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|---|---|---|
| **Last Modified:** 12-04-2024 | 6.11:8.1.0 | **Doc ID:** RM100000002BM1A |
| **Model Year Start:** 2023 | **Model:** Prius Prime | **Prod Date Range:** [03/2023 - ] |
| **Title:** M20A-FXS (ENGINE CONTROL): SFI SYSTEM: P21352B; Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation Signal Cross Coupled; 2023 - 2024 MY Prius Prius Prime [03/2023 - ] | | |

| | | |
|---|---|---|
| **DTC** | **P21352B** | **Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation Signal Cross Coupled** |

# DESCRIPTION

Refer to DTC P012011.

Click here INFO

| DTC NO. | DETECTION ITEM | DTC DETECTION CONDITION | TROUBLE AREA | MIL | DTC OUTPUT FROM | PRIORITY | NOTE |
|---|---|---|---|---|---|---|---|
| P21352B | Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation Signal Cross Coupled | The difference between the output voltage of VTA1 and VTA2 is 0.02 V or less for 2 seconds or more (1 trip detection logic). | • Throttle position sensor (throttle body with motor assembly)<br>• Short between VTA1 and VTA2 circuits<br>• Open in ETA circuit<br>• Open in VCTA circuit<br>• ECM | Comes on | Engine | A | SAE Code: P2135 |

# MONITOR DESCRIPTION

VTA1 and VTA2 should never be close to the same voltage level. If VTA1 is within 0.02 V or less of VTA2 for 2 seconds or more, the ECM will determine there is a short in the sensor circuit, illuminate the MIL and store this DTC.

# MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P2135: Throttle position sensor range check (correlation) |
| Required Sensors/Components (Main) | Throttle position sensor |
| Required Sensors/Components (Related) | - |
| Frequency of Operation | Continuous |
| Duration | 2 seconds |
| 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 | 8 V or higher |
| Ignition switch | ON |

