Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM1000000029QWW
Model Year Start: 2023	**Model:** Prius	**Prod Date Range:** [12/2022 -]
Title: HYBRID / BATTERY CONTROL: HV BATTERY (for HEV Model): CHARGING; 2023 - 2024 MY Prius [12/2022 -]		

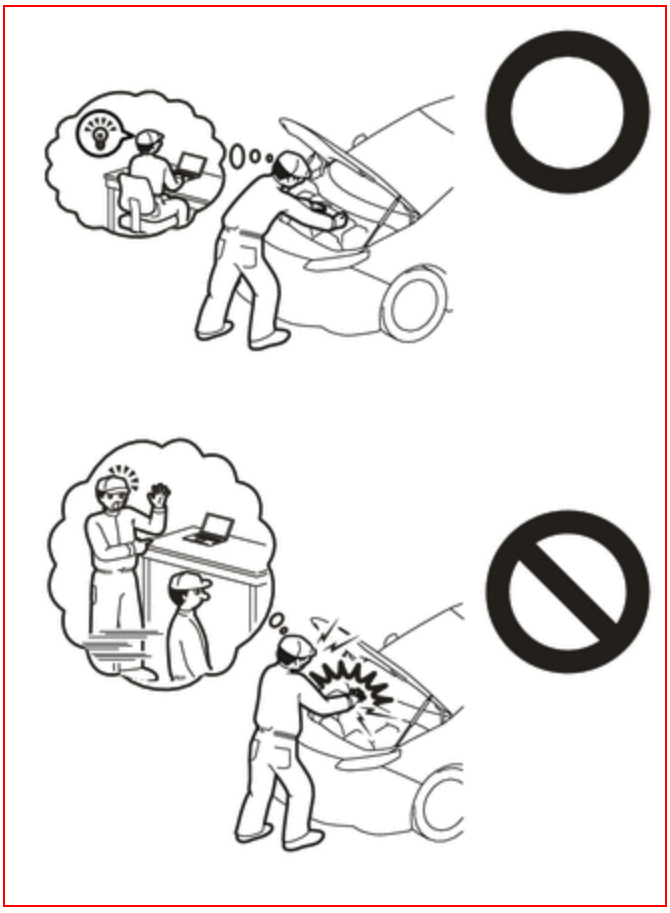
CHARGING

CAUTION / NOTICE / HINT

The necessary procedures (adjustment, calibration, initialization, or registration) that must be performed after parts are removed and installed, or replaced when charging the HV battery are shown below.

CAUTION:

- Orange wire harnesses and connectors indicate high-voltage circuits. To prevent electric shock, always follow the procedure described in the repair manual.



Click here INFO

- To prevent electric shock, wear insulated gloves when working on wire harnesses and components of the high voltage system.

NOTICE:

After turning the power switch off, waiting time may be required before disconnecting the cable from the negative (-) auxiliary battery terminal.

Click here INFO

HINT:

When the cable is disconnected/reconnected to the auxiliary battery terminal, systems temporarily stop operating. However, each system has a function that completes learning the first time the system is used.

Items for which learning is completed by driving the vehicle

EFFECT/INOPERATIVE FUNCTION WHEN NECESSARY PROCEDURES ARE NOT PERFORMED	NECESSARY PROCEDURES	LINK
Front Camera System	Drive the vehicle straight ahead at 35 km/h (22 mph) or more for 5 seconds or more.	INFO

Items for which learning is completed by operating the vehicle normally

EFFECT/INOPERATIVE FUNCTION WHEN NECESSARY PROCEDURES ARE NOT PERFORMED	NECESSARY PROCEDURES	LINK
Power Door Lock Control System*1 ◦ Back door opener	Perform door unlock operation with door control switch or electrical key transmitter sub-assembly switch.	INFO
Power Back Door System*2	Reset back door close position	INFO
Air Conditioning System	After the ignition switch is turned to ON, the servo motor standard position is recognized.	-
*1: w/o Power Back Door System *2: w/ Power Back Door System		

PROCEDURE

1. INSPECT AUXILIARY BATTERY VOLTAGE

(a) Measure the auxiliary battery voltage.

Standard Voltage:
Approximately 11 V or more

HINT:

- The horn should sound clearly.
- If the voltage is 10 V or less, either charge the auxiliary battery (charging usually takes about 1 hour), or replace it with an auxiliary battery that is already charged.

2. PREPARATION FOR HV BATTERY CHARGING (Using THS Charger)

CAUTION:

- The hybrid system has high-voltage circuits. Accidents, such as electric shock, or electric leaks may result if the hybrid system is not operated in a correct manner. Make sure to follow the correct procedure.

  Click here INFO
- Wear insulated gloves.

HINT:

- Removing the service plug grip interrupts the high voltage circuit.
- High voltage wiring connectors are orange.

(a) Check the SOC (State of Charge) of the HV battery.

(1) If the hybrid system fails to start and "Traction Battery Needs to be Protected. Shift into [P] to Restart" or "Traction Battery Needs to be Protected. Refrain From the Use of [N] Position" is displayed on the multi-information display, the HV battery may be discharged.

(2) Confirm if the engine starts. If the engine starts, leave it idling with the shift lever in P until the engine stops (self charge has completed).

If the engine cannot start, follow the procedure to charge the HV battery.

HINT:

- Before performing external charging, always use the GTS to perform troubleshooting.
- Charging time using the THS charger is 10 minutes per charge cycle. The charging time when using a THS charger is a short charging time (when the HV battery temperature is 25°C (77°F), 10 minutes may be sufficient, if the HV battery temperature is 0°C (32°F), then three 10 minute charge cycles may be required) for putting the engine in a condition where it can be started (the system can enter the READY-on state). (The THS charger will automatically stop 10 minutes after charging starts.)

(b) Remove the service plug grip.

Click here INFO

(c) Check the terminal voltage.

Click here INFO

HINT:

When performing Check Terminal Voltage when referring to the procedure to remove the HV battery, make sure to reinstall the components that were removed during the Check Terminal Voltage procedure.

(d) Refer to the HV battery removal procedure and perform the procedure up to the removal of the No. 1 HV battery cover panel RH.

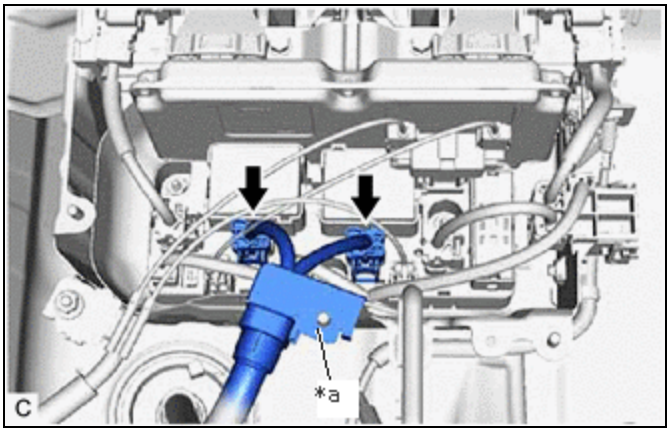
Click here INFO

(e) Disconnect the floor under wire.

(1) Disconnect the 2 No. 1 traction battery device box connectors.

NOTICE:

Insulate each disconnected high-voltage connector with insulating tape. Wrap the connector from the wire harness side to the end of the connector.



*a	Shield Ground

(2) Disconnect the shield ground from the HV battery.

(f) Inspect the electrical insulation of the HV battery.

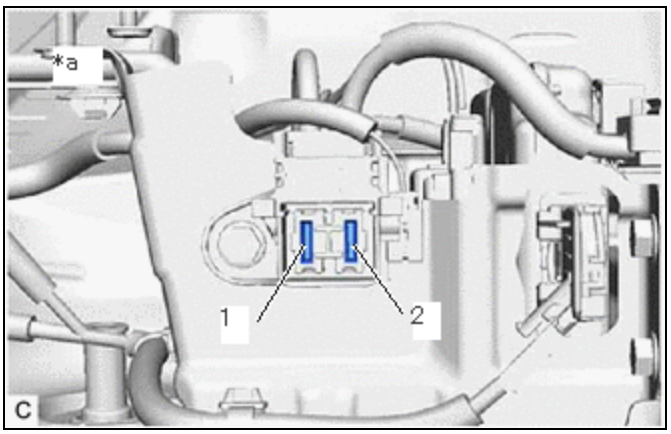
(1) Using a megohmmeter set to 500 V, measure the resistance according to the value(s) in the table below.

