

5. PROGRAMMED-FUEL INJECTION

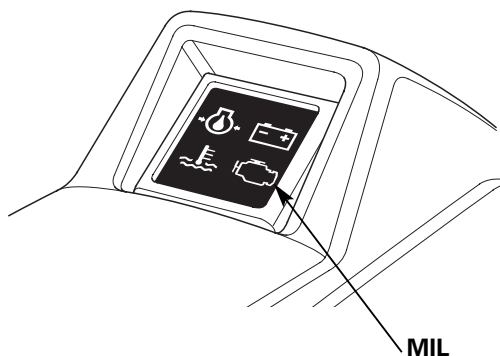
BF40D·BF50D

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1. SERVICE PRECAUTIONS

• PROGRAMMED-FUEL INJECTION TROUBLESHOOTING

- First, check the MIL of the indicator.
- Be sure to turn the combination switch OFF before disconnecting and connecting the connectors.
- Clear the DTCs and reset the ECM after inspection and repair (P. 5-12 and 43).



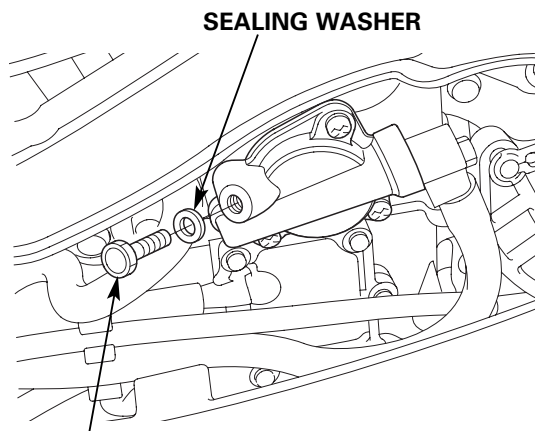
• FUEL LINE SERVICE

⚠ WARNING

Gasoline is highly flammable and explosive. You can be burned or seriously injured when handling fuel.

- Keep heat, sparks and flame away.
- Wipe up spills immediately.
- Handle fuel only outdoors.

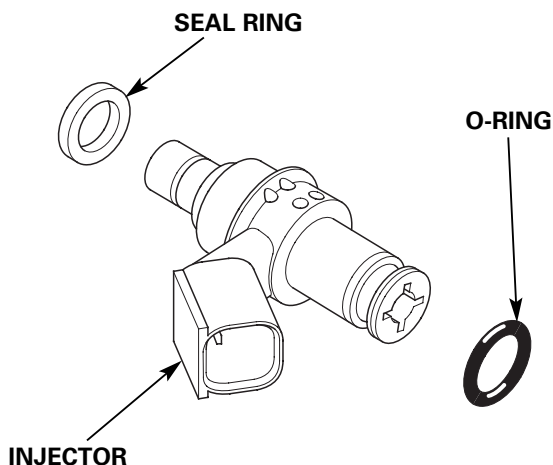
- Disconnect the battery cable from the battery negative (-) terminal.
- Before removing and installing the fuel line, relieve the fuel pressure by loosening the service check bolt of the high pressure side fuel strainer, as described in "How to relieve fuel pressure" (P. 5-79).
- Replace the sealing washers during reassembly.



SERVICE CHECK BOLT

11.8 N·m (1.2 kgf·m, 9 lbf·ft)

- Replace the O-rings and seal rings with new ones when the fuel line is removed/installed or replaced.
- Apply the recommended engine oil to the O-rings and seal rings before installation. Avoid using vegetable oil and alcoholic grease.



• CHECK AFTER OPERATION

- Check the parts for secure installation and the bolts, screws and other fasteners for secure tightening.
- Connect the battery cable to the battery negative (-) terminal.

• FUEL LEAK CHECK

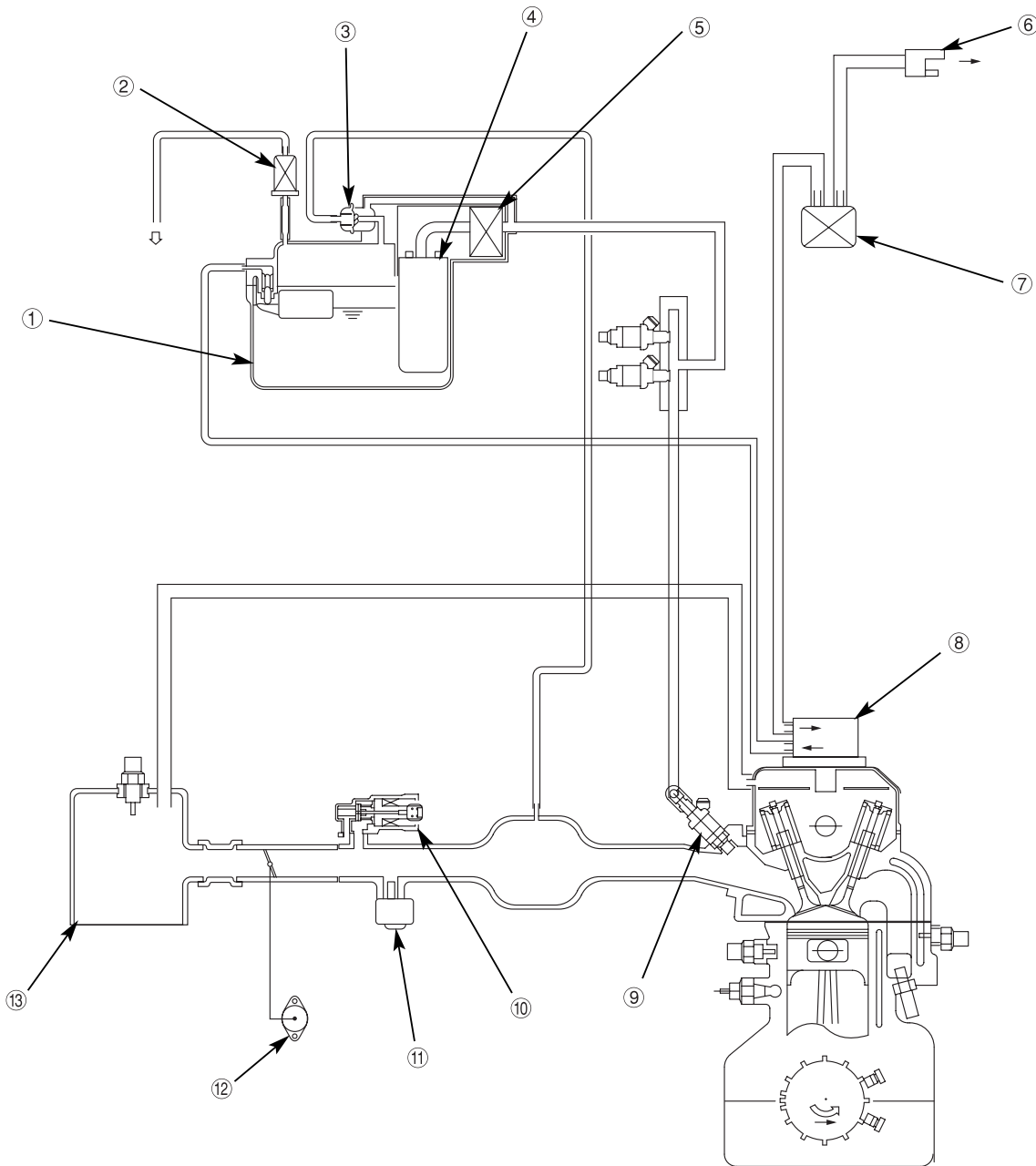
Turn the combination switch ON (but do not turn the starter) after connecting the fuel lines. The fuel pump (high pressure side) should operate for approximately 2 seconds and the fuel pressure in the high pressure side fuel line should rise. Repeat this operation 2 or 3 times and check for fuel leakage.

• WHEN THE BOAT IS EQUIPPED WITH RADIO EQUIPMENT/D-GPS

The ECM and its wires are designed to be unaffected by radio waves. However, the ECM can malfunction when it senses an extremely powerful electric wave. Note the following to avoid malfunction of the ECM.

- Install the antenna and the body of the radio equipment at least 50 cm (20.0 in) away from the ECM, remote control cable and the remote control box.
- Antenna wire must not be too long. Do not route the antenna wire along the main wire harness and other cables/wires.
- Do not mount high output power radio equipment on the boat. (The maximum output power of the radio equipment should be 10W.)
- Install the D-GPS antenna and the body unit at least 3m away from the engine.
- Connect the D-GPS antenna ground wire to ground.

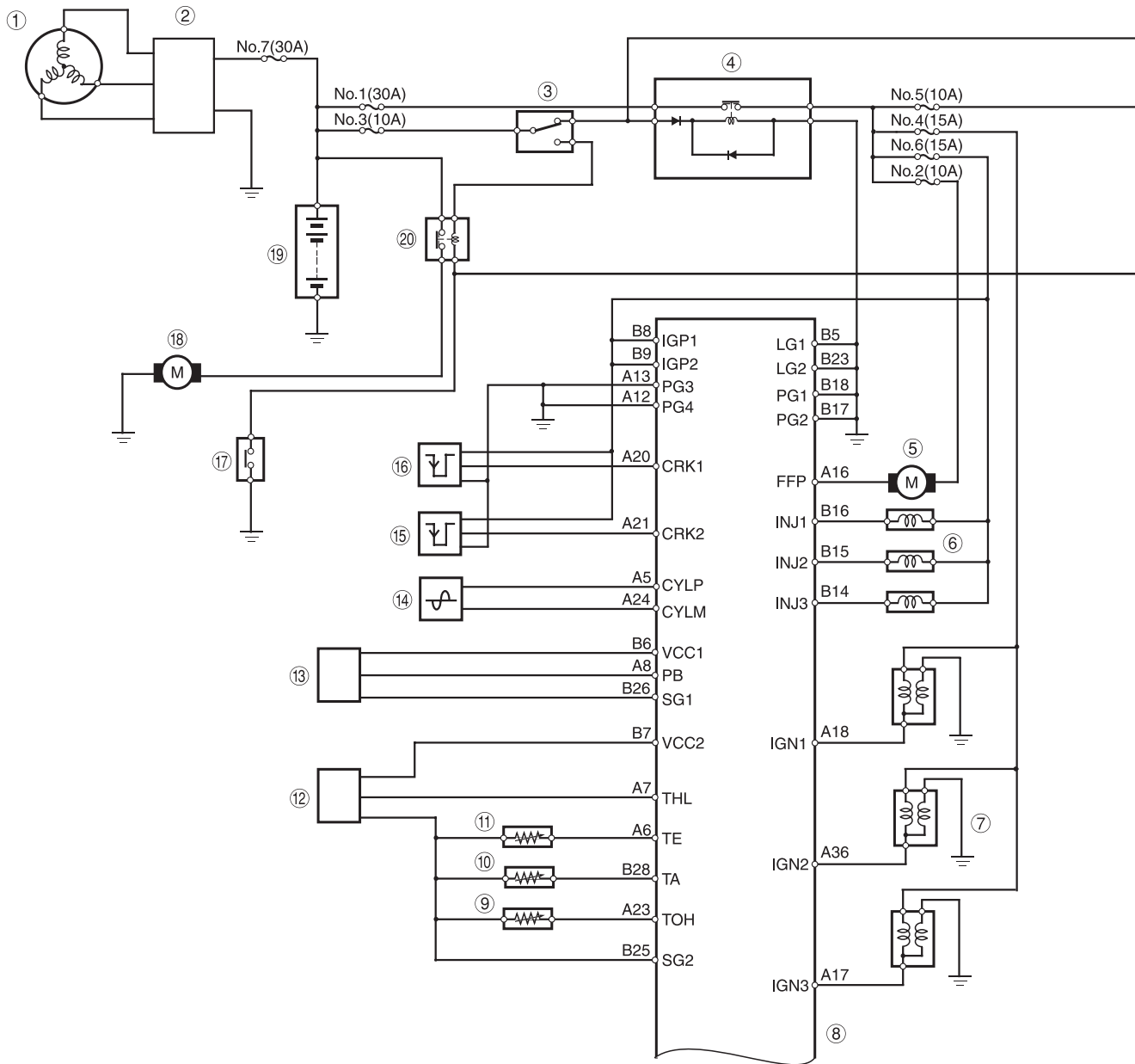
2. VACUUM CONNECTIONS



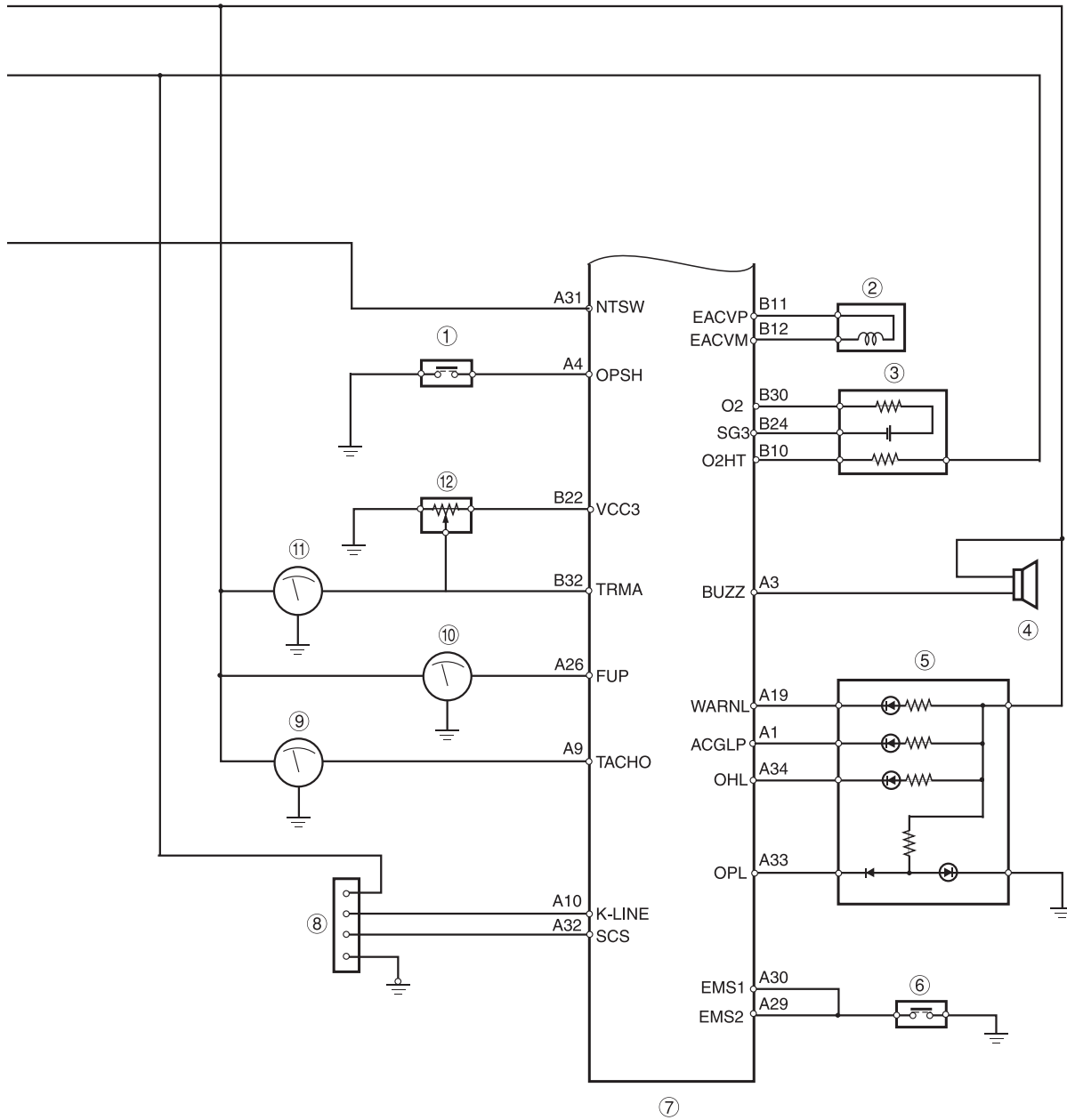
- ① VAPOR SEPARATOR
- ② AIR VENT STRAINER
- ③ PRESSURE REGULATOR
- ④ FUEL PUMP (HIGH PRESSURE SIDE)
- ⑤ FUEL STRAINER (HIGH PRESSURE SIDE)
- ⑥ FUEL CONNECTOR
- ⑦ FUEL STRAINER (LOW PRESSURE SIDE)

