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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): P1AC413; Hybrid/EV Battery Stack 1 Current Interrupt Device Circuit Open; 2023 - 2024 MY Prius Prime [03/2023 -]		

DTC	**P1AC413**	**Hybrid/EV Battery Stack 1 Current Interrupt Device Circuit Open**

DTC SUMMARY

MALFUNCTION DESCRIPTION

Current interrupt devices (CIDs), which mechanically shut off the high-voltage circuit, are installed in each HV battery cell to protect the HV battery from overcharge (overvoltage).

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

- Battery ECU assembly malfunction
- Hybrid battery stack malfunction

DESCRIPTION

The hybrid vehicle control ECU detects a shut-off by a CID in a HV battery cell.

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
P1AC413	Hybrid/EV Battery Stack 1 Current Interrupt Device Circuit Open	The hybrid vehicle control ECU detects that a CID has operated in the HV battery. When the ignition switch is ON (READY), the hybrid vehicle control ECU receives a signal indicating a drop in cell voltage from the battery ECU assembly due to the voltage before boosting being out of the normal range or the cumulative change in voltage before boosting is large for a certain amount of time. (1 trip detection logic)	Battery ECU assembly	Comes on	Master Warning Light: Comes on	Hybrid Control	A	SAE Code: P1AC4

Related Data List

DTC NO.	DATA LIST
P1AC413	• Hybrid/EV Battery Voltage

MONITOR DESCRIPTION

A malfunction is detected and the MIL is illuminated when following condition is met:

1. A large fluctuation in the DC/DC converter voltage occurs due to operation of the battery current interrupt device.
2. A large fluctuation in the battery charger output voltage occurs due to operation of the battery current interrupt device.

MONITOR STRATEGY

Related DTCs	P1AC4 (INF P1AC413): Hybrid/EV Battery Cell Voltage Low Pack1 or Stack "A" at CID interception
Required sensors/components	HV battery
Frequency of operation	-
Duration	TMC's intellectual property
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	P1AC4 (INF P1AC413) 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) and wait for 3 minutes or more. [*1]

HINT:

- According to the display on the GTS, read the Data List and monitor the values of "Hybrid/EV Battery Voltage" and "VL-Voltage before Boosting" for 3 minutes. If the difference between

"Hybrid/EV Battery Voltage" and "VL-Voltage before Boosting" is always less than 50 V, the vehicle has returned to normal.

- [*1] : Normal judgment procedure.

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

4. Enter the following menus: Powertrain / Hybrid Control / Utility / All Readiness.
5. 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 or N/A, perform the normal judgment procedure again.

CAUTION / NOTICE / HINT

NOTICE:

Do not turn the ignition switch to ON (READY) before completing repairs as this may cause a malfunction.

PROCEDURE

1.	**CHECK DTC OUTPUT (HV BATTERY)**

Pre-procedure1

(a) None.

Procedure1

(b) Check for DTCs.

Powertrain > HV Battery > Trouble Codes

RESULT	PROCEED TO
P1AC413 only is output, or DTCs except the ones in the table below are also output.	A
DTCs of hybrid battery system in the tables below are output.	B

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
System malfunction	Hybrid battery system	P1AC413	Hybrid/EV Battery Stack 1 Current Interrupt Device Circuit Open
		P1AC49E	Hybrid/EV Battery Stack 1 Current Interrupt Device Stuck On
		P1AC513	Hybrid/EV Battery Stack 2 Current Interrupt Device Circuit Open
		P1AC59E	Hybrid/EV Battery Stack 2 Current Interrupt Device Stuck On
		P1AC613	Hybrid/EV Battery Stack 3 Current Interrupt Device Circuit Open

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
		P1AC69E	Hybrid/EV Battery Stack 3 Current Interrupt Device Stuck On

HINT:

- P1AC413 may be output as a result of the malfunction indicated by the DTCs above.

  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.)

Post-procedure1

(c) Turn the ignition switch off.

B ▶ **GO TO DTC CHART (HYBRID BATTERY SYSTEM)**

A ▼

2.	**CHECK DTC OUTPUT (HYBRID CONTROL, MOTOR GENERATOR, HV BATTERY AND PLUG-IN CONTROL)**

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
P1AC413 only is output, or DTCs except the ones in the table below are also output.	A
DTCs of hybrid control system in the tables below are output.	B
DTCs of motor generator control system in the tables below are output.	C
DTCs of hybrid battery system in the tables below are output.	D

