Technical Service Information Bulletin

High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Service Category Engine/Hybrid System

Section

Market USA

Lexus Supports ASE Certification

Applicability

YEAR(S)	MODEL(S)	ADDITIONAL INFORMATION
2011 - 2017	CT200H	
2013 - 2018	ES300H	
2007 - 2011, 2013 - 2018	GS450H	
2010 - 2012	HS250H	
2008 - 2016	LS600H	
2015 - 2020	NX300H	
2006 - 2008	RX400H	
2010 - 2020	RX450H	

REVISION NOTICE

October 13, 2020 Rev1:

- **The entire bulletin has been updated.**

Any previous printed versions of this bulletin should be discarded.

Introduction

This bulletin includes basic procedures for performing a rescue charge on Ni-MH high voltage (HV) batteries. This bulletin should be used in conjunction with the applicable model and model year Repair Manual while performing the rescue charge. The GRX-5100 should be used wherever the Repair Manual references the Toyota Hybrid System (THS) charger.

High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Warranty Information

OP CODE	DESCRIPTION	TIME	OFP	T1	T2
N/A	Not Applicable to Warranty	–	–	–	–

Required Tools & Equipment

SPECIAL SERVICE TOOLS (SST)	PART NUMBER	QTY
High Voltage Battery Service Unit*	01413-00002	1
Interface ECU – 64*	01413-00017	1
High Voltage Cable* (A)	01413-00013	1
High Voltage Cable* (B)	01413-00014	1
High Voltage Cable* (C)	01413-00015	1
High Voltage Cable* (D)	01413-00016	1
High Voltage Cable* (E)	01413-00009	1
High Voltage Cable* (G)	01413-00018	1
Interlock Connector*	01413-00003	1
Stack Balance Cable* (I)	01413-00024	1
Low Voltage Cable* (P)	01413-00022	1
Low Voltage Cable* (Q)	01413-00023	1
Low Voltage Cable* (R)	01413-00004	1
Cell Voltage Cable* (J)	01413-00019	1
Temperature Sensor Cable* (K)	01413-00020	1
Cell Voltage Cable* (L)	01413-00021	1
Universal High Voltage Cable* (V)	01413-00007	1
Universal Fuse Box*	01413-00010	1
AC Power Cord* (S)	01413-00005	1
D/C Adapter Kit* (T&U)	01413-00006	1
Banana Jack Extension Cable* (X)	01413-00031	1
AC Circuit Checker*	01413-00012	1
Battery Diagnostic Tool*	DSS-5000P T	1

*Essential SST.

NOTE

Additional SSTs may be ordered by calling 1-800-933-8335.

High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Required Tools & Equipment (continued)

REQUIRED EQUIPMENT	SUPPLIER	PART NUMBER	QTY
Techstream ADVi*	ADE	TSADVUNIT	1
Techstream 2.0		TS2UNIT	
Techstream Lite		TSLITEPDLR01	
Techstream Lite (Green Cable)		TSLP2DLR01	

*Essential SST.

NOTE

- Only ONE of the Techstream units listed above is required.
- Software version 15.20.016 or later is required.
- Additional Techstream units may be ordered by calling Approved Dealer Equipment (ADE) at 1-800-368-6787.

Rescue Charge Ni-MH

1. Preliminary vehicle inspection.
   A. Inspect auxiliary battery voltage.
   B. Measure the voltage between the terminals of the auxiliary battery.

NOTE

- Standard voltage is approximately 11V or more.
- If the voltage is 11V or less, either charge the auxiliary battery or replace it with an auxiliary battery that is already charged.

High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Rescue Charge Ni-MH (continued)

2. Inspect the HV battery.

CAUTION

- **ALWAYS wear the appropriate Personal Protective Equipment (PPE) provided in the HEV Workstation when working with high voltage. (Insulated gloves, insulated apron, and arc protective helmet with face shield).**
- **ALWAYS use insulated tools when working with high voltage.**
- **ALWAYS use the cones, barriers and high voltage car toppers provided in the HEV Workstation to create a perimeter around the vehicle and work area.**

HINT

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

A. Check the charge level of the HV battery.

B. Check if the HV battery warning message is shown in the vehicle's multi-information display.

C. Confirm if the engine starts.

Does the engine start?

- **YES —** Go to step 6.
- **NO —** Continue to step 3.

