Manual Control of AC Power

Provide Simple Manual Control with Pacific Power UMC-31 Manual Controller

The UMC-31 provides operational control and high quality oscillator signals for both single and three phase Power Sources.

- Obtain precision frequency and phase conversion for manufacturing and test.
- Provide high quality, general purpose lab power where test versatility is required.
- Achieve low cost and power form flexibility for power supply tests.

Phase   Select single, split or three phase operation by internal jumper. Phase angles are fixed at 120° and 240° for three phase operation.

Frequency   Select 50, 60 or 400 Hz fixed or a variable frequency mode of 45 to 500 Hz.

Voltage   0–Vmax via 10-turn potentiometer on the front panel.

Metering   Autoranging Volts, Amps, and Frequency.

Simplify and Automate

UPC Studio makes it easy and convenient to take full advantage of the advanced features installed in your Pacific AC Power Source. Whether it's a quick test at a new voltage, frequency or waveform using your 3060-MS, or the application of a new power line disturbance test using your AMX Series-based test system, UPC Studio is the answer.

Browse Output Sequences

UPC Studio's Output Sequence Browser provides the ability to easily view and transfer annotated Output Sequences (programs) between the UPC Controller and the host computer.

Easy-To-Use UPC Studio Control Panel
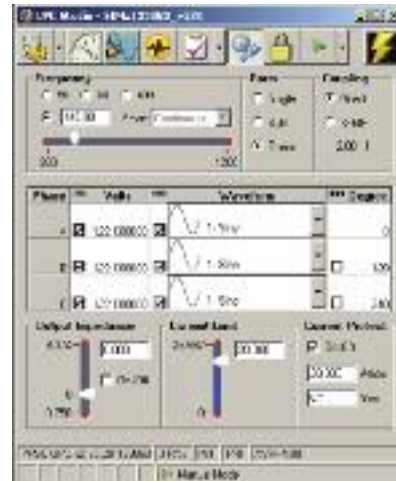
UPC Studio provides quick and easy control over the basic functions of a Pacific Power AC Power Source. Presets for 50, 60 and 400 Hz are provided for most common applications. Form, Coupling, Current Limit, Voltage and Waveforms are all easily accessed from this single easy-to-use soft panel.

The Leader in Power Technology

As a privately held, leading manufacturer of high-quality AC Power Conversion Equipment, Pacific Power Source, Inc. offers standard catalog products that range in power from 500 VA to >625 kVA. Low-power products include line conditioners, frequency converters and Programmable AC Power Sources. High-power systems include programmable power test equipment, power line conditioners, frequency converters and uninterruptible AC Power Sources.

Founded in 1971, the Irvine, California, company was an early pioneer in the development of linear solid-state power conversion for use in high-reliability applications. The company now manufactures both advanced linear and broadband switching types of AC Power Sources.

For Application Engineering Assistance

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Consult your local PPS Representative

AMX Series
Precision AC Test Power
Single and Three Phase Linear AC Power Sources

Models from 500 VA to 12,000 VA
Parallelable to 30 kVA

The Power of Expertise

PACIFIC POWER SOURCE®

www.pacificpower.com

Take Control of Your AC Test Power

The AMX Series is a family of High Performance Linear AC Power Sources covering the power range of 500 VA to 12 kVA. The product line offers both single and three phase models. Units are conservatively designed and rated output power is based on the most severe combination of input line, output voltage, power factor and temperature. This approach to product design allows the AMX Series to excel when delivering the high peak load currents demanded in the AC test environment. Great emphasis has been placed on low acoustic noise, ease of installation and maximum power per cubic inch of rack space. Control and operating features provide a high degree of application versatility and ease of use for the test engineer. Applications range from simple, manually controlled frequency conversion to harmonic testing and sophisticated bus programmable transient simulation.

Pacific Model 308AMX with UPC Controller

An exceptionally broad bandwidth (50 kHz small signal) combined with peak/RMS current of 4-6:1 give the AMX Series the ability to produce high quality, low distortion output power into the most dynamic loads.

