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Test & Measurement

- sales
- rentals
- calibration
- repair
- disposal

Complimentary Reference Material

This PDF has been made available as a complimentary service for you to assist in evaluating this model for your testing requirements.

TMG offers a wide range of test equipment solutions, from renting short to long term, buying refurbished and purchasing new. Financing options, such as Financial Rental, and Leasing are also available on application.

TMG will assist if you are unsure whether this model will suit your requirements.

Call TMG if you need to organise repair and/or calibrate your unit.

If you click on the "Click-to-Call" logo below, you can all us for FREE!

TMG Corporate Website **TMG Products Website**

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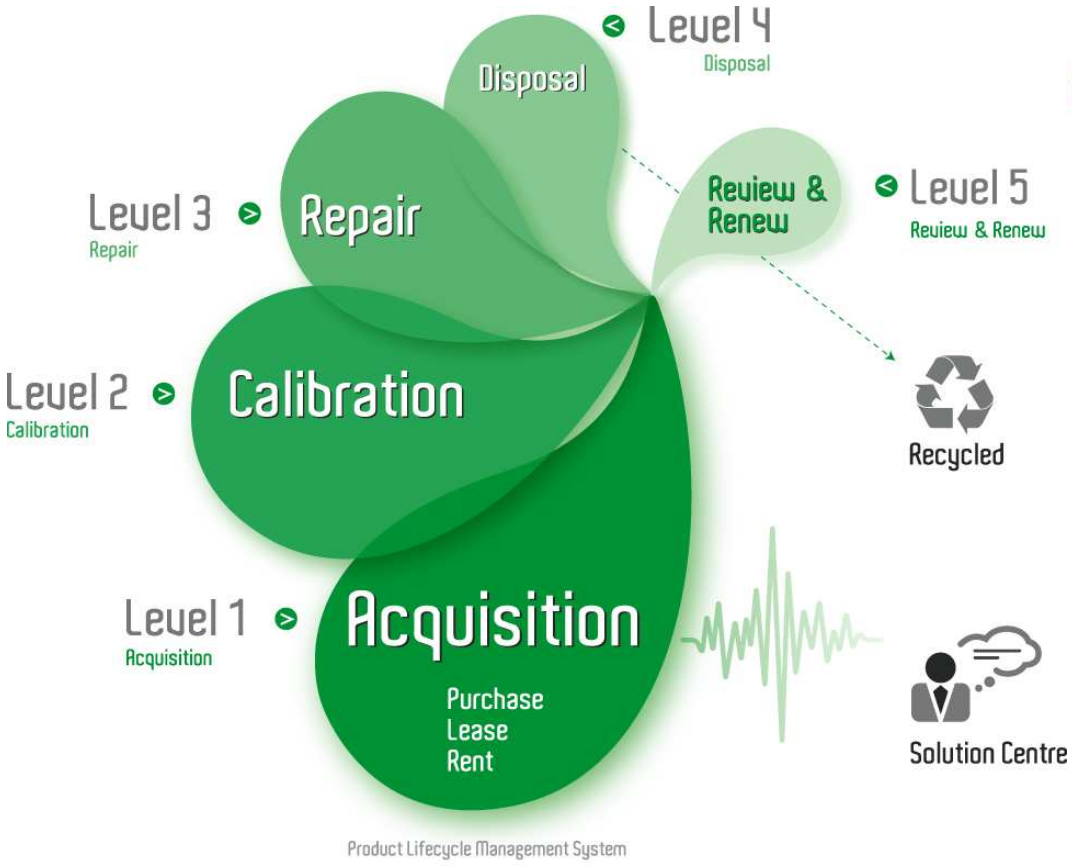

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AC Power Systems L-Series

Full Capability AC Sources for Product Test

Test All Products Operating from AC Power

- **Voltage ranges up to 400 V RMS, L-N**
  Standard 135/270 V or optional ranges to 400 V
- **Single- and Three Phase Models**
  3 kVA to 30 kVA products re-configurable for single- or three-phase operation (MODE option)
- **High Peak Current Capability**
  Up to 9:1 crest factor for driving high peak current loads
- **High Frequency Range**
  Capable of output frequencies up to 5000 Hz on some models

Controller Choices:

- **Simulate Non-Standard AC Line Conditions**
  Line disturbance simulation
- **Monitor Load Parameters Without Additional Instrumentation**
  Full measurement capability on programmable controllers

High Frequency PWM Design

- **Rack Space Savings up to 50 %**
  Small front panel size and weight for precision power
- **High Efficiency**
  Generates less heat and consumes less input power

Now you can test any product that operates from AC power with the most compact, versatile power source in the test industry. The L-Series' small size provides more power per inch than most other AC supplies. Highly efficient, these products dissipate less heat than previous generation systems and allow up to an additional 10 % output power. With a programmable controller, L-Series models provide the most comprehensive set of programmable functions in the industry. Automatic remote calibration and comprehensive self-tests simplify maintainability.

All L Series units are completely self-contained. Control is through an embedded oscillator, factory configured to your specific requirements. Output parameters are controlled via the front panel or the IEEE-488 bus. Bus programming, standard with -P, -PT and HGA controllers, allows programming and measurement function readback compatible with a number of other standards including VXI, MXI and RS232 via recommended translators. To simplify programming, the standard unit supports both Abbreviated Plain English programming and an ATLAS-based control language.

For avionics applications, any 3-phase model can be configured with 26 V and 5 V auxiliary outputs. (AX option)

The L Series is ideal for applications where small size, low heat dissipation and light weight are important. These include DC power supply testing, production test, quality assurance verification, engineering and ATE.

California Instruments

Our broad range of models lets you choose the right power level for your application

Model	Power at 35° C[1]	Phase[2]	Current in 135 V range A rms	A peak[3]	A peak[4]	Cur/phase 3ø mode	Size (H x W x D)	Weight
751L	833 VA	1	6.2	55.6	60	n/a		
1501L	1667 VA	1	12.3	55.6	60	n/a	5.25" x 19" x 23"	85 lb
1503L	1667 VA	3	4.1	9.3	10	4.1	133 x 483 x 584 mm	38.3 Kg
2001L	2000 VA	1	14.8	55.6	60	n/a		
2750L	3000 VA	1 or 3	22.2	83.3	90	7.4	10.5" x 19" x 23"	175 lb
4500L	5000 VA	1 or 3	37	83.3	90	12.3	267 x 483 x 584 mm	97.2 Kg
6000L	6000 VA	1 or 3	44.4	157.4	170	14.8		
9000L	10000 VA	1 or 3	74	166.7	180	24.7	21" x 19" x 23"	350 lb
12000L	12000 VA	1 or 3	90	314.8	340	30.0	533 x 483 x 584 mm	158 Kg
13500L	15000 VA	1 or 3	111.2	250.0	270	37.0	31.5" x 19" x 23"	525 lb
18000L	18000 VA	1 or 3	133.2	472.0	510	44.4	800 x 483 x 584 mm	238 Kg

Notes: 1 Derate power by 10% for operation at 50° C ambient or when using the -UP option
2 1 or 3 phase systems are factory configured unless the "MODE" option is specified
3 Repetitive peak current capability
4 Non repetitive peak inrush current

The L-Series offers the ultimate in flexibility. Select the power level best suited to your requirements. Then select the controller that provides the functions important to you. Complete your selection by choosing from the L-Series' comprehensive list of options, and you have a truly custom solution at an "off-the-shelf" price.

All L-Series Models Conform to These Specifications:

Output Voltage Ranges

Standard: 0-135 V, L-N
0-270 V, L-N

-HV Option: 0-156 V, L-N
0-312 V, L-N

-LV Option: 0-67.5 V, L-N
0-135 V, L-N

-EHV Option: 0-200 V, L-N
0-400 V, L-N

Total Harmonic Distortion

45 Hz to 2 kHz: 1 percent
To 5 kHz: 2 percent
50/60 Hz: 0.5 percent typical

Line Input

Models 751L, 1501L, 1503L, 2001L:
115 V or 230 V single phase
47 Hz to 440 Hz

Models 2750L, 4500L, 6000L, 9000L, 12000L, 13500L, 18000L:
187 V - 252 V, L-L, 3 phase
(342 V - 456 V, L-L, 3 phase with -UP option, except 6000L, 12000L and 18000L)

