Model 5700
DC Power Supply Test System

Engineering Characterization & Design Verification Functional Test

NH Research, Inc.

Features

- PowerScope 200MS/sec waveform digitizer for capturing fast transients
- Unlimited voltage, current & timing measurements relative to digital signals.
- Library of design verification test routines reduces program development time
- Configuration flexibility includes 3rd- party instruments

Applications

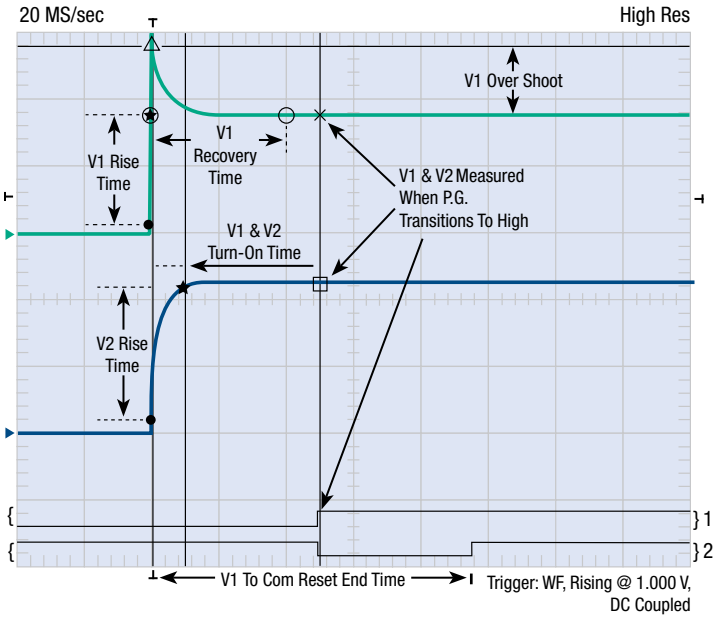
The Model 5700 is designed to yield comprehensive test data on a wide range of AC-DC and DC-DC power supplies with a minimum of programming effort. Such characterization testing is typically done in an engineering design-verification laboratory where the user's own designs or vendor prototypes are evaluated. This type of extensive testing is also often required for high-reliability power supplies used in medical, telecommunication, space and avionic applications.

PowerScope High-Speed Digitizer

The Model 5700 Digital Measurement System (DMS), consists of a 2×16, 100MHz multiplexer combined with 2 moderate-speed waveform digitizers. The DMS provides highly accurate channel-channel timing measurements and corresponding waveform displays. Should more than 16-input measurement channels be required, multiple 15-input expansion chassis can be added to the system.

A high-speed waveform digitizer supplements the above Digital Measurement System on the Model 5700. It provides three 8-bit analog signal digitizing channels with 200MS/Sec sample rate and 16 channels of digital signal input. This combination of multi-channel measurement circuits allows high-speed digital and analog information to be synchronously captured, displayed and measured. With up to 32MS/channel memory, the PowerScope can capture fast, non-repetitive transients even with relatively long separation from their triggering event.

Model 5700 *in a 3-bay cabinet*



Unlimited cursors and markers identify the exact point where the measurement is to be taken.

Design Verification Test Routines

To complement the powerful digital measurement system, a special suite of test routines are provided to determine power supply performance characteristics far beyond that available on a basic production tester. For instance, more than 20 different measurements can be extracted from each waveform capture and channel-to-channel measurements are all straight forward to execute. One example of this capability is sweep tests where one parameter, such as efficiency, is plotted across the full range of another parameter like output voltage or power. This test can now be programmed and executed in minutes rather than the hours and days required by previous generation test systems.

