产品手册

仪器型号：Model GUPS 2400A–104

西安安泰测试科技有限公司

仪器维修|租赁|销售|测试

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GLOBAL UNINTERRUPTIBLE POWER SUPPLY

Model GUPS 2400A–104

Operation Manual

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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

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SAFETY NOTICE

Before applying power to the system, verify that the GUPS 2400A–104 is configured properly for the user's particular application.

WARNING

Hazardous voltages in excess of 232 VRMS, 328V 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 also may be floating above (below) chassis ground.

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

Ensure that the AC power line ground is connected properly to the GUPS 2400A–104 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 power cables. Similarly, the GUPS 2400A–104 circuit breaker must be switched off prior to connecting or disconnecting output power.

In 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. The customer/user must ensure that the output power lines are labeled properly as to the safety hazards and that any inadvertent contact with hazardous voltages is eliminated.

Guard against risks of electrical shock during open cover checks by not touching any portion of the electrical circuits. Even when power is off, capacitors may retain an electrical charge. Use safety glasses during open cover checks to avoid personal injury by any sudden component failure.

Always disconnect the AC input power and allow three minutes, minimum, before performing any internal servicing.

Neither Elgar Electronics Corporation, San Diego, California, USA, nor any of the subsidiary sales organizations can accept any responsibility for personnel, material or consequential injury, loss or damage that results from improper use of the equipment and accessories.

SAFETY SYMBOLS

CAUTION
Risk of Electrical Shock

CAUTION
Refer to Accompanying Documents

Off (Supply)

Direct Current (DC)

Standby (Supply)

Alternating Current (AC)

On (Supply)

Three–Phase Alternating Current

Protective Conductor Terminal

Earth (Ground) Terminal

Fuse

Chassis Ground

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SECTION 1
OVERVIEW AND SPECIFICATIONS

1.1 Introduction

The Elgar Model GUPS 2400A-104 is a 2400 VA Global Uninterruptible Power Supply (GUPS) that provides regulated 115 VRMS, 60 Hz output power at up to 20.9 Amps RMS load current. The GUPS 2400A-104 accepts 3-phase AC input line voltages from 159V to 232V at frequencies from 370 Hz to 430 Hz. A battery backup of five minutes at 2400 VA output is provided by a removable battery pack. Output power is continuous when transferring from AC to battery or battery to AC.

1.2 General Description

The GUPS 2400A-104 is contained in a rack-mount enclosure. All input and output connections are made at the rear panel. Cooling air is drawn in through a filter on the front panel and exhausted out the rear panel. Operational and input/output power status is indicated by front panel LEDs. An AC input circuit breaker and control pushbutton switches also are located on the front panel. There are no operator adjustments.

1.3 Specifications

(Specifications Subject to Change Without Notice)

AC Input Voltage: 115/200V, 3-phase, 3-wire plus ground, neutral not used;
159V to 232V, line voltage;
92V to 134V, phase voltage

AC Input Current: 9.8A, maximum at 200V, 2400VA/1920W load, fully charged battery;
12.5A, maximum at 159V, 2400VA/1920W load, charging battery

AC Input Frequency: 370Hz to 430Hz

Batteries: 192VDC, sealed, maintenance-free, lead-acid

Battery Hold-Up Time: 5 minutes with a 2400VA/1920W load at 25°C

Battery Recharge Time: 4 hours to 90% full charge following discharge
at 2400VA/1920W and 25°C

Output Voltage: 115V, ±2%

Output Frequency: 60Hz, ±0.1%

Output Current: 20.9A(RMS)

Output Distortion: 2% THD, maximum with linear load

Output Power: 1920W with resistive load;
2400VA/1920W with a reactive load or a non-linear load

Efficiency: 77%

AC to Battery Crossover: 159V, maximum low-line voltage;
232V, minimum high-line voltage

Battery to AC Crossover: 169V, maximum low-line voltage;
232V, minimum high-line voltage

AC Input Voltage Unbalance: 7V (RMS) maximum difference in line voltages

Temperature: 0°C to 40°C (32°F to 104°F), operating;
-40°C to 65°C (-40°F to 149°F), non-operating

Humidity: 5% to 95% non-condensing, operating

Altitude: 0 to 10,000ft, operating;
0 to 40,000ft, 2000ft/min, maximum, non-operating

Dimensions: 7"H x 19"W x 25.1"D,
excluding protrusion of handles, controls, and connectors;
fits standard RETMA rack

Weight: 75lb (34kg), UPS enclosure;
48lb (22kg) battery module;
123lb (56kg) total weight

SECTION 2
INSTALLATION

2.1 Introduction

The Elgar Model GUPS 2400A–104 has been aligned, calibrated, and tested prior to shipment. The instrument is ready for immediate use upon receipt. However, the following checks should be made to ensure that the instrument was not damaged during shipment.

CAUTION!
The GUPS 2400A–104 weighs 75 pounds (34 kg) without the battery pack. The battery pack adds an additional 48 pounds (22 kg). A minimum two–person lift is required!

WARNING!
Hazardous voltages are present when operating this equipment. Please read the SAFETY NOTICE on page iv prior to installation, operation, or maintenance.

2.2 Unpacking and Inspection

Perform a visual inspection of the shipping container prior to accepting the package from the carrier. If extensive damage 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. Check for shipping damage such as dents, scratches, distortion, and damaged connectors. If the instrument or container(s) show signs of rough handling, remove the covers from the instrument to ensure that the circuit boards are securely in place and that no loose or broken components are evident.

In addition, the shipping container(s) and filler material should be saved for inspection. Forward a report of damage to the Elgar Service Department. Elgar will provide instructions for repair or replacement of the instrument.

When returning the instrument to Elgar, suitable shipping containers and packing material must be used. If the instrument needs to be shipped and proper packing material is not available, contact Elgar to provide containers and shipping instructions.

2.3 Installation

The Model GUPS 2400A–104 is 7" (178 mm) high and is designed to be installed in a standard 19" (483 mm) wide cabinet enclosure or a transit case.

Refer to Figure 2–1 through Figure 2–3 for information on outline and mounting dimensions.

2.4 Air Intake and Exhaust

The air intake is located on the front panel of the instrument and the exhaust is through the rear panel. Care must be taken not to block the air intake and exhaust. No special vertical separation is required when stacking instruments. However, a 1¾" (44.5 mm) vertical spacer above and below the instrument may improve cooling.

CAUTION!
Avoid blocking the instrument air intakes or exhaust.

2.5 Input/Output Connectors

Table 2–1 provides a listing of the GUPS 2400A–104 input and output connectors.

J1: AC Input Connector	
Panel Connector	PT02CE-14-5P
Mating Connector	PT06CE-14-5S (SR)
J2 – J7: AC Output Connectors	
Panel Connector	PT02CE-12-3SY
Mating Connector	PT06CE-12-3PY (SR)
J8: Data/Alarm Port Connector	
Panel Connector	PT02CE-12-8S
Mating Connector	PT06CE-12-8P (SR)

Table 2–1. GUPS 2400A–104 Input/Output Connectors

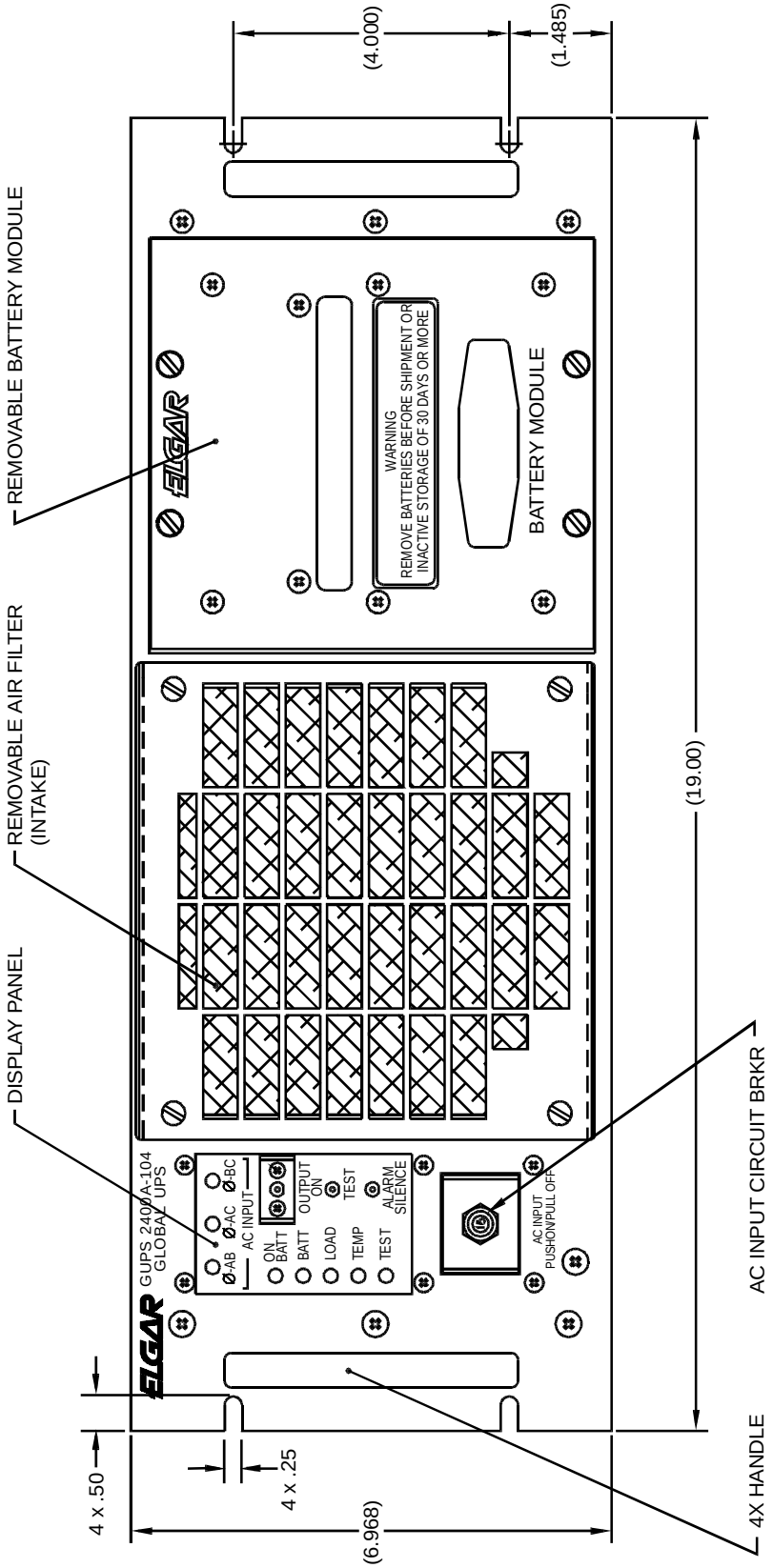

Figure 2–1. GUPS 2400A–104 (Front View)

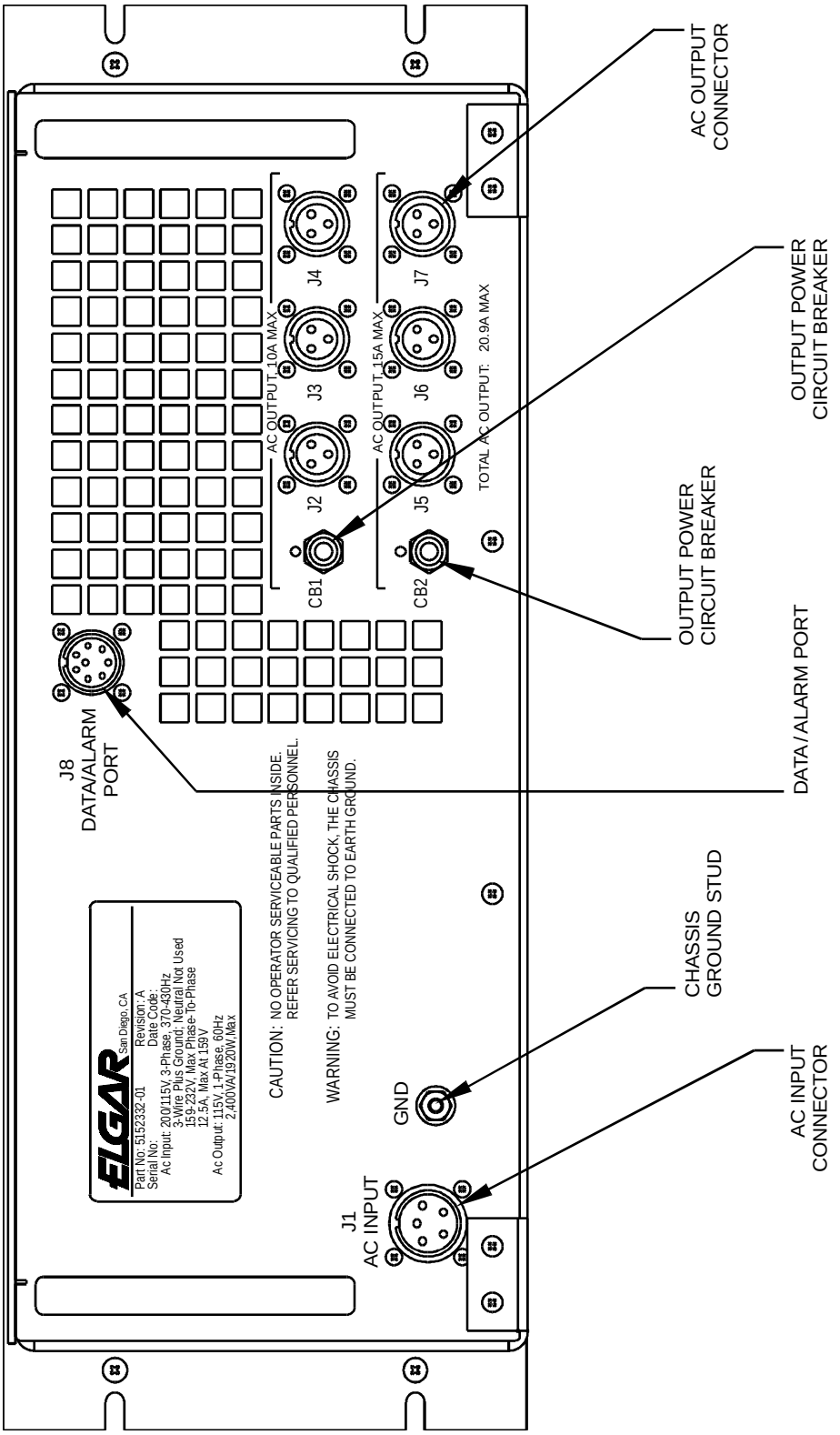

Figure 2–2. GUPS 2400A–104 (Rear View)

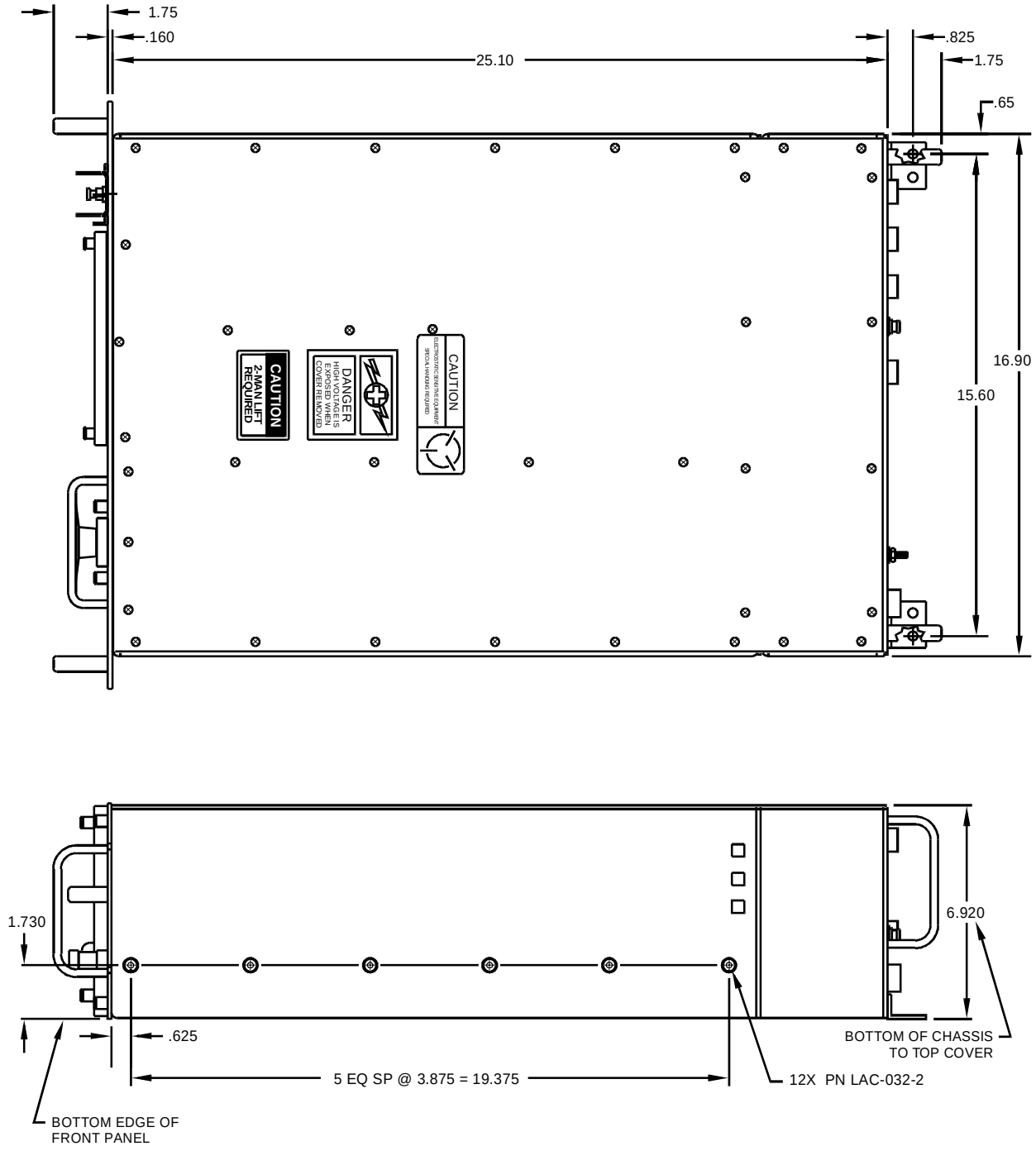

Figure 2–3. GUPS 2400A–104 Dimensions (Top, Side, and Front Views)

2.6 Wire Gauge Selection

The following guidelines assist in determining the optimum cable specification for the user's power applications. These guidelines are equally applicable to both DC and low frequency AC (up to 450 Hz) power cabling. The same engineering rules apply whether going into or out of an electrical device. Thus, this guide applies equally to the input cable and output cable for this Elgar instrument and application loads.

Power cables must be able to safely carry maximum load current without overheating or causing insulation destruction. It is important to everyday performance to minimize IR (voltage drop) loss within the cable. These losses have a direct effect on the quality of power delivered to and from instruments and corresponding loads.

When specifying wire gauge, the operating temperature needs to be considered. Wire gauge current capability and insulation performance drops with the increased temperature developed within a cable bundle and with increased environmental temperature. Thus, short cables with generously derated gauge and insulation properties are recommended for power source applications.

Avoid using published commercial utility wiring codes. These codes are designed for the internal wiring of homes and buildings and accommodate the safety factors of wiring loss, heat, breakdown insulation, aging, etc. However, these codes consider that up to 5% voltage drop is acceptable.

Such a loss directly detracts from the quality performance specifications of this instrument. Frequently, these codes do not consider bundles of wire within a cable arrangement.

In high performance applications, as in motor start-up and associated inrush/ transient currents, additional consideration is required. The cable wire gauge must consider peak voltages and currents which may be up to ten times the average values. An underrated wire gauge adds losses which alter the inrush characteristics of the application and thus the expected performance.

Table 2–2 identifies popular ratings for DC and AC power source cable wire gauges.

