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Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [12/2022 -]
Title: HYBRID / BATTERY CONTROL: MOTOR GENERATOR CONTROL SYSTEM (for M20A-FXS): P1CA51D; Hybrid/EV Generator Circuit Current Out of Range; 2023 - 2024 MY Prius Prius Prime [12/2022 -]		

DTC	**P1CA51D**	**Hybrid/EV Generator Circuit Current Out of Range**

DTC SUMMARY

MALFUNCTION DESCRIPTION

This DTC indicates that current does not flow as commanded due to a generator output circuit malfunction. The cause of this malfunction may be one of the following:

AREA	MAIN MALFUNCTION DESCRIPTION
Inside of inverter	Inverter with converter assembly internal circuit malfunction
Hybrid vehicle transaxle assembly	• Generator (MG1) internal malfunction (entry of foreign matter, etc.) • Open or short circuit in the generator coils
Inverter low-voltage circuit	The connectors are not connected properly
Motor cable (for MG1)	• Defective motor cable connection condition • Open circuit or poor insulation in motor cable
Hybrid vehicle control ECU	Hybrid vehicle control ECU internal circuit malfunction

DESCRIPTION

For a description of the inverter.

Click here INFO

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
P1CA51D	Hybrid/EV Generator Circuit Current Out of Range	Generator system malfunction: If current does not flow as commanded, the generator high voltage system may be malfunctioning. Malfunction is detected when the vehicle is stopped or the	• Inverter with converter assembly • Motor cable • Hybrid vehicle transaxle assembly • Hybrid vehicle control ECU	Comes on	Master Warning: Comes on	Motor Generator	A	SAE Code: P1CA5

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
		engine is starting. (1 trip detection logic)	• Wire harness or connector • HV floor under wire (rear traction motor cable)* • Rear traction motor with transaxle assembly*					

*: for 4WD

MONITOR DESCRIPTION

The motor generator control ECU monitors the generator. If the motor generator control ECU detects a malfunction of the generator, the motor generator control ECU will illuminate the MIL and store a DTC.

MONITOR STRATEGY

Related DTCs	P1CA5 (INF P1CA51D): Generator system malfunction (No generator torque)
Required sensors/components	Generator (MG1), inverter, generator resolver
Frequency of operation	Continuous
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

Motor generator control ECU	DTC P1CA5 (INF P1CA51D) 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) with the shift lever in P. [*1]
4. With the engine stopped, depress the accelerator pedal and start the engine. [*2]
5. Release the accelerator pedal immediately. (Start and stop the engine several times) [*3]

HINT:

[*1] to [*3]: Normal judgment procedure.

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

6. Enter the following menus: Powertrain / Motor Generator / Utility / All Readiness.
7. 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.

WIRING DIAGRAM

Refer to the wiring diagram for the Generator High-voltage Circuit.

Click here INFO

Refer to the wiring diagram for the Motor High-voltage Circuit.

Click here INFO

Refer to the wiring diagram for the Rear Motor High-voltage Circuit.

Click here INFO

Refer to the wiring diagram for the Shut Down Signal Circuit.

Click here INFO

CAUTION / NOTICE / HINT

CAUTION:

Refer to the precautions before inspecting high voltage circuit.

Click here INFO

NOTICE:

- After the ignition switch is turned off, there may be a waiting time before disconnecting the negative (-) auxiliary battery terminal.

  Click here INFO
- When disconnecting and reconnecting the auxiliary battery.

HINT:

When disconnecting and reconnecting the auxiliary battery, there is an automatic learning function that completes learning when the respective system is used.

Click here INFO

HINT:

- If an abnormality occurs after disconnecting and connecting the motor cable, reconfirm the cable connection condition.
- P1CA51D 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.)

