Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002BM2E
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: M20A-FXS (ENGINE CONTROL): SFI SYSTEM: P145011,P145015,P14502A,P14502F; Fuel Tank Pressure Sensor Circuit Short to Ground; 2023 - 2024 MY Prius Prius Prime [03/2023 -]		

DTC	**P145011**	**Fuel Tank Pressure Sensor Circuit Short to Ground**

DTC	**P145015**	**Fuel Tank Pressure Sensor Circuit Short to Battery or Open**

DTC	**P14502A**	**Fuel Tank Pressure Sensor Signal Stuck in Range**

DTC	**P14502F**	**Fuel Tank Pressure Sensor Signal Erratic**

DTC SUMMARY

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
P145011	Fuel Tank Pressure Sensor Circuit Short to Ground	The output voltage of the fuel tank pressure sensor is less than 0.15 V for 0.5 seconds or more.	• Fuel tank pressure sensor • Connector/wire harness (fuel tank pressure sensor - ECM) • ECM	Comes on	Engine	A	SAE Code: P1452
P145015	Fuel Tank Pressure Sensor Circuit Short to Battery or Open	The output voltage of the fuel tank pressure sensor is higher than 4.85 V for 0.5 seconds or more.	• Fuel tank pressure sensor • Connector/wire harness (fuel tank pressure sensor - ECM) • ECM	Comes on	Engine	A	SAE Code: P1453
P14502A	Fuel Tank Pressure Sensor Signal Stuck in Range	Fuel tank pressure sensor output voltage does not vary in certain time period.	• Fuel tank pressure sensor • Connector/wire harness (fuel tank pressure sensor - ECM) • ECM	Comes on	Engine	A	SAE Code: P1451

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
P14502F	Fuel Tank Pressure Sensor Signal Erratic	Fuel tank pressure sensor output voltage fluctuates frequently in certain time period.	• Fuel tank pressure sensor • Connector/wire harness (fuel tank pressure sensor - ECM) • ECM	Comes on	Engine	A	SAE Code: P1451

DTC NO.	MONITORING ITEM	DETECTION TIMING	DETECTION LOGIC	SAE CODE
P145011	Fuel tank pressure sensor voltage low	• EVAP monitoring (ignition switch off) • Ignition switch ON	1 trip	P1452
P145015	Fuel tank pressure sensor voltage high			P1453
P14502A	Fuel tank pressure sensor constant voltage (Stuck monitor)	EVAP monitoring (ignition switch off)	2 trip	P1451
P14502F	Fuel tank pressure sensor abnormal voltage fluctuation (Noise monitor)	• EVAP monitoring (ignition switch off) • Ignition switch ON		

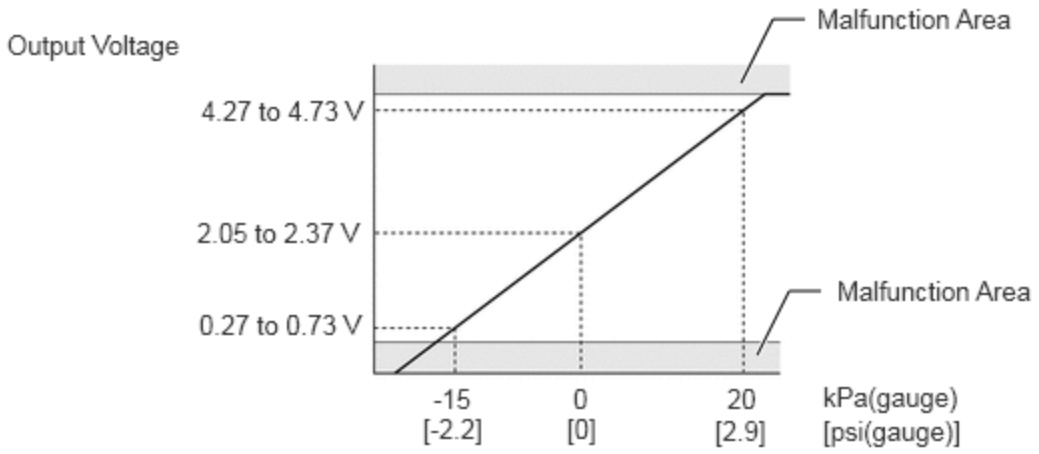
DESCRIPTION

Refer to EVAP (Evaporative Emission) System.

