Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002BMES
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: M20A-FXS (BATTERY / CHARGING): SOLAR CHARGING SYSTEM: P1EA412,P1EA414; Solar Charging Voltage Sensor Circuit Short to Auxiliary Battery; 2023 - 2024 MY Prius Prius Prime [03/2023 -]		

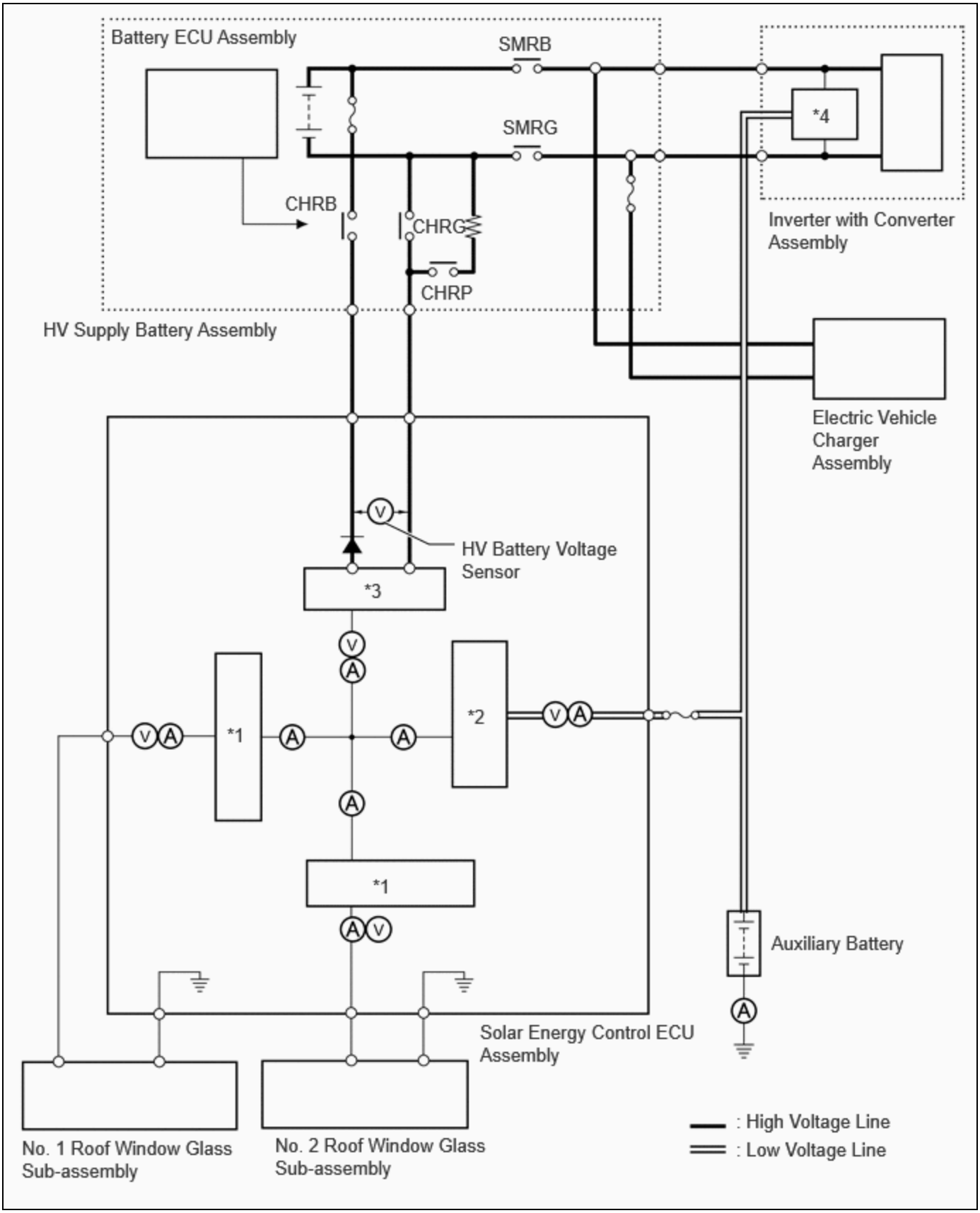
DTC	**P1EA412**	**Solar Charging Voltage Sensor Circuit Short to Auxiliary Battery**

DTC	**P1EA414**	**Solar Charging Voltage Sensor Circuit Short to Ground or Open**

DESCRIPTION

The HV supply battery assembly DC/DC converter built into the solar energy control ECU assembly boosts the solar roof voltage to that of the HV battery and charges the HV battery via the CHR relays.

