Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002AQP7
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: HEATING / AIR CONDITIONING: AIR CONDITIONING SYSTEM (for PHEV Model): Front Window Fogging; 2023 - 2024 MY Prius Prime [03/2023 -]		

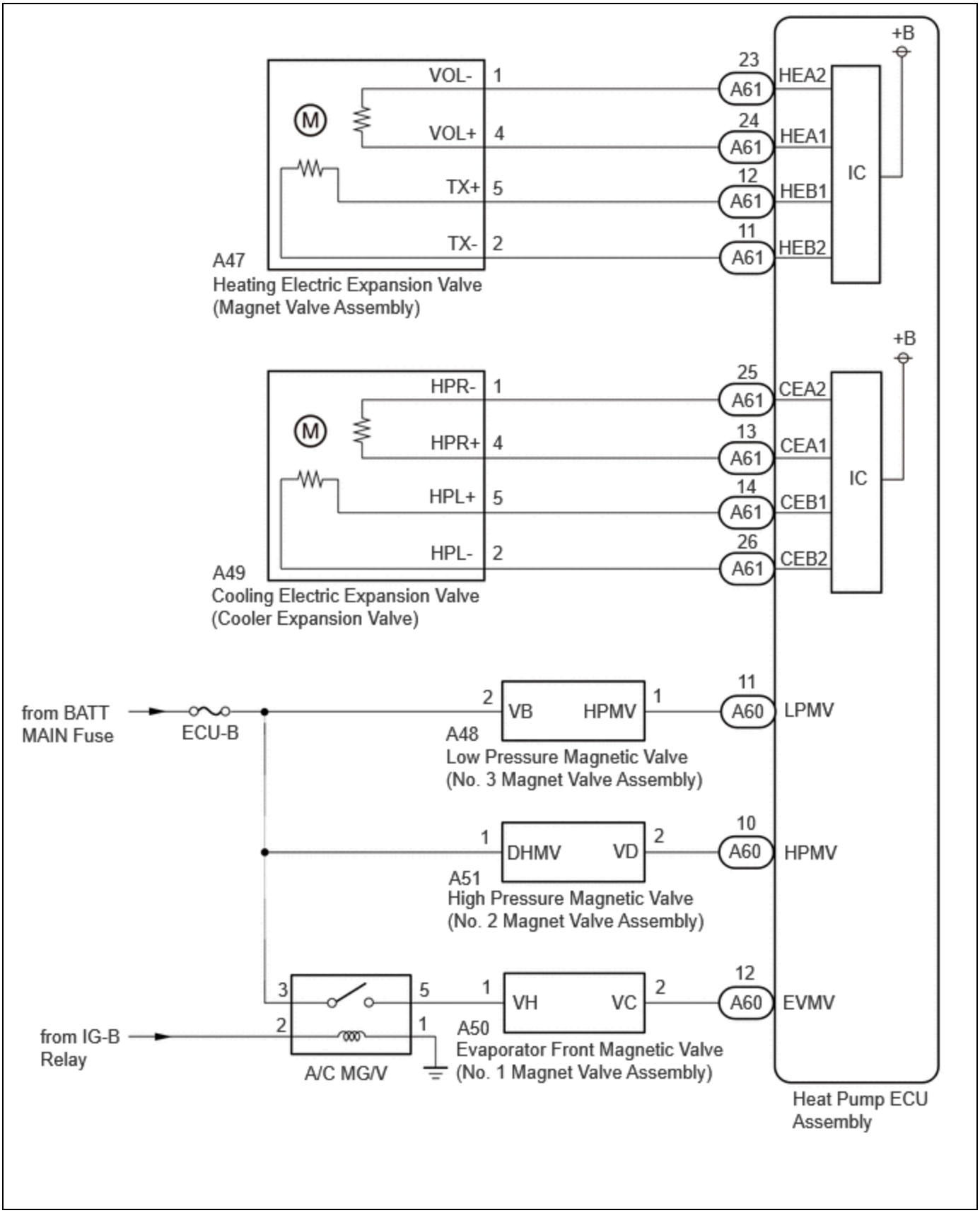
Front Window Fogging

DESCRIPTION

If the windshield frequently fogs up even though the air conditioning system is operating, the following factors may be the cause.

