P0327

2ZR-FXE ENGINE CONTROL: SFI SYSTEM: P0327,P0328: Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)

DESCRIPTION

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

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

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

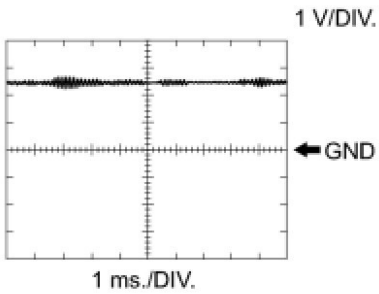
The voltage is generated when the engine block vibrates due to knocking. Occurrence of engine knocking can be suppressed by delaying the ignition timing.

DTC No.	DTC Detection Condition	Trouble Area
P0327	Output voltage of knock control sensor less than 0.5 V for 1 second or more (1 trip detection logic)	• Short in knock control sensor circuit • Knock control sensor • ECM
P0328	Output voltage of knock control sensor more than 4.5 V for 1 second or more (1 trip detection logic)	• Open in knock control sensor circuit • Knock control sensor • ECM

HINT

When either DTC P0327 or P0328 is 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 power switch is turned off.

Reference: Inspection using an oscilloscope



T

The correct waveform is as shown.

ECM Terminal Name	Between KNK1 and EKNK
Tester Range	1 V/DIV., 1 ms./DIV.
Condition	Engine speed maintained at 4000 rpm after warming up engine

MONITOR DESCRIPTION

If the output voltage transmitted by the knock control sensor remains low or high for more than 1 second, the ECM interprets this as a malfunction in the sensor circuit, and sets a DTC.

The monitor for DTCs P0327 and P0328 begins to run when 5 seconds have elapsed since the engine was started.

If the malfunction is not repaired successfully, DTC P0327 or P0328 is set 5 seconds after the engine is next started.

MONITOR STRATEGY

Related DTCs	P0327: Knock sensor (bank 1) range check (Low voltage) P0328: Knock sensor (bank 1) range check (High voltage)
Required Sensors/Components (Main)	Knock control sensor
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	1 second
MIL Operation	Immediately
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

TYPICAL MALFUNCTION THRESHOLDS

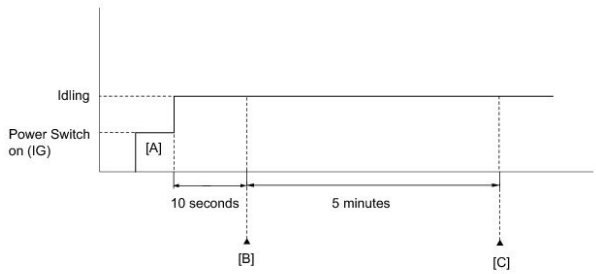
Knock Sensor Range Check (Low Voltage) P0327

Knock sensor voltage	Less than 0.5 V

Knock Sensor Range Check (High Voltage) P0328

Knock sensor voltage	More than 4.5 V

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the power switch on (IG) and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the power switch off and wait for 30 seconds.
5. Turn the power switch on (IG) and turn the Techstream on [A].
6. Put the engine in inspection mode Component Tests and General Diagnostics.
7. Start the engine and wait 10 seconds.
8. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.
9. Read the DTC [B].

HINT
*** If a DTC is output, the system is malfunctioning.**

*** If a DTC is not output, perform the following procedure.**

10. Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.

11. Input the DTC: P0327 or P0328.

12. Check the DTC judgment result.

Techstream Display	Description
NORMAL	● DTC judgment completed ● System normal
ABNORMAL	● DTC judgment completed ● System abnormal
INCOMPLETE	● DTC judgment not completed ● Perform driving pattern after confirming DTC enabling conditions
UNKNOWN	● Unable to perform DTC judgment ● Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT
*** If the judgment result shows NORMAL, the system is normal.**
*** If the judgment result shows ABNORMAL, the system has a malfunction.**
*** If the judgment result shows INCOMPLETE or UNKNOWN, idle the engine for 5 minutes.**

13. Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.

