Technical Service Information Bulletin

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

Service Category Engine/Hybrid System

Section Hybrid/Battery Control System **Market** USA

Lexus Supports ASE Certification

Applicability

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

Introduction

This bulletin includes basic procedures for preforming a Rescue Charge on Ni-MH High Voltage (HV) Batteries. This bulletin should be used in conjunction with the Repair Manual while performing the Rescue Charge. The GRX-5100 should be used wherever the Repair Manual references the Toyota Hybrid System (THS) Charger.

Warranty Information

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

Required Tools & Equipment

SPECIAL SERVICETOOLS (SST)	PART NUMBER	QTY
High Voltage Battery Service Unit*	01413-00002	1
Interface ECU - 64*	01413-00017	
High Voltage Cable* (A)	01413-00013	

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

Required Tools & Equipment (Continued)

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

NOTE

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

REQUIRED EQUIPMENT	SUPPLIER	PART NUMBER	QTY
Techstream 2.0*	ADE	TS2UNIT	1
Techstream Lite		TSLITEPDLR01	

*Essential SST.

NOTE

- **Only ONE of the Techstream units listed above is required.**
- **Software version 10.30.029 or later is required.**
- **Additional Techstream units may be ordered by calling Approved Dealer Equipment (ADE) at 1-800-368-6787.**

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

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 11 V or more.**

> **HINT**
>
> **If the voltage is 11 V or less, either charge the auxiliary battery or replace it with an auxiliary battery that is already charged.**

2. Inspect 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 w/ 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 whether the HV battery warning message is shown in the vehicle's multi-information display.
   C. Confirm if the engine starts. If the engine starts, let the vehicle idle in park (P) until the engine stops (self-charge has completed). If the engine cannot start, follow the procedures below to charge the HV Battery.

> **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.**

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

Rescue Charge Ni-MH (Continued)

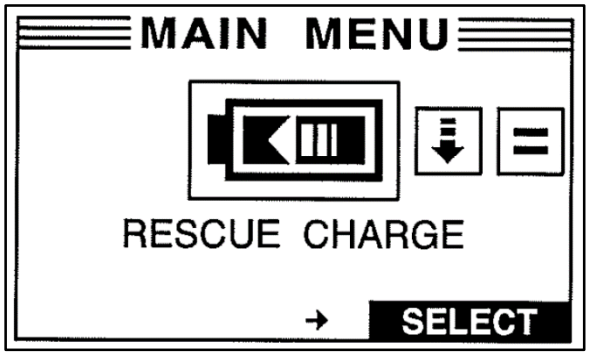
3. Connecting the GRX-5100 for Rescue Charge.
   A. Disconnect the 12 V auxiliary battery.
   B. Connect the power input (cable S) to the GRX-5100 and connect the cable into a grounded AC 100 to 240 V receptacle.

> **NOTICE**
>
> **Always confirm the AC 100 to 240 V 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.**

   C. Turn the GRX-5100 ON.

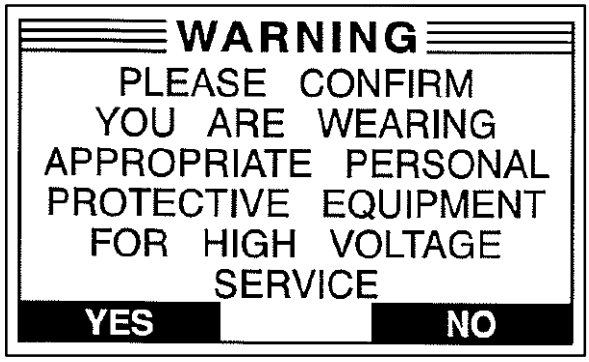
   D. Select *Rescue Charge* by using the arrow key, then press *Select*.

Figure 1.



   E. Confirm you are wearing the appropriate PPE for High Voltage service.

Figure 2.