MALFUNCTION STATUS	FACTOR
Windshield frequently fogs up	• Refrigerant volume • Compressor with motor assembly • Servo motor (mode) • Damper and damper link • Cooling electric expansion valve (cooler expansion valve) • Heating electric expansion valve (magnet valve assembly) • Evaporator front magnetic valve (No. 1 magnet valve assembly) • Low pressure magnetic valve (No. 3 magnet valve assembly) • High pressure magnetic valve (No. 2 magnet valve assembly) • Internal condenser temperature sensor • Outer heat exchanger refrigerant temperature sensor (No. 1 air conditioning thermistor assembly) • Evaporator refrigerant temperature sensor (No. 2 air conditioning thermistor assembly) • Evaporator temp. sensor (No. 1 cooler thermistor) • Air conditioning pressure sensor • Heat pump ECU assembly

WIRING DIAGRAM



PROCEDURE

1.	**CHECK REFRIGERANT SHORTAGE**

(a) Prepare the vehicle according to the table below.

Measurement Condition:

ITEM	CONDITION
A/C Switch	On
Ambient Temperature*1	0 to 49°C (32 to 120°F)
Air Conditioning Air Inlet Temperature*2	25 to 35°C (77 to 95°F)
Set Temperature	MAX COLD
Recirculation/fresh Control Switch	Recirculation
Air Vent Damper Position	FACE
Blower Speed	HI

HINT:

*1: This inspection can be judged correctly only if the ambient temperature is within a range of 0 to 49°C (32 to 120°F). Therefore, postpone the test if the temperature is low.

*2: This inspection can be judged correctly only if the air inlet temperature is within a range of 25 to 35°C (77 to 95°F). Therefore, postpone the test if the temperature is out of range.

(b) Using the GTS, check the amount of refrigerant.

Body Electrical > Air Conditioner > Utility

TESTER DISPLAY
Refrigerant Gas Volume Check

NOTICE:

If the conditions for the inspection are not met, "Refrigerant incorrect" will be displayed on the GTS. Confirm the conditions of the inspection and perform the check again.

HINT:

- If the amount of refrigerant is insufficient, "Refrigerant shortage" is displayed on the GTS and the indicator light on the A/C switch turns off.
- When performing this inspection, a DTC will not be output even if "Refrigerant shortage" is displayed on the GTS.

RESULT	AMOUNT OF REFRIGERANT
Refrigerant shortage	Insufficient or leakage
Refrigerant correct	Correct
Refrigerant incorrect	Incorrect

OK:

"Refrigerant correct" is displayed on the GTS.

NG ▶ **CHARGE SYSTEM WITH REFRIGERANT**

OK

2.	CHECK OPERATION

(a) Press the front defroster switch on the radio and display receiver assembly and check that the air outlet mode changes to DEF mode.

OK:

The air outlet mode changes to DEF mode.

NG ▶ **GO TO DTC B14037F**

OK

3.	INSPECT HEATING ELECTRIC EXPANSION VALVE (MAGNET VALVE ASSEMBLY)

NOTICE:

Check that the following DTCs are not stored.

- B3A0B18
- B3A0B19

(a) Install a manifold gauge set.

Click here INFO

(b) Perform the Active Test according to the display on the GTS.

