

DTC	P0351	Ignition Coil "A" Primary / Secondary Circuit
DTC	P0352	Ignition Coil "B" Primary / Secondary Circuit
DTC	P0353	Ignition Coil "C" Primary / Secondary Circuit
DTC	P0354	Ignition Coil "D" Primary / Secondary Circuit

DESCRIPTION

HINT:

- These DTCs indicate malfunctions relating to the primary circuit.
- If DTC P0351 is set, check the No. 1 ignition coil with igniter circuit.
- If DTC P0352 is set, check the No. 2 ignition coil with igniter circuit.
- If DTC P0353 is set, check the No. 3 ignition coil with igniter circuit.
- If DTC P0354 is set, check the No. 4 ignition coil with igniter circuit.

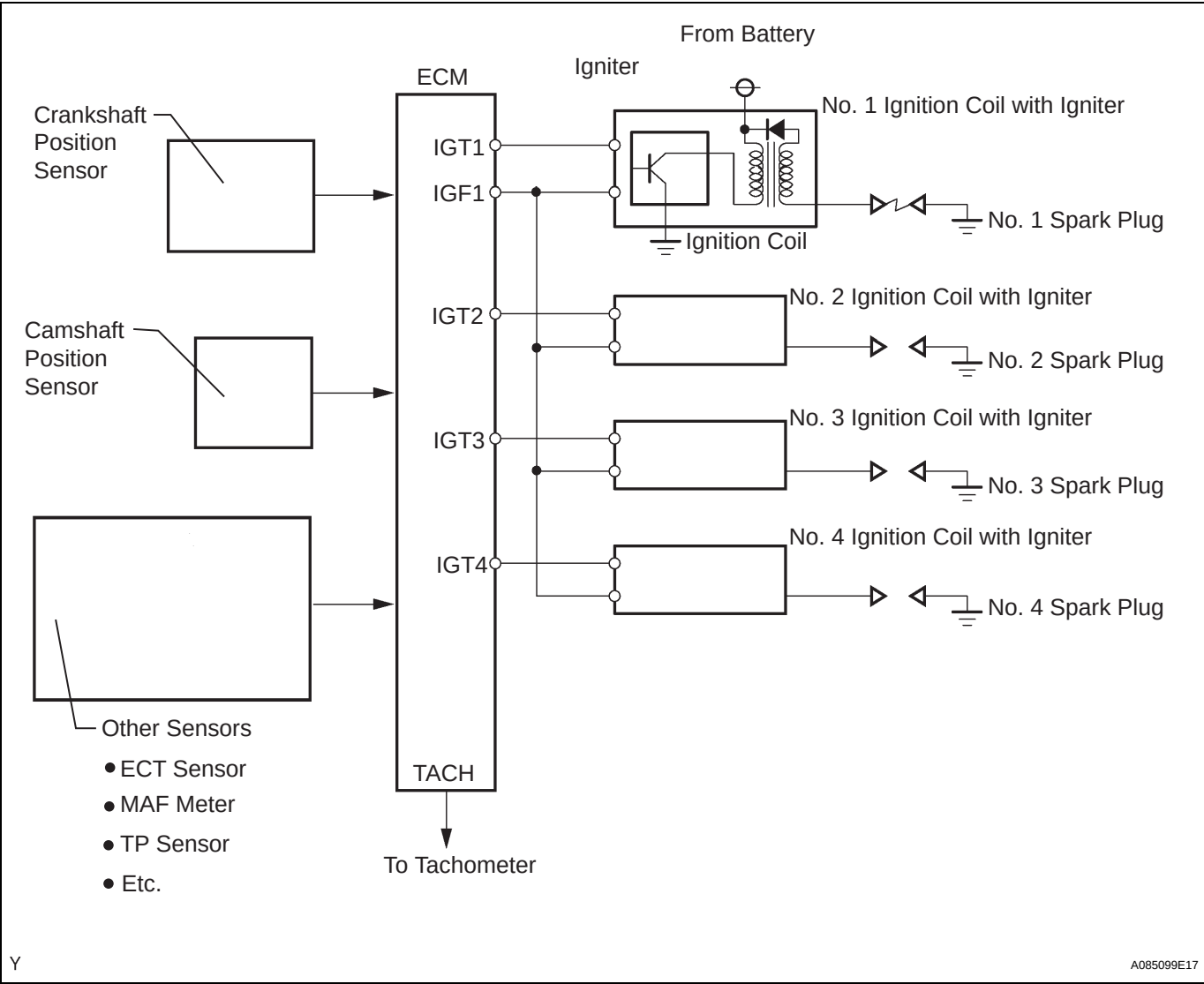
A Direct Ignition System (DIS) is used on this vehicle.