- ⑧ FUEL PUMP (LOW PRESSURE SIDE)
- ⑨ INJECTORS
- ⑩ IAC (IDLE AIR CONTROL) VALVE
- ⑪ MAP (MANIFOLD ABSOLUTE PRESSURE) SENSOR
- ⑫ TP (THROTTLE POSITION) SENSOR
- ⑬ SILENCER

3. CIRCUIT DIAGRAM



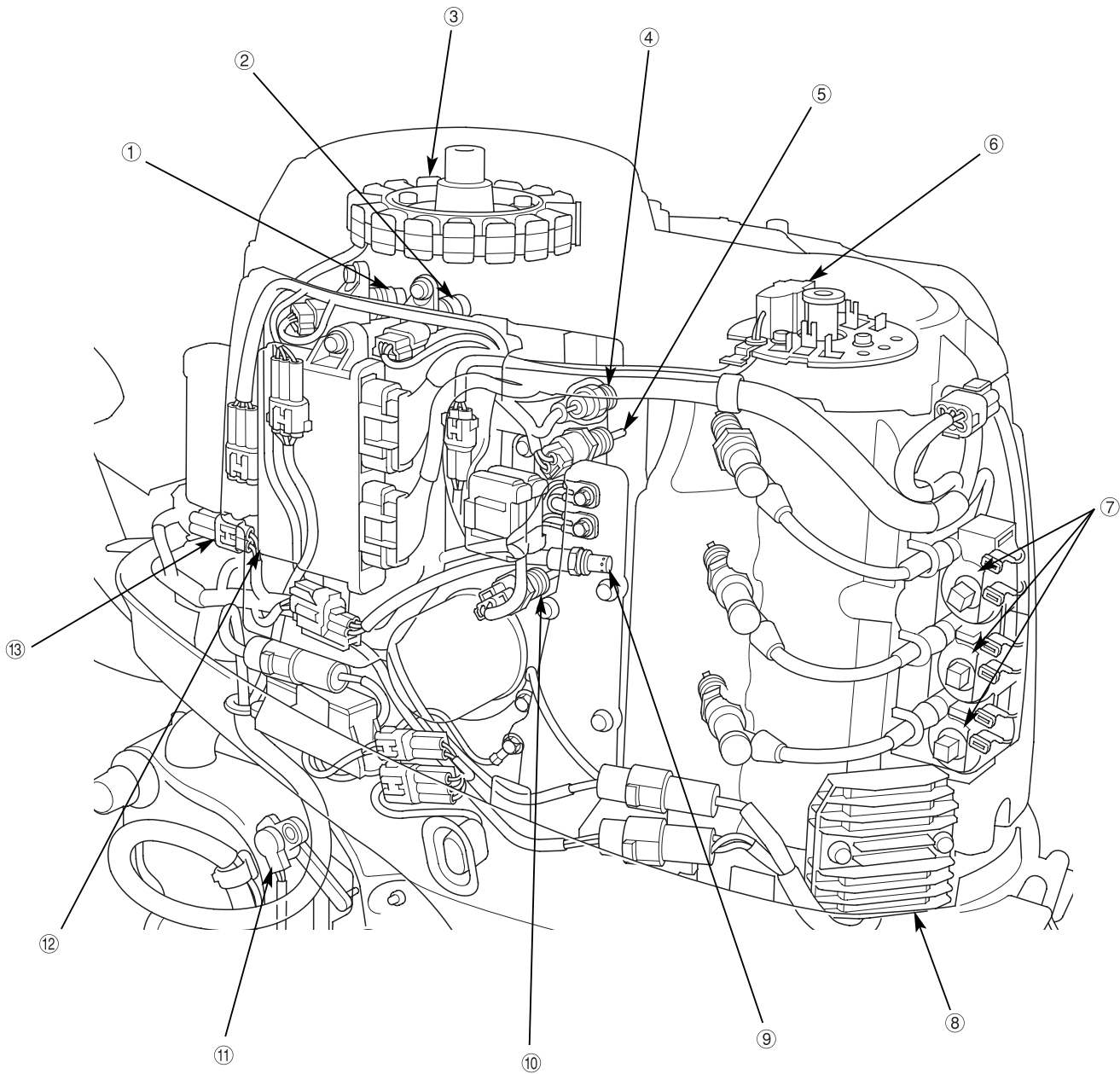
- | | |
|---|---|
| ① ALTERNATOR | ⑪ EBT (ENGINE BLOCK TEMPERATURE) SENSOR |
| ② REGULATOR/RECTIFIER | ⑫ TP (THROTTLE POSITION) SENSOR |
| ③ COMBINATION SWITCH | ⑬ MAP (MANIFOLD ABSOLUTE PRESSURE) SENSOR |
| ④ MAIN RELAY | ⑭ PULSER COIL |
| ⑤ FUEL PUMP (HIGH PRESSURE SIDE) | ⑮ CKP (CRANKSHAFT POSITION) SENSOR 2 |
| ⑥ INJECTORS | ⑯ CKP (CRANKSHAFT POSITION) SENSOR 1 |
| ⑦ IGNITION COILS | ⑰ NEUTRAL SWITCH |
| ⑧ ECT (ENGINE COOLANT TEMPERATURE) SENSOR | ⑱ STARTER MOTOR |
| ⑨ ECM | ⑲ 12V BATTERY |
| ⑩ IAT (INTAKE AIR TEMPERATURE) SENSOR | ⑳ STARTER SOLENOID |



- ① EOP (ENGINE OIL PRESSURE) SWITCH
- ② IAC (IDLE AIR CONTROL) VALVE
- ③ HO2S (HEATED OXYGEN SENSOR)
- ④ WARNING BUZZER
- ⑤ INDICATOR LIGHT
- ⑥ EMERGENCY STOP SWITCH
- ⑦ ECM

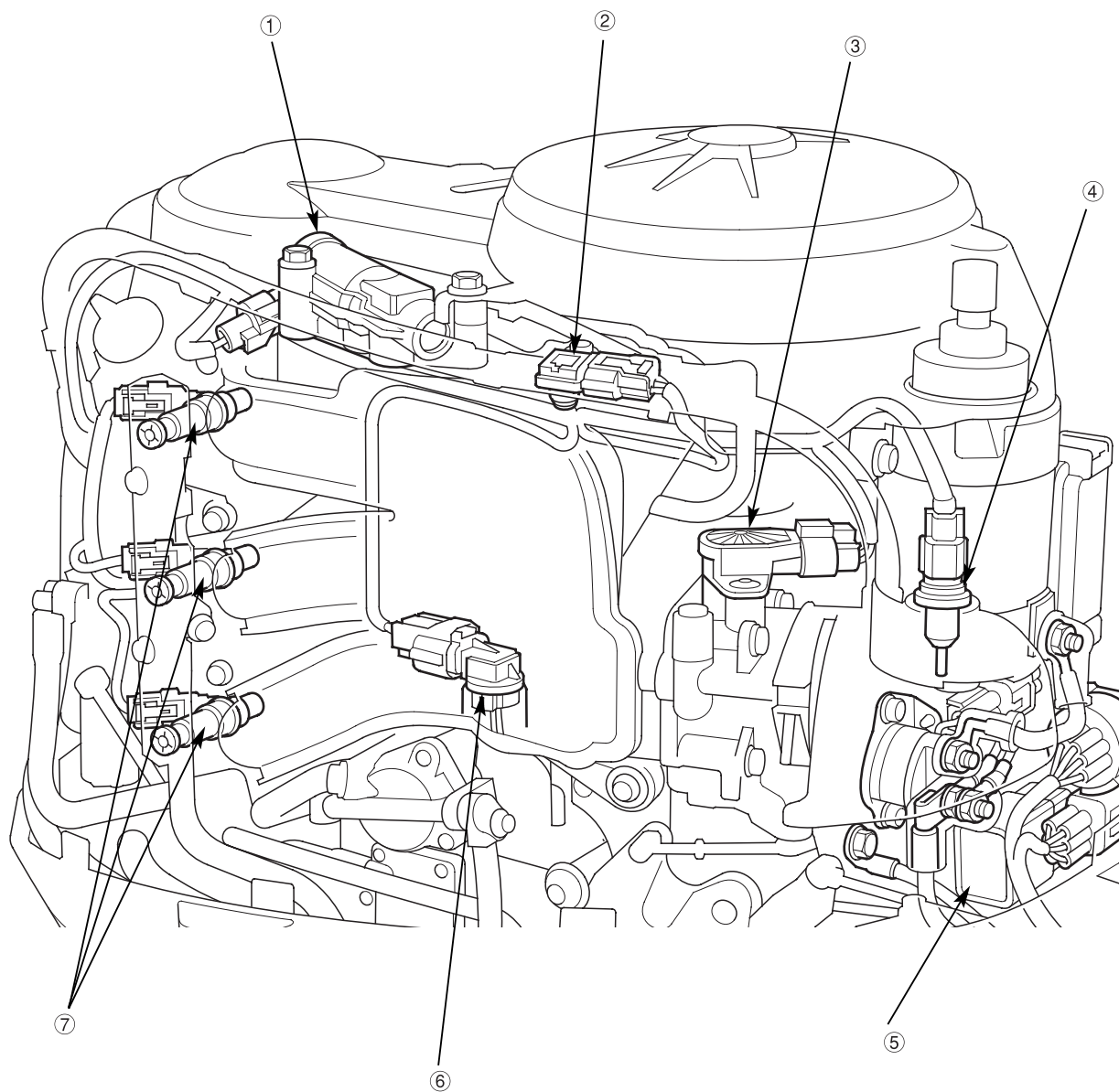
- ⑧ DLC (DATA LINK CONNECTOR)
- ⑨ TACHOMETER (OPTION)
- ⑩ FUEL CONSUMPTION METER (OPTION)
- ⑪ TRIM METER (OPTION)
- ⑫ TRIM ANGLE SENSOR (POWER TRIM/TILT TYPE ONLY)

4. COMPONENT LOCATION



- ① CKP (CRANKSHAFT POSITION) SENSOR 1
- ② CKP (CRANKSHAFT POSITION) SENSOR 2
- ③ ALTERNATOR STATOR
- ④ EOP (ENGINE OIL PRESSURE) SWITCH
- ⑤ ECT (ENGINE COOLANT TEMPERATURE) SENSOR
- ⑥ PULSER COIL
- ⑦ IGNITION COILS

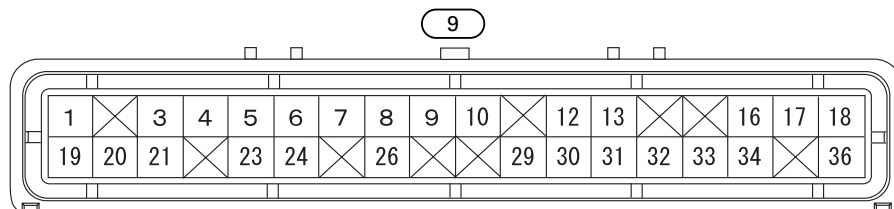
- ⑧ REGULATOR/RECTIFIER
- ⑨ HO2S (HEATED OXYGEN SENSOR)
- ⑩ EBT (ENGINE BLOCK TEMPERATURE) SENSOR
- ⑪ TRIM ANGLE SENSOR (POWER TRIM/TILT TYPE ONLY)
- ⑫ ECM
- ⑬ DLC (DATA LINK CONNECTOR)



- ① IAC (IDLE AIR CONTROL) VALVE
- ② MAP (MANIFOLD ABSOLUTE PRESSURE) SENSOR
- ③ TP (THROTTLE POSITION) SENSOR

- ④ IAT (INTAKE AIR TEMPERATURE) SENSOR
- ⑤ MAIN RELAY
- ⑥ FUEL PUMP (HIGH PRESSURE SIDE)
- ⑦ INJECTORS

• **ECM TERMINAL ARRANGEMENT**
ECM CONNECTOR A (GRAY)

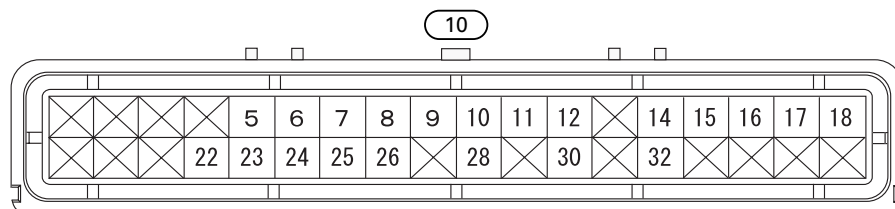


VIEWED FROM THE TERMINAL SIDE

Terminal No.	Terminal mark	Name	Content/Signal
1	ACGLP	Alternator indicator light	Alternator indicator light output
2	Not used		
3	BUZZ	Warning buzzer	Warning buzzer output
4	OPSH	EOP switch	EOP switch input
5	CYLP	Pulser coil (+)	Pulser coil (+) input
6	TE	EBT sensor	EBT sensor input
7	THL	TP sensor	TP sensor input
8	PB	MAP sensor	MAP sensor input
9	TACHO	Tachometer	Tachometer pulse output
10	K-LINE	Communication signal	Tester communication signal input/output
11	Not used		
12	PG4	Power ground 4	Power ground 4
13	PG3	Power ground 3	Power ground 3
14	Not used		
15	Not used		
16	FFP	Fuel pump	Fuel pump output
17	IGN3	No.3 ignition coil	No.3 ignition coil output
18	IGN1	No.1 ignition coil	No.1 ignition coil output
19	WARNL	MIL	MIL output
20	CRK1	CKP sensor 1	CKP sensor 1 input
21	CRK2	CKP sensor 2	CKP sensor 2 input
22	Not used		
23	TOH	ECT sensor	ECT sensor input
24	CYLM	Pulser coil (-)	Pulser coil (-) input
25	Not used		
26	FUP	Fuel consumption meter	Fuel consumption volume output
27	Not used		
28	Not used		
29	EMS2	Emergency stop switch 2	Emergency stop switch input 2
30	EMS1	Emergency stop switch 1	Emergency stop switch input 1
31	NTSW	Neutral switch	Neutral switch input
32	SCS	Service check signal	Service check signal input
33	OPL	Oil indicator light	Oil indicator light output
34	OHL	Overheat indicator light	Overheat indicator light output
35	Not used		
36	IGN2	No.2 ignition coil	No.2 ignition coil output

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ECM CONNECTOR B (BLACK)



VIEWED FROM THE TERMINAL SIDE

Terminal No.	Terminal mark	Name	Content/Signal
1	Not used		
2	Not used		
3	Not used		
4	Not used		
5	LG1	Logic ground 1	Logic ground 1
6	VCC1	Sensor power 1	Sensor power 5V output 1
7	VCC2	Sensor power 2	Sensor power 5V output 2
8	IGP1	Power source 1	Power 12V input 1
9	IGP2	Power source 2	Power 12V input 2
10	O2HT	HO2S heater	HO2S heater output
11	EACVP	IAC valve (+)	IAC valve (+) output
12	EACVM	IAC valve (-)	IAC valve (-) output
13	Not used		
14	INJ3	No.3 injector	No.3 injector output
15	INJ2	No.2 injector	No.2 injector output
16	INJ1	No.1 injector	No.1 injector output
17	PG2	Power ground 2	Power ground 2
18	PG1	Power ground 1	Power ground 1
19	Not used		
20	Not used		
21	Not used		
22	VCC3	Sensor power 3 (Power trim/tilt type only)	Sensor power 5V output 3 (Power trim/tilt type only)
23	LG2	Logic ground 2	Logic ground 2
24	SG3	Sensor ground 3	Sensor ground 3
25	SG2	Sensor ground 2	Sensor ground 2
26	SG1	Sensor ground 1	Sensor ground 1
27	Not used		
28	TA	IAT sensor	IAT sensor input
29	Not used		
30	O2	HO2S	HO2S input
31	Not used		
32	TRMA	Trim angle sensor (Power trim/tilt type only)	Trim angle sensor input (Power trim/tilt type only)
33	Not used		
34	Not used		
35	Not used		
36	Not used		

5. TROUBLESHOOTING

The ECM (Engine Control Module) has a self-diagnosis function that memorizes the failure code and turns the MIL (Malfunction Indicator Lamp) ON when it detects an abnormality with the input/output system.

If the MIL does not come ON but an engine failure (abnormality other than monitoring ECM) occurred, troubleshoot according to the troubleshooting procedure of each system (P. 5-73 and 76).