Body Electrical > Air Conditioner > Active Test

TESTER DISPLAY	MEASUREMENT ITEM	CONTROL RANGE	DIAGNOSTIC NOTE
Heating Electric Expansion Valve	This test activates heating electric expansion valve to a target position. (Heating electric expansion valve (magnet valve assembly))	0%: Min. 100%: Max.	• Ignition switch ON (READY) • EV Mode • Blower: Manual Hi • Set Temperature: Manual Hi • Ambient Temperature: -10°C (14.0°F) or more than -10°C (14.0°F) • A/C Switch: OFF • Air Inlet Mode: Outside Air • Engine Coolant Temperature: 40°C (104°F) or less than 40°C (104°F)

Body Electrical > Air Conditioner > Active Test

TESTER DISPLAY
Heating Electric Expansion Valve

OK:

Read the gauge of the manifold gauge set and check that the value is changing.

NG ▶ **REPLACE HEATING ELECTRIC EXPANSION VALVE (MAGNET VALVE ASSEMBLY)**

OK ▼

4.	**CHECK HARNESS AND CONNECTOR (EVAPORATOR FRONT MAGNETIC VALVE (NO. 1 MAGNET VALVE ASSEMBLY) - HEAT PUMP ECU ASSEMBLY)**

(a) Disconnect the A50 evaporator front magnetic valve (No. 1 magnet valve assembly) connector.

(b) Disconnect the A60 heat pump ECU assembly connector.

(c) Remove the magnet-clutch relay (A/C MG/V).

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

Standard Resistance:

EWD INFO

Click Location & Routing(A50,A60)
Click Connector(A50)
Click Connector(A60)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A50-2 (VC) - A60-12 (EVMV)	Always	Below 1 Ω
Relay terminal 5 - A50-1 (VH)	Always	Below 1 Ω
A50-2 (VC) or A60-12 (EVMV) - Body ground	Always	10 kΩ or higher
Relay terminal 5 or A50-1 (VH) - Other terminals and body ground	Always	10 kΩ or higher

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

OK ▼

5.	**CHECK COOLING ELECTRIC EXPANSION VALVE (COOLER EXPANSION VALVE)**

(a) Set the vehicle to the following conditions.

Measurement Condition:

ITEM	CONDITION
Vehicle Condition	Ignition switch ON (READY)
A/C Switch	On
Ambient Temperature*	0 to 49°C (32 to 120°F)
Set Temperature	MAX COLD
Recirculation/fresh Control Switch	Recirculation
Air Vent Damper Position	FACE
Blower Speed	HI

HINT:

*: This inspection can be judged correctly only if the ambient temperature is within a range of 0 to 49°C (32 to 120°F). Therefore, postpone the test if the temperature is low.

(b) Using the GTS, perform the Active Test and check the Data List values.

Body Electrical > Air Conditioner > Active Test

TESTER DISPLAY	MEASUREMENT ITEM	CONTROL RANGE	DIAGNOSTIC NOTE
Cooling Electric Expansion Valve	This test activates cooling electric expansion valve to a target position. (Cooling electric expansion valve (cooler expansion valve))	Min.: 0% Max.: 100%	• Ignition switch ON (READY) • Blower: Manual Hi • Set Temperature: Manual Lo • Ambient Temperature: 0°C (32°F) or more than 0°C (32°F)

Body Electrical > Air Conditioner > Data List

TESTER DISPLAY	MEASUREMENT ITEM	RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Evaporator Fin Thermistor	Evaporator temp. sensor (No. 1 cooler thermistor)	-327.68 to 327.67°C	Actual evaporator temperature displayed	Evaporator temp. sensor (No. 1 cooler thermistor) circuit malfunction
Regulator Pressure Sensor	Air conditioning pressure sensor	-32768 to 32767 kPa(gauge) (-32.768 to 32.767 MPaG)	Actual refrigerant pressure displayed	• Refrigerant line (gas leak etc.) • Air conditioning pressure sensor circuit malfunction
Compressor Actual Speed	Compressor speed	0 to 10000 rpm	Actual compressor speed displayed	When compressor running: • Compressor with motor assembly