The solar energy control ECU assembly monitors the voltage of the HV battery.



*1	Solar Roof DC/DC Converter	*2	Auxiliary Battery DC/DC Converter
*3	HV Supply Battery Assembly DC/DC Converter	*4	Main DC/DC Converter

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY
P1EA412	Solar Charging Voltage Sensor Circuit Short to Auxiliary Battery	HV battery voltage sensor short to +B. When the CHRB relay and CHRG relay are operating, the HV battery sensor voltage is more than the specified value for 2 seconds or more. (1 trip detection logic)	• Solar energy control ECU assembly • Floor Under Wire • Wire harness or connector	Solar Charging Warning Light: Comes on	Solar Charging Control	A
P1EA414	Solar Charging Voltage Sensor Circuit Short to Ground or Open	HV battery voltage sensor short to GND or open. When the CHRB relay and CHRG relay are operating, the HV battery sensor voltage is less than the specified value for 3 seconds or more. (1 trip detection logic)	• Solar energy control ECU assembly • Wire harness or connector	Solar Charging Warning Light: Comes on	Solar Charging Control	A

CONFIRMATION DRIVING PATTERN

HINT:

After completing repairs, clear the DTCs and then check that the vehicle has returned to normal by performing the following All Readiness check procedure.

Click here INFO

1. Park the vehicle in an area where the solar radiation will be steady.

Weather	Clear or mostly clear and sunny
Time	Between 11:00 and 14:00
Place	An area where sunlight strikes the solar roof directly

HINT:

- Make sure no part of the solar roof is shaded.
- If the solar roof is dirty, clean it.

2. Turn the ignition switch off and then disconnect the cable from the negative (-) auxiliary battery terminal.
3. Wait for 5 seconds or more, then disconnect the power source connector and then all other low voltage connectors the solar energy control ECU assembly.
4. Wait for 30 seconds or more, then connect the low voltage connectors of the solar energy control ECU assembly except the power source connector and then connect the power source connector.
5. Connect the cable to the negative (-) auxiliary battery terminal.
6. Turn the ignition switch to ON, wait for 5 to 10 seconds, and then turn the ignition switch off.

HINT:

Make sure to turn the ignition switch off within 10 seconds.

7. Wait for 20 minutes and then check for DTCs to check that no DTCs have been stored.

HINT:

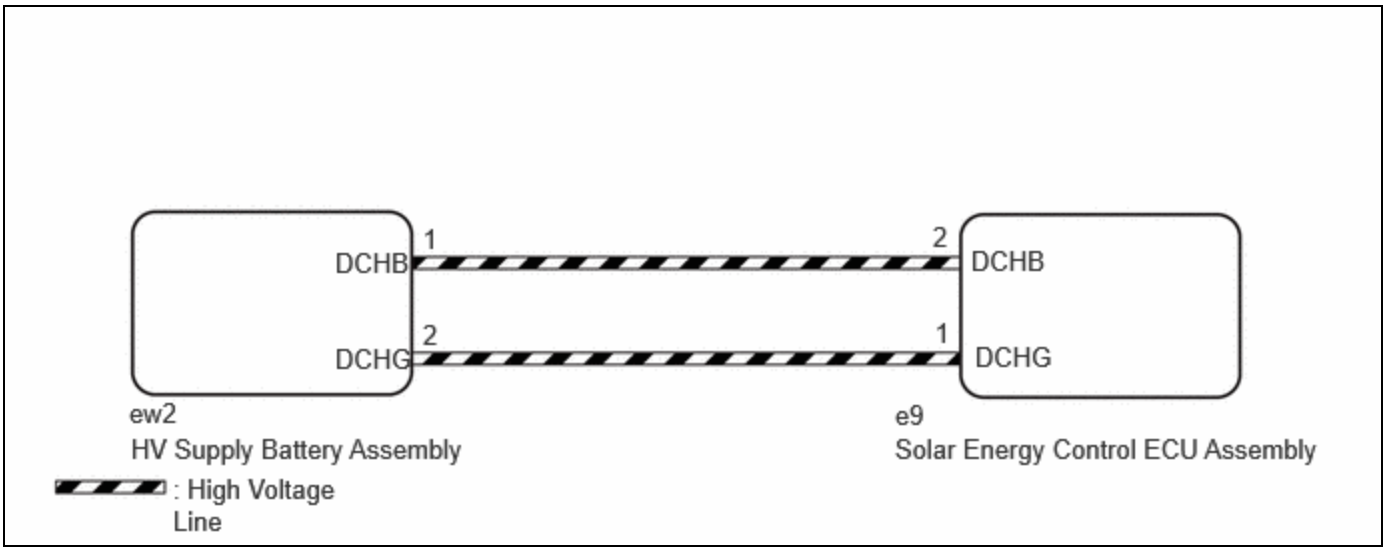
- While waiting, the HV battery will be charged by the solar charging system. However, depending on certain conditions, charging may not be performed.
- When the HV battery is fully charged, high voltage charging to the HV battery is not performed.
- If any of the following conditions is met, the HV battery will not be charged by the solar charging system:
  - The HV battery is charged via an external power source.
  - The ignition switch is turned to ACC.
  - The ignition switch is turned to ON.
  - The ignition switch is turned to ON (READY).
  - The HV battery heating system is operating.
  - The remote air conditioning system is operating.