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:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 - Body ground	Ignition switch off	10 MΩ or higher
2 - Body ground	Ignition switch off	10 MΩ or higher



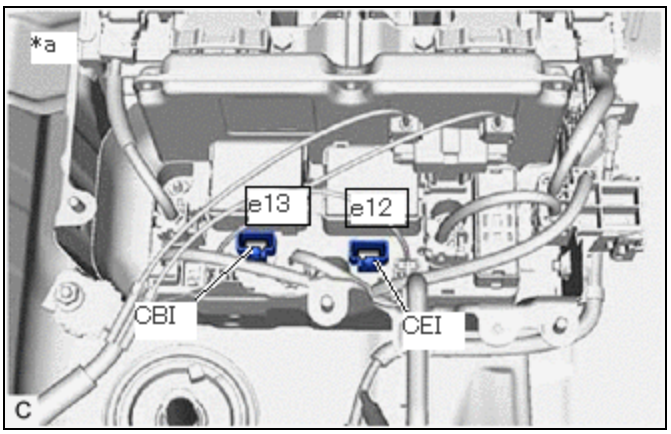
*a	Service Plug Grip Removed (Service Plug Grip Connecting Terminals)

(2) 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:



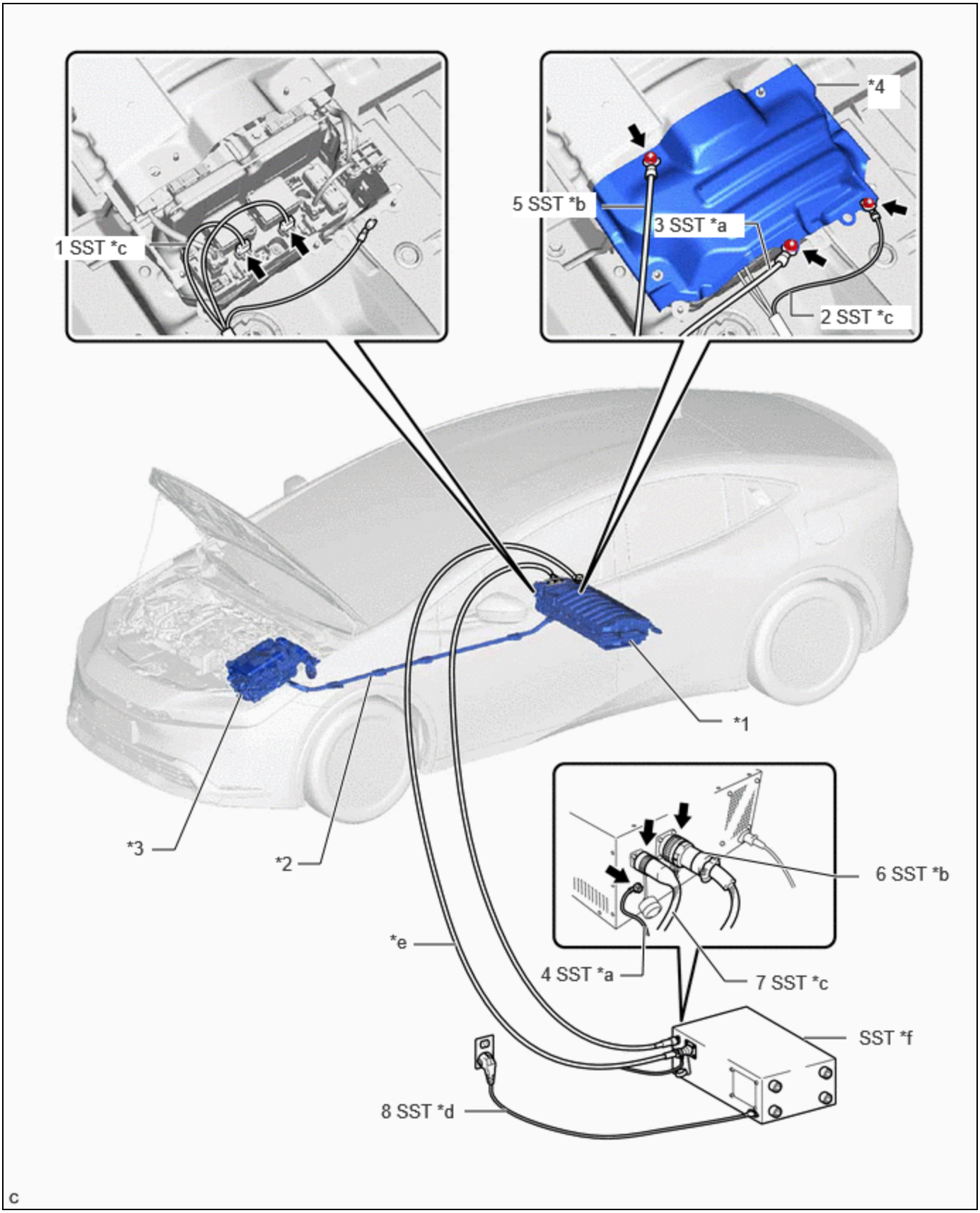
EWD INFO

*a	Component without harness connected (No. 1 Traction Battery Device Box)

Click Location & Routing(e13,e12)
Click Connector(e13)
Click Connector(e12)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
e13-1 (CBI) - Body ground	Ignition switch off	10 MΩ or higher
e12-1 (CEI) - Body ground	Ignition switch off	10 MΩ or higher

(g) Connect the THS charger in the order shown in the illustration.



*1	HV Battery	*2	Floor Under Wire
*3	Inverter with Converter Assembly	*4	NO. 1 HV Battery Cover Panel RH
*a	EV Bonding Cable (Green Cable)	*b	Low Voltage Cable
*c	High Voltage Cable	*d	Power Input Plug

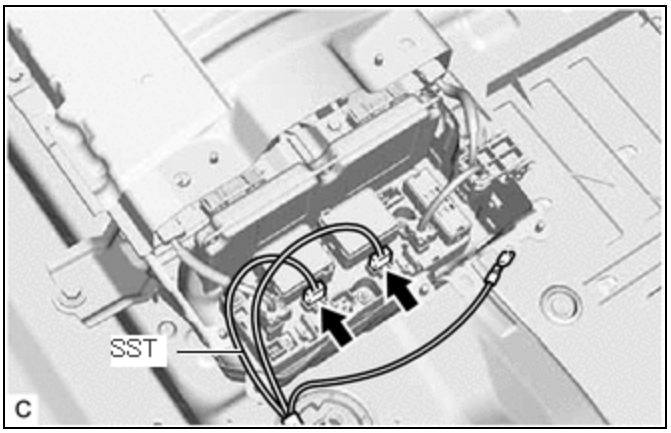
*e	Grounded AC 100 to 240 V Receptacle	*f	THS Charger

NOTICE:

- Make sure to connect the EV bonding cable first to prevent electrical shock.
- Connect all of the THS charger cables in the order shown in the illustration to prevent electrical shock.

(h) Connect the 2 SST (high voltage cable) connectors to the No. 1 traction battery device box.

SST: 09882-10090



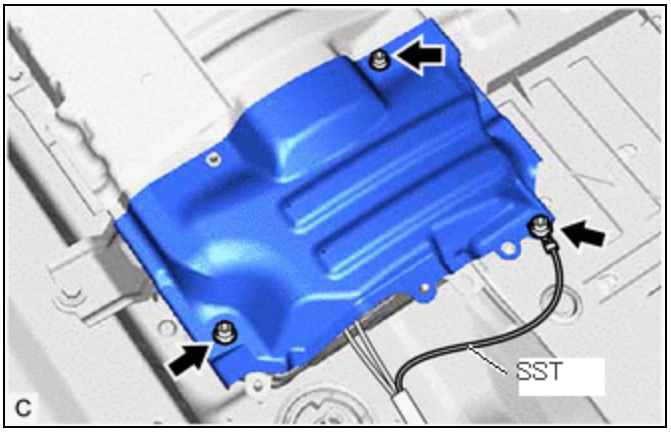
(i) Temporarily install the No. 1 HV battery cover panel RH with the 2 nuts.

