

***POWER CONVERSION  
EQUIPMENT  
GLOBAL UNINTERRUPTIBLE  
POWER SUPPLY (PCE-GUPS)  
MODEL R610D/GUPS 1200***

**OPERATION MANUAL**

***ELGAR***  
POWERFUL SOLUTIONS





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GLOBAL UNINTERRUPTIBLE  
POWER SUPPLY (PCE-GUPS)  
MODEL R610D/GUPS 1200  
OPERATION MANUAL**

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## **ELGAR ONE-YEAR WARRANTY**

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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 the Model R610D/GUPS 1200 is properly configured for the user's particular application.

### WARNING

**HAZARDOUS VOLTAGES IN EXCESS OF 230 VRMS, 400V 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 ALSO BE FLOATING ABOVE (BELOW) CHASSIS GROUND.**

Installation and servicing must be performed by QUALIFIED PERSONNEL who are aware of properly dealing with attendant hazards.

Ensure that the AC power line ground is properly connected to the Model R610D/GUPS 1200 input connector. Similarly, other power ground lines including those to application and maintenance equipment **MUST** be properly grounded for both personnel and equipment safety.

Always ensure that facility AC input power is de-energized prior to connecting or disconnecting the power cable. Similarly, the Model R610D/GUPS 1200 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 normally generated on the output terminals. The Customer/User must ensure that the output power (and sense) lines be properly labeled as to the SAFETY hazards and any that 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.



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# **SECTION I**

## **GENERAL DESCRIPTION**



## 1.1 INTRODUCTION

The Elgar Model R610D/GUPS 1200 Power Conversion Equipment - Global Uninterruptible Power Supply (PCE-GUPS) provides regulated 120V RMS, 60 Hz output power at up to 10A RMS load current for a total output of 1200 VA. The unit accepts AC input voltages from 95 VAC to 280 VAC at frequencies from 45 Hz to 450 Hz or DC input voltages from 24 VDC to 37 VDC. The unit also provides a battery backup of 5 minutes at 1200W output or 7 minutes at 840W output via the internal batteries. Output power is continuous when transferring from AC to DC, DC to AC, DC to battery, battery to DC, AC to battery, or battery to AC.

The R610D/GUPS1200 is designed for critical power conditioning requirements of remote and globally deployed computer based systems. The ability to accept varying and irregular input voltages and frequencies, as well as its rugged construction, makes the unit ideal for the following applications:

- Military C<sup>4</sup>I;
- Remote computer based systems;
- Motor generator output conditioning;
- Telecommunications;
- Geological exploration;
- Oil field instrumentation;
- Remote chart recording;
- Data acquisition;
- Telemetry backup;
- Mobile calibration; and,
- Paramedical services.

## 1.2 GENERAL DESCRIPTION

The R610D/GUPS 1200 PCE-GUPS is contained in a 7" (178 mm) high by 19" (483 mm) wide by 20.53" (521.46 mm) deep rack-mount enclosure. All input and output connections are made at the front panel. Cooling air is drawn in through a filter on the front panel and exhausted out the rear. Status of input and output power is indicated by front panel LEDs. A master power switch and a output circuit breaker are also provided on the front panel. There are no operator adjustments.

