

Electrical Installation

Symmetra[®] PX-XR Battery Enclosures

50-80 kW
200/208/400 V

About This Manual

Audience

This manual is intended for **APC-trained** or **APC-authorized electricians** who will be installing the APC Symmetra[®] PX-XR (50-80 kW) battery enclosures.

This manual provides detailed electrical and physical specifications and battery diagrams. It also provides instructions on how to make electrical connections between the batteries, and how to make electrical connections between the battery enclosures and other components in your system.

Read all sections of this document before installing or operating any of this equipment, then keep the manual nearby for reference. Proper installation, operation, and maintenance are needed to ensure continued satisfactory performance from your equipment.

For your information

The battery enclosures included in this manual are referred to by their APC product numbers: **SLB80XRL**, **SLB80XR**, and **SLB80XR-E**.

These products were manufactured and tested in accordance with current industry standards. The assemblies meet UL 1778, cUL, and CE requirements, and are UBC Seismic Zone 4 Certified.

Compliance with all applicable codes and regulations is the responsibility of installation personnel. Know these codes and follow them!

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Safety

Symbols and Instructions

Save these instructions

This manual contains important instructions that must be followed during installation, operation, and maintenance of the Symmetra[®] PX-XR 50-80 kW battery enclosures and their contained batteries.

Safety symbols used in this manual



Indicates an electrical hazard which, if not avoided, could result in injury or death!



Indicates a hazard which, if not avoided, could result in severe personal injury or substantial damage to product or other property!



Indicates a heavy load that should not be lifted without assistance.



Indicates important information.

Cross-reference symbols used in this manual



Indicates that more information is available on the same subject in a different section of this manual.



See also

Indicates that more information is available on the same subject in a different manual.

Warnings

Safety warnings



WARNING!

All electrical power must be installed by a qualified electrician and must comply with local and national codes. Never work inside the battery enclosures alone!



WARNING!

All batteries must be installed and connected by APC-trained or APC-authorized personnel. Never work on the batteries alone!



WARNING!

Battery servicing should be performed or supervised by personnel knowledgeable of batteries and battery precautions. Keep unauthorized personnel away from batteries!



WARNING!

Disconnect charging sources before connecting or disconnecting battery terminals! Be aware that lethal voltages may still be present even when the enclosure is non-operational, or when its switches are in the OFF position!



WARNING!

Contact with any part of a grounded battery can result in electrical shock! Such grounds should be removed prior to installation or servicing!



WARNING!

A battery presents the risk of producing high short-circuit current!



WARNING!

Do not lay tools or metal objects on top of batteries!



WARNING!

Batteries should only be replaced with the same number and type as previously used. These are valve-regulated, lead-acid type batteries!



WARNING!

Do not dispose of a battery in a fire. The battery may explode! Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes, and may be toxic!



See also

For configurations that include customer-supplied external batteries, refer to the manufacturer's battery installation and maintenance instructions.

Safety practices

Always wear:

- Goggles or face shields
- Acid-resistant, insulated rubber gloves
- Protective overshoes or rubber boots
- Protective aprons

Always use:

- Double-insulated tools
- Rubber mats to cover batteries during servicing
- Rubber mats or rubber stands on the floor
- Adequate lifting devices

Remove from your body:

- Watches
- Rings
- Other metal objects

Battery Enclosures

Mechanical Specifications

Enclosures

The *SLB80XRL*, *SLB80XR*, and *SLB80XR-E* battery enclosures were designed for installation with the Symmetra PX 80 kW UPS. These enclosures offer long run-time capability, front and rear removable panels, 10-year design life VRLA batteries, and an optional battery charger.

The *SLB80XRL* fits into the standard NetShelter dimensions and uses front-access batteries, while the *SLB80XR* and *SLB80XR-E* use top-terminal batteries. Each of these enclosures houses one full string of 32 batteries. The enclosures have the following physical specifications:

