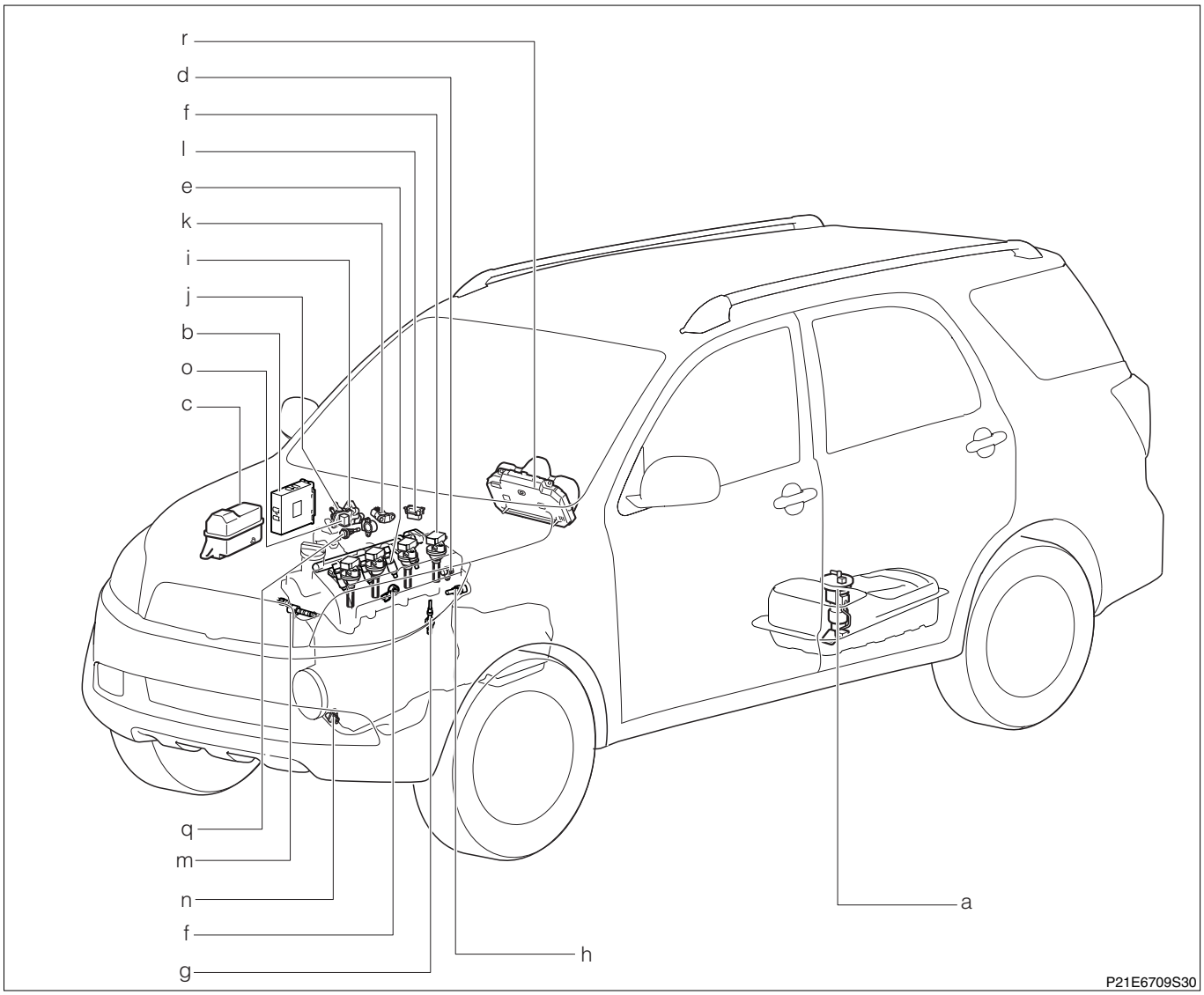


W21E5146S10

Terminal number	Terminal signal	Terminal name	Terminal number	Terminal signal	Terminal name
96	−	−	119	SIO1	DLC (SIO terminal)
97	N2+	Camshaft position sensor (+)	120	−	−
98	THW	Coolant temperature sensor	121	−	−
99	VTH	Throttle position sensor	122	−	−
100	N1−	Engine speed sensor (−)	123	−	−
101	VCPM	manifold pressure sensor power supply	124	−	−
102	PIM	manifold pressure sensor	125	−	−
103	IACBLO	ISC stepper motor 3	126	−	−
104	IACBHI	ISC stepper motor 4	127	−	−
105	ALT	Alternator cutoff control output	128	−	−
106	IG2	Ignition coil (#2)	129	N2−	Camshaft position sensor (−)
113	EFI-T	EFI-T check terminal	130	E1	Operation ground
114	SPD	Speed signal	131	E2	Sensor ground
115	ACVR	A/C temperature adjustment volume	132	KNK	Knock sensor
116	E21	Body sensor ground	133	PST	Power steering oil pressure switch
117	SIO2*2	Immobilizer ECU	134	−	−
118	REV	DLC (REV terminal)	135	IG3	Ignition coil (#3)

*1: Rear oxygen sensor equipped vehicles
*2: Immobilizer equipped vehicles
*3: Immobilizer non-equipped vehicles

13-5 LOCATION OF COMPONENTS



	Part name
a	Fuel pump
b	Engine control computer
c	Relay block
d	Cam angle sensor
e	Injector
f	Knock sensor
g	Front oxygen sensor
h	Engine coolant temperature sensor
i	ISC stepper motor
j	Throttle position sensor
k	Manifold absolute pressure sensor
l	Ignition coil
m	Oil control valve
n	Engine speed sensor
o	VSV control for evaporative purge
p	DLC
q	Intake air temperature sensor
r	Combination meter
t	Rear oxygen sensor*

*: Rear oxygen sensor equipped vehicles

13-6 HOW TO PROCEED WITH TROUBLE SHOOTING

13-6-1 DESCRIPTION

1. The engine control system is equipped with diagnosis functions that are capable of diagnosing malfunctioning sections. These functions give important clues in troubleshooting.
2. The diagnosis function of this system is equipped with the battery backup (which keeps supplying the power for diagnosis memory even when the IG switch is set to the "LOCK" position).

13-6-2 TROUBLE DIAGNOSIS PROCEDURE

Σ1. Bringing−in of malfunctioning vehicle

▼ Go to Σ2.

Σ2. Inquiry with the customer

1. Inquire the customer to obtain full information on the condition regarding how the failure occurred, the environment, and the problem.

▼ Go to Σ3.

Σ3. Confirmation and recording of the condition of the engine check lamp

1. Confirm and record the condition of how the engine check lamp is turned on when the IG switch is set to "ON" and after the engine is started.

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

▼ In the case of a, or b, go to Σ4.

▼ In the case of c, carry out the following luck operations. If there is no problem, replace the combination meter.

(1) Check the harness and the connectors between the battery and combination meter.
(2) Check the harness and the connectors between the combination meter and EFI ECU.
(3) Check the power supply system and the earth system of EFI ECU

Σ4. Confirmation and recording of the diagnosis trouble codes

1. Connect the diagnosis tester to the vehicle, and confirm and record the diagnosis code and the freeze data.

NOTE

- When shorting the terminals between EFI−T (12) and E (4) of DLC, confirm and record the diagnosis code output to the engine check lamp within the combination meter.

▼ Go to Σ5.

Σ5. Confirmation of the malfunction phenomenon

1. Confirm the malfunction phenomenon and confirm the condition of the malfunction.

▼ Go to Σ6.

Σ6. Erasing diagnosis code

1. Carry out erasing of a diagnosis code.

▼ Go to Σ7.

Σ7. Confirm reproduction of the malfunction phenomenon.

1. Confirm if it is possible to reproduce the malfunction phenomenon.
   ▼ If the malfunction phenomenon could be reproduced, go to Σ8.
   ▼ If the most function phenomenon could not be reproduced, go to Σ9.

Σ8. Reconfirmation of the diagnosis code

1. Reconfirm the diagnosis code.
   ▼ If an abnormal code is output, go to Σ10.
   ▼ If a normal code is output, go to Σ9.

Σ9. Basic check

1. Perform basic checks.
   Refer to Page B8-34.

   ▼ Go to Σ11.

Σ10. Troubleshooting according to diagnosis codes

1. Carry out troubleshooting concerning the diagnosis code being output.
   Refer to Page B8-41.

   ▼ After the repair work is completed, go to Σ12.

Σ11. Troubleshooting according to malfunction phenomena

1. Presume the cause of the malfunction phenomenon and carry out the troubleshooting accordingly.
   Refer to Page B8-36.

   ▼ After the repair is completed, go to Σ12.

Σ12. Erasing the diagnosis code

1. Erase the diagnosis code.
   ▼ Go to Σ13.

Σ13. Confirmation and recording of the diagnosis code

1. Confirm and record the diagnosis code.
   ▼ If a normal code is output, go to Σ14.
   ▼ If an abnormal code is output, go back to Σ5 and carry out checking again.

∑14. Confirmation test

1. Confirm if the malfunction phenomenon complained by the customer for a vehicle has been positively solved, and if the vehicle has returned to the normal condition.
   ▼ If OK, terminate the work operation.
   ▼ If NG, go back to ∑3 and carry out checking once again.

13-6-3 **CONNECTING PROCEDURE FOR THE CHECK SUB－HARNESS.**

1. When the ECU terminal voltage is measured with the EFI ECU connector connected to the EFI ECU, connect the SST by following the procedure given below.
   NOTE
   - Each of the terminal number of the SST connector is the same as the ECU connector.

2. Set the ignition switch to "LOCK". Disconnect the battery ground cable from the negative (－) terminal of the battery with the ignition switch set to "LOCK".
   NOTE
   - Be sure to record the diagnostic trouble code before disconnecting the battery cable.

3. Connect the following SST between the EFI ECU connector and the wire harness connectors.
   SST: 09842-97209-000

4. Reconnect the battery ground cable to the negative (－) terminal of the battery.
   CAUTION
   - When disconnecting the EFI ECU connectors, be sure to disconnect the negative (－) cable from the battery with the ignition switch and all accessory switches are set to "LOCK".
   - When installing a new battery, care must be taken not to mistake the battery polarity. Failure to observe this caution could cause an 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.

13-7 INQUIRY

13-7-1 DESCRIPTION

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. The information obtained by the inquiry can be referred to during the troubleshooting. Hence, it is necessary to focus your questions on the items related to the malfunction.
3. The following main points of the inquiry given below are the most important points in analyzing the malfunction. In some cases, the information about malfunctions that took place in the past and about the history of previous repairs may seem to be not relative to the current malfunction.
   Therefore, it is important to obtain as much information as possible and keep them accurately in mind as reference information when troubleshooting the malfunctioning phenomenon.

13-7-2 ENGINE CONTROL SYSTEM INQUIRY SHEET

[INQUIRY SHEET]

<table>
<tr><td colspan="8">Inquiry sheet</td></tr>
<tr><td colspan="2">Name of customer</td><td colspan="2">Vehicle model</td><td colspan="2">Engine - N/A, T/C,
S/C, carburetor,
EFI, LPG</td><td colspan="2">Transmission - 4M/T, 5M/T,
2WD, 4WD 2A/T, 3A/T,
4A/T</td></tr>
<tr><td rowspan="3">Details of vehicle</td><td>Frame No.</td><td colspan="2">Registration date · ·</td><td colspan="2">Date of malfunction · ·</td><td colspan="2">Running distance km</td></tr>
<tr><td colspan="7">Equipment:</td></tr>
<tr><td colspan="2">[Sex] of customer (driver)
Male Female</td><td>[Age]
Approx.</td><td colspan="2">[Occupation]</td><td>[Places where vehicle is mainly used]
Urban district/suburb/seacoast/mountain/others</td><td>[Parking place]
Outdoor/indoor</td></tr>
<tr><td rowspan="4">Symptom</td><td>Poor starting</td><td colspan="6">• No initial explosion takes place. • Explosion is incomplete although initial explosion takes place
• Hard starting (cold engine, hot engine, always) • No cranking takes place0.
• Other ( )</td></tr>
<tr><td>Faulty idling</td><td colspan="6">• Fast idling ineffective • Idling speed too low
• Idling speed too high • Idling unstable (cold engine, hot engine, always)
• Other ( )</td></tr>
<tr><td>Poor drive-ability</td><td colspan="6">• Hesitation (during start, during acceleration, during deceleration, during a certain period) • Knocking
• Backfire • Lack of power • Poor acceleration • Poor blow
• Other ( )</td></tr>
<tr><td>Engine stall</td><td colspan="6">• 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 ( )</td></tr>
<tr><td colspan="2">From when malfunction has started?</td><td colspan="6">• Since vehicle was purchased as a new car • Recently (since what year/ month)</td></tr>
<tr><td colspan="2">Frequency of occurrence</td><td colspan="6">• At all times • Under a certain condition ( ) • Sometimes</td></tr>
<tr><td rowspan="2">Meteorological conditions</td><td>Weather</td><td colspan="6">• At all times
• Fine • Cloudy • Rain • Snow • Other ( )</td></tr>
<tr><td>Temperature</td><td colspan="6">• Temperature (about ˚C) (Spring, summer, autumn, winter)</td></tr>
<tr><td colspan="2">Engine condition</td><td colspan="6">• When cold • After warming-up • During warming-up (Coolant temperature about ˚C)</td></tr>
<tr><td colspan="2">Road</td><td colspan="6">• Urban district • Suburb • Highway • Mountainous road (Uphill, downhill)</td></tr>
<tr><td colspan="2">Driving conditions</td><td colspan="6">• 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)</td></tr>
<tr><td colspan="2">Other situations</td><td colspan="6"></td></tr>
</table>

<table>
<tr><td>State of malfunction indicator lamp (MIL)</td><td colspan="2">• Illuminated or flashing at all times • Illuminated or flashing sometimes • Will not go on.</td></tr>
<tr><td rowspan="2">Indication of DTC
• Reading out by using OBD Ⅱ generic scan tool
• Reading-out of MIL flashing pattern by shorting terminal T</td><td>During checking</td><td>• Normal • Malfunction code ( )</td></tr>
<tr><td>2nd time</td><td>• Normal • Malfunction code ( )</td></tr>
</table>

13-8 SYMPTOM CONFIRMATION

13-8-1 CONFIRMATION OF THE MALFUNCTION PHENOMENON

1. In carrying out the trouble shooting, the operator cannot find out the cause before actually conforming the malfunctioning phenomenon. For this end, it is imperative to reproduce the malfunction phenomenon by creating conditions and environments similar to the situation where the malfunction took place, based on the information obtained by the diagnosis through inquiries.
2. As for the phenomenon that is difficult to be reproduced, it would be necessary to create the conditions similar to the running conditions under which the malfunction took place (road condition, meteorological condition and running condition), based on the information obtained by the diagnosis through inquiries. For this purpose, it is most important to try to reproduce the phenomenon patiently by applying external factors, such as vibration (moving wire harnesses or relays by hand), heat (applying hot wind) and water (giving humidity).
3. Furthermore, making a speculation on the possible section (part) that might have caused the malfunction and confirmation of the phenomenon by connecting and instruments such as a tester and the like would provide an opportunity at the same time for making judgment of the conformance or nonperformance of the section (part).

13-8-2 RECHECKING OF THE DIAGNOSIS CODE

1. By checking the diagnosis code after the malfunction phenomenon has been confirmed, it can be judged whether the code system that was displayed before the confirmation is still acceptable or not.

   NOTE

   - The number of vehicle operation that is necessary for confirmation of the diagnosis differs for every code.

   Refer to Page B8-30.

2. If a malfunction should occur during checking and an abnormality code is displayed even after the confirmation has been completed, carry out troubleshooting according to individual codes.
3. 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 troubleshooting according to malfunctioning phenomena.
4. 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 that was indicated before the confirmation of reproduction of the malfunctioning phenomenon.

13-9 CONFIRMATION, RECORD AND ERASURE OF DIAGNOSIS CODE

13-9-1 OUTLINE

1. When any abnormality code of the diagnosis is indicated, it is necessary to confirm the relationship with the reproduced malfunction phenomenon by ascertaining whether the system malfunction has occurred in the past or it still persists up to the present. To this end, the diagnosis code should be indicated twice, i.e. before and after the confirmation of the phenomenon.

13-9-2 DIAGNOSIS CODE DISPLAY METHOD(INDICATION BY THE DIAGNOSIS TESTER)

1. Stop the vehicle.
2. After setting the ignition switch to "LOCK", connect the diagnosis tester to DLC.
3. After setting the ignition switch to "ON", use the diagnosis tester to read out the diagnosis code.

13-9-3 DIAGNOSIS CODE DISPLAY METHOD(INDICATION BY THE ENGINE CHECK LAMP)

1. Stop the vehicle.
2. Short the terminals 12(EFI－T) and 4E of DLC by using the SST with the ignition switch set to "ON".

CAUTION

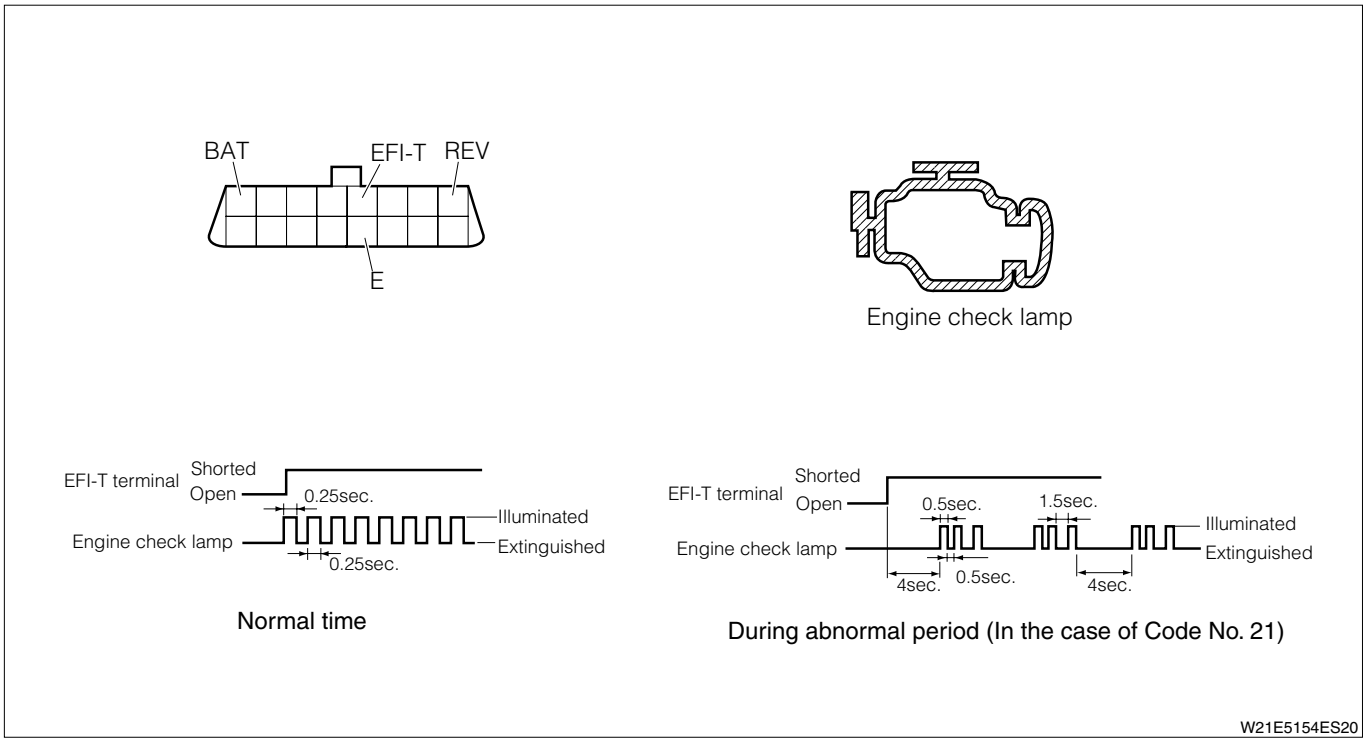
- To short the terminals of DLC, be sure to use the specified SST.
- Be sure to short the correct terminals. If wrong terminals are shorted, it will lead to malfunction.

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

NOTE

- If the SST (engine control system inspection wire) is not to be used, carry out the work operation by disconnecting DLC from the bracket. After the work operation is completed, make sure that DLC is positively fastened to the bracket.

3. The engine check lamp within the combination meter will blink and the diagnosis codes will be indicated.



NOTE

- All diagnosis codes that are stored in the memory will be displayed repeatedly in the order starting from the smallest number.

13-9-4 DIAGNOSIS CODE ERASE METHOD(ERASURE BY THE DIAGNOSIS TESTER)

NOTE

- After checking and repairing points for which an abnormality code has been emitted, erase the code in the ECU memory, following the procedure given below.
- If an abnormally take code cannot be eraced, performed checking and repairing of points where the abnormally codes occurred once again.
- When erasure of abnormality codes is carried out, the freeze frame data are also eraced. Check in advance if the erasure is permissible.

1. Stop the vehicle.
2. After setting the ignition switch to "LOCK", connect the diagnosis tester to the DLC.
3. After setting the ignition switch to "ON", use the diagnoses tester to erase the diagnosis codes.

13-9-5 DIAGNOSIS CODE ERASE METHOD(ERASURE BY DISCONNECTING THE FUSE)

1. Stop the vehicle.
2. Setting ignition switch to "LOOK", disconnect the EFI fuse by pulling it off for 60 seconds or more.
3. All codes stored in the memory can be erased by setting the ignition switch to "LOCK", and by disconnecting the EFI fuse for 60 seconds or more.

CAUTION

- When disconnecting the backup fuse, output and confirm the diagnosis codes of other systems, and then record it for the sake of the safety.

NOTE

- As a rough standard, erasure can be achieved by disconnecting diffuse for approximately 60 seconds. In some cases, however, it may take more time.
- Erasure can be also achieved by disconnecting the part supply from the battery, or the backup circuit such as fusible link. The time, however, in this case required for erasure will be longer.

13-9-6 **CONTENTS OF DIAGNOSIS**

Diagnosis code specified by ISO/SAE

DTC No.	Diagnosis items	Contents of diagnosis	The method for evaluating malfunctions	Warning indication
P0010/74	Oil control valve system	When an abnormality has occurred to the oil control valve controlling voltage	1trip	○
P0011/73	VVT control :Advance angle faulty	When abnormalities take place two times consecutively in the valve timing control ·An abnormality in the oil control valve; admission of foreign matters in the oil passage	2 trips	○
P0012/73	VVT control :Delay angle faulty	When abnormalities take place two times consecutively in the valve timing control ·An abnormality in the oil control valve; admission of foreign matters in the oil passage(Delay angle faulty)	2 trips	○
P0016/62	Chain timing faulty	When deviations between the camshaft position sensor signal and the engine rotation sensor signal are detected 5 times consecutively · Extension of the timing chain	5 trips	—
P0016/75	Valve timing faulty	When abnormalities take place two times consecutively in the valve timing control	2 trips	○
P0105/31	Manifold absolute pressure	When an abnormality takes place in the signal from the manifold absolute pressure sensor ·Malfunction of a sensor, breaking of wire or short－circuiting of a wire in the signal system, etc	1 trip	○
P0110/43	Intake air temperature sensor	When an abnormality takes place in the signal from the intake temperature integral sensor ·Malfunction of a sensor, breaking of wire or short－circuiting of a wire in the signal system, etc	1 trip	○
P0115/42	Coolant temperature sensor(short,open)	When malfunction takes place in the signal from the coolant temperature sensor ·Malfunction of a sensor, breaking of wire or short－circuiting of a wire in the signal system, etc	1 trip	○
P0120/41	Throttle sensor signal	When abnormality takes place in the signal from the throttle position sensor ·Malfunction of a sensor, breaking of wire or short－circuiting of a wire in the signal system, etc	1 trip	○
P0130/21	Front oxygen sensor(range,open)	When abnormalities take place two times consecutively in the signal from the front oxygen sensor ·Malfunction of a sensor, breaking of wire or short－circuiting of a wire in the signal system, etc	2 trips	○

DTC No.	Diagnosis items	Contents of diagnosis	The method for evaluating malfunctions	Warning indication
P0135/23	Front oxygen sensor heater signal	When an abnormality takes place in the signal from the front oxygen sensor heater ·Breaking of wire or short−circuiting of a wire in the front oxygen sensor heater system	1 trips	○
P0136/22*1	Rear oxygen sensor(range,open)	When abnormalities take place two times consecutively in the signal from the rear oxygen sensor ·Malfunction of a sensor, breaking of wire or short−circuiting of a wire in the signal system, etc	2 trips	○
P0171/25	Fuel system (lean faulty)	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, injector, oxygen sensor abnormal, etc	2 trips	○
P0172/26	Fuel system (rich faulty)	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, injector, oxygen sensor abnormal, etc	2 trips	○
P0325/18	Vibrating-type knock sensor signal	When abnormality takes place in the signal from the knock sensor ·Malfunction of a sensor, breaking of wire or short−circuiting of a wire in the signal system, etc	1 trip	− (Rear oxygen sensor equipped vehicles) ○ (Rear oxygen sensor not equipped vehicles)
P0335/13	Camshaft position sensor signal	When an abnormality takes place in the signal from the engine revolution sensor ·Malfunction of a sensor, breaking of wire or short−circuiting of a wire in the signal system, etc	1 trip	○
P0340/14	Camshaft position sensor signal	When malfunction takes place in the signal from the camshaft position sensor ·Malfunction of a sensor, breaking of wire or short−circuiting of a wire in the signal system, etc	1 trip	○
P0350/16	Ignition system (Primary)	When the ignition signal is not input consecutively	1 trip	○
P0443/76	Evaporator purge VSV	When an abnormality takes place in the VSV detection signal for the evaporator purging ·Breaking of wire or short−circuiting of a wire in the signal system, etc	1 trips	○

DTC No.	Diagnosis items	Contents of diagnosis	The method for evaluating malfunctions	Warning indication
P0500/52	Vehicle speed sensor signal system	When an abnormality takes place in the signal from the vehicle speed sensor ·Malfunction of a sensor, breaking of wire or short−circuiting of a wire in the signal system, etc	1 trip	○
P0505/71	ISC valve system	When malfunction takes place in the detection signal for the ISC stepper motor ·Breaking of wire or short−circuiting of a wire in the signal system, etc	1 trip	○
P0512/54	Starter signal system	When an abnormality takes place in the signal from the starter ·Breaking of wire or short−circuiting of a wire in the signal system, etc	1 trip	○
P0535/44	A/C evaporator temperature sensor	When an abnormality takes place in the signal from the evaporator temperature sensor signal ·Malfunction of a sensor, breaking of wire or short−circuiting of a wire in the signal system, etc	1 trip	−
P0603/83	E2PROM Read/Write	When a communication error with the immobilizer ECU occurs or when the code collation is mismatched.	1 trip	−
U0167/81	E2PROM Read/Write	When collation of the collation code in the communication with the immobilizer ECU due to an internal malfunction of the engine control computer system	1 trip	−

NOTE

- Malfunction evaluation method: "1 trip" indicates the IG switch should be set to ON, the engine operated, and the IG switch set to LOCK. "2 trips" indicates this process should be repeated twice and "5 trips" indicates the process should be repeated 5 times.
- MIL: warning lamp
- When the "O" mark is displayed in the MIL column, the engine check lamp will light up that diagnosis code number. However, when the "−" mark is displayed, the lamp will not light up that diagnosis code number. Therefore, it is possible to read out the diagnosis code number by using the diagnosis tester.
- Diagnosis code with *1: Rear oxygen sensor equipped vehicles only
- Diagnosis code with *2: immobilizer vehicles only

13-10 FAIL-SAFE FUNCTION

1. When abnormality takes place in the signal from various sensors, or malfunctions take place in the control of the oil control valve for the variable valve timing, conditions such as engine failure, catalyst overheating may result, if the control is continued under such a condition. To prevent this, the fail−safe function uses the values stored in the computer in order to control operations.
   When the malfunction is remedied to the normal condition after an abnormality was detected, the fail−safe control will be released. However, the diagnosis result will be stored in the memory.

List of fail safe function

Item	Fail−safe execution conditions	FAIL−SAFE SPECIFICATIONS
Camshaft position sensor system	When malfunction takes place in the signal from the camshaft position sensor	·The signal from the camshaft position sensor is set to a constant value.
Knock sensor signal system	When abnormality takes place in the signal from the knock sensor	·Ignition timing is retarded.
Rear oxygen sensor system*	When a malfunction occurs in the signal from the rear oxygen sensor.	Set the feedback control to the open control.
Manifold absolute pressure sensor signal system	When a malfunction occurs in the signal from the intake manifold pressure sensor.	·The manifold absolute pressure is estimated by the throttle opening angle and the engine revolution speed. When abnormality occurs in the signal from the throttle position sensor, the signal from the manifold absolute pressure sensor is set to the constant value. ·If both the throttle opening angle and engine speed exceed their set values, the fuel is cut.
Throttle position sensor system	When abnormality takes place in the signal from the throttle position sensor	·The signal from the throttle position sensor is set to a constant value.
Coolant temperature sensor system	When malfunction takes place in the signal from the coolant temperature sensor	·The signal from the water temperature sensor is set to a constant value.
Intake air temperature sensor signal system	When a malfunction occurs in the signal from the intake air temperature sensor.	·The signal from the intake temperature 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 is shut down.
Valve timing system	When abnormalities take place two times consecutively in the valve timing control	·The valve timing is set to the most retarded position.
Stepper motor system for ISC	When an abnormal signal occurred in the stepper motor for ISC	·Cut off the energizing control for the stepper motor for ISC. ·Cut off the fuel injection
Oil control valve system	When malfunction takes place in the control voltage for the oil control valve	·Prohibit the oil control valve energizing control.

*: Rear oxygen sensor equipped vehicles

13-11 BASIC CHECK

13-11-1 MEASUREMENT OF THE BATTERY VOLTAGE

1. Measure the battery voltage when the engine is stopped.
   SPECIFIED VALUE: 12 to 14V

13-11-2 VISUALLY INSPECT THE CONNECTOR SECTIONS AND CHECK THE CONTACT PRESSURE.

1. After the ignition switch is set to "LOCK", disconnect the negative terminal of the battery.
2. Check the connector of EFI ECU.
   Refer to Page A1-32.

13-11-3 POWER SUPPLY CIRCUIT CHECK

1. Disconnect the connector of EFI ECU, and measure the voltage between the connector terminal on the next ECU connection vehicle harness side and the body earth of the vehicle.
   (1) Between the ECU connected vehicle harness side connector 38 (BAT) terminal and the body earth.

   SPECIFIED VALUE: Battery voltage

13-11-4 EARTH CIRCUIT CHECK

1. Set the ignition switch to "LOCK" and disconnect the battery negative terminal.
2. Disconnect the connector of EFI ECU, and confirm the continuity between the connector terminal on the next ECU connection vehicle harness side and the body earth of the vehicle.
   (1) Between the ECU connected vehicle harness side connector 23 (E01) terminal and the body earth.
   (2) Between the ECU connected vehicle harness side connector 130 (E1) terminal and the body earth.

   SPECIFIED VALUE: Continuity exists

13-11-5 CHECKING THE INJECTOR OPERATION.

1. Use a sound scope or a long screw driver to check the injector's operating sound.
   SPECIFIED VALUE: Operating sound is provided

13-11-6 CHECKING THE FUEL PRESSURE (SIMPLE).

1. Start the engine. Pinch the fuel hose with your finger and confirm that the fuel pressure (pulsation) can be felt.
   SPECIFIED VALUE: Hose is under the fuel pressure

13-11-7 **SPARK CHECK**

WARNING

- The inspection will cause sparks to be generated, which is quite dangerous. Make sure no combustible materials are placed in the surrounding area.

1. Warm up the engine.
2. Perform fuel pressure release operation.
   Refer to Page B7-1.
3. Set the ignition switch to "LOCK".
4. Disconnect all injector connectors.

CAUTION

- This step will terminate fuel injection and prevent damage to the catalytic converter from uncombusted gas.

5. Remove the spark plug. Attach it to the ignition coil and ground the plug
6. Check if the spark plug generates sparks when cranking is performed.
   SPECIFIED VALUE: Sparks are generated

13-12 TROUBLE SHOOTING ACCORDING TO MALFUNCTION PHENOMENA

13-12-1 DESCRIPTION

1. In cases where no diagnosis code was detected during the DTC check and malfunction can be still confirmed during the basic check, perform the troubleshooting, referring to the following table.
2. In the trouble shooting according to malfunction phenomena, first arrange in order of the contents of diagnosis through inquiries, basic checks and ECU circuit checks. Next, narrow down possible causes, referring to the table showing possible causes according to malfunction phenomena.

WARNING

- Driving a vehicle with SST (EFI computer check sub－harness, etc.) being connected might cause an error operation to occur, which is extremely dangerous. Make sure that SST has been disconnected before driving the vehicle.

NOTE

- When checking each component, be sure to check the harness and connectors that are connected to the component part concerned.
- Two possible causes for no abnormality detected by the diagnosis function even though a malfunction phenomenon has been reproduced can be cited: it is possible that a malfunction has occurred outside the scope of diagnosis code output condition; or that a malfunction has occurred apart from the diagnosis system.

13-12-2 TABLE FOR THE LIST OF POSSIBLE CAUSES ACCORDING TO THE PHENOMENA OF MALFUNCTIONS

(1) Poor starting characteristics

Malfunction phenomena		Possible causes		
		System	Components	Malfunction mode
No initial ignition produced		Power supply system	EFI ECU power supply circuit	Breaking of wires, short−circuits
			IG switch	No turning "ON"
			Main relay	
		Engine earth system	Engine earth*1	Breaking of wires, defective earth
		Fuel system	Fuel pump relay	No turning "ON"
			Fuel line, Fuel filter	Clogging
			Injector	No injection, always injection
			Fuel pump	No operation
		Ignition system	Engine fuse*1	Fuse meltdown
			Ignition coil	No spark
			Spark plug	
			Ignition timing	Misalignment
		Control system	Engine speed sensor	No "NE signal" output
			Camshaft position sensor	Defective output signal
Initial ignition occurring No complete ignition		Fuel system	Fuel pump relay	No turning "ON"
			Fuel line, Fuel filter	Clogging
			Injector	Leakage, no injection, always injection
			Fuel pump	No operation
		Ignition system	Spark plug	Misfire
		Intake system	Air hose, etc.	Leak
		Control system	manifold pressure sensor	Deviation in the characteristics, breaking the liars, short−circuiting
			Coolant temperature sensor	
			Camshaft position sensor	Output signal defective
			Oil control valve	Defective operation
Difficulty in starting	cold period	Intake system	Throttle body	Defective opening, no opening possible
		Control system	Coolant temperature sensor	Deviation in the characteristics, breaking the liars, short−circuiting
	Hot period	Fuel system	Injector	Leak
		Intake system	ISC stepper motor	Defective opening, no opening possible
	At all times	Fuel system	Fuel pump relay	No turning "ON"
			Fuel line, Fuel filter	Clogging
			Injector	Leak
		Ignition system	Spark plug	Smoldering
		Intake system	ISC stepper motor	Defective opening
			Air hose, etc.	Leak

*1:If the ignition switch is set to "ON" when the connection between the engine earth (between 130 (E1) connecting earth and the engine block) is defective, the "E/G fuse" may sometimes melt down.

(2) **Idling defective**

Malfunction phenomena	Possible causes		
	System	Components	Malfunction mode
Fast idle not working	Intake system	ISC stepper motor	Defective opening, no opening possible
	Control system	Coolant temperature sensor	Breaking of wires, short−circuits
Idling speed is high	Intake system	Air hose, etc.	Leak
		Throttle body	Closing defective
		ISC stepper motor	Always open
	Control system	Manifold absolute pressure sensor	Deviation in the characteristics, breaking the liars, short−circuiting
		Coolant temperature sensor	
		Throttle position sensor	Deviation in the characteristics
		Stop lamp switch	Always "ON"
		Tail lamp switch	
		Blower switch	
Idling speed is low	Intake system	Air hose, etc.	Clogging
		Throttle body	
	Control system	Manifold absolute pressure sensor	Deviation in the characteristics
		Coolant temperature sensor	
		Stop lamp switch	No turning "ON"
		Tail lamp switch	
		Blower switch	
When idling hunting takes place	Intake system	Air hose, etc.	Leak
		Throttle body	
		ISC stepper motor	Always open
	Control system	Manifold absolute pressure sensor	Deviation in the characteristics
		Camshaft position sensor	Output signal defective
		Oil control valve	Operation defective
Unstable idling	Fuel system	Injector	Leakage, no injection
		Fuel pump	Operation defective
	Intake system	Throttle body	Sucking in
	Ignition system	Ignition coil	Poor contacting
		Spark plug	Misfire
	Control system	Manifold absolute pressure/ intake temperature integral sensor	Defective operation, defective contact
		Front oxygen sensor, Rear oxygen sensor	

(3) **Engine stalled**

Malfunction phenomena	Possible causes		
	System	Components	Malfunction mode
After starting the engine, it stops	Fuel system	Fuel pump relay	No turning "ON"
		Fuel line, Fuel filter	Clogging
		Fuel pump	No operation
	Control system	Coolant temperature sensor	Deviation in the characteristics
		Camshaft position sensor	Output signal defective
		Oil control valve	Operation defective
The engine stalls when pressing on the accelerator	Control system		Deviation in the characteristics
		Coolant temperature sensor	
		Camshaft position sensor	Output signal defective
		Oil control valve	Operation defective
The engine stalls when releasing the accelerator	Intake system	Throttle body	Operation defective
	Control system	manifold pressure sensor	Deviation in the characteristics
Engine stops when the air conditioner is turned on.	Intake system	ISC stepper motor	Constantly closed
Engine stops, but can be restarted.	Power supply system	EFI ECU power supply circuit	Poor contacting
		IG switch	
		Main relay	
	Intake system	ISC stepper motor	Constantly closed
	Ignition system	Ignition coil	Poor contacting
	Control system	manifold pressure sensor	Poor contacting
		Engine speed sensor	

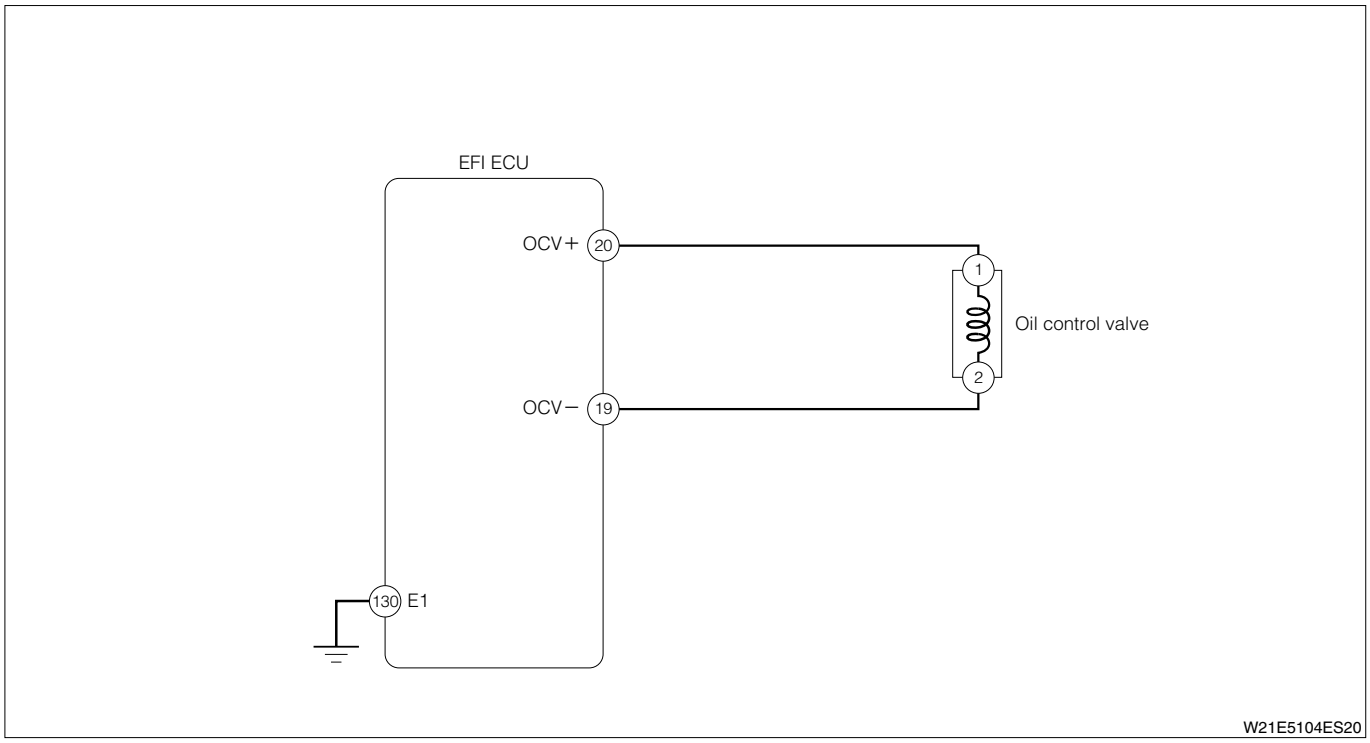
(4) **Defective running**

Malfunction phenomena	Possible causes		
	System	Components	Malfunction mode
Takes a pause when accelerating.	Fuel system	Fuel line, Fuel filter	Clogging
		Injector	Declining of the flow rate
		Fuel pump	
	Ignition system	Ignition coil	Missing ignition
		Spark plug	Misfire
		Ignition timing	Misalignment
	Control system		Deviation in the characteristics, breaking of wire, short−circuiting
		Coolant temperature sensor	
		Throttle position sensor	
		Knock sensor	Breaking of wires, short−circuits
Back fire After fire	Fuel system	Injector	Declining of the flow rate
	Ignition system	Ignition coil	Poor contacting
		Spark plug	Misfire
		Ignition timing	Misalignment
	Control system	SB08_EF_D99BE1_0338	Operation defective
		Coolant temperature sensor	Deviation in the characteristics
		Camshaft position sensor	Output signal defective
		Oil control valve	Operation defective
Engine output insufficient	Fuel system	Fuel line, Fuel filter	Fuel pressure not increased
		Injector	Declining of the flow rate
		Fuel pump	Fuel pressure not increased
	Ignition system	Spark plug	Misfire
	Control system	manifold pressure sensor	Deviation in the characteristics, breaking of wire, short−circuiting
		Coolant temperature sensor	
		Throttle position sensor	Deviation in the characteristics
		Camshaft position sensor	Output signal defective
		Oil control valve	Operation defective
Black smoke emitted	Fuel system	Injector	Always injection
	Control system	manifold pressure sensor	Deviation in the characteristics, breaking of wire, short−circuiting
		Coolant temperature sensor	Deviation in the characteristics
		Throttle position sensor	
Hunting carried out during running	Fuel system	Fuel line, Fuel filter	Clogging
		Injector	Operation defective
	Ignition system	Ignition coil	Poor contacting
	Control system	Throttle position sensor	Deviation in the characteristics
		Camshaft position sensor	Output signal defective
		Oil control valve	Operation defective
Abnormal knocking takes place	Control system	manifold pressure sensor	Deviation in the characteristics, breaking of wire, short−circuiting
		Throttle position sensor	Deviation in the characteristics
		Knock sensor	Deviation in the characteristics, breaking of wire, short−circuiting

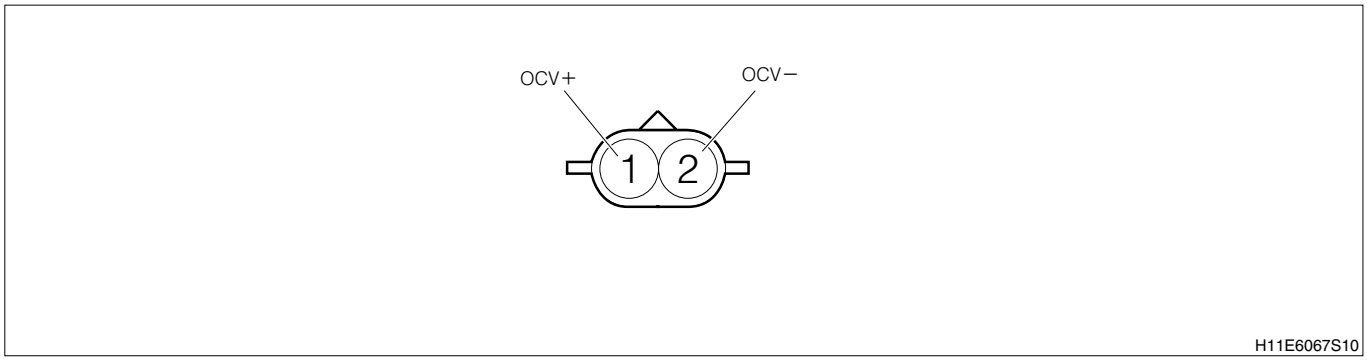
13-13 TROUBLE SHOOTING ACCORDING TO DIAGNOSIS CODE

13-13-1 P0010/74 OIL CONTROL VALVE SYSTEM

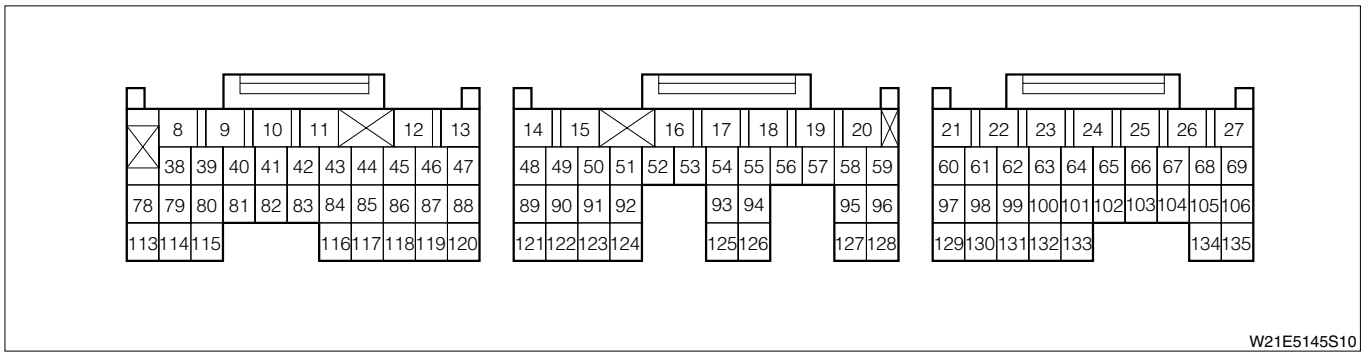
(1) System diagram



Oil control valve connected vehicle harness side connector



EFI ECU connection vehicle harness side connector



(2) Output conditions

1. When either of the following conditions lasted for a certain length of time or longer with the battery voltage maintained at 12 V or higher
   (1) When the oil control valve voltage is lower than the criterion value with the output duty ratio at 99% or higher
   (2) When the oil control valve voltage is higher than the criterion value with the output duty ratio at 0%

(3) **Checking points**

1. Oil control valve signal output by the EFI ECU.
2. Harness and connector(s) linking the oil control valve and the EFI ECU.
3. EFI ECU

(4) **Checking method**

Σ>1. Diagnosis code checking

1. Use diagnosis tester to read out the diagnosis code.
   SPECIFIED VALUE: P0016/62 (Chain timing control system) is not output.

