

The FIRSTLINE UPS
8 kW EMERGENCY LIGHTING SYSTEM

User's Manual



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Before Installing the Emergency Lighting Systems:

- Read all safety and installation instructions.
- Make sure that the System is the correct model for your application.
- Verify that the available power source matches the input rating of the UPS. Unless the UPS is equipped with a transformer option, the source should be 120 volts line to neutral, three phase, ABC sequence, with a grounded neutral.

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 derated 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 in the UPS have been connected.
- 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 UPS Emergency Lighting System is designed to provide power for maintaining critical lighting when utility power is not available. The combination of the UPS (uninterruptible power supply) and external batteries provide rated power for up to 90 minutes of operation during utility power outages. The true online, double conversion, three-phase UPS provides clean, well-regulated, sinusoidal voltage to the lighting loads.

Figure 1 shows the UPS cabinet dimensions. Figure 2 shows the Battery Cabinet dimensions. A system consists of one UPS cabinet and one Battery Cabinet.

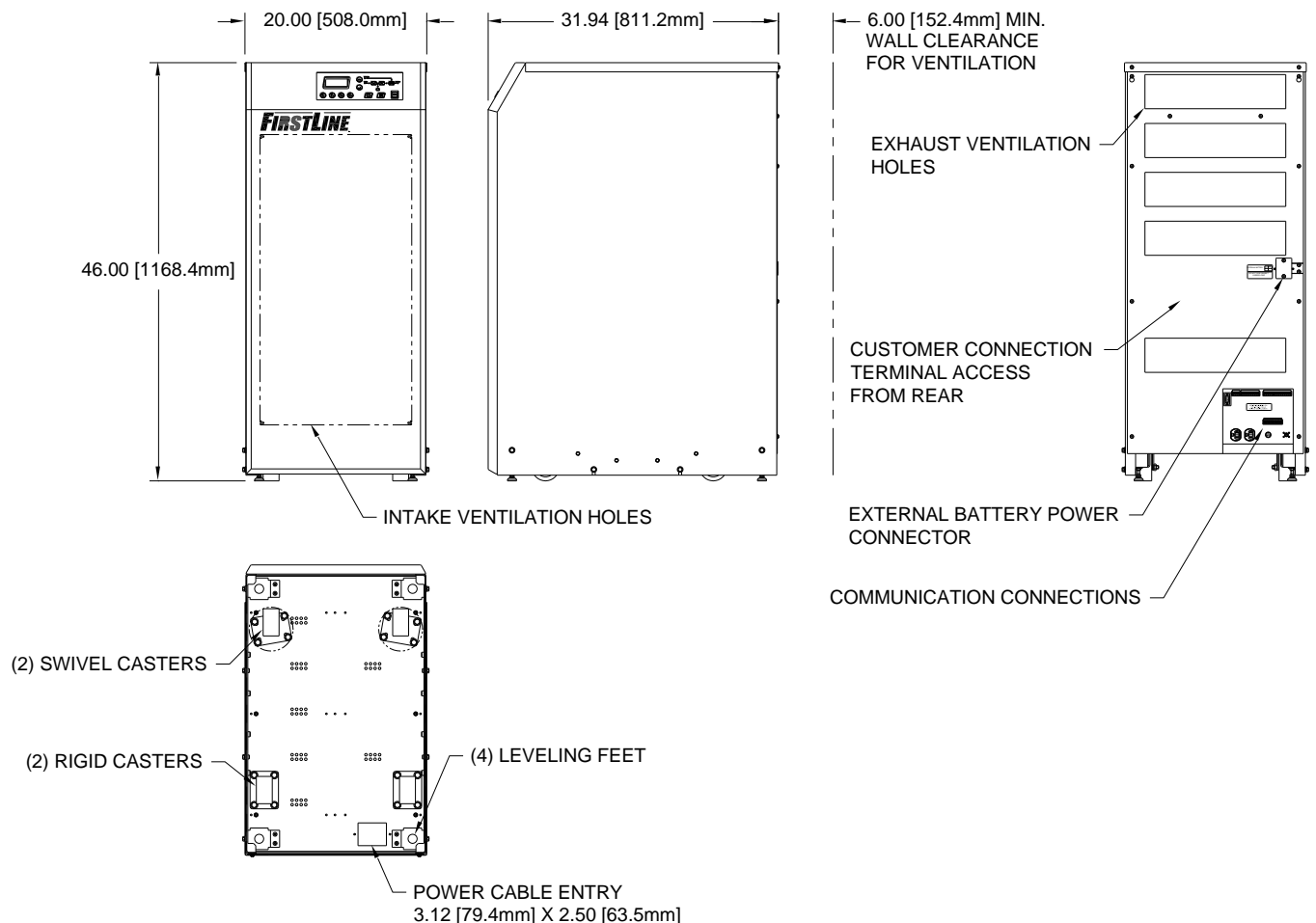


Figure 1 - The FirstLine 8 kW UPS

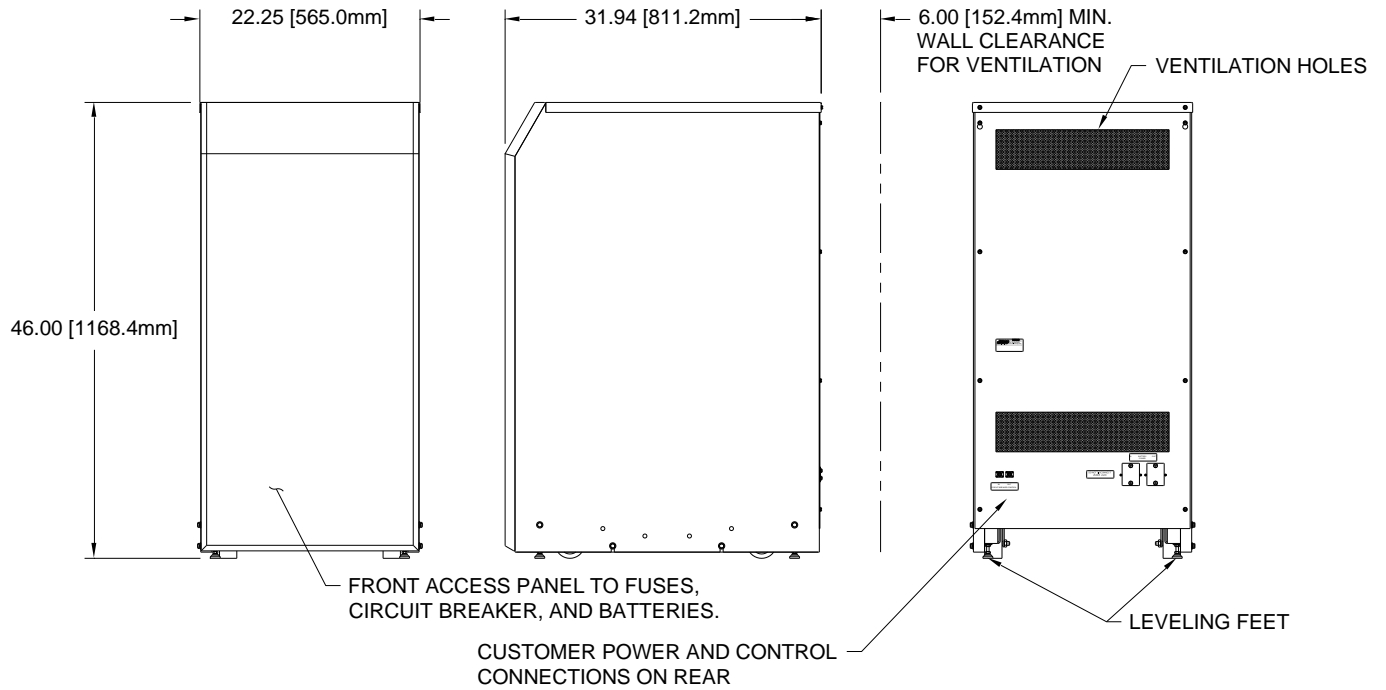


Figure 2 - The FirstLine 8 kW Extended Run Time Battery Cabinet

FirstLine Emergency Lighting System Part Number Scheme

Table 1 - Part Numbers and Floor Loadings

System Part Number	Rating	Vin	Vout	UPS Cabinet				Battery Cabinet			
				Maximum Weight		Point Loading		Maximum Weight		Point Loading	
				Lbs	kg	Lbs/in ²	kg/cm ²	Lbs	kg	Lbs/in ²	kg/cm ²
FLU924-8S-20	8 kW	208/120Y	208/120Y	548	249	174	12	1289	585	410	29
FLU924-8S-20-I	8 kW	208 Δ	208/120Y	731	332	233	16	1289	585	410	29
FLU924-8S-42	8 kW	480/277Y	208/120Y	682	309	217	15	1289	585	410	29
FLU924-8S-42-I	8 kW	480 Δ	208/120Y	733	332	233	16	1289	585	410	29
FLU924-8S-44	8 kW	480/277Y	480/277Y	807	366	257	18	1289	585	410	29
FLU924-8S-44-I	8 kW	480 Δ	480/277Y	858	389	273	19	1289	585	410	29

-I signifies that the UPS has an input isolation transformer and does not require an input neutral.