## 1.3 SPECIFICATIONS

### 1.3.1 Input Specifications

**AC Input Voltage:** Two ranges, automatically selected: 95-140 VAC and 190-280 VAC.

**AC Input Frequency:** 45-450 Hz.

**DC Input Voltage:** 24-37 VDC.

### 1.3.2 Battery Specifications

**Batteries:** Internal, 30V, 16 AH.

**Battery Hold-Up Time:** 5 minutes, minimum, with a 1200W load; 7 minutes, minimum, with an 840W load.

**Battery Recharge Time:** 4 hours, maximum, to 90% of full charge.

**1.3.3 Output Specifications**

**Output Voltage:** 120V  $\pm$ 2.5% over the full range of load and input voltage.

**Output Frequency:** 60 Hz  $\pm$ 0.1 Hz, crystal controlled.

**Output Current:** 10A RMS, 26A peak.

**Output Power:** 1200W into resistive load; 1200 VA into a  $\pm$ 0.6 power factor, maximum.

**Power Factor:** 0 lead, 0 lag.

**Output Distortion:** 5.5% Total Harmonic Distortion (THD), maximum.

**Output Protection:** Automatic current limiting, RMS current shutdown, and thermal shutdown.

**Efficiency:** 80% operating on AC; 70% operating on DC.

**AC to DC Crossover:** 105 VAC, minimum.

**Power Loss During Crossover:** None

**1.3.4 Environmental**

**Temperature Range:** Operating: 0°C to 40°C (32°F to 104°F); Non-Operating: -40°C to 65°C (-40°F to 149°F).

**Humidity:** 5% to 95% non-condensing, operating; 0% to 100% non-operating (condensing with protection).

**Altitude:** 0 to 10000 ft, operating; 0 to 40000 ft, non-operating.

**Electromagnetic Interference (EMI):** Conforms to FCC Docket 20780, Schedule A.

**1.3.5 General**

**Height:** 7" (178 mm)

**Depth:** 20.53" (521.46 mm)

**Width:** 19" (483 mm). Fits standard RETMA rack.

**Weight:** 99 lbs. (45 kg), maximum

**Vibration and Shock:** Per MIL-STD-810C, Method 516.2; Procedure I and Method 516.2; Procedure V when mounted in the appropriate transit case or rack.

**Standard Paint Color:** Federal Standard 5952, #26492 Gray.

**SPECIFICATIONS ARE SUBJECT TO CHANGE  
WITHOUT NOTICE.**

## **SECTION II**

# **INSTALLATION**



**2.1 INTRODUCTION**

The Elgar Model R610D/GUPS 1200 has been aligned, calibrated, and tested prior to shipment. The instrument is, therefore, ready for immediate use upon receipt. The following checks should be made, however, to ensure that the instrument has suffered no damage during shipment.

**WARNING**

**Hazardous voltages are present when operating this equipment. Read the "SAFETY" notices on page ii prior to performing installation, operation, or maintenance.**

**WARNING**

**The Model R610D/GUPS 1200 weighs 99 lbs. (45 kg). Four man lift required!**

**CAUTION**

**Do NOT apply AC input voltage to this instrument nor connect any load(s) without first verifying correct input line voltage and output wiring configuration. This instrument and any external loads or cables may be damaged by improper voltage settings, mixing modules of different channels, cable mis-wiring, etc.**

**2.2 UNPACKING****2.2.1 Package 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 and all shipping containers and filler material saved for inspection. Forward a report of damage to the Elgar Repair Department, which will provide instructions for repair or replacement of the instrument.

**2.2.2 Pre-Installation Inspection**

Perform a visual inspection of the instrument when it is removed from the shipping container. If the instrument or container show signs of rough handling, remove the covers from the instrument to ensure that the circuit boards are firmly in place and that no loose or broken components are evident.

**2.3 INSTALLATION**

The Model R610D is 7" (178 mm) high and is designed to be installed in a standard 19" (483 mm) RETMA cabinet enclosure.

**CAUTION**

**Avoid blocking the instrument air intakes or exhaust.**

**2.3.1 Air Intake and Exhaust**

The air intake is located on the front panel of the instrument and the exhaust is via 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 1.75" (45 mm) vertical spacer above and below the instrument may improve cooling.

**2.4 INSTALLATION/DIMENSIONAL DRAWING**

Refer to Figure 2-1 for information on the Model R610D/GUPS 1200 outline and mounting dimensions.

**2.5 INPUT/OUTPUT CONNECTIONS**

The Model R610D/GUPS 1200 has one input connector for AC, one for DC, four parallel output connectors for 117 V, 60 Hz output, and a power loss connector. Each connector has an identifying number. Pin assignments are contained in Table 2-1. An illustration of the R610D/GUPS 1200 front panel is provided in Figure 3-1.