Torque:

7.5 N·m {76 kgf·cm, 66 in·lbf}

NOTICE:

Be careful not to pinch SST (high voltage cable).



(j) Connect the SST (high voltage cable) terminal to the position shown in the illustration with the nut.

Torque:

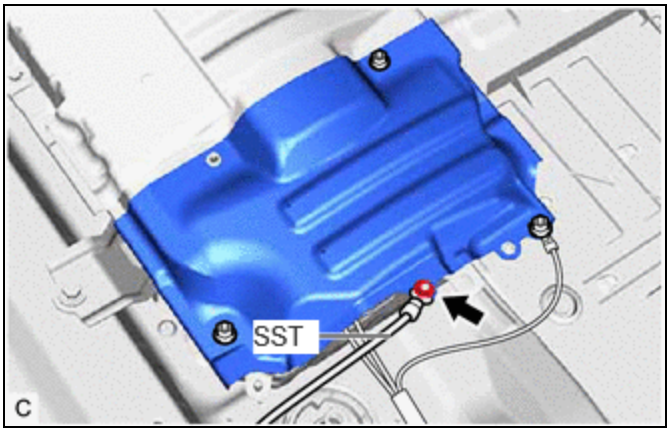
7.5 N·m {76 kgf·cm, 66 in·lbf}

(k) Connect SST (EV bonding cable (green cable)) to the position shown in the illustration with the nut.

SST: 09882-10070

Torque:

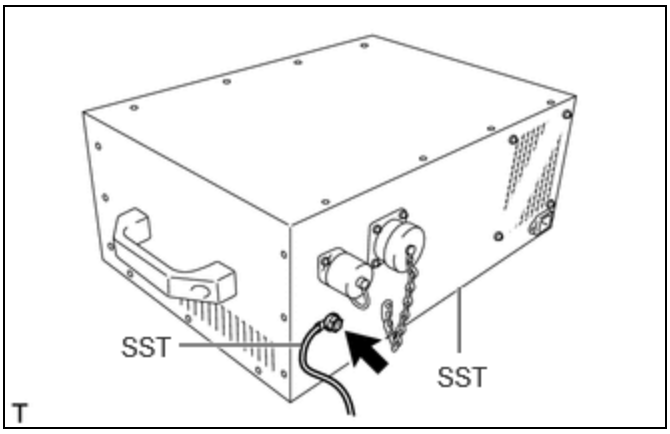
7.5 N·m {76 kgf·cm, 66 in·lbf}



(l) Connect SST (EV bonding cable (green cable)) to SST (THS charger).

SST: 09880-10021

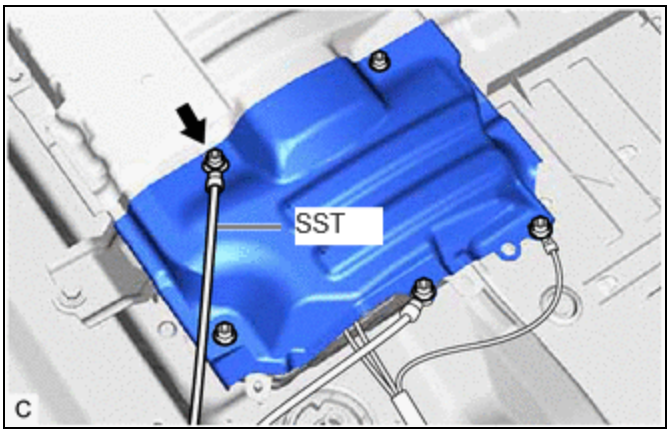
09881-10041



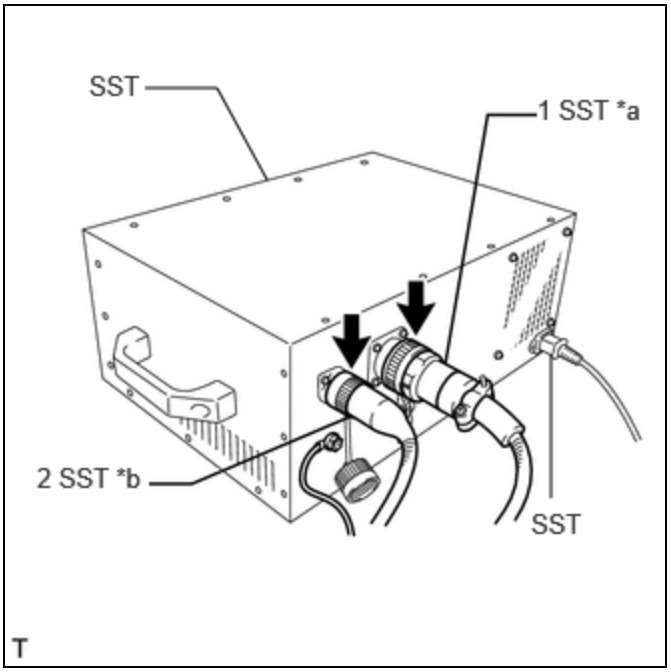
(m) Connect SST (low voltage cable) to the position shown in the illustration with the nut.

Torque:

7.5 N·m {76 kgf·cm, 66 in·lbf}



(n) Connect SST (low voltage cable) and SST (high voltage cable) to SST (THS charger) in the order shown in the illustration.



*a	Low Voltage Cable
*b	High Voltage Cable

(o) Install the service plug grip.

Click here INFO

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

for M20A-FXS: Click here INFO

for 2ZR-FXE: Click here INFO

(q) Connect SST (power input plug) of SST (THS charger) to a grounded AC 100 to 240 V receptacle.

SST: 09881-10081
SST: 09881-10050
SST: 09881-10090

NOTICE:

Always use an AC 100 to 240 V receptacle with a properly functioning ground. The ground is designed to reduce the chance of electric shock if a malfunction occurs. Do not use the charger if any of the pins on its plug have been damaged or removed.

3. PREPARATION FOR HV BATTERY CHARGING (Using GRX-5100T)

CAUTION:

- The hybrid system has high-voltage circuits. Accidents, such as electric shock, or electric leaks may result if the hybrid system is not operated in a correct manner. Make sure to follow the correct procedure.

  Click here INFO
- Be sure to wear insulated gloves.

HINT:

- Removing the service plug grip interrupts the high voltage circuit.
- High voltage wiring connectors are orange.

(a) Check the charge level of the HV battery.

(1) If the hybrid system fails to start and "Traction Battery Needs to be Protected. Shift into P to Restart" is displayed on the multi-information display, the HV battery may be discharged.

(2) Confirm if the engine starts. If the engine starts, leave it idling with the shift lever in P until the engine stops (self charge has completed).

If the engine cannot start, charge the HV battery.

HINT:

- Before performing external charging, always use the GTS to perform troubleshooting.
- Charging time using the GRX-5100T is 10 minutes per charge cycle. The charging time when using a GRX-5100T is a short charging time (when the battery temperature is 25°C (77°F), 10 minutes may be sufficient, if the battery temperature is 0°C (32°F), then three 10 minute charge cycles may be required) for putting the engine in a condition where it can be started (the system can enter the READY-on state). (The GRX-5100T will automatically stop 10 minutes after charging starts.)

(b) Remove the service plug grip.

Click here INFO

(c) Check the terminal voltage.

Click here INFO

HINT:

When performing Check Terminal Voltage when referring to the procedure to remove the HV battery, make sure to reinstall the components that were removed during the Check Terminal Voltage procedure.

(d) Refer to the HV battery removal procedure and perform the procedure up to the removal of the No. 1 HV battery cover panel RH.

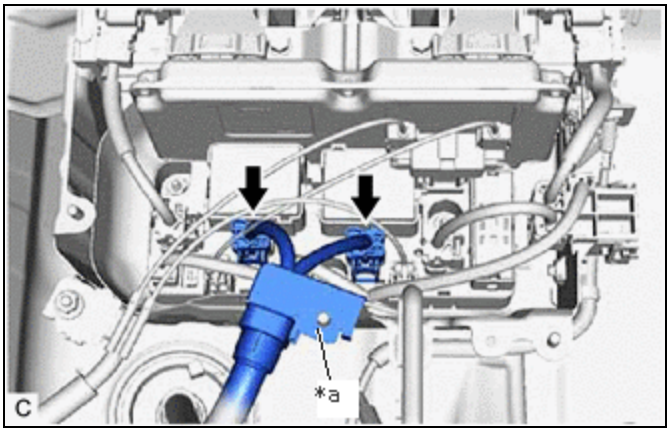
Click here INFO

(e) Disconnect the floor under wire.