   F. Press *Yes*.

> **HINT**
>
> **Always wear the appropriate personal protective equipment (PPE) when working with High Voltage: Insulated gloves, insulated apron, arc protective helmet w/face shield.**

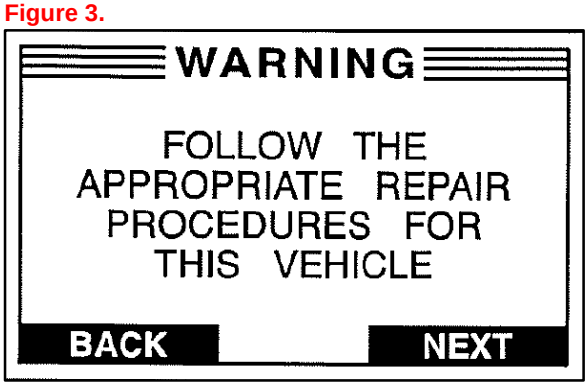
High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Rescue Charge Ni-MH (Continued)

G. Press *Next*.

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

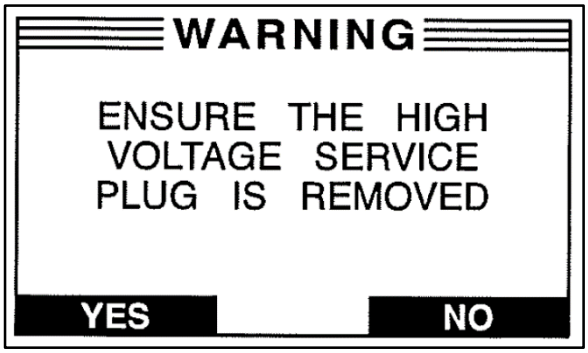
Figure 3.



H. Remove the service plug grip.

I. Press *Yes*.

Figure 4.

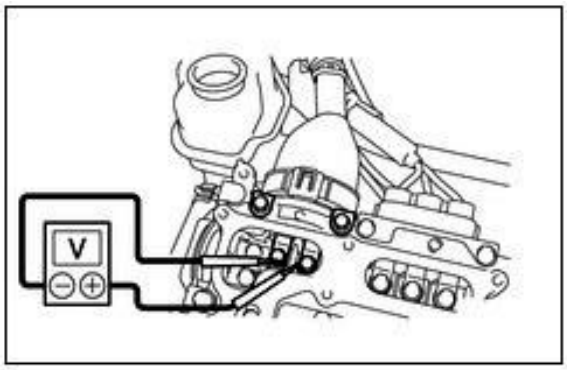


J. Remove the inverter terminal cover.

K. Check terminal voltage.

> **NOTE**
>
> **Standard Voltage: 0-volts.**

Figure 5.



L. Disconnect the frame wire.

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

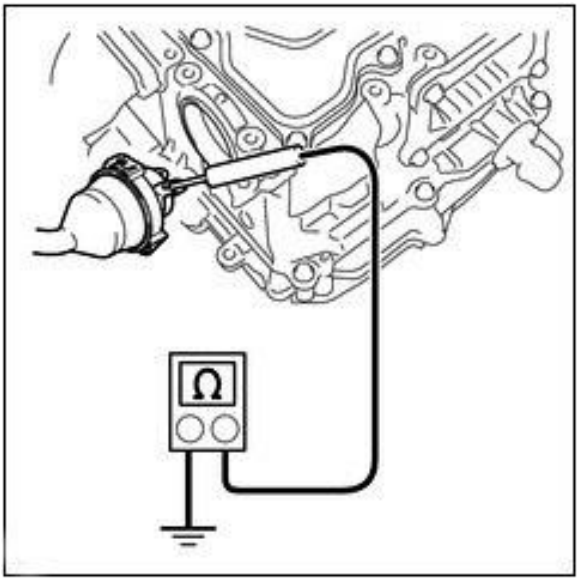
Rescue Charge Ni-MH (Continued)

M. 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

N. If the results are NOT as specified, inspect the connection according to the Repair Manual for proper installation.

HV Battery > Charging

O. 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.

Part Number / Model Application						
Model	MY	High Voltage Cables			HV Accessory	Low Voltage Cable / HV Bonding Cable
		01413-00015	01413-00016	01413-00009	01413-00003	01413-00004
		Cable (C)	Cable (D)	Cable (E)	Interlock Connector	Cable (R)
CT200h	11 - 16	-	-	x	x	x
HS250h	10 - 12	-	x	-	-	x
ES300h	13 - 16	-	x	-	-	x
NX300h	15 - 16	-	x	-	-	x
RX400h	06 - 08	x	-	-	-	x
RX450h	10 - 16	-	-	x	x	x
GS450h	07 - 16	-	x	-	-	x
LS600h	08 - 16	-	x	-	-	x

