

NEW

Model 5710 DC Power Supply Test System



Engineering Characterization & Design Verification Functional Test

Features

- Tektronix MDO-Series Mixed Signal Oscilloscope
- Unlimited voltage, current & timing measurements relative to digital signals.
- Library of design verification test routines reduces program development time
- Configuration flexibility

Applications

The Model 5710 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.

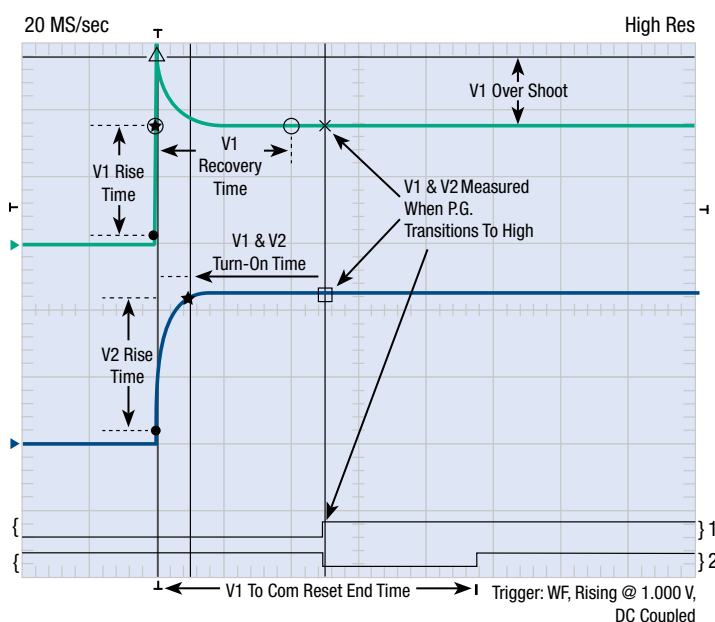
PowerScope High-Speed Digitizer

The Model 5710 embeds a mixed-signal Tektronix MDO-Series oscilloscope as the system digitizer with three channels each of which can sample up to a 2.5 GSPS rate. The digitizing function is further extended by paring two of the channels with a 16-channel multiplexer thus allowing automated selection and measurement of different measurement points. When more than 17 inputs are required, multiple 15-input extension chassis may be added to the system further increasing the multiplexing capability.

With a full 100 MHz of bandwidth, the primary multiplexing channel as well as the third fixed input channel precisely captures and digitizes fast moving signals. The second multiplexing channel supports 10 MHz bandwidth making it ideal for measuring DC and other slower moving signals. In mixed signal applications, a 16-input digital input captures digital signals along with analog measurements. All of the above measurements are synchronously captured, which provides complex analog-analog or analog-digital timing analysis. Finally, a 10 Mega-sample memory depth easily captures non-repetitive transients as well as digital states even when they occur with a relatively long separation from the trigger event.



Model 5710 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.