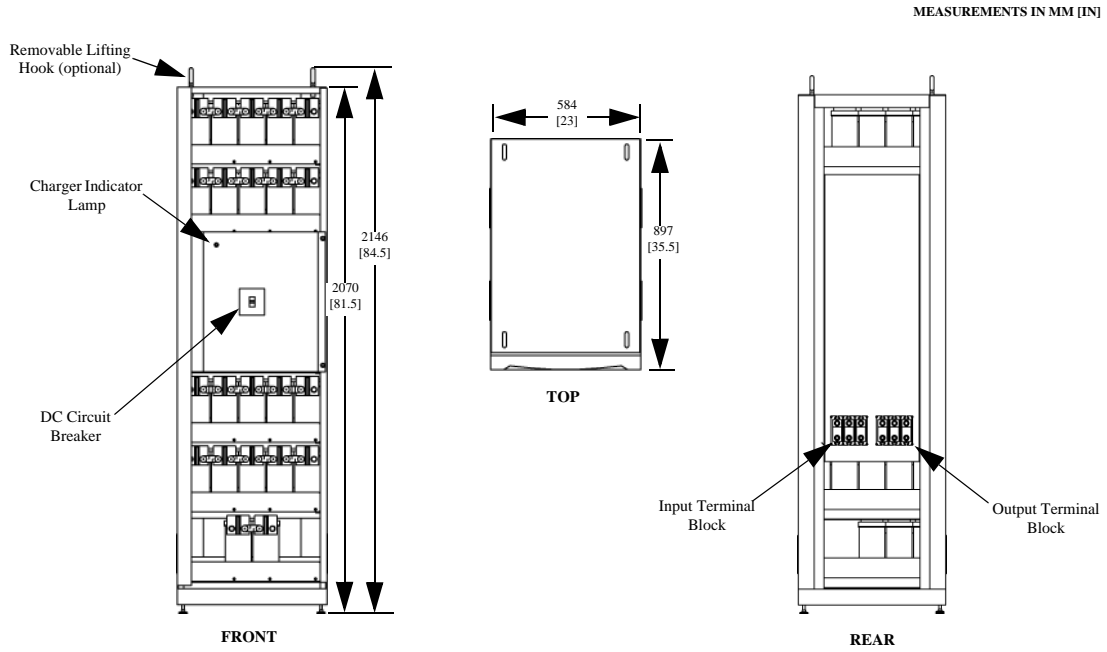
| SKU | Dimensions | | | | | | Weights | | | |
|------------------|------------|----|-------|-------|--------|-------|----------|-----|--------|------|
| | Width | | Depth | | Height | | Unloaded | | Loaded | |
| | mm | in | mm | in | mm | in | kg | lb | kg | lb |
| SLB80XRL | 584 | 23 | 897 | 35.5" | 2070 | 81.5" | 372 | 820 | 1488 | 3280 |
| SLB80XR | 864 | 34 | 897 | 35.5" | 2070 | 81.5" | 315 | 695 | 1404 | 3095 |
| SLB80XR-E | 864 | 34 | 897 | 35.5" | 2070 | 81.5" | 315 | 695 | 1404 | 3095 |

Cable access

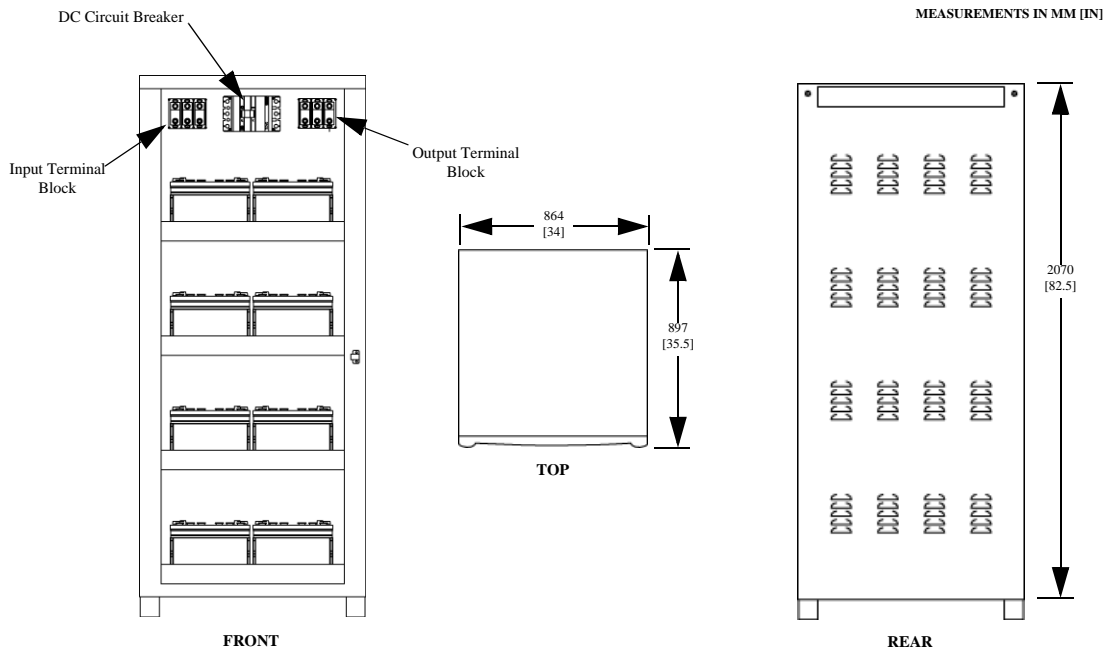
The enclosures were designed for hard-wiring a.) from the utility supply (if the charger is used); b.) to the Symmetra PX 80 kW UPS; and c.) between parallel battery enclosures.