Table 1

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
Insulation malfunction	Hybrid control system	P1C7C49	Hybrid/EV Battery Voltage System Isolation (A/C Area) Internal Electronic Failure
		P1C7D49	Hybrid/EV Battery Voltage System Isolation (Hybrid/EV Battery Area) Internal Electronic Failure
		P1C7E49	Hybrid/EV Battery Voltage System Isolation (Transaxle Area) Internal Electronic Failure
		P1C7F49	Hybrid/EV Battery Voltage System Isolation (Direct Current Area) Internal Electronic Failure
		P1C8049	Hybrid/EV Battery Voltage System Isolation (Rear Motor Area) Internal Electronic Failure
System main relay or high voltage circuit malfunction	Hybrid control system	P0AD911	Hybrid/EV Battery Positive Contactor Circuit Short to Ground
		P0AD915	Hybrid/EV Battery Positive Contactor Circuit Short to Auxiliary Battery or Open
		P0ADD11	Hybrid/EV Battery Negative Contactor Circuit Short to Ground
		P0ADD15	Hybrid/EV Battery Negative Contactor Circuit Short to Auxiliary Battery or Open
		P1C8449	High Voltage Power Resource Circuit Short during Ready ON

Table 2

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
Microcomputer malfunction	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
		P0A1B47	Drive Motor "A" Control Module Watchdog / Safety MC Failure

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
		P0A1C47	Drive Motor "B" Control Module Watchdog / Safety MCU Failure
		P0A1C49	Drive Motor "B" 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
		P1C2A71	Generator A/D Converter Circuit Actuator Stuck
		P1C2B1C	Drive Motor "A" Control Module A/D Converter Circuit Voltage Out of Range
		P1C2B49	Drive Motor "A" Control Module A/D Converter Circuit Internal Electronic Failure
		P1C2B71	Drive Motor "A" Control Module A/D Converter Circuit Actuator Stuck
		P1C2C1C	Drive Motor "B" Control Module AD Converter Circuit Voltage Out of Range
		P1C2C49	Drive Motor "B" Control Module AD Converter Internal Electronic Failure
		P1C2C71	Drive Motor "B" Control Module A/D Converter Circuit Actuator Stuck
		P310A83	Communication Error from Drive Motor "B" to Drive Motor "A" Value of Signal Protection Calculation Incorrect
		P310A86	Communication Error from Drive Motor "B" to Drive Motor "A" Signal (Some Circuit Quantity, Reported via Serial Data) Invalid
		P310A87	Communication Error from Drive Motor "B" to Drive Motor "A" Missing Message
		P310B83	Communication Error from Drive Motor "A" to Drive Motor "B" Value of Signal Protection Calculation Incorrect
		P310B86	Communication Error from Drive Motor "A" to Drive Motor "B" Signal (Some Circuit Quantity, Reported via Serial Data) Invalid
		P310B87	Communication Error from Drive Motor "A" to Drive Motor "B" Missing Message
		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
		P313387	Communication Error from Generator to Drive Motor "A" Missing Message
		P313483	Communication Error from Drive Motor "A" to Generator Value of Signal Protection Calculation Incorrect

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
		P313486	Communication Error from Drive Motor "A" to Generator Signal Invalid
		P313487	Communication Error from Drive Motor "A" to Generator Missing Message
		P32BF83	Lost Communication between Drive Motor "A" and "B" (Drive Motor "A") Value of Signal Protection Calculation Incorrect
		P32BF86	Lost Communication between Drive Motor "A" and "B" (Drive Motor "A") Signal (Some Circuit Quantity, Reported via Serial Data) Invalid
		P32BF87	Lost Communication between Drive Motor "A" and "B" (Drive Motor "A") Missing Message
		P32CF83	Lost Communication between Drive Motor "A" and "B" (Drive Motor "B") Value of Signal Protection Calculation Incorrect
		P32CF86	Lost Communication between Drive Motor "A" and "B" (Drive Motor "B") Signal (Some Circuit Quantity, Reported via Serial Data) Invalid
		P32CF87	Lost Communication between Drive Motor "A" and "B" (Drive Motor "B") Missing Message
	Hybrid control system	P0A1B49	Drive Motor "A" Control Module Internal Electronic Failure
Power source circuit malfunction	Motor generator control system	P06B01C	Generator Control Module Position Sensor REF Power Source Circuit Voltage Out of Range
		P06B31C	Drive Motor "B" Control Module Position Sensor REF Power Source Circuit Voltage Out of Range
		P06D61C	Generator Control Module Offset Power Circuit Voltage Out of Range
		P19F81C	Generator Control Module Offset Power Circuit Voltage Out of Range
		P19F91C	Drive Motor "B" Control Module Offset Power Circuit Voltage Out of Range
		P26DF1C	Generator Control Module Position Sensor REF Power Source Circuit Voltage Out of Range
Communication malfunction	Motor generator control system	U11B387	Lost Communication with Hybrid/EV Powertrain Control Module (ch5) Missing Message
Sensor and actuator circuit malfunction	Motor generator control system	P0A3F16	Drive Motor "A" Position Sensor Circuit Voltage Below Threshold
		P0A3F21	Drive Motor "A" Position Sensor Signal Amplitude < Minimum
		P0A3F22	Drive Motor "A" Position Sensor Signal Amplitude > Maximum

