

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)

CIRCUIT DESCRIPTION

A flat type knock sensor (non-resonant type) has the structure that can detect vibration in a wider band of the frequency from about 6 kHz to 15 kHz and has the following features.

Knock sensors are fitted on the cylinder block to detect engine knocking.

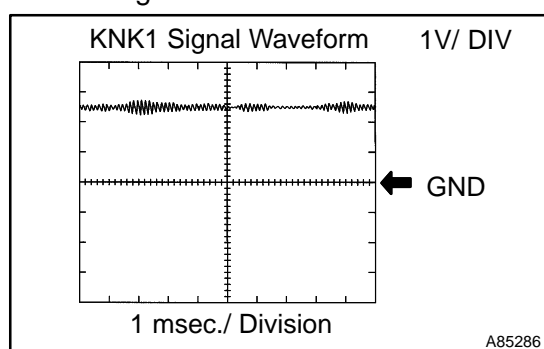
The knock sensor contains a piezoelectric element which generates voltage when it becomes deformed.

The generation of the voltage occurs when the cylinder block vibrates due to the knocking. If the engine knocking occurs, in order to suppress it, the ignition timing is retarded.

DTC No.	DTC Detecting Condition	Trouble Area
P0325	Knock sensor signal level remains at low for more than 10 seconds	<ul style="list-style-type: none"> • Open or short in knock sensor circuit • Knock sensor (under-torqued or looseness) • ECM
P0327	Output voltage of the knock sensor is 0.5 V or less	<ul style="list-style-type: none"> • Short in knock sensor circuit • Knock sensor • ECM
P0328	Output voltage of the knock sensor is 4.5 V or more	<ul style="list-style-type: none"> • Open in knock sensor circuit • Knock sensor • ECM

HINT:

If the ECM detects the DTC P0325,P0327 and P0328, it enters fail-safe mode in which the corrective retarded angle value is set to its maximum value.



Reference: Inspection by using an oscilloscope.

- (1) After warming up, run the engine at 2,500 rpm, check the waveform between terminals KNK1 and EKNK of the ECM connector.

MONITOR DESCRIPTION

The knock sensor, located on the cylinder block, detects spark knocks. When the spark knocks occur, the sensor picks-up vibrates 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 is too low for more than 10 seconds, and if the knock sensor 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

Related DTCs	P0325: Knock sensor (bank 1) range check or rationality P0327: Knock sensor (bank 1) range check (low voltage) P0328: Knock sensor (bank 1) range check (high voltage)
Required sensors/components	Main: Knock sensor Related: Crankshaft position sensor, Camshaft position sensor, Engine coolant temperature sensor, Mass air flow meter
Frequency of operation	Continuous
Duration	10 seconds
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page 05-20
Battery voltage	10.5 V or more
Idle	OFF
Time after engine start	5 seconds or more
Engine coolant temperature	60°C (140°F) or more
Intake air amount per revolution	0.3 g/rev or more

TYPICAL MALFUNCTION THRESHOLDS

Case 1: P0325 (Range check/Rationality)

Time while the voltage output of the knock sensor is below the specific threshold	10 seconds
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Case 2: P0325 (Fluttering *)

Knock sensor voltage	Less than 0.5 V and more than 4.5 V
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Case 3: P0327

Knock sensor voltage	Less than 0.5 V
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Case 4: P0328

Knock sensor voltage	More than 4.5 V
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*: Two different malfunctions intermingle.

