

AC Power Systems

i Series

Programmable AC/DC Power

High Power, Low Cost

- **3000 VA to 15000 VA of Output Power**
Capable of handling a wide range of applications
- **AC and DC Output Modes**
Perform AC or DC tests with a single power source
- **Higher Power Density**
Unprecedented power in just 7" (178 mm) cabinet height requires less rack space
- **Multiple Chassis Configurations**
For higher power 1Ø & 3Ø applications to 15 kVA
- **High Crest Factor Capability**
Drives a wide variety of non-linear loads
- **IEC 1000-3-2 and IEC 1000-3-3**
Meets source requirements for IEC Harmonics and Flicker testing



Affordable AC/DC Power Solutions

Compact AC Power

This Series combines the essential variable frequency, voltage, and current functions in a small and lightweight AC power source. By focusing on the key AC power requirements for commercial and industrial applications, the 5001i is ideally suited as a general purpose AC power source for both development and manufacturing applications. At only 7" (178 mm) high, the i Series is one of the highest power density AC power sources available today. With a rated output level of 5000 VA for a single unit configuration to 15,000 VA for multi unit configurations, the i Series has the power to drive a wide variety of tough loads.

Easy To Use Controls.

Completely microprocessor controlled, the i Series can be operated from an easy to use front panel keypad. Functions are grouped logically and are directly accessible from the keypad. This eliminates the

need to search through various levels of menus and / or softkeys.

A large shuttle knob located directly next to the bright LCD display allows most parameters to be slewed up or down dynamically. The shuttle knob employs a carefully tuned dynamic rate change algorithm that combines the benefits of precise control over small parameter changes with quick sweeps through the entire range.

Applications

Many AC power applications do not require the complexity and cost of large and heavy traditional AC sources. This series was designed specifically for those situations where a small, lightweight and fully programmable source is preferable. Typical applications include production testing, quality control and aircraft power simulation. Intuitive and easy to use, the unit is suitable for use by personnel with a variety of skill levels.

Product Evaluation and Test Applications

Increasingly, manufacturers of electronic equipment and appliances are required to fully evaluate and test their products over a wide range of input line conditions. To meet new international testing requirements, the low output impedance, and optional OMNI impedance matching network assure compatibility with the IEC 1000-3-2 and 1000-3-3 standards.

Avionics Applications

As an affordable and reliable source of 400 Hz AC power, the 5001i is well suited for aerospace applications. Precise frequency control and accurate load regulation are practical features in these applications. The small size and low weight make the 5001i the perfect frequency changer for workshop or field applications.

i Series - For Flexibility

Versatility

DC Output Mode

The DC output capability of the 5001i allows the same power source to be used for both AC or DC test applications. Switching between AC and DC output modes is done with the push of a button from the front panel or through one of the 5001i remote control interfaces. DC output voltage ranges are 0-135 V and 0-270 V.

High Crest Factor

With a crest factor of up to 5:1, the 5001i can drive non-linear loads with ease. Since many modern products use switching power supplies, they have a tendency to pull high repetitive peak currents. If the AC power source used to test these products has insufficient peak current drive capability, the waveform exhibits voltage harmonic distortion. The 5001i can deliver up to 110 Amps of repetitive peak current.

Multiphase Configurations

Three 5001i chassis can be configured as a three phase 15 kVA system using the systems interface. This configuration generates up to 234 V (L-L) with rms phase currents of 21.2A, or 468 V (L-L) with rms phase currents of 10.6 A.

Parallel Operation For Higher Output Power

For higher power single phase applications, up to three 5001i units can be used in parallel mode. A unique load sharing circuit ensures that the load current of up to 111 A rms (135 V range) is shared between the three chassis.

Turnkey Rack Systems

For multi unit configurations, turnkey 19 inch rack systems with a variety of pre-wired single and three phase outlet strips for different countries are available. This greatly facilitates the load connection.

Standard Measurements

The i Series incorporates a large array of load parameter measurements as a standard feature. Specifically, the following measurements are available on the front panel LCD or via the bus:

- Frequency
- Voltage (rms)
- Current(rms)
- Peak Current
- Crest Factor
- Real Power
- Apparent Power
- Power Factor

MEASUREMENTS 1	
VOLTAGE = 113.5VDC	FREQ = 60.0Hz
CURRENT = 36.9A	POWER = 4.11KW
PREVIOUS SCREEN	HOME

Measurements are directly accessible from the front panel by selecting the Measurements key. Four measurements are shown on a single screen in big letters for easy readability.

