

4700 Series High-Current DC Electronic Loads

*Relatively Low-Voltage Electronic Load (120V) with
High Current Capability*

NHR
NH Research

Features

- Eight (8) 120V Models between 1kW/200A & 36kW/7200A
- Automated test station or stand-alone bench-top use
- 7" Touch-Panel with Graphic User Interface (GUI)
- Micro-second transient load profile simulation
- Precision Voltage, Current, Power, & Timing Measurements
- Full current at 1V & operation down to 0.15V
- Air-cooled, linear design



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Applications

The 4700 Series Electronic Loads are designed for a wide variety of electronic loading from either within an automatic test station or as a stand-alone, bench-top set-up. The Loads are particularly well suited for testing applications that require a full current at low voltages, fast-transient simulation capability and comprehensive internal measurements. The 4700 can be operated manually through the large, touch-panel-enabled GUI or automatically through a remote controller and any number of standard test programming languages. Typical applications include the testing of power conversion/storage products such as DC power supplies, telecom rectifiers and batteries.

Complex & Fast-Transient Load Profiles

4700 Loads are capable of creating a wide variety of complex dynamic load profiles including micro-second pulses, multiple pulses of varying width, stepped responses, variable slew rates and even an AC component on the DC waveform (Fig. 1). The key to this capability is called a Macro, each of which contains up to 100-steps and is executed directly by the Load to achieve the fastest possible transition speed. Once created, Macros can be stored in the system controller for downloading to the Load when execution is required.

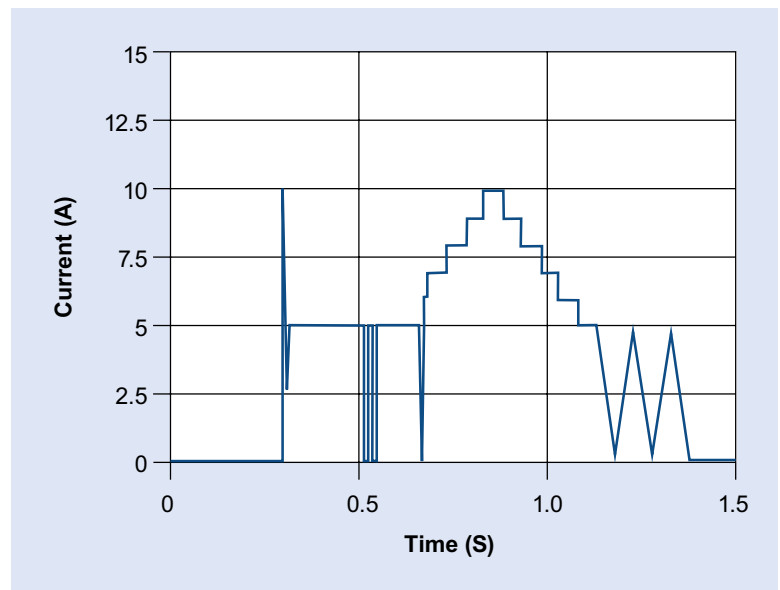


Figure 1 - Various Fast Transient Load Profiles

An Next Generation User Interface

The touch-panel-based GUI on the 4700 Series Loads is the ideal solution to the more extensive information and control needed in today's power-stimulus/measurement test instruments. The Load interface is organized through 6 tabs, each providing a full screen for a function with complete display and control of related information. For instance, the Monitor Tab (Fig. 2) displays continuous actual measurements of voltage, current, power and resistance even when the 4700 is being controlled remotely. The Control Tab (Fig. 3) allows manual settings of CC, CV, CR and CP operating modes and limits. A Scope Tab (Fig. 4) provides a graphical view of the voltage/current relationships along with markers where measurements are needed. This interface is particularly useful for engineering characterization and Unit-Under-Test (UUT) troubleshooting as well as test program development.

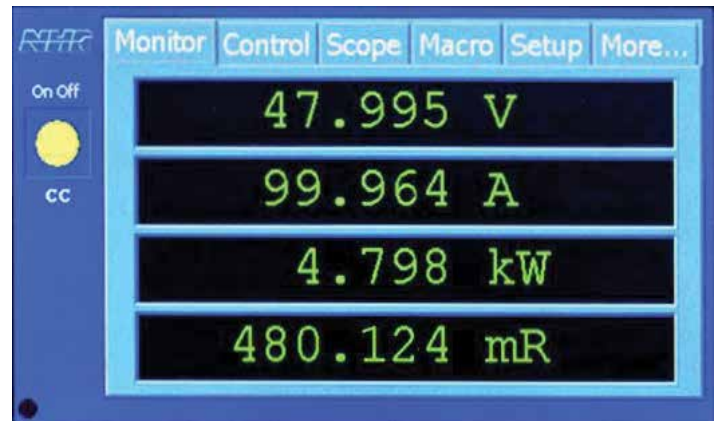


Figure 2 - Monitor Tab



Figure 3 - Control Tab

Precision Internal Measurements

The 4700 Loads frequently eliminate the need for separate external instruments such as a DMM, Power Meter or DSO to make precision measurements and display waveforms. Especially valuable are dynamic timing measurements such as Rise-Time, Turn-On-Time, Settle-Time and Overshoot. Built-in measurements provide faster testing throughput in addition to the initial cost savings gained by eliminating external measurement instruments.



Figure 4 - Scope Tab

Advanced Safety Features

In addition to the basic UUT OV, OT, OC & OP protections, 4700 Loads provide programmable safety limits to prevent damage that could occur due to operator error, programming errors, external and internal faults. When a safety limit is triggered, the load automatically disables the output, generates an error message and prevents further operation until the fault is cleared. Safety limits may be set using any of the control options.

Field Expandable

4700 Series Loads are modular and allow for expansion with other like-modules in the field. Future addition of auxiliary modules creates a virtual larger load with all the same functionality, only more current and power. Through this capability, the test engineer can select a load that meets current requirements without concerns that future higher loading demands will require an entirely new, higher power load.

Wide Constant-Power Operating Envelopes

The 4700 Series Loads have a broad constant-power operating envelope (Fig. 5) to provide rated power anywhere between 5V and 120V volts. Below 5V the load maintains full current capability down to 1V and then linearly reduced current down to 0.15V.

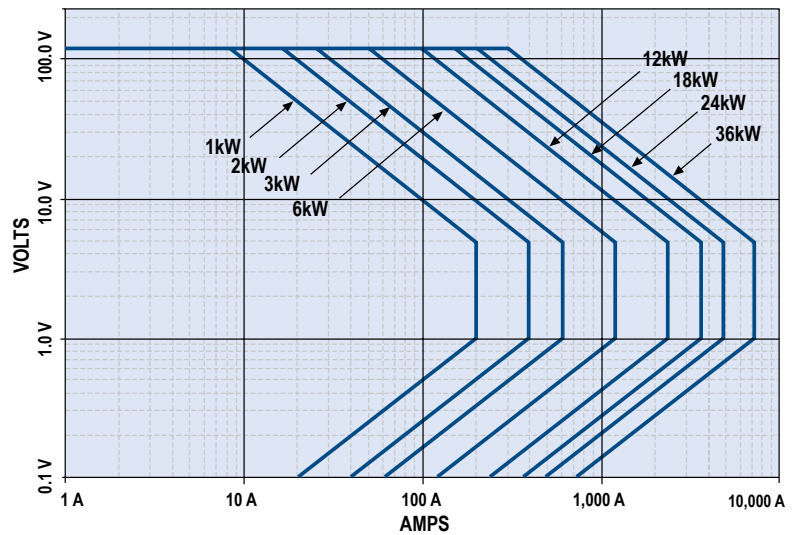


Figure 5 - Constant Power Operating Envelopes

4700 Series Panel Overview



- 1 Power Switch
- 2 Hardware error indicator
- 3 USB connector
- 4 7" Touch panel display
- 5 Status indicators
- 6 COMM In/Out connector

- 7 RS232 connector
- 8 Trig In/Out connectors
- 9 DIN/DOUT connector
- 10 Address switch
- 11 Sync In/Out connectors
- 12 OVPS connector

- 13 Remote sense connector
- 14 I Range switch
- 15 Enable indicator
- 16 I Control connector
- 17 I Monitor connector
- 18 Load connections

- 19 Network connectors
- 20 Parallel switch
- 21 Voltage select switch
- 22 Chassis GND stud
- 23 AC input connector
- 24 Parallel connectors

4700 Series High-Current DC Electronic Load Specifications¹

4700 Ratings	4700-1	4700-2	4700-3	4700-6	4700-12	4700-18	4700-24	4700-36	
Power	1kW	2kW	3kW	6kW	12kW	18kW	24kW	36kW	
Maximum Current ²	200A	400A	600A	1200A	2400A	3600A	4800A	7200A	
Voltage Range ³	1-120V	1-120V	1-120V	1-120V	1-120V	1-120V	1-120V	1-120V	
Programmable Modes	Accuracies: % of Set + % of Range, Resolution: % of Range								
Constant Current									
Ranges ⁴	20, 200A	40, 400A	60, 600A	120, 1200A	240, 2400A	360, 3600A	480, 4800A	720, 7200A	
Accuracy	0.12%+0.08%	0.12%+0.08%	0.12%+0.08%	0.12%+0.08%	0.12%+0.08%	0.12%+0.08%	0.12%+0.08%	0.12%+0.08%	
Resolution	0.025%	0.025%	0.025%	0.025%	0.025%	0.025%	0.025%	0.025%	
Constant Voltage									
Ranges	6.6, 20, 66, 120V	6.6, 20, 66, 120V	6.6, 20, 66, 120V	6.6, 20, 66, 120V	6.6, 20, 66, 120V	6.6, 20, 66, 120V	6.6, 20, 66, 120V	6.6, 20, 66, 120V	
Accuracy	0.05%+0.05%	0.05%+0.05%	0.05%+0.05%	0.05%+0.05%	0.05%+0.05%	0.05%+0.05%	0.05%+0.05%	0.05%+0.05%	
Resolution	0.025%	0.025%	0.025%	0.025%	0.025%	0.025%	0.025%	0.025%	
Constant Power									
Range	0 - 1kW	0 - 2kW	0 - 3kW	0 - 6kW	0 - 12kW	0 - 18kW	0 - 24kW	0 - 36kW	
Accuracy	1% + 1%	1% + 1%	1% + 1%	1% + 1%	1% + 1%	1% + 1%	1% + 1%	1% + 1%	
Resolution	0.025%	0.025%	0.025%	0.025%	0.025%	0.025%	0.025%	0.025%	
Constant Resistance									
Range	5mΩ - 180Ω	2.5mΩ - 90Ω	1.67mΩ - 60Ω	833μΩ - 30Ω	417μΩ - 15Ω	278μΩ - 10Ω	208μΩ - 7.5Ω	136μΩ - 5Ω	
Accuracy ⁵	2%	2%	2%	2%	2%	2%	2%	2%	
Slew Rate (10 - 90%)									
Range	1A/s - 20A/μs	2A/s - 40A/μs	3A/s - 60A/μs	6A/s - 120A/μs	12A/s - 240A/μs	18A/s - 360A/μs	24A/s - 480A/μs	36A/s - 720A/μs	
Rise Time	10 μs - 20s	10 μs - 20s	10 μs - 20s	10 μs - 20s	10 μs - 20s	10 μs - 20s	10 μs - 20s	10 μs - 20s	
Resolution	< 5μs	< 5μs	< 5μs	< 5μs	< 5μs	< 5μs	< 5μs	< 5μs	
Accuracy	1% +/- 5μs	1% +/- 5μs	1% +/- 5μs	1% +/- 5μs	1% +/- 5μs	1% +/- 5μs	1% +/- 5μs	1% +/- 5μs	
Short Circuit									
Resistance	50mΩ, 5mΩ	25mΩ, 2.5mΩ	17mΩ, 1.7mΩ	8.3mΩ, 833μΩ	4.17mΩ, 417μΩ	2.78mΩ, 278μΩ	2.08mΩ, 208μΩ	1.39mΩ, 139μΩ	
Current Max	33, 333A	67, 667A	60, 608A	120, 1200A	240, 2400A	360, 3600A	480, 4800A	720, 7200A	
Macro									
Modes	Any single Mode								
Repetition	Single Burst or Continuous								
Settings	100								
Period	40μs - 20s								
Delay	20μs - 20s								
Resolution	10μs								
Accuracy	1% +/- 5μs								
Measurements	Accuracies: % of Measurement + % of Range, Resolution: % of Range								
Current									
Ranges	20, 200A	40, 400A	60, 600A	120, 1200A	240, 2400A	360, 3600A	480, 4800A	720, 7200A	
Accuracy	0.12%+0.06%	0.12%+0.06%	0.12%+0.06%	0.12%+0.06%	0.12%+0.06%	0.12%+0.06%	0.12%+0.06%	0.12%+0.06%	
Resolution	0.0015%	0.0015%	0.0015%	0.0015%	0.0015%	0.0015%	0.0015%	0.0015%	
DC Voltage									
