Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002BLUY
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: M20A-FXS (ENGINE CONTROL): SFI SYSTEM: P012011; Throttle / Pedal Position Sensor / Switch "A" Circuit Short to Ground; 2023 - 2024 MY Prius Prius Prime [03/2023 -]		

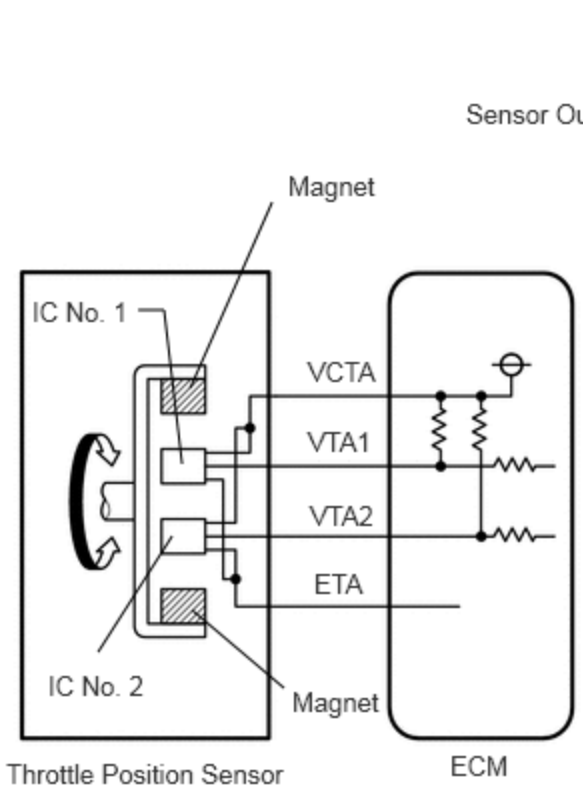
DTC	**P012011**	**Throttle / Pedal Position Sensor / Switch "A" Circuit Short to Ground**

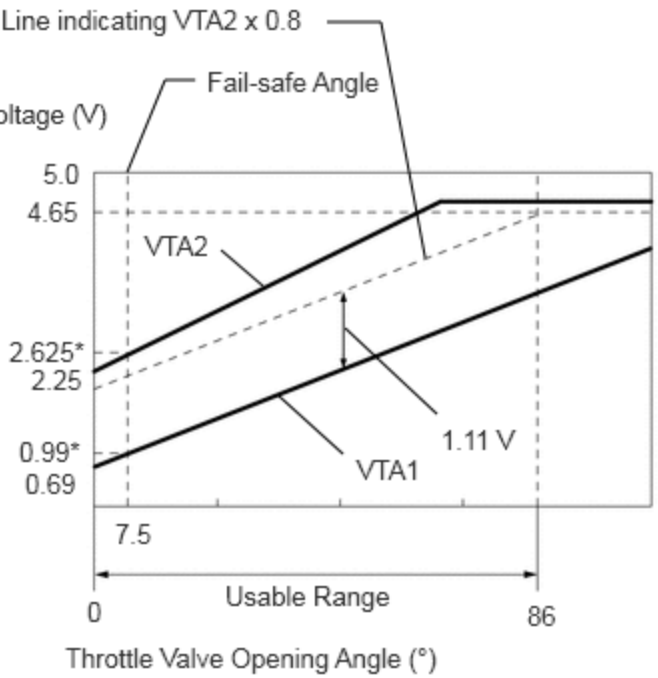
DESCRIPTION

The throttle position sensor is built into the throttle body with motor assembly and detects the opening angle of the throttle valve. This sensor is a non-contact type sensor. It uses Hall-effect elements in order to yield accurate signals even in extreme driving conditions, such as at high speeds as well as very low speeds.

The throttle position sensor has 2 sensor circuits, VTA1 and VTA2, each of which transmits a signal. VTA1 is used to detect the throttle valve angle and VTA2 is used to detect malfunctions in VTA1. The sensor signal voltages vary between 0 V and 5 V in proportion to the throttle valve opening angle, and are transmitted to the VTA1 and VTA2 terminals of the ECM.

As the valve closes, the sensor output voltage decreases and as the valve opens, the sensor output voltage increases. The ECM calculates the throttle valve opening angle according to these signals and controls the throttle actuator in response to a request from the hybrid system. These signals are also used in calculations such as air fuel ratio correction, power increase correction and fuel-cut control.





*: During fail-safe control

Note:

The throttle valve opening angle transmitted through sensor terminal VTA1 is expressed as a percentage.

