TOYOTA
Technical Service Bulletin

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

Service Category Engine/Hybrid System

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

Toyota Supports ASE Certification

Applicability

YEAR(S)	MODEL(S)	ADDITIONAL INFORMATION
2013 - 2018	Avalon HV	
2007 - 2017	Camry HV	
2006 - 2019	Highlander HV	
2012 - 2019	Prius C	
2012 - 2017	Prius V	
2001 - 2015	Prius	
2016 - 2018	RAV4 HV	

REVISION NOTICE

May 01, 2020 Rev1:

- **Applicability has been updated to include 2017 – 2018 model year Avalon Hybrid, 2017 model year Camry Hybrid, 2017 – 2019 model year Highlander Hybrid, 2017 – 2019 model year Prius C, 2017 model year Prius V, and 2016 – 2018 model year RAV4 vehicles.**
- **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 a 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	–	–	–	–

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

Required Tools & Equipment

SPECIAL SERVICETOOLS (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
Universal High Voltage Cable* (V)	01413-00007	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
Cell Voltage Cable* (L)	01413-00021	1
Temperature Sensor Cable* (K)	01413-00020	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*	DCA-8000P 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 15.00.028 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. Inspect the vehicle.
   A. Inspect the 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 less than 11V, 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 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 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 whether the engine starts.

Does the engine start?

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

3. Connect the GRX-5100 for a rescue charge.

NOTE

- ALWAYS use Techstream to troubleshoot the hybrid system before attempting an 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).
- 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.

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

Rescue Charge Ni-MH (continued)

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	01413-00010 UNIVERSAL FUSE BOX	HIGH VOLTAGE CABLES						HV ACCESSORY	LOW VOLTAGE CABLE/ HV BONDING CABLE		
				01413-00007 HV* CABLE V	01413-00013 HV* CABLE A	01413-00014 HV* CABLE B	01413-00015 HV* CABLE C	01413-00016 HV* CABLE D	01413-00009 HV* CABLE E	01413-00003 INTERLOCK CONNECTOR	01413-00022 LV** CABLE P	01413-00023 LV** CABLE Q	01413-00004 LV** CABLE R
Avalon HV	2013 – 2018	AVX40	X	X	–	–	–	X	–	–	–	–	X
Camry HV	2007 – 2011	AHV40	X	X	–	–	–	X	–	–	–	–	X
	2012 – 2017	AVV50	X	X	–	–	–	X	–	–	–	–	X
Highlander HV	2006 – 2007	MHU23	X	X	–	–	X	–	–	–	–	–	X
		MHU28	X	X	–	–	X	–	–	–	–	–	X
	2008 – 2010	MHU48	X	X	–	–	–	X	–	–	–	–	X
	2011 – 2013	GVU48	X	X	–	–	–	–	X	X	–	–	X
	2014 – 2019	GVU58	X	X	–	–	–	–	X	X	–	–	X
Prius	2001 – 2003	NHW11	X	X	X	–	–	–	–	–	X	–	–
	2004 – 2009	NHW20	X	X	–	X	–	–	–	–	–	X	–
	2010 – 2015	ZVW30	X	X	–	–	–	–	X	X	–	–	X
Prius C	2012 – 2019	NHP10	X	X	–	–	–	–	X	X	–	–	X
Prius V	2012 – 2017	ZVW41	X	X	–	–	–	–	X	X	–	–	X
RAV4 HV	2016 – 2018	AVA44	X	X	–	–	–	X	–	–	–	–	X

*HV = High Voltage
**LV = Low Voltage

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.

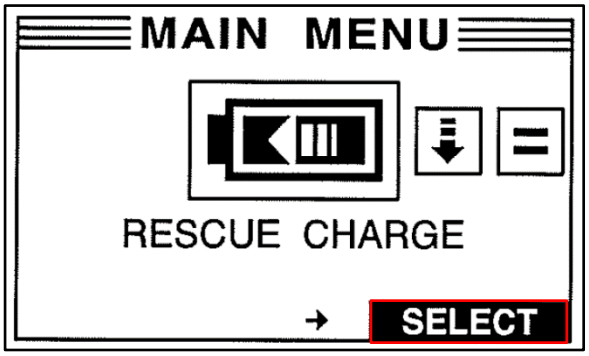
D. Turn the GRX-5100 ON.

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

Rescue Charge Ni-MH (continued)

E. Select RESCUE CHARGE by using the arrow key, then press SELECT.

Figure 1.



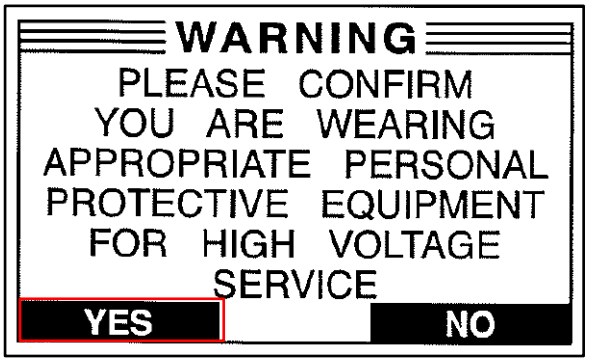
F. Confirm you are wearing the appropriate PPE for high voltage service.

CAUTION

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

G. Press YES.

Figure 2.

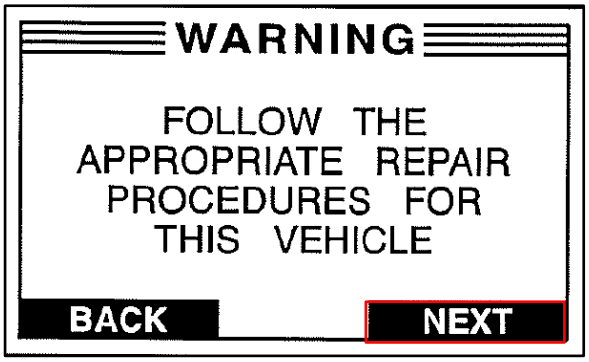


H. Press NEXT.

NOTE

Refer to the applicable model and model year Repair Manual for vehicle specific instructions for disassembly and connector locations.

Figure 3.



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

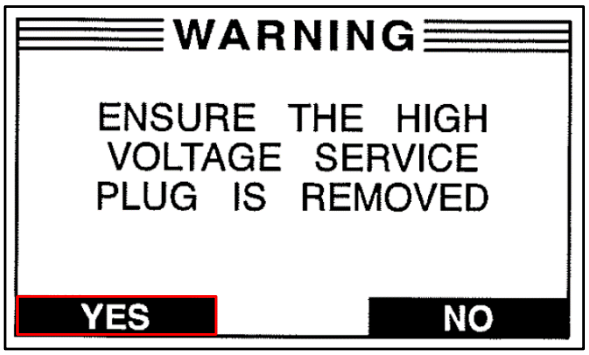
Rescue Charge Ni-MH (continued)

I. Remove the service plug grip.

> NOTE
>
> Refer to the applicable model and model year Repair Manual at *TIS – Engine Hybrid System – Hybrid/Battery Control System – HV Battery Charging* for the appropriate wait time AFTER the high voltage service plug grip is pulled.

J. Press YES.

Figure 4.

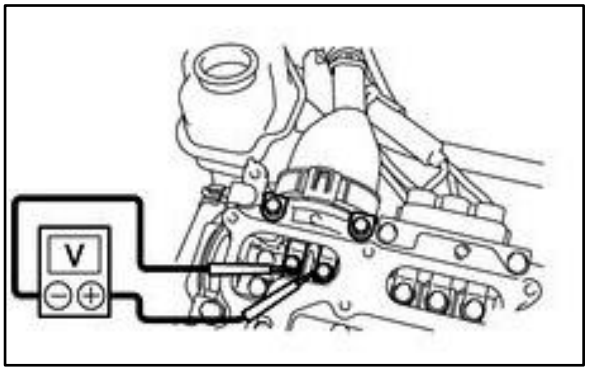


K. Remove the inverter terminal cover.

L. Check the terminal voltage.

> HINT
>
> Standard voltage is 0V.

Figure 5.



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

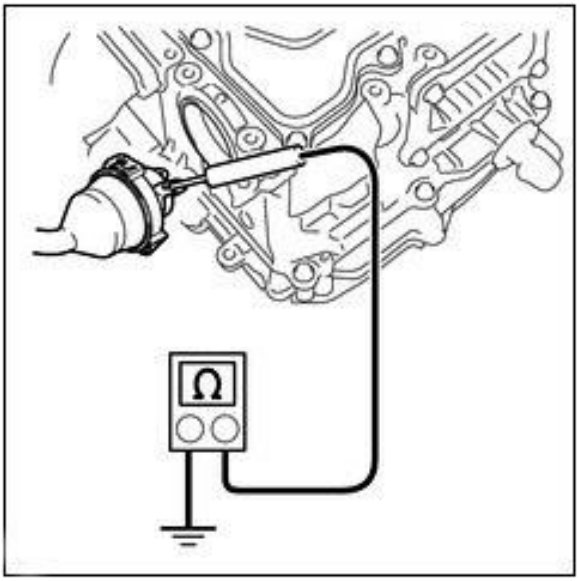
Rescue Charge Ni-MH (continued)

M. Disconnect the frame wire.

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

> NOTE
> 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 securely connected.**

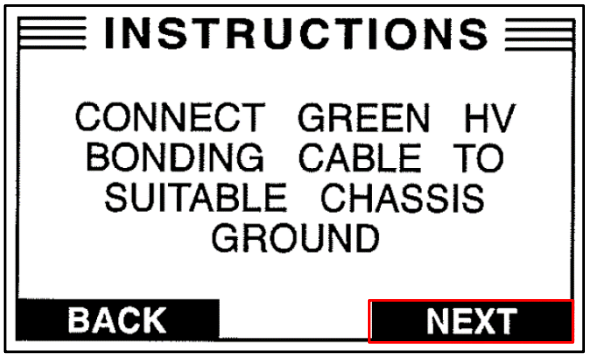
CAUTION

- **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 high voltage bonding cable to a suitable chassis ground.

V. Press NEXT.

Figure 7.



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

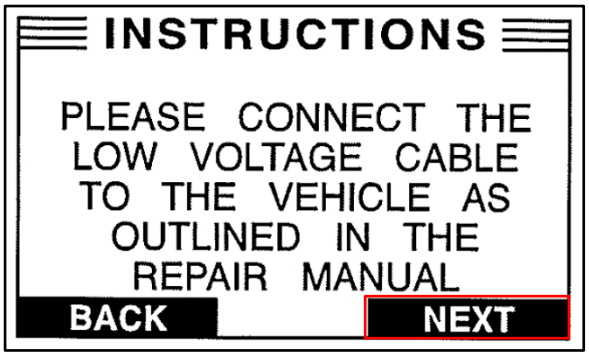
Rescue Charge Ni-MH (continued)

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.

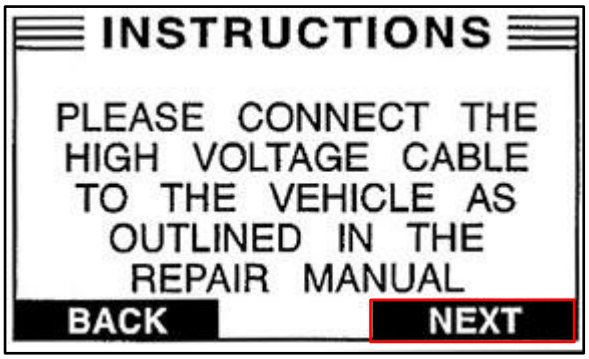


Y. Connect the high voltage cable to the vehicle's frame wire.

Z. Press NEXT.

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

Figure 9.



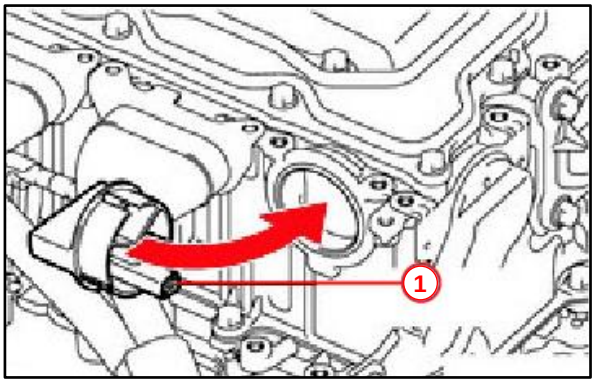
High Voltage (HV) Battery Rescue Charge (HEV Workstation / GRX-5100)

Rescue Charge Ni-MH (continued)

AA. Install the interlock connector in the inverter.

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

Figure 10.

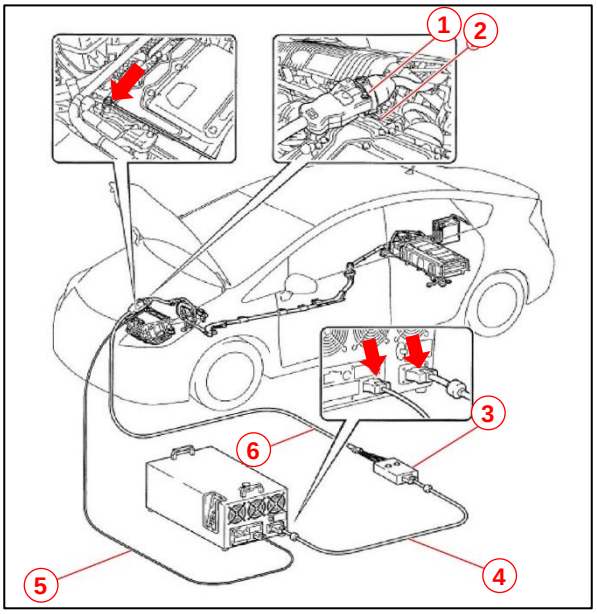


1	Interlock

BB. 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.

> NOTE
>
> An overall view of connectors and their connections for the GRX-5100 during a high voltage battery rescue charge is shown in Figure 11.

Figure 11.



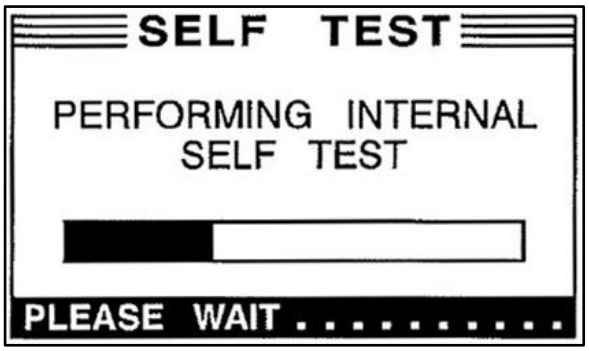
1	Grounding Bolt
2	Interlock Connector
3	Fuse Box
4	Cable V
5	Cable R
6	Cable E

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.

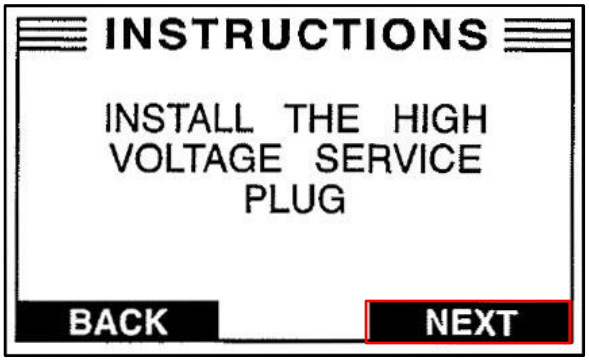


DD. Install the service plug grip.

EE. Press NEXT.

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

Figure 13.

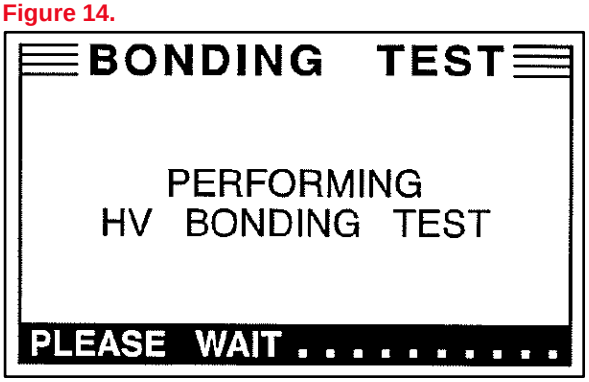


FF. Connect the negative (–) terminal of the auxiliary battery.

NOTE
Using the power supply mode, connect the Battery Diagnostic Tool to the auxiliary battery.

GG. Wait for the high voltage bonding test to complete.

Figure 14.



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

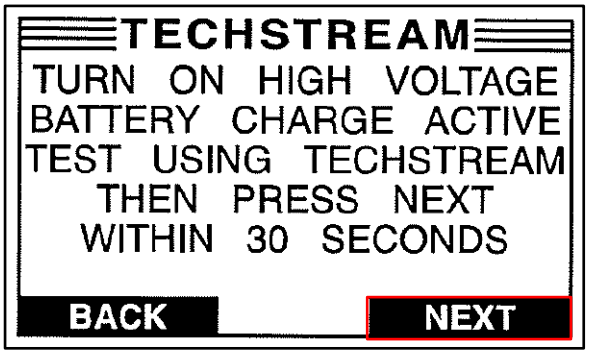
Rescue Charge Ni-MH (continued)

4. HV battery rescue charging.
   A. Turn the vehicle power switch to the IG-ON position.
   B. Connect Techstream to DLC3.
   C. Refer to 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 the *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.



> NOTE
>
> - AFTER the battery charge active test has been turned ON, press the NEXT button on the GRX-5100 within 30 seconds. If the NEXT button is NOT pressed 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 will NOT operate.
> - The GRX-5100 charging condition status will be displayed on the screen of the GRX-5100 while charging the HV battery.
> - 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 Techstream and cycle the vehicle's power switch to the IG-ON/OFF positions, and then perform the HV battery rescue charging procedure again.

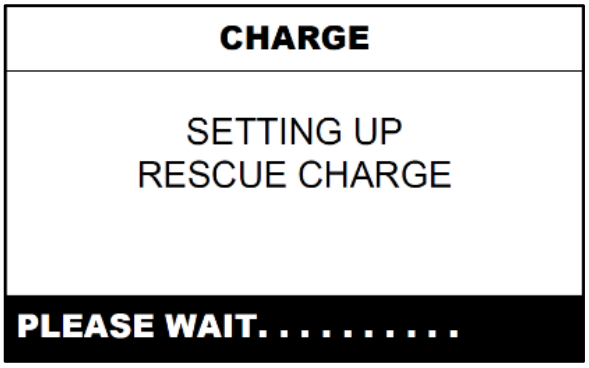
STEP	ACTIVE TEST BATTERY CHARGE	GRX-5100 START SWITCH	DATA LIST SYSTEM MAIN RELAY STATUS – SMRB	DATA LIST SYSTEM MAIN RELAY STATUS – SMRG
1	OFF	OFF	OFF	OFF
2	OFF → ON	OFF	OFF → ON	OFF → ON
3	ON	OFF → ON	ON	ON

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

Rescue Charge Ni-MH (continued)

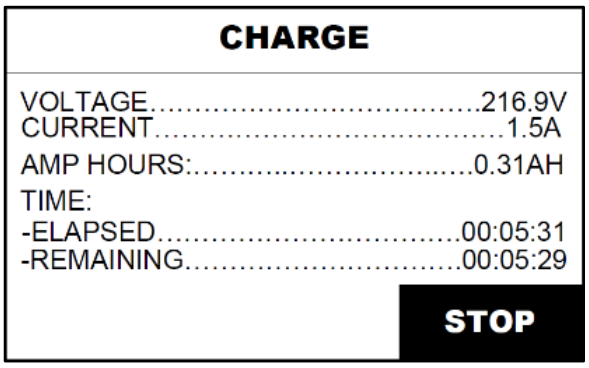
E. Wait for the HV battery rescue charge to start.

Figure 16.



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

Figure 17.



NOTE

- Charging time while using the GRX-5100 is 10 minutes per charge cycle when the battery temperature is above 77°F (25°C).
- 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 were 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 applicable model and model year Repair Manual at *TIS – Engine Hybrid System – Hybrid/Battery Control System – HV Battery Charging*.

   G. Install the service plug grip.

   H. Connect the 12V auxiliary battery.

   I. Check for ANY DTCs.

   J. Confirm whether the engine cranks.

   Does the engine crank?

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

   K. Confirm whether the engine starts.

   Does the engine start?

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

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