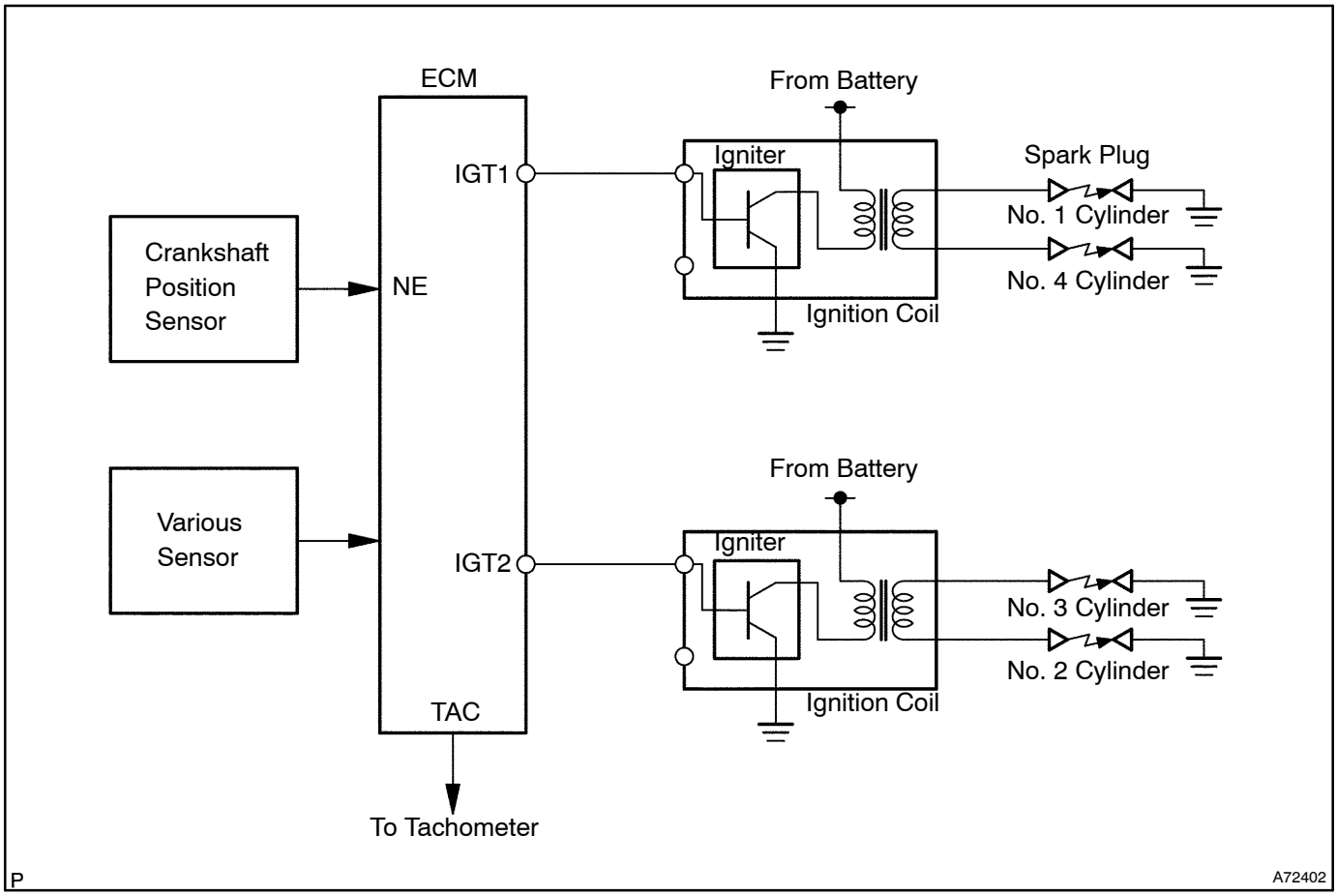
IGNITION SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