The DIS is a 1-cylinder ignition system in which each cylinder is ignited by one ignition coil and one spark plug is connected to the end of each secondary winding. A powerful voltage, generated in the secondary winding, is applied directly to each spark plug. The sparks of the spark plugs pass from the center electrodes to the ground electrodes.

The ECM determines the ignition timing and transmits the ignition (IGT) signals to each cylinder. Using the IGT signal, the ECM turns the power transistor inside the igniter on and off. The power transistor, in turn, switches on and off the current to the primary coil. When the current to the primary coil is cut off, a powerful voltage is generated in the secondary coil. This voltage is applied to the spark plugs, causing them to spark inside the cylinders. As the ECM cuts the current to the primary coil, the igniter sends back an ignition confirmation (IGF) signal to the ECM, for each cylinder ignition.

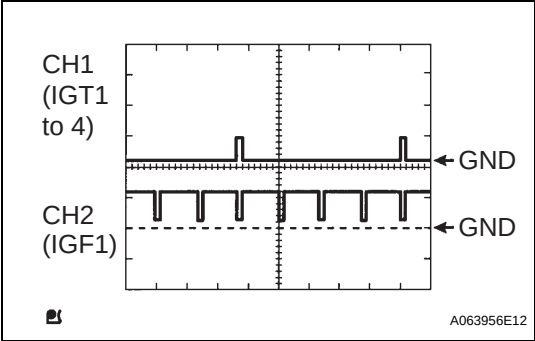
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DTC No.	DTC Detection Conditions	Trouble Areas
P0351 P0352 P0353 P0354	No IGF signal to ECM while engine is running (1 trip detection logic)	• Ignition system • Open or short in IGF1 or IGT circuit (1 to 4) between ignition coil with igniter and ECM • No. 1 to No. 4 ignition coils with igniters • ECM

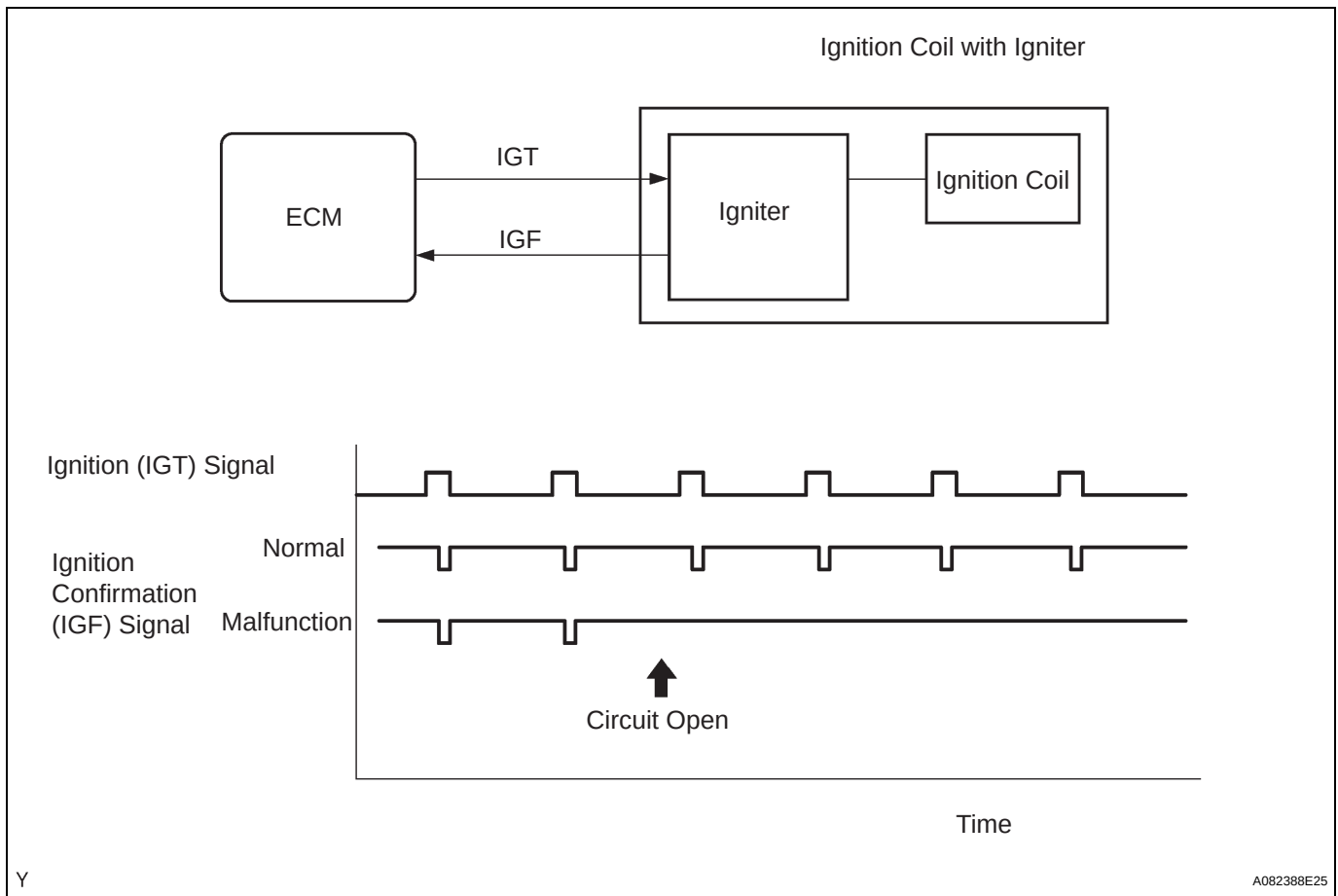
Reference: Inspection using an oscilloscope.



