Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002BI35
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: HYBRID / BATTERY CONTROL: HYBRID CONTROL SYSTEM (for PHEV Model): P19E100; DC/DC Converter System Performance; 2023 - 2024 MY Prius Prime [03/2023 -]		

DTC	**P19E100**	**DC/DC Converter System Performance**

DESCRIPTION

The DC/DC converter converts the voltage from the HV battery to supply power to the vehicle lights, audio system and various ECUs, etc.

At the same time, it performs charging of the auxiliary battery, controlling the output voltage to maintain a specific voltage at the auxiliary battery terminal.

Via CAN communication, the hybrid vehicle control ECU sends stop commands to the DC/DC converter, and receives DC/DC converter Normal/Malfunction status signals.

When an auxiliary charging system malfunction causes DC/DC converter output to stop, and either the auxiliary battery voltage is 11 V or more for 5 seconds or more, or the auxiliary battery voltage is 11 V or less for 0.05 seconds or more, this DTC is stored.

This DTC may also be stored if a malfunction of the inverter cooling system (blockage, inverter water pump malfunction, etc.) or a high-voltage insulation malfunction occurs.

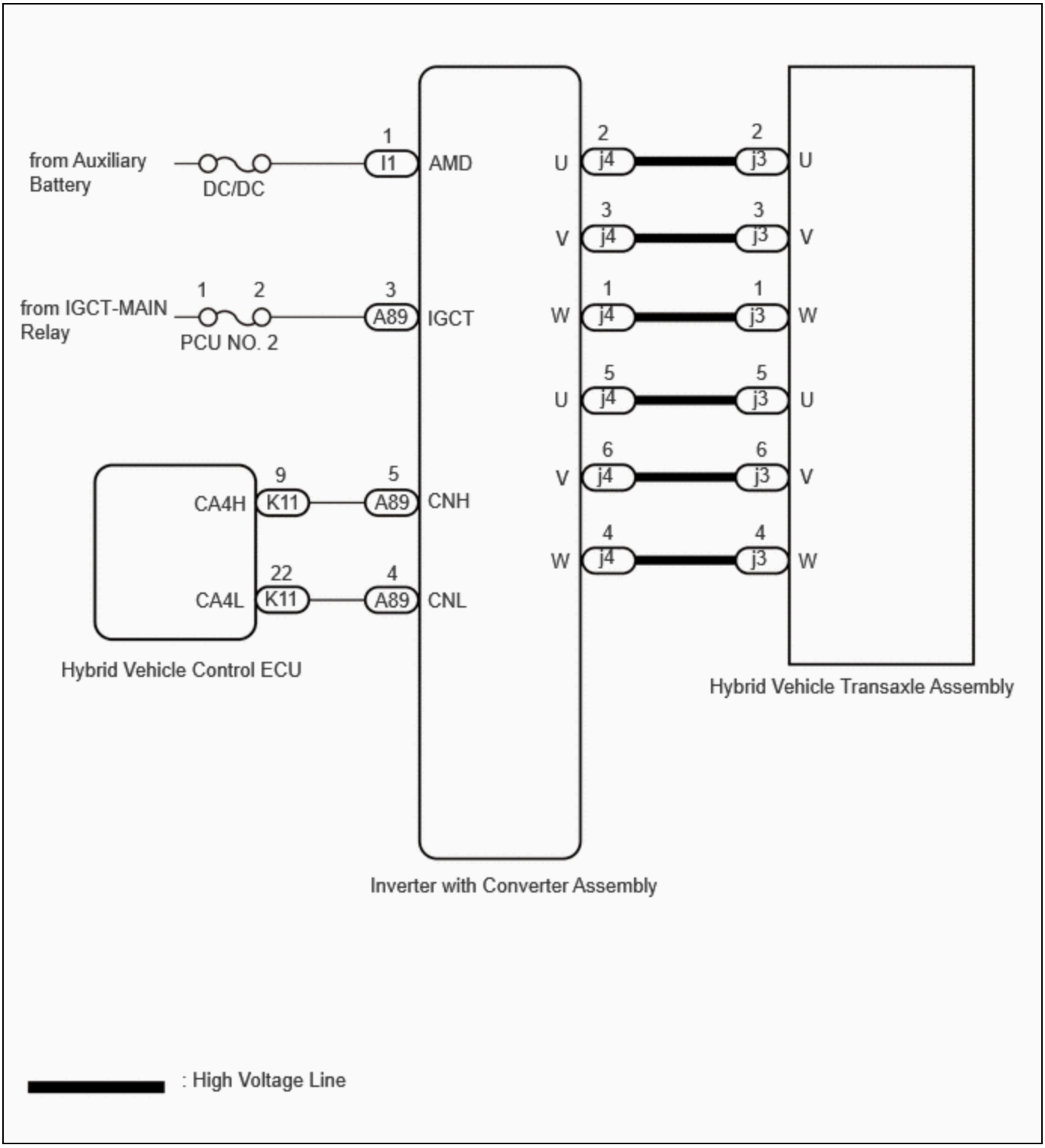
DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
P19E100	DC/DC Converter System Performance	Any of the following conditions are met: • DC/DC converter stop signal is ON, and auxiliary battery voltage is 11 V or more for 5 seconds or more* • DC/DC converter stop signal is ON, and auxiliary battery voltage is 11 V or less for 0.05	• Hybrid vehicle control ECU • Inverter with converter assembly • Hybrid vehicle transaxle assembly • Inverter cooling system • Cooling fan system • Wire harness or connector	Does not come on	Master Warning: Comes on	Hybrid Control	A	SAE Code: P19E1