High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Rescue Charge Ni-MH (continued)

3. Connect the GRX-5100 for rescue charge.

HINT

- ALWAYS use the Techstream to troubleshoot the hybrid system before attempting HV battery charge.
- Charging time while using the GRX-5100 is 10 minutes per charge cycle when the battery temperature is above 77°F (25°C); 10 minutes may be sufficient, if the battery temperature is below 32°F (0°C), 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-5100 will automatically stop 10 minutes AFTER charging starts.

A. Disconnect the 12V auxiliary battery.

B. Use the table below to select the high voltage and low voltage cables for a specific model. Some vehicles may also require a high voltage accessory.

Table 1

PART NUMBER/MODEL APPLICATION							
MODEL NAME	MODEL YEAR	MODEL CODE	HIGH VOLTAGE CABLES			HV ACCESSORY	LOW VOLTAGE CABLE/ HV BONDING CABLE
			01413-00015 HIGH VOLTAGE CABLE C	01413-00016 HIGH VOLTAGE CABLE D	01413-00009 HIGH VOLTAGE CABLE E	01413-00003 INTERLOCK CONNECTOR	01413-00004 LOW VOLTAGE CABLE R
CT 200h	2011 – 2017	ZWA10	–	–	X	X	X
HS 250h	2010 – 2012	ANF10	–	X	–	–	X
ES 300h	2013 – 2018	AVV60	–	X	–	–	X
NX 300h	2015 – 2020	AYZ10	–	X	–	–	X
		AYZ15	–	X	–	–	X
RX 400h	2006 – 2008	MHU33	X	–	–	–	X
		MHU38	X	–	–	–	X
RX 450h	2010 – 2015	GYL10	–	–	X	X	X
		GYL20	–	–	X	X	X
	2016 – 2020	GYL15	–	–	X	X	X
		GYL25	–	–	X	X	X
GS 450h	2007 – 2011	GWS191	–	X	–	–	X
	2013 – 2018	GWL10	–	X	–	–	X
LS 600hL	2008 – 2016	UVF46	–	X	–	–	X

High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Rescue Charge Ni-MH (continued)

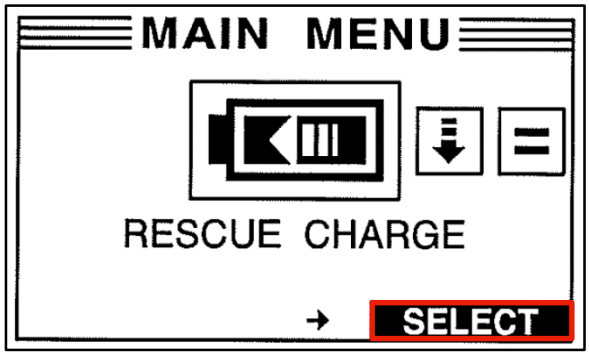
C. Connect the power input (cable S) to the GRX-5100 and connect the cable into a grounded AC 100 to 240V receptacle.

> **NOTICE**
>
> **ALWAYS confirm the AC 100 to 240V receptacle has a properly functioning ground by using the AC circuit checker provided in the HEV Workstation. 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 the plug (cable S) have been damaged or removed.**

D. Turn the GRX-5100 ON.

E. Select Rescue Charge by using the arrow key, then press Select.

Figure 1.

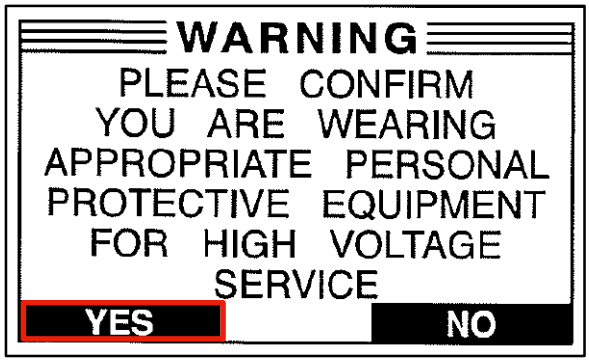


F. Confirm you are wearing the appropriate PPE for high voltage service.

G. Press Yes.

> HINT
>
> ALWAYS wear the appropriate PPE when working with high voltage: Insulated gloves, insulated apron, arc protective helmet w/face shield.