• HOW TO CARRY OUT TROUBLESHOOTING

When the MIL comes ON or blinks or any abnormality occurred during running, identify the problem detected by the ECM according to the following procedure, and troubleshoot accordingly.

Use a known-good battery to troubleshoot.

Read the circuit tester's operation instructions carefully, and observe the instructions during inspection.

To troubleshoot, connect the tester probe to a commercially available digital circuit tester. Note that the tester probe must fit the connector terminal of the digital circuit tester so as not to apply excessive force to the connector terminal.

Switch the tester lead polarities to check the circuit including the diode (see below). The circuit is normal if there is continuity in both directions or in neither direction, the circuit is faulty.

- Indicator light
- Main relay
- Regulator/rectifier
- Power tilt relay (Power trim/tilt type only)

Clean the ECM connectors and the neighboring area before disconnecting the connectors.

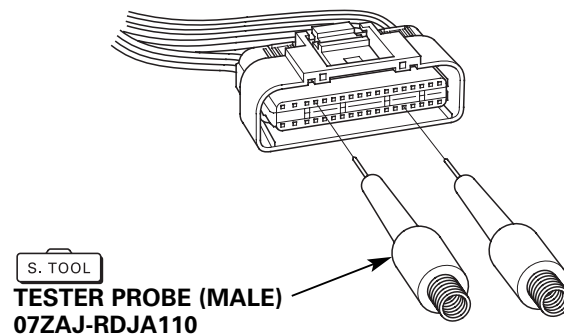
A loosely connected or corroded connector can cause programmed-fuel injection system malfunction.

Inspection on the main wire harness side ECM must be made using the special tool.

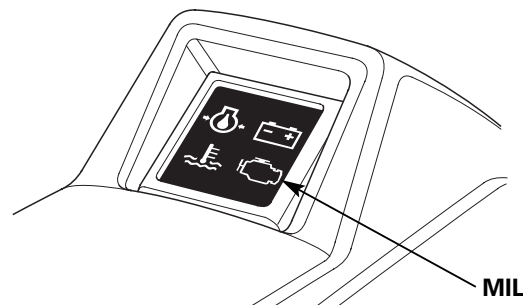
TOOL:

Tester probe (male)

07ZAJ-RDJA110



- 1) Turn the combination switch ON and check that the MIL comes ON.

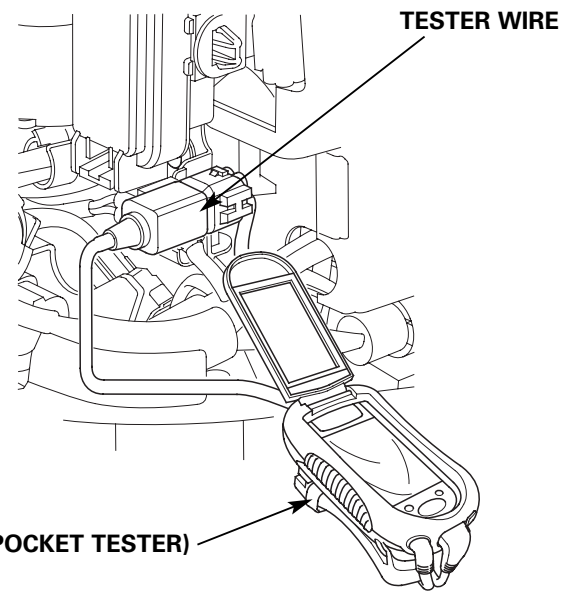
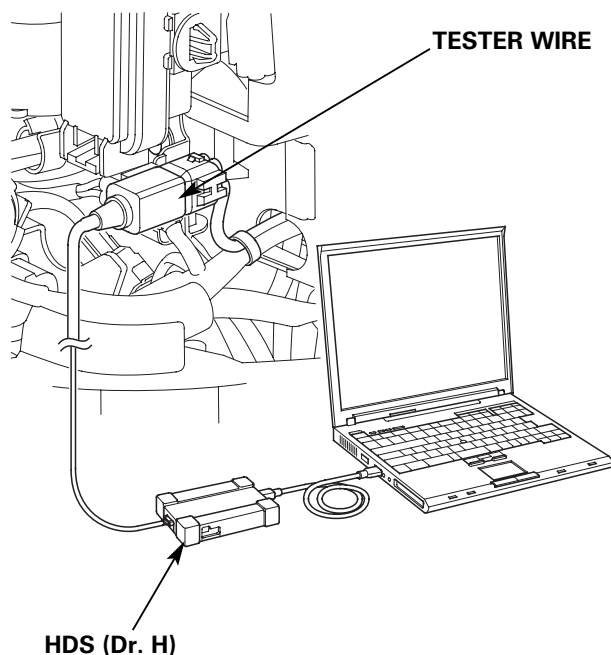
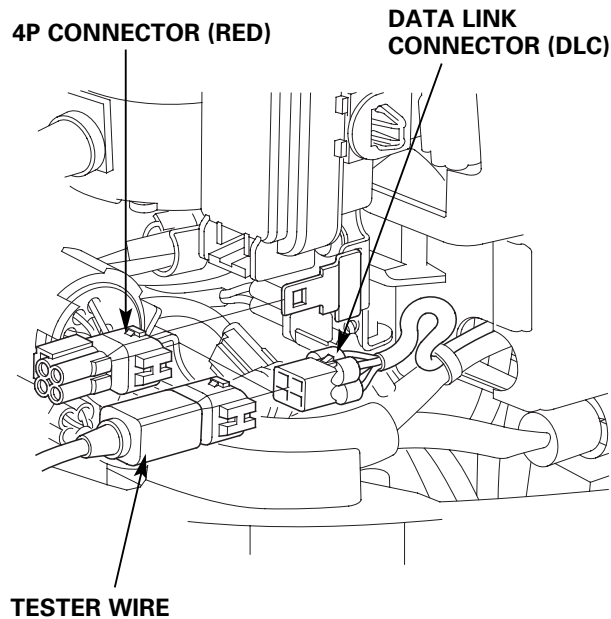


- 2) When the MIL is ON or blinking, check the DTC (Diagnostic Trouble Code) using the HDS (Dr. H or pocket tester) (P. 5-12).
Or, use the SCS short connector and troubleshoot the problem indicated by the number of blinks of the MIL (P. 5-43).
- 3) Perform troubleshooting by referring to the "Troubleshooting Guide by DTC" (P. 5-13) or "Troubleshooting Guide by No. of Blinks" (P. 5-45).
Check each connector and wire harness for secure connection and damage before troubleshooting.
Repair the connector and wire harness if necessary.
- 4) After troubleshooting, perform repairs as needed and perform the "FINAL PROCEDURE (AFTER TROUBLESHOOTING)" (P. 5-12 or 44).

6. TROUBLESHOOTING WITH HDS (Dr. H OR POCKET TESTER)

• DTC (DIAGNOSTIC TROUBLE CODE) CHECK

- 1) Remove the engine cover (P. 4-2).
- 2) Turn the combination switch OFF.
- 3) Disconnect the 4P connector (Red), and connect the HDS (Dr. H or pocket tester) to the data link connector (DLC).



- 4) Turn the combination switch ON, and check the DTC shown on the HDS (Dr. H or pocket tester). Refer to the HDS operation instructions for how to use the HDS.














• TO CLEAR DTC

- 1) Remove the engine cover (P. 4-2).
- 2) Turn the combination switch OFF.
- 3) Disconnect the 4P connector (Red), and connect the HDS (Dr. H or pocket tester) to the data link connector (DLC).
- 4) Turn the combination switch ON.
- 5) Clear the DTC using the HDS (Dr. H or pocket tester).
 - Refer to the HDS operation instructions for how to use the HDS.
 - When an abnormality remains in the system, the DTC does not clear as the ECM continues self-diagnosis.
- 6) Turn the combination switch OFF.










• FINAL PROCEDURE (AFTER TROUBLESHOOTING)

- 1) Clear the DTC.
- 2) Disconnect the HDS (Dr. H or pocket tester) from the data link connector and connect the 4P connector (Red).
- 3) Install the engine cover (P. 4-2).


• TROUBLESHOOTING GUIDE BY DTC

DTC	MIL	Detected component	Probable problem	Ref. page
0 or does not communicate	MIL does not come ON/blink 	ECM	<ul style="list-style-type: none"> • Indicator light • MIL circuit (Open) • ECM ground circuit (Open, poor grounding) • ECM 	2-36 2-46
0 or does not communicate	MIL stays ON 	ECM	<ul style="list-style-type: none"> • DLC circuit (Short) • MIL circuit (Short) • Sensor power circuit (Short) • ECM power circuit (Open) • ECM 	5-15
1-4	ON 	HO2S	<ul style="list-style-type: none"> • HO2S circuit (Open, short) • HO2S • Fuel supply system • ECM 	5-19
3-1	ON 	MAP sensor (Voltage too low)	<ul style="list-style-type: none"> • MAP sensor circuit (Short) • MAP sensor • ECM 	5-21
3-2	ON 	MAP sensor (Voltage too high)	<ul style="list-style-type: none"> • MAP sensor circuit (Open) • MAP sensor • ECM 	5-22
4-1	ON 	CKP sensor 1 (No pulse)	<ul style="list-style-type: none"> • CKP sensor 1 circuit (Open, short) • CKP sensor 1 • ECM 	5-23
4-2	ON 	CKP sensor 1 (Abnormal pulse)	<ul style="list-style-type: none"> • CKP sensor 1 • Guide plate • ECM 	5-24
6-1	ON 	EBT sensor (Voltage too low)	<ul style="list-style-type: none"> • EBT sensor circuit (Short) • EBT sensor • ECM 	5-25
6-2	ON 	EBT sensor (Voltage too high)	<ul style="list-style-type: none"> • EBT sensor circuit (Open) • EBT sensor • ECM 	5-26
7-1	ON 	TP sensor (Voltage too low)	<ul style="list-style-type: none"> • TP sensor circuit (Short) • TP sensor • ECM 	5-27
7-2	ON 	TP sensor (Voltage too high)	<ul style="list-style-type: none"> • TP sensor circuit (Open) • TP sensor • ECM 	5-28
8-1	ON 	CKP sensor 2 (No pulse)	<ul style="list-style-type: none"> • CKP sensor 2 circuit (Open, short) • CKP sensor 2 • ECM 	5-29
8-2	ON 	CKP sensor 2 (Abnormal pulse)	<ul style="list-style-type: none"> • CKP sensor 2 • Guide plate • ECM 	5-30

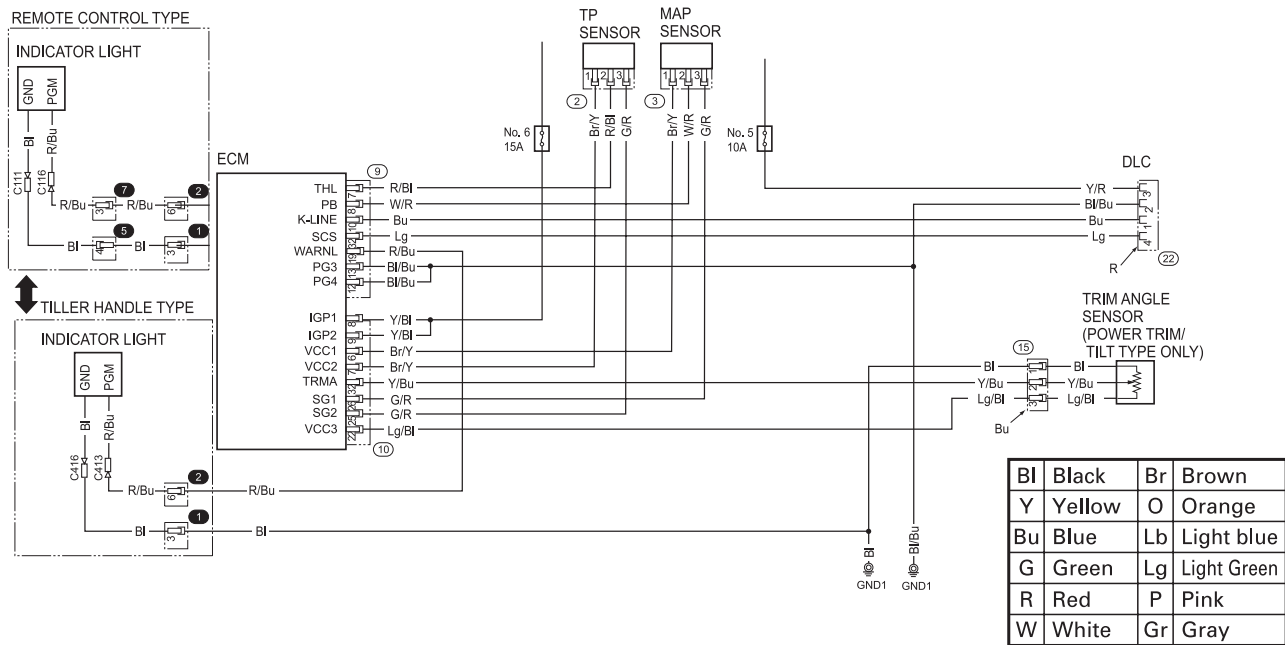
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DTC	MIL	Detected component	Probable problem	Ref. page
10-1	ON 	IAT sensor (Voltage too low)	<ul style="list-style-type: none"> • IAT sensor circuit (Short) • IAT sensor • ECM 	5-31
10-2	ON 	IAT sensor (Voltage too high)	<ul style="list-style-type: none"> • IAT sensor circuit (Open) • IAT sensor • ECM 	5-32
14-1	ON 	IAC valve (Abnormal current)	<ul style="list-style-type: none"> • IAC valve circuit (Open, short) • IAC valve • ECM 	5-33
41-2	ON 	HO2S heater (Abnormal current)	<ul style="list-style-type: none"> • HO2S heater circuit (Open, short) • HO2S heater • ECM 	5-35
58-1	ON 	Pulser coil (Abnormal current)	<ul style="list-style-type: none"> • Pulser coil circuit (Open, short) • Pulser coil • ECM 	5-37
58-2	ON 	Pulser coil (Abnormal current)	<ul style="list-style-type: none"> • Pulser coil • Pulser rotor • ECM 	5-38
140-1	ON 	ECT sensor (Voltage too low)	<ul style="list-style-type: none"> • ECT sensor circuit (Short) • ECT sensor • ECM 	5-39
140-2	ON 	ECT sensor (Voltage too high)	<ul style="list-style-type: none"> • ECT sensor circuit (Open) • ECT sensor • ECM 	5-40
142-1	ON 	EOP switch	<ul style="list-style-type: none"> • EOP switch circuit (Open, short) • EOP switch • ECM 	5-41

• When multiple DTCs are shown

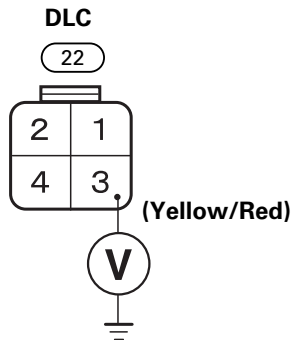
DTC	MIL	Detected component	Probable problem	Ref. page
6, 7, 10, 140	ON 	SG (Sensor Ground) line	<ul style="list-style-type: none"> • SG (Sensor Ground) line (Open) 	—

• ECM TROUBLESHOOTING



MIL Is ON But DTC Is 0 Or Does Not Communicate

- 1) **DLC power line open-circuit inspection**
 - a. Turn the combination switch OFF and disconnect the HDS (Dr. H or pocket tester).
 - b. Turn the combination switch ON. Measure the voltage between the DLC (22) No.3 (Yellow/Red) terminal and the engine ground.

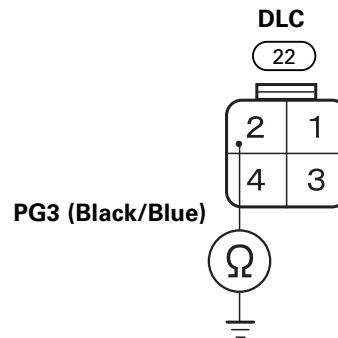


VIEWED FROM THE TERMINAL SIDE

- ◆ Is there the battery voltage?
 - YES - Go to "2) DLC ground line open-circuit inspection."
 - NO - Check the No.5 fuse and main relay (P. 18-17, 18). If there is no problem, replace the main wire harness.

2) **DLC ground line open-circuit inspection**

- Turn the combination switch OFF. Check for continuity between the DLC (22) No.2 (Black/Blue) terminal and the engine ground.