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
		seconds or more* (1 trip detection logic)	• DC/DC fuse • PCU NO. 2 fuse					

HINT:

*: If the DC/DC converter is malfunctioning, its operation and charging will be stopped and the auxiliary battery voltage will drop.

WIRING DIAGRAM



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 auxiliary negative (-) 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

HINT:

- After repair, clear the DTCs, turn the ignition switch off and wait for 30 seconds or more and perform the following procedure to confirm that the auxiliary battery low voltage indicated by this DTC has been repaired.
  a. Wait for 2 minutes with the shift lever in P, the ignition switch ON (READY) and the following conditions met, then confirm that Data List item "BATT Voltage (Hybrid control system)" is between 13.0 and 15.0 V.

     (If charging is not performed and the electrical load increases, +B voltage may not be steady and will gradually drop.)

     i. Headlight switch is in the HI position.
     ii. A/C blower fan switch is in the HI position.
     iii. Window defogger switch is turned on.
- By performing the following procedure, the DC/DC converter function can be checked.
  a. Connect the AC/DC 400 A probe to the positive (+) auxiliary battery cable.

     i. Turn the ignition switch to ON (READY) and leave the vehicle as is until the electric current flowing to the auxiliary battery becomes 10 A or less.
     ii. Turn the ignition switch to ON (READY) and turn the headlight switch and A/C blower fan switch to the HI position and the window defogger on.
     iii. Confirm that the current drawn from the auxiliary battery is 0 A or lower and the auxiliary battery voltage is between 13.0 and 15.0 V.
- This DTC may be also stored when a part other than the DC/DC converter is malfunctioning or depending on user operation.
- If this vehicle is used to jump start another vehicle with a discharged battery, a fuse may blow due to overcurrent or the DC/DC converter self-protection may be activated. Also, if this vehicle is jump started by a vehicle with a 24 V battery, the same malfunction may occur and this DTC may be stored. (The suspended DC/DC converter control will return to normal by clearing the DTCs and turning the ignition switch off.)
- Check whether high electrical load equipment such as a high-capacitance audio device or electric kettle is used in the vehicle. (A fuse of the auxiliary battery may be blown due to overcurrent.)
- If the DC/DC converter is malfunctioning, the auxiliary battery cannot be charged. Therefore, once the ignition switch is turned off, it may be impossible to turn it to ON (READY) again if the auxiliary battery is completely discharged. In this case, charge the auxiliary battery. Be careful as charging is not performed during the inspection.
- If the ignition switch turns off immediately after it is turned to ON (READY), the auxiliary battery voltage may be low. Charge the auxiliary battery.
- P19E100 may be output as a result of the malfunction 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.)