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 cabinets

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.

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)*

* The right side of the UPS needs 24" of clearance for service access if the UPS is a -42, -44, or -I model. If the battery cabinet is placed on the left side of the UPS, no minimum clearance is required.

The following clearances are recommended for the FirstLine Extended Run Time Battery Cabinet.

From Front of Cabinet	36" (91.4 cm) working space
From Back of Cabinet	6" (15.2 cm)

Floor Loading

When planning the installation, consider the Emergency Lighting System's weight for floor loading. The strength of the installation surface must be adequate for point and distributed loading. The approximate weights are shown in table 1.

Unloading the Cabinets

The following tools are required for unloading the cabinet(s):

- 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 and Battery cabinet are heavy (see Table 1). Unloading the cabinets requires at least two people to safely remove the cabinets from the pallet.

To remove the UPS or Battery cabinet from the ship pallet:

1. Remove all banding, wrapping, and foam protectors.
2. With a forklift, lift the cabinet and upper pallet using the forklift channels (see figure 3) 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 3).
4. Remove the guard board and 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.

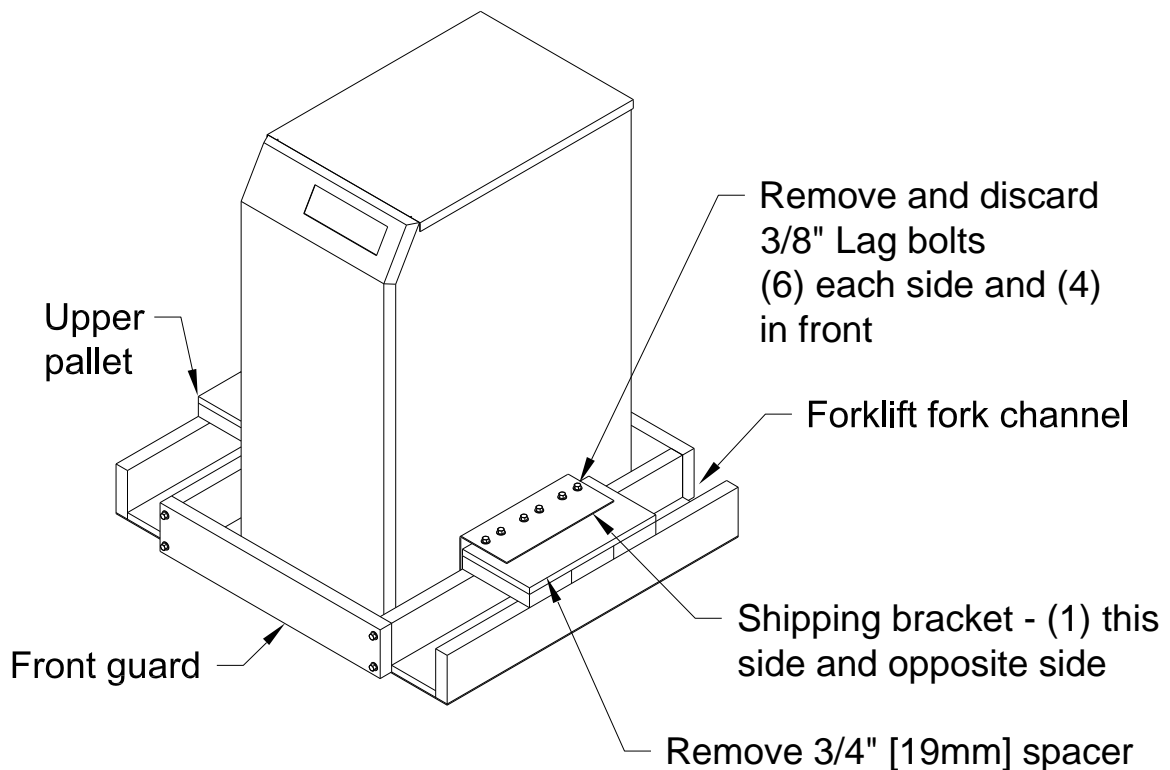


Figure 3 - UPS on pallet

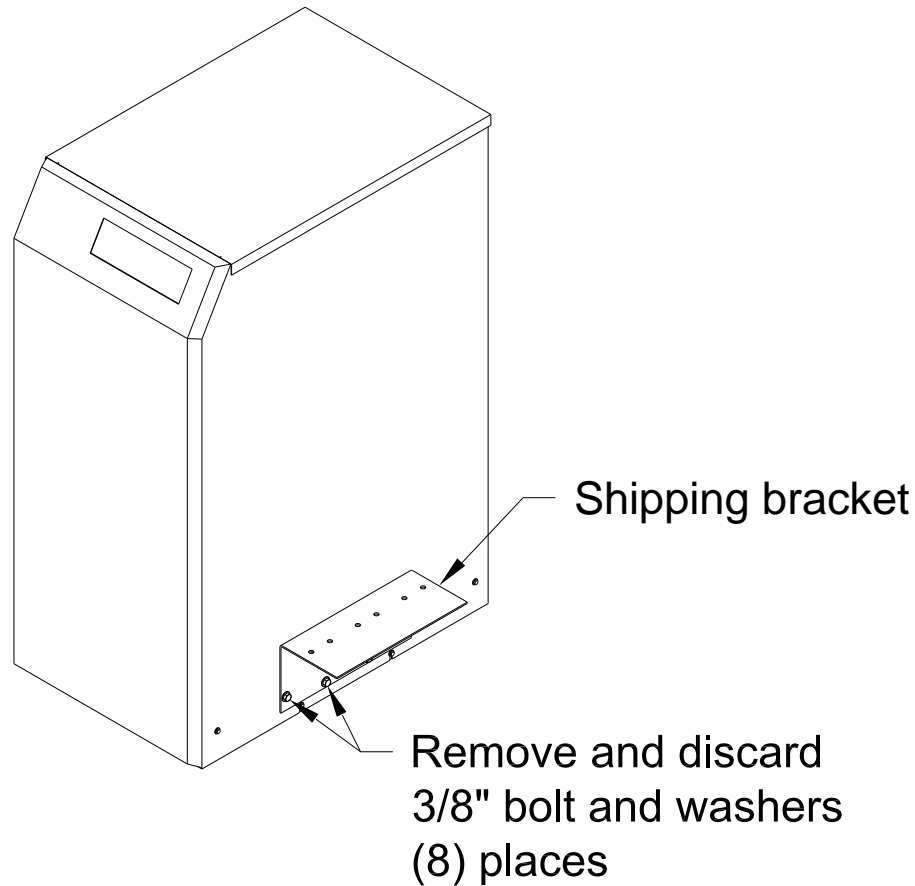


Figure 4 - Shipping Bracket

8. Remove the (8) 3/8" bolts mounting the shipping brackets to the UPS and remove the brackets (see figure 4).
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 5 - 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 pulling the panel outward at the bottom of the unit until it unsnaps and then lift up and off the cabinet (see figure 10). Adjust the leveling feet as shown in figure 6.

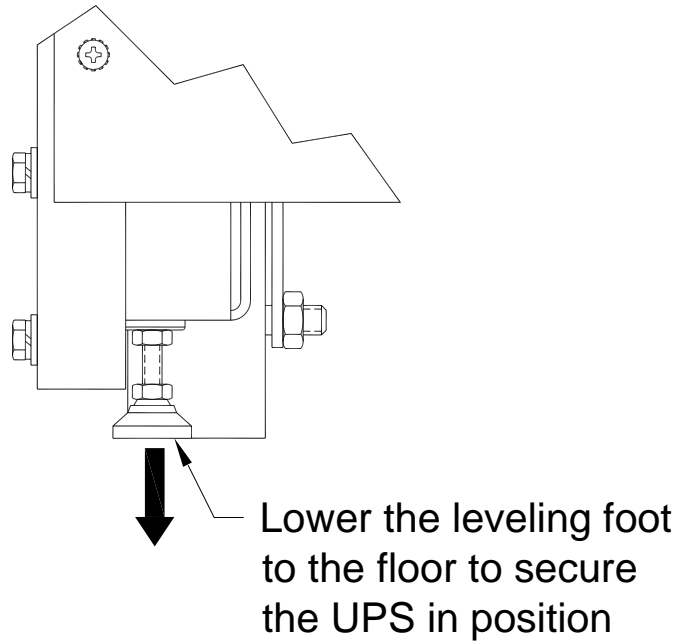


Figure 6 - Leveling foot being adjusted down to the floor

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. If the system is equipped with an isolation transformer, the system part number will be FLU924-8-YY-I, where YY is 20, 42, or 44. That is, the "-I" at the end designates the presence of an input isolation transformer.