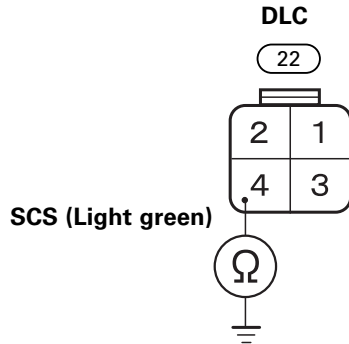


VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
 - YES - Go to "3) DLC short-circuit inspection."
 - NO - Repair open in the main wire harness between the ECM and the DLC.

3) DLC short-circuit inspection

- Disconnect the ECM connector A (9). Check for continuity between the DLC (22) No.4 (Light green) terminal and the engine ground.

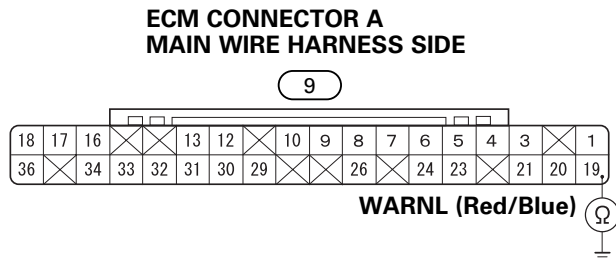


VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
 - YES** - Repair short in the main wire harness between the ECM and the DLC.
 - NO** - Go to "4) MIL ON line short-circuit inspection."

4) MIL ON line short-circuit inspection

- Check for continuity between the ECM connector A (9) main wire harness side No.19 (Red/Blue) terminal and the engine ground.



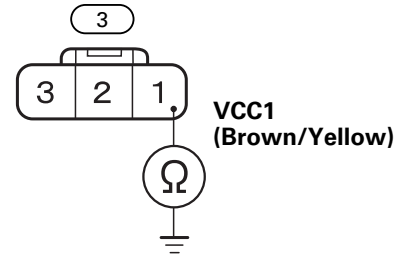
VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
 - YES** - Repair short in the main wire harness or handle cable between the ECM and the MIL.
 - NO** - Go to "5) MAP sensor power line short-circuit inspection."

5) MAP sensor power line short-circuit inspection

- Connect the ECM connector A (9) and disconnect the MAP sensor 3P connector (3).
- Turn the combination switch ON and check the MIL.
 - ◆ Does the MIL go OFF?
 - YES** - Replace the MAP sensor.
 - NO** - Go to the step c.
- Turn the combination switch OFF and disconnect the ECM connector B (10).
- Check for continuity between the MAP sensor 3P connector (3) main wire harness side No.1 (Brown/Yellow) terminal and the engine ground.

MAP SENSOR 3P CONNECTOR MAIN WIRE HARNESS SIDE



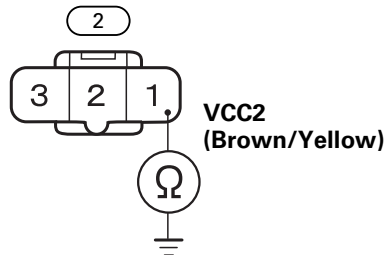
VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
 - YES** - Repair short in the main wire harness between the ECM and the MAP sensor.
 - NO** - Go to "6) TP sensor power line short-circuit inspection."

6) TP sensor power line short-circuit inspection

- a. Connect the ECM connector B (10) and disconnect the TP sensor 3P connector (2).
- b. Turn the combination switch ON and check the MIL.
 - ◆ Does the MIL go OFF?
 - YES** - Replace the throttle body.
 - NO** - Go to the step c.
- c. Turn the combination switch OFF and disconnect the ECM connector B (10).
- d. Check for continuity between the TP sensor 3P connector (2) main wire harness side No.1 (Brown/Yellow) terminal and the engine ground.

**TP SENSOR 3P CONNECTOR
MAIN WIRE HARNESS SIDE**



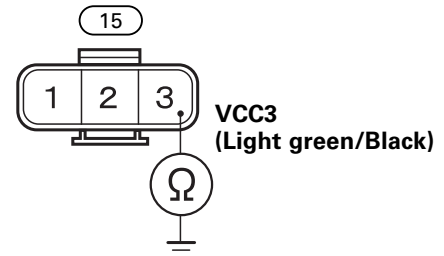
VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
 - YES** - Repair short in the main wire harness between the ECM and the TP sensor.
 - NO** - Go to "7) Trim angle sensor power line short-circuit inspection" (Power trim/tilt type only). Go to "8) ECM power line inspection" (Gas assisted type only).

7) Trim angle sensor power line short-circuit inspection (Power trim/tilt type only)

- a. Connect the ECM connector B (10) and disconnect the trim angle sensor 3P connector (15).
- b. Turn the combination switch ON and check the MIL.
 - ◆ Does the MIL go OFF?
 - YES** - Replace the trim angle sensor.
 - NO** - Go to the step c.
- c. Turn the combination switch OFF and disconnect the ECM connector B (10).
- d. Check for continuity between the trim angle sensor 3P connector (15) main wire harness side No.3 (Light green/Black) terminal and the engine ground.

**TRIM ANGLE SENSOR 3P CONNECTOR
MAIN WIRE HARNESS SIDE**



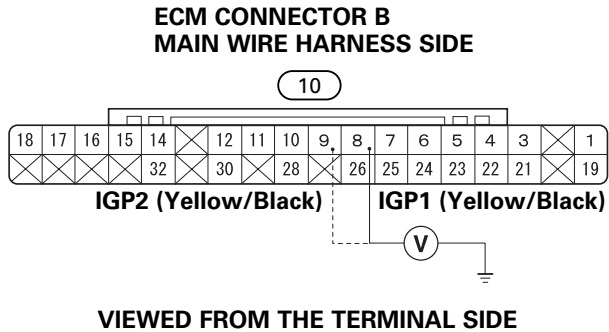
VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
 - YES** - Repair short in the main wire harness between the ECM and the trim angle sensor.
 - NO** - Go to "8) ECM power line inspection."

BF40D•BF50D

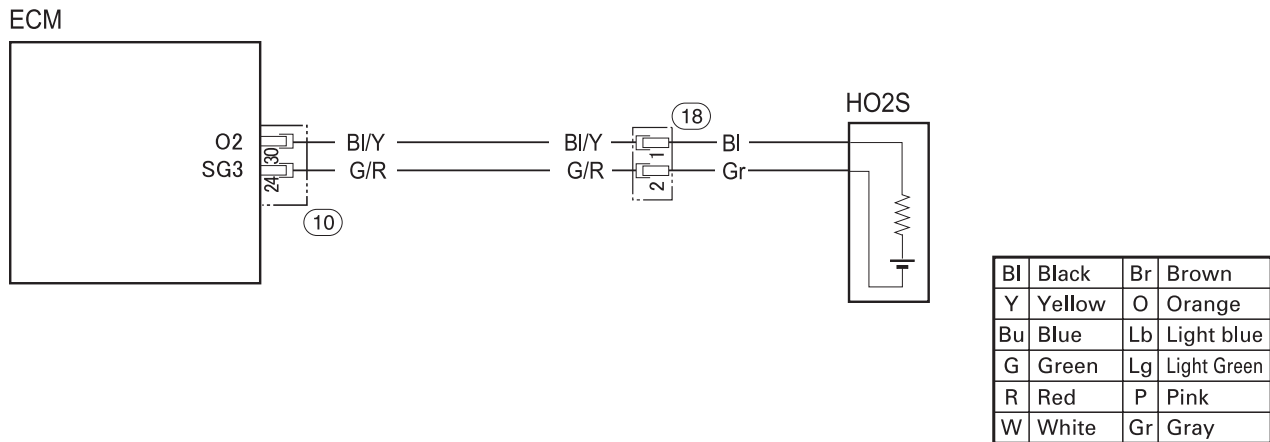
8) ECM power line inspection

- Turn the combination switch ON. Measure the voltage between the respective terminals of the main wire harness side No.8 (Yellow/Black) terminal and No.9 (Yellow/Black) terminal of the ECM connector B (10) and the body ground.



- ◆ Is there battery voltage?
 - YES** - Replace the ECM with a new one and recheck.
 - NO** - Check the No.6 fuse and the main relay (P. 18-17, 18). If there is no problem, replace the main wire harness.

• HO2S TROUBLESHOOTING



DTC 1-4: HO2S is faulty

NOTICE

Use a known-good battery to connect the battery to the connector terminal and take care not to short the circuit.

1) Symptom reproduction test

- a. Turn the combination switch OFF. Disconnect the HO2S 4P connector (18) once and connect it again.
- b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- c. Start the engine and let it run at 3,000 min⁻¹ (rpm) for 5 minutes or more under no load.
- d. Let the engine idle for 1 minute or more.
- e. Check the DTC using the HDS (Dr. H or pocket tester).

- ◆ Does the DTC 1-4 appear?
 - YES** - Go to "2) Fuel supply system inspection."
 - NO** - Temporary failure (Disappears).

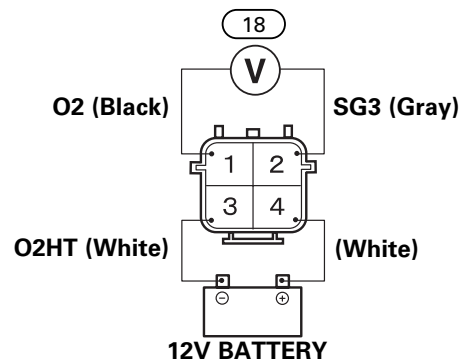
2) Fuel supply system inspection

- Turn the combination switch OFF and measure the fuel pressure (P. 5-80).
- ◆ Is the fuel pressure normal?
 - YES** - Go to "3) HO2S inspection"
 - NO** - Recheck with the normal fuel pressure.

3) HO2S inspection

- a. Turn the combination switch OFF and disconnect the HO2S 4P connector (18).
- b. Connect the battery positive (+) cable to the sensor side No.4 (White) terminal and the battery negative cable (-) to the sensor side No.3 (White) terminal of the HO2S 4P connector (18) respectively.
- c. Start the engine and let it run at 3,000 min⁻¹ (rpm) for 3 minutes or more under no load.
- d. Snap the engine with the engine speed in the range between the idle speed and 4,000 ± 500 min⁻¹ (rpm). Measure the voltage between the No.1 (Black) terminal and No.2 (Gray) terminal of the HO2S sensor side 4P connector (18).

HO2S 4P CONNECTOR HO2S SIDE



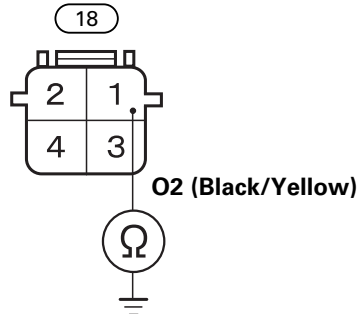
VIEWED FROM THE TERMINAL SIDE

- ◆ Is the voltage 0.6V or more with the throttle fully open and 0.4V or below with the throttle fully closed?
 - YES** - Go to "4) HO2S signal line short-circuit inspection."
 - NO** - Replace the HO2S with a new one and recheck.

4) HO2S signal line short-circuit inspection

- a. Turn the combination switch OFF and disconnect the battery.
- b. Disconnect the ECM connector B (10). Check for continuity between the HO2S 4P connector (18) main wire harness side No.1 (Black/Yellow) terminal and the engine ground.

**HO2S 4P CONNECTOR
MAIN WIRE HARNESS SIDE**



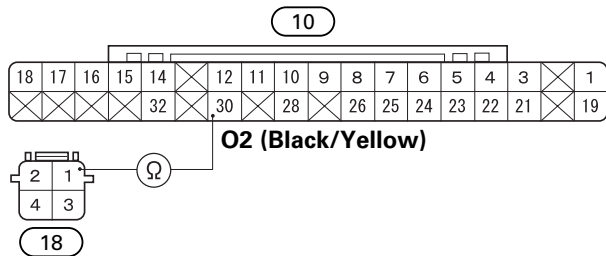
VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
 - YES** - Repair short in the main wire harness between the ECM and the HO2S.
 - NO** - Go to "5) HO2S signal line open-circuit inspection."

5) HO2S signal line open-circuit inspection

- Check for continuity between the HO2S 4P connector (18) main wire harness side No.1 (Black/Yellow) terminal and the ECM connector B (10) main wire harness side No.30 (Black/Yellow) terminal.

**ECM CONNECTOR B
MAIN WIRE HARNESS SIDE**



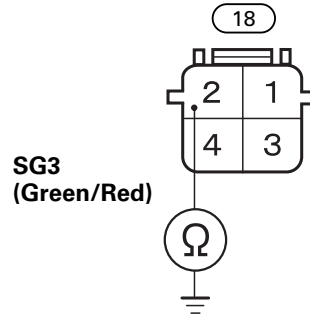
**HO2S 4P CONNECTOR
MAIN WIRE HARNESS SIDE** **VIEWED FROM THE
TERMINAL SIDE**

- ◆ Is there continuity?
 - YES** - Go to "6) HO2S GND line open-circuit inspection."
 - NO** - Repair open in the main wire harness between the ECM and the HO2S.

6) HO2S GND line open-circuit inspection

- Connect the ECM connector B (10). Check for continuity between the HO2S 4P connector (18) main wire harness side No.2 (Green/Red) terminal and the engine ground.

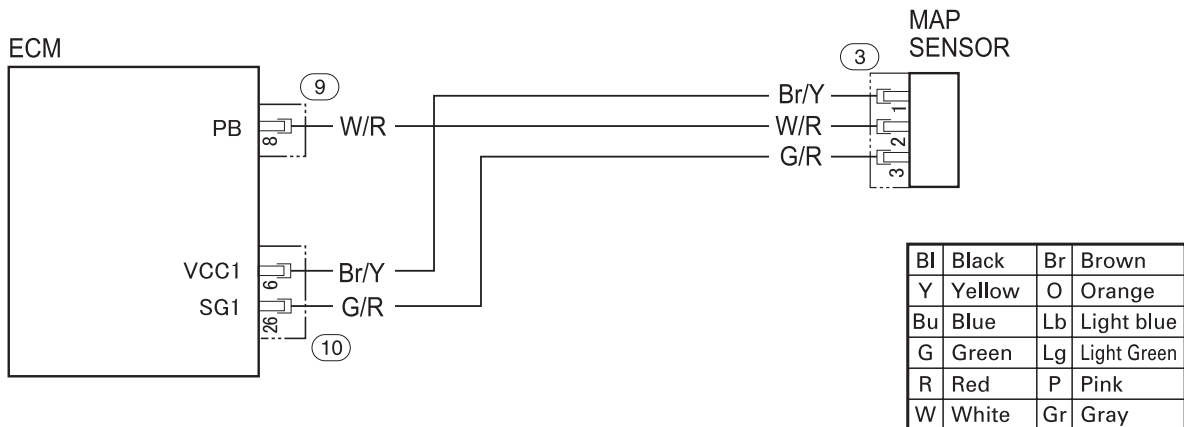
**HO2S 4P CONNECTOR
MAIN WIRE HARNESS SIDE**



VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
 - YES** - Replace the ECM with a new one and recheck.
 - NO** - Repair open in the main wire harness between the ECM and the HO2S.

• MAP SENSOR TROUBLESHOOTING



DTC 3-1: MAP sensor voltage is too low

1) Symptom reproduction test

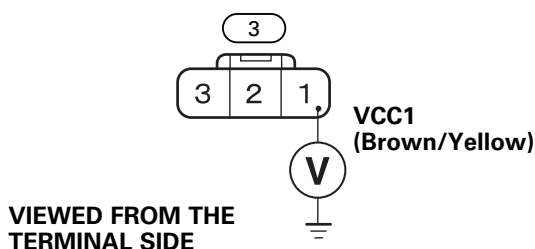
- a. Turn the combination switch OFF. Disconnect the MAP sensor 3P connector (3) once and connect it again.
- b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- c. Turn the combination switch ON. Measure the MAP sensor voltage using the HDS (Dr. H or pocket tester).

- ◆ Is there 0.23 — 4.5V?
 - YES** - Temporary failure (Disappears.)
 - NO** - Go to "2) MAP sensor power line open-circuit inspection."