(1) Disconnect the 2 No. 1 traction battery device box connectors.

NOTICE:

Insulate each disconnected high-voltage connector with insulating tape. Wrap the connector from the wire harness side to the end of the connector.



*a	Shield Ground

(2) Disconnect the shield ground from the HV battery.

(f) Inspect the electrical insulation of the HV battery.

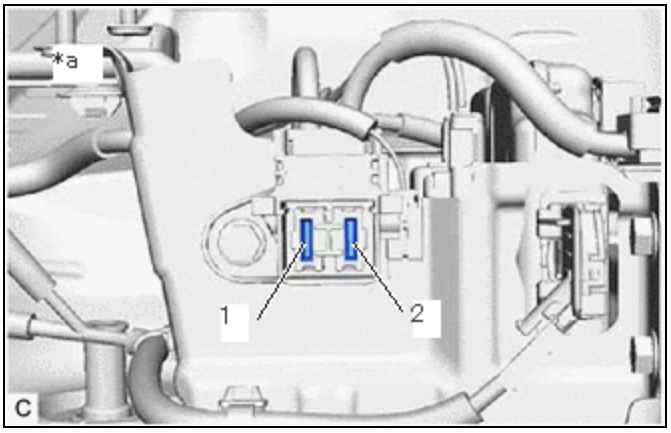
(1) Using a megohmmeter set to 500 V, measure the resistance according to the value(s) in the table below.

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:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 - Body ground	Ignition switch off	10 MΩ or higher
2 - Body ground	Ignition switch off	10 MΩ or higher



*a	Service Plug Grip Removed (Service Plug Grip Connecting Terminals)

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

NOTICE:

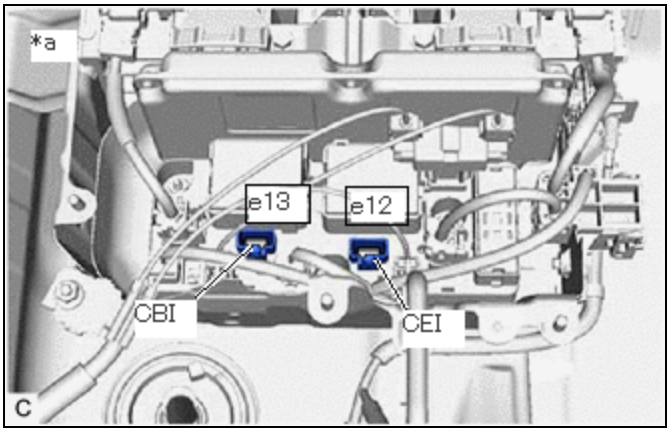
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.

Standard Resistance:

EWD INFO

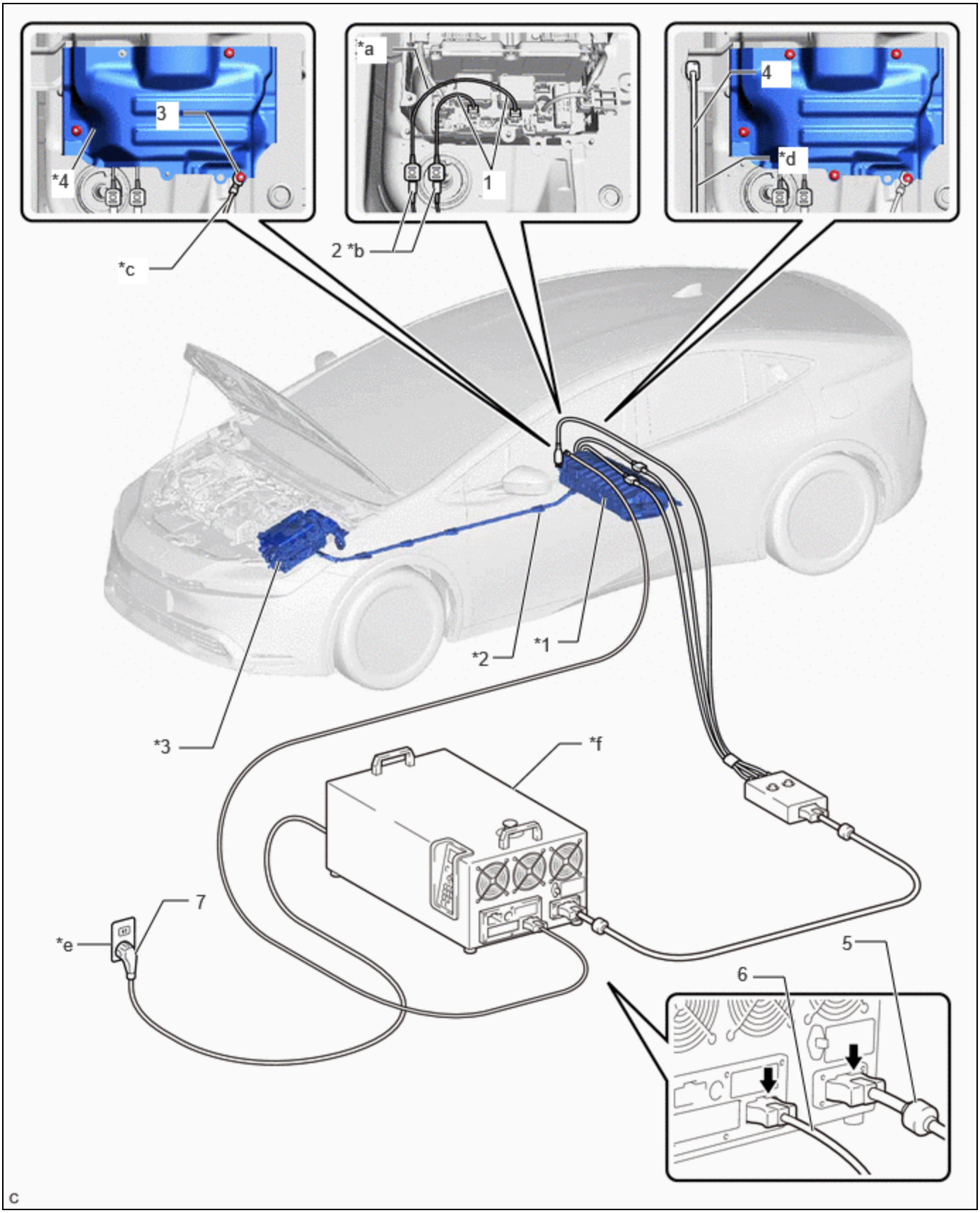
Click Location & Routing(e13,e12)
Click Connector(e13)
Click Connector(e12)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
e13-1 (CBI) - Body ground	ignition switch off	10 MΩ or higher
e12-1 (CEI) - Body ground	ignition switch off	10 MΩ or higher



*a	Component without harness connected (No. 1 Traction Battery Device Box)

(g) Connect the GRX-5100T in the order shown in the illustration.



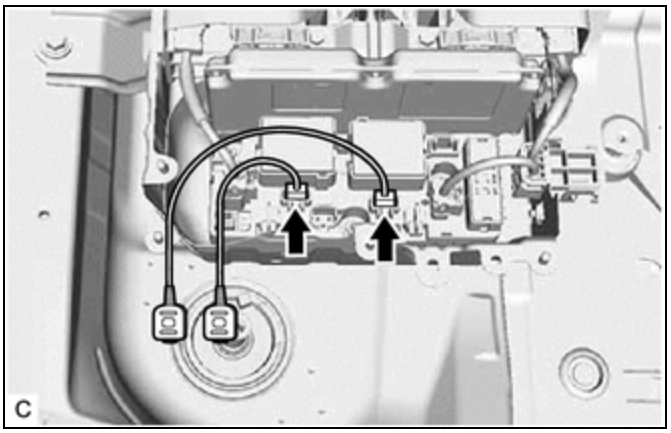
*1	HV Battery	*2	Floor Under Wire
*3	Inverter with Converter Assembly	*4	NO. 1 HV Battery Cover Panel RH
*a	Stack Balance Harness	*b	Banana Jack Combined Harness
*c	Banana Jack Combined Harness	*d	Low Voltage Harness

*e	Grounded AC 100 to 240 V Receptacle	*f	GRX-5100T

NOTICE:

Connect all of the GRX-5100T cables in the order shown in the illustration to prevent electrical shock.

