Dual-Lite® Trident TRF Battery Cabinet

10kVA (UL924 System)
10-30kVA (Alternate Runtimes)

USER MANUAL

HUBBELL Lighting

003-2608

For technical assistance, contact Dual-Lite's Technical Support Center at 1-800-848-6439. Technicians are available during normal working hours (EST).

Hubbell Lighting, Inc
701 Millennium Blvd
Greenville, SC 29607
Web site: www.dual-lite.com/

Thank you for choosing our product.

Safety Warnings

IMPORTANT SAFETY INSTRUCTIONS
SAVE THESE INSTRUCTIONS

This manual contains important instructions that you should follow during installation and maintenance of the battery cabinet. 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 1 - Symbols

	**Danger / Risk of Electric Shock** *This symbol indicates possibility of serious injury or substantial damage to the unit, unless adequate precautions are taken.*
	**Warning** *This symbol indicates important information which must be understood and any stated precautions taken*
	**Note**

DANGER

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

WARNING

This battery cabinet contains its own energy source (batteries). Hazardous voltage may be present even when the battery cabinet is not connected to a power source.

To reduce the risk of fire or electric shock, install this battery cabinet in a temperature and humidity controlled, indoor environment, free of conductive contaminants. Do not operate near water or excessive humidity (95% maximum).

WARNING

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 exists if the 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.

WARNING

This product contains Valve Regulated Sealed Acid Batteries. These batteries contain lead, a neurotoxin, and sulfuric acid, a corrosive. Additionally, the energy stored in the batteries can present a shock hazard and a burn hazard. Batteries should only be serviced by trained personnel. Appropriate safety precautions must be observed, including eye protection and skin protection. Contact with electrolyte requires flushing with a generous amount of clean water. Seek medical attention immediately following contact with electrolyte. Unwanted batteries must be recycled and should never be discarded.

WARNING

A battery can present a risk of electrical shock and short circuit current. The following precautions should be observed when working on batteries:

1. Remove watches, rings, or other metal objects.
2. Use tools with insulated handles.
3. Wear rubber gloves and boots.
4. Do not lay tools or metal parts on top of the batteries.
5. Disconnect charging source prior to connecting or disconnecting battery terminals.
6. Determine if the battery is inadvertently grounded. If inadvertently grounded, remove source of ground. Contact with any part of a grounded battery can result in electric shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance (applicable to a UPS and a remote battery supply not having a grounded supply circuit).

CONTENTS

1 Layout

1.1 Introduction

The Extended Run Time Battery Cabinet is used in conjunction with the uninterruptible power supplies (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.

1.2 Layout

Figure 1 shows the Battery Cabinet, which can be outfitted with one string of batteries.

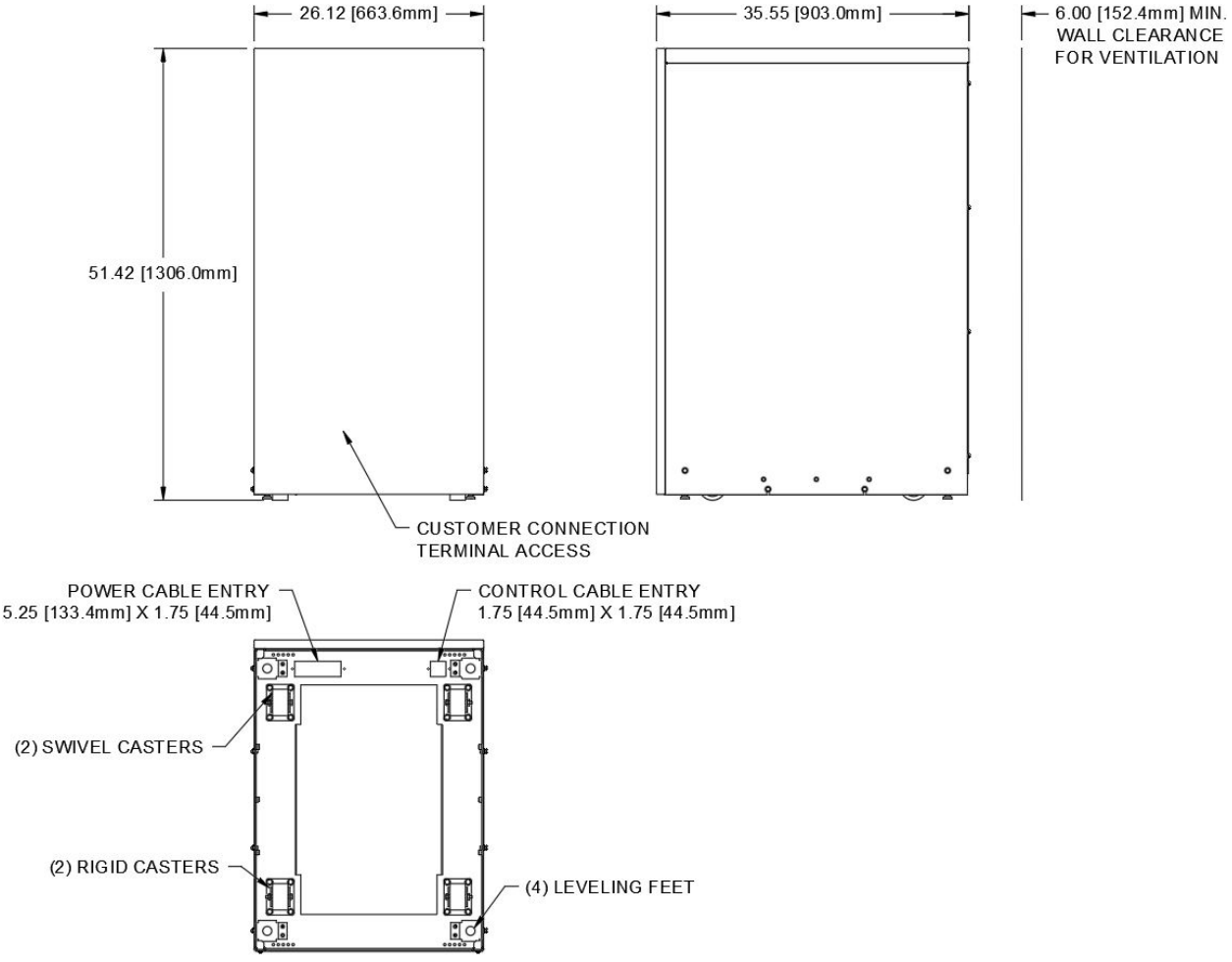
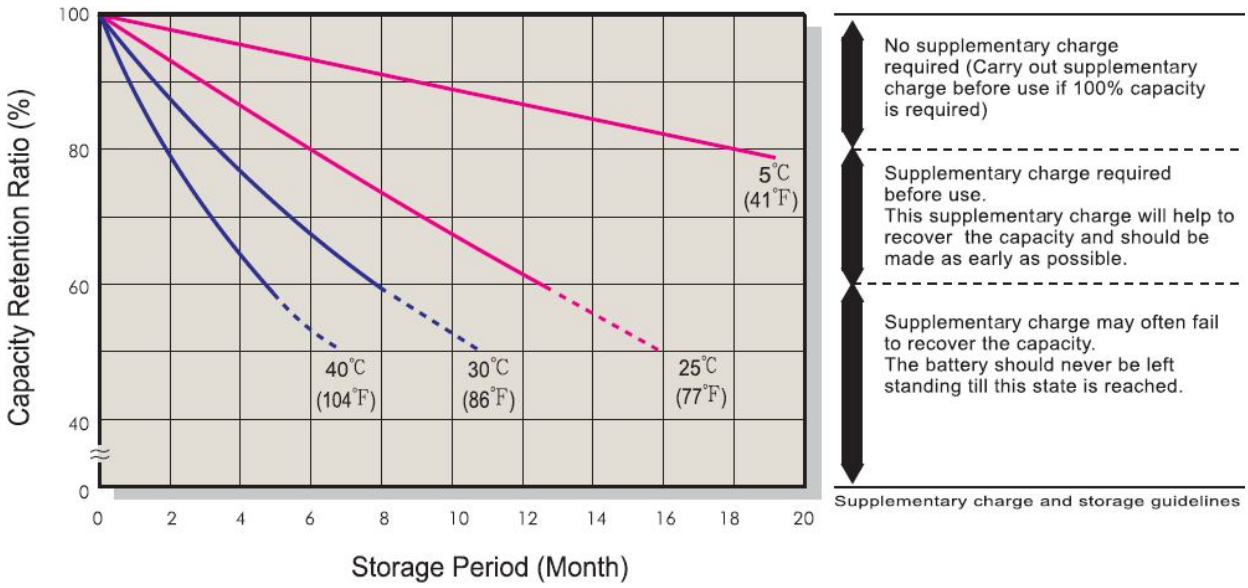