8. Check that solar charging is being performed.

HINT:

Be sure to check that high voltage battery charging is being performed by the solar roof.

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 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

PROCEDURE

1.	**CHECK DTC OUTPUT (HV, HV BATTERY, PLUG-IN CONTROL)**

Pre-procedure1

(a) None

Procedure1

(b) Enter the following menus.

Powertrain > Hybrid Control > Trouble Codes
Powertrain > HV Battery > Trouble Codes
Powertrain > Plug-in Control > Trouble Codes

RESULT	RESULT
Only P1EA412 or P1EA414 is output.	A
DTC P1EA412 or P1EA414 and other DTCs are output.	B

Post-procedure1

(c) Turn the ignition switch off.

B ▶ **GO TO DTC CHART**

A ▼

2.	**CHECK CONNECTOR CONNECTION CONDITION (SOLAR ENERGY CONTROL ECU ASSEMBLY LOW VOLTAGE CONNECTOR)**

CAUTION:

Be sure to wear insulated gloves.

Pre-procedure1

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

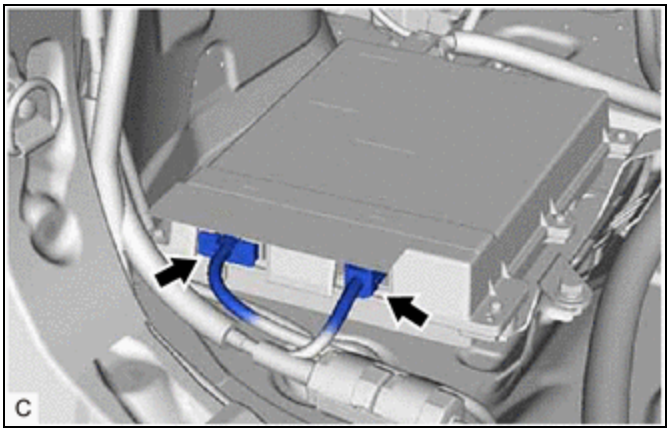
NOTICE:

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 solar energy control ECU assembly low voltage

connectors and the contact pressure of each terminal. Check the terminals for deformation, and check each connector for water ingress and foreign matter.



HINT:

Click here INFO

OK:

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

Result:

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

Post-procedure1

(c) None

B ▶ **CONNECT SECURELY**

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

A ▼

3.	**CHECK CONNECTOR CONNECTION CONDITION (SOLAR ENERGY CONTROL ECU ASSEMBLY)**

CAUTION:

Be sure to wear insulated gloves.

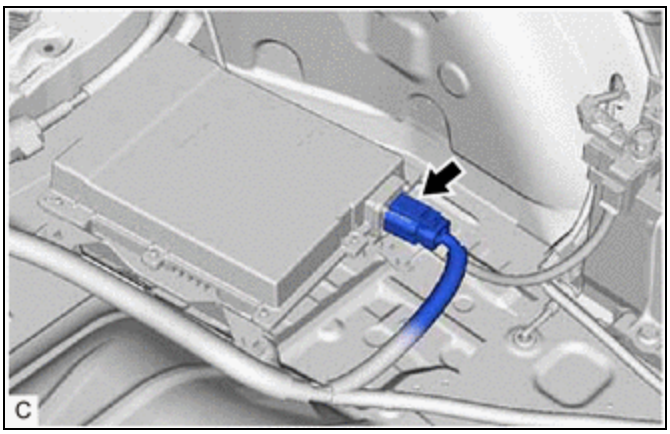
Pre-procedure1

(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) Check the connection of the solar energy control ECU assembly connector.