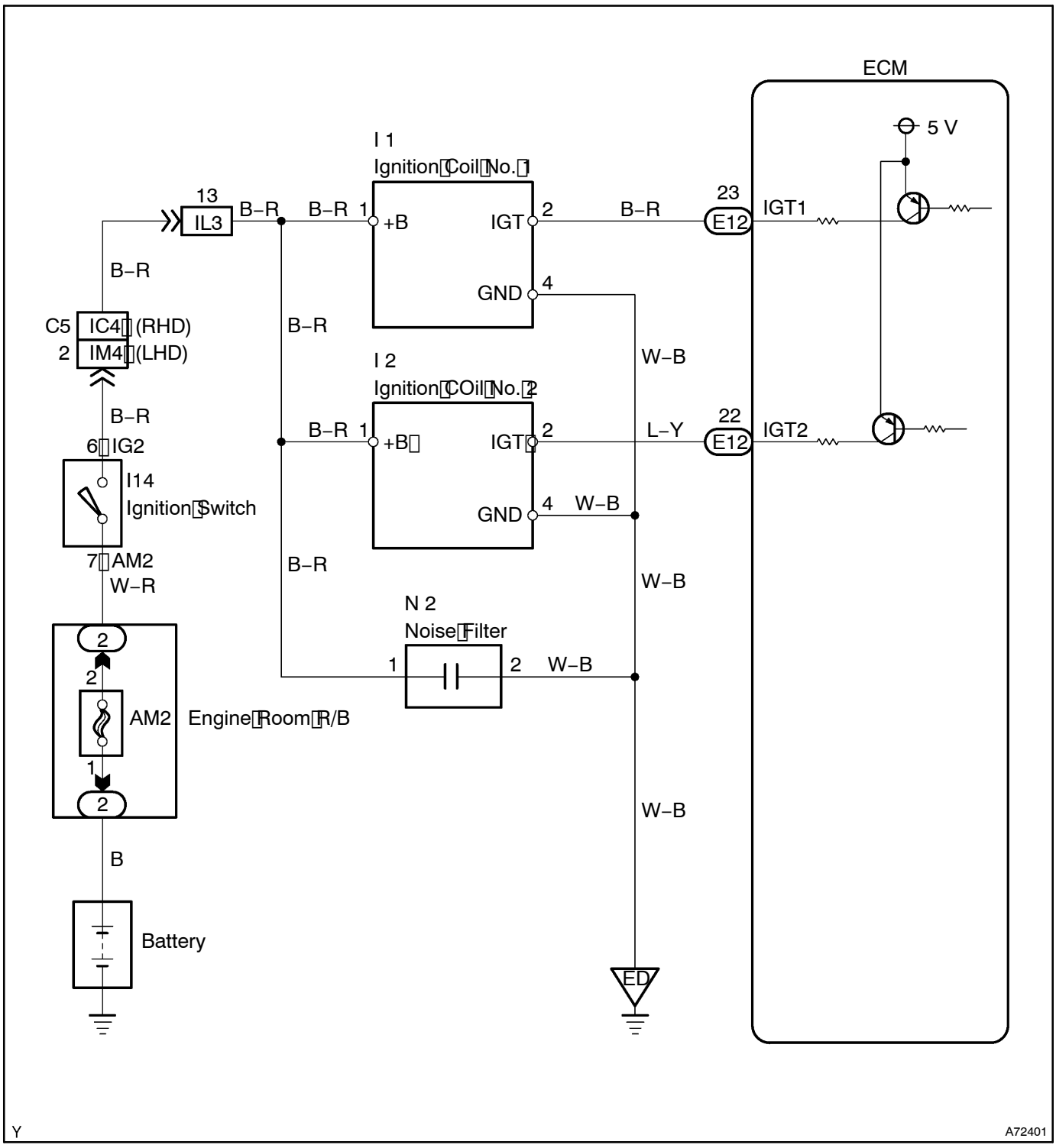
A direct ignition system (DIS) has been adopted, The DIS improves the ignition timing accuracy, reduces high–voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor.
The DIS is a 2–cylinder simultaneous ignition system which ignites 2 cylinders simultaneously with 1 ignition coil. In the 2–cylinder simultaneous ignition system, each of the 2 spark plugs is connected to the end of the secondary winding, High voltage generated in the secondary winding is applied directly to the 2 spark plugs. The sparks of the 2 spark plugs pass simultaneously from the center electrode to the ground electrode.
The ECM determines ignition timing and outputs the ignition signals (IGT) for each cylinder. Based on IGT signal, the power transistors in the igniter cuts off the current to the primary coil in the ignition coil is supplied simultaneously to the 2 spark plugs via the high–tension cords that are connected to the both ends of the secondary coil.



HINT:

- Ignition coil No. 1 is for cylinder No. 1 and No. 4.
- Ignition coil No. 2 is for cylinder No. 2 and No. 3.

WIRING DIAGRAM



INSPECTION PROCEDURE

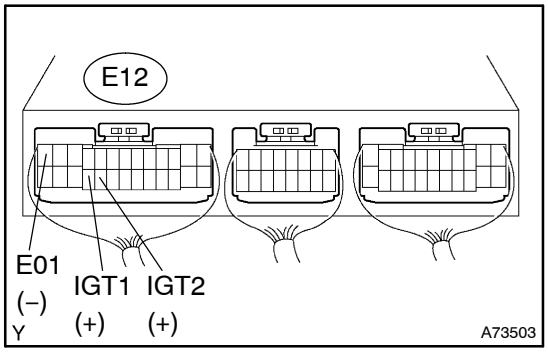
1	CHECK SPARK PLUG AND SPARK OF MISFIRING CYLINDER (See page 18–1)

OK: PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05–15)

NG

LAND CRUISER PRADO REPAIR MANUAL (RM990E)

2 CHECK ECM (IGT1 AND IGT2 VOLTAGE)



(a) Measure the voltage between the terminals of the E12 ECM connector when the engine is cranked.