Column 1 Size (AWG)	Column 2 Amperes (Maximum)	Column 3 Ohms/100 Feet (One Way)	Column 4 IR Drop/100 Feet (Col. 2 x Col. 3)
14	15	0.257	3.85
12	20	0.162	3.24
10	30	0.102	3.06
8	40	0.064	2.56
6	55	0.043	2.36
4	70	0.025	1.75
2	95	0.015	1.42
1/0	125	0.010	1.25
3/0	165	0.006	1.04

Table 2–2. Recommended Wire Gauge Selection Guide

The following notes apply to Table 2–2 and to the power cable definition:

1. The above figures are based upon insulated copper conductors at 25°C (77°F), two current carrying conductors in the cable plus a safety (chassis) ground.

   Columns 3 and 4 refer to "one way" ohms and IR drop of current carrying conductors (e.g., a 50-foot cable contains 100 feet of current carrying conductor).

2. Determine which wire gauge for the application by knowing the expected peak load current (I_{peak}), the maximum tolerated voltage loss (V_{loss}) within the cable, and the one way cable length. The formula below determines which ohms/100 feet entry is required from Column 3. Read the corresponding wire gauge from Column 1.

   (Column 3 value) = $V_{loss}/[I_{peak} \times 0.02 \times (\text{cable length})]$

   Where:

   Column 3 value = Entry of the table above.

   Cable length = One way cable length in feet.

   V_{loss} = Maximum loss, in volts, permitted within cable.

   SPECIAL CASE:

   Should the V_{loss} requirement be very loose, I_{peak} may exceed the maximum amperes (Column 2). In this case, the correct wire gauge is selected directly from the first two columns of the table.

   EXAMPLE:

   A 20 ampere (I_{peak}) circuit which may have a maximum 0.5 volt drop (V_{loss}) along its 15-foot cable (one way cable length) requires (by formula) a Column 3 resistance value of 0.083. This corresponds to wire gauge size 8 AWG.

   If the cable length was 10 feet, the Column 3 value would be 0.125 and the corresponding wire gauge would be 10 AWG.

3. Aluminum wire is not recommended due to soft metal migration at the terminals which may cause long term (on the order of years) poor connections and oxidation. If used, increase the wire gauge by two sizes (e.g., specify 10 gauge aluminum instead of 14 gauge aluminum).

4. Derate the above wire gauge (use a heavier gauge) for higher environmental temperatures since conductor resistance increases with temperature.

Temperature		Current
°C	°F	Capability
40	104	80%

5. Derate the above wire gauge (use a heavier gauge) for an increased number of current carrying conductors. This offsets the thermal rise of bundled conductors.

Number of Conductors	Current Capability
3 to 6	80%
Above 6	70%

6. The preferred insulation material is application dependent. Elgar recommends any flame retardant, heat resistant, moisture resistant thermoplastic insulation rated to a nominal 75°C (167°F). Voltage breakdown must exceed the combined effects of:

   - The rated output voltage;
   - Transient voltages induced onto the conductors from any source;
   - The differential voltage to other nearby conductors; and,
   - Safety margins to accommodate degradations due to age, mechanical abrasion and insulation migration caused by bending and temperature.

7. As frequency increases, the magnetic field of the current carrying conductors becomes more significant in terms of adverse coupling to adjacent electrical circuits. Use twisted pairs to help cancel these effects. Shielded twisted pairs are even better. Avoid close coupling with nearby cables by using separate cable runs for high power and low power cables.

8. The above general values and recommendations should be reviewed, modified and amended, as necessary, for each application. Cables should be marked with appropriate safety WARNING decals as hazardous voltages may be present.

SECTION 3
OPERATION

3.1 Introduction

This section provides detailed information on the controls and indicators, input/output connections, start-up and shutdown sequences, battery operation, and the RS-232 data communications port.

3.2 Control and Indicator Panel

All controls and indicators for the GUPS 2400A–104 are located on the front panel of the unit. There are no operator adjustments inside the unit. Refer to Figure 3–1 for the location of the controls and indicators listed below.

There are eight indicators and three pushbutton switches on the panel. In addition, there is an input circuit breaker located below the control panel.

3.2.1 Indicators

AC INPUT. Three green LEDs that indicate the presence of line voltage at the AC input. The indicators turn on when the line voltage is greater than 90V (phase voltage greater than 52V).

ON BATT. An amber LED that indicates the loss of AC input and operation from battery power.

BATT. A three-color LED that indicates the condition of the battery. The LED is green under normal operating conditions, amber when the battery is discharging or has low capacity while charging, and red when the battery capacity is low and impending inverter shutdown is approached.

LOAD. A three-color LED that indicates the amount of output load. The LED is green when the load is less than 80% of maximum output, amber when the load is within 80% to 105%, and red when the load exceeds 105% (indicating the inverter will shut down if the load is maintained).

TEMP. A two-color LED that indicates temperature condition within the GUPS. The LED is green under normal operating conditions, and red when an over-temperature shutdown occurs.

TEST. A two-color LED that indicates the results of the internal self-test. The LED blinks while a self-test is in progress. When the test is complete, the LED turns green if the test is passed and red it the test is failed.

3.2.2 Pushbutton Switches

OUTPUT ON. A momentary pushbutton switch on the front panel that alternately turns the output power on and off.

TEST. A momentary push button switch on the front panel that initiates the internal self-test.

ALARM SILENCE. A momentary pushbutton switch on the front panel that silences the audible alarm.

