

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)

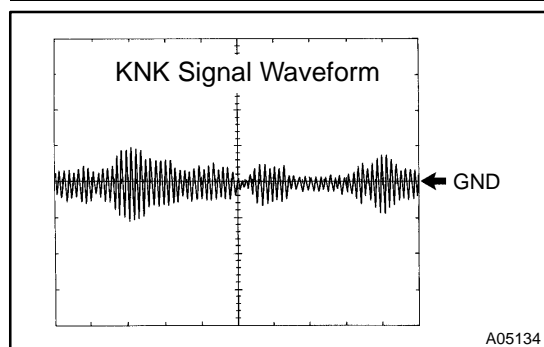
*: Only for 3MZ-FE

CIRCUIT DESCRIPTION

1MZ-FE:

Knock sensors are fitted on the right bank and left bank of the cylinder block to detect engine knocking. The sensor contains a piezoelectric element that becomes deformed by the cylinder block when the cylinder block vibrates as a result of engine knocking. The piezoelectric element generates voltage as a result of the cylinder block contact. If engine knocking occurs, the ignition timing is retarded to suppress it.

DTC No.	DTC Detection Condition	Trouble Area
P0325	Output voltage of knock sensor 1 decreases beyond threshold. (Threshold varies according to engine speed.)	<ul style="list-style-type: none"> • Knock sensor 1 • Knock sensor 1 (loose) • ECM
P0330	Output voltage of knock sensor 2 decreases beyond threshold. (Threshold varies according to engine speed.)	<ul style="list-style-type: none"> • Knock sensor 2 • Knock sensor 2 (loose) • ECM



Reference: Inspection using an oscilloscope.

The correct waveform is as shown in the illustration.

Item	Contents
Terminal	KNK1 or KNK2 – E1
Equipment Set	0.5 V/ DIV, 1 msec./ DIV
Condition	After warming up engine, keep engine speed at 4,000 rpm.

3MZ-FE:

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 engine knocking.
- The sensor contains a piezoelectric element that becomes deformed by the cylinder block when the cylinder block vibrates as a result of engine knocking. The piezoelectric element generates voltage as a result of the cylinder block contact. 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	<ul style="list-style-type: none"> • Knock sensor 1 or 2 • Knock sensor 1 or 2 (loose) • ECM
P0327 P0332	Output voltage of knock sensor 1 or 2 is 0.5 V or less	<ul style="list-style-type: none"> • Short in knock sensor 1 or 2 circuit • Knock sensor 1 or 2 • ECM
P0328 P0333	Output voltage of knock sensor 1 or 2 is 4.5 V or more	<ul style="list-style-type: none"> • Open in knock sensor 1 or 2 circuit • Knock sensor 1 or 2 • ECM

MONITOR DESCRIPTION (1MZ-FE, 3MZ-FE)

The knock sensor located on the cylinder block detects spark knock. When a spark knock occurs, the sensor picks up vibrations in a specific frequency range. When the ECM detects the voltage in this frequency range, it retards the ignition timing to suppress the spark knock.

The ECM also senses background engine noise with the knock sensor and uses this noise to check for faults in the sensor. If the knock sensor signal level remains low for more than 10 seconds the output voltage is out of the normal range, the ECM interprets this as a fault in the knock sensor and sets a DTC.

MONITOR STRATEGY (1MZ-FE, 3MZ-FE)

Related DTCs	P0325, P0330: Knock Sensor Rationality (only for 1MZ-FE) P0327, P0332: Knock Sensor Range Check (Low Voltage) (only for 3MZ-FE) P0328, P0333: Knock Sensor Range Check (High Voltage) (only for 3MZ-FE)
Required sensors / components (Main)	Knock Sensor
Required sensors / components (Related)	MAF meter, Crankshaft position sensor, ECT sensor
Frequency of operation	Continuous
Duration	10 seconds
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS (1MZ-FE, 3MZ-FE)

1MZ-FE:

Knock Sensor Rationality:

The monitor will run whenever these DTCs are not present	See page 05-507
Battery voltage	10 V or more
Idle	OFF
Time after engine start	5 seconds or more
ECT	60°C (140°F) or more
Spark cut	OFF
Intake air amount per revolution	0.5 g / rev
Engine RPM	2,000 to 5,600 rpm

3MZ-FE:

Knock Sensor Range Check:

The monitor will run whenever these DTCs are not present	See page 05-507
Battery voltage	10.5 V or more
Time after engine start	5 seconds or more
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

1MZ-FE:

Cumulative time for knock sensor "Fail mode"	10 seconds or more
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3MZ-FE:

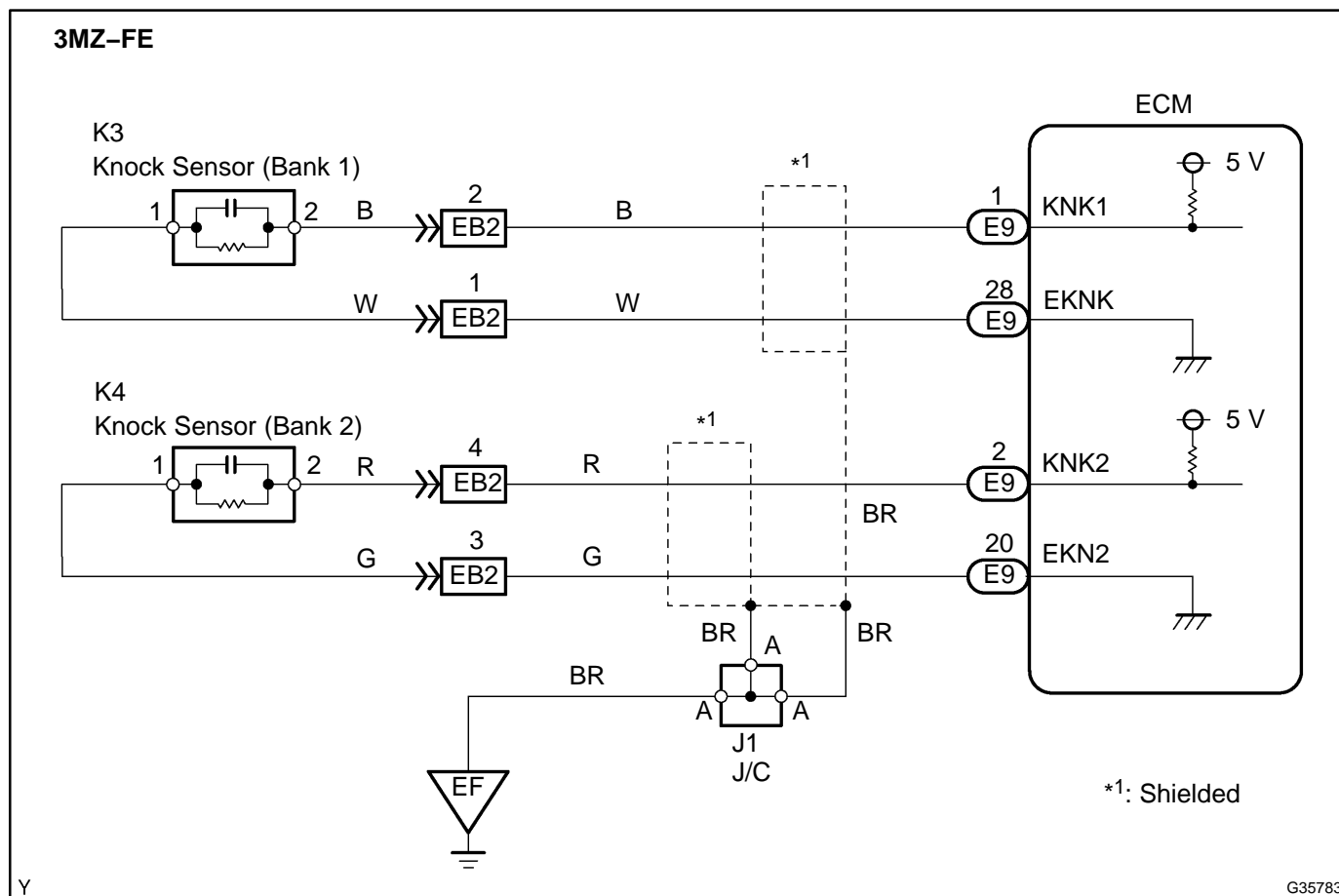
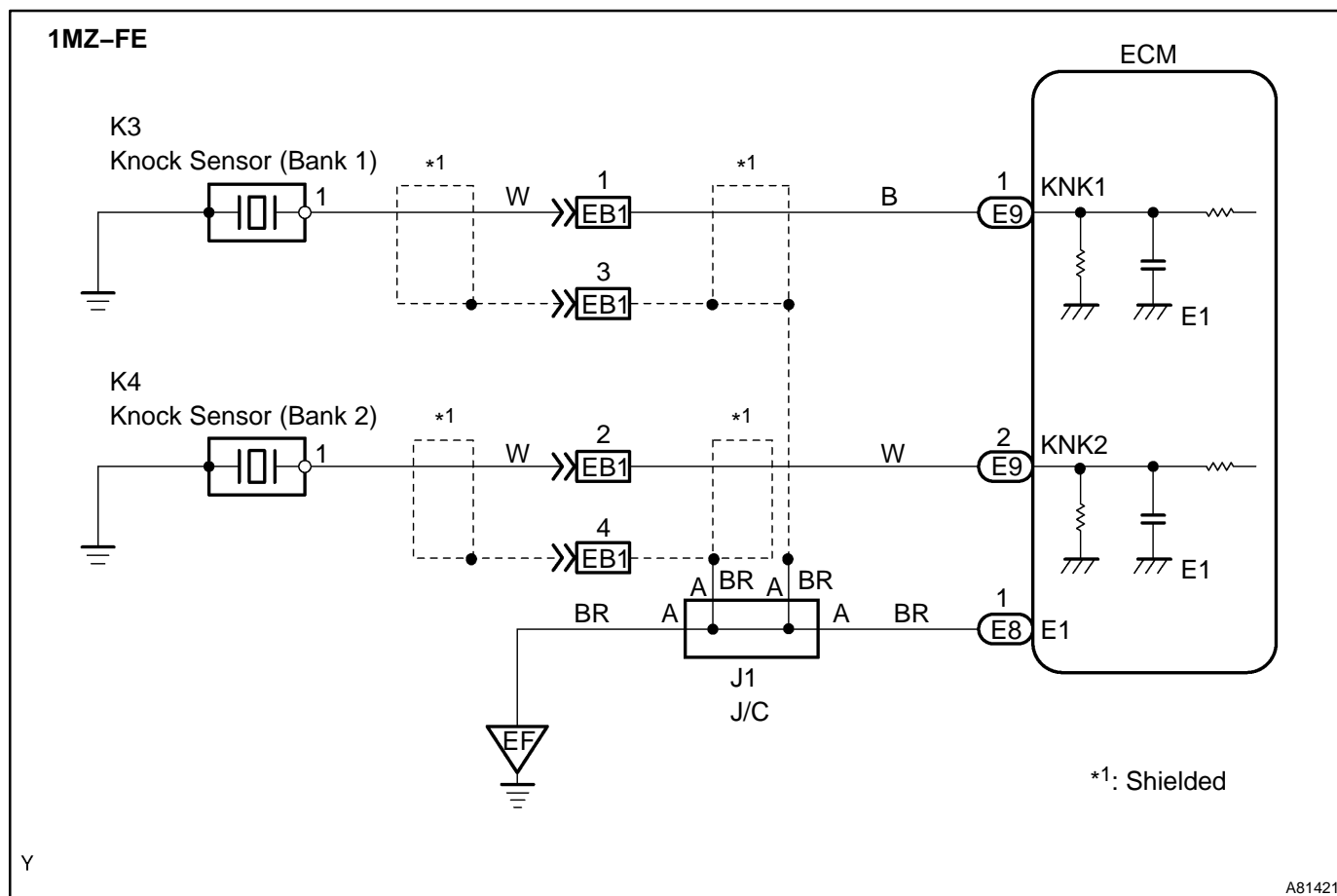
Knock Sensor Range Check (Low voltage):

