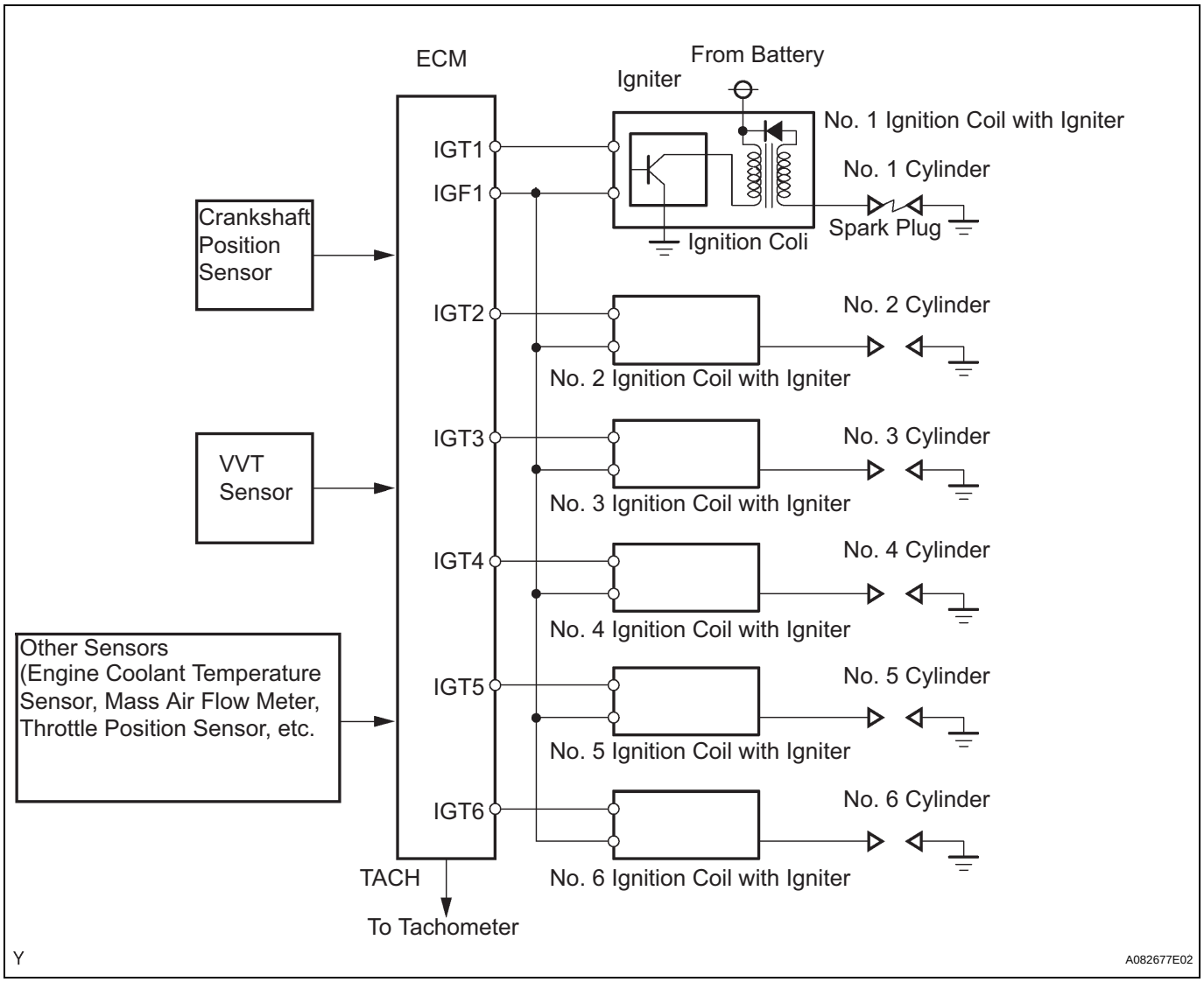
DTC	P0351	Ignition Coil "A" Primary / Secondary Circuit
DTC	P0352	Ignition Coil "B" Primary / Secondary Circuit
DTC	P0353	Ignition Coil "C" Primary / Secondary Circuit
DTC	P0354	Ignition Coil "D" Primary / Secondary Circuit
DTC	P0355	Ignition Coil "E" Primary / Secondary Circuit
DTC	P0356	Ignition Coil "F" Primary / Secondary Circuit

