Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002BLVT
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: M20A-FXS (ENGINE CONTROL): SFI SYSTEM: P02EE00,P02EF00,P02F000,P02F100; Cylinder 1 Injector Circuit Range/Performance; 2023 - 2024 MY Prius Prius Prime [03/2023 -]		

DTC	**P02EE00**	**Cylinder 1 Injector Circuit Range/Performance**

DTC	**P02EF00**	**Cylinder 2 Injector Circuit Range/Performance**

DTC	**P02F000**	**Cylinder 3 Injector Circuit Range/Performance**

DTC	**P02F100**	**Cylinder 4 Injector Circuit Range/Performance**

DESCRIPTION

By using Partial Lift Fuel Injection Control to spray fuel before the needle inside each direct fuel injector assembly has fully opened, the injection of fuel by the direct fuel injector assembly can be precisely controlled at partial lift. Due to the influence on the injected fuel volume due to wear and variations between injectors, feedback control is implemented for partial lift fuel injection.

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
P02EE00	Cylinder 1 Injector Circuit Range/Performance	The No. 1 cylinder partial lift control learned value exceeds the threshold (2 trip detection logic).	• Direct fuel injector assembly (No. 1 cylinder) • Fuel pressure sensor (for high pressure side) • Open or short in direct fuel injector assembly circuit • ECM	Comes on	Engine	B	SAE Code: P02EE
P02EF00	Cylinder 2 Injector Circuit Range/Performance	The No. 2 cylinder partial lift control learned value	• Direct fuel injector assembly	Comes on	Engine	B	SAE Code: P02EF

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
		exceeds the threshold (2 trip detection logic).	(No. 2 cylinder) • Fuel pressure sensor (for high pressure side) • Open or short in direct fuel injector assembly circuit • ECM				
P02F000	Cylinder 3 Injector Circuit Range/Performance	The No. 3 cylinder partial lift control learned value exceeds the threshold (2 trip detection logic).	• Direct fuel injector assembly (No. 3 cylinder) • Fuel pressure sensor (for high pressure side) • Open or short in direct fuel injector assembly circuit • ECM	Comes on	Engine	B	SAE Code: P02F0
P02F100	Cylinder 4 Injector Circuit Range/Performance	The No. 4 cylinder partial lift control learned value exceeds the threshold (2 trip detection logic).	• Direct fuel injector assembly (No. 4 cylinder) • Fuel pressure sensor (for high pressure side) • Open or short in direct fuel injector assembly circuit • ECM	Comes on	Engine	B	SAE Code: P02F1

Related Data List

DTC NO.	DATA LIST
P02EE00	• Target Fuel Pressure (High) • Fuel Pressure (High) • High Fuel Pressure Sensor • High Pressure Fuel Pump Duty Ratio (D4) • High Pressure Fuel Pump Discharge Rate • Injection Mode • Injection Timing Cylinder #1 (D4) • Injection Time Cylinder #1 (D4)
P02EF00	
P02F000	
P02F100	

MONITOR DESCRIPTION

The ECM calculates the partial lift control learning value for each cylinder. The ECM counts the number of times that the partial lift control learned value exceeds the threshold, and if the total number exceeds the threshold, the ECM determines that partial lift control is malfunctioning and illuminates the MIL and stores a DTC.

MONITOR STRATEGY

Related DTCs	P02EE: Injection volume learning (Partial Lift [PL] learning) value reaches upper or lower limit (No. 1 cylinder) P02EF: Injection volume learning (Partial Lift [PL] Learning) value reaches upper or lower limit (No. 2 cylinder) P02F0: Injection volume learning (Partial Lift [PL] learning) value reaches upper or lower limit (No. 3 cylinder) P02F1: Injection volume learning (Partial Lift [PL] learning) value reaches upper or lower limit (No. 4 cylinder)
Required Sensors/Components (Main)	Direct fuel injector assembly
Required Sensors/Components (Related)	ECM
Frequency of Operation	Once per driving cycle
Duration	Within 15 seconds
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All of the following conditions are met	-
Auxiliary battery voltage	11 V or higher
Partial lift injection for partial lift learning (*)	Executing
High pressure fuel system malfunction (P0087, P0088)	Not detected
Fuel system malfunction (P0171, P0172)	Not detected
Fuel system monitor is not prohibited by other malfunctions detected	-

(*) Partial lift injection for partial lift learning execute when all of the following conditions are met	-
Engine speed	4000 rpm or less
Engine coolant temperature	60°C (140°F) or higher
Fuel cut	Not executing

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met	A or B
A. Partial lift fuel injection malfunction counter	20 counts or more
B. Both of the following conditions are met	(a) and (b)
(a) Accumulated number of partial lift injection for partial lift learning after secondary parameters are met	60 counts or more
(b) Accumulated partial lift fuel injection malfunction counter / Accumulated number of partial lift injection for partial lift learning after secondary parameters are met	More than 0.8 times

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. Start the engine and warm it up until the engine coolant temperature is 75°C [167°F] or higher [A].
4. Turn the ignition switch off and wait for at least 30 seconds [B].
5. Start the engine and wait for at least 5 minutes [C].
6. Turn the GTS on.
7. Enter the following menus: Powertrain / Engine / Trouble Codes [D].
8. 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.
9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: P02EE00, P02EF00, P02F000 or P02F100.
11. 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, perform steps [A] through [D] again.
    - [A] to [D]: 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

Refer to DTC P020113.

