Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM1000000028ZVM
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [12/2022 -]
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM (for M20A-FXS): P0D2D1C; Drive Motor "A" Inverter Voltage Sensor Voltage Out of Range; 2023 - 2024 MY Prius Prius Prime [12/2022 -]		

DTC	**P0D2D1C**	**Drive Motor "A" Inverter Voltage Sensor Voltage Out of Range**

DTC SUMMARY

MALFUNCTION DESCRIPTION

The hybrid vehicle control ECU detects a VH sensor malfunction.

The cause of this malfunction may be one of the following:

Inverter voltage sensor internal circuit malfunction

- Voltage sensor malfunction
- Motor generator control ECU (MG ECU) malfunction
- Communication (wire harness) malfunction

High voltage system malfunction

Inverter with converter assembly malfunction

Air conditioning system malfunction

Compressor with motor assembly malfunction

DESCRIPTION

For a description of the inverter.

Click here INFO

The signal line from the inverter voltage (VH) sensor is connected to the MG ECU, which is built into the inverter with converter assembly.

HINT:

The term "drive motor A" indicates the motor (MG2).

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
P0D2D1C	Drive Motor "A" Inverter Voltage Sensor Voltage Out of Range	Inverter voltage (VH) sensor performance malfunction: When not boosting, difference between "VH-Voltage after	• Inverter with converter assembly • Air conditioning system	Comes on	Master Warning: Comes on	Hybrid Control	A	SAE Code: P0D2E

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
		Boosting" and "VL-Voltage before Boosting" is large and difference between "VH-Voltage after Boosting" and "Hybrid/EV Battery Voltage" is large. (1 trip detection logic)						

MONITOR DESCRIPTION

The hybrid vehicle control ECU monitors the inverter voltage (VH) sensor signal. If the hybrid vehicle control ECU detects a malfunction of the sensor signal, the hybrid vehicle control ECU interprets this as a VH sensor failure. The hybrid vehicle control ECU will illuminate the MIL and store a DTC.

MONITOR STRATEGY

Related DTCs	P0D2E (INF P0D2D1C): Drive Motor "A" Inverter Voltage Sensor Circuit Range/Performance
Required sensors/components	Motor inverter
Frequency of operation	-
Duration	-
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not stored	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Hybrid vehicle control ECU	P0D2E (INF P0D2D1C) is not detected

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 2 minutes or more.
3. Turn the ignition switch to ON (READY). [*1]
4. With the shift lever in D, depress both the accelerator pedal and brake pedal at the same time to raise the "Hybrid/EV Battery SOC" to a sufficient level. [*2]
5. Move the shift lever to P, check that the engine is stopped and move the shift lever to N. [*3]
6. Set the A/C for maximum cooling. [*4]
7. Leave the vehicle for a few minutes. [*5]

HINT:

- Confirm that the Data List item "Boost Ratio" is 0% when the accelerator pedal is not depressed. Check that the Data List items "VH-Voltage after Boosting" and "Hybrid/EV Battery Voltage" are almost the same.
- [*1] to [*5] : Normal judgment procedure.

  The normal judgment procedure is used to complete DTC judgment and also used when clearing permanent DTCs.

8. Enter the following menus: Powertrain / Hybrid Control / Utility / All Readiness.
9. Check the DTC judgment result.

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE, perform the normal judgment procedure again.

CAUTION / NOTICE / HINT

HINT:

- P0D2D1C may be output as a result of the malfunction indicated by the DTCs in table below.

  a. The chart above is listed in inspection order of priority.
  b. Check DTCs that are output at the same time by following the listed order. (The main cause of the malfunction can be determined without performing unnecessary inspections.)

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
Microcomputer malfunction	Hybrid Control System	P0A1B49	Drive Motor "A" Control Module Internal Electronic Failure
		P060647	Hybrid/EV Powertrain Control Module Processor Watchdog / Safety MCU Failure
		P060B49	Hybrid/EV Battery Energy Control Module A/D Processing Internal Electronic Failure
		P060687	Hybrid/EV Powertrain Control Module Processor to Monitoring Processor Missing Message
		P060A47	Hybrid/EV Powertrain Control Module Monitoring Processor Watchdog / Safety MCU Failure