There are two conduit landing areas on both sides of the *SLB80XRL* enclosure (refer to the step 2 graphic on page 15). Conduit fittings are supplied in these areas. The *XRL* also has a removable plate at the bottom-rear section of the unit. This opening can be used to run cables under a raised floor. The *SLB80XR* and *SLB80XR-E* are equipped with several knockouts on all sides.

SLB80XRL mechanical



SLB80XR and SLB80XR-E mechanical



Shipping Specifications

The enclosure is wrapped in packaging material and bolted to its pallet for shipment. The pallet is slotted at both ends to allow pallet-jack access. The enclosure can also be moved with a pallet-jack.

Batteries are shipped on a separate pallet and must be installed on-site. The optional battery charger is also shipped separately and must be installed on-site.

Receiving the enclosure and batteries

1. Upon receipt, examine the packaging for signs of rough handling or external damage.
 - DO NOT remove the enclosure’s protective packaging until the unit is off its pallet and ready for installation.
 - DO NOT remove the enclosure from its shipping pallet until all transporting is completed.
 - A thorough internal inspection should only be made after the enclosure has been positioned for installation, and before making electrical connections.
 - DO NOT unpack the batteries until the enclosure has been set in place for installation.
 - Batteries must be inspected individually for damage (cracks, etc.). DO NOT install damaged batteries!
2. Record any external or internal damage observed and call the carrier immediately to allow their personnel to conduct an equipment inspection.
 - DO NOT contact APC first—notify the carrier instead. Otherwise, APC may be unable to assist in recovering the amount of the claim.
 - All damage claims should be as specific as possible. Information about the shipment should appear on the shipping label and related paperwork.
 - BE SURE to request a copy of the carrier’s inspection report.
3. Make certain the entire shipment has arrived. Compare information from the shipping label against what has been received. If anything is missing, contact APC immediately



Refer to the contact list on the back cover of this manual.

Handling the enclosure and batteries



Use a properly rated forklift or pallet-jack to transport the enclosure and batteries (still on pallets) to the installation site or to a storage location. The enclosures can weigh up to 364 kg (800 lbs) and the batteries up to 1116 kg (2460 lbs).



Consider the weight restrictions of any floors or elevators that might be used during transportation of these components. Be aware of low doorways and ceilings that might hinder movement of the enclosure. The enclosure is 2070 mm (81.5 in) high.

Storing the enclosure and batteries

The enclosure and batteries should never be stored outdoors. If they do require storage:

- They should be stored indoors, on pallets and still wrapped in their packaging material.
- Their pallets should be set on a firm and level surface.
- They should be kept in a climate-controlled environment with a temperature range of 17° to 27°C (62° to 80°F) to maximize the life and performance of the batteries.
- They must be protected at all times from conductive contaminants, moisture, flammable liquids, gasses, or corrosive substances.
- Be aware that prolonged storage of batteries without recharge could affect battery operation. The manufacturer recommends recharging batteries every 180 days, at a minimum.

Installation Specifications

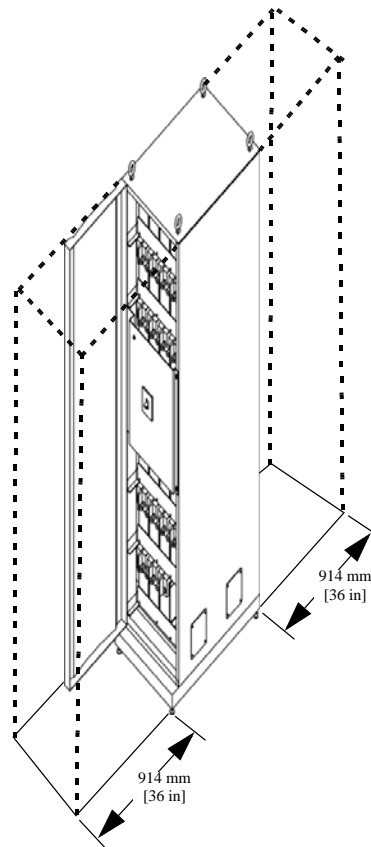
Site requirements



When determining where to install the enclosures, consider the size and weight of all fully loaded system components. Make sure the structural integrity of the floor can withstand the maximum weight of the entire system. Refer to “Enclosures” on page 5.

The installation site should satisfy the following requirements:

- It must be well-ventilated, non-condensing environment. An ambient temperature of 22° to 25°C (72° to 77°F) must be maintained to maximize the life and performance of the batteries.
- It must be able to accommodate at least 914 mm (36 in) of free space both in front of and behind the enclosure to permit battery installation and general maintenance.



- It must be clean and free of all conductive contaminants, excessive moisture (water condensation), flammable vapors, chemical fumes, corrosive gasses, and liquids.

