

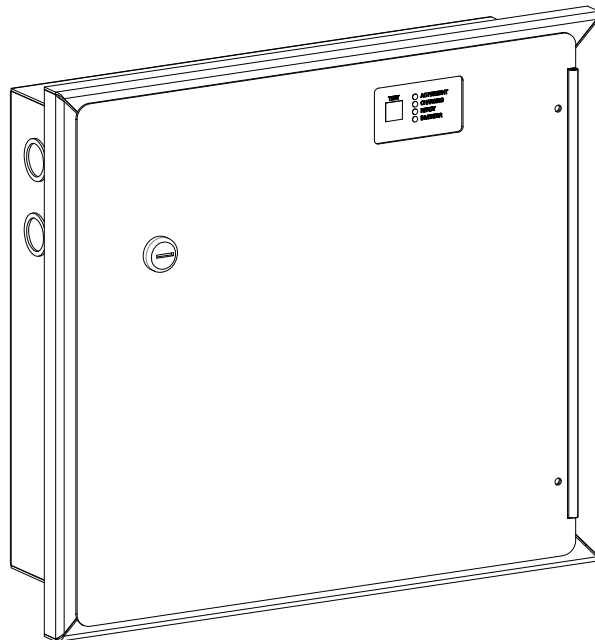


INSTALLATION & USER'S MANUAL

110W - 225W SINGLE PHASE

Series LVM

EMERGENCY LIGHTING CENTRAL INVERTER



Myers Power Products, Inc.
44 South Commerce Way, Bethlehem, PA 18017
1-800-526-5088 • (610) 868-3500 • Fax: (610) 868-8686
Service: (610) 868-5400
www.myerspoverproducts.com

This unit contains LETHAL VOLTAGES. All repairs and service should be performed by AUTHORIZED SERVICE PERSONNEL ONLY! There are NO USER SERVICEABLE PARTS inside this unit.

IMPORTANT SAFEGUARDS

When using electrical equipment, you should always follow basic safety precautions, including the following:

- 1. READ AND FOLLOW ALL SAFETY INSTRUCTIONS.**
- 2. Do not install the system outdoors.**
- 3. Do not install near gas or electric heaters or in other high-temperature locations.**
- 4. Use caution when servicing batteries. Depending on battery type, batteries contain either acid or alkali and can cause burns to skin and eyes. If battery fluid is spilled on skin or in the eyes, flush with fresh water and contact a physician immediately.**
- 5. Equipment should be mounted in locations where it will not be subjected to tampering by unauthorized personnel.**
- 6. The use of accessory equipment not recommended by Manufacturer may cause an unsafe condition and void the warranty.**
- 7. Do not use this equipment for other than its intended use.**
- 8. Qualified service personnel must perform all servicing of this equipment.**

SAVE THESE INSTRUCTIONS

The installation and use of this product must comply with all national, federal, state, municipal, or local codes that apply. If you need help, please call Service. 610-868-5400

CAUTION

**READ ENTIRE MANUAL AND REVIEW ALL DOCUMENTATION BEFORE ATTEMPTING SYSTEM
INSTALLATION!**

FOR SERVICE or INSTALLATION INFORMATION
TELEPHONE: (610) 868-5400 (24 HR. HOTLINE)
FAX: (610) 954-8227

**FOR YOUR PROTECTION...
PLEASE COMPLETE AND RETURN WARRANTY REGISTRATION CARD IMMEDIATELY.**

CAUTION

Do not drill the cabinet; drilling cabinet will void factory warranty; drill filings may damage the unit and keep it from operating. If you need larger knockouts, use a chassis punch to punch out the appropriate knockout.

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SECTION 1

SAFETY WARNINGS

Read the following precautions before you install this emergency lighting system.

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS. This manual contains important instructions that you should follow during installation and maintenance of the system and batteries. Please read all instructions before operating the equipment and save this manual for future reference.

DANGER

This system contains **LETHAL VOLTAGES**. **AUTHORIZED SERVICE PERSONNEL** should perform all repairs and service **ONLY**. There is **NO USER SERVICEABLE PARTS** inside the Emergency lighting power supply.

WARNING

- Do not install the system outdoors.
- Do not install near gas or electric heaters or in other high-temperature locations.
- Use caution when servicing batteries. Battery acid can cause burns to skin and eyes. If acid is spilled on skin or in the eyes, flush with fresh water and contact a physician immediately.
- Equipment should be mounted in locations where it is not readily subjected to tampering by unauthorized personnel.
- The use of accessory equipment not recommended by the manufacturer may cause an unsafe condition.
- Do not use this equipment for other than intended use.
- Only qualified service personnel (such as a licensed electrician) should perform the system and battery installation and initial startup. Risk of electrical shock.

BATTERY STORAGE

This shipment contains rechargeable, maintenance free batteries. They must be stored properly to assure proper operation upon installation. Therefore, please follow the following guidelines when storing batteries:

- Store in clean, dry and cool location. While it is safe to store batteries in environments of -18 to 40 degrees C (0 to 104 degrees F), it is recommended that you do not store at temperatures above 30 degrees C (86 degrees F). The warmer the ambient temperature, the higher the self discharge rate of the battery. This will require more frequent recharge of the individual batteries until they are placed in service.
- Avoid storing in direct sunlight or in front of or near heaters, heat duct or other sources of heat.
- Do not store directly on concrete structures. Always store on wooden pallets or metal shelves near floor level.
- Place the batteries in service within 180 days of receipt. If you cannot place the batteries in service within the 180 days, then the batteries must be recharged every 180 days, (more frequently if stored at elevated temperatures) while in storage. Failure to do so will void the warranty and may cause irreversible damage to the battery.

SECTION 2

INTRODUCTION

Keep this Manual.

This unit is a microprocessor controlled PWM (Pulse Width Modulated) pure sine wave based DC to AC power inverter utilizing MOSFET technology. It integrates a fully automatic 3-rate battery charger, a relay transfer system, control circuitry and maintenance free sealed lead calcium type batteries. Options that include mounting bracket, paint color, and input voltage make the Series LVM versatile for any application. The system components are carefully matched to make the unit a completely self-contained, fully automatic standby power source for operation on lighting loads. The batteries are sized and tested per UL-924 and Life Safety Code ANSI / NFPA 101, providing emergency power for a minimum of 90 minutes.

If the duration of a power failure is greater than the batteries storage capability, the inverter will automatically shut down when the battery voltage reaches 85% of the nominal DC voltage. This feature protects the battery from being permanently damaged from a deep discharge that could cause cell reversal. This battery protection feature is called "Low Voltage Disconnect" or L.V.D.

When the AC power is restored after a full discharge, the system will be ready for another power failure within 24hrs. If another power failure occurs after the batteries are charged to approximately 80% but before the 24-hour recharge time, the run time will be decreased.

The front panel LED overlay incorporates a test switch, healthy codes, and fault codes that provide the user with a self diagnostic system that are easy to discriminate. All user interface functions are available from the front panel assembly.

HOW TO USE THIS MANUAL

This manual tells you how to install, start and operate your unit and lets you know how to get more information for special situations.

Please record your unit's part number, serial number, and model number below. You can find these numbers on the Unit Information label on the backside of the cabinet panel.

Part Number _____

Serial Number _____

Model Number _____

Record Keeping

An on-site permanent log of the inspection, testing, and maintenance of the emergency electrical power supply system shall be maintained in accordance with this manual. The log shall include:

The date on which the inspection, testing, and maintenance exercise was carried out.

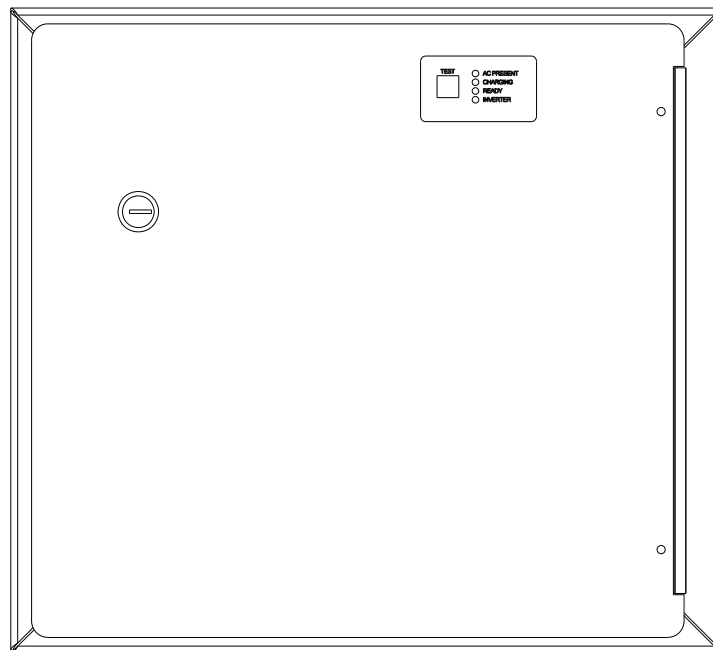
The name of the person(s) who performed the inspection, testing, and maintenance.

A note of any unsatisfactory condition observed or discovered, and the steps taken to correct the condition.

Service and Support

We are committed to outstanding customer service. A service technician is available **24** hours a day, **365** days a year. Service is also available **24** hours a day to give you access to technical notes and product information.

NOTE: Please have your unit's Serial and Part numbers available when you call; this number is located on the backside of the cabinet panel.