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.**

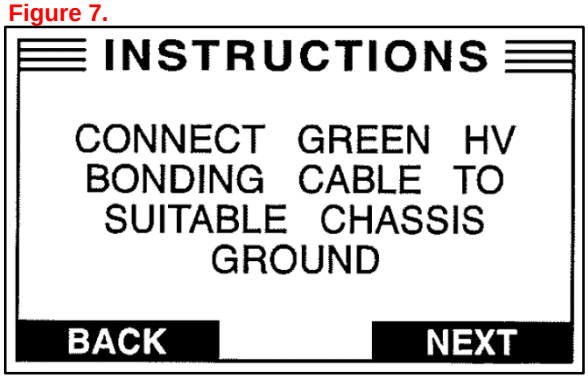
CAUTION

- **Always wear insulated gloves and the appropriate Personal Protective Equipment (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.

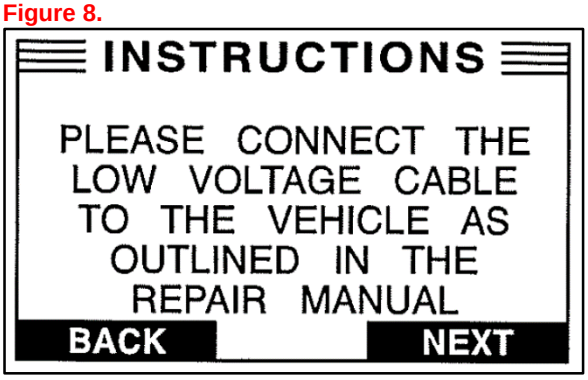


W. Connect the low voltage cable to inverter terminal cover.
X. Press *Next*.

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

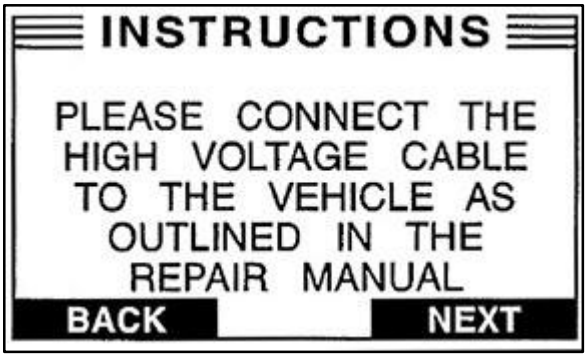
HV cable connections will vary by vehicle (refer to Step "O" for vehicle specific cable application)

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.

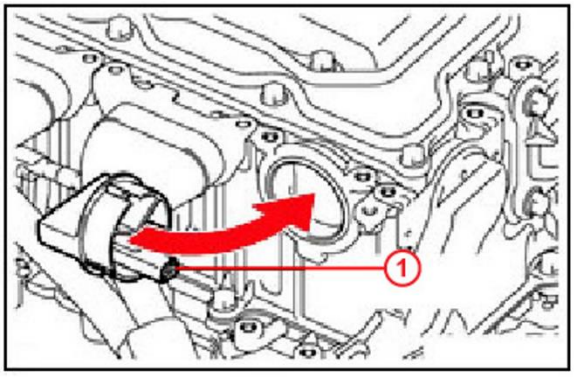


AA. Install the interlock connector in the inverter.

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 below for HV Battery Rescue Charge.