Knock sensor Voltage	Less than 0.5 V
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Knock Sensor Range Check (High voltage):

Knock sensor voltage	More than 4.5 V
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WIRING DIAGRAM



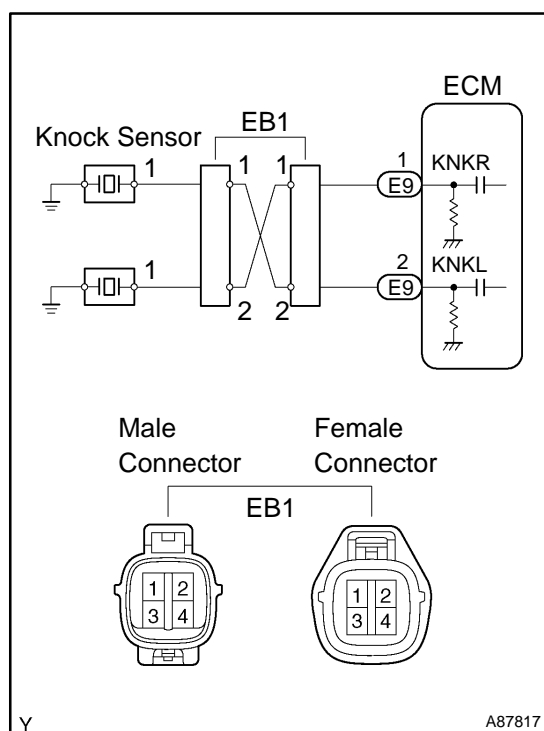
INSPECTION PROCEDURE

1MZ-FE:

HINT:

- DTC P0325 is for the bank 1 knock sensor circuit.
- DTC P0330 is for the bank 2 knock sensor circuit.
- Read freeze frame data using the hand-held tester or the OBD II scan tool. 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



- Disconnect the EB1 connector.
- Using lead wires, connect the EB1 connector terminals as follows.

Male connector – Female connector
Terminal 1 – Terminal 2
Terminal 2 – Terminal 1

- Warm up the engine.
- Run the engine to 3,000 rpm for 10 seconds or more.
- Check the DTCs.

Result :

Display	Proceed to
DTC same as when vehicle brought in P0325 → P0325 or P0330 → P0330	A
DTC different from when vehicle brought in P0325 → P0330 or P0330 → P0325	B

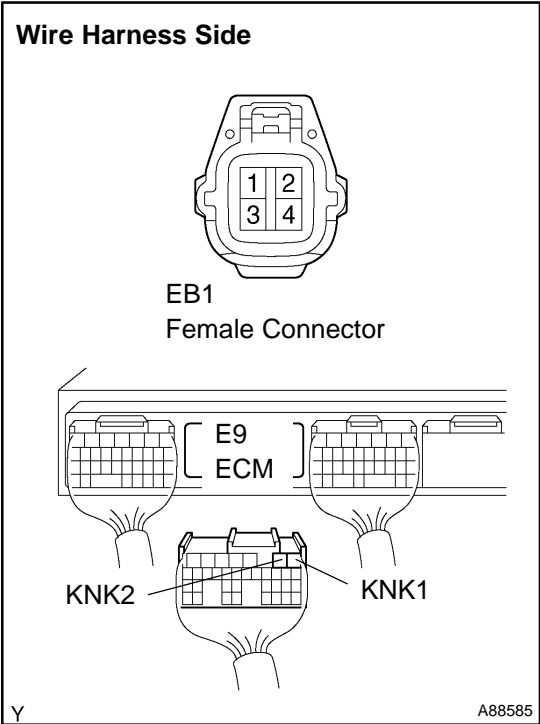
B

Go to step 3

A

2

CHECK WIRE HARNESS



- (a) Disconnect the EB1 connector.
- (b) Disconnect the E9 ECM connector.
- (c) Check the resistance of the wire harness side connectors.
- Standard:

Tester Connection	Specified condition
EB1 female connector 1 – E9-1 (KNK1) EB1 female connector 2 – E9-2 (KNK2)	Below 1 Ω
EB1 female connector 1 or E9-1 (KNK1) – Body ground EB1 female connector 2 or E9-2 (KNK2) – Body ground	10 k Ω or higher

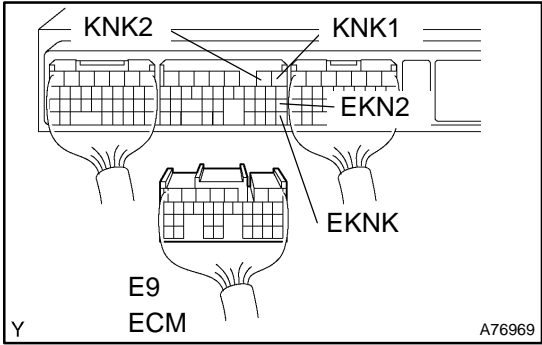
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REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE ECM (See page 10-25)

3 CHECK WIRE HARNESS



- (a) Disconnect the E9 ECM connector.
- (b) Turn the ignition switch ON.
- (c) Check the voltage of ECM terminals.

Standard:

Tester Connection	Specified Condition
E9-1 (KNK1) - E9-28 (EKNK) E9-2 (KNK2) - E9-20 (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, KNK2 and EKN2 of the ECM connector.

Standard:

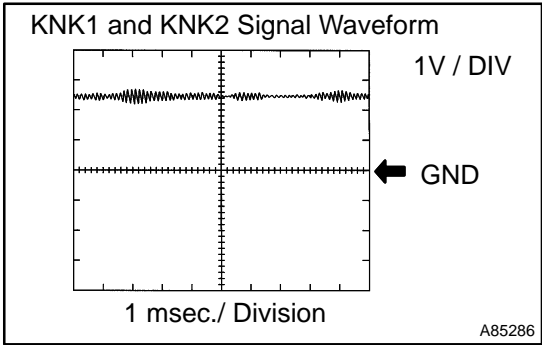
Tester Connection	Specified Condition
E9-1 (KNK1) - E9-28 (EKNK) E9-2 (KNK2) - E9-20 (EKN2)	Correct waveform is as shown

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE KNOCK SENSOR



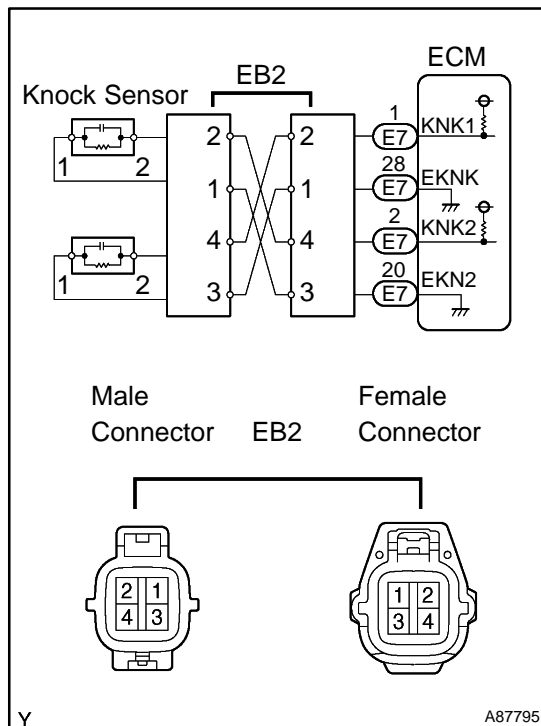
INSPECTION PROCEDURE

3MZ-FE:

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 or the OBD II scan tool. 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)



- Disconnect the EB2 connector.
- Using lead wires, connect the EB2 connector terminals as follows.