Design Provides Total Control of AC Power

- *All AMX Series Power Source models may be equipped with either a programmable Oscillator/Controller (UPC type) or a manually controlled Oscillator (UMC type).*

- *Single phase power source models may be controlled to operate on either a 0–135 VAC range or a 0–270 VAC range. Some models can operate to 150/300 Volts. Three phase models are switchable to 3Ø/2Ø/1Ø output power form.*

- *Total control of the output power form and the selection of either the direct output or the optional transformer output is available from the front panel or by computer interface.*

- *All operating functions may be controlled from either the front panel or from a remote RS-232 or IEEE-488.2/ SCPI interface. LabVIEW for Windows® and LabWindows® Instrument Drivers are provided.*

Key Features Provide Application Versatility

- *IEEE-488.2 or RS-232C with SCPI compatibility.*
- *LabVIEW for Windows®/LabWindows® drivers.*
- *Waveform Creation by Harmonic Synthesis Option.*
- *Graphical Analysis (Voltage and Current).*
- *Harmonic Analysis (Voltage and Current) Option.*
- *Metering of RMS and Peak Values.*
- *Continuous Self Calibration (CSC).*
- *Line Sync Option.*
- *6:1 Peak Current Capability.*
- *Low Impedance for IEC555 Testing.*
- *Programmable Output Impedance Option.*
- *Up to 0–300 VAC Direct Coupled Output.*
- *1 Phase / 3 Phase Switch Selectable Output.*
- *20–5,000 Hz Full Power Bandwidth.*
- *Power Levels from 500 VA to 12 kVA.*
- *Externally Referenced Meter Calibration.*
- *CE or ETL Mark Available.*

Special AMX Series Operating Features

Continuous Self Calibration
Provides for exceptional accuracy of the AC output voltage. When enabled, accuracy improves to ±0.03% referenced to the power source internal voltmeter.

Programmable Dynamic Output Impedance (Optional)
Provides positive or negative output impedance. The output voltage waveform at the right is flattened as a result of a high peak load current drawn by an electronic load at the peak of the sine wave.

Engaging the output impedance (Z°) feature dynamically compensates, as shown at the right, for the distribution or transformer losses up to ±10% of the output voltage.

Waveform Library
Up to 99 different waveforms may be stored in the waveform library for execution as part of a steady state test program or for substitution in any output phase as part of a transient test program. Memory location #1 is a non-editable high resolution sine wave. Locations 2–16 are editable and may be substituted in any output phase. Locations 19–99 are factory stored, non editable waveforms that may be copied to 2–16 for editing and execution.

Waveform Edit
Provides the ability to modify a stored waveform by specifying the waveform amplitude desired at each specific phase angle. This method can be used to quickly create spikes, dropouts, notches and other sub-cycle wave conditions. The resulting modified waveform can be stored for execution.

Waveform Analysis (Optional)
Provides a numeric display of the harmonic structure of a voltage or current waveform. The waveform is sampled at 512 samples per cycle using a 12-bit A/D converter. The resulting high fidelity waveform is analyzed for its harmonic structure up through the 51ST harmonic. Data presented includes the magnitude of each harmonic in percent, the total harmonic distortion, and the odd and even harmonic distortion in percent.

Waveform Synthesis (Optional)
Provides the ability to quickly create virtually any AC Test Waveform that may be required by building it out of harmonics. The process is as simple as keying in the harmonic multiple, the amplitude, and the phase angle for each desired harmonic up through the 51ST. If desired, waveforms may also be created in the time domain by making entries from the front panel or by downloading from a host PC.

Time-Based Transients
Provide the ability to create and execute, on command, transients that occur linearly over a specified time segment to modify output voltage or frequency.

Cycle-Based Transients
Provide the ability to create and execute, on command, transients that substitute a selected waveform in the output for 1 to 100 cycles. The waveform being substituted can be selected and/or modified from the waveform library. Substitution is for an integer number of cycles, regardless of frequency.
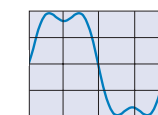

Oscillograph of voltage and current waveform at load due to distribution losses. THD=6.6%
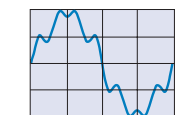

Same conditions as above with programmable Z engaged. THD=0.25%
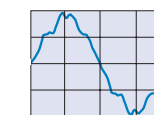
THD=8.7%   THD=22.2%   THD=18.1%

```
EDIT WAVEFORM: NUMBER=16   RANGE=2-16
STARTING PHASE ANGLE=0     0-359.5°
ENDING PHASE ANGLE=0       0-359.5°
VOLTAGE IN PERCENT=-100    (+/-)0-100%
```