Figure 1 - The Trident TRF Battery Cabinet

1.3 Battery Life

The batteries in your Dual-Lite UPS system were shipped from the factory fully charged. If you plan to place the batteries in storage for any period of time prior to installation and startup then the following precaution should be followed.

Batteries placed in storage will age. How fast they will age depends on the storage temperature. The batteries are rated for storage over a temperature range of -15° C to 40° C (5° F to 104° F). The amount of time the batteries may be stored without recharge varies greatly with storage temperature. Please consult the following table. If the batteries are allowed to sit in storage for an excessive period of time before recharging then they are subject to irreversible damage.



Once the batteries are placed into service and fully charged, the useful life of the batteries will be reduced if they are subjected to high temperatures. The operating temperature range of -15° C to 40° C (5° F to 104° F) must not be exceeded for even short periods of time. Batteries operating continuously at or near 40° C will experience a shorter useful life than batteries operating continuously at 25° C. Battery life will be further shortened if the batteries are allowed to fully discharge and then left in that condition for extended periods of time. As soon as the load is removed from the battery it will continue to age at a higher rate than a fully charged battery. The longer the battery remains discharged the greater the risk of irreversible damage.

Allowing the batteries to become damaged due to; a) operation or storage outside the rated temperature range, b) storage for extended periods of time without recharge per the table above, or c) sitting for a period of time in a discharged state will void the battery warranty.

2. Battery Cabinet Setup

This SECTION describes:
- Equipment inspection
- Floor loading and clearances
- Removing and replacing the cabinet panels
- Unloading the cabinet(s)

2.1 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.

2.2 Floor Loading

When planning the installation, consider the battery cabinet 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 2 - Model Floor Loadings

STANDARD MODEL FLOOR LOADING		
Battery Size	**Maximum Weight**	**Point Loading**
90W	939 lbs (426 kg)	299 lb/in^2 (21 kg/cm^2)
150W	1313 lbs (596 kg)	418 lb/in^2 (29 kg/cm^2)

2.3 Clearances

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

From Front of Cabinet	36” (91.4 cm) working space
From Back of Cabinet	6” (15.2 cm)
From Side of Cabinet to UPS	Minimum 24” (61 cm)

2.4 Unloading the Cabinet(s)

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

- Wrenches for 3/8” bolts
- Forklift

CAUTION

The battery cabinets are heavy (see **Table 2**). Unloading the cabinets requires at least two people to safely remove the cabinets from the pallet.

To remove the battery cabinet from the ship pallet:

1. Make sure the forklift is rated for the cabinet weight.

2. Remove all banding, wrapping, and foam protectors.

3. Remove and discard the six 3/8” bolts and washers securing the shipping brackets to the cabinet (see
4. **Figure** 2 and **Figure 3**).

5. Remove and discard the six 3/8” lag bolts securing the shipping brackets to the pallet and pull the brackets away from the cabinet.