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
		P0A4516	Drive Motor "B" Position Sensor Circuit Voltage Below Threshold
		P0A4521	Drive Motor "B" Position Sensor Signal Amplitude < Minimum
		P0A4522	Drive Motor "B" Position Sensor Signal Amplitude > Maximum
		P0A4B16	Generator Position Sensor Circuit Voltage Below Threshold
		P0A4B21	Generator Position Sensor Signal Amplitude < Minimum
		P0A4B22	Generator Position Sensor Signal Amplitude > Maximum
		P0A6012	Drive Motor "A" Phase V Current (High Resolution) Circuit Short to Battery
		P0A6014	Drive Motor "A" Phase V Current (High Resolution) Circuit Short to Ground or Open
		P0A601C	Drive Motor "A" Phase V Current (High Resolution) Circuit Voltage Out of Range
		P0A6312	Drive Motor "A" Phase W Current (High Resolution) Circuit Short to Battery
		P0A6314	Drive Motor "A" Phase W Current (High Resolution) Circuit Short to Ground or Open
		P0A631C	Drive Motor "A" Phase W Current (High Resolution) Circuit Voltage Out of Range
		P0A6912	Drive Motor "B" Phase V Current(High Resolution) Circuit Short to Battery
		P0A6914	Drive Motor "B" Phase V Current(High Resolution) Circuit Short to Ground or Open
		P0A691C	Drive Motor "B" Phase V Current(High Resolution) Circuit Voltage Out of Range
		P0A6C12	Drive Motor "B" Phase W Current(High Resolution) Circuit Short to Battery
		P0A6C14	Drive Motor "B" Phase W Current(High Resolution) Circuit Short to Ground or Open
		P0A6C1C	Drive Motor "B" Phase W Current(High Resolution) Circuit Voltage Out of Range
		P0BE512	Drive Motor "A" Phase U Current Sensor Circuit Short to Battery
		P0BE514	Drive Motor "A" Phase U Current Sensor Circuit Short to Ground or Open
		P0BE528	Drive Motor "A" Phase U Current Sensor Signal Bias Level Out of Range / Zero Adjustment Failure
		P0BE912	Drive Motor "A" Phase V Current Sensor Circuit Short to Battery