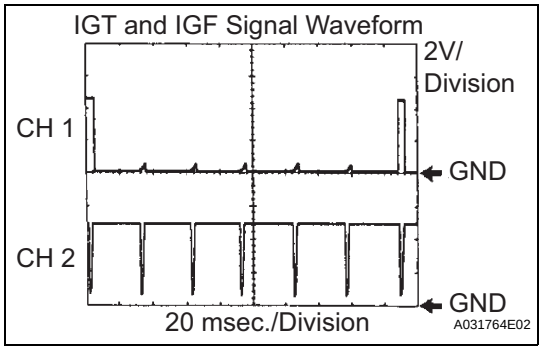
HINT:
- These DTCs indicate malfunctions relating to the primary circuit.
- If DTC P0351 is set, check No. 1 ignition coil with igniter circuit.
- If DTC P0352 is set, check No. 2 ignition coil with igniter circuit.
- If DTC P0353 is set, check No. 3 ignition coil with igniter circuit.
- If DTC P0354 is set, check No. 4 ignition coil with igniter circuit.
- If DTC P0355 is set, check No. 5 ignition coil with igniter circuit.
- If DTC P0356 is set, check No. 6 ignition coil with igniter circuit.

DESCRIPTION

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 wiring. A powerful voltage, generated in the secondary wiring, 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.



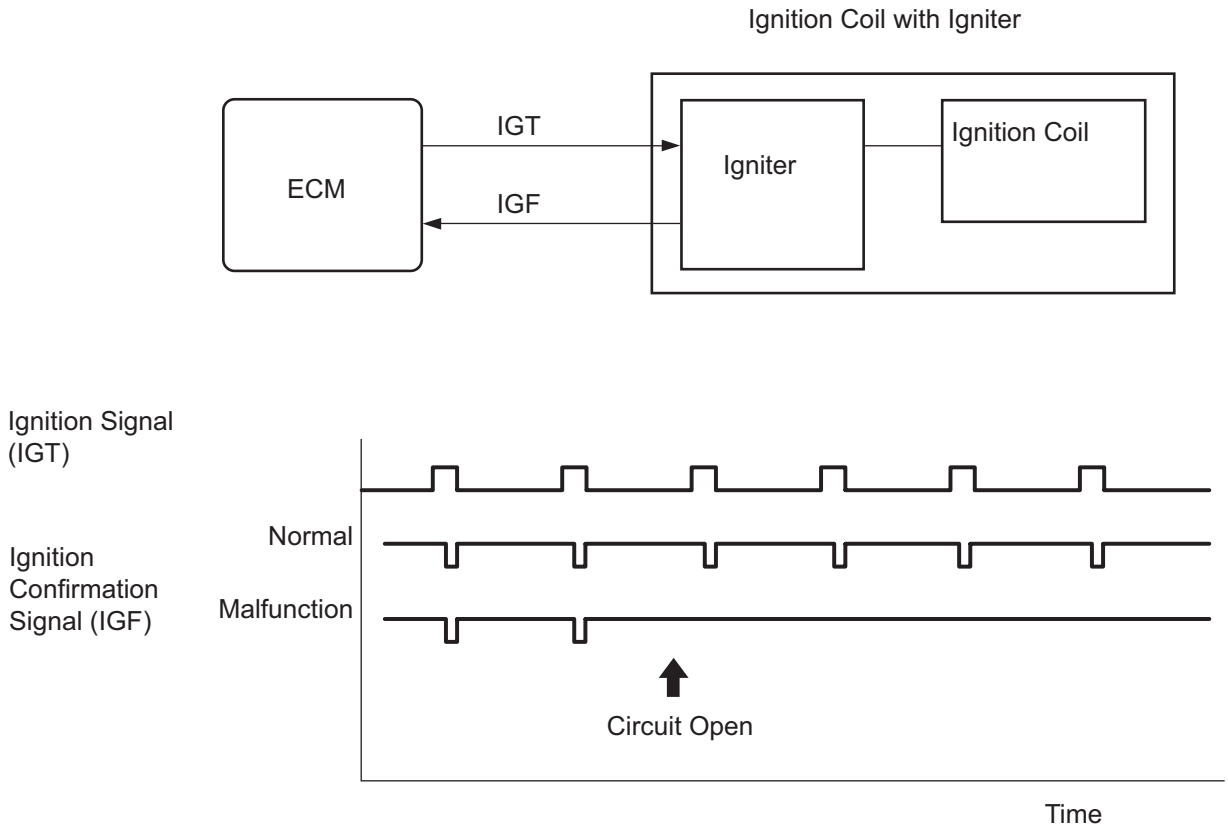
DTC No.	DTC Detection Conditions	Trouble Areas
P0351 P0352 P0353 P0354 P0355 P0356	No IGF signal to ECM while engine running (1 trip detection logic)	• Ignition system • Open or short in IGF1 or IGT circuit (1 to 6) between ignition coil with igniter and ECM • No. 1 to No. 6 ignition coils with igniters • ECM