While cranking or idling, check the waveform between terminals IGT (1 to 4) and E1, and IGF1 and E1 of the E3 ECM connector.

Items	Contents
Terminals	CH1: IGT1, IGT2, IGT3, IGT4 - E1 CH2: IGF1 - E1
Equipment Settings	2 V/Division, 20 ms./Division
Conditions	Cranking or idling

MONITOR DESCRIPTION



If the ECM does not receive any IGF signals despite transmitting the IGT signal, it interprets this as a fault in the igniter and sets a DTC.

If the malfunction is not repaired successfully, a DTC is set 1second after the engine is next started.

MONITOR STRATEGY

Related DTCs	P0351: Igniter (Cylinder 1) malfunction P0352: Igniter (Cylinder 2) malfunction P0353: Igniter (Cylinder 3) malfunction P0354: Igniter (Cylinder 4) malfunction
Required Sensors/Components (Main)	Igniter
Required Sensors/Components (Related)	Crankshaft position sensor
Frequency of Operation	Continuous
Duration	0.256 seconds and 4 sparks
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None
Engine RPM	1,500 rpm or less
Engine RPM	500 rpm or less: when battery voltage is 6 V or more More than 500 rpm: when battery voltage is 10 V or more

TYPICAL MALFUNCTION THRESHOLDS

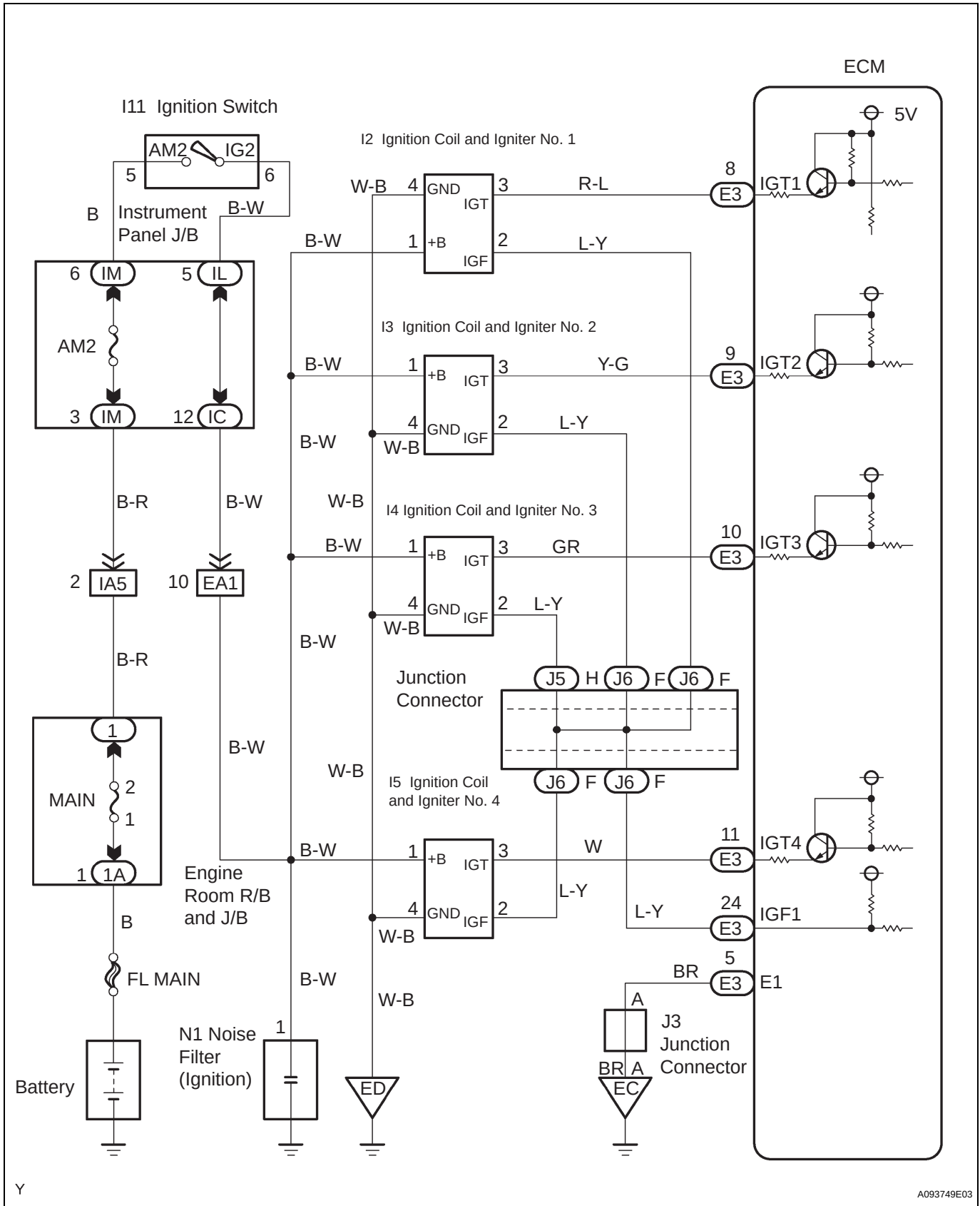
IGF signal	ECM does not receive any IGF signal despite ECM sending IGT signal to igniter