  Table 1

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
Insulation Malfunction	Hybrid control system	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	SYSTEM	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
High Voltage Circuit Malfunction	Hybrid control system	P0AA649	Hybrid/EV Battery Voltage System Isolation Internal Electronic Failure
		P0AD911	Hybrid/EV Battery Positive Contactor Circuit Short to Ground
		P0ADD11	Hybrid/EV Battery Negative Contactor Circuit Short to Ground
		P0AE411	Hybrid/EV Battery Precharge Contactor Circuit Short to Ground
		P1C8449	High Voltage Power Resource Circuit Short during Ready ON
		P300449	High Voltage Power Resource Circuit Short during Pre-Charge

Table 2

MALFUNCTION CONTENT	SYSTEM	RELEVANT DTC	
System malfunction	Hybrid control system	U01BD87	Lost Communication with DC/DC Converter Control Module "C"
		P0A9300	Inverter "A" Cooling System Performance
		P0C7396	Motor Electronics Coolant Pump "A" Component Internal Failure
		P314A31	Motor Electronics Coolant Pump "A" No Signal
	Motor generator control system	P0E5717	DC/DC Converter Voltage Sensor "A" (VL) Circuit Voltage Above Threshold

PROCEDURE

1.	**CHECK FUSE (DC/DC)**

Pre-procedure1

(a) Disconnect the cable from the negative (-) auxiliary battery terminal.

(b) Remove the DC/DC fuse from the No. 1 engine room relay block and No. 1 junction block assembly.

Procedure1

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
DC/DC fuse	Always	Below 1 Ω	Ω

Post-procedure1

(d) Install the DC/DC fuse.

(e) Connect the cable to the negative (-) auxiliary battery terminal.

NG ▶ **GO TO STEP 15**

OK ▼

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

Click here INFO

NG ▶ **CONNECT SECURELY**

OK ▼

3.	**CHECK CONNECTOR CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY CONNECTOR)**

CAUTION:

Be sure to wear insulated gloves.

Pre-procedure1

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

NOTICE:

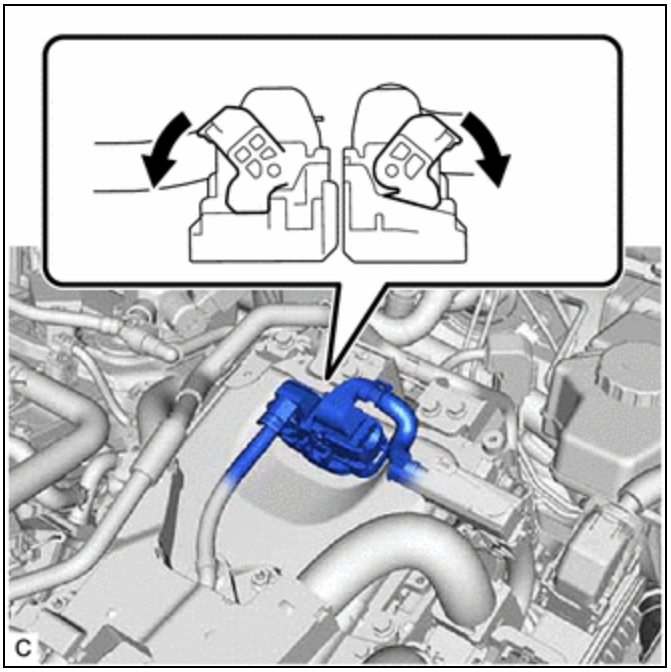
After removing the service plug grip, do not turn the ignition switch to ON (READY), unless instructed by the repair manual because this may cause a malfunction.

Procedure1

(b) Check the connection condition of the low voltage connectors of the inverter with converter assembly and the contact pressure of each terminal. Check the terminals for deformation, and the connector for water and foreign matter.

HINT:

Click here INFO



NOTICE:

Before disconnecting the connector, confirm that it is properly connected by checking that the claws of the lock levers are engaged and that the connector cannot be pulled off.

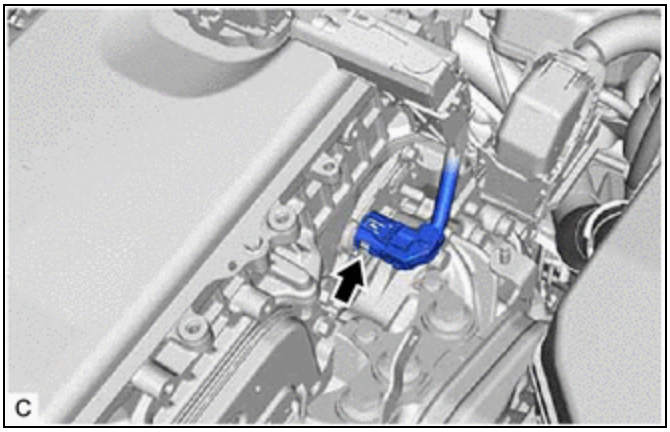
OK:

- The connector is connected securely.
- The terminals are not deformed and are connected securely.
- No water or foreign matter in the connector.

