

<b>Last Modified:</b> 12-04-2024	6.11:8.1.0	<b>Doc ID:</b> RM100000028ZZ1
<b>Model Year Start:</b> 2023	<b>Model:</b> Prius Prime	<b>Prod Date Range:</b> [12/2022 - ]
<b>Title:</b> HYBRID / BATTERY CONTROL: MOTOR GENERATOR CONTROL SYSTEM (for M20A-FXS): P0A7973; Drive Motor "B" Inverter Actuator Stuck Closed; 2023 - 2024 MY Prius Prius Prime [12/2022 - ]		

<b>DTC</b>	<b>P0A7973</b>	<b>Drive Motor "B" Inverter Actuator Stuck Closed</b>
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## DTC SUMMARY

### MALFUNCTION DESCRIPTION

This DTC is stored when a short is detected in the inverter with converter assembly (rear motor inverter) or the rear traction motor with transaxle assembly (rear motor (MGR)). The cause of this malfunction may be one of the following:

#### Internal inverter malfunction

- Rear motor inverter internal circuit malfunction

#### Rear traction motor with transaxle assembly (rear motor (MGR)) malfunction

- Open or short circuit
- Iron particles or damage from foreign objects

## 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
P0A7973	Drive Motor "B" Inverter Actuator Stuck Closed	Current flow to any phase of the rear motor (MGR) exceeds the threshold after the rear motor inverter is shut down due to a DTC indicating a rear motor inverter malfunction (overheating, overcurrent or circuit malfunction) being stored.  (1 trip detection logic)	<ul style="list-style-type: none"> <li>• Inverter with converter assembly</li> <li>• HV floor under wire (rear traction motor cable)</li> <li>• Rear traction motor with transaxle assembly</li> </ul>	Comes on	Master Warning: Comes on	Motor Generator	A	SAE Code: P0A79

## MONITOR DESCRIPTION

The motor generator control ECU monitors the rear motor inverter electric current. If the current exceeds the threshold for a specified period of time, the motor generator control ECU will illuminate the MIL and store a DTC.

## MONITOR STRATEGY

Related DTCs	P0A79 (INF P0A7973): RFIV detection (Short circuit malfunction)
Required sensors/components	Rear motor inverter
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	-
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## COMPONENT OPERATING RANGE

Motor generator control ECU	DTC P0A79 (INF P0A7973) is not detected
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## 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

- Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
- Turn the ignition switch off and wait for 2 minutes or more.
- Turn the ignition switch to ON and wait for 5 seconds or more. [\*1]
- Turn the ignition switch to ON (READY) and wait for 5 seconds or more. [\*2]
- With the vehicle stopped, begin moving with the accelerator opening angle between 20% to 50% and a speed of approximately 10 km/h (6 mph), then stop the vehicle and repeat the same procedure several times. [\*3]

### HINT:

- While doing this, check that the "Rear Motor Torque" value does not remain at 0 N\*m continuously, but rather changes to indicate that the rear motor is operating.

(Unless rear motor torque is restricted due to DTC output, the rear motor torque will not remain at 0 N\*m continuously.)

- [\*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 Rear Motor High-voltage 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](#)

- DTC P0A7973 is stored after DTCs P0A799E and/or P1C5E19 are stored. After troubleshooting and repairing the malfunction which caused DTC P0A7973 to be stored, be sure to troubleshoot the other DTCs.
- Depending on the conditions in which the vehicle is being operated when a short circuit occurs in the inverter with converter assembly, the rear traction motor with transaxle assembly may be affected. As this DTC is stored if a short circuit occurs in the inverter with converter assembly, it is necessary to perform a road test to check the rear traction motor with transaxle assembly. If problems are found, replace the malfunctioning parts.
- After completing the repair, including the repair of previously output DTCs, drive the vehicle at a speed of approximately 40 km/h (25 mph) for 1 minute and check that DTC P0A9100 is not output. If DTC P0A9100 is output, replace the rear traction motor with transaxle assembly.

**HINT:**

P0A7973 may be output as a result of the malfunctions indicated by the DTCs in table below.

1. The chart above is listed in inspection order of priority.
2. 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	RELEVANT DTC	
Insulation malfunction	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

MALFUNCTION CONTENT	RELEVANT DTC	
	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

## PROCEDURE

### 1. CHECK REAR TRACTION MOTOR WITH TRANSAXLE ASSEMBLY (REAR MOTOR (MGR))

**CAUTION:**

Be sure to wear insulated gloves.

Pre-procedure1

(a) Check that the service plug grip is not installed.

**NOTICE:**

After removing the service plug grip, do not turn the ignition switch to ON (READY), unless instructed by the repair manual because this may cause a malfunction.

