European Standards Tester

OPERATION MANUAL

Models:

EST1750-1	EST3700-1	EST5250-1
EST1750-2	EST3700-2	EST5250-2
EST1750-3	EST3700-3	EST5250-3
EST1750-4	EST3700-4	EST5250-4

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ELGAR ONE-YEAR WARRANTY

Elgar Electronics Corporation (hereinafter referred to as Elgar) warrants its products to be free from defects in material and workmanship. This warranty is effective for one year from the date of shipment of the product to the original purchaser. Liability of Elgar under this warranty shall exist provided that:

- the Buyer exposes the product to normal use and service and provides normal maintenance on the product;
- Elgar is promptly notified of defects by the Buyer and that notification occurs within the warranty period;
- the Buyer receives a Return Material Authorization (RMA) number from Elgar's Repair Department prior to the return of the product to Elgar for repair, phone 800-73-ELGAR (800-733-5427), ext. 2295;
- the Buyer returns the defective product in the original, or equivalent, shipping container;
- if, upon examination of such product by Elgar it is disclosed that, in fact, a defect in materials and/or workmanship does exist, that the defect in the product was not caused by improper conditions, misuse, or negligence; and,
- that Elgar QA seal and nameplates have not been altered or removed and the equipment has not been repaired or modified by anyone other than Elgar authorized personnel.

This warranty is exclusive and in lieu of all other warranties, expressed or implied, including, but not limited to, implied warranties of merchantability and fitness of the product to a particular purpose. Elgar, its agents, or representatives shall in no circumstance be liable for any direct, indirect, special, penal, or consequential loss or damage of any nature resulting from the malfunction of the product. Remedies under this warranty are expressly limited to repair or replacement of the product.

CONDITIONS OF WARRANTY

- To return a defective product, contact an Elgar representative or the Elgar factory for an RMA number. Unauthorized returns will not be accepted and will be returned at the shipper's expense.
- For Elgar products found to be defective within thirty days of receipt by the original purchaser, Elgar will absorb all ground freight charges for the repair. Products found defective within the warranty period, but beyond the initial thirty-day period, should be returned prepaid to Elgar for repair. Elgar will repair the unit and return it by ground freight pre-paid.
- Normal warranty service is performed at Elgar during the weekday hours of 7:30 am to 4:30 pm Pacific time. Warranty repair work requested to be accomplished outside of normal working hours will be subject to Elgar non-warranty service rates.
- Warranty field service is available on an emergency basis. Travel expenses (travel time, per diem expense, and related air fare) are the responsibility of the Buyer. A Buyer purchase order is required by Elgar prior to scheduling.
- A returned product found, upon inspection by Elgar, to be in specification is subject to an inspection fee and applicable freight charges.
- Equipment purchased in the United States carries only a United States warranty for which repair must be accomplished at the Elgar factory.

ELGAR

Committed to Quality...Striving for Excellence

SAFETY NOTICE

Before applying power to the system, verify that the EST system is configured properly for the user's particular application.

WARNING!

HAZARDOUS VOLTAGES IN EXCESS OF 280 VRMS, 600V PEAK MAY BE PRESENT WHEN COVERS ARE REMOVED. QUALIFIED PERSONNEL MUST USE EXTREME CAUTION WHEN SERVICING THIS EQUIPMENT. CIRCUIT BOARDS, TEST POINTS, AND OUTPUT VOLTAGES MAY BE FLOATING ABOVE (BELOW) CHASSIS GROUND.

Installation and service must be performed by qualified personnel who are aware of dealing with attendant hazards. This includes such simple tasks as fuse verification.

Ensure that the AC power line ground is connected properly to the EST system input connector or chassis. Similarly, other power ground lines including those to application and maintenance equipment must be grounded properly for both personnel and equipment safety.

Always ensure that facility AC input power is de-energized prior to connecting or disconnecting the input/output power cables.

During normal operation, the operator does not have access to hazardous voltages within the chassis. However, depending on the user's application configuration, HIGH VOLTAGES HAZARDOUS TO HUMAN SAFETY may be generated normally on the output terminals. Ensure that the output power lines are labeled properly as to the safety hazards and that any inadvertent contact with hazardous voltages is eliminated. To guard against risk of electrical shock during open cover checks, do not touch any portion of the electrical circuits. Even when the power is off, capacitors can retain an electrical charge. Use safety glasses during open cover checks to avoid personal injury by any sudden failure of a component.

Due to filtering, the unit has high leakage current to the chassis. Therefore, it is essential to operate this unit with a safety ground.

Some circuits are live even with the front panel switch turned off. Service, fuse verification, and connection of wiring to the chassis must be accomplished no less than five minutes after power has been removed via external means. All circuits and/or terminals to be touched must be safety grounded to the chassis.

After the unit has been operating for some time, the metal near the rear of the unit may be hot enough to cause injury. Let the unit cool before handling.

Qualified service personnel need to be aware that some heat sinks are not at ground, but at high potential.

CAUTION!

380V 3-PHASE INPUT POWER SYSTEMS (4 WIRE) MUST HAVE A NEUTRAL CONNECTION. THE NEUTRAL MUST NOT BE SWITCHED. APPLY NEUTRAL BEFORE PHASE VOLTAGE OR SERIOUS DAMAGE TO THE EQUIPMENT MAY RESULT.

For safe operation, it is required that output power neutral be connected to chassis ground. The EST system is shipped with a ground wire between power neutral and chassis ground.

SAFETY SYMBOLS

CAUTION
Risk of Electrical Shock

CAUTION
Refer to Accompanying Documents

Off (Supply)

Standby (Supply)

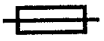
On (Supply)

Protective Conductor Terminal

Direct Current (DC)

Alternating Current (AC)

Three–Phase Alternating Current



Fuse

Earth (Ground) Terminal

CONTENTS

SECTION 3 – OPERATION

1 GENERAL DESCRIPTION

The Elgar European Standards Tester (EST) automates electrical standards testing. The integrated EST system includes the following:

- SmartWave SWAE AC Power Source with programmable low and standard reference impedance, 1750VA, 3700VA or 5250VA single phase output power
- PA1000 Analyzer for harmonics and flicker analysis
- User interface software with comprehensive diagnostics, displays, and a report generator. The program is compatible with Windows applications in any Windows 95 or Windows NT environment.

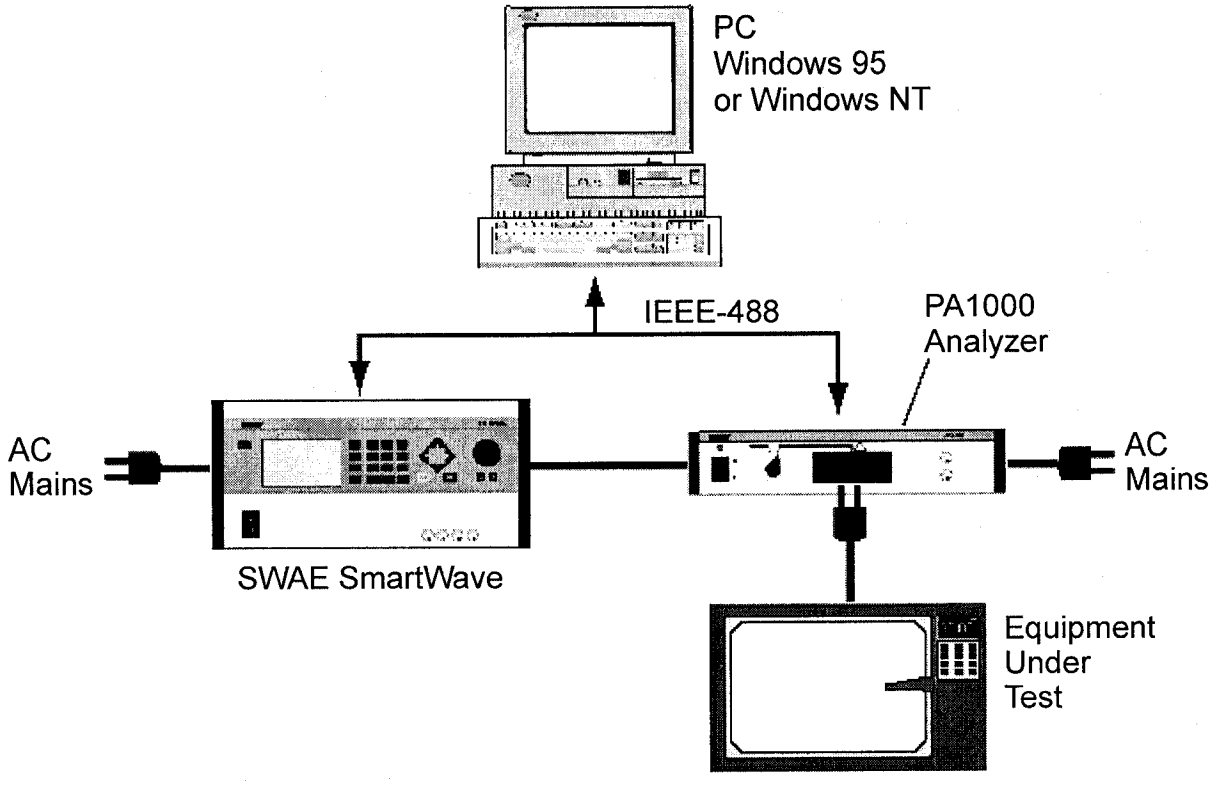


Figure 1-1 EST System Interconnect Block Diagram

The EST system is available in the following models and options:

Model Number	Power Range	AC Input
EST1750–1	0–1750VA	187–264 VAC (L–L), 3–wire
EST1750–2	0–1750VA	342–457 VAC (L–L), 4–wire
EST1750–3	0–1750VA	187–264 VAC (L–L), 3–wire, PFC
EST1750–4	0–1750VA	342–457 VAC (L–L), 4–wire, PFC
EST5250–1	0–5250VA	187–264 VAC (L–L), 3–wire
EST5250–2	0–5250VA	342–457 VAC (L–L), 4–wire
EST5250–3	0–5250VA	187–264 VAC (L–L), 3–wire, PFC
EST5250–4	0–5250VA	342–457 VAC (L–L), 4–wire, PFC
EST3700–1	0–3700VA	187–264 VAC (L–L), 3–wire,
EST3700–2	0–3700VA	342–457 VAC (L–L), 4–wire
EST3700–3	0–3700VA	187–264 VAC (L–L), 3–wire, PFC
EST3700–4	0–3700VA	342–457 VAC (L–L), 4–wire, PFC

Input Power Options
–1 = Rectifier USA –2 = Rectifier Intl –3 = PFC USA –4 = PFC Intl

1.1 SWAE

Utilizing the latest in switch mode technology and transformerless design, the SWAE's direct coupled amplifiers can create phase controlled spikes, sags, surges, drop-out, ramps, and user created arbitrary waveforms. Features include:

- Selectable output impedance for IEC1000-3-2 and IEC1000-3-3 testing
- Programmable voltage, frequency, current limit and waveform sequencing
- Single phase 1750VA, 3700VA or 5250VA (1495, 3680 or 4485VA at 230VRMS)
- Embedded interharmonic waveform generator for IEC 1000-4-13 testing.

1.1.1 Input Power Specifications (SWAE)

Input Power Ranges: Factory configured 187 to 264 VRMS, 3N L-L (3 wire), or 342 to 457 VRMS, 3N L-L (4 wire). A chassis ground is also required for safety.

Input Power Factor: .6 with USA rectifier; .35 with INTL rectifier; .99 with input PFC option.

Input Frequency Range: 47 to 63 Hz.

Efficiency: 70%, minimum, at full load.

Ride Through: 3 msec, minimum; 10 msec, minimum, with PFC option.

Input Current: Maximum currents are provided in Tables 2-7 and 2-8.

Initial Turn-on Current Surge: Limited to less than peak value listed in Tables 2-7 and 2-8.

1.1.2 Output Specifications (SWAE)

Power Factor of Load: 0 lagging to 0 leading.

AC Output Voltage: 0 to 156 VRMS L-N range 1; 0 to 312 VRMS L-N range 2.

Output Current Per Phase: 13A to 135V in 156V range; 6.5A to 270V in 312V range (1750 VA maximum).
For SW3700 Only: 16A to 115V in 156V range; 8A to 230V in 312V range (1850 VA maximum).

Crest Factor: 4.0 (peak output current to RMS output current).

Output Frequency: DC, or 40 to 500 Hz (sine).

Output Power: 1750 VA or 1850 VA, maximum, per phase.

Total Harmonic Distortion (Full Linear Load or No Load): 0.25% maximum, 40 to 100 Hz; 0.5% maximum to 500 Hz. Typical: Less than 0.1% at 50 Hz.

AC Noise Level: >60 dB RMS below full output (sine wave, 40 to 500 Hz).

Amplitude Stability With Remote Sense: ±0.1% of full scale over 24 hours at constant line, load and temperature.

Load Regulation: ±0.025% of full scale voltage for a full resistive load to no load.

Line Regulation (DC, or 40 to 500 Hz): ±0.025% of full scale for a ±10% input line change.

Voltage Accuracy (No Load, IEC Test Mode): ±0.1% of range. Add ±0.1% of full scale for "AC PLUS DC" mode. Valid for 5 to 156 VRMS and 10 to 312 VRMS at 25°C (77°F), sense leads connected. Temperature coefficient less than 50 ppm/°C.

Voltage Resolution: 0.05% of full scale.

Frequency Resolution: 0.01 Hz: 40 to 99.99 Hz
0.05 Hz: 100 to 500 Hz

Frequency Accuracy: ±0.01% at 25°C ±0.001%/°C.

Remote Output Voltage Sense: 5 VRMS total lead drop, maximum.

Output Impedance:

1750 AND 1850, 1 Phase, 312V Range:
Low Impedance Mode: Less than 0.07+j0.05 Ω (at 50 Hz)
Reference Impedance Mode: 0.40+j0.25 Ω (at 50 Hz ± 3.0%).

3700, 1 Phase, 312V Range:
Low Impedance Mode: Less than 0.05+j0.04 Ω (at 50 Hz)
Reference Impedance Mode: 0.40+j0.25 Ω (at 50 Hz ± 3.0%).

5250, 1 Phase, 312V Range:
Low Impedance Mode: Less than 0.03+j0.03 Ω (at 50 Hz)
Reference Impedance Mode: 0.40+j0.25 Ω (at 50 Hz ± 3.0%).

Low Impedance Mode meets or exceeds the requirements of IEC-1000-3-2, Annex A, Supply Source. Valid for equipment classes A, B, C, D, and fluctuating harmonics.

Reference Impedance Mode conforms to the requirements of IEC 725.

1.2 PA1000

The PA1000 directly performs all measurements and real-time digital signal processing. The PC is used only to display the user interface, and provide command and control of the other equipment. Features include:

- Complete and continuous data management
- Computations in DSP firmware to unburden PC requirements
- No drop outs or overlaps in measurement windows
- Sampling rate of 175,000 samples/second
- 18 bit A to D converters
- 24 bit/80 MIPS real-time DSP
- Optional Discrete Reference Impedance
- Short and long form reports, exportable to other Windows applications
- No level switching required to measure the full 16 amp range
- Six channel analyzer monitors AC source and reports errors if out of compliance
- Auto A/D feature which classifies equipment dynamically during tests
- Front or rear EUT connections.

1.2.1 Input Power Specifications (PA1000)

Input Power Ranges: 115 to 230 V RMS, 1N L-N (2 wire), a chassis ground is also required for safety.

Input Frequency Range: 47 to 63 Hz

Input Current: Maximum current 1 A RMS

Initial Turn-on Current Surge: 25A typ (AC in 100V), 50A typ (AC in 200V) at cold start.

1.2.2 AC Current Measurement Accuracy (PA1000)

The accuracy of all AC RMS measurements (both harmonic range based and non-harmonic based) is better than 0.1% + (0.07% times the fundamental frequency in kHz) of the total input current signal for input currents in the range of 50 mA to 20A RMS and frequencies in the range of 10 to 5000 Hz. The accuracy of all individual harmonic measurements having a harmonic frequency of less than or equal to 10 kHz shall be better than:

2nd or 3rd Harmonic: 0.05% + (0.025% times the fundamental frequency in kHz) of fundamental or 1% on indication, or 50μA RMS (whichever is the larger).

4th through 63rd Harmonic: 0.02% + (0.01% times the fundamental frequency in kHz) of fundamental, or 1% of indication, or 50μA RMS (whichever is the larger).

Current Phase Accuracy: The accuracy of all measurements related to the phase relationship has an equivalent to a phase relationship accuracy of 0.02° + 0.2° per kHz of frequency.

DC Current Measurement Accuracy: The accuracy of DC measurements is better than 0.1% of the input current + 1mA.

Peak Current Measurement Accuracy: The accuracy of all peak measurements is better than 0.5% of the measured peak + 5mA.

Current Sample Accuracy: The individual samples are accurate to within 0.5% + 5mA in amplitude and 8 μs in time.

1.2.3 AC Voltage Measurement Accuracy (PA1000)

The accuracy of all AC RMS measurements (both harmonic range based and non-harmonic based) shall be better than 0.1% + (0.07% times the fundamental frequency in kHz of the total input voltage signal for input voltage in the range of 2V to 500V RMS and frequencies in the range of 10 to 5000 Hz. The accuracy of all individual harmonic measurements having a harmonic frequency of less than or equal to 10 kHz shall be better than:

2nd or 3rd Harmonic: 0.05% + (0.025% times the fundamental frequency in kHz) of fundamental or 1% of indication, or 1mV RMS (whichever is the larger):

4th through 63rd Harmonic: 0.02% + (0.01% times the fundamental frequency in kHz) of fundamental, or 1% of indication, or 50μV RMS (whichever is the larger).

DC Voltage Measurement Accuracy: The accuracy of DC measurements is better than 0.1% of the input voltage + 25mV

Peak Voltage Measurement Accuracy: The accuracy of all peak measurements is better than 0.5% of the measured peak + 100mV.

Voltage Sample Accuracy: The individual samples are accurate to within 0.5% + 100mV in amplitude and 8μs in time.

1.3 DISCRETE REFERENCE IMPEDANCE OPTION

Low Current Option: Operating current: 0-6.5A RMS/0-8A RMS, 16A peak.

High Current Option: Operating Current: 0-16A RMS, 42A peak.

Frequency: 47-1000 Hz
(max. current at any harmonic per EN 61000-3-2, Table A times 1.5).

Total Line Side Inductance: 106 μh (Ls) + 371.5 μh (La)
Note: Total Line Side Inductance must be 478 μh, ±3%.

Total Line Side Resistance: 0.050Ω (Rs) + 0.075Ω (RLa) + 0.125Ω (Ra)
Note: Total Line Side Resistance must be 0.250Ω, ±2%.

Total Neutral Side Inductance: 318.3 μh (Ln)
Note: Total Neutral Side Inductance must be 318.3 μh, ±3%.

Total Neutral Side Resistance: 0.082Ω (Rn) + 0.86 (RLn)
Note: Total Neutral Side Resistance must be 0.150Ω, ±2%.

Total SRI Inductance: 796 μh (Lt), ±3%

Total SRI Resistance: 0.400Ω (Rt), ±2%

Definitions

La=Line Side Inductance

RLa=Line Side Inductor Resistance

Ln=Neutral Side Inductance

Ra=Line Side Resistance

Ls=Source Output Inductance

RLn=Neutral Side Inductor Resistance

Lt=Total SRI Inductance

Rn=Neutral Side Resistance

Rs=Source Output Resistance

Rt=Total SRI Resistance

1.4 PROTECTION AND SAFETY

Overvoltage Shutdown: Programmable for 15V to 255V peak, 156V range; 30V to 510V peak, 312V range.

Undervoltage Shutdown: Automatic, not programmable.

Programmable Current Limit Shutdown: Can be set to 1% of range; 0.5A to 13A for 156V range, 0.5A to 6.5A for 312V range. -OR- 0.5A to 16A for 156V range, 0.5A to 8A for 312V range.

Programmable Current Limit with Timed Shutdown: Can be set to 1% of range; the timeout can be set from 100 msec to 10 sec.

Programmable Constant Current: Can be set to 1% of range; 0.5A to 13A for 156V range, 0.5A to 6.5A for 312V range. –OR- 0.5A to 16A for 156V range, 0. 5A to 8A for 312V range. For all current accuracies, ± 1% of full scale, add ±1.5%/kHz above 500 Hz. For paralleled amplifiers, add ±1%.

Temperature Coefficient: <200 ppm/°C.

Overtemperature Shutdown: Automatic, not programmable.

1.5 AGENCY REQUIREMENTS

The EST1750, EST3700 and EST5250 are designed to meet the following agency requirements:

- UL 3111-1
- CUL 1010-1
- EN 61010-1
- EN 50081-2
- EN 50082-1
- IEC 1000-3-2, Annex A, Supply Source
- IEC 725 Reference Impedance
- IEC 801-2, -3 and -4
- IEC 1000-4-13
- FCC Part 15, Class A

1.6 PHYSICAL SPECIFICATIONS

SWAE:

Height: 8.75" (222 mm)

Width: 19" (483 mm)

Depth: 23.5" (597 mm)

Weight: SW 5250AE: 126.5 lbs. (57.2 kg)
SW 3700AE: 100.5 lbs. (45.6 kg)
SW 1750AE: 73 lbs. (33.1 kg)

Cooling: Air is drawn in from the top and sides and exhausted through the rear of the chassis. 200 CFM is required for specified operation.

PA1000:

Height: 3.5" (89 mm)

Width: 19" (483 mm)

Depth: 18" (457 mm)

Weight: 18 lbs. (8.2 kg)

1.7 ENVIRONMENTAL DATA

For Indoor Use Only

Operating Temperature: 0°C to 45°C (32°F to 113°F).
Note that temperature measured at air inlet of SW. If cabinet mounted, cabinet inlet air may be rated at lower maximum temperature due to warming of inlet air.

Storage Temperature: -40°C to 70°C (-40°F to 158°F)

Humidity (Non-condensing): 0 to 80% at 31°C (88°F);
derate to 50% at 40°C (104°F)

Altitude: Operating: 10,000 ft. (3,048 m); Non-operating: 40,000 ft. (12,192 m)

Installation Category:

SWAE: Installation Category III, Pollution Degree 2

PA1000: Installation Category II, Pollution Degree 2

1.8 OTHER STANDARD FEATURES

- **IEEE 488.2 Interface**
- **SCPI Protocol**
- **BNC Outputs for Waveform Viewing**

  Voltage Monitor: 50V per Volt Output

  Current Monitor: 5A per Volt Output

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE

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2 INSTALLATION

The Elgar Model EST5250, EST3700 or EST1750 has been fully calibrated and tested prior to shipment. The instrument is ready for immediate use upon receipt.

WARNING! The SmartWave unit weighs 73–126.5 lbs. (33.1–57.2 kg), depending on the model. A minimum two–person lift is required!

WARNING! Hazardous voltages are present when operating this equipment. Please read the Safety Notice at the beginning of this manual prior to installation, operation, or maintenance.

2.1 UNPACKING AND INSPECTION

Perform a visual inspection of the shipping container prior to accepting the package from the carrier. If extensive damage to the shipping container is evident, a description of the damage should be noted on the carrier's receipt and signed by the driver of the carrier agent.

If damage is not apparent until the instrument is unpacked, a claim for concealed damage should be placed with the carrier. In addition, the shipping container(s) and filler material should be saved for inspection. Forward a report of damage to the Elgar Repair Department. Elgar will provide instructions for repair or replacement of the instrument.

Perform a visual inspection of the instrument when it is removed from the shipping container. Check for shipping damage such as dents, scratches, distortion, and damaged connectors.

If the instrument needs to be returned to Elgar, suitable shipping containers and packing materials must be used. If proper packing material is not available, contact Elgar for availability of containers. A Return Material Authorization (RMA) must be obtained from the Elgar Repair Department before an instrument is returned.

2.2 INSTALLATION REQUIREMENTS

The EST system is designed to be installed in a standard 19" (483 mm) RETMA rack or a transit case; pem-nuts are provided for mounting optional slides (see Table 2-1 Mounting Slide).

The EST meets the requirements for Group 1, Class A ISM equipment. The EST system was tested per CISPR 11/EN 55011 for radiated EMI emissions under the following configuration: System was installed in a standard 19" RETMA rack with perforated back and utilized a one–meter shielded input power cable.

CAUTION! Avoid blocking the instrument air intakes or exhaust.

2.3 AIR INTAKE AND EXHAUST

The air intakes are located on the top and side panels of the instruments. The exhaust is through the rear panel. Care must be taken not to block the side air intakes; the top air intakes allow for additional cooling if this air is available. No special vertical separation is required when stacking instruments. However, a 1.75" (45 mm) vertical spacer above the instrument may improve cooling. The temperature of the intake air should not exceed 113°F (45°C).

At full power, the unit dissipates over 2250W with the PFC option. It is important that the heat produced is properly vented to the exterior of the chassis. Special baffling to control air flow may be required to prevent hot exhaust air being drawn into the intakes if the unit is to be run continuously at full power.