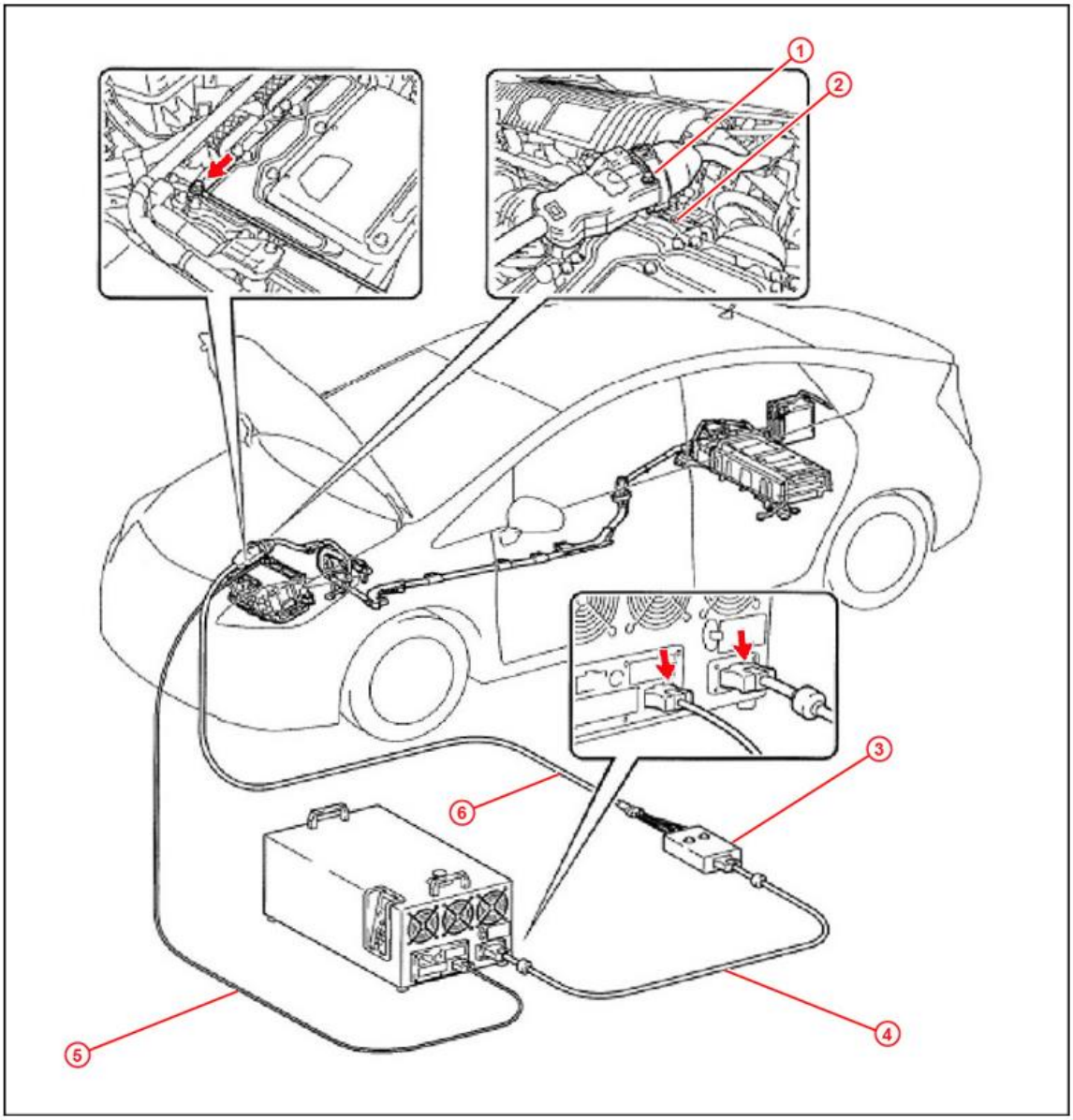
HINT

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 This is an example of a connection for a 2011 – 2015 CT 200h.



1	Grounding Bolt	4	Cable V
2	Interlock Connector	5	Cable R
3	Fuse Box	6	Cable E

NOTE

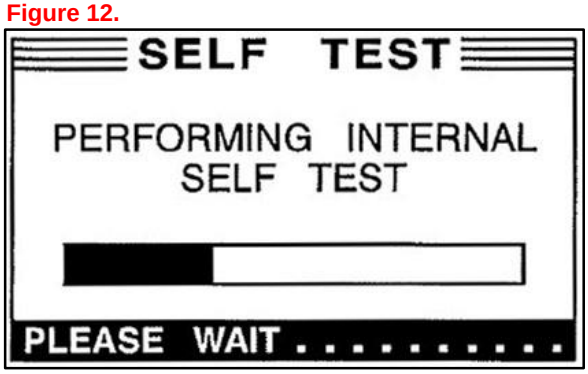
Refer to *HV Battery* > *Charging* in the Repair Manual for applicable model.

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

Rescue Charge Ni-MH (Continued)

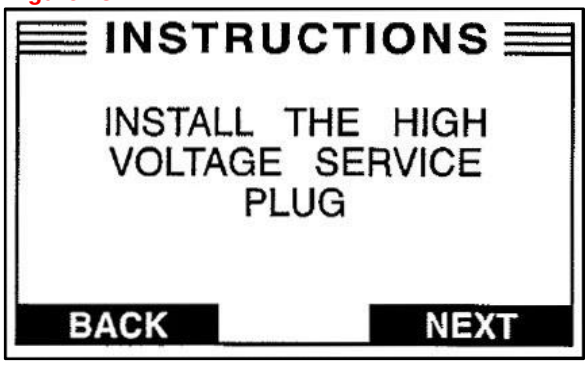
CC. Wait for the internal test to complete.