WAVEFORM EDIT
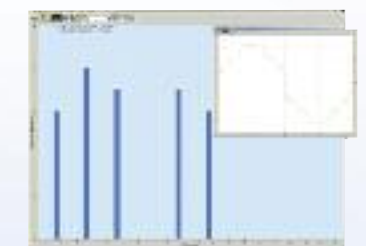
HARMONIC CONTENT OF METERED WAVEFORM

```
WAVEFORM SYNTHESIS:  WAVEFORM #2
HARMONIC:     2nd    3rd    4th    5th    6th
CONTENT:      .1%    0%     0%     0%     0%
ØANGLE:       0°     0°     0°     0°     0°
```

WAVEFORM SYNTHESIS

TIME-BASED TRANSIENTS

CYCLE-BASED TRANSIENTS

Metering

```
V/I METER:                ENTRY: 120.0
FREQ=60.00  Va=120.0  Vb=120.0   Vc=120.0
SENSE=INT   Vab=208.0 Vbc=208.0 Vca=208.0
MANUAL MODE  Ia=06.00  Ib=06.22  Ic=06.15
```

```
POWER METER:   PHASE A   PHASE B   PHASE C
KVA              0.720     0.746     0.738
KW               0.720     0.746     0.738
PF               1.000     1.000     1.000
```

```
AMPS METER:    PHASE A   PHASE B   PHASE C
RMS              0.720     0.746     0.738
PEAK             1.044     1.119     1.383
CREST FACTOR     1.45      1.50      1.90
```
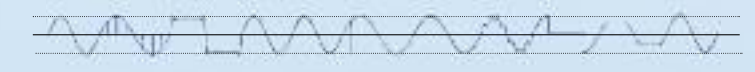
Waveform Control/Analysis

```
EDIT WAVEFORM: NUMBER=16      RANGE=2-16
STARTING PHASE ANGLE=0        0-359.5°
ENDING PHASE ANGLE=0          0-359.5°
VOLTAGE IN PERCENT=-100       (+/-)0-100%
```

```
WAVEFORM SYNTHESIS:  WAVEFORM #2
HARMONIC:   2nd    3rd   4th   5th   6th
CONTENT:    .1%    0%    0%    0%    0%
ØANGLE:     0°     0°    0°    0°    0°
```

```
ØA CURRENT THD=17.8 % OHD=17.8 EHD=0.3%
HARMONIC:   2nd    3rd    4th   5th   6th
CONTENT:    .1%    17.8%  0%    0%    0%
ØANGLE:     0°     0°     0°    0°    0°
```

Total Control, Metering, and Analysis of AC Power. Simple, Intuitive Operation.

Informative 160 Character LCD Display
- Soft green backlight.
- Adjustable.

Parameter Select Keys
Select phase voltages and operating frequency when manual control is desired. The selected parameter is indicated by the LCD display. The clear key erases entries and keeps erasing with repeated pressing until the basic V/I screen is displayed.
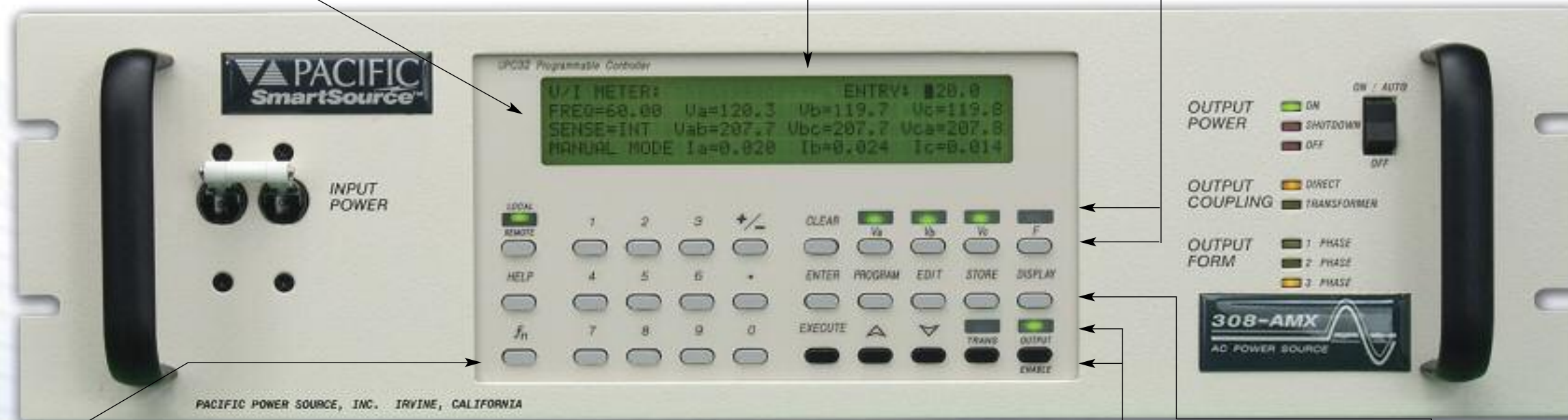
Function Key
Provides Access to Special Functions

```
SETUP:  PRESS   1 FOR PROGRAM SETUP
                2 FOR WAVEFORM SETUP
                3 FOR GENERAL SETUP
                4 FOR CALIBRATION MENU
```