The nominal input/output voltages are:

- 120/208 VAC
- 480V, 60 Hz input is available when using an input transformer.
- 480/480 VAC is available when using 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 5 on page 12.

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. Conduit landing plates are located at the rear bottom of the base to accommodate bottom wire entry to the cabinet (see Figure 7).

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.

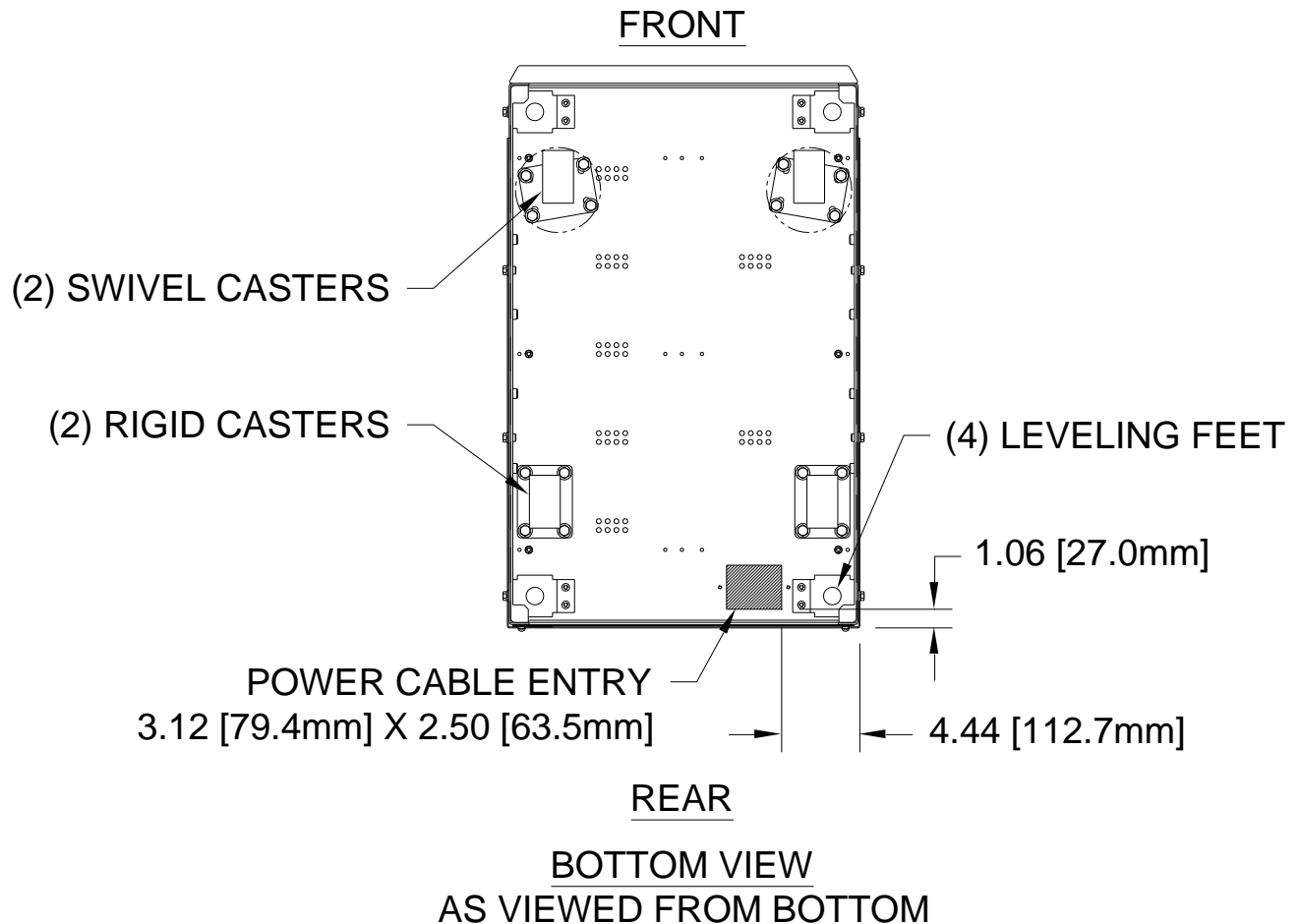


Figure 7 - UPS Bottom View

Wiring Installation

1. Unscrew and remove the rear panel.
2. Connect the input wires to the proper terminals shown in Figure 8. Insure proper phase rotation (A-B-C).
3. Connect the output wires to the proper terminals shown in Figure 8.
4. Replace the rear panel.

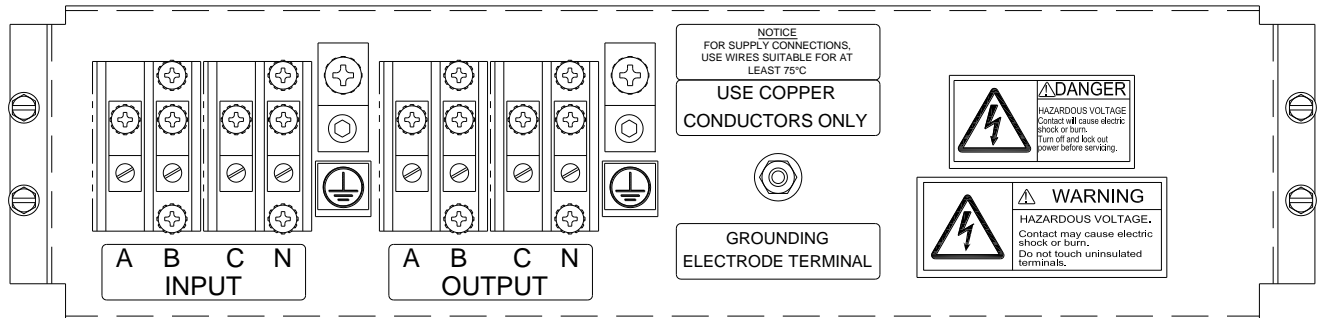


Figure 8 - UPS Terminal Blocks

Table 3 - 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 4 - 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 5 - FirstLine UPS 8 KW Current Requirements

UPS Rating	Input Voltage	Input Transformer Option	Max. Input Current (A) Allowed for Specified Branch Protector	Maximum Allowable Branch Circuit Protection (A)
8 kW	208 V	None	34	45
	208 V	Isolation	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	
8 kW	208 V	28	22	(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: Unless the system is a "-I" model with an input isolation transformer, the input neutral must be wired for proper operation or the UPS will not start. The input neutral must be grounded at the source. If an input isolation transformer is present, the input neutral is not used and no input neutral wire needs to be provided. The neutral of the isolation transformer is bonded to ground at the UPS. The UPS chassis must be grounded to the source via a grounding conductor per Table 6.

Note: Do not over-tighten the screws; be sure to use the specified tightening torque values shown in Table 3, Table 4, and Table 7.

8 KW, 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.

8 KW, 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.

Table 6 - 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
8 kW	208Y/120	NA	#6/2	#6/2	#6/2	#8/1-0
	208Δ	isolation	#6/2	(none)	(none)	#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 Min/Max
8 kW	208Y/120	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 90°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.