2) MAP sensor power line open-circuit inspection

- a. Turn the combination switch OFF and disconnect the MAP sensor 3P connector (3).
- b. Turn the combination switch ON. Measure the voltage between the MAP sensor 3P connector (3) main wire harness side No.1 (Brown/Yellow) terminal and the engine ground

**MAP SENSOR 3P CONNECTOR
MAIN WIRE HARNESS SIDE**

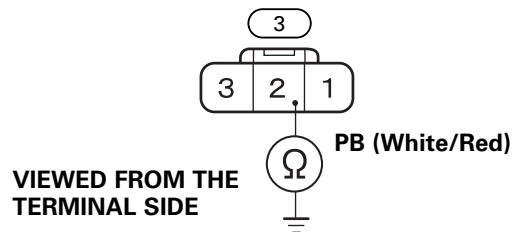


- ◆ Is there 4.75 — 5.25V?
 - YES** - Go to "3) MAP sensor signal line short-circuit inspection."
 - NO** - Repair open in the main wire harness between the ECM and the MAP sensor.

3) MAP sensor signal line short-circuit inspection

- Turn the combination switch OFF. Disconnect the ECM connector A (9). Check for continuity between the MAP sensor 3P connector (3) main wire harness side No.2 (White/Red) terminal and the engine ground.

**MAP SENSOR 3P CONNECTOR
MAIN WIRE HARNESS SIDE**



- ◆ Is there continuity?
 - YES** - Repair short in the main wire harness between the ECM and the MAP sensor.
 - NO** - Go to "4) MAP sensor inspection."

4) MAP sensor inspection

- a. Connect the ECM connector A (9). Replace the MAP sensor with a new one. Connect the MAP sensor 3P connector (3).
- b. Turn the combination switch ON. Measure the MAP sensor voltage using the HDS (Dr. H or pocket tester).

- ◆ Is the measurement 2.76 — 2.96V?
 - YES** - End of inspection
 - NO** - Replace the ECM with a new one and recheck.

DTC 3-2: MAP sensor voltage is too high

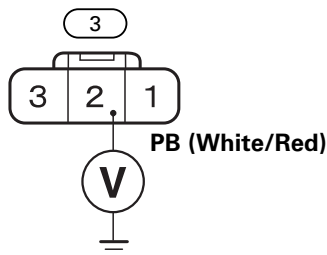
1) Symptom reproduction test

- a. Turn the combination switch OFF. Disconnect the MAP sensor 3P connector (3) once and connect it again.
 - b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
 - c. Turn the combination switch ON. Measure the MAP sensor voltage using the HDS (Dr. H or pocket tester).
- ◆ Is there 0.23 — 4.5V?
YES - Temporary failure (Disappears.)
NO - Go to "2) MAP sensor signal line open-circuit inspection."

2) MAP sensor signal line open-circuit inspection

- a. Turn the combination switch OFF and disconnect the MAP sensor 3P connector (3).
- b. Turn the combination switch ON. Measure the voltage between the MAP sensor 3P connector (3) main wire harness side No.2 terminal (White/Red) and the engine ground

**MAP SENSOR 3P CONNECTOR
MAIN WIRE HARNESS SIDE**



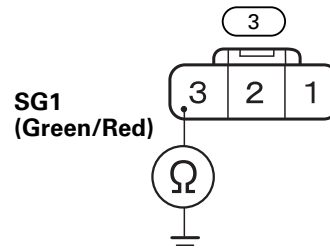
VIEWED FROM THE TERMINAL SIDE

- ◆ Is the measurement within 4.30 — 5.25V?
YES - Go to "3) MAP sensor GND line open-circuit inspection."
NO - Repair open in the main wire harness between the ECM and the MAP sensor.

3) MAP sensor GND line open-circuit inspection

- Turn the combination switch OFF. Check for continuity between the MAP sensor 3P connector (3) main wire harness side No.3 (Green/Red) terminal and the engine ground.

**MAP SENSOR 3P CONNECTOR
MAIN WIRE HARNESS SIDE**



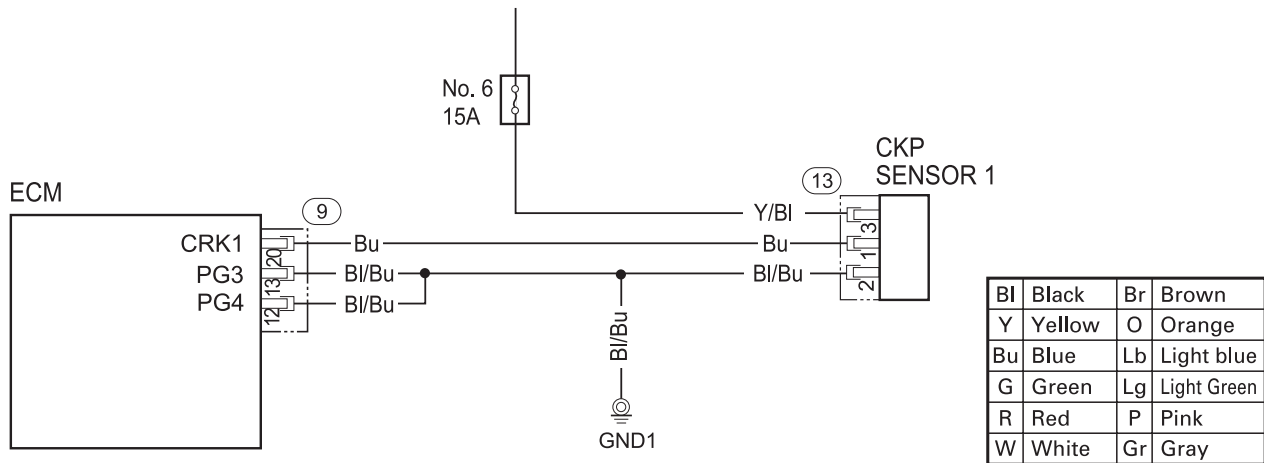
VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
YES - Go to "4) MAP sensor inspection."
NO - Repair open in the main wire harness between the ECM and the MAP sensor.

4) MAP sensor inspection

- a. Replace the MAP sensor and connect the MAP sensor 3P connector (3).
 - b. Turn the combination switch ON. Measure the MAP sensor voltage using the HDS (Dr. H or pocket tester).
- ◆ Is the measurement within 2.76 — 2.96V?
YES - End of inspection
NO - Replace the ECM with a new one and recheck.

• CKP SENSOR 1 TROUBLESHOOTING



DTC 4-1: No CKP sensor 1 pulse

1) Symptom reproduction test

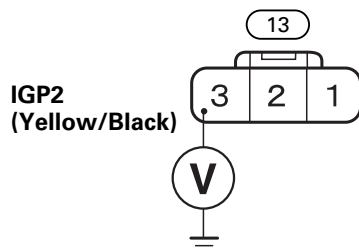
- a. Turn the combination switch OFF. Disconnect the CKP sensor 1 3P connector (13) once and connect it again.
- b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- c. Start the engine and check the DTC using the HDS (Dr. H or pocket tester).

- ◆ Does the DTC 4-1 appear?
 - YES** - Go to "2) CKP sensor 1 power line open-circuit inspection."
 - NO** - Temporary failure (Disappears.)

2) CKP sensor 1 power line open-circuit inspection

- a. Turn the combination switch OFF and disconnect the CKP sensor 1 3P connector (13).
- b. Turn the combination switch ON. Measure the voltage between the CKP sensor 1 3P connector (13) main wire harness side No.3 (Yellow/Black) terminal and the engine ground

**CKP SENSOR 1 3P CONNECTOR
MAIN WIRE HARNESS SIDE**



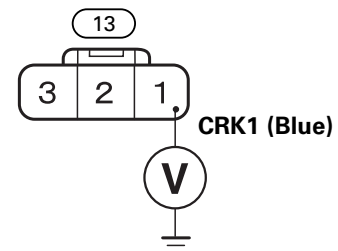
VIEWED FROM THE TERMINAL SIDE

- ◆ Is there the battery voltage?
 - YES** - Go to "3) CKP sensor 1 signal line open-circuit inspection."
 - NO** - Check the No.6 fuse and the main relay (P. 18-17, 18). If there is no problem, replace the main wire harness.

3) CKP sensor 1 signal line open-circuit inspection

- Measure the voltage between the CKP sensor 1 3P connector (13) main wire harness side No.1 (Blue) terminal and the engine ground.

**CKP SENSOR 1 3P CONNECTOR
MAIN WIRE HARNESS SIDE**



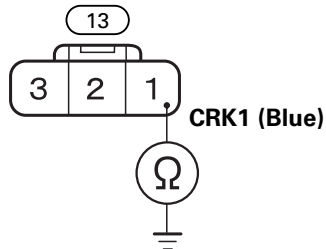
VIEWED FROM THE TERMINAL SIDE

- ◆ Is the measurement within 4.75 — 5.25V?
 - YES** - Go to "4) CKP sensor 1 signal line short-circuit inspection."
 - NO** - Repair open in the main wire harness between the ECM and the CKP sensor 1.

4) **CKP sensor 1 signal line short-circuit inspection**

- Turn the combination switch OFF. Disconnect the ECM connector A (9). Check for continuity between the CKP sensor 1 3P connector (13) main wire harness side No.1 (Blue) terminal and the engine ground.

**CKP SENSOR 1 3P CONNECTOR
MAIN WIRE HARNESS SIDE**



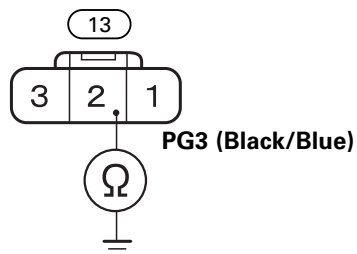
VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
 - YES** - Repair short in the main wire harness between the ECM and the CKP sensor 1.
 - NO** - Go to "5) CKP sensor 1 GND line open-circuit inspection."

5) **CKP sensor 1 GND line open-circuit inspection**

- Connect the ECM connector A (9). Check for continuity between the CKP sensor 1 3P connector (13) main wire harness side No.2 (Black/Blue) terminal and the engine ground.

**CKP SENSOR 1 3P CONNECTOR
MAIN WIRE HARNESS SIDE**



VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
 - YES** - Go to "6) CKP sensor 1 inspection."
 - NO** - Repair open in the main wire harness between the ECM and the CKP sensor 1.

6) **CKP sensor 1 inspection**

- Replace the CKP sensor 1 and connect the CKP sensor 1 3P connector (13).
- Start the engine and check the DTC using the HDS (Dr. H or pocket tester).
 - ◆ Does the DTC 4-1 appear?
 - YES** - Replace the ECM with a new one and recheck.
 - NO** - End of inspection

DTC 4-2: CKP sensor 1 pulse is abnormal

1) **Symptom reproduction test**

- Turn the combination switch OFF. Disconnect the CKP sensor 1 3P connector (13) once and connect it again.
- Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- Start the engine and check the DTC using the HDS (Dr. H or pocket tester).

- ◆ Does the DTC 4-2 appear?
 - YES** - Go to "2) Guide plate inspection."
 - NO** - Temporary failure (Disappears.)

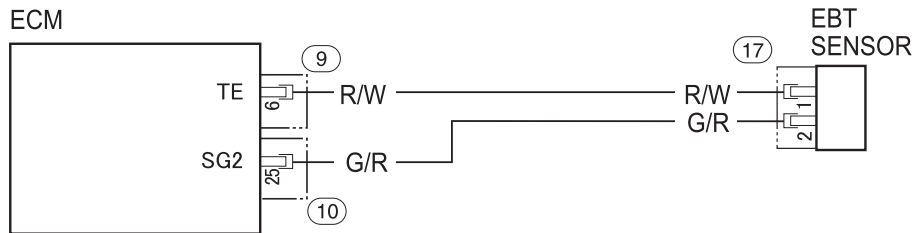
2) **Guide plate inspection**

- Inspect the guide plate.
 - ◆ Is the guide plate damaged?
 - YES** - Replace the guide plate with a new one and recheck.
 - NO** - Go to "3) CKP sensor 1 inspection."

3) **CKP sensor 1 inspection**

- Replace the CKP sensor 1 and connect the CKP sensor 1 3P connector (13).
- Start the engine and check the DTC using the HDS (Dr. H or pocket tester).
 - ◆ Does the DTC 4-2 appear?
 - YES** - Replace the ECM with a new one and recheck.
 - NO** - End of inspection

• EBT SENSOR TROUBLESHOOTING



Bl	Black	Br	Brown
Y	Yellow	O	Orange
Bu	Blue	Lb	Light blue
G	Green	Lg	Light Green
R	Red	P	Pink
W	White	Gr	Gray

DTC 6-1: EBT sensor voltage is too low

1) Symptom reproduction test

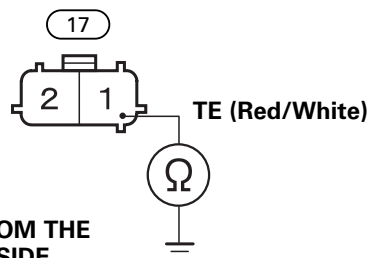
- a. Turn the combination switch OFF. Disconnect the EBT sensor 2P connector (17) once and connect it again.
- b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- c. Turn the combination switch ON. Measure the EBT sensor voltage using the HDS (Dr. H or pocket tester).

- ◆ Is the measurement within 0.078 — 4.92V?
 - YES** - Temporary failure (Disappears.)
 - NO** - Go to "2) EBT sensor signal line short-circuit inspection."

2) EBT sensor signal line short-circuit inspection

- a. Turn the combination switch OFF. Disconnect the ECM connector A (9) and the EBT sensor 2P connector (17).
- b. Check for continuity between the EBT sensor 2P connector (17) main wire harness side No.1 (Red/White) terminal and the engine ground.

**EBT SENSOR 2P CONNECTOR
MAIN WIRE HARNESS SIDE**



**VIEWED FROM THE
TERMINAL SIDE**

◆ Is there continuity?

- YES** - Repair short in the main wire harness between the ECM and the EBT sensor.
- NO** - Go to "3) EBT sensor inspection."

3) EBT sensor inspection

- a. Connect the ECM connector A (9). Remove the EBT sensor and connect the EBT sensor 2P connector (17).
- b. Turn the combination switch ON and measure the EBT sensor temperature using the HDS (Dr. H or pocket tester).
 - ◆ Does the measurement correspond to the ambient temperature?
 - YES** - Replace the ECM with a new one and recheck.
 - NO** - Replace the EBT sensor with a new one and recheck.

DTC 6-2: EBT sensor voltage is too high

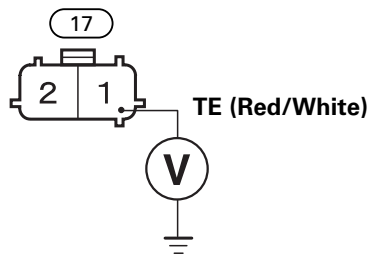
1) Symptom reproduction test

- a. Turn the combination switch OFF. Disconnect the EBT sensor 2P connector (17) once and connect it again.
- b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- c. Turn the combination switch ON. Measure the EBT sensor voltage using the HDS (Dr. H or pocket tester).
 - ◆ Is the measurement within 0.078 — 4.92V?
 - YES** - Temporary failure (Disappears.)
 - NO** - Go to "2) EBT sensor signal line open-circuit inspection."

2) EBT sensor signal line open-circuit inspection

- a. Turn the combination switch OFF and disconnect the EBT sensor 2P connector (17).
- b. Turn the combination switch ON. Measure the voltage between the EBT sensor 2P connector (17) main wire harness side No.1 (Red/White) terminal and the engine ground.

**EBT SENSOR 2P CONNECTOR
MAIN WIRE HARNESS SIDE**



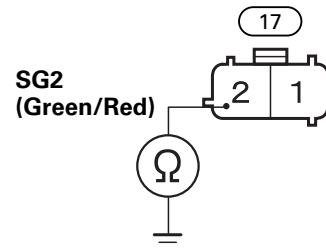
VIEWED FROM THE TERMINAL SIDE

- ◆ Is the measurement within 4.30 — 5.25V?
 - YES** - Go to "3) EBT sensor GND line open-circuit inspection."
 - NO** - Repair open in the main wire harness between the ECM and the EBT sensor.

3) EBT sensor GND line open-circuit inspection

- Turn the combination switch OFF. Check for continuity between the EBT sensor 2P connector (17) main wire harness side No.2 (Green/Red) terminal and the engine ground.