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COMPONENT OPERATING RANGE

IGF signal	Igniter transmits IGF signal when it receives IGT signal from ECM
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WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:
Read freeze frame data using an intelligent tester or OBD II scan tool. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can be helpful in determining whether the vehicle was running or stopped, whether the engine was warmed up or not, whether the air/fuel ratio was lean or rich, as well as other data recorded at the time of a malfunction.

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CHECK WHETHER DTC OUTPUT RECURS (DTC P0351, P0352, P0353 OR P0354)

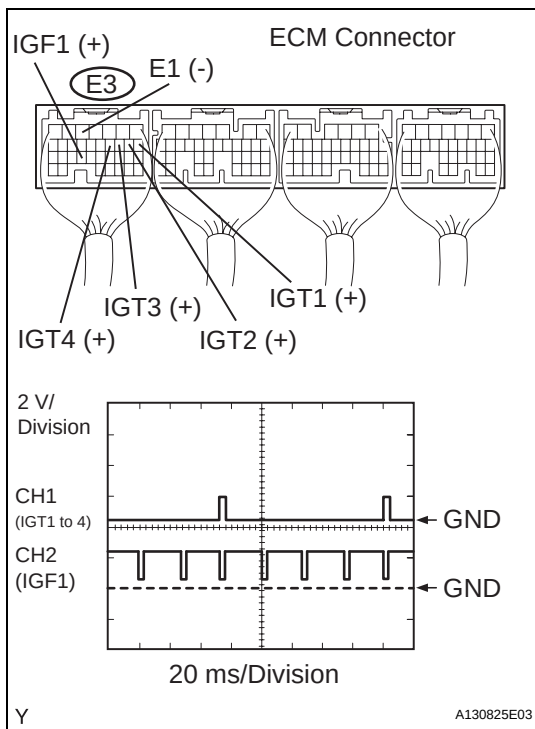
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- (a) Connect an intelligent tester or OBD II scan tool to the DLC3.
 - (b) Turn the ignition switch to ON.
 - (c) Turn the tester or scan tool ON.
 - (d) Clear DTCs (See page ES-30).
 - (e) Shuffle arrangement of the ignition coils with igniters (among No. 1 to No. 4 cylinders).
- NOTICE:**
Do not shuffle the connectors.
- (f) Perform a simulation test.
 - (g) Check DTCs displayed on the tester or scan tool.