Site restrictions

The installation site should have the following restrictions:

- Prohibit smoking and open flame, and avoid arcing in the immediate vicinity of the batteries.
- Ensure there is plenty of light for servicing the batteries and other internal components.
- Keep all vents free of dust accumulation that could restrict airflow.
- Never block or insert any object into ventilation holes or other openings.
- Make sure there is always an unobstructed path from the battery area to an exit.

Tools for installation

The following tools are needed to properly install the *SLB80XRL*, *SLB80XR*, and *SLB80XR-E* battery enclosures:

- Pallet-jack
- Torque wrench
- Sockets (various sizes) with ratchet or wrench
- Voltmeter
- Rated lifting devices for installing batteries and enclosures
- Strapping kit for the *SLB80XR* and *SLB80XR-E*

Torque values

| Connection | Torque |
|-------------------------|---------------------|
| Grounding: | 7.9 Nm (70 lb-in) |
| Battery terminal: | 13.5 Nm (120 lb-in) |
| DC circuit breaker: | 8.1 Nm (72 lb-in) |
| DC terminal block: | 25.7 Nm (228 lb-in) |
| Charger terminal block: | 0.8 Nm (7.1 lb-in) |

Placement of Enclosures

Step-by-step instructions



Note

Battery enclosures should be unloaded from their pallets at the installation site.



Heavy

At least two people should be present when unloading an enclosure.

1. Remove the protective packaging material from the enclosure.
2. Using a 14 mm (9/16 in) socket with ratchet or wrench, remove the four lag screws securing the enclosure to the pallet.



Caution

The enclosure is on casters and may begin to roll once the lag screws have been removed. Take steps to prevent the enclosure from rolling off the edge of the pallet.

3. These pallets and battery enclosures were designed to use the same ramp that comes with the Symmetra PX80 UPS. Set the ramp into position against the pallet, and then carefully roll the enclosure down the ramp.
4. Roll the enclosure to its final installation position, then adjust (lower) all four stabilizing feet until the pads make solid contact with the floor. Tighten the lock nuts located above the pads at the bottom of the stabilizing feet.

Optional seismic mounting

Any or all of the battery enclosures can optionally be bolted to a concrete floor to satisfy the requirements of a certified seismic installation, or just to gain additional stability. Refer to the system drawing provided with your enclosure(s).



Note

Seismic mounting requires removal of the casters from the enclosure.

The following table shows the minimum anchoring and torque requirements for each seismic zone.

| Seismic Zones | Anchor | Torque |
|----------------------|--|---------------------|
| I, IIA, IIB, III | 3/8 in Redhead Wedge anchor x 3 3/4 in | 30.4 Nm (300 lb-in) |
| IV | 1/2 in Redhead Wedge anchor x 4 1/4 in | 74.5 Nm (600 lb-in) |

Installation

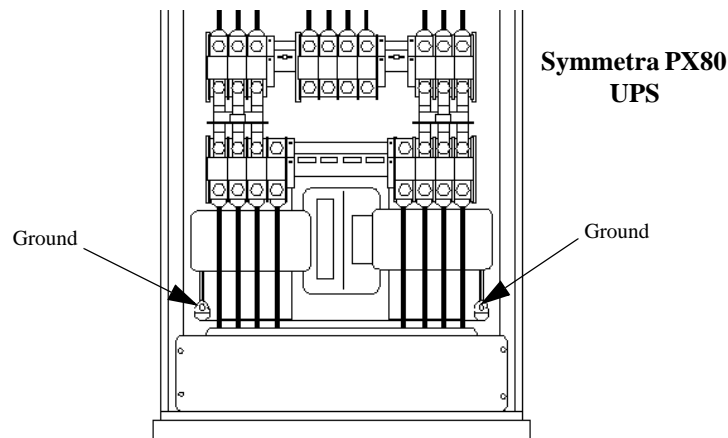
Overview

The system's main mechanical and electrical drawings and wiring diagrams are shipped with the battery enclosure. Wiring information for the **SLB80XRL** is also provided in "Appendix A: SLB80XRL Electrical" on page 35. Wiring information for the **SLB80XR** and **SLB80XR-E** is provided in "Appendix B: SLB80XR/SLB80XR-E Electrical" on page 37.

All of this information has been made available as reference material. During installation, use the system drawings and wiring diagrams as your primary guides.

Grounding the enclosures

Each enclosure contains one or more 6.5 mm (1/4 in)-20 ground studs and connecting hardware. To properly ground the battery enclosure, connect the supplied (green and yellow) grounding cables to the appropriate stud(s) as specified in Appendices A or B. Secure ground cables with 7.9 Nm (70 lb-in) of torque. See the below graphic for ground connection options to the Symmetra PX80 UPS. Secure this connection with 7.9 Nm (70 lb-in) of torque.