Reference: Inspection using an oscilloscope
While cranking or idling, check the waveform between terminals IGT(1 to 6) and E1, and IGF1 and E1 of the ECM connector.

Items	Contents
Terminals	CH1: IGT1, IGT2, IGT3, IGT4, IGT5, IGT6 - E1 CH2: IGF1 - E1
Equipment Settings	2 V/Division, 20 ms/Division
Conditions	Cranking or idling

MONITOR DESCRIPTION



Y

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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 P0355: Igniter (Cylinder 5) malfunction P0356: Igniter (Cylinder 6) malfunction

Required Sensors/Components (Main)	Igniter (Cylinder 1 to 6)
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

Monitor runs whenever following DTCs not present	None
Either of following conditions 1 or 2 met	-
1. Following conditions (a) and (b) met:	-
(a) Engine RPM	500 rpm or less
(b) Battery voltage	6 V or more
2. Following conditions (a) and (b) met:	-
(a) Engine RPM	More than 500 rpm
(b) Battery voltage	10 V or more
(c) Number of sparks after CPU is reset	5 sparks or more

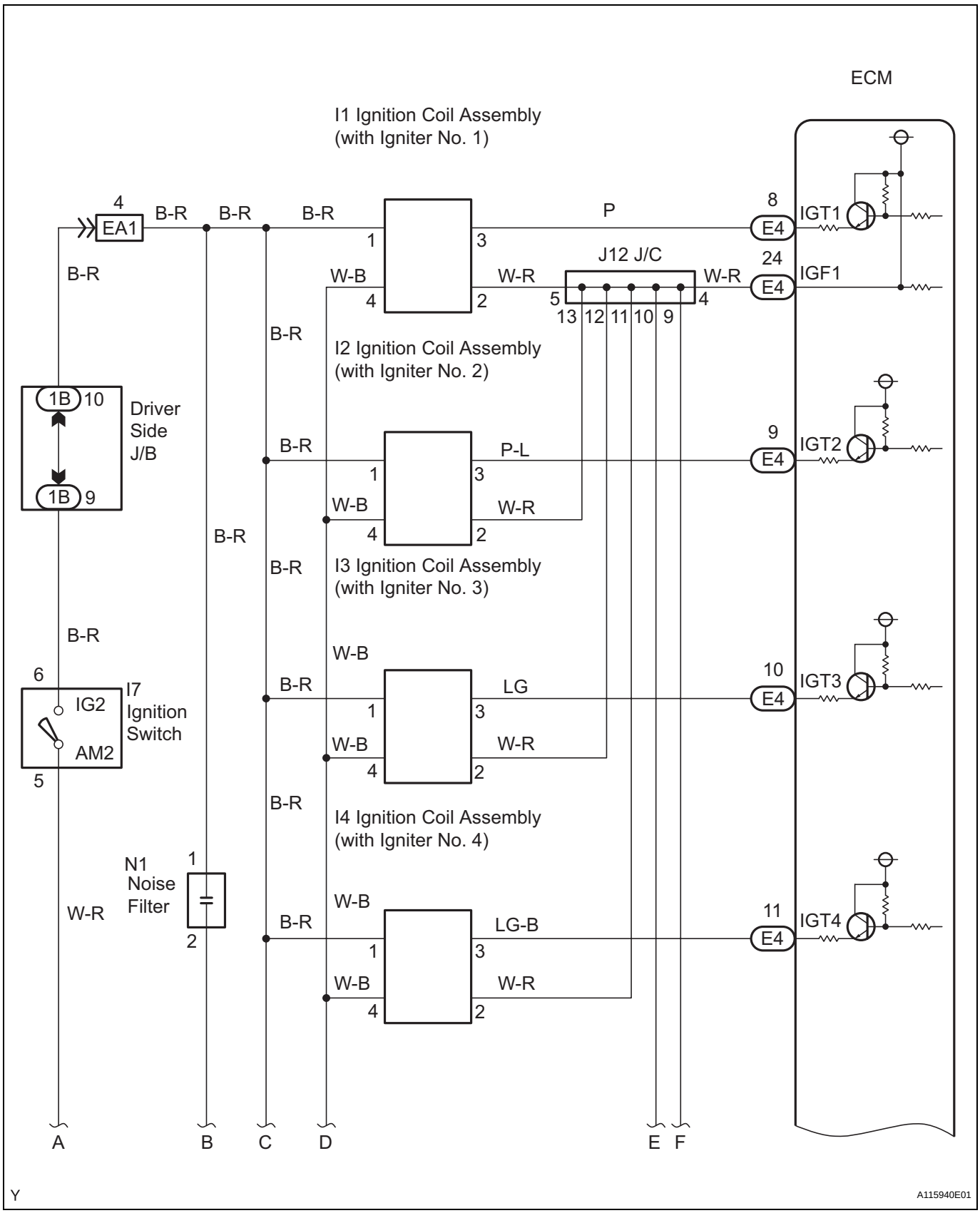
TYPICAL MALFUNCTION THRESHOLDS

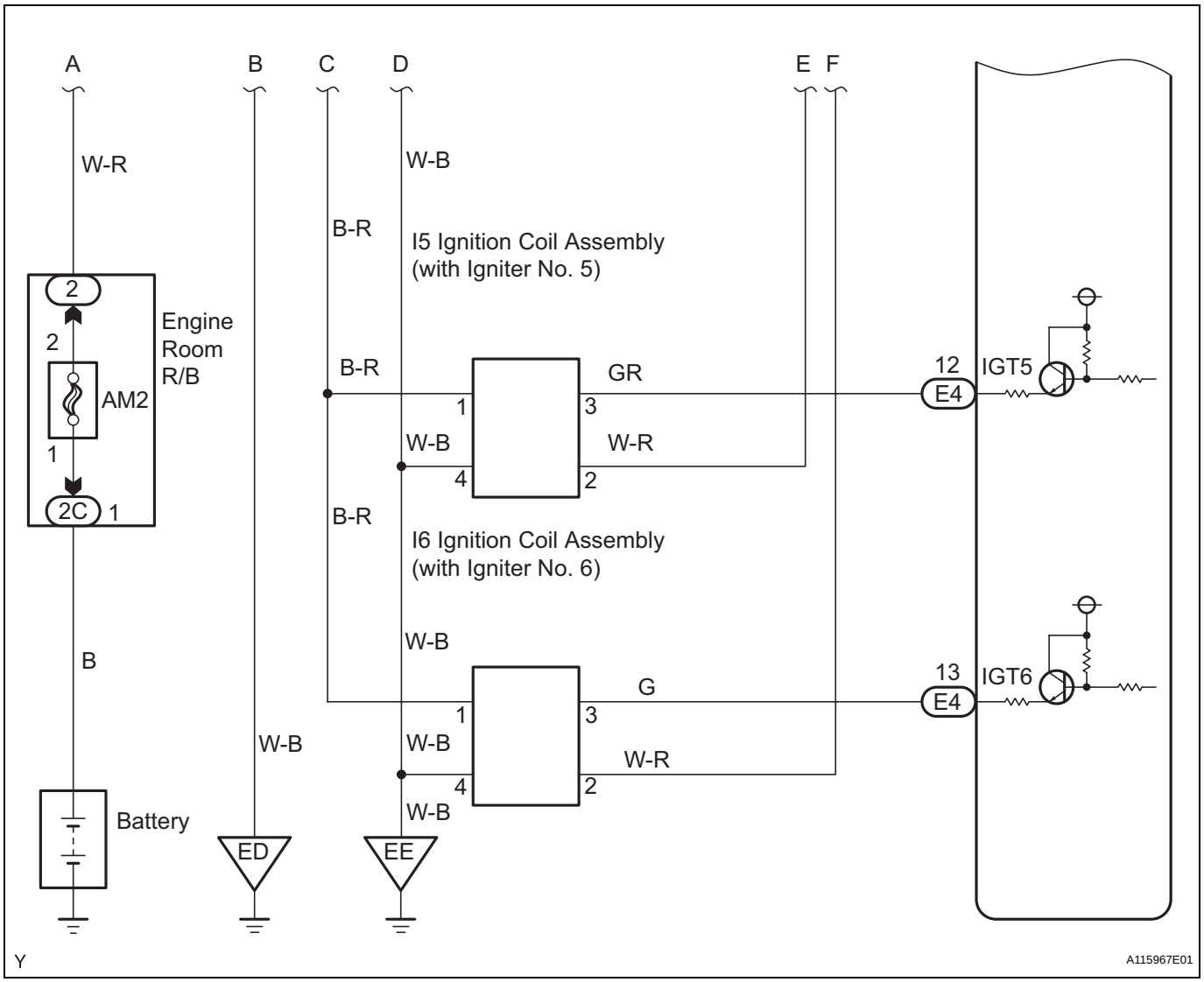
Ignition signal fail count	More than 2 times
Ignition signal fail count is on the right:	When IGF does not return despite sending IGT.