Voltage:

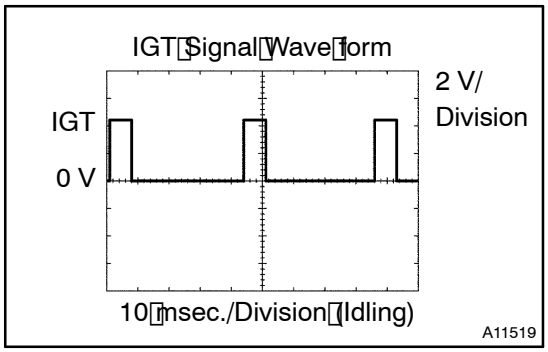
Symbols (Terminal No.)	Specified condition
IGT1 (E12–23) ↔ E01 (E12 –13)	More than 0.1 V and less than 4.5 V
IGT2 (E12–22) ↔ E01 (E12 –13)	

(b) Reference (using an oscilloscope).

(1) During cranking or idling, check the waveform between the terminals of the E12 ECM connector.

Standard:

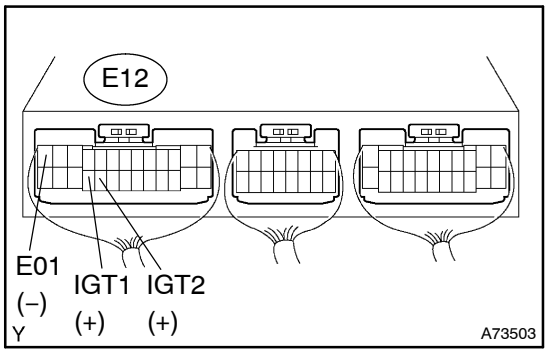
Symbols (Terminal No.)	Specified condition
IGT1 (E12–23) ↔ E01 (E12–13)	Correct waveform is as shown
IGT2 (E12–22) ↔ E01 (E12–13)	



NG → **CHECK AND REPLACE ECM**
(See page 01–36)

OK

3 CHECK ECM (IGT1 AND IGT2 VOLTAGE)



(a) Disconnect the #1 ignition coil No. 1 and #2 ignition coil No. 2 connectors.

(b) Measure the voltage between the terminals of the E12 ECM connector when the engine is cranked.

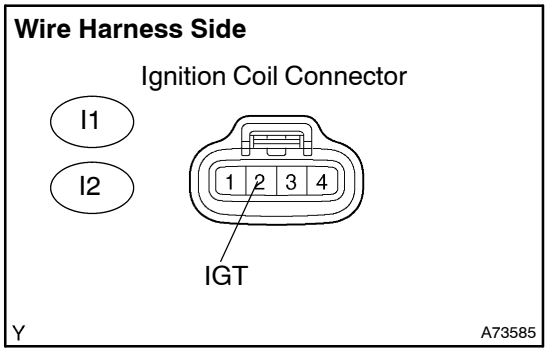
Voltage:

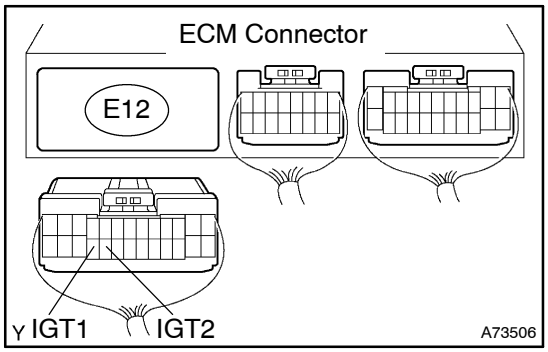
Symbols (Terminal No.)	Specified condition
IGT1 (E12–23) ↔ E01 (E12–13)	More than 0.1 V and less than 5 V
IGT2 (E12–22) ↔ E01 (E12–13)	

NG → **CHECK AND REPLACE ECM**
(See page 01–36)

OK

4 CHECK HARNESS AND CONNECTOR (IGNITION COIL ⇔ ECM)





(a) Disconnect the I1 and I2 ignition coil connectors.
(b) Disconnect the E12 ECM connector.
(c) Check the continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
IGT (I1–2) ⇔ IGT1 (E12–23)	Continuity
IGT (I2–2) ⇔ IGT2 (E12–22)	