   ▼ If it is output, check the timing chain for extension.
   ▼ If it is not output, go to Σ>2.

Σ>2. Data monitor (1)

1. Warm up the engine.
2. Use diagnosis tester to read out the data monitor [Target angle of intake cam] and [Actual angle of intake cam].
   SPECIFIED VALUE: While the vehicle is running, the real displacement angle will vary by following the target displacement angel.

   ▼ If the result is OK, it is possible that the system has returned to the normal condition. Therefore, leave the system as it is to observe the condition for a while.
   ▼ If the result is NG, go to Σ>3.

Σ>3. Data monitor (2)

1. Warm up the engine.
2. Use diagnosis tester to read out the data monitor [VVT control duty ratio].
   SPECIFIED VALUE:

The engine condition	Displayed data
The air conditioner is turned "OFF": no electric load applied; when the engine is "idling."	30 to 55%

The condition under which the air conditioner is turned "OFF": the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".

   ▼ If the result is OK, go to Σ>4.
   ▼ If the result is NG, check the EFI ECU circuit.
   Refer to Page A1-32.

Σ>4. Checking the wiring harness

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between EFI ECU connection vehicle harness side connector 20 (OCV+) and the oil control valve connected vehicle harness side connector 1 (OCV+).
   (2) Between EFI ECU connection vehicle harness side connector 19 (OCV−) and the oil control valve connected vehicle harness side connector 2 (OCV−).

   SPECIFIED VALUE: No abnormality exists.

   ▼ If it is OK, go to Σ>5.
   ▼ If it is "NG" repair or replace harness and connector at the faulty section.

⌦5. Checking the single unit of the oil control valve

1. Carry out the single unit checking of the oil control valve.
   Refer to Page B8-133.

   SPECIFIED VALUE: Oil control valve normal.

   ▼ If the result is OK, go to ⌦6.
   ▼ If the result is NG, replace the oil control valve.

⌦6. Checking the EFI ECU input signals

1. Carry out the troubleshooting in the same manner as the troubleshooting according to the diagnosis codes as shown below.
   (1) P0105/31 (Manifold absolute pressure signal)
   Refer to Page B8-49.

   (2) P0115/42 (Coolant temperature sensor(short,open))
   Refer to Page B8-53.

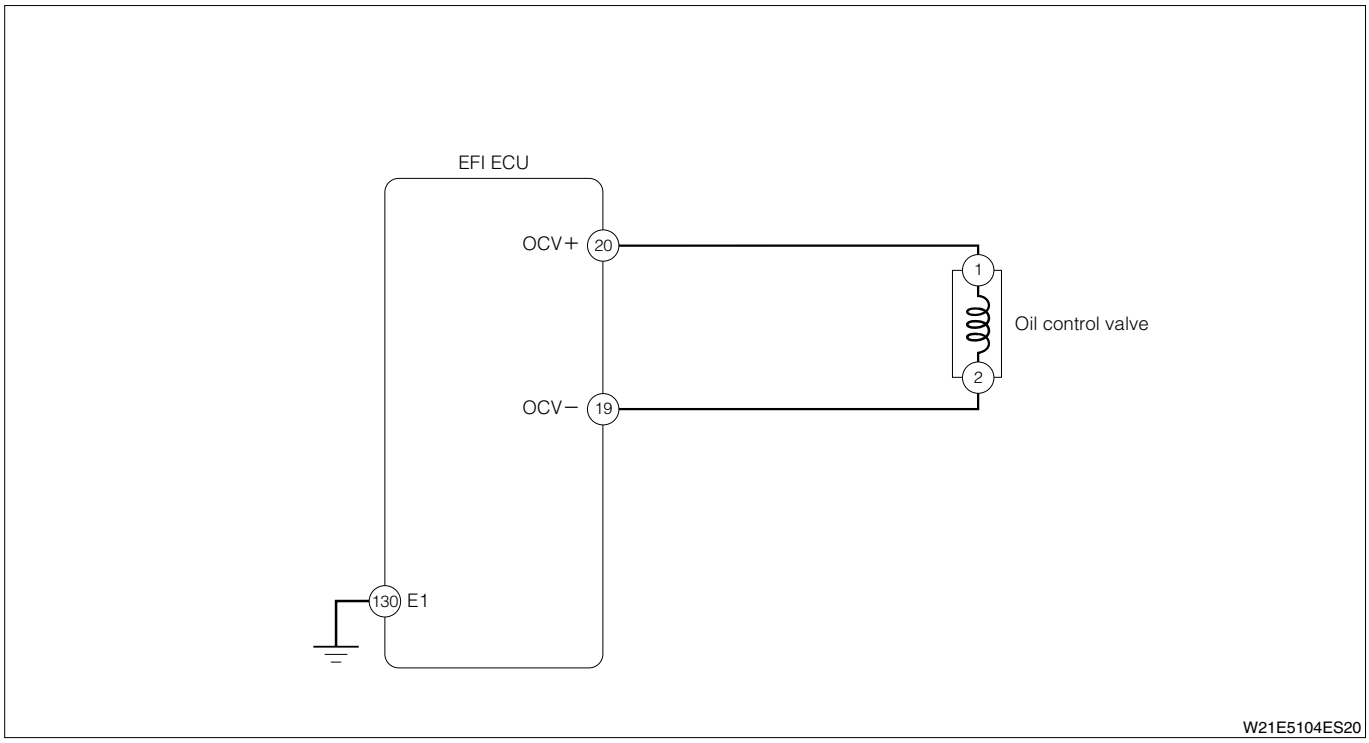
   (3) P0120/41 (Throttle sensor signal)
   Refer to Page B8-56.

   (4) P0335/13 (Engine revolution sensor signal)
   Refer to Page B8-76.

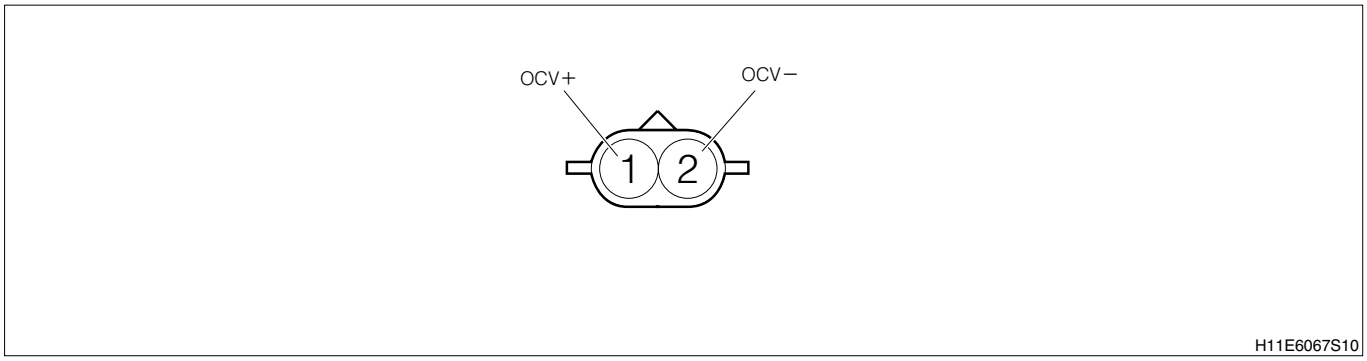
   (5) P0340/14 (Camshaft position sensor signal)
   Refer to Page B8-79.

13-13-2 P0011/73 VVT CONTROL :ADVANCE ANGLE FAULTY,P0012/73 VVT CONTROL :DELAY ANGLE FAULTY

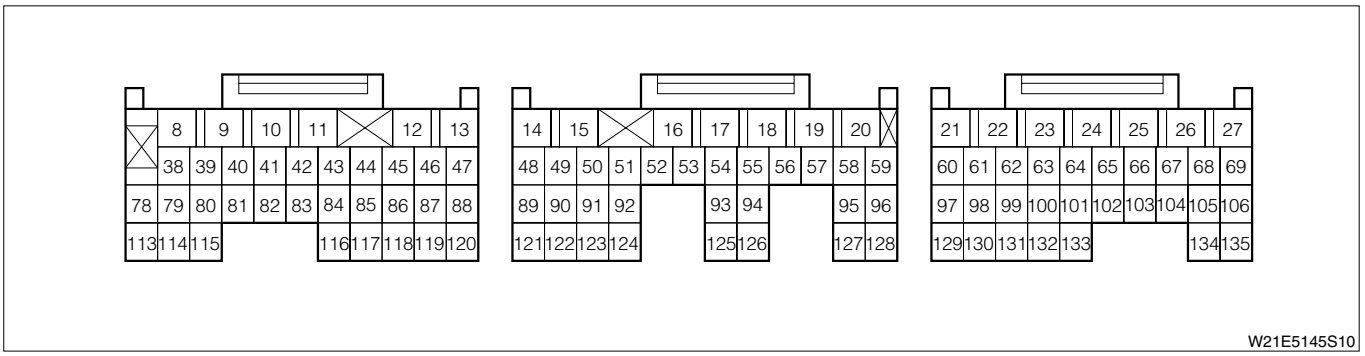
(1) System diagram



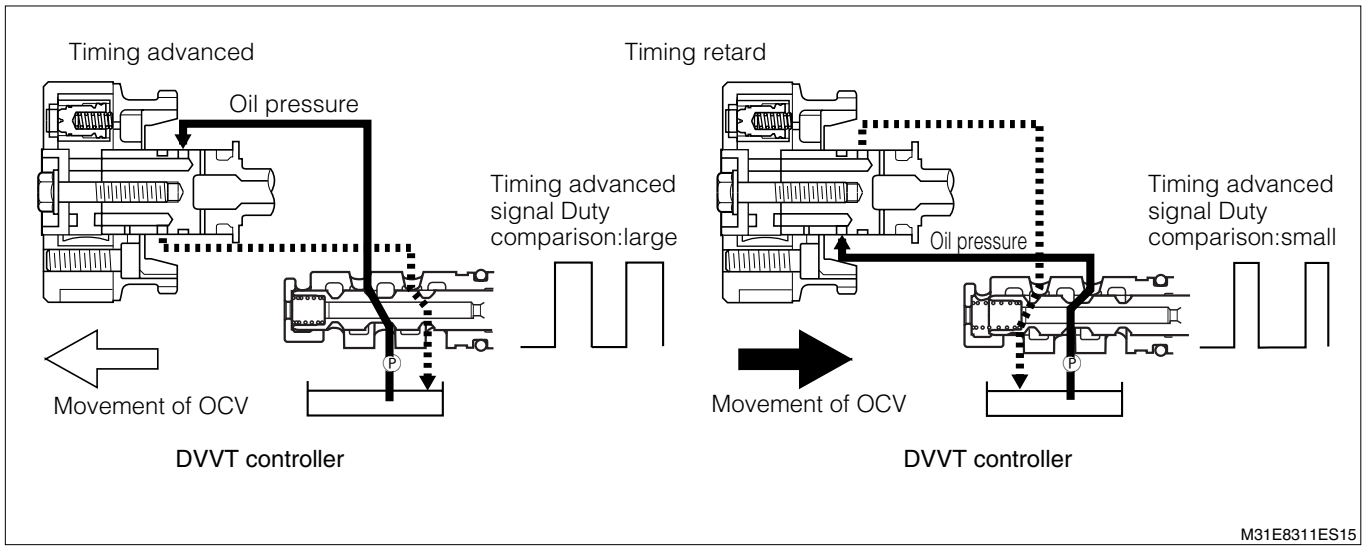
Oil control valve connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) **Outline of the variable valve timing control operation**



(3) **No. P0011/73 output condition**

1. When advance fail, of the variable valve timing has been depicted

(4) **No. P0012/73 output condition**

1. When retard fail, of the variable valve timing has been depicted

(5) **Checking points**

1. Operation of the variable timing controller.
2. Deviation in timing between the cam shaft timing sprocket Ay and the No. 1 camshaft timing sprocket (matchmark position).
3. EFI ECU

(6) **Checking Method**

∑1. Diagnosis code checking

1. Read out the diagnosis code by using the diagnosis tester.

SPECIFIED VALUE: P0016/62 (Chain timing faulty), P0016/75 (Valve timing faulty) and P0010/74 (Oil control valve system) is not output.

▼ If P0016/62 or P0016/75 is output, check the P0016/62 or P0016/75.
Refer to Page B8-48.

▼ If P0010/74 is output, check P0010/74 (Oil control valve system).
Refer to Page B8-41.

▼ If it is not output, go to ∑2.

∑2. Oil control valve operation checking

WARNING

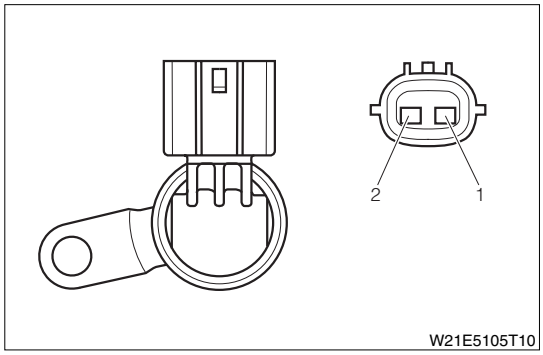
- The inspection will cause sparks to be generated, which is quite dangerous. Make sure no combustible materials are placed in the surrounding area.
- It is an operation to be performed while the engine is running. Pay special attention to the safety while performing the operation.

1. Disconnect the connector of the oil control valve.
2. Start the engine and keep idling.

3. Apply battery voltage to the oil control valve connector. (Align polarity of connector with that of battery.)

CAUTION

- Pay attention not to cause any short−circuiting to occur during work operation. (Connect the plus side via a fuse for the safety sake.)
- Make sure that the voltage is not applied for more than one minute.



4. Confirm the idling condition of the engine.

SPECIFIED VALUE: Rough idling or stalling of the engine occurs.

▼ If it is OK, go to ≫3.
▼ If it is NG, go to ≫4.

≫3. Checking the wiring harness

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between EFI ECU connection vehicle harness side connector 20 (OCV+) and the oil control valve connected vehicle harness side connector 1 (OCV+).
   (2) Between EFI ECU connection vehicle harness side connector 19 (OCV−) and the oil control valve connected vehicle harness side connector 2 (OCV−).

   Refer to Page A1-31.

   SPECIFIED VALUE: No abnormality exists.

   ▼ If it is OK, go to ≫7.
   ▼ If it is "NG" repair or replace harness and connector at the faulty section.

≫4. Checking the single unit of the oil control valve

1. Carry out the single unit checking of the oil control valve.
   Refer to Page B8-133.

   SPECIFIED VALUE: Oil control valve normal.

   ▼ If the result is OK, go to ≫5.
   ▼ If the result is NG, replace the oil control valve.
   Refer to Page B8-8.

≫5. Checking the single unit of the DVVT controller

1. Carry out the single unit checking of the camshaft timing sprocket Ay.
   Refer to Page B2-14.

   SPECIFIED VALUE: Cam shaft timing sprocket Ay normal.

   ▼ If the result is OK, go to ≫6.
   ▼ If the result is NG, replace the camshaft timing sprocket Ay.
   Refer to Page B2-14.

⌦6. Oil passage checking

1. Check the passage of the engine oil.
   SPECIFIED VALUE: No clogging

▼ If the result is OK, go to ⌦7.
▼ If the result is NG, repair the malfunctioning section of the oil passage.

⌦7. Camshaft gear deviation checking

1. Inspect deviation between the cam shaft timing sprocket Ay and the No. 1 camshaft timing sprocket (using the matchmark positions).
   SPECIFIED VALUE: No deviation existing.

▼ If the result is OK, check the EFI ECU circuit.
Refer to Page A1-32.

▼ If the result is NG, reassemble the camshaft.
Refer to Page B2-14.

13-13-3 **P0016/62 CHAIN TIMING FAULTY**
P0016/75 VALVE TIMING FAULTY

(1) **No. P0016/62 output condition**
1. When deviations between the camshaft position sensor and the engine revolution sensor have been detected 5 times consecutively

(2) **No. P0016/75 output condition**
1. Inspect when valve timing control errors occur twice in a row.

(3) **Checking points**
1. Timing chain stretch.
2. Timing chain for assembling.

(4) **Check procedure**

Σ>1.Timing chain for assembling checking
1. Check the timing chain for assembling
Refer to Page B2-7.

SPECIFIED VALUE: Assemble is not wrong.

▼ If the result is OK, go to Σ>2.
▼ If the result is NG, reassemble the timing chain and go to Σ>3.
Refer to Page B2-7.

Σ>2.Confirmation test (1)
1. Carry out erasing of a diagnosis code.
2. Start the engine and warm it up until the radiator fan starts rotating.
3. Read the diagnosis code, using the diagnosis tester or an OBD Ⅱ general-purpose scan tool
SPECIFIED VALUE: P0016/62 (Chain timing faulty) or P0016/75 (Valve timing faulty) not output

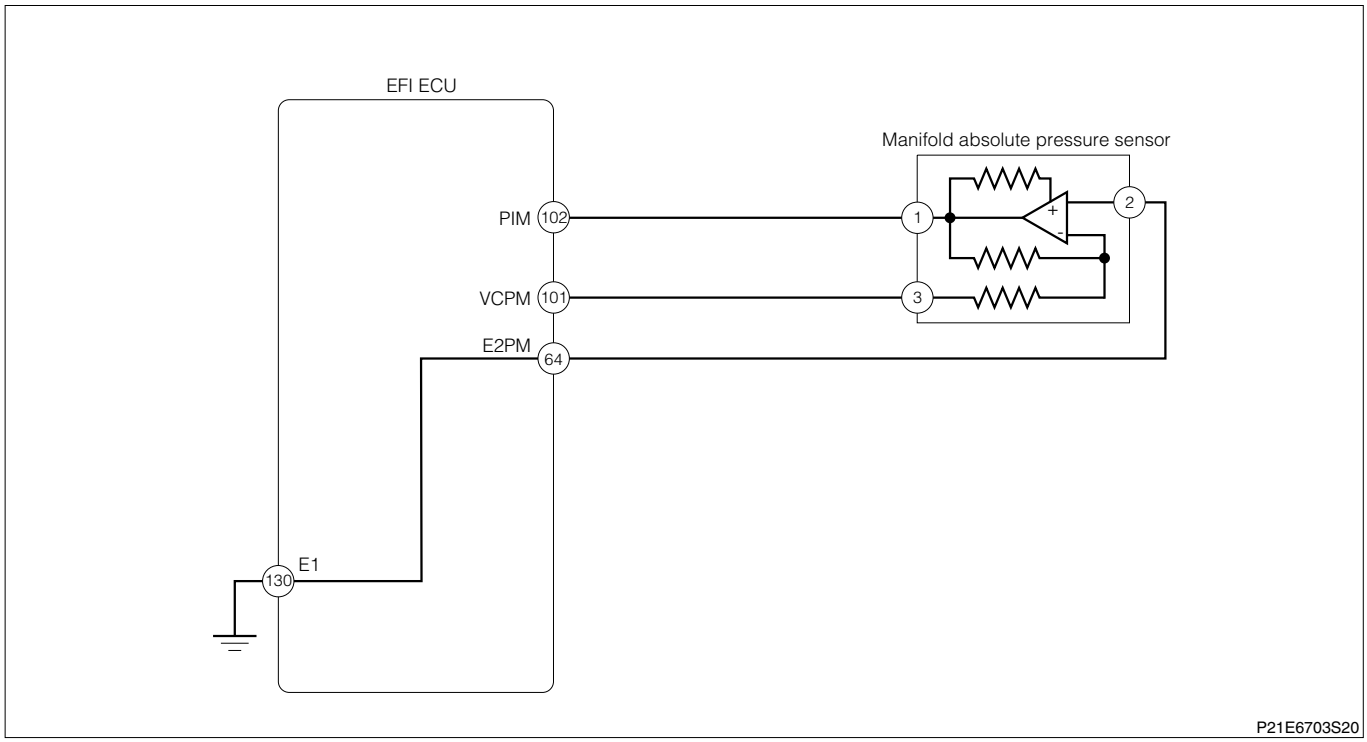
▼ If the result is OK, end of trouble shooting .
▼ If the result is NG, check the EFI ECU circuit.
Refer to Page A1-32.

Σ>3.Confirmation test (2)
1. Carry out erasing of a diagnosis code.
2. Start the engine and warm it up until the radiator fan starts rotating.
3. Read the diagnosis code, using the diagnosis tester or an OBD Ⅱ general-purpose scan tool
SPECIFIED VALUE: P0016/62 (Chain timing faulty) or P0016/75 (Valve timing faulty) not output

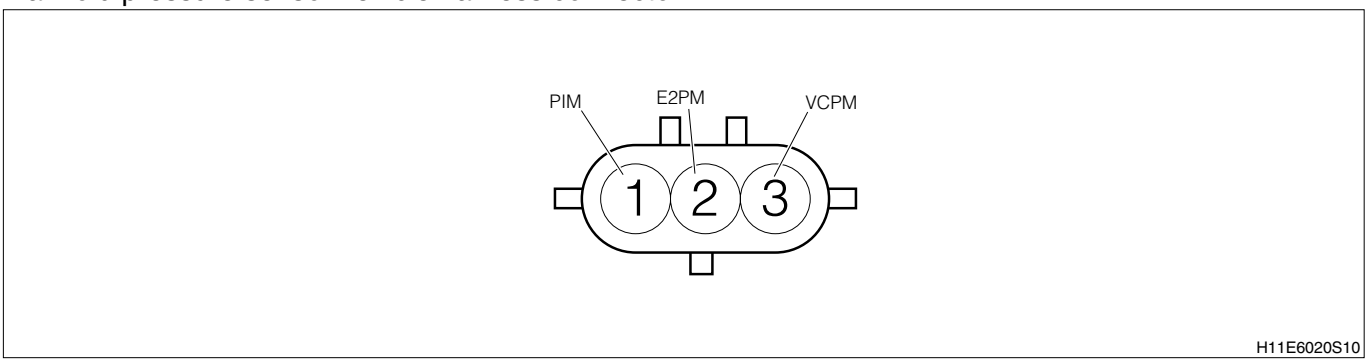
▼ If the result is OK, end of trouble shooting .
▼ If the result is NG, replace the timing chain.
Refer to Page B2-7.

13-13-4 P0105/31 MANIFOLD PRESSURE SENSOR

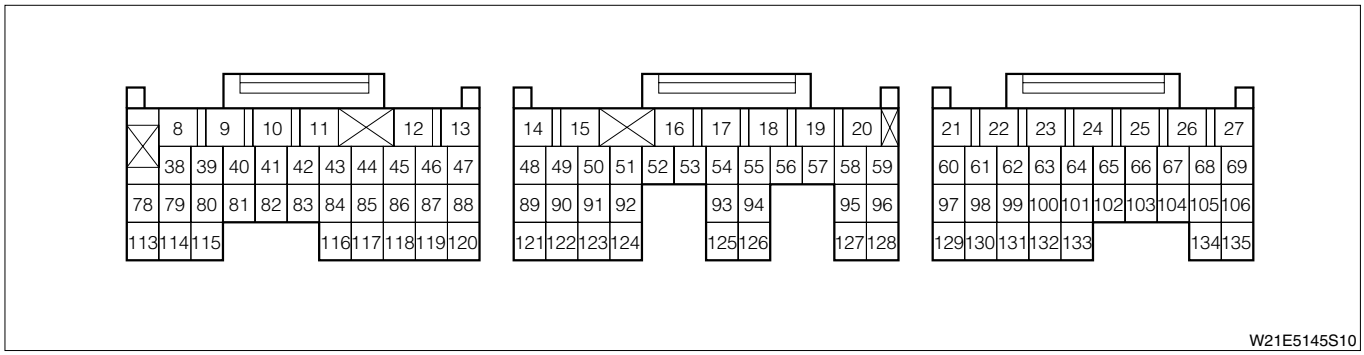
(1) System diagram



manifold pressure sensor vehicle harness connector



EFI ECU vehicle harness connector



(2) Output conditions

1. When the signal from the manifold pressure sensor is not continuously output more than the specified time.

(3) Checking points

1. Is the signal from the manifold pressure sensor input into the EFI ECU?
2. Is the harness between the manifold pressure sensor and EFI ECU normal?
3. Is the power supply voltage of the manifold pressure sensor normal?
4. Is the output of the manifold pressure sensor correct?

(4) **Checking method**

Σ1. Checking the EFI ECU signal

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

2. Set the ignition switch to "ON"
   (1) Between SST102 (PIM) and SST64 (E2PM)
   SPECIFIED VALUE: 3.1 to 4.1 V (ambient temperature)

   ▼ If OK, check the EFI ECU circuit.
   Refer to Page A1-32.

   ▼ If NG, proceed to step Σ2.

Σ2. Checking the wire harness continuity

1. Check the continuity between each of the following terminals.
   (1) Between EFI ECU vehicle harness connector 102 (PIM) and sensor vehicle harness connector 2 (PIM)
   (2) Between EFI ECU vehicle harness connector 64 (E2PM) and sensor vehicle harness connector 1 (E2PM)
   (3) Between EFI ECU vehicle harness connector 101 (VCPM) and sensor vehicle harness connector 3 (VCPM)
   SPECIFIED VALUE: Continuity exists.

   ▼ If OK, proceed to step Σ3.
   ▼ If NG, repair the harnesses and connectors.

Σ3. Checking the manifold pressure sensor voltage

1. Disconnect the manifold pressure sensor connector.
2. Set the ignition switch to "ON"
   (1) Between sensor vehicle harness connector 3 (VCPM) and sensor vehicle harness connector 1 (E2PM)
   SPECIFIED VALUE:

   ▼ If OK, proceed to step Σ4.
   ▼ If NG, check the EFI ECU circuit.
   Refer to Page A1-32.

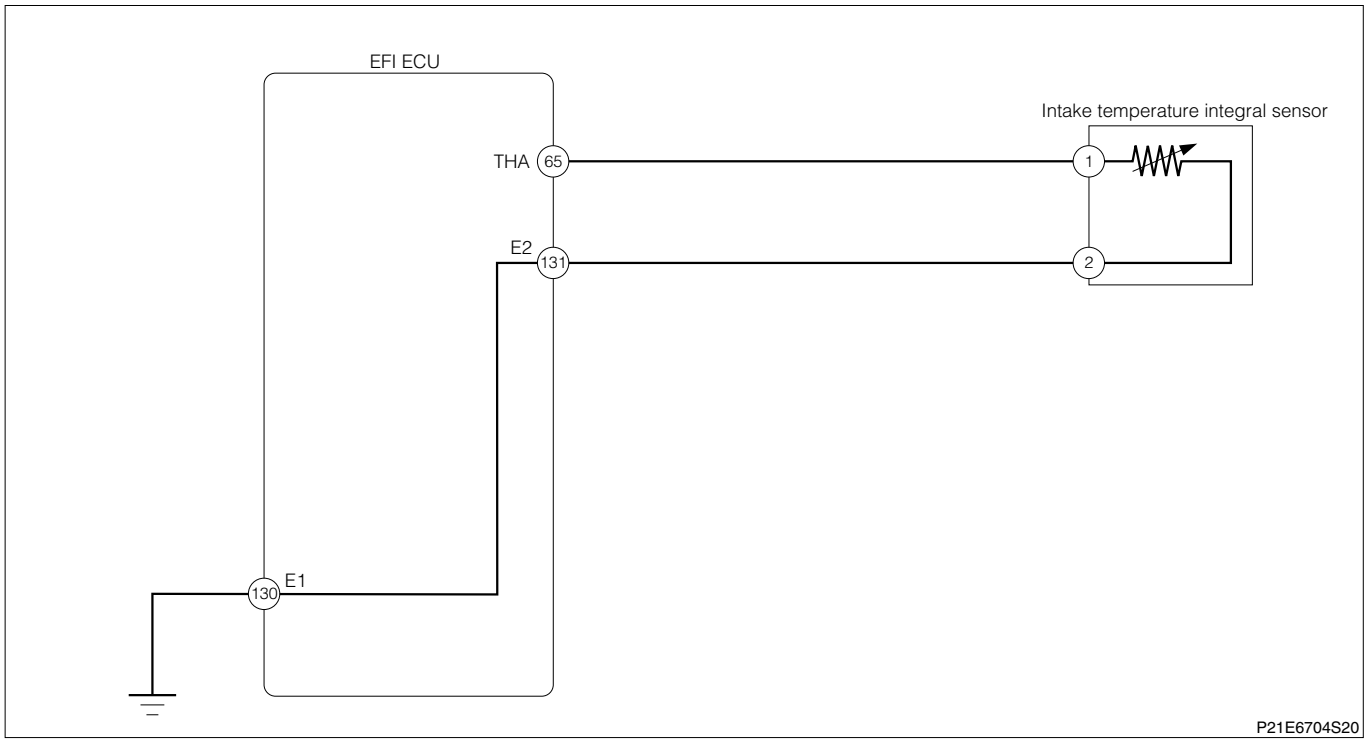
Σ4. Checking the manifold pressure sensor

1. Check the manifold pressure sensor.
   Refer to Page B8-128.

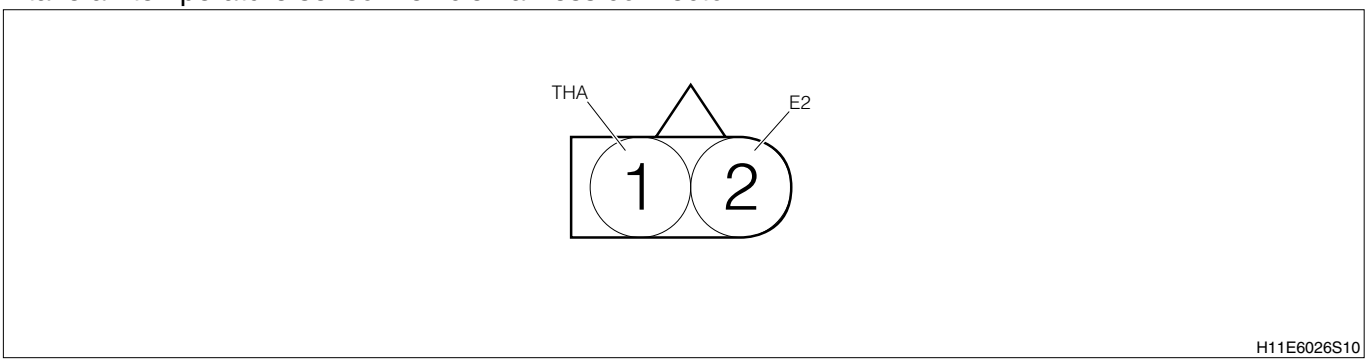
   ▼ If OK, check whether each connector is properly connected.
   ▼ If NG, replace the manifold pressure sensor.

13-13-5 P0110/43 INTAKE AIR TEMPERATURE SENSOR

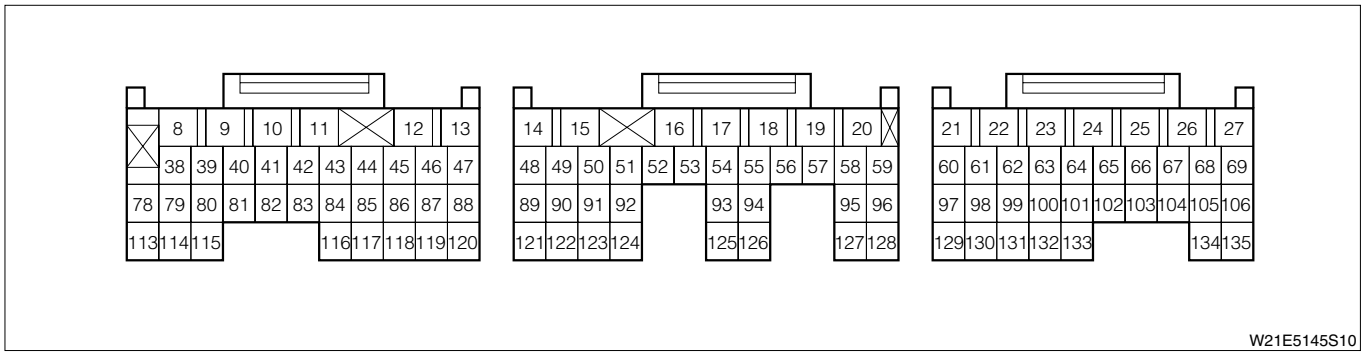
(1) System diagram



Intake air temperature sensor vehicle harness connector



EFI ECU vehicle harness connector



(2) Output conditions

1. When the signal from the intake temperature sensor is not continuously output more than the specified time after the engine is started.

(3) Checking points

1. Is the signal from the intake air temperature sensor input into the EFI ECU?
2. Is the harness between the intake air temperature sensor and EFI ECU normal?
3. Is the output of the intake temperature sensor correct?

(4) **Checking method**

∑1. Checking the EFI ECU signal

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

2. Set the ignition switch to "ON"
   (1) Between SST65 (THA) and SST131 (E2)
   SPECIFIED VALUE: 0.15 to 4.85 V (changes according to the intake air temperature)

   ▼ If OK, check the EFI ECU circuit.
   Refer to Page A1-32.

   ▼ If NG, proceed to step ∑2.

∑2. Checking the wire harness continuity

1. Check the continuity between each of the following terminals.
   (1) Between sensor vehicle harness connector 1 (THA) and EFI ECU vehicle harness connector 65 (THA)
   (2) Between sensor vehicle harness connector 2 (E2) and EFI ECU vehicle harness connector 131 (E2)
   SPECIFIED VALUE: Continuity exists.

   ▼ If OK, proceed to step ∑3.
   ▼ If NG, repair the harness and connectors.

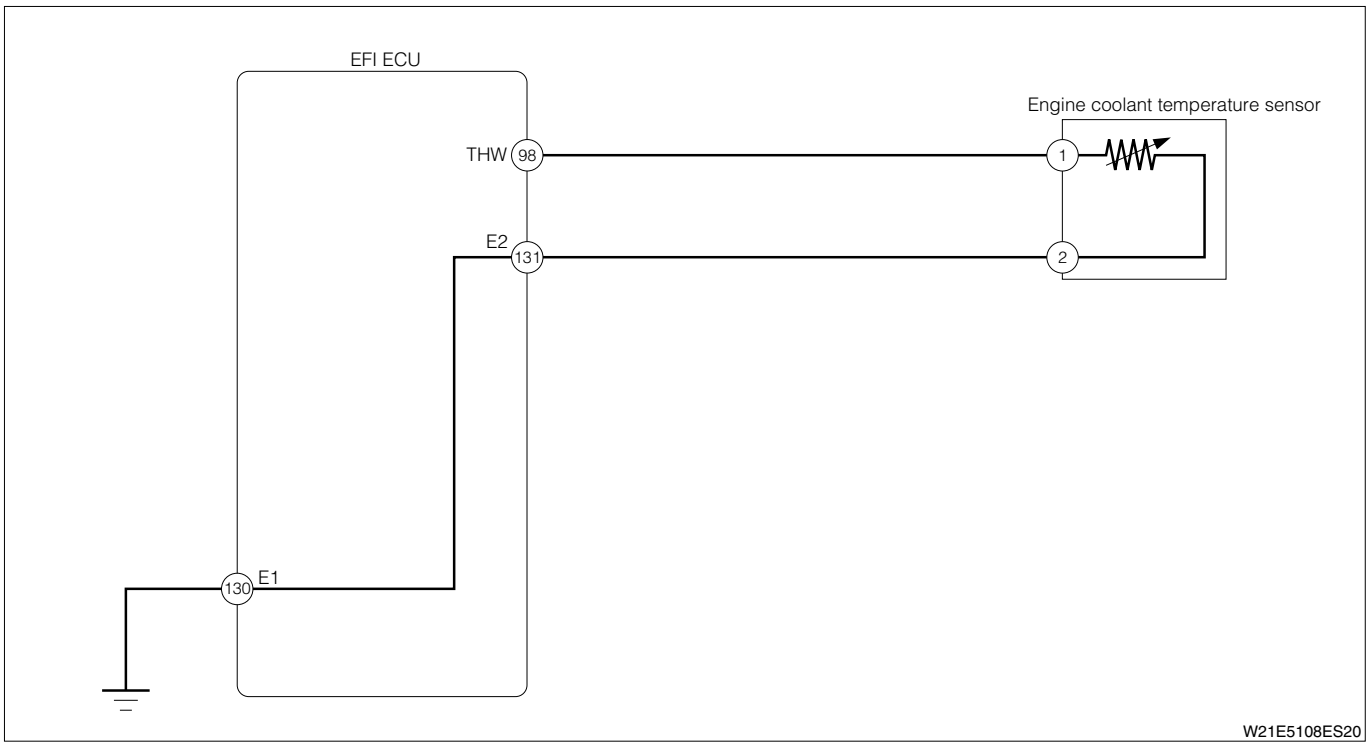
∑3. Checking the intake air temperature sensor

1. Check the intake air temperature sensor.
   Refer to Page B8-129.

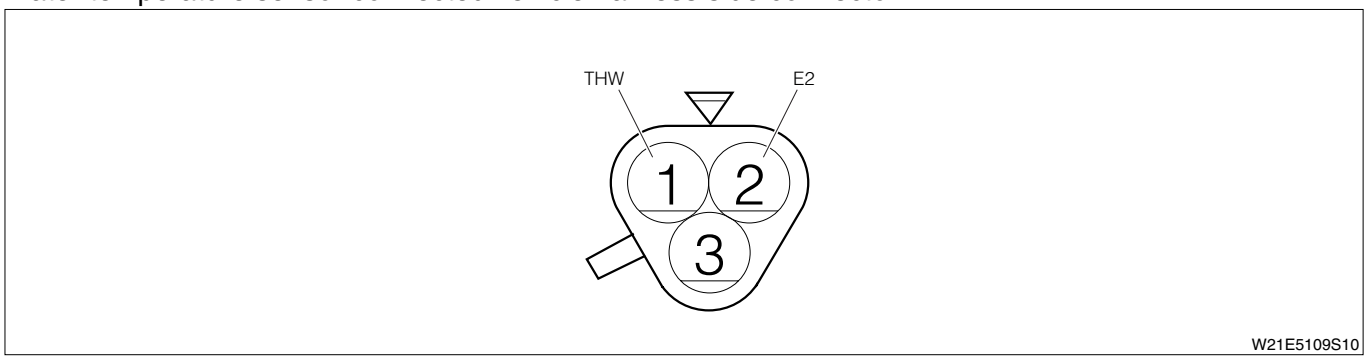
   ▼ If OK, check whether each connector is properly connected.
   ▼ If NG, replace the intake air temperature sensor.
   Refer to Page B8-6.

13-13-6 **P0115/42 COOLANT TEMPERATURE SENSOR(SHORT,OPEN)**

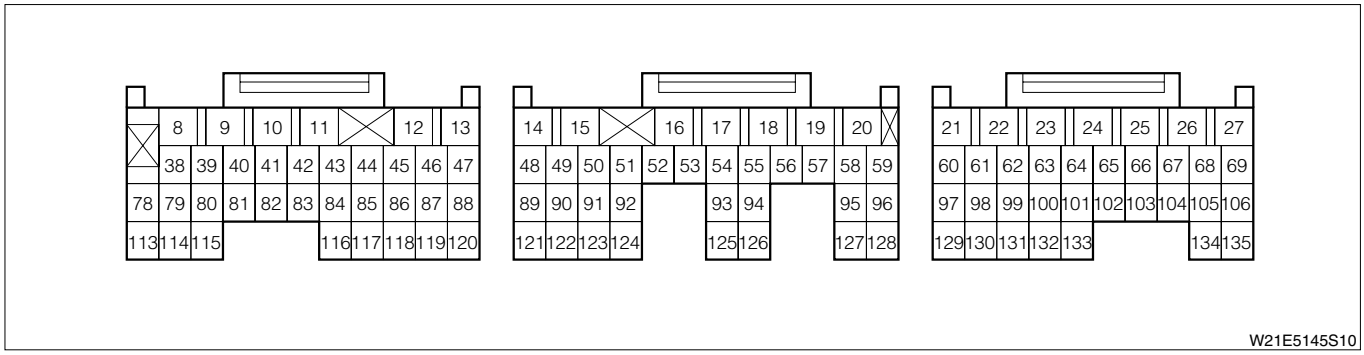
(1) **System diagram**



Water temperature sensor connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) **Output conditions**

1. When the signal from the water temperature sensor is not output consecutively for a certain length of time after the engine is started

(3) **Checking Points**

1. Signal from water temperature sensor input to the EFI ECU.
2. Harness and connectors linking the water temperature sensor and EFI ECU.
3. Water temperature sensor output signal.
4. EFI ECU

(4) **Checking procedure**

∑>1. Data monitor

1. Use diagnosis tester to read the data monitor [water temperature].

Water temperature(ECT)

	Displayed data	Possible causes of the malfunction
a	No change from −40 ℃.	Possibility of wire breaking within the water temperature sensor system.
b	No change from 140 ℃.	Possibility of short−circuiting within the water temperature sensor system
c	Deviation from the real water temperature	Possibility of abnormality in the resistance value within the water temperature sensor system
d	Equivalent to the real water temperature	Possibility of temporary malfunction

NOTE

- When confirming the water temperature, it is sometimes possible that a significant difference is produced between the temperature of the radiator and the hose and the surrounding temperature of the water temperature sensor, because of the function of the thermostat.
- The resistance characteristics (reference value) of the water temperature sensor are as shown below.

Temperature [℃]	−40	−20	20	80	110	140
Resistance	(1MΩ or higher) (wire breaking)	$14.96^{+1.38}_{-1.27}$	$2.44^{+0.16}_{-0.15}$	0.3143±0.0126kΩ	(0.1403kΩ)	(1 Ω or lower) (short−circuiting)

▼ On the basis of the possible causes of malfunction, go to ∑>2.

∑>2. Water temperature sensor on−vehicle checking

1. Disconnect the connector of the water temperature sensor, and measure the resistance value between the terminals with the water temperature at 20℃.
   (1) Sensor side connector 2 (THW) − 1 (E2)

SPECIFIED VALUE:

	resistance value	Possible causes of the malfunction
a	1 MΩ or higher	Possibility of breaking of wire within the water temperature sensor
b	1 Ω or lower	Possibility of short−circuiting within the water temperature sensor system
c	Abnormality in the resistance characteristics within the water temperature sensor	Possibility of abnormality in the resistance value in the water temperature sensor
d	No abnormality in the resistance characteristics of the water temperature sensor	The water temperature sensor is normal.

▼ In the case of d, go to ∑>3.

▼ In the case of a, b, or c, go to ∑>5.

≫3. Checking the wiring harness

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 98 (THW) linking the EFI ECU and the vehicle side harness connector 1 (THW) linking the water temperature sensor.
   (2) Between vehicle side harness connector 131 (E2) linking the EFI ECU and the vehicle side harness connector 2 (E2) linking the water temperature sensor.
   (3) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the ground connector.

   Refer to Page A1-31.

   SPECIFIED VALUE: No abnormality exists.

   ▼ If it is "OK", go to ≫4.
   ▼ If it is "NG" ,repair or replace harness and connector at the faulty section.

≫4. EFI ECU signal checking

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

2. With the connectors for the water temperature sensor disconnected, set the ignition switch to "ON" and measure the voltage between the following terminals.
   (1) Between SST54 (THW) and SST19 (E2).

   SPECIFIED VALUE: 4.75 V to 5.25 V

   ▼ If the result is OK, check the connecting state of the connectors at every section.
   ▼ If the result is NG, check the EFI ECU circuit.
   Refer to Page A1-32.