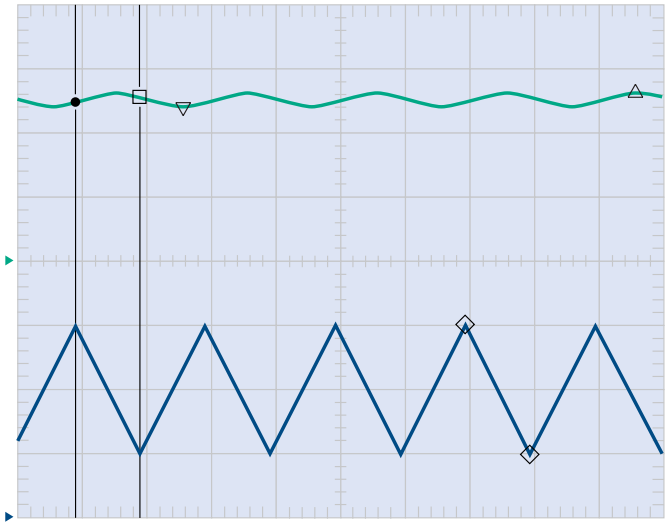
MODEL 5700 EMPOWER TEST CAPABILITY			
General Tests	Output Accuracy Output Adjustment Output Trim RMS Noise/Ripple Operator Data Entry, Test, Visual Acceptance & Instructions Power Fail Signal Power Good Signal P/ S ON Signal Operator Waveform Inspection Multi-Measure Monotonicity Shock/ Shake Test	***Timing Tests***	Rise-Time Fall Time Turn-On Time Turn-On Sequence (load-to-load timing) Turn-Off Time Turn-Off Sequence (load-to-load timing) Hold-Up Time Transient Recovery Time Overshoot Width Undershoot Width Pulsewidth as Time Pulsewidth as Frequency Multiple-Timing (Unlimited-Cursors)
Regulation Tests	Load Regulation Cross-Load Regulation Voltage Regulation Current Regulation Power Regulation	***Control***	Single Digital Control BYTE/WORD Digital Control OVP (OverVoltage) Driver OTP (OverTemperature) Driver Start/ Stop/ Pass/ Fail/ Busy/ Ready Controls 8 Measurement Channels Control for Vout & ID Outputs
Protection Tests	Over-Current Ramp Protection High Accuracy Over-Current Slew Protection Over-Voltage Protection (no scope required) Under-Voltage Protection High Accuracy Over-Power Slew Protection Over-Power Protection Short-Circuit Protection (up to 100A) Over-Temperature (via relay control)	***Output Measurement***	Voltage Current Power Digital State DC Positive Peak DC Negative Peak Voltage & Current Waveform Capture and Analysis Frequency Mean RMS AC Coupled RMS DC Coupled Peak Max Peak Min Peak-Peak Peak Absolute Time at Event Timing as Frequency Measurement at Event
Dynamic Tests	Single Load Transient Synchronized Multi-Output Load Transient Worst-Case Dynamic Transient (Frequency & Duty Cycle) Overshoot Undershoot Settle/ Recovery Voltage Settle/ Recovery Time	***Real Time (Manual Control)***	Interactive Real-Time Hardware Control Step-by-step Interactive Test Program Break Point for Fixture & UUT Debug

TEST REPORT EXAMPLES

Triangular Current Waveform Measurements

Vout Max	4.700 V	5.155 V	5.300 V	Pass
Vout Min	4.700 V	4.747 V	5.300 V	Pass
Iout Max	2.950 A	3.030 A	3.050 A	Pass
Iout Min	950.000 mA	1.016 A	1.050 A	Pass
Vout @ 1st Iout Max	4.700 V	4.851 V	5.300 V	Pass
Vout @ 1st Iout Min	4.700 V	5.062 V	5.300 V	Pass
Iout Frequency	495.000 Hz	497.512 Hz	505.000 Hz	Pass

