

# Outdoor Line Power System FLPS04

# **Installation & Operation Manual**



Part # 0100031-J0 *Effective: 04/2017* 

Your Power Solutions Partner

member of The ਰੀਮੀਸ਼ Group™

# FLPS04 +/-190Vdc Quad Line Power Up-Converter Outdoor Power System

#### NOTE:

Photographs contained in this manual are for illustrative purposes only. These photographs may not match your installation.

#### NOTE:

Operator is cautioned to review the drawings and illustrations contained in this manual before proceeding. If there are questions regarding the safe operation of this power system, contact Alpha Technologies or your nearest Alpha representative.

### NOTE:

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# SAVE THESE INSTRUCTIONS: This manual contains important safety instructions that

must be followed during the installation, servicing, and maintenance of the product. Keep it in a safe place. Review the drawings and illustrations contained in this manual before proceeding. If there are any questions regarding the safe installation or operation of this product, contact Alpha Technologies or the nearest Alpha representative.

# 1.1 Safety Symbols

To reduce the risk of injury or death, and to ensure the continued safe operation of this product, the following symbols have been placed throughout this manual. Where these symbols appear, use extra care and attention.

The use of ATTENTION indicates specific regulatory/code requirements that may affect the placement of equipment and/or installation procedures.

#### NOTE:

A NOTE provides additional information to help complete a specific task or procedure. Notes are designated with a checkmark, the word NOTE, and a rule beneath which the information appears

# <u>^</u>

CAUTION indicates safety information intended to PREVENT DAMAGE to material or equipment. Cautions are designated with a yellow warning triangle, the word CAUTION, and a rule beneath which the information appears.

## WARNING!

CAUTION!

WARNING presents safety information to PREVENT INJURY OR DEATH to personnel. Warnings are indicated by a shock hazard icon, the word WARNING, and a rule beneath which the information appears.



## HOT!

The use of HOT presents safety information to PREVENT BURNS to the technician or user. Hot surfaces are indicated by a yellow warning triangle depicting a heated surface.

## 1.2 General Warnings and Cautions

#### WARNING!

You must read and understand the following warnings before installing the enclosure and its component. Failure to do so could result in personal injury or death.

This system is designed to be installed in a restricted access location that is inaccessible to the general public.

- Read and follow all instructions included in this manual.
- Only trained personnel are qualified to install or replace this equipment and its components.
- Use proper lifting techniques whenever handling equipment, parts, or batteries.

#### 1.3 Mechanical Safety



**CAUTION!** 

Do not disassemble the product – call our qualified service centers for servicing. Incorrect reassembling may result in a risk of electrical shock or fire.

Do not operate the product if it has received a sharp blow, it has been dropped, or otherwise damaged in any way – return it to a qualified service center for repair.

## **1.4 Electrical Safety**



#### WARNING!

The DC input to the modules (and the converter system) – though not dangerous in voltage – has a high short circuit current capacity that may cause severe burns and electrical arcing.

The DC output is a potentially dangerous voltage. Do not touch the output connections when under power. Ensure that power has been removed from the outputs before working on them.

# AM C7

#### WARNING!

To be installed by qualified, trained personnel only, according to the installation instructions provided with each unit.

The equipment installation and RFT wiring shall comply with all local electrical codes and ordinances.

#### All AC Wiring shall be rated 70°C minimum.

Before working with any live battery or power system, follow these precautions:

- a. Remove all metallic jewelry, such as watches, rings, metal rimmed glasses, or necklaces.
- b. Wear safety glasses with side shields at all times during the installation.
- c. Use insulated hand tools. Do not rest tools on top of batteries.

# WARNING!

Lethal voltages are present within the power system. Always assume that an electrical connection or conductor is energized. Check the circuit with a voltmeter with respect to the grounded portion of the enclosure (both AC and DC) before performing any installation or removal procedure.



#### WARNING!

Multiple Power Inputs. Disconnect all inputs before servicing to avoid electric shock.

- Do not work alone under hazardous conditions.
- A licensed electrician is required to install permanently wired equipment. Input voltages can range up to 240 Vac. Ensure that the utility power is disconnected and locked out before performing any installation or removal procedure.
- Ensure that no liquids or wet clothes come into contact with internal components.
- Hazardous electrically live parts inside this unit are energized from the batteries even when the AC input power is disconnected.
- The enclosure which contains the DC and/or AC power system must remain locked at all times, except when authorized service personnel are present.
- Always assume electrical connections or conductors are live. Turn off all circuit breakers and doublecheck with a voltmeter before performing installation or maintenance.
- Place a warning label on the utility panel to warn emergency personnel that a reserve battery source is present which will power the loads in a power outage condition or if the AC power disconnect breaker is turned off.
- At high ambient temperature conditions, the internal temperature can be hot so use caution when touching the equipment.