Between 10% and 22%: Throttle valve fully closed

Between 64% and 96%: Throttle valve fully open

Approximately 19.8%: Fail-safe angle (7.5°)

Characteristics of sensor output:

VTA2 x 0.8 is approximately equal to VTA1 + 1.11 V

HINT:

- When throttle position sensor DTCs are output, check the throttle valve opening angle using the GTS. Enter the following menus: Powertrain / Engine / Data List / Throttle Position Sensor No.1 Voltage and Throttle Position Sensor No.2 Voltage.
- Throttle Position Sensor No.1 Voltage is the VTA1 signal, and Throttle Position Sensor No.2 Voltage is the VTA2 signal.

Reference (Normal Condition):

WHEN ACCELERATOR PEDAL FULLY RELEASED		WHEN ACCELERATOR PEDAL FULLY DEPRESSED (ENGINE RUNNING)	
THROTTLE POSITION SENSOR NO.1 VOLTAGE (VTA1)	THROTTLE POSITION SENSOR NO.2 VOLTAGE (VTA2)	THROTTLE POSITION SENSOR NO.1 VOLTAGE (VTA1)	THROTTLE POSITION SENSOR NO.2 VOLTAGE (VTA2)
0.6 to 1.1 V	2.1 to 3.1 V	3.2 to 4.8 V (Not fail-safe)	4.6 to 4.98 V (Not fail-safe)

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
P012011	Throttle / Pedal Position Sensor / Switch "A" Circuit Short to Ground	The output voltage of VTA1 is less than 0.56 V for 2 seconds or more (1 trip detection logic).	• Throttle position sensor (throttle body with motor assembly) • Short in VTA1 circuit • Open in VCTA circuit • ECM	Comes on	Engine	A	SAE Code: P0122

MONITOR DESCRIPTION

The ECM uses the throttle position sensor to monitor the throttle valve opening angle. If the VTA1 terminal voltage is less than the threshold, the ECM will illuminate the MIL and store this DTC.

MONITOR STRATEGY

Related DTCs	P0122: Throttle position sensor 1 range check (low voltage)
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

VTA1 voltage	Less than 0.56 V

CONFIRMATION DRIVING PATTERN

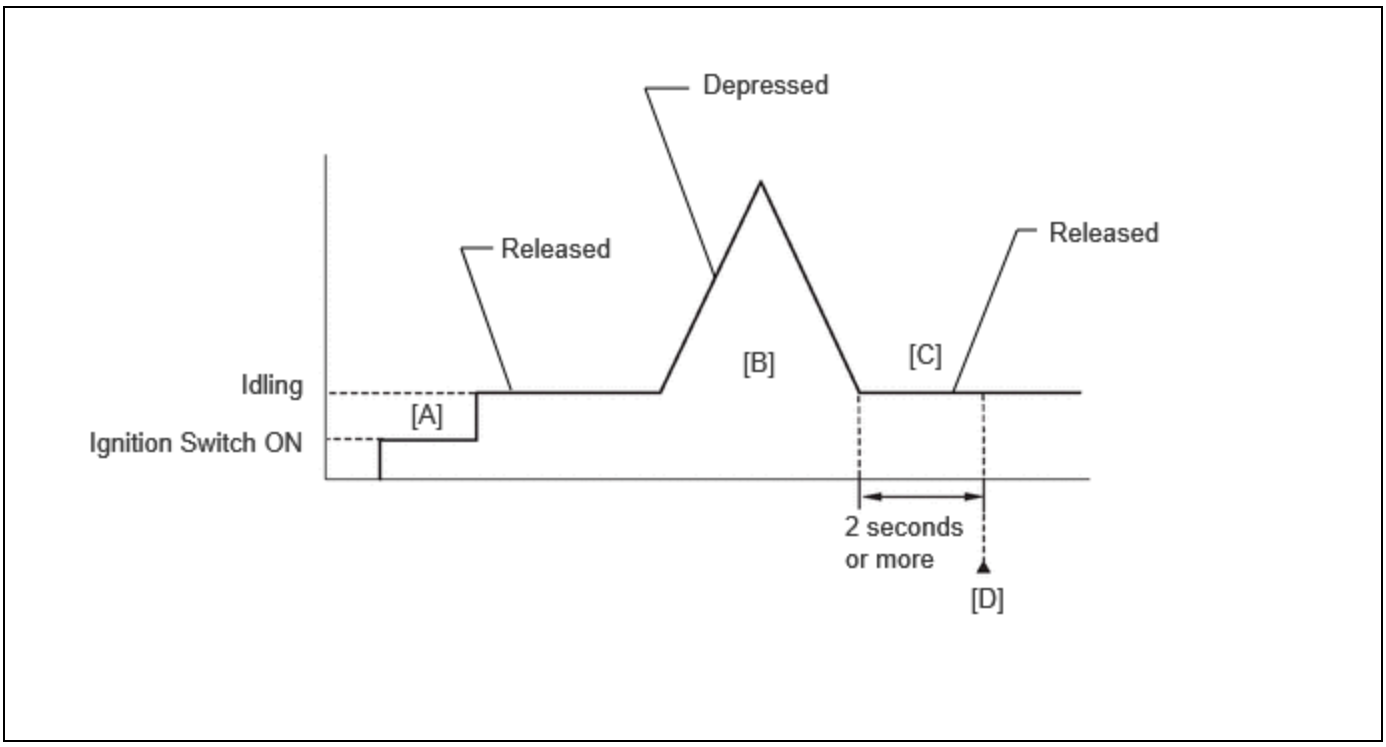
HINT:

- 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: P012011.
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.