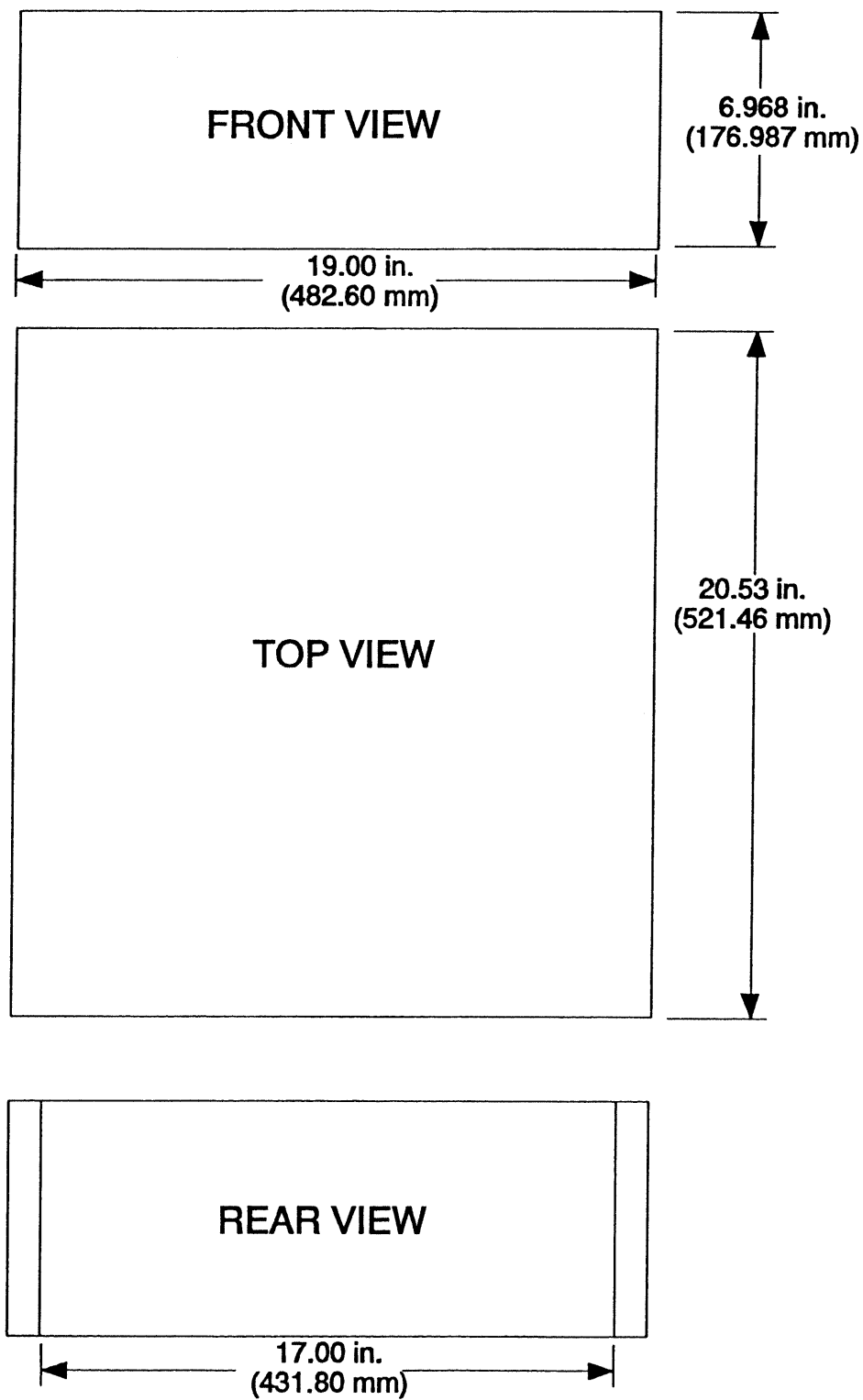


Figure 2-1. Model R610D/GUPS 1200 Installation Dimensions

**Table 2-1. R610D/GUPS 1200 Pin Connections**

<b>AC INPUT</b>		<b>AC OUTPUT (4)</b>	
<b>Pin</b>	<b>Function</b>	<b>Pin</b>	<b>Function</b>
A	115/230 VAC, 50/60/400 Hz Input	A	117 VAC, 60 Hz Output
B	Spare	B	Neutral
C	Neutral	C	Safety Ground
D	Safety Ground	D	Chassis Ground
<b>DC INPUT</b>		<b>POWER LOSS SIGNAL</b>	
<b>Pin</b>	<b>Function</b>	<b>Pin</b>	<b>Function</b>
A	+ 28 VDC	1	Switch 1
B	28 VDC Return	2	Switch 2
<b>GROUND STUD</b>		3	Switch 1 Return
<b>Pin</b>	<b>Function</b>	4	Switch 2 Return
#10	Earth Ground Screw		

# **SECTION III**

# **OPERATION**



### 3.1 INTRODUCTION

The controls and connectors for the Model R610D/GUPS 1200 are easily understood after a brief overview.

### WARNING

**Hazardous voltages are present when operating this equipment. Read the "SAFETY" notices on page ii before performing installation, operation or maintenance.**

### 3.2 FRONT PANEL

Refer to Figure 3-1 for the location of the controls, indicators, and connectors listed below. All controls, indicators, and connectors are located on the front panel. There are no operator adjustments inside the Model R610D/GUPS 1200.