Result

Display (DTC Output)	Proceed to
P0351, P0352, P0353 or P0354	A
Any other DTCs	B



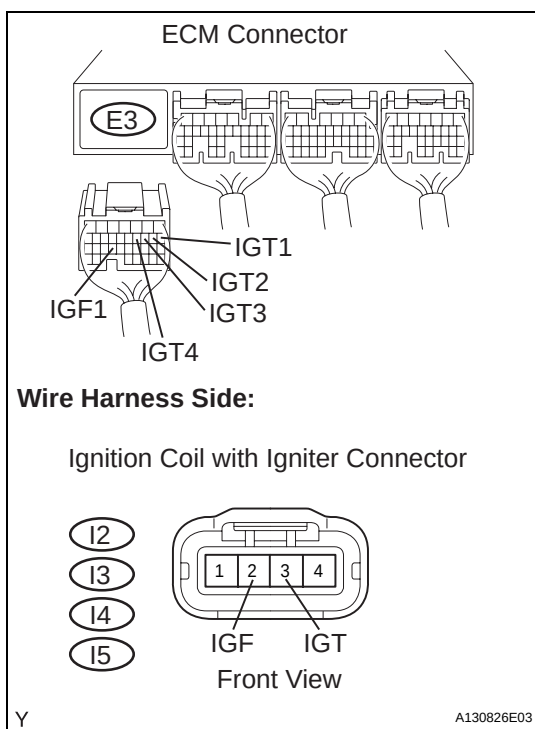
2 INSPECT ECM (IGT1, IGT2, IGT3, IGT4 AND IGF1 SIGNAL)

(a) Inspect the ECM using an oscilloscope.

- (1) While cranking or idling, check the waveform between the terminals of the E3 ECM connector.

Standard

Tester Connections	Specified Conditions
IGT1 (E3-8) - E1 (E3-5)	Correct waveform is as shown
IGT2 (E3-9) - E1 (E3-5)	Correct waveform is as shown
IGT3 (E3-10) - E1 (E3-5)	Correct waveform is as shown
IGT4 (E3-11) - E1 (E3-5)	Correct waveform is as shown
IGF1 (E3-24) - E1 (E3-5)	Correct waveform is as shown

NG**REPLACE ECM****OK****3 CHECK HARNESS AND CONNECTOR (IGNITION COIL ASSEMBLY - ECM)**

(a) Disconnect the I2, I3, I4 or I5 ignition coil with igniter connector.

(b) Disconnect the E3 ECM connector.

(c) Check the resistance.

Standard resistance (Check for open)

Tester Connections	Specified Conditions
IGF (I2-2) - IGF1 (E3-24)	Below 1 Ω
IGF (I3-2) - IGF1 (E3-24)	Below 1 Ω
IGF (I4-2) - IGF1 (E3-24)	Below 1 Ω
IGF (I5-2) - IGF1 (E3-24)	Below 1 Ω

Standard resistance (Check for open)

Tester Connections	Specified Conditions
IGT (I2-3) - IGT1 (E3-8)	Below 1 Ω
IGT (I3-3) - IGT2 (E3-9)	Below 1 Ω
IGT (I4-3) - IGT3 (E3-10)	Below 1 Ω
IGT (I5-3) - IGT4 (E3-11)	Below 1 Ω

Standard resistance (Check for short)