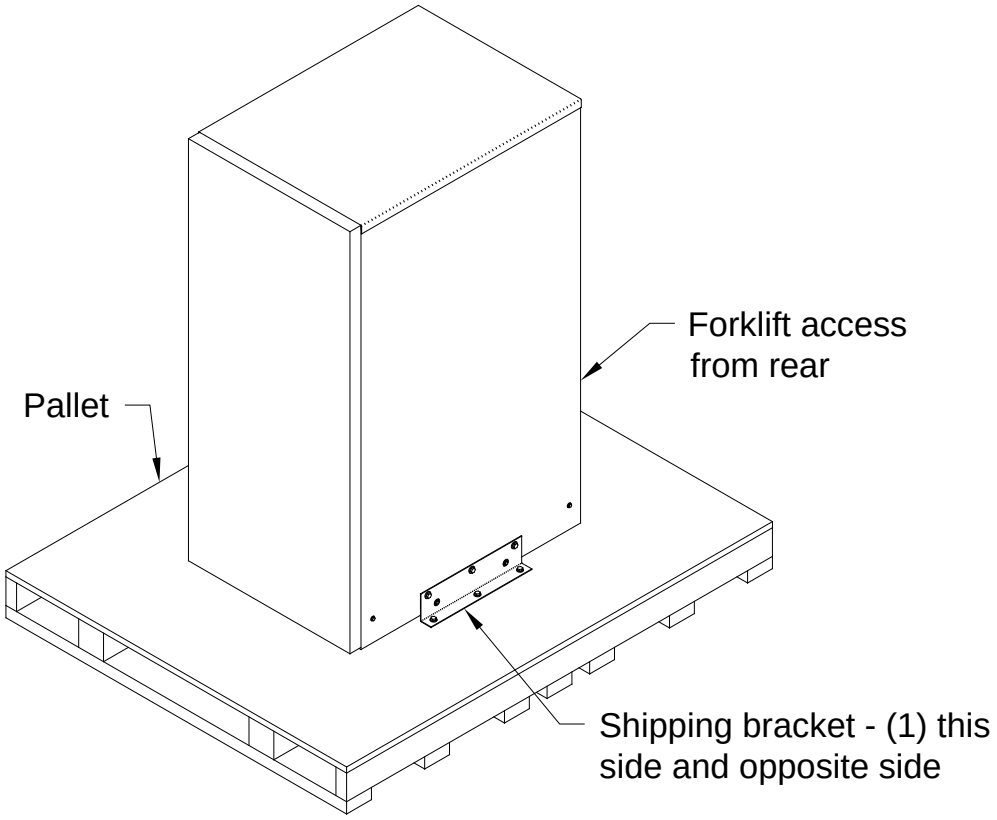


Figure 2 - Extended Run Time Battery Cabinet on Shipping Pallet

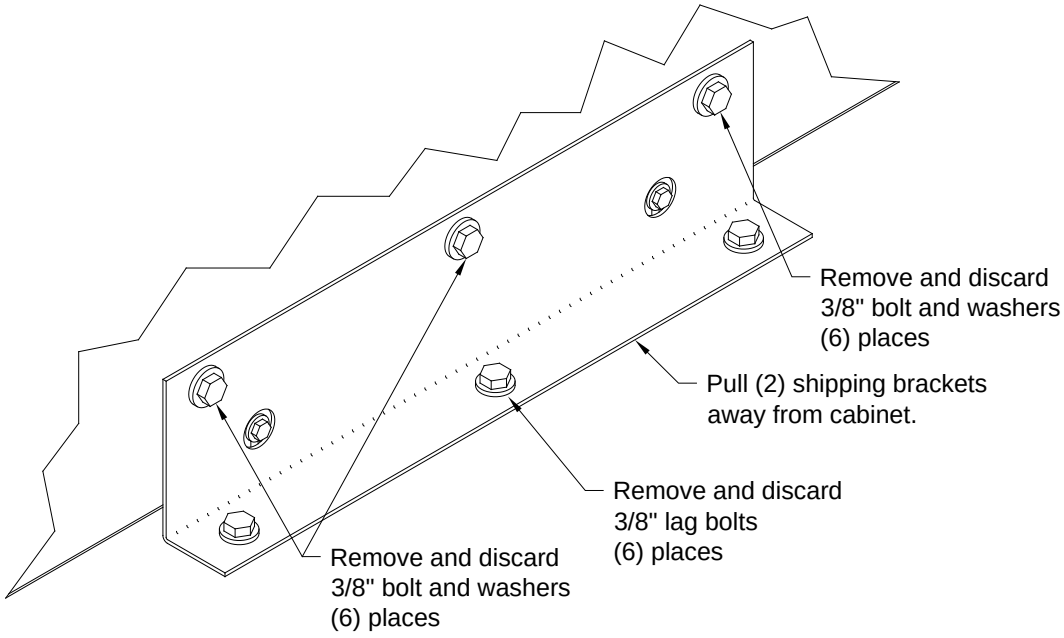


Figure 3 - Shipping Bracket

6. Remove the front cover (see **Figure 6**) before inserting the lifting forks.

7. 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.

8. Lift the cabinet with a forklift from the rear of the unit, one to two inches (1”-2” [2.5-5cm]) above the pallet (see **Figure 4**).

9. Slide the pallet completely away from the raised cabinet.

10. Slowly lower the cabinet to the floor or other appropriate flat surface.

WARNING

DO NOT ALLOW THE FORKLIFT TO MOVE WHILE THE CABINET IS RAISED, ONLY MOVE THE CABINET VERTICALLY TO REMOVE THE PALLET FROM UNDER THE CABINET.