TESTER DISPLAY	MEASUREMENT ITEM	RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Cooling Electric Expansion Valve Target Position	Target opening angle of cooling electric expansion valve (cooler expansion valve)	0 to 100 %	Target opening angle of cooling electric expansion valve (cooler expansion valve)	Cooling electric expansion valve (cooler expansion valve) circuit malfunction
Subcool Target Temperature	Target temperature of the sub-cooler calculated by ECU	-327.68 to 327.67°C	Target temperature of the sub-cooler calculated by ECU	Displays in range of 0 to 30°C (32 to 86°F)
Subcool Estimated Temperature (ECU Calculation Value)	Sub-cooler estimated temperature calculated by ECU	-327.68 to 327.67°C	Sub-cooler estimated temperature calculated by ECU	Displays in range of 0 to 30°C (32 to 86°F)
Cooling Electric Expansion Valve	Actual opening angle of cooling electric expansion valve (cooler expansion valve)	0 to 100 %	Actual opening angle following the target opening angle	Cooling electric expansion valve (cooler expansion valve) circuit malfunction

Body Electrical > Air Conditioner > Active Test

ACTIVE TEST DISPLAY
Cooling Electric Expansion Valve

DATA LIST DISPLAY
Evaporator Fin Thermistor
Regulator Pressure Sensor
Compressor Actual Speed
Cooling Electric Expansion Valve Target Position
Subcool Target Temperature
Subcool Estimated Temperature (ECU Calculation Value)
Cooling Electric Expansion Valve

OK:

The refrigerant pressure decreases when the control value of the cooling electric expansion valve (cooler expansion valve) is increased 20%.

The refrigerant pressure increases when the control value of the cooling electric expansion valve (cooler expansion valve) is reverted.

NG ▶ **GO TO STEP 9**

OK ▼

6.	CHECK HEATING ELECTRIC EXPANSION VALVE (MAGNET VALVE ASSEMBLY)

(a) Set the vehicle to the following conditions.

Measurement Condition:

ITEM	CONDITION
Vehicle Condition	Ignition switch ON (READY)
A/C Switch	On
Ambient Temperature*	0 to 25°C (32 to 77°F)
Set Temperature	MAX COLD
Recirculation/fresh Control Switch	Recirculation
Air Vent Damper Position	FACE
Blower Speed	HI

HINT:

*: This inspection can be judged correctly only if the ambient temperature is within a range of 0 to 25°C (32 to 77°F). Therefore, postpone the test if the temperature is low.

(b) Using the GTS, perform the Active Test and check the Data List values.

Body Electrical > Air Conditioner > Active Test

TESTER DISPLAY	MEASUREMENT ITEM	CONTROL RANGE	DIAGNOSTIC NOTE
Heating Electric Expansion Valve	This test activates heating electric expansion valve to a target position. (heating electric expansion valve (magnet valve assembly))	0%: Min. 100%: Max.	• Ignition switch ON (READY) • EV Mode • Blower: Manual Hi • Set Temperature: Manual Hi • Ambient Temperature: -10°C (14.0°F) or more than -10°C (14.0°F) • A/C Switch: OFF • Air Inlet Mode: Outside Air • Engine Coolant Temperature: 40°C (104°F) or less than 40°C

TESTER DISPLAY	MEASUREMENT ITEM	CONTROL RANGE	DIAGNOSTIC NOTE
			(104°F)