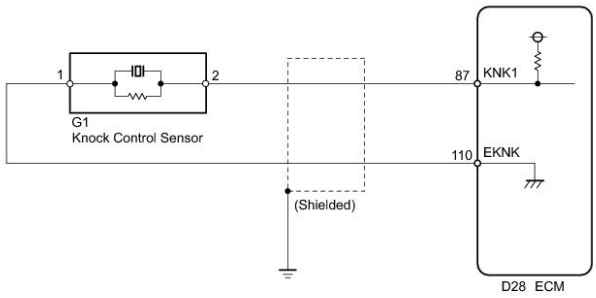
14. Check the judgment result [C].

HINT
*** If the judgment result shows NORMAL, the system is normal.**
*** If the judgment result shows ABNORMAL, the system has a malfunction.**

15. If the test result is INCOMPLETE or UNKNOWN and no DTC is output, perform a universal trip and check for permanent DTCs Reading and Clearing Diagnostic Trouble Codes.

HINT
*** If a permanent DTC is output, the system is malfunctioning.**
*** If no permanent DTC is output, the system is normal.**

WIRING DIAGRAM



Y

INSPECTION PROCEDURE

HINT
Read freeze frame data using the Techstream. 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.

PROCEDURE

1. READ VALUE USING TECHSTREAM (KNOCK FEEDBACK VALUE)

   (a) Connect the Techstream to the DLC3.

   (b) Turn the power switch on (IG) and turn the Techstream on.

   (c) Put the engine in inspection mode Component Tests and General Diagnostics.

   (d) Start the engine.

   (e) Warm up the engine.

   (f) Enter the following menus: Powertrain / Engine and ECT / Knock Feedback Value.

   (g) Read the value while driving the vehicle.

OK:

The value changes.

HINT

Malfunction does not occur	Knock Feedback Value changes
Malfunctions occur	Knock Feedback Value does not change

The knock feedback value change can be confirmed by running the engine with a high load, for example, by activating the air conditioning system and racing the engine.

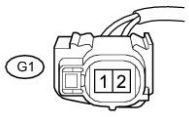
NG -- INSPECT ECM (KNK1 VOLTAGE)

OK -- CHECK FOR INTERMITTENT PROBLEMS Check for Intermittent Problems

2. INSPECT ECM (KNK1 VOLTAGE)

(a) Disconnect the knock control sensor connector.

*a



N

(b) Turn the power switch on (IG).

(c) Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
G1-2 - G1-1	Power switch on (IG)	4.5 to 5.5 V

Text in Illustration

*a	Front view of wire harness connector (to Knock Control Sensor)

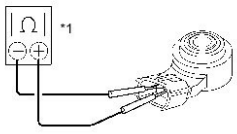
(d) Reconnect the knock control sensor connector.

NG -- CHECK HARNESS AND CONNECTOR (ECM - KNOCK CONTROL SENSOR)
OK -- Continue to next step.

3. INSPECT KNOCK CONTROL SENSOR

(a) Remove the knock control sensor.

*a



(b) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	120 to 280 kΩ

Text in Illustration

*1	Ohmmeter
*a	Component without harness connected (Knock Control Sensor)

(c) Reinstall the knock control sensor.

NG -- REPLACE KNOCK CONTROL SENSOR Removal

OK -- REPLACE ECM Removal

4. CHECK HARNESS AND CONNECTOR (ECM - KNOCK CONTROL SENSOR)

(a) Disconnect the knock control sensor connector.

(b) Disconnect the ECM connector.

(c) Measure the resistance according to the value(s) in the table below.

Standard Resistance (Check for Open):

Tester Connection	Condition	Specified Condition
G1-2 - D28-87 (KNK1)	Always	Below 1 Ω
G1-1 - D28-110 (EKNK)	Always	Below 1 Ω

Standard Resistance (Check for Short):

Tester Connection	Condition	Specified Condition
G1-2 or D28-87 (KNK1) - Body ground	Always	10 kΩ or higher
G1-1 or D28-110 (EKNK) - Body ground	Always	10 kΩ or higher

(d) Reconnect the knock control sensor connector.

(e) Reconnect the ECM connector.

NG -- REPAIR OR REPLACE HARNESS OR CONNECTOR (ECM - KNOCK CONTROL SENSOR)

OK -- REPLACE ECM Removal