≫5. Single unit checking of the water temperature sensor

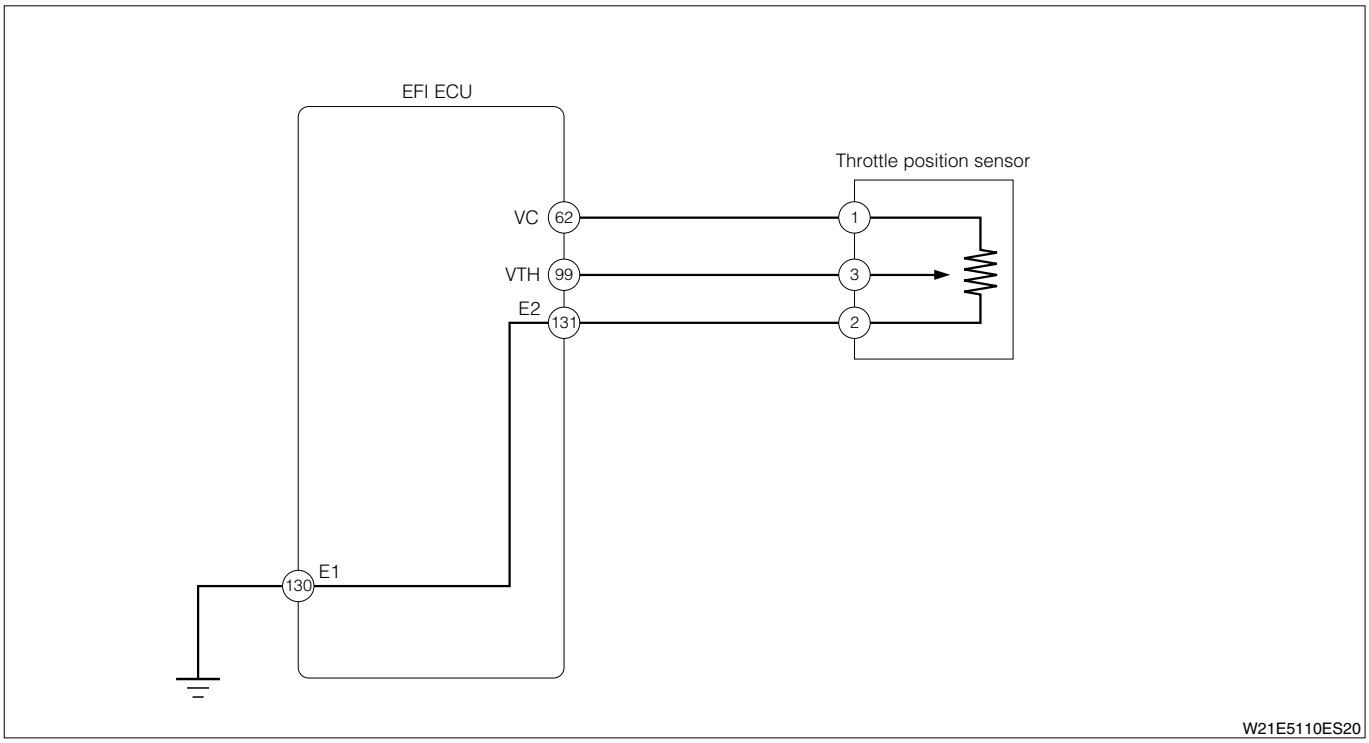
1. Carry out single unit checking of the water temperature sensor.
   Refer to Page B8-129.

   SPECIFIED VALUE: The water temperature sensor is normal.

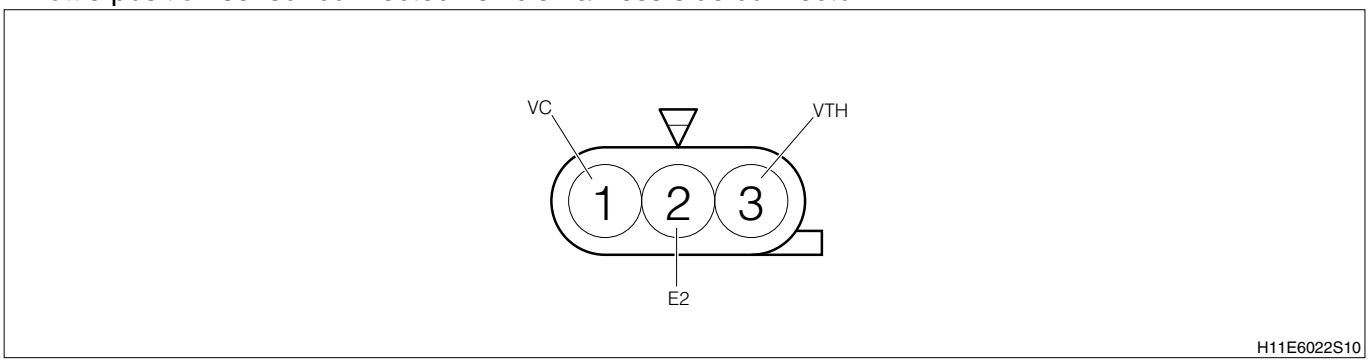
   ▼ If the result is OK, check the connecting state of the connectors at each section or the installation condition of the water temperature sensor.
   ▼ If the result is NG, replace the water temperature sensor.
   Refer to Page B8-5.

13-13-7 **P0120/41 THROTTLE POSITION SENSOR SIGNAL**

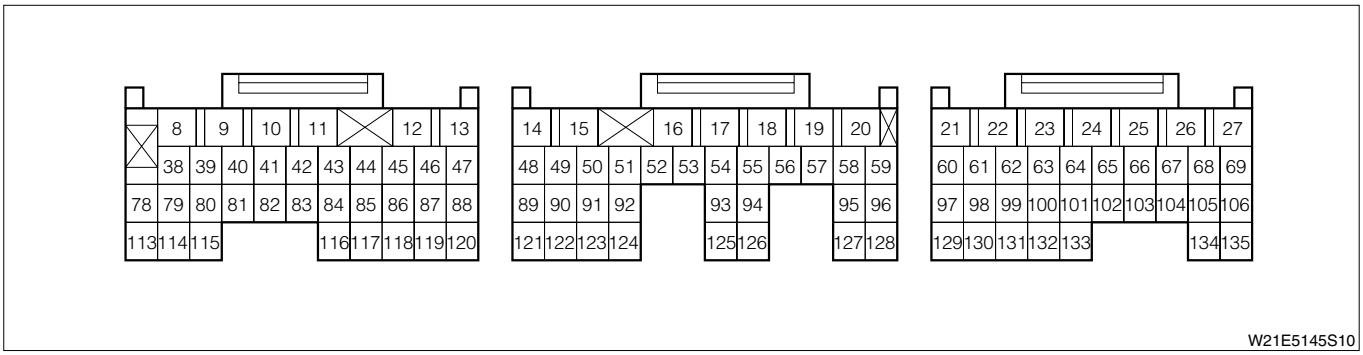
(1) **System diagram**



Throttle position sensor connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) **Output conditions**

1. When the signal from the throttle position sensor is not output for a certain length of time consecutively after the engine is started

(3) **Checking Points**

1. Signal from throttle position sensor input to the EFI ECU.
2. Harness and connectors linking the throttle position sensor and EFI ECU.
3. Power supply voltage for throttle position sensor.
4. Output signal of throttle position sensor.
5. EFI ECU

(4) **Check procedure**

∑1. Data monitor

1. Read from the data monitor [for relative throttle position sensor] using the DS－Ⅱ.
   SPECIFIED VALUE:

Condition of the accelerator pedal	Displayed data
Fully closed	0 to 20%
Fully opened	70 to 90%
Totally closed ⇄ totally opened	It varies in proportion to the throttle lever opening.

▼ If the result is OK, it is possible that the system has returned to the normal condition. Therefore, leave the system as it is to observe the condition for a while.
▼ If it is NG, go to ∑2.

∑2. Checking the signal unit of the throttle position sensor

1. Disconnect the connector of the throttle position sensor, and carry out the single unit checking of the throttle position sensor.
   Refer to Page B8-131.

SPECIFIED VALUE: The throttle position sensor is normal.

▼ If it is OK, go to ∑3.
▼ Replace throttle position sensor if faulty.
Refer to Page B8-9.

∑3. Throttle position sensor voltage checking

1. Disconnect the connector of the throttle position sensor.
2. With the ignition switch set to "ON", measure the voltage between the following terminals.
   (1) Between the throttle position sensor connected vehicle harness side connector 1 (VC) and body earth

SPECIFIED VALUE: 4.5 to 5.5V

▼ If it is OK, go to ∑4.
▼ If the result is the NG, check the EFI ECU circuit.
Refer to Page A1-32.

⊳4. Checking the wiring harness

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 62 (VC) linking the EFI ECU and the vehicle side harness connector 1 (VC) linking the throttle position sensor.
   (2) Between vehicle side harness connector 131 (E2) linking the EFI ECU and the vehicle side harness connector 2 (E2) linking the throttle position sensor.
   (3) Between vehicle side harness connector 99 (VTH) linking the EFI ECU and the vehicle side harness connector 3 (VTH) linking the throttle position sensor.
   (4) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the body ground connector.

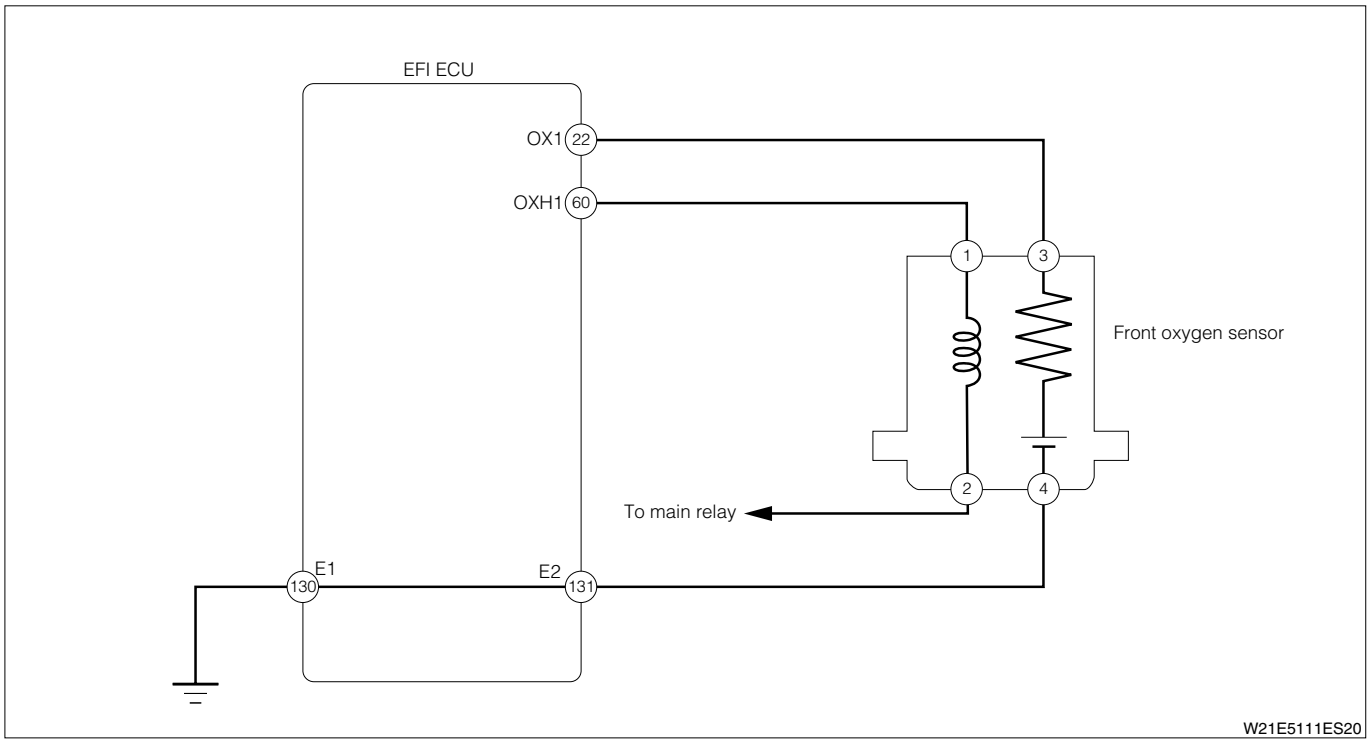
Refer to Page A1-31.

SPECIFIED VALUE: No abnormality exists.

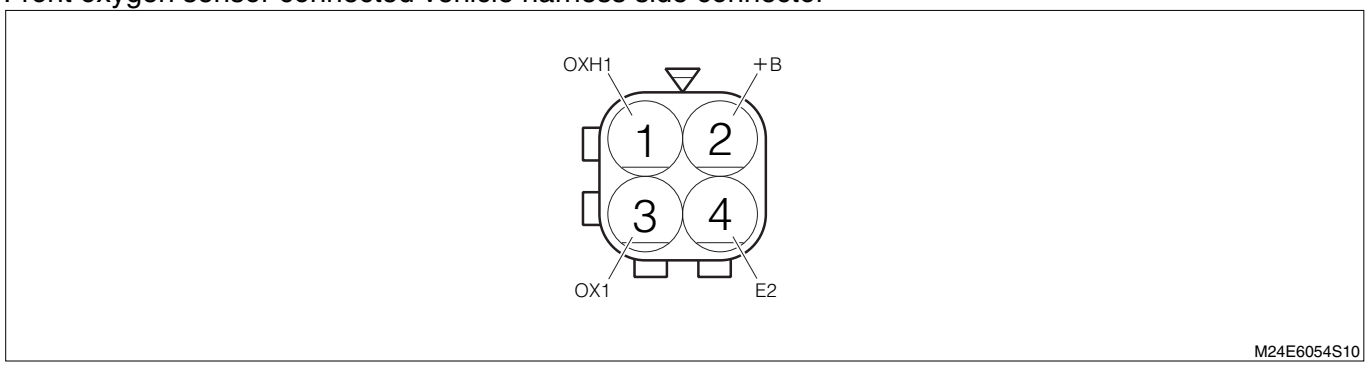
▼ If the result is OK, check the connecting state of the connectors at every section.
▼ If it is NG, repair or replace harness and connector at the faulty section.

13-13-8 P0130/21 FRONT OXYGEN SENSOR(RANGE,OPEN)

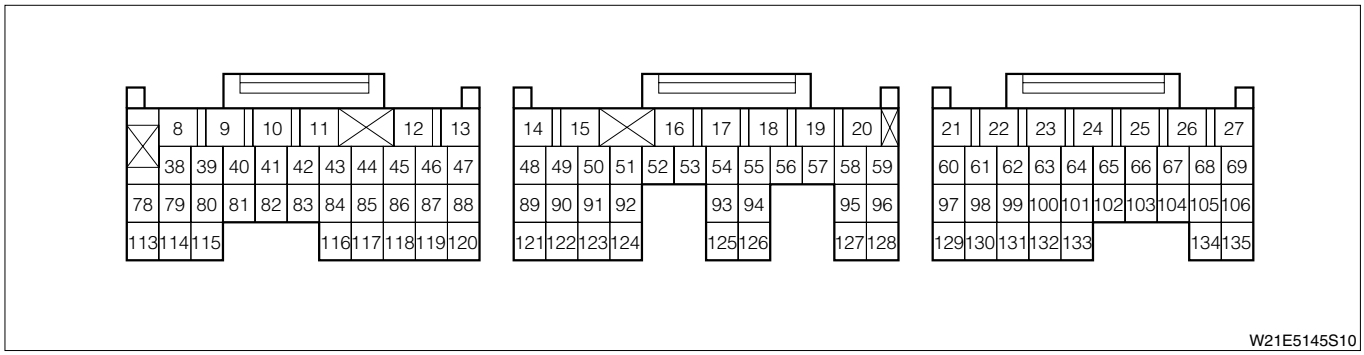
(1) System diagram



Front oxygen sensor connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) Output conditions

1. When the signal from the front oxygen sensor never reaches the rich side under the condition after the engine is warmed up in which the engine speed is maintained at 3000 rpm or higher and at the same time the power increase compensation at a value higher than the specified setting continued

(3) **Checking Points**

NOTE

- If this code has been output at the same time with another code, carry out the checking from the other code first.

1. Signal from the front oxgen sensor input to the EFI ECU.
2. Harness and connectors linking the front oxgen sensor and the EFI ECU.
3. Front oxgen sensor output signal (sensor is faulty if it sounds alarm continuously despite no obvious cause of lean A/F (high oxygen concentration in exhaust gas).
4. EFI ECU

(4) **Check procedure**

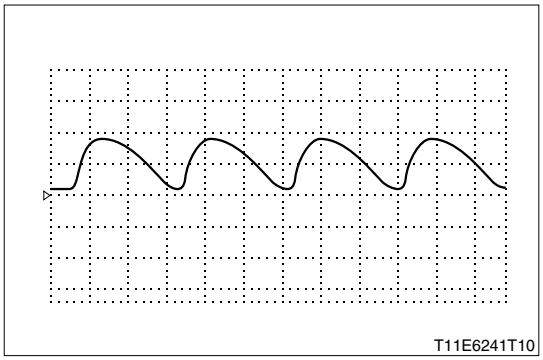
Σ1. Front oxygen sensor signal checking

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

2. Start the engine and keep it running at 3000 rpm for 4 minutes to activate the front oxygen sensor.
3. Use oscilloscope to monitor waveform output from the following connector.
   (1) Between SST22 (OX1) ~ SST130 (E1)

Time axis	200ms / DIV
Voltage axis	500mV / DIV
Condition	The Air conditioner set to "OFF"; no electric load applied; engine speed held at 3000 rpm

The condition under which the air conditioner is turned "OFF": the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".



NOTE

- Unable to identify waveform with the form shown in the figure (one example).

SPECIFIED VALUE: The 0⇄1V waveform is emitted when the front oxgen sensor is activated.

NOTE

- The signal from the front oxygen sensor cannot be checked for the correct output without using an oscilloscope.

▼ If it is OK, go to Σ2.

▼ If it is NG, go to Σ3.

∑2. Checking the wiring harness (1)

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 113 (EFI-T) linking the EFI ECU and the DLC connector 12 (EFI-T).
   (2) Between vehicle side harness connector 13 (W) linking the EFI ECU and the vehicle side harness connector 7 (CHK_E/G) linking the combination meter.

   SPECIFIED VALUE: No abnormality exists.

   ▼ If the result is OK, check the EFI ECU circuit and go to ∑5.
   Refer to Page A1-32.

   ▼ If the result is NG, repair or replace the harness and the connectors of the malfunctioning section and go to ∑5.

∑3. Checking the single unit of the front oxygen sensor

1. Carry out the single unit checking of the front oxygen sensor.
   Refer to Page B8-130.

   SPECIFIED VALUE: The front oxgen sensor is normal.

   ▼ If it is OK, go to ∑5.
   ▼ If the result is NG, replace the front oxygen sensor and go to ∑5.
   Refer to Page B8-12.

∑4. Checking the wiring harness (2)

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 22 (OX1) linking the EFI ECU and the vehicle side harness connector 3 (0X1) linking the front oxgen sensor.
   (2) Between vehicle side harness connector 131 (E2) linking the EFI ECU and the vehicle side harness connector 4 (E2) linking the front oxgen sensor.
   (3) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the ground connector.

   Refer to Page A1-31.

   SPECIFIED VALUE: No abnormality exists.

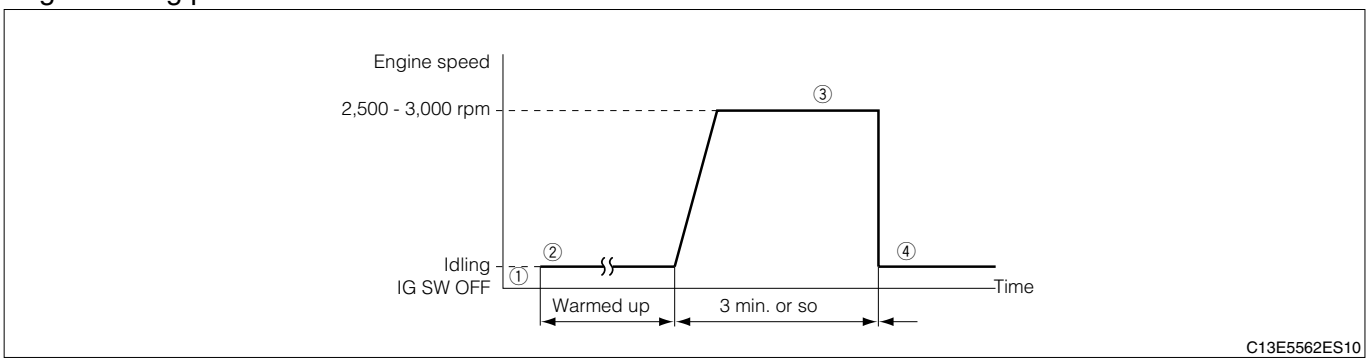
   ▼ If the result is OK, check the EFI ECU circuit and go to ∑5.
   Refer to Page A1-32.

   ▼ If the result is NG, repair or replace the harness and the connectors of the malfunctioning section and go to ∑5.

∑5. Confirmation test

1. By observing the following procedure, confirm that the diagnosis code is not output again.

Engine racing pattern



(1) Confirm the diagnosis code is not being output.
(2) Start the engine and warm it up until the radiator fan starts rotating.
(3) Maintain the engine speed at 2500 to 3000 rpm for approximately 3 minutes.
(4) After idling the engine for 1 minute, set the ignition switch to "LOCK", and carry out the above procedure from step (1) to (3).
(5) Confirm that the diagnosis code No. P0130/21 is not output.

NOTE

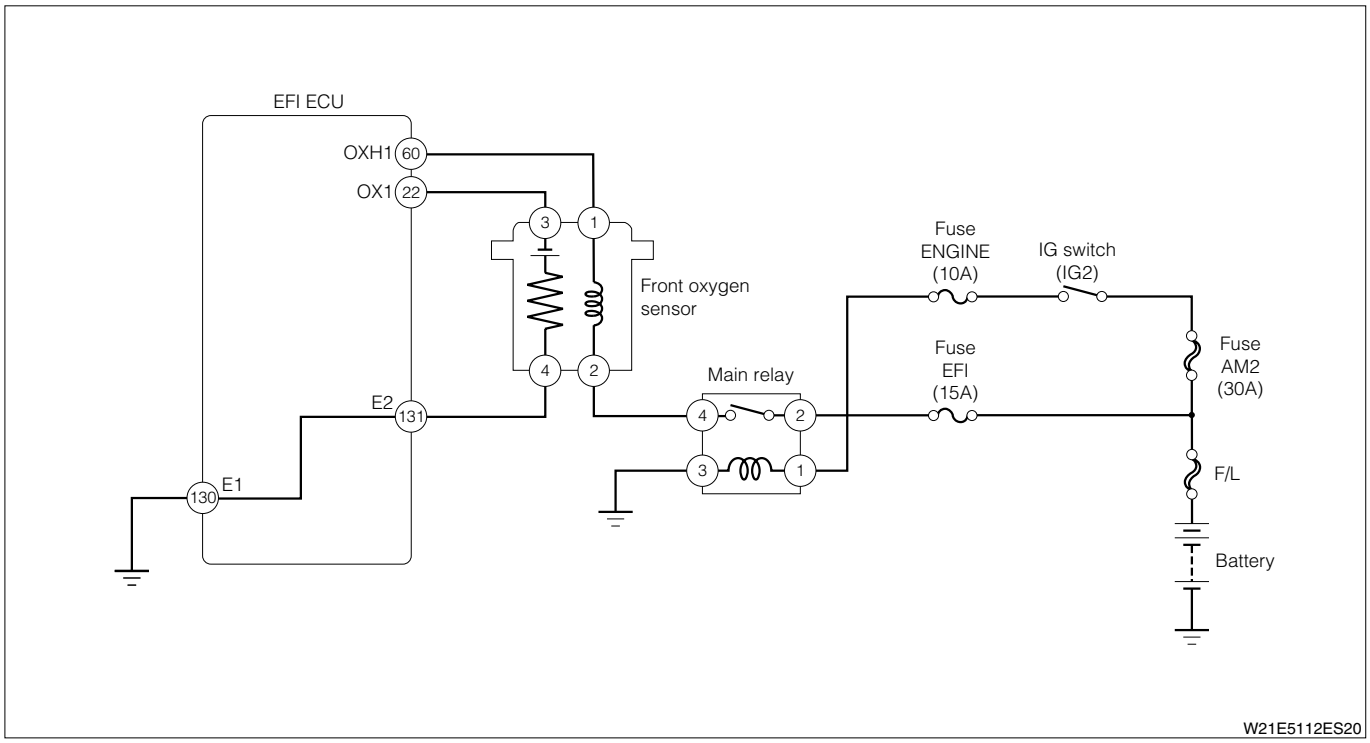
- If this test condition cannot be observed faithfully, this malfunction cannot be detected.

SPECIFIED VALUE: P0130/21 (front oxygen sensor signal system) is not output.

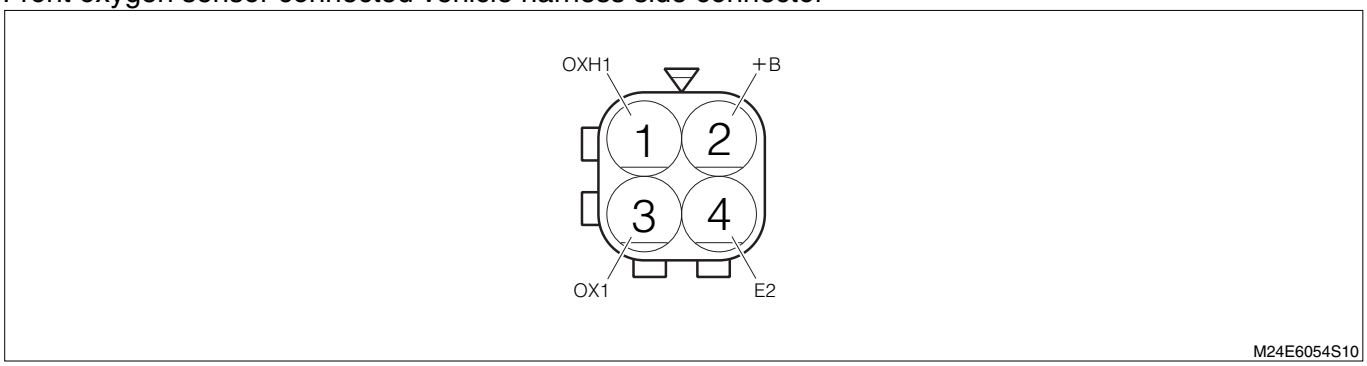
▼ If the result is OK, terminate the troubleshooting.
▼ If the result is NG, carry out the troubleshooting from ∑1 once again.

13-13-9 P0135/23 FRONT OXYGEN SENSOR HEATER SIGNAL

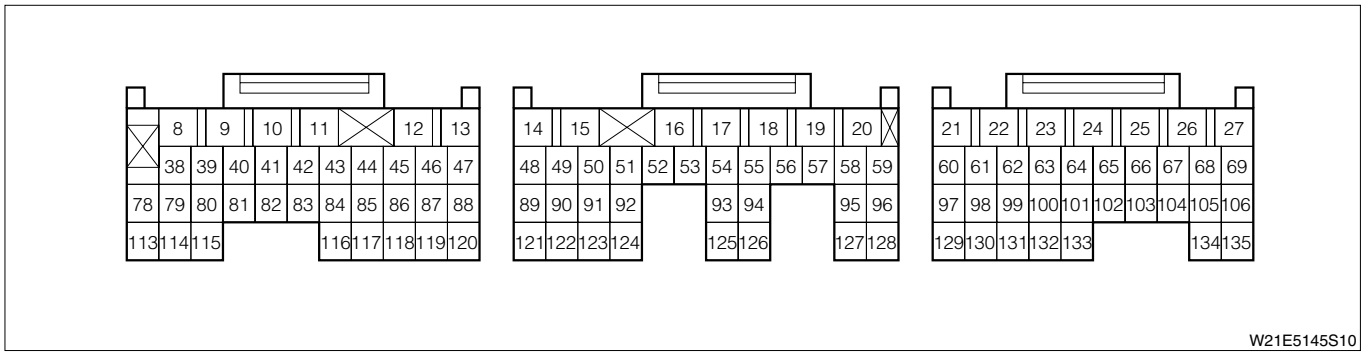
(1) System diagram



Front oxygen sensor connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) Output conditions

1. When front oxygen sensor heater system has a breaking of wire or a short−circuiting

(3) Checking Points

1. Heater signal input to the EFI ECU from the front oxgen sensor.
2. Harness and connectors linking the front oxgen sensor to the EFI ECU.
3. Disconnected lines or short-circuits in the front oxgen sensor heater system.
4. EFI ECU

(4) Check procedure

⊳1. Checking the single unit of the oxygen sensor

1. Carry out the single unit checking of the front oxygen sensor.
   Refer to Page B8-130.

   SPECIFIED VALUE: The front oxygen sensor is normal.

   ▼ If it is OK, go to ⊳2.
   ▼ If the result is NG, replace the malfunctioning oxygen sensor.
   Refer to Page B8-12.

⊳2. Oxygen sensor voltage checking

1. Disconnect the connector of the front oxygen sensor.
2. Set the ignition switch to "ON".
3. Measure the voltage between the following terminals.
   (1) Between the front oxygen sensor connected vehicle harness side connector 2 (+B) and the body earth.

   SPECIFIED VALUE: Battery voltage

   ▼ If it is OK, go to ⊳3.
   ▼ Inspect and repair as necessary the harness and relay between the battery and the front oxygen sensor if sensor is defective.

⊳3. EFI ECU signal checking

1. Connect the connector of the front oxygen sensor.
2. Connect SST.
   SST: 09842-97209-000

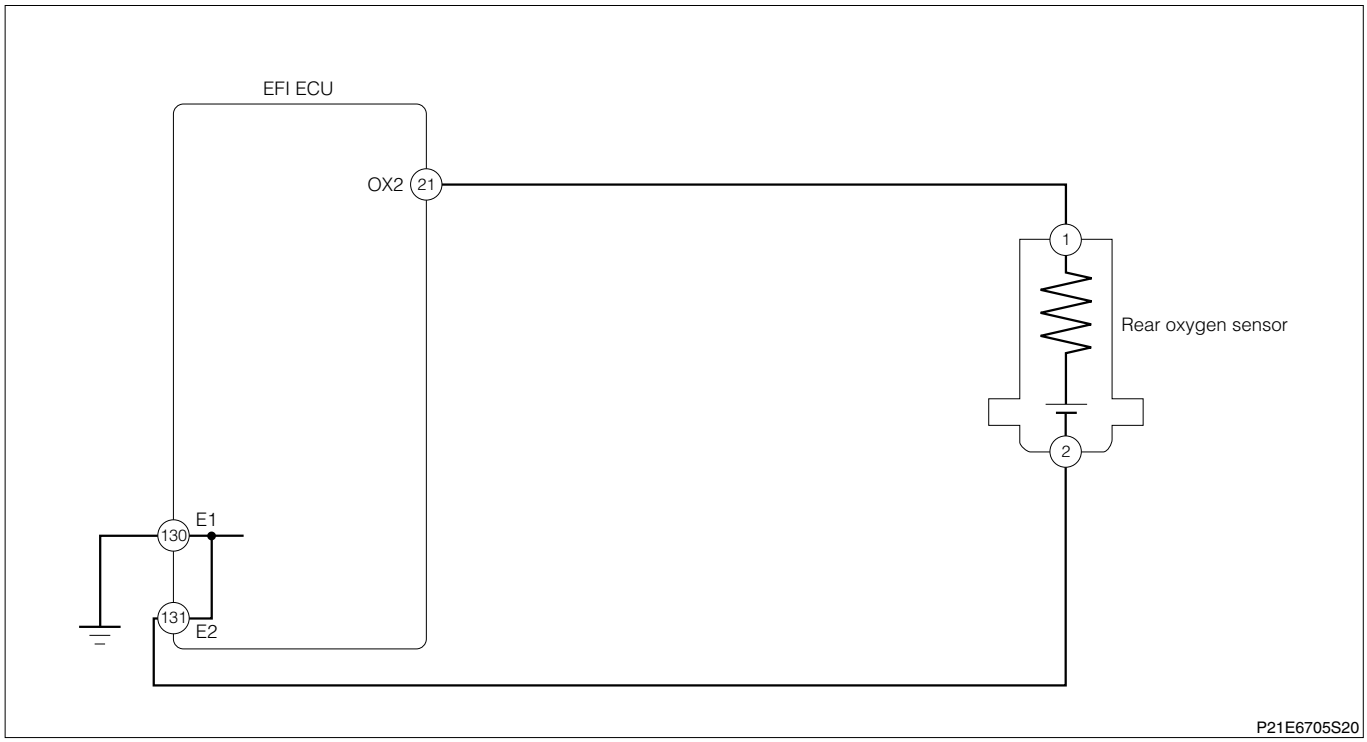
3. Measure the voltage between the following terminals after the engine is started when it is cold
   (1) Between SST60 (OXH1) and SST130 (E1)

   SPECIFIED VALUE: Around 0V

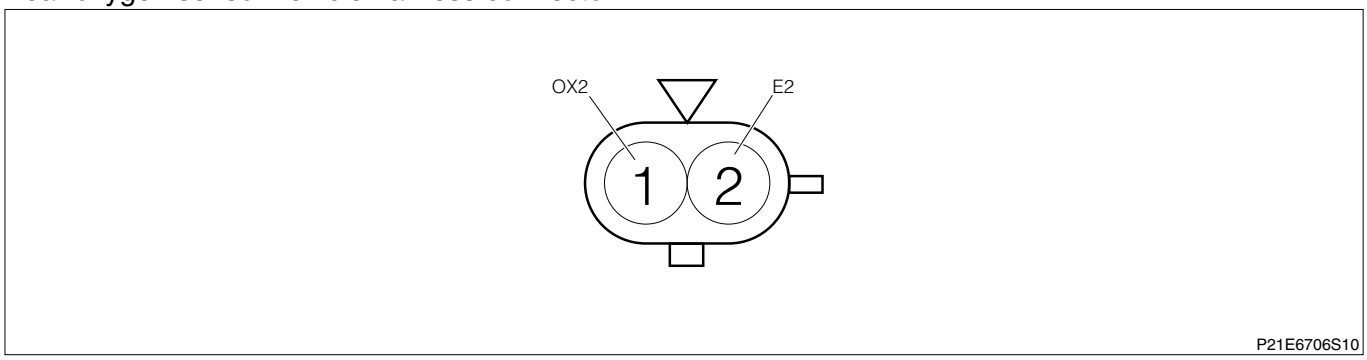
   ▼ If normal, inspect and repair as necessary the harness between the battery and the front oxygen sensor.
   ▼ If the result is NG, check the circuit of EFI ECU.
   Refer to Page A1-32.

13-13-10 P0136/22 REAR OXYGEN SENSOR SIGNAL

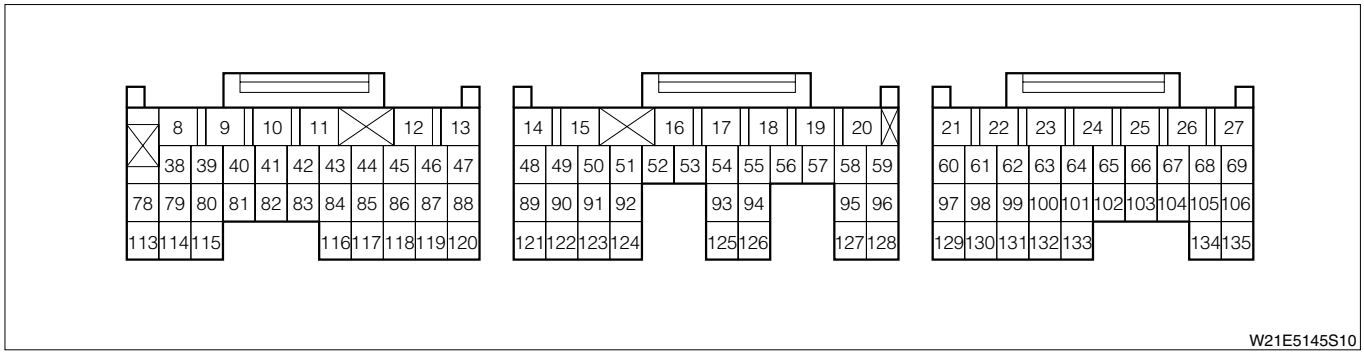
(1) System diagram



Rear oxygen sensor vehicle harness connector



EFI ECU vehicle harness connector



(2) Output conditions

1. When signals from the rear oxygen sensor never produce a rich mixture when the engine speed is 2000 rpm or more and the power increase compensation continues at a value higher than the specified value after warming the engine up.

(3) Checking points

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

(4) Checking procedure

Σ1. Data monitor

1. Race the engine for 5 minutes at 2000 rpm or more from when the rear oxygen sensor is cold.
2. Use the diagnosis tester to read the [Rear oxygen sensor output voltage] of the data monitor.

SPECIFIED VALUE:

Engine condition	Displayed data
From cold to warm	0 to 0.65 or more (rich mixture)
Turn the engine off and set the ignition switch to "ON".	0.55 or less*

*: Read when the rear oxygen sensor detects oxygen (lean mixture).

▼ If OK, check the EFI ECU circuit, and then proceed to step Σ4.
Refer to Page A1-32.

▼ If NG, proceed to step Σ2.

Σ2. Checking the rear oxygen sensor

1. Check the rear oxygen sensor.
   Refer to Page B8-130.

▼ If OK, proceed to step Σ3.
▼ If NG, replace the rear oxygen sensor, and then proceed to step Σ4.
Refer to Page B8-14.

Σ3. Checking the wire harness

1. Check between the following wire harnesses for an open circuit or a short circuit.
   (1) Between EFI ECU vehicle harness connector 21 (OX2) and rear oxygen sensor vehicle harness connector 1 (OX2)
   (2) Between EFI ECU vehicle harness connector 131 (E2) and rear oxygen sensor vehicle harness connector 4 (E2)
2. Between EFI ECU vehicle harness connector 130 (E1) and body ground
   Refer to Page A1-31.

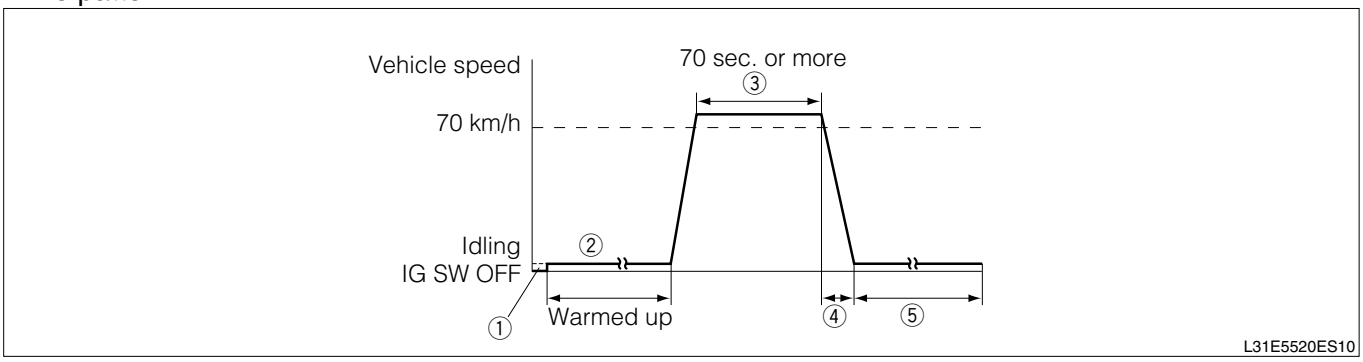
SPECIFIED VALUE: Normal

▼ If OK, proceed to step Σ4.
▼ If NG, repair or replace the harnesses and connectors that are faulty, and then proceed to step Σ4.

Σ4. Confirmation test

1. Follow the procedure described below to check that a diagnosis code is not output again.

Drive pattern



(1) Check the diagnosis code and check that a malfunction code is not output.
(2) Start the engine and let it warm up for 10 minutes or more until the temperature of the engine coolant is 90℃ or more. ②
(3) Accelerate from first to second until the vehicle speed reaches 70 km/h or more and run the vehicle at more than 70 km/h for at least 70 seconds. ③
(4) Release your foot from the accelerator pedal and let the vehicle decelerate for approximately 5 seconds without stepping on the brake. ④
(5) Let the engine idle. ⑤
(6) Without operating the ignition switch, repeat steps (1) to (5) three times.
(7) Set the ignition switch to "LOCK"
(8) Check that diagnosis code P0136/22 is not output.

NOTE

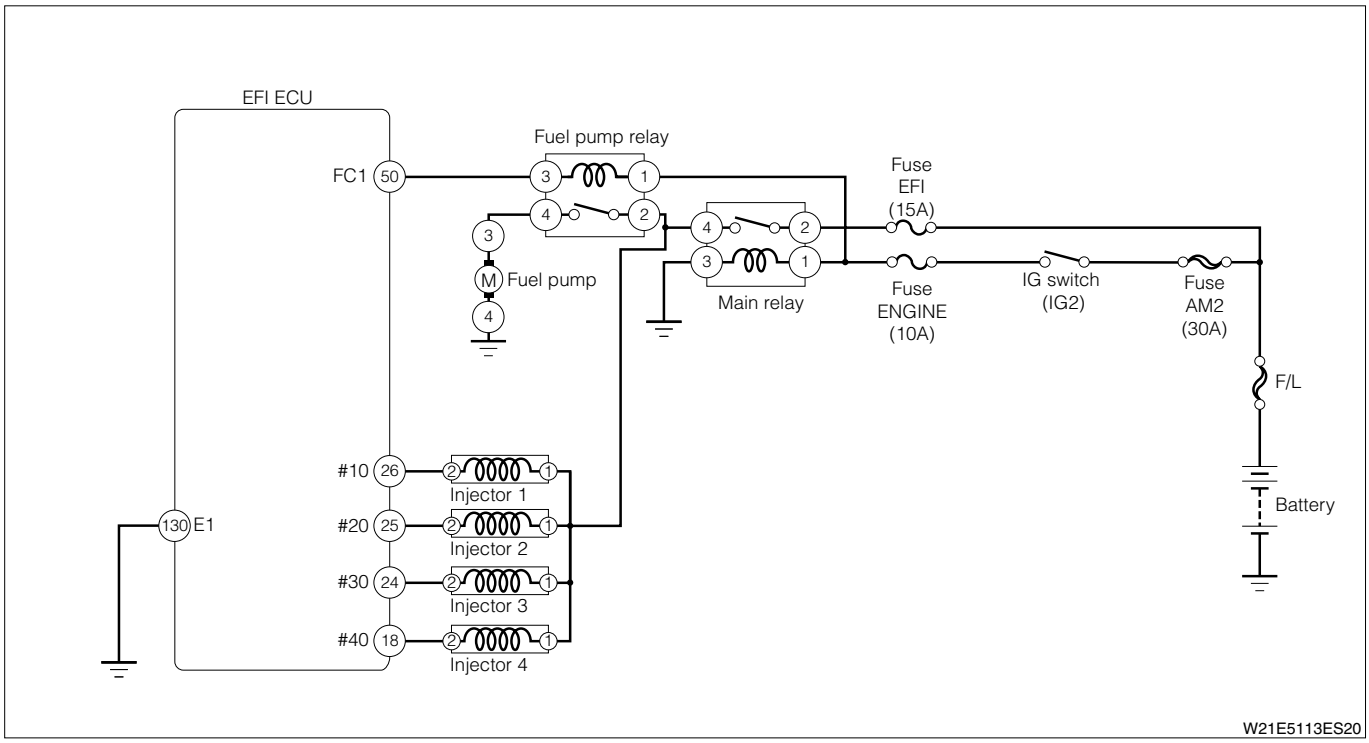
- If these test conditions are not executed correctly, these malfunctions cannot be detected.

SPECIFIED VALUE: P0136/22 (Rear oxygen sensor signal) is not output.

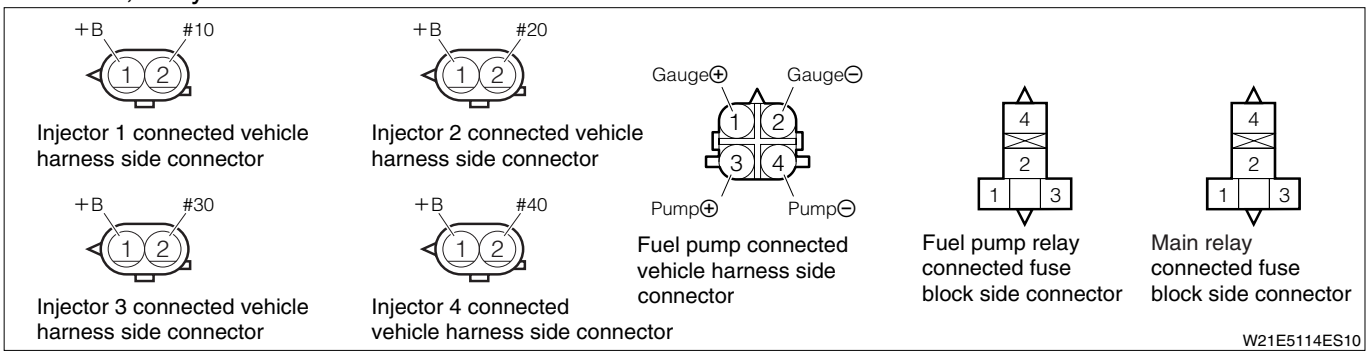
▼ If OK, the troubleshooting procedure is complete.
▼ If NG, perform the troubleshooting procedure again starting from step ∑1.

