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

CIRCUIT DESCRIPTION

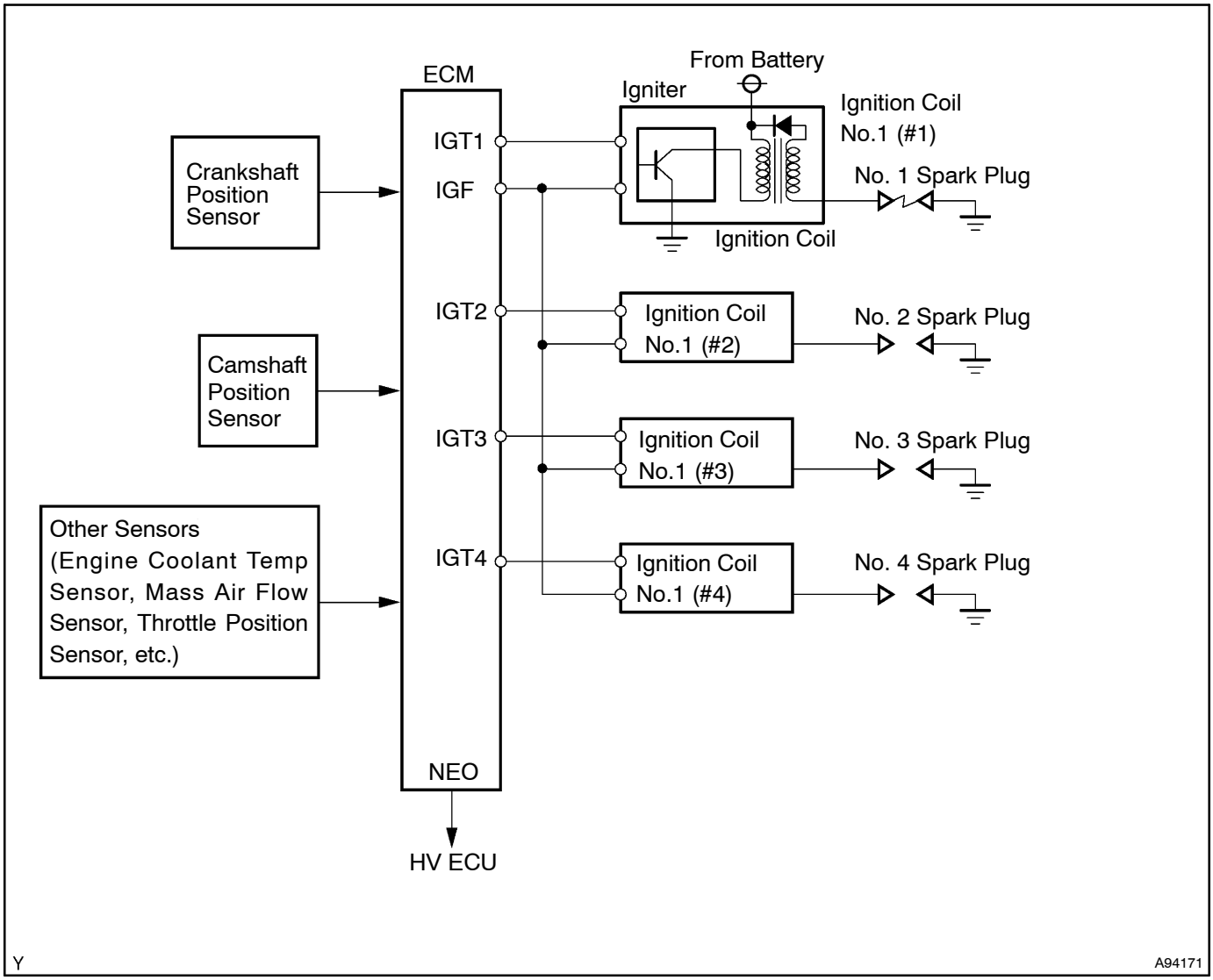
HINT:

- These DTCs indicate malfunction related to the primary circuit.
- If DTC P0351 is displayed, check the ignition coil No.1 (#1) circuit.
- If DTC P0352 is displayed, check the ignition coil No.1 (#2) circuit.
- If DTC P0353 is displayed, check the ignition coil No.1 (#3) circuit.
- If DTC P0354 is displayed, check the ignition coil No.1 (#4) circuit.