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM





ES

HINT:
Read freeze frame data using an intelligent tester. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

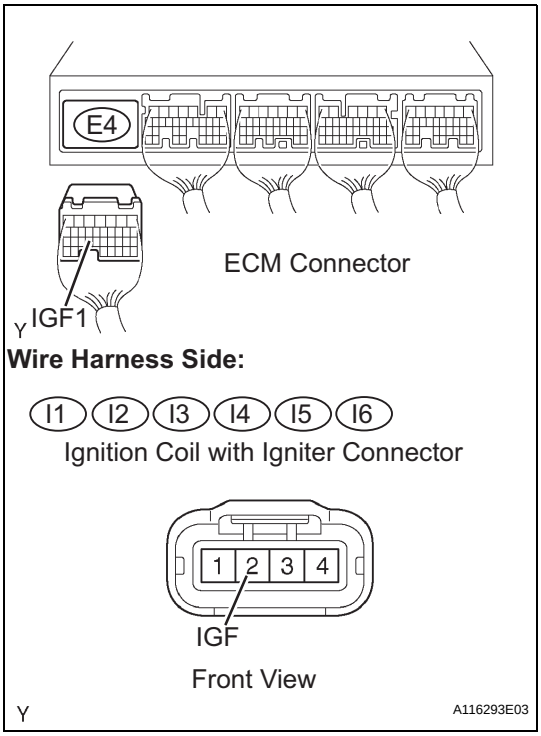
1	CHECK SPARK PLUG AND SPARK OF MISFIRING CYLINDER

(a) Check the spark plug and sparks of the misfiring cylinder (See page IG-3).

NG → Go to step 4

OK

2	CHECK HARNESS AND CONNECTOR (IGNITION COIL ASSEMBLY - ECM (IGF1 SIGNAL TERMINAL))



(a) Disconnect the I1, I2, I3, I4, I5 or I6 ignition coil with igniter connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance.

Standard Resistance (Check for open)

Tester Connections	Specified Conditions
IGF (I1-2) - IGF1 (E4-24)	Below 1 Ω
IGF (I2-2) - IGF1 (E4-24)	
IGF (I3-2) - IGF1 (E4-24)	
IGF (I4-2) - IGF1 (E4-24)	
IGF (I5-2) - IGF1 (E4-24)	
IGF (I6-2) - IGF1 (E4-24)	

Standard Resistance (Check for short)