Read freeze frame data using the hand-held tester or the OBD II scan tool. 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 READ OUTPUT DTCS

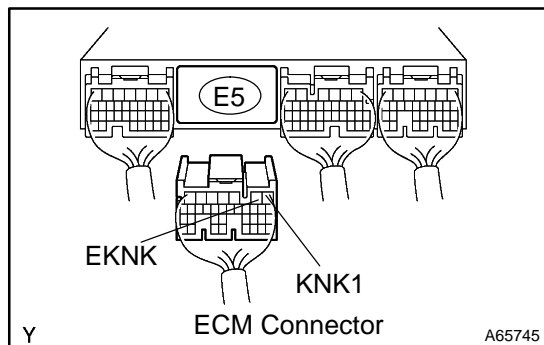
- (a) Connect the hand-held tester or the OBD II scan tool to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Turn the hand-held tester or the OBD II scan tool ON.
- (d) On the hand-held tester, select the item: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (e) Clear the DTCs.
- (f) Put the engine in inspection mode (see page 01-27).
- (g) Warm up the engine.
- (h) Run the engine at 2,500 rpm for 10 seconds or more.
- (i) Read DTCs.

Result :

Display (DTC output)	Proceed to
P0325	A
P0325, P0327 and/or P0328	B
No output	C

B**Go to step 3****C****CHECK FOR INTERMITTENT PROBLEMS**
(See page 05-17)**A****2 INSPECT KNOCK SENSOR**

- (a) Check the knock sensor installation.

OK:**Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)****NG****SECURELY REINSTALL SENSOR****OK****REPLACE KNOCK SENSOR****3 CHECK HARNESS AND CONNECTOR(ECM - KNOCK SENSOR)**

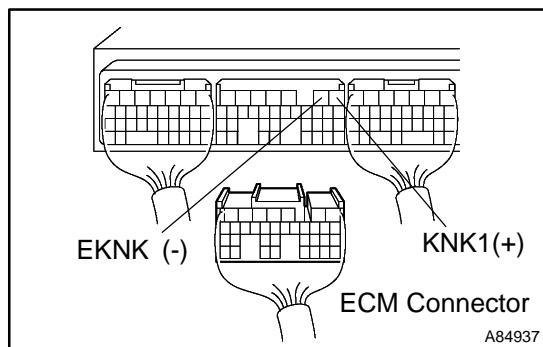
- (a) Disconnect the E5 ECM connector.
- (b) Measure the resistance between the terminals of the E5 ECM connector.

Standard:

Tester Connection	Specified Condition
KNK1 (E5-1) - EKNK (E5-2)	120 to 280 KΩ at 20°C (68°F)

- (c) Reconnect the ECM connector.

NG**Go to step 5****OK**

4 INSPECT ECM(KNK1 - EKNK VOLTAGE)

- (a) Disconnect the E5 ECM connector.
- (b) Turn the power switch ON (IG).
- (c) Measure the voltage between the terminals of the E5 ECM terminals.

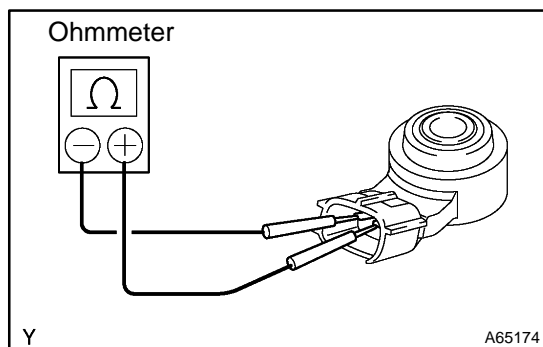
Standard:

Tester Connection	Specified Condition
KNK1 (E5-1) - EKNK (E5-2)	4.5 to 5.5 V

- (d) Reconnect the ECM connector.

NG**REPLACE ECM (See page 10-24)****OK****CHECK FOR INTERMITTENT PROBLEMS (See page 05-17)****NOTICE:**

Fault may be intermittent. Check wire harness and connectors carefully.

5 INSPECT KNOCK SENSOR

- (a) Remove the knock sensor.
- (b) Measure the resistance between the terminals.

Standard:

Tester Connection	Specified Condition
KNK1 (K1-2) - EKNK (K1-1)	120 to 280 K Ω at 20°C (68°F)

- (c) Reinstall the knock sensor.

NG**REPLACE KNOCK SENSOR****OK****REPAIR OR REPLACE HARNESS OR CONNECTOR**