50 KS/sec



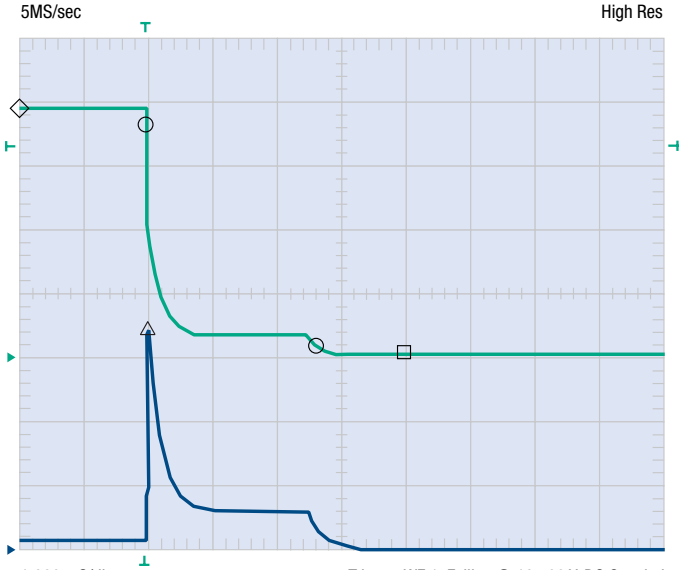
1.000 mS/div — Trigger: System Trigger

Wf1, (Current): 1 A/div, 0.0A @ -4 Div. Wf2, (Voltage): 2 V/div, 0.0V @ 0 Div.
Vout Max: Max = △ WF2: Voltage @ 9.560 mS, 5.155 V
Vout Min: Min = ▽ WF2: Voltage @ 2.560 mS, 4.747 V
Iout Max: Max = ◇ WF1: Current @ 6.940 mS 3.030 A
Iout Min: Min = ◇ WF1: Current @ 7.940 mS 1.016 A
Vout @ 1st Iout Max: Min = • WF1: Current @ 900.000 uS, 4.851 V
Vout @ 1st Iout Min: Max = □ WF1: Current @1.900 mS, 5.062 V

Short-Circuit Test

UUT Short-Circuit Response Time	0.000 S	2.592 mS	4.000 mS	Pass
Max Short-Circuit Current	3.340 A	69.034 A	75.000 A	Pass
Vout Before Short-Circuit	18.525 V	19.348 V	20.475 V	Pass
Vout 4mS After Short Circuit	0.000 V	100.637 mV	1.000 V	Pass

5MS/sec — High Res



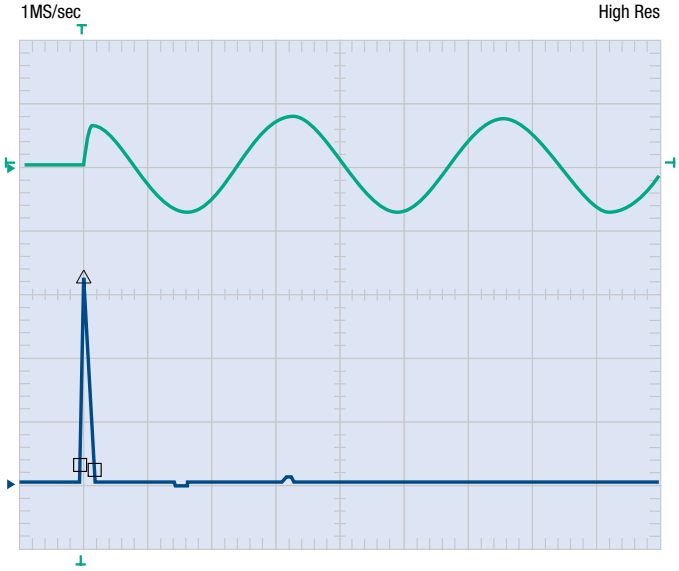
1.000 mS/div — Trigger: WF 1, Falling @ 16.500 V. DC Coupled

Wf1, Chn 001, 5V/div. Wf2, Chn 002, 20 A/div.
UUT Short-Circuit Response Time: Start = ○ WF1: Chn 001 @ 1.996 mS. 18.412 V: Stop = ○ WF1: Chn 001 @ 4.589 mS. 0.971 V
Max Short-Circuit Current: Max = △ WF2: Chn 002 @ 2.020 mS, 69.034 A
Vout Before Short-Circuit: Mean = ◇ WF1: Chn 001 @ 0.000 S, 19.348 V
Vout 4mS After Short-Circuit: Event = □ WF1: Chn 001 @ 6.000 mS, 100.637 mV

Inrush Waveform Measurement

Inrush Current	40.000 A	65.071 A	76.000 A	Pass
Inrush Current Width	500.000 uS	741.000 uS	2.000 mS	Pass
Vin	262.000 V	263.682 V	266.000 V	Pass
Vin Frequency	59.000 Hz	60.588 Hz	61.000 Hz	Pass

1MS/sec — High Res



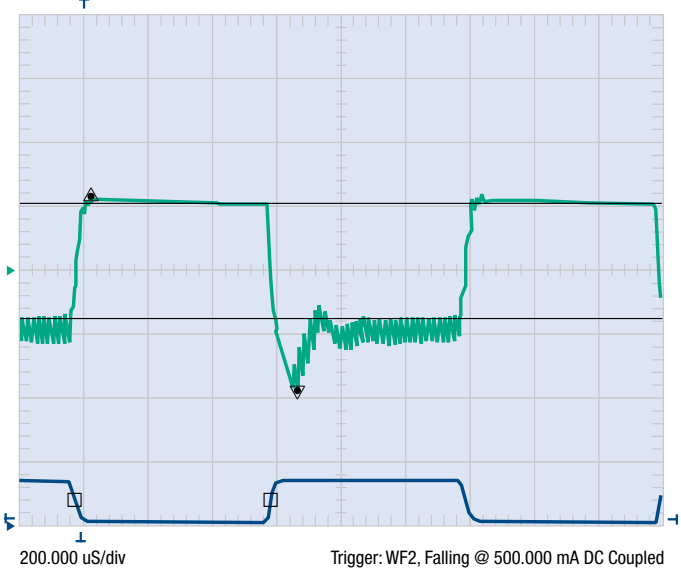
5.000 mS/div — Trigger: WF 3. Rising @ 30.012 V. DC Coupled

Wf1, Chn 003, 20A/div. Wf3, Fixed, 500 V/div.
Inrush Current: Max = △ WF1: Chn 005 @ 5.201 mS. 65.071 A
Inrush Current Width: Start = □ WF1: Chn 003 @ 4.925 mS. 6.762 A: Stop = □ WF1: Chn 003 @ 5.666 mS. 5.505 A

Dynamic Test

Vout Max	0.000 V	239.784 mV	500.000 mV	Pass
Vout High	0.000 V	209.241 mV	500.000 mV	Pass
Vout Min	0.000 V	-371.088 mV	-500.000 mV	Pass
Vout Low	0.000 V	-151.174 mV	-500.000 mV	Pass
Vout Overshoot	0.000 V	31.410 mV	500.000 mV	Pass
Vout Undershoot	0.000 V	145.136 mV	500.000 mV	Pass
Iout Pulse Width	585.000 uS	603.800 uS	615.000 uS	Pass
Iout Frequency	1.650 KHz	1.656 KHz	1.690 KHz	Pass

5 MS/sec — High Res



200.000 uS/div — Trigger: WF2, Falling @ 500.000 mA DC Coupled

Wf1, Chn 001, 200 mV/div, AC. Wf2, Chn 002, 5 A/div.
Vout Max: Max = △ WF1: Chn 001 @ 222.400 uS, 239.784 mV
Vout High: High = WF1: Chn 001 @ 0.000 S, 209.241 mV
Vout Min: Min = ▽ WF1: Chn 001 @ 866.800 uS, -371.088 mV
Vout Low: Low = WF1: Chn 001 @ 0.000 S, -151.174 mV
Vout Overshoot: Max = • WF1: Chn 001 @ 222.400 uS, 239.784 mV
Vout Undershoot Min = • WF1: Chn 001 @ 866.800 uS, -371.088 mV
Iout Pulse Width: Start = □ WF2: Chn 002 @ 184.000 uS, 1.840 A; Stop = □ WF2: Chn 002 @ 787.800 uS, 1.848 A

Model 5700 Power Supply Test System Specifications

SYSTEM CONTROL	
Rack Server CPU	Intel Dual Core 2.9 GHz
Memory	2 GB
Hard Drive	500GB
Monitor	17" Flat Panel
Accessories	Mouse & Keyboard

SOFTWARE	
Operating System	Win 7 Pro
Test Executive	emPower - An integrated environment for creating, debugging, running and collecting data for power supply functional test. Includes a test routine library, report generator and interactive instrument panels. Fully network compatible
Custom Test Program Languages	To extend the user-modifiable test routine library written in Visual Basic, test programs can also be written in any language supporting MS Active X control interface, including LabVIEW and LabWindows CVI

PHYSICAL	
Connectors	Terminal blocks or Hypertronics
Cabinet Dimensions HWD[1]	72 x 28 x 35in 1829 x 712 x 889mm
Cabinet Weight	~750 lbs/cabinet
Operating Temp.	0 -35° C full power
Input Power	All US and Intl. standards available