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.

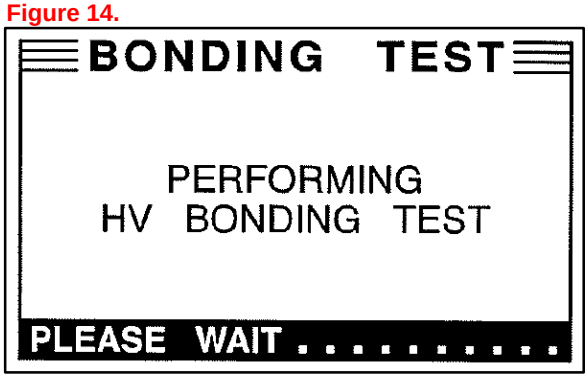
FF. Connect the negative (-) terminal of the auxiliary battery.

HINT

Connect the GR8 using power supply mode 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)

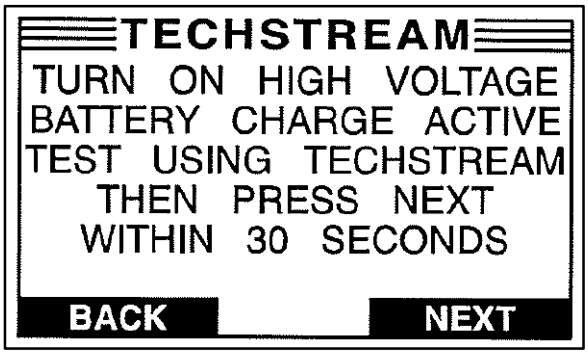
4. HV Battery rescue charging
   A. Turn the vehicle power switch (IG) ON.
   B. Connect Techstream to DLC3.
   C. Enter the following menus: *Powertrain – Hybrid Control – Active Test – Battery Charge*.

HINT

During the "Battery Charge" Active Test, check "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 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.**

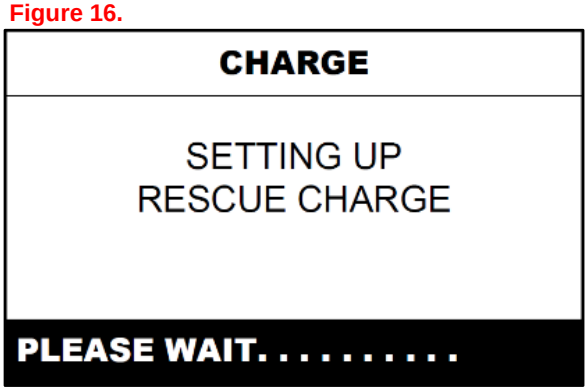
High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Rescue Charge Ni-MH (Continued)

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

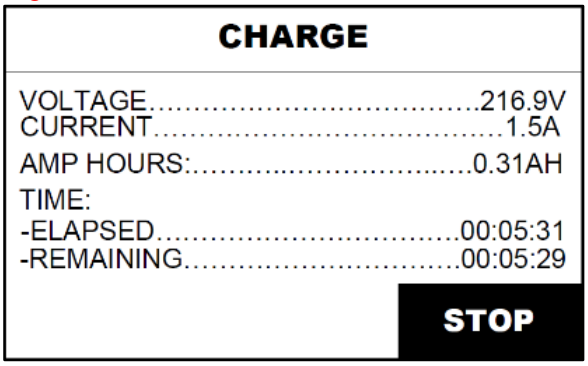
E. Please wait for the “Rescue Charge” to start.

Figure 16.



F. Repeat the charge cycle up to 3 times, if required.

Figure 17.



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

Rescue Charge Ni-MH (Continued)

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%.**

5. Reassemble the vehicle.

CAUTION

- **Always wear insulated gloves and the appropriate Personal Protective Equipment (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 12 V 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 12 V auxiliary battery.
I. Perform a Health Check using Techstream.
J. Confirm the vehicle will Ready ON.
K. Perform initialization of vehicle systems as needed.

HINT

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