**EBT SENSOR 2P CONNECTOR
MAIN WIRE HARNESS SIDE**



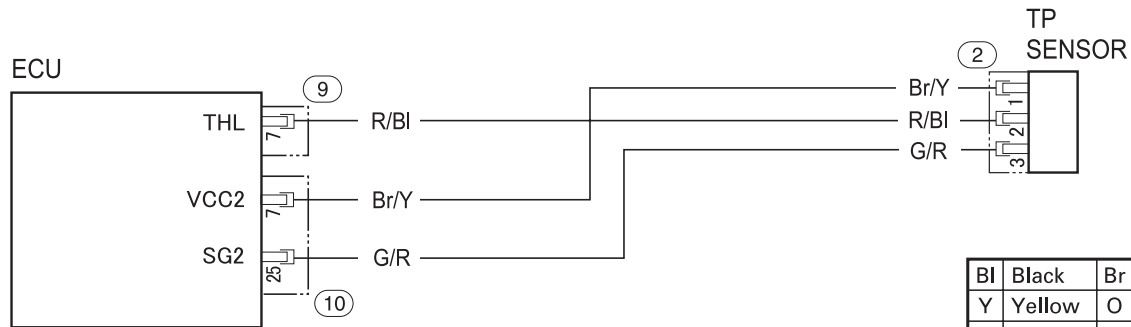
VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
 - YES** - Go to "4) EBT sensor inspection."
 - NO** - Repair open in the main wire harness between the ECM and the EBT sensor.

4) EBT sensor inspection

- a. Remove the EBT sensor and connect the EBT sensor 2P connector (17).
- b. Turn the combination switch ON. Measure the sensor temperature using the HDS (Dr. H or pocket tester).
 - ◆ Does the measurement correspond to the ambient temperature?
 - YES** - Replace the ECM with a new one and recheck.
 - NO** - Replace the EBT sensor with a new one and recheck.

• TP SENSOR TROUBLESHOOTING



Bl	Black	Br	Brown
Y	Yellow	O	Orange
Bu	Blue	Lb	Light blue
G	Green	Lg	Light Green
R	Red	P	Pink
W	White	Gr	Gray

DTC 7-1: TP sensor voltage is too low

1) Symptom reproduction test

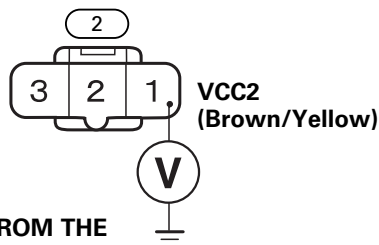
- a. Turn the combination switch OFF. Disconnect the TP sensor 3P connector (2) once and connect it again.
- b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- c. Turn the combination switch ON. Measure the TP sensor voltage using the HDS (Dr. H or pocket tester).

- ◆ Is the measurement within 0.23 — 4.89V?
 - YES** - Temporary failure (Disappears.)
 - NO** - Go to "2) TP sensor power line open-circuit inspection."

2) TP sensor power line open-circuit inspection

- a. Turn the combination switch OFF and disconnect the TP sensor 3P connector (2).
- b. Turn the combination switch ON. Measure the voltage between the TP sensor 3P connector (2) main wire harness side No.1 (Brown/Yellow) terminal and the engine ground.

**TP SENSOR 3P CONNECTOR
MAIN WIRE HARNESS SIDE**



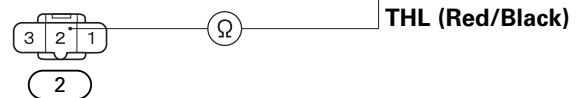
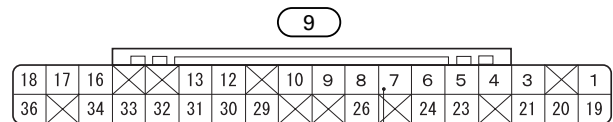
**VIEWED FROM THE
TERMINAL SIDE**

- ◆ Is the measurement within 4.75 — 5.25V?
 - YES** - Go to "3) TP sensor signal line open-circuit inspection."
 - NO** - Repair open in the main wire harness between the ECM and the TP sensor.

3) TP sensor signal line open-circuit inspection

- a. Turn the combination switch OFF and disconnect the ECM connector A (9).
- b. Check for continuity between the TP sensor 3P connector (2) main wire harness side No.2 (Red/Black) terminal and the ECM connector A (9) main wire harness side No.7 (Red/Black) terminal.

**ECM CONNECTOR A
MAIN WIRE HARNESS SIDE**



**TP SENSOR 3P CONNECTOR
MAIN WIRE HARNESS SIDE**

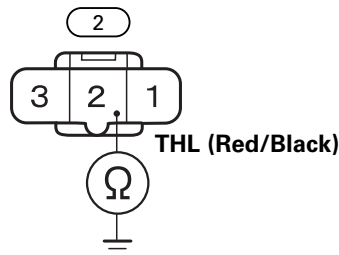
**VIEWED FROM THE
TERMINAL SIDE**

- ◆ Is there continuity?
 - YES** - Go to "4) TP sensor signal line short-circuit inspection."
 - NO** - Repair open in the main wire harness between the ECM and the TP sensor.

4) TP sensor signal line short-circuit inspection

- Check for continuity between the TP sensor 3P connector (2) main wire harness side No.2 (Red/Black) terminal and the engine ground.

TP SENSOR 3P CONNECTOR
MAIN WIRE HARNESS SIDE



VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
 - YES** - Repair short in the main wire harness between the ECM and the TP sensor.
 - NO** - Go to "5) TP sensor inspection."

5) TP sensor inspection

- Connect the ECM connector A (9) and the TP sensor 3P connector (2).
- Turn the combination switch ON. Measure the TP sensor voltage using the HDS (Dr. H or pocket tester).
 - ◆ Is the measurement 4.49 – 4.85V with the throttle fully open and 0.44 – 0.56V with the throttle fully closed?
 - YES** - Replace the ECM with a new one and recheck.
 - NO** - Replace the throttle body with a new one and recheck.

DTC 7-2: TP sensor voltage is too high

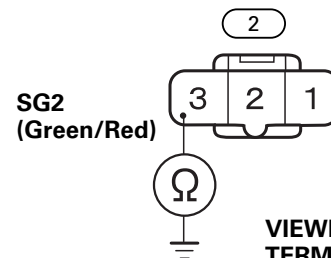
1) Symptom reproduction test

- Turn the combination switch OFF. Disconnect the TP sensor 3P connector (2) once and connect it again.
- Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- Turn the combination switch ON. Measure the TP sensor voltage using the HDS (Dr. H or pocket tester).
 - ◆ Is the measurement within 0.23 – 4.89V?
 - YES** - Temporary failure (Disappears.)
 - NO** - Go to "2) TP sensor GND line open-circuit inspection."

2) TP sensor GND line open-circuit inspection

- Turn the combination switch OFF and disconnect the TP sensor 3P connector (2).
- Check for continuity between the TP sensor 3P connector (2) main wire harness side No.3 (Green/Red) terminal and the engine ground.

TP SENSOR 3P CONNECTOR
MAIN WIRE HARNESS SIDE



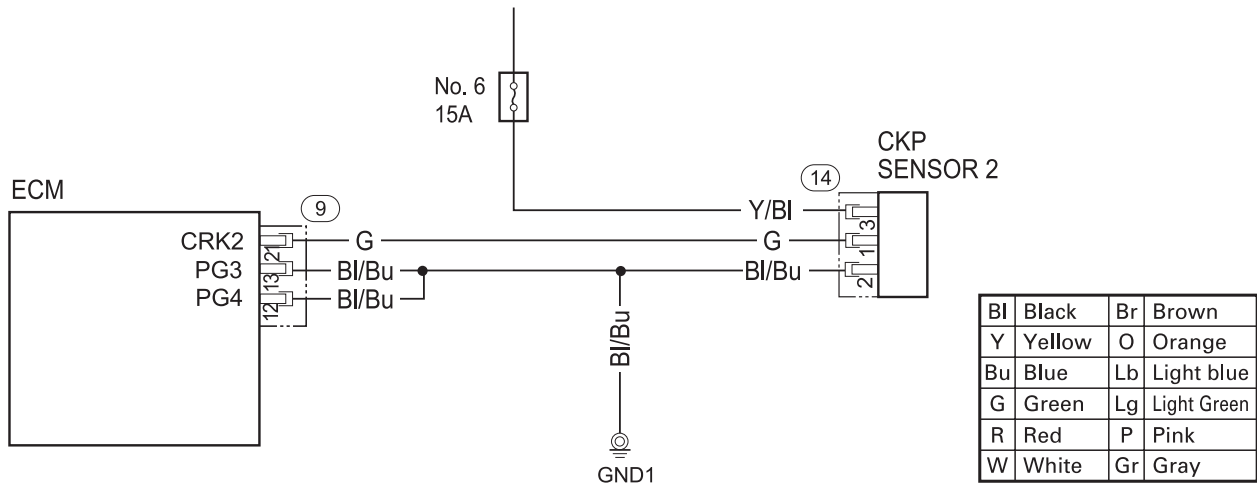
VIEWED FROM THE
TERMINAL SIDE

- ◆ Is there continuity?
 - YES** - Go to "3) TP sensor inspection."
 - NO** - Repair open in the main wire harness between the ECM and the TP sensor.

3) TP sensor inspection

- Connect the TP sensor 3P connector (2).
- Turn the combination switch ON and measure the TP sensor voltage using the HDS (Dr. H or pocket tester).
 - ◆ Is the measurement 4.49 – 4.85V with the throttle fully open and 0.44 – 0.56V with the throttle fully closed?
 - YES** - Replace the ECM with a new one and recheck.
 - NO** - Replace the throttle body with a new one and recheck.

• CKP SENSOR 2 TROUBLESHOOTING



DTC 8-1: No CKP sensor 2 pulse

1) Symptom reproduction test

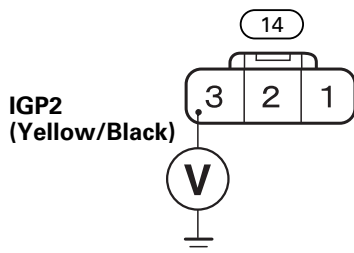
- a. Turn the combination switch OFF. Disconnect the CKP sensor 2 3P connector (14) once and connect it again.
- b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- c. Start the engine and check the DTC using the HDS (Dr. H or pocket tester).

- ◆ Does the DTC 8-1 appear?
 - YES** - Go to "2) CKP sensor 2 power line open-circuit inspection."
 - NO** - Temporary failure (Disappears.)

2) CKP sensor 2 power line open-circuit inspection

- a. Turn the combination switch OFF and disconnect the CKP sensor 2 3P connector (14).
- b. Turn the combination switch ON. Measure the voltage between the CKP sensor 2 3P connector (14) main wire harness side No.3 (Yellow/Black) terminal and the engine ground.

**CKP SENSOR 2 3P CONNECTOR
MAIN WIRE HARNESS SIDE**



VIEWED FROM THE TERMINAL SIDE

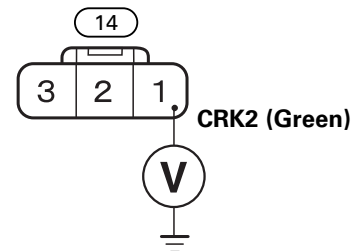
◆ Is there the battery voltage?

- YES** - Go to "3) CKP sensor 2 signal line open-circuit inspection."
- NO** - Check the No.6 fuse and the main relay (P. 18-17, 18). If there is no problem, replace the main wire harness.

3) CKP sensor 2 signal line open-circuit inspection

- Measure the voltage between the CKP sensor 2 3P connector (14) main wire harness side No.1 (Green) terminal and the engine ground.

**CKP SENSOR 2 3P CONNECTOR
MAIN WIRE HARNESS SIDE**



VIEWED FROM THE TERMINAL SIDE

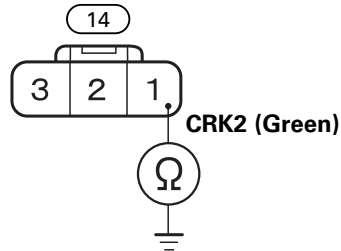
◆ Is the measurement within 4.75 – 5.25V?

- YES** - Go to "4) CKP sensor 2 signal line short-circuit inspection."
- NO** - Repair open in the main wire harness between the ECM and the CKP sensor 2.

4) **CKP sensor 2 signal line short-circuit inspection**

- Turn the combination switch OFF. Disconnect the ECM connector A (9). Check for continuity between the CKP sensor 2 3P connector (14) main wire harness side No.1 (Green) terminal and the engine ground.

**CKP SENSOR 2 3P CONNECTOR
MAIN WIRE HARNESS SIDE**



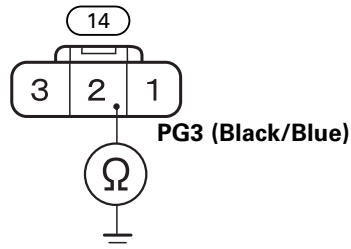
VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
YES - Repair short in the main wire harness between the ECM and the CKP sensor 2.
NO - Go to "5) CKP sensor 2 GND line open-circuit inspection."

5) **CKP sensor 2 GND line open-circuit inspection**

- Connect the ECM connector A (9). Check for continuity between the CKP sensor 2 3P connector (14) main wire harness side No.2 (Black/Blue) terminal and the engine ground.

**CKP SENSOR 2 3P CONNECTOR
MAIN WIRE HARNESS SIDE**



VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
YES - Go to "6) CKP sensor 2 inspection."
NO - Repair open in the main wire harness between the ECM and the CKP sensor 2.

6) **CKP sensor 2 inspection**

- Replace the CKP sensor 2 and connect the CKP sensor 2 3P connector (14).
- Start the engine and check the DTC using the HDS (Dr. H or pocket tester).
 - ◆ Does the DTC 8-1 appear?
YES - Replace the ECM with a new one and recheck.
NO - End of inspection

DTC 8-2: Abnormal CKP sensor 2 pulse

1) **Symptom reproduction test**

- Turn the combination switch OFF. Disconnect the CKP sensor 2 3P connector (14) once and connect it again.
- Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- Start the engine and check the DTC using the HDS (Dr. H or pocket tester).

- ◆ Does the DTC 8-2 appear?
YES - Go to "2) Guide plate inspection."
NO - Temporary failure (Disappears.)

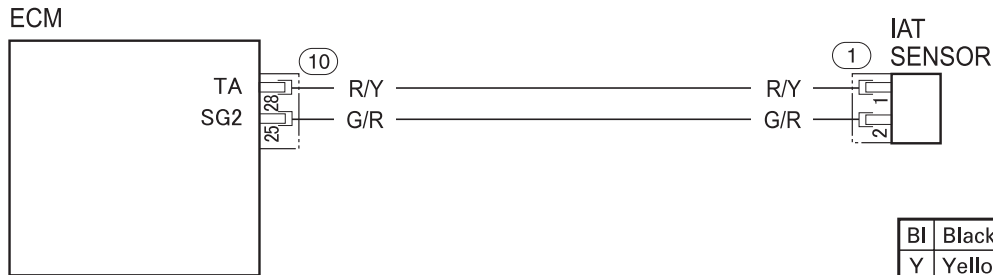
2) **Guide plate inspection**

- Inspect the guide plate.
 - ◆ Is the guide plate damaged?
YES - Replace the guide plate with a new one and recheck.
NO - Go to "3) CKP sensor 2 inspection."

3) **CKP sensor 2 inspection**

- Replace the CKP sensor 2 and connect the CKP sensor 2 3P connector (14).
- Start the engine and check the DTC using the HDS (Dr. H or pocket tester).
 - ◆ Does the DTC 8-2 appear?
YES - Replace the ECM with a new one and recheck.
NO - End of inspection

• IAT SENSOR TROUBLESHOOTING



Bl	Black	Br	Brown
Y	Yellow	O	Orange
Bu	Blue	Lb	Light blue
G	Green	Lg	Light Green
R	Red	P	Pink
W	White	Gr	Gray

DTC 10-1: IAT sensor voltage is too low

1) Symptom reproduction test

- a. Turn the combination switch OFF. Disconnect the IAT sensor 2P connector (1) once and connect it again.
- b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- c. Turn the combination switch ON. Measure the IAT sensor voltage using the HDS (Dr. H or pocket tester).

- ◆ Is the measurement within 0.078 — 4.92V?
 - YES** - Temporary failure (Disappears.)
 - NO** - Go to "2) IAT sensor signal line short-circuit inspection."