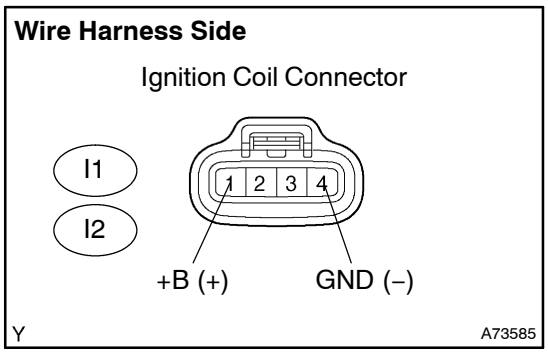
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
IGT (I1–2) or IGT1 (E12–23) ⇔ Other terminals and body ground	No continuity
IGT (I2–2) or IGT2 (E12–22) ⇔ Other terminals and body ground	

NG → **CHECK AND REPLACE HARNESS OR CONNECTOR**

OK

5 CHECK HARNESS AND CONNECTOR (IGNITION COIL POWER SOURCE)



(a) Disconnect the I1 and I2 ignition coil connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals.

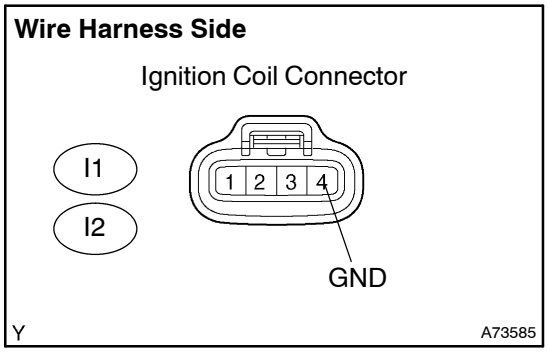
Voltage:

Symbols (Terminal No.)	Specified condition
+B (I1–1) ⇔ GND (I1–4)	9 – 14 V
+B (I1–1) ⇔ GND (I2–4)	

NG → **Go to step 7**

OK

6 CHECK HARNESS AND CONNECTOR (SENSOR GROUND)



(a) Disconnect the I1 and I2 ignition coil connector.
(b) Check the continuity between the terminals and body ground.

Standard (Check for open):

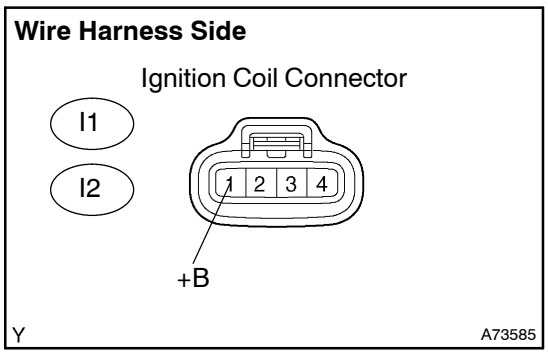
Symbols (Terminal No.)	Specified condition
GND (I1–4) ⇔ Body ground	Continuity
GND (I2–4) ⇔ Body ground	

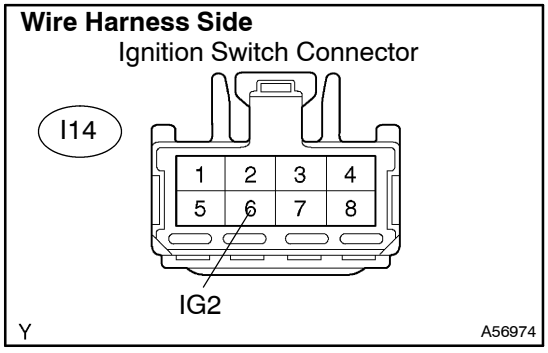
NG → **CHECK AND REPLACE HARNESS OR CONNECTOR**

OK

REPLACE IGNITION COIL

7 CHECK HARNESS AND CONNECTOR (IGNITION COIL ⇔ IGNITION SWITCH)





(a) Disconnect the I1 and I2 ignition coil connectors.
(b) Disconnect the I14 ignition switch connector.
(c) Check the continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
+B (I1–1) ⇔ IG2 (I14–6)	Continuity
+B (I2–1) ⇔ IG2 (I14–6)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
+B (I1–1) or IG2 (I14–6) ⇔ Other terminals and body ground	No continuity
+B (I2–1) or IG2 (I14–6) ⇔ Other terminals and body ground	

NG → **CHECK OR REPAIR HARNESS OR CONNECTOR (IGNITION SWITCH ⇔ BATTERY)**

OK

REPLACE IGNITION COIL