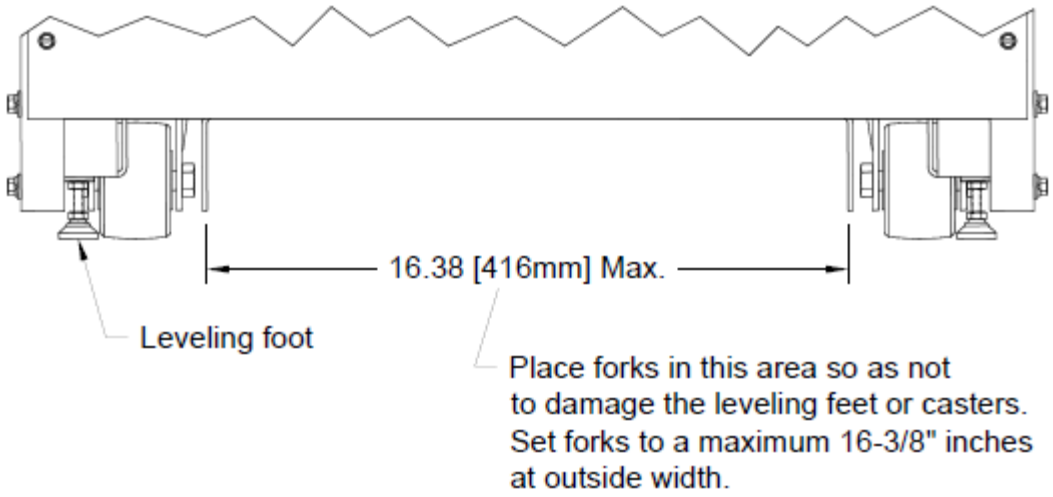


Figure 4 - Lifting Fork Area

11. Reinstall the front cover.

12. Roll the cabinet to the desired location.

13. Do not move the cabinet to another location by forklift as the cabinets are heavy and may fall. Do not tip the cabinet more than 15 degrees from vertical.

2.5 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 6**). Adjust the leveling feet as shown in **Figure** 5.

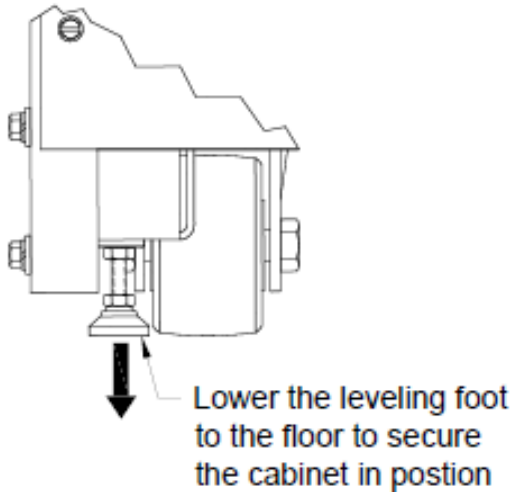


Figure 5 – Leveling Foot Being Adjusted Down To Floor

3. Electrical Installation

The Extended Run Time Battery Cabinet has the following power connections:

- TB1, 3 pole (positive, neutral, negative) terminal block and ground connection for battery power input. This goes to the UPS or to the next battery cabinet closer to the UPS.
- TB2, 3 pole (positive, neutral, negative) terminal block and ground connection for battery power output. This goes to the input of the next battery cabinet in the set.
- TB3, 3 pole (positive, neutral, negative) terminal block and ground connection for battery power output. This goes to the input of the –N version battery cabinet from the first –B version battery cabinet closest to the UPS.

WARNING

TB3 is energized at all times. Opening the circuit breakers does not remove power from this terminal block.

DANGER

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

3.1 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 battery input wiring unless at least one of the battery cabinets has disconnect.
3. Wire the UPS per the User's Manual.
4. Switch off utility power to the distribution point where the UPS is connected. Be absolutely sure there is no power.
5. Removing and replacing the front panel:
   - Lift the panel up and off the cabinet.

To replace the panel:

- Lower the shoulder screws at the top and bottom of the panel into the keyhole slots on the cabinet.

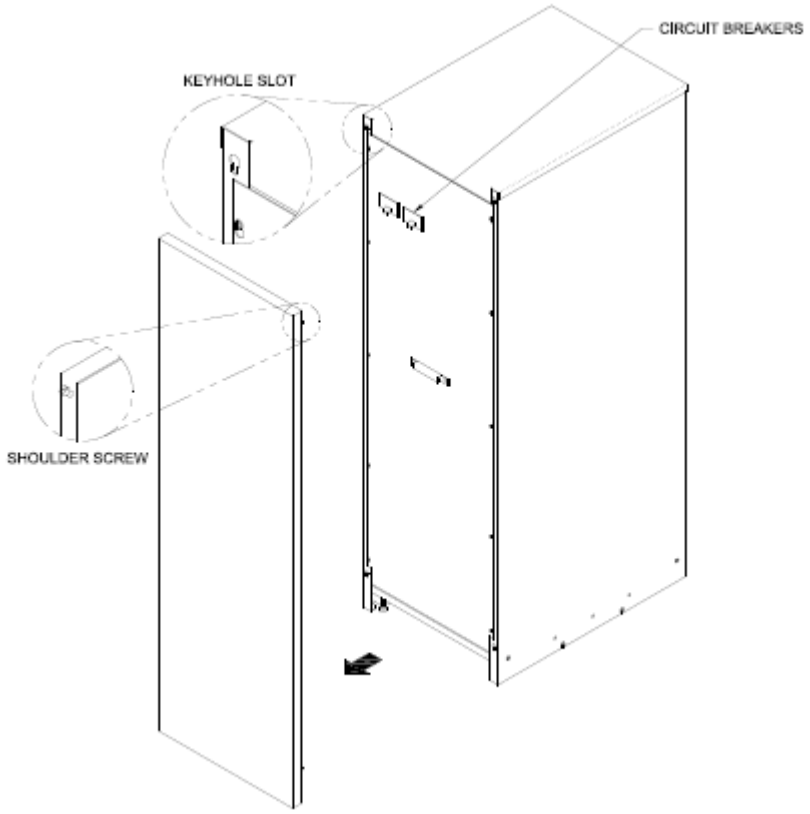


Figure 6 - Removing the UPS Front Panel

6. If the optional circuit breaker is included, switch it to the “OFF” position.

7. Remove the inner front cover by removing the (10) ten screws mounting it to the enclosure.

8. Conduit landing plates are located at the front bottom of the base to accommodate bottom wire entry to the cabinet (see **Figure 7**). Remove plates 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 plates and mount conduit.

