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Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: M20A-FXS (ENGINE CONTROL): SFI SYSTEM: P128300-P128600; Cold Start Fuel Injection Control Performance #1; 2023 - 2024 MY Prius Prius Prime [03/2023 -]		

DTC	**P128300**	**Cold Start Fuel Injection Control Performance #1**

DTC	**P128400**	**Cold Start Fuel Injection Control Performance #2**

DTC	**P128500**	**Cold Start Fuel Injection Control Performance #3**

DTC	**P128600**	**Cold Start Fuel Injection Control Performance #4**

DESCRIPTION

To improve emissions immediately after a cold start, cold start multi pulse fuel injection control is performed which divides a single pulse of the direct fuel injector into several smaller pulses.

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
P128300	Cold Start Fuel Injection Control Performance #1	Cold start multi pulse fuel injection control for the No. 1 cylinder is not performed (2 trip detection logic).	• Direct fuel injector assembly (No. 1 cylinder) • Open or short in direct fuel injector assembly circuit • ECM	Comes on	Engine	B	SAE Code: P1283
P128400	Cold Start Fuel Injection Control Performance #2	Cold start multi pulse fuel injection control for the No. 2 cylinder is not performed (2 trip detection logic).	• Direct fuel injector assembly (No. 2 cylinder) • Open or short in direct fuel injector assembly circuit • ECM	Comes on	Engine	B	SAE Code: P1284

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
P128500	Cold Start Fuel Injection Control Performance #3	Cold start multi pulse fuel injection control for the No. 3 cylinder is not performed (2 trip detection logic).	• Direct fuel injector assembly (No. 3 cylinder) • Open or short in direct fuel injector assembly circuit • ECM	Comes on	Engine	B	SAE Code: P1285
P128600	Cold Start Fuel Injection Control Performance #4	Cold start multi pulse fuel injection control for the No. 4 cylinder is not performed (2 trip detection logic).	• Direct fuel injector assembly (No. 4 cylinder) • Open or short in direct fuel injector assembly circuit • ECM	Comes on	Engine	B	SAE Code: P1286

Related Data List

DTC NO.	DATA LIST
P128300 P128400 P128500 P128600	• Engine Speed • Mass Air Flow Sensor • Coolant Temperature • Target Fuel Pressure (High) • Fuel Pressure (High) • High Fuel Pressure Sensor • Injection Mode • Injection Timing Cylinder #1 (D4) • Injection Time Cylinder #1 (D4) • Ignition Timing Cylinder #1

MONITOR DESCRIPTION

While performing cold start multi pulse fuel injection control, the ECM monitors the direct fuel injector assemblies. When cold start multi pulse fuel injection control is being performed, the ECM counts the number of times that an injector does not pulse per cycle, and if the total number exceeds the threshold, the ECM determines that cold start multi pulse fuel injection control is malfunctioning and illuminates the MIL and stores a DTC.

MONITOR STRATEGY

Related DTCs	P1283: Cold start fuel injection control performance #1 P1284: Cold start fuel injection control performance #2

	P1285: Cold start fuel injection control performance #3 P1286: Cold start fuel injection control performance #4
Required Sensors/Components (Main)	Direct fuel injector assembly ECM (Injector driver)
Required Sensors/Components (Related)	-
Frequency of Operation	Once per driving cycle
Duration	10 seconds
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever the following DTCs are not stored	None
All of the following conditions are met	-
Auxiliary battery voltage	11 V or higher
Time after engine start	3 seconds or more
Starter	Off
Engine coolant temperature at engine start	-10°C (14°F) or higher
Engine coolant temperature	-10°C (14°F) or higher, and less than 50°C (122°F)
Fuel-cut	Off
Atmospheric pressure	76 kPa(abs) [11 psi(abs)] or higher

TYPICAL MALFUNCTION THRESHOLDS

Malfunction counter (not multi-injection) / Firing counter of monitor condition enable	higher than 0.8

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. Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature.
4. Ensure that the engine coolant temperature is -10 to 50°C (14 to 122°F) then start the engine [A].
5. Allow the engine to idle for 15 seconds or more [B].
6. Enter the following menus: Powertrain / Engine / Trouble Codes [C].
7. 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.

8. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
9. Input the DTC: P128300, P128400, P128500 or P128600.
10. 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 [C] again.
- [A] to [C]: 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 P128300, P128400, P128500 AND/OR P128600)**

(a) Read the DTCs.

Powertrain > Engine > Trouble Codes

RESULT	PROCEED TO
P128300, P128400, P128500 or P128600 and other DTCs are output	A

RESULT	PROCEED TO
P128300, P128400, P128500 or P128600 is output	B

HINT:

If any DTCs other than P128300, P128400, P128500 and/or P128600 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 P128300, P128400, P128500 and P128600 is output	A
2 or more DTCs among DTC P128300, P128400, P128500 and P128600 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 6**

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
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 5**

NG ▼

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

Click here INFO

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

NG

5.	**REPLACE DIRECT FUEL INJECTOR ASSEMBLY**

HINT:

Click here INFO

NEXT **GO TO STEP 7**

6.	**REPLACE ECM**

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

OK:

DTCs are not output.

Post-procedure1

(c) None.

NEXT END