Ranges	6.6, 66, 166V	6.6, 66, 166V	6.6, 66, 166V	6.6, 66, 166V	6.6, 66, 166V	6.6, 66, 166V	6.6, 66, 166V	6.6, 66, 166V	
Accuracy	0.01%+0.02%	0.01%+0.02%	0.01%+0.02%	0.01%+0.02%	0.01%+0.02%	0.01%+0.02%	0.01%+0.02%	0.01%+0.02%	
Resolution	0.0015%	0.0015%	0.0015%	0.0015%	0.0015%	0.0015%	0.0015%	0.0015%	
Power									
Ranges	Current Range x Voltage Range								
Accuracy	Current Accuracy + Voltage Accuracy								
Resolution	0.0015% Range								
Waveform Capture									
Bandwidth	25kHz								
Accuracy	1% R								
Channels	Voltage, Current or both MUX'd								
Digitizing Rate ⁶	100 - 100K Samples/s								
Memory	256K Samples								
Timebase	10μs - 8s								
Triggering	System or External								
Waveform Analysis	Voltage, Current, Power, Overshoot, Undershoot, Rise/Fall Time, Turn-On Time, Settling Time, Hold-Up Time, AC RMS, AC+DC RMS								
Control									
User Interface	Manual control through touch panel or supplied PC-GUI								
Optional Software Tools	DC Load Sequencer, emPower™ Test Executive, Enerchron™ Test Management Software								
External Communication	LAN								
Supplied Drivers	IVI-C/IVI-COM, LabVIEW VIs, SCPI Command Reference Manual								
Physical									
Load Connectors	Bus bars with lugs								
Operating Temperature	0 - 40° C at full power and <75% duty cycle								
Input Power	115/230 ± 10% VAC, 47 - 63 Hz								
Dimensions	inches	5 1/4 x 19 x 22	5 1/4 x 19 x 22	10 1/2 x 19 x 22	10 1/2 x 19 x 22	35 x 23 x 30	43 x 23 x 30	57 x 23 x 30	78 x 23 x 30
(HxWxD)	millimeters	133 x 483 x 559	133 x 483 x 559	267 x 483 x 559	267 x 483 x 559	889 x 584 x 762	1092 x 584 x 762	1448 x 584 x 762	1980 x 584 x 762
Weight		40lbs/18kg	50lbs/23kg	75lbs/34kg	100lbs/45kg	250lbs/113kg	400lbs/181kg	570lbs/259kg	815lbs/370kg
Additional Features									
Remote Sense	2 VDC maximum drop between sense & load input terminals								
Self Test	Power-up self test of all major functions including status of input, output, control, & protection circuits								
Performance Monitoring	Continuous checking of performance parameters including internal over-voltage, over-current, over-voltage, & over-temperature								
Calibration	Closed, cover, all adjustments made in software & stored in EEPROM								
Trigger Output/Input	Synchronizes external devices to programmed load step. Synchronized programmed load step to an external device.								
Analog Control/Monitor	0 - 10V external signal appropriate to 100% current for the selected range								
Fan Noise Reduction	Automatic fan speed control								

¹ Specifications apply at 23° +/- 5° C after a 10 minute warm up.

² Accuracies apply when Settings &/or Measurements >10% of Range.

³ Current linearly reduced between 1 & 0.15V.

⁴ Models 2 - 36kW also have a 20A /1KW Range.

⁵ Reference users manual for additional details.

⁶ Single channel capture. Simultaneous Voltage & Current captures would halve sample rate & memory available.