Tester Connections	Specified Conditions
IGF (I2-2) or IGF1 (E3-24) - Body ground	10 k Ω or higher
IGF (I3-2) or IGF1 (E3-24) - Body ground	10 k Ω or higher
IGF (I4-2) or IGF1 (E3-24) - Body ground	10 k Ω or higher

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Tester Connections	Specified Conditions
IGF (I5-2) or IGF1 (E3-24) - Body ground	10 k Ω or higher

Standard resistance (Check for short)

Tester Connections	Specified Conditions
IGT (I2-3) or IGT1 (E3-8) - Body ground	10 k Ω or higher
IGT (I3-3) or IGT2 (E3-9) - Body ground	10 k Ω or higher
IGT (I4-3) or IGT3 (E3-10) - Body ground	10 k Ω or higher
IGT (I5-3) or IGT4 (E3-11) - Body ground	10 k Ω or higher

- (d) Reconnect the ECM connector.
 (e) Reconnect the ignition coil with igniter connector.

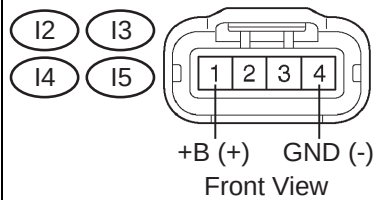
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REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4 INSPECT IGNITION COIL ASSEMBLY (POWER SOURCE)**Wire Harness Side:**

Ignition Coil with Igniter Connector



- (a) Disconnect the I2, I3, I4 or I5 ignition coil with igniter connector.
 (b) Check the resistance.

Standard resistance (Check for open)

Tester Connections	Specified Conditions
GND (I2-4) - Body ground	Below 1 Ω
GND (I3-4) - Body ground	Below 1 Ω
GND (I4-4) - Body ground	Below 1 Ω
GND (I5-4) - Body ground	Below 1 Ω

- (c) Turn the ignition switch to ON.
 (d) Measure the voltage between the terminals of the wire harness side connector.

Standard voltage

Tester Connections	Specified Conditions
+B (I2-1) - GND (I2-4)	Between 9 V and 14 V
+B (I3-1) - GND (I3-4)	Between 9 V and 14 V
+B (I4-1) - GND (I4-4)	Between 9 V and 14 V
+B (I5-1) - GND (I5-4)	Between 9 V and 14 V

- (e) Reconnect the ignition coil with igniter connector.

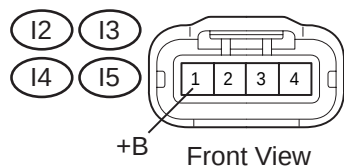
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REPLACE IGNITION COIL ASSEMBLY

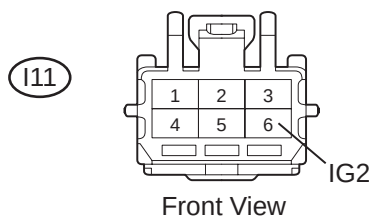
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5**CHECK HARNESS AND CONNECTOR (IGNITION COIL ASSEMBLY - IGNITION SWITCH)****Wire Harness Side:**

Ignition Coil with Igniter Connector



Ignition Switch Connector



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- (a) Disconnect the I2, I3, I4 or I5 ignition coil with igniter connector.
- (b) Disconnect the I11 ignition switch connector.
- (c) Check the resistance.

Standard resistance (Check for open)

Tester Connections	Specified Conditions
+B (I2-1) - IG2 (I11-6)	Below 1 Ω
+B (I3-1) - IG2 (I11-6)	Below 1 Ω
+B (I4-1) - IG2 (I11-6)	Below 1 Ω
+B (I5-1) - IG2 (I11-6)	Below 1 Ω

Standard resistance (Check for short)

Tester Connections	Specified Conditions
+B (I2-1) or IG2 (I11-6) - Body ground	10 k Ω or higher
+B (I3-1) or IG2 (I11-6) - Body ground	10 k Ω or higher
+B (I4-1) or IG2 (I11-6) - Body ground	10 k Ω or higher
+B (I5-1) or IG2 (I11-6) - Body ground	10 k Ω or higher

- (d) Reconnect the ignition coil with igniter connector.
- (e) Reconnect the ignition switch connector.

NG**REPAIR OR REPLACE HARNESS OR CONNECTOR****OK****REPLACE IGNITION COIL ASSEMBLY****ES**