#### 1.4.1 Grounding Connection Notes

To provide a ready, reliable source of backup power it is necessary to establish a grounding system that not only provides for the safety of the service personnel responsible for its operation and maintenance, but also facilitates the proper operation and protection of the equipment within the network. Such a grounding system will provide protection with respect to operator safety, system communication, and equipment protection.

#### 1.4.2 Safety Ground

The safety ground is a two-part system. The first part is a return path for stray current back to the input breaker, and the second is a return path from the enclosure to a second ground rod.

Typically, the safety, or utility ground, provides a return path to the input breaker or fuse panel by means of a connection to an appropriate driven ground rod at the base of the power pole. This path must meet National Electric Code (NEC) as well as local codes to ensure the breaker will open, preventing unwanted current fl ow from posing a hazard to service personnel.

#### 1.4.3 Strike (Lightning) Ground

Lightning strikes, grid switching, or other aberrations on the power line all have the potential to cause "fast risetime currents" which can cause damage to the powering system. Without a low-impedance path to ground, the current, while traveling through wires of varying impedance, can produce high voltages which will damage the powering equipment. The most viable method available to protect the system from damage is to divert these unwanted "fast rise-time currents" along a low-impedance path to ground. A low-impedance path to ground will prevent these currents from reaching high voltage levels and posing a threat to equipment. The single-point grounding system provides a low-impedance path to ground, and the key to its success is the proper bonding of the ground rods, so the components of the grounding system appear as a single point of uniform impedance.

# 1.5 Battery Safety

- Never transport an enclosure with batteries installed. Batteries must ONLY be installed after the enclosure has been securely set in place at its permanent installation location. Transporting the unit with batteries installed may cause a short circuit, fire, explosion, and/or damage to the battery pack/string, enclosure and installed equipment.
- Servicing and connection of batteries must be performed by, or under the direct supervision of, personnel knowledgeable of batteries and the required safety precautions.
- Batteries contain or emit chemicals known to cause cancer and birth defects or other reproductive harm. Battery post terminals and related accessories contain lead and lead compounds. Wash your hands after handling batteries.



#### WARNING!

Follow battery manufacturer's safety recommendations when working around battery systems. Do not smoke or introduce an open flame when batteries (especially vented batteries) are charging. When charging, batteries vent hydrogen gas, which can explode.

#### WARNING!

#### Lead-acid batteries contain dangerous voltages, currents and corrosive material. Battery installation, maintenance, service and replacement must be performed only by authorized personnel.

• Batteries are hazardous to the environment and should be disposed at a recycling facility. Consult the battery manufacturer for recommended local authorized recyclers.

#### 1.4.4 Chemical Hazards

Any gelled or liquid emissions from a valve-regulated lead-acid (VRLA) battery contain dilute sulfuric acid, which is harmful to the skin and eyes. Emissions are electrolytic, and are electrically conductive and corrosive. To avoid injury:

- Servicing and connection of batteries shall be performed by, or under the direct supervision of, personnel knowledgeable of batteries and the required safety precautions.
- Always wear eye protection, rubber gloves, and a protective vest when working near batteries. Remove all metallic objects from hands and neck.
- Batteries produce explosive gases. Keep all open flames and sparks away from batteries.
- Use tools with insulated handles, do not rest any tools on top of batteries.
- Batteries contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Battery post terminals and related accessories contain lead and lead compounds. Wash hands after handling (California Proposition 65).
- Wear protective clothing (insulated gloves, eye protection, etc.) whenever installing, maintaining, servicing, or replacing batteries.
- If any battery emission contacts the skin, wash immediately and thoroughly with water. Follow your company's approved chemical exposure procedures.
- Neutralize any spilled battery emission with the special solution contained in an approved spill kit or with a solution of one pound Bicarbonate of soda to one gallon of water. Report chemical spill using your company's spill reporting structure and seek medical attention if necessary.
- Never use uninsulated tools or other conductive materials when installing, maintaining, servicing or replacing batteries.