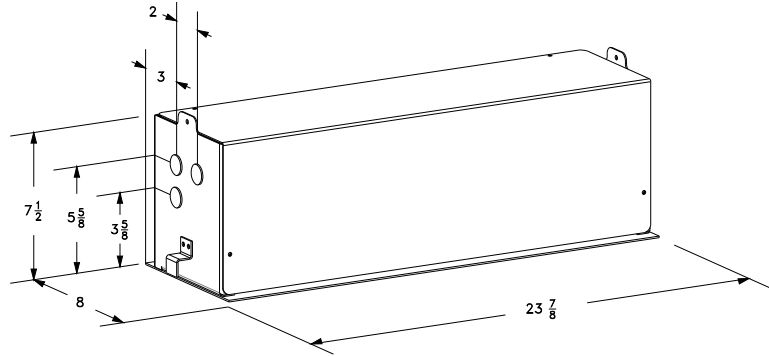


SECTION 3

BEFORE INSTALLING THE SYSTEM

System Dimensions and Weights

Required Clearance
 Top – 6" (15.24 cm)
 Sides – 2" (5.1 cm)
 Front – 12" (30.5 cm)



Conduit Knockout Size
 1.125"

Figure 3.1 110W - 225W (T-Grid Style) System Dimensions

Required Clearance
 Top – 6" (15.24 cm)
 Sides – 2" (5.1 cm)
 Front – 36" (91.4 cm)

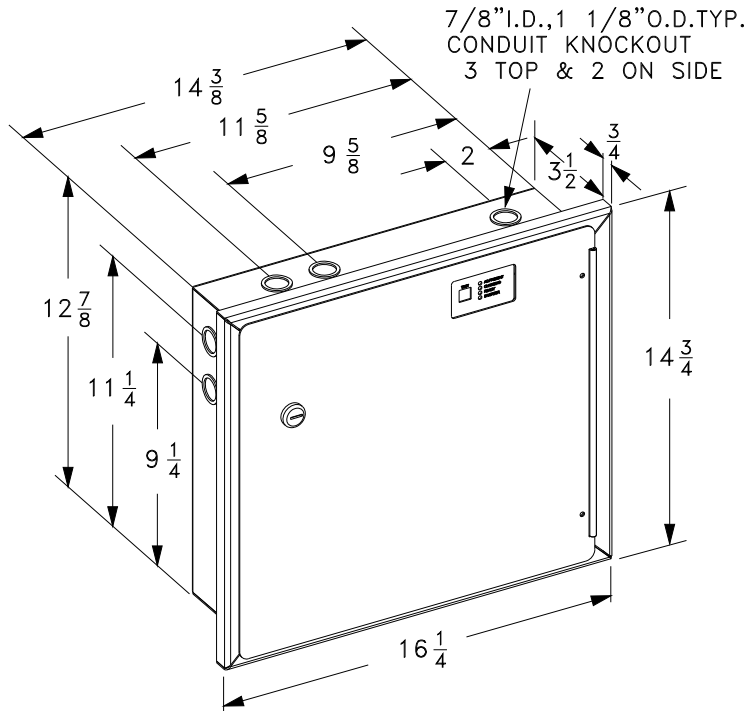


Figure 3.2 110W System Dimensions

Required Clearance
 Top – 6" (15.24 cm)
 Sides – 2" (5.1 cm)
 Front – 36" (91.4 cm)

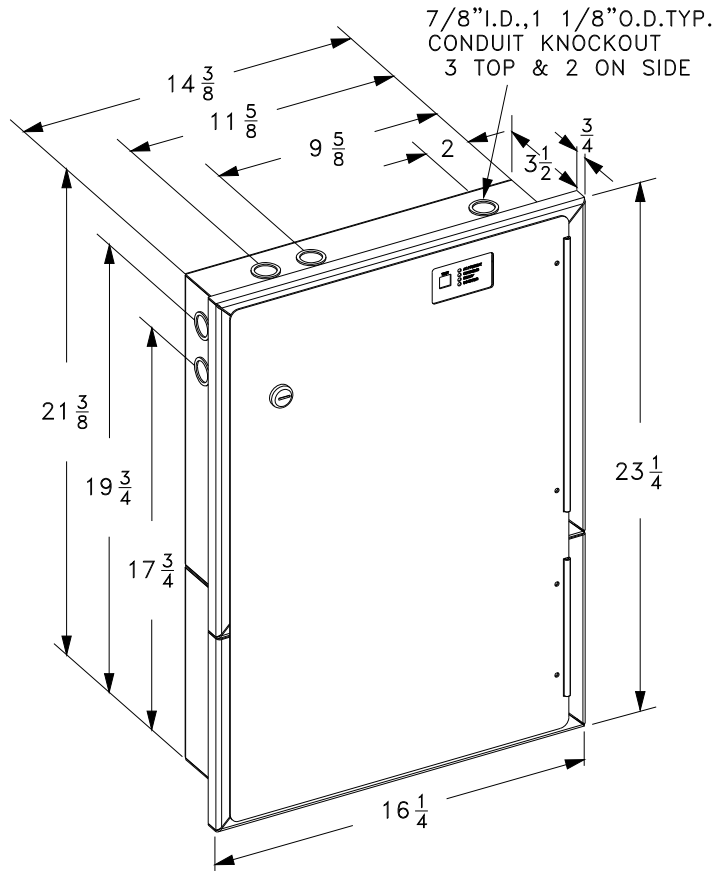


Figure 3.3 225W System Dimensions

Table 3.1 System weight [in lbs. (kg)]

	110W Recess	225W Recess	110W Grid	175W Grid	225W Grid
Inverter Cabinet	20 (9.1)	26 (11.8)	20 (9.1)	23 (10.4)	23 (10.4)
Batteries	17 (7.7)	34 (15.4)	17 (7.7)	25 (11.4)	34 (15.4)
System Total	37 (16.8)	60 (27.2)	37 (16.8)	48 (21.8)	57 (25.8)

Location Guidelines

Keep the following guidelines in mind when choosing the location for your system and batteries:

- Verify that the environment meets the requirements in “Storage and Operating Environment” below. The environment can affect the reliability and performance of both the unit and the batteries.
- Choose a permanent location for the unit.
- Refer to Table 3.1 when you choose a site to make sure that the area can support the weight of the system, the batteries, and any other necessary equipment.

CEC (Canadian Electric Code) requires the unit to be located in a service room. If the room is equipped with a sprinkler system, the unit must be provided with sprinkler proof cover.

The system should be connected to the emergency generator, if available.

Receiving and Moving the Unit and the Batteries

Systems weights vary, (see Table 3.1; ask your sales representative for additional information). Make sure you are prepared for these weights before you unload or move the unit or the batteries. Do not install any batteries until you have permanently installed the unit and connected all conduit and wiring.

Storage and Operating Environment

Make sure you store and install the system in a clean, cool, dry place with normal ventilation and level floors.

Storage Temperature

Store the batteries (in the system) at -18 to 40°C (0 to 104°F). Batteries have a longer shelf life if they are stored below 25°C (77°F). Keep stored batteries fully charged. Recharge the batteries every 90–180 days. The system without batteries may be stored at -20 to 70°C (-4 to 158°F).

Ventilation

The air around the unit must be clean, dust-free, and free of corrosive chemicals or other contaminants. Do not place the system or batteries in a sealed room or container.

Operating Temperature

System can operate from 20° to 30°C (68° to 86°F) and up to 95% relative humidity. The batteries' service life is longer if the operating temperature stays below 25°C (77°F).

High Altitude Operation

Maximum elevation for operation is 3000m (10,000 ft) above sea level.

Batteries

The temperature should be near 25°C (77°F) for optimum battery performance. Batteries are less efficient at temperatures below 18°C (65°F), and high temperatures reduce battery life. Typically, at about 35°C (95°F), battery life is half of what it would be at a normal temperature of 25°C (77°F). At about 45°C (113°F), battery life is one-fourth of normal.

Make sure that heaters, sunlight, air conditioners, or outside air vents are not directed toward the batteries. These conditions can make the temperature within battery strings vary, which can cause differences in the batteries' voltages. Eventually, these conditions affect battery performance.

Do not allow tobacco smoking, sparks, or flames in the system location because hydrogen is concentrated under the vent cap of each cell of the battery. Hydrogen is highly explosive, and it is hard to detect because it is colorless, odorless, and lighter than air.

Every type of battery can produce hydrogen gas, even sealed maintenance-free batteries. The gas is vented through the vent caps and into the air, mainly when the unit is charging the batteries. The batteries produce the most hydrogen when maximum voltage is present in fully charged batteries; the batteries do not produce hydrogen during float charging. The amount of current that the charger supplies to the batteries (not the battery ampere-hour) determines how much hydrogen is produced.

T-GRID INSTALLATION

CAUTION: Before installing, make certain the A.C. power is off.

NOTE: The battery is shipped inside the unit.

- 1) Remove the cover from the T-Grid unit.
- 2) Disconnect the wires going to the battery and remove the battery retaining bracket. Note the negative wire has a quick disconnect connector that can be unplugged instead of removing the wire from the terminal on top of the battery.
- 3) Remove the battery and place it in a location away from the work area to avoid damage until it is ready to be installed.
- 4) Remove the ceiling tile in the desired installation location.
- 5) Place the T-Grid unit across the 24" T-bars of the ceiling grid. Support the unit with wires attached to the building steel framing. Hanging ears are provided at the top of the T-Grid unit for support connections. **NOTE: DO NOT rely on the inverted T-bar structure to support the unit.**
- 6) Connect the conduits containing the AC supply and the remote fixture leads to the knock-outs provided in the T-Grid unit. (Plenum knock-out gaskets are supplied with the unit)
- 7) Reinstall the battery and the battery retaining bracket. Connect the input and the output wires to the T-Grid unit. Reconnect the battery wires. **NOTE: The battery MUST be secured in the T-Grid unit. DO NOT leave the battery loose or unsecured within the unit.**
- 8) Refer to the startup procedure, and then secure the cover on the T-Grid unit.
- 9) After installation is complete, replace properly-sized tile into the ceiling grid. The tile should rest on the flange of the T-Grid unit.