The preferred mounting method for full power operation is bottom mounting (refer to Figure 2-4). Slide mounting may impair airflow from the side air intakes. If slides must be used, select narrow slides to minimize restrictions to airflow and select cabinets without wide rails that can block airflow. Refer to Table 2-1 Mounting Slide for the recommended slides and Figure 2-2 for the mounting location.

2.4 INSTALLATION/DIMENSIONAL DRAWINGS

Refer to Figures 2-1 and 2-2 for information on outline and mounting dimensions of the units. Refer to Figure 2-3 and Tables 2-2 through 2-6 for rear panel connector information. Also refer to Figure 2-2 for customer wiring details.

TYPE	MANUFACTURER	PART NUMBER
Mounting Kit (for slides)	Jonathan	BK-3
Slides	Accuride	C-3307-16D

Table 2-1 Mounting Slide

2.4.1 Installation Guidelines

The procedure below is for a typical rack mounting installation using the Elgar 29.75" cabinet. All units are rail mounted with no input or output wiring of I/O panel.

WARNING! Do not use the 1.75" space directly below the PA1000 unit. This space is required for proper ventilation and cooling of the AC power source unit. Do not block the vent grilles on the power source.

NOTE: For detailed input power requirements, wiring connections, operating parameters, and output capabilities, please refer to the *SW 5250AE and SW 1750AE Operation Manual* (Elgar Document No. M162004-01).
OR- *SW 3700AE* Operation Manual (Elgar Document No. M161668-01).