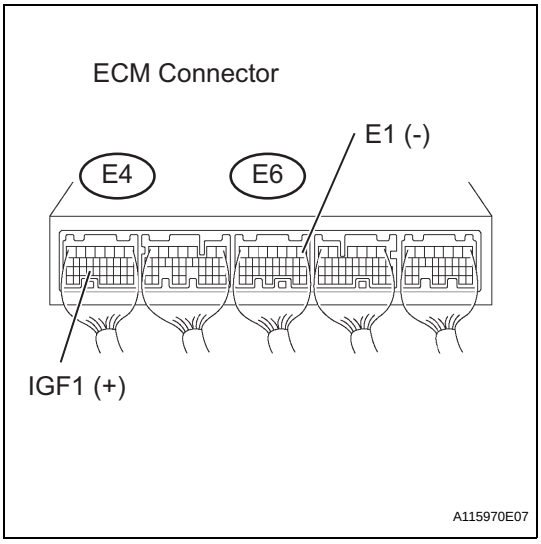
Tester Connections	Specified Conditions
IGF (I1-2) or IGF1 (E4-24) - Body ground	10 kΩ or higher
IGF (I2-2) or IGF1 (E4-24) - Body ground	
IGF (I3-2) or IGF1 (E4-24) - Body ground	
IGF (I4-2) or IGF1 (E4-24) - Body ground	
IGF (I5-2) or IGF1 (E4-24) - Body ground	
IGF (I6-2) or IGF1 (E4-24) - Body ground	

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

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT ECM (IGF1 VOLTAGE)



(a) Disconnect the ignition coil connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the E4 and E6 ECM connectors.

Standard Voltage

Tester Connection	Specified Condition
IGF1 (E4-24) - E1 (E6-1)	4.5 to 5.5 V

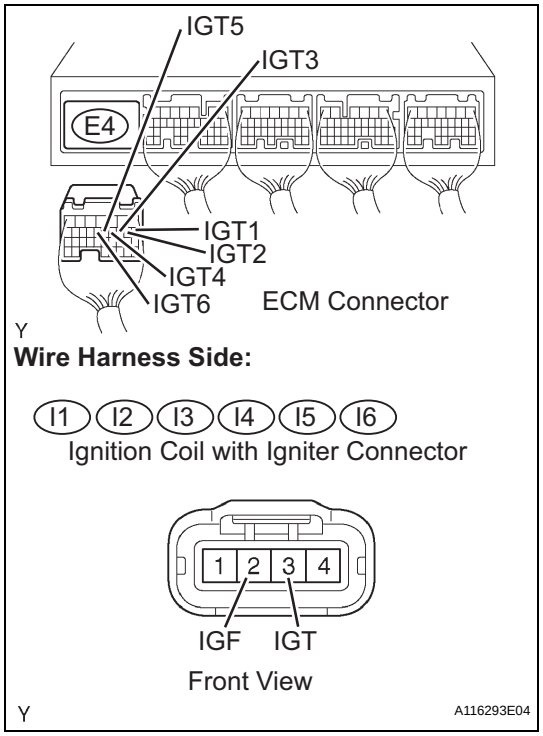
(d) Reconnect the ignition coil connector.

NG → **REPLACE ECM**

OK

REPLACE IGNITION COIL ASSEMBLY

4	CHECK HARNESS AND CONNECTOR (IGNITION COIL ASSEMBLY - ECM (IGT SIGNAL TERMINAL))



(a) Disconnect the I1, I2, I3, I4, I5 or I6 ignition coil with igniter connector.
(b) Disconnect the E4 ECM connector.
(c) Check the resistance.

Standard Resistance (Check for open)

Tester Connections	Specified Conditions
IGT (I1-3) - IGT1 (E4-8)	Below 1 Ω
IGT (I2-3) - IGT2 (E4-9)	
IGT (I3-3) - IGT3 (E4-10)	
IGT (I4-3) - IGT4 (E4-11)	
IGT (I5-3) - IGT5 (E4-12)	
IGT (I6-3) - IGT6 (E4-13)	

Standard Resistance (Check for short)

Tester Connections	Specified Conditions
IGT (I1-3) or IGT1 (E4-8) - Body ground	10 kΩ or higher
IGT (I2-3) or IGT2 (E4-9) - Body ground	
IGT (I3-3) or IGT3 (E4-10) - Body ground	
IGT (I4-3) or IGT4 (E4-11) - Body ground	
IGT (I5-3) or IGT5 (E4-12) - Body ground	
IGT (I6-3) or IGT6 (E4-13) - Body ground	