Figure 2.



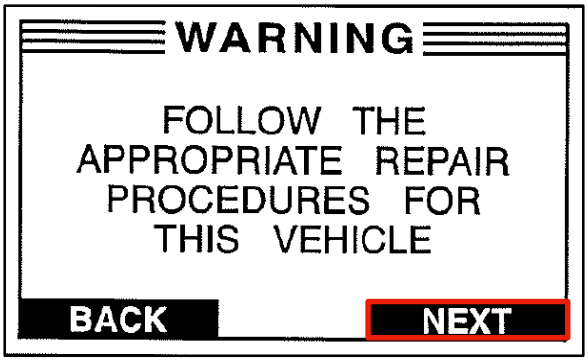
High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Rescue Charge Ni-MH (continued)

H. Press Next.

> HINT
>
> Please refer to the Repair Manual for vehicle specific instructions for disassembly and connector locations.

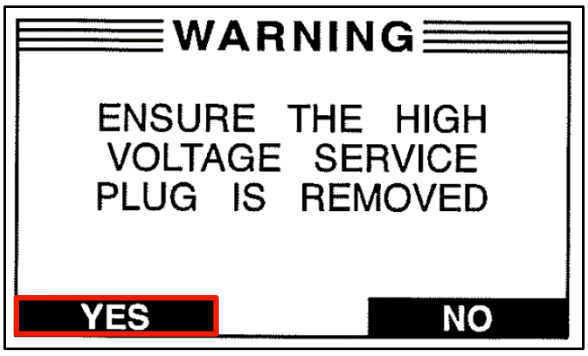
Figure 3.



I. Remove the service plug grip.

J. Press Yes.

Figure 4.

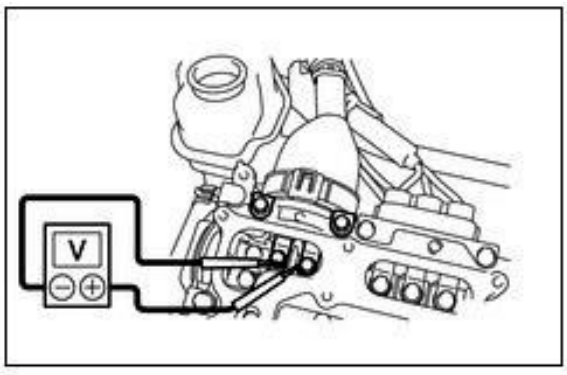


K. Remove the inverter terminal cover.

L. Check terminal voltage.

> NOTE
>
> Standard voltage: 0 volts.

Figure 5.



M. Disconnect the frame wire.

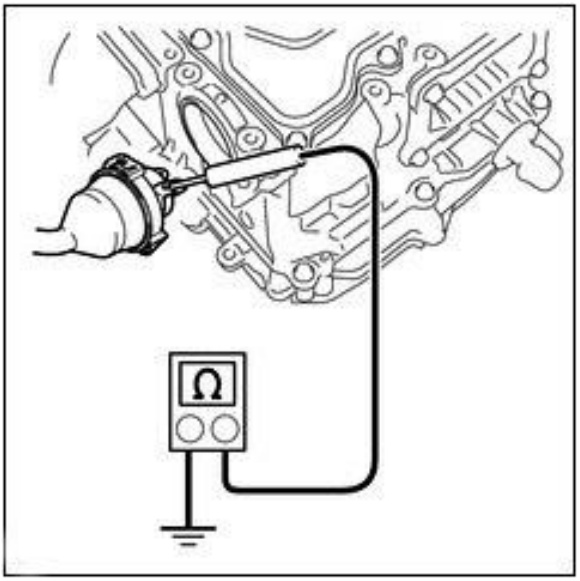
High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Rescue Charge Ni-MH (continued)

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

> HINT
>
> If the shielding of the frame wire is NOT securely connected to body ground, the GRX-5100 will NOT operate.

Figure 6.



TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Frame Wire Connector Housing – Body Ground	Always	Below 1 Ω

O. If the results are NOT as specified, inspect the connection according to the applicable model and model year Repair Manual at *TIS – Engine/Hybrid System – Hybrid/Battery Control System – HV Battery Charging* for proper installation.