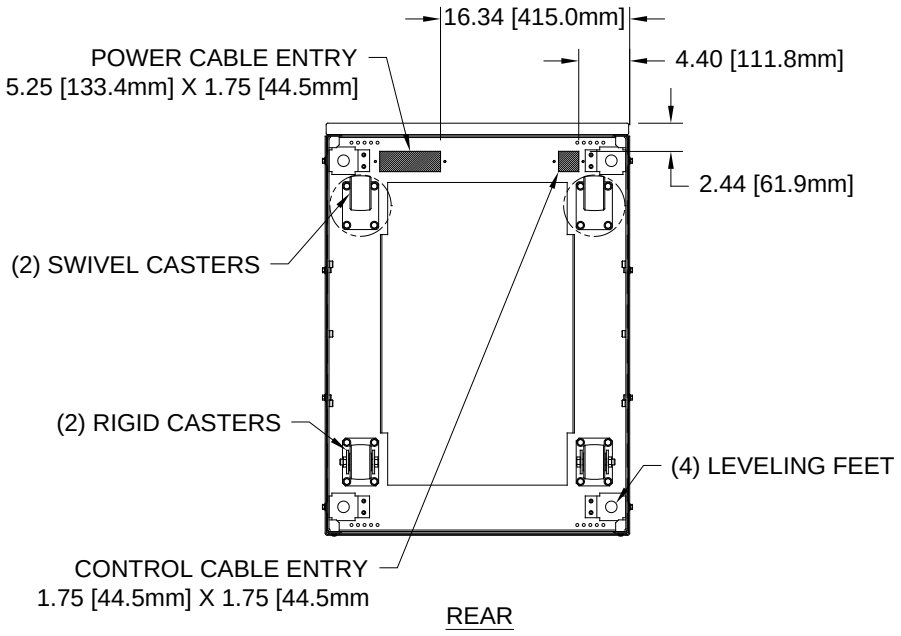


Figure 7 - Bottom View of Cabinet

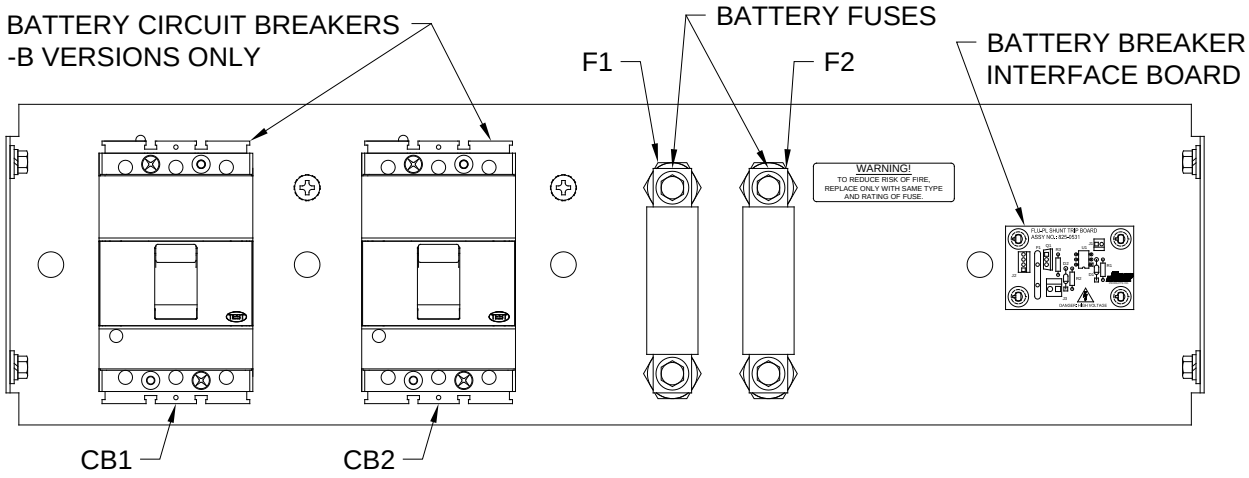


Figure 8 – Circuit Breaker Panel

3.2 Connecting to the Extended Battery Cabinet
To be performed by authorized service personnel:

1. Inspect battery trays for signs of damage. Verify that all terminal connections are sound. The red and black “powerpole” connectors will be connected, but the blue and white connectors on the wires joining the trays in the string should not be connected.

2. If possible, after connecting the loose “powerpole” connections (blue to blue, white to white), use a voltmeter to verify that the battery string is above 408 VDC at the TB3 connector. If the voltage is low or the voltage varies significantly from string to string, please consult Dual-Lite service.