RESULT	PROCEED TO
OK	A
NG (The connector is not connected securely.)	B
NG (The terminals are not making secure contact or are deformed, or water or foreign matter exists in the connector.)	C

HINT:

When connecting the connector, connect it with the lock levers raised. Rotate each lock lever downward and make sure that the connector is securely connected. When a lock lever is fully lowered, a click will be heard as its claw engages. After the click is heard, pull up on the connector to confirm that it is securely connected.



Post-procedure1

(c) None.

B ▶ **CONNECT SECURELY**

C ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

A

4.	**CHECK FUSE (PCU NO. 2)**

Pre-procedure1

(a) Remove the PCU NO. 2 fuse from the No. 1 engine room relay block and No. 1 junction block assembly.

Procedure1

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
PCU NO. 2 fuse	Always	Below 1 Ω	Ω

Post-procedure1

(c) Install the PCU NO. 2 fuse.

NG ▶ **REPLACE FUSE (PCU NO. 2)**

OK

5.	CHECK HARNESS AND CONNECTOR (DC/DC CONVERTER POWER SOURCE CIRCUIT)

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 inverter with converter assembly connector.

(c) Connect the cable to the negative (-) auxiliary battery terminal.

(d) Turn the ignition switch to ON.

Procedure1

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

Standard Voltage:

EWD INFO

Click Location & Routing(A89)
Click Connector(A89)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A89-3 (IGCT) - Body ground	Ignition switch ON	Same as auxiliary battery voltage

NOTICE:

Turning the ignition switch to ON with the service plug grip removed causes other DTCs to be stored. Clear the DTCs after performing this inspection.

Post-procedure1

(f) Turn the ignition switch off.

(g) Disconnect the cable from the negative (-) auxiliary battery terminal.

(h) Reconnect the inverter with converter assembly connector.

NG ▶ **REPLACE MALFUNCTIONING PARTS**

OK ▼

6.	CHECK AMD TERMINAL VOLTAGE

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) Connect the cable to the negative (-) auxiliary battery terminal.

Procedure1

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

Standard Voltage:

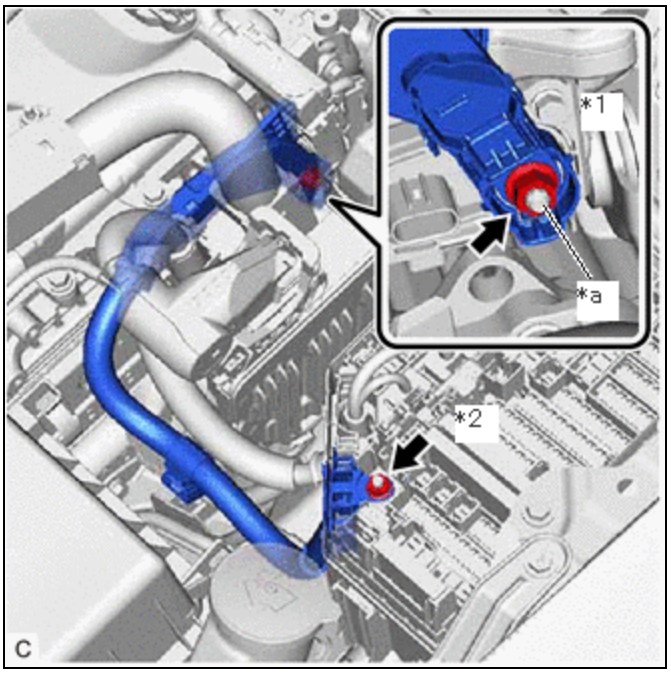
EWD INFO

Click Location & Routing(I1)
Click Connector(I1)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
I1-1 (AMD) - Body ground	Ignition switch off	Same as auxiliary battery voltage

Result:

PROCEED TO
OK
NG



*1	AMD Terminal (Inverter with Converter Assembly Side)
*2	AMD Terminal (No. 1 Engine Room Relay Block and No. 1 Junction Block Assembly Side)
*a	I1-1 (AMD)

Post-procedure1

(d) Disconnect the cable from the negative (-) auxiliary battery terminal.