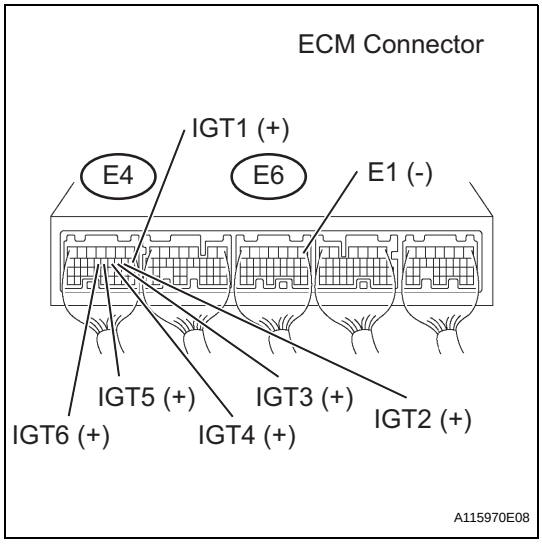
(d) Reconnect the ECM connector.
(e) Reconnect the ignition coil with igniter connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

ES

5	INSPECT ECM (IGT1, IGT2, IGT3, IGT4, IGT5, OR IGT6 VOLTAGE)



(a) Measure the voltage between the terminals of the E4 and E6 ECM connectors.

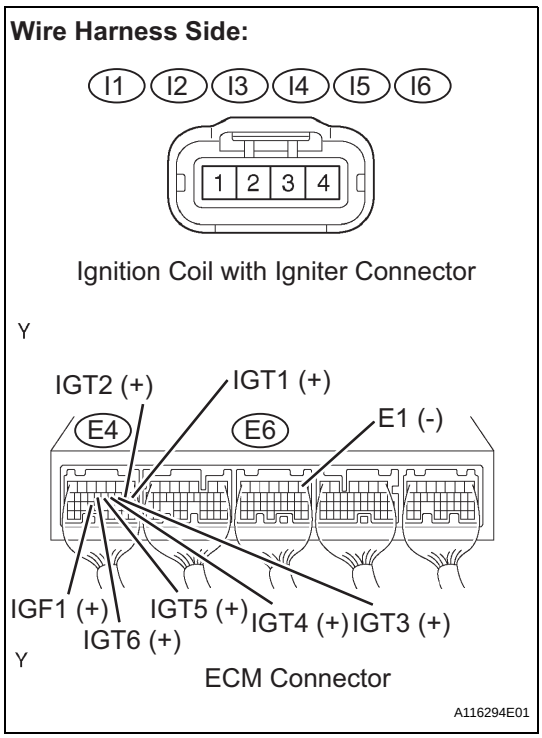
Standard Voltage

Tester Connections	Specified Conditions
IGT1 (E4-8) - E1 (E6-1)	0.1 to 4.5 V
IGT2 (E4-9) - E1 (E6-1)	
IGT3 (E4-10) - E1 (E6-1)	
IGT4 (E4-11) - E1 (E6-1)	
IGT5 (E4-12) - E1 (E6-1)	
IGT6 (E4-13) - E1 (E6-1)	

NG → **REPLACE ECM**

OK

6	INSPECT ECM (IGT1, IGT2, IGT3, IGT4, IGT5, OR IGT6 VOLTAGE)



(a) Disconnect the I1, I2, I3, I4, I5 or I6 ignition coil connector.

(b) Measure the voltage between the terminals of the E4 and E6 ECM connectors.

Standard Voltage

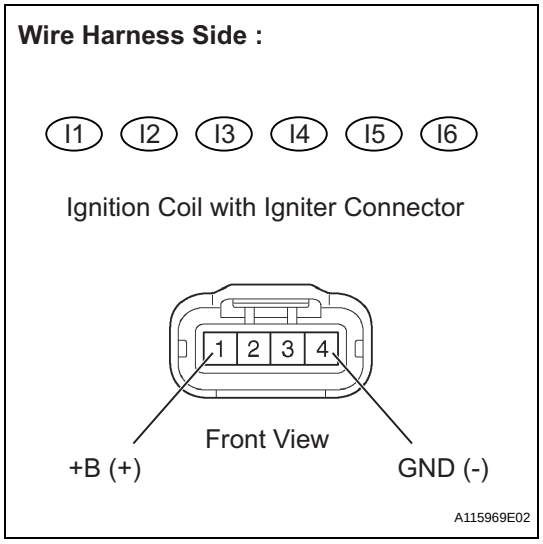
Tester Connections	Specified Conditions
IGT1 (E4-8) - E1 (E6-1)	4.5 V or more
IGT2 (E4-9) - E1 (E6-1)	
IGT3 (E4-10) - E1 (E6-1)	
IGT4 (E4-11) - E1 (E6-1)	
IGT5 (E4-12) - E1 (E6-1)	
IGT6 (E4-13) - E1 (E6-1)	

(c) Reconnect the ignition coil connector.

