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Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: M20A-FXS (ENGINE CONTROL): SFI SYSTEM: Fuel Pump Control Circuit; 2023 - 2024 MY Prius Prius Prime [03/2023 -]		

Fuel Pump Control Circuit

DESCRIPTION

The fuel pump (for low pressure side) circuit consists of the ECM, fuel pump (for low pressure side) and fuel pump control ECU (which operates the fuel pump (for low pressure side)). Based on the engine output, the ECM determines the fuel pump speed. The speed is then converted to a duty signal and sent to the fuel pump control ECU. Based on the signal sent from the ECM, the fuel pump control ECU adjusts the fuel pump (for low pressure side) operation speed.

WIRING DIAGRAM

Refer to DTC P062712.

Click here INFO

CAUTION / NOTICE / HINT

NOTICE:

Inspect the fuses for circuits related to this system before performing the following procedure.

PROCEDURE

1.	**CHECK FUEL LEAK**

(a) Check around and beneath the vehicle for fuel leaks, fumes, etc.

OK:

No fuel leaks present.

NG ▶ **REPAIR OR REPLACE FUEL LEAK POINT**

OK ▼

2.	**PERFORM ACTIVE TEST USING GTS (ACTIVATE THE CIRCUIT RELAY (BRUSHLESS))**

(a) Check whether the fuel pump operating sound occurs when performing the Active Test on the GTS.

Powertrain > Engine > Active Test

TESTER DISPLAY
Activate the Circuit Relay (Brushless)

Standard:

GTS OPERATION	STANDARD
ON	Operating sounds can be heard from fuel pump (for low pressure side)

NG ▶ **GO TO STEP 8**

OK ▼

3.	**PERFORM ACTIVE TEST USING GTS (CONTROL THE FUEL PUMP DUTY RATIO (BRUSHLESS))**

(a) Install the fuel pressure gauge (for low pressure line of low pressure side).

Click here INFO

(b) Compare the values in the Data List using the GTS and the fuel pressure gauge when the Active Test was performed.

Powertrain > Engine > Active Test

ACTIVE TEST DISPLAY
Control the Fuel Pump Duty Ratio (Brushless)

DATA LIST DISPLAY
Fuel Pressure (Low) / Fuel Pressure 2

Standard:

GTS OPERATION	STANDARD
Low	Data List value and fuel pressure gauge are within +/-50 kPag of each other
High	

NG ▶ **REPLACE NO. 2 FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE)**

OK

4.	**READ VALUE USING GTS (FUEL PRESSURE)**

(a) Read the values displayed on the GTS while the engine is cranking.

Powertrain > Engine > Data List

TESTER DISPLAY
Target Fuel Pressure (Low) / Target Fuel Pressure 2
Fuel Pressure (Low) / Fuel Pressure 2
Low Fuel Pressure Sensor

RESULT	PROCEED TO
Low Fuel Pressure Sensor value is within +/- 65 kPag of the Target Fuel Pressure (Low) / Target Fuel Pressure 2	A
Low Fuel Pressure Sensor value is more than 65 kPag higher than the target fuel pressure (low) / Target Fuel Pressure 2	B
Low Fuel Pressure Sensor value is more than 65 kPag lower than the target fuel pressure (low) / Target Fuel Pressure 2	C

B **REPLACE FUEL PUMP (FOR LOW PRESSURE SIDE)**

for HEV Model: Click here INFO

for PHEV Model: Click here INFO

HINT:

Relief blockage such as clogging of the jet pump is suspected.

C **GO TO STEP 6**

A

5.	**CHECK FUEL PRESSURE**

(a) Install the fuel pressure gauge (for low pressure line of low pressure side).

Click here INFO

(b) Put the engine in Inspection Mode (Maintenance Mode).

Click here INFO

(c) Start the engine.

(d) Measure the fuel pressure at idle.

Standard Fuel Pressure:

300 to 640 kPa (3.1 to 6.5 kgf/cm ^{2} , 44 to 93 psi)

HINT:

Refer to Standard Idle Speed.

Click here INFO

(e) Stop the engine.

(f) Check that the fuel pressure remains as specified for 5 minutes.