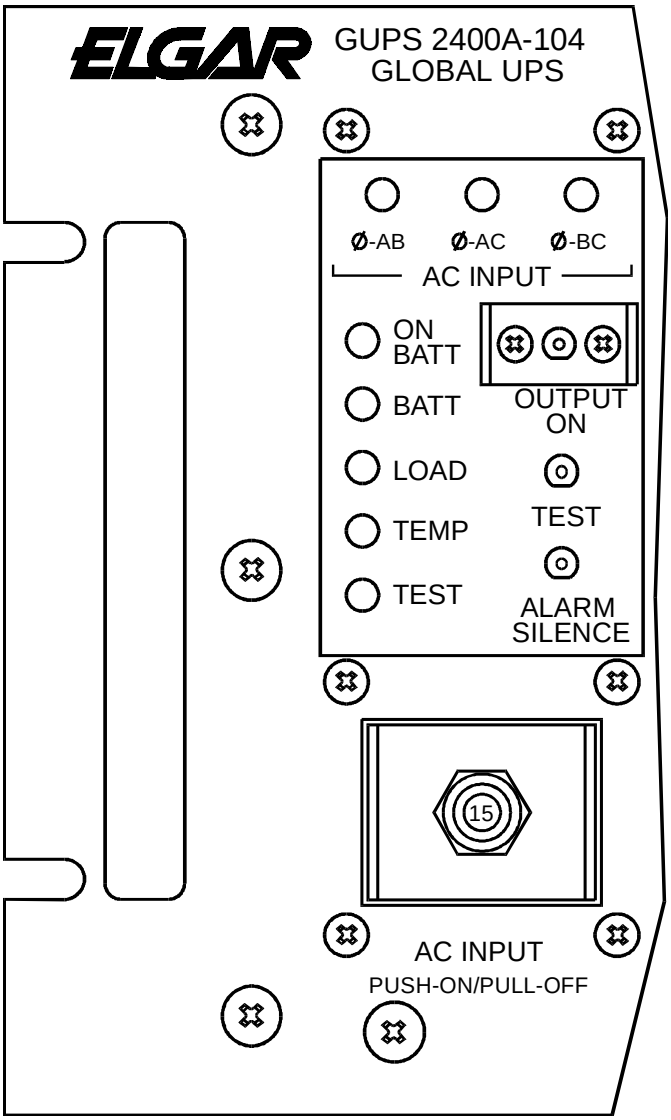

Figure 3–1. GUPS 2400A–104 Control and Indicator Panel

3.3 Circuit Breakers

AC INPUT

The AC input breaker is located on the front panel below the Control and Indicator Panel. It is turned ON by pushing in the actuator button, and it is turned OFF by pulling out the actuator button.

AC OUTPUT

Two circuit breakers are present on the rear panel: one rated at 10A for protecting one set of three AC output connectors; another rated at 15A for protecting the other set of three AC output connectors. They are turned ON by pushing in the actuator buttons, and they are turned OFF by pulling out the actuator buttons.

3.4 Audible Alarm

An audible alarm is sounded for the following alarm conditions: loss of AC input; low battery voltage; over-temperature. If the audible alarm is silenced and an alarm condition is again present, the audible alarm will again be sounded.

3.5 Control Signals

The Data/Alarm Port provides an interface to remote alarms or a host computer. The control signals provide annunciation of the mode of operation, control of the system shutdown, and RS-232 data communications. The control signals of the Data/Alarm Port and their signal return could be floated up to 80VPK above chassis ground.

AC FAIL

Normally-open relay contacts that close when the AC input is outside the allowed range for voltage or phase unbalance.

LOW BATTERY

Normally-open relay contacts that close when the battery voltage approaches the shutdown threshold for the inverter.

SHUTDOWN

Input to a relay coil whose contacts interface with the control circuits of the GUPS. Energizing the relay with a DC voltage, 16.8-36VDC (1,070 ±10% coil resistance), will result in shutdown.

If SHUTDOWN is asserted while the AC input is present, the output relay will open and output power will be turned off; the inverter and control circuits will continue to operate.

If SHUTDOWN is asserted while the AC input is not present and the inverter is running from the battery, the output relay will open and output power will be turned off; the inverter and control circuits will be shut down also. After shutdown, the OUTPUT ON switch must be manually toggled to turn the output back on.

RS-232 TRANSMIT/RECEIVE
RS-232 transmit and receive for data communications. Refer to Section 3.9 for more information on RS-232 interface.

OUTPUT CURRENT
An AC voltage signal that is proportional to the AC output current. The output is 0.221V/A, or 4.6 VRMS at full load. This signal is transformer isolated from the other control signals.

3.6 Connectors

The GUPS 2400A–104 has cylindrical, metal-shell connectors with bayonet coupling for all input/output connections of power and signal. All connectors are located on the rear panel.

Six output connectors are provided: one set of three protected with a 10A circuit breaker, and another set of three protected with a 15A circuit breaker. See Table 3–1 for pin assignments.

Connector	Pin Assignment
Connector J1, AC INPUT	Pin A: Phase A Pin B: Phase B Pin C: Phase C Pin D: Not used Pin E: Chassis Ground (Neutral not used)
Connectors J2 – J7, AC OUTPUT	Pin A: Neutral (internally connected to chassis) Pin B: Line Pin C: Chassis Ground
Connector J8, DATA/ALARM PORT	Pin A: AC FAIL normally-open relay contact Pin B: LOW BATTERY normally-open relay contact Pin C: SHUTDOWN input for remote shutdown Pin D: RS-232 TRANSMIT signal (output) Pin E: RS-232 RECEIVE signal (input) Pin F: SIGNAL RETURN for signals on Pins A-E Pin G: OUTPUT CURRENT sense signal Pin H: Return for OUTPUT CURRENT sense signal
GROUND STUD	#10-32 Stud: Earth Ground

Table 3–1. GUPS 2400A–104 Connector Pin Assignments

3.7 Start-Up and Shutdown Sequences

To run the GUPS 2400A–104 from an AC input, perform the following steps:

1. Turn on the AC input circuit breaker located on the front panel.

2. Wait approximately 10 seconds for completion of the start-up routines. During this time, the GUPS performs a self-test to assure proper functionality, and the rectifier undergoes a soft-start so that current surges on the AC input are prevented.

3. After the start-up delay, the inverter will turn on (fan will be energized), but the output will be off. Also, the charger will be on to charge the internal battery.

4. To turn ON the output, press the OUTPUT ON switch. The output relay will close and connect the inverter to the load. The inverter will momentarily turn off prior to closing of the output relay to prevent switching load current with the relay.

   If the AC input voltage exceeds the allowed range, the unit will draw power from the internal battery and continue to run until the battery is depleted. If the AC input returns to the allowed range, and low battery shutdown of the inverter has not yet occurred, the unit will again draw power from the AC input and also recharge the battery with the battery charger.

5. To turn OFF the output, press the OUTPUT ON switch again; the switch has a alternating ON/OFF action. The inverter will momentarily turn off and the output relay will open. The inverter will again turn on after the relay is open. The inverter is turned off while the relay is opening to prevent switching load current with the relay.

   If the AC input voltage exceeds the allowed range while the output is turned off, the unit will shut down; the inverter, charger, and all control circuits will be turned off.

3.8 Battery Operation

CAUTION!
If the battery module is not inserted when the unit is started, all front panel LEDs will indicate RED, and the unit will not operate.

To run the GUPS 2400A–104 from battery when an AC input is not present or outside the allowed operating range, perform the following:

1. The AC input circuit breaker located on the front panel could be either in the ON or OFF positions.

2. To turn ON the output, press the OUTPUT ON switch. After a short delay, the output relay will close and the inverter will start, supplying power to the load. The unit will run until the battery is depleted. If the AC input returns to the allowed range, and the AC input breaker is closed, power will be drawn from the AC input and the battery charger will recharge the battery.

3. To turn OFF the output, press the OUTPUT ON switch again to use the alternating ON/OFF action of the switch. The unit will shut down (with no AC input present); the inverter and all control circuits will turn off.

3.8.1 Battery Care and Handling

The battery used in the GUPS 2400A-104 requires proper storage and recharging to maintain reliability.