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

OK ▼

7.	CHECK AMD TERMINAL CONNECTION CONDITION

CAUTION:

Be sure to wear insulated gloves.

Pre-procedure1

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

NOTICE:

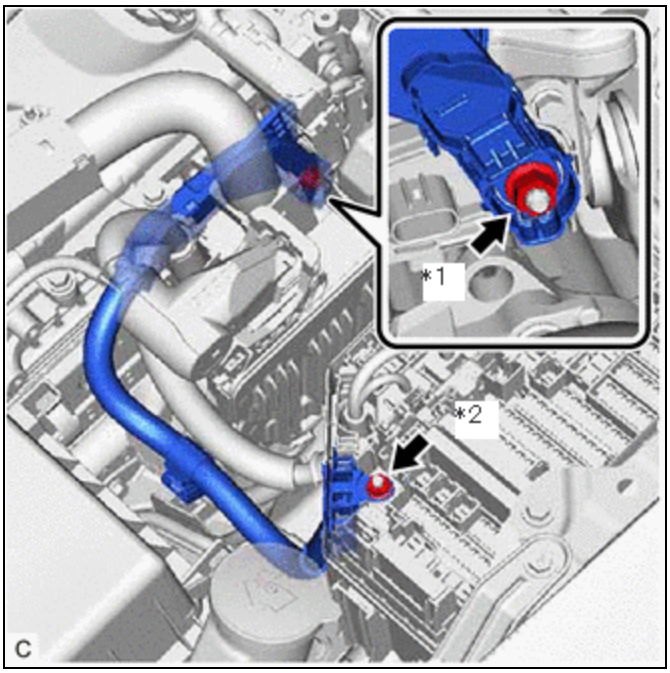
After removing the service plug grip, do not turn the ignition switch to ON (READY), unless instructed by the repair manual because this may cause a malfunction.

Procedure1

(b) Check that the nuts for the AMD terminal are tightened to the specified torque, the AMD terminal is connected securely, and there are no contact problems.

Result:

RESULT		PROCEED TO
There are no arc marks.	The terminal is connected securely and there are no contact problems.	A
There are no arc marks.	The terminal is not connected securely and there is a contact problem.	B
There are arc marks.	-	C



*1	AMD Terminal (Inverter with Converter Assembly Side)
*2	AMD Terminal (No. 1 Engine Room Relay Block and No. 1 Junction Block Assembly Side)

Post-procedure1

(c) None.

B ▶ **CONNECT SECURELY**

C ▶ **REPLACE MALFUNCTIONING PARTS**

A

8.	**CHECK GROUND WIRE CONNECTION CONDITION (INVERTER WITH CONVERTER ASSEMBLY)**

HINT:

Click here INFO

OK:

The ground wire is securely installed.

NG ▶ **CONNECT SECURELY**

OK ▼

9.	**CHECK HARNESS AND CONNECTOR (HYBRID VEHICLE CONTROL ECU - INVERTER WITH CONVERTER ASSEMBLY)**

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 inverter with converter assembly connector.

(c) Disconnect the hybrid vehicle control ECU connector.

Procedure1

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

Standard Resistance (Check for Open):

EWD INFO

Click Location & Routing(A89,K11)
Click Connector(A89)
Click Connector(K11)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
A89-5 (CNH) - K11-9 (CA4H)	Ignition switch off	Below 1 Ω	Ω
A89-4 (CNL) - K11-22 (CA4L)	Ignition switch off	Below 1 Ω	Ω

Standard Resistance (Check for Short):

EWD INFO

Click Location & Routing(A89,K11)
Click Connector(A89)
Click Connector(K11)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
A89-5 (CNH) or K11-9 (CA4H) - Body ground and other terminals	Ignition switch off	10 kΩ or higher	kΩ
A89-4 (CNL) or K11-22 (CA4L) - Body ground and other terminals	Ignition switch off	10 kΩ or higher	kΩ

Post-procedure1

(e) Reconnect the hybrid vehicle control ECU connector.

(f) Reconnect the inverter with converter assembly connector.