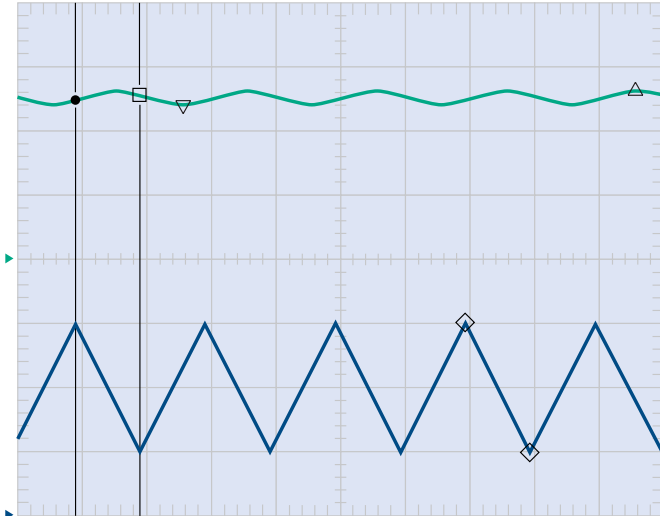
MODEL 5710 EMPOWER TEST CAPABILITY			
General Tests	Output Accuracy	Timing Tests	Rise-Time
	Output Adjustment		Fall Time
	Output Trim		Turn-On Time
	RMS Noise/Ripple		Turn-On Sequence (load-to-load timing)
Operator Data Entry, Test, Visual Acceptance & Instructions	Power Fail Signal	Turn-Off Time	Turn-Off Sequence (load-to-load timing)
Power Good Signal	Power S ON Signal	Hold-Up Time	Transient Recovery Time
Operator Waveform Inspection	Multi-Measure	Overshoot Width	Undershoot Width
Monotonicity	Shock/ Shake Test	Pulsewidth as Time	Pulsewidth as Frequency
Regulation Tests	Load Regulation	Control	Multiple-Timing (Unlimited-Cursors)
	Cross-Load Regulation		Single Digital Control
	Voltage Regulation		BYTE/WORD Digital Control
	Current Regulation		OVP (OverVoltage) Driver
	Power Regulation		OTP (OverTemperature) Driver
Protection Tests	Over-Current Ramp Protection	Output Measurement	Start/ Stop/ Pass/ Fail/ Busy/ Ready Controls
	High Accuracy Over-Current Slew Protection		8 Measurement Channels Control for Vout & ID Outputs
	Over-Voltage Protection (no scope required)		Voltage
	Under-Voltage Protection		Current
	High Accuracy Over-Power Slew Protection		Power
	Over-Power Protection		Digital State
Short-Circuit Protection (up to 100A)	Over-Temperature (via relay control)	DC Positive Peak	DC Negative Peak
Dynamic Tests	Single Load Transient	Real Time (Manual Control)	Voltage & Current Waveform Capture and Analysis
	Synchronized Multi-Output Load Transient		Frequency
	Worst-Case Dynamic Transient (Frequency & Duty Cycle)		Mean
	Overshoot		RMS AC Coupled
	Undershoot		RMS DC Coupled
	Settle/ Recovery Voltage		Settle/ Recovery Time
		Peak-Peak	Peak Absolute
		Time at Event	Timing as Frequency
		Measurement at Event	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 = Δ WF2: Voltage @ 9.560 mS, 5.155 V

Vout Min: Min = ∇ WF2: Voltage @ 2.560 mS, 4.747 V

Iout Max: Max = \diamond WF1: Current @ 6.940 mS 3.030 A

Iout Min: Min = \diamond WF1: Current @ 7.940 mS 1.016 A

Vout @ 1st Iout Max: Min = \bullet WF1: Current @ 900.000 μ S, 4.851 V

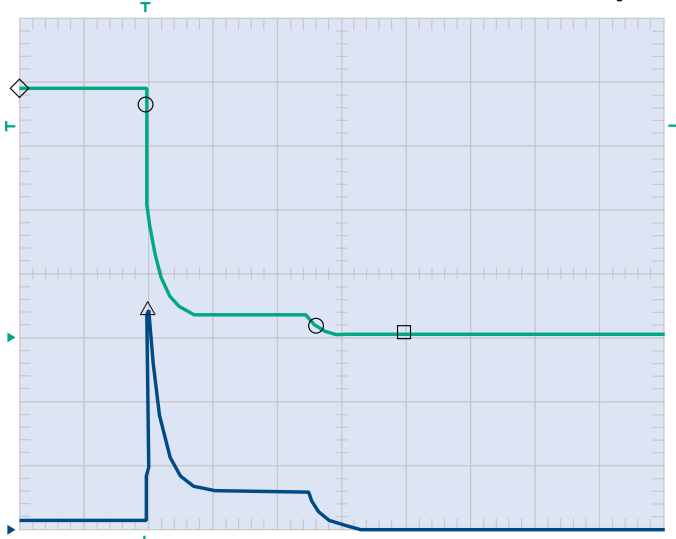
Vout @ 1st Iout Min: Max = \square WF1: Current @ 1.900 mS, 5.062 V

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 = \circ WF1: Chn 001 @ 1.996 mS, 18.412 V:

Stop = \circ WF1: Chn 001 @ 4.589 mS, 0.971 V

Max Short-Circuit Current: Max = Δ WF2: Chn 002 @ 2.020 mS, 69.034 A

Vout Before Short-Circuit: Mean = \diamond WF1: Chn 001 @ 0.000 S, 19.348 V

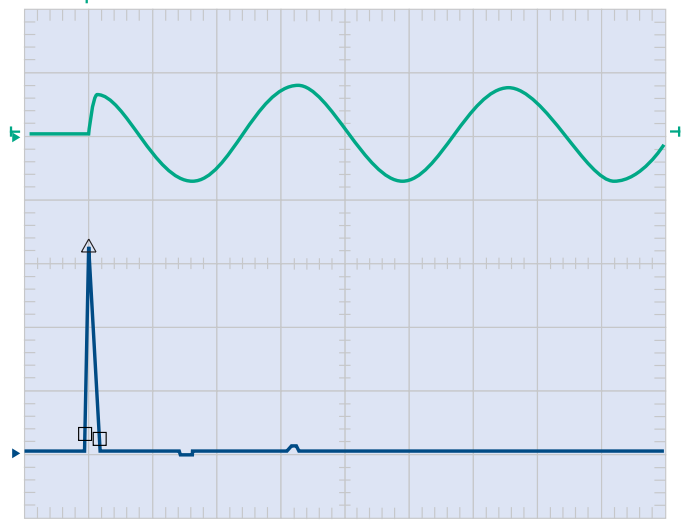
Vout 4mS After Short-Circuit: Event = \square WF1: Chn 001 @ 6.000 mS, 100.637 mV

Inrush Waveform Measurement

Inrush Current	40.000 A	65.071 A	76.000 A	Pass
Inrush Current Width	500.000 μ S	741.000 μ S	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 = Δ WF1: Chn 005 @ 5.201 mS, 65.071 A

Inrush Current Width: Start = \square WF1: Chn 003 @ 4.925 mS, 6.762 A: Stop = \square

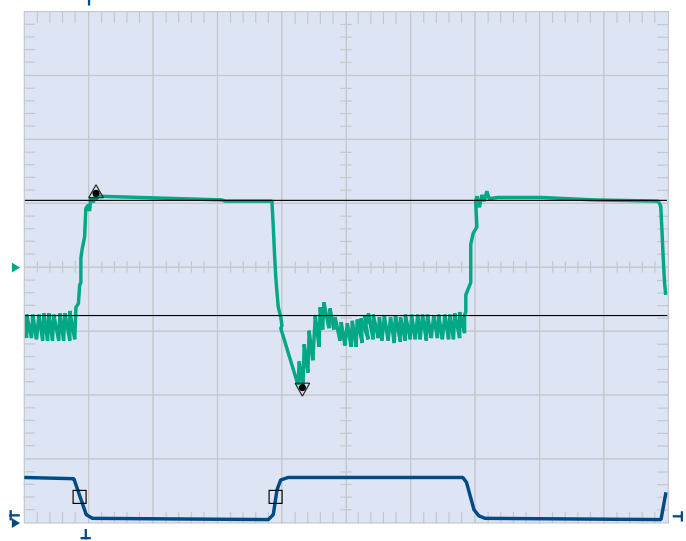
WF1: Chn 003 @ 5.666 mS, 5.505 A

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 μ S	603.800 μ S	615.000 μ S	Pass
Iout Frequency	1.650 KHz	1.656 KHz	1.690 KHz	Pass

5 MS/sec

High Res



200.000 μ S/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 = Δ WF1: Chn 001 @ 222.400 μ S, 239.784 mV

Vout High: High = WF1: Chn 001 @ 0.000 S, 209.241 mV

Vout Min: Min = ∇ WF1: Chn 001 @ 866.800 μ S, -371.088 mV

Vout Low: Low = WF1: Chn 001 @ 0.000 S, -151.174 mV

Vout Overshoot: Max = \bullet WF1: Chn 001 @ 222.400 μ S, 239.784 mV

Vout Undershoot Min = \bullet WF1: Chn 001 @ 866.800 μ S, -371.088 mV

Iout Pulse Width: Start = \square WF2: Chn 002 @ 184.000 μ S, 1.840 A: Stop = \square WF2: Chn 002 @ 787.800 μ S, 1.848 A

