| | | |
|---|---|---|
| **Last Modified:** 12-04-2024 | 6.11:8.1.0 | **Doc ID:** RM1000000028ZXD |
| **Model Year Start:** 2023 | **Model:** Prius Prime | **Prod Date Range:** [12/2022 - ] |
| **Title:** HYBRID / BATTERY CONTROL: MOTOR GENERATOR CONTROL SYSTEM (for M20A-FXS): P0A7A73; Generator Inverter Actuator Stuck Closed; 2023 - 2024 MY Prius Prius Prime [12/2022 - ] | | |

| | | |
|---|---|---|
| **DTC** | **P0A7A73** | **Generator Inverter Actuator Stuck Closed** |

# DTC SUMMARY

### MALFUNCTION DESCRIPTION

This DTC is stored when a short is detected in the inverter with converter assembly (generator inverter) or the hybrid vehicle transaxle assembly (generator (MG1)). The cause of this malfunction may be one of the following:

**Internal inverter malfunction**

- Generator inverter internal circuit malfunction

**Hybrid vehicle transaxle assembly (generator (MG1)) malfunction**

- Open or short circuit
- Damage from iron particles or other 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 |
|---|---|---|---|---|---|---|---|---|
| P0A7A73 | Generator Inverter Actuator Stuck Closed | Current flow to any phase of the generator (MG1) exceeds the threshold after the generator inverter is shut down due to a DTC indicating a generator inverter malfunction (overheating, overcurrent or circuit malfunction) being stored.<br>(1 trip detection logic) | • Inverter with converter assembly<br>• Motor cable<br>• Hybrid vehicle transaxle assembly | Comes on | Master Warning:<br>Comes on | Motor Generator | A | SAE Code:<br>P0A7A |

# MONITOR DESCRIPTION

The motor generator control ECU monitors the generator 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 | P0A7A (INF P0A7A73): GFIV detection (Short circuit malfunction) |
| Required sensors/components | Generator 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 | - |

## COMPONENT OPERATING RANGE

| | |
|---|---|
| Motor generator control ECU | DTC P0A7A (INF P0A7A73) 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 and wait for 5 seconds or more. [*1]
4. Turn the ignition switch to ON (READY) and wait for 5 seconds or more. [*2]

   **HINT:**

   Check that there are no abnormalities (abnormal sounds, coolant leaks, etc.).

5. Drive the vehicle for approximately 10 minutes mainly using the engine. [*3]

   **NOTICE:**

   As the state of charge of the HV battery may be low after driving in fail-safe mode, it will automatically be charged for 5 to 10 minutes with ignition switch ON (READY) after repairs have been performed.

   **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

## 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 P0A7A73 is stored after DTC P0A7A9E and/or P1C5F19 is stored. After troubleshooting and repairing the malfunction which caused DTC P0A7A73 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 hybrid vehicle 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 hybrid vehicle 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 P0A92000 is not output. If DTC P0A92000 is output, replace the hybrid vehicle transaxle assembly.

**HINT:**

- P0A7A73 may be output as a result of the malfunctions 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 | RELEVANT DTC | |
|---|---|---|
| Insulation malfunction | P1C7C49 | Hybrid/EV Battery Voltage System Isolation (A/C Area) Internal Electronic Failure |

| MALFUNCTION CONTENT | RELEVANT DTC | |
|---|---|---|
| | 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 |

## PROCEDURE

| | |
|---|---|
| 1. | **CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (GENERATOR (MG1))** |

**HINT:**

Click here INFO

**NG** ▶ **GO TO STEP 3**

**OK** ▼

| | |
|---|---|
| 2. | **REPLACE INVERTER WITH CONVERTER ASSEMBLY** |

**HINT:**

Click here INFO

**NEXT** ▶ **GO TO STEP 12**

| | |
|---|---|
| 3. | **CHECK MOTOR CABLE (FOR MG1)** |

**HINT:**

Click here INFO

**NG** ▶ **GO TO STEP 6**

**OK** ▼

| | |
|---|---|
| 4. | **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY** |

**HINT:**

Click here INFO

**NEXT**

| | |
|---|---|
| 5. | **REPLACE INVERTER WITH CONVERTER ASSEMBLY** |

**HINT:**

Click here INFO

**NEXT** GO TO STEP 12

| | |
|---|---|
| 6. | **CHECK HYBRID VEHICLE TRANSAXLE ASSEMBLY (GENERATOR (MG1))** |

**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 motor cable from the hybrid vehicle transaxle assembly.

**HINT:**

Click here INFO

Procedure1

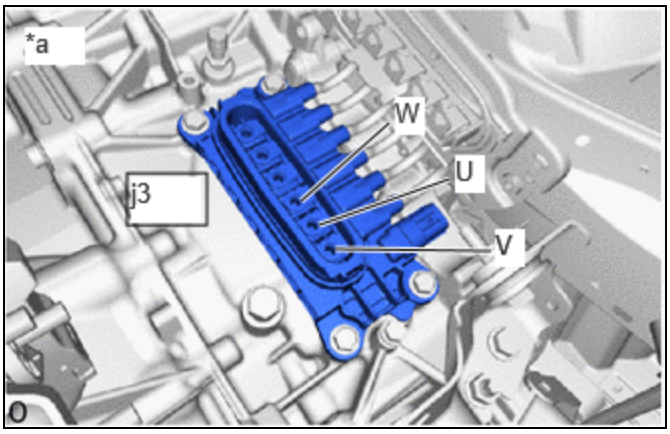
(c) Check the generator (MG1) for an interphase short using a milliohmmeter.

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

**HINT:**

If the generator (MG1) 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 | Motor Cable not connected<br>(Hybrid Vehicle Transaxle Assembly) |

EWD INFO

Click Location & Routing(j3)
Click Connector(j3)

| TESTER CONNECTION | CONDITION | SPECIFIED CONDITION |
|---|---|---|
| j3-4 (W) - j3-5 (U) | Ignition switch off | 41.0 to 47.4 mΩ [*1] |
| j3-5 (U) - j3-6 (V) | Ignition switch off | 41.1 to 47.5 mΩ [*2] |
| j3-4 (W) - j3-6 (V) | Ignition switch off | 41.3 to 47.6 mΩ [*3] |

**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).

R20 = Rt / {1 + 0.00393 X (T - 20)}

The calculation is based on the following:

R20: Resistance at 20°C (68°F) (mΩ)
Rt: Measured resistance (mΩ)
T: Temperature when the resistance is measured (°C)

Procedure2

(d) Check the difference in measured resistance values according to the table below.

Standard:

| INSPECTION ITEM | SPECIFIED CONDITION |
|---|---|
| [*1] - [*2] | -1.1 to 0.9 mΩ |
| [*2] - [*3] | -1.2 to 0.8 mΩ |
| [*3] - [*1] | -0.7 to 1.3 mΩ |

Procedure3

(e) 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:

EWD INFO

Click Location & Routing(j3)
Click Connector(j3)

| TESTER CONNECTION | CONDITION | SPECIFIED CONDITION |
|---|---|---|
| j3-4 (W) - Body ground and shield ground | Ignition switch off | 100 MΩ or higher |
| j3-5 (U) - Body ground and shield ground | Ignition switch off | 100 MΩ or higher |
| j3-6 (V) - Body ground and shield ground | Ignition switch off | 100 MΩ or higher |

Post-procedure1

(f) Connect the motor cable.

**NG** ▶ **GO TO STEP 9**

**OK**
▼

| | |
|---|---|
| **7.** | **REPLACE MOTOR CABLE** |

**HINT:**

Click here INFO

**NEXT**
▼

| | |
|---|---|
| **8.** | **REPLACE INVERTER WITH CONVERTER ASSEMBLY** |

**HINT:**

Click here INFO

**NEXT** ▶ **GO TO STEP 12**

| | |
|---|---|
| **9.** | **REPLACE MOTOR CABLE** |

**HINT:**

Click here INFO

**NEXT**
▼

| | |
|---|---|
| **10.** | **REPLACE HYBRID VEHICLE TRANSAXLE ASSEMBLY** |

**HINT:**

Click here INFO

**NEXT**

| | |
|---|---|
| **11.** | **REPLACE INVERTER WITH CONVERTER ASSEMBLY** |

**HINT:**

Click here INFO

**NEXT**

| | |
|---|---|
| **12.** | **CHECK DTC OUTPUT (MOTOR GENERATOR)** |

(a) Check the other DTCs that were output together with DTC P0A7A73.

**Powertrain > Motor Generator > Trouble Codes**

| RELEVANT DTC | |
|---|---|
| P0A7A9E | Generator Inverter Stuck On |
| P1C5F19 | Generator Inverter Circuit Current Above Threshold |

**NOTICE:**

DTC P0A7A73 is stored after DTC P0A7A9E and/or P1C5F19 is stored. After troubleshooting and repairing the malfunction which caused DTC P0A7A73 to be stored, be sure to troubleshoot the other DTCs.

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