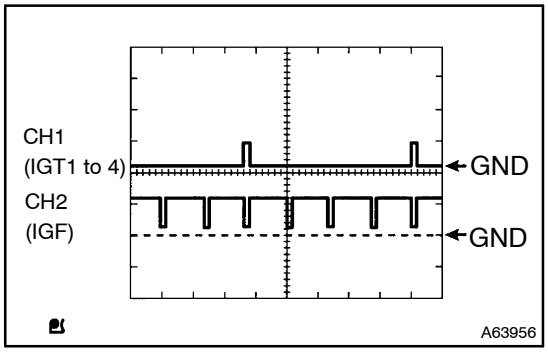
A Direct Ignition System (DIS) is used on this vehicle.

The DIS is a 1–cylinder ignition system which ignites one cylinder with one ignition coil. In the 1–cylinder ignition system, the one spark plug is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plug. The spark of the spark plug passes from the center electrode to the ground electrode.

The ECM determines the ignition timing and outputs the ignition (IGT) signals for each cylinder. Using the IGT signal, the ECM turns ON and OFF the power transistor inside the igniter and this switches ON and OFF the current to the primary coil. When the current flow to the primary coil is cut off, high–voltage is generated in the secondary coil and this voltage is applied to the spark plugs to spark inside the cylinders. As the ECM cuts the current to the primary coil, the igniter sends back the ignition confirmation (IGF) signal to the ECM.



DTC No.	DTC Detection Condition	Trouble Area
P0351 P0352 P0353 P0354	No IGF signal to ECM while engine is running	• Ignition system • Open or short in IGF or IGT circuit from ignition coil with igniter to ECM (ignition coil circuit 1 through 4) • Ignition coil No.1 (ignition coil circuit 1 through 4) • ECM