## TYPICAL MALFUNCTION THRESHOLDS

| | |
|---|---|
| Difference between VTA1 and VTA2 voltages | 0.02 V or less |

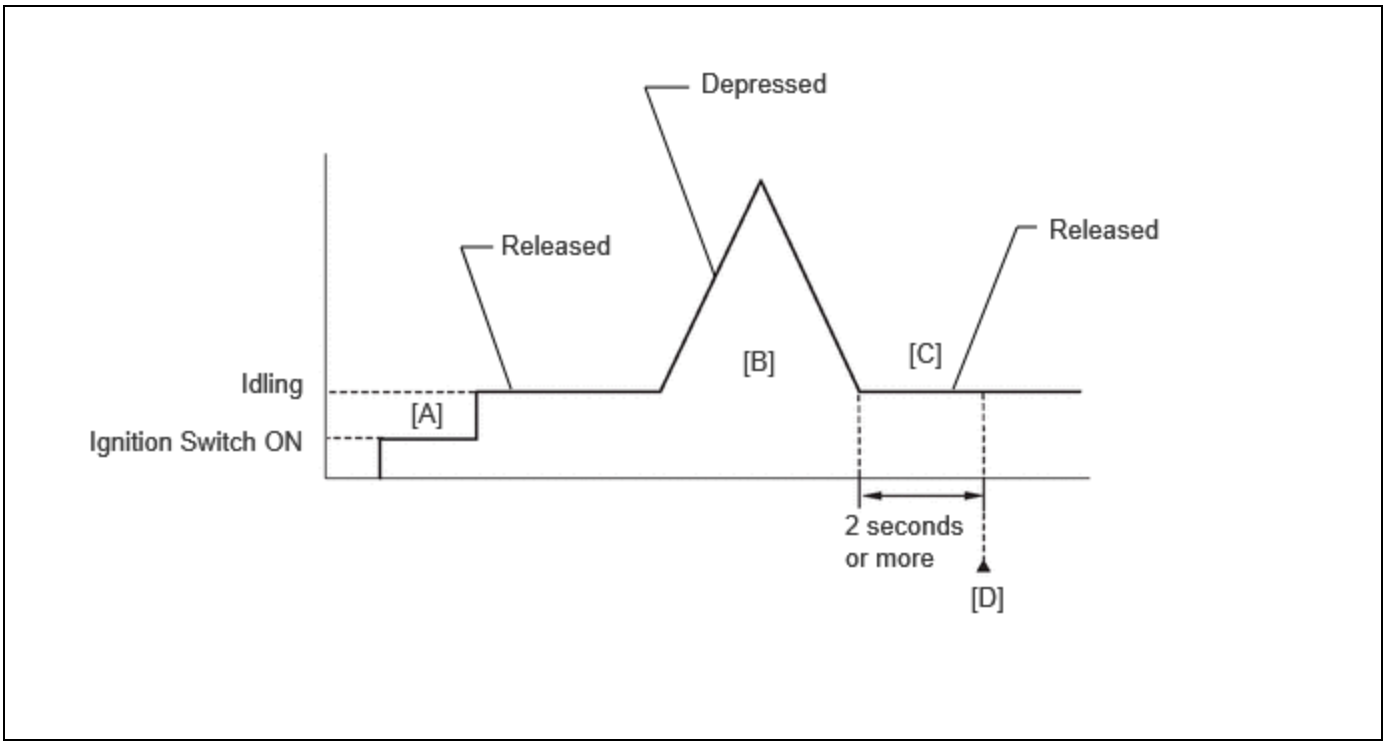
## CONFIRMATION DRIVING PATTERN

**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. Turn the ignition switch to ON [A].
4. Put the engine in Inspection Mode (Maintenance Mode).

   Click here INFO
5. Start the engine.

6. With the vehicle stationary, fully depress and release the accelerator pedal [B].

**HINT:**

During charge control, the engine speed is set at idle. Therefore, the engine speed will not increase when the accelerator pedal is depressed. In this case, perform step [B] after charge control has completed.

7. Idle the engine for 2 seconds or more [C].
8. Enter the following menus: Powertrain / Engine / Trouble Codes [D].
9. 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.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P21352B.
12. 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 [B] 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.

## FAIL-SAFE

When this DTC is stored, the ECM enters fail-safe mode. During fail-safe mode, the ECM cuts the current to the throttle actuator, and the throttle valve is returned to a 7.5° throttle valve opening angle by the return spring. The ECM then adjusts the engine output, by controlling the fuel injection (intermittent fuel cut) and ignition timing, in accordance with the engine torque request signal sent from the hybrid vehicle control ECU, to allow the vehicle to continue being driven at a minimal speed. If the accelerator pedal is depressed firmly and gently, the vehicle can be driven slowly.

Fail-safe mode continues until a pass condition is detected, and the ignition switch is turned off.

## WIRING DIAGRAM

Refer to DTC P012011.

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. | **READ VALUE USING GTS (THROTTLE POSITION SENSOR VOLTAGE)** |

(a) Read the values displayed on the GTS.

**Powertrain > Engine > Data List**

| TESTER DISPLAY |
|---|
| Throttle Position Sensor No.1 Voltage |
| Throttle Position Sensor No.2 Voltage |

| RESULT | PROCEED TO |
|---|---|
| The value of Throttle Position Sensor No.1 Voltage and Throttle Position Sensor No.2 Voltage are less than 0.56 V | A |
| The value of Throttle Position Sensor No.1 Voltage and Throttle Position Sensor No.2 Voltage are higher than 4.535 V | B |
| The value of Throttle Position Sensor No.1 Voltage and Throttle Position Sensor No.2 Voltage are 0.56 V or more, and 4.535 V or less | C |

**B** ▶ **GO TO STEP 4**

**C** ▶ **GO TO STEP 6**

**A** ▼

| | |
|---|---|
| 2. | **CHECK HARNESS AND CONNECTOR (THROTTLE POSITION SENSOR - ECM)** |

Pre-procedure1

(a) Disconnect the throttle body with motor assembly 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(C23,C52)**
**Click Connector(C23)**
**Click Connector(C52)**

| TESTER CONNECTION | CONDITION | SPECIFIED CONDITION | RESULT |
|---|---|---|---|
| C23-2 (VC) - C52-109 (VCTA) | Always | Below 1 Ω | Ω |
| C23-1 (VTA) - C52-108 (VTA1) | Always | Below 1 Ω | Ω |
| C23-3 (VTA2) - C52-87 (VTA2) | Always | Below 1 Ω | Ω |
| C23-4 (E2) - C52-110 (ETA) | Always | Below 1 Ω | Ω |
| C23-2 (VC) or C52-109 (VCTA) - Body ground and other terminals | Always | 10 kΩ or higher | kΩ |
| C23-1 (VTA) or C52-108 (VTA1) - Body ground and other terminals | Always | 10 kΩ or higher | kΩ |
| C23-3 (VTA2) or C52-87 (VTA2) - Body ground and other terminals | Always | 10 kΩ or higher | kΩ |

Post-procedure1

(d) None.