During storage, the self-discharge of the battery results in a sulfate coating that builds up on the plates. This coating reduces the effective surface area of the plates which reduces the available backup time. Allowing the batteries to self-discharge for too long may result in recharging problems or in battery degradation.

Storing the battery at low temperatures reduces the level of chemical activity, thus sulphation takes longer to occur. Reasonable storage times at different temperatures are listed in Table 3–2.

Storage Temperature	Storage Time
0°C (32°F)	20 Months
10°C (50°F)	10 Months
20°C (68°F)	5 Months
40°C (104°F)	1½ Months

Table 3–2. Battery Storage Times

The batteries should be recharged for 72 hours after prolonged storage.

CAUTION!
Failure to recharge the batteries after the storage time may result in permanent battery degradation.

3.9 RS-232 Data Communications Port

The RS-232 data communications port provides an interface between a data terminal (or a computer emulating a data terminal) and the GUPS 2400A–104. It allows transfer of information such as parameter values, mode of operation, and alarm conditions.

3.9.1 Hardware Interface

Interface signals for communication to and from the GUPS 2400A-104 are provided via a connector (PT02CE-12-8S) located on the rear panel of the unit. The RS-232 interface connector is designated as J8, DATA/ALARM PORT. The J8 connector pin-out for the RS-232 interface is given in Table 3–3.

Pin Number	Signal
D	Transmit from the GUPS
E	Receive to the GUPS
F	Signal Ground

Table 3–3. RS-232 Connector Pin-Out

3.9.2 Software Interface

The RS-232 interface firmware in the GUPS 2400A-104 has the following communication features:

- Two sets of remote terminal software commands
- Text data request commands, which are applicable for dumb terminal display of the unit status. Text data request commands return both descriptive text and the data values requested
- Fast “data only” data request commands called the Elgar Terminal Interface (ETI), for use by a program running on a host computer. The ETI commands return only the data values that are requested
- Data available via the RS-232 interface includes
- AC Line Loss signal
- AC Input voltage in floating point or hexadecimal
- AC output voltage in floating point or hexadecimal
- AC output current in floating point or hexadecimal
- Battery/Charger DC voltage in floating point or hexadecimal
- Impending shutdown annunciation

3.9.3 RS-232 Protocol

The GUPS 2400A–104 RS-232 communications port protocol is given in Table 3–4.

Baud Rate	9600
Data Bits	8
Start Bits	1
Stop Bits	1
Parity	None

Table 3–4. RS-232 Communications Port Protocol

3.9.4 Test Data Request Commands

The GUPS 2400A–104 RS-232 text data mode commands have been developed for a user interface utilizing a dumb terminal interface. The text data mode commands provide formatted responses that include both the name of data parameters and the measured values. Each of the text data requests supported by the GUPS 2400A–104 is described below.

3.9.4.1 List Selection Menu

Enter a “space” (0x20) character to view the following menu:

k = Display calibration constants
l = ETI calibration
m = ETI A/D
n = ETI Float
s = Status registers
v = Display version

3.9.4.2 Display Calibration Values

Enter a command ‘k’ (lowercase K) character to display the calibration constants for the A/D converter algorithms values. For example:

```
Calibration Constants:
80 percent current:  32F8          // Output current in hexadecimal
105 percent current:  424B
150 percent current:  50E7
Minimum voltage band:  2000        // Output voltage in hexadecimal
Maximum voltage band: 2100
Battery 200 volts  0198            // Battery voltage in hexadecimal
Battery bad:  0240
Battery shutdown:  0268
AC line A-B scale factor:  31030   // AC input line voltage scale factors in decimal
AC line B-C scale factor:  31030
AC line C-A scale factor:  31030
Vout rdbk cal:  91.3          /    / Output voltage readback calibration in
Vout rdbk dvm:  114.5              floating point format
```

3.9.4.3 Display Status Registers and A/D Values

Enter a command ‘s’ (lowercase S) character to display the two 16-bit status registers, along with the A/D values of the AC input voltage, Output voltage, Output current, and Battery/Charger voltage. For example:

```
Status word 1: 5540                // 16-bit status flags in hexadecimal
Status word 2: 0283
A/D Values:                        // A/D values in floating point and hexadecimal
Output Voltage:  115.0       2314
Output Current:  3.25        0028
Input Voltage A-B:  200.0    4E20
Input Voltage B-C:  200.0    4E20
Input Voltage C-A:  200.0    4E20
Battery Voltage:  190.00     0284
```

The status word formats are explained in Section 3.9.6.

3.9.4.4 Display Firmware Version Number

Enter a command ‘v’ (lowercase V) character to display the version number of the firmware. For example:

```
Firmware version number: P/N 5152457-01, Rev 2.0
```

3.9.5 Elgar Terminal Interface (ETI) Data Request Commands

The GUPS 2400A-104 RS-232 text data mode commands have been developed for use by a program running on a host computer. The ETI mode data request commands provide formatted responses of only the measured value data in a formatted form. Each of the ETI data request commands supported by the GUPS 2400A-104 is described below.

3.9.5.1 Provide Calibration Values

Enter a command ‘l’ (lowercase L) character to obtain the calibration constants for the A/D converter algorithms values. For example, this command will return the GUPS 2400A–104 calibration constants in the following order:

Output Current at 80%	// current calibration in hexadecimal
Output Current at 105%	
Output Current at 150%	
Minimum Output Voltage	// voltage calibration in hexadecimal
Maximum Output Voltage	
Battery Good Voltage	// battery voltage in hexadecimal
Battery Bad Voltage	
Battery Shutdown Voltage	
Output Voltage Measurement	// scale factor in floating point
Output Voltage Measurement	

3.9.5.2 Provide Status Words and Hexadecimal A/D Values

Enter a command ‘m’ (lowercase M) character to obtain the Status Words and hexadecimal A/D calibration constants for the A/D converter algorithms values. For example, this command will return the A/D values and the unit status in the following order:

Status word 1	// 16-bit status flags in hexadecimal
Status word 2	
Output Voltage	// A/D values in hexadecimal
Output Current	
AC Input Voltage Line A-B	
AC Input Voltage Line B-C	
AC Input Voltage Line C-A	
Battery/Charger Voltage	

The status word formats are explained in Section 3.9.6.

3.9.5.3 Provide Status Words and Floating Point A/D Values

Enter a command ‘n’ (lowercase N) character to obtain the Status Words and floating point A/D calibration constants for the A/D converter algorithms values.

This command will return the A/D values and the unit status as in the ‘m’ command, but the voltages and currents will be returned in IEEE floating point format.

3.9.6 Status Words

The status words may be used to examine the current state of the GUPS 2400A–104, but are not meant to be used in applications that are time–critical such as AC line loss detection. The “Line Loss Detected” message sent from the GUPS 2400A–104 (refer to Section 3.9.7), or the AC Line Loss signal (relay contact closure) will have the quickest response time.