### 3.3 CONNECTORS

The Model R610D/GUPS 1200 has one input connector for AC, one for DC, four parallel output connectors for the 120 VAC, 60 Hz outputs, and a power loss signal connector. Each connector has an identifying number. Pin assignments are provided in Table 2-1.

### 3.4 SWITCHES/CIRCUIT BREAKERS

There are two front panel switches/circuit breakers:

- The MASTER power switch/circuit breaker turns the Model R610D/GUPS 1200 off and inhibits battery operation.

- The AC OUTPUT ON/OFF switch/circuit breaker disconnects the AC output from the front panel connectors.

### 3.5 INDICATORS

There are six indicators on the front panel (refer to Figure 3-1).

#### 3.5.1 AC INPUT ON Indicator

This indicator is illuminated green when the AC input connector is energized.

#### 3.5.2 DC INPUT ON Indicator

This indicator is illuminated when the DC input connector is energized. The indicator is green when the DC is connected with the correct polarity, and red when the DC input is reversed.

#### 3.5.3 MASTER ON Indicator

This indicator is illuminated green when the MASTER power switch/circuit breaker is in the ON (up) position.

#### 3.5.4 FAULT Indicator

This indicator is illuminated red when a fault condition occurs. Fault conditions are as follows:

- AC output over-current;
- AC input voltage too high;
- DC input over-current; or,
- Internal temperature too high.

