

| | | |
|------------|--------------|--|
| 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 | P0332 | Knock Sensor 2 Circuit Low Input (Bank 2) |
| DTC | P0333 | Knock Sensor 2 Circuit High Input (Bank 2) |

DESCRIPTION

A flat type knock sensor (non-resonant type) has a structure that can detect vibrations over a wide band of frequencies: between approximately 6 kHz and 15 kHz.

Knock sensors are fitted onto the engine block to detect engine knocking.

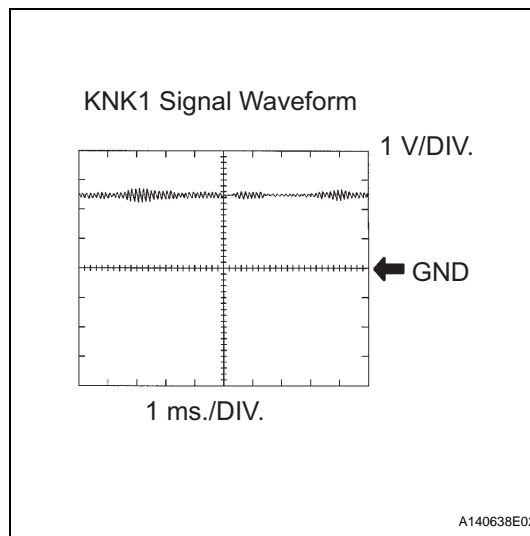
The knock sensor contains a piezoelectric element which generates a voltage when it becomes deformed. The voltage is generated when the engine block vibrates due to knocking. Any occurrence of engine knocking can be suppressed by delaying the ignition timing.

| DTC No. | DTC Detection Condition | Trouble Area |
|----------------|---|--|
| P0327 P0332 | Output voltage of knock sensor 1 or 2 is 0.5 V or less (1 trip detection logic) | <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 (1 trip detection logic) | <ul style="list-style-type: none"> • Open in knock sensor 1 or 2 circuit • Knock sensor 1 or 2 • ECM |

HINT:

When any of DTCs P0327, P0328, P0332 and P0333 are set, the ECM enters fail-safe mode. During fail-safe mode, the ignition timing is delayed to its maximum retardation. Fail-safe mode continues until the engine switch is turned off.

Reference: Inspection using an oscilloscope



The correct waveform is as shown.

| Item | Content |
|-----------|----------------------------------|
| Terminals | KNK1 - EKNK or KNK2 - EKN2 |

| Item | Content |
|--------------------|---|
| Equipment Settings | 0.01 to 10 V/DIV. 0.01 to 10 ms./DIV. |
| Conditions | Keep engine speed at 4,000 rpm with warm engine |

MONITOR DESCRIPTION

The knock sensor, located on the cylinder block, detects spark knock. When spark knock occurs, the piezoelectric element of the sensor vibrates. When the ECM detects a voltage in this frequency range, it retards the ignition timing to suppress 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, or if the knock sensor output voltage is outside the normal range, the ECM interprets this as a fault in the knock sensor and sets a DTC.

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MONITOR STRATEGY

| | |
|---------------------------------------|--|
| Related DTCs | P0327: Knock sensor (Bank 1) open/short (Low voltage) P0328: Knock sensor (Bank 1) open/short (High voltage) P0332: Knock sensor (Bank 2) open/short (Low voltage) P0333: Knock sensor (Bank 2) open/short (High voltage) |
| Required Sensors/Components (Main) | Knock sensor (Bank 1 and 2) |
| Required Sensors/Components (Related) | - |
| Frequency of Operation | Continuous |
| Duration | 1 second |
| MIL Operation | Immediate |
| Sequence of Operation | None |

TYPICAL ENABLING CONDITIONS

| | |
|--|-------------------|
| Monitor runs whenever following DTCs are not present | None |
| Battery voltage | 10.5 V or more |
| Time after engine start | 5 seconds or more |
| Engine switch | ON |
| Starter | OFF |