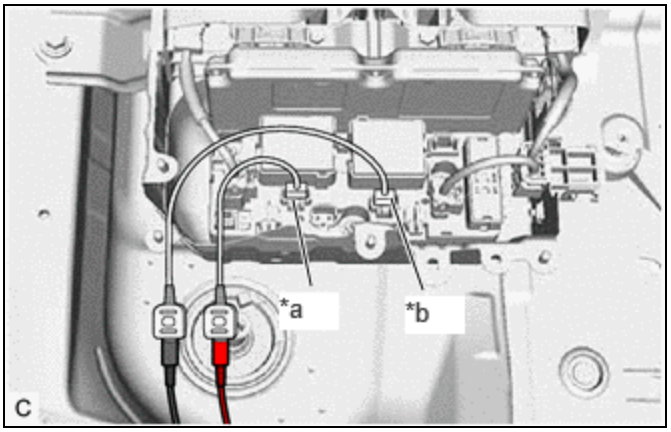
(h) Connect the 2 stack balance harness connectors to the No. 1 traction battery device box.



(i) Connect the banana jack combined harness to the HV battery as shown in the illustration, with the red cable connected to the positive (+) battery side and the black cable connected to the negative (-) battery side.

HINT:

If the positive (+) battery cable and negative (-) battery cable are connected in reverse, the GRX-5100T will detect an error and charging will not start.

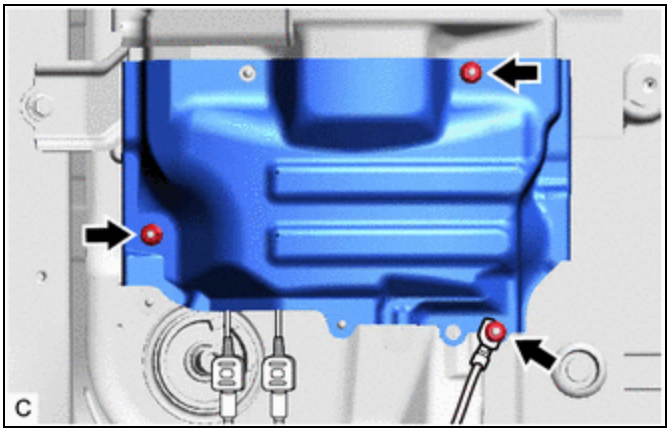


*a	Positive (+) Battery Side
*b	Negative (-) Battery Side

(j) Temporarily install the No. 1 HV battery cover panel RH with the 2 nuts.

Torque:

7.5 N·m {76 kgf·cm, 66 in·lbf}

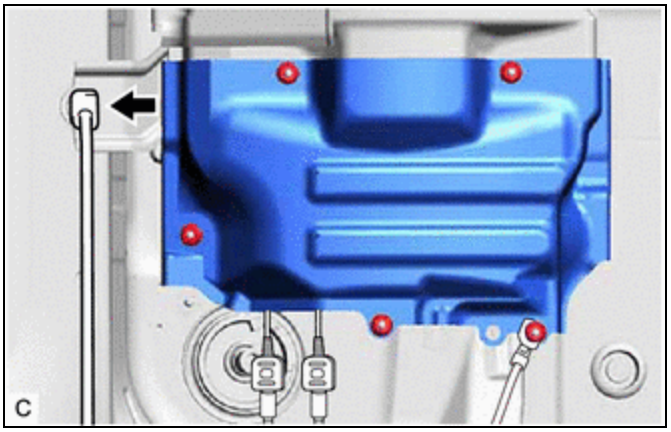


(k) Connect the banana jack combined harness terminal to the position shown in the illustration with the nut.

Torque:

7.5 N·m {76 kgf·cm, 66 in·lbf}

(l) Connect the low voltage cable terminal to the position shown in the illustration.



(m) Connect the universal HV cable and low voltage harness terminals to GRX-5100T.

(n) Install the service plug grip.

Click here INFO

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

for M20A-FXS: Click here INFO

for 2ZR-FXE: Click here INFO

(p) Connect GRX-5100T to a grounded AC 100 to 240 V receptacle.

NOTICE:

Always use an AC 100 to 240 V receptacle with a properly functioning ground. The ground is designed to reduce the chance of electric shock if a malfunction occurs. Do not use the GRX-5100T if any of the pins on its plug have been damaged or removed.

4. HV BATTERY CHARGING (Using THS Charger)

(a) Enter the following menus: Powertrain / Hybrid Control / Active Test / Hybrid/EV Battery Charge

Powertrain > Hybrid Control > Active Test

ACTIVE TEST DISPLAY
Hybrid/EV Battery Charge

DATA LIST DISPLAY
SMRG Status
SMRB Status

HINT:

- While performing the [Hybrid/EV Battery Charge] Active Test, check the Data List items [SMRB Status] and [SMRG Status].
- If the values of the Data List items are not as specified in the table below, turn the GTS and the ignition switch off and then perform the HV battery charging procedure again.

[SMRB Status] and [SMRG Status] in Data List during [Hybrid/EV Battery Charge] Active Test:

STEP	ACTIVE TEST [HYBRID/EV BATTERY CHARGE]	THS CHARGER START SWITCH	DATA LIST [SMRB STATUS]	DATA LIST [SMRG STATUS]
1	OFF	OFF	OFF	OFF
2	OFF → ON	OFF	OFF → ON	OFF → ON
3	ON	OFF → ON	ON	ON

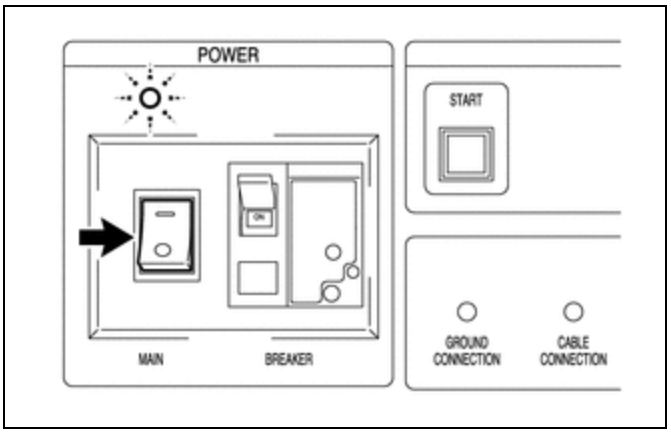
(b) Make sure that the EMERGENCY STOP switch is in the reset condition (the switch is turned clockwise and released).

(c) Make sure that the BREAKER is in the ON position.

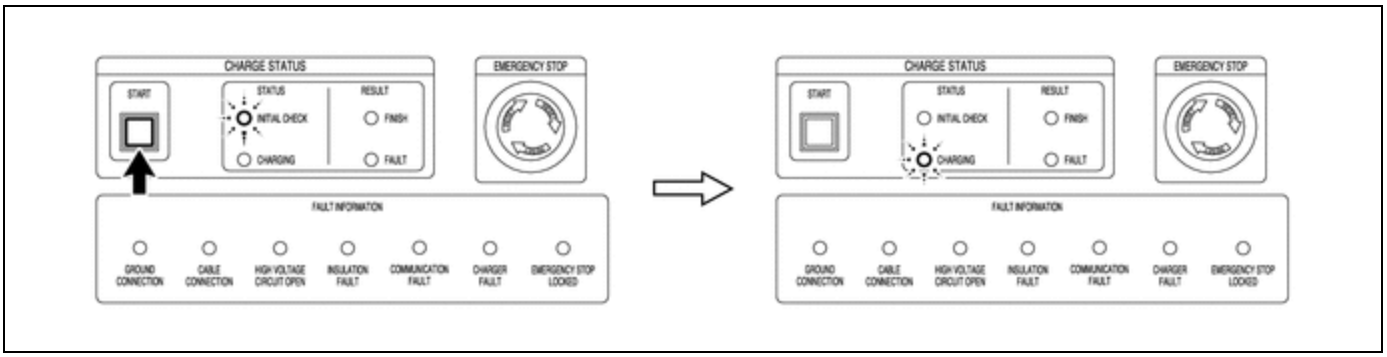
(d) Turn the THS charger MAIN switch on.