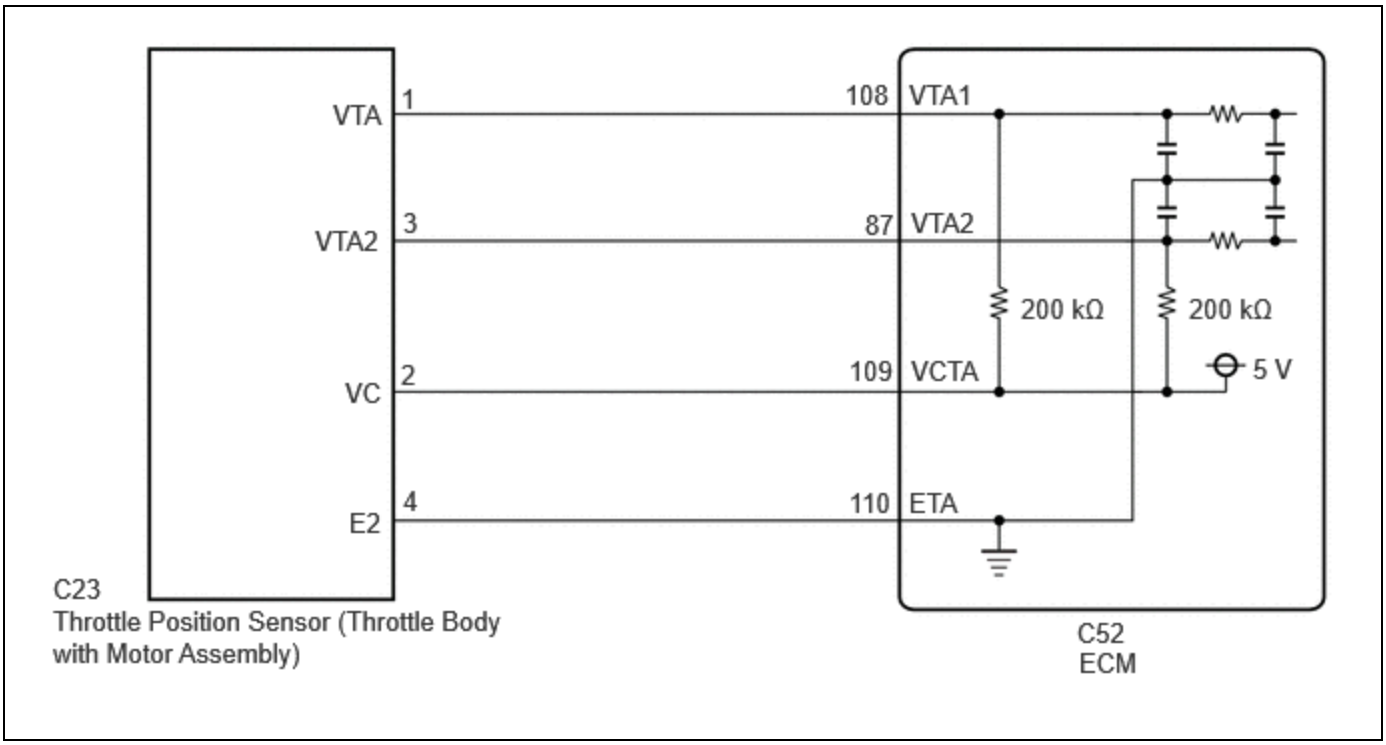
- When clearing the permanent DTCs, do not disconnect the cable from the auxiliary battery terminal or attempt to clear the DTCs during this procedure, as doing so will clear the universal trip and normal judgment histories.

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



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 NO.1 VOLTAGE)**

Pre-procedure1

(a) Read the values displayed on the GTS.

Powertrain > Engine > Data List

TESTER DISPLAY
Throttle Position Sensor No.1 Voltage

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

Procedure1

(c) Compare the value of the Data List item Throttle Position Sensor No.1 Voltage after disconnecting the throttle body with motor assembly connector to the value when the connector was connected.

RESULT	PROCEED TO
Changes from less than 0.56 V to higher than 4.535 V	A
Does not change from less than 0.56 V	B

Post-procedure1

(d) None.

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

B ▼

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) or C52-108 (VTA1) - Body ground	Always	10 kΩ or higher	kΩ

Post-procedure1

(d) None.

OK ▶ **REPLACE ECM**

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