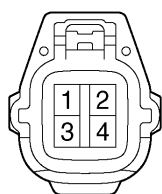
Male Connector – Female Connector
Terminal 2 – Terminal 4
Terminal 1 – Terminal 3
Terminal 4 – Terminal 2
Terminal 3 – Terminal 1

- Warm up the engine.
- Run the engine at 3,000 rpm for 10 seconds or more.
- Check the DTCs.

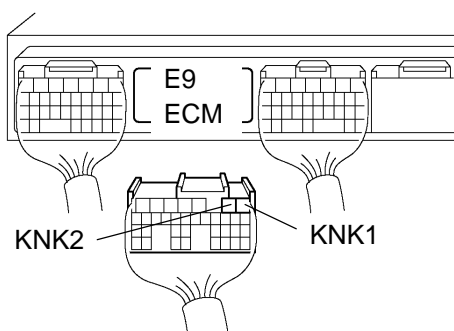
Result:

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 WIRE HARNESS (EB1 CONNECTOR – ECM)**Wire Harness Side**

EB1
Female Connector



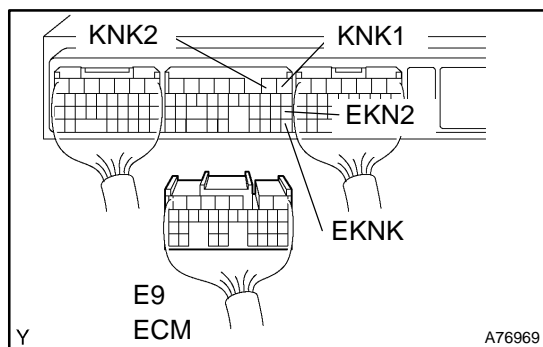
Y

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- Disconnect the EB1 connector.
- Disconnect the E9 ECM connector.
- Check the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified condition
EB1 female connector 1 – E9–1 (KNK1) EB1 female connector 2 – E9–2 (KNK2)	Below 1 Ω
EB1 female connector 1 or E9–1 (KNK1) – Body ground EB1 female connector 2 or E9–2 (KNK2) – Body ground	10 k Ω or higher

NG**REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****3 INSPECT ECM**

Y

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- Disconnect the E9 ECM connector.
- Turn the ignition switch ON.
- Check the voltage of ECM terminals.

Standard:

Tester Connection	Specified Condition
E9–1 (KNK1) – E9–28 (EKNK) E9–2 (KNK2) – E9–20 (EKN2)	4.5 to 5.5 V

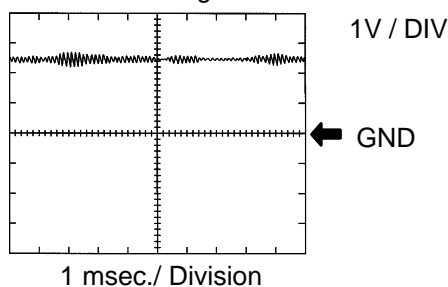
HINT:

Reference: Inspection using the oscilloscope.

After warming up run the engine at 4,000 rpm, check the waveform between terminal KNK1 and EKNK, KNK2 and EKN2 of the ECM connector.