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
		P0BE914	Drive Motor "A" Phase V Current Sensor Circuit Short to Ground or Open
		P0BE928	Drive Motor "A" Phase V Current Sensor Signal Bias Level Out of Range / Zero Adjustment Failure
		P0BED12	Drive Motor "A" Phase W Current Sensor Circuit Short to Battery
		P0BED14	Drive Motor "A" Phase W Current Sensor Circuit Short to Ground or Open
		P0BED28	Drive Motor "A" Phase W Current Sensor Signal Bias Level Out of Range / Zero Adjustment Failure
		P0BF112	Drive Motor "B" Phase U Current Sensor Circuit Short to Battery
		P0BF114	Drive Motor "B" Phase U Current Sensor Circuit Short to Ground or Open
		P0BF128	Drive Motor "B" Phase U Current Sensor Signal Bias Level Out of Range / Zero Adjustment Failure
		P0BF512	Drive Motor "B" Phase V Current Sensor Circuit Short to Battery
		P0BF514	Drive Motor "B" Phase V Current Sensor Circuit Short to Ground or Open
		P0BF528	Drive Motor "B" Phase V Current Sensor Signal Bias Level Out of Range / Zero Adjustment Failure
		P0BF912	Drive Motor "B" Phase W Current Sensor Circuit Short to Battery
		P0BF914	Drive Motor "B" Phase W Current Sensor Circuit Short to Ground or Open
		P0BF928	Drive Motor "B" Phase W Current Sensor Signal Bias Level Out of Range / Zero Adjustment Failure
		P0BFD62	Drive Motor "A" Phase U-V-W Current Sensor Signal Compare Failure
		P0BFE62	Drive Motor "B" Phase U-V-W Current Sensor Signal Compare Failure
		P0C5013	Drive Motor "A" Position Sensor Circuit "A" Circuit Open
		P0C5016	Drive Motor "A" Position Sensor Circuit "A" Circuit Voltage Below Threshold
		P0C5017	Drive Motor "A" Position Sensor Circuit "A" Circuit Voltage Above Threshold
		P0C5513	Drive Motor "B" Position Sensor Circuit "A" Circuit Open
		P0C5516	Drive Motor "B" Position Sensor Circuit "A" Circuit Voltage Below Threshold

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
		P0C5517	Drive Motor "B" Position Sensor Circuit "A" Circuit Voltage Above Threshold
		P0C5A13	Drive Motor "A" Position Sensor Circuit "B" Circuit Open
		P0C5A16	Drive Motor "A" Position Sensor Circuit "B" Circuit Voltage Below Threshold
		P0C5A17	Drive Motor "A" Position Sensor Circuit "B" Circuit Voltage Above Threshold
		P0C5F13	Drive Motor "B" Position Sensor Circuit "B" Circuit Open
		P0C5F16	Drive Motor "B" Position Sensor Circuit "B" Circuit Voltage Below Threshold
		P0C5F17	Drive Motor "B" Position Sensor Circuit "B" Circuit Voltage Above Threshold
		P0C6413	Generator Position Sensor Circuit "A" Circuit Open
		P0C6416	Generator Position Sensor Circuit "A" Circuit Voltage Below Threshold
		P0C6417	Generator Position Sensor Circuit "A" Circuit Voltage Above Threshold
		P0C6913	Generator Position Sensor Circuit "B" Circuit Open
		P0C6916	Generator Position Sensor Circuit "B" Circuit Voltage Below Threshold
		P0C6917	Generator Position Sensor Circuit "B" Circuit Voltage Above Threshold
		P0D2D16	Drive Motor "A" Inverter Voltage Sensor (VH) Circuit Voltage Below Threshold
		P0D2D17	Drive Motor "A" Inverter Voltage Sensor (VH) Circuit Voltage Above Threshold
		P0DFA62	Generator Phase U-V-W Current Sensor Signal Compare Failure
		P0E0012	Generator Phase U Current Sensor Circuit Short to Battery
		P0E0014	Generator Phase U Current Sensor Circuit Short to Ground or Open
		P0E0028	Generator Phase U Current Sensor Signal Bias Level Out of Range / Zero Adjustment Failure
		P0E0412	Generator Phase V Current Sensor Circuit Short to Battery
		P0E0414	Generator Phase V Current Sensor Circuit Short to Ground or Open
		P0E0428	Generator Phase V Current Sensor Signal Bias Level Out of Range / Zero Adjustment Failure
		P0E0812	Generator Phase W Current Sensor Circuit Short to Battery