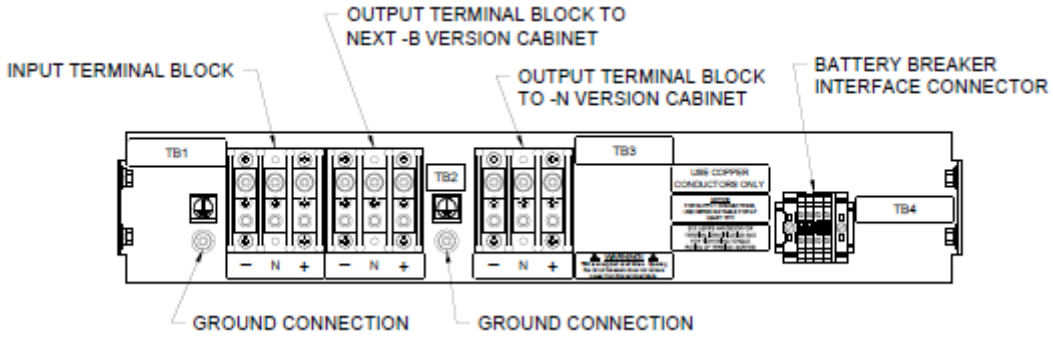


Figure 9 - Connection Panel

3. The battery cabinet(s) to be installed must include the at least one –B version. The first –B cabinet must have its input terminal block (TB1) wired directly to the UPS. To wire additional battery cabinets, wire from TB2 of the first battery cabinet to TB1 of the second –B battery cabinet. Repeat these steps for additional –B cabinets. Use wire sized per local codes, #6 AWG 75° C copper wire minimum to #2/0 AWG maximum.

   When a –N version cabinet is installed with a –B cabinet, the –B cabinet must have its TB1 terminal block wired to the UPS or another –B cabinet. To wire from the –B cabinet to the –N cabinet, wire from TB3 of the –B cabinet to TB1 of the –N cabinet. To wire additional –N battery cabinets, wire from TB2 of the first –n battery cabinet to TB1 of the second –N battery cabinet. Repeat these steps for additional -N cabinets.

   There must be at least one –B cabinet among the battery cabinets. If it is desired to create a battery system involving all –N version cabinets and a user provided disconnect switch, contact Dual-Lite for requirements for the disconnect switch.

DANGER

TB3 is energized at all times. Opening the circuit breakers does not remove power from this terminal block.

4. Connect the ground wire to the ¼-20 ground stud with a ring terminal or pressure lug by removing and replacing the top nut and washers only with a 7/16” wrench.

5. Before working within the UPS cabinet, verify that the UPS has no power applied. Before touching the Extended Run Time Battery connector in the UPS, verify that all internal battery strings are disconnected (that is, verify that the blue and white "powerpole" connectors are NOT mated). Refer to the UPS manual. Repeat procedures 3 and 4 to the UPS Extended Run Time Battery connector located in the lower left side of the UPS. We recommend that the wires be marked as to which is positive (+) and negative (-) to ensure that the wires are not accidentally crossed. See **Figure 8** and **Figure 9**.

DANGER

Never connect the positive to the negative. Severe damage and injury could result. Check polarity at the TB3 terminal block.

6. For –B cabinets, connect the Circuit Breaker Interface per Section **4. Circuit Breaker Interface**.

7. Mate the blue connections, blue to blue, and then the white connections, white to white. See **Figure 13**. Repeat this procedure for the other battery cabinets, if present.

8. Reinstall the front inner panel on each battery cabinet using the screws provided.

9. After the internal batteries in the UPS are connected, reinstall any panels that were removed and close the UPS doors. Refer to the UPS manual for guidance regarding this procedure. After the UPS cabinet is closed, the battery cabinet breakers may be closed and the outer front panels may be replaced on the battery cabinets.

Terminal blocks on the –N version cabinets are disconnected by unplugging the "powerpole" connectors in all cabinets. This requires the removal of the inner panel by authorized personnel only.

Table 3 – Terminal Tightening Torques and Wires Sizes

BATTERY INPUT/OUTPUT TERMINAL TIGHTENING TORQUE	
#2/0 - #6 AWG	120 inch-pounds

GROUND STUD TIGHTENING TORQUE	
Extended Run Time Battery Cabinet	100 inch-pounds
UPS Cabinet	55 inch-pounds

kVA Rating	Minimum Input/Output Wire Size	Minimum Ground Wire Size
10 / 15	#6 AWG	#10 AWG
20	#4 AWG	#10 AWG
30	#2 AWG	#8 AWG

*Wire must be rated 75°C or higher. Use copper conductors only.

4. Circuit Breaker Interface

NOTE: Disregard this section if tripping the battery cabinet breakers via REPO activation is not required.

Figure 9 shows the location of the Battery Breaker Interface terminal block on the battery cabinet.

NOTE: Wires to the Battery Breaker Interface terminal block TB4 must not enter the UPS or battery cabinet through the same port as the input/output or battery power wires.

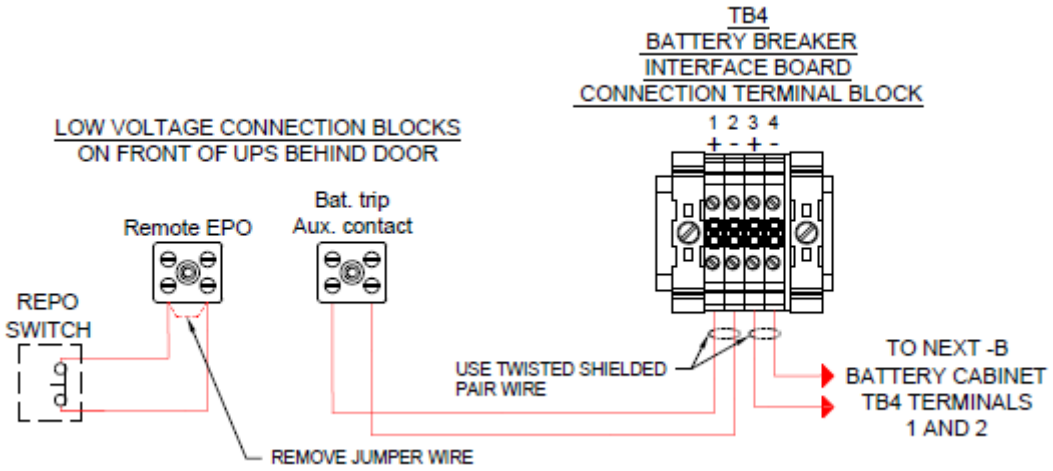


Figure 10 – Communication Interface Board Connections

To trip the battery circuit breakers via the REPO of the UPS, connect the battery cabinet interface connector (TB4) to the UPS per **Figure 10**. If any additional battery cabinets are –N versions, no other connections are needed. If a Dual-Lite maintenance bypass switch cabinet is included, wire those connections instead per
Figure 5 of the Maintenance Bypass Switch User's Manual.