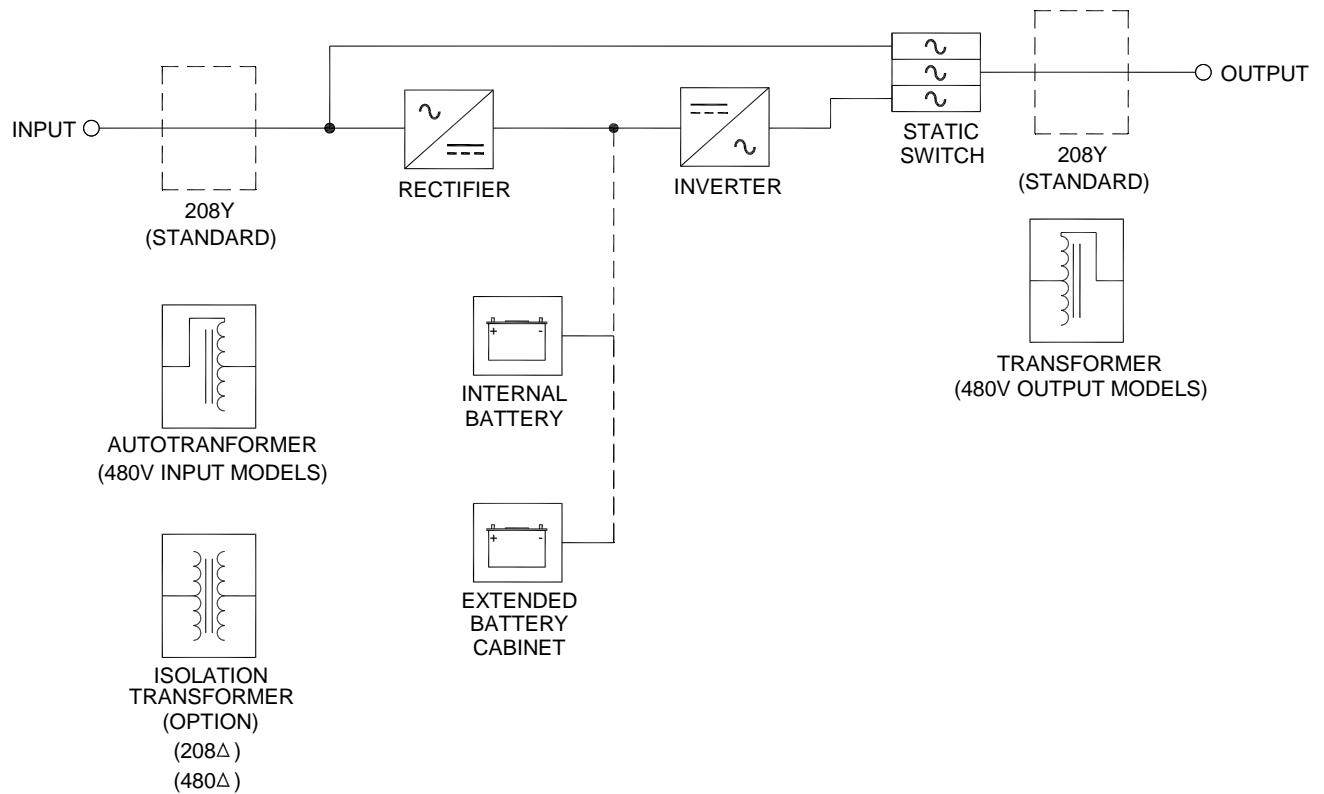


Figure 9 - Wiring Single Line Diagram

SECTION 5

Connecting the Battery

(To be performed by trained and authorized service personnel)

1. Position the Battery Cabinet next to the UPS and secure by lowering the leveling feet. If the UPS is equipped with transformers (480 Volt and 208 Volt with delta input), the right side of the UPS should be kept clear.
2. It is recommended that the Battery Cabinet be inspected for internal damage:
 - a. Remove the front panel by lifting it up and away. Refer to figure 10.

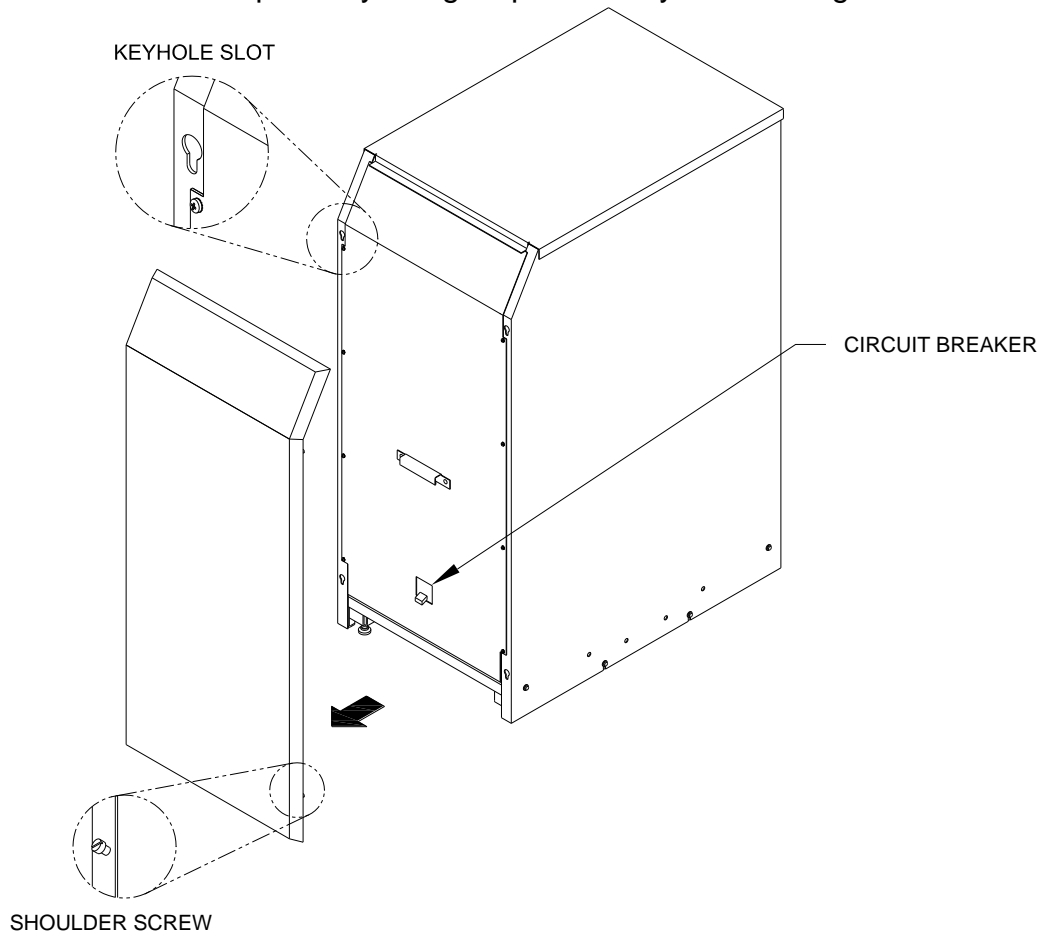


Figure 10 - Removing the Battery Cabinet Front Panel

- b. Remove the front inner panel by removing 8 screws and lifting the panel clear. Inspect for bent or broken metal and for cracked battery cases or any sign of electrolyte leakage. Verify that all of the connectors shown in figure 11 are securely mated.

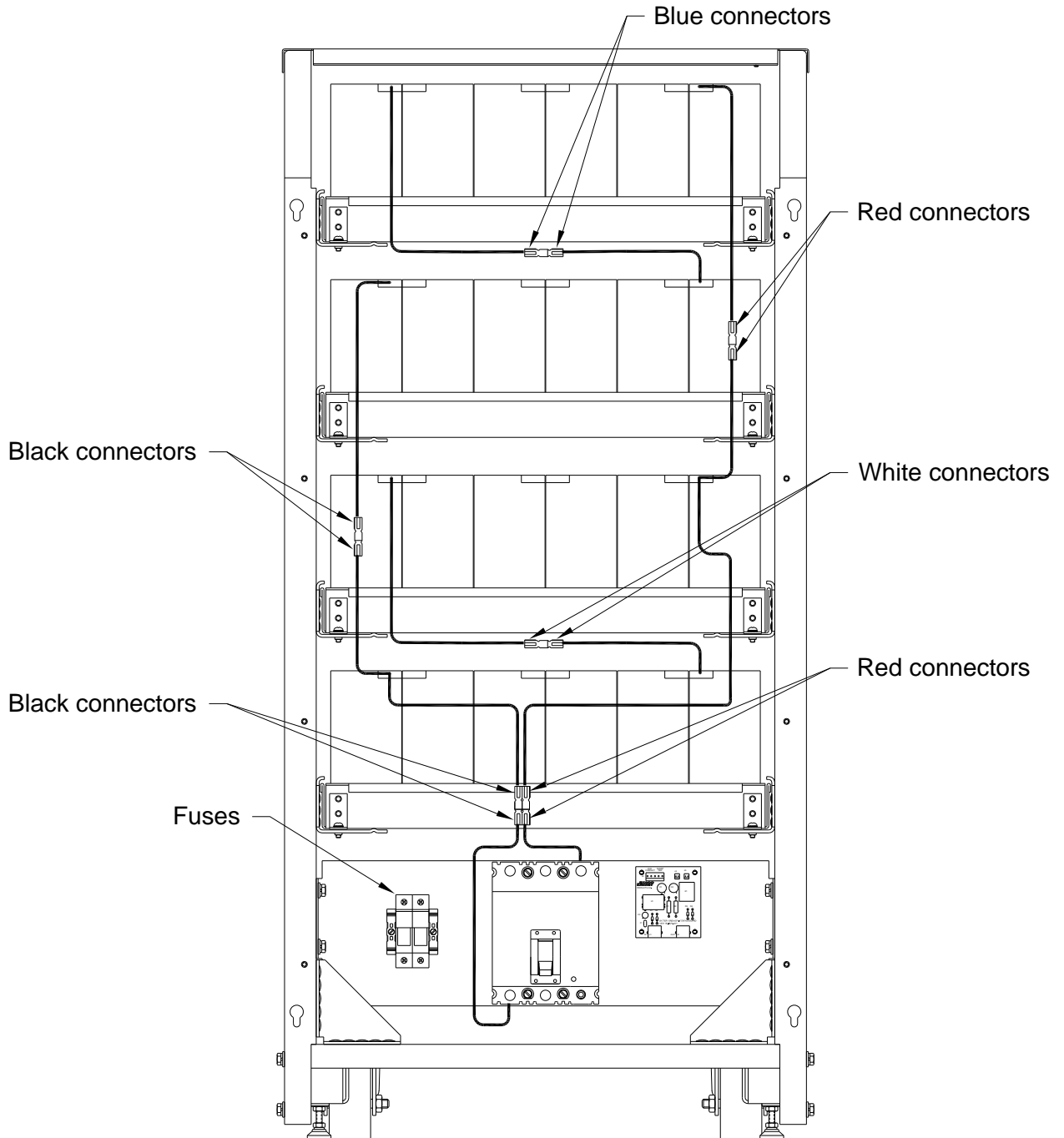


Figure 11 - Batteries

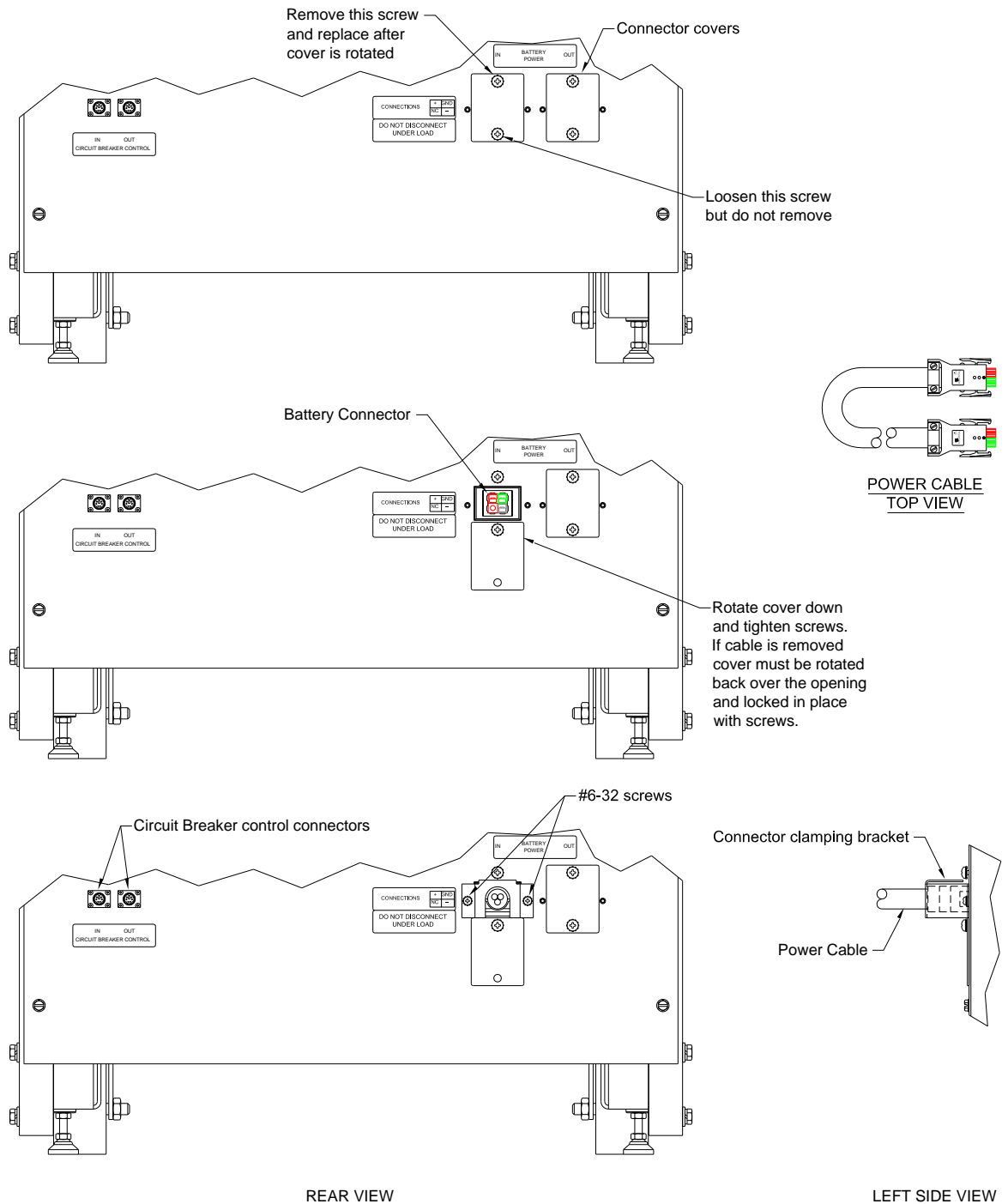
c. Replace inner front cover.

- With the supplied 10 foot long power cable (**Staco part number 817-0368**), connect from the left (input) battery power terminals on the rear of the cabinet to the similar connector on the rear of the UPS. Ensure that the positive red connector of the cable connects to the positive red connector on the rear of the cabinets. See figure 12.



Never connect the positive (red) to the negative (black). Severe damage and injury could result.

- Once the power cable is connected, place the connector clamping brackets over the connectors as shown in figure 12 and lock in place with the #6-32 screws.



REAR VIEW
Figure 12 - Battery Cabinet Connectors

LEFT SIDE VIEW

5. With the supplied 10 foot long 6 pin Mini-DIN cable (**Staco part number 273-0413**), connect from the left (input) circuit breaker control connector on the rear of the cabinet to the similar connector on the rear of the UPS. See figure 14.
6. Remove the front panel of the UPS in the same manner as the Battery Cabinet.
7. Remove the front interior panel from the UPS. If the UPS is equipped with transformers, there will be two fans attached to this panel. Take care to not damage the wiring to the fans. It is possible to disconnect the fan wiring by unplugging connectors, take note of how they connect and be sure to restore the connections when the panel is replaced.
8. Inspect the UPS for signs of damage.
9. Connect the internal battery by joining the red and black connectors. Refer to figure 13.

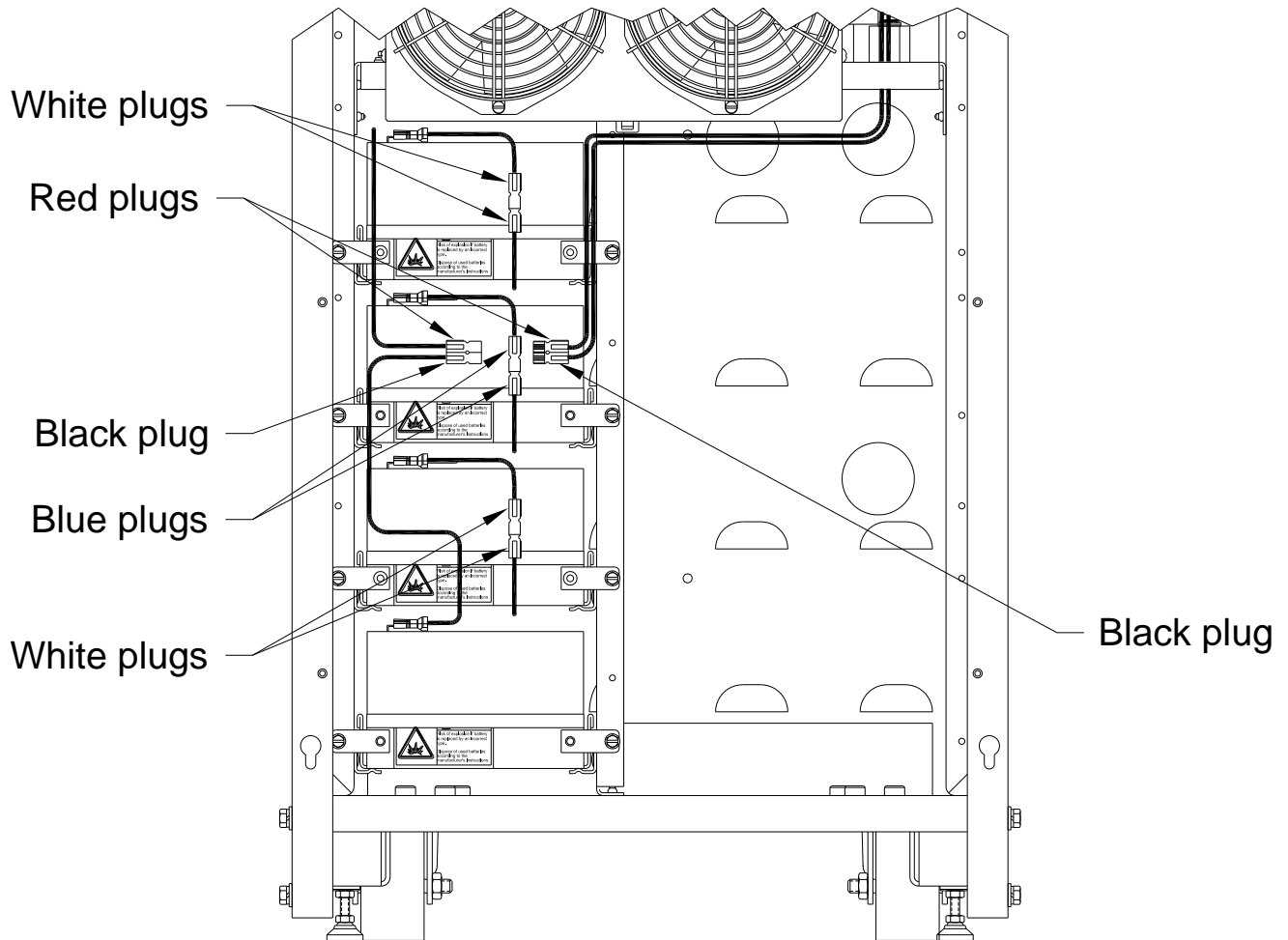


Figure 13 - UPS Internal Battery

10. Replace the interior front panel.
11. Initial start-up can now be performed on the UPS. Refer to section 8.
12. With the UPS off, close the breaker on the Battery Cabinet.
13. Replace the outer front panels on the Battery Cabinet and on the UPS by engaging the shoulder screws in the keyhole slots and lowering the panels into place.
14. The UPS is now ready for normal operation.



CAUTION: If the circuit breaker trips, the internal batteries of the UPS are still connected and providing power to the UPS.

SECTION 6

Communication

Figure 14 shows the location of the communication options and terminals on the UPS.

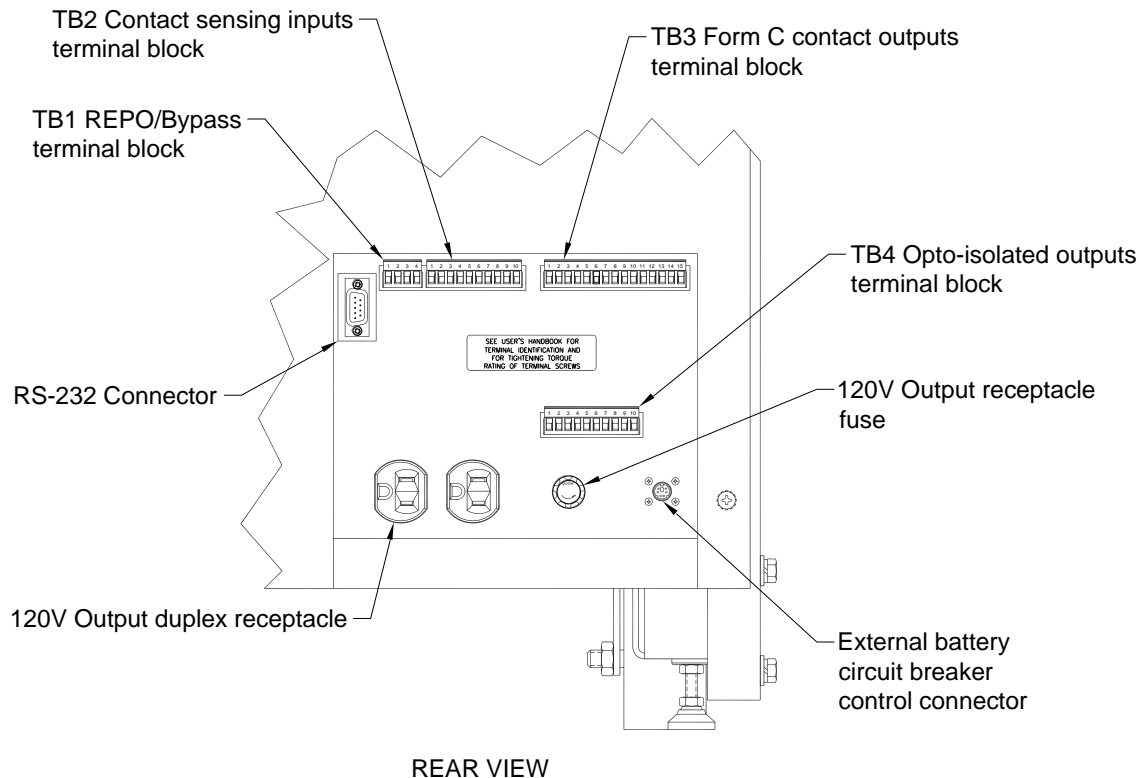


Figure 14 - UPS Communication Options and Control Terminals

120 Volt Output Duplex Receptacle

The 120 volt receptacle is only to be used to power Staco supplied communications equipment. It is imperative that no other loads be connected to this receptacle.

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. For future use.
- 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-Automaitc 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.

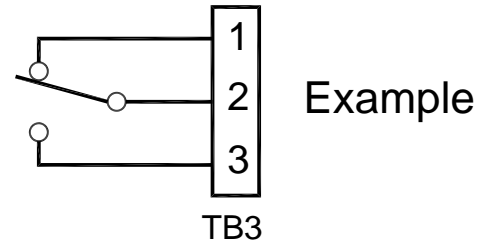


Figure 15 - TB3

J232 is an RS-232 DCE three wire interface. See separate specification for details.

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

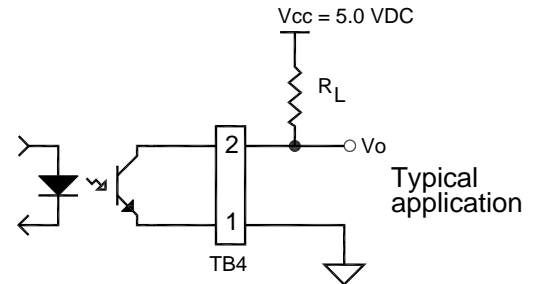


Figure 16 - TB4

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.

Table 7 - Torque Values for TB1, 2, 3, 4

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

SECTION 7

Front Panel Display

Control Panel Functions

The UPS has LCD with backlight. It provides useful information about the UPS itself, load status, events, measurements, and setting (see figure 17).

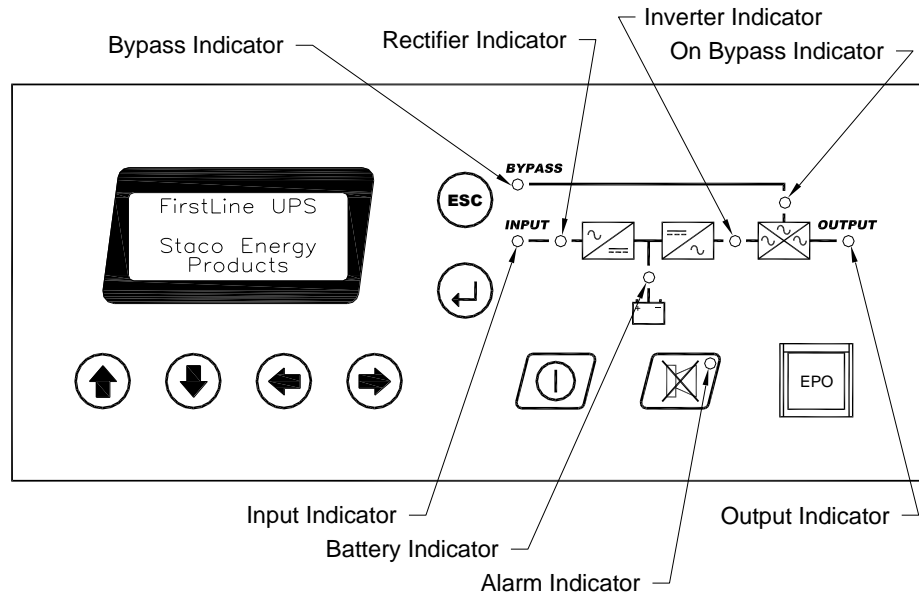


Figure 17 - FirstLine UPS Front Panel Display and Control Module

To assure that the Emergency Lighting System is functioning properly, observe the front panel display on the UPS. There are three conditions that could exist:

System Normal

(everything is working as desired)

The INVERTER indicator, the INPUT indicator, the Rectifier Indicator, the Battery Indicator, and the OUTPUT indicator will all be green. The BYPASS indicator will also be green if the input is within specification for bypass operation. During normal operation, the system will power the load with the inverter with the battery available in the event that the input fails. The battery will automatically recharge during normal operation.

On Battery

(the input is outside of specified operating range and the battery is being used to power the load)

The Battery Indicator will be yellow.

Abnormal

(the system is running on bypass or there is a fault)

If neither the SYSTEM NORMAL nor the ON BATTERY condition exists, then the system is ABNORMAL. If the system is on bypass due to an output overload, the overload must be eliminated before normal operation can be restored. Use table 8 and table 9 as guides to obtain information to determine what fault might be present.

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 over current
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 8 - UPS 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 arrow buttons (↑,↓,← and →) to scroll through the menu structure.

The following table shows the basic menu structure.

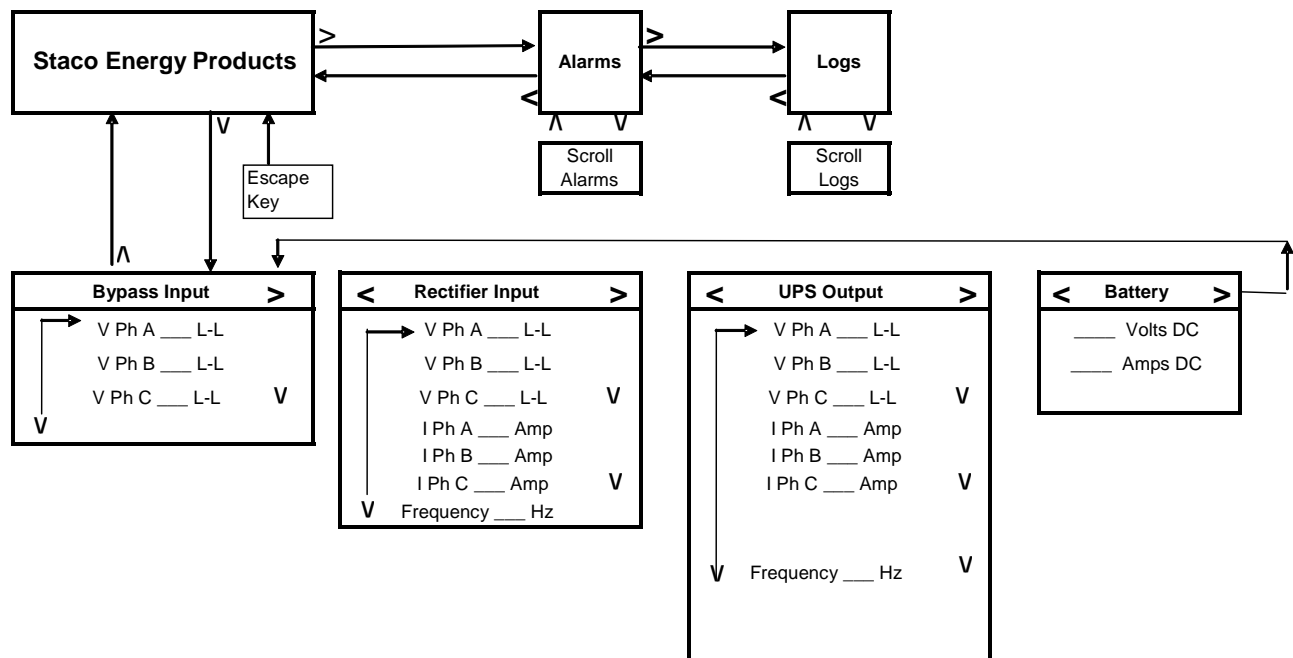



Table 9 - Menu Pap for Display Functions

SECTION 8


UPS Operations

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 applying power to the 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 5.
5. Reinstall the rear cover, the top cover, and the front inner access panel. Reinstall the decorative front panel.
6. Close the breaker on the Extended Battery Cabinet connected to the UPS.
7. Apply power to the UPS.
8. Press the on/off button  to start the UPS. The button must be held for one second.

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. The EPO button or REPO input will also trip the breaker on the Battery Cabinet. Be sure to reset the breaker 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.

On the Extended Battery Cabinet connected to the UPS, do not open the circuit breaker while the UPS is on. If the circuit breaker is open, do not close the circuit breaker while the UPS is operating. See Section 9 for the proper procedure to close the circuit breaker.

Testing the Emergency Lighting System

This test must only be performed by authorized personnel.

Before testing the emergency lighting system, verify that the system condition is normal. The INVERTER indicator, the INPUT indicator, the Rectifier Indicator, the Battery Indicator, and the OUTPUT indicator should all be green. The BYPASS indicator will also be green if the input is within specification for bypass operation.

Gain access to the circuit breaker that supplies the UPS. Generally, this breaker should have restricted access, so that unauthorized personnel cannot disable the input to the emergency lighting system. To initiate the test, open the breaker.

The UPS should continue to operate, but the Battery indicator on the front panel will change to yellow.

To terminate the test, close the breaker that supplies power to the UPS. The UPS will return to normal operation and the Battery indicator will change back to green.

The length of the test is up to the user. A longer test gives additional confidence as to the condition of the battery, but battery life is adversely affected by the number and depth of discharges. Also, the available battery run-time is reduced as a function of the amount of energy used during the test, so the battery time available will be reduced until sufficient charging has occurred.

The front panel display can be used to observe battery voltage and current during the discharge. Multiplying the two numbers gives an approximation of the power supplied by the battery (in watts; ignore the sign of the answer, since discharge is reported as negative current).

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

Use of a Staco supplied maintenance bypass switch is recommended. Use of a non Staco switch is not recommended due to safety concerns. Use of a non-Staco switch may void the product warranty.

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.
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.
5. There is no overload present.
6. There have not been more than three overload-caused transfers to bypass in a one hour period.

Over Load

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 9

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.



To service the battery trays, they must be removed from the cabinet by a fork lift. The 3 bus bars at the back of the tray, as shown in figure 18, must be removed before servicing or replacing the batteries.

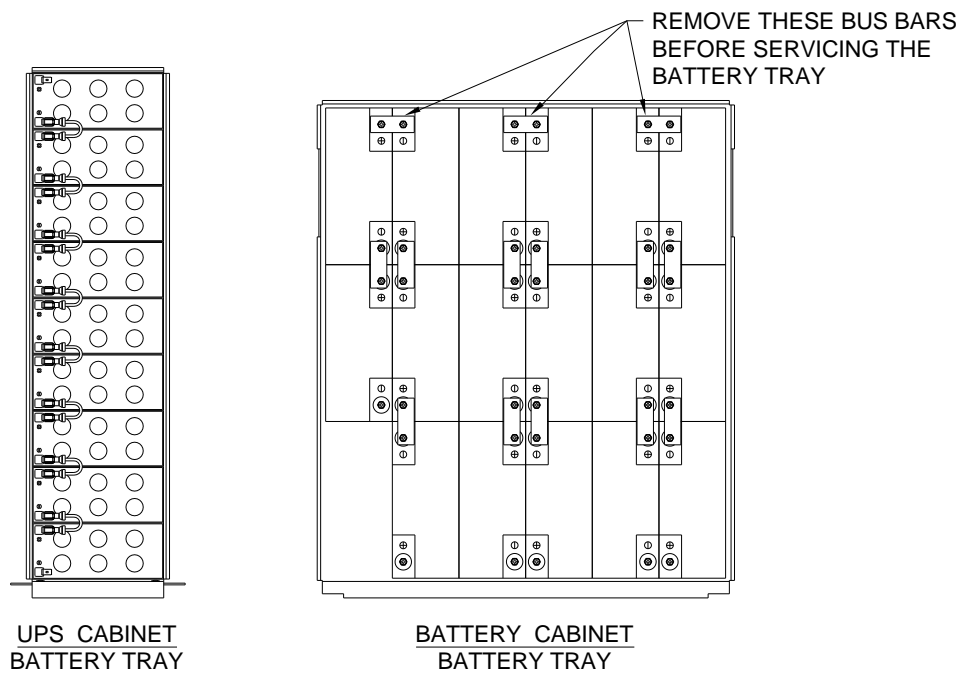


Figure 18 - Battery Trays

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

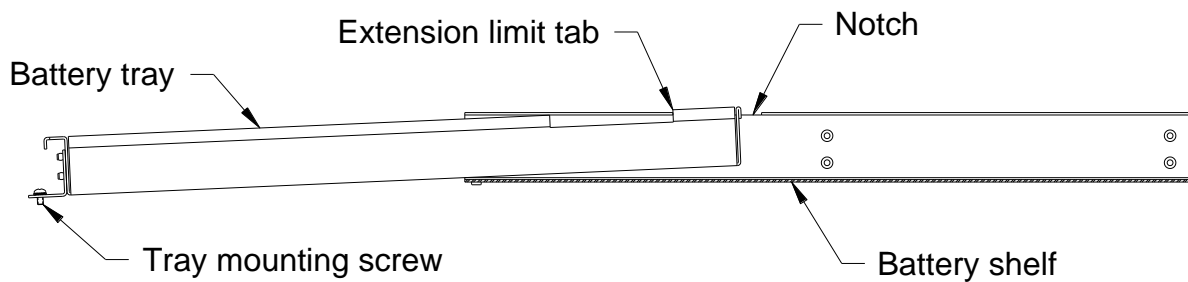
It is very important that only one tray at a time be extended from the cabinet. If more than one tray is extended, the cabinet can become unstable and topple over.

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 will be necessary to use a lifting device to support the trays as they are removed.

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.



Cutaway side view of battery tray
batteries not shown for clarity

Figure 19 - Battery Cabinet Battery Tray Side View

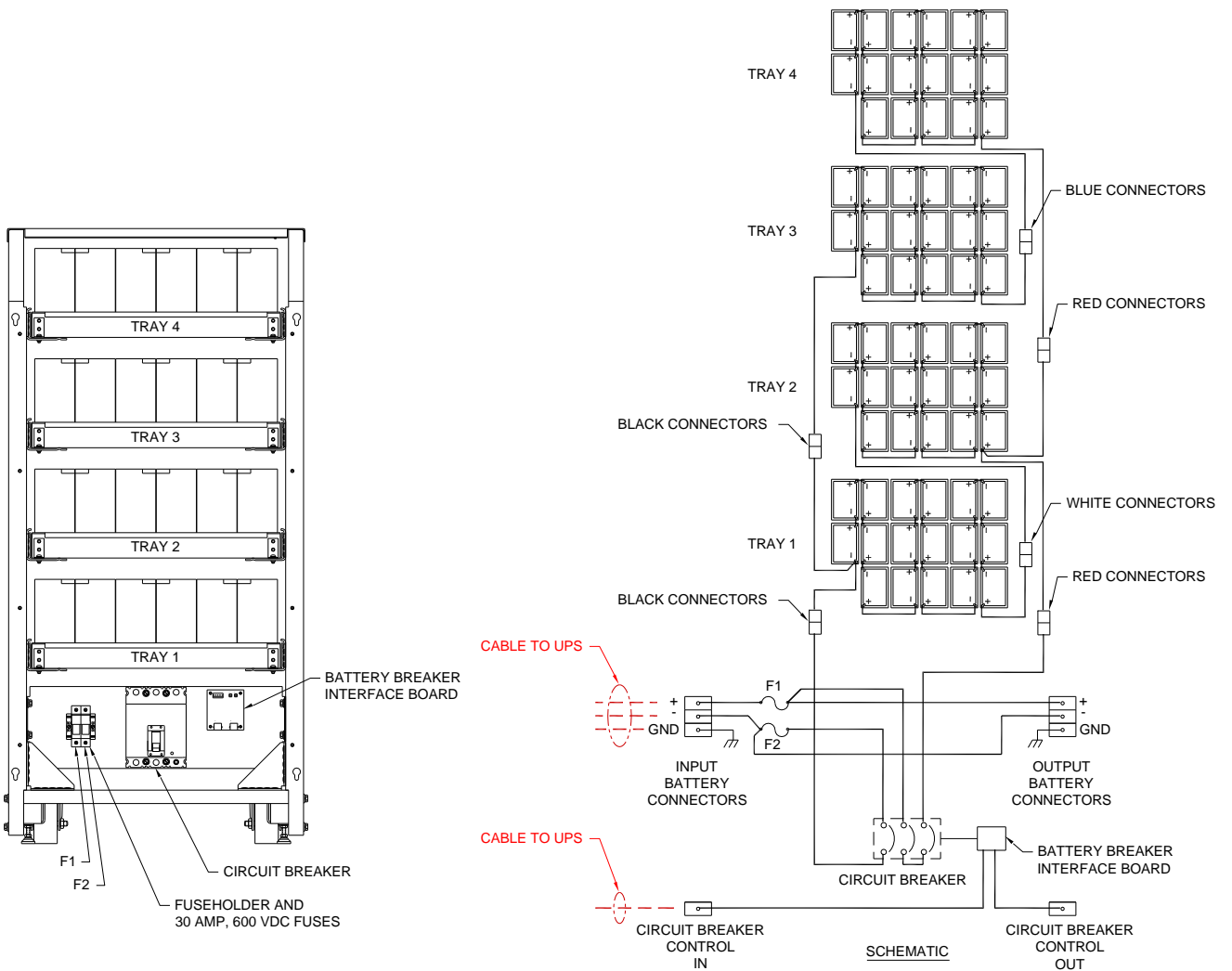


Figure 20 - Battery Cabinet Battery Installation

Special Considerations for Connecting Batteries to the FirstLine UPS

It is never safe to work within either the UPS or the Extended Run Time 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. The rectifier runs whenever the UPS is on. If a battery is disconnected while the rectifier is running (for example, if the 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 procedure, below, for stopping the rectifier.

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 in the Extended Battery Cabinet is open. It is possible for a breaker to be opened during operation, which requires that the rectifier be stopped before closing the breaker. The breaker 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

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.

UPS CABINET REPLACEMENT BATTERY		
Manufacturer	Cat. Number	Quantity Required
China Storage Battery	HRL1234WF2	34
REPLACEMENT BATTERY Suitable for computer-room applications		
Manufacturer	Cat. Number	Quantity Required
China Storage Battery	HRL1234WF2FR	34
Power-Sonic	PSH-1280F2-FR	34

BATTERY CABINET REPLACEMENT BATTERY		
Manufacturer	Cat. Number	Quantity Required
China Storage Battery	HRL1280W	68
China Storage Battery	HR1290W	68
REPLACEMENT BATTERY Suitable for computer-room applications		
Manufacturer	Cat. Number	Quantity Required
China Storage Battery	HR1280WFR	68
China Storage Battery	HR1290WFR	68

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

All servicing should be performed by qualified service personnel.

SECTION 10**FirstLine UPS Technical Specifications****Table 10 - Technical Specifications**

UPS Rating: 8 Kw		
Input		
Voltage ² (Line to Line, Line to Neutral)	208,120	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	12
	Rated: 34	15
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	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	22	10
Heat Rejection (BTU/Hr)	4100	5600
Battery		
Run Time ³	90 Minutes	
Recharge Time	24 Hours (Typical)	168 Hours (Any condition)
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)		
Refer to Figures 1 and 2 in Section 1 and Table 1 in Section 1		
Standards		
UPS 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. System listed to UL 924.		



² Input is 4 wires plus ground (Delta input available with -I option).

³ Run time depends on the battery state of charge, age, operating temperature and other conditions.