(b) Disconnect the HV floor under wire (rear traction motor cable) from the rear traction motor with transaxle assembly.

Procedure1

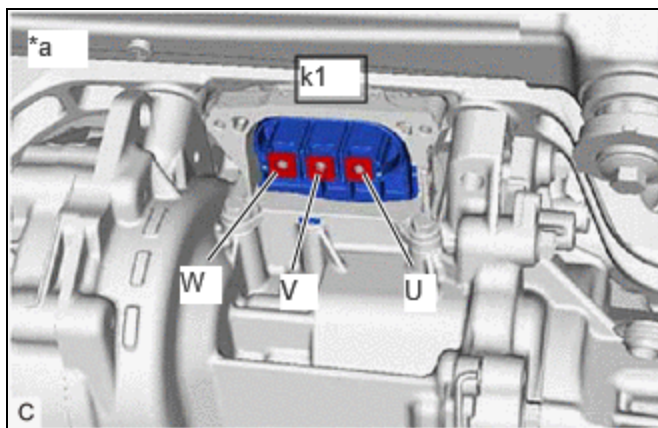
(c) Check the rear motor (MGR) for an interphase short using a milliohmimeter.

(1) Using a milliohmimeter, measure the resistance according to the value(s) in the table below.

**HINT:**

If the rear motor (MGR) temperature is high, the resistance will vary greatly from the specification. Therefore, measure the resistance at least 8 hours after the vehicle has been stopped.

Standard Resistance:



\*a HV floor under wire (rear traction motor cable) not connected (Rear Traction Motor with Transaxle Assembly)



[Click Location & Routing\(k1\)](#)

[Click Connector\(k1\)](#)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
k1-1 (U) - k1-2 (V)	Ignition switch off	90.3 to 100.9 mΩ	mΩ

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
k1-2 (V) - k1-3 (W)	Ignition switch off	90.3 to 100.9 mΩ	mΩ
k1-3 (W) - k1-1 (U)	Ignition switch off	90.5 to 101.1 mΩ	mΩ

**HINT:**

To correct the variation of the measured resistance due to temperature, use the following formula to calculate the resistance at 20°C (68°F).

$$R_{20} = R_t / \{1 + 0.00393 \times (T - 20)\}$$

The calculation is based on the following:

R<sub>20</sub>: Resistance at 20°C (68°F) (mΩ)

R<sub>t</sub>: Measured resistance (mΩ)

T: Temperature when the resistance is measured (°C)

## Procedure2

(d) Using a megohmmeter set to 500 V, measure the resistance according to the value(s) in the table below.

**NOTICE:**

Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.

Standard Resistance:



[Click Location & Routing\(k1\)](#)

[Click Connector\(k1\)](#)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
k1-1 (U) - Body ground and shield ground	Ignition switch off	100 MΩ or higher	MΩ
k1-2 (V) - Body ground and shield ground	Ignition switch off	100 MΩ or higher	MΩ
k1-3 (W) - Body ground and shield ground	Ignition switch off	100 MΩ or higher	MΩ

## Post-procedure1

(e) Connect the HV floor under wire (rear traction motor cable).

**NG** **GO TO STEP 4**

**OK**



**2. REPLACE INVERTER WITH CONVERTER ASSEMBLY****HINT:**[Click here](#) **INFO****NEXT****3. REPLACE HV FLOOR UNDER WIRE (REAR TRACTION MOTOR CABLE)****HINT:**[Click here](#) **INFO****NEXT** **GO TO STEP 7****4. REPLACE REAR TRACTION MOTOR WITH TRANSAXLE ASSEMBLY****HINT:**[Click here](#) **INFO****NEXT****5. REPLACE INVERTER WITH CONVERTER ASSEMBLY****HINT:**[Click here](#) **INFO****NEXT****6. REPLACE HV FLOOR UNDER WIRE (REAR TRACTION MOTOR CABLE)****HINT:**[Click here](#) **INFO****NEXT**

**7. CHECK DTC OUTPUT (MOTOR GENERATOR)**

(a) Check the other DTCs that were output together with DTC P0A7973.

**Powertrain > Motor Generator > Trouble Codes**

RELEVANT DTC	
P0A799E	Drive Motor "B" Inverter Stuck On
P1C5E19	Drive Motor "B" Inverter Circuit Current Above Threshold

**NOTICE:**

DTC P0A7973 is stored after DTCs P0A799E and/or P1C5E19 are stored. After troubleshooting and repairing the malfunction which caused P0A7973 to be stored, be sure to troubleshoot the other DTCs.

**NEXT**  **GO TO DTC CHART (MOTOR GENERATOR CONTROL SYSTEM)**