Installation Overview

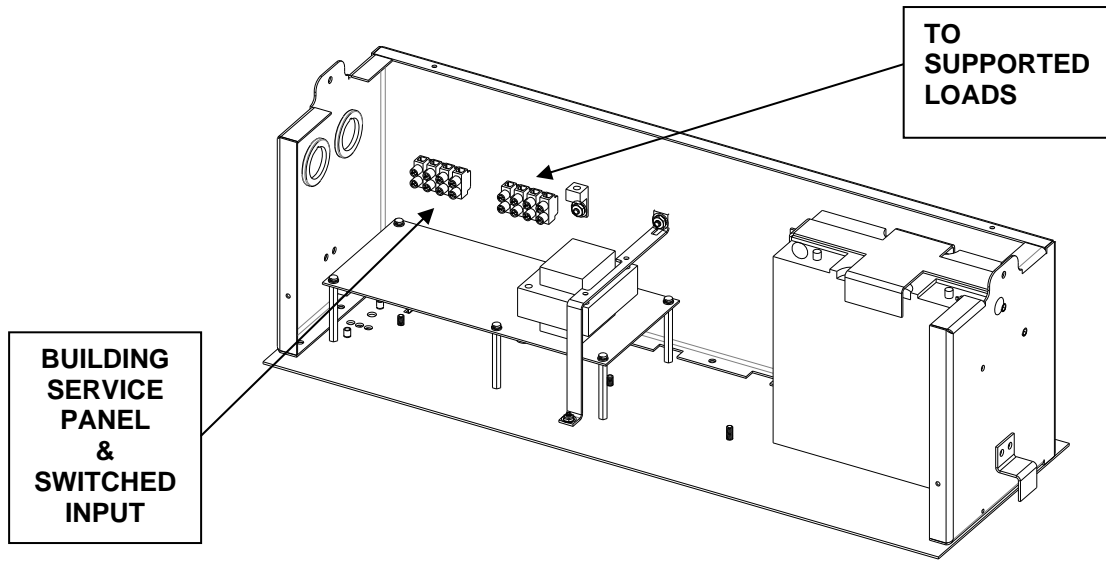


Figure 3.4 Typical Hardwire Installation for T-Grid

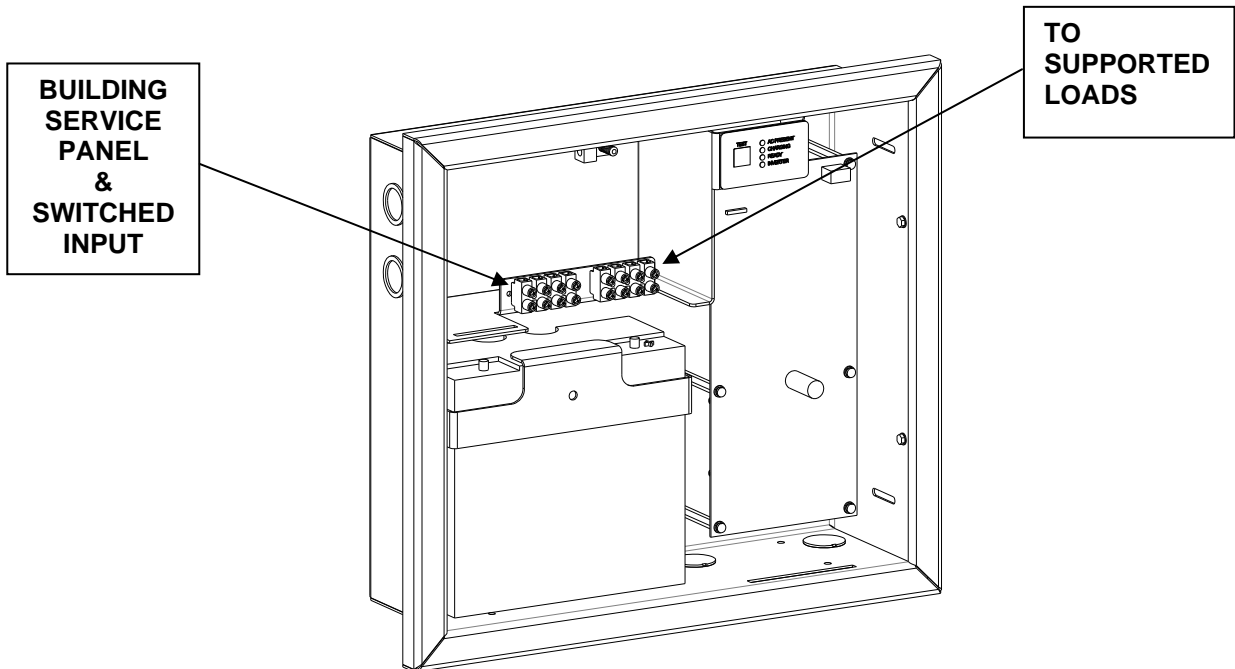


Figure 3.5 Typical Hardwire Installation for Recess

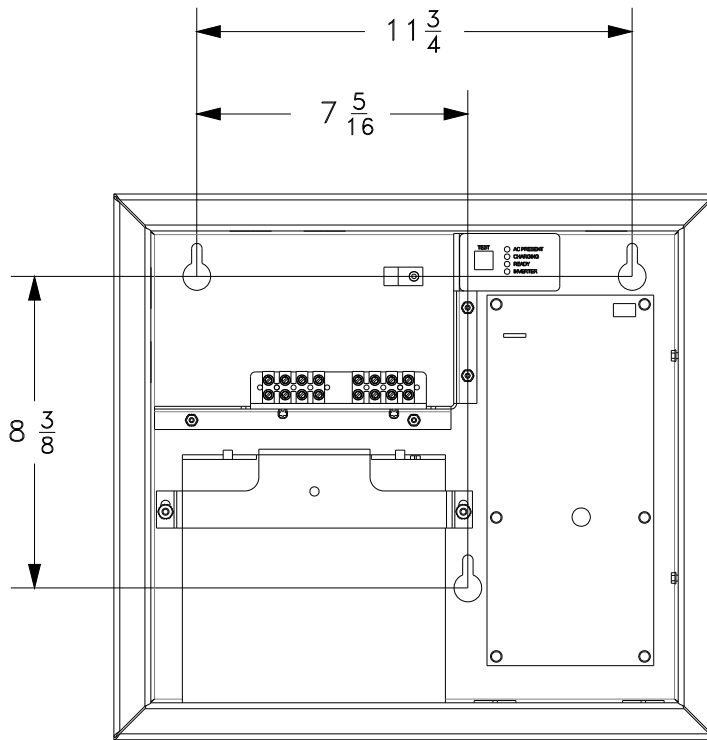


Figure 3.6 Mounting Dimensions for Recess

SECTION 4

AC INPUT & AC OUTPUT INSTALLATION

WARNING

Only qualified service personnel (such as a licensed electrician) should perform the AC installation. Risk of electrical shock.

Read the following cautions before you continue.

CAUTION

- Unit contains hazardous AC and DC voltages. Because of these voltages, a qualified electrician must install the system, AC line service, and batteries. The electrician must install the AC line service according to local and national codes and must be familiar with batteries and battery installation.
 - Before you install, maintain, or service the unit, always remove or shut off all sources of AC and DC power. You must disconnect AC line input at the service panel to make sure the unit does not supply output voltage.
 - Whenever AC and/or DC voltage is applied, there is AC voltage inside the unit; this is because the unit can supply power from AC line or from its batteries. To avoid equipment damage or personal injury, always assume that there may be voltage inside the unit.
 - Remove rings, watches, and other jewelry before installing the AC wiring. Always wear protective clothing and eye protection and use insulated tools when working near batteries. Whenever you are servicing an energized unit with the door open, electric shock is possible; follow all local safety codes. **TEST BEFORE TOUCHING!**
1. Open the cabinets' front door. Make sure the Main AC Input Circuit Breaker is open and the negative wire of the battery disconnect is unplugged.
 2. Look at the ID label on the inside of the front cover. Write down the following information:
Input Voltage: _____
Output Voltage: _____
 3. Now, make sure the input and output voltages are what you need.
 - Does the input voltage available for the system at the AC service panel match the input voltage shown on the unit's ID label?
Service Panel Voltage = _____ Input Voltage ___Yes / ___No
 - Does the output voltage on the ID label match the voltage for your loads (protected equipment)?
Load Voltage = _____ Output Voltage ___Yes/___NoIf you answered NO to either of the preceding questions, call SERVICE.

- Now, use the information you wrote down in Step 2 to find the correct circuit breaker for the service panel that is for your system.