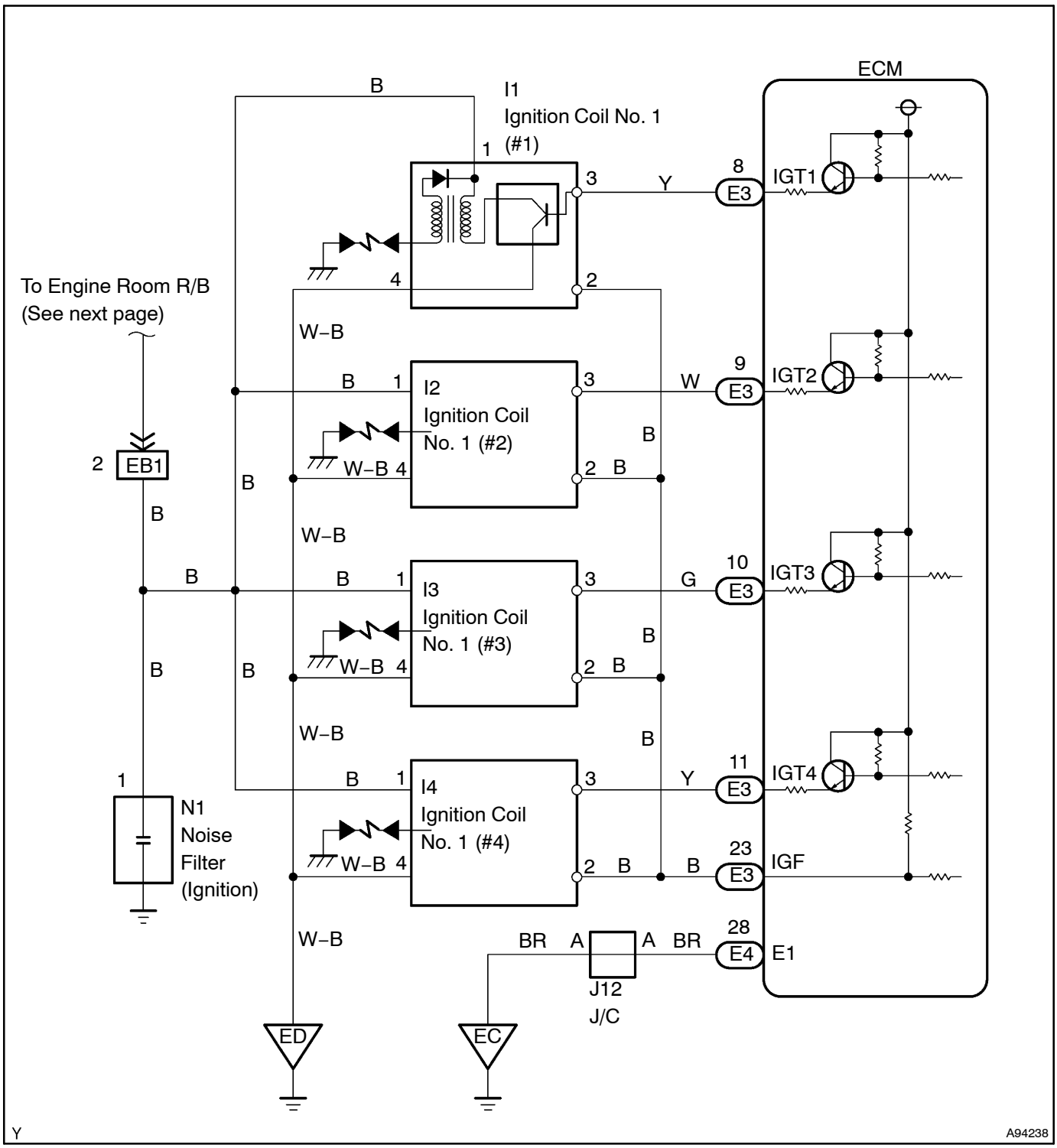
Reference: Inspection using an oscilloscope.