13-13-11 **P0171/25 FUEL SYSTEM (LEAN FAULTY),P0172/26 FUEL SYSTEM (RICH FAULTY)**

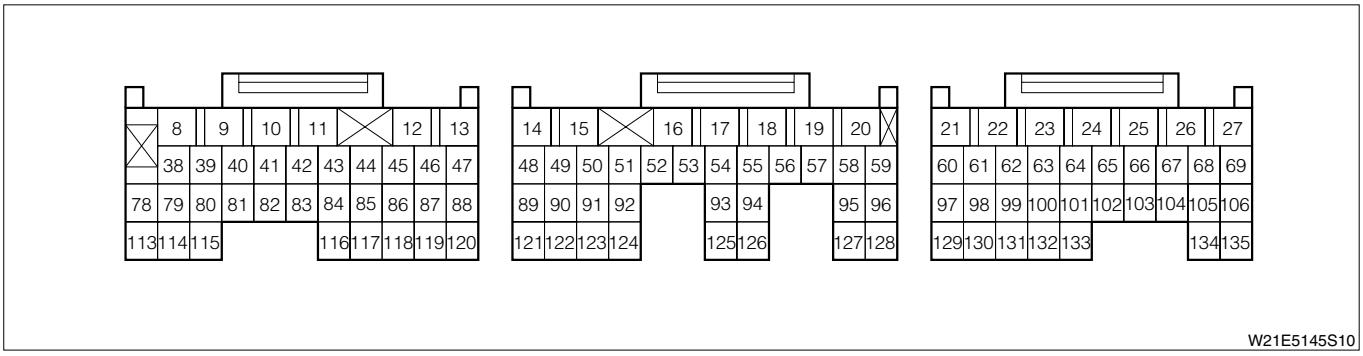
(1) **System diagram**



Each unit, relay etc. connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) **P0171/25 output condition**

1. When the calibration coefficient for one of the factors (lean air-fuel ratio) is fixed during air-fuel ratio feedback.

(3) **P0172/26 output condition**

1. When the calibration coefficient for the other factor (rich air-fuel ratio) is fixed during air-fuel ratio feedback.

(4) **Checking Points**

1. Fuel pressure
2. PCV valve
3. Injector
4. Ignition system
5. Front oxygen sensor
6. EFI ECU

(5) **Check procedure**

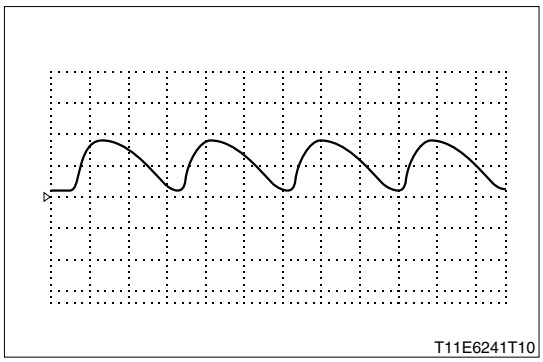
∑1. Front oxygen sensor signal checking

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

2. Start the engine and keep it running at 3000 rpm for 4 minutes to activate the front oxygen sensor.
3. Use oscilloscope to monitor waveform output from the following connector.
   (1) Between SST22 (OX1) ~ SST130 (E1)

Time axis	200ms / DIV
Voltage axis	500mV / DIV
Condition	The Air conditioner set to "OFF"; no electric load applied; engine speed held at 3000 rpm

The condition under which the air conditioner is turned "OFF": the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".



NOTE

- Unable to identify waveform with the form shown in the figure (one example).

SPECIFIED VALUE: The 0⇄1V waveform is emitted when the front oxgen sensor is activated.

NOTE

- The signal from the front oxygen sensor cannot be checked for the correct output without using an oscilloscope.

▼ If it is OK, go to ∑2.
▼ If the result is NG, go to ∑6.

∑2. PCV valve system checking

1. Carry out checking of the PCV valve and hoses.
   Refer to Page A1-14.

SPECIFIED VALUE: PCV valve and hoses are normal.

▼ If it is OK, go to ∑3.
▼ If the result is NG, repair or replace the malfunctioning section and go to ∑10.

∑3. Single unit checking of the spark plug

1. Carry out single unit checking of the spark plug.
   Refer to Page B1-1.

   SPECIFIED VALUE: Spark plugs are normal.

   ▼ If it is OK, go to ∑4.
   ▼ If the result is NG, replace the spark plug and go to ∑10.
   Refer to Page B10-2.

∑4. Injector system checking

1. Check the injector system.
   Refer to Page B8-133.

   SPECIFIED VALUE: Injector system is normal.

   ▼ If it is OK, go to ∑5.
   ▼ If the result is NG, repair the injector system and go to ∑10.

∑5. Fuel pressure checking

1. Carry out the fuel pressure checking.
   Refer to Page B8-127.

   SPECIFIED VALUE: Fuel pressure inspection shows normal.

   ▼ If the result is OK, check the EFI ECU circuit and go to ∑10.
   Refer to Page A1-32.

   ▼ If the result is NG, check and repair the following section and go to ∑10.
   (1) Fuel pump system
   (2) Fuel line

∑6. Front oxygen sensor signal checking

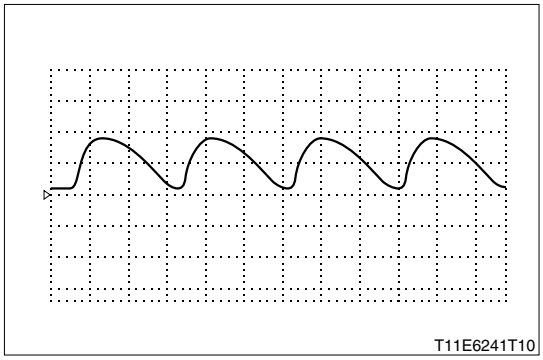
1. Connect the SST.
   SST: 09842-97209-000

2. Start the engine and keep it running at 3000 rpm for 4 minutes to activate the front oxygen sensor.

3. Use oscilloscope to monitor waveform output from the following connector.
   (1) Between SST22 (OX1) and SST130 (E1)

Time axis	200ms / DIV
Voltage axis	500mV / DIV
Condition	The air conditioner set to "OFF"; no electric load applied; engine speed held at 3000 rpm

The condition under which the air conditioner is turned "OFF," and the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF."



NOTE
- Unable to identify waveform with the form shown in the figure (one example) to the right.

SPECIFIED VALUE: The 0⇄1V waveform is emitted when the front oxgen sensor is activated.

NOTE
- The signal from the front oxygen sensor cannot be checked for the correct output without using an oscilloscope.

▼ If the result is OK, go to ⋗7.
▼ If the result is NG, go to ⋗8.

⋗7. Checking the wiring harness (1)

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 113 (EFI-T) linking the EFI ECU and the DLC connector 12 (EFI-T).
   (2)

SPECIFIED VALUE: No abnormality exists

▼ If the result is OK, check the EFI ECU circuit and go to ⋗10.
Refer to Page A1-32.

▼ If the result is NG, repair or replace the harness and the connectors of the malfunctioning section and go to ⋗10.

⋗8.Checking of the single unit of the front oxygen sensor.

1. Carry out the single unit checking of the front oxygen sensor.
Refer to Page B8-130.

SPECIFIED VALUE: The front oxgen sensor is normal.

▼ If the result is OK, go to ⋗9.
▼ If the result is NG, replace the front oxygen sensor and go to ⋗10.
Refer to Page B8-12.

Σ9. Checking the wiring harness(2)

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 22 (OX1) linking the EFI ECU and the vehicle side harness connector 3 (OX1) linking the front oxgen sensor.
   (2) Between vehicle side harness connector 131 (E2) linking the EFI ECU and the vehicle side harness connector 4 (E2) linking the front oxgen sensor.
   (3) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the ground connector.

   Refer to Page A1-31.

   SPECIFIED VALUE: No abnormality exists

   ▼ If the result is OK, check the EFI ECU circuit and go to Σ10.

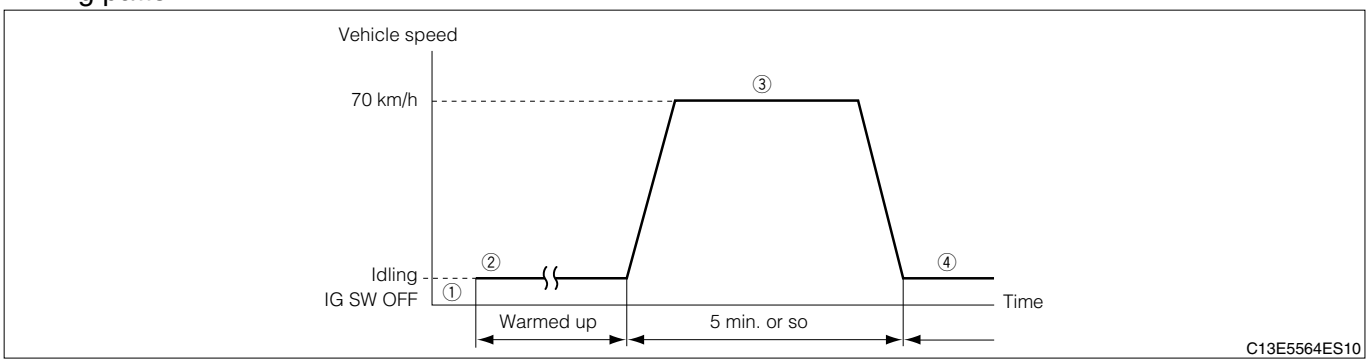
   Refer to Page A1-32.

   ▼ If the result is NG, repair the malfunctioning harness and the connectors or replace them with new items, go to Σ10.

Σ10. Confirmation test

1. By observing the following procedure, confirm that the diagnosis code is not output again.

Driving pattern



   (1) Confirm the diagnosis code is not being output.
   (2) Start the engine and warm it up for 5 minutes or more until the temperature of the engine cooling water reaches 90℃ or higher.
   (3) Put the gear lever into the 5th gear or select [D] range, and drive the vehicle for 5minutes or more at a speed of 70 km/h or higher.
   (4) Let the vehicle idle for 1 minute or longer.
   (5) Set the ignition switch to "LOCK". Carry out the above (2) to (4) once again.
   (6) Confirm that the diagnosis code No. P0171/52 or No.P172/26 is not output.

   NOTE

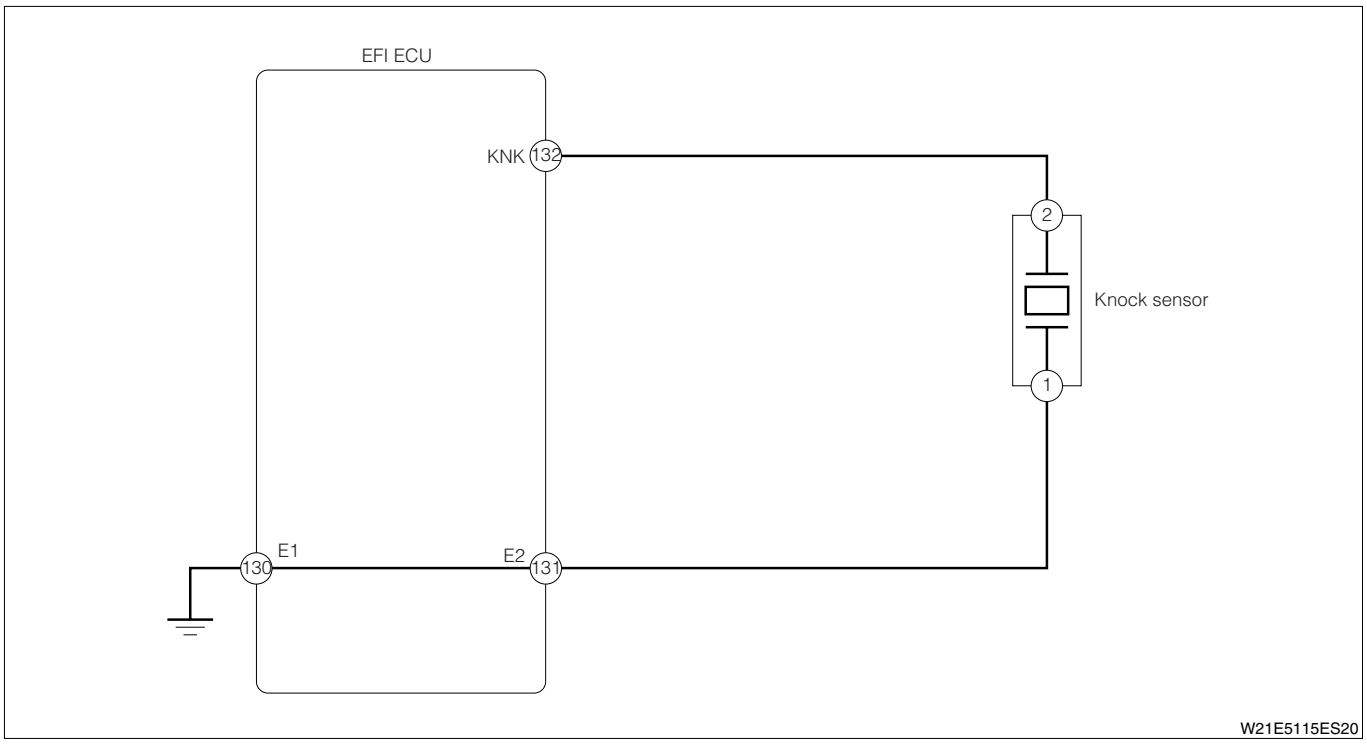
   • If this test condition cannot be observed faithfully, this malfunction cannot be detected.

   SPECIFIED VALUE: P0171/25 (Fuel system (lean faulty)) or P0172/26 (Fuel system (rich faulty)) not output

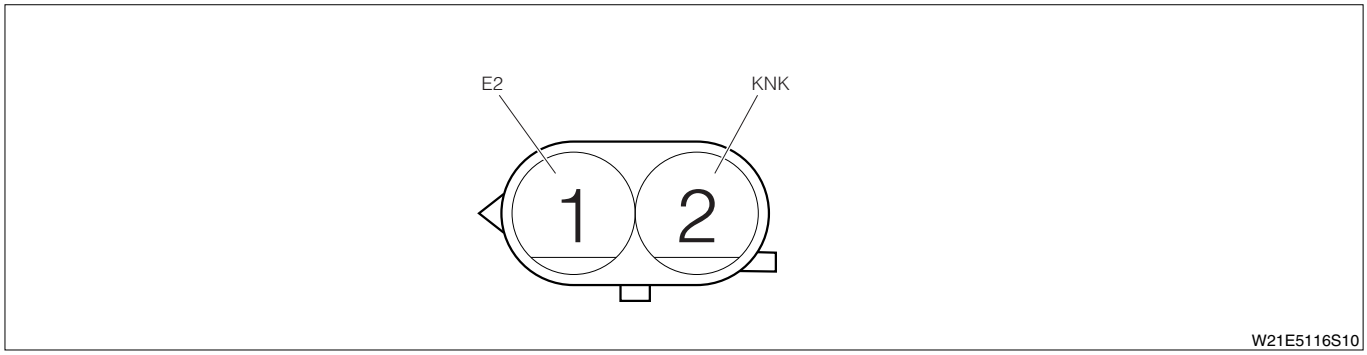
   ▼ If the result is OK, terminate the troubleshooting.
   ▼ If the result is NG, carry out the troubleshooting from Σ1 once again.

13-13-12 P0325/18B VIBRATING-TYPE KNOCK SENSOR SIGNAL

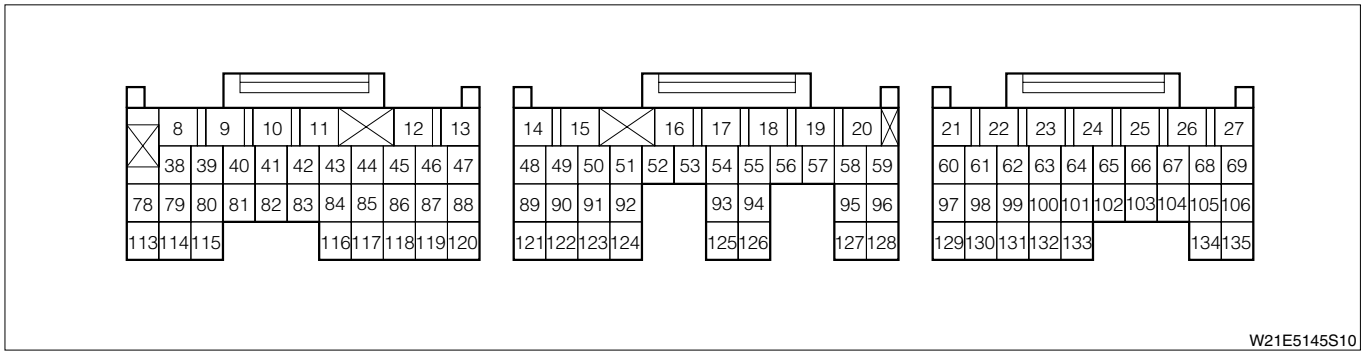
(1) System diagram



Knock sensor connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) Output conditions

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

(3) Check point

1. Signal from knock sensor input to the EFI ECU.
2. Harness and connectors linking the knock sensor to the EFI ECU.
3. Knock sensor output signal
4. EFI ECU

(4) **Check procedure**

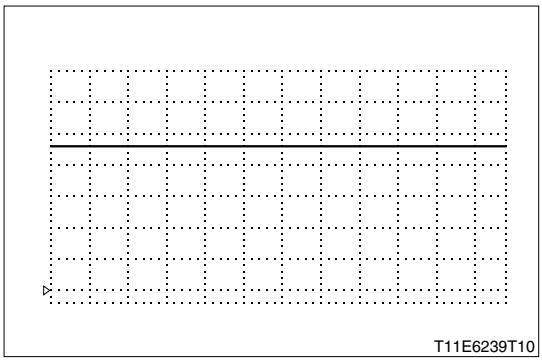
∑1. Checking the EFI ECU signal

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

2. Start the engine.
3. Use an oscilloscope to measure the waveform emitted from the following connector.
   (1) Between SST132 (KNK) and SST130 (E2)

Time axis	50μs / DIV
Voltage axis	500mV / DIV
Condition	When the air conditioner turned "OFF", no electric load, and while idling

The condition under which the air conditioner is turned "OFF": the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".

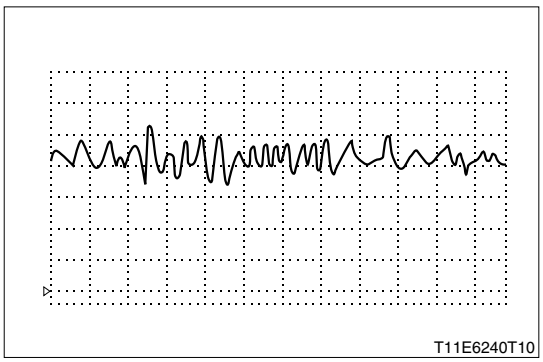

T11E6239T10

NOTE

- Unable to identify waveform with the form shown in the figure (one example) to the right.

Time axis	50μs / DIV
Voltage axis	500mV / DIV
Condition	When the air conditioner turned "OFF", no electric load, and while racing

The condition under which the air conditioner is turned "OFF": the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".


T11E6240T10

NOTE

- Unable to identify waveform with the form shown in the figure (one example) to the right.

SPECIFIED VALUE: Waveforms are supplied for the idling time and the racing time, respectively.

▼ If the result is OK, check the EFI ECU circuit.
Refer to Page A1-32.

▼ If it is NG, go to ∑2.

∑2. Checking the wire harness

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 131 (E2) linking the EFI ECU and the vehicle side harness connector 1 (E2) linking the knock sensor.
   (2) Between vehicle side harness connector 132 (KNK) linking the EFI ECU and the vehicle side harness connector 2 (KNK) linking the front oxgen sensor.
   (3) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the ground connector.

   Refer to Page A1-31.

   SPECIFIED VALUE: No abnormality exists.

▼ If it is OK, go to ∑3.
▼ If it is NG, repair or replace harness and connector at the faulty section.

⌦3. Checking the signal unit of the knock sensor.

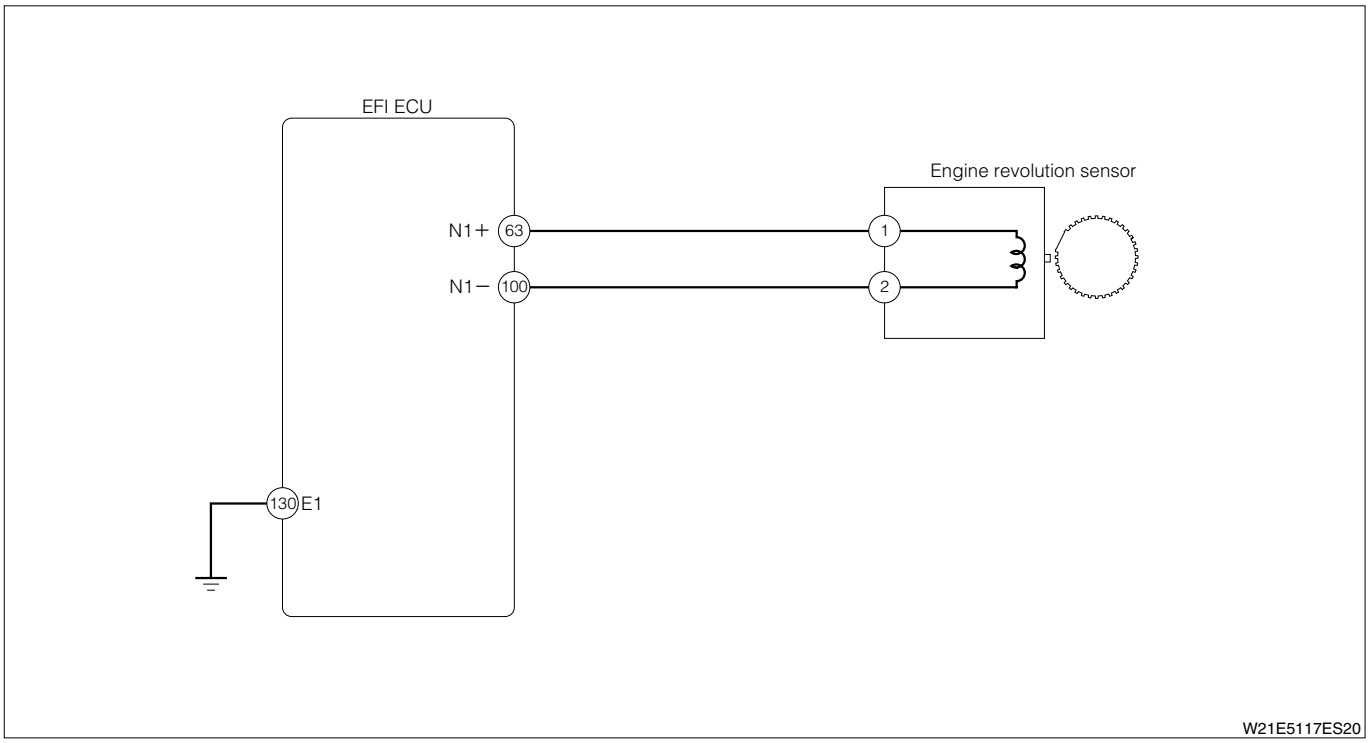
1. Carry out the single unit checking of the knock sensor.
   Refer to Page B8-130.

   SPECIFIED VALUE: The knock sensor is normal.

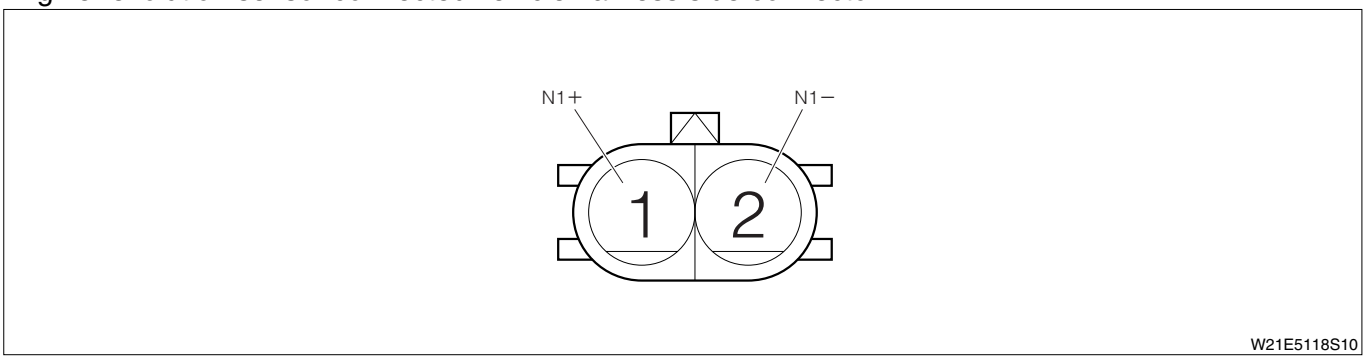
   ▼ If the result is OK, check the connecting state of the connector at each section or the installation condition of the knock sensor.
   ▼ If the result is NG, replace knock sensor.
   Refer to Page B8-4.

13-13-13 P0335/13 ENGINE REVOLUTION SENSOR SIGNAL

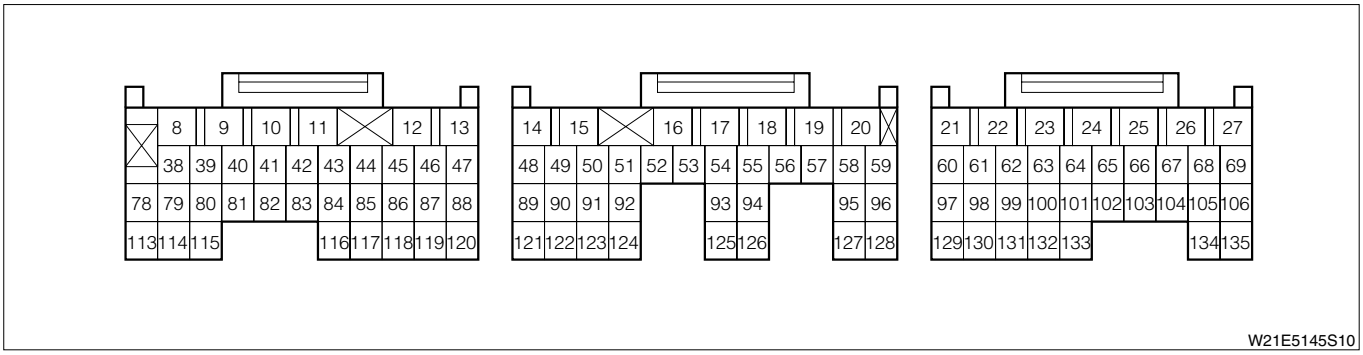
(1) System diagram



Engine revolution sensor connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) Output conditions

1. If no revolution speed signal is input while cranking is continued for several seconds

(3) Checking Points

1. Signal from the engine RPM sensor input to the EFI ECU.
2. Harness and connectors linking the engine RPM sensor to the EFI ECU.
3. Engine RPM sensor output signal
4. EFI ECU

(4) **Check procedure**

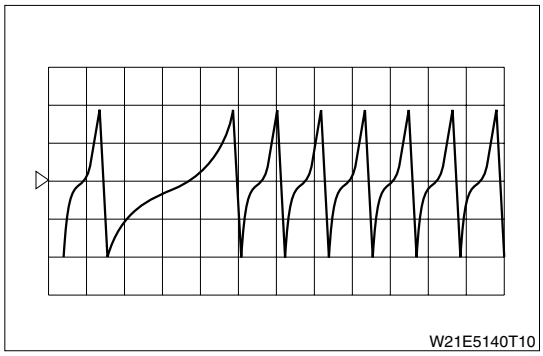
≫1. Checking the EFI ECU signal

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

2. Use an oscilloscope to measure the waveform emitted from the following connector.
   (1) Between SST68 (N1+) and SST100 (N1−)

Time axis	10ms /DIV
Voltage axis	2V / DIV
Condition	The air conditioner is turned "OFF": no electric load applied; when the engine is "idling."

The condition under which the air conditioner is turned "OFF": the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".



NOTE

- Unable to identify waveform with the form shown in the figure (one example) to the right.

SPECIFIED VALUE: Waveform cycle shortens as engine RPMs increase when regular waveform is emitted.

▼ If the result is OK, check the EFI ECU circuit.
Refer to Page A1-32.

▼ If it is NG, go to ≫2.

≫2. Checking the wire harness

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 63 (N1+) linking the EFI ECU and the vehicle side harness connector 1 (N1+) linking the engine RPM sensor.
   (2) Between vehicle side harness connector 100 (N1−) linking the EFI ECU and the vehicle side harness connector 2 (N1−) linking the engine RPM sensor.
   (3) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the body ground connector.

   Refer to Page A1-31.

   SPECIFIED VALUE: No abnormality exists.

   ▼ If it is OK, go to ≫3.
   ▼ If it is "NG" repair or replace harness and connector at the faulty section.

≫3. Checking the single unit of the engine revolution sensor

1. Carry out the single unit checking of the engine revolution sensor.
   Refer to Page B8-129.

   SPECIFIED VALUE: The engine RPM sensor is normal.

   ▼ If it is OK, go to ≫4.
   ▼ If the result is NG, replace the engine revolution sensor.
   Refer to Page B8-2.

⊳4. Checking the signal rotor

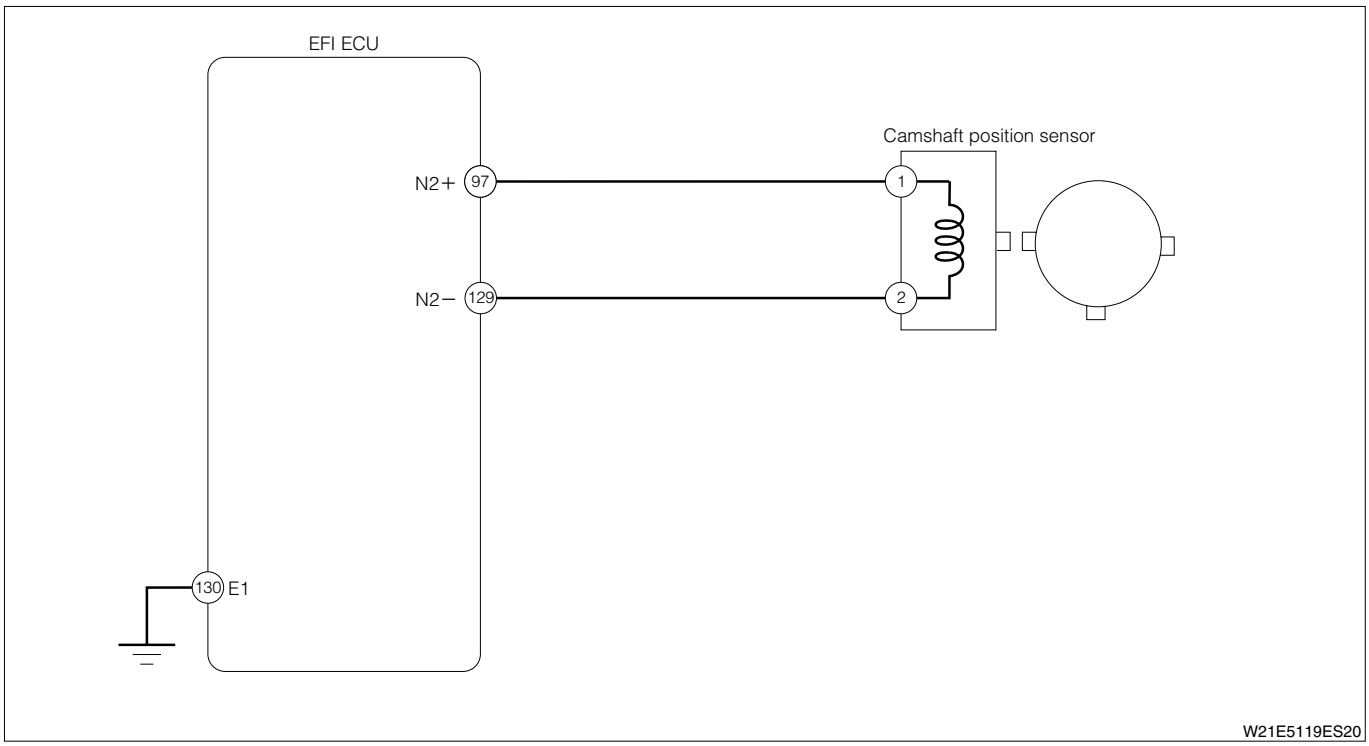
1. Visually check the signal rotor section of the crank shaft for any missing teeth or deformation.
   SPECIFIED VALUE: No missing teeth or deformation

▼ If the result is OK, check the connecting status of the connectors at each section or the installation condition of the engine revolution sensor.

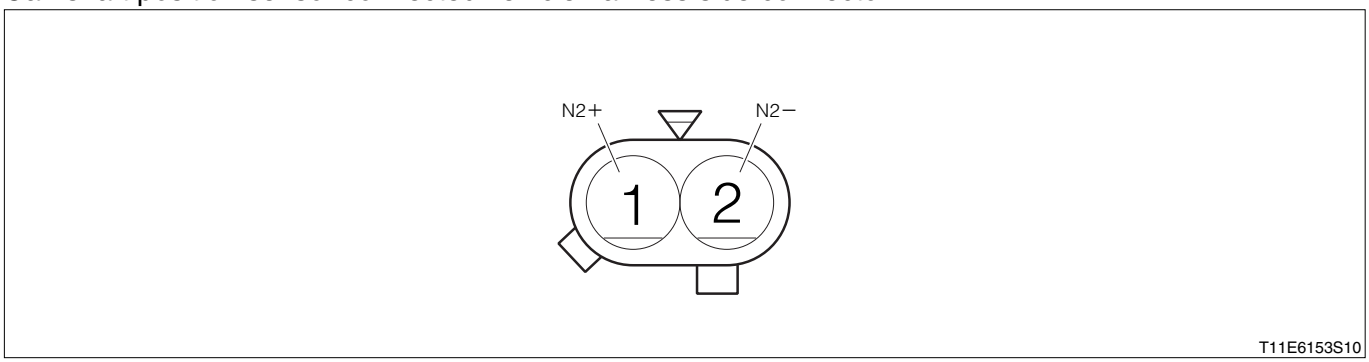
▼ If the result is NG, replace the signal rotor .

13-13-14 P0340/14 CAMSAFT POSITION SENSOR SIGNAL

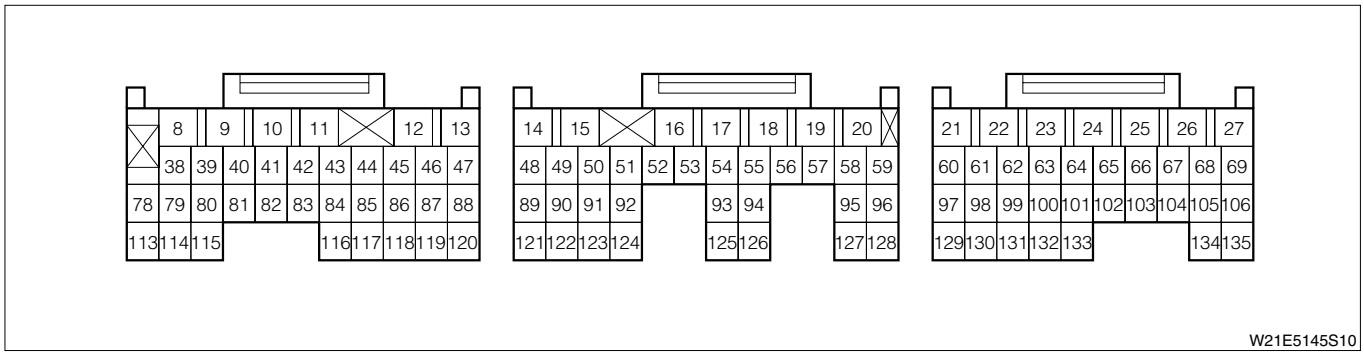
(1) System diagram



Camshaft position sensor connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) Output conditions

1. When the signal from the camshaft position sensor is not outputted consecutively for a certain length of time after the engine is started

(3) Checking Points

1. Signal from camshaft position sensor input to the EFI ECU.
2. Harnesses and connectors linking the camshaft position sensor to the EFI ECU.
3. Output signal from the camshaft position sensor
4. EFI ECU

(4) **Check procedure**

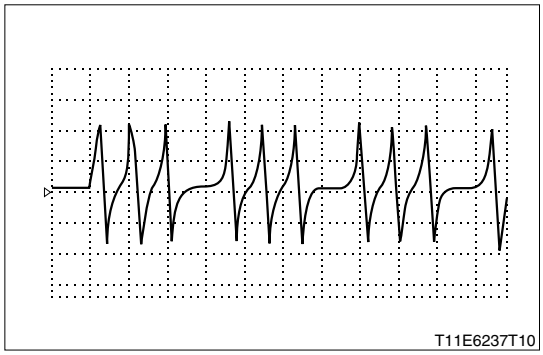
∑1. Checking the EFI ECU output signal

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

2. Use an oscilloscope to measure the waveform emitted from the following connector.
   (1) Between SST97 (N2+) and SST129 (N2−)

Time axis	50ms / DIV
Voltage axis	1V / DIV
Condition	The air conditioner is turned "OFF": no electric load applied; when the engine is "idling."

The condition under which the air conditioner is turned "OFF," and the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF."



NOTE

- Unable to identify waveform with the form shown in the figure (one example) to the right.

SPECIFIED VALUE: Waveform cycle shortens as engine RPMs increase when regular waveform is emitted.

▼ If the result is OK, it is possible that the system has returned to the normal condition. Therefore, leave the system as it is to observe the condition for a while.

▼ If it is NG, go to ∑2.

∑2. Checking the wire harness

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 97 (N2+) linking the EFI ECU and the vehicle side harness connector 1 (N2+) linking the engine RPM sensor.
   (2) Between vehicle side harness connector 129 (N2−) linking the EFI ECU and the vehicle side harness connector 2 (N2−) linking the engine RPM sensor.
   (3) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the body ground connector.

Refer to Page A1-31.

SPECIFIED VALUE: No abnormality exists.

▼ If it is OK, go to ∑3.

▼ If the result is NG, repair the malfunctioning harness and the connectors or replace them with new items.

∑3. Checking the single unit of the camshaft position sensor

1. Carry out the single unit checking of the camshaft position sensor.

Refer to Page B8-129.

SPECIFIED VALUE: The camshaft position sensor is normal.

▼ If it is OK, go to ∑4.

▼ If the result is NG, replace the camshaft position sensor.

Refer to Page B8-3.

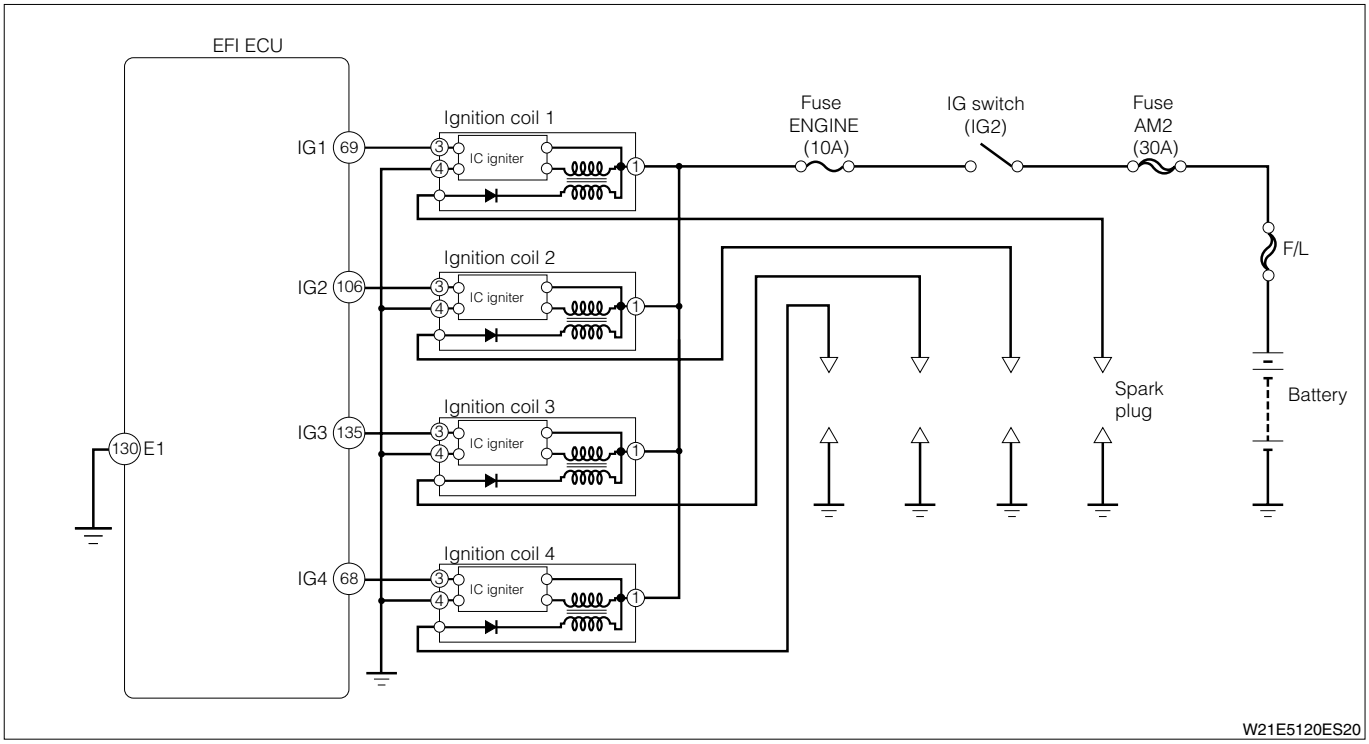
⌦4. Checking the cam shaft

1. Visually check the signal rotor section of the cam shaft for any missing teeth or deformation.
   SPECIFIED VALUE: No missing teeth or deformation

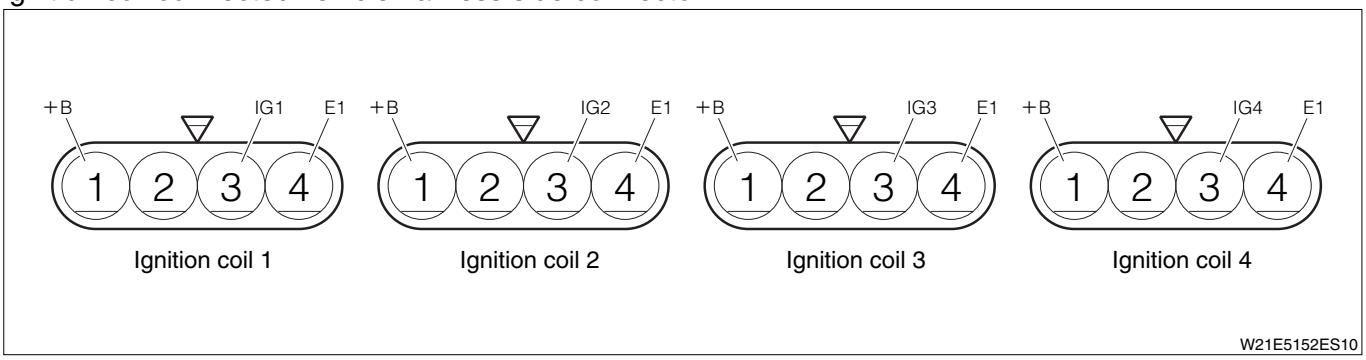
▼ If the result is OK, check the connecting status of the connectors at each section or the installation condition of the camshaft position sensor.
▼ If the result is NG, replace the cam shaft.

13-13-15 P0350/16 IGNITION SYSTEM (PRIMARY)

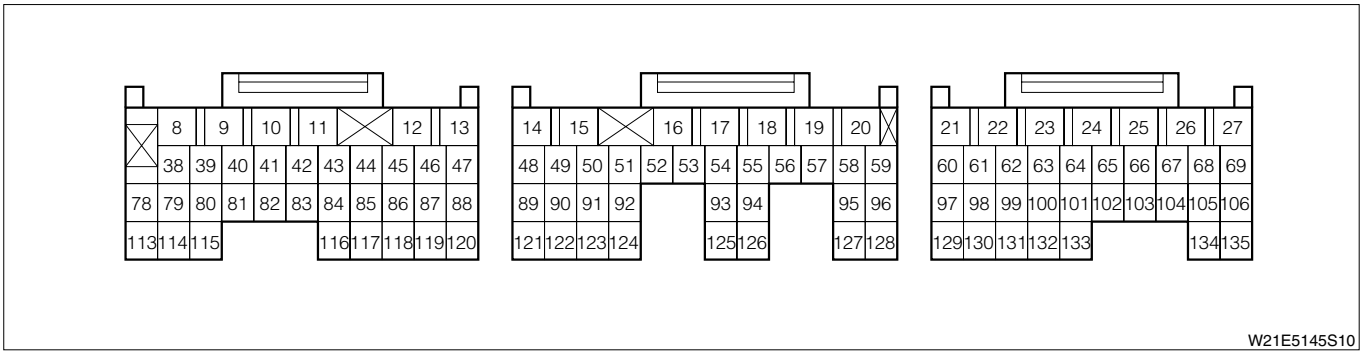
(1) System diagram



Ignition coil connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) Output conditions

1. When the ignition signal is not outputted consecutively for a certain length of time after the engine is started

(3) Checking Points

1. Ignition coil power supply voltage
2. Harness and connectors linking the ignition coil to the EFI ECU.
3. Spark from spark plugs.