- Use special caution when connecting or adjusting battery cabling. An improperly connected battery cable or an unconnected battery cable can make contact with an unintended surface that can result in arcing, fire, or possible explosion.
- A battery showing signs of cracking, leaking, or swelling should be replaced immediately by Authorized Personnel using a battery of identical type and rating.

#### 1.4.5 Battery Maintenance Guidelines

The battery maintenance instructions listed below are for reference only. Battery manufacturer's instructions for transportation, installation, storage or maintenance take precedence over these instructions. To prevent damage, inspect batteries every 3 months for:

- Signs of battery cracking, leaking or swelling. The battery should be replaced immediately by authorized personnel using a battery of the identical type and rating.
- Signs of battery cable damage. Battery cable should be replaced immediately by Authorized Personnel using replacement parts specified by vendor.
- Loose battery connection hardware. Refer to battery manufacturer's documentation for the correct torque and connection hardware for the application.
- Apply battery manufacturer's specified antioxidant compound on all exposed connections.
- Verify battery terminals and/or exposed connection hardware is not within close proximity of a conductive surface. Reposition batteries as necessary to maintain adequate clearance.
- Clean up any electrolyte (battery emission) in accordance with all federal, state, and local regulations or codes.
- Proper venting of the enclosure is recommended. Follow the Battery Manufacturer's approved transportation and storage instructions.
- Always replace batteries with those of an identical type and rating. Never install old or untested batteries.
- Do not charge batteries in a sealed container. Each individual battery should have at least 0.5 inches of space between it and all surrounding surfaces to allow for convection cooling.
- All battery compartments must have adequate ventilation to prevent an accumulation of potentially dangerous gas.

# 2. Product Overview

The FLPS04 is a compact, stand-alone AC to DC power system designed for distributed power communications applications using +/- 190Vdc (RFT-V circuit) over twisted copper wire pairs. Using switched mode technology, the FLPS04 quad output converter module provides outstanding efficiency.

Applications include, powering mini DSLAMs, optical network terminals in fiber to the home networks (FTTHN), as well as with municipal Wi-Fi access points. The FLPS04 may be installed on a wall or pole mounted with an optional kit.

Alpha's FLPS04 unit incorporates a full range of standard features including, current limiting and individual ground fault interrupt for each circuit. Particular emphasis is placed on recognizing a fault condition and shutting down the circuit as quickly as possible to ensure the highest level of safety. Compliance with GR-1089-CORE Class A2 enables craft personnel to work on the equipment while powered which significantly reduces the administrative and labeling requirements and overhead for the high voltage wiring.

• Four +/- 190Vdc line powering RFT-V channels with current limiting and ground fault protection



Figure 1 — FLPS04

## 2.1 Part Numbers

Part number:

- 0100031-002 FLPS04 outdoor power system with battery charging and heater assembly
- 0100031-003 FLPS04-BE battery expansion system enclosure, 8x batteries (not included)
- 0370379-001 Kit, FLPS04 w/o enclosure (protector block not included)

# 3. Specifications

Electrical			
Input Voltage:	120Vac		
Input Frequency	47 to 63Hz		
Input Current	8A		
Output Voltage:	±190Vdc (RFT-V)		
Power:	90W max. per output channel (4 output channels available)		
Efficiency:	>91%		
Regulation:	<2% no load to full load <1% line		
Output Noise: Wide band:	<500mVRMS (10kHz to 10MHz) <2.5V p-p (10kHz to 100MHz)		
Connections:	66 IDC Termination (Power System) Two blunt cut cables (Kit)		
Recommended Breaker:	10A		
Enclosure:	Type 3R		
	Mechanical		
Dimensions (HxWxD):	603 mm x 356 mm x 140 mm (23.75 in x 14 in x 5.5 in)		
Weight:	18.6 kg (41 lb) without batteries (Power Enclosure) 11.8 kg (26 lb) without batteries (Battery Enclosure)		
	Environmental		
Temperature Operating: Temperature Storage:	- 40 to 46°C (-40 to 115°F) - 40 to 85°C (-40 to 185°F)		
Humidity:	0 to 100% RH non-condensing		
Altitude:	-500 to 2800m (1640 to 9186ft)		
	Performance / Features		
Alarm indicating LEDs (1 per channel)	Channel OK (green) Recoverable (yellow) Irrecoverable Fault (red)		
	Agency Compliance		
Safety:	CAN/CSA C22.2 No. 60950-1-07+A1:2011+A2:2014 CAN/CSA C22.2 No. 60950-21-03 CAN/CSA C22.2 No. 60950-22-07 UL 60950-1-2007 UL 60950-21-2003 UL 60950-22-2007		
EMC:	FCC CFR 47, Part 15, Subpart B, Class A ICES-003 Class A		
This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.			
MTBF:	> 400,000 @30°C (86°F) ambient; test model Telcordia SR-332, Issue 2 (2006)		

# 4.1 Converter Modules

An FLPS04 system contains a DC-DC supply unit with four isolated line powering converter (channels) with a common control and supervisory circuit. Each converter output operates independently. An internal micro controller monitors both the inputs and outputs of the converter, turns the converters on and off, and generates converter fail alarm if required.

