

HYBRID CONTROL SYSTEM, Diagnostic DTC:P0C73-776

DTC Code	DTC Name
P0C73-776	Motor Electronics Coolant Pump "A" Control Performance

DESCRIPTION

The inverter water pump assembly transmits rotation revolution information to the power management control ECU. The power management control ECU monitors the revolution and detects malfunctions.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0C73	776	A speed or intermittent stop malfunction occurs in the inverter water pump assembly. A revolution malfunction (speed is too high/low) or an intermittent stop malfunction (operation stops intermittently when the revolution speed is abnormal) occurs in the inverter water pump assembly.	<ul style="list-style-type: none"> Inverter cooling system Wire harness or connector Inverter water pump assembly Power management control ECU

Tech Tips

The inverter water pump assembly operates when the power switch is on (READY).

Related Data List

DTC No.	INF Code	Data List Item
P0C73	776	<ul style="list-style-type: none"> W/P Run Control Duty*1 Inverter W/P Revolution Ready Signal

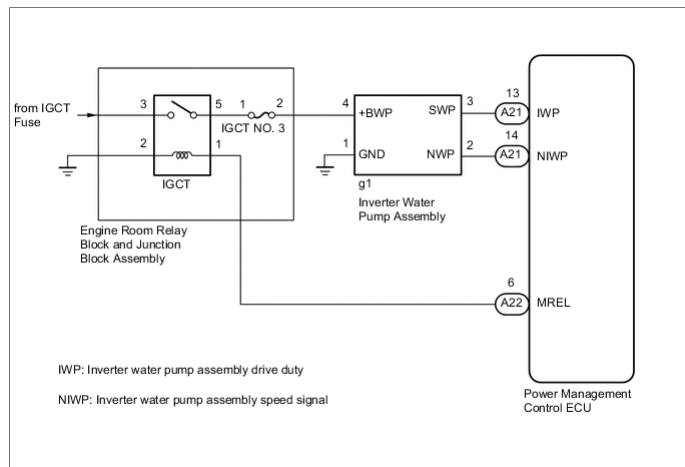
*1: This Data List item is related to the inverter water pump assembly.

Related Active Test

DTC No.	INF Code	Active Test
P0C73	776	Activate the Water Pump*2

*2: This is an Active Test of the inverter water pump assembly.

WIRING DIAGRAM



CAUTION / NOTICE / HINT

Note

- In the case of a coolant leak, the inverter water pump assembly activates a fail-safe function. If the inverter water pump assembly is not the cause of the coolant leak, it is not necessary to replace it.
- 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 DTC. (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.)
- If air enters the system while bleeding air during coolant exchange, etc. and the inverter water pump assembly revolution speed becomes abnormally high, the inverter water pump assembly may suspend control as a fail-safe function and the hybrid vehicle control ECU may store this DTC. (When air bleeding is complete, the inverter water pump assembly will resume normal operation. In this case, it is not necessary to replace the inverter water pump assembly.)

Tech Tips

After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.

1. Turn the power switch on (READY) and wait for 2 minutes or more.

PROCEDURE

1. CHECK QUANTITY OF HV COOLANT

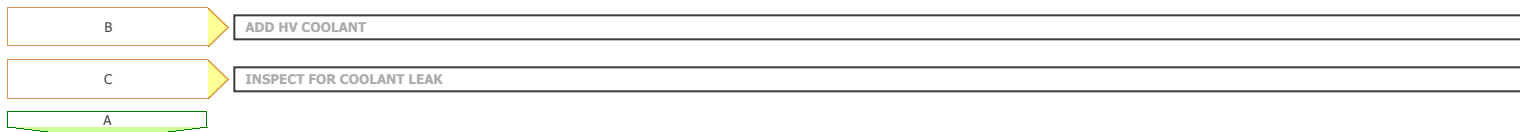
- a. Check the coolant level in the inverter reserve tank.
- b. Check for coolant leaks.