High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Rescue Charge Ni-MH (continued)

P. Connect the corresponding high voltage cable to the fuse box.
Q. Connect High Voltage Cable V to the fuse box.
R. Connect High Voltage Cable V to the GRX-5100.
S. Connect the corresponding Low Voltage cable to the GRX-5100.
T. Install the inverter terminal cover to the inverter assembly.

NOTICE

- **Do NOT allow ANY foreign material or water to enter the inverter assembly.**
- **Make sure ALL connectors are connected securely.**

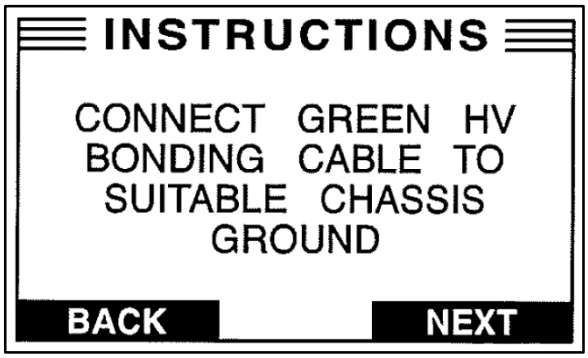
CAUTION

- **ALWAYS wear insulated gloves and the appropriate PPE provided in the HEV Workstation when working with high voltage.**
- **ALWAYS use insulated tools provided in the HEV Workstation when working with high voltage.**

U. Connect the green HV bonding cable to a suitable chassis ground

V. Press Next.

Figure 7.

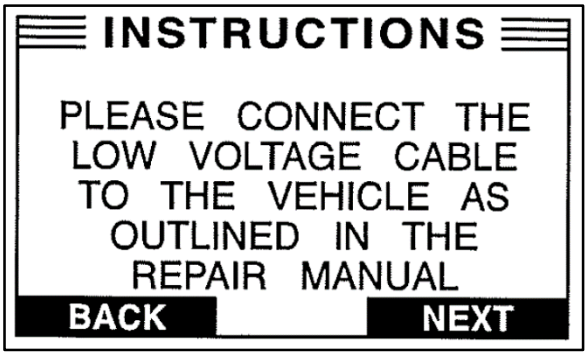


W. Connect the low voltage cable to inverter terminal cover.
X. Press Next.

NOTE

NOT ALL vehicles require a separate low voltage cable circuit.

Figure 8.



High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Rescue Charge Ni-MH (continued)

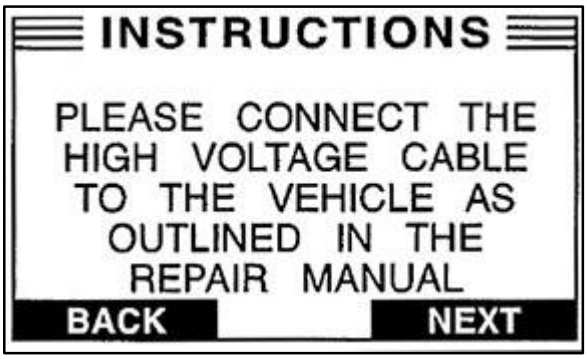
Y. Connect the HV cable to the vehicle's frame wire.

> NOTE
>
> HV cable connections will vary by vehicle (refer to substep O for vehicle specific cable application)

Z. Press Next.

> HINT
>
> - Certain HV cables require a grounding bolt to complete the HV bonding test.
> - HV cables requiring a grounding bolt have been labeled using a black sticker indicating bolt location, size, and torque.

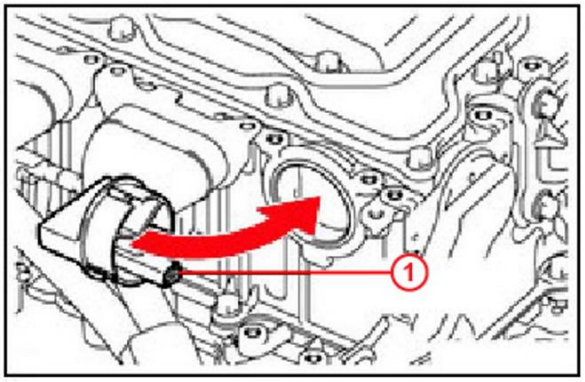
Figure 9.



AA. Install the interlock connector in the inverter.