Table 4.1 Recommended Circuit Breaker for Maximum Input Current

System	Input Voltage (Vac)	Max. Current	Recommended Circuit Breaker
110W	120V	1.5 Amps	5A, 1-Pole
110W	277V	0.6 Amps	5A, 1-Pole
175W	120V	2.0 Amps	5A, 1-Pole
175W	277V	1.0 Amp	5A, 1-Pole
225W	120V	2.6 Amps	5A, 1-Pole
225W	277V	1.1 Amps	5A, 1-Pole

**** WARNING: The external Input Circuit Breaker protecting the system must be a “Motor Start”, Delayed Trip Type. This is due to the magnetic inrush current drawn during application of AC Power. Exceeding a 20-Amp circuit breaker can damage the system.**

- Write down the circuit breaker value that applies to your system from Table 4.1: _____
- Now, refer to Table 4.2 and use the notes to find the proper gauge wire for the recommended circuit breaker recorded in step 5.

Table 4.2 Recommended Minimum Wire Sizes

Read These Important Notes!	For this Input Circuit Breaker Size...		Use this Size 90°C Copper Wire	
			AWG	mm ²
This table lists the AWG and mm ² wire size for each circuit breaker size. The minimum recommended circuit breaker sizes for each model and voltage application are listed in Table 4.1. The temperature rating of conductor must not be less than 90° C wire. Based on the ampacities given in Tables 310-16 of the National Electrical Code, ANSI/NFPA 70-1993 and NEC article 220. Circuit conductors, must be the same size (ampacity) wires and equipment-grounding conductors must meet Table 250-95 of the National Electrical Code. Code may require a larger wire size than shown in this table because of temperature, number of conductors in the conduit, or long service runs. Follow local code requirements.	5, 10, 15		14	2.08

- The input circuit breaker in the customer provided service panel provides the means for disconnecting AC to the unit. Only authorized persons shall be able to disconnect AC to the unit [see NEC 700-20]. If you are using the input circuit breaker to disconnect AC, you must make sure that only authorized persons have control of the circuit breaker panel to meet the requirements of NEC 700-20.

CAUTION

To prevent the possibility of electrical shock or damage to personnel or the equipment, the circuit breaker at the input service panel must be turned off.

- Install the conduit. You must run the AC input service conductors and AC output conductors through separate conduits. Emergency output conductors and non-emergency output conductors must also be run through separate conduits. Emergency output circuits shall be installed in dedicated conduit systems and not shared with other electrical circuits as described in NEC 700-9(b). Branch circuits for Emergency Power or Lighting are restricted from being part of a multi wire branch circuit as described in NEC 700-19.

Failure to comply with NEC 700-9(b) and NEC 700-19 will void factory warranty.

The next step explains where to make the AC connections to the system.

INSTALLING AC INPUT WIRES: (See Figure 4.1)

Connect AC utility from the service panel circuit breaker to the system. Connect feed hot wire to the Input Terminal Block labeled “**LINE**”, connect the feed neutral wire to the Input Terminal Block labeled “**NEUTRAL**” and connect the ground wire to the ground terminal block labeled “**GND**”.**

**** NOTE:** The inside of the door contains a label showing the input and output terminal blocks and their respective labels.

INSTALLING AC OUTPUT WIRES: (See Figures 4.1 & 4.2)

Connect load wires to the system’s area labeled “**OUTPUT TERMINAL BLOCK**”. Connect the load hot wire to the Main Output Terminal block labeled “**NORMALLY ON**” or “**NORMALLY OFF**” depending on the output function desired. If a switched output is required then connect the switch hot lead to the “**SWITCHED LINE**” terminal of the output terminal block and the load hot lead to the “**NORMALLY OFF**” output. Connect load neutral to “**SWITCHED NEUTRAL**” and ground wires.

**** NOTE:** The inside of the door contains a label showing the input and output terminal blocks and their respective labels.

OUTPUT TYPES:

Normally On Output (NORMALLY ON): Provides Power to the output load during utility present, utility failures, and test modes.

Normally Off Output (NORMALLY OFF/SWITCHED): Output is dedicated for emergency-only equipment which operates only during utility failure and test modes.

Switched Input (SWITCHED LINE): Apply a source to this input to convert the **Normally Off Output** to a **Switched Output**. This source can be controlled by wall switches, dimmers, photo eyes, etc.

Note: A source applied to the “**SWITCHED LINE**” terminal will power the “**NORMALLY OFF/SWITCHED**” if the utility is present. During utility failures and test modes the “**NORMALLY OFF/SWITCHED OUT**” will be powered from the battery. Refer to Figure 4.2

***** NOTE:** The switched output is an isolated input that accepts the same voltage as the input. This input is a control input and does not directly tie to the load in the on position, so a dimmed signal cannot be sent through this input.

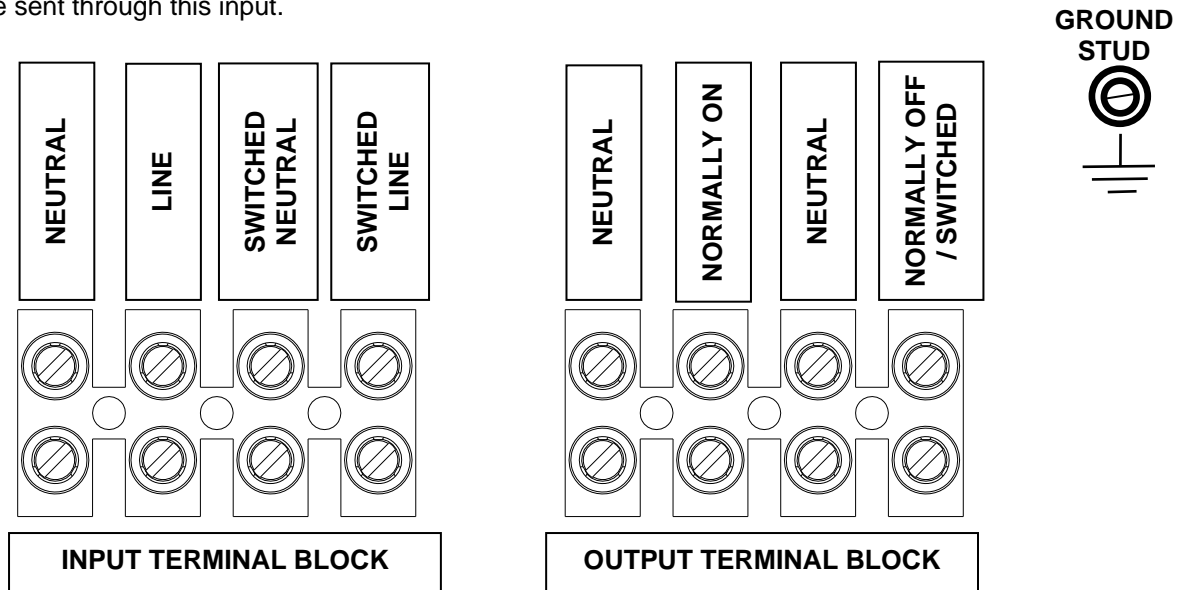


Figure 4.1 AC Input and Output connections

WARNING

The utility AC to the Wall Switch or the Dimmer Panel **MUST** be the same voltage, the same phase and the same common neutral that is connected to the “LVM” system.