Program Setup
- Copy a program.
- Delete a program.
- Erase all memory, reset CPU.

Waveform Setup
- Edit a waveform.
- Copy a waveform.
- Waveform synthesis.

General Setup
- UPC setup.
- LCD setup.
- UPC status.
- Power source status.
- Range control.
- Slew rate setup.

Calibration Menu
- Execute externally referenced calibration.
- View calibration constants.

Special Functions Accessed Through UPC Setup Menu

- **Sense** Establishes either local or remote sense for metering and CSC.
- **CSC** Continuous self calibration – provides for exceptional voltage accuracy.
- **Program Z** Programmable output impedance dynamically compensates for output transformer or line distribution losses. Can simulate a soft power grid.
- **Transition Time** Permits control of the transition time when changing the output voltage and frequency.
- **Frequency Limits** Sets min and max programmable frequency limits.
- **Voltage Limits** Sets min and max programmable voltage limits.

Execute Key
Instantly executes a stored program that has been selected with the program key.

Slew Keys
Smoothly change the designated voltage or frequency parameters. Rates are separately programmable.

Transient (Trans) Key
Turns time based or cycle based transients On or Off. Indicator is On when transient is executed.

Output Enable Key
Turns the output contactor of the power source On or Off. Indicator is On when the contactor is closed.

Enter Key
Stores new parameter data that has been keyed in.

Program Key
Selects 1 of 99 programs for edit or execution.

Edit Key
Selects the program edit mode and prompts for new entry.

Store Key
Stores a program upon completion of editing.

Display Key
Sequences through each metering screen:
- V/I Meter.
- Power Meter.
- AMPS Meter.
- Waveform Analysis (option).

AMX Power Source Models

MODEL	RATED POWER (VA)	MAX POWER (VA)	OUTPUT FORM (Note 2)	OUTPUT VOLTS-MAX (V$_{RMS}$) (Note 3)	OUTPUT AMPS (A$_{RMS}$) (Note 4)	OUTPUT AMPS (A$_{PEAK}$)	INPUT POWER FORM (Note 5)	PANEL HEIGHT (IN. + U)	WEIGHT (LBS.)
105AMX	500	800	1Ø	135/270	4/2	40/20	1Ø	5¼-3U	65
108AMX	750	1200	1Ø	135/270	6/3	40/20	1Ø	5¼-3U	65
112AMX	1200	1400	1Ø	150/300	10/5	40/20	1Ø	5¼-3U	65
125AMX	2500	3900	1Ø	150/300	20/10	90/45	3Ø	10½-6U	110
140AMX	4000	6400	1Ø	135/270	32/16	140/70	3Ø	14-8U	170
305AMX	500	950	3Ø	135/270 135 (L-N)	4/2 1.5/Ø	45/15 15/Ø	1Ø	5¼-3U	65
308AMX	750	1200	3Ø	135/270 135 (L-N)	6/2 2/Ø	45/15 15/Ø	1Ø	5¼-3U	65
312AMX	1200	1450	3Ø	150/300 150 (L-N)	10/3.3 3.3/Ø	45/15 15/Ø	1Ø	5¼-3U	70
320AMX	2000	3000	3Ø	135/270 135 (L-N)	18/6 6/Ø	60/20 20/Ø	3Ø	8¾-5U	100
345AMX	4500	7250	3Ø	135/270 135 (L-N)	36/12 12/Ø	165/55 55/Ø	3Ø	14-8U	175
360AMX	6000	9700	3Ø	135/270 135 (L-N)	48/16 16/Ø	210/70 70/Ø	3Ø	14-8U	185
390AMX	9000	14500	3Ø	135/270 135 (L-N)	72/24 24/Ø	330/110 110/Ø	3Ø	28-16U (2 each × 14')	175 × 2
3120AMX	12000	19400	3Ø	135/270 135 (L-N)	96/32 32/Ø	420/140 140/Ø	3Ø	28-16U (2 each × 14')	185 × 2