Body Electrical > Air Conditioner > Data List

TESTER DISPLAY	MEASUREMENT ITEM	RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Regulator Pressure Sensor	Air conditioning pressure sensor	-32768 to 32767 kPa(gauge) (-32.768 to 32.767 MPaG)	Actual refrigerant pressure displayed	• Refrigerant line (gas leak etc.) • Air conditioning pressure sensor circuit malfunction
Front Right Air Outlet Temperature	Target air outlet temperature	-327.68 to 327.67°C	Target air outlet temperature displayed • MAX COLD: -327.68°C • MAX HOT: 327.67°C	-
Front Right Set Temperature	Set temperature	MAX COLD / 14.0°C to 32.0°C (58°F to 90°F) / MAX HOT	Set temperature displayed	Air conditioning control assembly circuit malfunction
Compressor Actual Speed	Compressor speed	0 to 10000 rpm	Actual compressor speed displayed	When compressor running: • Compressor with motor assembly
Heating Electric Expansion Valve Target Position	Target opening angle of heating electric expansion valve (magnet valve assembly)	0 to 100 %	Target opening angle of heating electric expansion valve (magnet valve assembly)	Heating electric expansion valve (magnet valve assembly) circuit malfunction
Subcool Target Temperature	Target temperature of the sub-cooler calculated by ECU	-327.68 to 327.67°C	Target temperature of the sub-cooler calculated by ECU	Displays in range of 0 to 30°C (32 to 86°F)

TESTER DISPLAY	MEASUREMENT ITEM	RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Subcool Estimated Temperature (ECU Calculation Value)	Sub-cooler estimated temperature calculated by ECU	-327.68 to 327.67°C	Sub-cooler estimated temperature calculated by ECU	Displays in range of 0 to 30°C (32 to 86°F)
Heating Electric Expansion Valve	Actual opening angle of heating electric expansion valve (magnet valve assembly)	0 to 100 %	Actual opening angle following the target opening angle	Heating electric expansion valve (magnet valve assembly) circuit malfunction

Body Electrical > Air Conditioner > Active Test

ACTIVE TEST DISPLAY
Heating Electric Expansion Valve

DATA LIST DISPLAY
Regulator Pressure Sensor
Front Right Air Outlet Temperature
Front Right Set Temperature
Compressor Actual Speed
Heating Electric Expansion Valve Target Position
Subcool Target Temperature
Subcool Estimated Temperature (ECU Calculation Value)
Heating Electric Expansion Valve

OK:

The refrigerant pressure decreases when the control value of the heating electric expansion valve (magnet valve assembly) is increased 50%.

The refrigerant pressure increases when the control value of the heating electric expansion valve (magnet valve assembly) is reverted.

OK ▶ **REPLACE HEAT PUMP ECU ASSEMBLY**

NG
▼

7.	**CHECK HARNESS AND CONNECTOR (HEATING ELECTRIC EXPANSION VALVE (MAGNET VALVE ASSEMBLY) - HEAT PUMP ECU ASSEMBLY)**

(a) Disconnect the A47 heating electric expansion valve (magnet valve assembly) connector.

(b) Disconnect the A61 heat pump ECU assembly connector.

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

Standard Resistance:

EWD INFO

Click Location & Routing(A47,A61)
Click Connector(A47)
Click Connector(A61)

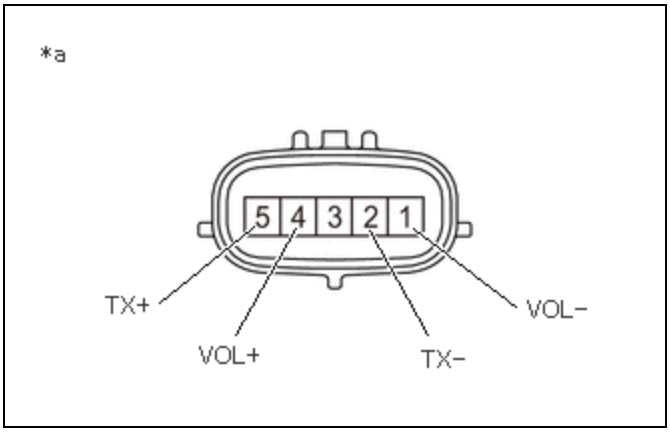
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A47-1 (VOL-) - A61-23 (HEA2)	Always	Below 1 Ω
A47-4 (VOL+) - A61-24 (HEA1)	Always	Below 1 Ω
A47-5 (TX+) - A61-12 (HEB1)	Always	Below 1 Ω
A47-2 (TX-) - A61-11 (HEB2)	Always	Below 1 Ω
A47-1 (VOL-) or A61-23 (HEA2) - Other terminals and body ground	Always	10 kΩ or higher
A47-4 (VOL+) or A61-24 (HEA1) - Other terminals and body ground	Always	10 kΩ or higher
A47-5 (TX+) or A61-12 (HEB1) - Other terminals and body ground	Always	10 kΩ or higher
A47-2 (TX-) or A61-11(HEB2) - Other terminals and body ground	Always	10 kΩ or higher