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

OK ▼

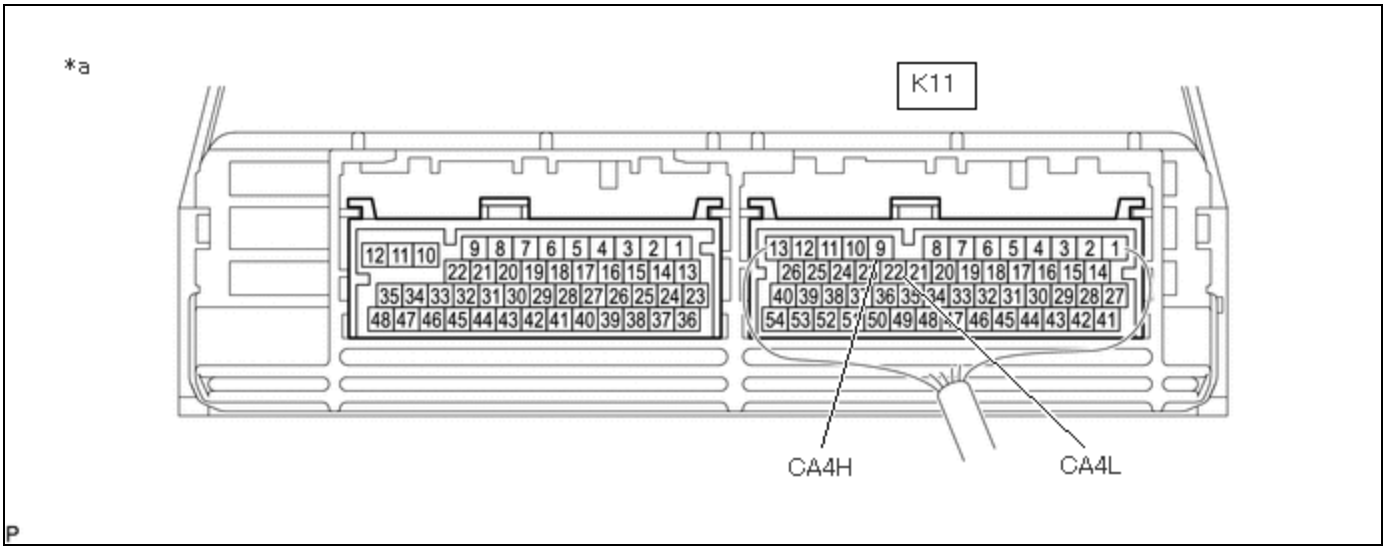
10.	**INSPECT HYBRID VEHICLE CONTROL ECU**

Pre-procedure1

(a) Disconnect the hybrid vehicle control ECU connector.

Procedure1

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



*a	Component without harness connected (Hybrid Vehicle Control ECU)	-	-

Standard Resistance:

EWD INFO

Click Location & Routing(K11)
Click Connector(K11)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
K11-9 (CA4H) - K11-22 (CA4L)	Ignition switch off	80 to 170 Ω	Ω

Post-procedure1

(c) Reconnect the hybrid vehicle control ECU connector.

NG ▶ **REPLACE HYBRID VEHICLE CONTROL ECU**

OK
▼

11.	**CHECK COOLING SYSTEM**

Click here INFO

NEXT
▼

12.	CHECK DC/DC CONVERTER FUNCTION

HINT:

The current at the AMD terminal cannot be measured directly because of space limitations. Measure the current flowing at the auxiliary battery instead.

Pre-procedure1

(a) Connect the AC/DC 400 A probe of the tester to the positive (+) auxiliary battery cable.

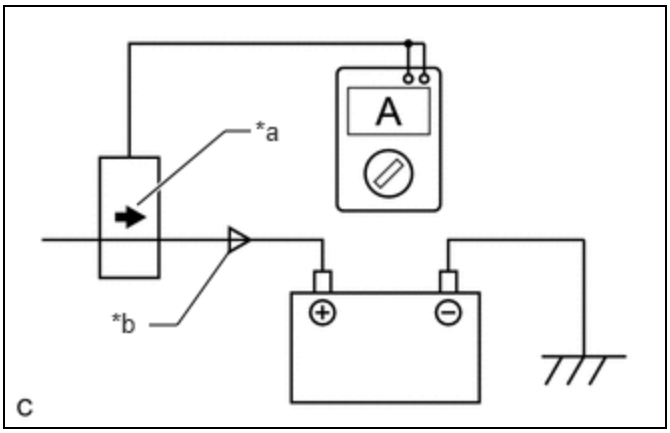
(b) Install the service plug grip.