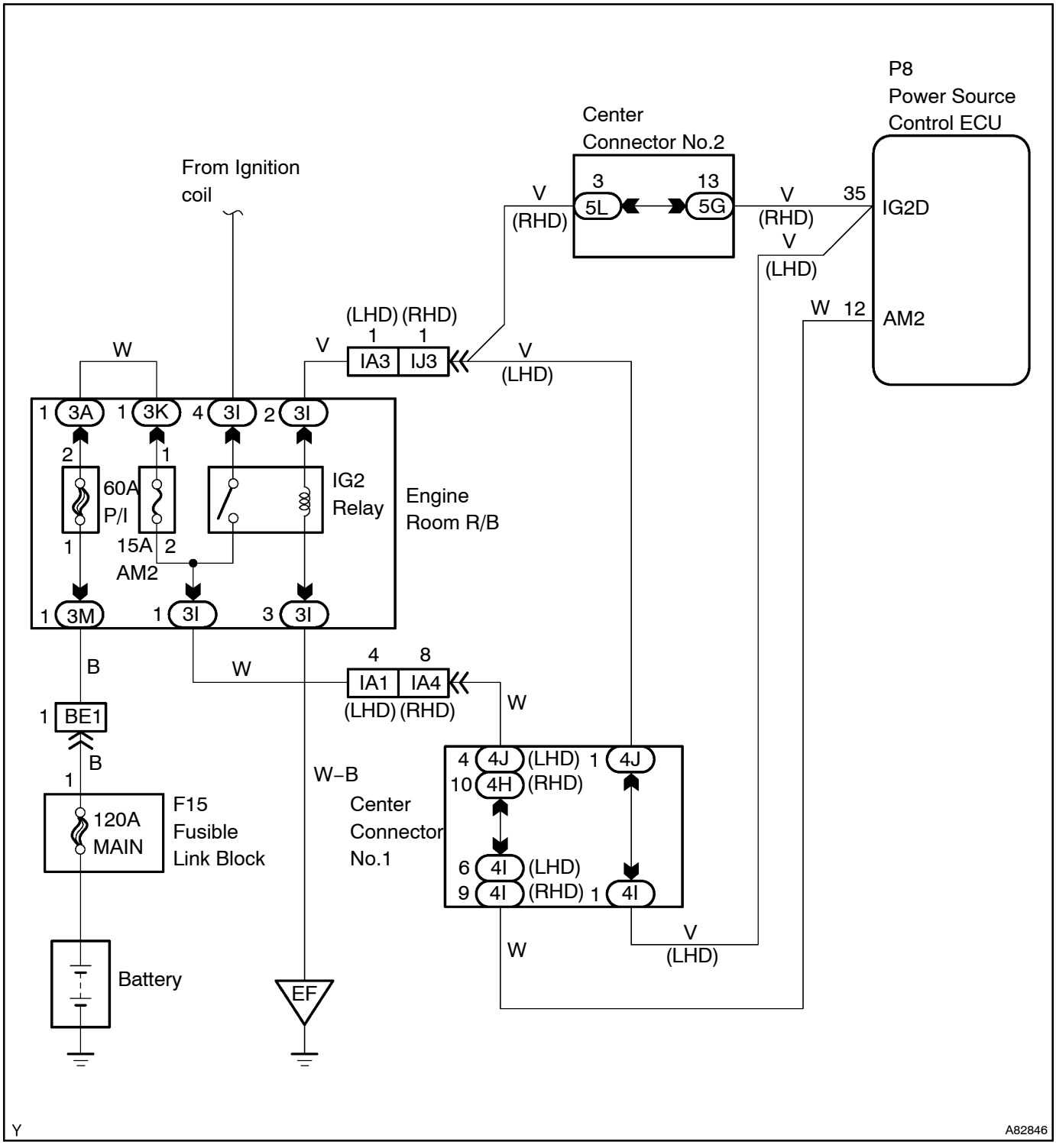
HINT:

The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: IGT1, IGT2, IGT3, IGT4 – E1 CH2: IGF – E1
Equipment Setting	2 V/Division, 20 ms/Division
Condition	While the engine is cranking or idling

WIRING DIAGRAM




P8
Power Source
Control ECU
Center
Connector No.2
From Ignition
coil
3
13
5L
5G
V
(RHD)
V
35
IG2D
V
(LHD)
W
12
AM2
(LHD) (RHD)
1
1
IA3
IJ3
V
(LHD)
W
1
3A
1
3K
4
3I
2
3I
2
1
60A
P/I
15A
AM2
2
1
IG2
Relay
Engine
Room R/B
1
3M
1
3I
3
3I
B
W
4
8
IA1
IA4
(LHD) (RHD)
W
1
BE1
B
1
120A
MAIN
F15
Fusible
Link Block
W–B
Center
Connector
No.1
4
4J
(LHD)
1
4J
10
4H
(RHD)
6
4I
(LHD)
9
4I
(RHD)
1
4I
W
V
(LHD)
Battery
EF
Y
A82846

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the intelligent tester II. Freeze frame data records the engine condition when malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, 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.

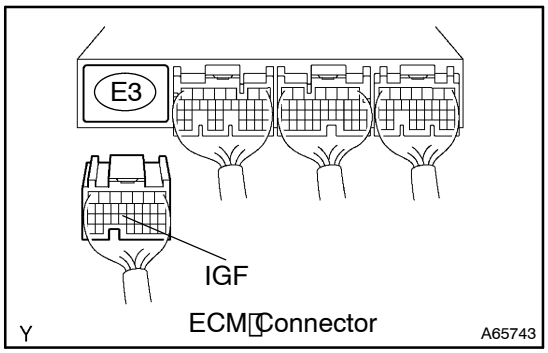
1	CHECK SPARK PLUG AND SPARK OF MISFIRING CYLINDER (See page 18–3)