Standard Fuel Pressure:

98 kPa (1.0 kgf/cm ^{2} , 14.2 psi) or more

OK ▶ **PROCEED TO NEXT SUSPECTED AREA SHOWN IN PROBLEM SYMPTOMS TABLE**

NG ▶ **REPLACE FUEL PUMP (FOR LOW PRESSURE SIDE)**

for HEV Model: Click here INFO

for PHEV Model: Click here INFO

6.	**CHECK SHORTAGE OF FUEL**

(a) Check the amount of fuel remaining.

HINT:

- No fuel remains in the fuel tank: Malfunction of the fuel sender gauge assembly is suspected.
- Only the fuel pump side fuel chamber has no fuel remaining: Malfunction of the jet pump is suspected.
- Fuel remains in the fuel tank: Malfunction of the fuel pump (for low pressure side) is suspected.

NEXT ▼

7.	**REPLACE FUEL PUMP (FOR LOW PRESSURE SIDE)**

for HEV Model: Click here INFO

for PHEV Model: Click here INFO

NEXT ▶ END

8.	**PERFORM ACTIVE TEST USING GTS (FUEL PUMP SINGLE PHASE ENERGIZATION)**

(a) Disconnect the fuel pump (for low pressure side) connector.

(b) Operate the fuel pump control ECU using the Active Test function and measure the voltage according to the value(s) in the table below.

Powertrain > Engine > Active Test

TESTER DISPLAY
Fuel Pump Single Phase Energization

Standard Voltage:

EWD INFO

Click Location & Routing(R50)
Click Connector(R50)

TESTER CONNECTION	GTS OPERATION	SPECIFIED CONDITION
R50-3 (BLPU) - Body ground	U Phase	4.4 to 8.4 V*
R50-4 (BLPV) - Body ground	V Phase	4.4 to 8.4 V*
R50-2 (BLPW) - Body ground	W Phase	4.4 to 8.4 V*

HINT:

- *: This Active Test restricts the fuel pump control ECU output duty cycle to 50%. Therefore, the output voltage of the fuel pump control ECU will be approximately 50% of the power source voltage.
- Before performing this inspection, check that the auxiliary battery voltage is between 11 and 14 V (not depleted).

NG ▶ GO TO STEP 10

OK ▼

9.	**REPLACE FUEL PUMP (FOR LOW PRESSURE SIDE)**

for HEV Model: Click here INFO

for PHEV Model: Click here INFO

NEXT ▶ END

10.	**CHECK HARNESS AND CONNECTOR (FUEL PUMP CONTROL ECU - FUEL PUMP (FOR LOW PRESSURE SIDE))**

(a) Disconnect the fuel pump control ECU connector.

(b) Disconnect the fuel pump (for low pressure side) connector.

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

Standard Resistance:

EWD INFO

Click Location & Routing(R28,R50)
Click Connector(R28)
Click Connector(R50)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
R28-2 (FPU) - R50-3 (BLPU)	Always	Below 1 Ω
R28-3 (FPV) - R50-4 (BLPV)	Always	Below 1 Ω
R28-4 (FPW) - R50-2 (BLPW)	Always	Below 1 Ω
R28-2 (FPU) or R50-3 (BLPU) - Body ground and other terminals	Always	10 kΩ or higher
R28-3 (FPV) or R50-4 (BLPV) - Body ground and other terminals	Always	10 kΩ or higher
R28-4 (FPW) or R50-2 (BLPW) - Body ground and other terminals	Always	10 kΩ or higher

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

OK ▼

11.	**CHECK HARNESS AND CONNECTOR (POWER SOURCE OF FUEL PUMP CONTROL ECU)**

(a) Disconnect the fuel pump control ECU connector.

(b) Turn the ignition switch to ON.

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

Standard Voltage:

EWD INFO

Click Location & Routing(R27)
Click Connector(R27)

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
R27-1 (+B) - R27-3 (GND)	Ignition switch ON	11 to 14 V

NG ▶ **GO TO STEP 14**

OK ▼

12.	**INSPECT ECM (FPC TERMINAL)**

(a) Disconnect the fuel pump control ECU connector.

(b) Operate the fuel pump control ECU using the Active Test function and measure the resistance according to the value(s) in the table below.