#### 4.1.1 Status Indicators

The FLPS04 system's DC-DC supply unit has four LED indicators – one per converter.

The LEDs are color-coded to indicate converter channel status as follows:

Table A — Converter Status LEDs			
LED State	Converter Status		
Green	Normal operation (Vout > 90%)		
Yellow	Recoverable: • Over temperature		
Blinking yellow	Recoverable: • OCP/Overload • Input quality not OK		
Red	Locked-State: • OVP • Fuse Fail		
Blinking red	Recoverable: • GFI		
OFF	No power • Input fuse cut-off		



## 5.1 Pre-installation Requirements

#### 5.1.1 Effective Capacitance

The effective capacitance of each output of the FLPS04 is 2.7 microfarads maximum between the output connections to the telecommunications network and 0.5 microfarads between each output connection to the telecommunications network and earth ground.

• At the time of installation, carry out a system assessment to ensure that the effective capacitance of the total system, including the capacitance of the FLPS04 system, does not exceed 11  $\mu$ F (Line to Earth) and 40 $\mu$ F (Line to Line).

#### 5.1.2 RFT-V Circuits

• At the time of installation, ensure that the voltage rating of the wiring of the telecommunication network is adequate for the normal RFT circuit voltage (+/-200Vdc), together with superimposed transients.

• Ensure that the circuits to be connected together are all RFT-V circuits.

#### 5.1.3 Primary Protection

The FLPS04 has built-in second level surge protection in compliance with the GR-1089 requirement. Primary protection must be in place at the customer site.

The FLPS04 includes secondary surge protection. External primary surge protection devices are necessary to optimally protect the RFT-V circuits from lightning surges and to maintain product safety certification to UL/CSA 60950-21.

Each channel (pair) must be properly protected by the upstream system using a 5-pin protector to a level corresponding to a Bourns 2410 Series. For example: 2410-33-G-MSP-S provides the part in a red color. This surge protector module should be UL 497 listed and rated for a 300-400V voltage breakdown range.

# 6. Inspection

# 6.1 Packing Materials

Alpha is committed to providing products and services that meet our customers' needs and expectations in a sustainable manner, while complying with all relevant regulatory requirements. As such, Alpha strives to follow our quality and environmental objectives from product supply and development through to the packaging for our products.

Packaging assemblies and methods are tested to International Safe Transit Association standards.

Rectifiers and batteries are shipped on individual pallets and are packaged according to the manufacturer's guidelines.

Almost all of Alpha's packaging material is from sustainable resources and or is recyclable. See the following table for the material and its environmental codes.

20 PAP/PCB	PET	PE-LD	PS	40 FE	ALU	50 NW
Cardboard	Polyethylene Terephthalate	Low Density Polyethylene	Polystyrene	Steel	Aluminum	Wood
Packing boxes Caps	Flexible film Packaging	Bubble wrap Shrink wrap Plastic bags	Foam	Strapping on pallets	Strapping on pallets	Pallets Lumber

#### 6.1.1 Returns for Service

Save the original shipping container. If the product needs to be returned for service, it should be packaged in its original shipping container. If the original container is unavailable, make sure that the product is packed with at least three inches of shock-absorbing material to prevent shipping damage.

Alpha Technologies is not responsible for damage caused by improper packaging of returned products.

## 6.2 Check for Damage

Before unpacking the product, note any damage to the shipping container. Unpack the product and inspect the exterior for damage. If any damage is observed, contact the carrier immediately.

Continue the inspection for any internal damage. In the unlikely event of internal damage, inform the carrier and contact Alpha Technologies for advice on the impact of any damage.

# 6.3 General Receipt of Shipment

The inventory included with your shipment depends on the options you have ordered. The options are clearly marked on the shipping container labels and bill of materials.