Remote Control

Standard IEEE-488 and RS232C remote control interfaces allow programming of all instrument functions from an external computer. The popular SCPI command protocol is used for programming. Optionally, the California Instruments Abbreviated Plain English command language is offered to maintain software compatibility with existing CI products.

Windows Graphical User Interface

A Windows 3.1™ or Windows 95™ compatible Graphical User Interface offers a virtual front panel interface for operation from a PC. This ready to run software package also offers data logging and Dynamic Data Exchange (DDE) support to allow for turnkey test operation.

Low Cost Of Ownership

Through the use of modular construction and quality components, the i Series is designed to provide many years of uninterrupted service. The modular construction allows components or subassemblies to be replaced quickly to minimize downtime.

Quiet Operation

Load sensitive fan control assures quiet operation when possible, yet ensures adequate cooling when required.

Safety

Load Protection

The i Series has been designed to provide maximum protection of the load while at the same time avoiding nuisance tripping. Both constant voltage and constant current mode are available. In constant current mode, a programmable current limit allows the output current to be limited

to a preset level. The i Series will enter into a constant current mode when the output current exceeds the preset current limit for a period of time that exceeds the programmed trip delay value. This will cause the output voltage to drop from its programmed value. This constant current mode allows the i Series to be used for starting up loads such as electric motors that require a high inrush current for relatively long periods of time.

In constant voltage mode, the output of the i Series will trip off after a fixed period of time when the preset current limit is exceeded. An external or bus reset is required to enable the output again. The output voltage will be set to zero volt after a trip occurs. This provides protection of loads against overcurrent conditions.

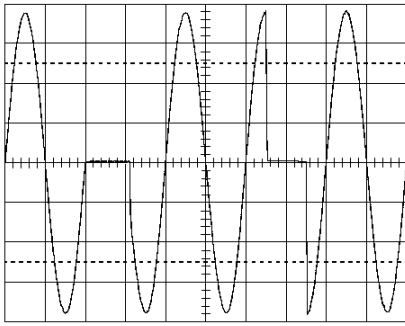
Load Regulation

Output voltage regulation is better than 1% with fast response to changes in load impedance, ensuring constant voltage levels to drive your loads.

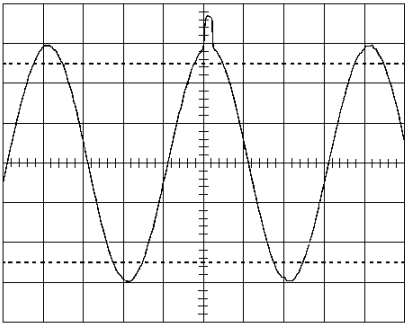
Input Protection

Protection is provided for both input overvoltage and overcurrent situations. Additionally the unit will shut off when the internal temperature exceeds a preset limit.

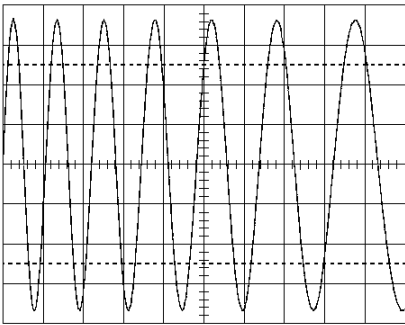
i Series - For Easy Transient Programming



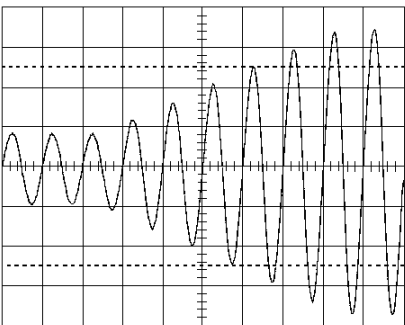
Drop transient causes output voltage to drop to zero for a user specified period. Sub cycle dropouts can be simulated without problem due to the DC coupled output stage of the 5001i



Voltage Surge transient for 2 ms programmed at 90° causes output voltage to surge



Frequency Sweep transient causes the output frequency to change at a user specified rate and phase angle.



Voltage Sweep transient causes output voltage to change at a programmed rate.

Extensive Transient Control

Using a powerful microprocessor controlled oscillator, the 5001i is capable of producing complex transients with a high degree of user programmability. Parameter entry is facilitated by a series of menus that allow the user to precisely control amplitude, frequency, slew rate, phase angle and duration. Time resolution is 1 ms with a maximum time interval of 9999 seconds. This allows the effects of fast transients, as well as long term phenomena on a unit under test, to be evaluated.