2750L: 1 or 3 phase input 187 - 252 V

Output Frequency

See V-F derating for 17 Hz to 45 Hz performance

Models 751L, 1501L, 1503L, 2001L, 2750L-3, 4500L-3 and 6000L-3:
17 Hz to 5 kHz

Models 2750L-1, 4500L-1, 9000L and 13500L:
17 Hz to 2 kHz

Models 6000L-1, 12000L and 18000L:
17 Hz to 440 Hz

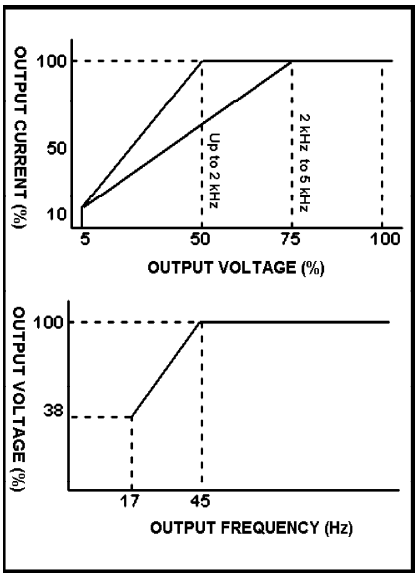
All models with -PT controller:
17 Hz to 550 Hz except 6000L, 12000L and 18000L

AC Noise Level

160 mV rms typical

Connectors

- Input provided on rear terminal block
- Output provided on rear terminal block (Remote sense



Rating Curves

mating connectors are provided)

Protection

- Overcurrent
- Overpower
- Short circuit
- Overtemperature
- Current limit trip standard with programmable units. All units have adjustable current limit.

Three Different Controllers Offer Programmability Choices[1]

Specification	Programmable -P	Programmable -PT	Manual -M
Controller Type	Programmable controller	Fast Transient controller	Manual control oscillator
Voltage			
Range	0 - 135 V / 0 - 270 V L-N Programmable range change Individual phase programming	0 - 135 V / 0 - 270 V L-N Programmable range change Individual phase programming	Variable pot control Switchable range change Option -RPV for 0-FS control using 0 - 10 VDC input.
Accuracy	± 0.135V from 5 V to 135 V ± 0.54 V from 135 V to 270 V @ 25° C ± 1° C	± 0.7 % FS from 5 % to FS Constant line, load and temperature @ 25° C ± 1° C	Variable control Analog meter readback
Load Regulation	TRMS Sense: ± 0.05 % FS no load to full load	- 0.5 % FS from 45 Hz to 100 Hz - 2 % FS from 100 Hz to 550 Hz	± 0.05 % from 45 Hz to 5 kHz
Line Regulation	± 0.02 % FS for ± 10 % line change	± 2 % of full output for a ± 10 % line change	± 0.02 % of full output for a ± 10 % line change
Stability	± 0.015 % FS over 24 hours at constant line, load and temperature	± 0.25 % FS over 24 hours at constant line, load and temperature	± 0.015 % FS over 24 hours at constant line, load and temperature
Initial value	0.0 or 5.0 Vrms field selectable	0 Vrms	N/A
Settling time	16 msec, no-load from 5 V to within 2 % of final value; 16 msec, full load from 5 V to within 15 % of final value	0.5 msec	N/A
Programmable THD	N/A	0 - 20 % THD clipped sine 1 % resolution	N/A
Amplitude Modulation	N/A	0 to 5 V RMS generates 0 to 11 % amplitude modulation of output voltage. 45 Hz to 5 kHz input	0 to 5 V RMS generates 0 to 11 % amplitude modulation of output voltage.
Frequency			
Range	2750L-1P, 4500L-1P and all multibox systems: 45 Hz to 2 kHz -3P and 751L - 2001L: 45 Hz to 5 kHz 6000L, 12000L and 18000L: 45 Hz to 440 Hz	6000L, 12000L and 18000L: 45 to 440 Hz All other models: 45 Hz to 550 Hz	2750L-1M, 4500L-1M and all multibox systems: 45 Hz to 2 kHz -3M and 751L - 2001L: 45 Hz to 5 kHz 6000L, 12000L and 18000L: 45 Hz to 440 Hz
Resolution	0.01 Hz; 45.00 Hz to 99.99 Hz 0.1 Hz; 100.0 Hz to 999.9 Hz 1 Hz; 1000 Hz to 5000 Hz	0.01 Hz; 45.00 Hz to 99.99 Hz 0.1 Hz; 100.0 Hz to 550.0 Hz	3 digits
Accuracy	± 0.001 % of programmed value	± 0.001 % of programmed value	± 0.005 % of set value
Initial value	Any within range	Any within range	Setting
External Sync Input	TTL level	TTL level	N/A
Phase			
Range	Phase B and/or C relative to phase A: 0 to ± 360° in 0.1° increments	Phase B and/or C relative to phase A: 0 to ± 360° in 0.1° increments	N/A
Accuracy	± 2 °	± 2 °	± 3 °
Current			
Programmable Limit	Adjustable trip	Adjustable trip	Adjustable foldback with recovery
Remote Inhibit	Contact closure turns output off	Contact closure trips unit off. Sets defaults.	Contact closure turns output off
Measurements			
Voltage	resolution 0.1 Volt, accuracy ± 10 digits		N/A
Current	resolution 0.01 Amp or 0.1 Amp, accuracy ± 10 digits		N/A
Power	resolution 1 W or 0.01 kW, accuracy ± 10 digits		N/A
Phase angle	resolution 0.1°, accuracy ± 2° to 2 kHz, ± 3° to 5 kHz		N/A
Power Factor	range 0.000 to 0.001		N/A
Frequency	resolution four decades, accuracy ± 0,02 Hz to 99.99 Hz, ± 0.2 Hz to 500.0 Hz, ± 0.5 Hz to 999.9 Hz, ± 10 Hz to 5 kHz		N/A
Apparent Power	resolution 1 VA or 0.01 kVA, accuracy ± 10 digits		N/A