Call Alpha Technologies if you have any questions before you proceed: 1 888 462-7487.

# 7. Installation

This instruction describes the field installation of an FLPS04 Power System alone or together with a FLPS04-BE Battery Expansion System for increased battery run time.

# 7.1 Parts List

- Personal Safety Equipment
- Basic Hand Tools
- FLPS04 Power System Unit, P/N 0100031-002 and/or
- FLPS04-BE Battery Expansion System Unit, P/N 0100031-003
- Pole Mount Kit, P/N 0380452-001 (optional)
- Four 1/2" Stainless Steel Straps and Buckles (Customer supplied for pole mounting)
- System Schematic Wiring Diagram, P/N 0100031-05

# 7.2 Removing the FLPS04 Front Cover

- 1. Remove small screw from bottom of front cover as shown in inset photo.
- 2. Disengage front cover by pushing it up slightly.
- 3. Swing out the bottom portion of the cover to remove from chassis.







# 7.3 Pole Mounting the FLPS04

#### 7.3.1 Pole Mount, Strapped to Pole

- 1. Attach the mounting channel bracket to the pole using 4x appropriate 1/2" steel straps (customer supplied).
- 2. Fasten the mounting plates to the rear of the chassis with the hardware provided (bolt and washer combo).
- 3. If an LPS04 module is present, remove the indicated screws to slide the module left and right to gain access to the rear of chassis mounting holes. Reinstall screws after the pole mounting the plate is secured to the chassis.
- 4. Hang the chassis onto the mounting channel bracket, inserting the bracket plate louver into the tab on the top channel.



5. Secure the chassis in place using the hardware provided (bolt, split washer, washer) to the pole mount bracket. Install front cover and reinstall the bottom screw.



#### 7.3.2 Pole Mount, Bolted to Pole

- 1. Attach the mounting channel bracket to the pole using 2x appropriate 3/8" diameter threaded rods of suitable length for pole diameter and secure with appropriate 3/8" hardware.
- 2. Fasten the mounting plates to the rear of the chassis with the hardware provided (bolt and washer combo).



- 3. If an LPS04 module is present, remove the indicated screws to slide the module left and right to gain access to the rear of the chassis mounting holes. Reinstall screws after pole mounting plate is secured to the chassis.
- 4. Hang the chassis onto the mounting channel bracket, inserting the bracket plate louver into the tab on the top channel.
- 5. Secure the chassis in place using the hardware provided (bolt, split washer, washer) to the pole mount bracket. Install front cover and reinstall the bottom screw.





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#### 7.3.3 Pole Mount, Screwed to Pole

- 1. Attach the mounting channel bracket to the pole using 2x appropriate 3/8" diameter lag bolt of suitable length for pole diameter.
- 2. Fasten the mounting plates to the rear of the chassis with the hardware provided (bolt and washer combo).
- 3. If an LPS04 module is present, remove the indicated screws to slide the module left and right to gain access to the rear of the chassis mounting holes. Reinstall screws after pole mounting plate is secured to the chassis.
- 4. Hang the chassis onto the mounting channel bracket, inserting the bracket plate louver into the tab on the top channel.



5. Secure the chassis in place using the hardware provided (bolt, split washer, washer) to the pole mount bracket. Install front cover and reinstall the bottom screw.



# 7.4 Wall Mounting the FLPS04

- 1. If pre-drilling is required, hold the chassis to the wall surface to mark the mounting hole locations. Fasten the chassis to the wall using appropriate 5/16" size hardware intended for the surface. If an LPS04 is present, refer to section 7.3, step 3 of the manual for the pole mounting.
- 2. Install the front cover.



## 7.5 FLPS04 Power System and FLPS04-BE Battery Expansion System Battery Installation

1. Before proceeding, ensure that battery circuit breaker(s) are in the OFF position.



2. Connect supplied battery terminal w/ connector plug wire assemblies onto all batteries observing the correct terminal polarity RED for ( + ) and BLK for ( - ) for each connection.

#### NOTE:

# The FLPS04 has x4 batteries (single string) and the FLPS04-BE has x8 batteries (two strings).

- 3. Install all batteries on to the given shelf location(s).
- 4. Connect plugs from each battery to the corresponding mating receptacle on the battery string wire harness located on the front retaining bracket. Position the battery heater thermostat in between the two middle batteries on the bottom shelf for the FLPS04 and in between the two middle batteries on the top shelf for the FLPS04-BE.