Transient Program Storage

Frequently used transients can be saved in non-volatile memory for later recall. This allows a library of commonly used transient tests to be kept available for instant recall.

Transient List Programming

To simulate common line disturbance occurrences, the 5001i offers a list of 32 transient events that can be programmed with ease from the front panel. The Transient menu offers a choice of transient events to choose from.

SCPI Protocol Programming Commands

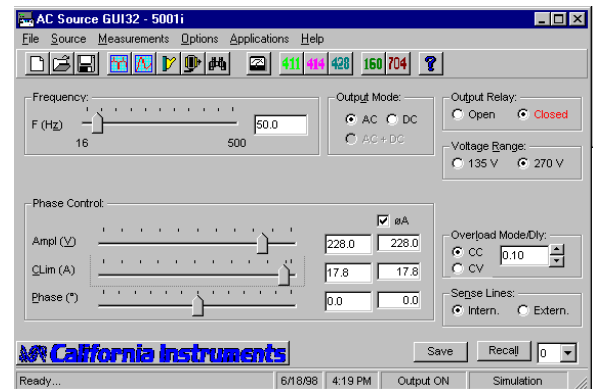
All functions of the i Series instruments are completely programmable over the IEEE-488 or RS232C bus. For example, the following tasks can be performed over the bus:

- Set voltage to any level
- Change frequency
- Generate a 1 ms dropout at any phase angle
- Turn on the output at 90° to simulate worst case inrush current conditions
- Measure peak current, rms current and real power
- Change slew rate for changing output voltage over a user specified time
- Switch between AC and DC modes
- Recall complete instrument setup from non-volatile memory with a single SCPI command
- Reset the instrument
- Adjust current limit value
- Toggle between constant current and constant voltage mode
- Switch between high and low voltage range
- Download or upload transient list programs

Application Software

Windows 3.1™ or Windows 95/98™ application software is provided for all i Series models. This easy to use graphical interface program provides complete control over all instrument functions using either the RS232C or IEEE-488 interface. With enhanced capabilities such as data logging to file and Dynamic Data Exchange to other Windows programs, many applications can be addressed without the need for writing custom code.

The same program provides functions for calibration of output and measurements, greatly facilitating in-place, closed case calibration.



i Series - For Simple Front Panel Operation

The California Instruments *i* Series LCD message display guides the user through all setup operations with clear and easy to read instructions. It also allows up to four measurement parameters to be displayed simultaneously such as Voltage, Current, Power and Apparent Power without the need to switch measurement modes.

The *i* Series features a large, smooth operating shuttle knob that can be used to set any parameter. This allows the user to slowly slew a value to its final setting or quickly sweep through an entire range.

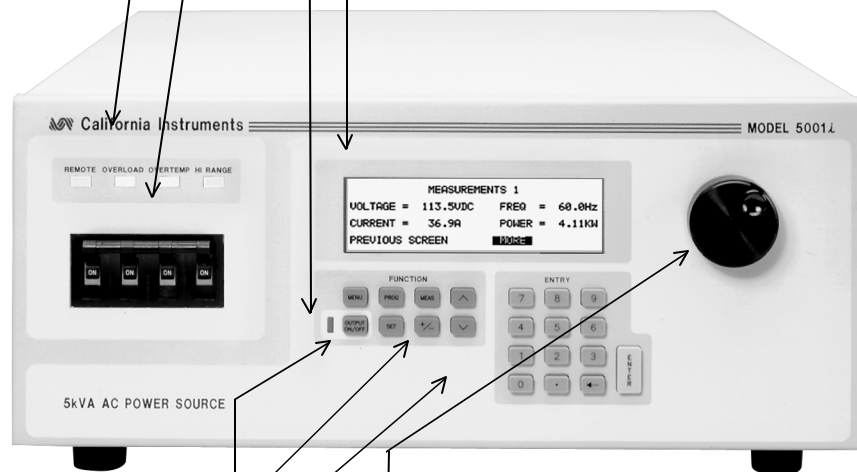
A sophisticated acceleration algorithm adjusts the step size according to speed and duration of adjustment. *SI* changes are reflected on the power source output immediately. Alternatively, using the *SET* mode of operation, the user can preset all parameters first and then update all output settings simultaneously using the *ENTER* button.

Clear Status Indicators - Large and bright status indicators inform the user of important conditions such as overload or overtemperature. A remote indicator informs the user that the unit is under remote control. The Hi Range indicator is lit any time the unit is switched to the high output range.