(c) Disconnect the solar energy control ECU assembly connector.

Procedure1

(d) Check the contact pressure of each terminal of the solar energy control ECU assembly connector and check for foreign matter or arc marks on the terminals.

HINT:

Click here INFO

RESULT		PROCEED TO
The terminals are connected securely and there are no contact problems.	There are no arc marks or foreign matter.	A
The terminals are not connected securely and there is a contact problem.	There are arc marks or foreign matter.	B
The terminals are not connected securely and there is a contact problem.	There are no arc marks or foreign matter.	C
The terminals are connected securely and there are no contact problems.	There are arc marks or foreign matter.	B

Post-procedure1

(e) Reconnect the solar energy control ECU assembly connector.

B ▶ **REPLACE MALFUNCTIONING PARTS**

C ▶ **CONNECT SECURELY**

A

4.	**CHECK CONNECTOR CONNECTION CONDITION (HV SUPPLY BATTERY ASSEMBLY CONNECTOR)**

CAUTION:

Be sure to wear insulated gloves.

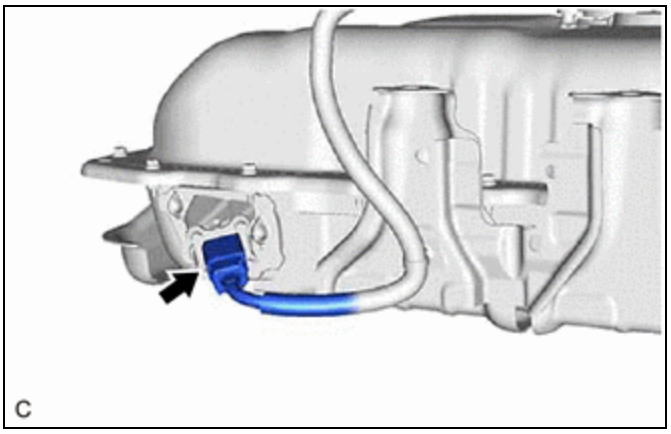
Pre-procedure1

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

NOTICE:

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

(b) Check the connection of the HV supply battery assembly connector.



(c) Disconnect the HV supply battery assembly connector.

Procedure1

(d) Check the contact pressure of each terminal of the HV supply battery assembly connector and check for foreign matter or arc marks on the terminals.

HINT:

Click here INFO

RESULT		PROCEED TO
The terminals are connected securely and there are no contact problems.	There are no arc marks or foreign matter.	A
The terminals are not connected securely and there is a contact problem.	There are arc marks or foreign matter.	B
The terminals are not connected securely and there is a contact problem.	There are no arc marks or foreign matter.	C
The terminals are connected securely and there are no contact problems.	There are arc marks or foreign matter.	B

Post-procedure1

(e) Reconnect the HV supply battery assembly connector.

B ▶ **REPLACE MALFUNCTIONING PARTS**

C ▶ **CONNECT SECURELY**

A ▼

5.	**CHECK HARNESS AND CONNECTOR (HV SUPPLY BATTERY ASSEMBLY - SOLAR ENERGY CONTROL ECU ASSEMBLY)**

CAUTION:

Be sure to wear insulated gloves.

Pre-procedure1

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

NOTICE:

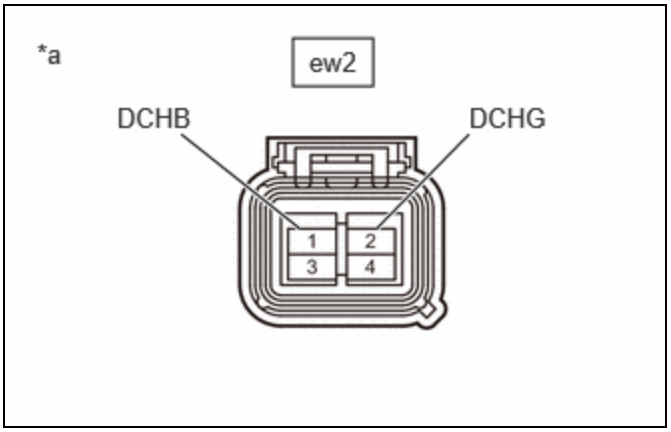
After removing the service plug grip, do not turn the ignition switch to ON (READY), unless instructed by the repair manual because this may cause a malfunction.