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
		P0E0814	Generator Phase W Current Sensor Circuit Short to Ground or Open
		P0E0828	Generator Phase W Current Sensor Signal Bias Level Out of Range / Zero Adjustment Failure
		P0E3116	DC/DC Converter Voltage Sensor "A" (VL) Circuit Voltage Below Threshold
		P0E3117	DC/DC Converter Voltage Sensor "A" (VL) Circuit Voltage Above Threshold
		P0E5111	DC/DC Converter Current Sensor Circuit Short to Ground
		P0E5115	DC/DC Converter Current Sensor Circuit Short to Battery or Open
		P1CAC49	Generator Position Sensor Internal Electronic Failure
		P1CAD49	Drive Motor "A" Position Sensor Internal Electronic Failure
		P1CAE49	Drive Motor "B" Position Sensor Internal Electronic Failure
		P1CAF38	Generator Position Sensor REF Signal Cycle Malfunction Signal Frequency Incorrect
		P1CB038	Drive Motor "A" Position Sensor REF Signal Frequency Incorrect
		P1CB138	Drive Motor "B" Position Sensor REF Signal Frequency Incorrect
		P1CFF62	Hybrid/EV Battery Current/DC/DC Converter Current Signal Compare Failure
	Hybrid control system	P0C7600	Hybrid/EV Battery System Discharge Time Too Long
		P0D2D1C	Drive Motor "A" Inverter 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
System malfunction	Motor generator control system	P0A7873	Drive Motor "A" Inverter Actuator Stuck Closed
		P0A7973	Drive Motor "B" Inverter Actuator Stuck Closed
		P0A7A73	Generator Inverter Actuator Stuck Closed
		P0A9000	Drive Motor "A" Performance
		P0A9100	Drive Motor "B" Performance
		P0A9200	Hybrid/EV Generator Performance
		P1C5D19	Drive Motor "A" Inverter Circuit Current Above Threshold

PROCEDURE

1.	**CHECK DIAGNOSIS RELATED INFORMATION**

Pre-procedure1

(a) None

Procedure1

(b) Read the diagnosis related information.

Powertrain > Motor Generator > Utility

TESTER DISPLAY
Diagnosis Related Information

RESULT	PROCEED TO
Diagnosis Related Information P0A9200 is output	A
None of the above conditions are met	B

Post-procedure1

(c) Turn the ignition switch off.

A ▶ **GO TO DTC CHART (P0A9200)**

B ▼

2.	**CHECK FREEZE FRAME DATA AND DIAGNOSIS RELATED INFORMATION**

Pre-procedure1

(a) None

Procedure1

(b) Read the diagnosis related information and freeze frame data of DTC P1CA51D.

Powertrain > Motor Generator > Utility

TESTER DISPLAY
Diagnosis Related Information

Powertrain > Motor Generator > Trouble Codes

RESULT	PROCEED TO
DTC U11B300 or U11B387 is listed in Diagnosis Related Information.	A
DTC U11B300 or U11B387 is not listed in Diagnosis Related Information and the value of freeze frame data item Emergency Shutdown Signal is ON.	B
Other than above	C

Post-procedure1

(c) Turn the ignition switch off.

A ▶ **GO TO DTC CHART (U11B300)**

B ▶ **GO TO DTC CHART (P321E9F)**

C

3.	**CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR)**

Click here INFO

RESULT	PROCEED TO
OK	A
NG (The connector is not connected securely.)	B
NG (The terminals are not making secure contact or are deformed, or water or foreign matter exists in the connector.)	C

B ▶ **CONNECT SECURELY**

C ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

A

4.	**CHECK SHUT DOWN SIGNAL CIRCUIT**

Click here INFO

NEXT

5.	**CHECK GENERATOR HIGH-VOLTAGE CIRCUIT**

Click here INFO

NEXT

6.	**CHECK MOTOR HIGH-VOLTAGE CIRCUIT**

Click here INFO

NEXT

7.	**CONFIRM VEHICLE SPECIFICATION**

RESULT	PROCEED TO
for 2WD	A
for 4WD	B

A **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

B

8.	**CHECK REAR MOTOR HIGH-VOLTAGE CIRCUIT**

Click here INFO

NEXT REPLACE INVERTER WITH CONVERTER ASSEMBLY