TYPICAL MALFUNCTION THRESHOLDS

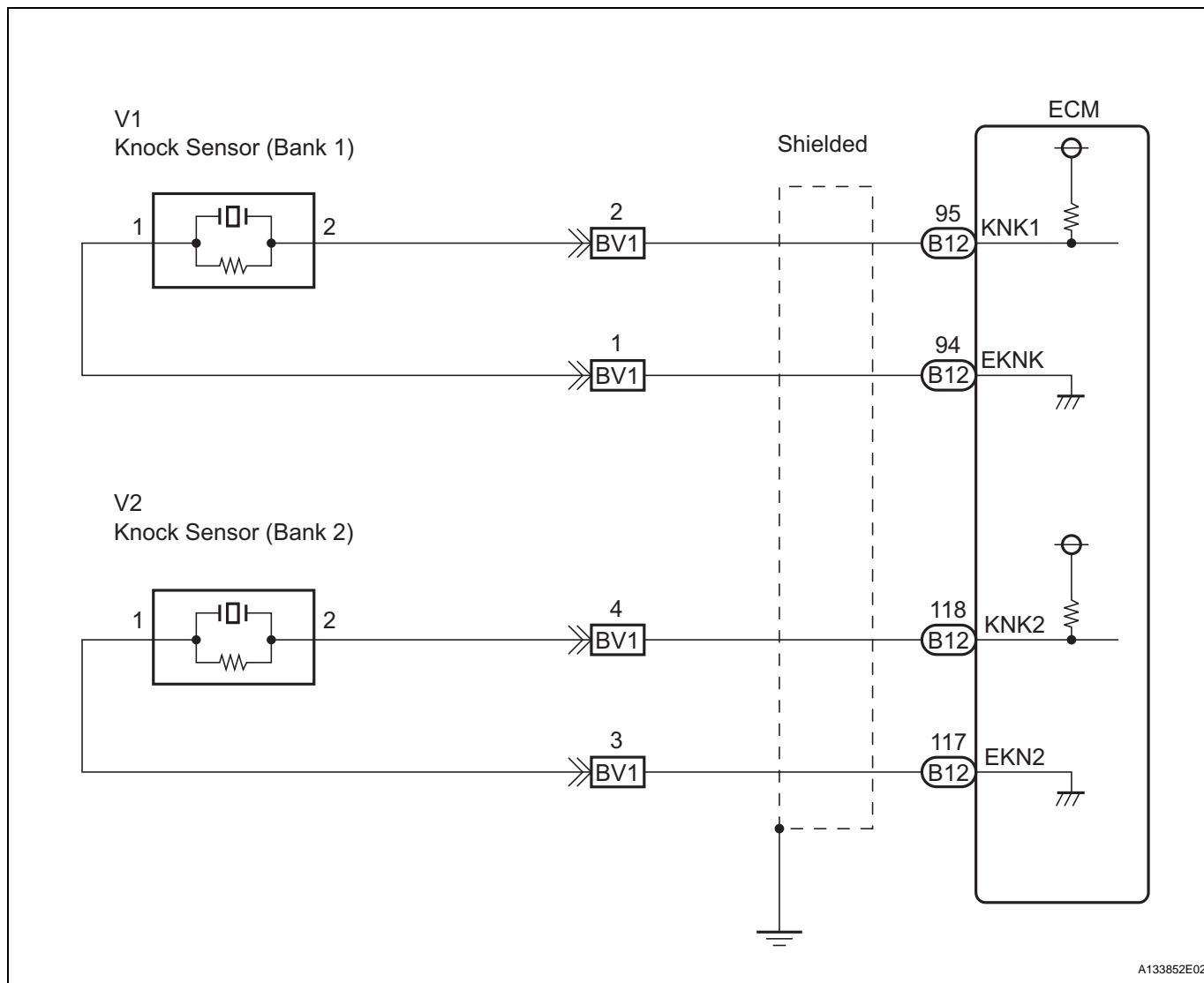
Knock Sensor Range Check (Low voltage) P0327 and P0332:

| | |
|----------------------|-----------------|
| Knock sensor voltage | Less than 0.5 V |
|----------------------|-----------------|

Knock Sensor Range Check (High voltage) P0328 and P0333:

| | |
|----------------------|-----------------|
| Knock sensor voltage | More than 4.5 V |
|----------------------|-----------------|

WIRING DIAGRAM



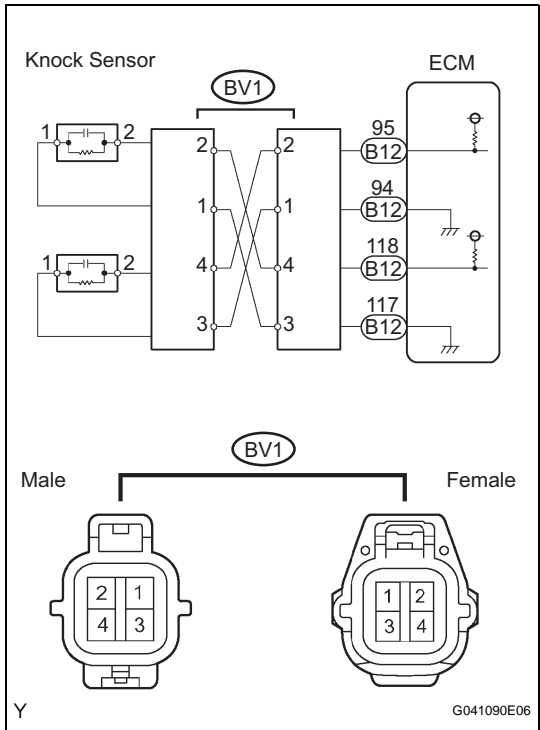
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INSPECTION PROCEDURE