(4) **Check procedure**

∑1. Spark check

1. Check the spark check.
   Refer to Page B8-35.

   SPECIFIED VALUE: Sparks are generated.

   ▼ If the result is OK, the ignition system is normal.
   ▼ If it is NG, go to ∑2.

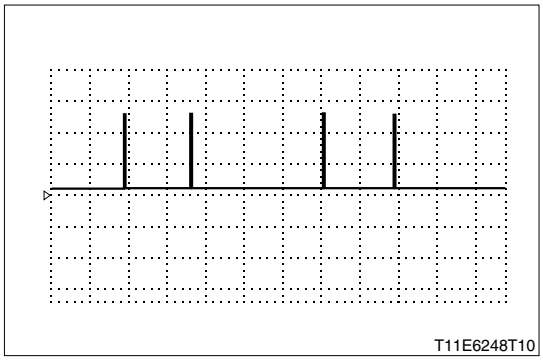
∑2. Checking the EFI ECU output signal

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

2. Use an oscilloscope to measure the waveform emitted from the following connector.
   (1) Between SST69 (IG1) and SST130 (E1)
   (2) Between SST106 (IG2) and SST130 (E1)
   (3) Between SST135 (IG3) and SST130 (E1)
   (4) Between SST68 (IG4) and SST130 (E1)

Time axis	100ms / DIV
Voltage axis	2V / DIV
Condition	The air conditioner is turned "OFF": no electric load applied; when the engine is "idling."

The condition under which the air conditioner is turned "OFF": the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".



NOTE

- Unable to identify waveform with the form shown in the figure (one example) to the right.
- The ignition signal cannot be checked correctly without using an oscilloscope.

SPECIFIED VALUE: Waveform cycle shortens as engine RPMs increase in response to 0 ⇄ 5V pulse.

▼ If it is OK, go to ∑3.
▼ If the result is NG, check the EFI ECU circuit.
Refer to Page A1-32.

∑3. Checking the ignition coil voltage

1. Measure the voltage between the following connectors while the ignition switch is On.
   (1) Between each ignition coil connected vehicle harness side connector 1 (+B) and the body earth

   SPECIFIED VALUE: Battery voltage

   ▼ If it is OK, go to ∑4.
   ▼ If faulty, repair or replace as necessary the harnesses and connectors linking the ignition coils to the battery.

⊳4. Checking the wiring harness

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 69 (IG1) linking the EFI ECU and the vehicle side harness connector 3 (IG1) linking ignition coil 1.
   (2) Between vehicle side harness connector 106 (IG2) linking the EFI ECU and the vehicle side harness connector 3 (IG2) linking ignition coil 1.
   (3) Between vehicle side harness connector 135 (IG3) linking the EFI ECU and the vehicle side harness connector 3 (IG3) linking ignition coil 1.
   (4) Between vehicle side harness connector 68 (IG4) linking the EFI ECU and the vehicle side harness connector 3 (IG4) linking ignition coil 1.
   (5) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the body ground connector.

Refer to Page A1-31.

SPECIFIED VALUE: No abnormality exists.

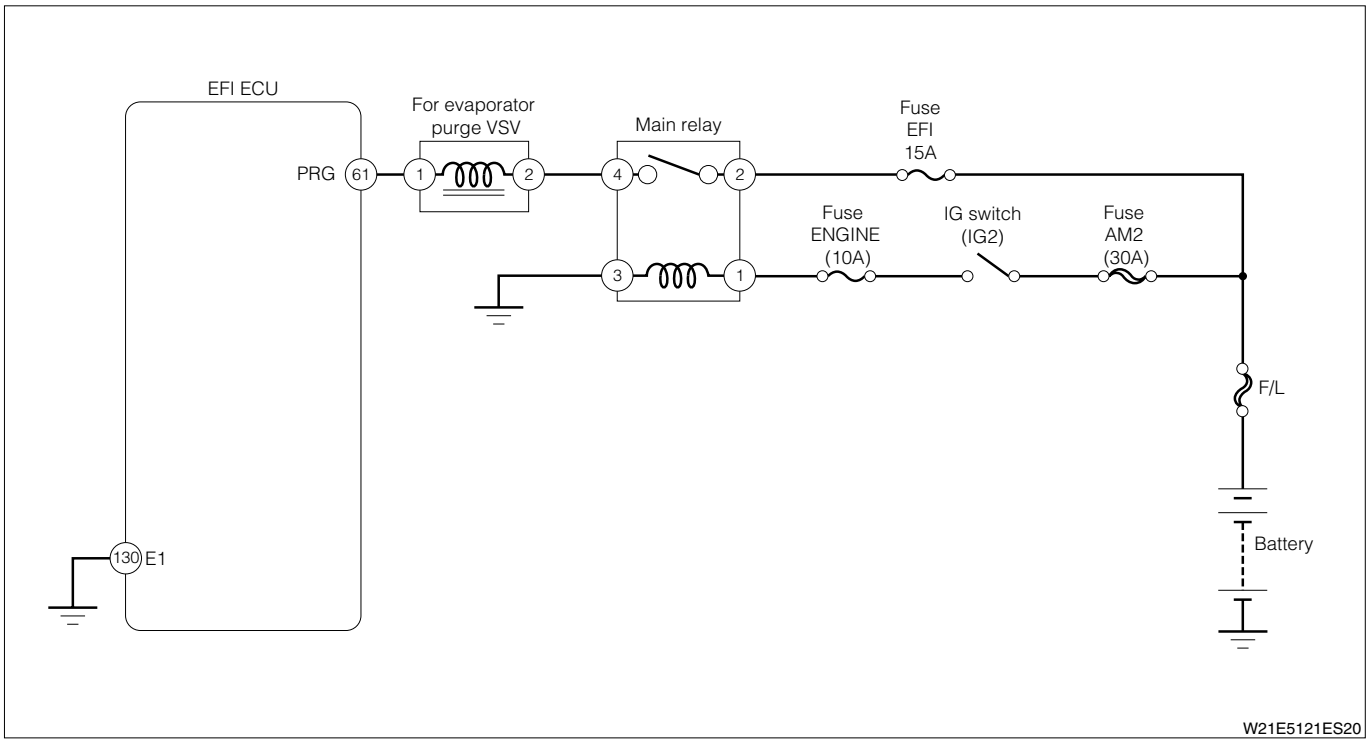
▼ If the result is OK, replace the ignition coil.

Refer to Page B10-2.

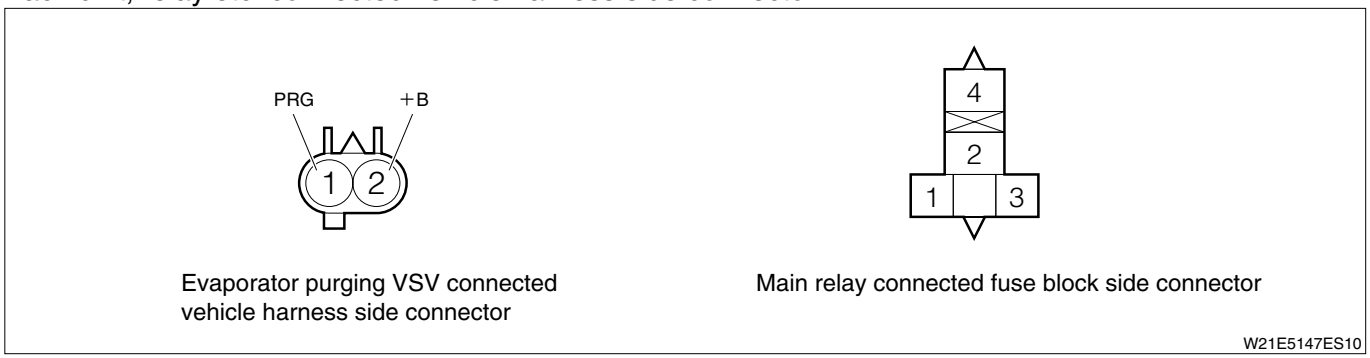
▼ If the result is NG, repair or replace the harness and the connector of the malfunctioning section.

13-13-16 P0443/76 EVAPORATOR PURGE VSV

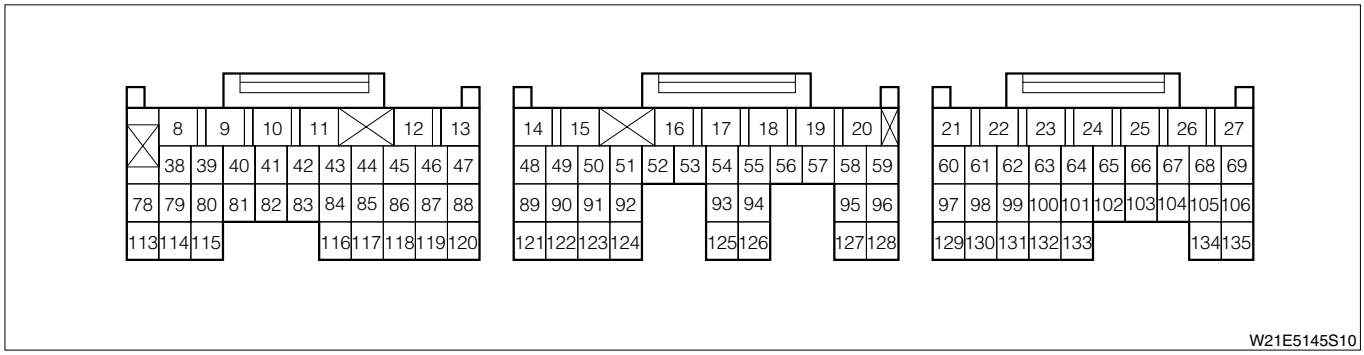
(1) System diagram



Each unit, relay etc. connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) Output conditions

1. When it has never been turned "ON" or "OFF" by the VSV detection signal for the evaporator purge after the engine is started

(3) Checking Points

1. Harness and connectors linking evapo-purge VSV and the EFI ECU.
2. Evapo-purge VSV control signal output from the EFI ECU.
3. VSV Operation for the evapo-purge.
4. EFI ECU

(4) **Check procedure**

∑1. Checking of the evaporator purge system hose

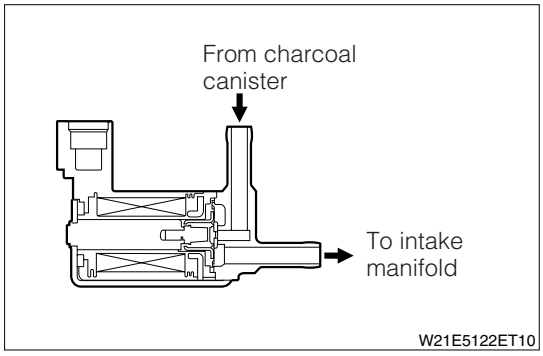
1. Check the hose for the evaporator purge system for missing or damages.
   SPECIFIED VALUE: No missing or damages existing

▼ If it is OK, go to ∑2.
▼ If the result is NG, repair or replace the hose.

∑2. Active test

1. Carry out the active test [Purge VSV] by using the diagnosis tester.
   SPECIFIED VALUE:

	Ventilation between ports
When it is "ON"	Ventilation existing
When it is "OFF"	No ventilation existing



▼ If the result is OK, go to ∑7.
▼ If it is NG, go to ∑3.

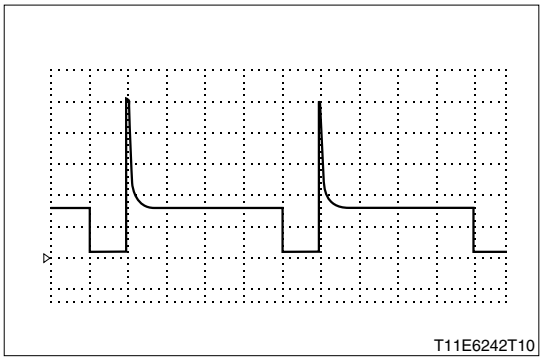
∑3. Checking the EFI ECU output signal

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

2. Use an oscilloscope to measure the waveform emitted from the following connector.
   (1) Between SST61 (PRG) and SST130 (E1)

Time axis	20ms / DIV
Voltage axis	10V / DIV
Condition	After the engine has warmed up, engine speed is 2000rpm or higher, air conditioner is "OFF", no electric load

The condition under which the air conditioner is turned "OFF": the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".



NOTE

- Unable to identify waveform with the form shown in the figure (one example).
- VSV for the evaporator purge will operate only during air−to−fuel ratio feedback.

SPECIFIED VALUE: 0 ⇄ battery voltage pulse is output.

▼ If it is OK, go to ∑4.
▼ If the result is NG, check the EFI ECU circuit.
Refer to Page A1-32.

⊳4. evapo purge.

1. Disconnect the evapo purge VSV connector.
2. Measure the voltage between the following terminals with the ignition switch set to "ON".
   (1) Between vehicle side VSV harness connector (+B) linking the evapo-purge and the body ground connector.

SPECIFIED VALUE: Battery voltage

Refer to Page J5-1.

▼ If it is OK, go to ⊳5.
▼ If faulty, repair or replace as necessary the harnesses and connectors linking the evapo purge VSV to the battery.

⊳5. Checking the single unit of the VSV for evaporator purge

1. Carry out the single unit checking of the VSV for evaporator purge.
   Refer to Page B8-134.

SPECIFIED VALUE: The evapo purge VSV is normal.

▼ If the result is OK, go to ⊳6.
▼ If the result is NG, replace the VSV for the evaporator.
Refer to Page B3-2.

⊳6. Checking the wiring harness

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 61 (PRG) linking the EFI ECU and the vehicle side harness connector 1 (PRG) linking the evapo purge VSV.
   (2) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the body ground connector.

Refer to Page A1-31.

SPECIFIED VALUE: No abnormality exists.

▼ If the result is OK, check the EFI ECU circuit.
Refer to Page A1-32.

▼ If it is NG, repair or replace harness and connector at the faulty section.

≫7. Data monitor

1. Read out the data monitor [Evaporative purge output] by using the diagnosis tester.
   (1) After the engine is warmed up (after the radiator fan rotated one time or more), carry out the checking while stepping on the accelerator pedal (with the idling switch set to "OFF") for 2 minutes or more.

SPECIFIED VALUE:

The engine condition	Displayed data
Air conditioner turned "OFF"; no electrical load applied; engine speed at 2000 rpm retained	0 to 100%*

The condition under which the air conditioner is turned "OFF," and the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF."

* Pulse generated by the duty control.

NOTE

- VSV for the evaporator purge will operate only during air−to−fuel ratio feedback.

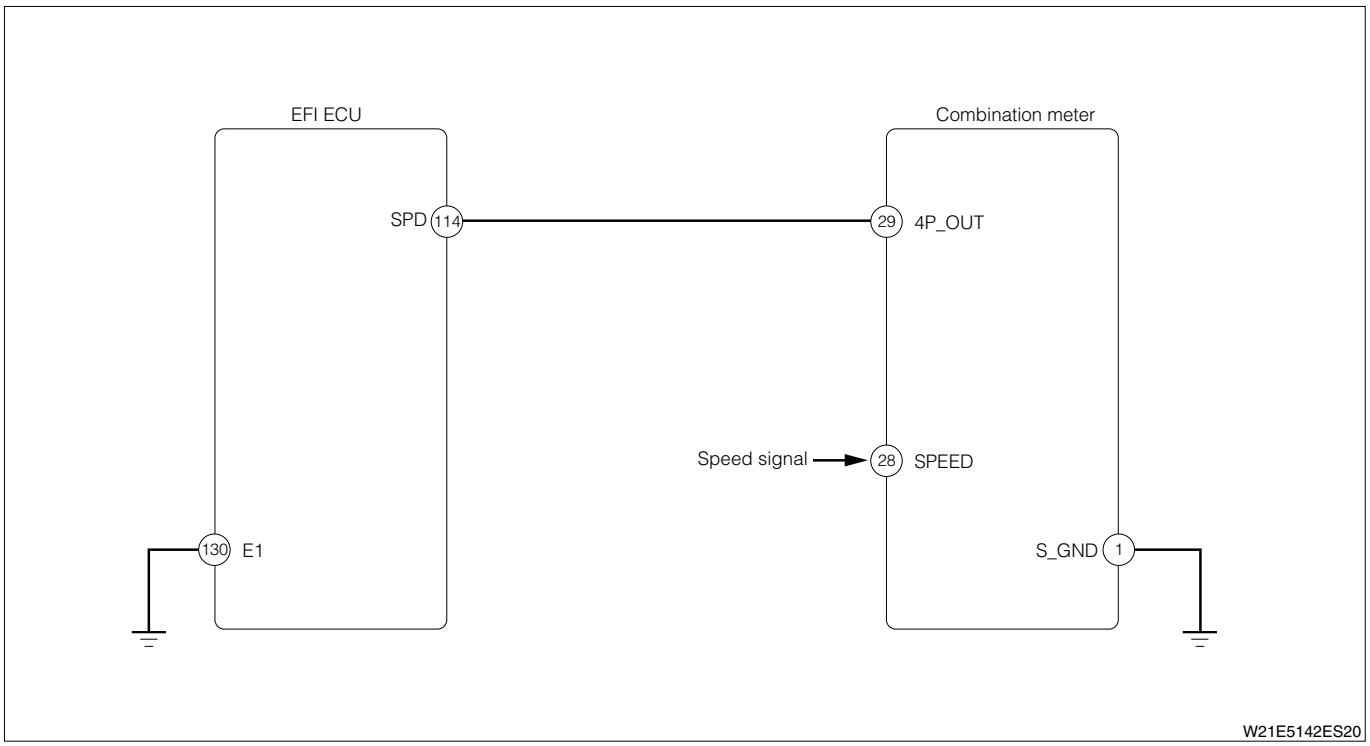
▼ If the result is OK, replace the VSV for the evaporator purge.

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

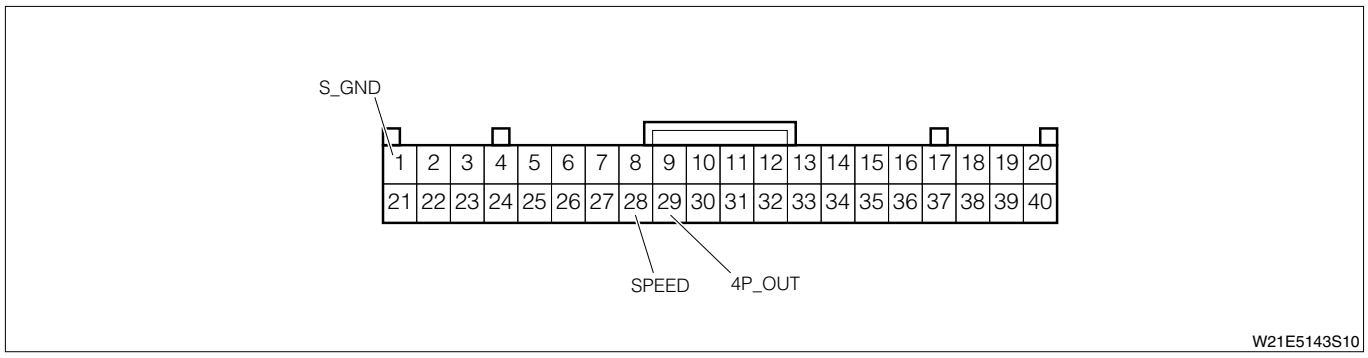
Refer to Page A1-32.

13-13-17 P0500/52 VEHICLE SPEED SENSOR SIGNAL SYSTEM

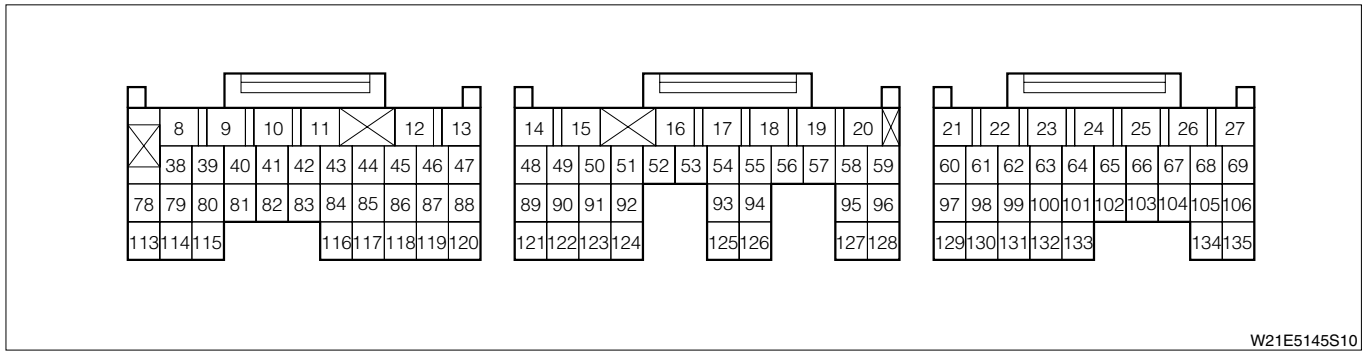
(1) System diagram



Combination meter connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) Output conditions

1. When a condition in which the vehicle speed reached 0 km/h lasted for a certain length of time within the setting range of the engine speed at deceleration during fuel cutting

(3) Checking Point

1. Harness and connectors linking combination meter and the EFI ECU.
2. Combination meter
3. EFI ECU

(4) Check procedure

∑1. Data monitor

1. Read out the data monitor [Vehicle speed] by using the diagnosis tester.

SPECIFIED VALUE:

The engine condition	Displayed data
Ignition switch on and engine stopped.	0 km/h
Traveling at fixed speed.	No major fluctuations.

▼ If it is OK, go to ∑2.

▼ If the result is NG, check the combination meter Ay.

Refer to Page J3-8.

∑2. Checking the EFI ECU output signal

1. Connect the SST to the vehicle.

SST: 09842-97209-000

2. Use an oscilloscope to measure the waveform emitted from the following connector.

(1) Between SST114 (SPD) and SST130 (E1)

Time axis	20ms / DIV
Voltage axis	2V / DIV
Condition	Vehicle traveling at 20km/h

The condition under which the air conditioner is turned "OFF": the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".

NOTE

- Unable to identify waveform with the form shown in the figure (one example).

SPECIFIED VALUE: Waveform cycle shortens as engine RPMs increase when regular waveform is emitted.

▼ If it is OK, go to ∑3.

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

Refer to Page A1-32.

∑3. Checking the wiring harness

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 114 (SPD) linking the EFI ECU and the vehicle side harness connector 29 (4P_OUT) linking the combination meter.
   (2) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the body ground connector.
   (3) Between vehicle side harness connector 1 (S_GND) linking the combination meter and the body ground connector.

Refer to Page A1-32.

SPECIFIED VALUE: No abnormality exists.

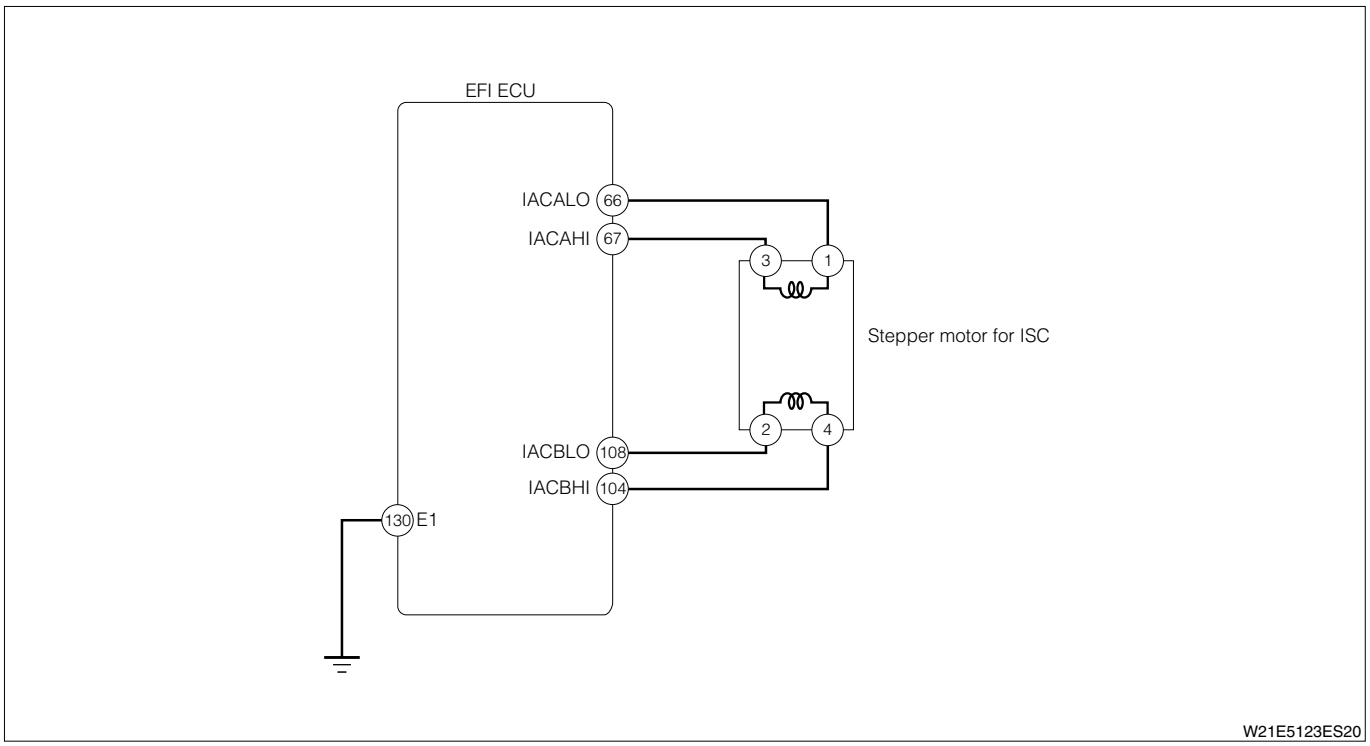
▼ If normal, replace the combination meter Ay.

Refer to Page J3-3.

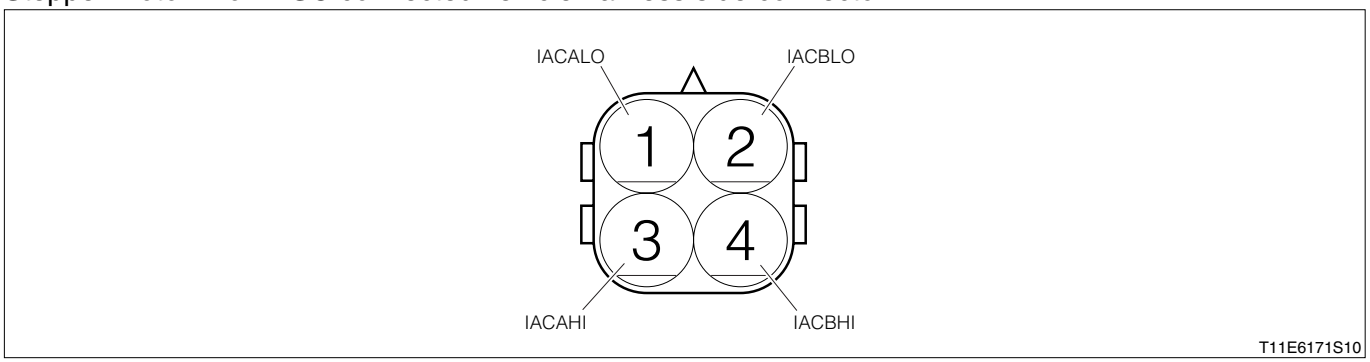
▼ If it is NG, repair or replace harness and connector at the faulty section.

13-13-18 P0505/71 ISC VALVE SYSTEM (IDLING CONTROL SYSTEM)

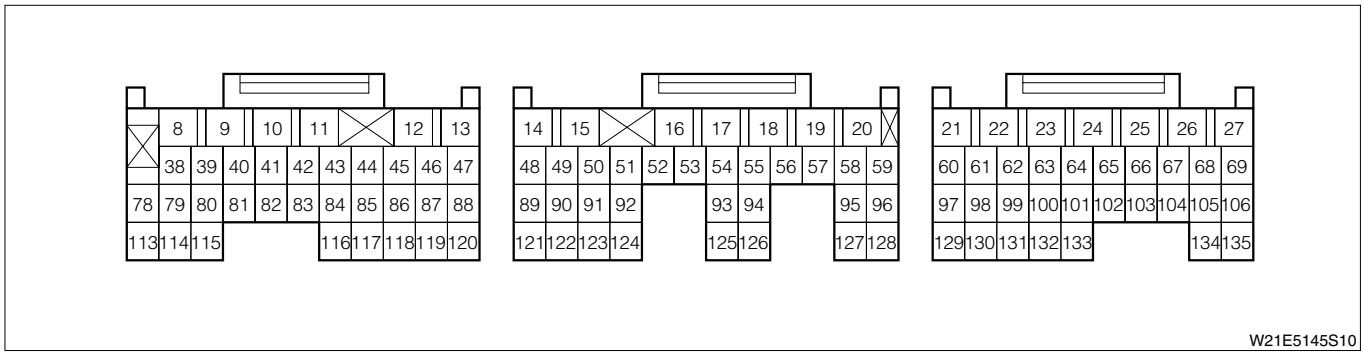
(1) System diagram (idling control system)



Stepper motor−for−ISC connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) Output conditions

1. When the signal is continuously outside the setting range for a certain length of time.

(3) Checking Points

1. Harness and connectors linking evapo-stepper motor and the EFI ECU.
2. ISC stepper motor
3. EFI ECU

(4) **Check procedure**

∑1. Data monitor (1)

1. Read out the data monitor [Engine revolution speed] by using the diagnosis tester.
   (1) Check if the engine speed is high when it is cold but slows down as it warms up and maintains the idling speed.

SPECIFIED VALUE:

The engine condition	Displayed data
The air conditioner is turned "OFF": no electric load applied; when the engine is "idling."	750±50

The condition under which the air conditioner is turned "OFF," and the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF."

▼ If the result is OK, it is possible that the system has returned to the normal condition. Therefore, leave the system as it is to observe the condition for a while.

▼ If it is NG, go to ∑2.

∑2. Data monitor (2)

1. Read out the data monitor [ISC step] by using the diagnosis tester.

SPECIFIED VALUE:

	The engine condition	Displayed data
a	Where the engine is idling after it is warmed up (Head light "OFF" the air conditioner "OFF" neutral)	6 or less
b		7 to 50
c		51 or more

The condition under which the air conditioner is turned "OFF," and the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF."

▼ In the case of a, go to ∑3.

▼ In the case of b, go to ∑4.

▼ In the case of c, check PCV, the hoses and the throttle body for evaporator purge, the intake system of the intake manifold for clogging.

∑3. Active test (1)

1. Carry out the active test [ISC] by using the diagnosis tester.

SPECIFIED VALUE:

	The engine condition
When "closed" (10 steps) is selected.	The idling speed does not change, or is increased a little.
When "open" (100 steps) is selected.	The idling speed is increased.

▼ If the result is OK, check to confirm if there is any air sucked in from PCV, hoses of evaporator purge and the throttle body, or the intake system of the intake manifold.

▼ If it is NG, go to ∑5.

⊳4. Active test (2)

1. Carry out the active test [ISC] by using the diagnosis tester.

SPECIFIED VALUE:

	The engine condition
When "open" (100 steps) is selected.	The idling speed is increased.
When "closed" (10 steps) is selected.	The idling speed is decreased. (The engine is stalled or idling becomes unstable.)

▼ If the result is OK, check to confirm if there is any air sucked in from PCV, hoses of evaporator purge and the throttle body, or the intake system of the intake manifold.

▼ If it is NG, go to ⊳5.

⊳5. Checking the wiring harness

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 66 (IACALO) linking the EFI ECU and the vehicle side harness connector 1 (IACALO) linking the ISC stepper motor.
   (2) Between vehicle side harness connector 103 (IACBLO) linking the EFI ECU and the vehicle side harness connector 2 (IACBLO) linking the ISC stepper motor.
   (3) Between vehicle side harness connector 67 (IACAHI) linking the EFI ECU and the vehicle side harness connector 3 (IACAHI) linking the ISC stepper motor.
   (4) Between vehicle side harness connector 104 (IACBHI) linking the EFI ECU and the vehicle side harness connector 4 (IACBHI) linking the ISC stepper motor.
   (5) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the body ground connector.

Refer to Page A1-31.

SPECIFIED VALUE: No abnormality exists.

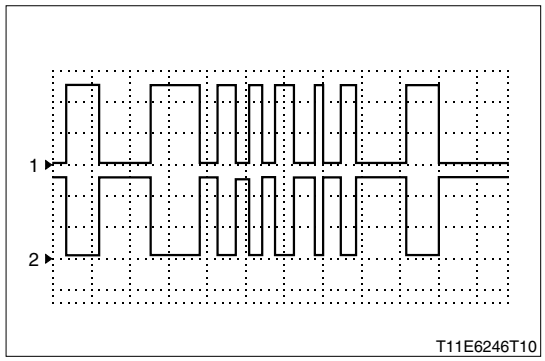
▼ If the result is OK, go to ⊳6.

▼ If the result is NG, repair or replace the harness and the connector of the malfunctioning section.

⌦6. EFI ECU signal checking

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

2. Use an oscilloscope to measure the waveform emitted from the following connector.
   (1) Between SST66 (IACALO) and SST130 (E1) (Fig. 1▶)
   (2) Between SST67 (IACAHI) and SST130 (E1) (Fig. 2▶)



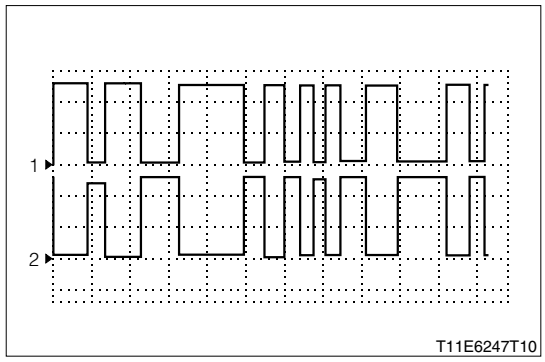
Time axis	1s / DIV
Voltage axis	5V / DIV
Condition	Air conditioner "ON" when idling

The condition under which the air conditioner is turned "ON", and the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "ON".

NOTE

- Unable to identify waveform with the form shown in the figure (one example).

   (3) Between SST103 (IACBLO) and SST130 (E1) (Fig. 1▶)
   (4) Between SST104 (IACBHI) and SST130 (E1)(Figure 2▶)



Time axis	1s / DIV
Voltage axis	5V / DIV
Condition	Air conditioner "ON" when idling

Air conditioner ON: The condition under which the air conditioner is turned "ON", and the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "ON".

NOTE

- Unable to identify waveform with the form shown in the figure (one example).

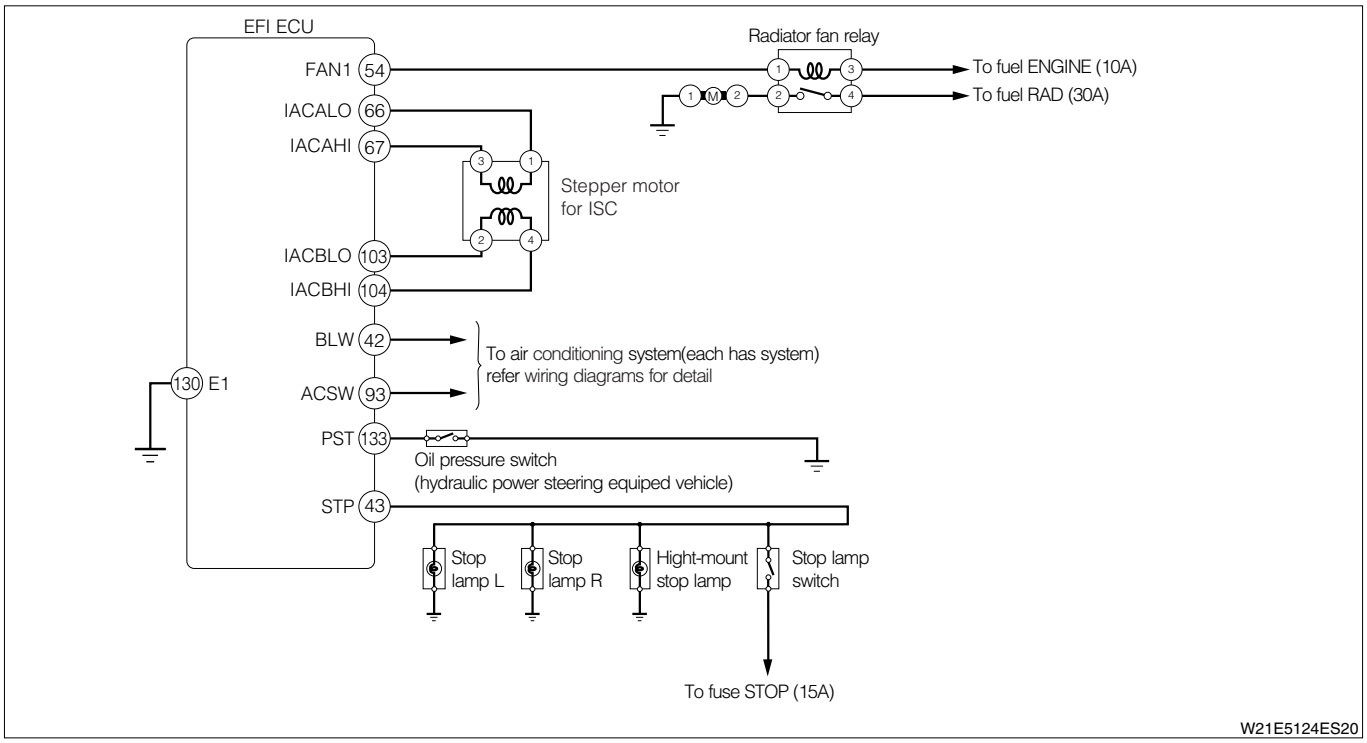
SPECIFIED VALUE: Battery voltage pulse of 0V ⇄ occurs, resulting in waveforms being reverse phase between "LO" and "HI".

▼ If the result is OK, replace the throttle body Ay.
Refer to Page B3-7.

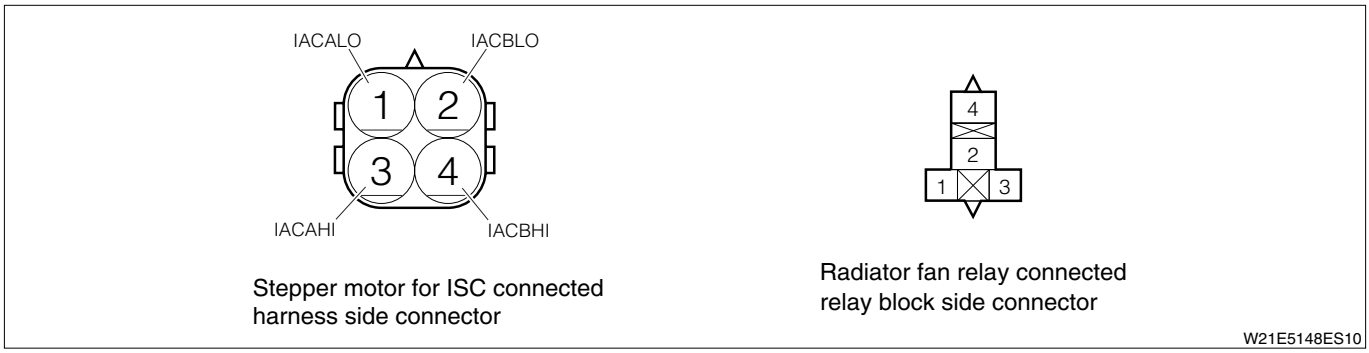
▼ If the result is NG, check the EFI ECU circuit.
Refer to Page A1-32.

13-13-19 P0505/71 ISC VALVE SYSTEM(IDLING－UP CONTROL SYSTEM)

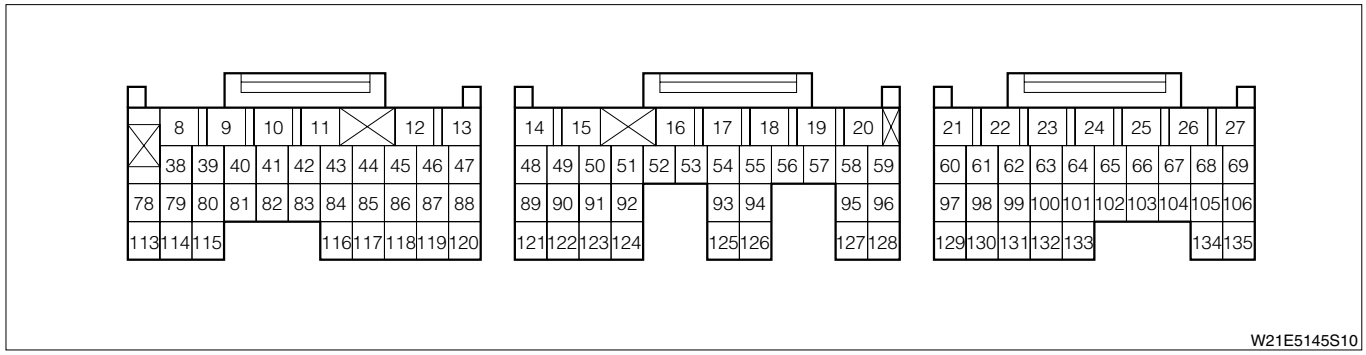
(1) System circuit diagram



Each unit connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) CHECKING POINTS

1. Harness and connectors linking ISC stepper motor and the EFI ECU.
2. ISC stepper motor control signal output from the EFI ECU.
3. Harness and connectors linking sensors and switches to the EFI ECU.
4. ISC stepper motor
5. EFI ECU

(3) **Check procedure**

∑1. Data monitor (1)

1. Warm up the engine.
2. Read out the data monitor [Engine revolution speed] in the neutral by using the diagnosis tester.

SPECIFIED VALUE:

	Displayed data
When the electric load is "ON" or when the power steering is operated	750±50
When the air conditioner is "ON"	900^{+100}_{-50}

The electric load "ON" refers to a condition that any of the headlight ,the blower or radiator fan is turned "ON"

The air conditioner "ON" refers to a condition that all of the air−conditioner switch (ACSW), the blower switch (BLW), and the magnetic clutch (MGC) are turned "ON".

▼ If the result is OK, it is possible that the system has returned to the normal condition. Therefore, leave the system as it is to observe the condition for a while.

▼ If it is NG, go to ∑2.

∑2. Data monitor (2)

1. Read out the following data by using the diagnosis tester.

(1) Electric load (DSW)

The switch condition	Displayed data
Headlight,blower or the radiator fan is "ON"	ON
Headlight,blower and the radiator fan are all "OFF"	OFF

(2) Air conditioner signal (AC)

The switch condition	Displayed data
The air conditioner switch "ON"	ON
The air conditioner switch "OFF"	OFF

(3) Power steering signal (PST)*

The steering condition	Displayed data
The vehicle is stopped, and when the steering is operated	ON
The vehicle is stopped, and when the steering is not operated	OFF

(4) Stop lamp signal (STP)

The switch condition	Displayed data
When the brake pedal is stepped on	ON
When the brake pedal is released	OFF

*:Hydraulic power steering equipped vehicle

▼ If the result is all OK, check the idling control system.

Refer to Page B8-91.

▼ If it is NG, go to ∑3.