Figure 2 — FLPS04





#### 7.6 FLPS04 Power System AC Power & Battery Backup Power Connections

- 1. Connect an appropriately sized 120V AC power supply cable to the L, N and G wire terminals located on the AC power input terminal block (TB1) to supply the system.
- 2. Connect an appropriately sized 48V DC power cable from the FLPS04-BE unit to the (+) and (-) terminals located on the DC power output / battery connection terminal block (TB2). This connection only needs to be made if the FLPS04 system was ordered with a FLPS04-BE for battery expansion. Refer to system schematic wiring diagram P/N 0100031-05.



AC Power Input Terminal Block (TB1) 48V DC Power Output / Battery Connection Terminal Block for FLPS04-BE Battery Expansion Cable (TB2)

# 7.7 FLPS04-BE Battery Expansion System AC Power & Battery Backup Power Connections

- 1. Connect an appropriately sized 120V AC power supply cable to the L, N and G wire terminals located on the AC power input terminal block (TB1) to supply the battery heater.
- Connect an appropriately sized 48V DC power cable from the FLPS04 unit to the FLPS04 battery expansion unit (+) and (-) wire terminals located on the DC power output / battery connection terminal block (TB2). Refer to system schematic wiring diagram P/N 0100031-05.



# 7.8 DC Power Load Connections

Connect designated load equipment DC power (+) and (-) copper wire pairs (#24 AWG minimum) to the protector block IDC terminals as required. Refer to system schematic wiring diagram P/N 0100031-05.



Protector Block

This completes the FLPS04 power system and FLPS04-BE battery expansion system wiring.

- 1. Turn ON AC power supply to the FLPS04 Power System and then turn on all battery circuit breakers.
- 2. Verify that all circuits are functioning properly.
- 3. Reinstall front cover by reversing the steps used to remove the front cover, section 7.2 on page 15.

# 7.9 Chassis Ground

**CAUTION!** 



### An enclosure that is not properly grounded presents an electrical hazard. Only a licensed electrician can connect AC power and grounding to the enclosure.

A proper grounding system that meets or exceeds the specifications of the equipment must be engineered to site layout requirements and installed prior to, or in conjunction with, mounting the enclosure. The ground system must be bonded to the enclosure to ensure a "common" or "single point" ground.

Refer to local codes and practices for proper acceptable grounding arrangements. Only a licensed electrician should be used to install the grounding system.

#### 7.9.1 Site Ground Wiring

A provided external ground stud for the site ground wire connection is located at the top inner edge of the unit chassis as shown Figure 4 and Figure 5. Terminate this connection to the external ground ring with an exothermic connections or similar as required. A minimum of #6 AWG insulated wire is required.



Figure 4 — External Ground Stud on FLPS04



Figure 5 — External Ground Stud on FLPS04-BE

## 7.10 Battery Installation

This information is provided as a guideline and is not meant to imply that batteries are part of this power system.

### WARNING!

#### Follow the battery manufacturer's safety recommendations when working around battery systems and review the safety instructions provided in this manual.

#### 7.10.1 Preparation/Mounting

The batteries should be located in a temperature-controlled environment. The temperature should be regulated to approximately 25°C (77°F). Significantly lower temperatures reduce the performance and higher temperatures decrease the life expectancy.

Provide adequate ventilation. VRLA batteries, though not requiring special ventilation requirements of a flooded battery, should not be installed in an airtight enclosure. Hydrogen gas can be emitted from a failed battery.

If applicable, clean the cells before assembly as per the battery manufacturer's recommendations. First neutralize any acid with a baking soda and water solution, then wipe the cells with clean water.

#### 7.10.2 Installing Batteries

#### WARNING!

# Verify that all battery breakers, DC circuit breakers, and fuses on the distribution panels are either in the OFF position or removed for fuses.

Apply a corrosion-inhibiting agent, such as NO-OX-ID "A", on all battery terminal connections.

- 1. If required, assemble the battery rack and the cells or mono-blocks as per the installation instructions supplied with the batteries.
- 2. Ensure that the battery output cabling can reach the [+] and [-] terminals of the series battery string and that the batteries are oriented correctly for easy installation of the inter-unit "series" connectors.
- 3. Remove any NO-OX-ID "A" grease from battery terminals.
- 4. Burnish the terminal posts with a non-metallic brush, polishing pad or 3M Scotch Brite scouring pad.
- 5. Apply a new light coating of NO-OX-ID "A" grease to the terminal posts.
- 6. If lead plated inter-unit connectors are used, they should also be burnished and NO-OX-ID "A" grease applied as above. Install the inter-unit connectors between batteries.

