Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002BLVY
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: M20A-FXS (ENGINE CONTROL): SFI SYSTEM: P032511; Knock Sensor 1 Bank 1 or Single Sensor Circuit Short to Ground; 2023 - 2024 MY Prius Prius Prime [03/2023 -]		

DTC	**P032511**	**Knock Sensor 1 Bank 1 or Single Sensor Circuit Short to Ground**

DESCRIPTION

A flat-type knock control sensor (non-resonant type) has a structure that can detect vibrations between approximately 5 and 23 kHz.

The knock control sensor is 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.

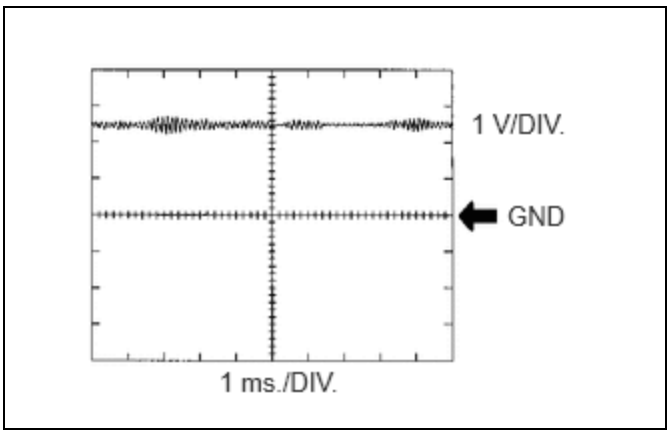
The voltage is generated when the engine block vibrates due to knocking. Any occurrence of engine knocking can be suppressed by delaying the ignition timing.

HINT:

When DTC P032511 is stored, 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 ignition switch is turned off.

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
P032511	Knock Sensor 1 Bank 1 or Single Sensor Circuit Short to Ground	The knock control sensor output voltage is less than 0.5 V for 1 second or more (1 trip detection logic).	• Short in knock control sensor circuit • Knock control sensor • ECM	Comes on	Engine	A	SAE Code: P0327

Reference: Inspection using an oscilloscope



HINT:

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 2500 rpm after warming up engine

MONITOR DESCRIPTION

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

MONITOR STRATEGY

Related DTCs	P0327: Knock control sensor range check (low voltage)
Required Sensors/Components (Main)	Knock control sensor
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	1 second
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever the following DTCs are not stored	None
Both of the following conditions are met	-
Auxiliary battery voltage	10.5 V or higher
Time after engine start	5 seconds or more

TYPICAL MALFUNCTION THRESHOLDS

Knock control sensor voltage	Less than 0.5 V

CONFIRMATION DRIVING PATTERN

HINT:

- After repair has been completed, clear the DTC and then check that the vehicle has returned to normal by performing the following All Readiness check procedure.

  Click here INFO
- When clearing the permanent DTCs, refer to the "CLEAR PERMANENT DTC" procedure.

  Click here INFO

1. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
2. Turn the ignition switch off and wait for at least 30 seconds.
3. Put the engine in Inspection Mode (Maintenance Mode).

Click here INFO

4. Start the engine and wait 5 minutes [A].
5. Enter the following menus: Powertrain / Engine / Trouble Codes [B].
6. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