∑3. EFI ECU signal checking

1. Connect the SST.

SST: 09842-97209-000

2. Said the ignition switch to "ON", and measure the voltage between the terminals on which the data monitor indicated a malfunction signal.
   (1) Blower: between SST42 (BLW) and SST130 (E1)
   (2) Radiator fan: between SST54 (FAN1) and SST130 (E1)
   (3) Air conditioner switch: between SST93 (ACSW) and SST130 (E1)
   (4) Power steering switch: between SST133 (PST) and SST130 (E1) (Hydraulic P/S equipped vehicle)
   (5) Stop lamp: between SST43 (STP) and SST130 (E1)

SPECIFIED VALUE:

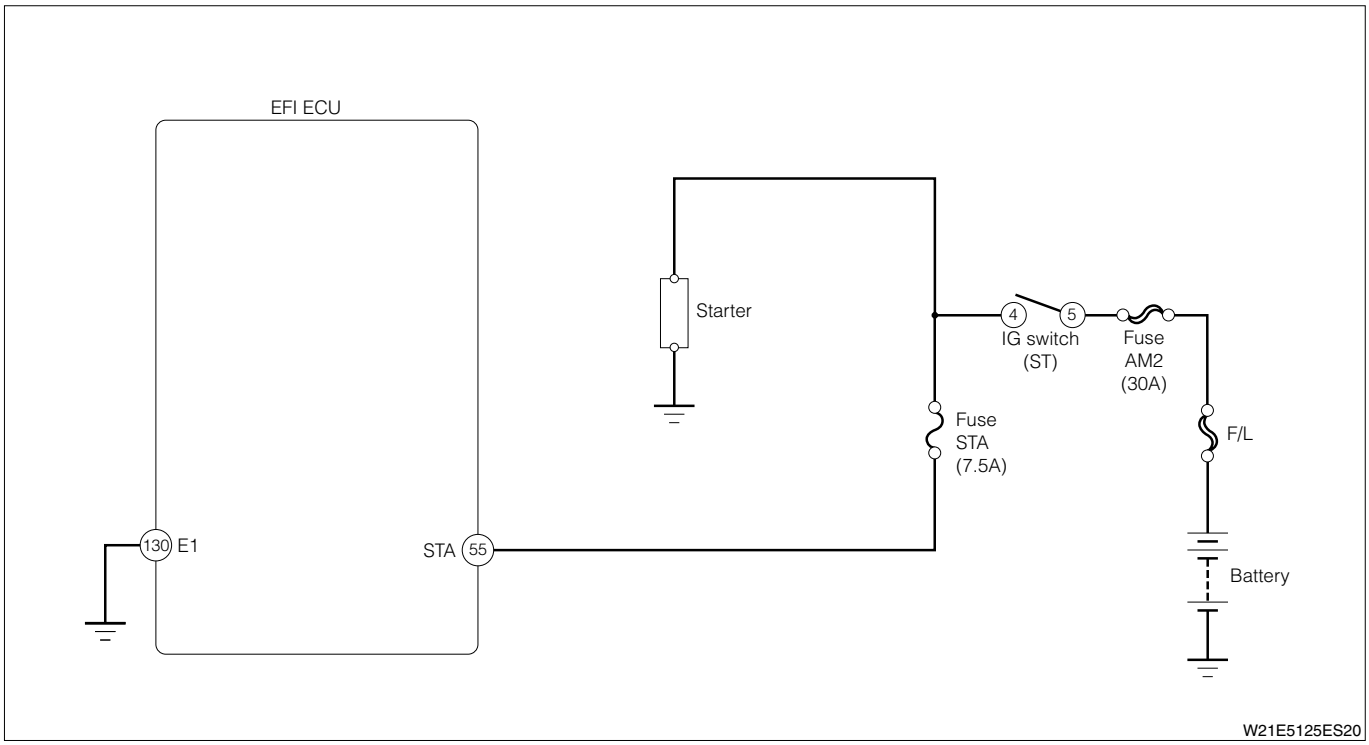
Check signal	Terminal	Measuring conditions	Reference value
Blower	42(BLW) to 130(E1)	When the blower switch is set to "ON".	0 to 0.5V
		When the blower switch is set to "OFF".	Battery voltage
Radiator fan	54(FAN1) to 130(E1)	When the magnetic clutch is on.	1V or less
		When the magnetic clutch is off.	Battery voltage
Air conditioner switch	93(ACSW) to 130(E1)	When the air conditioner is operating.	Battery voltage
		When the air conditioner is not operating.	0 to 0.5V
Power steering switch	133(PST) to 130(E1)	When the steering wheel is steered and the vehicle is parked.	0 to 1V
		When the steering wheel is not steered and the vehicle is parked.	Battery voltage
Stop lamp	43(STP) to 130(E1)	When the stop lamp is on.	Battery voltage
		When the stop lamp is off.	0 to 0.5V

▼ If the result is OK, check the EFI ECU circuit.
Refer to Page A1-32.

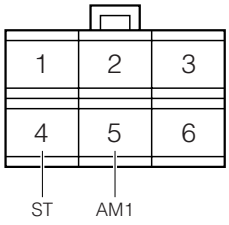
▼ If the result is NG, repair or replace the circuit, the harness, the relay, and the switch of the malfunctioning section.

13-13-20 **P0512/54 STARTER SIGNAL SYSTEM**

(1) **System diagram**

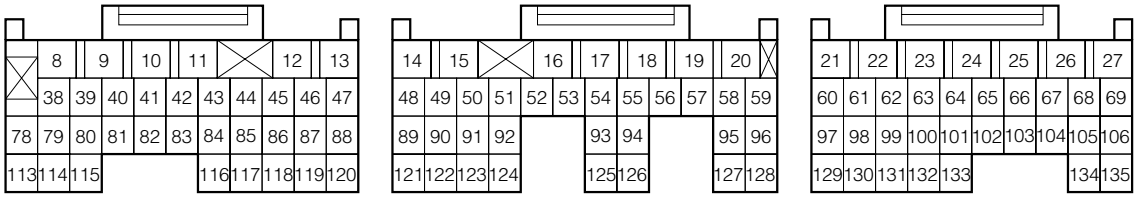


IG switch connected vehicle harness side connector



W21E5153S10

EFI ECU connected vehicle harness side connector



W21E5145S10

(2) **Output conditions**

1. When engine rpm exceeds set value with a vehicle traveling at 0km/h and starter output signal is faulty.

(3) **Checking Point**

1. Harness and connectors linking starter and the EFI ECU.
2. EFI ECU

(4) **Check procedure**

Σ1. EFI ECU signal checking

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

2. Measure voltage between the following connectors during starting.
   (1) Between SST55 (STA) and SST130 (E1)
   SPECIFIED VALUE: Battery voltage

   ▼ If the result is OK, check the EFI ECU circuit.
   Refer to Page A1-32.

   ▼ If it is NG, go to Σ2.

Σ2. Checking the wiring harness

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 55 (STA) linking the EFI ECU and the vehicle side harness connector 4 (ST) linking the ignition switch.
   (2) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the body ground connector.
   Refer to Page A1-31.

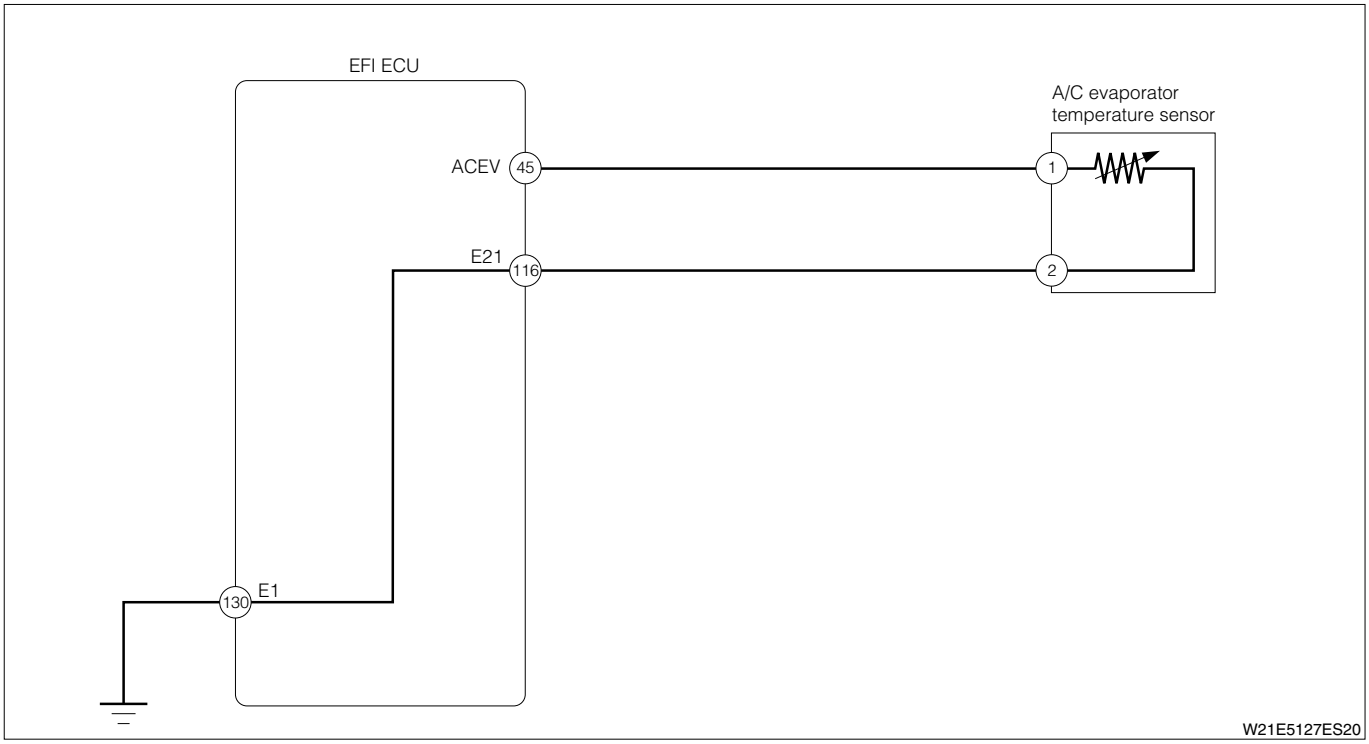
   SPECIFIED VALUE: No abnormality exists.

   ▼ If normal, inspect starter circuit.
   Refer to Page B11-2.

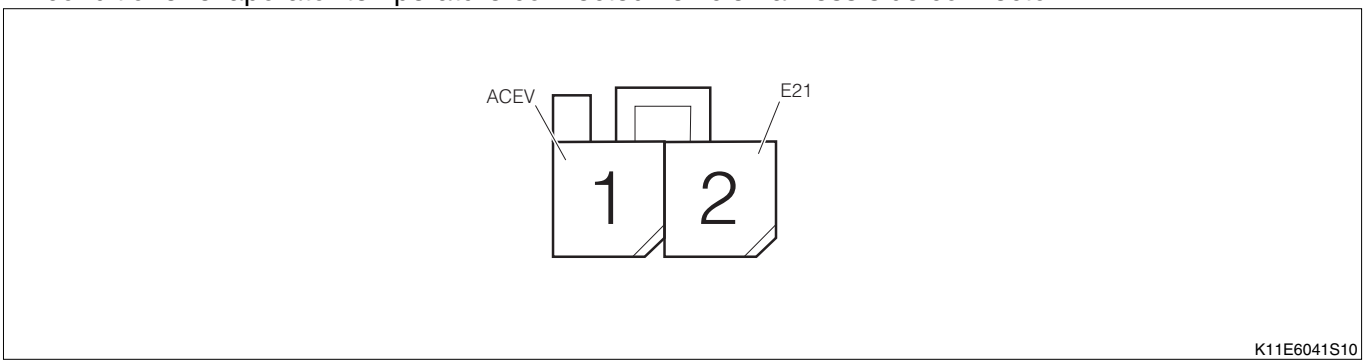
   ▼ If it is NG, repair or replace harness and connector at the faulty section.

13-13-21 **P0535/44 A/C EVAPORATOR TEMPERATURE SENSOR**

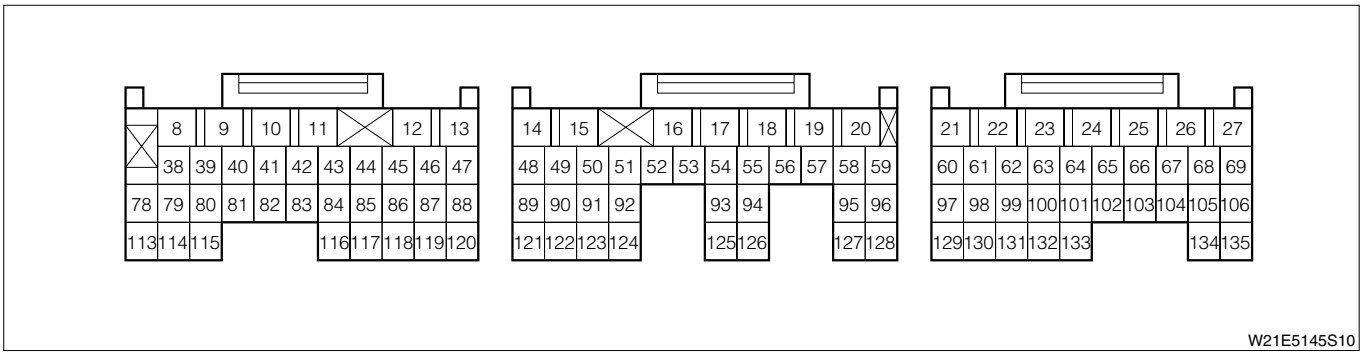
(1) **System diagram**



Air conditioner evaporator temperature connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) **Output conditions**

1. When the signal from the air conditioner evaporator temperature sensor is not outputted consecutively for a certain length of time with the air conditioner switch is set to "ON" after the engine is started

(3) **Checking Points**

1. Signal from air-conditioner evaporator temperature sensor that is input to the EFI ECU.
2. Harness and connectors linking air-conditioner evaporator temperature sensor and the EFI ECU.
3. Output of air-conditioner evaporator temperature sensor.
4. EFI ECU

(4) **Check procedure**

∑1. EFI ECU signal checking (1)

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

2. With the ignition switch set to "ON", measure the voltage between the following terminals.
   (1) Between SST45 (ACEV) and SST116 (E21)
   SPECIFIED VALUE: 0.15 to 4.8 V (varies according to the temperature)

▼ If it is OK, go to ∑4.
▼ If it is NG, go to ∑2.

∑2. Checking the single unit of the air conditioner evaporator temperature sensor

1. Carry out the single unit checking of the air conditioner evaporator temperature sensor.
   Refer to Page B8-132.

   SPECIFIED VALUE: The air-conditioner evaporator sensor is normal.

▼ If it is OK, go to ∑3.
▼ If the result is NG, replace the air conditioner evaporator temperature sensor.

∑3. Checking the wiring harness

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 45 (ACEV) linking the EFI ECU and the vehicle side harness connector 1 (ACEV) linking the air-conditioner evaporator temperature sensor.
   (2) Between vehicle side harness connector 116 (E21) linking the EFI ECU and the vehicle side harness connector 2 (E21) linking the air-conditioner evaporator temperature sensor.
   (3) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the body ground connector.
   Refer to Page A1-31.

   SPECIFIED VALUE: No abnormality exists.

▼ If it is OK, go to ∑4.
▼ If it is NG, repair or replace harness and connector at the faulty section.

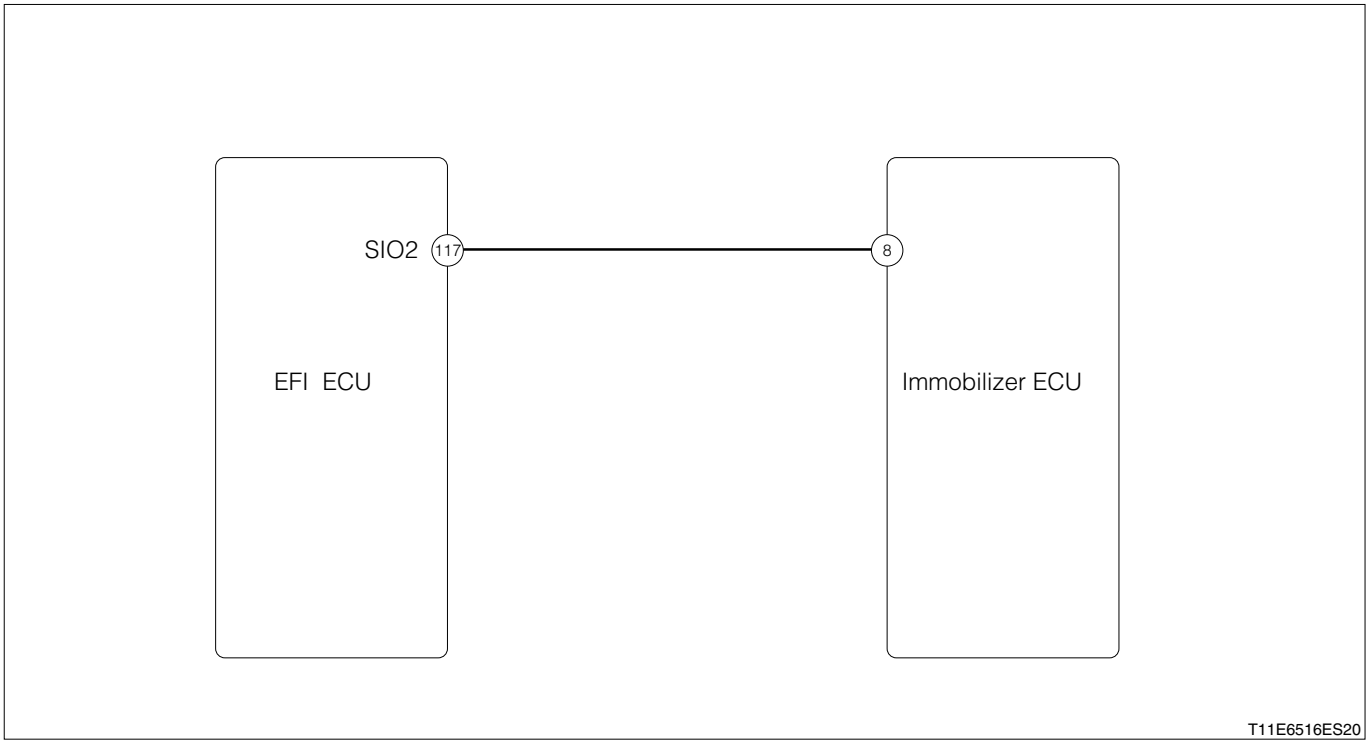
∑4. EFI ECU signal checking (2)

1. With the air conditioner evaporator temperature sensor connector disconnected, turn the ignition switch to "ON" and measure the voltage between the following terminals.
   (1) Between SST45 (ACEV) and SST116 (E21)
   SPECIFIED VALUE: 4.75 V to 5.25 V

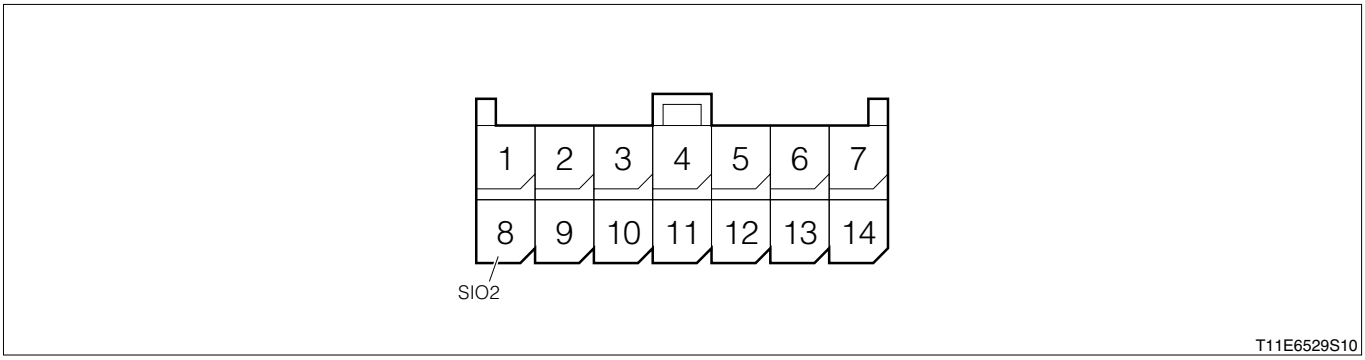
▼ If the result is OK, check the connecting status of the connectors at each section or the installation condition of the air conditioner evaporator temperature sensor.
▼ If the result is NG, check the EFI ECU circuit.
Refer to Page A1-32.

13-13-22 P0603/83 IMMOBILIZER SYSTEM COMMUNICATION SYSTEM (ABNORMAL ECU)

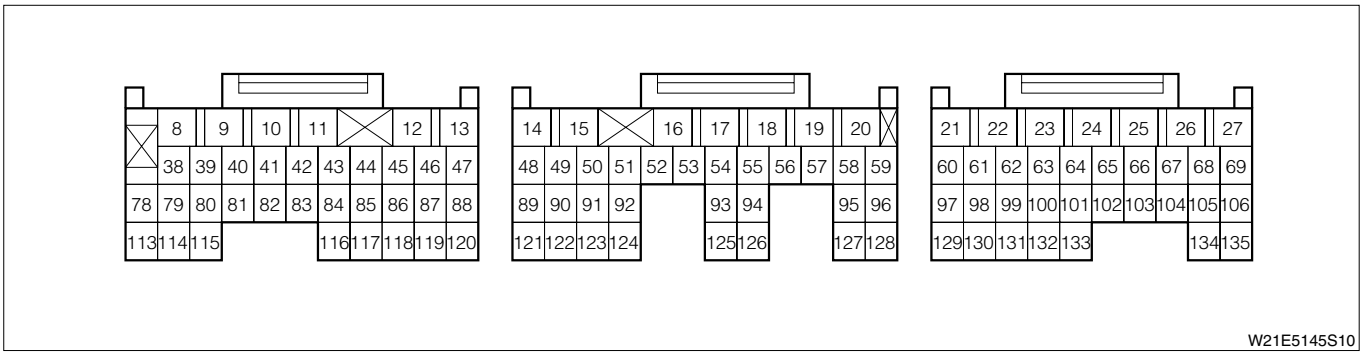
(1) System diagram



Immobilizer ECU vehicle harness connector



EFI ECU vehicle harness connector



(2) Output conditions

1. When the rolling codes from the EFI ECU cannot be read or written when the engine is started.

(3) **Checking procedure**

⌦1. Checking the diagnosis codes again

1. Set the ignition switch to "LOCK".
2. Connect the diagnosis tester.
3. Set the ignition switch to "ON"
4. Erase the diagnosis codes.
5. Turn the power of the tester off, and then set the ignition switch to "LOCK".
6. Set the ignition switch to "ON"
7. Check the diagnosis codes.
8. Is code number P0603/83 output?

▼ If the code is output, proceed to step ⌦2.

▼ If the code is not output, proceed to step ⌦3.

⌦2. Checking the wire harness

1. Set the ignition switch to "LOCK".
2. Check the continuity between the following terminals.
   (1) Between EFI ECU vehicle harness connector 117 (SIO2) and immobilizer ECU vehicle harness connector 8 (SIO2)

SPECIFIED VALUE: Continuity exists.

▼ If OK, proceed to step ⌦3.

▼ If NG, repair or replace the harnesses and connectors that are faulty.

⌦3. Checking the immobilizer diagnosis code

1. Set the ignition switch to "ON"
2. Check the immobilizer diagnosis code.

▼ If the code is not output, replace the EFI ECU.

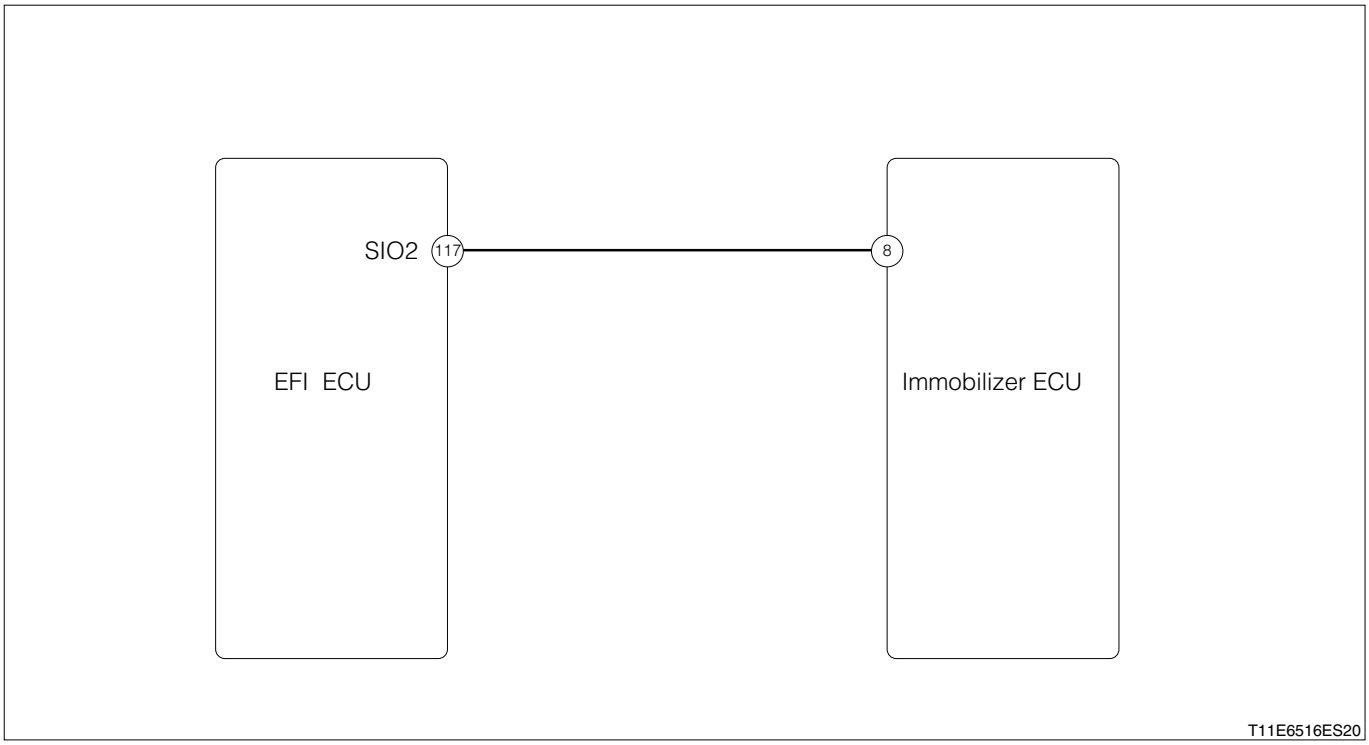
Refer to Page B8-1.

▼ If the code is output, check the immobilizer.

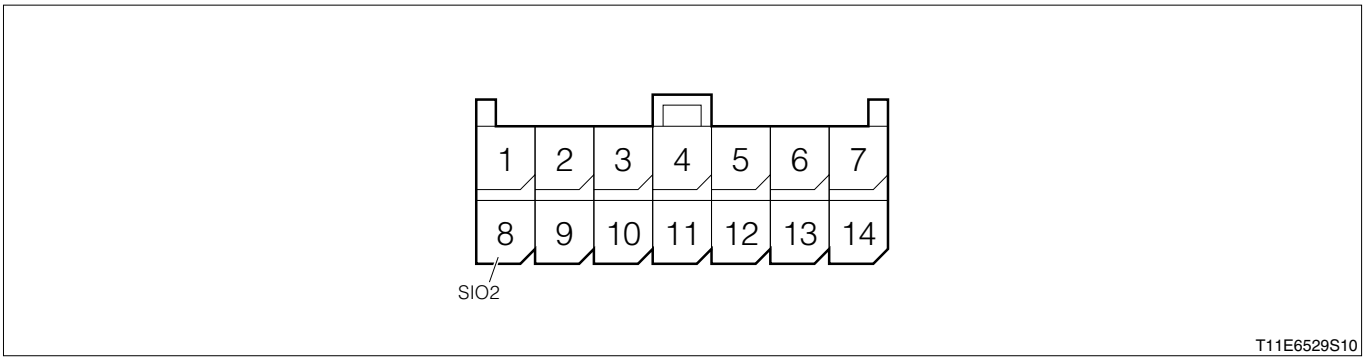
Refer to Page I4-9.

13-13-23 U0167/81 IMMOBILIZER SYSTEM COMMUNICATION SYSTEM (CODES DO NOT MATCH, COMMUNICATION ERROR)

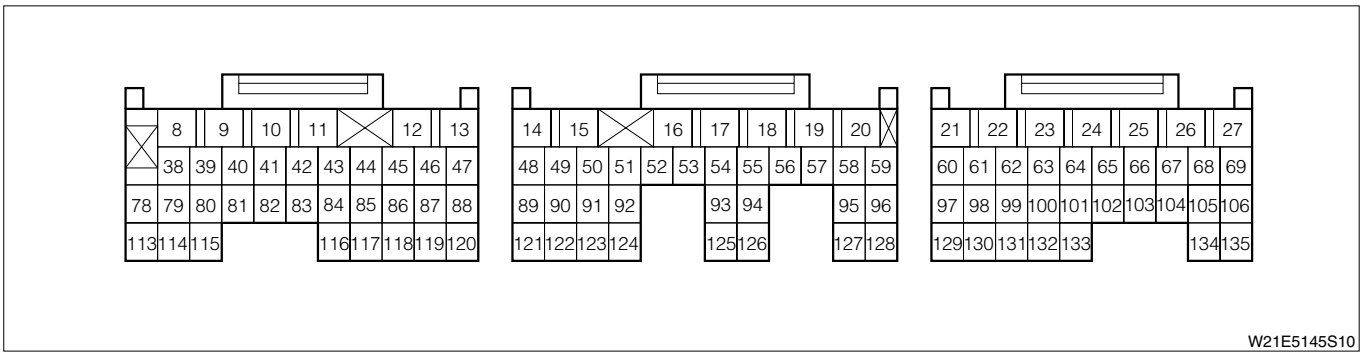
(1) System diagram



Immobilizer ECU vehicle harness connector



EFI ECU vehicle harness connector



(2) Output conditions

1. When the engine is started and the rolling codes do not match.

(3) Checking point

1. Is the harness between the immobilizer ECU and EFI ECU normal?

(4) **Checking procedure**

⊃1. Checking the wire harness

1. Connect the SST. Be sure to disconnect the SST connector at the EFI ECU end.
   SST: 09842-97201-000

2. Disconnect the immobilizer ECU connector.
3. With the ignition switch set to "LOCK"
   (1) Between immobilizer ECU vehicle harness connector 8 (SIO2) and SST117 (SIO2)
   SPECIFIED VALUE: Continuity exists.

▼ If OK, proceed to step ⊃2.
▼ If NG, repair or replace the harnesses and connectors.

⊃2. Checking the immobilizer system (1)

1. Connect the immobilizer ECU connector.
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 OK, check or replace the EFI ECU.
▼ If NG, proceed to step ⊃3.

⊃3. Checking the immobilizer system (2)

1. With the ignition switch set to "LOCK"
2. Start the engine with the master key.
   SPECIFIED VALUE: The engine starts.

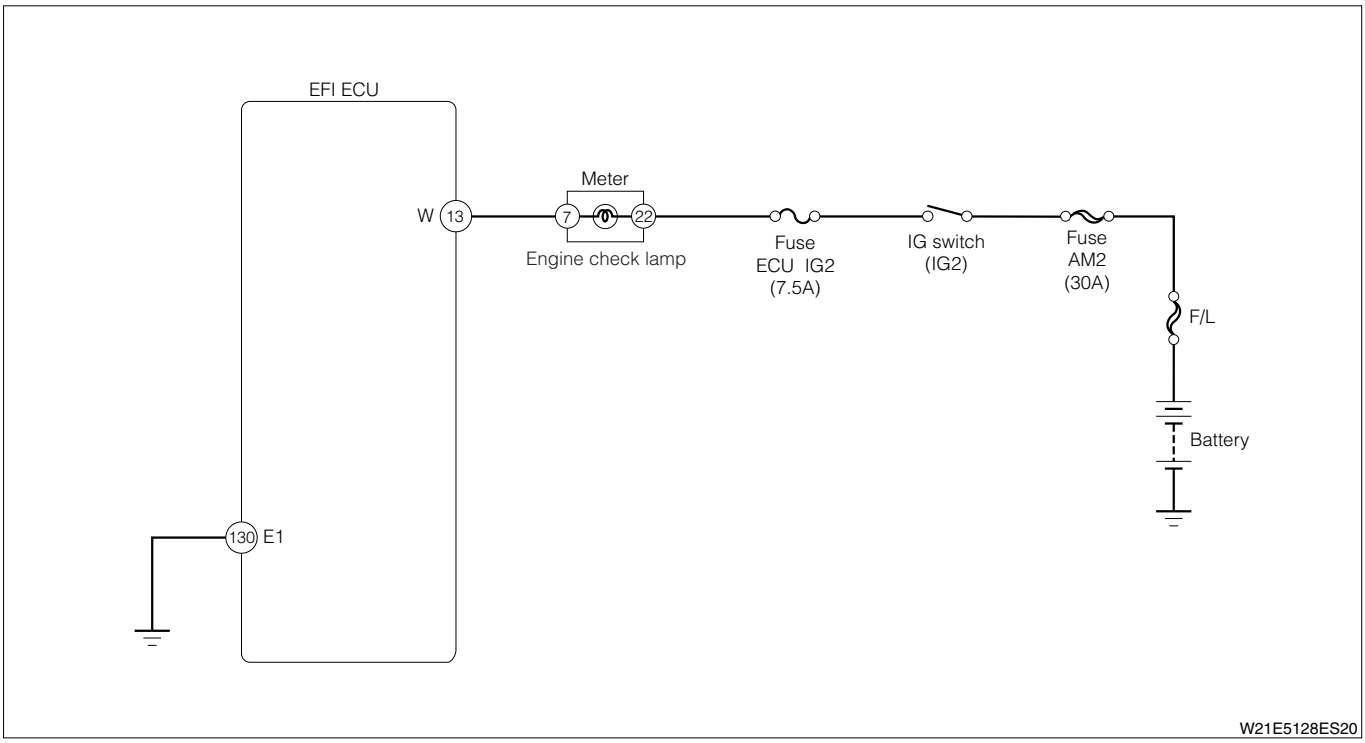
▼ If OK, check the ignition key and the antenna coil.
Refer to Page I4-21.

▼ If NG, replace the immobilizer ECU.

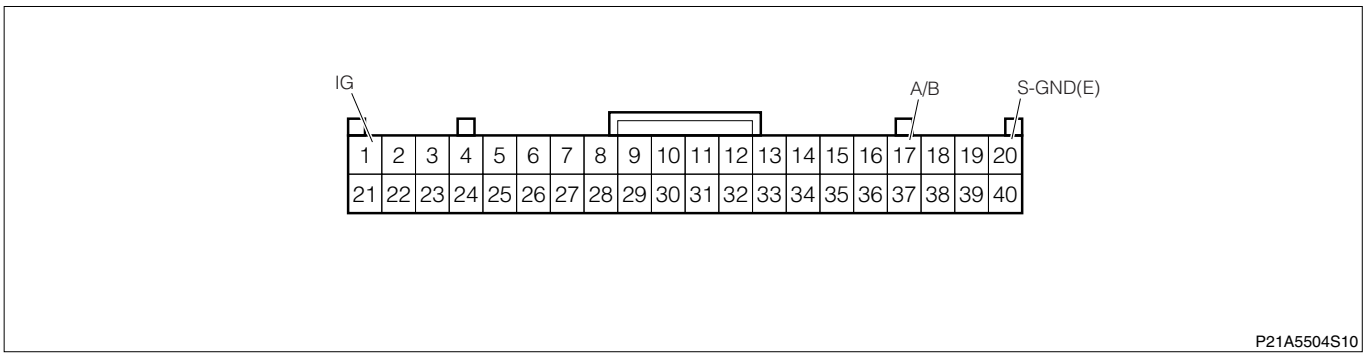
13-14 TROUBLE SHOOTING ACCORDING TO SYSTEM

13-14-1 CHECKING THE ENGINE CHECK LAMP SYSTEM

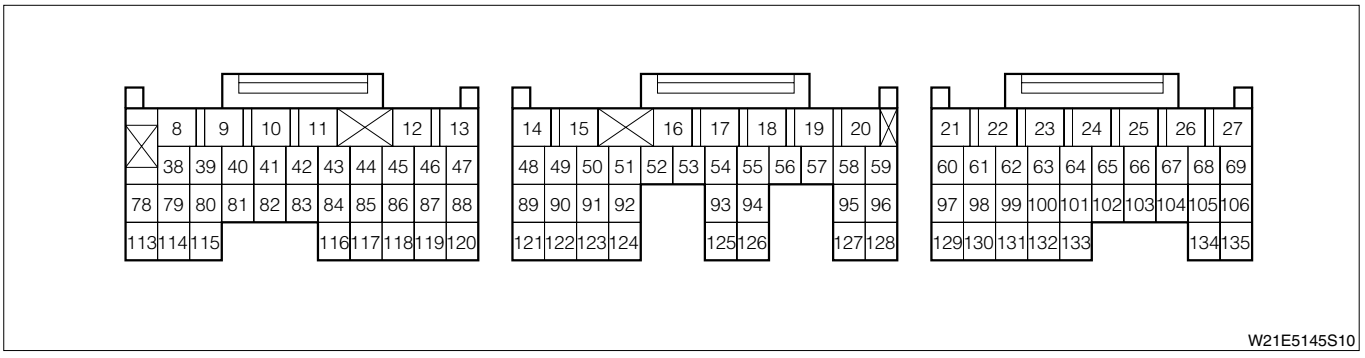
(1) System diagram



Combination meter connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) **Checking points**

1. Engine check lamp valve
2. Harness and connectors linking combination meter and the EFI ECU.
3. Power supply voltage and ground circuit for EFI ECU.

NOTE

- If the sensor system power supply (5 V) is short−circuited to the earth side, the ECU circuit protection function may temporarily shut down the power supply of the EFI ECU. For this reason, be sure to carry out checking of the sensor system power supply circuit also.

4. Power supply voltage and ground circuit for combination meter.

(3) **Checking method**

Σ1. Checking the engine check lamp condition

1. Confirm that the engine check lamp turn on when the ignition switch is turned "ON", and the engine check lamp goes off when the engine is started.

SPECIFIED VALUE:

	The engine check lamp condition
a	Illuminated → extinguished
b	Remaining being illuminated
c	Does not go on (remaining being distinguished)

▼ In the case of a, there is no abnormality in the engine check lamp system.
▼ In the case of b, go to Σ2.
▼ In the case of c, go to Σ3.

Σ2. Diagnosis code checking

1. Read out the diagnosis code by using the diagnosis tester.

SPECIFIED VALUE:

a	If the diagnosis code is not output but the lamp remains being illuminated
b	If the diagnosis code is outputted

▼ In the case of a, go to Σ6.
▼ In the case of b, check the code that is outputted.

Σ3. Checking the EFI ECU power supply voltage

1. Disconnect the connector on the EFI ECU side and measure the voltage between each of the terminals with the ignition switch set to "ON".
   (1) Between the ECU connected vehicle harness side connector 27 (+B1) and the ECU connected vehicle harness side connector 130 (E1)
   (2) Between the ECU connected vehicle harness side connector 38 (BAT) and the ECU connected vehicle harness side connector 130 (E1)

SPECIFIED VALUE: Battery voltage

▼ If it is OK, go to Σ4.
▼ If the result is NG, check the EFI ECU power supply system.
Refer to Page B8-109.

∑4. EFI ECU sensor.

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

2. Measure the voltage between the following connectors.
   (1) Between SST62 (VC) and SST130 (E1)
   (2) Between SST101 (VCPM) and SST130 (E1)
   SPECIFIED VALUE: 4.75 V to 5.25 V

▼ If it is OK, go to ∑5.
▼ If the result is NG, check the EFI ECU power supply system.
Refer to Page B8-109.

∑5. Checking the combination meter

1. Carry out checking of the combination meter.
   Refer to Page J3-8.

   SPECIFIED VALUE: The combination meter is normal.

▼ If the result is OK, go to ∑6.
▼ If the result is NG, check the circuit of the combination meter.
Refer to Page A1-32.

∑6. Checking the wiring harness

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 13 (W) linking the EFI ECU and the vehicle side harness connector 7 (CHK_E/G) linking the combination meter.
   (2) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the body ground connector.
   Refer to Page A1-31.

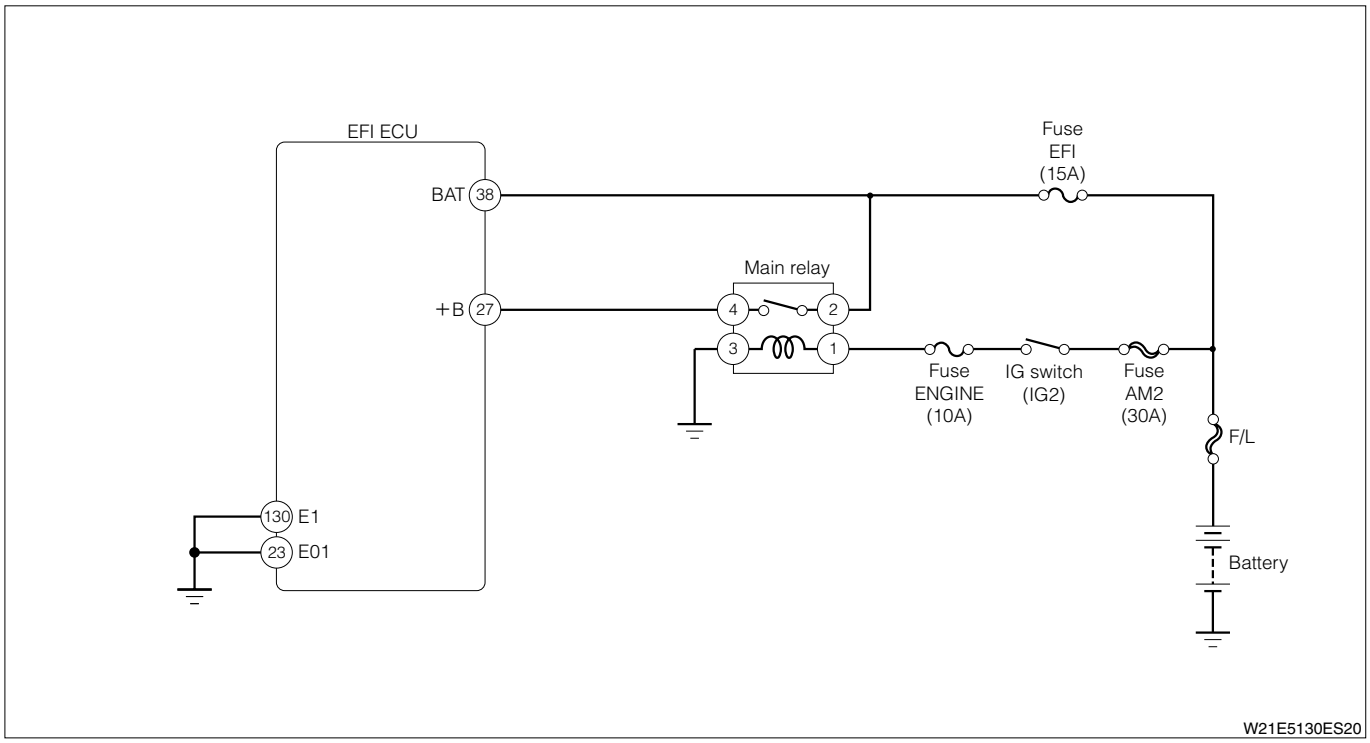
   SPECIFIED VALUE: No abnormality exists.

▼ If the result is OK, check the EFI ECU circuit and the combination meter circuit.
Refer to Page A1-32.

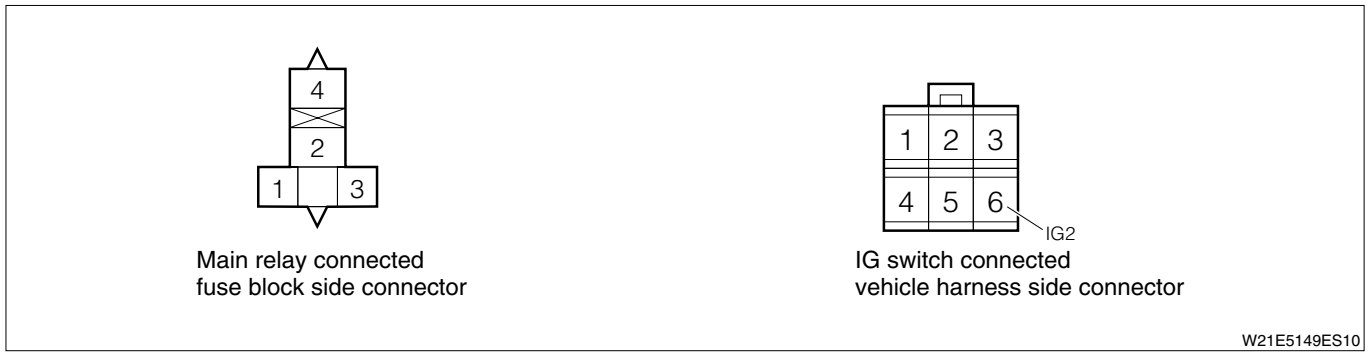
▼ If it is NG, repair or replace harness and connector at the faulty section.

13-14-2 CHECKING THE EFI ECU VOLTAGE SYSTEM

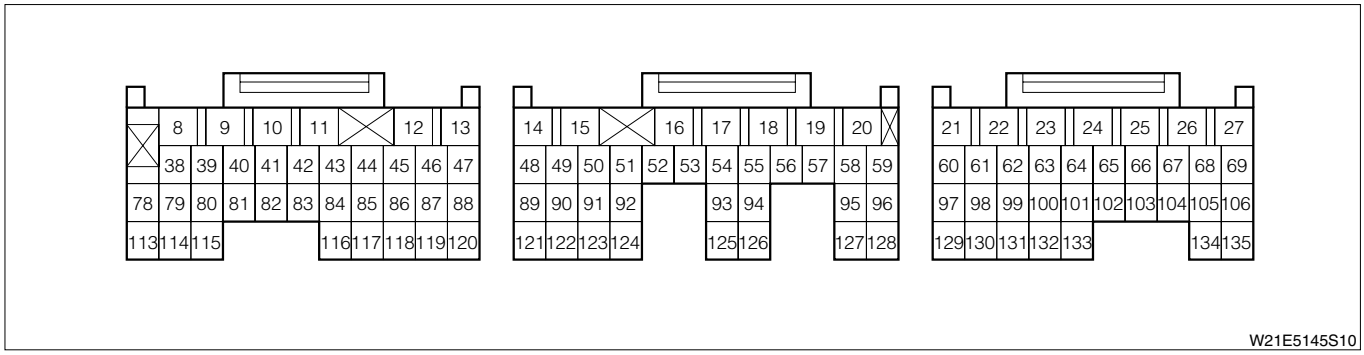
(1) System diagram



Each unit connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) Checking point

1. Power supply system for the EFI ECU.

NOTE

- If the sensor system power supply (5 V) is short−circuited to the earth side, the ECU circuit protection function may temporarily shut down the power supply of the EFI ECU. For this reason, be sure to carry out checking of the sensor system power supply circuit also.