HINT:

- DTCs P0327 and P0328 are for the bank 1 knock sensor circuit.
- DTCs P0332 and P0333 are for the bank 2 knock sensor circuit.
- Read freeze frame data using the intelligent tester. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can be helpful in determining whether the vehicle was running or stopped, whether the engine was warmed up or not, whether the air-fuel ratio was lean or rich, as well as other data recorded at the time of a malfunction (See page [ES-41](#)).

1 READ OUTPUT DTC (CHECK KNOCK SENSOR CIRCUIT)



- (a) Disconnect the BV1 connector.
- (b) Using lead wires, connect the 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) Connect the intelligent tester to the DLC3.
- (f) Turn the engine switch on (IG) and turn the intelligent tester on.
- (g) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (h) Read the DTCs.

Result

| Display | Proceed to |
|---|------------|
| DTCs same as when vehicle brought in: P0327, P0328 → P0327, P0328 or P0332, P0333 → P0332, P0333 | A |
| DTCs different from when vehicle brought in: P0327, P0328 → P0332, P0333 or P0332, P0333 → P0327, P0328 | B |

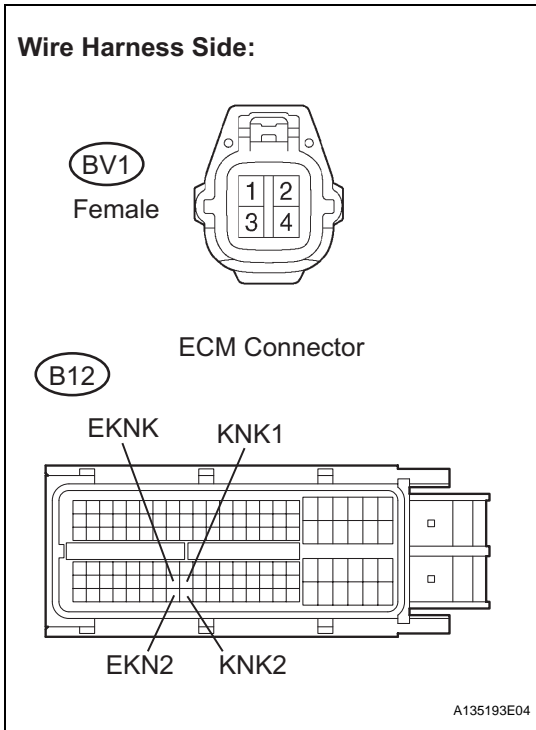
- (i) Reconnect the BV1 connector.

B → **Go to step 4**

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2 CHECK WIRE HARNESS AND CONNECTOR (CONNECTOR - ECM)



- (a) Disconnect the BV1 connector.
- (b) Disconnect the B12 ECM connector.
- (c) Measure the resistance according to the value(s) in the table below.

Standard resistance (Check for open)

| Tester Connection | Specified Condition |
|---|---------------------|
| BV1 female connector 2 - KNK1 (B12-95) | Below 1 Ω |
| BV1 female connector 1 - EKNK (B12-94) | Below 1 Ω |
| BV1 female connector 4 - KNK2 (B12-118) | Below 1 Ω |
| BV1 female connector 3 - EKN2 (B12-117) | Below 1 Ω |

Standard resistance (Check for short)

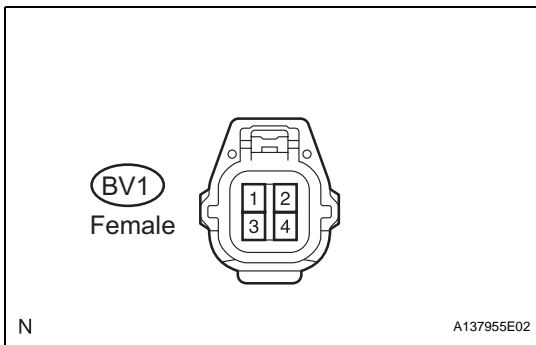
| Tester Connection | Specified Condition |
|--|---------------------|
| BV1 female connector 2 or KNK1 (B12-95) - Body ground | 10 kΩ or higher |
| BV1 female connector 1 or EKNK (B12-94) - Body ground | 10 kΩ or higher |
| BV1 female connector 4 or KNK2 (B12-118) - Body ground | 10 kΩ or higher |
| BV1 female connector 3 or EKN2 (B12-117) - Body ground | 10 kΩ or higher |

- (d) Reconnect the BV1 connector.
- (e) Reconnect the ECM connector.

