DTC	P0325	KNOCK SENSOR 1 CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC	P0327	KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

DTC	P0328	KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

DTC	P0330	KNOCK SENSOR 2 CIRCUIT (BANK 2)

DTC	P0332	KNOCK SENSOR 2 CIRCUIT LOW INPUT (BANK 2)

DTC	P0333	KNOCK SENSOR 2 CIRCUIT HIGH INPUT (BANK 2)

CIRCUIT DESCRIPTION

A flat type knock sensor (non–resonant type) can detect vibrations in a wide band of frequency (about 6 kHz to 15 kHz) and has the following features:

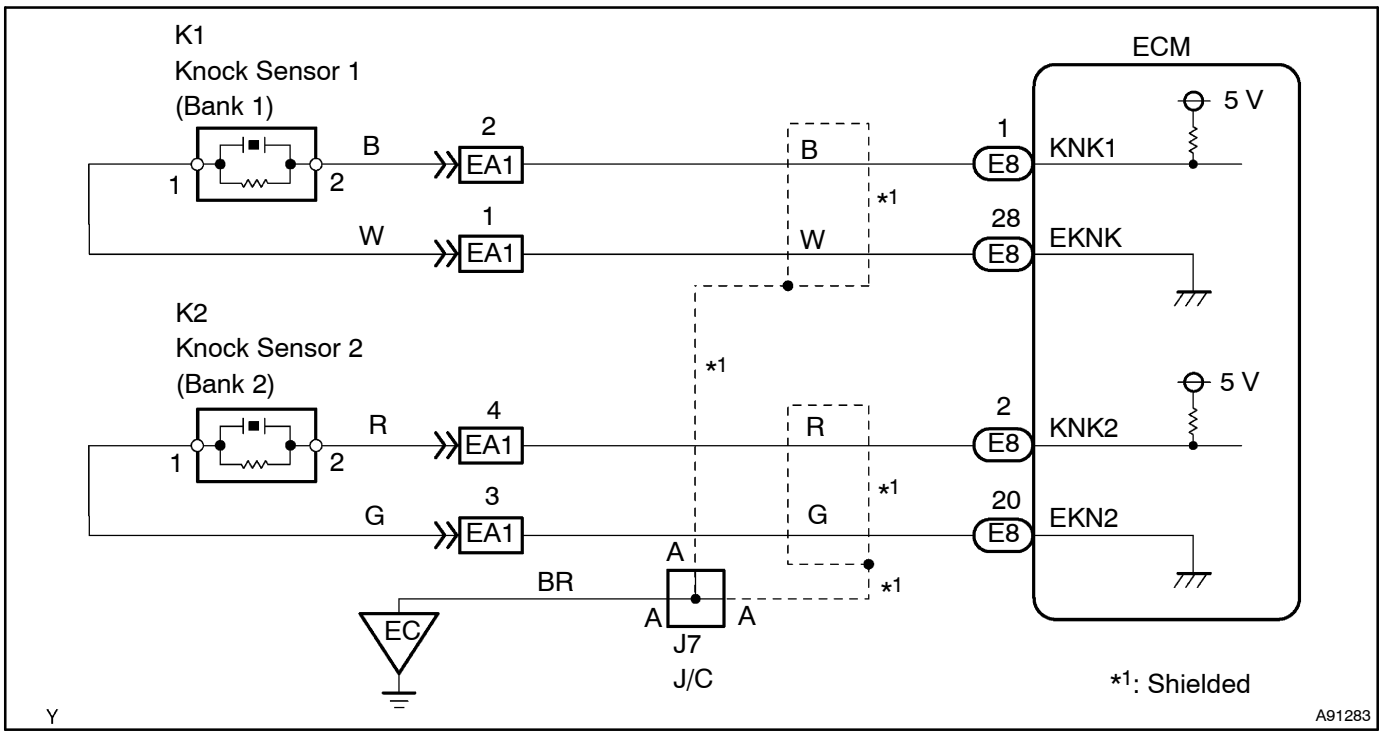
- Knock sensors are fitted on the cylinder block to detect the engine knocking.
- The sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, the ignition timing is retarded to suppress it.

DTC No.	DTC Detection Condition	Trouble Area
P0325 P0330	Knock sensor signal level remains at low for more than 10 seconds	• Knock sensor 1 or 2 • Knock sensor 1 or 2 (loose) • ECM
P0327 P0332	Output voltage of the knock sensor 1 or 2 is 0.5 V or less	• Short in knock sensor 1 or 2 circuit • Knock sensor 1 or 2 • ECM
P0328 P0333	Output voltage of the knock sensor 1 or 2 is 4.5 V or more	• Open in knock sensor 1 or 2 circuit • Knock sensor 1 or 2 • ECM

HINT:

If the ECM detects the DTC P0325, it enters the fail–safe mode in which the corrective retarded angle value is set to the maximum value.