Mechanical Installation

SLB80XR and SLB80XR-E enclosures

Two or more *SLB80XR* or *SLB80XR-E* battery enclosures can optionally be bolted together in a side-by-side configuration at the final installation location. It is recommended that mechanical connection takes place before making any electrical connections inside or to the enclosure.



Note

SLB80XRL enclosures DO NOT have provisions for mechanical installation. Its side panels are part of the enclosure structure and cannot be removed.

1. Open each enclosure's front door and remove its back panel to gain full internal access to both enclosures. The front door has a keyed lock identical to the lock on the UPS.
2. Remove the "facing" side panels on each of the enclosures being joined. This will expose the four matching holes needed for mechanical connection.
3. Use a rated lifting device to position the enclosures adjacent to one another with the four matching holes aligned. Adjust the height of either or both enclosures by raising or lowering their leveling feet to achieve alignment.
4. Use 13 mm (1/2 in) hardware (bolt head/washer on one side, washer/lockwasher/nut on the other side) to join the enclosures. Hardware is not supplied. Bind enclosures until rigid.

Loading Batteries

1. Open the front door of the battery enclosure. The front door has a keyed lock identical to the lock on the UPS. Remove the rear panel from the enclosure.
2. To gain better access to the *SLB80XR* enclosure, use a 13 mm (1/2 in) socket with ratchet or wrench to remove the two bolts securing the breaker plate. This allows the plate to swing out.

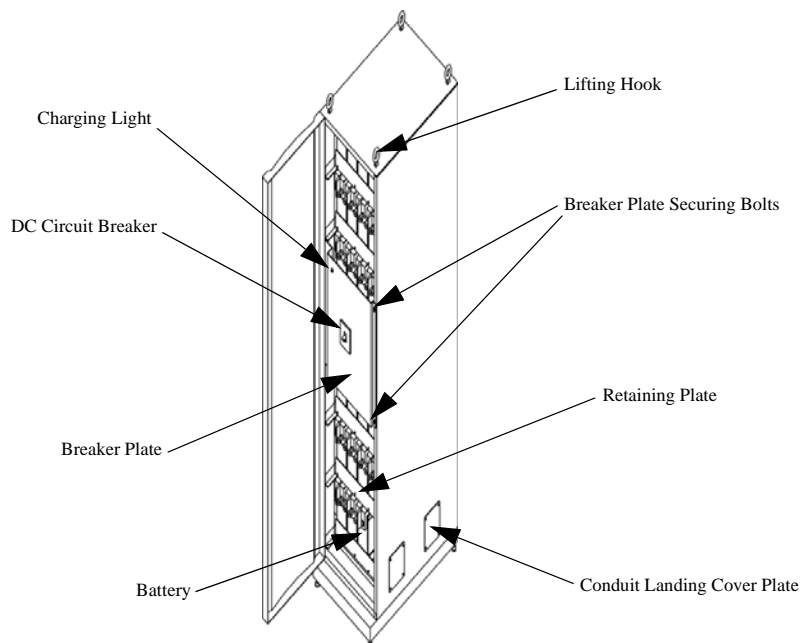


Note

The *SLB80XR* and *SLB80XR-E* do not have a swing-out breaker plate. The DC breaker and terminal plate in those enclosures is located at the top-front of the unit.



Refer to “SLB80XR and SLB80XR-E mechanical” on page 6.



3. Make sure all interior enclosure surfaces that will come in contact with the batteries (once installed) are covered with rubber rail insulation.
4. Follow the layout in your wiring diagrams when placing the batteries in the enclosure. Completely load the bottom shelf first, and then work upward one shelf at a time.



Note

Make sure the positive and negative terminals (polarity) on each battery are properly positioned.

5. Using a voltmeter, measure the voltage of all batteries to ensure they contain an acceptable charge. Each 12 V battery should measure 12.6 V or greater.



Note

DO NOT install any batteries that fail to contain an acceptable charge!

6. After all of the batteries have been loaded into the enclosure, secure them in place:



Note

For the *SLB80XRL*, use additional adhesive-backed rubber rail insulation on the inside of the front retaining plates. Install these plates using the supplied attachment bolts. If installed correctly, the batteries should not move at all.



Note

For the *SLB80XR* and *SLB80XR-E*, use a strapping kit to secure each row of batteries to its assigned shelf.

Wiring Batteries

SLB80XRL enclosures



The following instructions apply only to the *SLB80XRL* battery enclosures.



Refer to “Safety” on page 1, and pay strict attention to all safety warnings and other relevant safety instructions before making connections. Failure to follow the recommended safety measures could result in serious injury or death!



Refer to “Appendix A: SLB80XRL Electrical” on page 35 and your wiring diagrams before making connections.