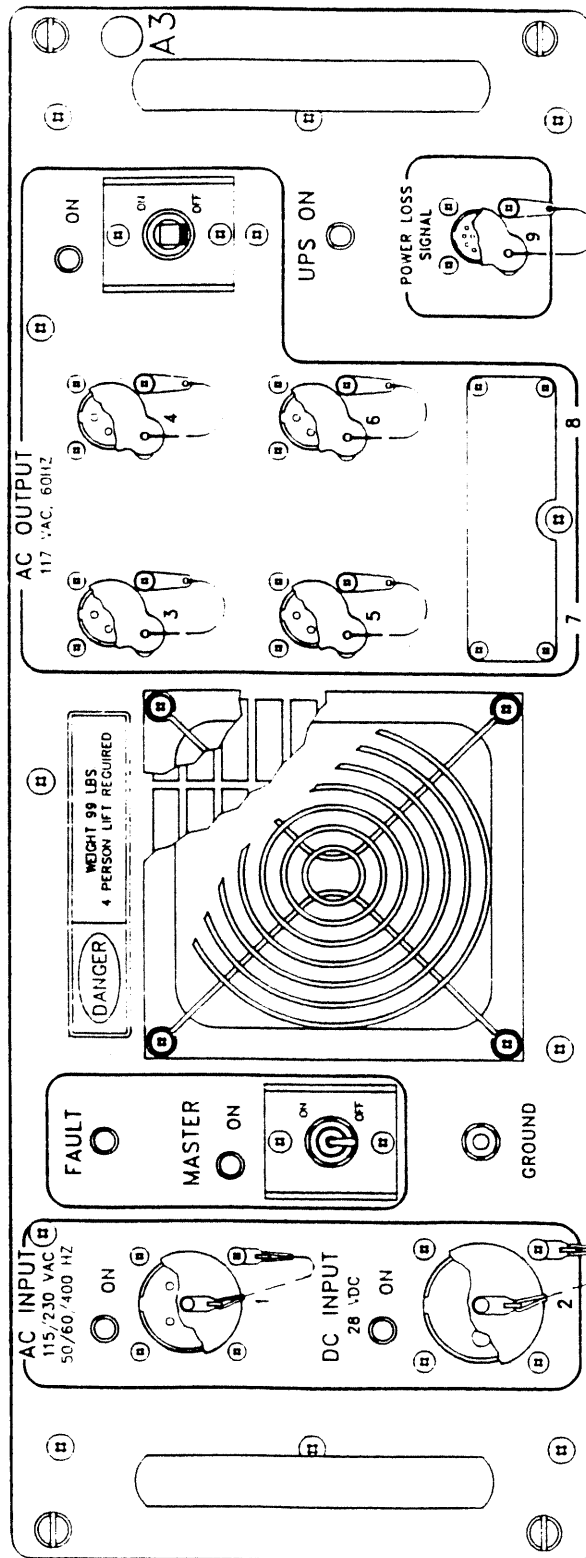


FIGURE 3-1 FRONT PANEL LAYOUT

The fault is reset when the MASTER power switch/circuit breaker is turned OFF (down) for 10 seconds then turned back to the ON (up) position.

### **3.5.5 AC OUTPUT ON Indicator**

This indicator is illuminated green when the AC output is available, whether or not the AC OUTPUT ON/OFF switch/circuit breaker is on or off.

### **3.5.6 UPS ON Indicator**

This indicator is illuminated amber when input power has failed and the Model R610D/GUPS 1200 is running on batteries.

## **3.6 POWER UP SEQUENCE**

### **CAUTION**

**Ensure that the Model R610D/GUPS 1200 AC OUTPUT ON/OFF switch/circuit breaker in the OFF (down) position prior to applying power to the unit.**

Perform the following:

1. Position the MASTER power switch/circuit breaker to the ON (up) position. Ensure that the MASTER ON indicator is illuminated (green).
2. After three to nine seconds, the AC OUTPUT ON indicator should illuminate (green). If the indicator does not illuminate, or if the FAULT indicator is illuminated (red), the unit should be inspected for proper operation by qualified service personnel.

3. After the AC OUTPUT ON indicator illuminates, place the AC OUTPUT ON/OFF switch/circuit breaker to the ON (up) position. This provides power to the load.

### **NOTE**

If the UPS ON indicator illuminates, no AC or DC power is applied to the Model R610D/GUPS 1200 and the unit is operating on batteries. The **MASTER power switch/circuit breaker should immediately be turned OFF (down) before the charge in the batteries is depleted.**

The Model R610D/GUPS 1200 automatically tests whether the AC line voltage is in the 95-140 VAC or the 190-280 VAC range. This test is accomplished when the MASTER ON/OFF power switch/circuit breaker is first energized, and the result is stored until the MASTER ON/OFF power switch/circuit breaker is de-energized and then re-energized. It is, therefore, necessary for proper operation to have the proper range of AC applied at power up. If the Model R610D/GUPS 1200 is energized on DC or batteries, it is necessary to power down before changing to AC. If the AC source is changed from one range to another, the unit must be powered down and powered up again with the new AC source connected.

**CAUTION**

**Damage may occur if the AC source is changed without first powering down the unit.**

**3.7 BATTERY OPERATION**

When AC power is available and greater than 105 VAC (210 VAC if operating in the 190-280 VAC range) the Model R610D/GUPS 1200 will operate on AC power. If only external DC is available and the voltage is greater than 24 VDC, the unit will operate on DC power. If neither is available, the unit will operate on power supplied by the internal batteries. If the batteries are fully charged, operation will be for seven minutes minimum (typically ten minutes) with full computer load.