Click here INFO

MONITOR DESCRIPTION

Fuel Tank Pressure Sensor Specification:



1. P145011: Fuel tank pressure sensor voltage low

If the fuel tank pressure sensor output voltage (pressure) is less than 0.15 V: -20.0244 kPa(gauge) [-2.9035 psi(gauge)], the ECM interprets this as an open or short circuit in the fuel tank pressure sensor or its circuit, and stops the EVAP system monitor. If any deterioration has occurred, the ECM will illuminate the MIL and store this DTC (1 trip detection logic).

2. P145015: Fuel tank pressure sensor voltage high

   If the fuel tank pressure sensor output voltage (pressure) is higher than 4.85 V: 55.6341 kPa(gauge) [8.0669 psi(gauge)], the ECM interprets this as an open or short circuit in the pressure sensor or its circuit, and stops the EVAP system monitor. If any deterioration has occurred, the ECM will illuminate the MIL and store this DTC (1 trip detection logic).

3. P14502A: Fuel tank pressure sensor being constant (Stuck monitor)

   If the fuel tank pressure sensor output voltage does not change, the ECM interprets this as the sensor voltage being constant, and stops the EVAP system monitor. The ECM then illuminates the MIL and stores this DTC (2 trip detection logic).

4. P14502F: Fuel tank pressure sensor abnormal voltage fluctuation (Noise monitor)

   If the fuel tank pressure sensor output voltage fluctuates rapidly for 10 seconds, the ECM stops the EVAP system monitor. The ECM interprets this as the fuel tank pressure sensor voltage fluctuating, and stops the EVAP system monitor. The ECM then illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Required Sensors/Components (Main)	Fuel tank pressure sensor
Required Sensors/Components (Related)	-
Frequency of Operation	Once per driving cycle: P1451 (stuck monitor) Continuous: P1451 (noise monitor), P1452 and P1453
Duration	Within 15 minutes: P1451 0.5 seconds: P1452, P1453
MIL Operation	2 driving cycles: P1451 Immediate: P1452, P1453
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

P1451 (Noise Monitoring)

All of the following conditions are met	-
Fuel tank pressure	-15 kPa(gauge) [-2.2 psi(gauge)] or higher, and less than 50 kPa(gauge) [7.3 psi(gauge)]
Auxiliary battery voltage	10.5 V or higher
Intake air temperature	4.4°C (39.9°F) or higher, and less than 50°C (122°F)
Fuel tank pressure sensor malfunction (P1452 and P1453)	Not detected
Either of the following conditions is met	A or B
A. Ignition switch	ON
B. Key-off duration	5 or 7 or 9.5 hours

P1451 (Stuck Monitoring)

Key-off monitor runs when all of the following conditions are met	-
Atmospheric pressure	70 kPa(abs) [10.2 psi(abs)] or higher, and less than 110 kPa(abs) [16 psi(abs)]
Auxiliary battery voltage	10.5 V or higher
Vehicle speed	Less than 4 km/h (2.5 mph)
Ignition switch	Off
Engine condition	Not running
Key-OFF duration	5, 7 or 9.5 hours
Pressure sensor of canister pump module malfunction (P0451, P0452, P0453)	Not detected
Fuel tank pressure sensor malfunction (P1451, P1452, P1453)	Not detected
Purge VSV	Not operated by scan tool
Vent valve	Not operated by scan tool
Fuel vapor-containment valve	Not operated by scan tool
Leak detection pump	Not operated by scan tool
Purge flow before key-OFF	Performed
Engine coolant temperature	4.4°C (39.9°F) or higher, and less than 35°C (95°F)
Intake air temperature	4.4°C (39.9°F) or higher, and less than 35°C (95°F)

P1452 and P1453

All of the following conditions are met	-
Auxiliary battery voltage	7 V or higher
One of the following conditions is met	Condition (a), (b) or (c)
(a) Ignition switch	On
(b) ECM started by	Internal engine off timer
(c) ECM started by	Fuel lid opener switch

TYPICAL MALFUNCTION THRESHOLDS

P1451: Fuel Tank Pressure Sensor Noise

Frequency that fuel tank pressure change is 0.3 kPa(gauge) [0.04 psi(gauge)] or higher	10 times or more in 10 seconds

P1451: Fuel Tank Pressure Sensor Stuck

Either of the following conditions 1 or 2 is met	-

1. Following condition met when fuel tank pressure is -2.5 kPa(gauge) [-0.4 psi(gauge)] or less, or 3 kPa(gauge) [0.4 psi(gauge)] or higher	-
Fuel tank pressure change while fuel vapor-containment valve and vent valve are closed	Less than 0.35 kPa(gauge) [0.051 psi(gauge)]
2. Following condition met when fuel tank pressure is higher than -2.5 kPa(gauge) [-0.4 psi(gauge)], and less than 3 kPa(gauge) [0.4 psi(gauge)]	-
Fuel tank pressure change when vacuum introduction for fuel tank	Less than 0.5 kPa(gauge) [0.07 psi(gauge)]

P1452: Fuel Tank Pressure Sensor Range Check (Low Voltage)

Fuel tank pressure sensor voltage [Fuel tank pressure]	Less than 0.15 V [Less than -20.0244 kPa(gauge) (-2.9035 psi(gauge))]

P1453: Fuel Tank Pressure Sensor Range Check (High Voltage)

Fuel tank pressure sensor voltage [Fuel tank pressure]	Higher than 4.85 V [Higher than 55.6341 kPa(gauge) (8.0669 psi(gauge))]

CONFIRMATION DRIVING PATTERN

NOTICE:

- The Evaporative System Check (Automatic Mode) consists of 9 steps performed automatically by the GTS. It takes a maximum of approximately 40 minutes.
- Do not perform the Evaporative System Check when the fuel tank is more than 90% full because the cut-off valve may be closed, making the fuel tank leak check unavailable.
- Do not start the engine during this operation.
- When the temperature of the fuel is 35°C (95°F) or higher, a large amount of vapor will form and any check result will be inaccurate. When performing the Evaporative System Check, keep the fuel temperature less than 35°C (95°F).

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. Turn the ignition switch to ON [A].
4. Enter the following menus: Powertrain / Engine / Utility / Evaporative System Check / Automatic Mode [B].
5. After the "Evaporative System Check" is completed, check for All Readiness by entering the following menus: Powertrain / Engine / Utility / All Readiness.
6. Input the DTC: P145011, P145015, P14502A or P14502F.
7. 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.
   - [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

Refer to DTC P045011.

Click here INFO

CAUTION / NOTICE / HINT

NOTICE:

- When a vehicle is brought into the workshop, leave it as it is. Do not change the vehicle condition. For example, do not tighten the fuel tank cap assembly.
- The GTS is required to conduct the following diagnostic troubleshooting procedure.
- 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.	**CONFIRM DTC AND FUEL TANK PRESSURE**

(a) Read the DTCs.