After assembly, number the batteries and take "as received" readings, including specific gravity, cell voltage, and temperature. Designate one cell as the pilot cell. This is usually the cell with either the lowest specific gravity or voltage. Refer to the manufacturer's literature for guidelines. See the following table for a typical maintenance report:

Company:		Date:	
Address:			
Battery location and/or ne	umber:		
No. of cells:	Туре:	Date new:	
Date installed:	Float voltage:	Ambient temp.:	

Table B — Typical VRLA battery maintenance report						
Cell #	Serial #	Voltage	Specific	Ohms	Mhos	Observations

Remarks and recommendations:

Readings taken by: \_\_\_\_\_

# 8. Troubleshooting

# 8.1 Converter Status Indicator LEDs

#### 8.1.1 Card Alarms (All 4 LEDs)

LED State	Individual Converter Status	Action
Green	Normal Operation (Vout > 90%)	None
Yellow	Recoverable: • Ambient temperature high	Resets automatically when ambient temperature reduces to approximately 85°C or below.
Blinking Yellow	Input qualify not OK	Output is disabled if input voltage is not within the range of 40-60Vdc.
OFF	Recoverable: • No power	Check input wiring
	Non-recoverable: • Main input fuse cut-off	Potential component failure. Replace with new module.

#### 8.1.2 Individual Channel Alarms

LED State	Individual Converter Status	Action
Green	Normal	None
Blinking Yellow	Recoverable: • OCP/Overload	Ensure the load is within the rated current.
	Recoverable: • Vout low	Check that output is within the regular range.
	Non-recoverable:	Potential component failure. Replace with new module.
Red	Recoverable: • OVP	OVP will cause the output to restart every 2 seconds, until the fault is removed. If the fault persists for 60 seconds, the output will shut down for 60 seconds and then attempt to restart every 60 seconds until the fault is cleared.
	Non-recoverable:	Failed fuses are not field replaceable. Replace with new module.
Blinking Red	Recoverable: • GFI	The converter attempts to restart every 2 seconds until the fault is removed. If the fault persists for 60 seconds, the output will shut down for 30 seconds and attempt to restart every 30 seconds until the fault is cleared.

# 9. Maintenance

Although very little maintenance is required with Alpha systems, routine checks and adjustments are recommended to ensure optimum system performance. Qualified service personnel should do the repairs.

The following table lists a few maintenance procedures for this system. These procedures should be performed at least once a year.



#### WARNING!

Use extreme care when working inside the unit while the system is energized. Do not make contact with live components or parts.

Circuit cards, including RAM chips, can be damaged by static electricity. Always wear a grounded wrist strap when handling or installing circuit cards.

Ensure redundant modules or batteries are used to eliminate the threat of service interruptions while performing maintenance on the system's alarms and control settings.

Table C — Sample maintenance log		
Procedure	Date Completed	
Clean ventilation openings.		
Inspect all system connections. Re-torque if necessary.		
Verify alarm/control settings.		
Verify alarm relay operation.		

# 10. Warranty and Service Information

#### **10.1 Technical Support**

In Canada and the USA, call toll free 1-888-462-7487.

Customers outside Canada and the USA, call +1-604-436-5547.

### 10.2 Warranty Statement

For full information details review Alpha's online Warranty Statement at www.alpha.ca.

## 10.3 Product Warranty

Alpha warrants that for a period of two (2) years from the date of shipment its products shall be free from defects under normal authorized use consistent with the product specifications and Alpha's instructions, the terms of the manual will take precedence.

The warranty provides for repairing, replacing or issuing credit (at Alpha's discretion) for any equipment manufactured by it and returned by the customer to the factory or other authorized location during the warranty period.

There are limitations to this warranty coverage. The warranty does not provide to the customer or other parties any remedies other than the above. It does not provide coverage for any loss of profits, loss of use, costs for removal or installation of defective equipment, damages or consequential damages based upon equipment failure during or after the warranty period. No other obligations are expressed or implied. Warranty also does not cover damage or equipment failure due to cause(s) external to the unit including, but not limited to, environmental conditions, water damage, power surges or any other external influence.

The customer is responsible for all shipping and handling charges. Where products are covered under warranty Alpha will pay the cost of shipping the repaired or replacement unit back to the customer.