3.9.6.1 Status Word 1 Format

Table 3–5 provides the bit position information and definition of the data in Status Word 1.

Bit	Name	Definition
0	Over Temperature	0 = Normal Operation 1 = Over Temperature
1	Alarm Sense	0 = Alarm Not Sensed 1 = Alarm Sensed
2	Alarm Silence	0 = Alarm Silence Not Enabled 1 = Alarm Silence Enabled
3	Charger Status	0 = Charger Not On 1 = Charger On
4	Current Overload	0 = Normal Operation 1 = Current Overload
5	Battery Switch	0 = Battery Switch Not On 1 = Battery Switch On
6	Test Mode	0 = Normal Operation 1 = Test Mode
7	Inverter Status	0 = Inverter Not On 1 = Inverter On
8	Output Relay	0 = Output Relay Open 1 = Output Relay Closed
9	Impending Shutdown	0 = Greater then 1 minute 1 = Less then 1 minute
10	Rectifier Slow Start	0 = Normal Operation 1 = Rectifier In Slow Start
11	Equalization Charge	0 = Equalization Charge Not On 1 = Equalization Charge On
12	Power Available	0 = Power Not Available 1 = Power Available
13	PWM Soft Start	0 = Normal Operation 1 = Unit In Soft Start Mode
14	Reserved	—
15	Battery Slow Start	0 = Normal Operation 1 = Battery Slow Start

Table 3–5. Status Word 1 Data Format

3.9.6.2 Status Word 1 Status Bit Condition Definitions

The definitions of the conditions and usage of the bits in Status Word 1 are defined below.

Over Temperature (Status Word 1, Bit 0)

The Over Temperature status bit indicates that the thermostat internal to the GUPS 2400A-104 has exceeded its trip point. A binary value of 0 indicates normal operation, while a binary value 1 indicates that the thermostat sensor has exceeded its trip point value of 95 degrees Celsius.

Alarm Sense (Status Word 1, Bit 1)

The Alarm Sense bit indicates that an alarm condition is currently being detected by the unit. A binary value of 0 indicates that no alarms are being sensed, while a binary value of 1 indicates that an alarm is being sensed.

Alarm Silence (Status Word 1, Bit 2)

The Alarm Silence bit reflects the setting of the front panel Alarm Silence button of the GUPS 2400A-104. A binary value of 0 indicates that the Alarm Silence is Not Enabled (when an alarm condition is sensed the audible alarm will annunciate it), while a binary value of 1 indicates that the Alarm Silence is Enabled (a subsequent change in the alarm condition will re-enable the alarm).

Charger Status (Status Word 1, Bit 3)

The Charger Status bit reflects the condition of the charger enabled logic of the GUPS 2400A-104. A binary value of 0 indicates that the charger is not on, while a binary value of 1 indicates that the charger is on.

Current Overload (Status Word 1, Bit 4)

The Current Overload bit indicates that the unit has sensed a current overload of greater than 105% of the specified output current. A binary value of 0 indicates normal operation, while a binary value of 1 indicates that the output current is greater than 105% of the specified current output capability of the unit.

Battery Switch (Status Word 1, Bit 5)

The Battery Switch bit reflects the status of the SCR battery switch in the GUPS 2400A-104 which connects the battery to the internal DC bus. A binary value of 0 indicates that the battery switch is not on, while a binary value of 1 indicates that the battery switch is on.

Test Mode (Status Word 1, Bit 6)

The Test Mode status bit indicates if the GUPS 2400A-104 is in test mode. A binary value of 0 indicates that the unit is in normal operating mode, while a binary value of 1 indicates that the unit is in test mode (as commanded by the execute test mode button on the front panel of the GUPS 2400A-104).

Inverter Status (Status Word 1, Bit 7)

The Inverter Status bit indicates the operating condition of the output inverter of the GUPS 2400A-104. A binary value of 0 indicates that the output inverter is not on, while a binary value of 1 indicates that the inverter is on.

Output Relay (Status Word 1, Bit 8)

The Output Relay status bit indicates the state of the units output relay. A binary value of 0 indicates that the units output relay is open, while a binary value of 1 indicates that the output relay is closed.

Impending Shutdown (Status Word 1, Bit 9)

The Impending Shutdown status bit indicates the status of the battery of the unit. A binary value of 0 indicates more than 1 minute of back-up time is available or that the battery voltage is greater than 177 volts, while a binary value of 1 indicates that less then 1 minute of back-up time is available or that the battery voltage that is less than 177 volts.

Rectifier Slow Start (Status Word 1, Bit 10)

The Rectifier Slow Start status bit indicates that the unit is in rectifier slow start mode. A binary value of 0 indicates that the unit is in normal operating mode, while a binary value of 1 indicates that the unit is in rectifier slow start mode.

Equalization Charge (Status Word 1, Bit 11)

The Equalization Charge status bit indicates that the unit is in equalization charge enable mode. A binary value of 0 indicates that the unit is normal operating mode, while a binary value of 1 indicates that the unit is in equalization charge mode.

Power Available (Status Word 1, Bit 12)

The Power Available status bit indicates that power is available to the unit either from the AC input or the battery. A binary value of 0 indicates that power is not available, while a binary value of 1 indicates that power is available.

PWM Soft Start (Status Word 1, Bit 13)

The PWM Soft Start status bit indicates that the unit is in PWM soft start mode. A binary value of 0 indicates that the unit is in normal operating mode, while a binary value of 1 indicates that the unit is in soft start mode.

Status Word 1, Bit 14

Reserved

Battery Slow Start (Status Word 1, Bit 15)

The Battery Slow Start status bit indicates the unit is in battery slow start mode. A binary value of 0 indicates that the unit is in normal operating mode, while a binary value of 1 indicates that the unit is in battery slow start mode.

3.9.6.3 Status Word 2 Format

Table 3–6 provides the bit position information and definition of the data in Status Word 2.

Bit	Name	Definition
0	Running on Battery	0 = Running on AC 1 = Running on battery
1	Reserved	
2	Inverter Keypress	0 = No Keypress Pending 1 = Inverter Keypress Pending
3	System Shutdown	0 = System Operating 1 = System Shutdown
4	Reserved	—
5	Running on AC Line	0 = Running on Battery 1 = Running on AC Line
6	150% Overload Sense	0 = Normal Operation 1 = 150% Overload Detected
7	Float Timer Time-out	0 = Not Float Charging 1 = Float Timer Time-out
8	Wait to equalize	0 = No Equalization Pending 1 = Waiting To Equalize
9	Pass/Fail System Self-Test	0 = Self Test Failed 1 = Self Test Passed
10	System Down	0 = System Operational 1 = System Is Shutting Down
11	AC Input Line Out of Range	0 = AC Input Line In Range 1 = AC Input Line Out of Range
12	Delayed Event Flag	0 = No Pending Delayed Events 1 = Delayed Event Pending
13	Reserved	—
14	Reserved	—
15	Improper Output Voltage	0 = Output Normal 1 = Output Is Low

Table 3–6. Status Word 2 Data Format

3.9.6.4 Status Word 2 Status Bit Condition Definitions

The definitions of the conditions and usage of the bits in Status Word 2 are defined below.