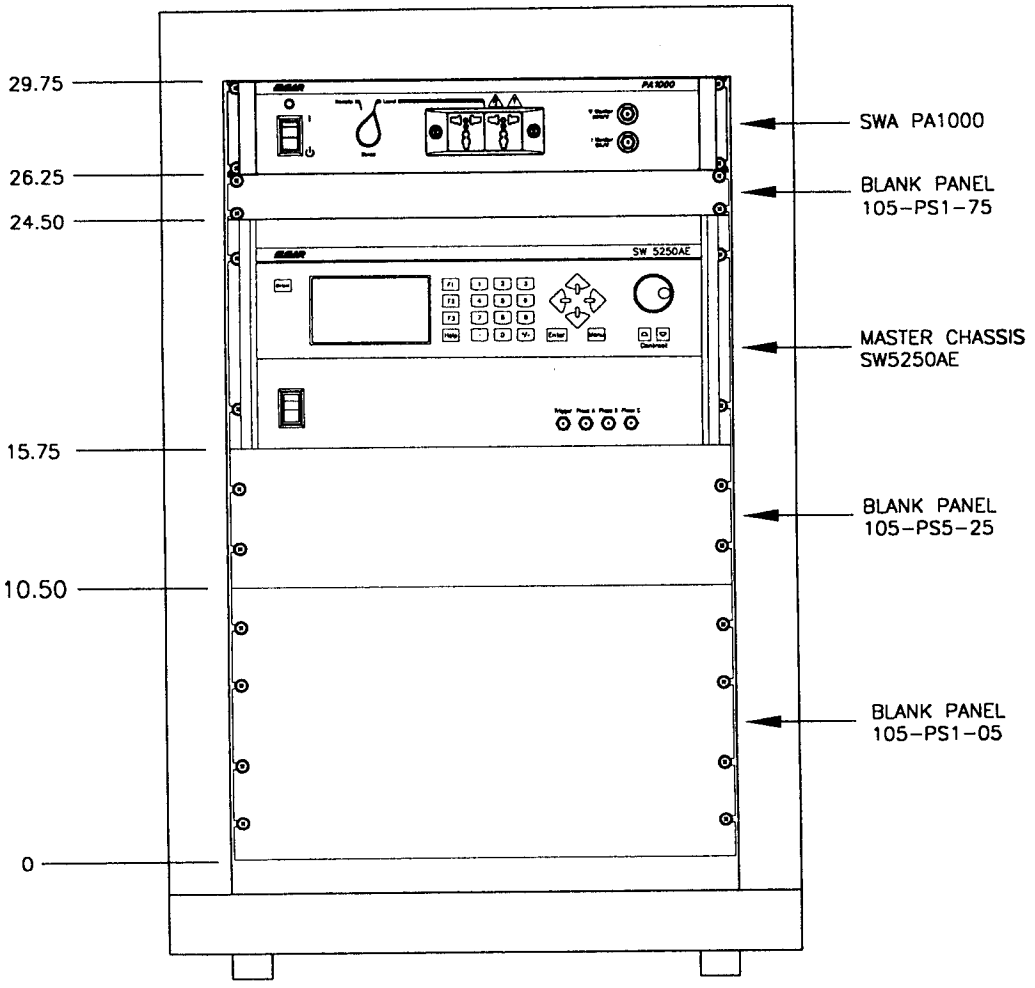


Figure 2-1 Cabinet Front View

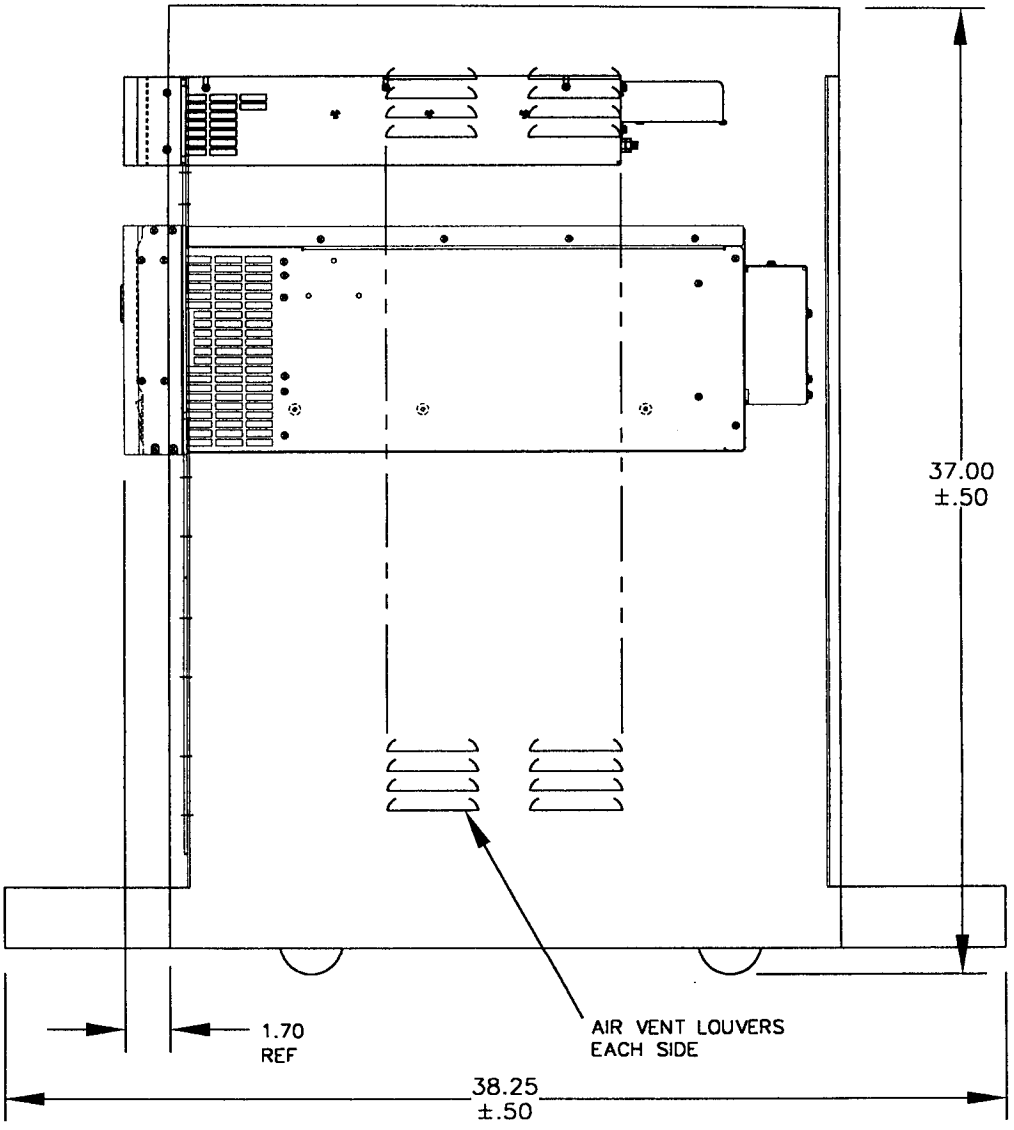


Figure 2-2 Cabinet Side View

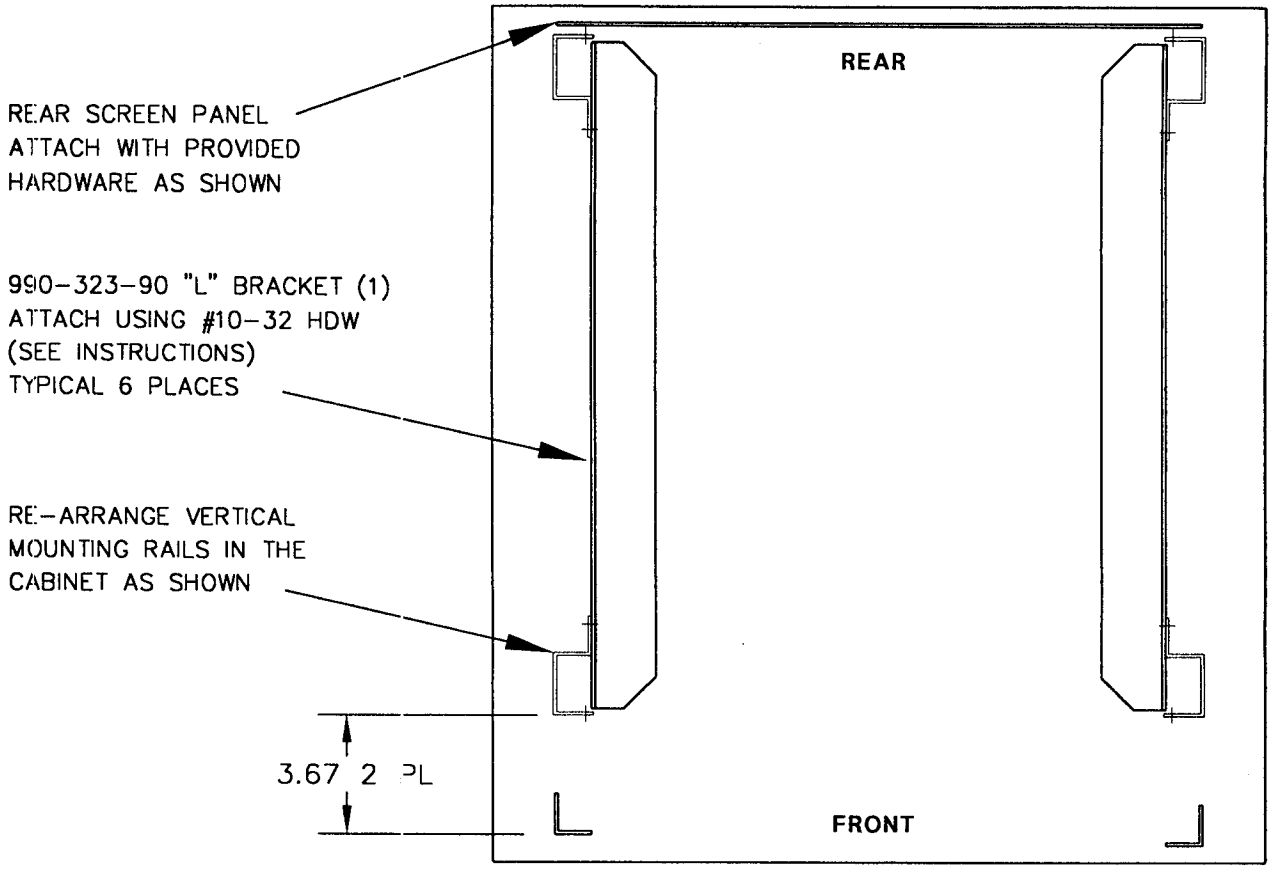


Figure 2-3 Cabinet Top View

2.5 INTERCONNECT WIRING

The SWAE input power wiring should be shielded in order to meet CE mark approval. The unit is shipped with flying lead shielded input wiring. The system cables are listed below.

Qty	Model/Part #	Description
1 ea	5161366-01	Cable Assembly, Phase
1 ea	5161447-01	Cable Assembly, V Sense
1 ea	890-540-01	Cable, GPIB, 1 Meter, System
1 ea	5161466-01	Cable Assembly, Input Power

For proper EST operation, wiring connections must be made as shown in Figure 2-4:

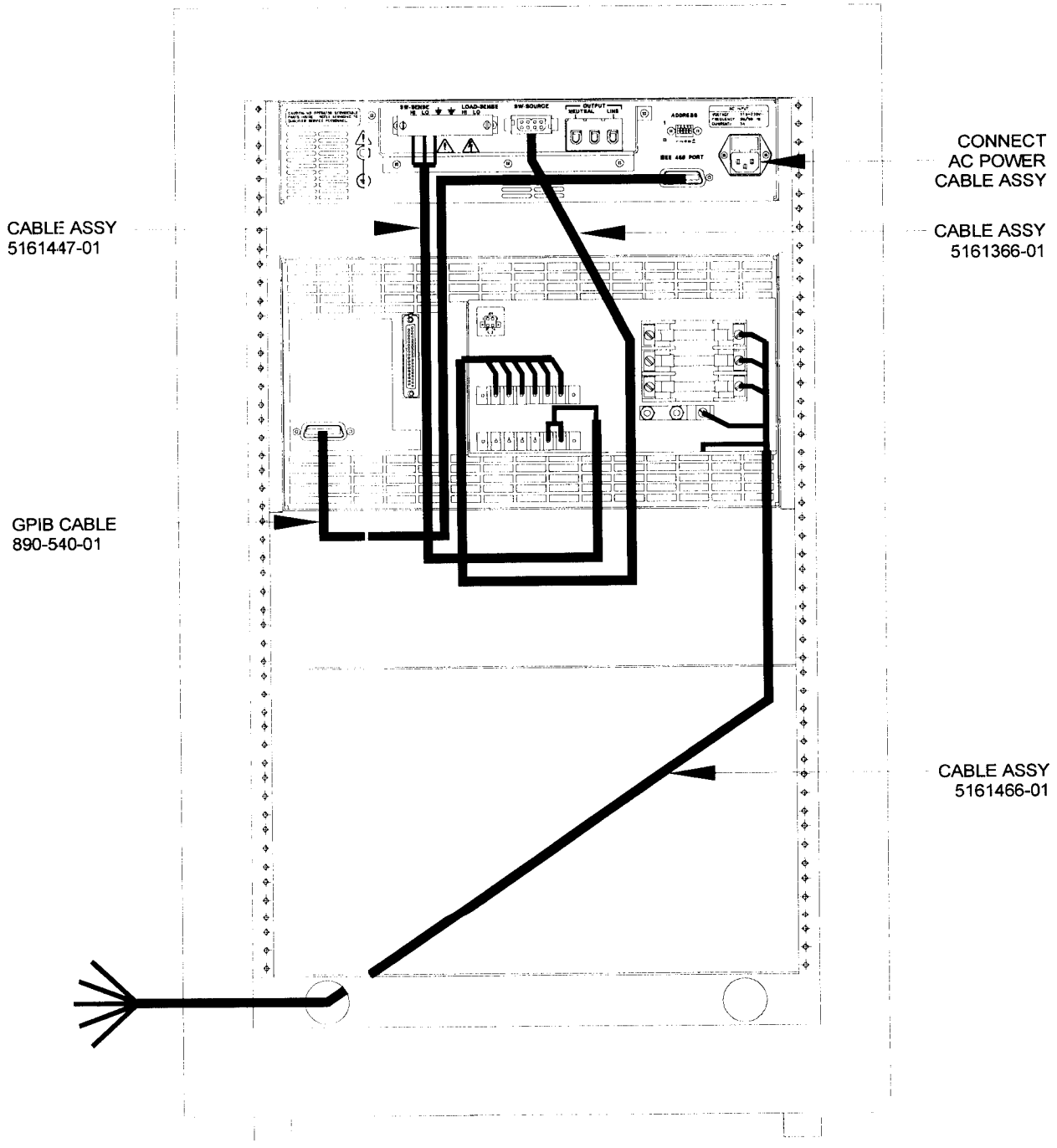


Figure 2-4 Cabinet Rear View

2.6 INPUT/OUTPUT CONNECTORS

For detailed information on SWAE input/output connectors, refer to the *SW 5250AE, SW 3700AE and SW 1750AE Operation Manual*, Elgar Document No. M162004-01 -OR- M161668-01.

