

<b>Last Modified:</b> 12-04-2024	6.11:8.1.0	<b>Doc ID:</b> RM100000028ZVK
<b>Model Year Start:</b> 2023	<b>Model:</b> Prius Prime	<b>Prod Date Range:</b> [12/2022 - ]
<b>Title:</b> HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM (for M20A-FXS): P0C7396; Motor Electronics Coolant Pump "A" Component Internal Failure; 2023 - 2024 MY Prius Prius Prime [12/2022 - ]		

<b>DTC</b>	<b>P0C7396</b>	<b>Motor Electronics Coolant Pump "A" Component Internal Failure</b>
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## DTC SUMMARY

### MALFUNCTION DESCRIPTION

This DTC is stored when the inverter water pump assembly is malfunctioning. The cause of this malfunction may be one of the following:

#### Inverter water pump assembly malfunction

- Inverter water pump assembly internal malfunction
- Open or short in wire harness
- Improperly connected connector

#### Hybrid cooling system malfunction

- Foreign matter in inverter water pump assembly
- Hybrid cooling system coolant is frozen

#### HINT:

If this DTC is stored, the driving torque may be restricted.

## DESCRIPTION

The inverter water pump assembly transmits rotation speed information to the hybrid vehicle control ECU. The hybrid vehicle control ECU monitors the speed and detects malfunctions.

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
P0C7396	Motor Electronics Coolant Pump "A" Component Internal Failure	The inverter water pump assembly revolution speed is abnormally high or low (or stopped) for 1 minute or more.  (1 trip detection logic)	<ul style="list-style-type: none"> <li>• Inverter cooling system</li> <li>• Wire harness or connector</li> <li>• Inverter water pump assembly</li> <li>• Hybrid vehicle control ECU</li> </ul>	Comes on	Master Warning:  Comes on	Hybrid Control	A	SAE Code:  P0C73

#### HINT:

The inverter water pump assembly operates when the ignition switch is ON (READY).

## MONITOR DESCRIPTION

The hybrid vehicle control ECU monitors speed of the inverter water pump assembly. If there is an abnormality in speed, the hybrid vehicle control ECU will illuminate the MIL and store a DTC.

## MONITOR STRATEGY

Related DTCs	P0C73 (INF P0C7396): Motor Electronics Coolant Pump "A" malfunction
Required sensors/components	Inverter water pump assembly
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

Hybrid vehicle control ECU	DTC P0C73 (INF P0C7396) 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 (READY). [\*1]
- Wait for 2 minutes or more. [\*2]

### HINT:

[\*1] to [\*2] : Normal judgment procedure.

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

- Enter the following menus: Powertrain / Hybrid Control / Utility / All Readiness.

## 6. 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 Cooling System.

Click here 

**CAUTION / NOTICE / HINT****NOTICE:**

If this vehicle is jump started, etc. and excessive voltage is applied to the auxiliary battery, the inverter water pump assembly may suspend control as a self-protection function and store DTCs.

(When the auxiliary battery voltage returns to normal, the inverter water pump assembly will resume normal operation. In this case it is not necessary to replace the inverter water pump assembly.)

**HINT:**

P0C7396 may be output as a result of the malfunction 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	
Microcomputer malfunction	P060647	Hybrid/EV Powertrain Control Module Processor Watchdog / Safety MCU Failure
	P06881F	ECM/PCM Power Relay Sense Circuit Intermittent
Sensor and actuator circuit malfunction	P314A31	Motor Electronics Coolant Pump "A" No Signal

**PROCEDURE**

<b>1.</b>	<b>INSPECT INVERTER WATER PUMP ASSEMBLY</b>
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**NOTICE:**

Be sure to perform the inspection with the auxiliary battery voltage at 11 V or more.

**HINT:**

- When the auxiliary battery voltage is low, the inverter water pump assembly may not operate.
- When the inverter water pump assembly signal line (SWP - IWP) is open or its connection is faulty, the inverter water pump assembly is operated forcibly.

Pre-procedure1

(a) None.

Procedure1

(b) According to the display on the GTS, read the Data List.

**Powertrain > Hybrid Control > Data List**

TESTER DISPLAY
Inverter Water Pump Revolution

OK:

TESTER DISPLAY	CONDITION	SPECIFIED CONDITION
Inverter Water Pump Revolution	Ignition switch ON	200 rpm or less

**HINT:**

When the inverter water pump assembly is not operating, the Data List item "Inverter Water Pump Revolution" displays a value 200 rpm or less.

RESULT	PROCEED TO
The value of Inverter Water Pump Revolution is 200 rpm or less	A
None of the above conditions are met	B

Post-procedure1

(c) Turn the ignition switch off.

**B**  **GO TO STEP 5**

**A**  


<b>2.</b>	<b>CLEAR DTC</b>
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Pre-procedure1

(a) Read and record the DTCs and Freeze Frame Data.

**Powertrain > Hybrid Control > Trouble Codes**

Procedure1

(b) Clear the DTCs and Freeze Frame Data.

**Powertrain > Hybrid Control > Clear DTCs**

Post-procedure1

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

**NEXT**



**3. PERFORM ACTIVE TEST USING GTS (ACTIVATE THE INVERTER WATER PUMP)**

**NOTICE:**

- Make sure that the HV coolant level is above the low line of the inverter reserve tank.
- Be sure to perform the inspection with the auxiliary battery voltage at 11 V or more.

**HINT:**

When the auxiliary battery voltage is low, the inverter water pump assembly may not operate.

Pre-procedure1

(a) None.

Procedure1

(b) According to the display on the GTS, perform the Active Test "Activate the Inverter Water Pump" and, check the value of the Data List item "Inverter Water Pump Revolution".

**Powertrain > Hybrid Control > Active Test**

ACTIVE TEST DISPLAY
Activate the Inverter Water Pump

DATA LIST DISPLAY
Inverter Water Pump Revolution

OK:

TESTER DISPLAY	CONDITION	SPECIFIED CONDITION
Inverter Water Pump Revolution	Ignition switch ON During Active Test	3000 to 9500 rpm

**HINT:**

- Perform the Active Test with the inverter coolant temperature between -15 and 65°C (5 to 149°F).
- When the inverter water pump assembly is not operating, the Data List item "Inverter Water Pump Revolution" displays a value 200 rpm or less.

Post-procedure1

(c) Turn the ignition switch off.

**NG** **GO TO STEP 5**

**OK**

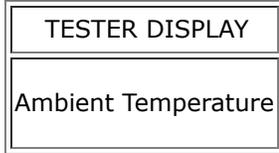


**4. CHECK HV COOLANT (CHECK FOR CONDITIONS THAT MAY HAVE CAUSED FREEZING)**

Pre-procedure1

(a) Read the Freeze Frame Data item "Ambient Temperature" using the GTS.

**Powertrain > Hybrid Control > DTC(P0C7396) > Freeze Frame Data**



Procedure1

(b) Check if the Freeze Frame Data item "Ambient Temperature" is below the freezing temperature of the HV coolant.

RESULT	PROCEED TO
Ambient Temperature value is above freezing temperature of the HV coolant.	A
Ambient Temperature value is below freezing temperature of the HV coolant.	B

**HINT:**

- HV coolant (SLLC) with a 30% concentration freezes at -15°C (5°F) and HV coolant (SLLC) with a 50% concentration freezes at -35°C (-31°F).
- If the HV coolant freezes in the HV radiator or inverter water pump, the coolant temperature in the inverter with converter assembly rises because the HV coolant cannot circulate. As a result, a DTC may be stored.
- A DTC is stored when the inverter water pump impeller cannot rotate due to freezing of the HV coolant.
- If DTCs are output due to freezing of the LLC, the problem symptom cannot be reproduced. Check the LLC replacement history and whether the LLC was frozen based on the ambient temperature when the DTCs were stored.

Post-procedure1

(c) Turn the ignition switch off.

**A** ► **GO TO STEP 11**

**B** ► **REPLACE HV COOLANT**

**5. CHECK CONNECTOR CONNECTION CONDITION (HYBRID VEHICLE CONTROL ECU CONNECTOR)**

Click here [INFO](#)

**NG** ► **CONNECT SECURELY**

**OK**



6.

## CHECK CONNECTOR CONNECTION CONDITION (INVERTER WATER PUMP ASSEMBLY CONNECTOR)

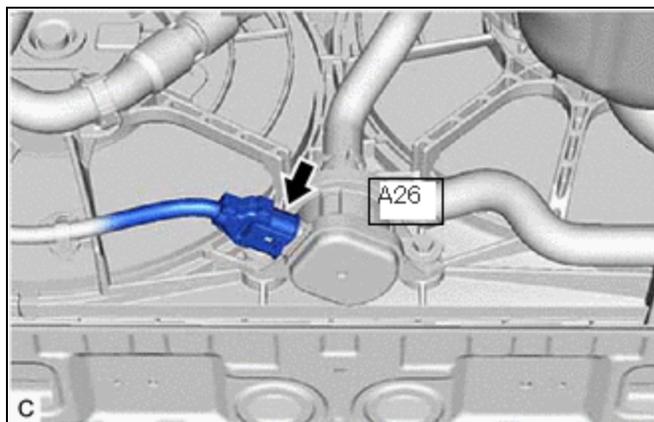
- (a) Check the connector connections and contact pressure of the relevant terminals for the inverter water pump assembly connector.

### HINT:

Click here 

OK:

The connector is connected securely, the terminals are not deformed or corroded and there are no contact problems.



**NG**  **CONNECT SECURELY**

**OK**



7.

## CHECK HARNESS AND CONNECTOR (HYBRID VEHICLE CONTROL ECU - INVERTER WATER PUMP ASSEMBLY)

Pre-procedure1

- (a) Disconnect the hybrid vehicle control ECU connector.  
 (b) Disconnect the inverter water pump assembly connector.

Procedure1

- (c) Measure the resistance according to the value(s) in the table below.

Standard Resistance (Check for Open):



[Click Location & Routing\(A57,A26\).](#)

[Click Connector\(A57\).](#)

[Click Connector\(A26\).](#)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
A57-32 (IWP) - A26-3 (SWP)	Ignition switch off	Below 1 $\Omega$	$\Omega$

Standard Resistance (Check for Short):



[Click Location & Routing\(A57,A26\).](#)

[Click Connector\(A57\).](#)

[Click Connector\(A26\).](#)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
A57-32 (IWP) or A26-3 (SWP) - Body ground and other terminals	Ignition switch off	10 k $\Omega$ or higher	k $\Omega$

**HINT:**

Check the condition (looseness, deterioration, etc.) of the wire to body ground for the inverter water pump assembly.

Post-procedure1

(d) Reconnect the inverter water pump assembly connector.

(e) Reconnect the hybrid vehicle control ECU connector.

**NG** **REPAIR OR REPLACE HARNESS OR CONNECTOR**

**OK**



<b>8.</b>	<b>READ VALUE USING GTS (INVERTER WATER PUMP REVOLUTION)</b>
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**NOTICE:**

Be sure to perform the inspection with the auxiliary battery voltage at 11 V or more.

**HINT:**

When the auxiliary battery voltage is low, the inverter water pump assembly may not operate.

Pre-procedure1

(a) Remove the INV W/PMP NO. 2 fuse from No. 1 engine room relay block and No. 1 junction block assembly.

Procedure1

(b) According to the display on the GTS, read the Data List.

**Powertrain > Hybrid Control > Data List**

TESTER DISPLAY
Inverter Water Pump Revolution

OK:

TESTER DISPLAY	CONDITION	SPECIFIED CONDITION
Inverter Water Pump Revolution	Ignition switch ON	200 rpm or less

RESULT	PROCEED TO
The value of Inverter Water Pump Revolution is 200 rpm or less	A
None of the above conditions are met	B

Post-procedure1

- (c) Turn the ignition switch off.
- (d) Install the INV W/PMP NO. 2 fuse.

## **B** REPLACE HYBRID VEHICLE CONTROL ECU

Click here 

## **A**

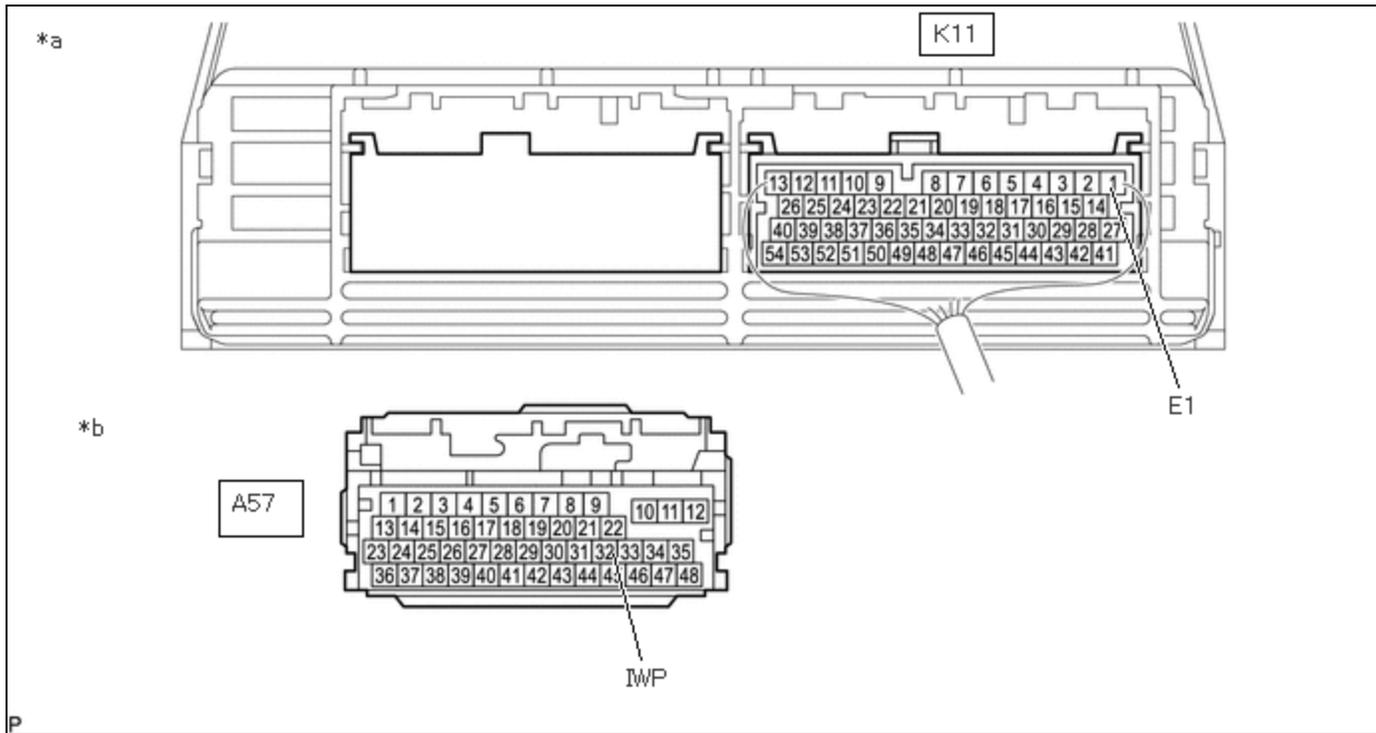
<b>9.</b>	<b>CHECK HARNESS AND CONNECTOR (HYBRID VEHICLE CONTROL ECU - INVERTER WATER PUMP ASSEMBLY)</b>
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Pre-procedure1

- (a) Disconnect the hybrid vehicle control ECU connector.
- (b) Turn the ignition switch to ON.

Procedure1

- (c) Measure the voltage according to the value(s) in the table below.



*a	Component with harness connected (Hybrid Vehicle Control ECU)	*b	Front view of wire harness connector (to Hybrid Vehicle Control ECU)
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Standard Voltage:



[Click Location & Routing\(A57,K11\).](#)

[Click Connector\(A57\).](#)

[Click Connector\(K11\).](#)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
A57-32 (IWP) - K11-1 (E1)	Ignition switch ON	11 to 14 V	V

**NOTICE:**

Make sure to check for and clear DTCs after performing this inspection.

Post-procedure1

(d) Turn the ignition switch off.

(e) Reconnect the hybrid vehicle control ECU connector.

**NG** **GO TO STEP 11**

**OK**



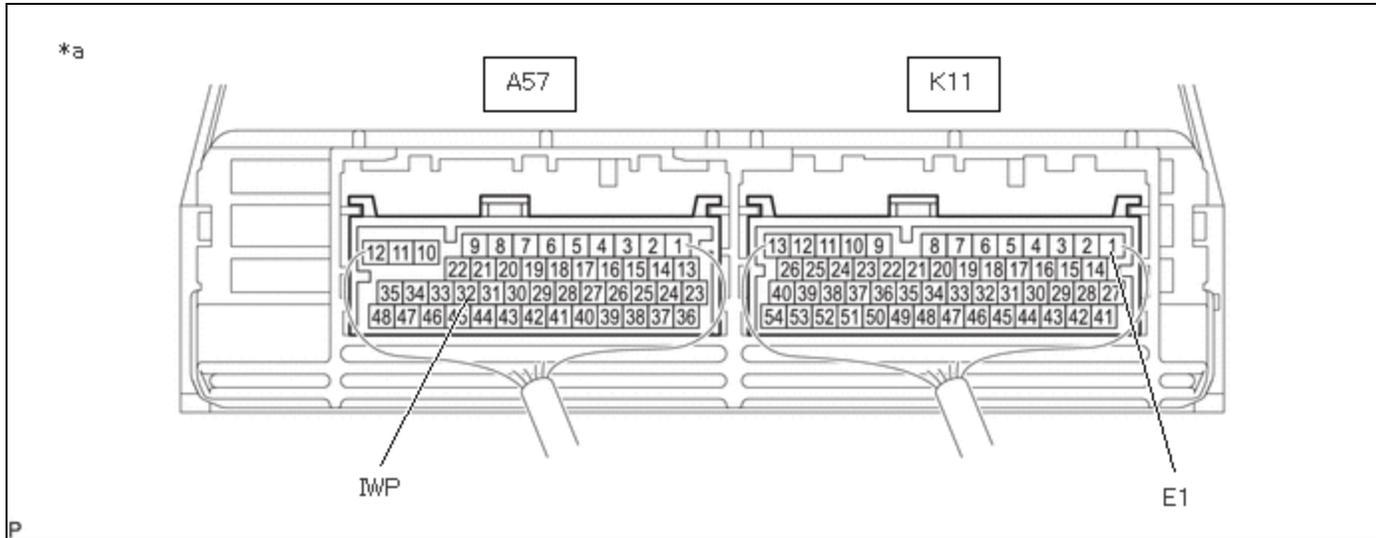
<b>10.</b>	<b>CHECK HYBRID VEHICLE CONTROL ECU (CHECK WAVEFORM)</b>
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Pre-procedure1

- (a) Connect an oscilloscope between the hybrid vehicle control ECU terminals specified in the table below.
- (b) Turn the ignition switch to ON.

Procedure1

- (c) Check the waveform while turning the ignition switch to ON.



*a	Component with harness connected (Hybrid Vehicle Control ECU)	-	-
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ITEM	CONTENT
Terminal	A57-32 (IWP) - K11-1 (E1)
Equipment Setting	5 V/DIV., 50 ms./DIV.
Condition	Ignition switch ON

OK:

Waveform duty ratio is between 3% and 9%.

Post-procedure1

- (d) Turn the ignition switch off.

**NG** **REPLACE HYBRID VEHICLE CONTROL ECU**

Click here

**OK**



<b>11.</b>	<b>REPLACE INVERTER WATER PUMP ASSEMBLY</b>
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**HINT:**

[Click here](#) 

**NEXT**



<b>12.</b>	<b>ADD HV COOLANT AND PERFORM AIR BLEEDING</b>
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(a) After replacing the inverter water pump assembly, add HV coolant and perform air bleeding.

**HINT:**

[Click here](#) 

**NEXT**  **END**