> HINT
>
> The battery charge active test will fail and a DTC will set if the interlock connector is NOT installed.

Figure 10.



1	Interlock

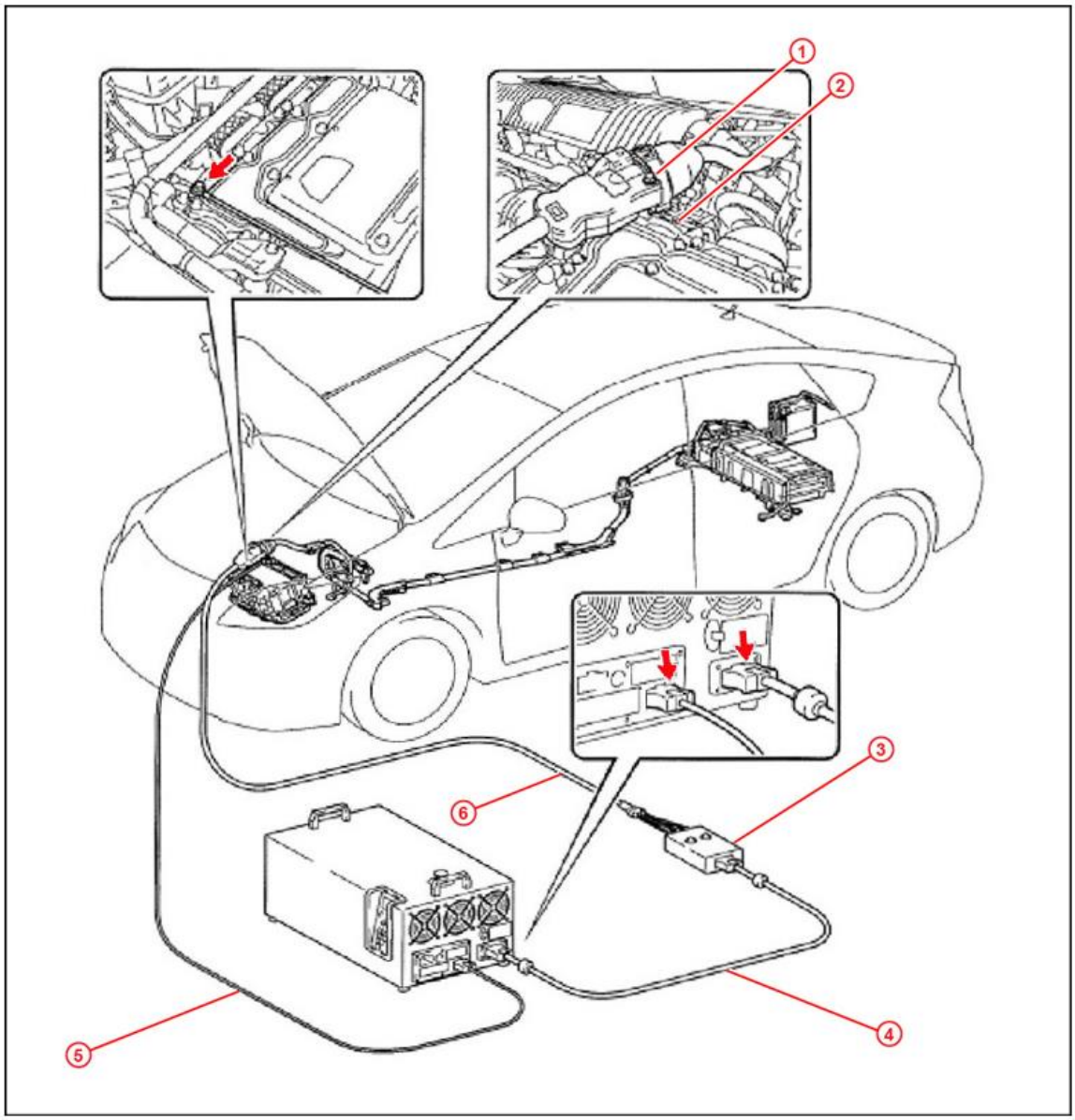
BB. Overall view of connectors and their connections for the GRX-5100 are shown in Figure 11 for HV battery rescue charge.

> HINT
>
> Please refer to the Repair Manual for vehicle specific instructions for disassembly and connector locations.