WARNING

CAUTION: The Battery Breaker Interface Board is an electrostatic sensitive device. The user should be grounded when connecting to this assembly.

CAUTION: If the battery cabinet circuit breakers trip or are opened, the internal batteries of the UPS are still connected and providing power to the UPS. They also cause the terminals of the TB1 and TB2 to be energized with hazardous voltage.

5. Battery Removal, Installation, and Service

The batteries must only be serviced by authorized service personnel. Always wear eye protection and have eye wash near at hand. Never work on any connections that have not been disconnected from all other sources of voltage. Parallel connected battery cabinets require that all battery strings in all battery cabinets be disconnected before working within any particular cabinet. Also, the UPS is usually equipped with internal batteries that must be disconnected before service (refer to the UPS manual).

Before servicing batteries, the UPS should be turned off, power should be removed from the UPS input, and all battery breakers and disconnect switches should be open. If a Maintenance Bypass Switch (MBS) is present, power to the load can be maintained during service. Refer to the instructions for the MBS to put the system in bypass mode before removing power from the UPS.

Before any battery service is attempted, the batteries must be disconnected by unplugging the cables to the battery trays. If it is necessary to remove the cables from the batteries, the connections should be marked in a way that no confusion will exist when it is time to reconnect the cables (see **Figure 13**). 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.

WARNING

To service the battery trays, they must be removed from the cabinet by a fork lift. The 2 bus bars at the back of the tray, as shown in Figure 11**, for -150 cabinets or 3 busbars on the right of the tray for the -090 cabinets must be removed before servicing or replacing the batteries.**

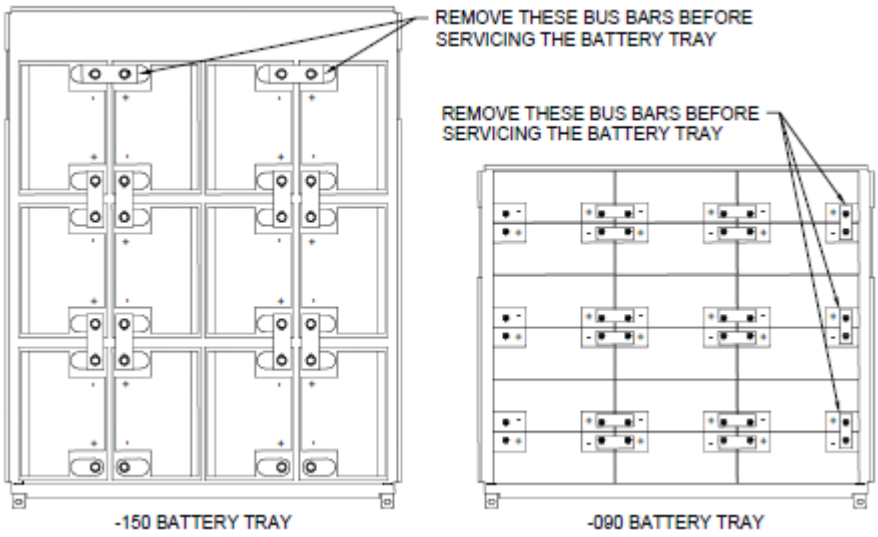


Figure 11 – Battery Bus Bar

If batteries are being replaced, only use the same manufacturer and battery type and rating as the battery removed. When the bus bars connecting the batteries are removed, be careful to avoid dropping bolts or shifting the bus bars so that they might short across adjacent battery terminals. We recommend using a piece of electrical insulating paper (for example, “Nomex”) as a temporary shield between the bus bars during service.

WARNING

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.

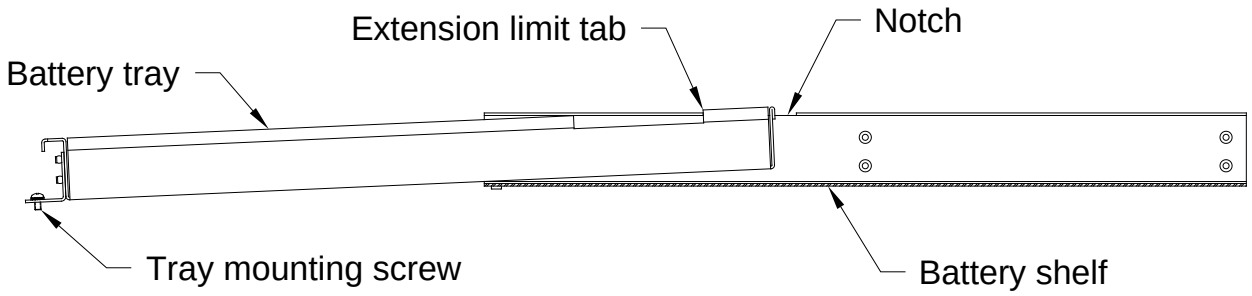
After each tray is installed or serviced, it must be fully inserted and secured using the supplied threaded fasteners before attempting to install or service another tray.

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. When the trays are to be reinstalled, use the procedure in the following paragraph.

The battery trays are very heavy and it will be necessary to use a lifting device to support the trays as they are installed. Do not take away the external support until the extension limit tabs on the upper sides of the battery tray are inserted past the notches on the upper edge of the battery shelf (see **Figure 12**). Always install the lowest battery tray first. 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.

DANGER

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 12 – Battery Tray

6. Maintenance

The Extended Run Time Battery Cabinet 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 Extended Run Time Battery Cabinet series, please contact Dual-Lite service center for details.

