NEW

REGENERATIVE DC LOAD/SOURCE

For cycling of EV/HEV batteries and automating battery charger test

MODEL 4912, BI-DIRECTIONAL TEST CHANNEL

- ❑ **Source to 7 kW and sink to 12 kW per Channel**
- ❑ **Parallelable to 144 kW/2400 A at 120 V**
- ❑ **Tester-per-Channel design for unmatched configuration flexibility**
- ❑ **Fast, seamless transitions between source and sink**
- ❑ **Discharge power recycled back into utility grid**
- ❑ **Touch-Panel manual interface**
- ❑ **Advanced safety features to protect batteries/modules**
- ❑ **Automated battery charger testing applications**
- ❑ **LAN communication interface, compatible with LabVIEW and other popular languages**

Cabinet with up to 3 Channels

HIGHLY FLEXIBLE TESTER-PER-CHANNEL DESIGN

The advantage of multiple independent test channels is configuration flexibility. For instance, battery modules, each with a different test profile, power level and start/stop times, can be tested at the same time. Alternately, a higher-power battery pack can be tested by arranging the channels in parallel. For a battery test laboratory or a production facility that has a wide mix of batteries/modules to test, this configuration flexibility offers the benefit of meeting the widest range of test requirements with a minimum investment in tester hardware.

DISCHARGE POWER BACK INTO THE UTILITY GRID

In addition to being on the right side of the movement to reduce our carbon footprint, recycling discharge power back on to the utility grid makes good economic sense. First, recycling reduces electricity costs. Secondly, recycling eliminates the cost of equipment necessary to deal with removing waste heat, whether this is additional air-conditioning tonnage or elaborate water cooling systems.

NHR

MODEL 4912 BI-DIRECTIONAL TEST CHANNEL

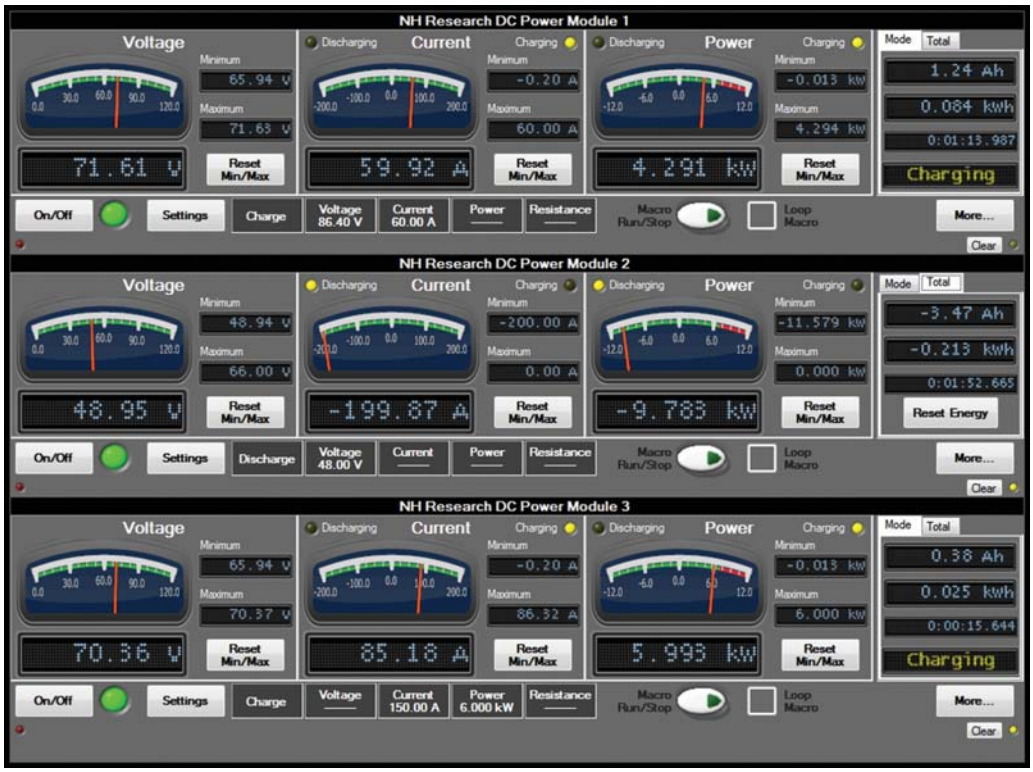


Fig. 2 – 3 Channel Monitor Panel

TOUCH-PANEL LOCAL CONTROL

Each cabinet, which contains up to 3 channels (36 kW), has a Touch-Panel that monitors & controls voltage, current and power. Through the main monitor panel (Figure 2), the user can access pop-up screens to make settings in any one of the 4 operating modes (Figure 3), set safety limits (Figure 5) or create a basic charge/discharge test profile (Figure 4). Called Macros, these test profiles are a sequence of time-precise settings with up to 1000 steps and can be edited and saved to file for future use.

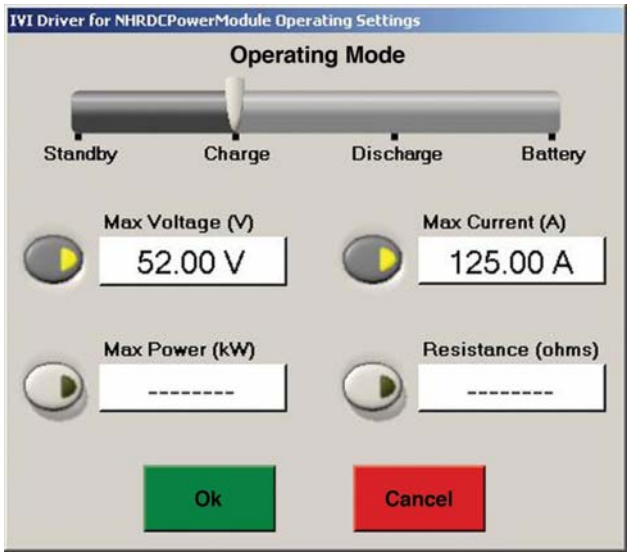


Fig. 3 – Setting Operating Conditions

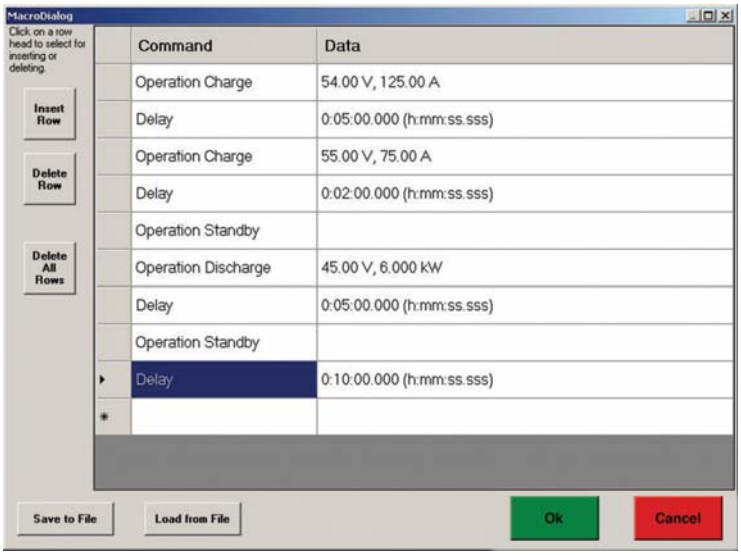


Fig. 4 – Macro Creation

SAFETY FEATURES

Given the typically high value of EV/HEV batteries, extra safety features are built into each channel to prevent damage from both external and internal faults. To start with, each channel may operate independently and safely without the availability of the network or user's computer hardware. All safety functions shall remain operational and controlled by the local Touch-Panel. Further, each channel shall go into an open state if for any reason the channel is unable to communicate with the user's computer, the Touch-Panel or the Grid. Each channel shall also go to an open state if any of the user-defined charge/discharge limits are exceeded. Once the channel is shut down, it will not be permitted to restart until the fault is cleared. Within each channel there is extensive monitoring to insure that it is functioning properly. And, when this isn't enough to catch a fault, the user can abort testing and disconnect the battery/module through an emergency power-off switch prominently mounted on the exterior of the cabinet.

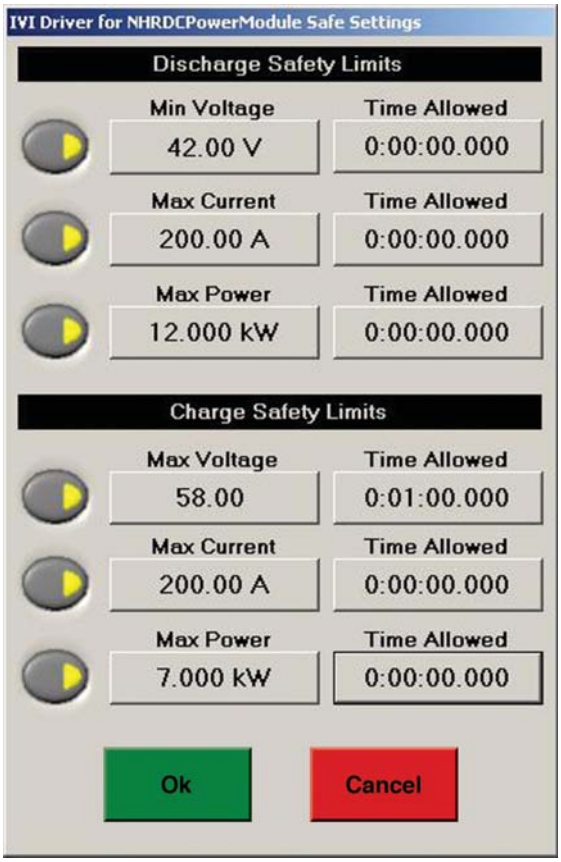


Fig. 5 – Set Safety Limits

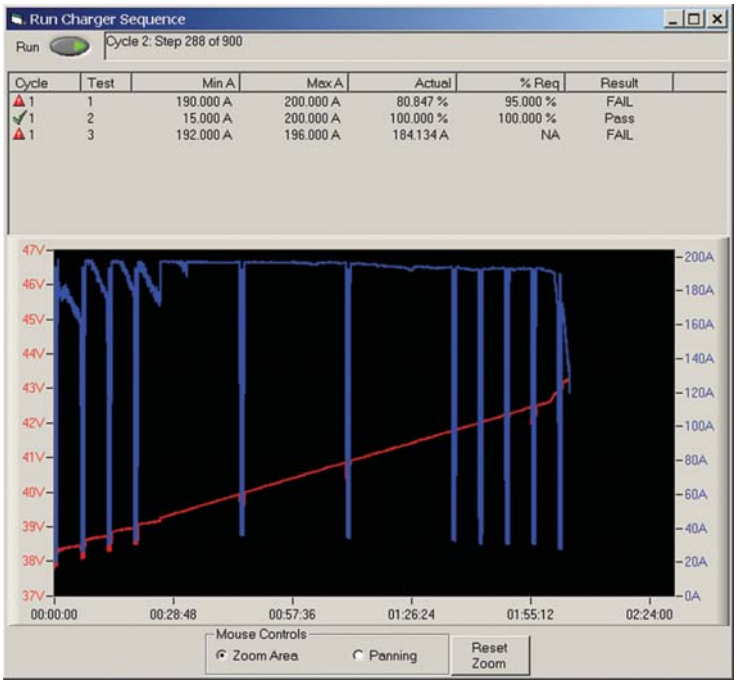


Fig. 6 – Battery Charger Test

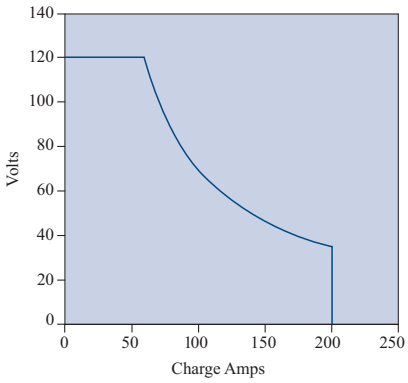
BATTERY CHARGER TEST

A battery is emulated for charger testing In the Battery Mode of the Load Channel. To support this usage, a fill-in-the–blanks Cycle Data Entry dialog defines how the emulated battery is to look to the charger-under-test at the beginning and end of each cycle. Implicit in the program is a charging algorithm that keeps the voltage within a linearly-rising-voltage envelope wherein the channel adjusts its voltage in order to modulate charger current until the end-of-cycle voltage is achieved. Within each test cycle are test steps that provide checking the charger's current characteristics.

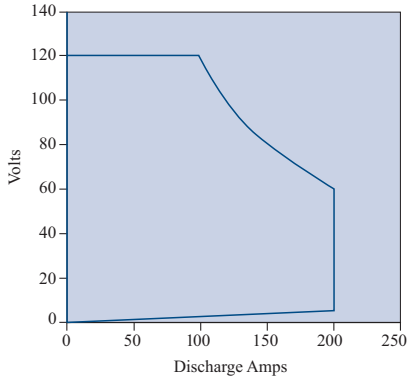
MODEL 4912 INDIVIDUAL CHANNEL SPECIFICATIONS

Programming Capability			
Operating States	Charge, Discharge, Standby, Battery		
Charge/Discharge Modes	CV, CC, CP, CR, Ramp		
Charging Envelope	0-120 V, 7 kW, 200 A		
Discharging Envelope	4-120 V, 12 kW, 200 A		
Parallelability	Up to 12 channels may be run independently and/or combined for a total of 144 kW		
Macro Test Profiles			
Development Source	Touch-Panel, import from Excel or user's system controller		
Maximum Steps	1000		
Minimum Time Delay	5 mS		
Charge-to-Discharge Time	10 mS		
Mode Switch Time	1 mS		
Slew Rate	0 - 1200 V/S, 0 - 20,000 A/S		
Programming	Range	Accuracy[1]	Resolution[1]
Voltage	0-120 V	0.1% + 0.1%	0.005%
Current	±200 A	0.2% + 0.2%	0.005%
Power	±12 kW	0.4% + 0.4%	0.005%
Resistance	0 -1 kW	<1mW: 6%, <1W: 2%	
Test Measurement (4-Wire)	**Range**	**Accuracy[1]**	**Resolution[1]**
Voltage, DC Average	0 -120V	0.05% + 0.05%	0.005%
Current, DC Average, Amp-Hr	0 - 200A	0.1% + 0.1%	0.005%
Power, Watt-Hr	± 12 kW	0.4% + 0.4%	0.005%
Resistance	0 -10 kW	<1mW: 4%, <1W: 1.5%	
Time	1 mS - 1 yr	0.1%	0.002% of Set
Control			
Local User Interface	Touch-Panel with graphic meters & controls plus Macro development/execution screens		
Ext. System Communication	LAN (Ethernet)		
Drivers (Win XP or Win 7 OS)	LabVIEW, IVI-COM, IVI-C		
Analog Current Monitor	0 to +10V charge/0 to -10V discharge		
Analog Voltage Monitor	0 to +10 V full scale voltage		
Safety			
Test Channel Independence	Each Channel can operate entirely independent of all others		
Isolation	Line, Test Channel, Battery and Chassis		
Channel Internal Protection	Over/Under-Voltage, Over-Current, Over-Power, Over-Temperature		
Physical	Emergency Stop Button on cabinet with remote connector		
Programmable Safety Limits	UV, OV, OC charge, OC discharge, OP charge, OP discharge		
Watchdog Timer	Continuously monitors control communications, the loss of which triggers channel output relay to disconnect the battery-under-test		
Restart after loss of power or communications	Automatic or user intervention with saved data		
Physical			
Test Channel Connectors	Cam-Lok Single Pole		
Cabinet[2] Dimensions	72" H x 28" W x 30" D		
Cabinet Weight (3 Channels)	1100 lbs		
Operating Temperature	0 - 35°C full power		
Input Power per Module	3 Ø, 50 - 60 Hz, 200VAC/39A, 208VAC/38A, 220VAC/36A, 380VAC/21A or 480VAC/17A		
Calibration	Semi-Automatic , closed cover with standard lab equipment capable of measuring voltage and current to ¼ of device specifications		

[1] All Accuracies are % of Set + % of Range, All Resolutions are % of Range unless otherwize indicated
[2] Standard Cabinet contains 1,2 or 3 Channels



Charge Operating Envelope



Discharge Operating Envelope

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