M5283 describes a multi-cabinet AC Power Source which can be expanded up to five cabinets. Addition or deletion of cabinets is easily performed by the user in the field. The standard AMX-Series features, such as automatic output form selection, extensive output metering and dual range capabilities remain intact. The system may also be specified with Programmable Output Impedance, Harmonic Analysis/Synthesis, and most other AMX-Series options when outfitted with the UPC-32 Controller.

M5283 Field Parallelable Models

Switch Selectable Master/Slave Models	Dedicated Slave Models	Unit Rated Power	Output Form	Maximum Rated System Power
140AMX-UPC12/M5283	140AMX/M5283/M5304	4 kVA	1	20 kVA
160AMX-UPC12/M5283	160AMX/M5283/M5304	6 kVA	1	30 kVA
345AMX-UPC32/M5283	345AMX/M5283/M5304	4.5 kVA	3	22.5 kVA
360AMX-UPC32/M5283	360AMX/M5283/M5304	6 kVA	3	30 kVA

1. M5283 allows paralleling of up to five like models to form a single High Power AC Test Power System.
2. System may consist of one master unit and any combination of four additional master/slave selectable or dedicated slave units. One master unit with UPC Oscillator required per system.
3. Specify "AMXT" versions when dual range option required.
4. Manual versions available, consult factory.

Notes:
1. Rated output power is based on a combination of output voltage, current and load power factor. Values stated represent the maximum capabilities of a given model. Consult factory for assistance in determining specific unit capabilities as they might apply to your application.
2. All single phase units are operable with dual voltage ranges as listed. All three phase units are operable as single phase with dual voltage range capability or as three phase. Output voltage ranges and 1Ø/3Ø conversions are selected by front panel or bus command.
3. Output voltage ranges listed are for standard units. VMAX is achievable with nominal input voltage at full load. Other voltage ranges are available with the output magnetics option.
4. Current ratings at 125 VRMS output. Current may vary with power factor.
5. Input power frequency is 47–63 Hz. Single Phase: 100, 110, 120, 200, 208, 220, 230, 240, VAC ±10%. Three phase: 208, 220, 240, 380, 400, 416 VAC ±10% (480 VAC option available).
6. Single phase and 400 Hz input options available. Consult Factory.

Power Source Specifications

(V$_{out}$ > 25% F.S.)

Output Frequency	20 to 5,000 Hz Full Power.
Line Regulation	0.1% max for a 10% line change.
Load Regulation (Direct Coupled)	0.25% 20 to 2,000 Hz. 0.5% 2,000 to 5,000 Hz. Can be improved to less than 0.03% with CSC engaged.
Output Distortion	0.1% THD$_{avg}$ from 45 to 1,000 Hz. 0.25% THD$_{avg}$ from 1,000 to 5,000 Hz.
Ripple and Noise	−72 dB.
Response Time	5μsec typical to a step load change. Small signal bandwidth is 5 Hz to 50 kHz, typical.

Mechanical Specifications

All models are designed for operation in 19-inch equipment racks. Models above 1,800 VA have side handles for ease of handling.

Mounting	Standard 19-inch rack. Slide rails are available as an option for all models.
Height	See model table above for panel height.
Depth	Will not exceed 24 inches from the front panel to the rear of the chassis.
Cooling	Forced air, front or side intakes, rear exhaust with auto fan-speed control for low acoustic noise operation.

