

## AC Power Test

- **Multi-mode AC Electronic Load**  
*Flexible solution for a wide range of AC power test applications*
- **3000 Watt Power Dissipation**  
*Master / Auxiliary configurations for higher power and multi phase applications*
- **50 to 350 V, 45 Hz to 440 Hz**  
*Commercial, Military and Avionics applications*
- **Programmable Crest Factor and Power Factor**  
*Test AC power products for real-world conditions*
- **Built-in Readback Measurements**  
*Eliminates the need for additional test equipment in bench or ATE applications*
- **Remote Control**  
*IEEE-488 and RS232C Interface for automated test applications*

### Introduction

The 3091LD is designed to provide precisely controlled, non-linear loads for testing AC power generation equipment such as UPS's and AC sources. In addition, any active or passive current carrying devices such as switches, circuit breakers, fuses, connectors and power semiconductors can be tested.

Traditionally, many of these products are tested using resistive load banks. This approach does not simulate real-world conditions such as switching AC/DC converters found in many AC powered products. This type of conventional testing does not fully exercise the equipment under test (EUT) under worst case operating conditions. High peak currents and low power factor loads can significantly impact the operating characteristics of a UPS or AC power product.

The 3091LD AC Load can simulate high crest factor and variable power factor load conditions. This provides an effective method of testing AC products against real-world conditions and can significantly increase product reliability. Unless properly exercised, product defects may go undetected until a unit is used at a customer site, resulting in costly field returns.

### Front Panel Control

The AC load can be operated from an easy to use, menu driven front panel. Product tests can be performed quickly in an R&D setting by punching up specific load conditions on the front panel and reading the measurement screen of the 3091LD. This fast interactive front panel control mode can be used during a product's early development cycle to isolate potential performance problems before the product leaves the engineering lab.

### Automated Test

The 3091LD can be deployed in ATE test stations using either IEEE-488 or RS232C remote control. The industry standard SCPI (Standard Commands for Programmable Instrumentation) protocol is used and instrument drivers are available to ease test software development. The built-in metering functions of the 3091LD AC load can be used to eliminate the need for additional test equipment such as meters, power analyzers and oscilloscopes.

This and the reduced size of the 3091LD compared to passive load banks, represents a savings in both cost and rack space.

## AC Electronic Load Model 3091LD



Model 3091LD



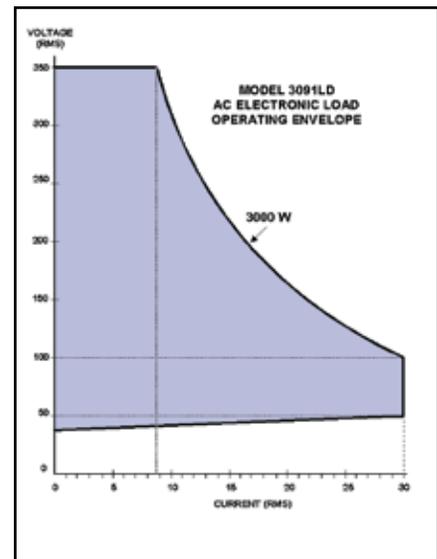
### Power Levels

Each 3091LD is capable of dissipating 3000 W of single phase AC power. For higher power or three phase applications, a 3091LD master unit can be combined with one or more auxiliary units. The master 3091LD unit provides the required consolidated measurements so the test system controller - or the operator - need only interface to the master unit, regardless of the specific configuration. Single, split or three phase configurations can be software configured from the master 3091LD.

