

User's Manual



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Before Installing the UPS:

- Read all safety and installation instructions.
- Make sure that the UPS is the correct model for your application.
- Verify that the available power source matches the input rating of the UPS.

Before starting the UPS:

- Read all safety and operating instructions.
- Verify that the UPS is installed in a clean, temperature controlled area.
- If the UPS is installed at an altitude above 1000 meters, the output load capability must be de-rated by 1% for each 100 meters above 1000 meters.
- Verify that the installation includes an input breaker of the proper rating.
- Verify that the wiring is correct and that all connections are neat and tight.
- Verify that the internal batteries have been connected.
- If an optional Extended Run Time Battery Cabinet is present, verify that the battery breaker is closed before the UPS is started.
- Make sure that single phase loads are fairly evenly distributed across the three output phases. Balanced operation maximizes efficiency and reliability. (Check the individual output phase currents when the UPS is operating).

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SECTION 1

Introduction

The FirstLine uninterruptible power supply (UPS) is a true online, double-conversion, three-phase system that can be used to prevent loss of valuable electronic information and minimize equipment downtime. It is ideal for protecting essential information technology and electrical engineering infrastructure in corporate, telecom, health care, banking, and industrial applications.

The FirstLine UPS continually monitors incoming electrical power and removes surges, spikes, sags, and other irregularities that are inherent in commercial utility power. Working with a building's electrical systems, the UPS supplies clean consistent power that sensitive electronic equipment requires for reliable operation. During brownouts, blackouts, and other power interruptions, batteries provide emergency power to safeguard operation.

Figure 1 shows the UPS cabinet dimensions.

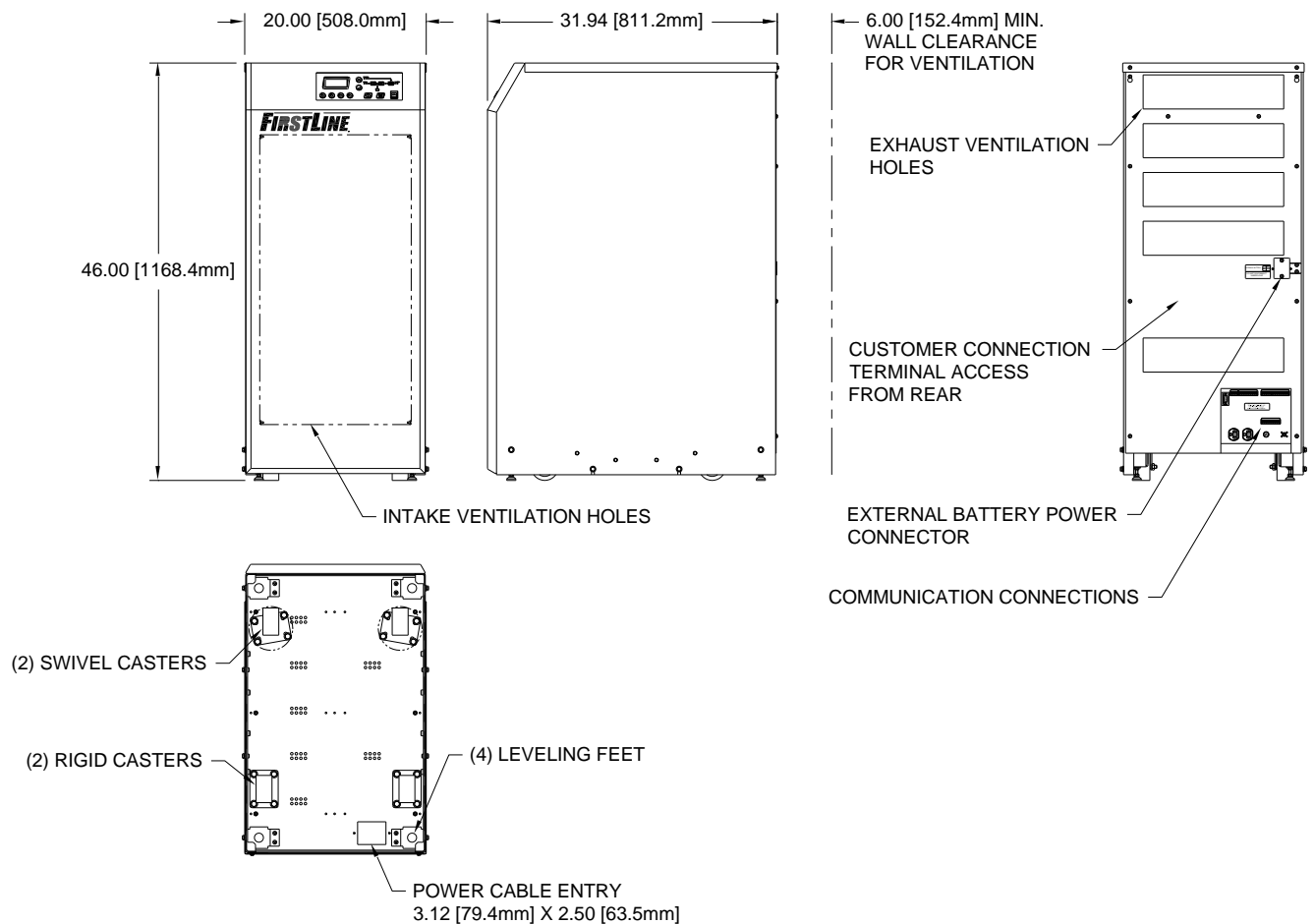


Figure 1 - The FirstLine UPS 10'S kVA

FirstLine UPS Part Number System

Table 1 - Part Numbering System

kVA	Input Voltage	Output Voltage	Run Time (min.)	Full Part Number		
				Basic Part No.	Battery Option	Other Options
10	480	208Y/120	9	FLU-10S-42	-1	-I
	480	480Y/277	9	FLU-10S-44	-1	-I
	208Y/120	208Y/120	24	FLU-10S-20	-2	
	208Y/120	208Y/120	9	FLU-10S-20	-1	-I
	220Y/127	220Y/127	10	FLU-10S-22	-1	
	220Y/127	220Y/127	26	FLU-10S-22	-2	

Battery Option

- 1 = 1 string
- 2 = 2 string
- 0 = Without Batteries

Other Options	Suffix	Notes
Isolation Transformer	-I	Isolation transformer required for use with delta (3-wire) input. Standard is K20 rated.

220V Models are not listed to UL, CUL, or CSA.

Note that the FirstLine UPS series includes a 10KVA model in a larger cabinet than this one. The correct user's manual for the "10T" series is Staco Part Number 003-2256.

Accessories

There are several external accessories that are designed to work with the FirstLine UPS:

- The FirstLine Extended Run Time Battery Cabinet allows the addition of up to two additional battery strings per cabinet to increase the available battery run time. Up to three FirstLine Extended Run Time Battery Cabinets can be used with each UPS. The cabinet is styled to match the FirstLine UPS. Each battery cabinet is supplied with a circuit breaker. The FirstLine Extended Run Time Battery Cabinet is listed to UL1778. See section 9.
- The FirstLine Options Cabinet is a steel enclosure designed to hold option devices to be used in conjunction with the FirstLine UPS. The enclosure is styled to match the UPS and includes provisions for terminating a number of conduits to facilitate wiring. Available option devices include several transformers, a Maintenance Bypass Switch (MBS), output panelboards, and output meters. The FirstLine Options Cabinet is listed to UL1778.
- The FirstLine Wall-Mounted Maintenance Bypass Switch is the same MBS switch arrangement that is available in the Options Cabinet, but in a more compact enclosure that mounts on a wall. The FirstLine Wall-Mounted Maintenance Bypass Switch is listed to UL1778.
- Contact Staco Energy Company, your tailored power solutions provider, for additional information.

SECTION 2

Safety Warnings







**IMPORTANT SAFETY INSTRUCTIONS
SAVE THESE INSTRUCTIONS**

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

READ AND FOLLOW ALL SAFETY INSTRUCTIONS

- a. Do not use outdoors.
- b. Do not route wiring across or near hot surfaces.
- c. Do not install near gas or electric heaters.
- d. Use caution when servicing batteries. Battery acid can cause burns to skin and eyes. If acid is spilled on skin or in eyes, flush acid with fresh water and contact a physician immediately.
- e. Equipment should be installed where it will not readily be subjected to tampering by unauthorized personnel.
- f. The use of accessory equipment not recommended by the manufacturer may cause an unsafe condition.
- g. Do not use this equipment for other than intended use.

Table 2 - Symbols

	Danger / Risk of Electric Shock
	Caution
	Risk of Explosion
	Note
	Ground Connection
	Electrostatic Sensitive Device

DANGER

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

WARNING

- This UPS contains its own energy source (batteries). The UPS output may carry live voltage even when the UPS is not connected to an AC supply.
- To reduce the risk of fire or electric shock, install this UPS in a temperature and humidity controlled, indoor environment, free of conductive contaminants. Do not operate near water or excessive humidity (95% maximum).
- Input and output over-current protection and disconnect switches must be provided by others.

CAUTION

Batteries can present a risk of electrical shock or burn from high short circuit current. Observe proper precautions. Servicing should be performed by qualified service personnel knowledgeable of batteries and required precautions. Keep unauthorized personnel away from batteries.



Risk of explosion if batteries are replaced by an incorrect type. Replace with same type and rating only.

Proper disposal of batteries is required. Refer to your local codes for disposal requirements.

Never dispose of batteries in a fire. Batteries may explode when exposed to flame.

SECTION 3

UPS Setup

This section describes:

- Equipment inspection
- Floor loading and clearances
- Removing and replacing the cabinet panels
- Unloading the cabinet

Inspecting the Equipment

If any equipment has been damaged during shipment, keep the shipping and packing materials for the carrier or place of purchase and file a claim for shipping damage. If you discover damage after acceptance, file a claim for concealed damage.

To file a claim for shipping damage or concealed damage: 1) File with the carrier within 15 days of receipt of the equipment, 2) Send a copy of the damage claim within 15 days to your service representative.

Floor Loading

When planning the installation, consider the UPS weight for floor loading. The strength of the installation surface must be adequate for point and distributed loading. The approximate weights are shown in the following table.

Table 3 - Model Floor Loadings

STANDARD MODEL FLOOR LOADING		
10KVA Model	Maximum Weight	Point Loading
208 I/O	548 Lbs (249 kg)	174 lb/in ² (12 kg/cm ²)
Extended Run	803 Lbs (364 kg)	256 lb/in ² (18 kg/cm ²)
480 I/O	858 Lbs (389 kg)	273 lb/in ² (19 kg/cm ²)

Clearances

The following clearances are recommended for the FirstLine UPS.

From Front of Cabinet	36" (91.4 cm) working space
From Back of Cabinet	6" (15.2 cm)
From Right Side of Cabinet (on -I or 480V units)	Minimum 24" (61 cm)

Unloading the Cabinet

The following tools are required for unloading the cabinet:

- Wrenches for 3/8" bolts
- Forklift (For removing the cabinet from the truck and to separate the lower pallet from the upper pallet and cabinet only. Once removed from the truck, remove the cabinet from the pallet as stated below. DO NOT move to final location by forklift.)