1. Complete the inter-battery connections:

- Make the 25 battery-to-battery connections. Start with the batteries at the top of the enclosure and work down.
- Make the six shelf-to-shelf connections. Start with the top shelf and work down.



- Pay special attention to battery polarities before making contact with cable lugs.
- Apply No-Ox grease (supplied) to each battery terminal before and after connection.
- Torque connections to the first setting displayed on the battery (13.5 Nm/120 lb-in).



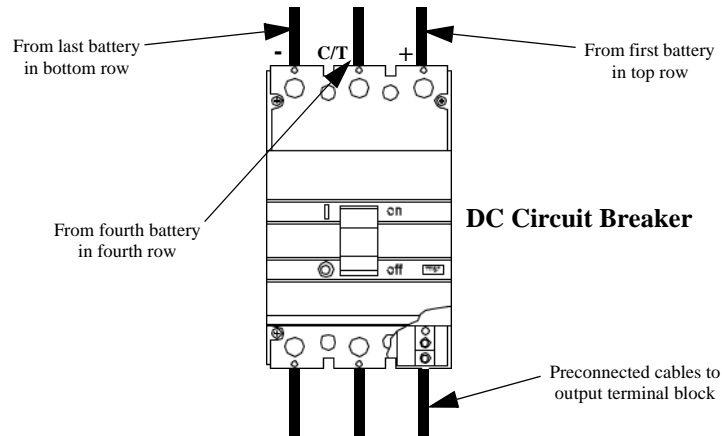
BEFORE making the final shelf-to-shelf connection, use a voltmeter to measure the voltage between the battery terminals that will be interconnected. If there is more than a one- to two-volt difference, recheck the battery connection sequence to ensure correct polarities. **DO NOT MAKE THE FINAL SHELF-TO-SHELF CONNECTION UNTIL CORRECT POLARITIES FOR ALL INTERCONNECTS ARE VERIFIED.**

2. After all of the inter-battery connections have been made, use a voltmeter to measure the voltage of the entire string.



This reading should be +/- 216 to +/- 220.8 VDC (432 to 441.6 V). If your reading is not within this range, check the connections and take another reading. If the reading is still outside this range, recheck the individual battery voltages.

3. Complete the connections between the batteries and the DC circuit breaker:
 - Make the **negative** connection between the last battery (- terminal) in the bottom row of the enclosure and the negative (-) terminal at the top of the circuit breaker.
 - Make the **midpoint** connection between the fourth battery (c/t terminal) in the fourth row of the enclosure and the midpoint (C/T) terminal at the top of the circuit breaker.
 - Make the **positive** connection between the first battery (+ terminal) in the top row of the enclosure and the positive (+) terminal at the top of the circuit breaker.



- Apply No-Ox grease (supplied) to each battery terminal before and after connection.
- Torque the battery terminal connections and the DC circuit breaker connections to 13.5 Nm (120 lb-in).

4. To ensure there are no inadvertent grounds, use a voltmeter to measure voltage between the positive (+) terminal on the breaker and the enclosure ground. Do the same between the negative (-) terminal on the breaker and the enclosure ground.



Each of these readings should be less than 0.5 V.

5. The DC circuit breaker has been prewired to the output terminal block per the above graphic.

SLB80XR and SLB80XR-E enclosures



The following instructions apply only to SLB80XR and SLB80XR-E battery enclosures.



Refer to “Safety” on page 1, and pay strict attention to all safety warnings and relevant safety instructions before making connections. Failure to follow the recommended safety measures could result in serious injury or death!



Refer to “Appendix B: SLB80XR/SLB80XR-E Electrical” on page 37 and your wiring diagrams before making connections.

1. Complete the inter-battery connections:

- Make the 24 battery-to-battery connections. Start with the batteries at the top of the enclosure and work down.
- Make the four row-to-row connections. Start with the top shelf and work down.
- Make the three shelf-to-shelf connections. Start with the top shelf and work down.



- Pay special attention to battery polarities before making contact with cable lugs.
- Apply No-Ox grease (supplied) to each battery terminal before and after connection.
- Torque connections to the first setting displayed on the battery (13.5 Nm/120 lb-in).



BEFORE making the final shelf-to-shelf connection, use a voltmeter to measure the voltage between the battery terminals that will be interconnected. If there is more than a one- to two-volt difference, recheck the battery connection sequence to ensure correct polarities. **DO NOT MAKE THE FINAL SHELF-TO-SHELF CONNECTION UNTIL CORRECT POLARITIES FOR ALL INTERCONNECTS ARE VERIFIED.**

2. After all of the inter-battery connections have been made, use a voltmeter to measure the voltage of the entire string.