Operation on batteries is indicated by the front panel UPS ON indicator being illuminated (amber) and by contact closures brought out through the Power Fail connector.

The Model R610D/GUPS 1200 will automatically sense when the batteries are nearly discharged and de-energize power before the batteries are damaged. If this point is reached, a period of approximately one hour of operation on either AC or DC external power will be necessary before the unit will operate on batteries again. Approximately four hours will be required to bring the batteries up to full charge.

**3.8 BATTERY INFORMATION, CARE AND HANDLING**

The batteries used in the Model R610D/GUPS 1200 require proper storage and recharging if they are to remain reliable.

When a battery is discharged, by operation or storage, a sulfate coating builds up on the plates. This coating reduces the effective surface area of the plates, which reduces backup time. If the coating is severe, then the battery is useless. Light levels of sulphation are removed by cycling (charging and discharging the battery). Storing the battery at reduced temperatures reduces the level of chemical activity, thus sulphation time takes longer. Reasonable storage times are provided in Table 3-1.

Table 3-1. Reasonable Battery Storage Times

Storage Temperature	Storage Time
0°C (32°F)	240 days
10°C (50°F)	120 days
20°C (68°F)	60 days
40°C (104°F)	18 days

The batteries will maintain 60% capacity during storage (this does not mean that run time will be 60% of specification). The backup time will be minimal, a minute or two at best. The batteries can be stored longer than indicated in Table 3-1, but there may be no backup, and restoring the batteries will take a significant amount of time.

Damage occurs to the batteries after lengthy storage time (extensive cycling required), as indicated in Table 3-2.

Table 3-2. Maximum Battery Storage Times

Storage Temperature	Storage Time
0°C (32°F)	230 months
10°C (50°F)	115 months
20°C (68°F)	52 months
40°C (104°F)	13 months

The batteries must be cycled to return them to full capacity. Perform the following:

### **CAUTION**

Ensure that the Model R610D/GUPS 1200 AC OUTPUT ON/OFF switch/circuit breaker in the OFF (down) position prior to applying power to the unit.

1. Connect the unit to a source of AC power and connect a 100W load to the output.
2. Place the MASTER ON/OFF power switch/circuit breaker in the ON (up) position. Ensure that the MASTER ON indicator is illuminated (green).

3. Allow the batteries to charge for a minimum of 6 hours with the AC OUTPUT ON/OFF switch/circuit breaker in the OFF (down) position.
4. Place the AC OUTPUT ON/OFF switch/circuit breaker in the ON (up) position. Ensure that the AC OUTPUT ON indicator is illuminated (green).
5. Unplug the AC input. Ensure that the UPS ON indicator is illuminated (amber).
6. Run the batteries down until the unit shuts off.
7. Repeat steps 1 through 6 several times. After recharge, increase the load to 1000W.
8. If the unit runs for 5 minutes with the 1000W load, the unit is ready for use.

9. If the unit does not run for 5 minutes, reduce the load to 100W and repeat step 1 through 7.

If the batteries need to be stored for a longer period of time, they can be periodically recharged or floated at a constant charge voltage. If the batteries are in the unit, the unit can be connected to the appropriate AC source with the MASTER power switch/circuit breaker in the ON (up) position.

When the batteries are not in the unit, they must be charged by a dedicated battery charger. The Model R610D/GUPS 1200 includes a 30V battery pack. When using a dedicated charger for this pack, use a constant current fixed voltage power supply. The batteries shall be charged at 35.25 volts with a supply current limited to 2.5 amps per battery pack. When more than one pack is to be charged, packs shall be connected in parallel.

Charging paralleled batteries with wide variations in charge state requires adding a current limit resistor between the plus charge bus and each battery (1  $\Omega$ , 10W). This prevents the charged batteries from quick charging the discharged batteries.