Running on Battery (Status Word 2, Bit 0)

The Running on Battery status bit indicates that the unit is operating on batteries. A binary value of 0 indicates that the unit is running on AC input, while a binary value of 1 indicates that the unit is running on battery.

Status Word 2, Bit 1

Reserved.

Inverter Keypress (Status Word 2, Bit 2)

The Inverter Keypress status bit indicates that a front panel keypress has occurred. A binary value of 0 indicates that no key presses are pending, while a binary value of 1 indicates that a keypress has occurred.

System Shutdown (Status Word 2, Bit 3)

The System Shutdown status bit indicates that the system has been commanded to shut down, and a system shutdown is in effect. A binary value of 0 indicates that the system is operating (normal operating mode), while a binary value of 1 indicates that the unit is in system shutdown mode.

Status Word 2, Bit 4

Reserved.

Running on AC Line (Status Word 2, Bit 5)

The Running on Line status bit indicates that the unit is operating on the AC input. A binary value of 0 indicates that the unit is running on battery input, while a binary value of 1 indicates that the unit is running on the AC input.

150% Overload Sense (Status Word 2, Bit 6)

The 150% Current Overload bit indicates that the unit has sensed a current overload of greater than 150% of the specified output current. A binary value of 0 indicates normal operation, while a binary value of 1 indicates that the output current is greater than 150% of the specified current output capability of the unit.

Float Timer Time-out (Status Word 2, Bit 7)

The Float Timer Time-out status bit indicates the condition of the units float timer function. A binary value of 0 indicates that the timer has not timed out, while a binary value of 1 indicates that the unit's float timer has timed-out.

Wait to Equalize (Status Word 2, Bit 8)

The Wait to Equalize status bit indicates if the unit is waiting to equalize the batteries. A binary value of 0 indicates that the unit has no equalization pending, while a binary value of 1 indicates that the unit is waiting to equalize the batteries.

Pass/Fail System Self-Test (Status Word 2, Bit 9)

The Pass/Fail System Self-Test status bit indicates the results of the last run system self test. A binary value of 1 indicates that the unit passed the last self-test, while a binary value of 0 indicates that the unit failed the last self-test.

System Down (Status Word 2, Bit 10)

The System Down status bit indicates that the unit is in shutdown mode. A binary value of 0 indicates that the unit is operational, while a binary value of 1 indicates that the system is in shutdown mode.

AC Input Line (Status Word 2, Bit 11)

The AC Input Line status bit indicates the condition of the AC input line. A binary value of 0 indicates that the AC input line is within the specified input range, while a binary value of 1 is not within the specified input range.

Delayed Event Flag (Status Word 2, Bit 12)

The Delayed Event Flag status bit indicates the status of pending delayed events. A binary value of 0 indicates that the unit has no pending delayed events, while a binary value of 1 indicates that unit has at least one delayed event pending.

Status Word 2, Bit 13

Reserved.

Status Word 2, Bit 14

Reserved.

Improper Output Voltage (Status Word 2, Bit 15)

The Improper Output status bit indicates that the unit has sensed a sustained low voltage condition on the output. A binary value of 0 indicates that the output is normal, while a binary value of 1 indicates that the output voltage has dropped to less than 80 % of its nominal value.

3.9.7 AC Line Loss Signal

When the AC line is lost, the GUPS 2400A–104 will send the message “Line Loss Detected” out the RS-232 port. Applications may use this as a trigger to take action on a host computer.

SECTION 4
MAINTENANCE

4.1 Introduction

This section contains general information about maintenance of the GUPS 2400A-104. There are no adjustments accessible to the user.

WARNING

Hazardous voltages are present when operating this equipment. Please read the SAFETY NOTICE on page iv prior to installation, operation, or maintenance.

4.2 Service Information

Questions concerning the operation, repair or service of this instrument should be directed to the nearest Elgar representative or to the Elgar Service Department, Elgar Electronics Corporation, 9250 Brown Deer Road, San Diego, CA 92121-2294. Include the model number and serial number in any correspondence concerning this instrument. DO NOT return the unit to the factory without prior authorization.

4.3 Spare and Repair Parts

When ordering spare parts or repair parts, specify the part name, part number, component value and rating, and the Elgar part number, if available.

If complete assemblies are required, contact the Elgar Service Department. When ordering, specify the assembly part number as marked on the assembly and the unit model number, GUPS 2400A-104.

4.4 Periodic Maintenance

The only maintenance required for this instrument is to periodically remove and clean or replace the front panel fan filter.

The amount of time between cleaning is dependent on the environment in which the unit is used. Dust and dirt accumulation in the air filter can cause restricted airflow and subsequent overheating or reduced life on the internal components and batteries.

4.5 Troubleshooting

In the event that a problem arises during unit operation, refer to the guidelines listed in Table 4–1 to assist in determining the cause and to repair the unit as quickly as possible.

Symptom	Probable Cause	Suggested Solution
No indicators are illuminated.	The AC line voltage is not present.	Energize the input circuit breaker; press the OUTPUT ON pushbutton.
All indicators are illuminated red.	The battery module is unplugged.	Open the input circuit breaker, unplug the battery module then re-insert the battery module into the connector.
AC is not present on the output.	The output relay is not closed; the output circuit breakers are open.	Press the OUTPUT ON pushbutton; close the output circuit breakers.
The ON BATT indicator is illuminated amber.	The AC input is either below 169V or is above 232V.	Ensure the AC line is within the proper operating range.
The TEMP indicator is illuminated red.	The filter is clogged.	Clean the filter, if required.
The BATTERY indicator is illuminated red.	1) Low battery voltage or 2) a defective battery.	1) Recharge the battery or 2) replace the battery, as required.
The inverter transfers to battery then quickly shuts down.	1) The batteries are discharged; 2) the batteries are sulfated; or 3) the output relay is open.	1) Allow a 4-hour recharge of the batteries; 2) allow a 72-hour recharge of the batteries; or 3) press the OUTPUT ON pushbutton, as required.
The LOAD indicator is illuminated red.	There is an overload on the output.	Reduce the load.
The LOAD indicator is not illuminated.	The output relay is open.	Press the OUTPUT ON pushbutton to close the output relay.
The TEST indicator is blinking.	The TEST pushbutton has been pressed.	Wait until the self-test is complete before operating any other controls.
The TEST indicator does not blink when the TEST pushbutton is pressed.	The output relay is closed.	TEST will only be performed if the relay is open.

Table 4–1. GUPS 2400A-104 Troubleshooting Guide