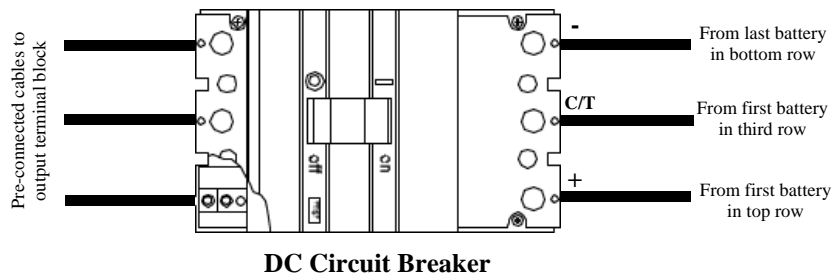


This reading should be +/- 216 to +/- 220.8 VDC (432 to 441.6 V). If your reading is not within this range, check the connections and take another reading. If the reading is still outside this range, recheck the individual battery voltages.

3. Complete the connections between the batteries and the DC circuit breaker:
 - Make the **negative** connection between the last battery (- terminal) in the bottom row of the enclosure and the negative (-) terminal on the right side of the circuit breaker.
 - Make the **midpoint** connection between the first battery (+ terminal) in the third row of the enclosure and the midpoint (C/T) terminal on the right side of the circuit breaker.
 - Make the **positive** connection between the first battery (+ terminal) in the top row of the enclosure and the positive (+) terminal on the right side of the circuit breaker.



The DC circuit breaker in the *SLB80XR* has been rotated 90 degrees clockwise. The inputs are on the right and the outputs are on the left.



- Apply No-Ox grease (supplied) to each battery terminal before and after connection.
- Torque the battery terminal connections and the DC circuit breaker connections to 13.5 Nm (120 lb-in).

4. To ensure there are no inadvertent grounds, use a voltmeter to measure voltage between the positive (+) terminal on the breaker and the enclosure ground. Do the same between the negative (-) terminal on the breaker and the enclosure ground.



Each of these readings should be less than 0.5 V.

5. The DC circuit breaker has been prewired to the output terminal block per the above graphic.

Connecting to the UPS

Step-by-step procedure

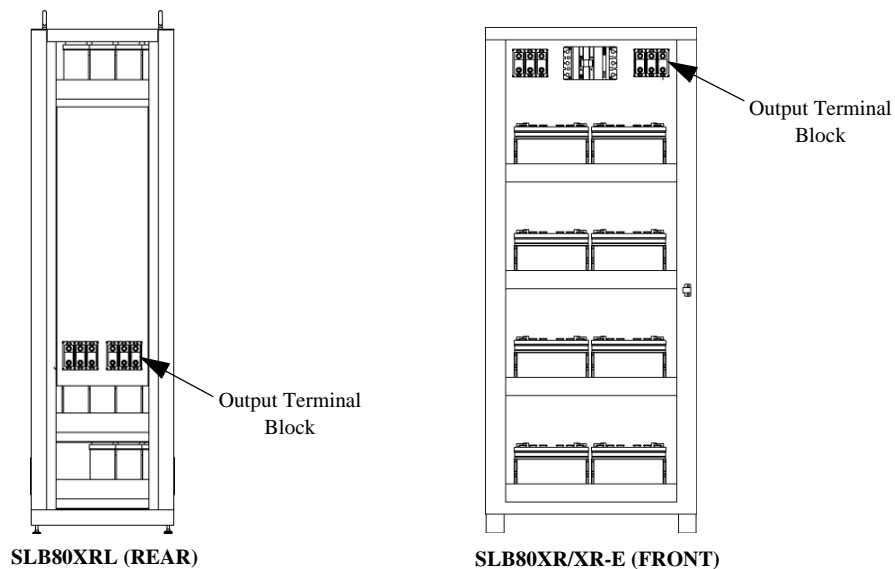


Refer to “Safety” on page 1, and pay strict attention to all safety warnings and relevant safety instructions before making connections. Failure to follow the recommended safety measures could result in serious injury or death!



Refer to the documentation provided with your UPS for recommended UPS safety instructions before making these connections. Failure to follow these safety measures could result in serious injury or death!

70mm² (2/0) cables are supplied for connection between the output terminal block and the UPS. If the cable length is not sufficient, use alternative cables with equivalent ratings that meet all applicable codes. Consider also any special compensation needed for long cable runs.



1. Switch the DC circuit breaker ON (closed).
2. Use a voltmeter to measure the voltage between the outer terminals on the terminal block.



Pay particular attention to the polarity of the terminals used during measurement. Damage or explosion could occur if incorrect polarities are connected.



This reading should be +/- 198.4 to +/- 206.4 VDC (396.8 to 412.8 V). If your reading is not within this range, check the battery connections and take another reading. If the reading is still outside this range, recheck the individual battery voltages.