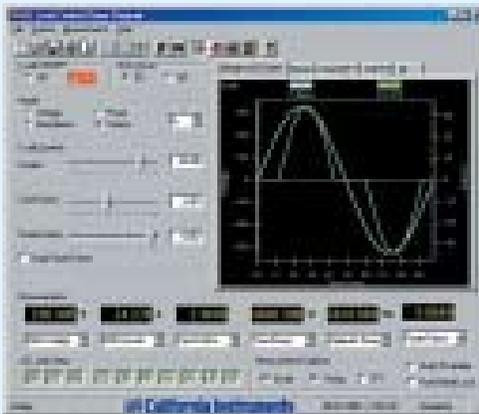
# 3091LD - Operating Modes

The 3091LD can be used to emulate a wide variety of AC load conditions to support real-world testing and evaluation of UPS and AC source products. Specifically, the following modes can be selected:

Mode		Description
Constant Power	CP	This mode effectively emulates constant power loads such as switching power supplies.
Constant Resistance	CR	Emulates a conventional resistive load or power resistor. A programmable range from 2.5 Ohms to 1000 Ohms covers a wide range of applications. This mode can be used to replace conventional resistive load banks.
Constant Current	CC	Provides a constant current load. This mode may be used to simulate both linear (resistive) and non-linear (active) loads for voltage regulation testing.
Constant Voltage	CV	This mode emulates a shunt regulator load and may be used to test current source products.
Short circuit	SC	Test the short circuit protection mode of the EUT by providing a short condition. The 3001LD can handle surge currents of up to 300 Amps for up to 50 msec and sustained currents of 30 Amps in this mode of operation. The low voltage cut-off of the load can be programmed from 50 Volts up.



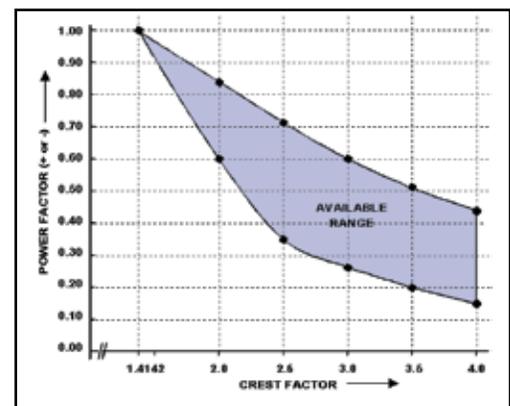
Load Power Rating curve for 3091LD.



The large LCD screen is used to display setup information as well as measurement data. Measurements include volt RMS, volt peak, current RMS, current peak, crest factor, true power, apparent power, power factor and frequency. Both voltage and current waveforms at the load input terminals can be digitized and displayed on the front panel graphical LCD. This allows EUT output behavior to be analyzed quickly without the need to hook up additional test equipment. A Windows graphical user interface (GUI) is provided to expand the measurement and display capabilities of the 3091LD. The GUI can be used to save and print test results for report purposes.

## Crest Factor and Power Factor control

When operating in constant current or constant power mode, the 3091LD supports crest factor control by narrowing the conduction angle of the current waveform in order to match the requested crest factor. Thus, the peak current is increased while retaining the RMS current level. While the apparent power remains constant, the true power decreases. This results in a reduced true power factor. Consequently, as crest factor is increased, the true power factor automatically decreases. The load further controls power factor by shifting the current with respect to the input voltage (displacement power factor). Both leading and lagging power factor control is available. A phase shift of the current is only possible if the crest factor is higher than 1.414. Thus, crest factor and power factor control ranges are coupled as shown in the graph to the right.



Power and Crest factor control range.

# Specifications

## California Instruments

Total Customer Satisfaction is the goal of all California Instruments' employees. It is the driving force behind everything we do. This not only affects the product that you purchase from California Instruments, but everything about your interface with the company. Our applications engineers are ready to assist you with your AC power application. With over 35 years of experience designing and building precision AC power supplies, chances are we can meet your needs and exceed your expectations. The same dedication to customer satisfaction you will find in our applications group also permeates our modern manufacturing facility where our products are carefully built. No unit leaves our factory without being thoroughly tested to ensure quality, reliability and conformance to specifications.

## Protection

**Over Current** Limited by input Circuit Breaker and Set Maximum Current Limit in software.

**Over Voltage** Output protected for voltage transients over 500 V in hardware.

**Over Power** Power limited at maximum average and peak rated power in hardware. Limited to Set Maximum Power Limit in software.