Result

Result	Proceed to
No leaks are found and coolant level in the inverter reserve tank assembly is above the low line.	A
No leaks are found and coolant level in the inverter reserve tank assembly is below the low line.	B
HV coolant leaks are evident.	C

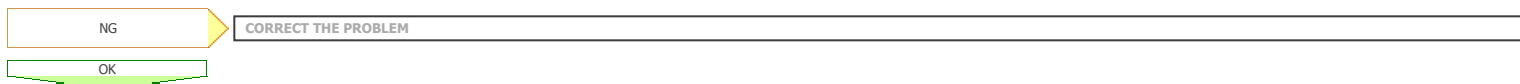
Tech Tips

After repairing the coolant leaks and adding coolant, perform the "Activate the Water Pump" Active Test (HV Active Test item) and the "Control the Electric Cooling Fan" Active Test (Engine Active Test item) and make sure that there are no malfunctions.



2. CHECK COOLANT HOSE

- a. Check if the hoses of the cooling system are kinked or clogged.



3. CHECK INVERTER WATER PUMP ASSEMBLY

Note

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

Tech Tips

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

- a. Connect the GTS to the DLC3.
- b. Turn the power switch on (IG).
- c. Enter the following menus: Powertrain / Hybrid Control / Data List.
- d. Select Inverter W/P Revolution in the Data List.
- e. Read the Data List.

Result

Tester Display	Condition	Specified Condition
Inverter W/P Revolution	Power switch on (IG)	625 rpm or less

Tech Tips

When the inverter water pump assembly is not operating, the Data List item "Inverter W/P Revolution" displays a value lower than 625 rpm.

- f. Turn the power switch off.



4. CLEAR DTC

- a. Connect the GTS to the DLC3.
- b. Turn the power switch on (IG).
- c. Enter the following menus: Powertrain / Hybrid Control / Trouble Codes.
- d. Clear DTCs and freeze frame data.
- e. Turn the power switch off.

NEXT

5. PERFORM ACTIVE TEST USING GTS (ACTIVATE THE WATER PUMP)

Note

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

Tech Tips

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

- a. the GTS to the DLC3.
- b. Turn the power switch on (IG).
- c. Enter the following menus: Powertrain / Hybrid Control / Active Test / Activate the Water Pump.
- d. Select Inverter W/P Revolution in the Data List.
- e. While performing the "Activate the Water Pump" Active Test, check Inverter W/P Revolution in the Data List.

Result

Tester Display	Condition	Specified Condition
Inverter W/P Revolution	Power switch on (IG)	2250 to 5625 rpm

Tech Tips

- 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 W/P Revolution" displays a value lower than 625 rpm.

- f. Turn the power switch off.

NG

CHECK CONNECTOR CONNECTION CONDITION (POWER MANAGEMENT CONTROL ECU CONNECTOR) [Click here](#)

OK

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

- a. Connect the GTS to the DLC3.
- b. Turn the power switch on (IG).
- c. Read the freeze frame data Ambient Temperature using the GTS.
- d. Check if the freeze frame data Ambient Temperature is below freezing.

Result

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

Tech Tips

- 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 HV 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 set.
- A DTC is set when the water pump impeller cannot rotate due to freezing of the HV coolant.
- If a DTC is set due to freezing of HV coolant, the problem cannot be reproduced. Judge whether freezing of HV coolant occurred according to the freeze point of the HV coolant, HV coolant change history and ambient temperature when the DTC was set.

- e. Turn the power switch off.

A

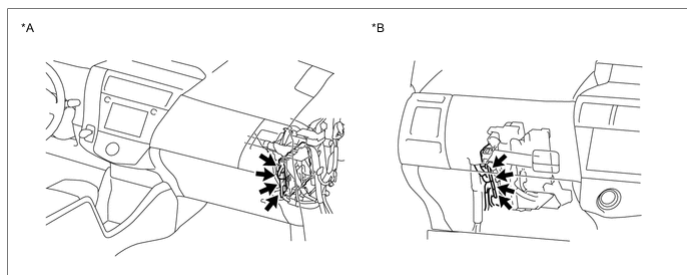
REPLACE INVERTER WATER PUMP ASSEMBLY [Click here](#)

B

REPLACE HV COOLANT

7. CHECK CONNECTOR CONNECTION CONDITION (POWER MANAGEMENT CONTROL ECU CONNECTOR)

- a. Check the connector connections and contact pressure of the relevant terminals for the power management control ECU connectors [Click here](#).