Model 5710 Power Supply Test System Specifications

SYSTEM CONTROL	
Rack Server CPU	≥ 3.3GHz Intel processor
Memory	4 GB
Hard Drive	≥ 500GB
Monitor	17" Flat Panel
Accessories	Mouse & Keyboard

SOFTWARE	
Operating System	Windows 10
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	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			
<i>Basic Digital Measurement Capability</i>	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	0.1% 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 + 0.14 % FS
10 Hz - 1 MHz			
Pk-to-Pk Noise	100mV, 500mV, 5V	0.02% FS	1.0% R + 1.0% FS
5 KHz - 100 MHz			
Frequency ¹	10Hz to 5MHz	1/100ns	0.016% R @ ≤ 500Hz
Timing	0 to 7 minutes	100ns	0.02% R + 200nsec
Waveform Capture	DC to 100 MHz	0.003%	1% FS
Phase Angle ¹	0° to 360°	1°	0.5° @ 50/60Hz
THD (2 - 64th) ¹	0 to 100%	0.01%	1% R
<i>High-Frequency Measurement Digitizer</i>		<i>I/O Module (Expandable to 8)</i>	
Scope Family	Tektronix MDO Series	Multiplexer	
Channels	3 Analog + 16 Digital	Input Channels	16, differential
Resolution	8-Bit	Output Channels	2, differential
Sample Rate	2.5GS/sec Maximum	Bandwidth (-3db)	
Memory Depth	10 Mega-samples	Output 1	100MHz
Channel 1		Output 2	10MHz
Connection	Multiplexer Output 1	Max Voltage	± 500V
Bandwidth	100Mhz	Max Current	100mA
Channel 2		General Purpose Relays	
Connection	Multiplexer Output 2	Quantity	8 DPDT
Bandwidth	10Mhz	Contact Rating	5A, 30VDC or 120/240VAC
Channel 3		Relay Drivers	
Connection	Fixed Input	Quantity	16
Bandwidth	100Mhz	Rating	48V @ 500mA
Channel 4		Digital Drivers	
Connection	System Trigger	Quantity	16
		Rating	100mA, 70VDC, 0.5W
		Digital Receivers	
		Quantity	8
		Input Voltage	± 10V
		Accuracy	1%

¹ Measurement derived by empower using digitized measurement data.

Configuration Flexibility

A wide variety of source and load instruments as well as third-party, bulk DC sources are available to configure the 5710 system in a single or multiple cabinet form depending on instruments selected. Check with factory for driver availability.

TYPE	AC/DC SOURCES			MODULAR DC SOURCES	MODULAR DC LOADS		FULL CHASSIS OR CABINET LOADS	
	5427	9420-4	9420 (4 Power Sizes)	6100 (4 Voltage Models)	4312 (3 Power Models)	4350 (3 Power Models)	4700 (8 Power Sizes)	4760 (8 Power Sizes)
Model Number								
AC Mode								
Voltage	150V/300VRMS	175/350VRMS	175/350VRMS					
Phase	1ø	1ø	1, 2, & 3ø					
Power	2.7KVA	4kW	12, 24, 36, 48kW					
Current	9 & 18ARMS	30ARMS	30, 60, 90, 120A/ø					
Peak Current	90A	90A	90, 180, 270, 360A/ø					
Frequency	40 - 500Hz	45 - 880Hz	45 - 880Hz					
DC Mode								
Voltage	212,424VDC	200/400VDC	200/400VDC	20, 40, 80, 450VDC	120VDC	500VDC	120VDC	600VDC
Power	2kW	4kW	12, 24, 36, 48kW	450W	150, 300, 600W	150, 300, 600W	1, 2, 3, 6, 12, 18, 24, 36kW	1, 2, 3, 6, 12, 18, 24, 36kW
Current	18, 9A	30A	90, 180, 240, 360ADC	60, 30, 15, 8ADC	40, 80, 150A	30, 60, 120A	200 - 7200A	50 - 1800A
Chassis Capability				to 6 sources	to 16 of the 150W loads	to 16 of the 150W loads		

* Request model data sheets for complete specifications.



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