2) IAT sensor signal line short-circuit inspection

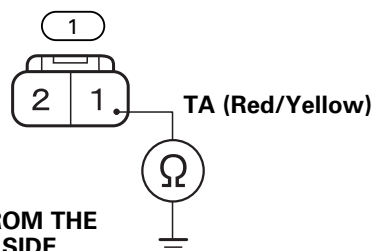
- a. Turn the combination switch OFF. Disconnect the ECM connector B (10) and the IAT sensor 2P connector (1).
- b. Check for continuity between the IAT sensor 2P connector (1) main wire harness side No.1 (Red/Yellow) terminal and the engine ground.

- ◆ Is there continuity?
 - YES** - Repair short in the main wire harness between the ECM and the IAT sensor.
 - NO** - Go to "3) IAT sensor inspection."

3) IAT sensor inspection

- a. Connect the ECM connector B (10) and the IAT sensor 2P connector (1).
 - b. Turn the combination switch ON and measure the sensor temperature using the HDS (Dr. H or pocket tester).
- ◆ Does the measurement correspond to the ambient temperature?
 - YES** - Replace the ECM with a new one and recheck.
 - NO** - Replace the IAT sensor with a new one and recheck.

**IAT SENSOR 2P CONNECTOR
MAIN WIRE HARNESS SIDE**



VIEWED FROM THE
TERMINAL SIDE

DTC 10-2: IAT sensor voltage is too high

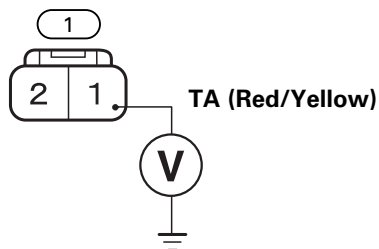
1) Symptom reproduction test

- a. Turn the combination switch OFF. Disconnect the IAT sensor 2P connector (1) once and connect it again.
- b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- c. Turn the combination switch ON. Measure the IAT sensor voltage using the HDS (Dr. H or pocket tester).
 - ◆ Is the measurement within 0.078 — 4.92V?
 - YES** - Temporary failure (Disappears.)
 - NO** - Go to "2) IAT sensor signal line open-circuit inspection."

2) IAT sensor signal line open-circuit inspection

- a. Turn the combination switch OFF and disconnect the IAT sensor 2P connector (1).
- b. Turn the combination switch ON. Measure the voltage between the IAT sensor 2P connector (1) main wire harness side No.1 (Red/Yellow) terminal and the engine ground.

**IAT SENSOR 2P CONNECTOR
MAIN WIRE HARNESS SIDE**



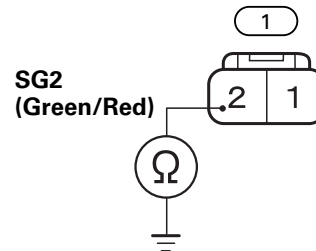
VIEWED FROM THE TERMINAL SIDE

- ◆ Is the measurement within 4.30 — 5.25V?
 - YES** - Go to "3) IAT sensor GND line open-circuit inspection."
 - NO** - Repair open in the main wire harness between the ECM and the IAT sensor.

3) IAT sensor GND line open-circuit inspection

- Turn the combination switch OFF. Check for continuity between the IAT sensor 2P connector (1) main wire harness side No.2 (Green/Red) terminal and the engine ground.

**IAT SENSOR 2P CONNECTOR
MAIN WIRE HARNESS SIDE**



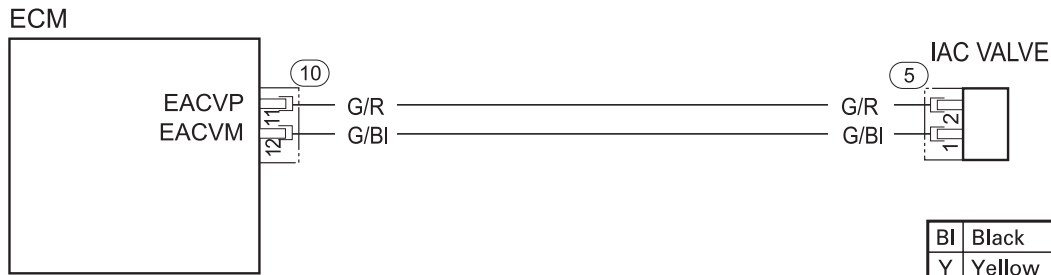
VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
 - YES** - Go to "4) IAT sensor inspection."
 - NO** - Repair open in the main wire harness between the ECM and the IAT sensor.

4) IAT sensor inspection

- a. Connect the IAT sensor 2P connector (1).
- b. Turn the combination switch ON. Measure the sensor temperature using the HDS (Dr. H or pocket tester).
 - ◆ Does the measurement correspond to the ambient temperature?
 - YES** - Replace the ECM with a new one and recheck.
 - NO** - Replace the IAT sensor with a new one and recheck.

• IAC VALVE TROUBLESHOOTING



Bl	Black	Br	Brown
Y	Yellow	O	Orange
Bu	Blue	Lb	Light blue
G	Green	Lg	Light Green
R	Red	P	Pink
W	White	Gr	Gray

DTC 14-1: Abnormal IAC valve

1) Symptom reproduction test

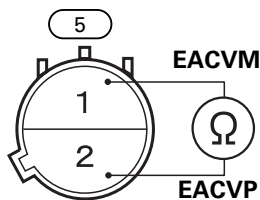
- a. Turn the combination switch OFF. Disconnect the IAC valve 2P connector (5) once and connect it again.
- b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- c. Start the engine and check the DTC using the HDS (Dr. H or pocket tester).

- ◆ Does the DTC 14-1 appear?
 - YES** - Go to "2) IAC valve inspection."
 - NO** - Temporary failure (Disappears.)

2) IAC valve inspection

- a. Turn the combination switch OFF and disconnect the IAC valve 2P connector (5).
- b. Measure the resistance between the IAC valve side No.1 terminal and No.2 terminal of the IAC valve 2P connector (5).

IAC VALVE 2P CONNECTOR IAC VALVE SIDE

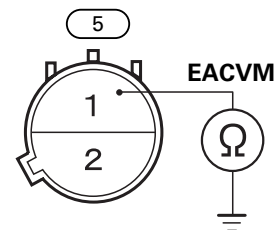


VIEWED FROM THE TERMINAL SIDE

- ◆ Is the measurement within 10 — 13Ω?
 - YES** - Go to the step c.
 - NO** - Replace the IAC valve with a new one and recheck.

- c. Check for continuity between the IAC valve 2P connector (5) IAC valve side No.1 terminal and the engine ground.

IAC VALVE 2P CONNECTOR IAC VALVE SIDE

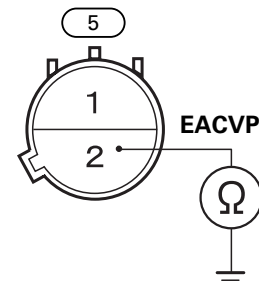


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- ◆ Is there continuity?
 - YES** - Replace the IAC valve with a new one and recheck.
 - NO** - Go to the step d.

- d. Check for continuity between the IAC valve 2P connector (5) IAC valve side No.2 terminal and the engine ground.

IAC VALVE 2P CONNECTOR IAC VALVE SIDE

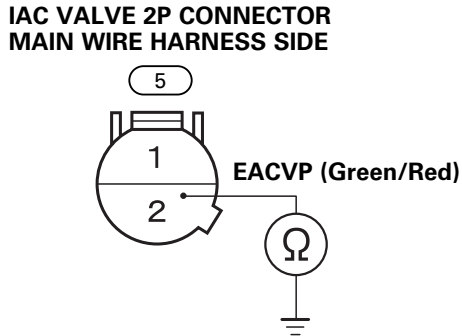


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- ◆ Is there continuity?
 - YES** - Replace the IAC valve with a new one and recheck.
 - NO** - Go to "3) EACVP line short-circuit check."

3) EACVP line short-circuit check

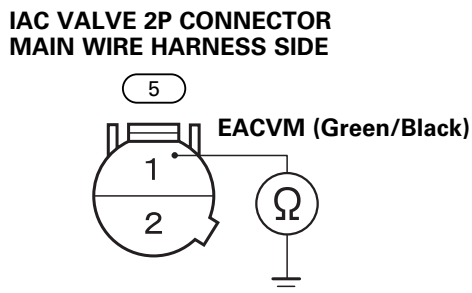
- Disconnect the ECM connector B (10). Check for continuity between the IAC valve 2P connector (5) main wire harness side No.2 (Green/Red) terminal and the engine ground.



- ◆ Is there continuity?
 - YES** - Repair short in the main wire harness between the ECM and the IAC valve.
 - NO** - Go to "4) EACVM line short-circuit inspection."

4) EACVM line short-circuit inspection

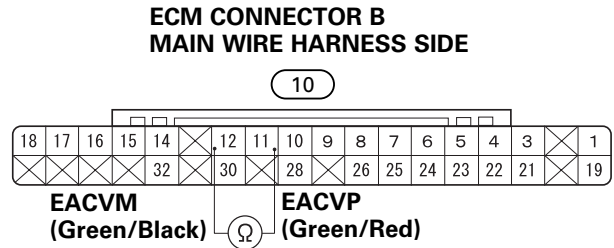
- Check for continuity between the IAC valve 2P connector (5) main wire harness side No.1 (Green/Black) terminal and the engine ground.



- ◆ Is there continuity?
 - YES** - Repair short in the main wire harness between the ECM and the IAC valve.
 - NO** - Go to "5) IAC valve line open-circuit inspection."

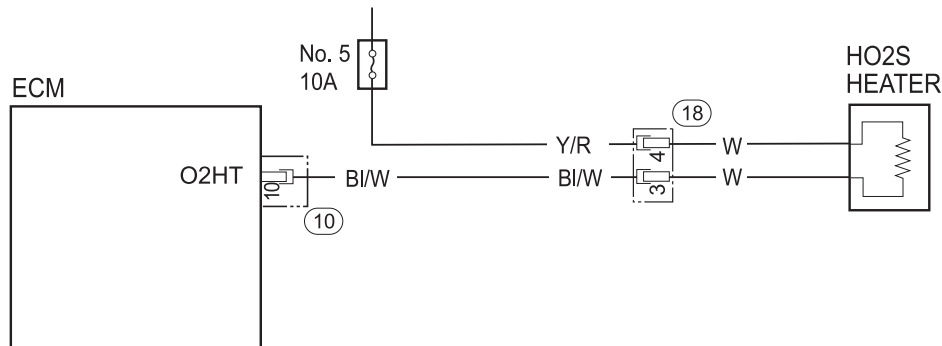
5) IAC valve line open-circuit inspection

- Connect the IAC valve 2P connector (5). Measure the resistance between the main wire harness side No.11 (Green/Red) terminal and the No.12 (Green/Black) terminal of the ECM connector B (10).



- ◆ Is the measurement within 10 — 13Ω?
 - YES** - Replace the ECM with a new one and recheck.
 - NO** - Repair open in the main wire harness between the ECM and the IAC valve.

• HO2S HEATER TROUBLESHOOTING



Bl	Black	Br	Brown
Y	Yellow	O	Orange
Bu	Blue	Lb	Light blue
G	Green	Lg	Light Green
R	Red	P	Pink
W	White	Gr	Gray

DTC 41-2: Abnormal HO2S heater

1) Symptom reproduction test

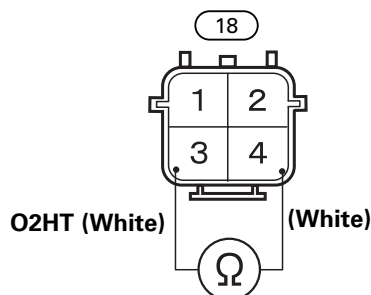
- a. Turn the combination switch OFF. Disconnect the HO2S 4P connector (18) once and connect it again.
- b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- c. Start the engine and let it run at 3,000 min⁻¹ (rpm) for 5 minutes or more under no load.
- d. Check the DTC using the HDS (Dr. H or pocket tester).

- ◆ Does the DTC 41-2 appear?
 - YES** - Go to "2) HO2S heater inspection."
 - NO** - Temporary failure (Disappears.)

2) HO2S heater inspection

- a. Turn the combination switch OFF and disconnect the HO2S 4P connector (18).
- b. Measure the resistance between the HO2S side No.3 (White) terminal and the No.4 (White) terminal of the HO2S 4P connector (18).

HO2S 4P CONNECTOR HO2S SIDE



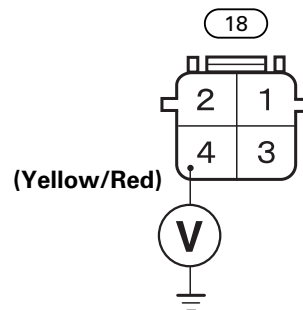
VIEWED FROM THE TERMINAL SIDE

- ◆ Is the measurement within 10 — 40Ω?
 - YES** - Go to "3) HO2S heater power line open-circuit inspection."
 - NO** - Replace the HO2S with a new one and recheck.

3) HO2S heater power line open-circuit inspection

- Turn the combination switch ON. Measure the voltage between the HO2S 4P connector (18) main wire harness side No.4 (Yellow/Red) terminal and the engine ground.

**HO2S 4P CONNECTOR
MAIN WIRE HARNESS SIDE**



VIEWED FROM THE TERMINAL SIDE

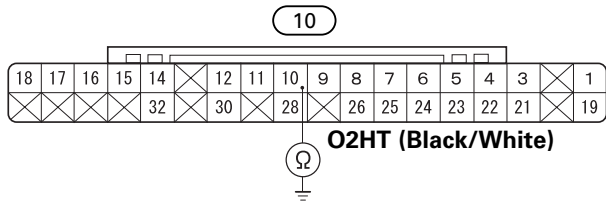
- ◆ Is there the battery voltage?
 - YES** - Go to "4) HO2S heater line short-circuit inspection."
 - NO** - Check the No.5 fuse and the main relay (P. 18-17, 18). If there is no problem, replace the main wire harness.

BF40D•BF50D

4) HO2S heater line short-circuit inspection

- Turn the combination switch OFF and connect the HO2S 4P connector (18).
- Disconnect the ECM connector B (10). Check for continuity between the ECM connector B (10) main wire harness side No.10 (Black/White) terminal and the engine ground.

ECM CONNECTOR B MAIN WIRE HARNESS SIDE



VIEWED FROM THE TERMINAL SIDE

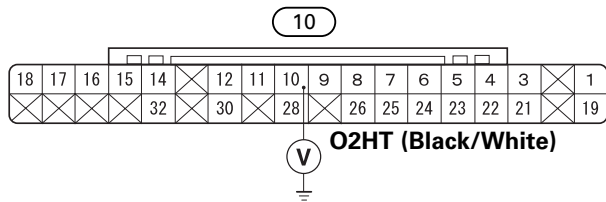
◆ Is there continuity?

- YES** - Repair short in the main wire harness between the ECM and the HO2S.
- NO** - Go to "5) HO2S heater line open-circuit inspection."

5) HO2S heater line open-circuit inspection

- Turn the combination switch ON. Measure the voltage between the ECM connector B (10) main wire harness side No.10 (Black/White) terminal and the engine ground.

ECM CONNECTOR B MAIN WIRE HARNESS SIDE

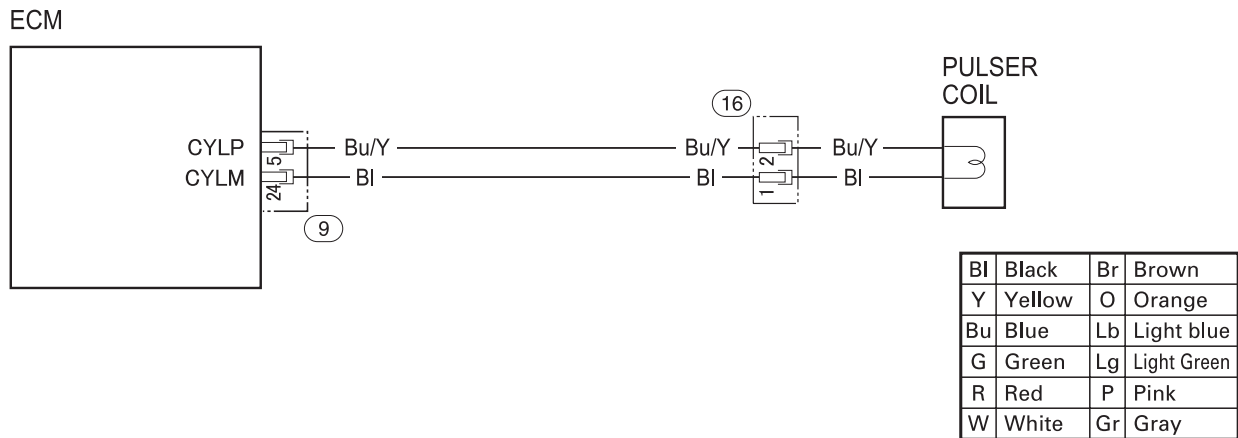


VIEWED FROM THE TERMINAL SIDE

◆ Is there the battery voltage?