MEASUREMENTS

Basic Digital Measurement Capability	**Range**	**Resolution**	**Accuracy**
Channels	2		
Resolution	16 Bit		
Sample Rate	100KS/Sec		
DC Volts	± 2, 20, 200, 500	0.003% FS	0.01% + 0.01% FS
AC Volts RMS	14, 140 350VRMS	0.004% FS	± 1% R + 0.065% FS
DC Volts Peak	± 20, 200, 500V	0.012% FS	1% R + 0.02% FS
RMS Noise	70mV, 350 mV, 3.5V	0.012% FS	1% R + 0.5 % FS
10 Hz - 100 MHz			
Pk-to-Pk Noise	100mV, 500mV, 5V	0.02% FS	1.0% R + 2.0% FS
5 KHz - 100 MHz			
Frequency	10Hz, 5MHz	1/100ns	0.016% R
Timing	0 to 7 minutes	100ns	0.02% R + 200nsec
Waveform Capture	DC to 100 MHz	0.003%	1% FS
Phase Angle	0 to 360°	1°	± 1% @ 50/60Hz
THD (2 -64th)	0 to 100%	0.01%	1% R

Powerscope High-Frequency Measurement Module	
Channels	3 Analog + 16 Digital
Resolution	8-Bit
Sample Rate	200MS/Sec Maximum
DC Accuracy	1.5% Rdg + 1% Rge
AC Accuracy - DC Coupled or AC Coupled High Impedance	1.5% Rdg + 1% Rge @ 50KHz
AC Accuracy - 50 Ohm AC Coupled	1.5% Rdg + 1% Rge @ 2MHz
Hardware Ranges+/- V Pk	0.05, 0.125, 0.25, 0.5, 1.25, 2.5, 5, 12.5, 25, 50V
Memory Capacity	8 MB per channel

I/O Module (Expandable to 8)	
Multiplexer	
Input Channels	16, differential
Output Channels	2, differential
Bandwidth (-3db)	
Output 1	100MHz
Output 2	10MHz
Max Voltage	± 500V
Max Current	100mA
General Purpose Relays	
Quantity	8 DPDT
Contact Rating	5A, 30VDC or 120/240VAC
Relay Drivers	
Quantity	16
Rating	48V @ 500mA
Digital Drivers	
Quantity	16
Rating	100mA, 70VDC, 0.5W
Digital Receivers	
Quantity	8
Input Voltage	± 10V
Accuracy	1%

Configuration Flexibility

A wide variety of source and load instruments are available to configure the 5700 system in a single or multiple cabinet form depending on instruments selected.

TYPE	AC/DC SOURCES			MODULAR DC SOURCES	MODULAR DC LOADS			FULL CHASSIS OR CABINET LOADS	
Model Number	***5427***	***5100***	***9410***	***6100*** *(4 Voltage Models)*	***4100***	***4200***	***4350*** *(3 Power Models)*	***4700***	***4760***
AC Mode									
Phase	1ø	1ø	1, 2, & 3ø						
Power	2.7kVA	4.5kVA	20, 40, 60, 80kVA						
Voltage	150V 300VRMS	140/280VRMS	320VRMS						
Current	9 & 18ARMS	25/12.5A RMS	30, 60, 80, 120A/ø						
Peak Current	90A	200/100A	90, 180, 270, 360A/ø						
Frequency	40 - 500Hz	40 - 500Hz	45 - 880Hz						
DC Mode									
Power (continued)	2kW	3kW	12, 25, 36, 48kW	450W	300W	300W	150, 300 & 600W	1, 2, 3, 6, 12, 18, 24, 36kW	1, 2, 3, 6, 12, 18, 24, 36kW
Voltage	±212,424VDC	±100, 200, 400VDC	155, 350VRMS	20, 40, 80, 450VDC	450V	120V	500V	120V	600V
Current	±18, 9ADC	50, 25,12.5ADC	50, 25, 12.5ADC	60, 30, 15, 8ADC	60A	60A	30, 60, 120A	200 - 7200A	50 - 1800A
Peak Current	90, 45A	200,200,160A	84,169,252,336ADC						
Chassis Capability				to 6 sources	to 6 loads	to 6 loads	to 16 of the 150 W loads		

* Request model data sheets for complete specifications. Consult factory for additional instrumentation availability

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