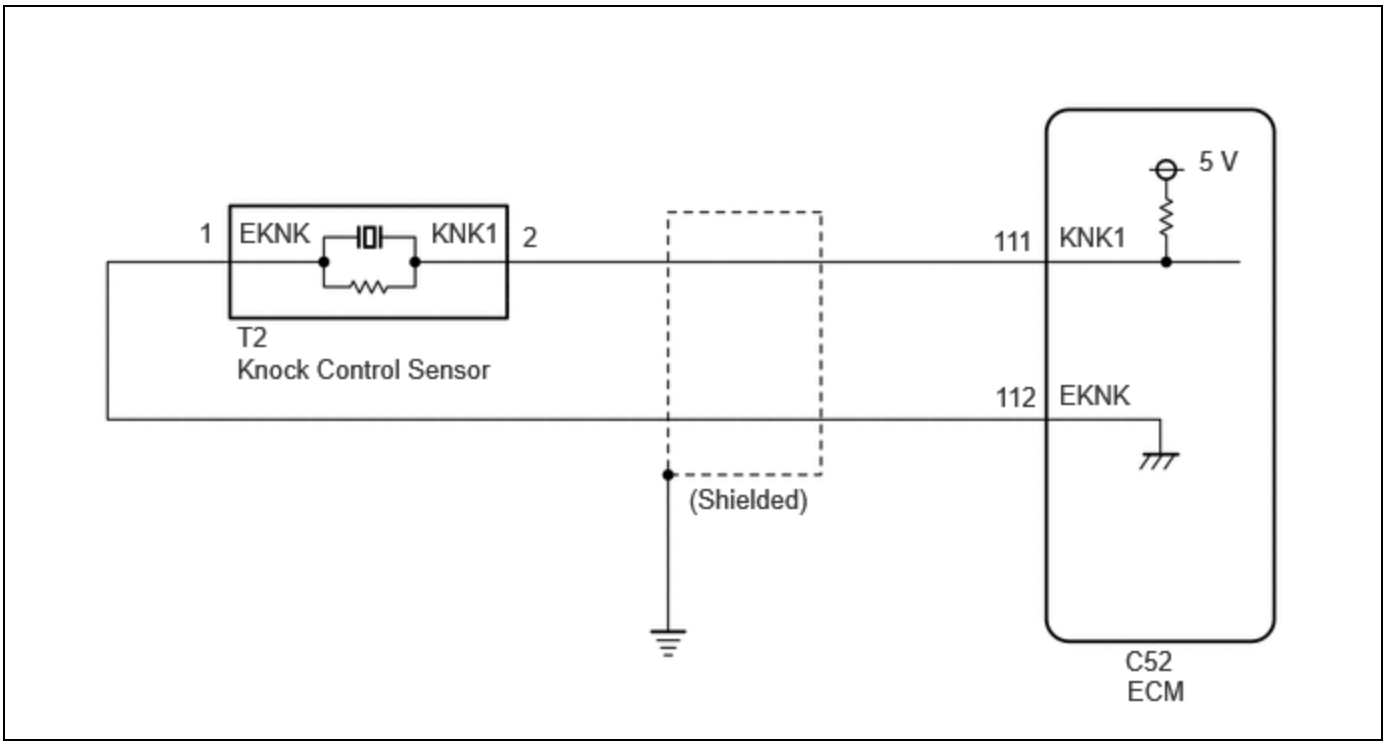
7. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
8. Input the DTC: P032511.
9. Check the DTC judgment result.

HINT:

- If the judgment result is NORMAL, the system is normal.
- If the judgment result is ABNORMAL, the system is malfunctioning.
- If the judgment result is INCOMPLETE, idle the engine for 5 minutes and check the DTC judgment result again.
- [A] to [B]: Normal judgment procedure.

  The normal judgment procedure is used to complete DTC judgment and also used when clearing permanent DTCs.
- When clearing the permanent DTCs, do not disconnect the cable from the auxiliary battery terminal or attempt to clear the DTCs during this procedure, as doing so will clear the universal trip and normal judgment histories.

WIRING DIAGRAM



CAUTION / NOTICE / HINT

NOTICE:

- Vehicle Control History may be stored in the hybrid vehicle control ECU if the engine is malfunctioning. Certain vehicle condition information is recorded when Vehicle Control History is stored. Reading the vehicle conditions recorded in both the freeze frame data and Vehicle Control History can be useful for troubleshooting.

for HEV Model: Click here INFO

for PHEV Model: Click here INFO

(Select Powertrain in Health Check and then check the time stamp data.)

- If any "Engine Malfunction" Vehicle Control History item has been stored in the hybrid vehicle control ECU, make sure to clear it. However, as all Vehicle Control History items are cleared simultaneously, if any Vehicle Control History items other than "Engine Malfunction" are stored, make sure to perform any troubleshooting for them before clearing Vehicle Control History.

for HEV Model: Click here INFO

for PHEV Model: Click here INFO

PROCEDURE

1.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF KNOCK CONTROL SENSOR)**

Pre-procedure1

(a) Disconnect the knock control sensor connector.

(b) Turn the ignition switch to ON.

Procedure1

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

Standard Voltage:

EWD INFO

Click Location & Routing(T2)
Click Connector(T2)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
T2-2 (KNK1) - T2-1 (EKNK)	Ignition switch ON	4.5 to 5.5 V	V

Post-procedure1

(d) None

NG ▶ **GO TO STEP 3**

OK ▼

2.	**INSPECT KNOCK CONTROL SENSOR**

Click here INFO

OK ▶ **GO TO STEP 4**

NG ▶ **REPLACE KNOCK CONTROL SENSOR**

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

Pre-procedure1

(a) Disconnect the knock control sensor connector.

(b) Disconnect the ECM connector.

Procedure1

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

Standard Resistance:

EWD INFO

Click Location & Routing(T2,C52)
Click Connector(T2)
Click Connector(C52)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
T2-2 (KNK1) or C52-111 (EKNK) - Body ground	Always	10 kΩ or higher	kΩ

Post-procedure1

(d) None

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

4.	CLEAR DTC

Pre-procedure1

(a) None

Procedure1

(b) Clear the DTCs.

Powertrain > Engine > Clear DTCs

Post-procedure1

(c) Turn the ignition switch off and wait for at least 30 seconds.

NEXT

5.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P032511)**

Pre-procedure1

(a) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

Procedure1

(b) Read the DTCs.

Powertrain > Engine > Trouble Codes

RESULT	PROCEED TO
DTCs are not output	A
P032511 is output	B

Post-procedure1

(c) None

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

B ▶ **REPLACE ECM**