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
		P060A87	Hybrid/EV Powertrain Control Module Processor from Monitoring Processor Missing Message
	Motor Generator Control System	P0A1B1F	Generator Control Module Circuit Intermittent
		P0A1A47	Generator Control Module Watchdog / Safety MC Failure
		P0A1A49	Generator Control Module Internal Electronic Failure
		P1C2A1C	Generator A/D Converter Circuit Circuit Voltage Out of Range
		P1C2A49	Generator A/D Converter Circuit Internal Electronic Failure
		P313383	Communication Error from Generator to Drive Motor "A" Value of Signal Protection Calculation Incorrect
		P313386	Communication Error from Generator to Drive Motor "A" Signal Invalid
	Hybrid Battery System	P060B49	Hybrid/EV Battery Energy Control Module A/D Processing Internal Electronic Failure
		P060687	Hybrid/EV Battery Energy Control Module Processor to Monitoring Processor Missing Message
		P060A47	Hybrid/EV Battery Energy Control Module Monitoring Processor Watchdog / Safety MCU Failure
		P060A87	Hybrid/EV Battery Energy Control Module Processor from Monitoring Processor Missing Message
		P0E2D00	Hybrid/EV Battery Energy Control Module Hybrid/EV Battery Monitor Performance
Power source circuit malfunction	Motor Generator Control System	P06D61C	Generator Control Module Offset Power Circuit Voltage Out of Range
Communication system malfunction	Hybrid Control System	U011187	Lost Communication with Hybrid/EV Battery Energy Control Module "A" Missing Message
	Motor Generator Control System	P313387	Communication Error from Generator to Drive Motor "A" Missing Message
Sensor and actuator circuit malfunction	Hybrid Battery System	P301A1C	Hybrid Battery Stack 1 Cell Voltage Detection Voltage Out of Range
		P1A001C	Hybrid Battery Stack 2 Cell Voltage Detection Voltage Out of Range
		P1AFD1C	Flying Capacitor/Internal Control Module Hybrid/EV Battery Monitor Voltage
System malfunction	Motor Generator Control System	P0D2D16	Drive Motor "A" Inverter Voltage Sensor (VH) Circuit Voltage Below Threshold
		P0D2D17	Drive Motor "A" Inverter Voltage Sensor (VH) Circuit Voltage Above Threshold
		P0E3116	DC/DC Converter Voltage Sensor "A"(VL) Circuit Voltage Below Threshold

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
		P0E3117	DC/DC Converter Voltage Sensor "A"(VL) Circuit Voltage Above Threshold

PROCEDURE

1.	**CHECK FOR VEHICLE CONTROL HISTORY (HYBRID CONTROL SYSTEM)**

Pre-procedure1

(a) None.

Procedure1

(b) Check for Vehicle Control History.

Powertrain > Hybrid Control > Utility

TESTER DISPLAY
Vehicle Control History (RoB)

RESULT	PROCEED TO
Vehicle Control History Code "X0523" is stored	A
Vehicle Control History Code "X0523" is not stored	B

Post-procedure1

(c) Turn the ignition switch off.

B ▶ **GO TO STEP 4**

A ▼

2.	**CHECK TIME STAMP**

HINT:

By checking Time Stamp, the time and order in which DTCs were stored in an ECU can be checked.

Pre-procedure1

(a) Enter the following menus: Health Check.

(b) Select the systems for which to perform Health Check and check for time stamp data: Store All Data.

(c) Select "Yes" when "Do you want to store time stamp data?" is displayed.

HINT:

If "Yes" is not selected, time stamp data will not be stored.

(d) After Health Check has completed, select "Time Stamp Data" to display the Time Stamp screen.

(e) Select the "HV" from the drop-down list on the bottom of the Time Stamp screen.

(f) Check the trip count for DTC P0D2D1C.

Procedure1

(g) Check the trip count for Vehicle Control History Code "X0523".

RESULT	PROCEED TO
Trip counts for DTC P0D2D1C and Vehicle Control History Code "X0523" are identical.	A
Trip counts for DTC P0D2D1C and Vehicle Control History Code "X0523" are not identical.	B

Post-procedure1

(h) Turn the ignition switch off.

B ▶ **GO TO STEP 4**

A ▼

3.	**CHECK FREEZE FRAME DATA (READY SIGNAL, SMR STATUS)**

Pre-procedure1

(a) None.

Procedure1

(b) Read the Freeze Frame Data of DTC P0D2D1C.

Powertrain > Hybrid Control > DTC(P0D2D1C) > Freeze Frame Data

TESTER DISPLAY
Ready Signal
SMRG Status
SMRB Status

RESULT	PROCEED TO
All of the following conditions are met: • "SMRG Status" is OFF at the time DTC confirmed. • "SMRB Status" is ON at the time DTC confirmed. • "Ready Signal" items are all OFF before and after DTC confirmed.	A
At least one of the following conditions is not met: • "SMRG Status" is OFF at the time DTC confirmed. • "SMRB Status" is ON at the time DTC confirmed. • "Ready Signal" items are all OFF before and after DTC confirmed.	B

Post-procedure1

(c) Turn the ignition switch off.

A ▶ **CHECK AUXILIARY BATTERY** INFO

B ▶ **GO TO STEP 4**

4.	**CHECK DTC OUTPUT (AIR CONDITIONER)**

Pre-procedure1

(a) None.

Procedure1

(b) Check for DTCs.

Body Electrical > Air Conditioner > Trouble Codes

RESULT	PROCEED TO
B14721C is not output	A
B14721C is output	B

Post-procedure1

(c) Turn the ignition switch off.

B ▶ **GO TO DTC CHART (AIR CONDITIONING SYSTEM)**

A

5.	**INSPECT COMPRESSOR WITH MOTOR ASSEMBLY**

Pre-procedure1

(a) Operate the compressor under the following conditions.

ITEM	ITEM
Ignition switch	ON (READY)
A/C switch	On
Blower speed	HI
Temperature setting	MAX COLD
Ambient temperature	25°C (77°F) or higher

(b) Turn the ignition switch off.

Procedure1

(c) Check that there is no abnormal noise from the compressor immediately after the ignition switch is turned off.

RESULT	PROCEED TO
No abnormal noise.	A
Abnormal noise is heard.	B

Post-procedure1

(d) None.

A ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

B ▶ **REPLACE COMPRESSOR WITH MOTOR ASSEMBLY** INFO