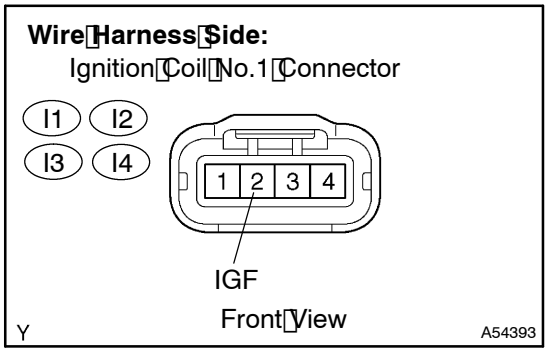
OK: Spark occurs.

NG → **Go to step 4**

OK

2	CHECK HARNESS AND CONNECTOR(IGNITION COIL NO.1 – ECM (IGF SIGNAL TERMINAL))





(a) Disconnect the I1, I2, I3 or I4 ignition coil No.1 connector.
(b) Disconnect the E3 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
IGF (I1–2) – IGF (E3–23)	Below 1 Ω
IGF (I2–2) – IGF (E3–23)	Below 1 Ω
IGF (I3–2) – IGF (E3–23)	Below 1 Ω
IGF (I4–2) – IGF (E3–23)	Below 1 Ω

Standard (Check for short):

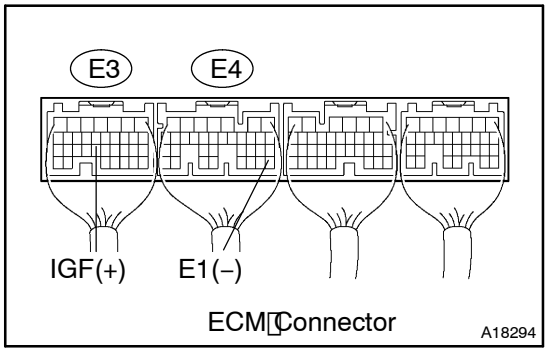
Tester Connection	Specified Condition
IGF (I1–2) or IGF (E3–23) – Body ground	10 kΩ or higher
IGF (I2–2) or IGF (E3–23) – Body ground	10 kΩ or higher
IGF (I3–2) or IGF (E3–23) – Body ground	10 kΩ or higher
IGF (I4–2) or IGF (E3–23) – Body ground	10 kΩ or higher

(d) Reconnect the ignition coil No.1 connector.
(e) Reconnect the ECM connector.

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

OK

3 INSPECT ECM(IGF VOLTAGE)



(a) Disconnect the I1, I2, I3 or I4 ignition coil No.1 connector.
(b) Turn the power switch ON (IG).
(c) Measure the voltage between the specified terminals of the E3 and E4 ECM connectors.

Standard:

Tester Connection	Specified Condition
IGF (E3–23) – E1 (E4–28)	4.5 to 5.5 V

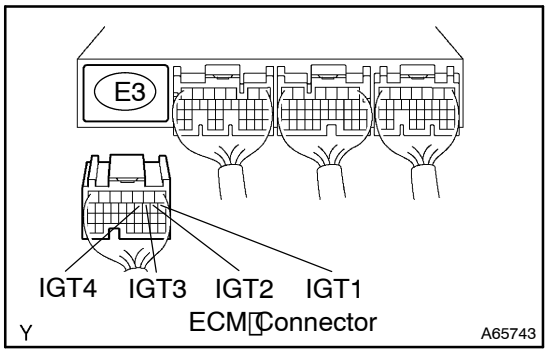
(d) Reconnect the ignition coil No.1 connector.