Trip Circuit Breaker - The prominently located three-phase breaker includes shunt trip sense operating from internal DC bus voltages. All sensitive overvoltage conditions are covered, in addition to the traditional over-current operation. Secondary contactor control circuits are eliminated, which means that you know OFF is really **OFF**

Output On/Off - The output relay can be controlled from the front panel using the On/Off button. This allows the user to disconnect the load quickly. A green status indicator always displays the status of the output relay.

Large LCD Display - A large high contrast LCD display with backlight provides easy to read guidance through all setup operations. An adjustable viewing angle makes it easy to read from all practical locations.



Shuttle Knob - The heavy mass of the shuttle knob creates a smooth flywheel-like operation which allows for precise control over all values entered.

Decimal Keypad - A conventional decimal keypad facilitates quick entry of numerical values such as voltage, current limit etc. The large blue enter key will make the value you enter effective.

Using the *SET* key allows the user to preset all parameter values and update them all at once by pressing the *ENTER* key.

Up Down Arrow Keys - A set of up and down arrow keys is used to move the cursor position in all menus. This allows quick selection of the desired function or parameter.

Function Keys - Function keys provide direct access to the most commonly used setup menus. No need to hunt through multi-levels of softkeys or menus. This greatly enhances operator speed.

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 30 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.

CE Mark

The 5001i-400V (400 V L-L input option) has been fully tested for compliance with 1996 CE Mark requirements. This allows products and systems with the -400 option to be used in the European Economic Community. Identical design and manufacturing standards are applicable to the standard 208V (L-L) input models.



Measurements

Parameter	Range	Accuracy		Resolution
Frequency	16.00 - 500.0 Hz	0.01% ± 0.01 Hz		0.01 Hz
		< 100 Hz	> 100 Hz	
Voltage	0 - 300 V	50 mV	100 mV	10 mV
Current (rms)	0 - 50 A*	50 mA	100 mA	1 mA
Peak Current	0 - 150 A*	50 mA	100 mA	1 mA
Crest Factor	0 - 6	0.05	0.05	0.01
Real Power	0 - 6 kW*	5 W	5 W	1 W
Apparent Power	0 - 6 kVA*	10 VA	20 VA	1 VA
Power Factor	0.00 - 1.00	0.05	0.05	0.01

*Note: ranges are increased for two and three unit, single phase configurations to accommodate higher current and power values. Accuracy and resolution are changed by a factor of 10.

SPECIFICATIONS:

Output

Power

Maximum 5000 VA at full scale voltage

Power Factor

0 to unity at full output VA

Steady State Current Capability

See order information chart

Operating Modes

AC or DC

Voltage Ranges

Low : 0-135 Volt
High : 0-270 Volt

Voltage Accuracy

±0.5% of F.S.

Voltage Resolution

100 mV

Load Regulation

Less than ± 1% of F.S.
up to 400 Hz

Isolation Voltage

300 Vrms output to chassis

Output Relay

Push button controlled or programmable output relay

Output impedance

7 mΩ Resistive typical
50 μH Inductive typical

AC only specifications

Frequency Range

16 Hz - 500 Hz

Frequency Resolution

0.01 Hz from 16 Hz to 80.91 Hz
0.1 Hz from 81.0 Hz to 500.0 Hz

Frequency Accuracy

0.01%

Peak Repetitive AC Current

110 A @ 135 Volt range
92 A @ 270 Volt range

Crest Factor

Up to 5:1

Current Limit

Programmable from 0 to max. current for selected range.

DC Offset

Less than 50 mV
(into resistive or symmetrical load)

Slew rate

1.8 V/μs

Output Noise

400 mV rms. @ 0-135 V range
800 mV rms. @ 0-270 V range
(from 20 kHz to 1 MHz)

Harmonic Distortion

1% max. linear load @ 50/60 Hz
2% max. linear load @ 400 Hz

DC only specifications

Slew rate

1.8 V/μs

Output Noise

< 1 % Full Scale
(from 20 kHz to 1 MHz)

System

Non volatile memory storage

16 complete instrument setups
8 transient lists, 32 events per list¹

Transient types

Voltage drop, Voltage step, Voltage sweep, Voltage sag/surge, Frequency step, Frequency sweep, Volt and Frequency sweep

¹ Sag/ Surge transients require two list entries.

Line Input

Voltage Standard

208-240 VAC \pm 10%,
(L-L, 3 Phase)
3001*i* Single phase (L-N)

Voltage Option -400

400-480 VAC \pm 10%
(L-L, 3 Phase)
(Input range must be specified
when ordering)

Line Current (per phase)

24 Amps max. @ 208-240 V
12 Amps max. @ 400-480 V

Inrush Current

< 14 A rms. / 84 A_{peak} for 200 μ s
@ 208-240 V
< 8 A rms. / 36 A_{peak} for 400 μ s
@ 400-480 V

Line Frequency: 45 - 66 Hz

Efficiency: 82% typical

Power Factor: 0.9 typical

Hold-up Time: At least 10 ms

Isolation

2200 VAC input to output
1350 VAC input to chassis

Remote Control

IEEE-488.2 Interface

IEEE-488.2 (GPIB) talker listener.
Subset:
SH1, AH1, T6, L3, SR1, RL2, DC1, DT1

RS232C Interface

Bi-directional serial interface.
9 pin D-shell connector
Handshake: CTS,RTS
Databits: 7,8
Stopbits: 1,2
Baud rate: 1200, 2400, 4800, 9600
Supplied with RS232C cable

Code and Format

SCPI

Response times

Remote command response time typically
10 msec.

Protection

Constant Current Mode

Programmable delay
Range: 100 ms to 5 s
Automatic recovery

Constant voltage mode

Programmable trip delay
Range: 100 ms to 5 s
After trip delay, output relay is opened
and voltage set to 0 V

Input Overcurrent

Front-panel circuit breaker trips

Input Overvoltage

Front-panel circuit breaker trips

Over Temperature

Automatic shutdown and recovery

Designed to Meet :

UL3111, EN58001, EN58002,
EN61010 (CE-Mark equivalent), CSA22.2

Model	Output Power	Output Phases	Max. current per phase				Input Voltage 3 ϕ
			135 V range		270 V range		
			AC	DC	AC	DC	
3001 <i>i</i>	3 kVA	1	22	11	11	5.5	208-240V L-N
5001 <i>i</i>	5 kVA	1	37	18.5	18.5	9.3	208-240V L-L
5001 <i>i</i> -400	5 kVA	1	37	18.5	18.5	9.3	400-480V L-L
10001 <i>i</i> ¹	10 kVA	1	74	37	37	18.5	208-240V L-L
10001 <i>i</i> -400 ¹	10 kVA	1	74	37	37	18.5	400-480V L-L
15001 <i>i</i> ¹	15 kVA	1	111	55.5	55.5	27.8	208-240V L-L
15001 <i>i</i> -400 ¹	15 kVA	1	111	55.5	55.5	27.8	400-480V L-L
15003 <i>i</i> ²	15 kVA	3	37	18.5	18.5	9.3	208-240V L-L
15003 <i>i</i> -400 ²	15 kVA	3	37	18.5	18.5	9.3	400-480V L-L

Note (1): Supplied with System Interface cable(s). Controller in master unit only.

Note (2): Supplied with Clock and Lock cables. One controller per phase.

Physical

Dimensions per 5001*i* unit

Height : 7" (178 mm)
Width : 19" (483 mm)
Depth : 24" (610 mm)
(Depth includes rear panel
connectors)

Weight

61 lbs / 28 Kg net per 5001*i* unit

Vibration and Shock

Designed to meet NSTA standards

Air Intake/Exhaust

Forced air cooling, side air intake,
rear exhaust

Operating Temperature

0 to 40° C

Storage Temperature

-20 to +70° C

Acoustic Noise at 1 meters

65 dbA max. below 50% of full load
75 dbA max. above 50% of full load

Connectors

- Three phase AC Input terminal block with cover
- Single phase AC output terminal block with cover
- IEEE-488.2 (GPIB) connector
- 9 pin D-Shell RS232C connector
- CI Unit Interface connector*
- Clock and Lock BNC (2) connectors
- Remote voltage sense terminal block
(*Mating connector supplied)

Ordering Information

Model

Refer to table shown for model
numbers and configurations.

Supplied with

User Manual, RS232C serial cable

Factory Installed Options

-OMNI-1-18i	Impedance matching network for single phase IEC-1000-3-3 flicker tests.
-OMNI-3-18i	Impedance matching network for three phase IEC-1000-3-3 flicker tests.
-704	Mil Std 704D test firmware
-160	RTCA/DO-160C test firmware
-411	IEC 1000-4-11 test firmware
-APE	Abbreviated Plain English bus command language. (backward compatible with older CI AC sources.
-HDK	Front panel Handle Kit
-RMK	Rack Mount Kit (includes handles)
-RMS.	Rackmount Slides

Customer Support

For technical support and service, or to discuss your AC power application needs, contact California Instruments Corp. at (858) 677-9040 or your local representative.

Ordering Information

TERMS: Net 30 days

DELIVERY: 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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