Standard:

Tester Connection	Specified Condition
E9–1 (KNK1) – E9–28 (EKNK) E9–2 (KNK2) – E9–20 (EKN2)	Correct waveform is as shown

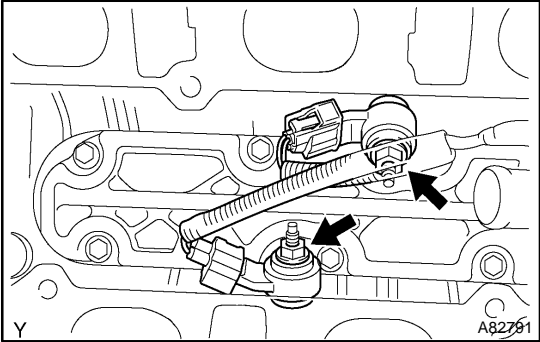
NG**REPLACE ECM (See page 10-25)****OK****KNK1 and KNK2 Signal Waveform**

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CHECK FOR INTERMITTENT PROBLEMS (See page 05-500)

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

4 CHECK KNOCK SENSOR



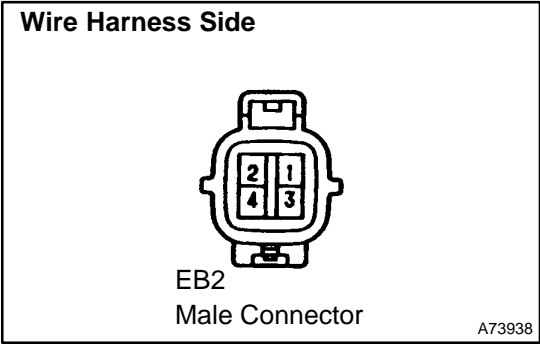
- (a) Check the knock sensor installation.
OK: Torque is 20 N·m (204 kgf·cm, 15 ft·lbf)

NG TIGHTEN SENSOR

OK

REPLACE KNOCK SENSOR (See page 10-20)

5 INSPECT KNOCK SENSOR



- (a) Disconnect the EB2 male connector.
(b) Check the resistance between the terminals of the EB2 male connector.

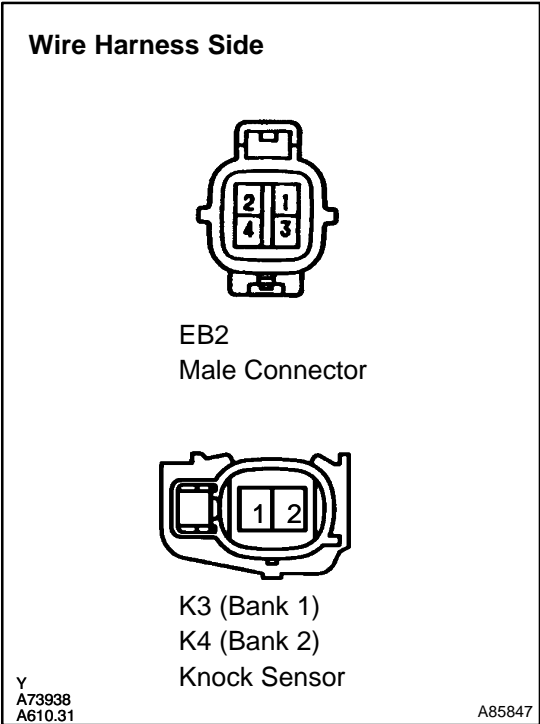
Standard:

Tester Connection	Specified Condition
EB2 male connector 2-1 EB2 male connector 4-3	120 to 280 kΩ

OK CHECK FOR INTERMITTENT PROBLEMS (See page 05-500)

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6 CHECK WIRE HARNESS (EB2 CONNECTOR - KNOCK SENSOR)



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 EB2 connector.
- (b) Disconnect the K3 or K4 knock sensor connector.
- (c) Measure the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
EB2 male connector 2 - K3-2 EB2 male connector 1 - K3-1 EB2 male connector 4 - K4-2 EB2 male connector 3 - K4-1	Below 1 Ω
EB2 male connector 2 or K3-2 - Body ground EB2 male connector 1 or K3-1 - Body ground EB2 male connector 4 or K4-2 - Body ground EB2 male connector 3 or K4-1 - Body ground	10 k Ω or higher

NG REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE KNOCK SENSOR (See page 10-20)