HINT:

The MAIN indicator will illuminate (green).



(e) Press the START switch.



HINT:

- When the START switch is turned on, the INITIAL CHECK indicator illuminates and an initial check starts. When the initial check completes successfully, the INITIAL CHECK indicator turns off, the CHARGING indicator illuminates and charging will start at the same time.
- While the INITIAL CHECK indicator is illuminated, the insulation, 400 V output, emergency stop switch, connector connections and ground connection are inspected.

(f) Repeat the charge cycle 3 times. When the last cycle has finished, turn the THS charger MAIN switch off.

HINT:

- Charging time using the THS charger is 10 minutes per charge cycle. The charging time when using a THS charger is a short charging time (when the battery temperature is 25°C (77°F), 10 minutes may be sufficient, if the battery temperature is 0°C (32°F), then three 10 minute charge cycles may be required) for putting the engine in a condition where it can be started (the system can enter the READY-on state). (The THS charger will automatically stop 10 minutes after charging starts.)
- There is very little chance of overcharging the HV battery during the second or third charging cycle. The SOC will not likely increase beyond the upper limit because it was low enough to prevent the engine from starting. Even if the SOC was to increase enough to exceed the limit, the hybrid vehicle control ECU will stop the Active Test to prevent overcharging.
- Cranking the engine once causes the SOC to drop approximately 1%.
- Charging the HV battery once (10 minutes) using the THS charger restores the SOC approximately 2%.

(g) Turn the ignition switch off.

(h) Remove the THS charger and connect the HV floor under wire (for HV Battery).

NOTICE:

Make sure to disconnect the EV bonding cable last.

(1) Disconnect SST (power inlet plug) of SST (THS charger) from the grounded AC 100 to 240 V receptacle.

(2) Disconnect the cable to the negative (-) auxiliary battery terminal.

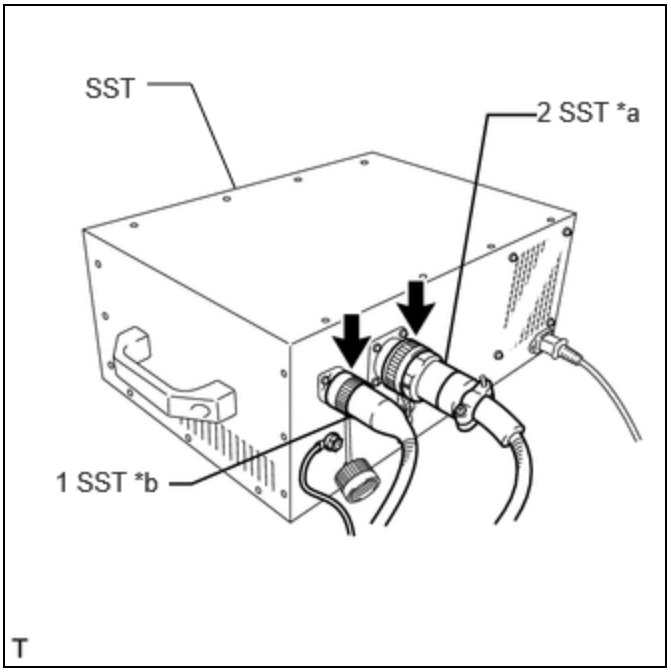
for M20A-FXS: Click here INFO

for 2ZR-FXE: Click here INFO

(3) Remove the service plug grip.

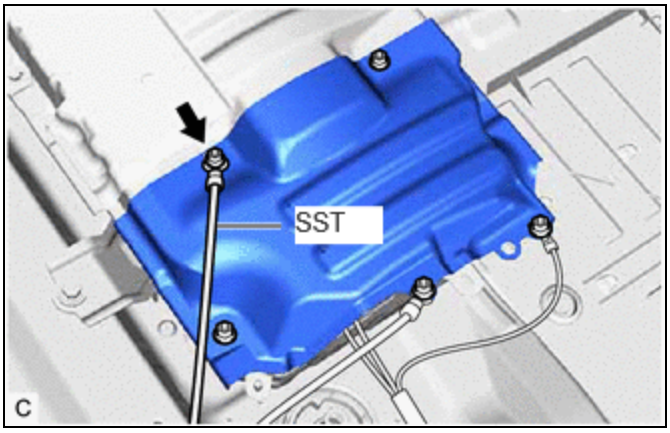
Click here INFO

(4) Disconnect SST (high voltage cable) and SST (low voltage cable) from SST (THS charger) in the order shown in the illustration.

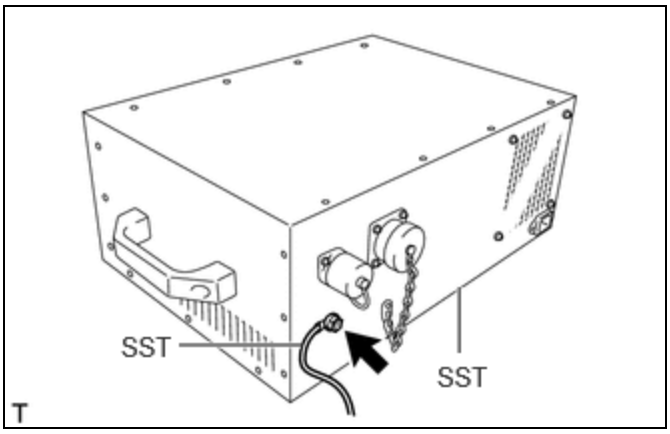


*a	Low Voltage Cable
*b	High Voltage Cable

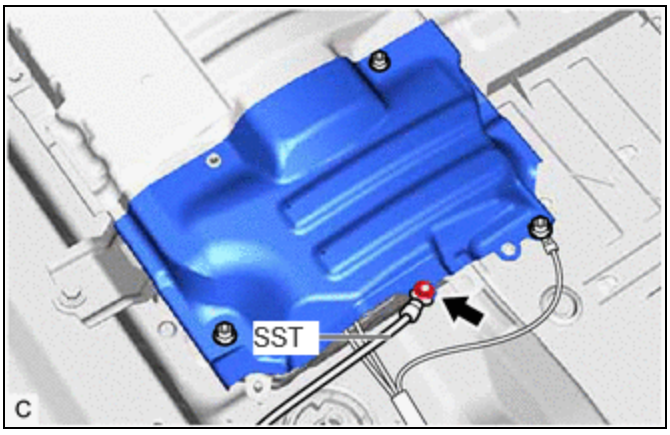
(5) Remove the nut and disconnect SST (low voltage cable).



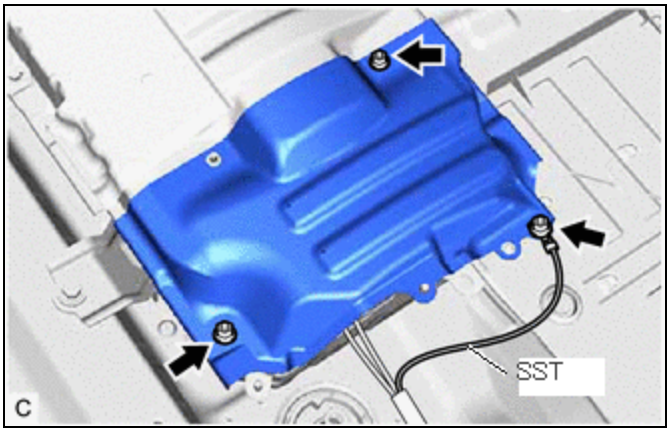
(6) Disconnect SST (EV bonding cable (green cable)) from SST (THS charger).



(7) Remove the nut and disconnect SST (EV bonding cable (green cable)).