Click here INFO

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 ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P02EE00, P02EF00, P02F000 AND/OR P02F100)**

(a) Read the DTCs.

Powertrain > Engine > Trouble Codes

RESULT	PROCEED TO
P02EE00, P02EF00, P02F000 or P02F100 and other DTCs are output	A
P02EE00, P02EF00, P02F000 or P02F100 is output	B

HINT:

If any DTCs other than P02EE00, P02EF00, P02F000 and/or P02F100 are output, troubleshoot those DTCs first.

A ▶ GO TO DTC CHART

B

2.	CHECK DTC OUTPUT

(a) Read the DTCs.

Powertrain > Engine > Trouble Codes

RESULT	PROCEED TO
Only 1 DTC among DTC P02EE00, P02EF00, P02F000 and P02F100 is output	A
2 or more DTCs among DTC P02EE00, P02EF00, P02F000 and P02F100 are output	B

HINT:

If the malfunction occurred for one cylinder or multiple cylinders can be determined based on the stored DTCs.

B ▶ **GO TO STEP 5**

A

3.	CHECK HARNESS AND CONNECTOR

Pre-procedure1

(a) Disconnect the ECM connector.

Procedure1

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

Standard Resistance:

EWD INFO

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

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
C52-16 (#1D+) - C52-17 (#1D-)	20°C (68°F)	1.34 to 1.64 Ω	Ω
C52-11 (#2D+) - C52-10 (#2D-)	20°C (68°F)	1.34 to 1.64 Ω	Ω

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
C52-12 (#3D+) - C52-13 (#3D-)	20°C (68°F)	1.34 to 1.64 Ω	Ω
C52-15 (#4D+) - C52-14 (#4D-)	20°C (68°F)	1.34 to 1.64 Ω	Ω
C52-16 (#1D+) or C52-17 (#1D-) - Body ground and other terminals	Always	1 MΩ or higher	MΩ
C52-11 (#2D+) or C52-10 (#2D-) - Body ground and other terminals	Always	1 MΩ or higher	MΩ
C52-12 (#3D+) or C52-13 (#3D-) - Body ground and other terminals	Always	1 MΩ or higher	MΩ
C52-15 (#4D+) or C52-14 (#4D-) - Body ground and other terminals	Always	1 MΩ or higher	MΩ

HINT:

- The standard values shown are direct fuel injector assembly resistance values.
- If the measured resistance value differs from the other cylinders and the injector resistance is normal, check the related cylinder as a poorly connected connector is suspected.

Post-procedure1

(c) None

OK ▶ **GO TO STEP 9**

NG ▼

4.	**INSPECT DIRECT FUEL INJECTOR ASSEMBLY (RESISTANCE)**

(a) Inspect the resistance of the direct fuel injector assembly.

Click here INFO

OK ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (DIRECT FUEL INJECTOR ASSEMBLY - ECM)**

NG ▶ **GO TO STEP 9**

5.	**PERFORM ACTIVE TEST USING GTS (CONTROL THE INJECTION MODE (DIRECT))**

Pre-procedure1

(a) Start the engine and warm it up (until the engine coolant temperature is 75°C (167°F) or higher).

Powertrain > Engine > Data List

TESTER DISPLAY
Coolant Temperature

Procedure1

(b) According to the display on the GTS, read the Data List with the Active Test "Control the Injection Mode" set to Direct.

Powertrain > Engine > Active Test

ACTIVE TEST DISPLAY
Control the Injection Mode

DATA LIST DISPLAY
Injection Mode
Short FT B1S1
Long FT B1S1

ITEM		PROCEED TO
INJECTION MODE	SHORT FT B1S1 + LONG FT B1S1	
Direct	-25% or less, or +25% or higher	A
	Between -25% and +25%	B

Post-procedure1

(c) None

B ▶ **GO TO STEP 9**

A ▼

6.	**REPLACE FUEL PRESSURE SENSOR (FOR HIGH PRESSURE SIDE)**

HINT:

Click here INFO

NEXT

7.	**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

8.	**CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED**

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
P02EE00, P02EF00, P02F000 or P02F100 is output	B

Post-procedure1

(c) None

A END

B ▶ **REPLACE DIRECT FUEL INJECTOR ASSEMBLY**

9.	**REPLACE DIRECT FUEL INJECTOR ASSEMBLY**

HINT:

Click here INFO

NEXT

10.	**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

11.	**CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED**

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
P02EE00, P02EF00, P02F000 or P02F100 is output	B

Post-procedure1

(c) None

A ▶ **END**

B

▼

12.	**REPLACE ECM**

HINT:

Click here INFO

NEXT

▼

13.	**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

▼

14.	**CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED**

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

OK:

DTCs are not output.

Post-procedure1

(c) None

NEXT END