**Over Temperature** Monitors heat sink temperature.

## Ratings

Power:	3000 W @ 0-37° C, 2400 W @ 38-50° C
Max. Peak power:	13 kW (up to 20% duty cycle)
Current:	30 A <sub>RMS</sub>
Max. Peak current:	90 A <sub>PEAK</sub>
Max. Surge current:	300 A <sub>PEAK</sub> for 50 ms
Voltage:	50 to 350 V <sub>RMS</sub>
Max. Peak voltage:	500 V <sub>PEAK</sub>
Frequency:	45 to 440 Hz

## Operating Modes

### Constant Current

Range:	0 to 30 A <sub>RMS</sub>
Accuracy:	0.2 % of full scale
Resolution:	0.05 % of full scale
Min. Set Current	Voltage / Maximum Set Resistance

### Constant Voltage

Range:	50 to 350 V <sub>RMS</sub>
Accuracy:	0.2 % of full scale
Resolution:	0.05 % of full scale

### Constant Resistance

Range:	2.5 to 100 Ohms 100 to 1000 Ohms
Accuracy:	1% FS, 5% FS
Resolution:	0.05 % FS
Max. Set Resistance	1 / (Freq.*1.3e-5)

### Constant Power

Range:	3000 W @ 0-37° C, 2400 W @ 38-50° C
Accuracy:	0.5% of full scale
Resolution:	0.1% of full scale

### Crest factor

Range:	1.4142 to 4.0, limited to 90 A <sub>peak</sub>
Accuracy:	1 % of full scale
Resolution:	0.1 % of full scale

### Power factor

Range:	0 to 1 lead or lag limited by Crest factor settings
Accuracy:	1 % of full scale
Resolution:	0.1 % of full scale

### Short circuit Mode

Max. Surge current:	300 A <sub>PEAK</sub> , up to 50 msec
Max. Cont. current:	30 A <sub>RMS</sub>
Max. Voltage drop:	2.5 V <sub>RMS</sub>

## Measurements

### Frequency

Range:	45 to 440 Hz
Accuracy:	0.1% FS
Resolution:	0.05% FS

### Voltage

Range:	50 to 350 V <sub>RMS</sub>
Accuracy:	0.1% FS
Resolution:	0.05% FS

### Peak Voltage

Range:	50 to 500 V
Accuracy:	0.5% FS
Resolution:	0.1% FS

### Current

Range:	0 to 30 A <sub>RMS</sub>
Accuracy:	0.2% FS
Resolution:	0.1% FS

### Peak Current

Range:	0 to 90A
Accuracy:	0.5% FS
Resolution:	0.1% FS

### Crest factor

Range:	1,4142 to 4.0
Accuracy:	0.5% FS
Resolution:	0.1% FS

### Apparent Power

Range:	0 to 3000 VA
Accuracy:	0.5% FS
Resolution:	0.1% FS

### True Power

Range:	0 to 3000 W
Accuracy:	0.5% FS
Resolution:	0.1% FS

### Peak Power

Range:	0 to 45,000 W
Accuracy:	1% FS
Resolution:	0.1% FS

### Reactive Power

Range:	0 to 3000 VA
Accuracy:	0.5% FS
Resolution:	0.1% FS

### Power factor

Range:	0 to 1
Accuracy:	0.5% FS
Resolution:	0.1% FS

### Resistance

Range:	2.5 to 100 Ohms, 100 to 1000 Ohms
Accuracy:	1% FS, 5% FS
Resolution:	0.05% FS

## Supplemental Characteristics

Size:	8.75"H x 16.88"W x 25"D / 222 x 429 x 635 mm
Weight:	74 lbs / 34 Kg.
Remote Sensing:	Max. 2V drop between sense and load lines
Isolation:	1000 V between input and chassis ground
Operating temperature:	3000 W @ 0-37° C, 2400 W @ 39-50° C
Audible Noise (@ 1meter):	Low power - 49.0 dBA / Full power - 69.5 dBA
Control power input:	115 Vac or 230 Vac (model -230) ± 10%, 47 to 63Hz

Note: All specifications apply for 23° C ± 5° C

## Remote Control

**IEEE-488.2** GPIB talker, listener  
Subset: AH1, C0, DC1, DT1, L3,  
PP0, RL2, SH1, SR1, T6  
Language: SCPI

**RS232C**  
Baud rates: 9600, 19200, 38400  
Handshake: RTS/CTS  
Format: 8,n,1  
Language: SCPI

## Ordering Information

**Models:**  
3091LD 3000 W AC load, 115 V AC  
Line input.  
3091 3000 W AC load auxiliary  
unit, 115 V  
AC line input.