(3) **Check procedure**

∑1. EFI ECU voltage check

1. Disconnect the connector on the EFI ECU side and measure the voltage between each of the terminals with the ignition switch set to "ON".
   (1) Between the ECU connected vehicle harness side connector 27 (+B1) and the ECU connected vehicle harness side connector 130 (E1)
   (2) Between the ECU connected vehicle harness side connector 38 (BAT) and the ECU connected vehicle harness side connector 130 (E1)

   SPECIFIED VALUE: Battery voltage

   ▼ If it is OK, go to ∑2.
   ▼ If the result is NG, go to ∑3.

∑2. Inspect power supply voltage for EFI ECU sensor.

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

2. Measure the voltage between the following connectors.
   (1) Between SST62 (VC) and SST130 (E1)
   (2) Between SST101 (VCPM) and SST130 (E1)

   SPECIFIED VALUE: 4.75 V to 5.25 V

   ▼ If normal, the EFI ECU power supply system is operating normally.
   ▼ If the result is NG, go to ∑3.
   Refer to Page A1-32.

∑3.Wire harness check(1)

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 27 (+B1) linking the EFI ECU and connector 4 on the fuse block connecting to the main relay.
   (2) Between vehicle side harness connector 38 (BAT) linking the EFI ECU and connector 2 on the fuse block connecting to the main relay.
   (3) Between fuse block connector 2 linking the main relay and the body ground connector.

   Refer to Page A1-31.

   SPECIFIED VALUE: No abnormality exists.

   ▼ If it is OK, go to ∑4.
   ▼ If it is NG, repair or replace harness and connector at the faulty section.

∑4. Checking the single unit of the main relay

1. Carry out the single unit checking of the main relay.
   Refer to Page B8-135.

   SPECIFIED VALUE: The main relay is normal.

   ▼ If it is OK, go to ∑5.
   ▼ If the result is NG, replace the main relay.

⌦5. Main relay voltage check

1. Disconnect the main relay.
2. Measure voltage between each terminal while IG SW is set to "ON".
   (1) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the body ground connector.
   (2) Between fuse block connector 2 (switch side) linking the main relay and the body ground connector.

SPECIFIED VALUE: Battery voltage

▼ If normal, inspect and repair as necessary the harness and connectors linking the main relay to the body ground connector.
▼ If the switch is faulty, inspect and repair as necessary the harness and connectors linking the main relay to the battery.
▼ If the coil is faulty, proceed to step ⌦6.

⌦6.Wire harness check (2)

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between connector 1 (coil side) linking the fuse box connecting to the main relay and the vehicle side harness connector 6 (IG2) linking the ignition switch.

Refer to Page A1-31.

SPECIFIED VALUE: No abnormality exists.

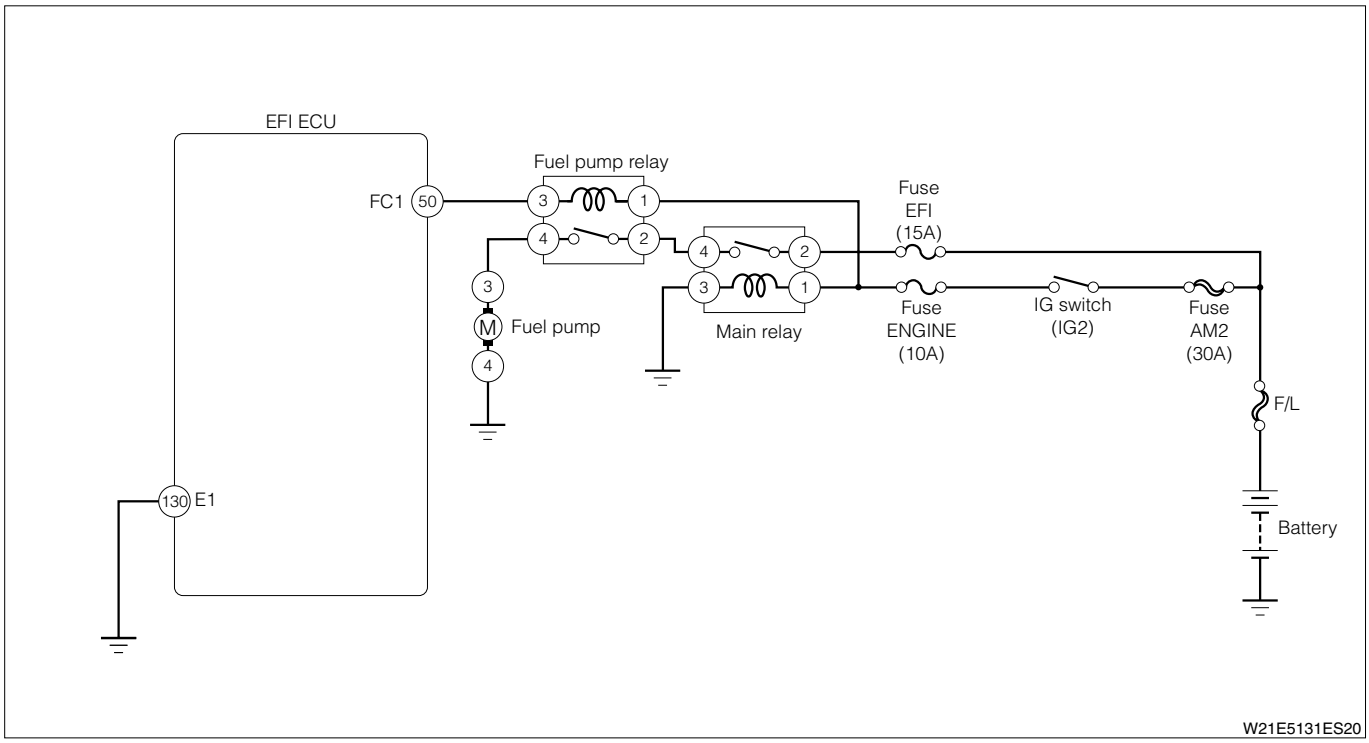
▼ If the result is OK, check the IG switch. Repair if necessary.

Refer to Page A1-32.

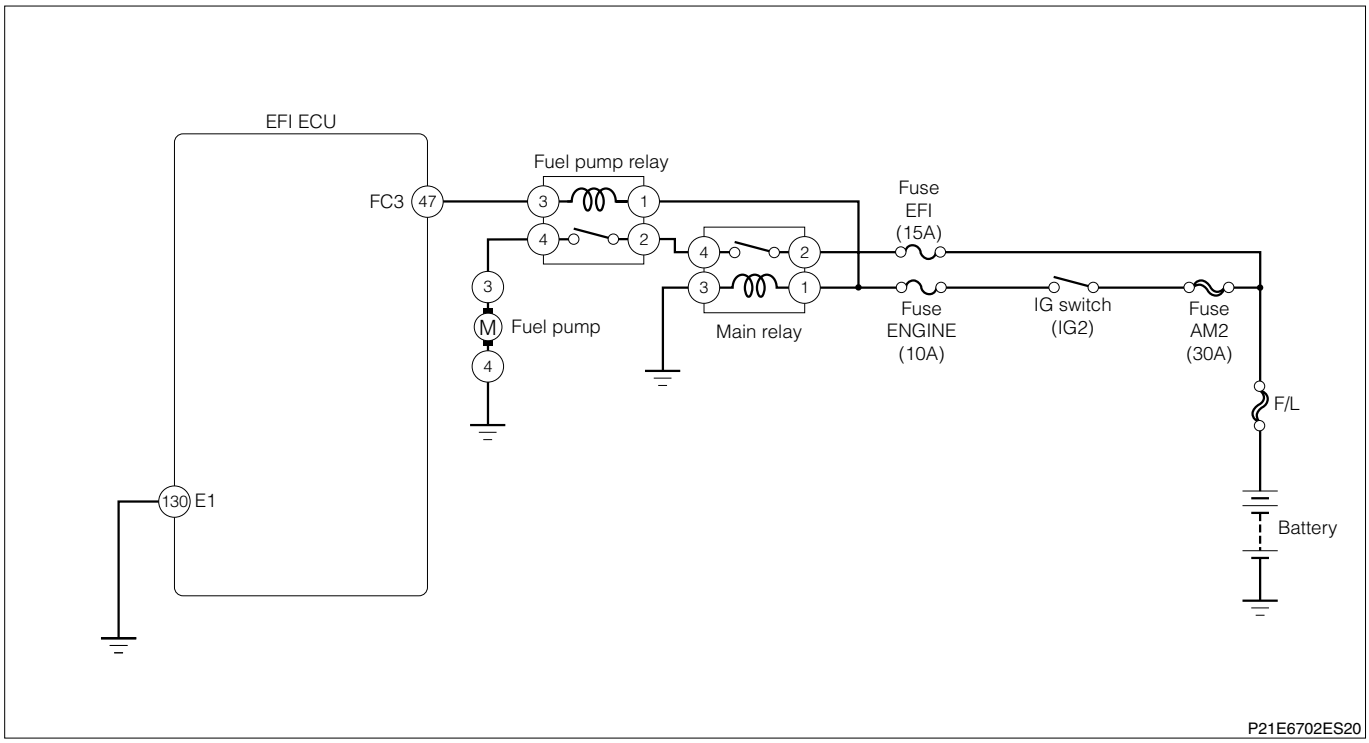
▼ If it is NG, repair or replace harness and connector at the faulty section.

13-14-3 CHECKING THE FUEL PUMP SYSTEM

(1) System diagram

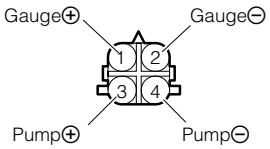


Immobilizer non-equipped vehicles

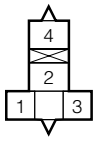


Immobilizer equipped vehicles

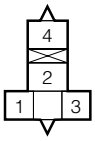
Each unit connected vehicle harness side connector



Fuel pump connected
vehiclie harness side connecter



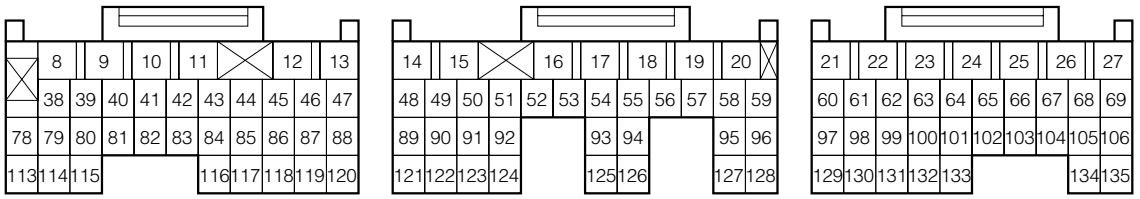
Fuel pump relay connected
fuse block side connector



Mein relay connected
fuse block side connector

W21E5150ES10

EFI ECU connected vehicle harness side connector



W21E5145S10

(2) **Checking points**

1. Fuel pump relay connector voltage
2. The fuel pump relay.
3. Fuel pump power supply voltage
4. The fuel pump system.

(3) **Check procedure**

∑1. Active test

1. Carry out the active test [Fuel pump] by using the diagnosis tester.
   SPECIFIED VALUE:

	The fuel pump condition
When it is "ON"	Driving
When it is "OFF"	Stopped

NOTE

- Check the operating sound at the fuel inlet side.

▼ If it is OK, go to ∑2.
▼ If it is NG, go to ∑5.

∑2. Fuel pressure checking

1. Carry out the fuel pressure checking.
   Refer to Page B8-127.

   SPECIFIED VALUE: Fuel pressure inspection shows normal.

   ▼ If it is OK, go to ∑3.
   ▼ If it is NG, go to ∑4.

∑3. Checking the EFI ECU output signal (1)

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

2. Measure the voltage between terminals SST50 (FC1) and SST130 (E1)under the following condition.
3.
   SPECIFIED VALUE:

Condition	Specified value
2 seconds after the ignition switch is set to "ON"	2.0 V or lower
When 2 seconds or more have elapsed after the ignition switch is set to "ON"	Battery voltage
When idling	2.0 V or lower

   ▼ If the result is OK, the fuel pump system is normal.
   ▼ If the result is NG, check the EFI ECU circuit.
   Refer to Page A1-32.

∑4. Checking the single unit of the fuel pump (1)

1. Carry out the single unit checking of the fuel pump.
   Refer to Page B8-127.

   SPECIFIED VALUE: The fuel pump is normal.

   ▼ If the result is OK, check or repair the fuel line.
   ▼ If the result is NG, replace the fuel pump.
   Refer to Page A1-29.

∑5. Checking the fuel pump relay voltage

1. Disconnect fuel pump relay.
2. Measure voltage between each terminal while IG SW is set to "ON".
   (1) Between connector 1 (coil side) linking the fuse box connecting the fuel pump relay and the body ground connector.
   (2) Between connector 2 (switch side) linking the fuse box connecting the fuel pump relay and the body ground connector.

   SPECIFIED VALUE: Battery voltage

   ▼ If normal, proceed to step ∑6.
   ▼ If switch is faulty, proceed to step ∑11.
   ▼ If the coil is faulty, proceed to inspect and repair the following parts.
   (3) Harness and connectors linking fuel pump relay and the battery.
   (4) Fuse
   (5) Ignition Switch

∑6. Checking the single unit of the fuel pump relay

1. Carry out the single unit checking of the fuel pump relay.
   Refer to Page B8-135.

   SPECIFIED VALUE: The fuel pump relay is normal.

   ▼ If it is OK, go to ∑7.
   ▼ If the result is NG, replace the fuel pump relay.

∑7.Wire harness check (1)

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between connector 4 linking the fuse box connecting the fuel pump relay and the vehicle side harness connector 3 (pump+) linking the fuel pump.
   (2) Between connector 4 (pump−) linking the fuse box connecting the fuel pump and the body ground connector.

   SPECIFIED VALUE: No abnormality exists.

   ▼ If it is OK, go to ∑8.
   ▼ If it is NG, repair or replace harness and connector at the faulty section.

∑8. Checking the single unit of the fuel pump (2)

1. Carry out the single unit checking of the fuel pump.
   Refer to Page B8-127.

   SPECIFIED VALUE: The fuel pump is normal.

   ▼ If it is OK, go to ∑9.
   ▼ If the result is NG, replace the fuel pump.
   Refer to Page B7-9.

∑9. Checking the EFI ECU output signal (2)

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

2. Measure the voltage between terminals SST50 (FC1) and SST130 (E1)under the following condition.
3. Under the following conditions, measure the voltage between the SST47 (FC3) and SST130 (E1) terminals. (Immobilizer equipped vehicles)
   SPECIFIED VALUE:

Condition	Specified value
2 seconds after the ignition switch is set to "ON"	2.0 V or lower
When 2 seconds or more have elapsed after the ignition switch is set to "ON"	Battery voltage
When idling	2.0 V or lower

▼ If it is OK, go to ∑10.
▼ If the result is NG, check the EFI ECU circuit.
Refer to Page A1-32.

∑10.Wire harness check (2)

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 50 (FC1) linking the EFI ECU and connector 3 on the fuse block connecting fuel pump relay.
   (2) Between EFI ECU vehicle harness connector 47 (FC3) and fuel pump relay fuse block connector 3 (immobilizer equipped vehicles)

SPECIFIED VALUE: No abnormality exists.

▼ If the result is OK, check the EFI ECU circuit.
Refer to Page A1-32.

▼ If it is NG, repair or replace harness and connector at the faulty section.

∑11.Wire harness check (3)

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between connector 2 (switch side) linking the fuse box connecting the fuel pump relay and connector 4 the fuse box connecting the main relay.

SPECIFIED VALUE: No abnormality exists.

▼ If it is OK, go to ∑12.
Refer to Page A1-32.

▼ If it is NG, repair or replace harness and connector at the faulty section.

⌦12. Checking the single unit of the main relay

1. Carry out the single unit checking of the main relay.
   Refer to Page B8-135.

   SPECIFIED VALUE: The main relay is normal.

   ▼ If it is OK, go to ⌦13.
   ▼ If the result is NG, replace the main relay.

⌦13. Main relay voltage check

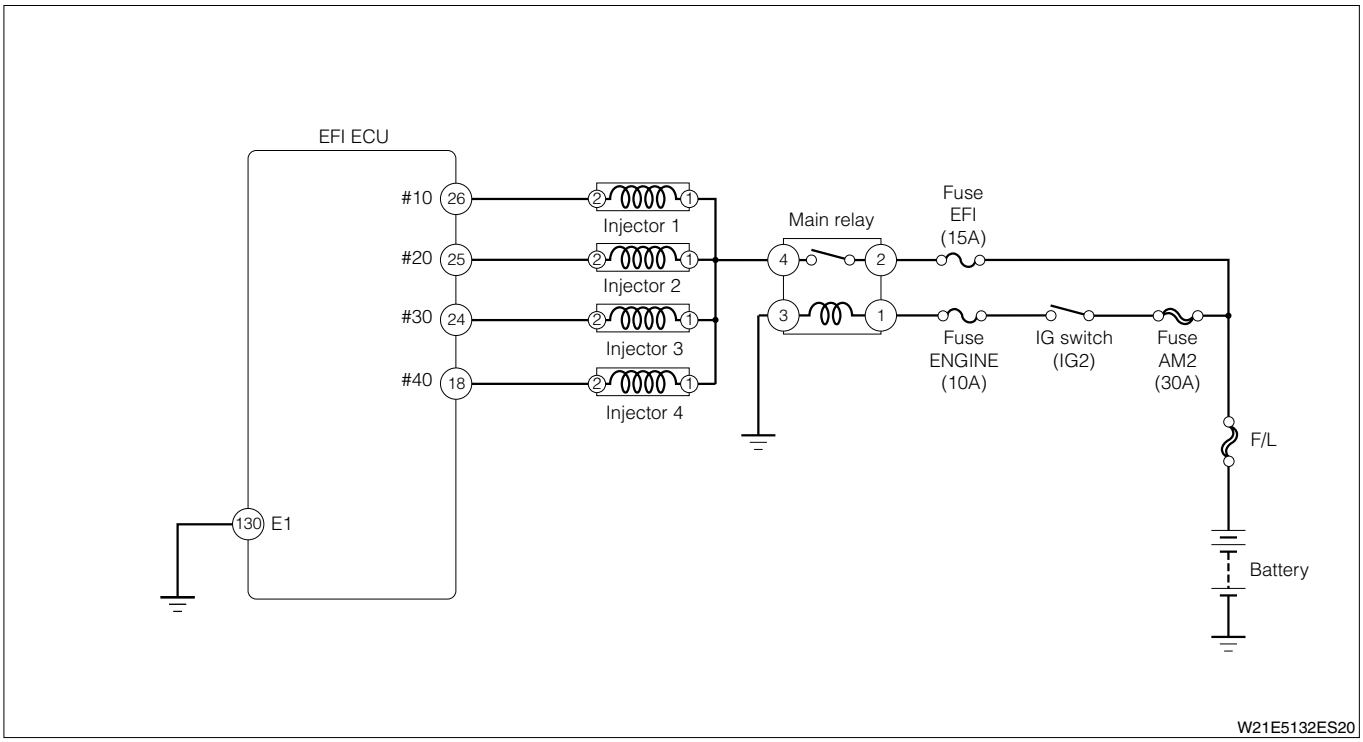
1. Disconnect the main relay.
2. Measure voltage between each terminal while IG SW is set to "ON".
   (1) Between fuse bloke connector 1(coil side) linking the main relay and the body ground connector.
   (2) Between fuse block connector 2 (switch side) linking the main relay and the body ground connector.

   SPECIFIED VALUE: Battery voltage

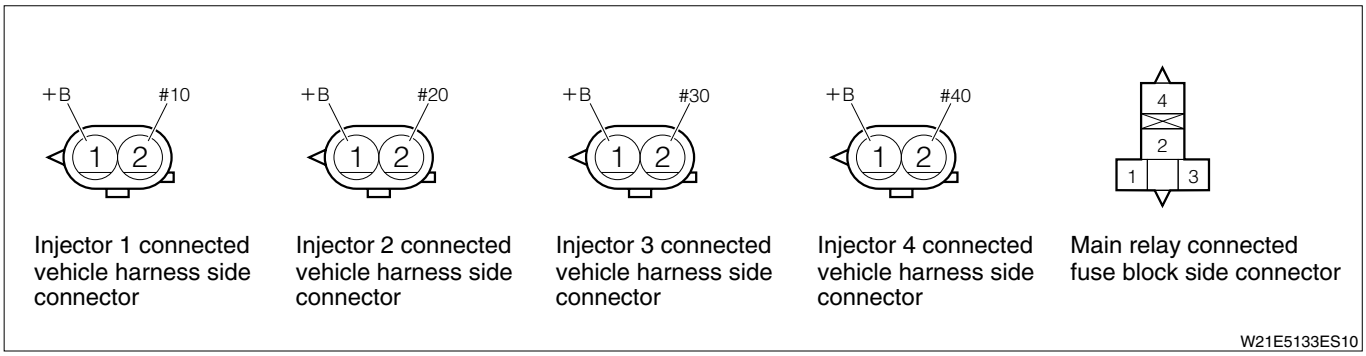
   ▼ If normal, inspect and repair as necessary the harness and connectors linking the main relay to the body ground connector.
   ▼ If the switch is faulty, inspect and repair as necessary the harness and connectors linking the main relay to the battery.
   ▼ If the coil is faulty, inspect and repair as necessary the following parts.
   (3) Between connector 1 linking the fuse box connecting the main relay and the vehicle side harness connector linking the battery.
   (4) Fuse
   (5) Ignition Switch

13-14-4 **CHECKING THE INJECTOR SYSTEM**

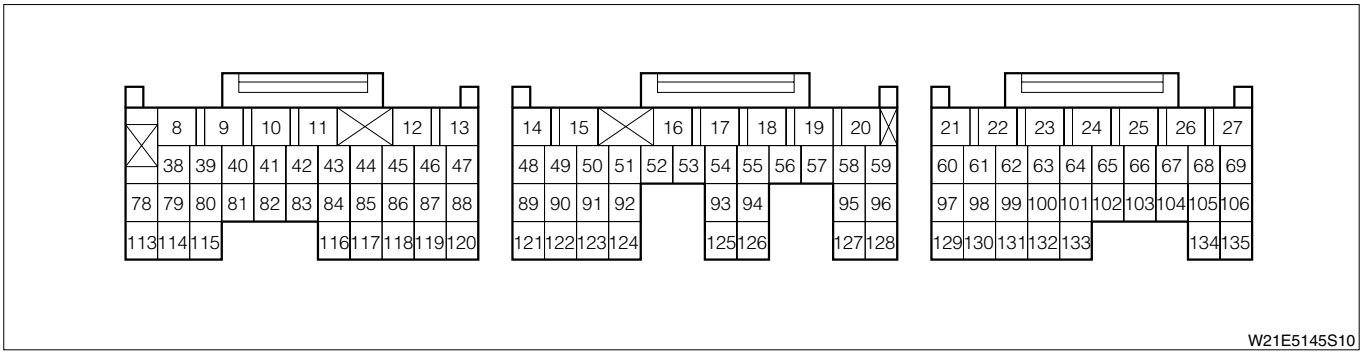
(1) **System diagram**



Each unit connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) **Checking points**

1. Injector control signal output from the EFI ECU.
2. Injector connector voltage
3. Harness and connectors linking injector and the EFI ECU.
4. Injector spray

(3) **Check procedure**

⊳1. Checking the injector operation.

1. Use a sound scope or a long screw driver to check if the injector's operating sound is generated.
   SPECIFIED VALUE: The operating sound is emitted.

▼ If it is OK, go to ⊳2.
▼ If it is NG, go to ⊳4.

⊳2. Fuel pressure checking

1. Carry out the fuel pressure checking.
   Refer to Page B8-127.

   SPECIFIED VALUE: Fuel pressure inspection shows normal.

▼ If it is OK, go to ⊳3.
▼ If faulty, perform inspection of fuel pump system.
Refer to Page B8-127.

⊳3. Carry out the single unit checking of the injector (1)

1. Carry out the single unit checking of the injector.
   Refer to Page B8-133.

   SPECIFIED VALUE: The injector is normal.

▼ If the result is OK, the injection system is normal.
▼ If the result is NG, replace the injector.
Refer to Page B7-9.

⊳4. Checking of the injector voltage

1. The ignition switch set to "LOCK".
2. Disconnect all connectors at the injector side.
3. Measure the voltage between each of the terminals with the ignition switch set to "ON".
   (1) Between each injector connected vehicle harness side connector 2 (+B) to the body earth
   SPECIFIED VALUE: Battery voltage

▼ If it is OK, go to ⊳5.
▼ If faulty, repair or replace as necessary the harnesses and connectors linking the injector to the battery.

∑5.Wire harness check

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 26 (#10) linking the EFI ECU and the vehicle side harness connector 1 (#10) linking ignition coil 1.
   (2) Between vehicle side harness connector 25 (#20) linking the EFI ECU and the vehicle side harness connector 2 (#20) linking ignition coil 1.
   (3) Between vehicle side harness connector 24 (#30) linking the EFI ECU and the vehicle side harness connector 3 (#30) linking ignition coil 1.
   (4) Between vehicle side harness connector 18 (#40) linking the EFI ECU and the vehicle side harness connector 4 (#40) linking ignition coil 1.
   (5) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the body ground connector.

   SPECIFIED VALUE: No abnormality exists.

   ▼ If it is OK, go to ∑6.
   ▼ If it is NG, repair or replace harness and connector at the faulty section.

∑6. Carry out the single unit checking of the injector (2)

1. Carry out the single unit checking of the injector.
   Refer to Page B8-133.

   SPECIFIED VALUE: The injector is normal.

   ▼ If it is OK, go to ∑7.
   ▼ If the result is NG, replace the injector.
   Refer to Page B7-11.

∑7. Checking the EFI ECU output signal

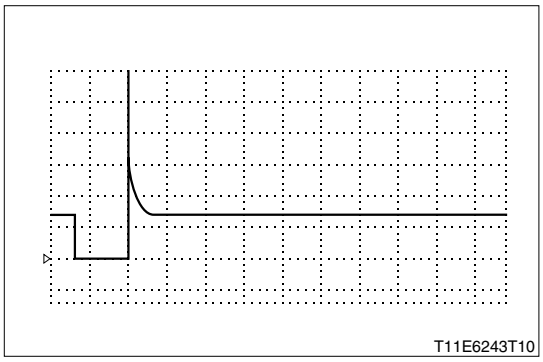
1. Connect the SST to the vehicle.
   SST: 09842-97209-000

2. Use an oscilloscope to measure the waveform emitted from the following connector.
   (1) Between SST26 (#10) and SST130 (E1)
   (2) Between SST25 (#20) and SST130 (E1)
   (3) Between SST24 (#30) and SST130 (E1)

(4) Between SST18 (#40) and SST130 (E1)

Time axis	2ms / DIV
Voltage axis	10V / DIV
Condition	The air conditioner is turned "OFF": no electric load applied; when the engine is "idling."

The condition under which the air conditioner is turned "OFF": the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".



NOTE

- Unable to identify waveform with the form shown in the figure (one example) to the right.

SPECIFIED VALUE: The battery voltage level changes to 0V during fuel injection.

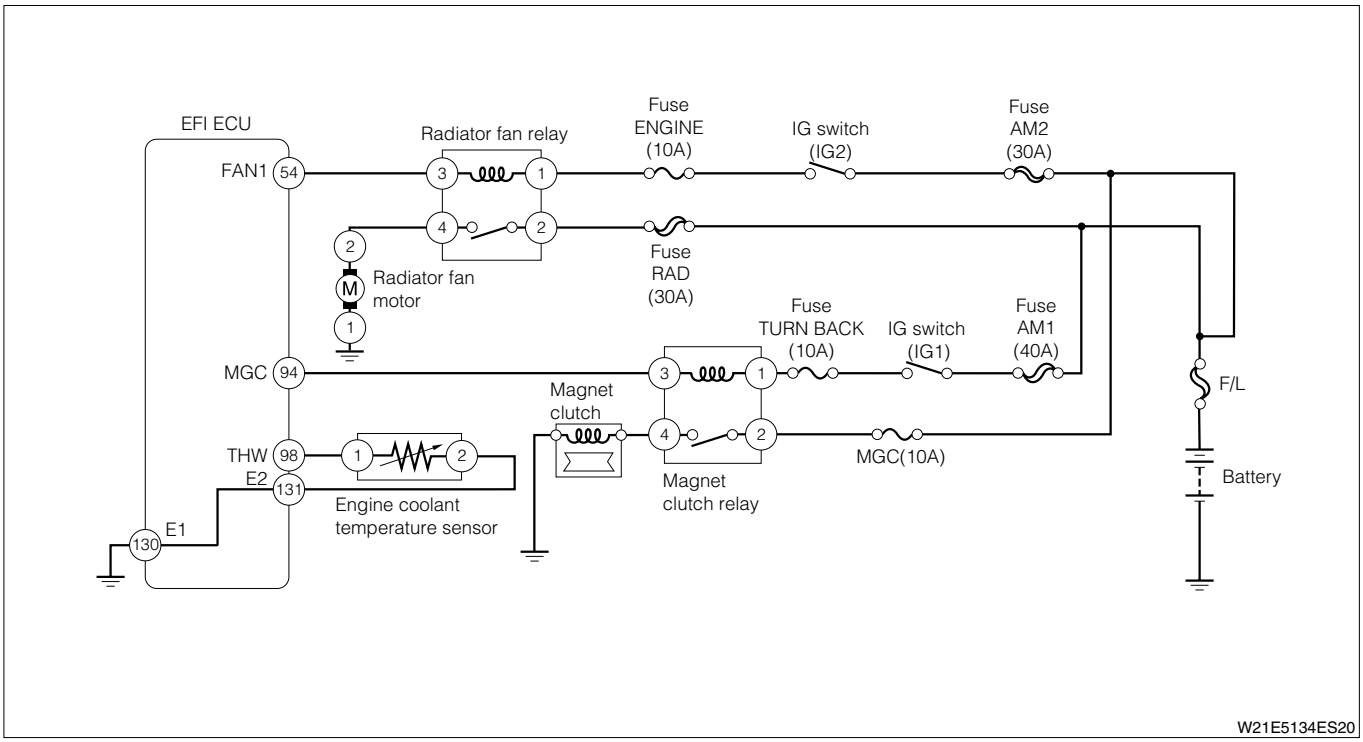
▼ If normal, inspect and repair as necessary the harness and connectors linking the EFI ECU and injecter.

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

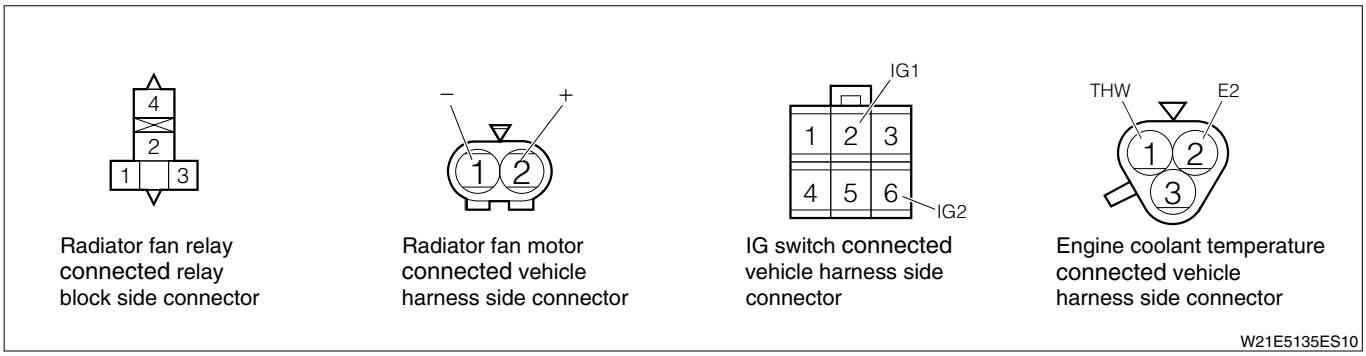
Refer to Page A1-32.

13-14-5 CHECKING THE RADIATOR FAN SYSTEM

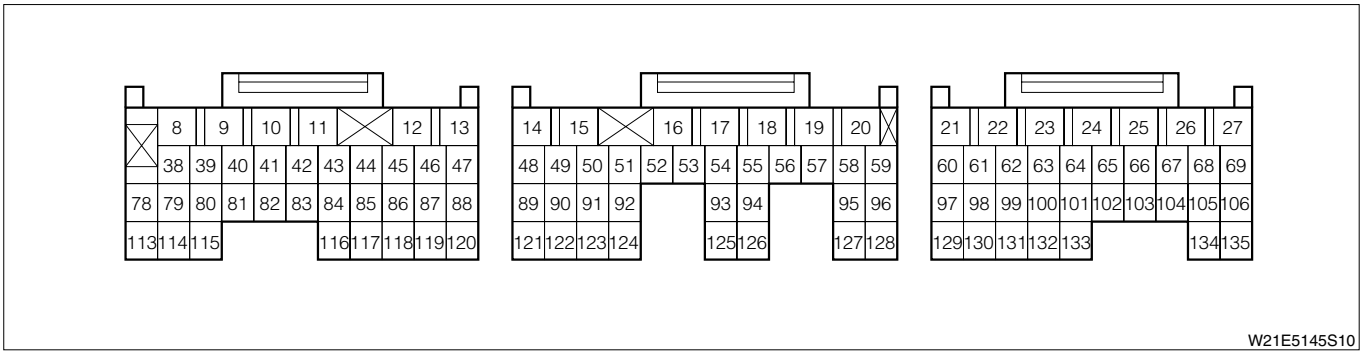
(1) System diagram



Each unit connected vehicle harness side connector



EFI ECU connected vehicle harness side connector



(2) Checking points

1. Signal from water temperature sensor input to the EFI ECU.
2. Water temperature sensor
3. Harness and connectors linking water temperature sensor and the EFI ECU.
4. Radiator fan motor
5. Harness and connectors linking radiator fan relay and the EFI ECU.
6. Magnetic clutch
7. Harness and connectors linking magnetic clutch relay and the EFI ECU.

(3) **Check procedure**

∑1. Diagnosis code checking

1. Read out the diagnosis code by using the diagnosis tester.

▼ If the diagnosis code is not outputted, go to ∑2.

▼ If the diagnosis code is outputted, check the code that is outputted.

Refer to Page B8-30.

∑2. Active test

1. When the air conditioner is "OFF", and when the engine is cold, carry out the active test [radiator fan] by using the diagnosis tester.

SPECIFIED VALUE:

	Operating the diagnosis tester	The radiator fan condition
a	"ON"→"OFF"	Rotation → Stopped
b		No rotation
c		No stopping (always rotating)

Air conditioner "ON": The air conditioner switch (ACSW), blower switch (BLW), magnet clutch (MGC) are all set to "ON".

▼ In the case of a, go to ∑3.

▼ In the case of b, go to ∑8.

▼ In the case of c, go to ∑12.

∑3. Confirmation of the operating status of the radiator fan (1)

1. Confirm the operating status of the radiator when the air conditioner is set to "OFF"→"ON" when the engine is cold.

SPECIFIED VALUE:

The air conditioning condition	The radiator fan condition
"OFF"→"ON"	Stopped → Rotating

Air conditioner "ON": The air conditioner switch (ACSW), blower switch (BLW), magnet clutch (MGC) are all set to "ON".

▼ If it is OK, go to ∑5.

▼ If it is NG, go to ∑4.

∑4. Checking the magnet clutch operation

1. Check that the magnet clutch operates normally when the air conditioner is turned "ON".

SPECIFIED VALUE: The magnet clutch is set to "ON".

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

Refer to Page A1-32.

▼ If the result is NG, carry out the checking of troubleshooting according to malfunction phenomena in the air conditioner system: the compressor clutch does not turn on.

Refer to Page K1-3.

∑>5. Checking the radiator fan operating status (2)

1. Read out the data monitor [water temperature] by using the diagnosis tester.
2. Confirm the operating status of the radiator when the air conditioner is set to "OFF" and the coolant temperature 80 ℃ or less → 100 ℃ or over.

SPECIFIED VALUE:

Water temperature condition	Radiator fan condition
At 80℃ or lower → 100℃	Stopped → Rotating

The condition under which the air conditioner is turned "OFF": The air conditioner switch (ACSW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".

▼ If the result is OK, the radiator fan system is normal.

▼ If the result is NG, go to ∑>6.

∑>6. Checking the single unit of the water temperature sensor

1. Carry out the single unit checking of the water temperature sensor.
   Refer to Page B8-129.

SPECIFIED VALUE: The water temperature sensors is normal.

▼ If the result is OK, go to ∑>7.

▼ If the result is NG, replace the water temperature sensor.

Refer to Page B8-5.

∑>7. Checking the wiring harness (1)

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 98 (THW) linking the EFI ECU and the vehicle side harness connector 1 (THW) linking the water temperature sensor.
   (2) Between vehicle side harness connector 131 (E2) linking the EFI ECU and the vehicle side harness connector 2 (E2) linking the water temperature sensor.
   (3) Between vehicle side harness connector 130 (E1) linking the EFI ECU and the body ground connector.

SPECIFIED VALUE: No abnormality exists.

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

Refer to Page A1-32.

▼ If it is NG, repair or replace harness and connector at the faulty section.

∑>8. Checking the single unit of the radiator fan relay

1. Carry out the single unit checking of the radiator fan relay.
   Refer to Page B8-135.

SPECIFIED VALUE: The radiator fan relay is normal.

▼ If the result is OK, go to ∑>9.

▼ If the result is NG, replace the radiator fan relay.

≫9. Checking the EFI ECU signal (1)

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

2. Carry out the active test [radiator fan] by using the diagnosis tester.
3. Measure the voltage between the following terminals when "ON" → "OFF" operation is performed.
   (1) Between SST54 (FAN1) and SST130 (E1)
   SPECIFIED VALUE:

	Measurement value
ON	1V or less
OFF	Battery voltage

▼ If the result is OK, go to ≫10.
▼ If the result is NG, check the EFI ECU circuit.
Refer to Page A1-32.

≫10. Checking the radiator fan relay voltage

1. When the ignition switch is set to "ON", measure the voltage between each of the following terminals.
   (1) Between the radiator fan relay connected vehicle harness side connector 1 and the body earth
   (2) Between the radiator fan relay connected vehicle harness side connector 2 and the body earth
   SPECIFIED VALUE: Battery voltage

▼ If the result is OK, go to ≫11.
▼ If faulty, inspect and repair as necessary the harness and connectors linking the radiator fan relay with the battery.

≫11. Checking the wiring harness (2)

1. Check the wiring harness between the following sections for breaking of wires, and short−circuiting.
   (1) Between vehicle side harness connector 54 (FAN1) linking the EFI ECU and the relay block connector 3 (coil side) linking the radiator fan relay.
   (2) Between relay block connector 4 (switch side) linking the radiator fan relay and the vehicle side harness connector 2 linking the radiator fan motor.
   (3) Between vehicle side harness connector 1linking the radiator fan motor and the bodyground connector.
   Refer to Page A1-31.

   SPECIFIED VALUE: No abnormality exists.

▼ If the result is OK, check the radiator fan motor.
▼ If it is NG, repair or replace harness and connector at the faulty section.

≫12. Checking the single unit of the radiator fan really (2)

1. Carry out the single unit checking of the radiator fan relay.
   Refer to Page B8-135.

   SPECIFIED VALUE: The radiator fan relay is normal.

▼ If the result is OK, go to ≫13.
▼ If the result is NG, replace the radiator fan relay.

⊳13. Checking the EFI ECU signal (2)

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

2. Carry out the active test [radiator fan] by using the diagnosis tester.
3. Measure the voltage between the following terminals when "ON" → "OFF" operation is performed.
   (1) Between SST54 (FAN1) and SST130 (E1)

SPECIFIED VALUE:

	Measurement value
ON	1V or less
OFF	Battery voltage

▼ If normal, inspect and repair as necessary the harness and connectors linking the radiator fan motor and radiator fan relay.

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

Refer to Page A1-32.

13-15 UNIT CHECK

WARNING

- Driving a vehicle with SST (EFI computer check sub－harness, etc.) being connected might cause an error operation to occur, which is extremely dangerous. Make sure that SST has been disconnected before driving the vehicle.

13-15-1 FUEL PRESSURE CHECKING

WARNING

- Never use fire during the work.
  Place cloth, etc. to prevent fuel from splashing.

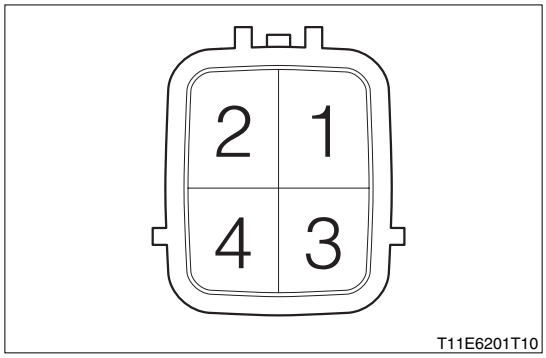
1. Connect diagnosis tester.
2. Remove the fuel hose from the fuel delivery pipe inlet and attach the fuel pressure gage to the pipe via a 3 way.
3. Set the ignition switch to "ON".
4. Carry out the active test [fuel pump] by using the diagnosis tester.
5. Measure the fuel pressure when the fuel pump is driven.
   SPECIFIED VALUE: 324±5 kPa {3.3± 0.05 kgf/cm^2}
   No significant variation taking place.

13-15-2 FUEL PUMP

WARNING

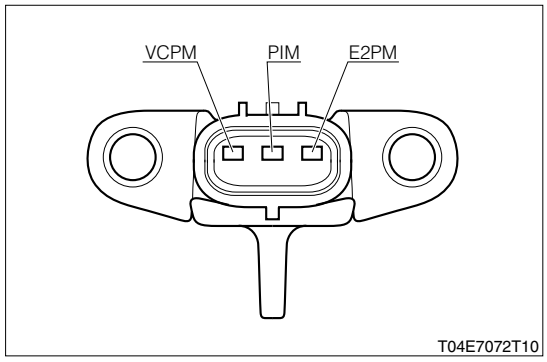
- Never use fire during the work.

1. Set the ignition switch to "ON".
2. Carry out the active test [fuel pump] by using the diagnosis tester.
3. Measure the fuel pressure when the fuel pump is driven.
   SPECIFIED VALUE: 324±5kPa{3.3±0.05kgf/cm^2}
   No major change
4. Set the ignition switch to "LOCK".
5. Disconnect the pump connector on the fuel tank.
6. Measure the resistance between 3 (pump＋) and 4 (pump －).
   SPECIFIED VALUE: 0.2 to 3.0Ω



13-15-3 **MANIFOLD PRESSURE SENSOR**

1. Connect the SST.
   SST: 09842-97209-000
2. .
   (1) Between SST101 (VCPM) and SST64 (E2PM)
   SPECIFIED VALUE: 4.75 to 5.25V
3. With the ignition switch set to "ON", measure the voltage between the following terminals.
   (1) Between SST102 (PIM) and SST64 (E2PM)
   SPECIFIED VALUE: 3.1 to 4.1V
4. Disconnect the connector of the fuel pump and perform cranking. And then, measure the voltage between the following terminals.
   (1) Between SST102 (PIM) and SST64 (E2PM)
   SPECIFIED VALUE: The voltage values vary.

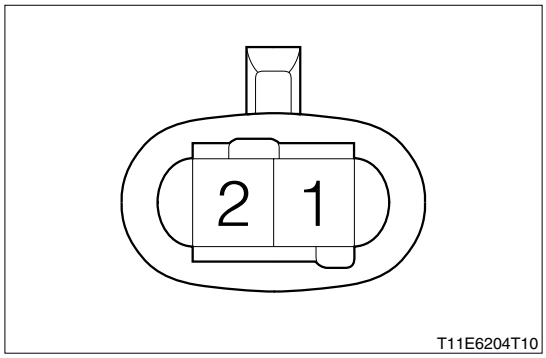


13-15-4 INTAKE AIR TEMPERATURE SENSOR

1. Measure the resistance value between the following terminals.
   (1) Between 1 (E2) and 2 (THW)

Characteristics of intake air temperature sensor

Temperature (℃)	−30	−20	20	80	120
Resistance (kΩ)	(28.6)	16.2±1.6	2.45±0.24	0.322±0.032	(0.117)

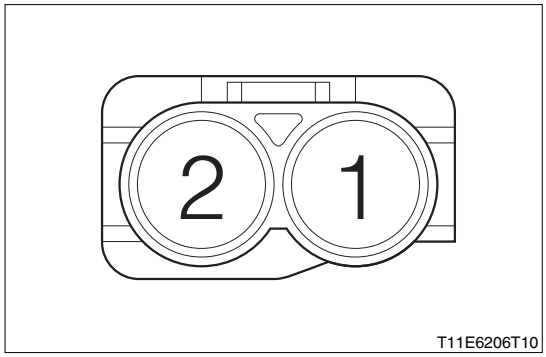


NOTE

- Figures inside parentheses show reference values.