(b) Disconnect the HV supply battery assembly connector.

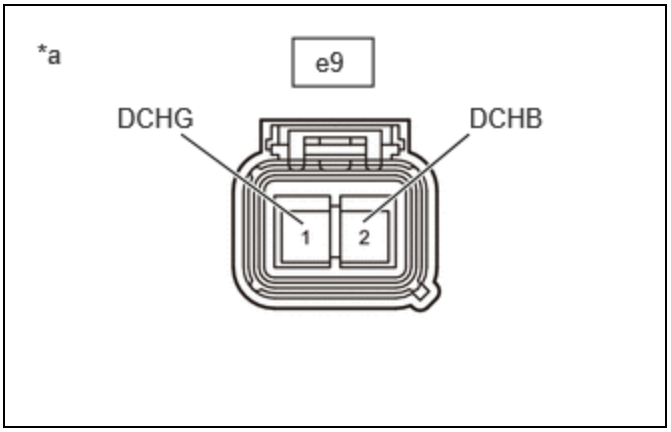
(c) Disconnect the solar energy control ECU assembly connector.

Procedure1

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



*a	Front view of wire harness connector (to HV Supply Battery Assembly)



*a	Front view of wire harness connector (to Solar Energy Control ECU Assembly)

Standard Resistance:

EWD INFO

Click Location & Routing(ew2,e9)
Click Connector(ew2)
Click Connector(e9)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
ew2-1 (DCHB) - e9-2 (DCHB)	Ignition switch off	Below 1 Ω	Ω
ew2-2 (DCHG) - e9-1 (DCHG)	Ignition switch off	Below 1 Ω	Ω

Post-procedure1

(e) Reconnect the solar energy control ECU assembly connector.

(f) Reconnect the HV supply battery assembly connector.

NG ▶ **REPLACE FLOOR UNDER WIRE**

OK ▼

6.	**CHECK HARNESS AND CONNECTOR (HV SUPPLY BATTERY ASSEMBLY - SOLAR ENERGY CONTROL ECU 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 HV supply battery assembly connector.

(c) Disconnect the solar energy control ECU assembly connector.

Procedure1

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

NOTICE:

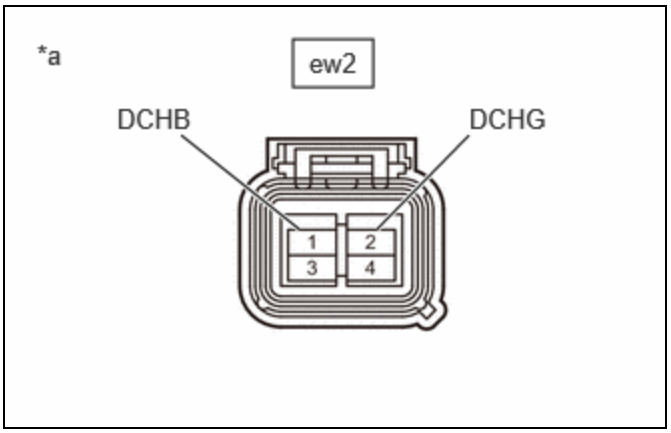
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.

Standard Resistance:

EWD INFO

Click Location & Routing(ew2)
Click Connector(ew2)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
ew2-1 (DCHB) - ew2-2 (DCHG)	Ignition switch off	10 MΩ or higher	MΩ
ew2-1 (DCHB) - Body ground and shield ground	Ignition switch off	10 MΩ or higher	MΩ
ew2-2 (DCHG) - Body ground and shield ground	Ignition switch off	10 MΩ or higher	MΩ



*a	Front view of wire harness connector (to HV Supply Battery Assembly)

Result:

RESULT
OK
NG

Post-procedure1

(e) Reconnect the solar energy control ECU assembly connector.

(f) Reconnect the HV supply battery assembly connector.

OK ▶ REPLACE SOLAR ENERGY CONTROL ECU ASSEMBLY

NG ▶ **REPLACE FLOOR UNDER WIRE**