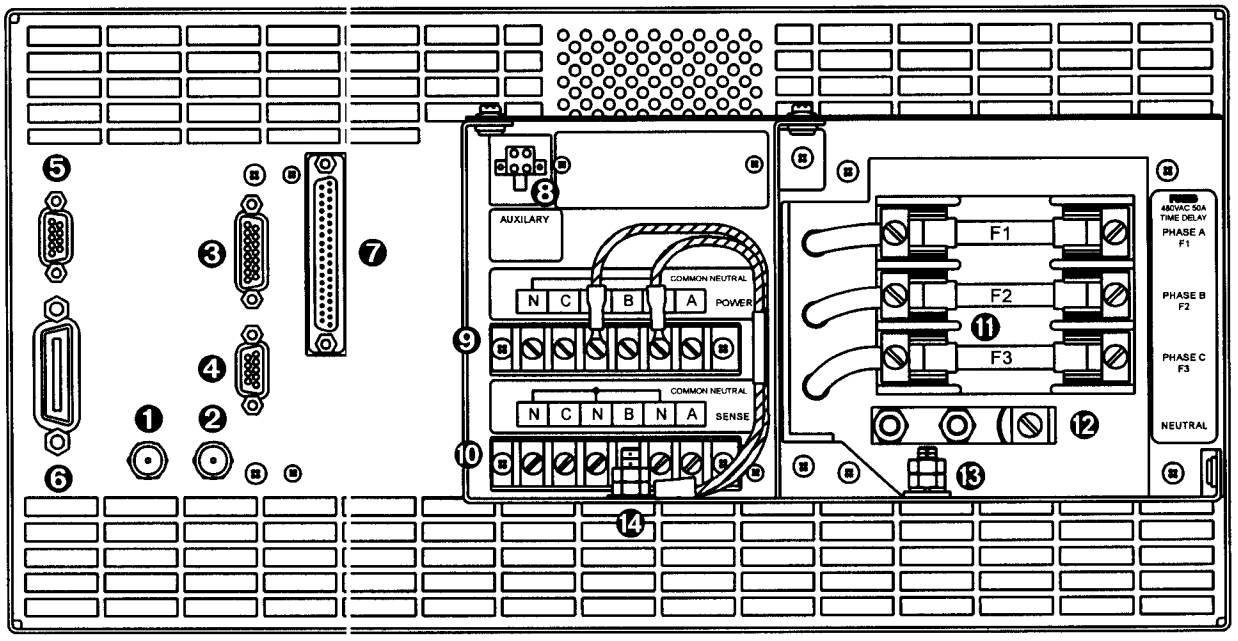


Figure 2-8 SW5250AE Rear Panel

Table 2-2 lists the SW input and output connectors shown in Figure 2-8.

ITEM #	NAME	TYPE	MANUFACTURER / PART #
1	SYNC OUT	BNC	KINGS, PN KC-79-179
2	CLOCK & LOCK	BNC	KINGS, PN KC-79-179
3	EXT IN ± 7.5V MAX	15 POS SUB-D FEMALE (Gold Contacts)	AMP, PN 747052-3
4	RS232	9 POS SUB-D MALE (Gold Contacts)	AMP, PN 747043-4
5	DFI	9 POS SUB-D FEMALE (Gold Contacts)	AMP, PN 747052-4
6	IEEE 488.2	25 POS FEMALE (Gold Contacts)	AMP, PN 554434-1
7	SLAVE	37 POS SUB-D FEMALE	ITT CANNON, PN ADC37SOL2
8	AUX OUT	4 POS MINIFIT JR	MOLEX, PN 39-29-9045
9	OUTPUT POWER TERMINAL BARRIER STRIP	6 POS (#6 HDW)	MAGNUM, PN A30410607CAMP8
10	REMOTE SENSE TERMINAL BARRIER STRIP	6 POS (#6 HDW)	MAGNUM, PN A30410607CAMP8
11	**Refer to Tables 2-8 and 2-9 for Fuse Ampere Rating**		
	INPUT FUSES	480VAC 50A TIME DELAY	BUSSMAN, SC50 LITTELFUSE, SLC50
	INPUT FUSES	480VAC 40A TIME DELAY	BUSSMANN, SC40 LITTELFUSE, SLC40
	INPUT FUSES	600VAC 20A TIME DELAY	GOULD SHAWMUT ATDR20 LITTELFUSE, CCMR20
12	INPUT, NEUTRAL LUG, SINGLE BARREL	90A, 8AWG-2AWG	PANDUIT, PN C070-14-Q
13	SAFETY GROUND	STUD	#1/4-20 X .75 LG
14	CHASSIS GROUND	STUD	#1/4-20 X .75 LG

Table 2-2 SW Input/Output Connectors

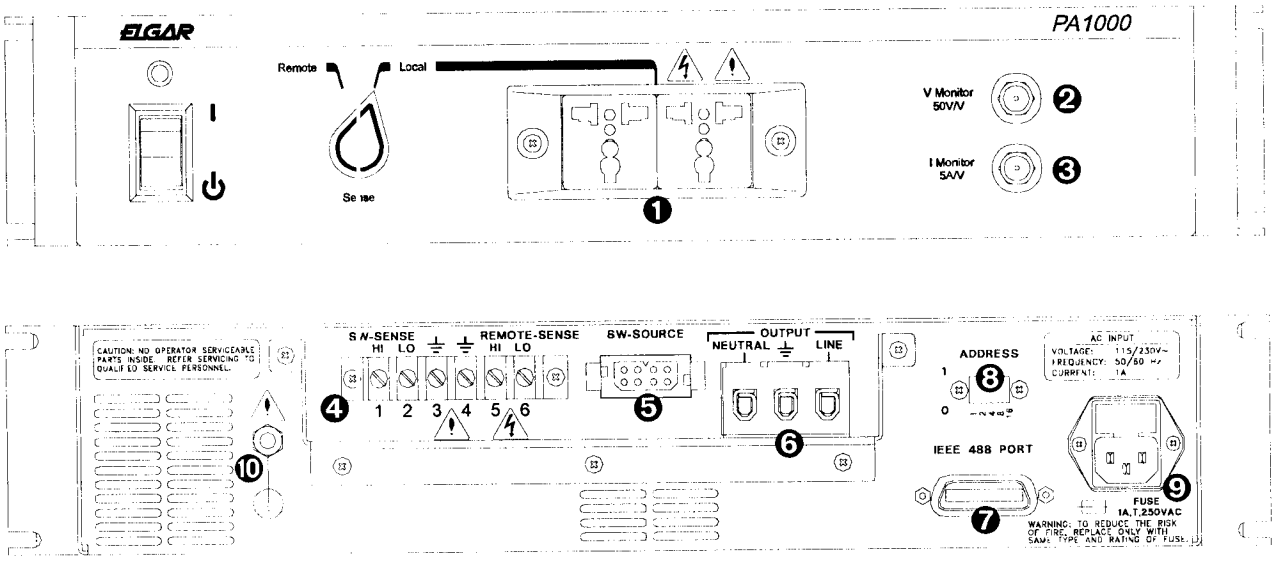


Figure 2-9 PA1000 Front and Rear Panels

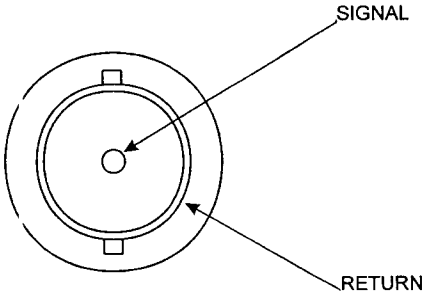
Table 2-3 lists the PA1000 input and output connectors shown in Figure 2-9.

ITEM #	NAME	TYPE	MANUFACTURER / PART #
1	OUTPUT (Front Panel)	UNIVERSAL POWER OUTLET	CHROMA/WINPRO, PN 856-250-20 (See Spec)
2	V MONITOR (Front Panel)	BNC	KINGS, PN KC-79-179
3	I MONITOR (Front Panel)	BNC	KINGS, PN KC-79-179
4	SENSE LEAD TERMINAL BLOCK	6 POS (#6 HDW)	CURTIS, PN GFT S-6
5	SW-SOURCE	8 POS CONN	POSITRONICS, PN PLB08F80820
6	OUTPUT (Rear Panel)	3 POS TERM BLOCK	MARATHON, PN B-03
7	IEEE 488.2	25 POS FEMALE (Gold Contacts)	AMP, PN 554434-1
8	IEEE 488 ADDRESS	5 POS DIP SWITCH	CTS, PN 206-5LPS
9	FUSE	1A TIME DELAY (Qty 2)	LITTLEFUSE, PN 218 001
10	SAFETY GROUND	STUD	#1/4-20 X .75 LG

Table 2-3 PA1000 Input/Output Connectors

2.6.1 BNC Connectors

The diagram below illustrates the signal and return connections. Refer to Figure 2-8, Items 1 and 2.



2.6.2 Sense Lead Terminal–PA1000

The SmartWave Voltage Regulation Sense leads should be connected to the PA1000 Sense Lead Terminal at Pins 1 and 2. See Interconnect wire list for correct wiring.

Refer to Figure 2-9, Item 4.

PIN #	MNEMONIC	CONNECTION
1	SENSE HI	SMARTWAVE VOLTAGE
2	SENSE LO	REGULATION SENSE LEADS
3	SHIELD	CHASSIS
4	SHIELD	CHASSIS
5	SENSE LOAD HI	EXTERNAL LOAD SENSE
6	SENSE LOAD LO	LEAD CONNECTION

Table 2-1 Sense Lead Terminal Connector

2.6.3 SW Source Connector–PA1000

Refer to Figure 2-9, Item 5.

PIN #	MNEMONIC	CONNECTION
1	PHASE B	SMARTWAVE PHASE B
2	PHASE A	SMARTWAVE PHASE A
3	SHIELD	CHASSIS
4	NEUTRAL A	SMARTWAVE NEUTRAL A
5	PHASE C	SMARTWAVE PHASE C
6	Not Used	—
7	NEUTRAL B	SMARTWAVE NEUTRAL B
8	NEUTRAL C	SMARTWAVE NEUTRAL C

Table 2-5 SW Source Connector Pinout

2.6.4 IEEE 488.2 Connector (SWAE and PA1000)

Refer to Figure 2-8, Item 6 and Figure 2-9, Item 7.

PIN #	MNEMONIC	PIN #	MNEMONIC	PIN #	MNEMONIC
1	DIO1	9	IFC	17	REN
2	DIO2	10	SRQ	18	GND (TW PAIR W/DAV)
3	DIO3	11	ATN	19	GND (TW PAIR W/NRFD)
4	DIO4	12	SHIELD	20	GND (TW PAIR W/NDAC)
5	EOI	13	DIO5	21	GND (TW PAIR W/IFC)
6	DAV	14	DIO6	22	GND (TW PAIR W/SRQ)
7	NRFD	15	DIO7	23	GND (TW PAIR W/ATN)
8	NDAC	16	DIO8	24	SIGNAL GROUND

Table 2-6 IEEE 488.2 Connector Pinout

2.6.5 Output Connector–PA1000 Rear Panel

Refer to Figure 2-6, Item 6.

PIN #	MNEMONIC	CONNECTION
1	NEUTRAL A	LOAD NEUTRAL A
2	GROUND	CHASSIS
3	LINE	LOAD PHASE A

Table 2-7 Output Connector Pinout

2.6.6 Grounding

The two PA1000 waveform outputs (V MONITOR & I MONITOR) share the same FLOATING ground. This ground should not exceed ±20V Peak from chassis ground. If possible, this ground should be connected to the chassis.

IEEE 488.2 SHIELD is connected to chassis ground.

2.7 INPUT POWER REQUIREMENTS

Input power is connected to the SW 5250AE, SW 3700AE or SW 1750AE via the rear panel connectors. See Tables 2-8 and 2-9 for input current values. A universal power cord is supplied for the PA1000. See Table 2-9 for input current values.

WARNING! An overcurrent protection device (i.e., circuit breaker) is required in the building installation. The circuit breaker must disconnect the 3-phase voltages; the neutral must not be disconnected. The circuit breaker should be rated for continuous current as required by the SW system (see Table 2-1). Installation should comply with local safety standards.

A device to disconnect the SW system from the energy supply source is also required. This switch or circuit breaker must be close to the SW system, within easy reach of the operator, and clearly labeled as the disconnection device for the SW system.

		MAXIMUM LINE CURRENT	MAXIMUM NEUTRAL CURRENT	F1-F3 FUSE RATING	RECOMMENDED CIRCUIT BREAKER RATING (MAX.)
SW 5250AE					
PFC	USA	25A RMS	Not Required	40A	40A RMS
PFC	INTL	13A RMS	13A RMS	20A	20A RMS
RECT	USA	39A RMS	Not Required	50A	50A RMS
RECT	INTL	39A RMS	68A RMS	50A	50A RMS
SW 3700AE					
PFC	USA	27A RMS	Not Required	40A	40A RMS
PFC	INTL	14A RMS	14A RMS	20A	20A RMS
RECT	USA	28A RMS	Not Required	40A	40A RMS
RECT	INTL	28A RMS	48A RMS	40A	40A RMS
SW 1750AE					
PFC	USA	14A RMS	Not Required	20A	20A RMS
PFC	INTL	13A RMS	13A RMS	20A	20A RMS
RECT	USA	13A RMS	Not Required	20A	20A RMS
RECT	INTL	13A RMS	23A RMS	20A	20A RMS

Table 2-8 Input Currents for 3-Phase Input Power

		REQ'D INPUT TERMINAL JUMPER CONNECTIONS	CONNECT 1-PHASE INPUT POWER TO	VOLTAGE	MAXIMUM INPUT CURRENT	F1-F3 FUSE RATING	RECOMMENDED CIRCUIT BREAKER RATING (MAX.)
SW 5250AE							
PFC*	USA	F1 to F2	F1, F3	187-264 VRMS, L-L	28A RMS	40A	40A RMS
PFC	INTL	F1 to F2, F2 to F3	F1, Neutral	187-264 VRMS, L-N	42A RMS	20A	40A RMS
SW 3700AE							
PFC	USA	F1 to F2	F1, F3	187-264 VRMS, L-L	30A RMS	40A	40A RMS
PFC	INTL	F1 to F2, F2 to F3	F1, Neutral	187-264 VRMS, L-N	30A RMS	20A	40A RMS
SW 1750AE							
PFC	USA	None	F1, F3	187-264 VRMS L-L	14A RMS	20A	20A RMS
PFC	INTL	None	F1, Neutral	187-264 VRMS L-N	14A RMS	20A	20A RMS
PA1000							
RECT	USA	None	F1, Neutral	115-230 VRMS L-N	1A RMS	1A T	15A RMS
RECT	INTL	None	F1, Neutral	115-230 VRMS L-N	1A RMS	1A T	15A RMS

* Only Phase A and Phase B are present at the output.

Table 2-9 Single-Phase Input Configurations

2.7.1 187 to 264 VRMS 3-Phase Operation (3-Wire USA)

Connect the input wires to the phase A (F1), B (F2), and C (F3) input fuse terminals (no Neutral is required). **Ensure that the chassis safety ground is also connected.** Use cables with ratings equal to or greater than the current rating listed on the unit or in Table 2-8. Any phase sequence of wiring can be used.

2.7.2 342 to 457 VRMS 3-Phase Operation (4-Wire INTL)

It is essential that the Neutral connection is present when using the unit. An external circuit breaker is required for the 3-phase voltages. **Do not pass Neutral through the breaker.** Only units factory set at this voltage will operate at this voltage.

CAUTION! Neutral must not be broken by an external switch. Severe damage to the unit may occur if Neutral is broken and phase voltage is present.

Connect the input wires to phases A (F1), B (F2), C (F3) and Neutral. **Ensure that the chassis safety ground is also connected.** Use cables with ratings equal to or greater than the current rating listed on the unit or in Table 2-8.

2.7.3 Single-Phase Input Connections

The SW system is designed for three-phase input power operation, either 3-wire (USA) or 4-wire (EUR) plus a chassis safety ground. However, if only single-phase input power is available, the configurations listed in Table 2-9 are possible.

An overcurrent protection device and a device for disconnecting the single-phase energy supply source are required as indicated in Section 2.7 above.

2.8 SW OUTPUT CONNECTIONS

2.8.1 SW 5250AE Output Connections

The SW 5250AE outputs may be directly paralleled for greater power. If the outputs are paralleled it is important to program the unit to the parallel mode before shorting the outputs together (refer to Figure 2-7). Outputs cannot be placed in series since the Neutral is common.

The sense Neutral is also common. Thus, it is important to wire the sense wires properly (refer to Figure 2-7). When remote sense is used:

- Sense A is connected to Power A;
- Sense B is connected to Power B;
- Sense C is connected to Power C; and
- Neutral Sense is connected to Neutral Power.

Output power neutral must be connected to chassis ground for safe operation. The SW system is shipped with a green/yellow wire connected from output power neutral to chassis ground. It is important that the Neutral not be >20V away from the chassis potential; the unit will shut down if this voltage is exceeded.

If a transformer or inductive load is present, the unit should be programmed to AC. This prevents small amounts of DC being generated which may saturate the magnetics.

For best performance, the sense leads should be connected and output neutral should be connected to chassis ground.

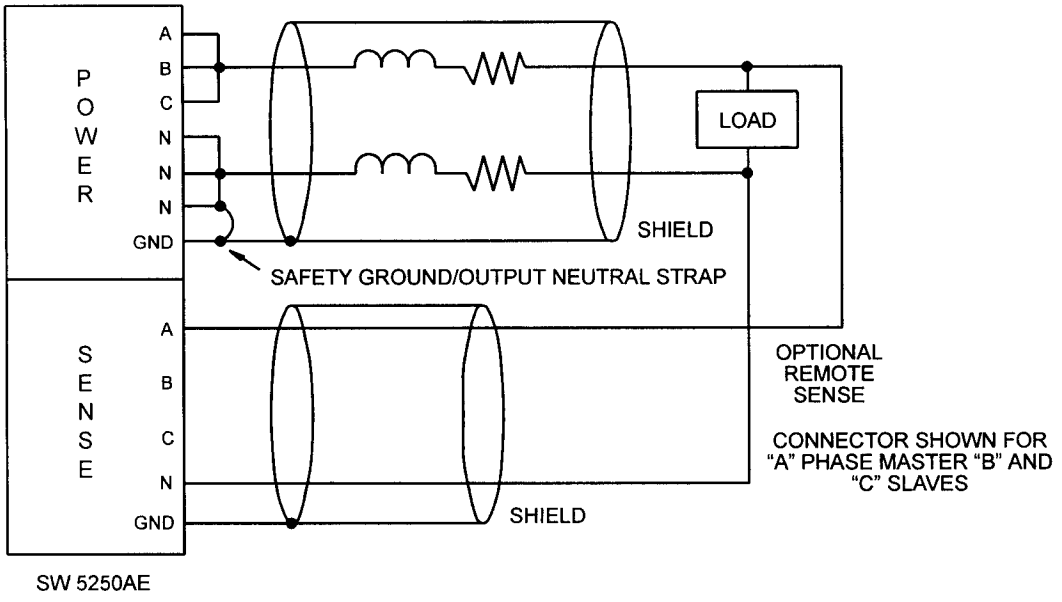


Figure 2-10 Parallel Connections

The output power and sense leads should be shielded and the shield connected to the chassis to prevent noise pickup (or radiation to sensitive circuits in the vicinity). Again, the shield should be connected to chassis ground.

Due to the high voltages present, 312 VRMS line-to-neutral and 437 VRMS line-to-line cables rated to these voltages must be used for both the Power and Sense leads.

2.8.2 SW 1750AE Output Connections

The SW 1750AE has only phase A present; phases B and C are open circuits.

2.8.3 SW 3700AE Output Connections

The SW 3700AE has phases A and B present; phase C is open circuit.

2.9 WIRING OF UNITS

Due to the high voltages and frequencies involved, it is recommended that all input and output wiring is protected with flexible conduit. Holes for this purpose are made in the terminal box. All wiring must meet local standards for safety.

2.9.1 Wire Gauge Selection

For wire gauge selection, refer to the *SW 5250AE, SW 3700AE and SW 1750AE Operation Manual*, Elgar Document No. M162004-01or M161668-01.

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3 OPERATION

The EST is controlled by the attached PC via IEEE488 interface. SWAE and PA1000 front panel controls to turn power on and select local or remote operation are discussed below.

3.1 FRONT PANEL CONTROLS

3.1.1 SWAE

The front panel (Figure 3-1) is used for programming and data entry in local mode operation of the SWAE. It is not used during normal EST operation.

For detailed information on front panel controls, refer to the *SW 5250AE, SW 3700AE and SW 1750AE Operation Manual*, Document No. M162004-01 or M161668-01.

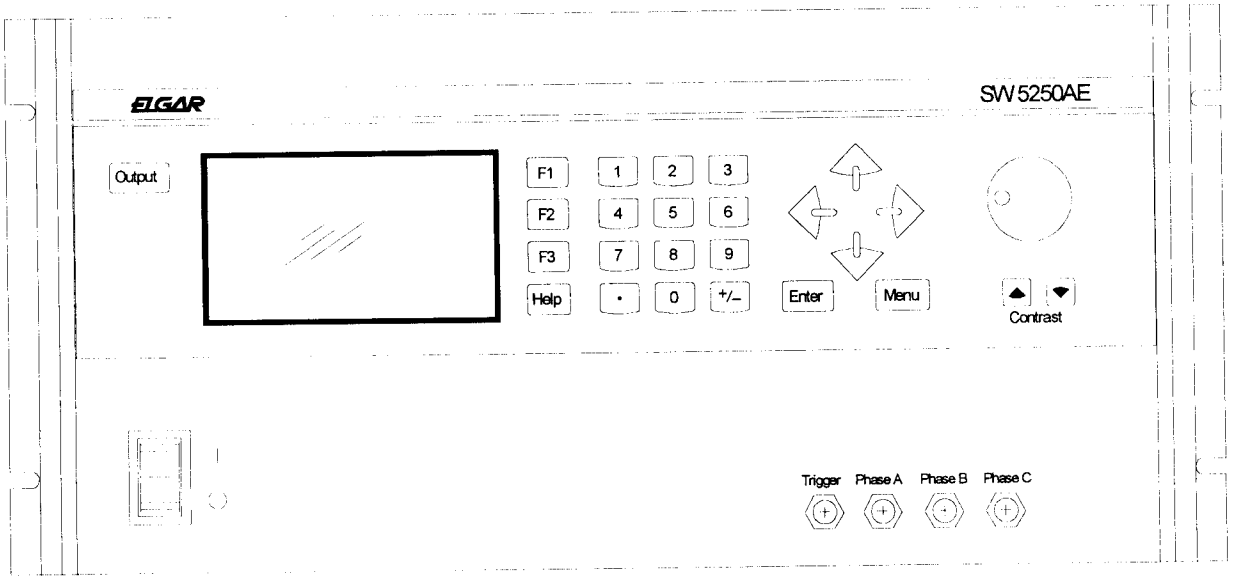

Figure 3-1 Front Panel (SW 5250AE)

The **Power On/Standby** switch is located in the lower left of the front panel. Pressing the top portion of the switch turns power on; pressing the bottom portion of the switch places the unit in the STANDBY mode.

When power is turned on, the unit goes through the power up cycle. This cycle may last between 30 seconds and five minutes, depending on the amount of software that needs to be loaded and initialized.

3.1.2 PA1000

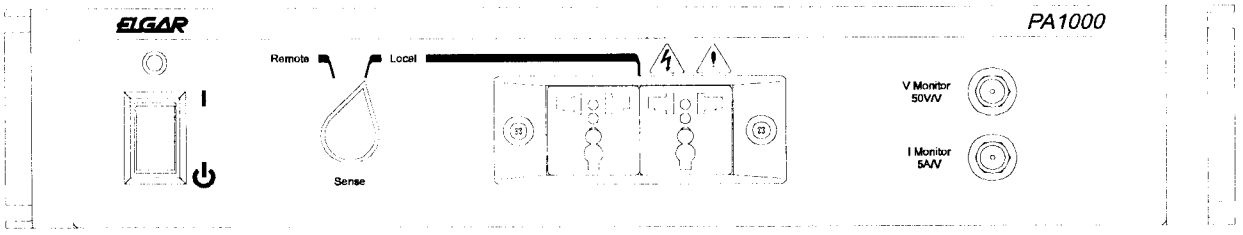

Figure 3-2 Front Panel (PA1000)

The PA1000 front panel has the following controls:

The **Power On/Standby** switch is located on the left side of the front panel. Pressing the top portion of the switch applies power to the PA1000; pressing the bottom portion of the switch places the unit in the STANDBY mode.

CAUTION: Although power is OFF to the PA1000, the power output connection will remain at a hazardous voltage as long as the SWAE is ON, output enabled and connected to the PA1000.

The **Sense Local/Remote** switch allows selection of local or remote voltage measurements.

- In **Local** mode, the PA1000 measures the voltage of the Equipment Under Test at the Front Panel Universal Power connector.
- In **Remote** mode, the voltage is measured at the end of the wires connected to the Load Sense Leads on the rear panel. For maximum accuracy, these wires should be connected as close as possible to the Equipment Under Test.