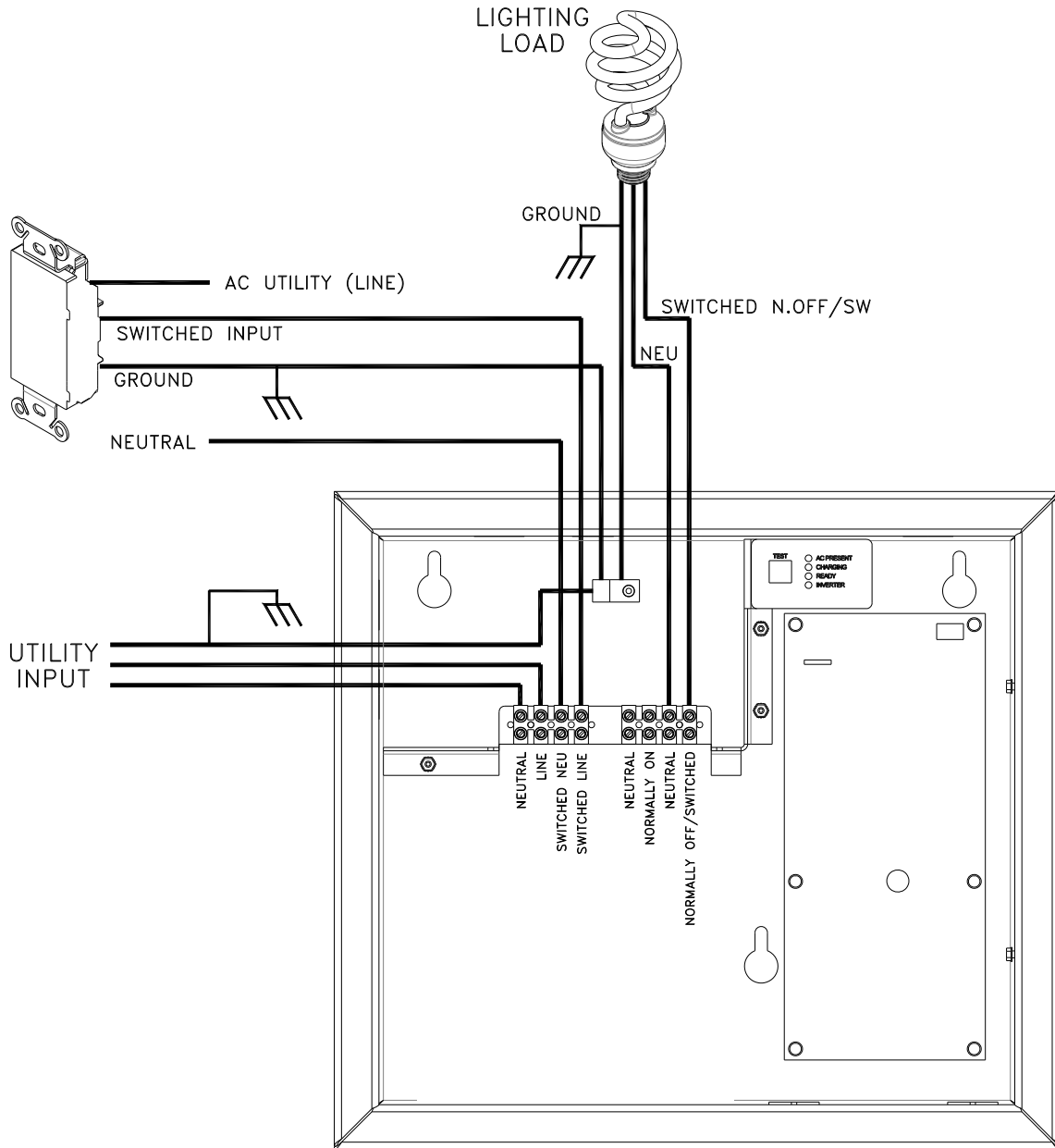


Figure 4.2 Switched diagram

SECTION 5

BATTERIES AND DC WIRING

WARNING

Only qualified service personnel (such as a licensed electrician) should perform the battery and DC wiring installation. Risk of electrical shock.

Safety Instructions

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This section contains important instructions that a qualified service person should follow during installation and maintenance of the system and batteries. ONLY a qualified service person should work with the batteries.

CAUTION

Full voltage and current are always present at the battery terminals. The batteries used in this system can produce dangerous voltages, extremely high currents, and a risk of electric shock. They may cause severe injury if the terminals are shorted together. You must be extremely careful to avoid electric shock and burns caused by contacting battery terminals or shorting terminals during battery installation. Do not connect wires between terminals of the same battery. Do not touch un-insulated battery terminals.

A qualified electrician familiar with battery systems and required precautions must install and service the batteries. Any battery used with this unit shall comply with the applicable requirements for batteries in the standard for emergency lighting and power equipment, UL 924. Cabinets are designed to be used with, and batteries must be replaced with, manufacturer battery number or a manufacturer approved equivalent (see the battery wiring diagram that came with the system). If you substitute batteries not supplied by manufacturer, the unit's UL listing is void and the equipment may fail. Installation must conform to national and local codes as well. Keep unauthorized personnel away from batteries.

The electrician must take these precautions:

Wear protective clothing and eyewear. Batteries contain corrosive acids or caustic alkalis and toxic materials and can rupture or leak if mistreated. Remove rings and metal wristwatches or other metal objects and jewelry. Don't carry metal objects in your pockets where the objects can fall onto the batteries or into the cabinet.

Tools must have insulated handles and must be insulated so that they do not short battery terminals. Do not allow a tool to short a battery terminal to another battery terminal or to the cabinet at any time. Do not lay tools or metal parts on top of the batteries, and do not lay them where they could fall onto the batteries or into the cabinet.

Install the batteries as shown on the battery-wiring diagram provided with the system. When connecting cables, never allow a cable to short across a battery's terminals, the string of batteries, or to the cabinet.

Align the cables on the battery terminals so that the cable lug does not contact any part of the cabinet even if the battery is moved. Keep the cable away from any sharp metal edges.

CAUTION

Always use insulated tools when you work with batteries. Always torque connections to the manufacturer's recommendations.

Battery Voltage (vdc)

All models of the LVM series use a 12V battery.

Battery Cable Sizing

The battery cables or wires used are Number 10-Gauge (5.26 mm²) for all applications:

DC Disconnect

The system has a Battery Disconnect Connector in the negative battery wire inside the cabinet; unplugging this connector lets you remove DC power from the system.

Connecting the Batteries

Battery Wiring Diagram

There is a battery-wiring diagram for each system in this section. This battery-wiring diagram shows how you should install the batteries and make terminal connections. Use the diagram as you follow the steps below.

To make sure a location is acceptable for the system, review the requirements in Section 3.

CAUTION

Never install the batteries in an airtight enclosure.

Torque Wrench

When you make battery terminal connections, use the torque wrench to tighten the battery terminal connections securely. You can find out what torque value to use by finding the battery number on the front of the battery. Then, use Table 5.1 to find the torque value for that battery.

Table 5.1 Battery Torque

Battery Type	Torque
BAT-CG12024A	Torque to 35 in lbs. (3.95 Nm)
BAT-CG12033A	Torque to 35 in lbs. (3.95 Nm)

Follow these steps to connect the cables:

NOTE: For standard 90-minute runtimes, 110W and 175W models have only one twelve volt battery. 225W have two twelve volt batteries connected in parallel.

CAUTION

If you are replacing batteries or repairing battery connections, follow the procedure in the section 6 to shut down your system and remove both AC and DC input power.

LVM-110 & LVM-175 (12vdc) Single Battery Installation

When shipped from the factory, the battery and the battery retaining bracket should be already installed as well as the positive battery connection. The negative wire should be attached to the battery terminal and have a quick disconnect connector installed on the negative wire lead that is unplugged. Inspect the mounting bracket, hardware and battery connection to ensure that they are securely attached.

DO NOT plug the negative wire battery quick disconnect together at this time. Please refer to Section 6 Startup Procedure for proper sequence.

LVM-225 (12vdc x 2) Dual Battery Installation

When shipped from the factory, the batteries and the battery retaining brackets should be already installed as well as the positive battery connections. The negative wires should be attached to the battery terminal and have a quick disconnect connector installed on the negative wire leads that is unplugged. Inspect the mounting brackets, hardware and battery connection to ensure that they are securely attached.

DO NOT plug the negative wire battery quick disconnect together at this time. Please refer to Section 6 Startup Procedure for proper sequence.

CAUTION

Hazardous voltage is present! System batteries are high current sources. These batteries can produce dangerous voltages, extremely high currents, and a risk of electric shock.

Next, using the voltmeter to check the DC voltage between the battery positive (+) and the battery negative (-) on the battery terminals. This voltage should be approximately the battery voltage 12VDC as recorded on the unit ID label. If it is greater than + or – 10% Vdc, the battery may be incorrect or damaged. Check that the battery is the correct model (see battery wiring diagram) and check that there is no visible damage, cracks, or liquid on or around the battery area. If you cannot find the cause of the problem, call SERVICE for further guidance.

CAUTION

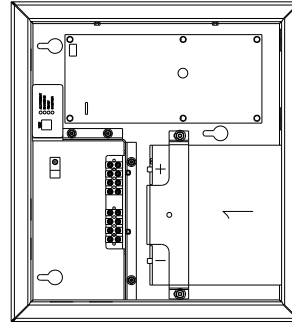
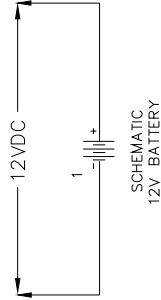
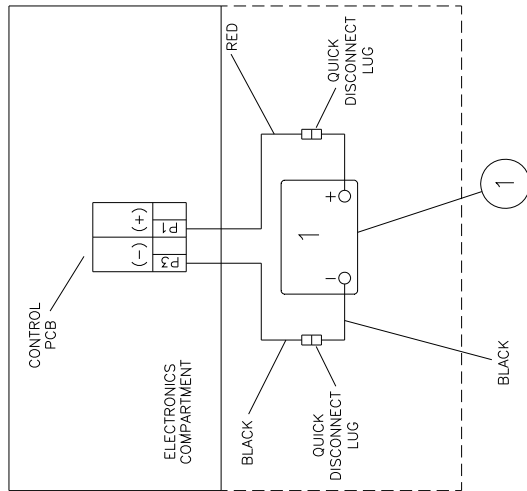
If you do not verify that voltage is correct, the equipment may fail.

Table 5.2 Extended Run Time vs. Output Power

	LVM-110	LVM-175	LVM-225
Run Time (Minutes)	Output Power (Watts)	Output Power (Watts)	Output Power (Watts)
120 Minutes	80W	135W	175W
180 Minutes	55W	95W	120W
240 Minutes	45W	75W	95W
300 Minutes	30W	55W	70W
360 Minutes	25W	45W	55W

Battery Wiring Diagram for LVM-110W

CAUTION:
 1-OBSERVE POLARITY, CONNECT BATTERIES AS SHOWN.
 2-FOLLOW START-UP PROCEDURE IN SYSTEM MANUAL.