For maximum availability of the UPS, the batteries should be replaced as part of a comprehensive preventive maintenance program.

Table 4 – Replacement Batteries and Operating Temperatures

REPLACEMENT BATTERY			
Cabinet Model	**Manufacturer**	**Cat. Number**	**Qty Required**
-090	China Storage Battery	HR1290W	36 Per String
-150	China Storage Battery	HRL12150W	36 Per String

RECOMMENDED REPLACEMENT INTERVALS	
Batteries	2 to 5 years

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.

OPERATING TEMPERATURE	
Recommended Range	15-25º C (59-77º F)
Maximum Range	10-40º C (50-104º F)

This product contains Value Regulated Sealed Acid Batteries. These batteries contain lead, a neurotoxin, and sulfuric acid, a corrosive. Additionally, the energy stored in the batteries can present a shock hazard and a burn hazard. Batteries should be serviced by trained personnel. Appropriate safety precautions must be observed, including eye protection and skin protection. Contact with electrolyte requires flushing with generous amounts of clean water. Seek medical attention immediately following contact with electrolyte. Unwanted batteries must be recycled and should never be discarded.

The functional lifetime of batteries is significantly affected by the temperature at which they are stored and operated. Ideally, batteries should be used in a 70° F (21° C) environment. For every 15° F (8.3° C) increase in temperature, the life expectancy of a battery will be halved.

Exposure to temperatures in excess of 90°F (32°C) should be limited to no more than 30 days per year. Under no circumstances should the battery be exposed to temperatures over 104° F (40° C) which can lead to thermal runaway, a condition that damages the battery. Thermal runaway can cause batteries to swell. If the battery cases burst, the hazardous contents may be exposed.

Maintaining proper ambient temperature usually requires installing the product in a temperature controlled space. Equipment rooms without cooling systems do not generally maintain the proper conditions for good battery life.

See Hubbell Lighting's website for warranty details:
http://www.hubbelllighting.com/resources/warranty/

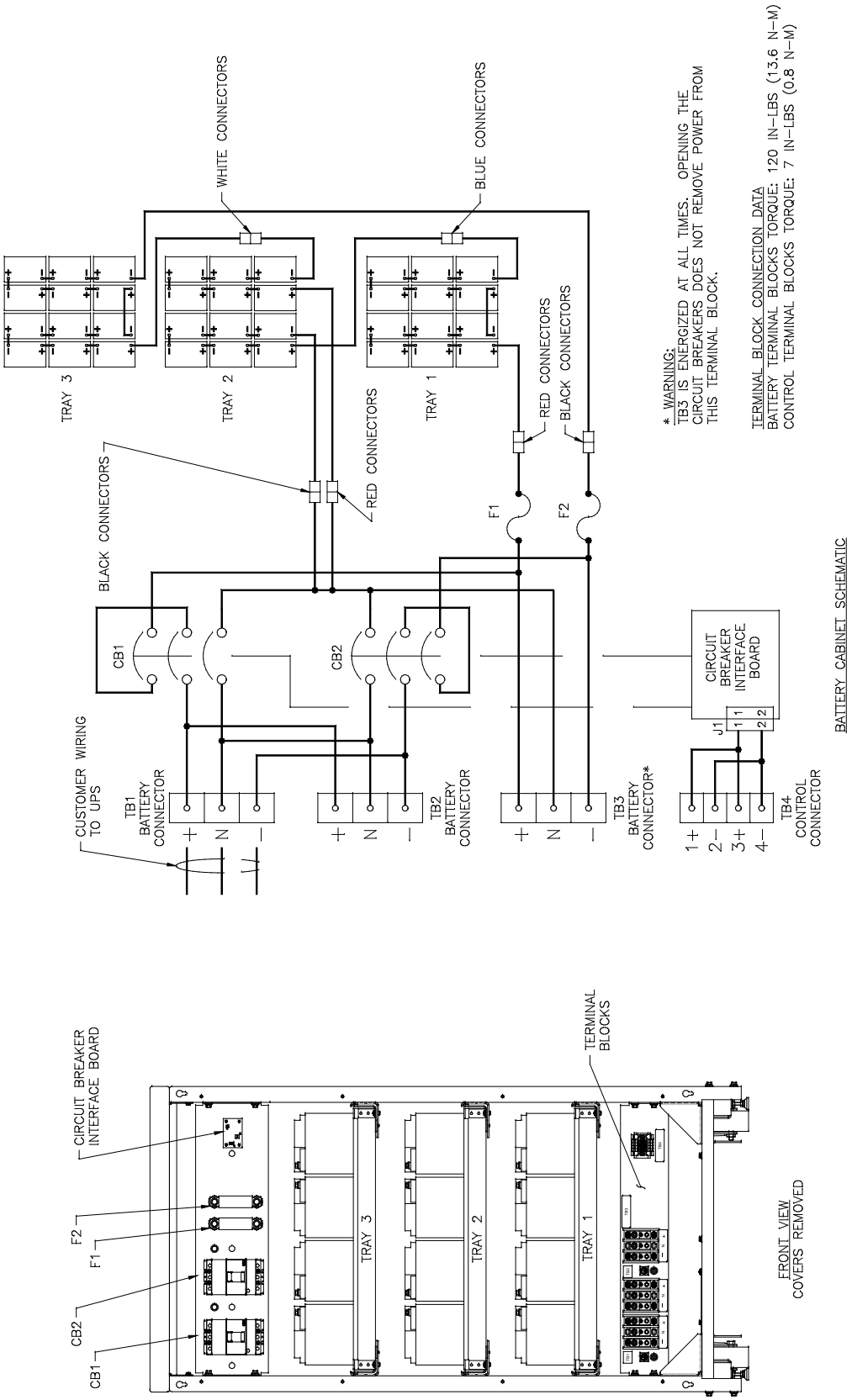


Figure 13 – Cabinet Schematic

Notes: