1.1 INTRODUCTION

The Elgar Model SW 5250 uses transformerless, direct coupled amplifiers and a true arbitrary waveform generator based controller. This technology allows the user to create, edit and generate complex SmartWave™ waveforms with high DC content for critical ATE and power line disturbance simulation testing.

The SW 5250 can create complex waveforms with high DC content for simulating real world power irregularities, including phase controlled sub–cycle or multi–cycle dropouts, spikes, sags, surges, frequency excursions, plus frequency and voltage ramps (sweeps). The unit can also generate clipped waveforms, harmonic distortion, high current inrush and other complex waveshapes.

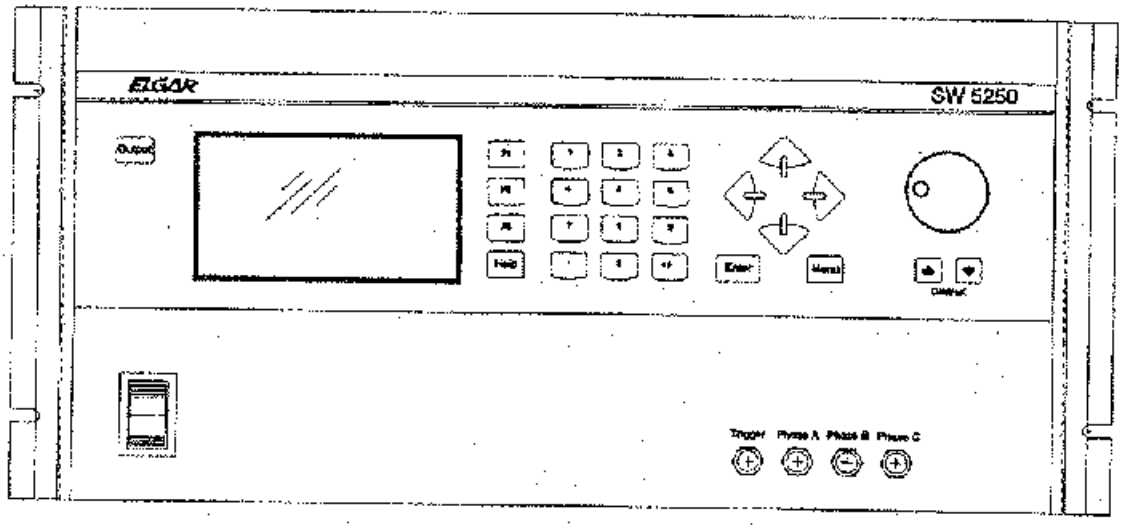

Figure 1–1. Elgar Model SW 5250 AC Power Source (Rack Mount Version)

Programming can be accomplished from the front panel or with a personal computer (PC) using optionally available software. A GPIB card in the computer is also required.

A library of 50 factory–supplied waveshapes is provided in Read Only Memory (ROM). Non–volatile memory storage is available for an additional 50 user–created waveshapes.

Waveshapes from the libraries can be assigned amplitude and frequency parameters and be stored as setups in non–volatile memory for immediate user recall. In addition, up to 1000 timed segments can be created by the user and linked together to form sequences (transient programs).

A back lit graphics LCD display allows quick confirmation of waveforms when created or edited from the front panel. Front panel BNCs provide waveform reference outputs for oscilloscope viewing. The front panel includes a keypad, knob and Help screens.

The SmartWave™ sources are true DC as well as AC power supplies. Up to 312 VRMS are available in AC or AC+DC modes. Multi-phase models can be switched to single or three-phased operation via the front panel or the GPIB.

A wide frequency range of DC or 40 Hz to 5 kHz is available for a broad array of applications. Utilizing the latest in AC switch mode technology, the SW 5250 achieves 55 dB of noise and ripple with total harmonic distortion (THD) of <0.5% to 500 Hz. A crest factor of 4.0 provides high peak-to-RMS current capability. An optional power factor correction (PFC) of .99 is also available.

1.2 INPUT SPECIFICATIONS

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

Input Power Factor: .6 (.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.

1.3 OUTPUT SPECIFICATIONS

Power Factor of Load: 0 lagging to 0 leading.

AC or DC 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).

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

Output Frequency: DC, or 40 Hz to 5 kHz. For output frequencies greater than 1 kHz, the maximum slew rate allowed is 1 kHz per second.

Output Power: 1750 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; and 1% maximum to 1 kHz plus 1%/kHz to 5 kHz.

AC Noise Level: 55 dB RMS below full output.

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; above 1 kHz, add ±0.01%/kHz.

Line Regulation (DC, or 40 Hz to 5 kHz): ±0.025% of full scale for a ±10% input line change.

Voltage Accuracy: ±0.1% of range. Above 1 kHz, add 0.2%/kHz. 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.

Voltage Resolution: 0.05% of full scale.

Frequency Resolution:

- 0.01 Hz: 40 to 99.99 Hz
- 0.05 Hz: 100 Hz to 999.9 Hz
- 0.5 Hz: 1000 Hz to 5000 Hz

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

Phase Accuracy, Phase-to-Phase Balanced Linear Resistive Load: ±1°, 40 Hz to 1 kHz, plus ±1°/kHz above 1 kHz.

Phase Angle Resolution: 0.1°.

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

1.4 WAVEFORM SPECIFICATIONS

Waveshape Libraries: 50 factory supplied in ROM; storage available for up to 50 user created in non-volatile RAM.

User Created Setups: A total of 100 steady-state waveforms, consisting of parameters such as waveshapes from the libraries plus amplitude, frequency, phase angle and current limit.

Sequencing/Transient Programs: 1000 user-created segments stored in non-volatile RAM. Segments include wave-shape, amplitude, frequency, phase angle, time (from 1 msec to 7 days), and number of cycles.

MIL-STD-704 Transients

1.5 STANDARD MEASUREMENTS

1.5.1 Parameters Measured

- 1- to 3-Phase to Neutral RMS Output Voltages
- 1- to 3-Phase to Phase Voltages are Calculated
- 1- to 3-Phase RMS Output Currents
- 1- to 3-Phase Peak Current
- Output Frequency
- 1- to 3-Phase Power
- 1- to 3-Phase VA
- Power Factor of Load Calculated from 1 or 3 Phases
- Output Phase B and C Relative to Phase A

1.5.2 Measurement Capabilities and Accuracies

1.5.2.1 Measurement Capability

4.5 Digit Analog to Digital Measurement System

Calibration Interval: Calibrate at least yearly. 6 months recommended.

Temperature Range for Specified Accuracy: 25°C ±5°C.

Operating Temperature Range: 0°C to 45°C (32°F to 113°F).

1.5.2.2 Phase to Neutral RMS Voltage Measurement

Valid for phases A, B and C (use phase A for Parallel Mode).

Range: 0V to 350.0V plus sign bit for DC range.

Accuracy: ±0.3% of range, DC or 47 Hz to 1 kHz; ±0.5% of range, 40 to 47 Hz and for 1 kHz to 5 kHz.

Temperature Coefficient: ±200 ppm outside specified range.

1.5.2.3 Phase to Phase RMS Voltage Calculation

Calculated from Phase to Neutral voltages and phases.

Range: 0V to 700V.

Accuracy and **Temperature Coefficient** the same as for the Phase to Neutral voltage (see paragraph 1.5.2.2).

1.5.2.4 RMS Current Measurement

Valid for phases A, B, and C (use phase A for Parallel Mode).

Range 1: 0A to 7.5A plus sign bit for DC range; 3–phase mode, 312V range.

Range 2: 0A to 15A plus sign bit for DC range; 3–phase mode, 156V range.

Range 3: 0A to 22.5A plus sign bit for DC range; parallel mode, 312V range.

Range 4: 0A to 45A plus sign bit for DC range; parallel mode, 156V range.

Accuracy: ±1.0% of range, DC or 40 Hz to 500 Hz; add ±1.5%/kHz above 500 Hz. Accuracies are specified for a maximum crest factor of 4.0.

Temperature Coefficient: ±300 ppm outside specified range.

1.5.2.5 Peak Current Measurement

Valid for phases A, B, and C (use phase A for Parallel Mode).

Range 1: 0A to 28A; 3-phase mode, 312V range.

Range 2: 0A to 56A; 3-phase mode, 156V range.

Range 3: 0A to 84A; parallel mode, 312V range.

Range 4: 0A to 168A; parallel mode, 156V range.

Accuracy: ±5% of range, 40 to 500 Hz; add ±1%/kHz, 500 to 5 kHz.

Temperature Coefficient: ±300 ppm outside specified range.

1.5.2.6 Power Measurement

Valid for phases A, B, and C. Up to 3 phase total power and parallel mode (use phase A for parallel mode).

Range 1: 0 kW to 1.8 kW; 3-phase mode.

Range 2: 0 kW to 5.6 kW; parallel mode and total 3-phase power.

Accuracy: ±2.5% of range, DC or 40 to 500 Hz for crest factors <2.0. Add ±1% for crest factors up to 4.0. Add ±1%/kHz above 500 Hz.

Temperature Coefficient: ±500 ppm outside specified range.

1.5.2.7 VA Measurement

Valid for phases A, B, and C. Up to 3 phase total VA and parallel mode (use phase A for parallel mode).

Range 1: 0 kW to 1.8 kVA; 3-phase mode.

Range 2: 0 kW to 5.6 kVA; parallel mode and total 3-phase power.

Accuracy: ±2.5% of range, DC or 40 to 500 Hz for crest factors <2.0. Add ±1% for crest factors up to 4.0. Add ±1%/kHz above 500 Hz.

Temperature Coefficient: ±500 ppm outside specified range.

1.5.2.8 Power Factor Calculation

Valid for phases A, B, C, and TOTAL (use phase A for Parallel Mode).

The Power Factor is calculated from the Power and VA measurements. Phase powers are measured then the total power is calculated; phase VAs are measured then the total VA is calculated. Power is divided by VA; the result is the Power Factor.

Range: 0 to 1.00.

Accuracy: ±5% of range at full power, DC or 40 to 500 Hz for crest factors <2.0. Add ±2% for crest factors up to 4.0. Add ±1%/kHz above 500 Hz.

Temperature Coefficient: ±500 ppm outside specified range.

1.5.2.9 Frequency Measurement

Frequencies are calculated based on output zero crossing time measurements. To minimize errors due to switching noise, a 1 μs filter is used to filter the output signal before the zero comparator.

Resolution: Frequency is displayed to 5 figures maximum; the leading zeros are blanked. Displayed resolution is 0.01 Hz.

Accuracy: ±0.5% of reading, at 10% to full output voltage, 0°C to 45°C (32°F to 113°F).

1.5.2.10 Phase Measurement

Valid for phases A, B, and C relative to each other.

The phase of measured signals are calculated from timing measurements. The reference is the negative to positive zero crossing of the phase A reference signal. End of timing is the negative to positive crossing and the polarity signals are used for these measurements.

Results for phase A relative measurements are calculated from individual timings and displayed as: Phase 'X' is leading/lagging phase 'Y' by 'Z' degrees.

Resolution: ±1°.

Accuracy: ±2°, 40 to 500 Hz; add ±2°/kHz above 500 Hz. For sine wave, balanced resistive load, 10% to 100% of voltage measurement range. All accuracies are specified for 0°C to 45°C (32°F to 113°F).

1.6 PROTECTION AND SAFETY

Overvoltage Shutdown: Programmable for 60V to 255V peak, 156V range; 120V to 510V peak, 312V range.

Programmable Current Limit Shutdown: Settable to 1% of range (0.5A to 13A for 156V range; 0.5A to 6.5A for 312V range).

Programmable Current Limit with Timed Shutdown: Settable to 1% of range; the timeout is settable from 10 msec to 10 sec.

Programmable Constant Current: Settable to 1% of range (0.5A to 13A for 156V range; 0.5A to 6.5A for 312V range). For all current accuracies, add ±1.5%/kHz above 500 Hz. For paralleled amplifiers, add ±1%.

Overtemperature Shutdown (automatic, not programmable).

1.7 DESIGNED TO MEET THE FOLLOWING AGENCY REQUIREMENTS

- UL 1244
- IEC 1010-1
- IEC 555-2
- IEC 801-4 and 5
- FCC Part 15, Class A

1.8 PHYSICAL SPECIFICATIONS (Models SW 5250, SW 3500, SW 1750)

Height: 8.75" (222 mm)

Width: 19" (483 mm)

Depth: 23.5" (597 mm)

Weight:

- SW 5250 – 126.5 lbs. (57.2 kg)
- SW 3500 – 100 lbs. (45.4 kg)
- SW 1750 – 73 lbs. (33.1 kg)

Cooling: Air is drawn in from the top, bottom, and sides and exhausted through the rear of the chassis.

1.9 ENVIRONMENTAL DATA

Operating Temperature: 0°C to 45°C (32°F to 113°F).

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

Humidity (Non–condensing): 0 to 85% at 25°C (77°F); derate to 50% at 40°C (104°F).

1.10 OTHER STANDARD FEATURES

- **1– to 3–Phase Programmable**
- **IEEE 488.2 Interface**
- **SCPI Protocol**
- **Waveform Trigger Output**
  (1 MegΩ Load Drive; positive edge is at 0° ±30μs)
- **BNC Outputs for Waveform Viewing** (1 MegΩ Load Drive)
- **SYNC OUT. User programmed for:**
  - Cycle Start, all cycles
  - Segment Start, all segments
  - Segment Start, selected segments

  For loads ≥2 kΩ: Vout ≤1V Low State; Vout ≥2.4V High State; Negative edge is at 0° ±30μs.
- **External Amplitude Modulation**
  - 0 to 5 VRMS provides 0 to ≥20% output amplitude modulation (±2% of full scale output).
- **CLOCK/LOCK**
  - **CLOCK** pulses at programmed frequency for loads ≥2 kΩ Vout ≤1V Low State; Vout ≥2.4V High State. Negative edge is at 0° ±30μs.
  - **LOCK** locks output to input 'TTL' frequency; signal needs to supply pull down current of 15 mA with voltage drop of ≤0.6V; no pull up needed. Negative edge is at 0° ±30μs.

- **PLL Specifications**
  - External PLL input frequency range is 45.00 Hz to 4500.00 Hz.
  - Tracking range is ±10% of programmed PLL center frequency.
  - External PLL input duty cycle is 50% ±10%.
  - External PLL input slew rate is .02% of input frequency/second, maximum, which produces a maximum phase shift of 5° from the external PLL input falling edge to the output rising edge.
  - The rising edge of the output will be locked to the falling edge of the external PLL input and will have less than a 30 μsec propagation delay.
  - Maximum output jitter when locked is <1% of external PLL input period.
  - PLL lock is achieved in <5 seconds.
- **External Drive**
  - Normal Amplifier, 0 to 5 VRMS (DC to 5 kHz) or ±5 VDC input for zero to full voltage output (±2% of full scale output).
- **External Gain Control**
  - 0 to ±7.07 VDC provides zero to full output (±2% of full scale output).
- **External Input Impedance**
  - ≥30 kΩ.

1.11 OPTIONS

- Parallelable For Additional Power above 5250 VA
- External Waveform Creation Software
- Elgar's VXP-1000 Controller For VXI
- Input Power Factor Correction to 0.99
- 5V or 25V, 0.25A Auxiliary AC Outputs for 115V on Phase A
- Test and Measurement can be removed.

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.