**Options:**  
-230 AC Line input 230 V L-N.  
*Must be specified at the time of  
original order.*  
-MSK Master/Auxiliary Cable Kit.  
Required to use 3091LD as

-RMS auxiliary unit.  
C Rack Mount Slides.  
Cabinet. Add prefix "C" to  
model number to order a  
rack mounted system.  
Note: For rack mounting, option  
-RMS is recommended.

**Ordering Examples:**  
1 x 3091LD-RMS  
2 x 3091-RMS  
Three unit, 9000 Watt system with  
rack slides.  
3091LD-230  
Single unit rated for 230 V L-N input.

## Supplied with:

- Instruction / Programming Manual
- Windows™ Graphical User Interface
- Load Input Connector
- RS232C Serial Cable

## Configurations

Higher power AC loads or multi phase AC loads can be created by combining one 3091LD master with one or more 3091 auxiliary units in a rack system. Contact factory for system configuration information.

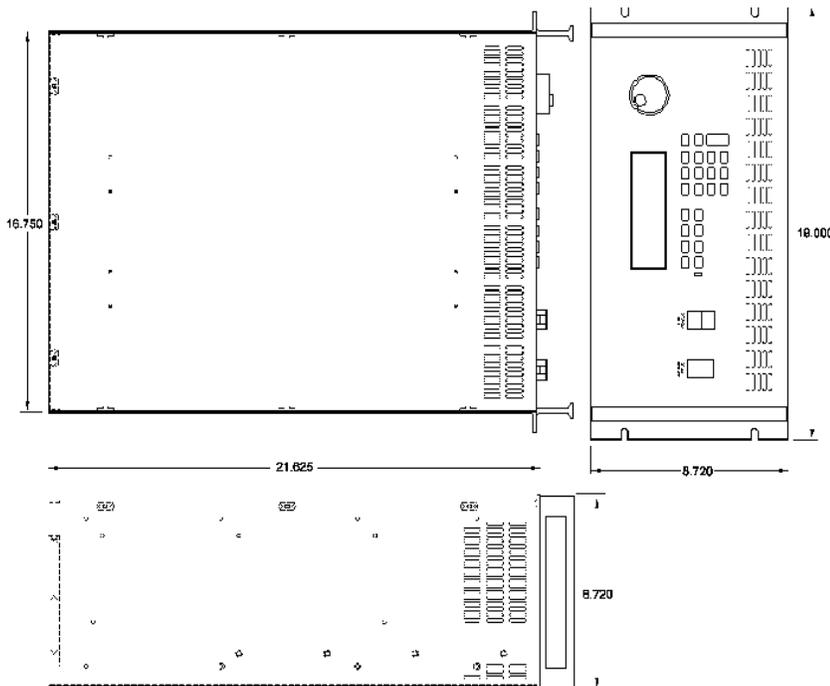
## AC and DC Sources

Expand your AC test systems with line input immunity testing of voltage sags, surges, swells and drop-outs using the California Instruments iX Series of programmable AC and DC power sources. The iX Series is an ideal companion product to the LD Series AC loads, providing 3000 VA to 30 kVA of AC power. Features include arbitrary waveforms, transient generation and extensive measurements.

## Customer Support

For technical support and service, or to discuss your AC power application needs, contact California Instruments Corp. or your local representative.

3091LD Dimension drawing



Contact California Instruments:

TEL: 858 677-9040

FAX: 858 677-0940

Email: [sales@calinst.com](mailto:sales@calinst.com)

Web URL: <http://www.calinst.com>

 **California Instruments**

9689 Towne Centre Drive, San Diego, CA 92121-1964

(858) 677-9040

© Copyright 1999, California Instruments Corp.

Specifications subject to change without notice

Printed in the USA.

FAX : (858) 677-0940

3091LD 06/04