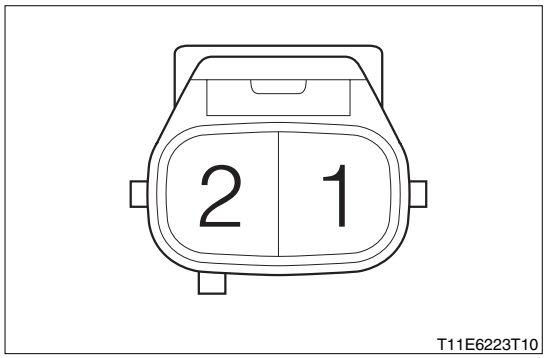
13-15-5 ENGINE REVOLUTION SENSOR

1. Measure the resistance value between the following terminals.
   (1) Between 1 (N1+) and 2 (N1−)
   SPECIFIED VALUE: 2150±300Ω (20℃)



13-15-6 CAMSHAFT POSITION SENSOR

1. Measure the resistance value between the following terminals.
   (1) Between 1 (N2+) and 2 (N2−)
   SPECIFIED VALUE: 2150±300Ω (20℃)



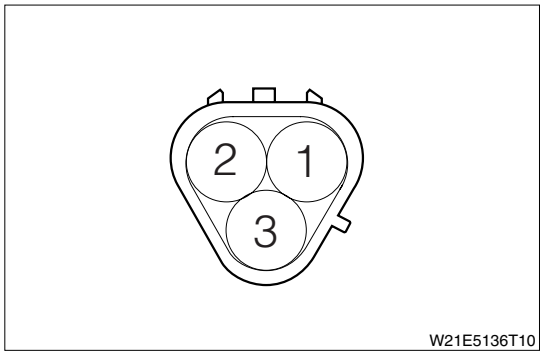
13-15-7 COOLANT TEMPERATURE SENSOR

1. Measure the resistance value between the following terminals.
   (1) Between 1 (E2) and 2 (THW)

Temperature (℃)	−20	20	80	110
Resistance (kΩ)	$14.96^{+1.3}_{-1.27}$	$2.44^{+0.16}_{-0.15}$	0.3143±0.0126	(0.1403)

NOTE

- Figures inside parentheses show reference values.

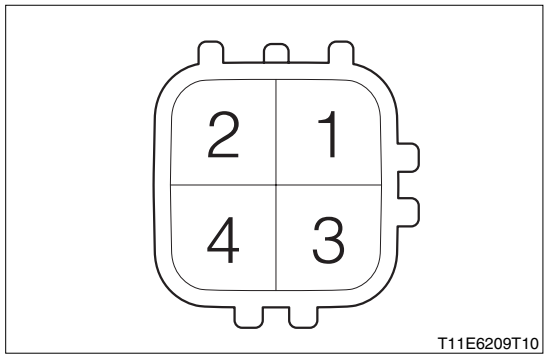


13-15-8 FRONT OXYGEN SENSOR

1. Measure the resistance value between the following terminals.
   (1) Between 1 (OXH1) and 2 (+B)

   SPECIFIED VALUE: $5.6^{+0.8}_{-0.6}\Omega$ (20±1℃)
2. Confirm that there is no continuity existing between the following terminals.
   (1) Between the front oxygen sensor main unit and 3 (OX1)
   (2) Between front oxygen sensor main unit and 4 (E2)
   (3) Between front oxygen sensor main unit and 1 (OXH1)
   (4) Between front oxygen sensor main unit and 2 (+B)
   (5) Between 3 (OX1) and 1 (OXH1)
   (6) Between 3 (OX1) and 2 (+B)
   (7) Between 4 (E2) and 1 (OXH1)
   (8) Between 4 (E2) and 2 (+B)

   SPECIFIED VALUE: No continuity exists



NOTE

- A part from the above checking of a single unit, carry out checking of voltage of the front oxygen sensor under the condition that the sensor is attached to the vehicle.
  (Refer to the troubleshooting according to diagnosis code P0130/21, P0135/23).

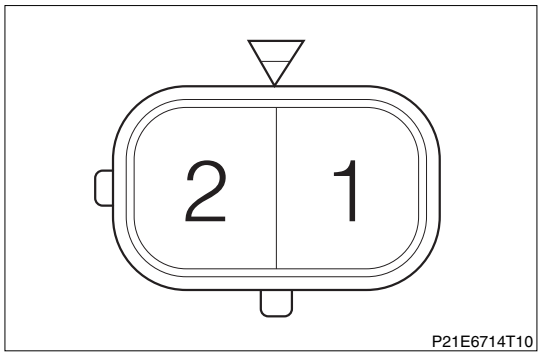
Refer to Page B8-59.

Refer to Page B8-63.

13-15-9 REAR OXYGEN SENSOR

1. Check that there is no continuity between the rear oxygen sensor and each terminal.
   (1) Between the rear oxygen sensor and 1 (OX2)
   (2) Between the rear oxygen sensor and 2 (E2)

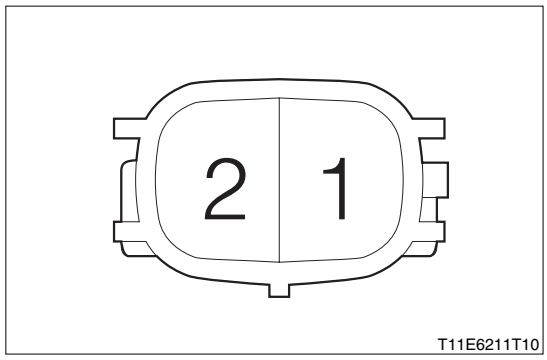
   SPECIFIED VALUE: No continuity



13-15-10 KNOCK SENSOR

1. Measure the resistance value between the following terminals.
   (1) Between 1 (E2) and 2 (KNK1)

   SPECIFIED VALUE: 200±80kΩ

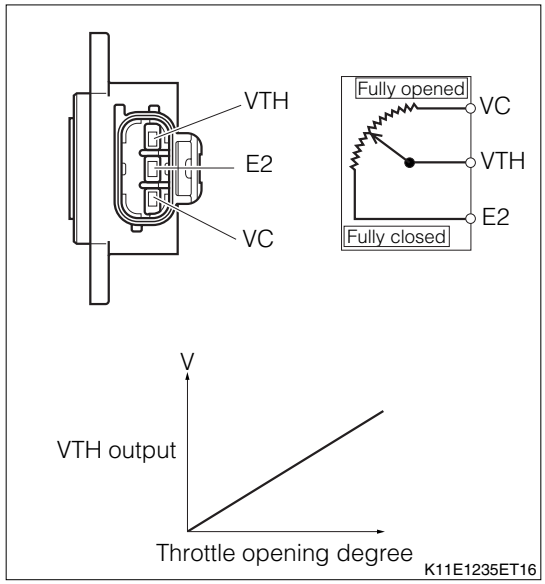


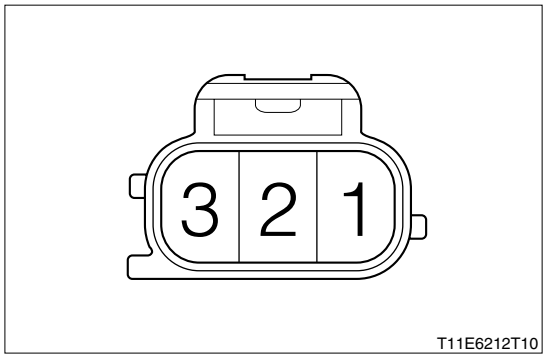
13-15-11 THROTTLE POSITION SENSOR

1. Measure the resistance between the following terminals.
   (1) Between 1 (VC)−2 (E2)
   SPECIFIED VALUE: 2.5 to 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.

NOTE

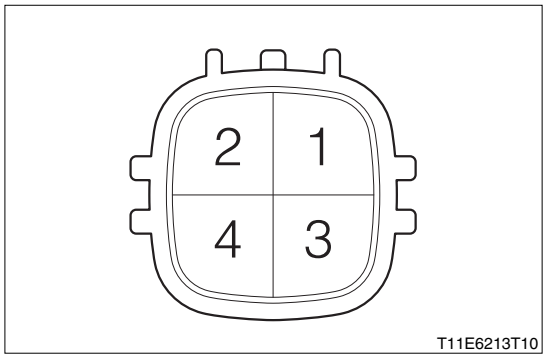
- The resistance value when the throttle lever is fully opened: R_O
  The resistance value when the throttle lever is fully closed: R_C
  Resistance value between 1(VC)−2(E2): R_A
  $R_O = R_C + 0.7 \times R_A$



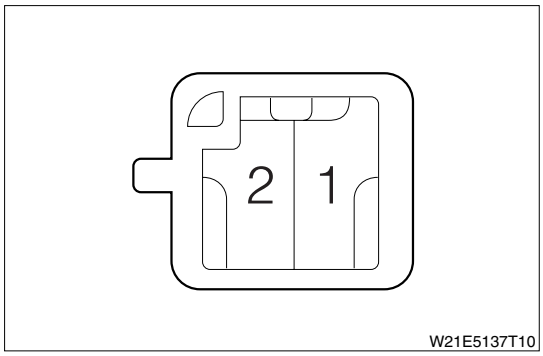


13-15-12 ISC STEPPER MOTOR

1. Completely warm up the engine.
2. Confirm the engine speed when the engine is idling with no electric load such as air conditioner and the like applied.
   SPECIFIED VALUE: The engine is idling at the specified The idling engine speed: 750±50rpm
3. Carry out the active test [ISC] by using the diagnosis tester.
   SPECIFIED VALUE: Opening (100 Steps): engine RPMs rise. Closing (10 steps): engine RPMs decline or engine stalls.



13-15-13 AIR CONDITIONER EVAPORATOR TEMPERATURE SENSOR



1. Measure the resistance between the sensor side connector terminals
2. Connect the connectors, and turned "ON" the air conditioner, and then wait for 5 minutes.

NOTE

- Air conditioner "ON": The air conditioner switch (ACSW), blower switch (BLW), magnet clutch (MGC) are all set to "ON".

3. Turn the air conditioner to "OFF," and measure the resistance value of the following terminals.

NOTE

- The condition under which the air conditioner is turned "OFF": The air conditioner switch (ACSW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".

(1) Between 1 (ACEV) and 2 (E21)

SPECIFIED VALUE: The resistance value varies before and after the operation of the air conditioner.

NOTE

- The resistance value increases as the temperature goes down.
- Air conditioner evaporator temperature sensor resistance characteristics (reference values) are shown below.

Temperature (℃)	0	15
Resistance (kΩ)	4.852±0.062	2.341±0.094

13-15-14 INJECTOR

WARNING

- Never use fire during the work.
- Be sure to prevent the fuel from splashing by using waste cloths.

1. Remove the injector before carrying out the checking.

CAUTION

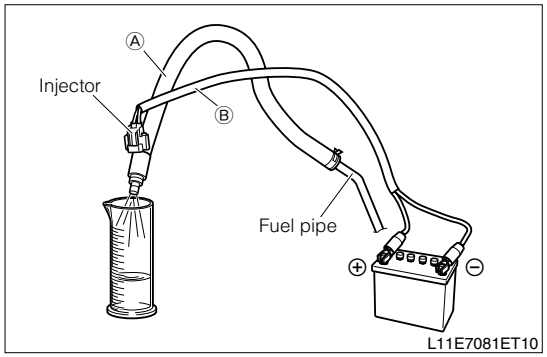
- Install a substitute injector to prevent foreign matters from entering.

2. Remove the fuel hose between the fuel inlet pipe and the fuel pipe.
3. Connect the injector for inspection purposes to disconnected fuel hoses using SST (measuring tool and EFI inspection wires). (see figure.)
   SST: 09275-87701-000Ⓐ
   09842-30070-000Ⓑ
4. Carry out the active test [fuel pump] by using the diagnosis tester.
5. Confirm that the injector injects the fuel when the voltage from the battery voltage is applied to the injector.
   SPECIFIED VALUE: The injector injects the fuel.

CAUTION

- Switching of "ON" or "OFF" is carried out at the battery side.

6. After inspecting injection performance, disconnect the battery and measure the volume of fuel that leaks from the injector for one minute.
   SPECIFIED VALUE: One drop or less
7. Measure the resistance value between the injector terminals.
   SPECIFIED VALUE: 12.2 Ω (20℃)



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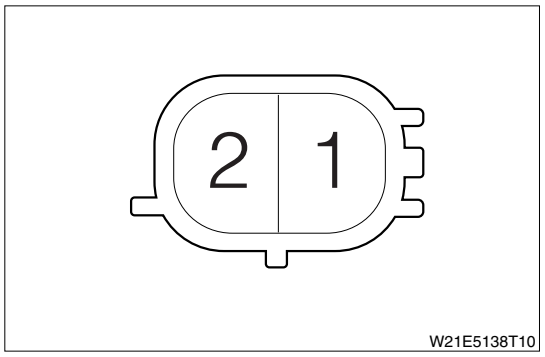
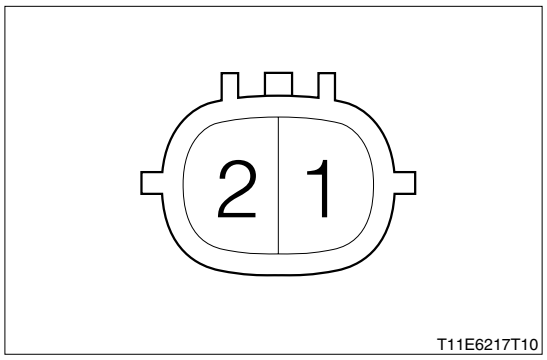


W21E5138T10

13-15-15 OIL CONTROL VALVE

1. Visually check the operation of the oil control valve when the battery voltage is applied to the connector terminals of the oil control valve.

	The target of the connection
Positive terminal of the battery	1 (OCV+)
Negative battery of the battery	2 (OCV−)



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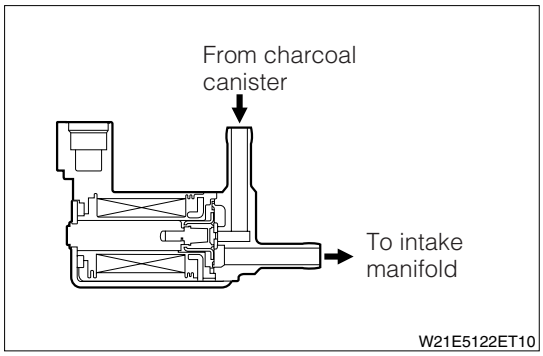
CAUTION

- Make sure that the battery voltage is applied no more than 1 minute.

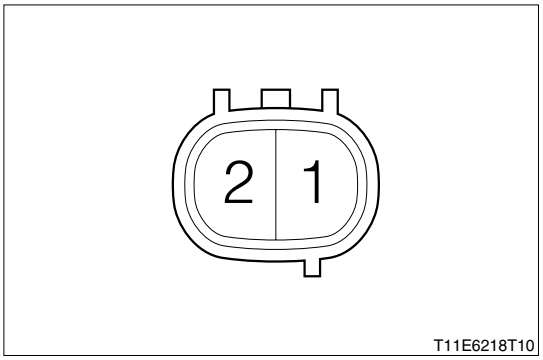
SPECIFIED VALUE: The valve operates when the battery voltage is applied.

13-15-16 EVAPORATOR PURGE VSV

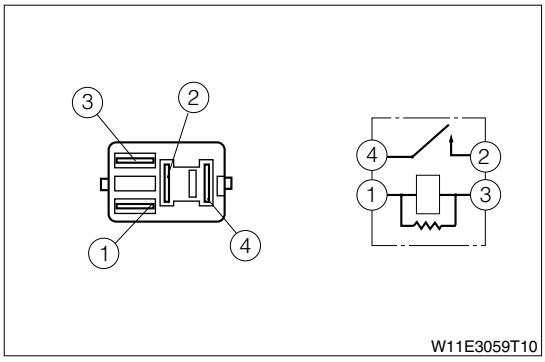
1. Check the ventilation between the ports.
   SPECIFIED VALUE: No ventilation
2. Check the ventilation between the ports when the battery voltage is applied to the connectors on the VSV side for evaporator purge.
   SPECIFIED VALUE: Ventilation existing



3. Measure the resistance between the following terminals.
   (1) Between 1 (PRG) and 2 (+B)
   SPECIFIED VALUE: 30 to 34 Ω (20°C)

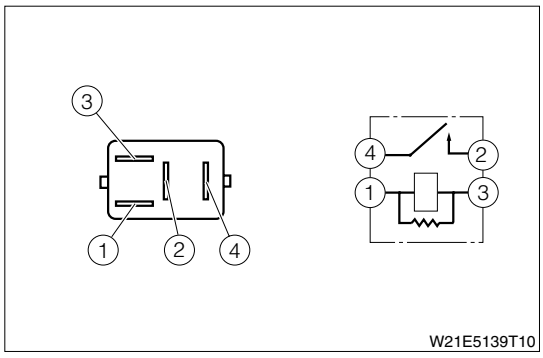


13-15-17 RADIATOR FAN RELAY (RAD), EFI MAIN RELAY (MGC),FUEL PUMP RELAY (F/P)



1. Check if the relay operates when the ignition switch is set to "ON" by means of sound and vibration.
   WARNING
   - Do not touch the relay with your hand as it may become hot during operation.
2. Measure the resistance between the relay side terminals 1 and 3.
   SPECIFIED VALUE: 131 to 230 Ω (at 20℃)
   NOTE
   - Carry out the measurement when the temperature inside the relay reaches the same value as the surrounding temperature (20℃).
     (Carry out the measurement after waiting 1 hour with the relay turned "OFF" with the temperature maintained at the surrounding temperature of 20℃.)
3. Confirm that there is no continuity existing between terminals other than between terminals 1 and 3 at the relay side.
4. When the battery voltage is applied to terminals 1 and 3 at the relay side, confirm that the continuity exists between terminals 2 and 4 at the relay side.

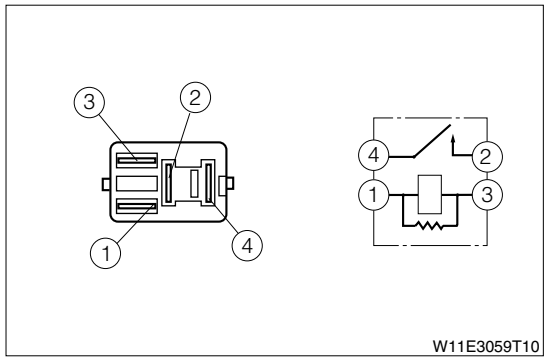
13-15-18 MAGNET CLATCH RELAY (MGC)



1. Check if the relay operates when the ignition switch is set to "ON" by means of sound and vibration.
   WARNING
   - Do not touch the relay with your hand as it may become hot during operation.
2. Measure the resistance between the relay side terminals 1 and 3
   SPECIFIED VALUE: 131 to 230 Ω (at 20℃)
   NOTE
   - Carry out the measurement when the temperature inside the relay reaches the same value as the surrounding temperature (20℃).
     (Carry out the measurement after waiting 1 hour with the relay turned "OFF" with the temperature maintained at the surrounding temperature of 20℃.)
3. Confirm that there is no continuity existing between terminals other than between terminals 1 and 3 at the relay side.
4. When the battery voltage is applied to terminals 1 and 3 at the relay side, confirm that the continuity exists between terminals 2 and 4 at the relay side.

13-15-19 **STARTER RELAY**

1. Check if the relay operates when the ignition switch is set to "ON" by means of sound and vibration.
   WARNING
   - Do not touch the relay with your hand as it may become hot during operation.
2. Measure the resistance between the relay side terminals 1 and 3
   SPECIFIED VALUE: 131 to 230 Ω (at 20℃)
   NOTE
   - Carry out the measurement when the temperature inside the relay reaches the same value as the surrounding temperature (20℃).
     (Carry out the measurement after waiting 1 hour with the relay turned "OFF" with the temperature maintained at the surrounding temperature of 20℃.)
3. Confirm that there is no continuity existing between terminals other than between terminals 1 and 3 at the relay side.
4. When the battery voltage is applied to terminals 1 and 3 at the relay side, confirm that the continuity exists between terminals 2 and 4 at the relay side.



13-16 ECU INPUT/OUTPUT SIGNAL CHECK

13-16-1 CHECKING METHOD

WARNING

- Driving a vehicle with SST (EFI computer check sub－harness, etc.) being connected might cause an error operation to occur, which is extremely dangerous. Make sure that SST has been disconnected before driving the vehicle.

13-16-2 SPECIFIED VALUE FOR INPUT/ OUTPUT SIGNAL

Checking system	Terminal	Measuring conditions	Reference value
Power supply	27(+B1) − 130(E1)	When the ignition switch is set to "ON".	Battery voltage
	38(BAT) − 130(E1)	At all times	
Manifold pressure sensor	101(VCPM) − 64(E2PM)	When the ignition switch is set to "ON".	4.75 to 5.25V
	102(PIM) − 64(E2PM)	When the ignition switch is set to "ON" (atmospheric pressure).	3.1 to 4.1V
		After the engine is started.	Changes according to the opening of the accelerator
Throttle position sensor	62(VC) − 131(E2)	When the ignition switch is set to "ON".	4.75 to 5.25V
	99(VTH) − 131(E2)	When the throttle valve is fully closed.	0.4 to 0.8V
		When the throttle valve is fully open.	3.2 to 5.0V
Coolant temperature sensor	98(THW) − 131(E2)	When warm (60 to 120℃ coolant temperature)	0.3 to 1.3V
Intake air temperature sensor	65(THA) − 131(E2)	When warm	0.5 to 4.3V
Knock sensor	132(KNK) − 131(E2)	When the engine is idling and when racing the engine.	Pulse generated
Engine speed sensor	63(N1+) − 100(N1−)	When the engine is idling.	Pulse generated
Camshaft position sensor	97(N2+) − 129(N2−)	When the engine is idling.	Pulse generated
Front oxygen sensor	22(OX1) − 131(E2)	After maintaining the engine speed at 3000 rpm for 4 minutes	Changes between 0.2 to 1.0V
Front oxygen sensor heater	60(OXH1) − 131(E2)	When the engine is idling.	3.0 or less
		When the ignition switch is set to "ON".	Battery voltage
Rear oxygen sensor	51(OX3) − 131(E2)	After maintaining the engine speed at 3000 rpm for 4 minutes	Changes between 0.2 to 1.0V
Injector system	26(#10) − 130(E1)	When the ignition switch is set to "ON".	Battery voltage
		When the engine is idling.	Pulse generated
	25(#20) − 130(E1)	When the ignition switch is set to "ON".	Battery voltage
		When the engine is idling.	Pulse generated
	24(#30) − 130(E1)	When the ignition switch is set to "ON".	Battery voltage
		When the engine is idling.	Pulse generated
	18(#40) − 130(E1)	When the ignition switch is set to "ON".	Battery voltage
		When the engine is idling.	Pulse generated
Ignition system	69(IG1) − 130(E1)	When the ignition switch is set to "ON".	0 to 0.11V
		When the engine is idling.	Pulse generated
	106(IG2) − 130(E1)	When the ignition switch is set to "ON".	0 to 0.11V
		When the engine is idling.	Pulse generated
	135(IG3) − 130(E1)	When the ignition switch is set to "ON".	0 to 0.11V
		When the engine is idling.	Pulse generated
	68(IG4) − 130(E1)	When the ignition switch is set to "ON".	0 to 0.11V
		When the engine is idling.	Pulse generated

Checking system	Terminal	Measuring conditions	Reference value
ISC drive signal	66(IACALO) — 130(E1)	When the engine is idling.	Pulse generated
	67(IACAHI) — 130(E1)		
	103(IACBLO) — 130(E1)		
	104(IACBHI) — 130(E1)		
Power steering signal	133(PST) — 130(E1)	When the oil pressure switch is set to "ON".	0 to 1V
		When the oil pressure switch is set to "OFF".	Battery voltage
Fuel pump	47(FC3) — 130(E1)	When the fuel pump is stopped.	Battery voltage
		When the engine is idling or when cranking the engine.	1.2V or less
Starter signal	55(STA) — 130(E1)	When the starter switch is set to "ON".	Battery voltage
		When the starter switch is set to "OFF".	Around 0V
Evaporator temperature sensor	45(ACEV) — 116(E21)	When the air conditioner is on.	0.15 to 4.8V
Air conditioner input signal	93(ACSW) — 130(E1)	When the air conditioner switch is set to "ON".	Battery voltage
		When the air conditioner switch is set to "OFF".	0 to 0.5V
Magnetic clutch relay	94(MGC) — 130(E1)	When the magnetic clutch relay is on.	Around 0V
		When the magnetic clutch relay is off.	Battery voltage
Stop lamp	43(STP) — 130(E1)	When the stop lamp is on.	Battery voltage
		When the stop lamp is off.	0 to 0.5V
Tail lamp	41(H/L) — 130(E1)	When the tail lamp is on.	Battery voltage
		When the tail lamp is off.	0 to 0.5V
defogger signal	11 (DEF)—130 (E1)	When the defogger switch is set to "ON".	Battery voltage
		When the defogger switch is set to "OFF".	0 to 0.5V
VSV evaporator page system	61 (PRG)—130 (E1)	When engine revolution speeds is 2000rpm constantly	Pulse generated
Blower	42(BLW) — 130(E1)	When the blower switch is set to "ON"	Battery voltage
		When the blower switch is set to "OFF"	0 to 0.5V
Radiator fan control system	54(FAN1) — 130(E1)	When the magnetic clutch is on.	1V or less
		When the magnetic clutch is off.	Battery voltage
Variable valve timing control system	20(OCV+) — 19(OCV—)	When the engine is idling.	Pulse generated
Engine speed output	118(REV) — 130(E1)	When the engine is idling.	Pulse generated
Ground	Between 131 (E2) and body	At all times	Continuity exists.
	Between 23 (E01) and body		
	Between 116 (E21) and body		
	Between 130 (E1) and body		

13-16-3 OSCILLOSCOPE WAVEFORMS

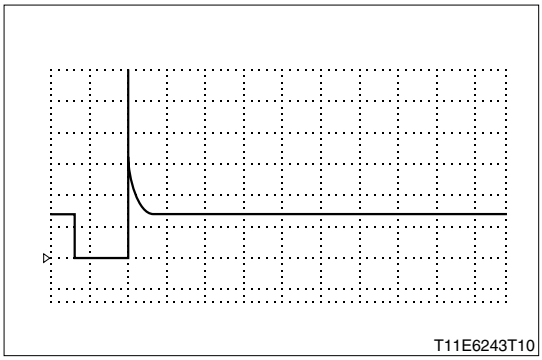
(1) Injector

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

2. Use an oscilloscope to measure the waveform emitted from the following connector.
   (1) Between SST26 (#10) and SST130 (E1)
   (2) Between SST25 (#20) and SST130 (E1)
   (3) Between SST24 (#30) and SST130 (E1)
   (4) Between SST18 (#40) and SST130 (E1)

Time axis	2ms / DIV
Voltage axis	10V / DIV
Condition	The air conditioner is turned "OFF": no electric load applied; when the engine is "idling."

The condition under which the air conditioner is turned "OFF": the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".


T11E6243T10

NOTE

- Unable to identify waveform with the form shown in the figure (one example).

3. Confirm the following points.
   (1) The voltage changes from the battery voltage to 0 V during fuel injection time.

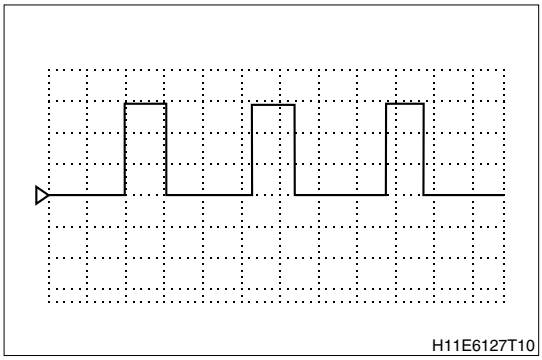
(2) Oil control valve

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

2. Completely warm up the engine.
3. Use an oscilloscope to measure the waveform emitted from the following connector.
   (1) SST20 (OCV+) and SST19 (OCV−)
4. In the case of measuring range and the measuring condition as an example, the oscilloscope waveform will be as in the right diagram.

Time axis	1ms / DIV
Voltage axis	5V / DIV
Condition	The air conditioner is turned "OFF": no electric load applied; when the engine is "idling."

The condition under which the air conditioner is turned "OFF," and the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".


H11E6127T10

NOTE

- Unable to identify waveform with the form shown in the figure (one example) to the right.

5. Confirm the following points.
   (1) 0 ⇄ a battery voltage is generated.

(3) Engine speed output signal

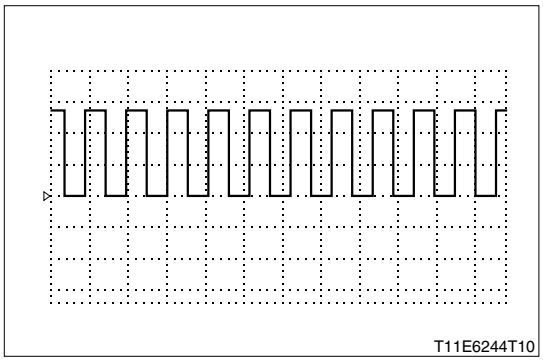
1. Connect the SST.
   SST: 09842-97209-000

2. Use an oscilloscope to measure the waveform emitted from the following connector.
3. Completely warm up the engine.
   (1) SST118 (REV) and SST130 (E1)

4. In the case of measuring range and the measuring condition as an example, the oscilloscope waveform will be as in the right diagram.

Time axis	50ms / DIV
Voltage axis	5V / DIV
Condition	The air conditioner is turned "OFF": no electric load applied; when the engine is "idling."

The condition under which the air conditioner is turned "OFF," and the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".


T11E6244T10

NOTE

- Unable to identify waveform with the form shown in the figure (one example) to the right.

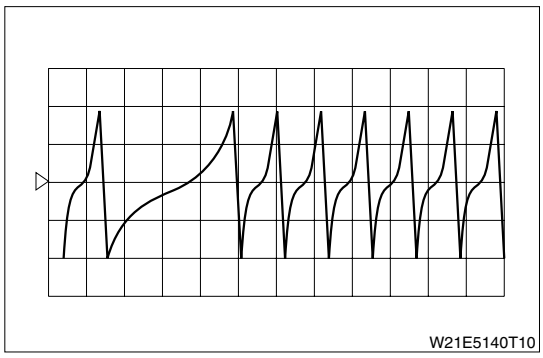
5. Confirm the following points.
   (1) 0 ⇄ a battery voltage is generated.
   (2) The waveform period becomes shorter as the engine speed rises.

(4) **Engine revolution sensor**

1. Connect SST.
   SST: 09842-97209-000
2. Use an oscilloscope to measure the waveform emitted from the following connector.
3. Fully warm up the engine.
   (1) Between SST63 (N1＋) and SST100 (N1－)
4. In the case of the measurement range and the measurement condition as shown below, the result will be, as an example, as shown in the diagram.

Time axis	10ms / DIV
Voltage axis	2V / DIV
Condition	The air conditioner is turned "OFF": no electric load applied; when the engine is "idling."

The condition under which the air conditioner is turned "OFF," and the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".


W21E5140T10

NOTE

- Unable to identify waveform with the form shown in the figure (one example) to the right.

5. Confirm the following points.
   (1) Regular waveform is emitted.
   (2) The waveform cycle becomes shorter as the engine revolution speed rises.

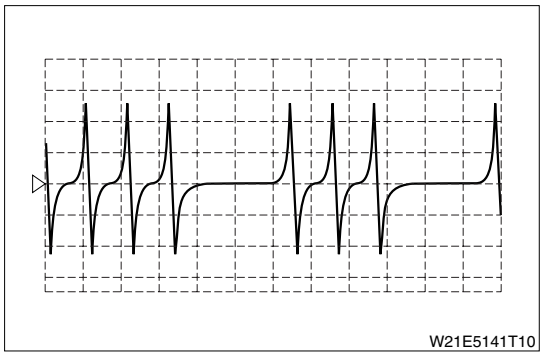
(5) **Camshaft position sensor**

1. Connect SST.
   SST: 09842-97209-000
2. Use an oscilloscope to measure the waveform emitted from the following connector.
3. Fully warm up the engine.
   (1) Between SST97 (N2＋) and SST129 (N2－)

4. In the case of the measurement range and the measurement condition as shown below, the result will be, as an example, as shown in the diagram.

Time axis	50ms / DIV
Voltage axis	1V / DIV
Condition	The air conditioner is turned "OFF": no electric load applied; when the engine is "idling."

The condition under which the air conditioner is turned "OFF," and the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".



NOTE

- Unable to identify waveform with the form shown in the figure (one example) to the right.

5. Confirm the following points.
   (1) The waveform cycle becomes shorter as the engine revolution speed rises.

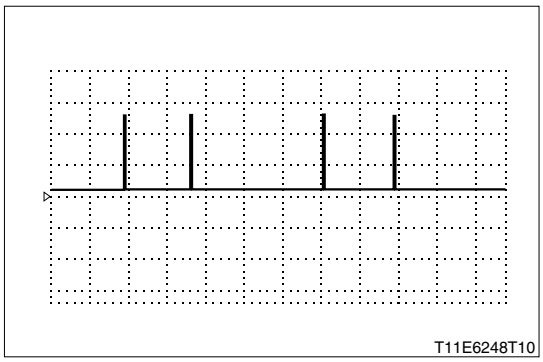
(6) **Ignition signal**

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

2. Use an oscilloscope to measure the waveform emitted from the following connector.
   (1) Between SST69 (IG1) and SST130 (E1)
   (2) Between SST106 (IG2) and SST130 (E1)
   (3) Between SST135 (IG3) and SST130 (E1)
   (4) Between SST68 (IG4) and SST130 (E1)

Time axis	100ms / DIV
Voltage axis	2V / DIV
Condition	The air conditioner is turned "OFF": no electric load applied; when the engine is "idling."

The condition under which the air conditioner is turned "OFF": the air conditioner switch (ASCW), blower switch (BLW), magnet clutch (MGC) are all set to "OFF".



NOTE

- Unable to identify waveform with the form shown in the figure (one example) to the right.
- The ignition signal cannot be checked correctly without using an oscilloscope.

3. Confirm the following points.
   (1) 0⇄5V pulse is generated.
   (2) The waveform cycle becomes shorter as the engine revolution speed rises.

13-17 ECU DATA MONITOR/FREEZE FRAME DATA

13-17-1 LIST OF ECU DATA MONITOR/FREEZE FRAME DATA

(1) Scanning data

1. The following data values are the typical values obtained by using a scanning tool under the normal condition. Use these values as your reference.
   Even if the measurement values may differ from those values listed here, it is possible that the system may be operating normally. Therefore, the judgment concerning the system as to whether a malfunction has occurred or not must not be made by only on the basis of these data values under the so−called "normal condition."

CAUTION

- 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.
- To check data when the engine is in the "idling" or "racing" condition, the shift lever must be put in neutral, with the A/C switch set to "OFF," and all accessory switches set to "OFF."

Scanning data

The data name (Abbreviated name)	Explanations of items	Checking condition	Reference value	During an abnormality Major checking items
Number of diagnosis codes (DIAG)	Indicatives the number of diagnosis codes (0−255)	−	0	−
Engine coolant temperature (ECT)	Indicates the temperature of the engine cooling water. (−40 to 140℃)	Complete warming up	80 to 97℃	THW voltage
		When the sensor is short−circuited	119 to 140℃	
		When the sensor wire is broken	−40℃	
Manifold absolute pressure (MAP)	Indicates the pressure in the manifold by using the absolute pressure (0 to 120kPa)	Engine stopped	90 to 110kPa	VCPM voltage PIM voltage
		When idling after the engine is warmed up (Air conditioner set to "OFF," with no engine load applied)	20 to 40kPa	
		When the engine is running at a certain speed (with the air conditioner OFF, and no load applied to the engine) 2000rpm	19 to 39kPa	
Engine revolution speed (RPM)	Indicates the engine speed.	When the engine is running at a certain speed	No significant variation	N2 voltage

The data name (Abbreviated name)	Explanations of items	Checking condition	Reference value	During an abnormality Major checking items
Vehicle speed (VS)	Indicates the vehicle speed.	When a certain amount of distance has been traveled	No significant variation	SPD voltage
Ignition timing advance (ITA)	Indicates the ignition timing of the first cylinder. (BTDC63.5 − ATDC64 degrees)	When cranking	4 to 8 degrees	IG1 voltage Each sensor voltage
		When idling after the engine is warmed up (Air conditioner set to "OFF," with no engine load applied)	0 to 15 degrees	
		When the engine is running at a certain speed (air conditioner "OFF," with no engine load applied) 2000rpm	20 to 40 degrees	
Intake air temperature (IAT)	Indicate the intake air temperature (−40 to 140℃)	Ignition switch set to "ON"	Equivalent to the surrounding temperature	THA voltage
		When the sensor is short−circuited	119 to 140℃	
		When the sensor is short−circuited	−40℃	
Output volt of FR O2 SSR (O2FV)	Indicates the output voltage of the front oxygen sensor (0 to 1.275V)	When the engine is running at a certain speed (with no engine load applied) 2500rpm	0 to 1.0V	OX1 voltage
Short term of FR O2 SSR (O2FP)	Indicates the feedback compensation coefficient of the front oxygen sensor (−100 to 99.2%)	When the engine is running at a certain speed (with no engine load applied) 2500rpm	−20 to +20%	OX1 voltage
Output volt of RR O2 SSR (O2FV)	Indicates the output voltage of the rear oxygen sensor (0 to 1.275V)	When the engine is running at a certain speed (with no engine load applied) 2500rpm	0 to 1.0V	OX2 voltage
Short term of RR O2 SSR (O2FP)	Indicates the feedback compensation coefficient of the rear oxygen sensor (−100 to 99.2%)	When the engine is running at a certain speed (with no engine load applied) 2500rpm	−20 to +20%	OX2 voltage
Evaporative Purge output (EVAP)	Display duty rate of the VSV for evaporative purge control signal.	IG SW "ON", engine stopped	0%	PRG voltage
		When engine revolution speed is constant (Air conditioner "OFF", No engine load): 2000rpm	0 to 100%	
Battery voltage (VPWR)	Indicates the battery voltage.	IG SW "ON", engine stopped	11to13V	Power source voltage
Total fuel trim bank 1 (TFAK)	Indicates the compensation amount (compensation time) for the fuel basic injection amount (injection time) as a coefficient.	After the engine is warmed up, at 3000rpm (with no engine load applied)	0.74 to 1.49	Intake system, fuel system, ignition system, exhaust system
Abs. throttle position SSR (TP)	Indicates the relative opening of the throttle valve.	When the accelerator pedal is fully closed (IG SW "ON")	0 to 1.6%	VTH temperature
ISC learning value (DLRN)	Indicates the ISC value of learning.	When idling after the engine is warmed up	0 to 20%	ISC stepper motor voltage

*:Vehicles with rear oxygen sensor

Data name (Abbreviated name)	Explanations of items	Checking condition	Reference value	Major checking items when an abnormality occurred
Knock corr. advance angle (AKNK)	Indicates the corrected angle of displacement when knocking is generated.	When idling after the engine is warmed up	0 to 3 degrees CA	KNK voltage
Purge corr. coefficient (FPRG)	Indicates the feedback correction coefficient of the evaporator purge control.	IG SW "ON", engine stopped	0%	PRG voltage
		When engine revolution speed is constant (Air conditioner "OFF", No engine load): 2000rpm	30 to 40%	
Idle switch position (IDL)	Display when idle SW is set to "ON" or "OFF".	When the accelerator pedal is fully closed→ fully opened	ON → OFF	VTH voltage
Air conditioner signal (AC)	Indicates the input of the air conditioner signal	Air conditioner switch OFF state → ON state	OFF → ON	ACSW voltage
Electric load (DSW)	Indicates the conditions of the headlight, the defogger, the heater blower, and the radiator fan	Any of the headlight, the defogger, the heater blower, or the radiator fan is set to "ON"	ON	Each switch voltage
		All of the headlight, the defogger, the heater blower, or the radiator fan are set to "OFF"	OFF	
Stop lamp signal (STP)	Display either stop lamp signal "ON" or "OFF".	When brake pedal is stepped on	ON	STP voltage
		When brake pedal is released	OFF	
PST	Display either power steering signal "ON" or "OFF".	Vehicle stopped, steering controlled	ON	PST voltage
		Vehicle stopped, steering not controlled	OFF	

Data name (Abbreviated name)	Explanations of items	Checking condition	Reference value	Major checking items when an abnormality occurred
Target angle of intake cam (VTT)	Indicates the target angle of displacement of VVT control of the intake cam (0 to 50 degrees CA)	When idling after the engine is warmed up (Electric load "OFF," with no engine load)	0 to 5 degrees CA	OCV voltage
Actual angle of intake cam (VT)	Air intake camshaft actual displacement angle is displayed. (0 to 50 degrees CA)	After the engine is warmed up, engine idling (Electric load "OFF," with no engine load)	0 to 5 degrees CA	
VVT control duty ratio (DVT)	Display duty rate of the DVVT control OCV driving signal.	After engine is warmed up, and the engine is idling (Electric load "OFF," with no engine load)	30 to 55%	PIM,N1,N2,THW voltage
TVVT angle converted val. (VTB)	Display VVT zero point learning value.	After engine is warmed up, and the engine is idling (Electric load "OFF," with no engine load)	32 to 42 degrees	N1,N2 voltage
ISC current step position (STEP)	Step number of the current step position of the ISC stepper motor is displayed.	After engine is warmed up, and the engine is idling (Electric load "OFF," with no engine load)	7 to 50 step	ISC stepper motor voltage
		After engine is warmed up, and the engine is idling (Electric load "ON", with no engine load)	50 to 115step	
ISC (Duty ration) (ISC)	Indicates the duty ratio of the ISC driving signal (0 to100%)	When idling after the engine is warmed up (Air conditioner set to "OFF," with no engine load applied)	6 to 14%	VC voltage VTH voltage THW voltage
		When idling after the engine is warmed up (Air conditioner set to "OFF")	20 to 60%	
Injection time (TAU)	Indicates the injection time of the injector (0 to 3.264ms)	Cold start → Complete warming up (Air conditioner is set to "OFF," with no engine load)	1.4 to 2.5ms	PIM voltage THW voltage OX1 voltage
		When idling after the engine is warmed up (Air conditioner is set to "OFF," with no engine load)	1.4 to 1.8ms	
		At 2000 rpm (Air conditioner is set to "OFF," with no engine load)	1.0 to 1.8ms	
VF monitor (VFKG)	Fuel−to−air ratio is revised to display a learning value.	After the engine is warmed up, engine is running at constant speed(engine under no load). 3000rpm	0.75 to 1.48	Intake system, fuel system, ignition system, exhaust system
O2 sensor signal (OX)	Display "RICH" or "LEAN"	After the engine is warmed up, engine is running at constant speed(engine under no load). 3000rpm	Lean⇄Rich	OX1voltage

CAUTION

- The values produced by the data monitor tend to show discrepancies over time due to measuring errors and changes in operating environments, making it difficult to display accurate reference values (deciding values). Therefore, poor operation may develop even when values are within the reference range.
- A technique involving gathering data using a vehicle of the same model tested under the same conditions is used to assess such difficult to assess events as second wind and rough idling. Assessments are broadly based on all items covered by the data monitor.

13-17-2 LIST OF FREEZE FRAME DATA

(1) Freeze frame data

1. If the phenomena of the outputted diagnosis code cannot be reproduced, check the freeze−frame data.

List of the freeze frame data

Item names	Abbreviation	Unit	Minimum value of variation
Engine coolant temperature	ECT	℃	1
Manifold absolute pressure	MAP	kPa	1
Engine revolution speed	RPM	rpm	1
Vehicle speed	VS	km/h	1
Ignition timing advance	ITA	degrees	0.1
Intake air temperature	IAT	℃	1
Abs. throttle position SSR	TP	%	0.1
Output volt of FR O2 SSR	O2FV	V	0.001
Short term of FR O2 SSR	O2FP	%	0.1
Total fuel trim bank 1	TFAK	−	0.001
Battery voltage	VPWR	V	0.1
ISC learning value	DLRN	%	0.1
Idle switch position	IDL	−	−
Air conditioner signal	AC	−	−
Electric load	DSW	−	−
Stop lamp signal	STP	−	−
Power steering signal	PST	−	−
ISC current step position	STEP	step	1
ISC (Duty ration)	ISC	%	0.1
Manifold absolute pressure	PMVT	MPa	0.01
Injection time	TAU	ms	0.01

13-18 ACTIVE TEST

CAUTION

- Pay attention to the fact that the normal control is not activated during the active test.
  (Such as overheating caused by stopping driving of the fan for the radiator; or over−run caused by the ISC driving.)
- After an active test is completed, make sure to confirm that the normal condition has been resumed.

Diagnosis tester items	Contents	control condition
ISC	Control between ISC stepper motor 100 step(open side) and 10 step(close side).	Vehicle stopped, engine is idling
Fuel pump	Control of "ON" (driving) or "OFF" (stop) of the fuel pump	−
Purge VSV	Control of "ON" (energized) or "OFF" (not energized) to the purge VSV	−
Radiator fan	Control of "ON" (driving) and "OFF" (stop) of the radiator fan	−
Terminal T	Control of ON (short circuit) and OFF (release) of T terminal	−