WIRING DIAGRAM

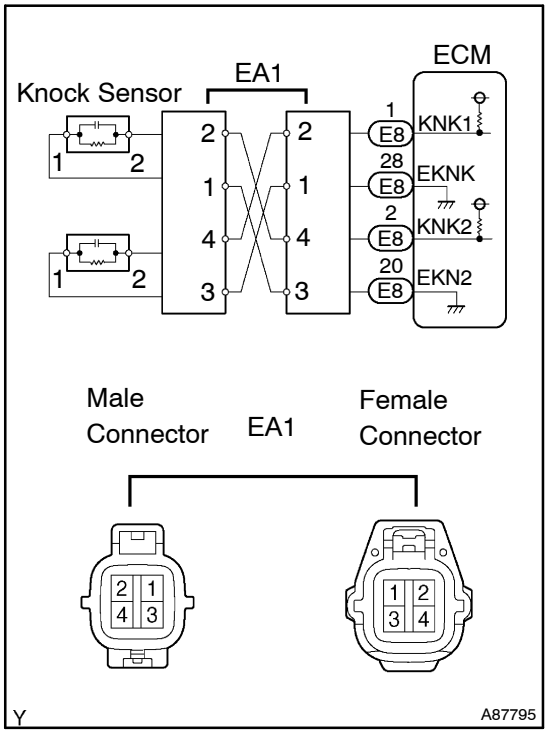


INSPECTION PROCEDURE

HINT:

- DTC P0325, P0327 and P0328 are for the bank 1 knock sensor circuit.
- DTC P0330, P0332 and P0333 are for the bank 2 knock sensor circuit.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a 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 READ OUTPUT DTC (CHECK KNOCK SENSOR CIRCUIT)



(a) Disconnect the EA1 connector.
(b) Using lead wires, connect the EA1 connectors as follows.

Male connector – Female connector
Terminal 2 – Terminal 4
Terminal 1 – Terminal 3
Terminal 4 – Terminal 2
Terminal 3 – Terminal 1

(c) Warm up the engine.
(d) Run the engine at 3,000 rpm for 10 seconds or more.
(e) Check the DTC.

Result :

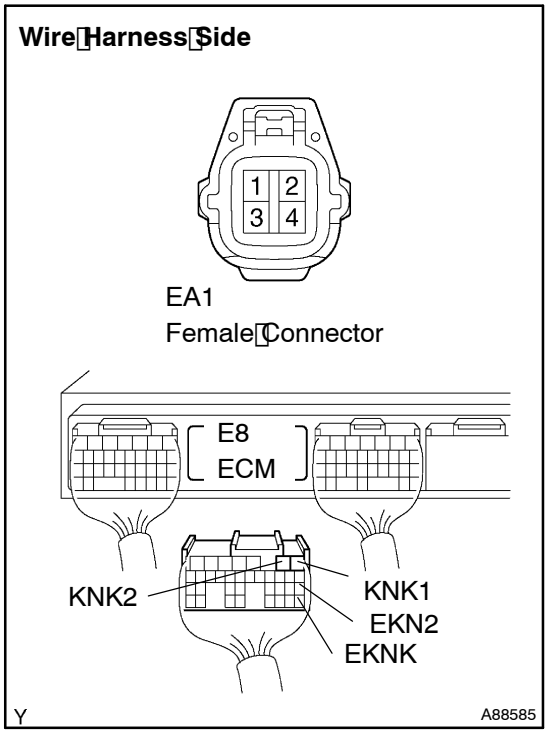
Display	Proceed to
DTC same as when vehicle brought in P0325, P0327, P0328 → P0325, P0327, P0328 or P0330, P0332, P0333 → P0330, P0332, P0333	A
DTC different from when vehicle brought in P0325 → P0330 or P0330 → P0325	B
DTC different from when vehicle brought in P0327, P0328 → P0332, P0333 or P0332, P0333 → P0327, P0328	C

B → **Go to step 4**

C → **Go to step 5**

A

2 CHECK HARNESS AND CONNECTOR (EA1 CONNECTOR – ECM)



(a) Disconnect the EA1 connector.
(b) Disconnect the E8 ECM connector.
(c) Check the resistance of the wire harness side connector.

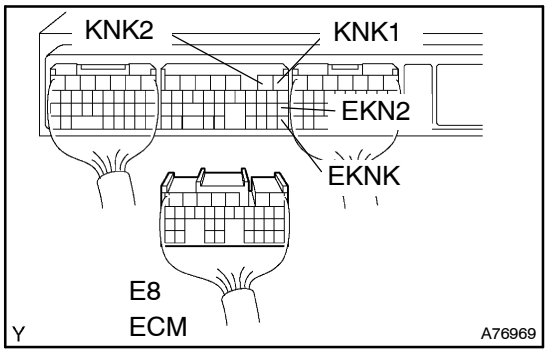
Standard:

Tester Connection	Specified Condition
2 of EA1 female connector – E8–1 (KNK1) 1 of EA1 female connector – E8–28 (EKNK) 4 of EA1 female connector 4 – E8–2 (KNK2) 3 of EA1 female connector – E8–20 (EKN2)	Below 1 Ω
2 of EA1 female connector or E8–1 (KNK1) – Body ground 1 of EA1 female connector or E8–28 (EKNK) – Body ground 4 of EA1 female connector or E8–2 (KNK2) – Body ground 3 of EA1 female connector or E8–20 (EKN2) – Body ground	10 kΩ or higher

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

OK

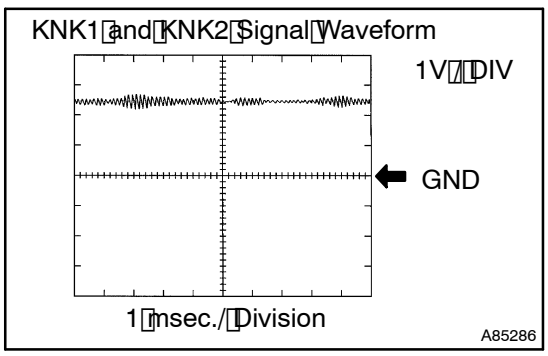
3 INSPECT ECM



(a) Disconnect the E8 ECM connector.
(b) Turn the ignition switch ON.
(c) Check the voltage of ECM terminals.

Voltage:

Tester Connection	Specified Condition
E8–1 (KNK1) – E8–28 (EKNK) E8–2 (KNK2) – E8–20 (EKN2)	4.5 to 5.5 V



HINT:
Reference: Inspection using the oscilloscope.
After warming up, run the engine at 4,000 rpm, check the waveform between terminal KNK1 and EKNK of the ECM connector.

Standard:

Tester Connection	Specified Condition
E8–1 (KNK1) – E8–28 (EKNK) E8–2 (KNK2) – E8–20 (EKN2)	Correct waveform is as shown

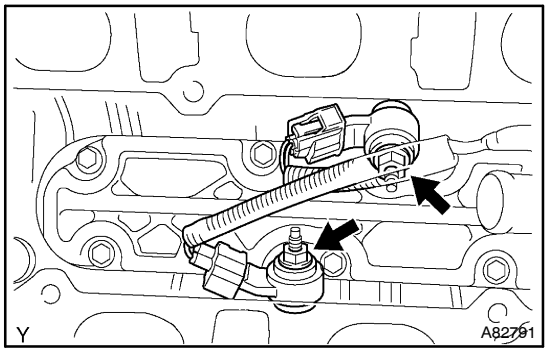
NG → **REPLACE ECM (See page 10–13)**

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05–8)

NOTICE:
Fault may be intermittent. Check harness and connectors carefully and retest.

4 CHECK KNOCK SENSOR



(a) Check the knock sensor installation.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

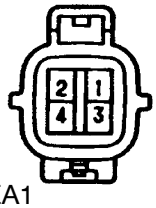
NG → TIGHTEN SENSOR

OK

REPLACE KNOCK SENSOR (See page 10–9)

5 INSPECT KNOCK SENSOR

Wire Harness Side



EA1
Male Connector
A73938

(a) Disconnect the EA1 connector.
(b) Check the resistance of the terminals of the EA1 male connector.
Standard:

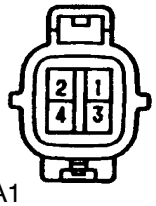
Tester Connection	Specified Condition
2 – 1 of EA1 male connector 4 – 3 of EA1 male connector	120 to 280 kΩ

OK → CHECK FOR INTERMITTENT PROBLEMS (See page 05–8)

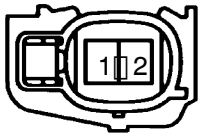
NG

6	CHECK HARNESS AND CONNECTOR (EA1 CONNECTOR – KNOCK SENSOR)

Wire Harness Side



EA1
Male Connector



K1 (Bank 1)
K2 (Bank 2)
Knock Sensor

Y
A73938
A610.31

A85847

HINT:

- If DTC P0327 has changed to P0328, or if DTC P0332 has changed to P0333, check the knock sensor circuit on the bank 1 side.
- If DTC P0332 has changed to P0327, or if DTC P0333 has changed to P0338, check the knock sensor circuit on the bank 2 side.

(a) Disconnect the EA1 connector.
(b) Disconnect the K1 or K2 knock sensor connector.
(c) Check the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
2 of EA1 male connector – K1–2 1 of EA1 male connector – K1–1 4 of EA1 male connector – K2–2 3 of EA1 male connector – K2–1	Below 1 Ω
2 of EA1 male connector or K1–2 – Body ground 1 of EA1 male connector or K1–1 – Body ground 4 of EA1 male connector or K2–2 – Body ground 3 of EA1 male connector or K2–1 – Body ground	10 kΩ or higher

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

OK

REPLACE KNOCK SENSOR (See page 10–9)