Note 1 One of these three controller types must be specified when ordering a L Series power source or, for Arbitrary waveform generation, refer to the HGA controller.

Plug-in Controller Concept Provides Choice of Features

All L-Series models offer a choice of three controllers, allowing you to specify the levels of performance and control best suited to your requirements.

Type -P, the standard programmable controller, uses True RMS sensing, providing the most accurate output voltage regulation. Output settling times for the -P controller are longer than the -PT controller due to the RMS sense response time. With Type -P, transients are programmable over time or cycles.

Type -PT uses a fast real-time servo, instantly creating exact waveform definitions ideal for applications such as switching DC power supplies where real-time feedback and fast output settling times are critical. The -PT controller is recommended for applications that require fast transients to be programmed over time or cycles.

Type -M, the manual controller, is ideal for portable or benchtop applications where local control is sufficient. An optional remote programmable voltage input can be added to allow amplitude control using a DC input signal.

Single and Three Phase Versions

All controllers are available in either single or three phase versions. For special applications, two phase or split phase configurations can be ordered as well. For three phase -P and -PT controllers, a phase mode option can be added which allows switching between both single and three phase output modes without the need to rewire the output terminals.

Measurements

Both -P and -PT controllers provide a full range of output readback measurements , either via front-panel display or over the standard IEEE-488 bus. Measurements provided are Volt RMS, Current RMS, Power, Apparent Power, Power Factor, Frequency and Phase.

Controller and Amplifier Options

The L Series is highly configurable using a wide array of options for both the amplifier and the controller. This makes the L Series one of the most versatile AC power solutions on the market. If your application requirements can not be met using any of the options listed here, contact the factory for configuration assistance.

Controller Options Provide Capability for Specialized Testing

-MODE: Allows certain L-Series models to be IEEE-programmed or switch configured for single-phase or three phase output.

-MT: Primarily for military applications, where CIIL and full confidence test is required. Not available on 751L.

-RPV: Allows amplitude of any L-Series unit, when using a manual oscillator, to be programmed with an external 0 - 10 VDC input.

-SQW: Allows square wave capability with programmable controller. Not available on 2750L-1, 4500L-1, 6000L or any multi-box system.

-704: MIL-STD-704 test. These test routines are embedded in the -P and -PT controller along with the standard APE language.