Powertrain > Engine > Active Test

TESTER DISPLAY
Fuel Pump Single Phase Energization

Standard Resistance:

EWD INFO

Click Location & Routing(R27)
Click Connector(R27)

TESTER CONNECTION	GTS OPERATION	SPECIFIED CONDITION
R27-2 (FPC) - Body ground	Before Active Test → During Active Test	Before Active Test: Resistance is stable → During Active Test: Resistance fluctuates*

HINT:

*: Using the Active Test, duty control of the transistors in the ECM will be performed. Due to the duty control, resistance of the FPC terminal will be unstable during the Active Test. If the resistance is stable before the Active Test and fluctuates while performing the Active Test, it can be determined that the transistor is operating. If the transistor does not operate during the Active Test, the ECM may be malfunctioning.

OK ▶ **REPLACE FUEL PUMP CONTROL ECU**

NG ▼

13.	**CHECK HARNESS AND CONNECTOR (FUEL PUMP CONTROL ECU - ECM)**

(a) Disconnect the fuel pump control ECU connector.

(b) Disconnect the ECM connector.

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

Standard Resistance:

EWD INFO

Click Location & Routing(R27,A92)
Click Connector(R27)
Click Connector(A92)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
R27-2 (FPC) - A92-16 (FPC)	Always	Below 1 Ω
R27-2 (FPC) or A92-16 (FPC) - Body ground and other terminals	Always	10 kΩ or higher

OK ▶ **REPLACE ECM**

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

14.	**CHECK HARNESS AND CONNECTOR (FUEL PUMP CONTROL ECU - BODY GROUND)**

(a) Disconnect the fuel pump control ECU connector.

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

Standard Resistance:

EWD INFO

Click Location & Routing(R27)
Click Connector(R27)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
R27-3 (GND) - Body ground	Always	Below 1 Ω

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

OK ▼

15.	**CHECK HARNESS AND CONNECTOR (POWER SOURCE VOLTAGE OF EFI-MAIN NO. 2 RELAY)**

(a) Remove the EFI-MAIN NO. 2 relay from the No. 1 engine room relay block and No. 1 junction block assembly.

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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 (EFI-MAIN NO. 2 relay) - Body ground	Always	11 to 14 V

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (AUXILIARY BATTERY - EFI-MAIN NO. 2 RELAY)**

OK ▼

16.	**INSPECT EFI-MAIN NO. 2 RELAY**

Click here INFO

NG ▶ **REPLACE EFI-MAIN NO. 2 RELAY**

OK ▼

17.	**CHECK HARNESS AND CONNECTOR (EFI-MAIN NO. 1 RELAY - EFI-MAIN NO. 2 RELAY)**

(a) Remove the EFI-MAIN NO. 1 relay and EFI-MAIN NO. 2 relay from the No. 1 engine room relay block and No. 1 junction block assembly.

(b) Remove the VVT relay and EFI-MAIN NO. 3 relay from the No. 1 engine room relay block and No. 1 junction block assembly.

HINT:

Remove the VVT relay and EFI-MAIN NO. 3 relay connected between the checked terminals as the coil inside the relay influences the measurement value.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
5 (EFI-MAIN NO. 1 relay) - 2 (EFI-MAIN NO. 2 relay)	Always	Below 1 Ω
5 (EFI-MAIN NO. 1 relay) or 2 (EFI-MAIN NO. 2 relay) - Body ground and other terminals	Always	10 kΩ or higher

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

OK

18.	CHECK HARNESS AND CONNECTOR (EFI-MAIN NO. 2 RELAY - BODY GROUND)

(a) Remove the EFI-MAIN NO. 2 relay from the No. 1 engine room relay block and No. 1 junction block assembly.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 (EFI-MAIN NO. 2 relay) - Body ground	Always	Below 1 Ω

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

OK

19.	CHECK HARNESS AND CONNECTOR (EFI-MAIN NO. 2 RELAY - FUEL PUMP CONTROL ECU)

(a) Remove the EFI-MAIN NO. 2 relay from the No. 1 engine room relay block and No. 1 junction block assembly.

(b) Disconnect the fuel pump control ECU connector.

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

Standard Resistance:

EWD INFO

Click Location & Routing(R27)
Click Connector(R27)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
5 (EFI-MAIN NO. 2 relay) - R27-1 (+B)	Always	Below 1 Ω
5 (EFI-MAIN NO. 2 relay) or R27-1 (+B) - Body ground and other terminals	Always	10 kΩ or higher

OK ▶ **GO TO ECM POWER SOURCE CIRCUIT**

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