- YES** - Replace the ECM with a new one and recheck.
- NO** - Repair open in the main wire harness between the ECM and the HO2S.

• PULSER COIL TROUBLESHOOTING



DTC 58-1: Abnormal pulser coil current

1) Symptom reproduction test

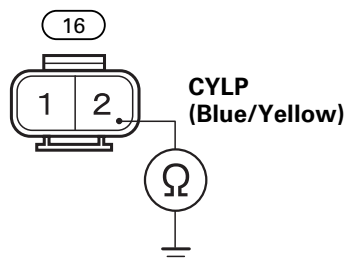
- a. Turn the combination switch OFF. Disconnect the pulser coil 2P connector (16) once and connect it again.
- b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- c. Start the engine and check the DTC using the HDS (Dr. H or pocket tester).

◆ Does the DTC 58-1 appear?
YES - Go to "2) CYLP line short-circuit inspection."
NO - Temporary failure (Disappears.)

2) CYLP line short-circuit inspection

- a. Turn the combination switch OFF. Disconnect the pulser coil 2P connector (16) and the ECM connector A (9).
- b. Check for continuity between the pulser coil 2P connector (16) main wire harness side No.2 (Blue/Yellow) terminal and the engine ground.

**PULSER COIL 2P CONNECTOR
MAIN WIRE HARNESS SIDE**



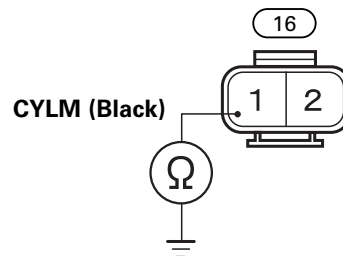
VIEWED FROM THE TERMINAL SIDE

◆ Is there continuity?
YES - Repair short in the main wire harness between the ECM and the pulser coil.
NO - Go to "3) CYLM line short-circuit inspection."

3) CYLM line short-circuit inspection

- Check for continuity between the pulser coil 2P connector (16) main wire harness side No.1 (Black) terminal and the engine ground.

**PULSER COIL 2P CONNECTOR
MAIN WIRE HARNESS SIDE**

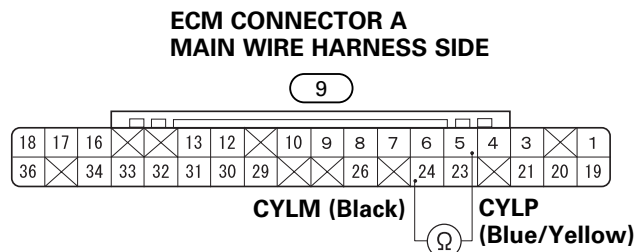


VIEWED FROM THE TERMINAL SIDE

◆ Is there continuity?
YES - Repair short in the main wire harness between the ECM and the pulser coil.
NO - Go to "4) CYL line open-circuit inspection."

4) CYL line open-circuit inspection

- Connect the pulser coil 2P connector (16). Check for continuity between the ECM connector A (9) main wire harness side No.5 (Blue/Yellow) terminal and the No.24 (Black) terminal.



VIEWED FROM THE TERMINAL SIDE

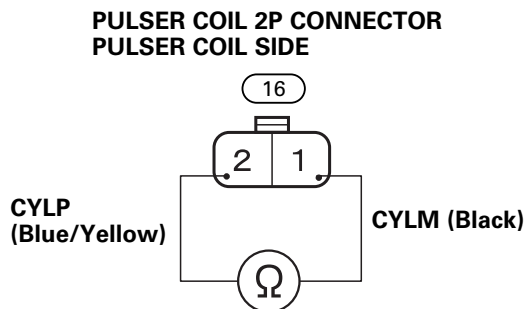
- ◆ Is there continuity?

YES - Go to "5) Pulser coil inspection."

NO - Repair open in the main wire harness between the ECM and the pulser coil.

5) Pulser coil inspection

- Disconnect the pulser coil 2P connector (16). Measure the resistance between the pulser coil side No.1 terminal and No.2 terminal of the pulser coil 2P connector (16).



VIEWED FROM THE TERMINAL SIDE

- ◆ Is the measurement within 288 — 352Ω?

YES - Replace the ECM with a new one and recheck.

NO - Replace the pulser coil with a new one and recheck.

DTC 58-2: Abnormal pulser coil current

1) Symptom reproduction test

- Turn the combination switch OFF. Disconnect the pulser coil 2P connector (16) once and connect it again.
- Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- Start the engine and check the DTC using the HDS (Dr. H or pocket tester).

- ◆ Does the DTC 58-2 appear?

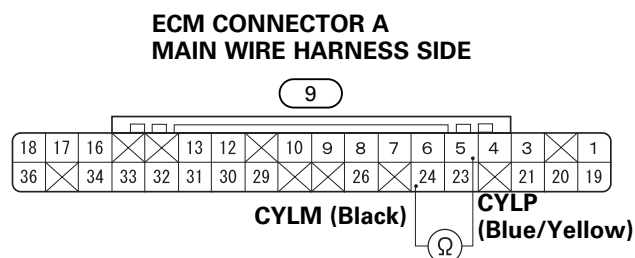
YES - Go to "2) CYL line open-circuit inspection."

NO - Temporary failure (Disappears.)

2) CYL line open-circuit inspection

- Turn the combination switch OFF and disconnect the ECM connector A (9).

- Check for continuity between the main wire harness side No.5 (Blue/Yellow) terminal and No.24 (Black) terminal of the ECM connector A (9).



VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?

YES - Go to "3) Pulser rotor inspection."

NO - Repair open in the main wire harness between the ECM and the pulser coil.

3) Pulser rotor inspection

- Check the pulser rotor.

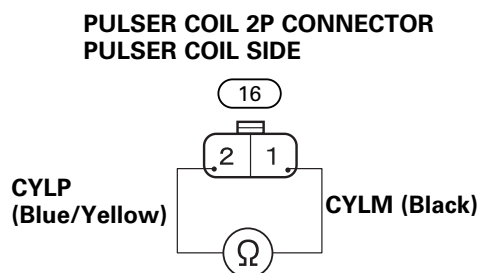
- ◆ Is the pulser rotor damaged?

YES - Replace the pulser rotor with a new one and recheck.

NO - Go to "4) Pulser coil inspection."

4) Pulser coil inspection

- Disconnect the pulser coil 2P connector (16). Measure the resistance between the pulser coil side No.1 terminal and No.2 terminal of the pulser coil 2P connector (16).



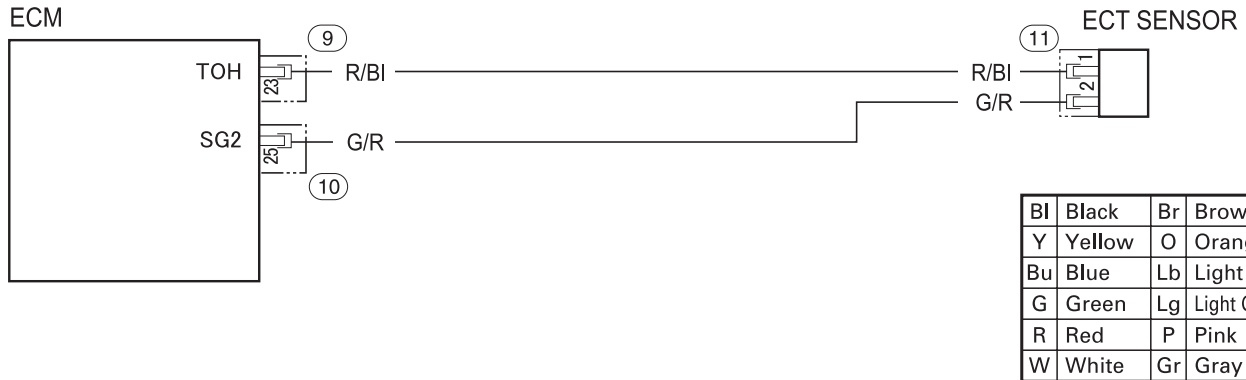
VIEWED FROM THE TERMINAL SIDE

- ◆ Is the measurement within 288 — 352Ω?

YES - Replace the ECM with a new one and recheck.

NO - Replace the pulser coil with a new one and recheck.

• ECT SENSOR TROUBLESHOOTING



DTC 140-1: ECT sensor voltage is too low

1) Symptom reproduction test

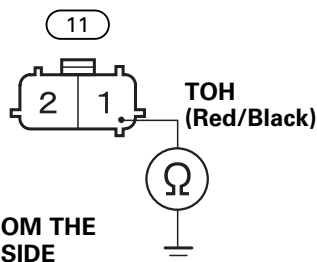
- a. Turn the combination switch OFF. Disconnect the ECT sensor 2P connector (11) once and connect it again.
- b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- c. Turn the combination switch ON. Measure the ECT sensor voltage using the HDS (Dr. H or pocket tester).

- ◆ Is the measurement within 0.078 — 4.92V?
 - YES** - Temporary failure (Disappears.)
 - NO** - Go to "2) ECT sensor signal line short-circuit inspection."

2) ECT sensor signal line short-circuit inspection

- a. Turn the combination switch OFF. Disconnect the ECM connector A (9) and the ECT sensor 2P connector (11).
- b. Check for continuity between the ECT sensor 2P connector (11) main wire harness side No.1 (Red/Black) terminal and the engine ground.

**ECT SENSOR 2P CONNECTOR
MAIN WIRE HARNESS SIDE**



**VIEWED FROM THE
TERMINAL SIDE**

- ◆ Is there continuity?
 - YES** - Repair short in the main wire harness between the ECM and the ECT sensor.
 - NO** - Go to "3) ECT sensor inspection."

3) ECT sensor inspection

- a. Connect the ECM connector A (9). Remove the ECT sensor and connect the ECT sensor 2P connector (11).
- b. Turn the combination switch ON and measure the ECT sensor temperature using the HDS (Dr. H or pocket tester).
 - ◆ Does the measurement correspond to the ambient temperature?
 - YES** - Replace the ECM with a new one and recheck.
 - NO** - Replace the ECT sensor with a new one and recheck.

DTC 140-2: ECT sensor voltage is too high

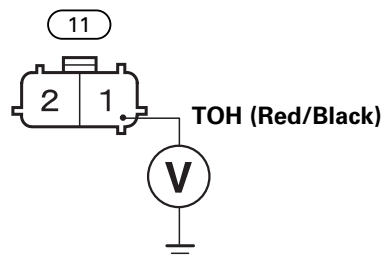
1) Symptom reproduction test

- a. Turn the combination switch OFF. Disconnect the ECT sensor 2P connector (11) once and connect it again.
- b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- c. Turn the combination switch ON. Measure the ECT sensor voltage using the HDS (Dr. H or pocket tester).
 - ◆ Is the measurement within 0.078 — 4.92V?
 - YES** - Temporary failure (Disappears.)
 - NO** - Go to "2) ECT sensor signal line open-circuit inspection."

2) ECT sensor signal line open-circuit inspection

- a. Turn the combination switch OFF and disconnect the ECT sensor 2P connector (11).
- b. Turn the combination switch ON. Measure the voltage between the ECT sensor 2P connector (11) main wire harness side No.1 (Red/Black) terminal and the engine ground.

**ECT SENSOR 2P CONNECTOR
MAIN WIRE HARNESS SIDE**



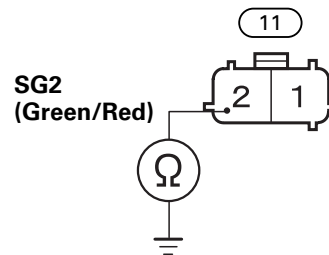
VIEWED FROM THE TERMINAL SIDE

- ◆ Is the measurement within 4.30 — 5.25V?
 - YES** - Go to "3) ECT sensor GND line open-circuit inspection."
 - NO** - Repair open in the main wire harness between the ECM and the ECT sensor.

3) ECT sensor GND line open-circuit inspection

- Turn the combination switch OFF. Check for continuity between the ECT sensor 2P connector (11) main wire harness side No.2 (Green/Red) terminal and the engine ground.

**ECT SENSOR 2P CONNECTOR
MAIN WIRE HARNESS SIDE**



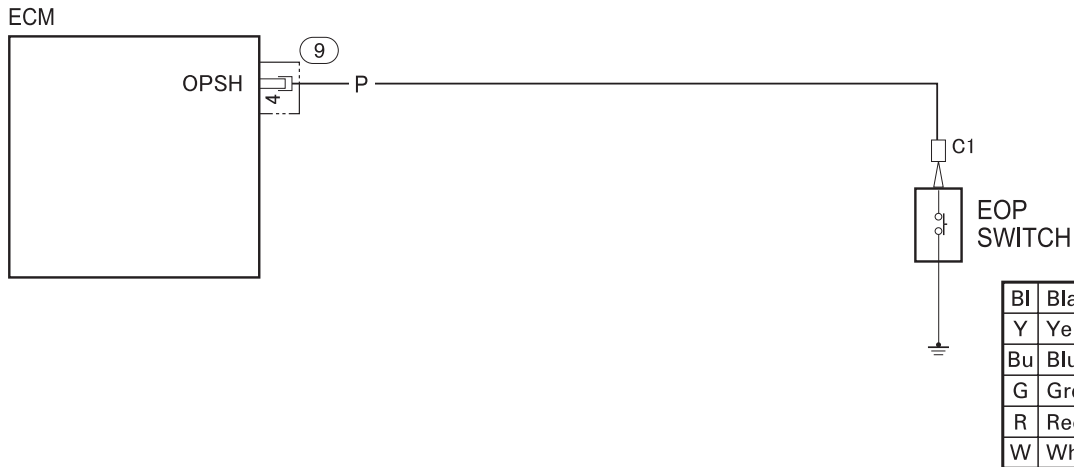
VIEWED FROM THE TERMINAL SIDE

- ◆ Is there continuity?
 - YES** - Go to "4) ECT sensor inspection."
 - NO** - Repair open in the main wire harness between the ECM and the ECT sensor.

4) ECT sensor inspection

- a. Remove the ECT sensor and connect the ECT sensor 2P connector (11).
- b. Turn the combination switch ON and measure the sensor temperature using the HDS (Dr. H or pocket tester).
 - ◆ Does the measurement correspond to the ambient temperature?
 - YES** - Replace the ECM with a new one and recheck.
 - NO** - Replace the ECT sensor with a new one and recheck.

• EOP SWITCH TROUBLESHOOTING



DTC 142-1: Abnormal EOP switch

1) Symptom reproduction test

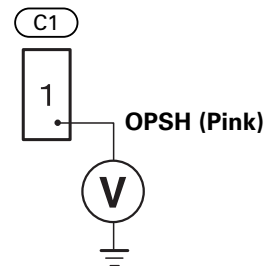
- a. Turn the combination switch OFF. Disconnect the EOP switch terminal (C1) once and connect it again.
- b. Clear the DTC (P. 5-12).
 - Continue the procedure when the DTC does not clear.
- c. Turn the combination switch ON. Check the DTC using the HDS (Dr. H or pocket tester).

- ◆ Does the DTC 142-1 appear?
 - YES** - Go to "2) EOP switch signal line open-circuit inspection."
 - NO** - Temporary failure (Disappears.)

2) EOP switch signal line open-circuit inspection

- a. Turn the combination switch OFF and disconnect the EOP switch terminal (C1).
- b. Measure the voltage between the EOP switch terminal (C1) main wire harness side No.1 (Pink) terminal and the engine ground.

EOP SWITCH TERMINAL MAIN WIRE HARNESS SIDE



VIEWED FROM THE TERMINAL SIDE

- ◆ Is there the battery voltage?
 - YES** - Replace the EOP switch with a new one. If the DTC 142-1 appears again, replace the ECM with a new one and recheck.
 - NO** - Repair open in the main wire harness between the ECM and the EOP switch.