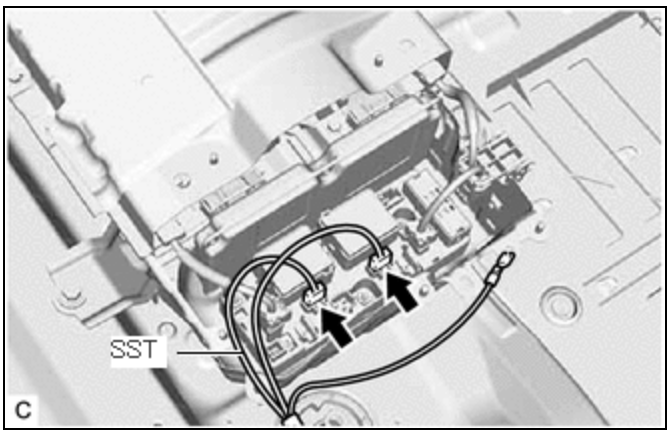


(8) Remove the nut and disconnect the SST (high voltage cable) terminal.



(9) Remove the 2 nuts and No. 1 HV battery cover panel RH.

(10) Disconnect the 2 SST (high voltage cable) connectors from the No. 1 traction battery device box.



(11) Connect the shield ground to the HV battery.

(12) Connect the 2 No. 1 traction battery device box connectors.

NOTICE:

Make sure that the connectors are connected securely.

(13) Install the No. 1 HV battery cover panel RH.

Click here INFO

(14) Install the service plug grip.

Click here INFO

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

for M20A-FXS: Click here INFO

for 2ZR-FXE: Click here INFO

(j) Turn the ignition switch on (READY) and check if the engine starts.

HINT:

If the engine does not start, perform the HV battery charging operation again.

(k) Refer to the HV battery installation procedure and make sure to perform all restoration procedures.

Click here INFO

5. HV BATTERY CHARGING (Using GRX-5100T)

(a) Enter the following menus: Powertrain / Hybrid Control / Active Test / Hybrid/EV Battery Charge

Powertrain > Hybrid Control > Active Test

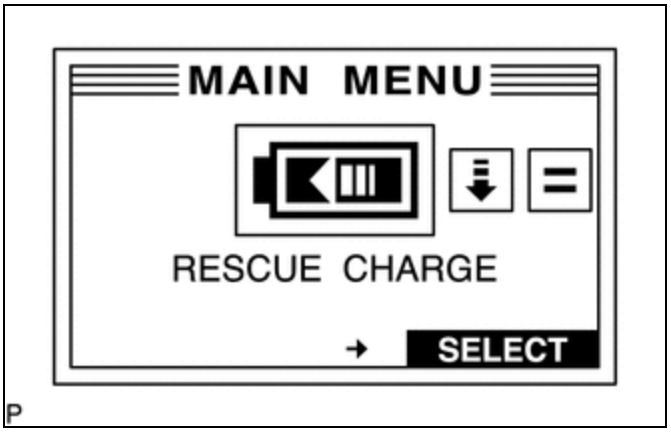
ACTIVE TEST DISPLAY
Hybrid/EV Battery Charge

DATA LIST DISPLAY
SMRG Status
SMRB Status

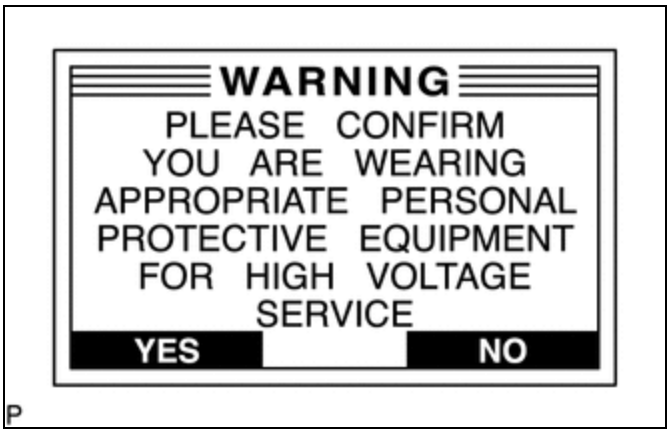
HINT:

While performing the [Hybrid/EV Battery Charge] Active Test, check the Data List items [SMRB Status] and [SMRG Status].

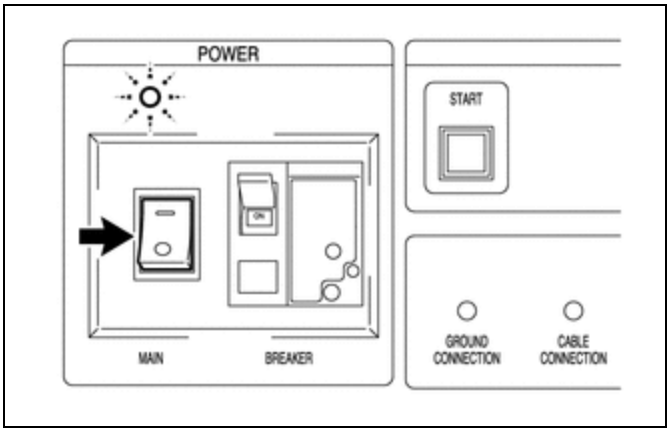
(b) Move to "RESCUE CHARGE" by arrow key then press "SELECT".



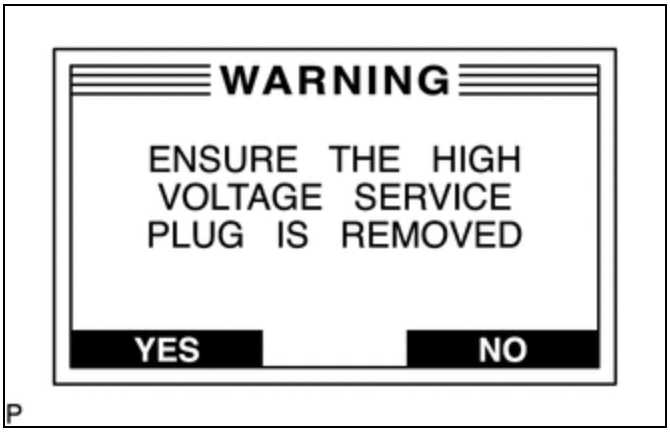
(c) Press "YES".



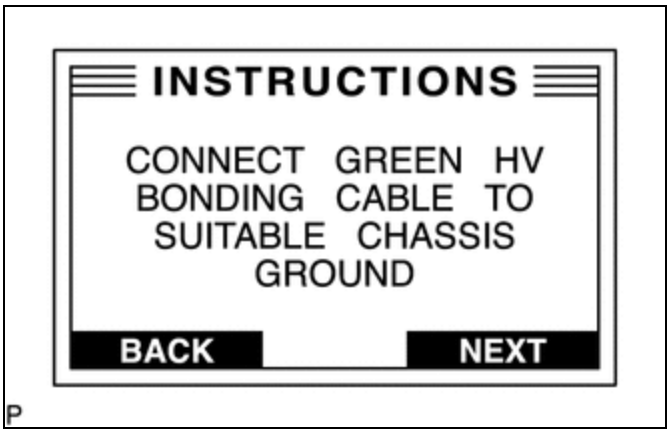
(d) Press "NEXT".



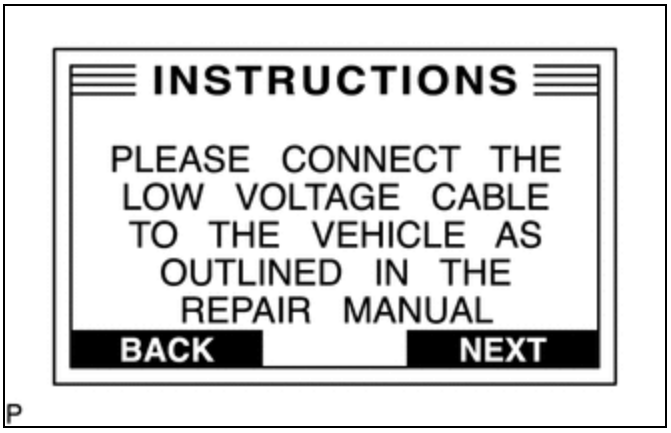
(e) Press "YES".