AMX Series Power sources can be equipped with output transformers to provide an alternate output voltage range. Selection of direct or transformer coupled range is performed by the controller via front panel or bus command. The standard frequency range for transformer coupled outputs is 45 to 5000 Hz. Standard output ratios are 1.5:1, 2.0:1, and 2.5:1. Transformer outputs are supplied internally or externally via a Magnetics Module. Consult the factory for additional information regarding special output ranges not listed.

UPC Controller Specifications

The UPC controller is essentially a 3 phase AC arbitrary waveform generator and Precision AC metering system. Each waveform stored in the UPC is encoded with 12-bit amplitude and 10-bit time resolution for each cycle. The waveform for each phase may be independently selected and may be independently varied in amplitude and phase angle with respect to phase A.

The UPC output metering samples the output volts and amps at 512 samples per measurement using a 12-bit A/D converter. This technique provides exceptional metering accuracy and resolution (20 bits), and delivers a high-fidelity waveform back to a host computer for analysis.

The UPC includes a remote GPIB interface compatible with IEEE-488.2 and SCPI. An available option is an RS-232 serial port that operates up to 38.4 kBaud.

Frequency	20.00 to 5,000 Hz ± 0.01%.
Voltage Direct	Programmable, 0–V$_{MAX}$, in 0.1 volt steps (see table on page 6).
Voltage Transformer	Multi-range units are equipped with output transformers. When alternate range is selected, voltage at transformer output is programmable in steps of 0.5 volts.
Accuracy Command Voltages	Executed voltage is within ±50 mV (0.03%) of command voltage, referenced to the internal voltmeter with CSC engaged.
Accuracy Command Frequency	±0.01%, 20–5,000 Hz.
Output Z$_o$ (Optional)	Dynamic output impedance (Z$_o$) is programmable, 0 to ±Z$_o$ max., in 0.1% steps. Z$_o$ value in milliohms varies with different models but usually results in a ±10% change in output voltage at maximum load amps.
Phase Angle	Phase Angle (Ø) of Phases B and C relative to Phase A is programmable from 0°–359° in 1° increments ±0.5°.
Current Limit	Current limit is programmable from 0 to I$_{PEAK}$ maximum of the power source. Accuracy is ±1% F. S., resolution ±0.05%.
Library Steady State Programs	Stores up to 99 steady state parameter sets consisting of waveform, voltage, frequency, angle and current limit. Can be executed by program number from the front panel or the bus.
Library Transient Programs	Stores up to 99 transient programs – one associated with each steady state program. Allows for changes in volts and frequency vs. time, or waveform changes by cycle count.
Library Waveform	Stores up to 99 waveforms that can be edited and executed in any manner and in any output phase.

Voltmeter	Range	0–354 V L-N. 0–708 V L-L.
	Resolution	0.10V$_{AC}$ to front panel. 0.001V$_{AC}$ to remote interface.
	Accuracy	±0.25% of reading ±0.1% of range (50–500 Hz).
Ammeter	Range Resolution	300% of system current rating. 0.01A$_{AC}$ to front panel. 0.001A$_{AC}$ to remote interface.
	Accuracy	±0.25% of reading ±0.1% of range (50–500 Hz).
Power Meter	Range Resolution	Based on ammeter range. 1.0 watts or VA to front panel. 0.001 Watts or VA to remote interface.
	Accuracy	±1% of Full Scale.
Power Factor & Crest Factor		Calculated and displayed to three significant digits.
Ext. Input		Each phase is algebraically summed with UPC waveform and amplified 25× to the direct output.
Amplitude Mod. Input		±10 V input for each phase. modulates the output ±100%.
Sync Outputs		1) Zero crossing, Phase A. 2) Transient start-stop. 3) True when Transient is enabled. 4) Clock – 1024 times the output freq.
Command Response Time		Average time to start of parameter change from bus command (end of string character) is 50 ms. Ramp transition time to final value is settable from 250 μs to 300 sec.
Waveform Synthesis		Permits waveform creation by entering percent amplitude and phase angle for the 2nd through the 51ST harmonics.
Waveform Analysis		Reports voltage and current waveform harmonic content in percent and phase angle for the 2nd through the 51ST harmonics. Displays THD, OHD, EHD in percent.