COVER OMITTED FOR CLARITY

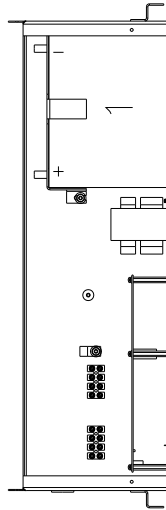
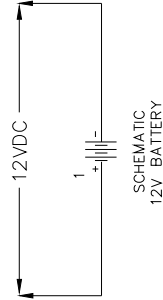
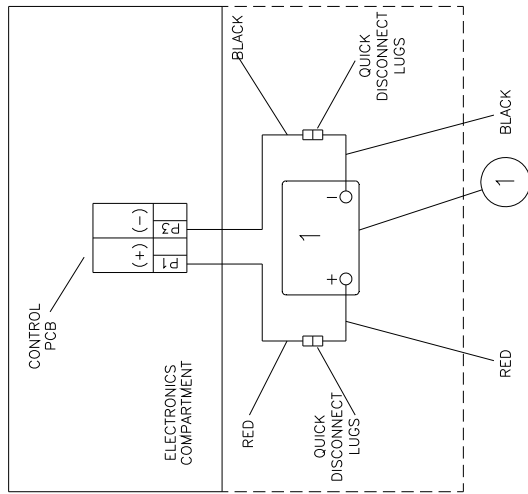
1	BATTERY	EVH12240	1	BAT-CG12024A
ITEM NO.	DESCRIPTION	QTY.	PART NO.	
SCALE: 1 = 4		DRAWN BY: K W		
DATE: 08/03/15		APPROVED BY:		
BATTERY INTERCONNECT, "LVM"				
DRAWING NUMBER: 110VA @ 90 min. 303650				

REV.	DATE	BY	DESCRIPTION
X	X	X	
X	X	X	
X	X	X	

Battery Wiring Diagram for LVM-175W (Grid Mount)

CAUTION:

- 1-OBSERVE POLARITY, CONNECT BATTERIES AS SHOWN.
- 2-FOLLOW START-UP PROCEDURE IN SYSTEM MANUAL.

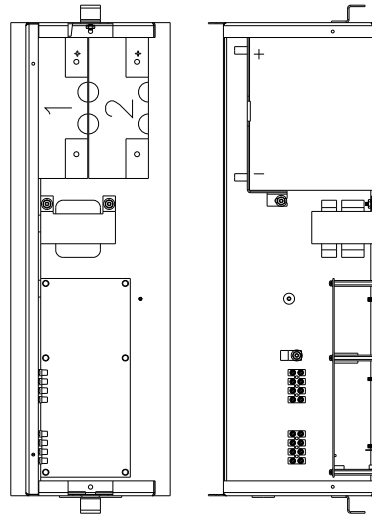
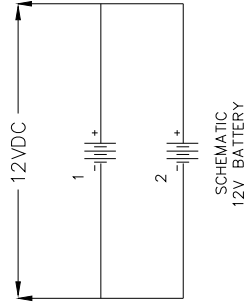
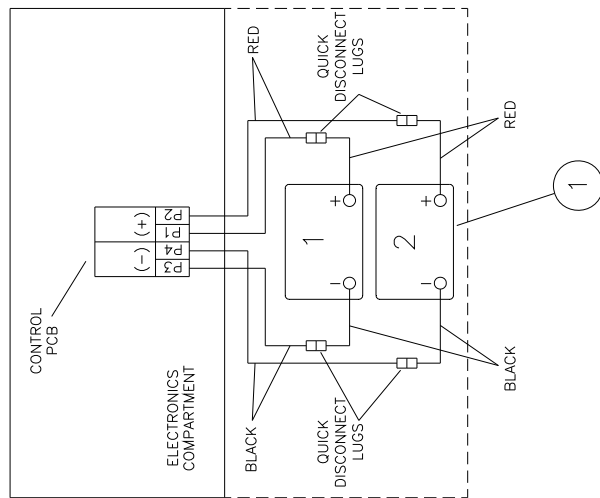


COVER OMITTED FOR CLARITY

1	BATTERY	GPI2340	1	BAT-CG12033A
ITEM NO.	DESCRIPTION	QTY.	PART NO.	
	SCALE: 1 = 4		DRAWN BY: K W	
	DATE: 08/03/15		APPROVED BY:	
	BATTERY INTERCONNECT, "LVM"			
	DRAWING NUMBER			
	GRID STYLE, 175VA @ 90 min.			303649
REV.	DESCRIPTION	DATE	BY	
X			X	
X			X	
X			X	

Battery Wiring Diagram for LVM-225W (Grid Mount)

CAUTION:
 1—OBSERVE POLARITY, CONNECT BATTERIES AS SHOWN.
 2—FOLLOW START-UP PROCEDURE IN SYSTEM MANUAL.



COVER OMITTED FOR CLARITY

1	BATTERY	EVH12240	2	BAT-CG12024A
ITEM NO.	DESCRIPTION	QTY.	PART NO.	
	SCALE: 1 = 4		DRAWN BY: K. W.	
	DATE: 08/03/15		APPROVED BY:	
	BATTERY INTERCONNECT, "LVM"			
	GRID STYLE, 225VA @ 90 min.			
			DRAWING NUMBER:	303652

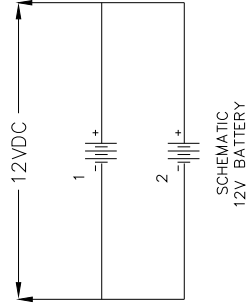
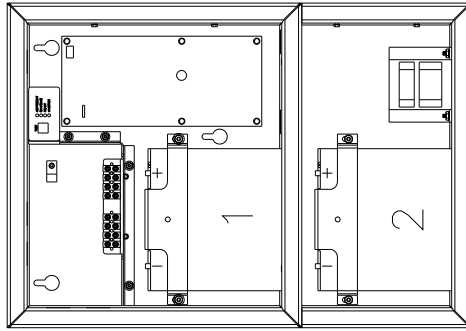
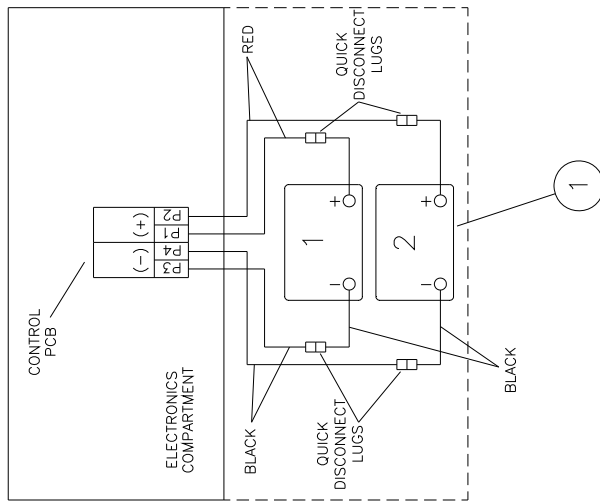
REV.	DESCRIPTION	DATE	BY
X			X
X			X
X			X

Battery Wiring Diagram for LVM-225W

CAUTION:

- 1—OBSERVE POLARITY, CONNECT BATTERIES AS SHOWN.
- 2—FOLLOW START-UP PROCEDURE IN SYSTEM MANUAL.

WIRING DIAGRAM
TOP VIEW OF BATTERIES
SHOWN BELOW
NO. SCALE



COVER OMITTED FOR CLARITY

1	BATTERY	EVH12240	2	BAT-CG12024A
ITEM NO.	DESCRIPTION	QTY.	PART NO.	
SCALE: 1 = 4		DRAWN BY: K W		
DATE: 08/03/15		APPROVED BY:		
BATTERY INTERCONNECT, LVM ¹⁷				
REV.		DATE	BY	DRAWING NUMBER:
X	X			303651
				225VA @ 90 min.

Replacing the Batteries

CAUTION

A battery can present a risk of electrical shock and high short circuit current. A qualified electrician familiar with battery systems should service the batteries.

Review all the safety instructions at the beginning of this chapter before you replace any batteries.

Use the Same Quantity and Type of Battery

CAUTION

You must use the same quantity and type of battery. Substituting batteries not supplied by manufacturer voids the UL listing and may cause equipment damage.

To ensure continued superior performance of your system and to maintain proper charger operation, you must replace the batteries in the system with the same number of batteries. These batteries must be the same types as the original batteries. The replacement batteries should have the same voltage and ampere-hour rating as the original batteries.

Handle Used Batteries with Care!

Assume that old batteries are fully charged. Use the same precautions you would use when handling a new battery. Do not short battery terminals or the battery string with a cable or tool when you disconnect the batteries! Batteries contain lead. Please dispose of old batteries properly.

CAUTION

Do not dispose of batteries in a fire because the batteries could explode. Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.

Dispose of Batteries Properly

CAUTION

Batteries contain lead. Many states and local governments have regulations about used battery disposal. Please dispose of the batteries properly.

SECTION 6

STARTUP AND SHUTDOWN PROCEDURE

STARTUP PROCEDURE

For the initial startup of the system, follow these instructions. Failure to do so will void warranty.

CAUTION: HAZARDOUS VOLTAGES – ONLY QUALIFIED SERVICE PERSONNEL SHOULD PERFORM PROCEDURE.

1. Service Panel Circuit Breaker is off to the system and the Battery Wire Disconnect is unplugged.
2. Turn on input feed circuit breaker at the building service panel.
3. Verify that the Battery Disconnect Plug (black wire) is connected to the negative terminal of the battery.
4. Connect the battery quick disconnects in the negative lead(s) (Black wire(s)). A small spark may occur.
5. The system is now running. There should be an output voltage present to the load and the AC Present light should illuminate. If there are no lights present on the LED Panel call service immediately.

SHUTDOWN PROCEDURE

1. Follow all safety precautions under section 5 and unplug the DC Battery Disconnect(s). For the 225W system each battery contains a DC Battery Disconnect.
2. Interrupt the AC Main to the system by turning off the circuit breaker at the service panel.

CAUTION:

HAZARDOUS VOLTAGES STILL EXIST AT THE BATTERY TERMINAL CONNECTIONS AND WITHIN THE SYSTEM. AUTHORIZED SERVICE TECHNICIANS MUST TURN OFF UTILITY POWER BEFORE SERVICING EQUIPMENT.