High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Rescue Charge Ni-MH (continued)

Figure 11. Example of a connection for a 2011 – 2015 CT 200h



1	Grounding Bolt
2	Interlock Connector
3	Fuse Box

4	Cable V
5	Cable R
6	Cable E

NOTE

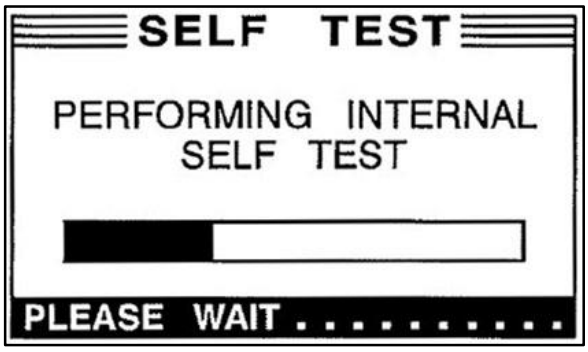
Refer to *HV Battery – Charging* in the Repair Manual for applicable model.

High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Rescue Charge Ni-MH (continued)

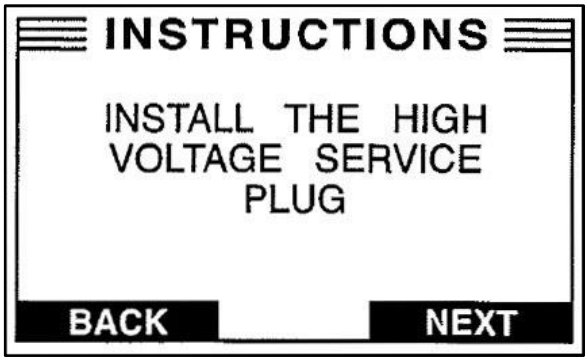
CC. Wait for the internal test to complete.

Figure 12.



DD. Install the service plug grip.

Figure 13.



EE. Press Next.

NOTICE

Make sure the service plug grip's interlock is fully engaged.

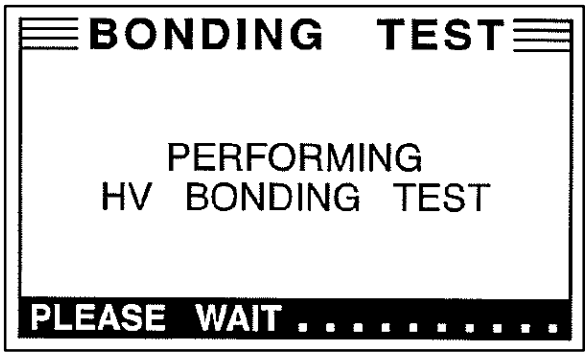
FF. Connect the negative (-) terminal of the auxiliary battery.

HINT

Using the power supply mode, connect the battery diagnostic tool to the auxiliary battery.

GG. Please wait for the HV bonding test to complete.

Figure 14.



High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

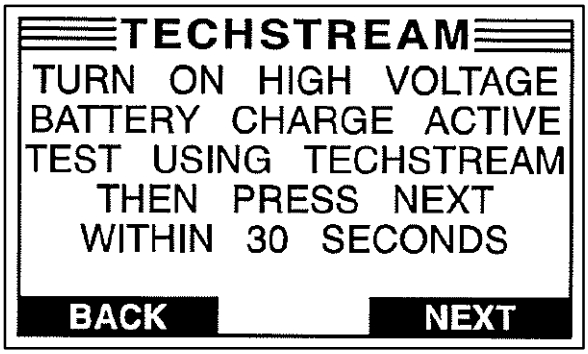
Rescue Charge Ni-MH (continued)

4. HV battery rescue charging.
   A. Turn the vehicle power switch (IG) ON.
   B. Connect Techstream to DLC3.
   C. Enter the following menus: *Powertrain – Hybrid Control – Active Test – Battery Charge*.

> HINT
>
> During the battery charge active test, check the *System Main Relay Status – SMRB* and *System Main Relay Status – SMRG* on the data list.

   D. Open the battery charge active test and click the ON button on Techstream, then press NEXT on the GRX-5100 to start HV battery charging within 30 seconds.

Figure 15.