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

**OK** ▼

| | |
|---|---|
| **3.** | **INSPECT TERMINAL VOLTAGE (POWER SOURCE OF THROTTLE POSITION SENSOR)** |

Pre-procedure1

(a) Disconnect the throttle body with motor assembly 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(C23)**
**Click Connector(C23)**

| TESTER CONNECTION | CONDITION | SPECIFIED CONDITION | RESULT |
|---|---|---|---|
| C23-2 (VC) - C23-4 (E2) | Ignition switch ON | 4.5 to 5.5 V | V |

Post-procedure1

(d) None.

**OK** ▶ **REPLACE THROTTLE BODY WITH MOTOR ASSEMBLY**

**NG** ▶ **REPLACE ECM**

| 4. | CHECK HARNESS AND CONNECTOR (GROUND CIRCUIT) |
|---|---|

**HINT:**

Make sure that the connector is properly connected. If it is not, securely connect it and check for DTCs again.

Pre-procedure1

(a) Disconnect the throttle body with motor assembly connector.

Procedure1

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

Standard Resistance:

EWD INFO

**Click Location & Routing(C23)**
**Click Connector(C23)**

| TESTER CONNECTION | CONDITION | SPECIFIED CONDITION | RESULT |
|---|---|---|---|
| C23-4 (E2) - Body ground | Always | Below 1 Ω | Ω |

Post-procedure1

(c) None.

**OK** ▶ **REPLACE THROTTLE BODY WITH MOTOR ASSEMBLY**

**NG** ▼

| 5. | CHECK HARNESS AND CONNECTOR (THROTTLE POSITION SENSOR - ECM) |
|---|---|

Pre-procedure1

(a) Disconnect the throttle body with motor assembly 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(C23,C52)**
**Click Connector(C23)**
**Click Connector(C52)**

| TESTER CONNECTION | CONDITION | SPECIFIED CONDITION | RESULT |
|---|---|---|---|
| C23-2 (VC) - C52-109 (VCTA) | Always | Below 1 Ω | Ω |
| C23-1 (VTA) - C52-108 (VTA1) | Always | Below 1 Ω | Ω |
| C23-3 (VTA2) - C52-87 (VTA2) | Always | Below 1 Ω | Ω |
| C23-4 (E2) - C52-110 (ETA) | Always | Below 1 Ω | Ω |
| C23-2 (VC) or C52-109 (VCTA) - Other terminals | Always | 10 kΩ or higher | kΩ |
| C23-1 (VTA) or C52-108 (VTA1) - Other terminals | Always | 10 kΩ or higher | kΩ |
| C23-3 (VTA2) or C52-87 (VTA2) - Other terminals | Always | 10 kΩ or higher | kΩ |

Post-procedure1

(d) None.

**OK** ▶ **REPLACE ECM**

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

| | |
|---|---|
| **6.** | **CHECK HARNESS AND CONNECTOR (SHORT CIRCUIT)** |

Pre-procedure1

(a) Disconnect the throttle body with motor assembly connector.

Procedure1

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

Standard Resistance:

EWD INFO

**Click Location & Routing(C23)**
**Click Connector(C23)**

| TESTER CONNECTION | CONDITION | SPECIFIED CONDITION | RESULT |
|---|---|---|---|
| C23-1 (VTA) - C23-3 (VTA2) | Always | 10 kΩ or higher | kΩ |

Post-procedure1

(c) None.

**OK** ▶ **REPLACE THROTTLE BODY WITH MOTOR ASSEMBLY**

**NG** ▼

| | |
|---|---|
| **7.** | **CHECK HARNESS AND CONNECTOR (SHORT CIRCUIT)** |

Pre-procedure1

(a) Disconnect the throttle body with motor assembly 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(C23)**
**Click Connector(C23)**

| TESTER CONNECTION | CONDITION | SPECIFIED CONDITION | RESULT |
|---|---|---|---|
| C23-1 (VTA) - C23-3 (VTA2) | Always | 10 kΩ or higher | kΩ |

**HINT:**

If the resistance changes when the ECM connector is disconnected, there is an internal short in the ECM.

Post-procedure1

(d) None.

**OK** ▶ **REPLACE ECM**

**NG** ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (THROTTLE POSITION SENSOR - ECM)**