#### **10.4 Battery Warranty**

Note that battery warranty terms and conditions vary by battery and by intended use. Contact your Alpha sales representative or the Technical Support team at the above number to understand your entitlements under Battery Warranty.

## 10.5 Warranty Claims

Any claim under this Limited Warranty must be made in writing to Alpha BEFORE sending material back. Alpha will provide Product return instructions upon approval of return request. A Service Repair Order (SRO) and / or Return Authorization (RA) number will be issued ensuring that your service needs are handled promptly and efficiently.

Claims must be made online at: www.alpha.ca.

#### **10.6 Service Information**

For a list of international service centers, refer to the Alpha website: www.alpha.ca

# **11. Acronyms and Definitions**

AC	Alternating current
ANSI	American National Standards Institute
AWG	American Wire Gauge
BTU	British thermal unit
CAN	Controller area network
CEC	Canadian Electrical Code
CSA	Canadian Standards Association
CX	Cordex™ series; e.g., CXC for Cordex System Controller
DC	Direct current
DHCP	Dynamic Host Configuration Protocol
EIA	Electronic Industries Alliance
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
ERM	Electromagnetic Compatibility and Radio Spectrum Matters
ESD	Electrostatic Discharge
FCC	Federal Communications Commission (for the USA)
GFI	Ground Fault Interupt
HVSD	High voltage shutdown
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
LED	Light emitting diode
LVD	Low voltage disconnect
MIL	One thousandth of an inch; used in expressing wire cross sectional area
MOV	Metal oxide varistor
MTBF	Mean time between failures
NC	Normally closed
NEC	National Electrical Code (for the USA)
NO	Normally open
OSP	Outside plant
OVP	Over voltage protection
RAM	Random access memory
RFT	Remote feeding telecommunication circuit: A secondary circuit within the equipment, intended to supply or receive DC power via a telecommunication network at voltages exceeding the limits for TNV circuits, and on which overvoltages from telecommunication networks are possible.
RFT-V	An RFT circuit, which is so designed and protected that under normal operating conditions and single fault conditions, the voltages are limited and the accessible area of contact is limited
RU	Rack unit (1.75")
SELV	Safety Extra Low Voltage
TCP/IP	Transmission Control Protocol / Internet Protocol
THD	Total harmonic distortion
UL	Underwriters Laboratories
VRLA	Valve regulated lead acid

# 12. Certification

#### About CSA and NRTL

CSA (Canadian Standards Association also known as CSA International) was established in 1919 as an independent testing laboratory in Canada. CSA received its recognition as an NRTL (Nationally Recognized Testing Laboratory) in 1992 from OSHA (Occupational Safety and Health Administration) in the United States of America (Docket No. NRTL-2-92). This was expanded and renewed in 1997, 1999, and 2001. The specific notifications were posted on OSHA's official website as follows:

- Federal Register #: 59:40602 40609 [08/09/1994]
- Federal Register #: 64:60240 60241 [11/04/1999]
- Federal Register #: 66:35271 35278 [07/03/2001]

When these marks appear with the indicator "C and US" or "NRTL/C" it means that the product is certified for both the US and Canadian markets, to the applicable US and Canadian standards. (1)

Alpha rectifier and power system products, bearing the aforementioned CSA marks, are certified to CSA C22.2 No. 60950-01 and UL 60950-01. Alpha UPS products, bearing the aforementioned CSA marks, are certified to CSA C22.2 No. 107.3 and UL 1778.

As part of the reciprocal, US/Canada agreement regarding testing laboratories, the Standards Council of Canada (Canada's national accreditation body) granted Underwriters Laboratories (UL) authority to certify products for sale in Canada. (2)

Only Underwriters Laboratories may grant a licence for the use of this mark, which indicates compliance with both Canadian and US requirements. (3)

#### **NRTLs** capabilities

NRTLs are third party organizations recognized by OSHA, US Department of Labor, under the NRTL program.

The testing and certifications are based on product safety standards developed by US based standards developing organizations and are often issued by the American National Standards Institute (ANSI). (4)

The NRTL determines that a product meets the requirements of an appropriate consensus-based product safety standard either by successfully testing the product itself, or by verifying that a contract laboratory has done so, and the NRTL certifies that the product meets the requirements of the product safety standard. (4)

#### **Governance of NRTL**

The NRTL Program is both national and international in scope with foreign labs permitted.







<sup>(1)</sup>www.csagroup.org(2) www.scc.ca(3) www.ulc.ca(4) www.osha.gov















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