> HINT
>
> - AFTER the battery charge active test has been turned ON, push the NEXT button on the GRX-5100 within 30 seconds. If the next button is NOT pushed within the 30 seconds, the SMR will open and the GRX-5100 will NOT be able to charge the HV battery.
> - If the shielding of the frame wire is NOT securely connected to body ground, the GRX-5100 charging condition status will be displayed on the screen of the GRX-5100 while HV battery charging.
> - During the HV battery charge cycle, the voltage and charge current will be recorded on the flash drive.
> - The GRX-5100 will automatically stop 10 minutes after charging starts. SMRs will automatically open as soon as the GRX-5100 stops charging.
> - If the Data List values are NOT as specified in the table below, restart the Techstream and cycle the vehicle's power switch (IG) OFF/ON, and then perform the HV battery rescue charging procedure again.

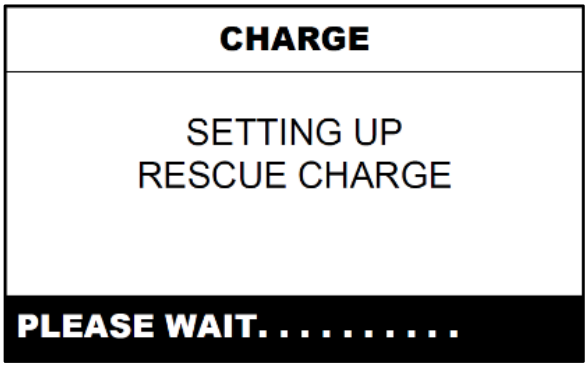
STEP	ACTIVE TEST BATTERY CHARGE	GRX-5100 START SWITCH	DATA LIST SYSTEM MAIN RELAY STATUS – SMRB	DATA LIST SYSTEM MAIN RELAY STATUS – SMRG
1	OFF	OFF	OFF	OFF
2	OFF → ON	OFF	OFF → ON	OFF → ON
3	ON	OFF → ON	ON	ON

High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Rescue Charge Ni-MH (continued)

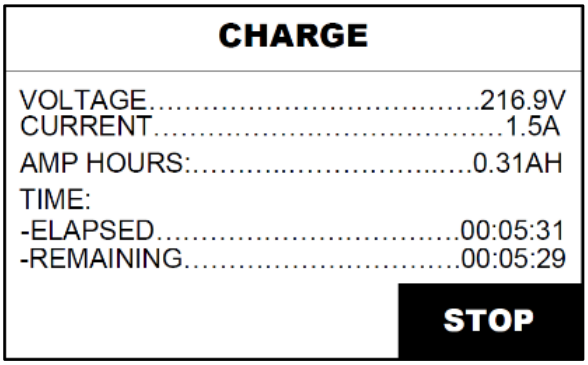
E. Please wait for the rescue charge to start.

Figure 16.



F. Repeat the charge cycle up to three times, if required.

Figure 17.



HINT

- Charging time while using the GRX-5100 is 10 minutes per charge cycle when the battery temperature is above 77°F (25°C); 10 minutes may be sufficient, if the battery temperature is below 32°F (0°C), 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-5100 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 GRX-5100 restores the SOC approximately 2%.

High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Rescue Charge Ni-MH (continued)

5. Reassemble the vehicle.

> **CAUTION**
> - **ALWAYS wear insulated gloves and the appropriate PPE provided in the HEV Workstation when working with high voltage.**
> - **ALWAYS use insulated tools provided in the HEV Workstation when working with high voltage.**

A. Turn the GRX-5100 power switch OFF.
B. Turn the vehicle power switch OFF.
C. Disconnect 12V auxiliary battery.
D. Remove the service plug grip.
E. Remove the GRX-5100 cables and interlock connector.
F. Reassemble the vehicle following the Repair Manual.
G. Install the service plug grip.
H. Reconnect the 12V auxiliary battery.
I. Check for ANY DTCs.
J. Confirm if the engine cranks.

Does the engine crank?

- **YES —** Continue to substep K.
- **NO —** Repeat steps 3 – 5.

K. Confirm if the engine starts.

Does the engine start?

- **YES —** Continue to step 6.
- **NO —** Continue diagnosis using the applicable Repair Manual.

> HINT
> Please refer to the Repair Manual for vehicle specific instruction for reassembly and connector locations.

6. Allow the vehicle to idle in park “P” until the engine stops. Once the engine stops, self-charge has been completed.