-160: RTCA/DO-160 test. These test routines are embedded in the -PT controller along with the standard APE language. (not available on -P controller)

L-Series Amplifier Options Provide Additional Flexibility

One of the following may be specified:

-HV: High voltage. Changes output transformer to 156 V/ 312 V, L-N.

-EHV: Extra high voltage. Changes output transformer to 200 V/ 400 V, L-N (45 Hz to 1000 Hz frequencies only).

-LV: Low voltage. Changes output transformer to 67.5 V/ 135 V, L-N. Especially useful when 115 V, L-L is required.

Any of the following may be specified:

-AX: Provides separate isolated 26 VAC regulated and 5 VAC unregulated outputs. The 26 V is normally used for servo-synchro excitation, and the 5 V for lamp power. Available on Models 2750L, 4500L, 1503L only.

26 Volt - **Accuracy:** ±2%. **Current Capacity:** 3 ARMS. **Frequency:** 360/440 Hz. **Regulation:** ±0.05%
5 Volt - Accuracy: ±5%. **Current Capacity:** 5 ARMS.

-UP: Allows any system configured from Model 4500L and up to accept 3-phase L-L voltage from 342 V to 456 V, L-L.

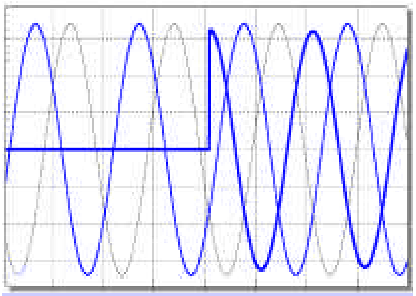
-LKM: Clock/Lock Master Unit. Installs necessary hardware to adapt to one slave unit.

-LKS: Clock/Lock Slave Unit. Installs necessary hardware to accept Clock/Lock inputs from LKM unit. Only one slave unit may be driven from a master unit.

210960 Rack slides. Required for mounting in 19” (483 mm) instrument rack.

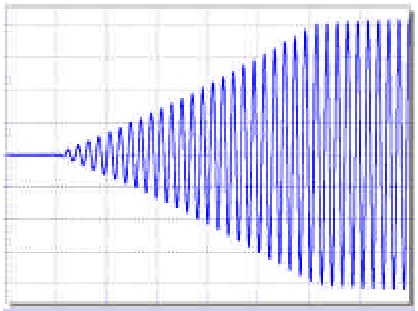
Programmable Functions Allow Simulation of Complex Line Conditions

The broad range of programmable functions available with the L-Series allow you to test for virtually any line occurrence. The -P and -PT programmable controllers are equipped with 16 transient registers that can be programmed from the front panel keypad or the IEEE-488 interface. Here are some capabilities of the L Series programmable controllers:



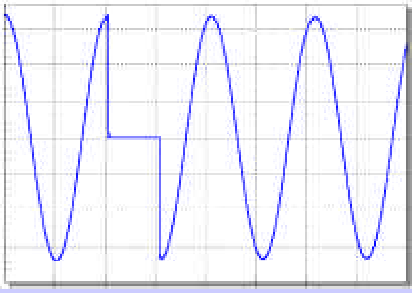
Programmable start at 90° on Phase A

- **Set the voltage** on each phase individually with 0.1 volt resolution.
- **Set the frequency** with 4 digit resolution.
- **Set phase angles** for phase B and C with respect to phase A with 0.1 degree resolution.
- **Set a power surge or blackout** from 1 mSec to 2 hours duration to simulate power utility generation and distribution problems.



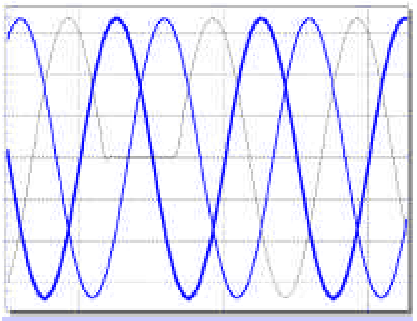
Programmed Voltage Sweep

- **Set the starting point** of the sine wave anywhere from 0 to 360 degrees with 0.1 degree programming to test for maximum load in-rush current.
- **Select sweep** of voltage, frequency and/or phase angle to test for catastrophic failure and brown-out conditions.
- **Program voltage dropouts** at any phase angle, either by time or cycle count, to test for correct operation in the vicinity of a heavy intermittent load such as an air conditioner or refrigeration plant.