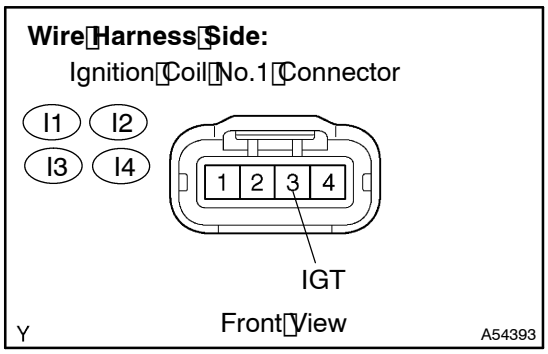
NG → **REPLACE ECM (See page 10–24)**

OK

REPLACE IGNITION COIL NO.1

4 CHECK HARNESS AND CONNECTOR(IGNITION COIL NO.1 – ECM (IGT SIGNAL TERMINAL))





(a) Disconnect the I1, I2, I3 or I4 ignition coil No.1 connector.
(b) Disconnect the E3 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
IGT (I1–3) – IGT1 (E3–8)	Below 1 Ω
IGT (I2–3) – IGT2 (E3–9)	Below 1 Ω
IGT (I3–3) – IGT3 (E3–10)	Below 1 Ω
IGT (I4–3) – IGT4 (E3–11)	Below 1 Ω

Standard (Check for short):

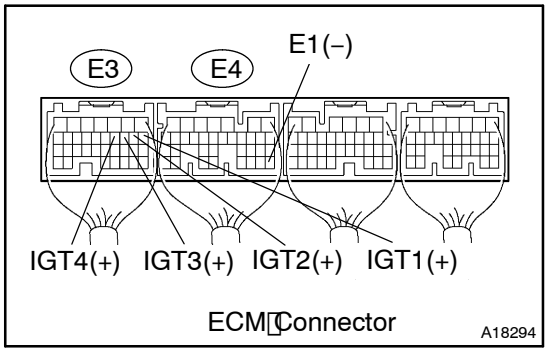
Tester Connection	Specified Condition
IGT (I1–3) or IGT1 (E3–8) – Body ground	10 kΩ or higher
IGT (I2–3) or IGT2 (E3–9) – Body ground	10 kΩ or higher
IGT (I3–3) or IGT3 (E3–10) – Body ground	10 kΩ or higher
IGT (I4–3) or IGT4 (E3–11) – Body ground	10 kΩ or higher

(d) Reconnect the ignition coil No.1 connector.
(e) Reconnect the ECM connector.

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

OK

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



(a) Measure the voltage between the applicable terminals of the E3 and E4 ECM connectors when the engine is cranked.

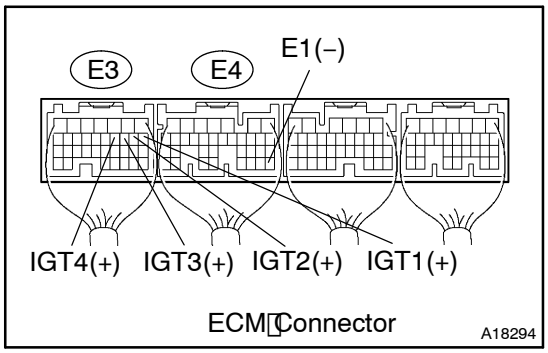
Standard:

Tester Connection	Specified Condition
IGT1 (E3–8) – E1 (E4–28)	Between 0.1 V and 4.5 V
IGT2 (E3–9) – E1 (E4–28)	Between 0.1 V and 4.5 V
IGT3 (E3–10) – E1 (E4–28)	Between 0.1 V and 4.5 V
IGT4 (E3–11) – E1 (E4–28)	Between 0.1 V and 4.5 V

NG → REPLACE ECM (See page 10–24)

OK

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



(a) Disconnect the #1, #2, #3 or #4 ignition coil No.1 connector.

(b) Measure the voltage between the applicable terminals of the E3 and E4 ECM connectors when the engine is cranked.

