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Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM (for PHEV Model): P0B231C; Hybrid/EV Battery "A" Voltage Sensor Voltage Out of Range; 2023 - 2024 MY Prius Prime [03/2023 -]		

DTC	**P0B231C**	**Hybrid/EV Battery "A" Voltage Sensor Voltage Out of Range**

DTC SUMMARY

MALFUNCTION DESCRIPTION

The hybrid vehicle control ECU detects a VB sensor malfunction.

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

Battery ECU assembly VB sensor internal circuit malfunction

- Battery ECU assembly malfunction
- Communication (wire harness) malfunction

High voltage system malfunction

HV battery malfunction

DESCRIPTION

The battery ECU assembly sends HV battery voltage information to the hybrid vehicle control ECU via serial communication.

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
P0B231C	Hybrid/EV Battery "A" Voltage Sensor Voltage Out of Range	Battery ECU assembly malfunction: When not boosting, difference between "Hybrid/EV Battery Voltage" and "VL-Voltage before Boosting" is large and difference between "Hybrid/EV Battery Voltage" and "VH-Voltage after Boosting" is large. (1 trip detection logic)	Battery ECU assembly	Comes on	Master Warning: Comes on	Hybrid Control	A	SAE Code: P0B23

MONITOR DESCRIPTION

The hybrid vehicle control ECU calculates the differences between the received HV battery voltage, boost converter voltage, and inverter voltage. If the differences exceed prescribed values, the hybrid vehicle control ECU determines that there is a malfunction in the battery ECU assembly circuit. If the hybrid vehicle control ECU detects this malfunction, it will illuminate the MIL and store a DTC.

MONITOR STRATEGY

Related DTCs	P0B23 (INF P0B231C): Hybrid/EV Battery "A" Voltage
Required sensors/components	Battery ECU assembly
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	DTC P0B23 (INF P0B231C) 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:

   - After the repair if "VL-Voltage before Boosting" and the "Hybrid/EV Battery Voltage" are approximately the same when the ignition switch is turned to ON (READY) with shift lever in P and the accelerator pedal not depressed, the condition is judged as normal.
   - [*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

NOTICE:

Performing the check procedures for a long time with shift lever in N may cause DTC P300000 to be set.

HINT:

- If the battery ECU assembly has been replaced, it is necessary to confirm the voltage of each battery block. With ignition switch ON (READY), shift lever in P, the engine stopped and the HV battery voltage at 208 V or more, check the value of Data List items "Hybrid/EV Battery Voltage", "VL-Voltage before Boosting" and "VH-Voltage after Boosting". When the system is normal, the values of "Hybrid/EV Battery Voltage", "VL-Voltage before Boosting", and "VH-Voltage after Boosting" should be almost equal. If the difference between each value is more than the voltages specified below, the system is malfunctioning.

INSPECTION VOLTAGE	MAXIMUM VOLTAGE DIFFERENCE
Difference between "Hybrid/EV Battery Voltage" and "VL-Voltage before Boosting"	50 V
Difference between "Hybrid/EV Battery Voltage" and "VH-Voltage after Boosting"	70 V
Difference between "VL-Voltage before Boosting" and "VH-Voltage after Boosting"	90 V

HINT:

- P0B231C 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 Powertrain 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
		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 µC Failure
		P0A1A49	Generator Control Module Internal Electronic Failure

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
		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
		P060B16	Hybrid/EV Battery Energy Control Module A/D Processing Circuit Voltage Below Threshold
		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 Out of Range
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
		P0E3117	DC/DC Converter Voltage Sensor "A" (VL) Circuit Voltage Above Threshold

PROCEDURE

1.	**CHECK DTC OUTPUT (HYBRID CONTROL, MOTOR GENERATOR, HV BATTERY)**

Pre-procedure1

(a) None.

Procedure1

(b) Check for DTCs.

Powertrain > Hybrid Control > Trouble Codes
Powertrain > Motor Generator > Trouble Codes
Powertrain > HV Battery > Trouble Codes

RESULT	PROCEED TO
P0B231C only is output, or DTCs except the ones in the table below are also output.	NEXT

Post-procedure1

(c) Turn the ignition switch off.

NEXT ▶ **REPLACE BATTERY ECU ASSEMBLY**