Powertrain > Engine > Trouble Codes

RESULT	PROCEED TO
P145011 is output	A
P145015 is output	B
P14502A or P14502F is output	C

DISPLAY (DTC OUTPUT)	DATA LIST DISPLAY (VAPOR PRESSURE PUMP)	SUSPECTED TROUBLE AREA
P145011	Less than -20.0244 kPa(gauge) [-2.9035 psi(gauge)]	• Wire harness/connector (fuel tank pressure sensor - ECM) • Fuel tank pressure sensor • Short in ECM circuit
P145015	Higher than 55.6341 kPa(gauge) [8.0669 psi(gauge)]	• Wire harness/connector (fuel tank pressure sensor - ECM) • Fuel tank pressure sensor • Open in ECM circuit
P14502A P14502F	-	Fuel tank pressure sensor

B ▶ **GO TO STEP 4**

C ▶ **GO TO STEP 5**

A

▼

2.	**CHECK HARNESS AND CONNECTOR (FUEL TANK PRESSURE SENSOR - ECM)**

Pre-procedure1

(a) Turn the ignition switch off.

(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(A92)
Click Connector(A92)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
A92-55 (PTNK) - Body ground	Always	Below 10 Ω	Ω

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	SUSPECTED TROUBLE AREA
A92-[55] (PTNK) - Body ground and other terminals	Always	Below 10 Ω	• Wire harness or connector (fuel tank pressure sensor - ECM) • Short in fuel tank pressure sensor circuit
		10 kΩ or higher	• Wire harness or connector (fuel tank pressure sensor - ECM) • Short in ECM circuit

Post-procedure1

(d) None.

NG ▶ **GO TO STEP 7**

OK ▼

3.	CHECK HARNESS AND CONNECTOR (FUEL TANK PRESSURE SENSOR - ECM)

Pre-procedure1

(a) Disconnect the fuel tank pressure 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(A92)
Click Connector(A92)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
A92-55 (PTNK) - Body ground	Always	10 kΩ or higher	kΩ

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	SUSPECTED TROUBLE AREA
A92-[55] (PTNK) - Body ground and other terminals	Always	10 kΩ or higher	Short in fuel tank pressure sensor circuit
		Below 10 Ω	Wire harness or connector (fuel tank pressure sensor - ECM)

Post-procedure1

(d) None.

NG ▶ **GO TO STEP 6**

OK ▼

4.	CHECK HARNESS AND CONNECTOR (FUEL TANK PRESSURE SENSOR - ECM)

Pre-procedure1

(a) Disconnect the fuel tank pressure 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(t1)
Click Connector(t1)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
t1-3 (PTNK) - Body ground	Ignition switch ON	4.75 to 5.25 V	V

Post-procedure1

(d) Turn the ignition switch off.

Pre-procedure2

(e) None

Procedure2

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

Standard Resistance:

EWD INFO

Click Location & Routing(t1)
Click Connector(t1)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
t1-1 (VC) - Body ground	Always	Below 10 Ω	Ω

RESULT	SUSPECTED TROUBLE AREA
Voltage and resistance within standard ranges	Open in fuel tank pressure sensor circuit
Voltage and resistance outside standard ranges	Open in wire harness or connector (fuel tank pressure sensor - ECM)

Post-procedure2

(g) None

NG ▶ **GO TO STEP 6**

OK

▼

5.	**REPLACE FUEL TANK PRESSURE SENSOR**

HINT:

for HEV Model: Click here INFO

for PHEV Model: Click here INFO

NEXT ▶ **GO TO STEP 8**

6.	**REPAIR OR REPLACE HARNESS OR CONNECTOR (FUEL TANK PRESSURE SENSOR - ECM)**

NEXT ▶ **GO TO STEP 8**

7.	**REPLACE ECM**

HINT:

Click here INFO

NEXT

▼

8.	**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

9.	**CHECK WHETHER DTC OUTPUT RECURS (AFTER REPAIR)**

Pre-procedure1

(a) Perform the Evaporative System Check using the GTS, referring to the Confirmation Driving Pattern.

Procedure1

(b) Check the DTC judgment result.

Powertrain > Engine > Utility

TESTER DISPLAY
All Readiness

GTS 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

(c) Input the DTC: P145011, P145015, P14502A or P14502F.

Post-procedure1

(d) None.

NEXT **END**