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

OK
▼

8.	**INSPECT HEATING ELECTRIC EXPANSION VALVE (MAGNET VALVE ASSEMBLY)**

(a) Disconnect the A47 heating electric expansion valve (magnet valve assembly) connector.



*a	Component without harness connected (Heating Electric Expansion Valve (Magnet Valve Assembly))

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 (VOL-) - 4 (VOL+)	20°C (68°F)	8 to 10 Ω
2 (TX-) - 5 (TX+)	20°C (68°F)	8 to 10 Ω

OK ▶ **REPLACE HEAT PUMP ECU ASSEMBLY**

NG ▶ **REPLACE HEATING ELECTRIC EXPANSION VALVE (MAGNET VALVE ASSEMBLY)**

9.	**CHECK HARNESS AND CONNECTOR (COOLING ELECTRIC EXPANSION VALVE (COOLER EXPANSION VALVE) - HEAT PUMP ECU ASSEMBLY)**

(a) Disconnect the A49 cooling electric expansion valve (cooler expansion valve) connector.

(b) Disconnect the A61 heat pump ECU assembly connector.

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

Standard Resistance:

EWD INFO

Click Location & Routing(A49,A61)
Click Connector(A49)
Click Connector(A61)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A49-1 (HPR-) - A61-25 (CEA2)	Always	Below 1 Ω

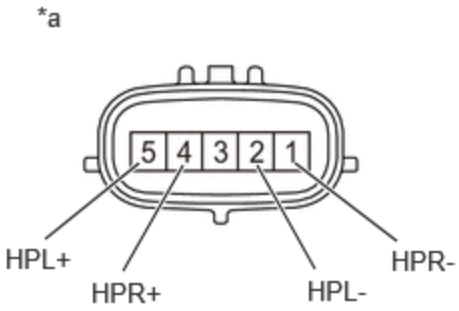
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A49-4 (HPR+) - A61-13 (CEA1)	Always	Below 1 Ω
A49-5 (HPL+) - A61-14 (CEB1)	Always	Below 1 Ω
A49-2 (HPL-) - A61-26 (CEB2)	Always	Below 1 Ω
A49-1 (HPR-) or A61-25 (CEA2) - Other terminals and body ground	Always	10 kΩ or higher
A49-4 (HPR+) or A61-13 (CEA1) - Other terminals and body ground	Always	10 kΩ or higher
A49-5 (HPL+) or A61-14 (CEB1) - Other terminals and body ground	Always	10 kΩ or higher
A49-2 (HPL-) or A61-26 (CEB2) - Other terminals and body ground	Always	10 kΩ or higher

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

OK ▼

10.	**INSPECT COOLING ELECTRIC EXPANSION VALVE (COOLER EXPANSION VALVE)**

(a) Disconnect the A49 cooling electric expansion valve (cooler expansion valve) connector.



*a	Component without harness connected (Cooling Electric Expansion Valve (Cooler Expansion Valve))

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 (HPR-) - 4 (HPR+)	20°C (68°F)	8 to 10 Ω
2 (HPL-) - 5 (HPL+)	20°C (68°F)	8 to 10 Ω

OK ▶ **REPLACE HEAT PUMP ECU ASSEMBLY**

NG ▶ **REPLACE COOLING ELECTRIC EXPANSION VALVE (COOLER EXPANSION VALVE)**