(c) Connect the cable to the negative (-) auxiliary battery terminal.

(d) Turn the ignition switch to ON (READY) and leave the vehicle as it is until the electric current flowing to the auxiliary battery becomes 10 A or less.

HINT:

If the ignition switch turns off immediately after it is turned to ON (READY), auxiliary battery voltage may be low. Recharge the auxiliary battery and perform this procedure again.



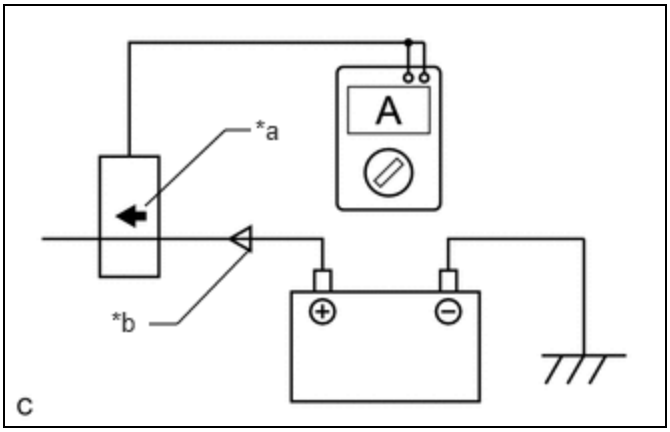
*a	Probe Direction
*b	Current Flowing to Auxiliary Battery

Procedure1

(e) Measure the current flowing from the auxiliary battery with the ignition switch ON (READY), the headlight position switch and blower motor switch in the HI position, and the rear window defogger turned on.

Standard Current:

ITEM	CONDITION	SPECIFIED CONDITION
Current flowing from auxiliary battery	Ignition switch ON (READY) (The headlight position switch and blower motor switch are in the HI position, and the rear window defogger is turned on.)	0 A or less (no current from auxiliary battery)



*a	Probe Direction
*b	Current Flowing from Auxiliary Battery

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

Standard Voltage:

ITEM	CONDITION	SPECIFIED CONDITION
Auxiliary battery voltage	Ignition switch ON (READY) (The headlight position switch and blower motor switch are in the HI position, and the rear window defogger is turned on.)	12.5 to 15 V

Post-procedure1

(g) Turn the ignition switch off.

NG ▶ **GO TO STEP 14**

OK ▼

13.	CHECK DTC OUTPUT (HYBRID CONTROL)

Pre-procedure1

(a) None.

Procedure1

(b) Check for DTCs.

Powertrain > Hybrid Control > Trouble Codes

Result	PROCEED TO
P19E100 is output	A
P19E100 is not output	B

HINT:

As the DTC detection conditions include decreased auxiliary battery voltage, if the DTC is not input again, when the auxiliary battery is charged it can be judged that the vehicle has returned to normal.

Post-procedure1

(c) Turn the ignition switch off.

A ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

B ▶ **RECHARGE AUXILIARY BATTERY**

14.	CHECK HIGH VOLTAGE INSULATION

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) Remove the inverter cover from the inverter with converter assembly.

Procedure1

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

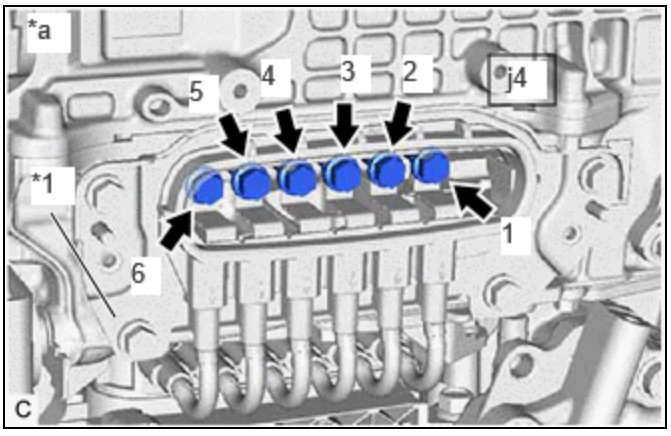
NOTICE:

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(j4)
Click Connector(j4)



*1	Shield Ground

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
j4-1 (W) - Body ground and shield ground	Ignition switch off	1 MΩ or higher	MΩ
j4-2 (U) - Body ground and shield ground	Ignition switch off	1 MΩ or higher	MΩ
j4-3 (V) - Body ground and shield ground	Ignition switch off	1 MΩ or higher	MΩ
j4-4 (W) - Body ground and shield ground	Ignition switch off	1 MΩ or higher	MΩ
j4-5 (U) - Body ground and shield ground	Ignition switch off	1 MΩ or higher	MΩ
j4-6 (V) - Body ground and shield ground	Ignition switch off	1 MΩ or higher	MΩ

*a	Motor Cable (Inverter with Converter Assembly Side)

HINT:

Perform this inspection while the motor cable is connected.

Result:

PROCEED TO
OK
NG

Post-procedure1

(d) Install the inverter cover to the inverter with converter assembly.

OK ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

NG ▶ **GO TO STEP 17**

15.	**CHECK HARNESS AND CONNECTOR (INVERTER WITH CONVERTER ASSEMBLY - NO. 1 ENGINE ROOM RELAY BLOCK AND NO. 1 JUNCTION BLOCK ASSEMBLY)**

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 cable from the negative (-) auxiliary battery terminal.

(c) Disconnect the No. 3 engine wire from the AMD terminal connector (inverter with converter assembly side and No. 1 engine room relay block and No. 1 junction block assembly side).

Procedure1

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

Standard Resistance:

EWD INFO

Click Location & Routing(I1)
Click Connector(I1)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
I1-1 (AMD) or 1B-1 - Body ground and other terminals	Ignition switch off	10 kΩ or higher	kΩ

Post-procedure1

(e) Reconnect the AMD terminal connector.

(f) Connect the cable to the negative (-) auxiliary battery terminal.

NG ▶ **GO TO STEP 20**

OK ▼

16.	CHECK INVERTER WITH CONVERTER ASSEMBLY (AMD TERMINAL)

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 No. 3 engine wire from the inverter with converter assembly (AMD terminal connector).

Procedure1

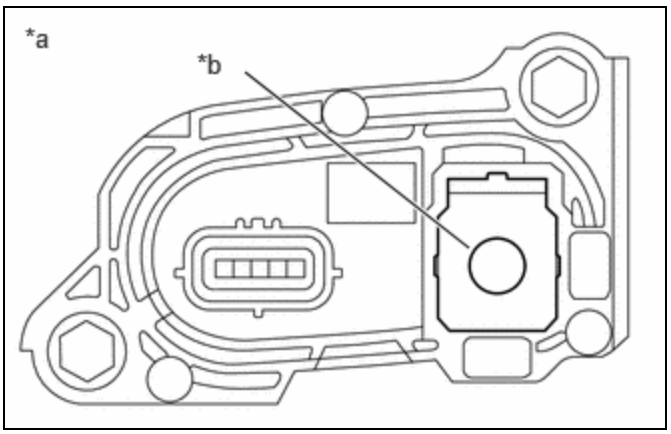
(c) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

EWD INFO

Click Location & Routing(I1)
Click Connector(I1)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
I1-1 (AMD) - Body ground	Ignition switch off	10 kΩ or higher	kΩ



*a	Component without harness connected Inverter with Converter Assembly
*b	I1-1 (AMD)

Result:

PROCEED TO
OK
NG

Post-procedure1

(d) Reconnect the No. 3 engine wire.

OK ▶ **REPLACE FUSE (DC/DC)**

NG ▶ **GO TO STEP 19**

17.	CHECK GENERATOR HIGH-VOLTAGE CIRCUIT

Click here INFO

NEXT

18.	CHECK MOTOR HIGH-VOLTAGE CIRCUIT

Click here INFO

NEXT ▶ **REPLACE INVERTER WITH CONVERTER ASSEMBLY**

19.	**REPLACE INVERTER WITH CONVERTER ASSEMBLY**

HINT:

Click here INFO

NEXT **REPLACE FUSE (DC/DC)**

20.	**REPAIR OR REPLACE HARNESS OR CONNECTOR**

NEXT **REPLACE FUSE (DC/DC)**