DO NOT LEAVE THE SYSTEM SHUTDOWN FOR A PROLONGED LENGTH OF TIME. LEAD BASED BATTERIES WILL EXPERIENCE PERMANENT DAMAGE FROM LACK OF CHARGING AFTER A FEW MONTHS.

WARNING:

If the AC Input fuse is removed or blown greater than 48 hours, the DC Disconnect must be unplugged for each battery. Failure to do so could permanently damage the battery.

SECTION 7

OPERATION

The following is a description of the system status by the LED indicators on the front panel.

AC Present – Green LED

When the AC Mains is present, with both the frequency and rms voltage in tolerance, the system is phased locked to the line, and a line qualify period of 30 seconds has passed the green “AC PRESENT” LED will illuminate. If the AC input has just returned it may take up to 1 minute to transition system from an error code to the solid normal status.

A single flashing light indicates the voltage of the AC main is out of tolerance.

A double flashing light indicates the frequency of the AC main is out of tolerance.

A triple flashing light indicates the system cannot phase lock to the AC main.

Battery Charging – Red LED

When the AC Mains is connected to the line and the battery is charging under normal conditions, the red “BATTERY CHARGING” LED will illuminate. If the system is operating normal but in transition from an AC Mains return the light will be off.

A single flashing light indicates a charger fault

A double flashing light indicates a DC overvoltage fault. This occurs when there is another source connected to the load. Please make sure the output wires from the inverter are the only wires connected to the load. This may also occur if the battery is excessively charged (> 15.5 vdc).

System Ready – Yellow LED

When the system has adequate battery voltage to transfer, the yellow “SYSTEM READY” LED will illuminate. The system ready set point is approximately 5% above the nominal battery voltage. This feature prevents damage from multiple deep discharges of the battery. If the light is off the system is not ready for a discharge event.

A single flash of the LED indicates a failed monthly test. The alarm can be cleared by a total shutdown of the system or a successful monthly test.

A double flash of the LED indicates a failed yearly test. The alarm can be cleared by a total shutdown of the system or a successful yearly test.

A triple flash of the LED indicates a load reduction alarm. This will occur if there is a difference between the load reduction calibrated set point and the actual load during a monthly or yearly test. The alarm can be cleared by a total shutdown of the system or a successful load reduction test.

Battery Power – Green LED

When the inverter is producing output power (battery is being discharged), the green “INVERTER” LED will be illuminated. If the light is on the system is not passing the AC main to the load.

A single flash of the LED indicates an inverter overload while on inverter. The alarm can be cleared by a total shutdown of the system or by reducing the load to an acceptable value.

Summary Alarm Dry Contacts (SDC) – Refer to Figure 7.1

Contacts will change states with the following failures: Charger fault, failed monthly test, failed yearly test, load reduction fault, not passing AC utility to the load, overload fault, output voltage high or low, heatsink over temperature, input fuse failed and battery low voltage disconnect
Maximum contact rating is 277VAC/10-amps. Silkscreen nomenclature shows a fault condition.

Time Delay – Refer to Figure 7.1

This feature delays opening the normally off circuit and continues to supply emergency power to the normally off loads for 15 minutes after the return of utility power. Remove jumper “JP4” prior to start up to activate time delay.

Load Reduction Fault – Refer to Figure 7.1

To enable the Load Reduction function:

1. Follow the start up procedure to turn on the “LVM” system. Ensure the desired load is connected to the output. This will be used for the calibration of the load reduction alarm.
2. Remove the “JP3” LRED jumper on the Control Board 404285. Caution: Removing the jumper will cause the UPS to transfer to battery.
3. The UPS will transfer to battery operation. At this time the load is being calibrated for the alarm set point which is 90% of the measured load.
4. Once the unit transfers back to line operation the Load Reduction Function is configured.
5. Ensure that the jumper “JP3” is placed back on the control board. Failure to do so will result in disabling the load reduction function the when power is removed.

To disable the Load Reduction function:

1. Completely power the system down by removing both AC and DC voltages. Remove the jumper “JP3” from the control board 404285.
2. Follow the startup procedure to turn power on the “LVM” system.
3. Place the jumper “JP3” back on the control board 404285.

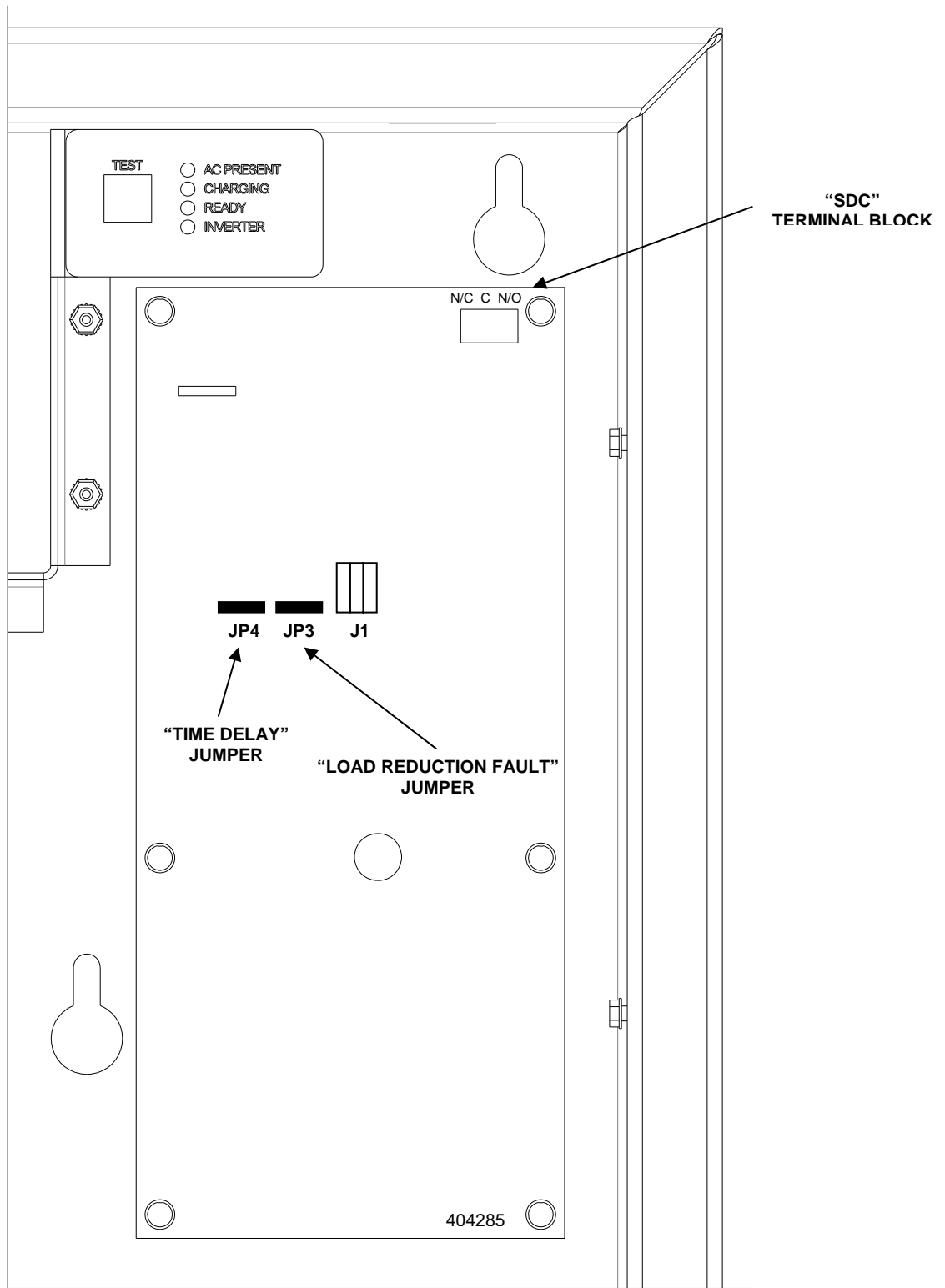


Figure 7.1 SDC, "JP3" JUMPER & "JP4" JUMPER

SECTION 8

SPECIFICATIONS

LVM Series General Specifications

Input	Voltage	120 or 277Vac 1-phase 2-wire +10% -15%
	Input Frequency	60Hz, +/- 3%
	Synchronizing Slew Rate	1Hz per second nominal
	Protection	Fuse
	Harmonic Distortion	< 10% (For Resistive Load)
	System Short Circuit Rating	1,500 AIC
	Output	Voltage
Static Voltage		Load current change +/-2%, battery discharge +/-12.5%
Dynamic Voltage		+/-10% for load step change, recovery within 5 cycles
Harmonic Distortion		< 3% THD for linear load
Overload		Input fuse protected on AC mains and timed overcurrent during inverter operation
Output Frequency		60Hz +/- .05Hz during emergency mode
Load Power Factor		.5 lag to .5 lead
Inverter Overload		250% for 25 Cycles, 110% continuously
Output Types		Normally-On, Normally-Off & Switch
Crest Factor		2.8
Battery	Type	Valve-regulated sealed lead-calcium
	Charger	Micro controller, 3-stage charger (recharge in 24 Hours)
	Protection	Fuse Protection and automatic low-battery disconnect; automatic restart upon utility return.
	Disconnect	Quick Disconnect Terminal
Environmental	Altitude	< 10,000 feet (above sea level) without derating
	Operating Temperature	Inverter: 0° to 40° C (32° to 104° F) Battery: 20° to 30° C (68° to 86° F) per UL-924
	Storage Temperature	-20° to 70° C (-4° To 158° F) (electronics only)
	Relative Humidity	< 95% (non-condensing)
General	Design	Line interactive PWM inverter type utilizing MOSFET technology with 2mS transfer time.
	Generator Input	Compatible with generators. (10KVA or larger)
	Indicator Lights & Switch	AC Present, Charging, Ready, Inverter and Test switch
	Alarm Contacts	Summary Fault Form "C"
	Warranty	3 year standard warranty includes all parts. Up to 10 years prorated warranty on batteries.
	Optional Warranties	Extended warranties, Preventative Maintenance and/or Customized Service Plans.
	Factory Start-up 5 Year Service Plan	Optional factory start-up is available. Optional 5 year service plan is available.
Physical	Cabinet	Wall/Recess or T-Grid
	Cooling	Convection Cooled
	Cable Entry	Top or Side
	Access	Front

SECTION 9

MAINTENANCE AND SERVICE

The Self-testing feature of the inverter ensures that the system is tested at least once per month for 5 minutes and once per year for 90 minutes. If there are any problems with the self-tests, the alarm LED's should indicate which faults occurred. Please see the fault descriptions and troubleshooting guide.