NG → **Go to step 8**

OK

7 INSPECT IGNITION COIL ASSEMBLY (POWER SOURCE)



(a) Disconnect the I1, I2, I3, I4, I5 or I6 ignition coil with igniter connector.

(b) Check the resistance.

Standard Resistance (Check for open)

Tester Connections	Specified Conditions
GND (I1-4) - Body ground	Below 1 Ω
GND (I2-4) - Body ground	
GND (I3-4) - Body ground	
GND (I4-4) - Body ground	
GND (I5-4) - Body ground	
GND (I6-4) - Body ground	

(c) Turn the ignition switch ON.

(d) Measure the voltage between the terminals of the wire harness side connector.

Standard Voltage

Tester Connections	Specified Conditions
+B (I1-1) - GND (I1-4)	9 to 14 V
+B (I2-1) - GND (I2-4)	
+B (I3-1) - GND (I3-4)	
+B (I4-1) - GND (I4-4)	
+B (I5-1) - GND (I5-4)	
+B (I6-1) - GND (I6-4)	

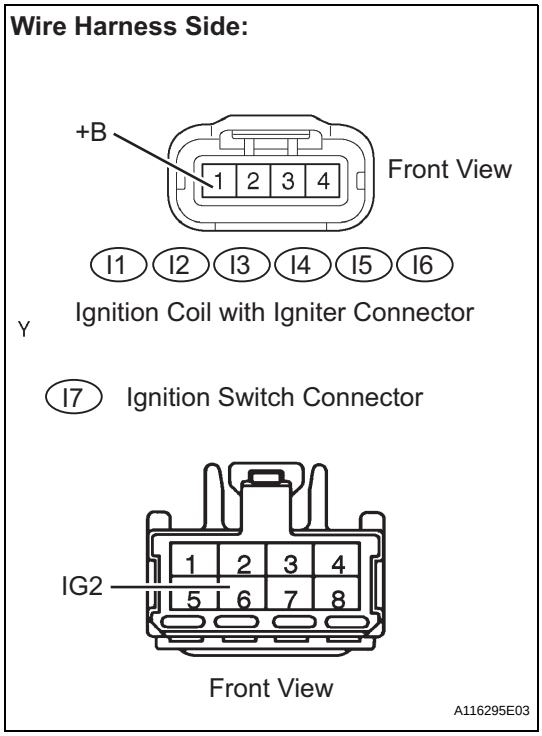
(e) Reconnect the ignition coil with igniter connector.

OK → **REPLACE IGNITION COIL ASSEMBLY**

NG

ES

8	CHECK HARNESS AND CONNECTOR (IGNITION COIL ASSEMBLY - IGNITION SWITCH)



(a) Disconnect the I1, I2, I3, I4, I5 or I6 ignition coil with igniter connector.
(b) Disconnect the I7 ignition switch connector.
(c) Check the resistance.

Standard Resistance (Check for open)

Tester Connections	Specified Conditions
+B (I1-1) - IG2 (I7-6)	Below 1 Ω
+B (I2-1) - IG2 (I7-6)	
+B (I3-1) - IG2 (I7-6)	
+B (I4-1) - IG2 (I7-6)	
+B (I5-1) - IG2 (I7-6)	
+B (I6-1) - IG2 (I7-6)	

Standard Resistance (Check for short)

Tester Connections	Specified Conditions
+B (I1-1) or IG2 (I7-6) - Body ground	10 kΩ or higher
+B (I2-1) or IG2 (I7-6) - Body ground	
+B (I3-1) or IG2 (I7-6) - Body ground	
+B (I4-1) or IG2 (I7-6) - Body ground	
+B (I5-1) or IG2 (I7-6) - Body ground	
+B (I6-1) or IG2 (I7-6) - Body ground	

(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