NG REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3 INSPECT ECM



- (a) Disconnect the BV1 connector.
- (b) Turn the engine switch on (IG).
- (c) Measure the voltage according to the value(s) in the table below.

Standard voltage

| Tester Connection | Specified Condition |
|----------------------------|---------------------|
| BV1 female connector 2 - 1 | 4.5 to 5.5 V |
| BV1 female connector 4 - 3 | 4.5 to 5.5 V |

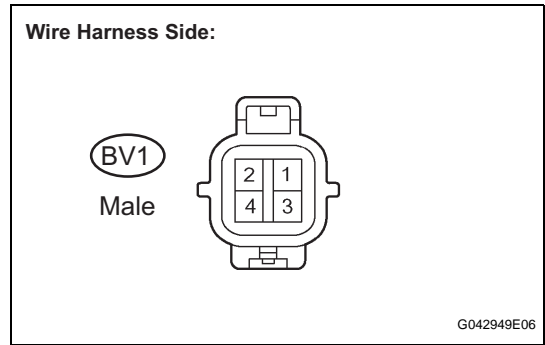
- (d) Reconnect the ECM connector.

NG REPLACE ECM (See page [ES-543](#))

OK

CHECK FOR INTERMITTENT PROBLEMS

4 INSPECT KNOCK SENSOR



- (a) Disconnect the BV1 connector.
- (b) Measure the resistance according to the value(s) in the table below.

Standard resistance

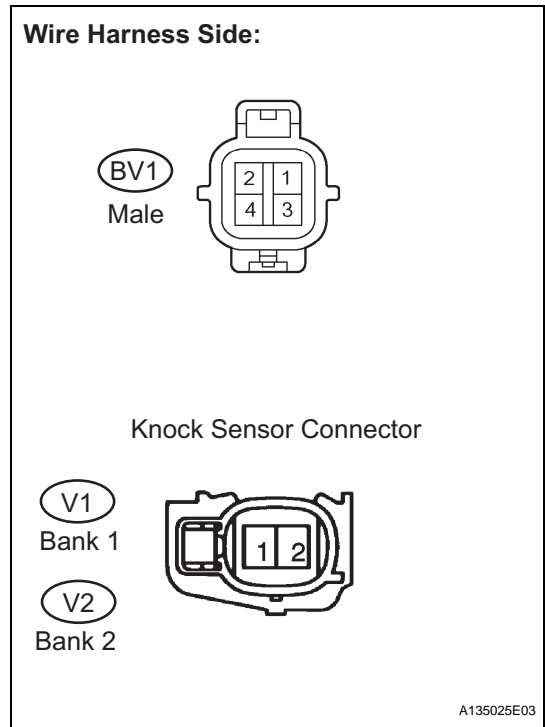
| Tester Connection | Specified Condition |
|--------------------------|---------------------|
| BV1 male connector 1 - 2 | 120 to 280 kΩ |
| BV1 male connector 3- 4 | 120 to 280 kΩ |

- (c) Reconnect the BV1 connector.

OK → **CHECK FOR INTERMITTENT PROBLEMS**

NG

5 CHECK HARNESS AND CONNECTOR (CONNECTOR - KNOCK SENSOR)



HINT:

- If DTC P0327 or P0328 has changed to P0332 or P0333, check the knock sensor circuit on the right bank side.
- If DTC P0332 or P0333 has changed to P0327 or P0328, check the knock sensor circuit on the left bank side.

- (a) Disconnect the BV1 connector.
- (b) Disconnect the V1 and V2 knock sensor connectors.
- (c) Measure the resistance according to the value(s) in the table below.

Standard resistance (Check for open)

| Tester Connection | Specified Condition |
|-----------------------------|---------------------|
| BV1 male connector 2 - V1-2 | Below 1 Ω |
| BV1 male connector 1 - V1-1 | Below 1 Ω |
| BV1 male connector 4 - V2-2 | Below 1 Ω |
| BV1 male connector 3 - V2-1 | Below 1 Ω |

Standard resistance (Check for short)

| Tester Connection | Specified Condition |
|--|---------------------|
| BV1 male connector 2 or V1-2 - Body ground | 10 kΩ or higher |
| BV1 male connector 1 or V1-1 - Body ground | 10 kΩ or higher |
| BV1 male connector 4 or V2-2 - Body ground | 10 kΩ or higher |
| BV1 male connector 3 or V2-1 - Body ground | 10 kΩ or higher |

- (d) Reconnect the BV1 connector.
- (e) Reconnect the knock sensor connectors.

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

OK

REPLACE KNOCK SENSOR (See page ES-525)