Standard:

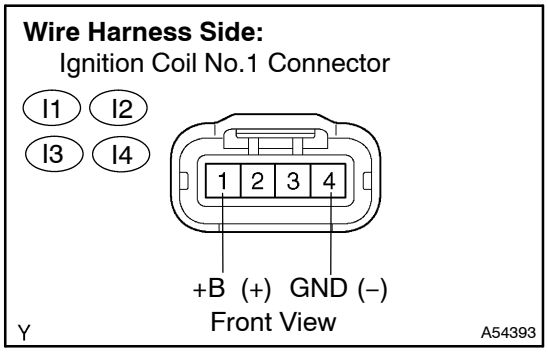
Tester Connection	Specified Condition
IGT1 (E3–8) – E1 (E4–28)	4.5 V or more
IGT2 (E3–9) – E1 (E4–28)	4.5 V or more
IGT3 (E3–10) – E1 (E4–28)	4.5 V or more
IGT4 (E3–11) – E1 (E4–28)	4.5 V or more

(c) Reconnect the ignition coil No.1 connector.

NG → REPLACE ECM (See page 10–24)

OK

7 INSPECT IGNITION COIL NO.1(POWER SOURCE)



(a) Disconnect the I1, I2, I3 or I4 ignition coil No.1 connector.
(b) Turn the power switch ON (IG).
(c) Measure the voltage between the terminal of the wire harness side connector and body ground.

Standard:

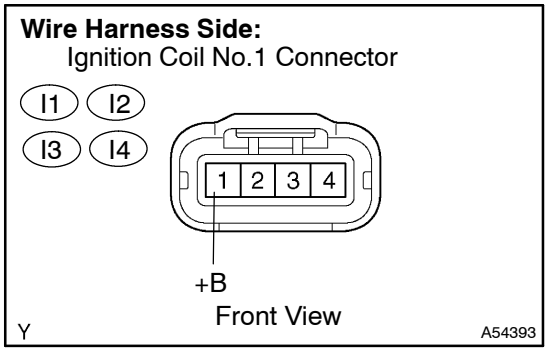
Tester Connection	Specified Condition
+B (I1–1) – GND (I1–4)	9 to 14 V
+B (I2–1) – GND (I2–4)	9 to 14 V
+B (I3–1) – GND (I3–4)	9 to 14 V
+B (I4–1) – GND (I4–4)	9 to 14 V

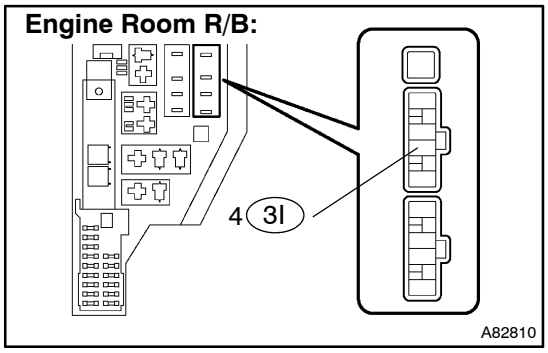
(d) Reconnect the ignition coil No.1 connector.

OK → **REPLACE IGNITION COIL NO.1**

NG

8 CHECK HARNESS AND CONNECTOR(IGNITION COIL NO.1 – IG2 RELAY)





(a) Disconnect the I1, I2, I3 or I4 ignition coil No.1 connector.
(b) Remove the integration relay from engine room R/B.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
+B (I1–1) – IG2 relay (3I–4)	Below 1 Ω
+B (I2–1) – IG2 relay (3I–4)	Below 1 Ω
+B (I3–1) – IG2 relay (3I–4)	Below 1 Ω
+B (I4–1) – IG2 relay (3I–4)	Below 1 Ω
GND (I1–4) – Body ground	Below 1 Ω
GND (I2–4) – Body ground	Below 1 Ω
GND (I3–4) – Body ground	Below 1 Ω
GND (I4–4) – Body ground	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
+B (I1–1) or IG2 relay (3I–4) – Body ground	10 kΩ or higher
+B (I2–1) or IG2 relay (3I–4) – Body ground	10 kΩ or higher
+B (I3–1) or IG2 relay (3I–4) – Body ground	10 kΩ or higher
+B (I4–1) or IG2 relay (3I–4) – Body ground	10 kΩ or higher

(d) Reconnect the ignition coil No.1 connector.
(e) Reinstall the integration relay.

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

OK

REPLACE IGNITION COIL NO.1