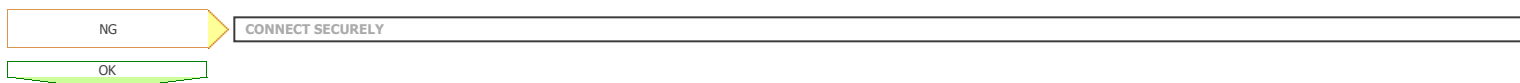


Text in Illustration

*A	for LHD	*B	for RHD
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OK

The connectors are connected securely and there are no contact pressure problems.

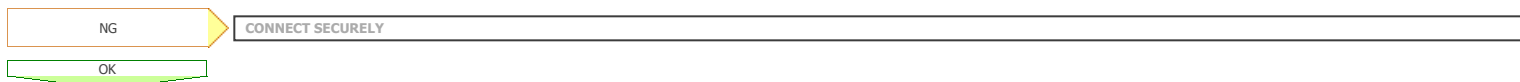
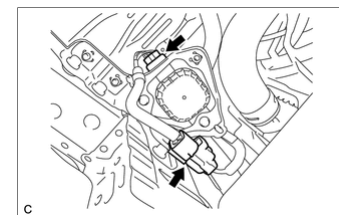


8. CHECK CONNECTOR CONNECTION CONDITION (INVERTER WATER PUMP ASSEMBLY CONNECTOR)

a. Check the connector connections and contact pressure of the relevant terminals for the inverter water pump assembly connector [Click here](#).

OK

The connector is connected securely and there are no contact pressure problems.

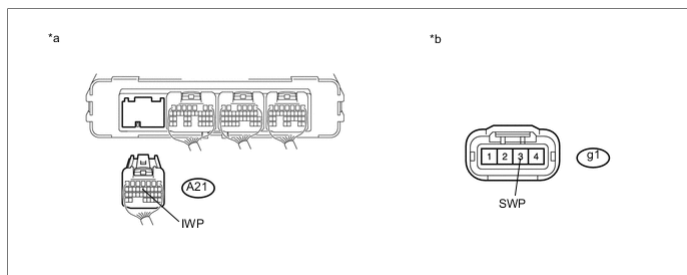


9. CHECK HARNESS AND CONNECTOR (POWER MANAGEMENT CONTROL ECU - INVERTER WATER PUMP ASSEMBLY)

a. Disconnect the A21 power management control ECU connector.

b. Disconnect the g1 inverter water pump assembly connector.

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



Text in Illustration

*a	Rear view of wire harness connector (to Power Management Control ECU)	*b	Front view of wire harness connector (to Inverter Water Pump Assembly)
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Standard Resistance (Check for Open)

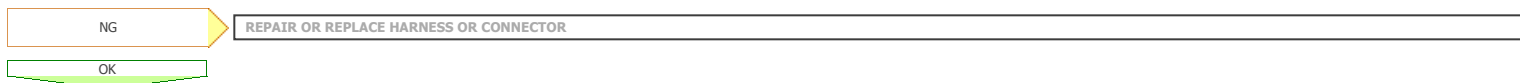
Tester Connection	Condition	Specified Condition
g1-3 (SWP) - A21-13 (IWP)	Power switch off	Below 1 Ω

Standard Resistance (Check for Short)

Tester Connection	Condition	Specified Condition
g1-3 (SWP) or A21-13 (IWP) - Body ground and other terminals	Power switch off	10 kΩ or higher

d. **Reconnect the A21 power management control ECU connector.**

e. **Reconnect the g1 inverter water pump assembly connector.**



10. READ VALUE USING GTS (INVERTER W/P REVOLUTION)

Note

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

Tech Tips

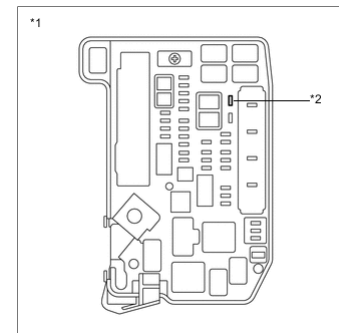
When the auxiliary battery voltage is low, the inverter water pump assembly may not operate.