CAUTION



The UPS cabinet is heavy (see Table 3). Unloading the cabinet requires at least two people to safely remove the cabinet from the pallets.

To remove the UPS cabinet from the shipping pallets:

1. Remove all banding, wrapping, and foam protectors.
2. With a forklift, lift the cabinet and upper pallet using the forklift channels (see figure 2) from the lower pallet by 1 to 2 inches. Slide the lower pallet completely away from the cabinet. Lower the upper pallet and cabinet to the floor.
3. Remove the (12) 3/8" lag bolts securing the shipping brackets to the pallet and the (4) 3/8" lag bolts securing the front guard board in place (see figure 2).
4. Remove the guard board and the 3/4" wood spacers under each of the shipping brackets.
5. Ensure that the four (4) leveling feet are raised so that they will not touch the floor when the cabinet is placed on the floor.
6. Slowly roll the cabinet forward off the pallet.
7. Once the UPS is fully off the pallet, slide the pallet completely away from the UPS.

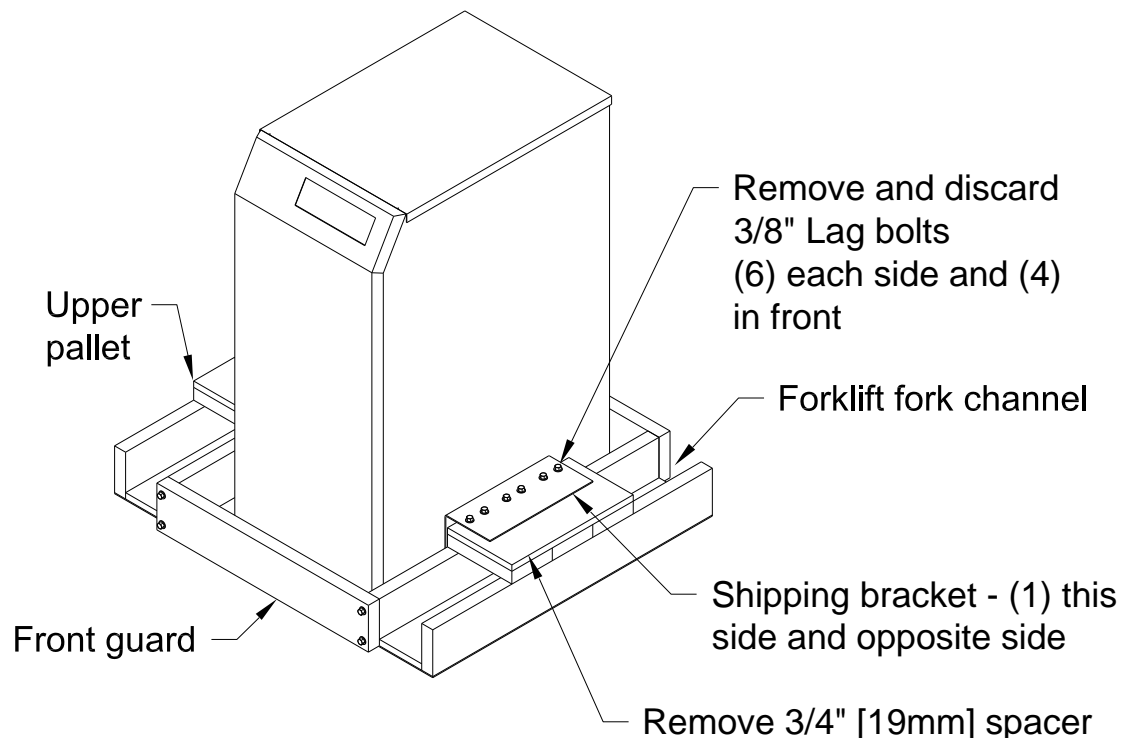


Figure 2 - UPS on pallet

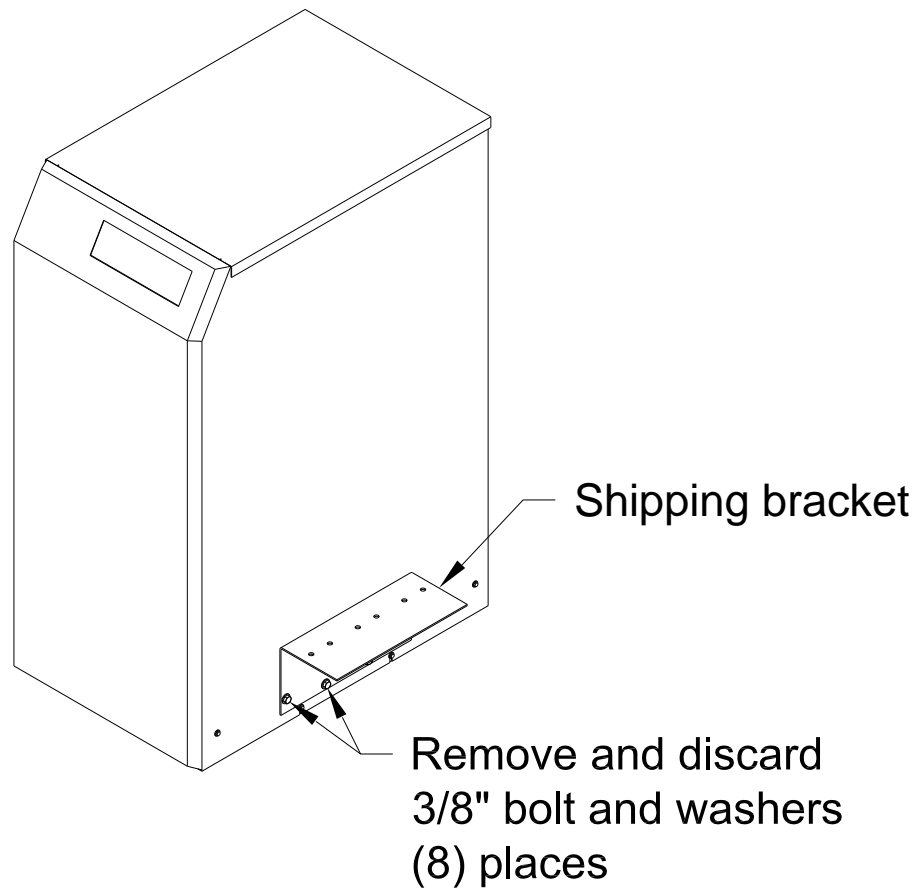


Figure 3 - Shipping Bracket

8. Remove the (8) 3/8" bolts mounting the shipping brackets to the UPS and remove the brackets (see figure 3).
9. Roll the cabinet to the desired location
10. **Do not move the cabinet to another location by forklift, as the cabinets are heavy and may fall.**

The stay rod and cotter pins (see figure 4) that are supplied in the same zip bag as this manual must be saved to be used by a qualified service technician. The stay rod will allow the technician to hold the lifted top shelf in place while servicing the UPS. This rod must be removed after use and stored outside the UPS for use at a later date.



Figure 4 - Stay Rod and Cotter Pins

Placing the Cabinet

Once the cabinet has been rolled into position, remove the front panel to access the front leveling feet by lifting the panel up and off the cabinet (see figure 9). Adjust the leveling feet as shown in figure 5.

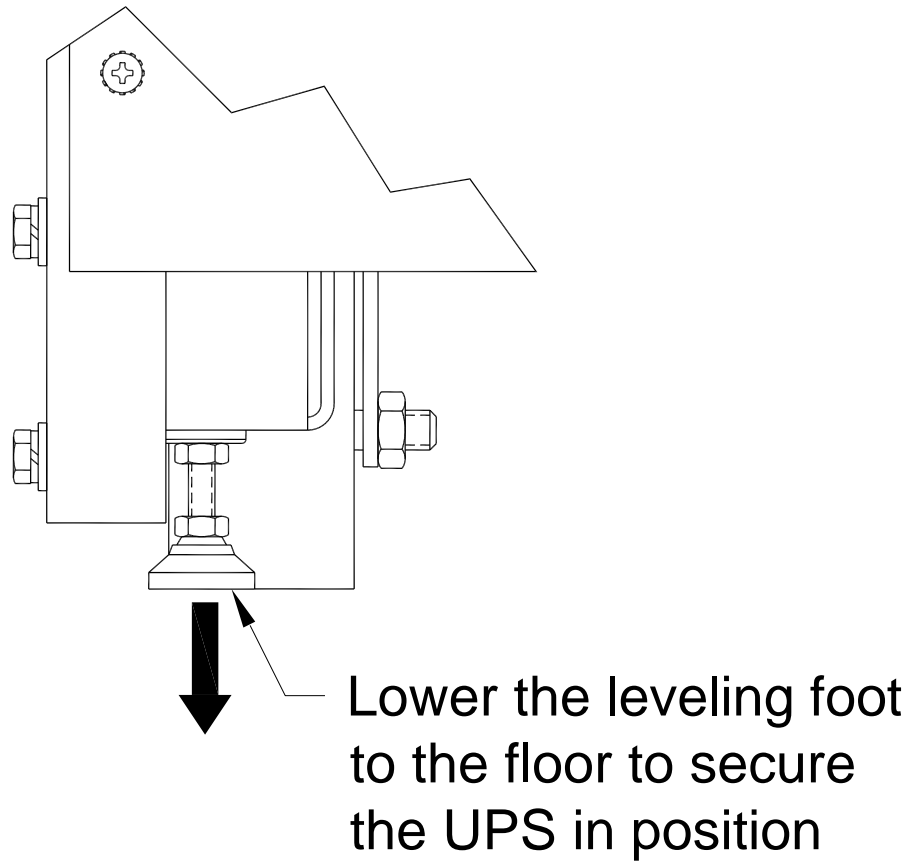


Figure 5 - Leveling foot being adjusted

SECTION 4

Electrical Installation

The FirstLine has the following power connections:

- 3-phase (L1, L2, and L3), neutral, and ground connection for rectifier/bypass input
- 3-phase (L1, L2, and L3), neutral, and ground connection for load output

The input neutral connection is not used when the UPS is equipped with the optional isolation transformer.

The nominal input/output voltages are:

- 120/208 VAC is the base version.
- 208 VAC, 60 Hz delta input is available when the UPS is ordered with an input isolation transformer (-I option).
- 127/220 VAC is available, this model is not listed to UL or CSA.
- 480V, 60 Hz input is available when the UPS is ordered with an input transformer, (isolation or auto.)
- 480/480 Vac is available when the UPS is ordered with an input and output transformer.

Input and output overcurrent protection and disconnect switch must be provided by others.

WARNING



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

Wiring Preparation

To begin wiring the UPS:

1. Verify that the electrical connections to the installation site have been properly installed.
2. A wall-mounted, user-supplied, readily-accessible disconnection device must be incorporated in the input wiring.

Compare the circuit breaker ratings to the ones in Table 6 on page 13.

3. Switch off utility power to the distribution point where the UPS will be connected. Be absolutely sure there is no power.
4. Determine your equipment's grounding requirements according to your local electrical code.
5. Remove the UPS rear panel.
6. The conduit landing plate is located at the rear bottom of the base to accommodate bottom wire entry to the cabinet (see figure 6).

Remove plate and drill or punch hole to fit conduit bushing with Greenlee punch or similar device. Make certain that the bushing will be clear in the opening in the base. Mount bushing to plate and tighten to manufacturer's recommendations. Replace the plate and mount conduit.

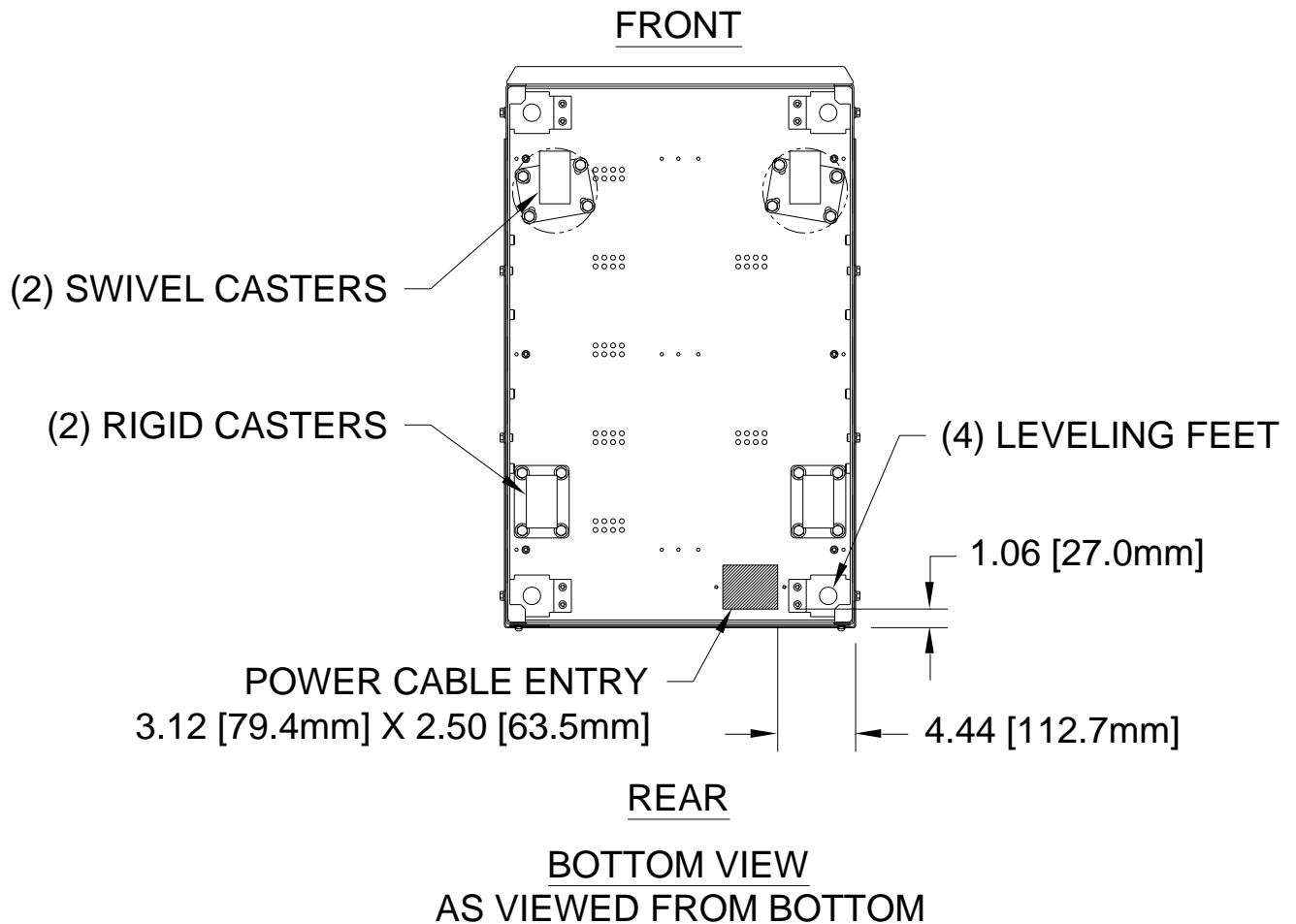


Figure 6 - Bottom View

Wiring Installation

1. Unscrew and remove the rear panel.
2. Connect the input wires to the proper terminals shown in Figure 7. Insure proper phase rotation. Input neutral is not required if the UPS is equipped with an optional input isolation transformer.
3. Connect the output wires to the proper terminals shown in Figure 7.
4. Replace the rear panel.

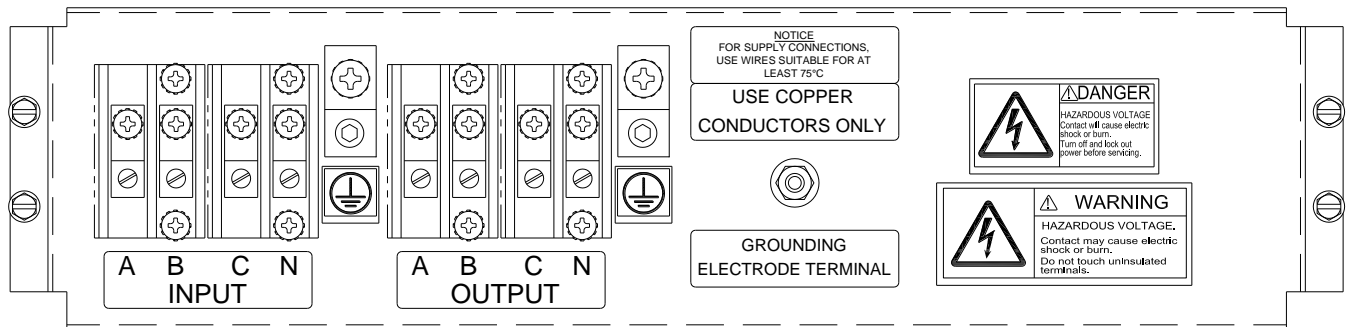


Figure 7 - Terminal Blocks

Table 4 - Input/Output Terminal

INPUT/OUTPUT TERMINAL TIGHTENING TORQUE	
#2	50 inch-pounds
#4 - #6 AWG	45 inch-pounds
#8	40 inch-pounds
#10 - #14	35 inch-pounds

Table 5 - Ground Lugs

GROUND LUGS TIGHTENING TORQUE	
#10 AWG	35 inch-pounds
#8 AWG	40 inch-pounds
#4 - #6 AWG	45 inch-pounds
#1/0 - #2 AWG	50 inch-pounds

Table 6 - FirstLine UPS 10-20kVA Current Requirements

UPS Rating	Input Voltage	Input Transformer Option	Max. Input Current (A) Allowed for Specified Branch Protector	Maximum Allowable Branch Circuit Protection (A)
10 kVA	208 V	None	34	45
	208 V	Isolation	34	45
	220 V	None	34	45
	480 V	Standard auto	15	20
	480 V	Isolation	15	20

UPS Rating	Output Voltage	Rated Max. Output Current (A) (note 2)		Maximum Allowable Circuit Protection (A)
		PF=.8	PF=1	
10 kVA	208 V	28	22	(note 1)
	220 V	26	21	(note 1)
	480 V	12	10	20

Note 1: Output circuit protection requirement determined by distribution circuit.

Note 2: Do not apply continuous loads in excess of rated maximum output current. If the power factor of the load is not known, use PF=1. The UPS controls will permit transient loads within the limits described in the OVERLOAD section of this manual.

Wiring Specifications and Diagrams

Note: Input neutral must be wired for proper operation or the UPS will not start.



Note: *Do not* over-tighten the screws; be sure to use the specified tightening torque values shown in Table 4 and Table 5.

10 kVA, 208V: **CAUTION** to reduce the risk of fire, connect only to a circuit provided with 45 amperes maximum branch circuit protection in accordance with the National Electrical Code, ANSI/NFPA 70.

10 kVA, 480V: **CAUTION** to reduce the risk of fire, connect only to a circuit provided with 20 amperes maximum branch circuit protection in accordance with the National Electrical Code, ANSI/NFPA 70.

220V units should be equipped with the same maximum rated breaker as 208V units.

Table 7 - Terminal Block Wiring

UPS Rating	Voltage	Input Transformer Type	Phase Conductor Min/Max	Neutral Conductor Min/Max	Neutral Conductor with non-linear loads Min/Max	Ground Wire Min/Max
10 kVA	208Y/120	NA	#6/2	#6/2	#6/2	#8/1-0
	208Δ	isolation	#6/2	(none)	(none)	#8/1-0
	220Y/127	NA	#6/2	#6/2	#6/2	#8/1-0
	480Y/277	auto	#10/2	#10/2	#6/2	#8/1-0
	480Δ	isolation	#10/2	(none)	(none)	#8/1-0
OUTPUT -Minimum wire size required to support rated load. Smaller wire may be used if rated load current is not needed and the appropriate circuit protection is applied.						
UPS Rating	Voltage	Output Transformer Type	Phase Conductor	Neutral Conductor	Neutral Conductor with non-linear loads	Ground Wire
10 kVA	208Y/120	NA	#8	#8	#6	#8/1-0
	220Y/127	NA	#8	#8	#6	#8/1-0
	480Y/277	auto	#12	#12	#10	#8/1-0

Note: No output circuit protection is required if the output conductor sizes are at least as large as the input conductors, unless the UPS is equipped with an input isolation transformer. If the UPS is equipped with an input isolation transformer, the UPS is considered a separately derived source and circuit protection for the output conductors must be provided.

Use at least 75°C-rated copper wire. Minimum wire size is based on 120/208 full load ratings applied to NEC Code Table 310-16. Code may require a large AWG size than shown in this table because of temperature, number of conductors in the conduit, or long service runs. Follow local requirements.

Per NEC article 300-20(2), all three-phase conductors must be run in the same conduit. Neutral and ground must be run in the same conduit as the phase conductors.

Conduit to be sized to accommodate one neutral conductor the same size as the phase conductor and one ground conductor. If two neutral conductors or an oversized neutral conductor are to be installed, check the size of the conduit needed to accommodate the extra wire or size and use that conduit size in place of the conduit size listed. Conduit sizes can be chosen from NEC Table C1, type letters RHH, RHW, RHW-2, TW, THW, THHW, THW-2.