1/2 cycle dropout at 90°

- **Select internal or external synchronization** signal and measurement strobe function to ensure reliable operation in a complex measurement system that includes an oscilloscope or other recording device.



1/2 cycle dropout on Phase C at 400 Hz

- **Save custom setups** in non-volatile memory for easy recall (front panel or bus)
- **Link memory locations** for complex setup sequencing that can cover many hours for complex multi-line standard burn-in testing.

Included Windows™ Software Eases Transient Programming

All L Series AC sources shipped with a programmable controller (-P, -PT or HGA) include a Windows™ Graphical User Interface (GUI) program. The GUI supports all functions and capabilities of the L Series controller used. The following tasks can easily be performed through this graphical user interface using the IEEE-488 interface (National Instruments PC IEEE controller required):

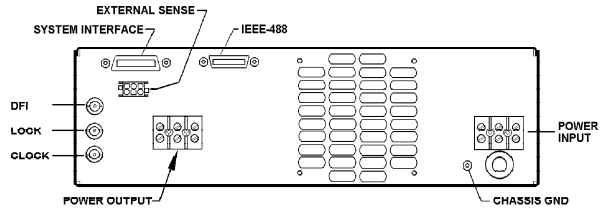
- Control all output parameters such as voltage, current limit, phase and frequency.
- Compile lists of transient programs on disk for quick recall and execution
- Measure and record key output parameters such as volt rms, current, peak current, real power, and power factor.
- Run RTCA/DO160C (requires option -160) or MIL-STD 704D tests (requires option -704)
- Monitor remote control commands over the bus using the built in command viewer window to quickly learn how to program the L Series yourself.

Drivers for popular programming environments such as LabView™ or LabWindows/CVI™ are available as well for custom software development. If needed, the front panel can be locked out to prevent operator intervention during test runs.

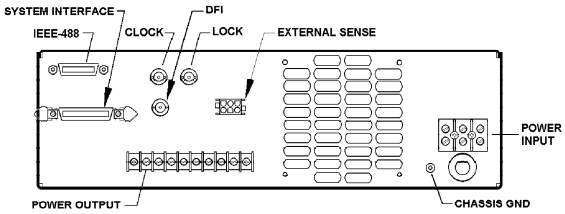
Mechanical Specifications

Model 751L, 1501L and 2001L

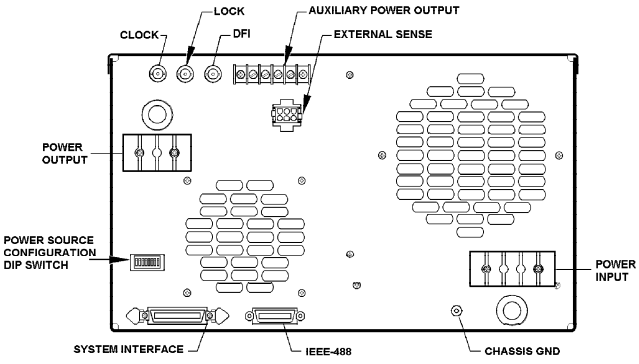
Rear Panels



751L / 1501L / 2001L REAR PANEL



1503L REAR PANEL



2750L / 4500L / 6000L REAR PANEL

Order Example

1503L -3P -HV

Basic Model No. | **Controller Type: Designate P, PT, M and phase (if applicable)** | **Options (See list)**

Default Frequency: 400 Hz
Output Voltage Range Initialization: 135V
Input Voltage: 115V

Note:
When ordering, please specify:

- Output default frequency (60 Hz if not specified)
- Output voltage range initialization (specify High or Low)
- Input voltage for Models 751L, 1501L, 1503L

Ordering Information

Terms: Net 30 days
Delivery: Within 30 days ARO
F.O.B.: Factory San Diego, CA
Shipment: Freight Collect

Contact California Instruments:
Toll-Free: 800-4AC-POWER
800-422-7693
FAX: 858-677-0940
Email: sales@calinst.com
Web page: http://www.calinst.com

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