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
Microcomputer malfunction	Hybrid control system	P060647	Hybrid/EV Powertrain Control Module Processor Watchdog / Safety MCU Failure
		P0A1B49	Drive Motor "A" Control Module Internal Electronic Failure
	Motor generator control system	P0A1A47	Generator Control Module Watchdog / Safety MC Failure
		P0A1A49	Generator Control Module Internal Electronic Failure
		P0A1B1F	Generator Control Module Circuit Intermittent
		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	P060A47	Hybrid/EV Battery Energy Control Module Monitoring Processor Watchdog / Safety MCU Failure
		P060B16	Hybrid/EV Battery Energy Control Module A/D Processing Circuit Voltage Below Threshold
		P060B49	Hybrid/EV Battery Energy Control Module A/D Processing Internal Electronic Failure
Power source circuit malfunction	Motor generator control system	P06D61C	Generator Control Module Offset Power Circuit Voltage Out of Range
	Hybrid battery system	P1CBB12	Hybrid/EV Battery Current Sensor Power Supply Circuit Short to Auxiliary Battery
		P1CBB14	Hybrid/EV Battery Current Sensor Power Supply Circuit Short to Ground or Open
Communication system malfunction	Hybrid control system	P312387	Lost Communication with Drive Motor Control Module "A" from Hybrid/EV Control Module Missing Message
		U011187	Lost Communication with Hybrid/EV Battery Energy Control Module "A" Missing Message
		U019B87	Lost Communication with Hybrid/EV Battery Charger Control Module Missing Message
	Motor generator control system	P313387	Communication Error from Generator to Drive Motor "A" Missing Message
	Hybrid battery system	P060687	Hybrid/EV Battery Energy Control Module Processor to Monitoring Processor Missing Message
		P060A87	Hybrid/EV Battery Energy Control Module Processor from Monitoring Processor Missing Message
Sensor and actuator circuit malfunction	Motor generator control system	P0D2D16	Drive Motor "A" Inverter Voltage Sensor(VH) Circuit Voltage Below Threshold

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
		P0D2D17	Drive Motor "A" Inverter Voltage Sensor(VH) Circuit Voltage Above Threshold
	Hybrid battery system	P0ABF11	Hybrid/EV Battery Current Sensor "A" Circuit Short to Ground
		P0ABF15	Hybrid/EV Battery Current Sensor "A" Circuit Short to Auxiliary Battery or Open
		P0ABF28	Hybrid/EV Battery Current Sensor "A" Signal Bias Level Out of Range / Zero Adjustment Failure
		P0ABF2A	Hybrid/EV Battery Current Sensor "A" Signal Stuck In Range
		P0B0E11	Hybrid/EV Battery Current Sensor "B" Circuit Short to Ground
		P0B0E15	Hybrid/EV Battery Current Sensor "B" Circuit Short to Auxiliary Battery or Open
		P0B1362	Hybrid/EV Battery Current Sensor "A"/"B" Signal Compare Failure
		P2BE411	Hybrid/EV Battery Pack Current Sensor "C" Low Circuit Short to Ground
		P2BE415	Hybrid/EV Battery Pack Current Sensor "C" High Circuit Short to Auxiliary Battery or Open
		P2BE41C	Hybrid/EV Battery Pack Current Sensor "C" Circuit Range/Performance Circuit Voltage Out of Range
		P2BE428	Hybrid/EV Battery Pack Current Sensor "C" Circuit Range/Performance Signal Bias Level Out of Range / Zero Adjustment Failure
System malfunction	Hybrid control system	P0A1F94	Hybrid/EV Battery Energy Control Module Unexpected Operation
		P0ABF00	Hybrid/EV Battery Current Sensor "A" Circuit Range/Performance
		P0D2D1C	Drive Motor "A" Inverter Voltage Sensor Voltage Out of Range
		P0D4C1C	Hybrid/EV Battery Charger Hybrid/EV Battery Input Voltage Sensor Voltage Out of Range
		P0E311C	Boosting Converter Voltage Sensor "A" Voltage Out of Range
		P1C2D62	Hybrid/EV Battery "A" Voltage Sensor/Boosting Converter Voltage Sensor "A" Signal Compare Failure
		P1C8349	High Voltage Power Resource Circuit Voltage Sensor after Boosting Malfunction
	Motor generator control system	P0CA300	DC/DC Converter Step Up Voltage Performance
		P1CB69E	Drive Motor "A" Inverter Voltage Sensor(VH) Stuck On

HINT:

- P1AC413 may be output as a result of the malfunction indicated by the DTCs above.

  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.)

Post-procedure1

(c) Turn the ignition switch off.

B ▶ **GO TO DTC CHART (HYBRID CONTROL SYSTEM)**

C ▶ **GO TO DTC CHART (MOTOR GENERATOR CONTROL SYSTEM)**

D ▶ **GO TO DTC CHART (HYBRID BATTERY SYSTEM)**

A

3.	**REPLACE BATTERY ECU ASSEMBLY**

HINT:

Click here INFO

NEXT

4.	**SIMULATION TEST**

Pre-procedure1

(a) Turn the ignition switch to ON.

NOTICE:

Do not turn the ignition switch to ON (READY) before completing repairs as this may cause a malfunction.

(b) Clear the DTCs.

Powertrain > Hybrid Control > Clear DTCs

(c) Turn the ignition switch off and wait for 2 minutes or more.

(d) Turn the ignition switch to ON and wait for 30 seconds or more.

Procedure1

(e) Check if DTCs are output.

Powertrain > HV Battery > Trouble Codes

RESULT	PROCEED TO
No DTCs are output.	A
DTCs of hybrid battery system are output.	B

Post-procedure1

(f) Turn the ignition switch off.

A ▶ **END**

B ▶ **GO TO DTC CHART (HYBRID BATTERY SYSTEM)**