A few simple maintenance operations performed periodically will help ensure many years of trouble free operation. Battery terminals should be checked for tightness and corrosion. If severe corrosion is evident, maintenance is required to correct this situation.

Since the unit depends on unrestricted airflow for cooling of power handling components, it is important to keep the air vents free of any obstruction. If the environment tends to be extremely dusty, occasionally blow away any accumulation of dust on components. Please follow the shutdown procedure before cleaning.

CAUTION: Follow the shutdown procedure (See Section 6) before cleaning. An authorized technician only should perform Service!

Table 9.1 Preventive Maintenance Schedule

SERVICE TO PERFORM:	PERFORM SERVICE EVERY:		
	3 MONTHS	6 MONTHS	12 MONTHS
<p>TEST UNIT:</p> <p>NOTE: Perform manual test only when critical load is connected but not required. ----- Output voltage should be present. ----- Confirm operations of Front Panel Indicators.</p>	X		
<p>INSPECT BATTERIES:</p> <p>----- All connections are tight. ----- Connections have no corrosion. (Clean if necessary).</p>		X	
<p>CLEAN UNIT:</p> <p>NOTE: Unit must be shut down during this service. ----- Inspect air vents and clean if necessary. ----- Clean excessive dust from inside cabinet.</p>			X

"X" Indicates when to perform service. Lines below the "X" are for the date of service.

TROUBLE SHOOTING CHART

THE NUMBER IN THE CHART INDICATES ORDER IN WHICH PROBLEMS SHOULD BE CHECKED	SYMPTOMS	Inverter will not run during a power failure	System draws excessive AC input current	System noisy, excessive transformer hum during normal run conditions	AC output voltage low during utility power failure	System overheats, smells, smokes, etc.	System noisy, transformer hum during a power failure	Inverter jitters or staggers during a power failure	System blows battery fuse	Charger not charging properly, batteries low or dead	Charger stays in HI charge	Battery acid leaking in cabinet or around tops of batteries	Battery voltage does not read properly after installation of fresh cells	Battery Voltage low or non-existent
		2	3	5	3	2	1	1	2	1	2	1	4	1
PROBLEMS														
Shorted IGBT module(s)					3	3		1	2					
No AC input voltage										2				
Defective inverter		3			2	2	1	3	4					
Output volt-ampere rating of unit being exceeded		5	1		1	1	2	2	5					
Ambient temperature too high												1		
Shorted load			2		4		3							
Open battery fuse		1												1
Battery polarity wrong									1					
Defective charger		9	1			4				5	1	2	4	2
Battery capacity low		6											3	3
Wrong amount of battery cells Battery voltage = 12V		8	2			6			3	3	2	4	1	
Batteries dead, low or defective		7								4	3	3	2	
Transfer module and/or control circuit malfunction		4												
Transformer not connected properly or shorted winding			3			5				1				

SECTION 10

WARRANTY

RETURN MATERIAL AUTHORIZATION (RMA) POLICY

No return material is accepted without advanced approval by the Field Service Department "Return Material Authorization"(RMA).

Every effort will be made to correct problems over the phone before a RMA is granted. Cooperation will save both time and expense for customer and manufacturer.

If it is deemed necessary to return material, an order must be placed with the original distributor for the replacement material with a core charge agreement.

Under the core charge agreement an order will be placed by the original distributor for a predetermined amount. The customer has 30 days to return the non-working material after receiving the replacement material. If it is not received back within the allotted time frame the order will be invoiced and the customer will be responsible for the incurred charges.

OUT OF WARRANTY REPAIR CHARGES AND LABOR

Contact Field service for current parts and labor rates. A minimum rate will be assessed. The manufacturer will not proceed with repairs of an out of warranty unit until authorization in the form of a purchase order is received from the customer. The unit for repair must be returned prepaid with an RMA number on the carton. For travel to the job site, a quote "Not to Exceed" estimate will be given. A purchase order to cover that amount is required before a trip to the job site is made.

LIMITED WARRANTY

The parts for the electronics portion of this equipment are warranted against defects in workmanship and material for a period of three years from time of shipment, but in no case will this warranty be valid if installation of equipment is not accomplished within 180 days from date of shipment. Batteries cannot be disconnected from the unit for long periods (180 days) or they will not be able to charge, creating malfunction of both batteries and/or electronics and thereby voiding the warranty. Systems ordered with "Heavy Lead" batteries over 25 Ah have a one year unconditional battery warranty with an additional prorated warranty contingent upon timely return of warranty registration card and the terms called out in the particular battery warranty sheet. See individual battery warranty policy.

The warranty does not cover damage caused by abuse, improper environmental conditions, shipping damage, improper electronics and/or battery installation, unauthorized modifications, service by unauthorized personnel, transportation of damaged equipment, or acts of war. Damage due to lack of maintenance (where applicable) or damage resulting from installation in areas with other than normal temperatures are not covered. See the battery warranty policy for details, as adverse environmental conditions reduce battery life and void the warranty. Replacement of fuses, and/or contractor labor is not included in warranty. Damage do to acts of nature, such as, but not limited to, lightning, flooding, explosions and earthquakes, are not covered.

The warranty is limited to the repair and/or replacement of parts and/or units that upon examination at our factory are determined to be defective and in our judgment are subject to repair or replacement.

All such repair shall be manufacturer's exclusive remedy. A date code, part number and serial number identify all such units.

TO THE EXTENT ALLOWED BY LAW, MANUFACTURER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, AND LEED WARRANTIES OR MERCHANT ABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND ANY IMPLIED WARRANTY OF MERCHANT ABILITY OR FITNESS FOR A PARTICULAR PURPOSE ON PRODUCT IS LIMITED IN DURATION TO THE DURATION OF THIS WARRANTY. TO THE EXTENT ALLOWED BY LAW, THE MANUFACTURER SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS, INJURIES TO PROPERTY, LOSS OF USE OF THE PRODUCT OR ANY ASSOCIATED EQUIPMENT.

Special on site extended warranties are also available upon request. The warranty period may be adjusted because of special circumstances, but only by arrangement with the manufacturer at the time of purchase.

All in or out of warranty repaired material or replacement units/parts carry a 90-day new part guarantee. Return of your original repaired component or unit is not guaranteed.

This limited warranty is for the 48 contiguous states.

For international warranty information, call the Field Service Department. See telephone number in front of manual. The standard warranty can be extended and renewed for a nominal fee. Please contact the factory for pricing information.

10 Year Stationary Battery Heavy Lead Series Sealed Lead Calcium Warranty Policy

All sealed lead calcium batteries of 24-ampere hours or more are guaranteed against defective material and workmanship for one year from date of shipment. The manufacturer will repair or replace at its option, F.O.B. factory, any battery proven to be faulty due to a manufacturing defect. This does not include physical damage caused during shipment.

There is also an additional nine year prorated warranty, providing the following conditions are met:

- A. The batteries shall be installed, and constantly maintained and operated in accordance with published instructions in our standby power unit or battery charger manuals.
- B. Continuous battery maintenance must be performed under the Manufacturer's Service / Maintenance Contract or an approved equal.
- C. The average ambient temperature shall not exceed 77 degrees Fahrenheit.
- D. Cell temperatures shall not exceed 92 degrees Fahrenheit for more than 30 days annually.
- E. Battery service records must be maintained.
- F. Batteries must be installed and energized within 180 days of shipment.
- G. System warranty registration card must be filled out and returned to the manufacturer upon installation.

If any battery fails to deliver 80% of its capacity *, within the 10 year warranty period, the manufacturer, at its option, will repair or replace it on a prorated basis, F.O.B. factory, based on the current battery price and remaining service life.

This warranty only applies to the original end user of the manufacturer's battery powered backup equipment or battery chargers listed on the warranty registration card and is non-transferable. This warranty does not apply to broken containers, covers, or terminals or batteries which have been frozen or damage due to neglect, undercharging, shipping, or abuse such as fire, flooding, explosives or any acts of nature. This warranty does not include labor to remove or install batteries covered herein. For battery service, call or write to the address that is on front of the manual.

*All batteries are rated to give 95% capacity upon installation and 48 hour charge. These batteries will reach 100% of rated capacity after a minimum of six months on float service or ten complete charge and discharge cycles.