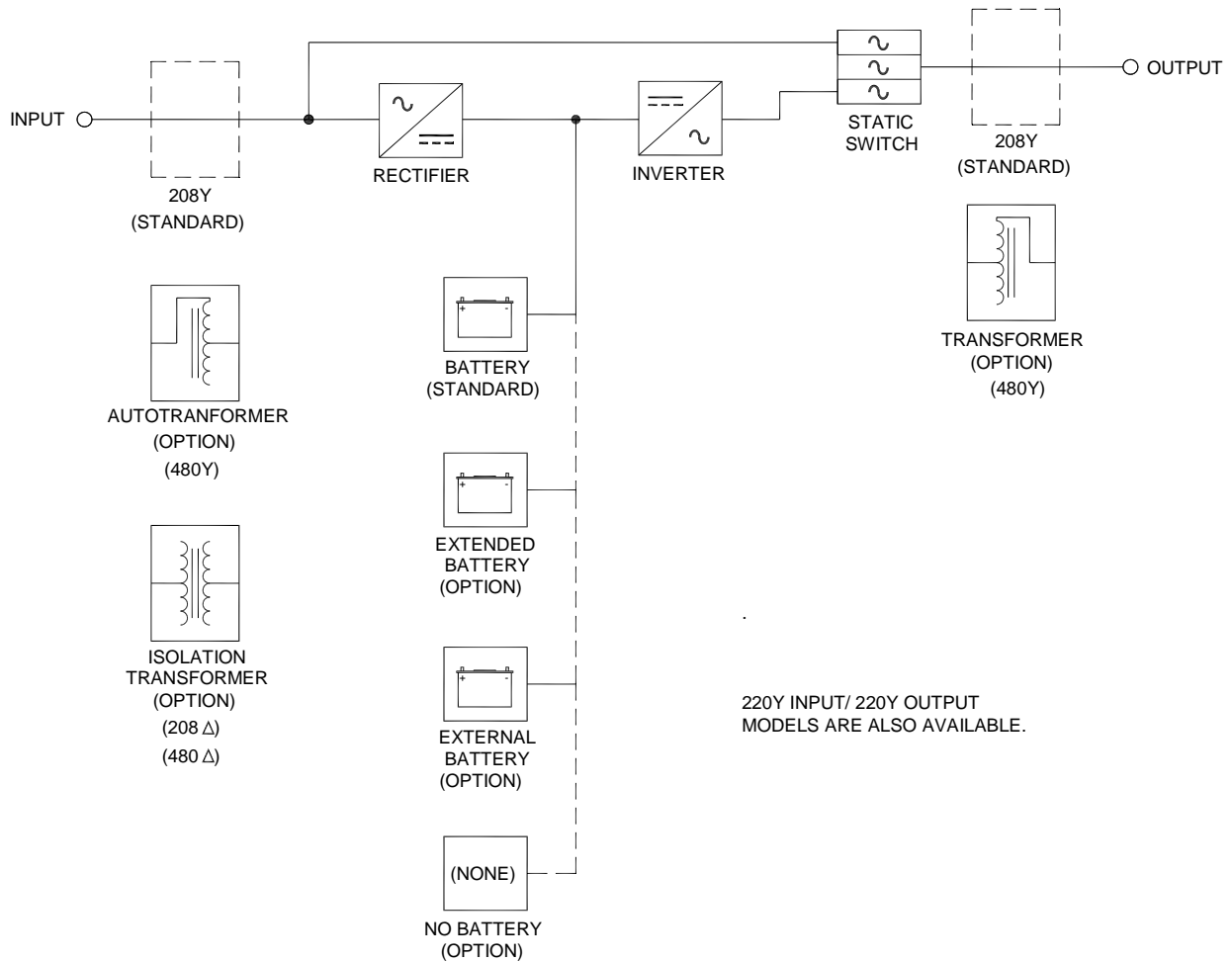


Figure 8 - UPS Wiring-Single Line Diagram

Removing and Replacing the Front Panel

Lift the panel up and off the cabinet.

To replace the panel:

1. Lower the shoulder screws on the rear of the panel into the keyhole slots on the cabinet.
2. Press the panel downward until the panel is firmly mounted in place.

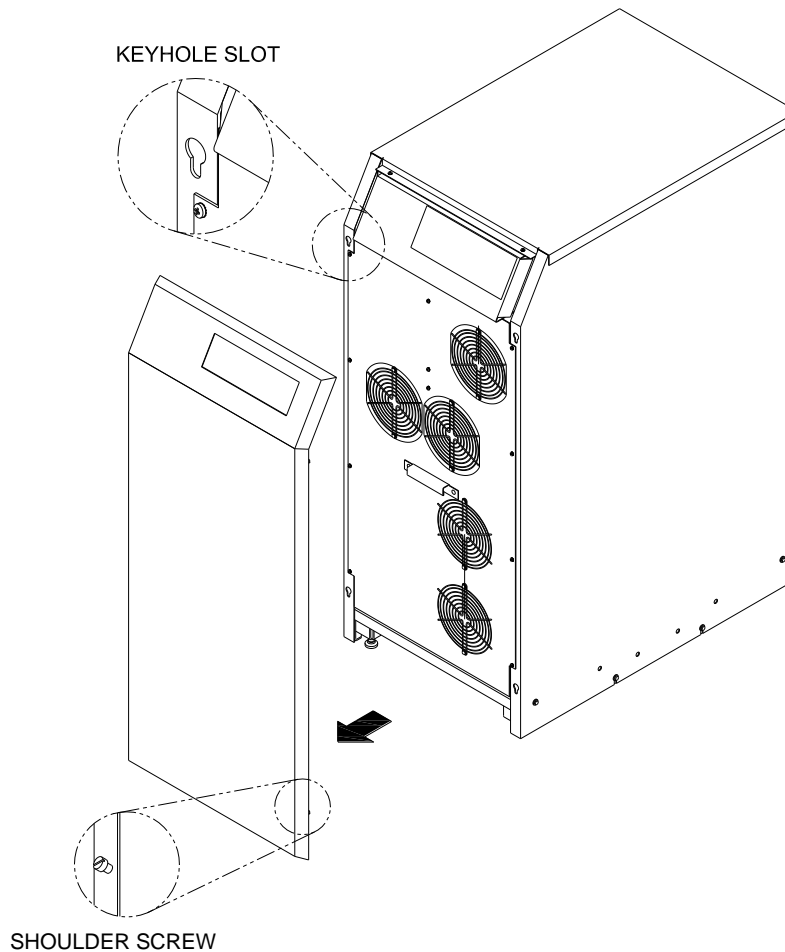


Figure 9 - Removing the UPS Front Panel

Connect the Internal Battery

To be performed by authorized service personnel:

1. Remove front cover panel and interior panel.
2. Inspect battery trays for signs of damage. Verify that all terminal connections are sound.
3. Use a voltmeter to verify that the battery string is above 420 VDC at the battery plug shown in figure 10.
4. Verify that the white, blue, black and red plugs of the battery trays are connected as shown in figure 10.

⚠ Never connect the two plugs from the same tray together. Severe damage and injury could result.

5. If an Extended Battery Cabinet is to be connected, do so at this time. Refer to the User's Manual for the FIRSTLINE EXTENDED RUN TIME BATTERY CABINET. Also, refer to the special notes in Section 8 of this manual.
6. Reference figure 10. Connect the red and black battery plugs to the same colored plugs hanging from above.
7. If the UPS is equipped with a second battery string, repeat steps 4, 5, and 6 for the second battery string.
8. Replace front panels.

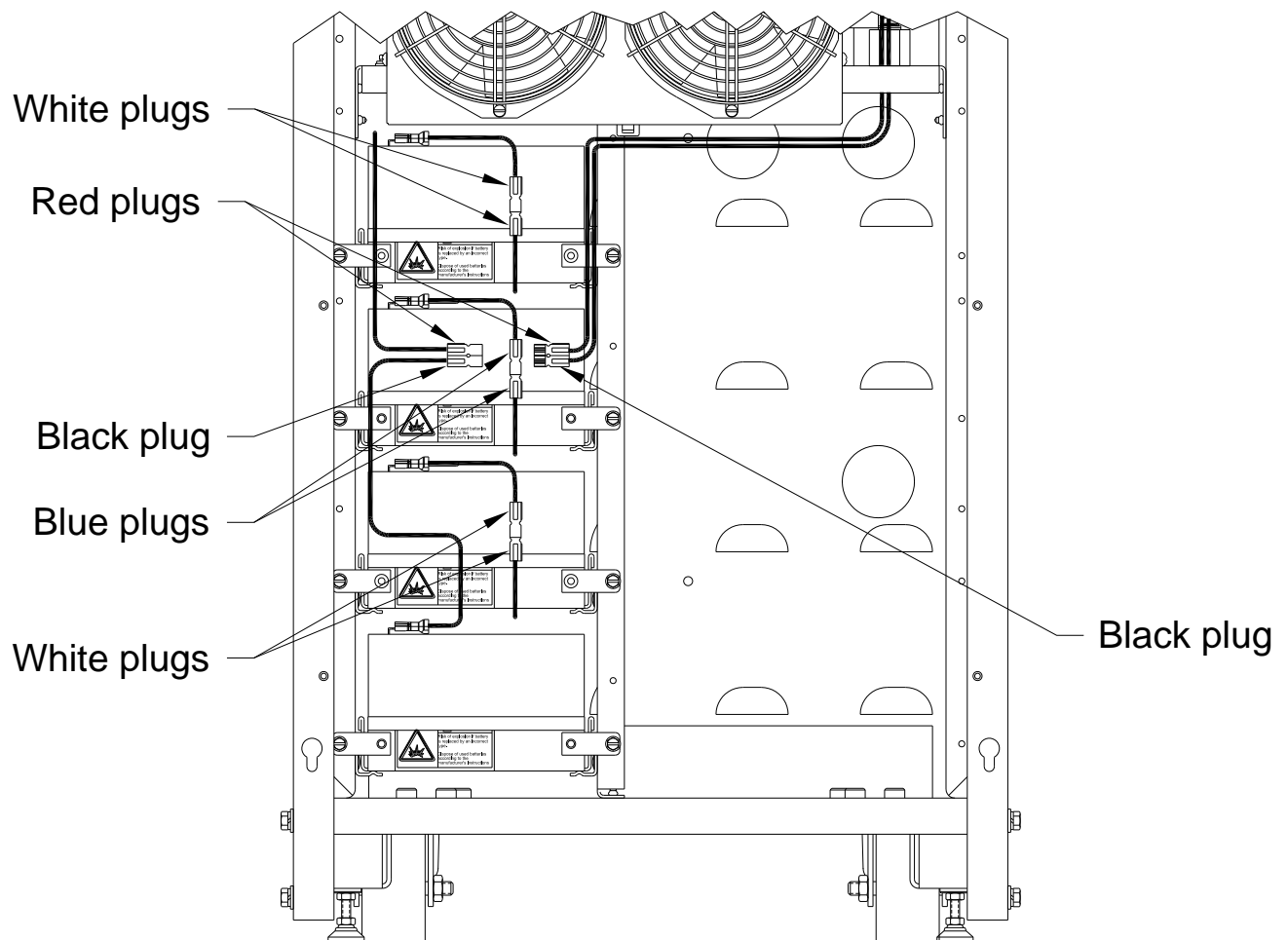


Figure 10 - Internal Battery

SECTION 5

Communication

Figure 11 shows the location of the communication options and terminals on the UPS.

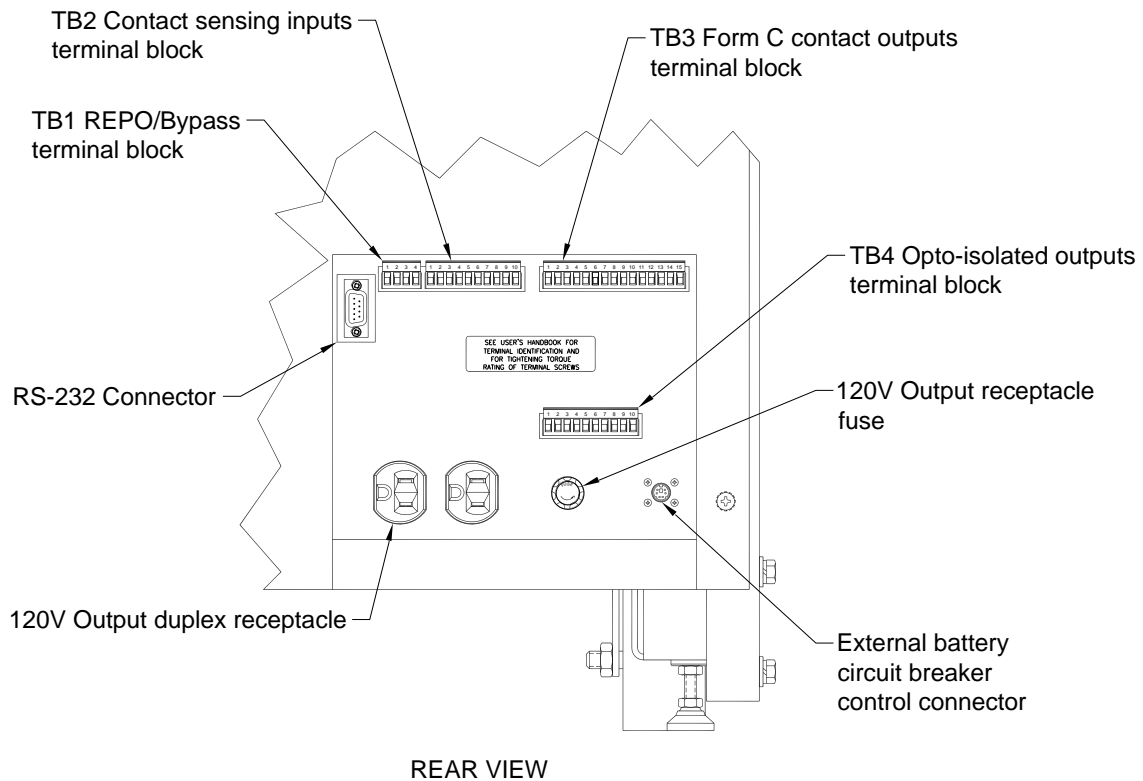


Figure 11 - Communication Options and Control Terminals

CAUTION: The 120V receptacle on the rear panel must only be used to power Staco supplied communications accessories.



Note: TB1, TB2, TB3, TB4 plug-in terminal blocks, fuse, and fuse cap are shipped in the zip-lock bag with this manual. Install them before powering the UPS.

Customer Interface

The Customer Interface is located on the rear cover of the UPS. There are seven dry contact inputs that function as follows:

- TB1 terminals 1 and 2-Remote Emergency Power Off (REPO) contact closure causes immediate shutdown of the UPS. Contact the factory if a normally closed REPO switch is required.
- TB1 terminals 3 and 4-Bypass Switch Sensing (To Staco MBS, if present).
- TB2 terminals 1 and 2-Battery Charge Inhibit. For future use.
- TB2 terminals 3 and 4-Reduced Current Operation. For future use.
- TB2 terminals 5 and 6-Automatic Restart Inhibit. For future use.
- TB2 terminals 7 and 8-not defined.
- TB2 terminal 9 and 10-not defined

There are five sets of form-C dry contact available as outputs. They are capable of switching up to 30 volts (AC or DC) at up to 1 amp. Listed in order of NO, COM, NC.

- TB3 terminals 1, 2, 3 – running on inverter.
- TB3 terminals 4, 5, 6- battery discharging.
- TB3 terminals 7, 8, 9- low battery reserve.
- TB3 terminals 10, 11, 12- on bypass.
- TB3 terminals 13, 14, 15- alarm present.

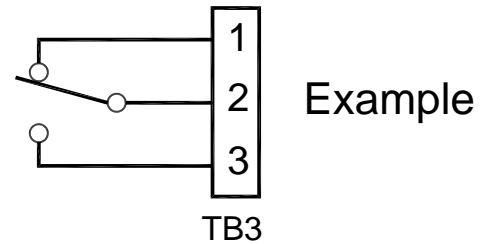


Figure 12 - TB3

There are five sets of optically isolated open collector outputs available. They are capable of switching up to 30 volts DC and up to 3 milliamps. Listed in order of Emitter, Collector.

- TB4 terminals 1,2 – running on inverter
- TB4 terminals 3,4 – battery discharging
- TB4 terminals 5,6 – low battery reserve
- TB4 terminals 7,8 – on bypass
- TB4 terminals 9, 10 – alarm present

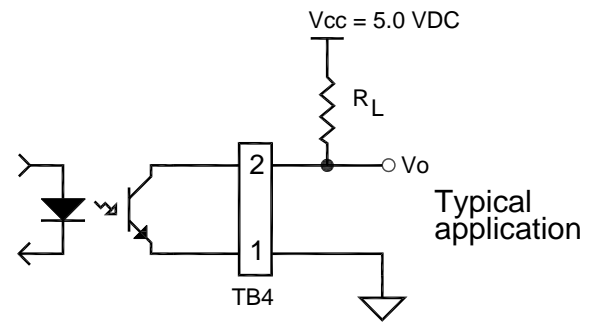


Figure 13 - TB4

An RS-232 DCE three wire interface is available. The UPS shipped with an installation CD containing monitor software and an RS-232 cable. The monitor software will allow a single user to connect the UPS to a computer via the RS-232 port for local monitoring of UPS operation.

For advanced monitoring Ethernet and SNMP are supported via the RS-232 interface with an external adaptor. A 120 volt AC outlet has been provided on the back panel of the UPS for powering the external adaptor. Consult the factory for more details.

The local RS-232 monitor function cannot be used at the same time as the external monitoring adaptor.

If the UPS is connected to the Staco Maintenance Bypass Switch, there are required connections between TB1-3, TB1-4, TB3-10, TB3-11 and the MBS. If an MBS is present, TB3-10, 11, 12 (“On Bypass”) contacts are not available to the user.

Table 8 - Torque Values for TB1, 2, 3, 4

TORQUE VALUES FOR TERMINAL BLOCKS ON CUSTOMER INTERFACE BOARD	
#22 - #12 AWG	4.4 inch-pounds

SECTION 6

Operation

This SECTION contains information on how to use the FirstLine UPS, including front panel operation, UPS startup and shutdown.

Control Panel Functions

The UPS has an LCD with backlight. It provides useful information about the UPS itself, load status, events, measurements, and setting (see figure 14).

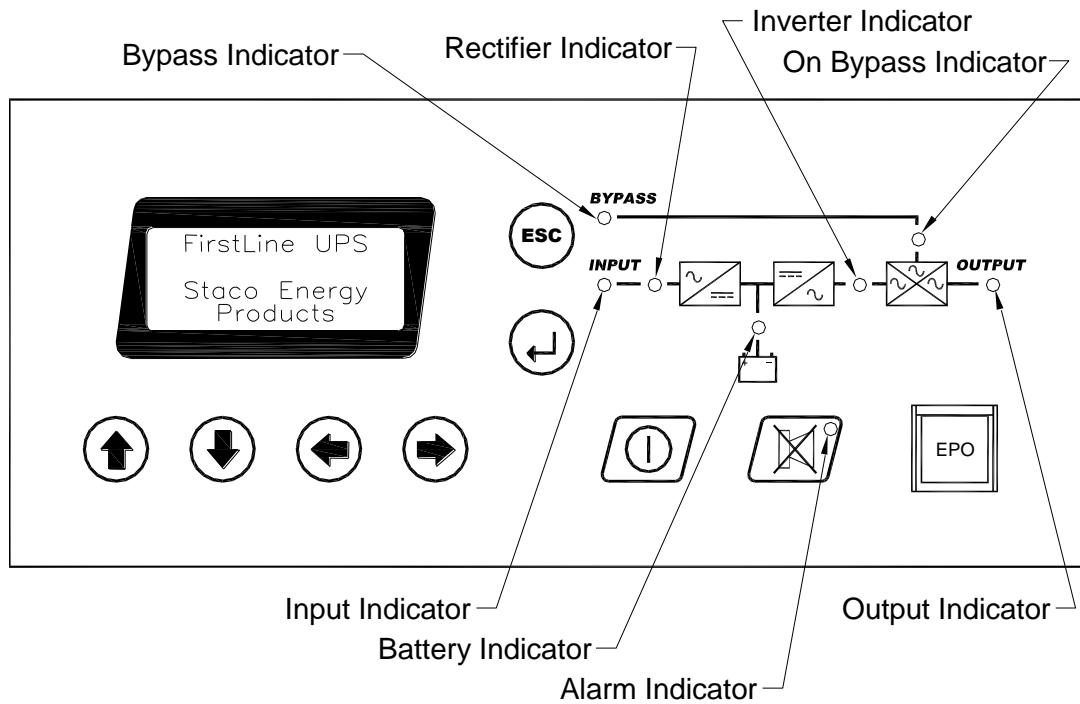


Figure 14 - FirstLine Front Panel Display and Control Module

The following table shows the indicator status and description:

Indicator	Status	Description
Bypass	Off	Bypass input voltage or frequency not qualified
Bypass	Green	Bypass input voltage or frequency qualified
Bypass	Yellow	Inverter output not synchronized to bypass input
Bypass	Red	Bypass input voltage has incorrect phase sequence
Input	Off	Rectifier input voltage or frequency not qualified
Input	Green	Rectifier input voltage and frequency qualified
Input	Red	Rectifier input voltage has incorrect phase sequence
Rectifier	Off	System OFF or Rectifier input not qualified
Rectifier	Green	Rectifier is running normally
Rectifier	Yellow	Rectifier is running at input power limit
Rectifier	Red	Rectifier failure or DC Bus Fault, call for Service
Battery	Off	System OFF
Battery	Green	Battery is being charged or is at full charge
Battery	Yellow	Battery is discharging
Battery	Red	Battery fault or no battery present
Inverter	Off	System OFF or on Bypass
Inverter	Green	Running ON INVERTER (normal mode)
Inverter	Yellow	Bus voltage out of range or tripped on overcurrent
Inverter	Red	Inverter failure, call for service
On Bypass	Off	System OFF or not on Bypass (normal mode)
On Bypass	Green	ON Bypass
On Bypass	Yellow	On Bypass, overload present, reduce load before system shuts down
On Bypass	Red	Static Switch Failure, Do Not Operate UPS, call for Service
Output	Off	System off
Output	Green	Output is present (On Inverter or on Bypass)
Output	Yellow	Output is overloaded, reduce load before system shuts down
Output	Red	Output failed or EPO was activated or REPO was activated
Alarm	Off	No alarms are present
Alarm	Yellow	An alarm is present

Table 9 - Indicator Status and Description

Display Functions

As the default or after 15 minutes of inactivity, the LCD displays the selectable startup screen. The default is the Staco Energy Products Co. logo and can be changed to the Mimic screen in the User Settings menu.

The backlit LCD automatically dims after a long period of inactivity. Press any button to restore the screen.

Use the two middle buttons (↑ and ↓) to scroll through the menu structure. Press the → button to enter a submenu. Press the ← button to select an option. Press the **ESC** button to cancel or return to the previous menu.

The following table shows the basic menu structure.

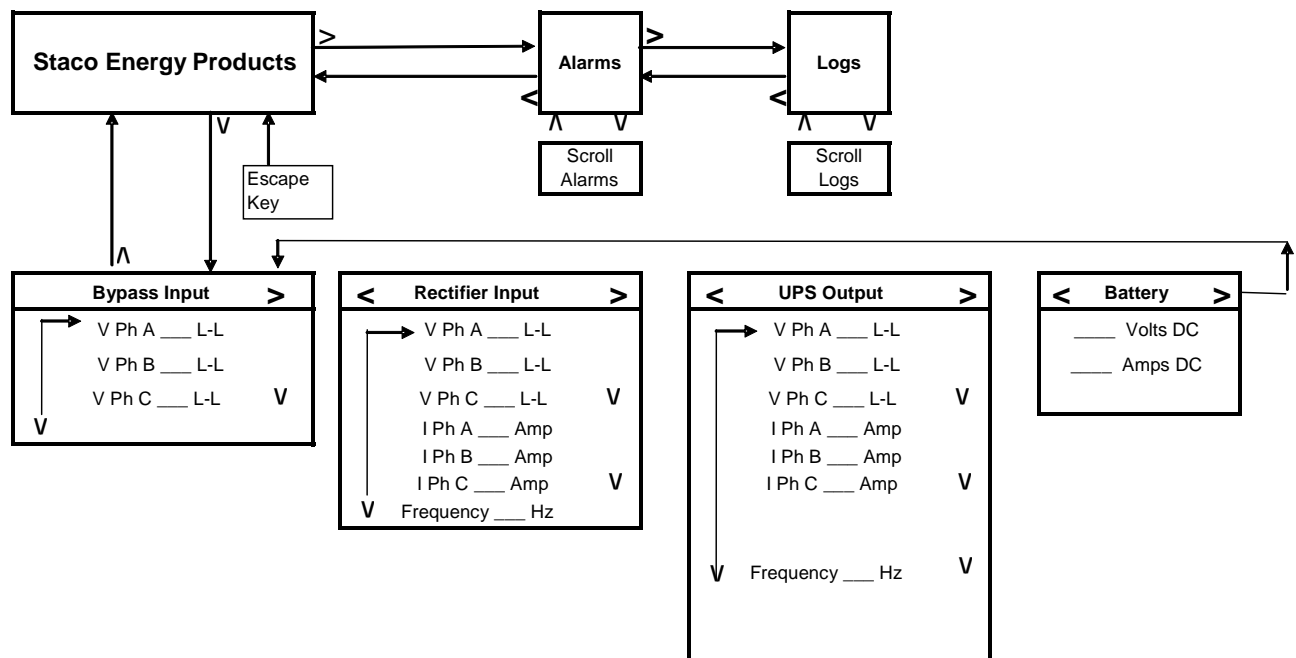



Table 10 - Menu Map for Display Functions


SECTION 7

Initial Start Up

To be performed by authorized service personnel.

1. Inspect for damage. Remove front cover panel, inner front access panel, front shipping support panel, top cover, and rear panel. Look for signs of damage due to handling including bent supports, loose components, etc.
2. Connect input power source and load to terminal blocks at rear of unit as described in Section 4. Before apply power to Ups, verify that the correct voltage is available and that the phase sequence is correct (A-B-C).
3. If an external bypass switch is to be used, contact the factory for the correct method to interface contact sensing to the UPS.
4. Double check that there is no visible damage to the battery. Insure the battery is connected as described in Section 4.
5. Reinstall the rear cover, the top cover, and the front inner access panel. Reinstall the decorative front panel.
6. If one or more Extended Battery Cabinets are connected to the UPS, close the circuit breaker on each cabinet.
7. Apply power to the UPS.
8. Press the on/off button  to start the UPS.

Normal Operation

To start the UPS, press the on/off power button . If the bypass input is qualified (voltage, frequency, and phase sequence correct), the UPS will start on bypass. The rectifier and inverter will automatically start and the static switch will transfer the load to the inverter.

To stop the UPS, press the on/off button.

In an emergency, the UPS can be stopped by lifting the guard and pressing the “EPO” button (Emergency Power Off). Activation of Emergency Power Off, either via the front panel EPO button or via the Remote Emergency Power Off function (TB1 on the Customer Interface), will also cause the system to reset, interrupting any display or communication process that is underway. EPO and REPO also trip the breaker(s) in the External Battery Cabinet(s), so be sure to reset before restarting the UPS.

The output circuits of the UPS; should not be considered safe unless the UPS is OFF and the input power source to the UPS has been removed by opening the input disconnect device which is external to the UPS.

If one or more Extended Battery Cabinets are connected to the UPS, do not open the circuit breaker on any cabinet. If the circuit breaker is open, do not close the circuit breaker while the UPS is operating. See Section 8 for the proper procedure to close the circuit breaker.

Manual Transfer to Bypass

Verify that the bypass input is qualified by observing that the bypass indicator is green. While holding down the ESC key, press the up-arrow key. When the conditions are met for a transfer to bypass (bypass input is qualified and inverter is synchronized to bypass), the static switch will transfer the load to bypass. After a few seconds, the mimic display will update to show this.

Manual Transfer to Inverter

This procedure enables an automatic transfer to inverter. While holding down the ESC key, press the down-arrow key. When the conditions are met for a transfer to inverter (inverter is running and synchronized to bypass), the static switch will transfer the load to inverter. After a few seconds, the mimic display will update to show this.

External Bypass Arrangement

If the UPS is connected to a Staco Maintenance Bypass Switch, refer to the Manual for that product for proper operation. The MBS is equipped with a label that describes common transfer operations and a brief summary is provided below. Bypass switches provided by others are not recommended as they are not equipped with the proper interlocks to prevent backfeed, a hazardous condition that can be lethal to service personnel. Use of a non-Staco bypass switch may void the UPS product warranty.

The normal mode of operation (i.e. not bypass) requires that switches 1 and 3 in the MBS are closed. The UPS should be operating in this state. To transfer operation of the load to Maintenance Bypass mode, first perform a manual transfer to bypass per the procedure above. Verify that the mimic display changes to show that the load is now connected to the bypass line. Close Switch 2 in the MBS, then open Switch 3. Turn off the UPS, if desired,, then open Switch 1.

To return from Maintenance Bypass to Normal mode, close Switch 1 and start the UPS, Select Manual Transfer to Bypass mode. Verify that the UPS is running and that the mimic diagram shows that the output is being supplied from the bypass line. Close Switch 3, then open Switch 2. Select Automatic Transfer to Inverter per the procedure below.

If the UPS fails to start and it is desired to get power to the load, open Switches 1 and 3 on the MBS, then close Switch 2. The load is now powered from the bypass, Note that the UPS logic is not involved in the decision to apply bypass power to the load, so there is no assurance that the bypass source is suitable for powering the load. This procedure is performed at the user's risk. Also note that the UPS will not start when the bypass source is out of specification.

Automatic Transfer to Bypass

The static switch will automatically transfer the load to bypass if the bypass input is qualified and one of the following conditions applies:

1. Initial start-up of UPS.
2. The inverter is unable to support the load due to a) failure, b) overload, c) battery reaches end of discharge voltage threshold.
3. Loss of output voltage is detected.

Automatic Transfer to Inverter

The static switch will automatically transfer the load to inverter if all of the following conditions are true:

1. The inverter has been started and is running normally.
2. The inverter is phase-locked to the bypass input.
3. There was no manual transfer to bypass.
4. There is no overload present.
5. There have not been more than three overload-caused transfers to bypass in a one hour period.

OverLoad

Inverter

Load	Time Supported
100%	Continuous
110%	2 Minutes
125%	30 Seconds

When the overload limits are exceeded while running on inverter, an automatic transfer to bypass occurs. When the overload clears, an automatic transfer to inverter occurs, unless there have been three overloads within one hour. Inverter overload performance is not guaranteed while running on battery.

Bypass

Load	Time Supported
110%	Continuous
125%	2 Minutes
150%	10 Seconds
700%	5 Cycles

When the overload limits are exceeded while on bypass, the static switch will turn off. Note that external circuit protection devices may operate during overload conditions.

Rectifier

The rectifier is microprocessor controlled using algorithms that limit the input current to levels that protect the rectifier components. If the inverter requires more current than the rectifier can provide, the battery will supply current as needed. Thus, the rectifier will supply as much energy as is available from the rectifier input. At 80% input voltage, the rectifier can support the rated inverter load, but does not have any extra capacity to charge the battery. At higher line voltages, there is enough capacity to charge the battery while supporting rated load.

The rectifier uses an advanced high frequency Pulse Width Modulated design that presents low current distortion to the input power source. Its high power factor means that maximum power is obtained for a given input current.

SECTION 8

Battery Removal, Installation, and Service

The batteries must only be serviced by authorized service personnel.

Before any battery service is attempted, the batteries must be disconnected by unplugging the cables to the battery trays. Before unplugging the cables, the connections should be marked in a way that no confusion will exist when it is time to reconnect the cables. The batteries are mounted in slide out trays that permit access to the battery to battery connections when the trays are withdrawn from the cabinet.

If batteries are being replaced, only use the same manufacturer and battery type and rating as the battery removed.

It is very important that only one tray at a time be extended from the cabinet. If more than one tray is extended, the cabinet can become unstable and topple over.

After each tray is installed or serviced, it must be fully inserted and secured using the supplied threaded fasteners before attempting to install or service another tray.

If the trays are to be removed, always remove the highest tray first. The battery trays are very heavy and it may be necessary to use a lifting device to support the trays as they are removed. When the trays are to be reinstalled, use the procedure in the following paragraph.

If the UPS was shipped with no batteries installed, batteries may be installed at a later time using only those battery types shown in the **REPLACEMENT BATTERY** table under UPS Maintenance. **A Staco battery string consists of four (4) battery trays, two each of Staco part number 812-1369-S; consisting of 8 batteries each and Staco part number 812-1368-S trays; consisting of 9 batteries each. 220/127V models use (4) trays of Staco part number 812-1368-S only.** First, verify that the cabinet is equipped with shelves to receive the battery trays. If this is not the case, contact the factory for assistance. The battery trays are heavy and it may be necessary to use a lifting device to support the trays as they are installed. Do not take away the external support until the middle of the battery tray is inserted past the first louver on the upper edge of the battery shelf (see figure 15). Always install the lowest battery tray first (see figure 15). After it is inserted fully into the support shelf, secure the tray with the supplied threaded fasteners. After all of the trays are reinstalled and secured, reconnect the cables using the markings as a guide. If this is a new battery installation, connect the battery cables using the procedure in the following paragraphs.

WARNING

Never connect the two cables from a battery tray or from a battery string (two trays) together as severe damage will occur, resulting in fire and/or injury. Battery connections should only be made by a person wearing eye protection. It is advised that eye wash be available. If there are any doubts about the proper connections, do not proceed.

For a four tray (single string) battery, connect the white plugs of the upper two trays together and then the white plugs of the lower two trays together. Connect the blue plugs from the middle two trays together. Connect the black plug from the lower tray and the red plug from the upper tray that are joined together, to the joined black plug and the red plug from the battery fuse on the front of the electronics section (see figures 10 and 15).

For an eight tray (double string) battery, connect the right four trays as described above. Then, take the joined black plug from the lowest tray and the red plug from the upper tray and insert them into the second dc input connector, making sure that the red plug from the battery tray goes to the red side of the dc input connector and that the black plug from the battery tray goes to the black side of the dc input connector.

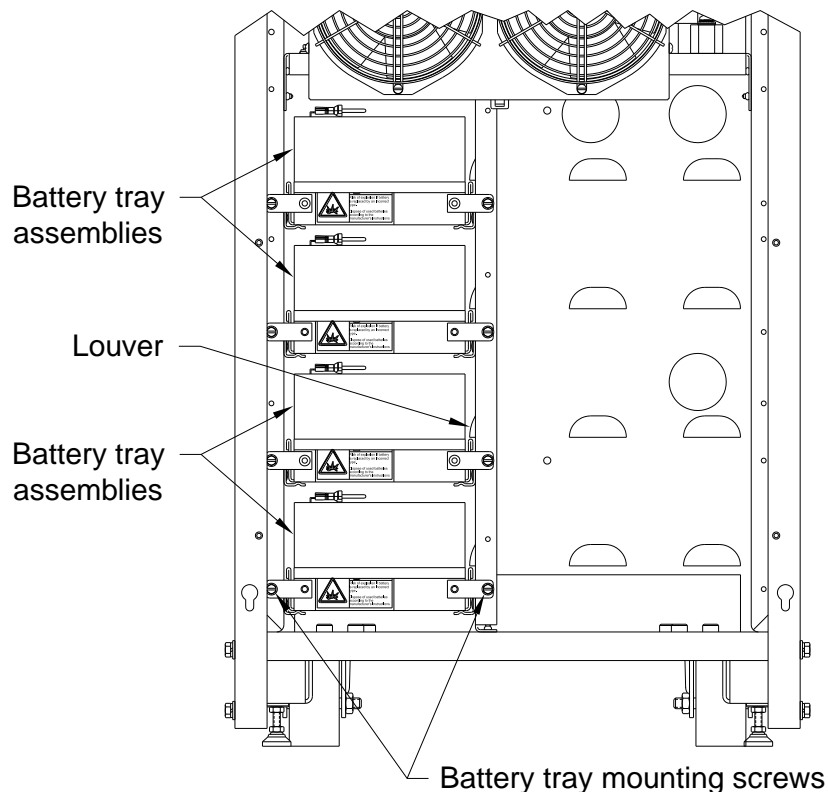
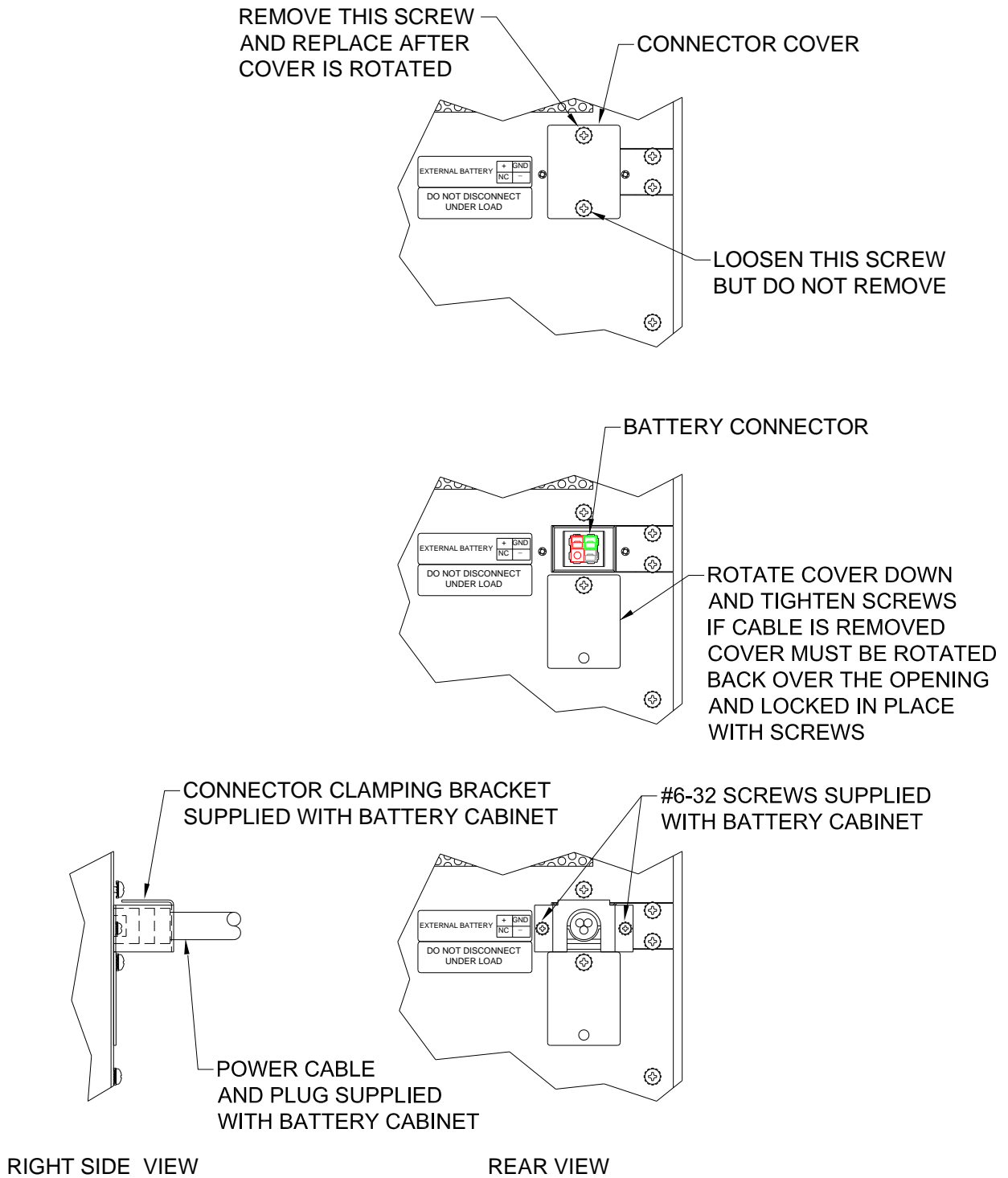


Figure 15 - Battery Installation

Special Considerations for Connection Batteries to the FirstLine UPS, including Extended Run Time Battery Cabinets

It is never safe to work within either the UPS or the extended battery cabinet while the UPS is powered. The batteries produce a lethal voltage whether or not the UPS is powered or running. Always work with extreme caution. No service work should be performed unless the personnel are properly trained and appropriate tools and equipment are available.

All batteries must be connected to the UPS prior to starting the rectifier. See figure 16 for connecting to the Extended Run Time Battery Cabinet. The rectifier runs whenever the UPS is on. If a battery is disconnected while the rectifier is running (for example, if the circuit breaker on an extended battery cabinet is opened while the UPS is running) it must not be closed without first stopping the rectifier. Connecting a battery while the rectifier is running will cause equipment damage that is not covered by the equipment warranty. See the following procedure for stopping the rectifier.



Plug the cable supplied with the Extended Run Time Battery Cabinet into the external battery connector on the rear panel as shown in figure 16. Mount clamping bracket as shown. Connect opposite end of cable to input battery power connector on the Extended Run Time Battery Cabinet using the same procedure as shown in figure 16. See user's manual 003-2359 for more details on the Extended Run Time Battery Cabinet.

Figure 16 - Extended Run Time Battery Cabinet Connections

Stopping the Rectifier in the UPS

Before connecting any batteries to the UPS, the rectifier must be stopped. The rectifier is stopped whenever the UPS is OFF. The batteries are disconnected whenever the disconnect breaker(s) in the Extended Run Time Battery Cabinet(s) is (are) open. The Extended Battery Cabinet(s) is(are) equipped with a disconnect breaker, it is possible for a breaker to be opened during operation, which requires that the rectifier be stopped before closing the breaker. All breakers should be closed when the UPS is started. Generally, the only reason to open any of the battery disconnect devices is to perform service, which requires that the UPS be turned off. It is best to close the disconnect devices before starting the UPS and leave them closed during operation. In the event of an emergency condition that requires opening a disconnect device, it will be necessary to stop the rectifier in order to restore the system to normal configuration.

The simplest way to stop the rectifier is to turn off the UPS by pressing the power ("line-circle") button on the front panel. This will remove power from the load. Once the battery breaker(s) has (have) been closed, the UPS can be restarted by pressing the power button.

If the UPS is connected to the load using a Maintenance Bypass Switch (MBS), the load can be maintained when the UPS is turned OFF.

To transfer to MBS:

1. Verify that the bypass source is available (Bypass lamp on UPS mimic display is green).
2. Perform a manual transfer to bypass mode on the UPS by pressing and holding the ESC key while simultaneously pressing the UP-ARROW key.
3. Verify that the UPS output is ON BYPASS by observing that the lamp associated with the bypass line at the static switch block on the mimic display is green and that the lamp associated with the inverter is not lit.
4. Operate the MBS to put it in bypass mode.

It is now safe to turn off the UPS and close the battery breaker(s). Restart the UPS. To transfer back to normal mode:

1. Verify that the UPS is still ON BYPASS by observing the mimic display. If not, perform a manual transfer to bypass as described, above.
2. Operate the MBS to put it in normal mode.
3. Enable automatic transfer by pressing and holding the ESC key while simultaneously pressing the DOWN-ARROW key. After a few seconds, the mimic display should show that the static switch has transferred the load to inverter.

UPS Maintenance

The FirstLine UPS is designed to be virtually user maintenance free, requiring only the occasional wipe with a damp cloth or non-abrasive cleaner.

Spare kits are available for the FirstLine UPS series, please contact Staco Energy Products Co. service center for details.

For maximum availability of the UPS, the components that are subject to wear should be replaced as part of a comprehensive preventive maintenance program:

RECOMMENDED REPLACEMENT INTERVALS	
Dc Filter Capacitors	5 years
AC Filter Capacitors	5 years
Fans	2 years
Rectifier Chokes	10 years
Batteries	2 to 5 years ¹

REPLACEMENT BATTERY		
Manufacturer	Cat. Number	Quantity Required²
China Storage Battery	HRL 1234WF2	34 per string
Shenzen Sunnyway	12V9AH	34 per string
Yuasa	NPW45-12	34 per string
Power-Sonic	PSH-1280F2-FR	34 per string
REPLACEMENT BATTERY		
Suitable for computer-room applications		
Manufacturer	Cat. Number	Quantity Required
China Storage Battery	HRL 1234WF2FR	34 per string
Yuasa	NPW45-12FR	34 per string
Ascent Battery Supply	WKA12-9F2-FP	34 per string

Note: Batteries suitable for computer rooms are good for all applications.

All servicing should be performed by qualified service personnel.

Battery Fuse Replacement

If an input line voltage transient well in excess of the UPS rating occurs while the UPS is running on battery, it is possible for the battery fuse to clear open. The symptom of an open battery fuse is the same as a disconnected battery: after the UPS is started, the battery lamp on the mimic display glows red. Prior to starting the UPS, the front panel display can be used to read the battery voltage. If the voltage is less than 380 VDC, the

¹ Battery life is highly dependent on the ambient temperature and the number and depth of discharge cycles. A discharged battery should be recharged as soon as possible. If the battery is left in a discharged state, irreversible sulfation occurs, reducing the capacity (run-time) of the battery.

² Some model configurations will use 36 batteries per string. 36 battery models are not part of the UL listing.

UPS will determine that there is no useable battery present. Possible causes include a blown fuse, a disconnected battery, and a defective battery.

There are two battery fuses. Either one could be open, so the safe action is to replace both of them. The following procedure should only be performed by trained, authorized service personnel. For continued safety, fuses must be replaced by parts of proper rating.

1. Turn off the UPS. If an MBS is present, the load can be maintained by transferring to Maintenance Bypass mode prior to turning off the UPS.
2. Remove the utility ac power from the input of the UPS.
3. If any external battery cabinets are present, disconnect the batteries in all of them. The external battery cabinet is equipped with a circuit breaker, it is only necessary to open (turn off) this breaker which is accessible by removing the front cover of the cabinet.
4. Remove the outer panel from the UPS by pulling the top away from the UPS, lifting the panel, and pulling it away from the UPS.
5. Remove the inner panel by removing the screws around the periphery of the panel and from the three holes next to the fans. The panel can be lifted off, but it is attached to the UPS by a ground wire that will limit movement.
6. Unplug the battery by disconnecting the red and black plugs. If the UPS is equipped with two sets of batteries, also disconnect the second battery connector.
7. Visually verify that all batteries are disconnected and wait at least 5 minutes for capacitors to discharge.
8. The battery fuses are located on the printed circuit board assembly located behind the upper most fan, see figure 17. Pull and replace the fuses labeled – BATTERY FUSE and +BATTERY FUSE. These are 30 AMP, 500 VDC rated fuses and must be replaced with the same rated fuse, Staco Part Number 307-0333-S. If one or both battery fuses are open, check the battery Static Switch for shorts or other damage before replacing the fuses. If damage is present, the Static Switch Board Assembly must be replaced.

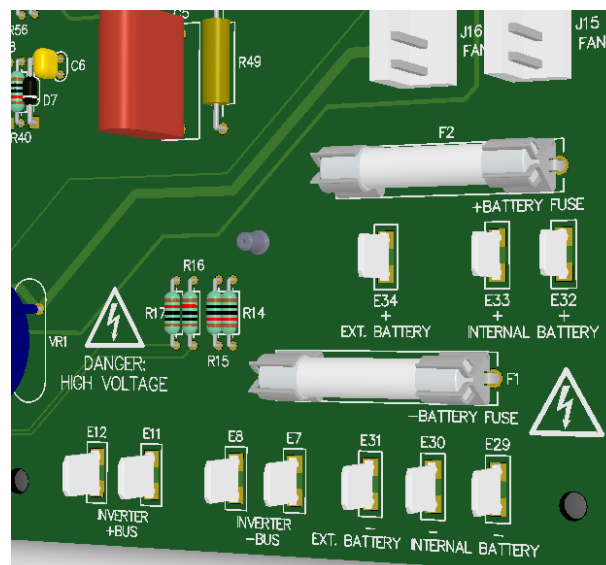


Figure 17 - Battery Fuses

9. Reconnect the internal battery(s) in the UPS.
10. Replace the inner panel.
11. If there is an external battery, reconnect all of the batteries and replace the inner panel. Close the breaker to connect the battery.
12. Replace the outer panels on the UPS and the battery cabinet (if present).
13. Reapply utility ac power to the UPS.
14. Start the UPS.
15. Verify that the battery lamp glows green. Look at the battery parameter screen (Down, Right, Right, Right) and verify that the battery current is positive (charging) or that it is near zero and the voltage is 460 - 470 Vdc.

SECTION 9

Optional FirstLine Extended Run Time Battery Cabinet

The FirstLine extended run time battery cabinet is used in conjunction with the FirstLine uninterruptible power supply (UPS) to prevent loss of valuable electronic information and minimize equipment downtime. During brownouts, blackouts, and other power interruptions, batteries provide emergency power to safeguard operation.

Figure 18 shows the FirstLine extended run time battery cabinet, which can be outfitted with one or two strings of batteries and includes a circuit breaker. Connections on the rear of the UPS for the extended run time battery cabinet are shown in figure 16. For installation, wiring and maintenance instructions see user's manual no. 003-2359.

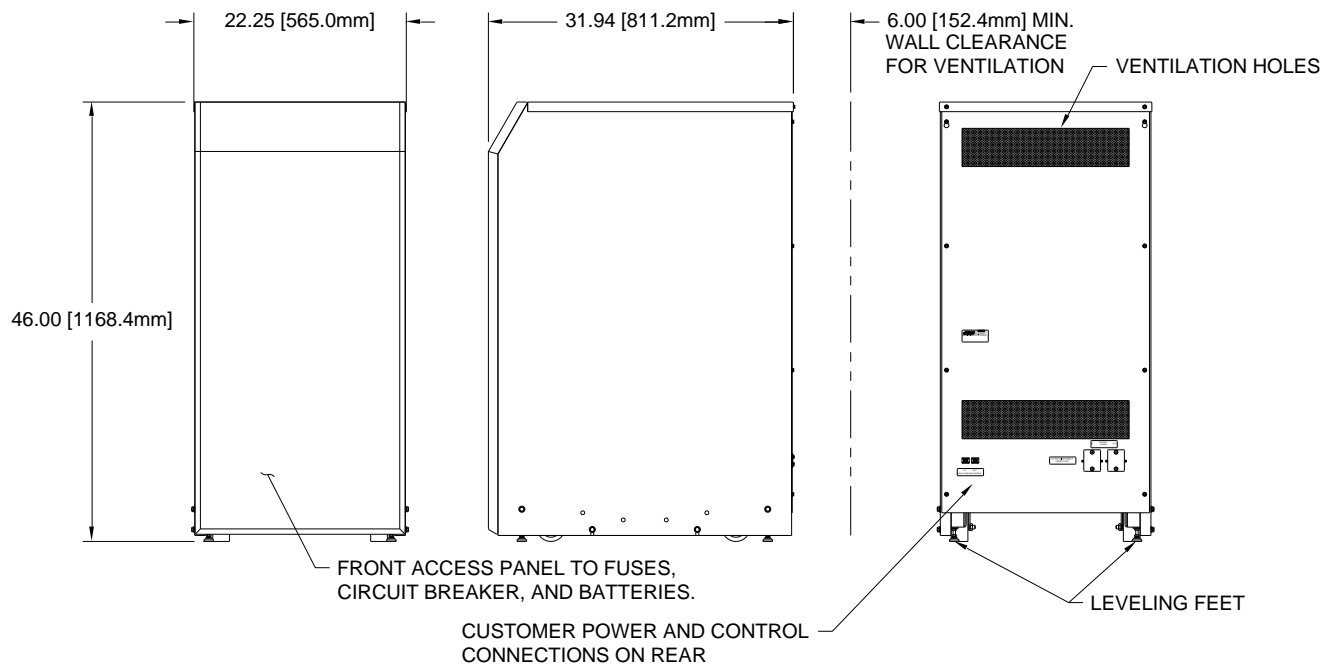


Figure 18 - The FirstLine Extended Run Time Battery Cabinet

The following battery cabinet models are available for use with the FirstLine 10 kVA UPS:

FirstLine Extended Run Time Battery Cabinet Part Number System

Part Number	Number of Strings	DC Bus Voltage
FLU-BAT-10-1-B	1	408 VDC
FLU-BAT-10-2-B	2	408 VDC
FLU-BAT-12-1-B	1	432 VDC
FLU-BAT-12-2-B	2	432 VDC

Note: -12 units are not part of UL Listing and are used with the FLU-10S-22 UPS models only.
--

Table 11 - Battery Cabinet Part Numbering System

SECTION 10**FirstLine UPS Technical Specifications**

UPS Rating: 10 kVA, 8 Kw			
Input			
Voltage ¹ (Line to Line, Line to Neutral)	208,120	220,127	480, 277
Range	+10% -20% From Nominal (-15% For Battery Recharge) +10% -10% from nominal to start UPS		
Frequency	57-63 Hz		
Power Factor	> 0.98 At Full Load		
Current Distortion (THD)	< 5% At Full Load		
Input Current	Nominal:	28	26
	Rated:	34	33
Input Current Inrush	Walk-In from 25% maximum to 100% full load rating in 5 seconds		
Output			
Voltage (Line to Line, Line to Neutral)	208,120	220,127	480, 277
Frequency (free running on battery)	60 Hz +/- 0.01%		
Voltage Regulation	+/- 1% balanced load, +/- 3% with 100% unbalanced load		
Voltage Transient Response	< 5% voltage change for 100% load step with recovery to less than 2% in less than 1 cycle		
Voltage Distortion THD	< 2% with linear load, < 5% with 100% non-linear load		
Inverter Overload	100% continuous, 125% for 2 minutes, 150% for 1 second		
Bypass Overload	110% continuous, 125% for 2 minutes, 150% for 10 seconds, 700% for 5 cycles		
Output Current (Amp's at .8/1 PF)	28/22	26/21	12/10
Heat Rejection (BTU/Hr)	4100	4200	5600
Battery Run Time-Minutes²			
-1 option	9		
-2 option	24		
Environmental			
Altitude	Derate load capability above 1000 meters 1% per 100 meters,		
Operating Temperature	0 + 40° C		
Non-Operating Temperature	-20 to + 60° C. Exceeding 0 - 40° C will degrade battery life.		
Dimensions and Weights (mm) (Kg)			
208 I/O	20.0 in (508.0) W x 31.94 in (811.2) D x 46.0 in (1168.4) H		548 lbs (249)
Internal Extended Battery	20.0 in (508.0) W x 31.94 in (811.2) D x 46.0 in (1168.4) H		803 lbs (364)
480/480 I/O	20.0 in (508.0) W x 31.94 in (811.2) D x 46.0 in (1168.4) H		858 lbs (389)
Standards			
208V and 480V Models	UL listed to 1778, CUL to CSA C22.2, NEMA PE-1, ASME, ASA-C-39.1-1984, FCC Part 15 Subpart J Class B, NEC, OSHA, IEEE587, ANSI C 62.41-1980, ISO9000		

¹ Input is 4 wires plus ground (Delta input available with -I option).

² Run time is approximate and depends on the battery state of charge, age, operating temperature and other conditions.



220V models are not listed to UL, CUL, or CSA Standards.