- a. **Connect the GTS to the DLC3.**
- b. **Remove the IGCT No. 3 fuse from the engine room relay block and junction block assembly.**
- c. **Turn the power switch on (IG).**
- d. **Enter the following menus: Powertrain / Hybrid Control / ECU Data List / Inverter W/P Revolution.**
- e. **Read the Data List.**

Result

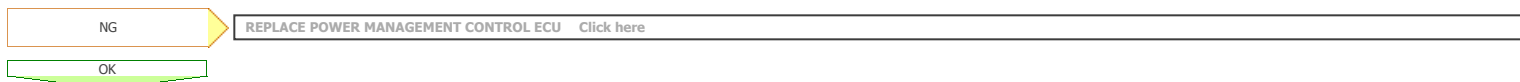
Tester Display	Condition	Specified Condition
Inverter W/P Revolution	Power switch on (IG)	125 rpm or less

- f. **Turn the power switch off.**
- g. **Install the IGCT No. 3 fuse.**



Text in Illustration

*1	Engine Room Relay Block and Junction Block Assembly
*2	IGCT No. 3 Fuse



11. CHECK HARNESS AND CONNECTOR (POWER MANAGEMENT CONTROL ECU - INVERTER WATER PUMP ASSEMBLY)

- a. **Disconnect the A21 power management control ECU connector.**
- b. **Turn the power switch on (IG).**
- c. **Measure the voltage according to the value(s) in the table below.**

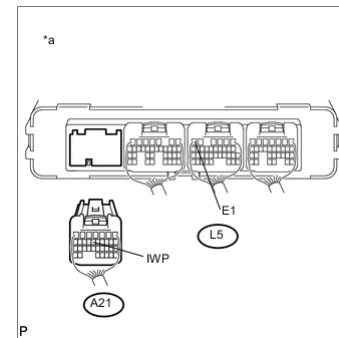
Standard Voltage

Tester Connection	Condition	Specified Condition
A21-13 (IWP) - L5-6 (E1)	Power switch on (IG)	11 to 14 V

Note

Turning the power switch on (IG) with the power management control ECU connector disconnected causes other DTCs to be stored. Clear the DTCs after performing this inspection.

- d. **Turn the power switch off.**
- e. **Reconnect the A21 power management control ECU connector.**



Text in Illustration
*a Rear view of wire harness connector (to Power Management Control ECU)

NG → REPLACE INVERTER WATER PUMP ASSEMBLY [Click here](#)

OK

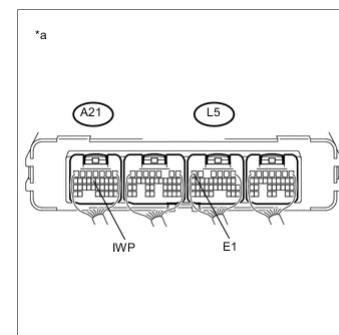
12. CHECK POWER MANAGEMENT CONTROL ECU

- a. Turn the power switch on (IG).
- b. While turning the power switch on (IG), check the waveform between the power management control ECU terminals.

Item	Content
Terminal	A21-13 (IWP) - L5-6 (E1)
Equipment Setting	5 V/DIV, 50 ms./DIV.
Condition	Power switch on (IG)

OK
Waveform duty ratio is between 3% and 9%.

- c. Turn the power switch off.



Text in Illustration
*a Component with Harness Connected (Power Management Control ECU)

OK → REPLACE INVERTER WATER PUMP ASSEMBLY [Click here](#)

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REPLACE POWER MANAGEMENT CONTROL ECU [Click here](#)