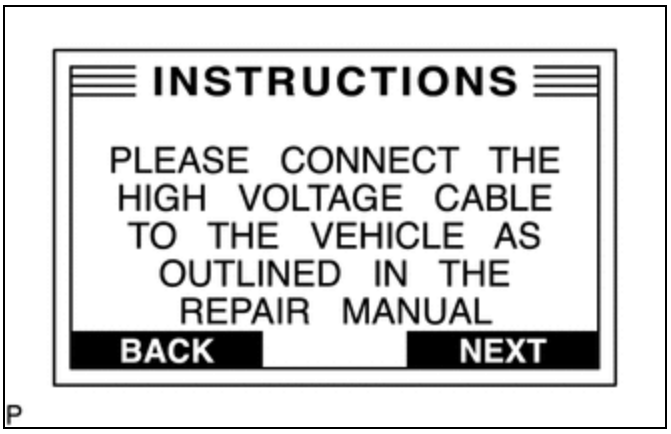
(f) Press "NEXT".



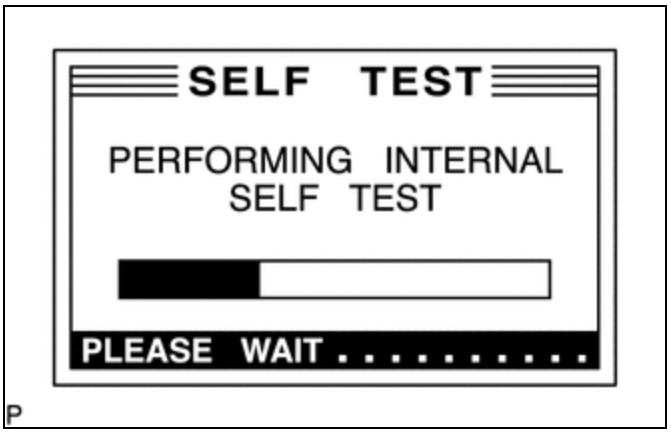
(g) Press "NEXT".



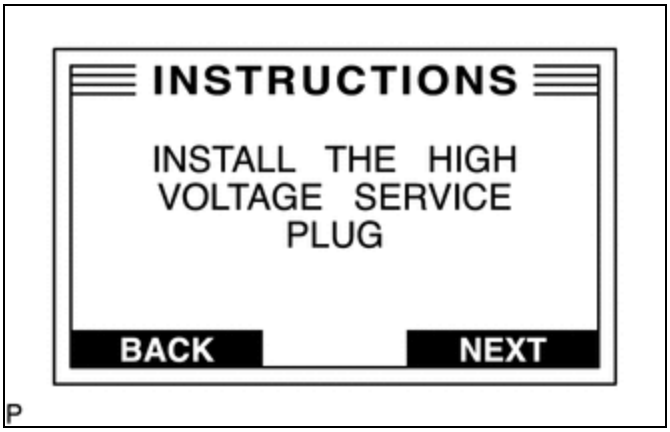
(h) Press "NEXT".



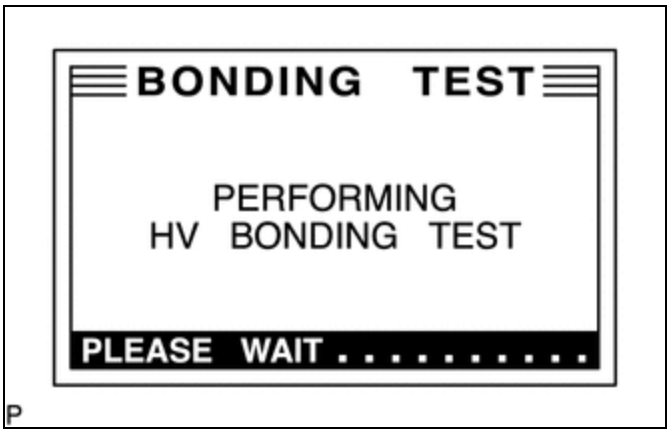
(i) Please wait for a while.



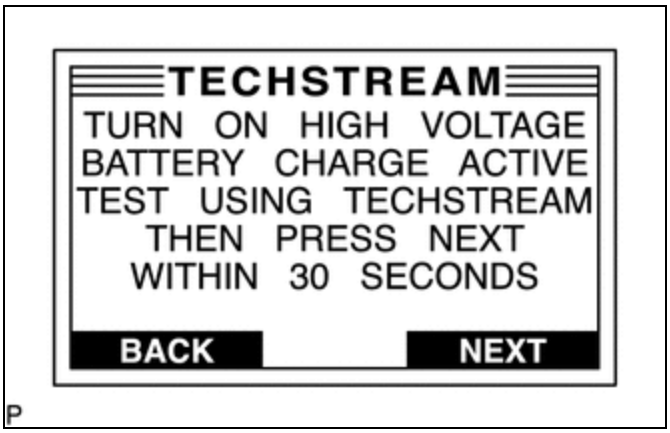
(j) Press "NEXT".



(k) Please wait for a while.



(l) Close SMR by the [Hybrid/EV Battery Charge] Active Test, then press "NEXT" on the GRX-5100T to start HV battery charging.



HINT:

- Charging condition status will be displayed on the screen of GRX-5100T while HV battery charging.
- While HV battery charging, voltage and charge current will be recorded in thumb nail drive.
- The GRX-5100T will automatically stop 10 minutes after charging starts with beep sound. As soon as The GRX-5100T stops the charging, SMRs are also automatically open.
- If the values of the Data List items are not as specified in the table below, turn the GTS and the ignition switch off and then perform the HV battery charging procedure again.

[SMRB Status] and [SMRG Status] in Data List during [Hybrid/EV Battery Charge] Active Test:

STEP	ACTIVE TEST [HYBRID/EV BATTERY CHARGE]	GRX-5100T START SWITCH	DATA LIST [SMRB STATUS]	DATA LIST [SMRG STATUS]
1	OFF	OFF	OFF	OFF
2	OFF → ON	OFF	OFF → ON	OFF → ON
3	ON	OFF → ON	ON	ON

(m) Repeat the charge cycle 3 times, if required. When the last cycle has finished, turn the GRX-5100T MAIN switch off.

HINT:

- Charging time using the GRX-5100T is 10 minutes per charge cycle. The charging time when using a GRX-5100T is a short charging time (when the battery temperature is 25°C (77°F), 10 minutes may be sufficient, if the battery temperature is 0°C (32°F), then three 10 minute charge cycles may be required) for putting the engine in a condition where it can be started (the system can enter the READY-on state).
- There is very little chance of overcharging the HV battery during the second or third charging cycle. The SOC will not likely increase beyond the upper limit because it was low enough to prevent the engine from starting. Even if the SOC was to increase enough to exceed the limit, the hybrid vehicle control ECU will stop the Active Test to prevent overcharging.
- Cranking the engine once causes the SOC to drop approximately 1%.
- Charging the HV battery once (10 minutes) using the GRX-5100T restores the SOC approximately 2%.

(n) Turn the ignition switch off.

(o) Remove the GRX-5100T and connect the floor under wire (for HV Battery).

(1) Disconnect power inlet plug of GRX-5100T from the grounded AC 100 to 240 V receptacle.

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

for M20A-FXS: Click here INFO

for 2ZR-FXE: Click here INFO

(3) Remove the service plug grip.

Click here INFO

(4) Disconnect the high voltage cable and low voltage cable from GRX-5100T.

(5) Connect the 2 No. 1 traction battery device box connectors.

NOTICE:

Make sure that the connectors are connected securely.

(6) Connect the shield ground to the HV battery.

(7) Install the No. 1 HV battery cover panel RH.

Click here INFO

(8) Install the service plug grip.

Click here INFO

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

for 2ZR-FXE: Click here INFO

for M20A-FXS: Click here INFO

(q) Turn the ignition switch to ON (READY) and check if the engine starts.

HINT:

If the engine does not start, perform the HV battery charging operation again.

(r) Refer to the HV battery installation procedure and make sure to perform all restoration procedures.

Click here INFO

6. CHECK HV BATTERY AFTER HV BATTERY CHARGE

(a) Check for DTCs.

Powertrain > Hybrid Control > Trouble Codes
Powertrain > HV Battery > Trouble Codes

(b) Perform the self-charging operation.

(1) Start the engine and leave it idling with the shift lever in P until the engine stops.

HINT:

When the engine stops idling, this indicates that self-charging is complete. Perform any initialization procedures required after the cable is disconnected and reconnected to the negative (-) auxiliary battery terminal.