- Use a voltmeter to measure the voltage between the outer terminals and the center terminal.

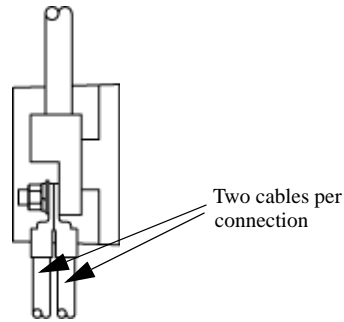


Pay particular attention to the polarity of the terminals used during measurement. Damage or explosion could occur if incorrect polarities are connected.

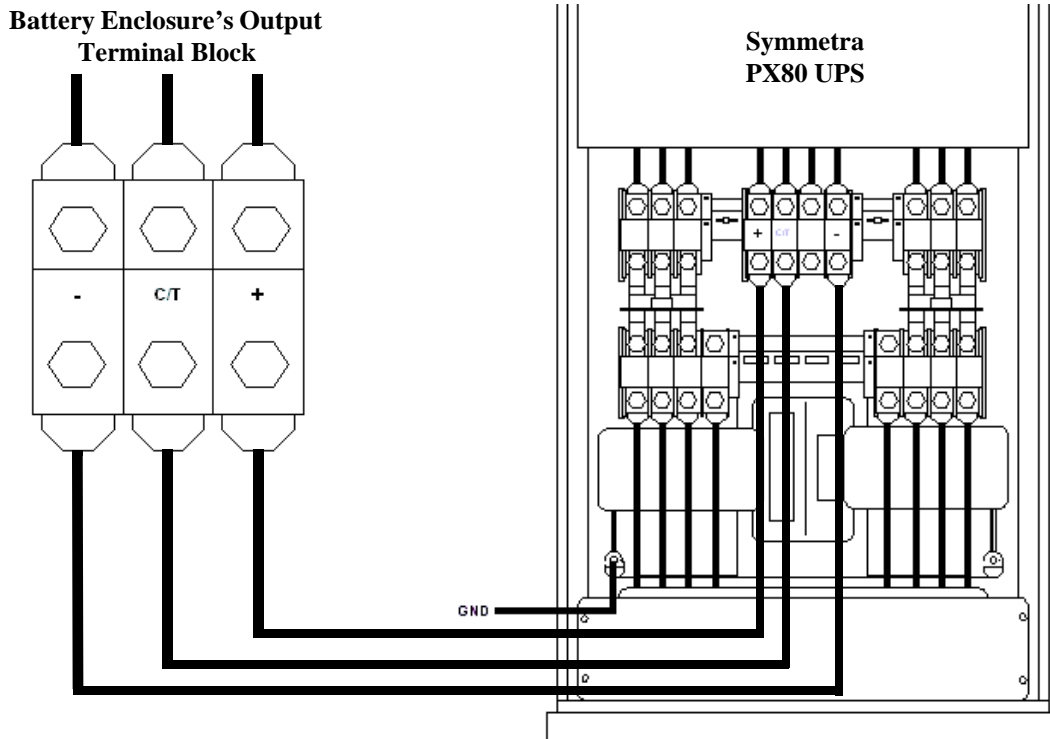


These readings should be about half the total system voltage, and nearly equal to one another. If more than a two-volt difference, check the battery connections and take additional readings. If readings are still bad, recheck the individual battery voltages.

- Switch the circuit breaker OFF (open).
- Remove the protective cover from the output terminal block.
- Connect six 70 mm² (2/0) cables from the output terminal block to the UPS (below graphic). Two 2/0 cables are required at each connection point (right graphic shows proper positioning of cable lugs).



Make certain each cable from the output terminal block connects to the proper polarity on the UPS. Torque to 31.0 Nm (275 lb-in).



- Re-attach the protective cover to the output terminal block.

Paralleling Battery Enclosures

Step-by-step procedure



Refer to “Safety” on page 1, and pay strict attention to all safety warnings and relevant safety instructions before making connections. Failure to follow the recommended safety measures could result in serious injury or death!

Up to six battery enclosures can be paralleled to the UPS. If your installation involves multiple battery enclosures, start the process by installing and wiring all batteries in each enclosure.



Refer to “Mechanical Installation” on page 14 through “Wiring Batteries” on page 17.



Note

When making connections between battery enclosures, use the same cable type (70 mm² or 2/0) that was used to connect the first enclosure to the UPS.

1. Before paralleling battery enclosures, switch their DC circuit breakers ON (closed) and use a voltmeter to measure the voltage at each terminal block involved in the connection:



Pay particular attention to the polarity of the terminals during measurement. Damage or explosion could occur if incorrect polarities are connected.

- Measure the voltage between the outer terminals on each terminal block.



Note

This reading should be +/- 198.4 to +/- 206.4 VDC (396.8 to 412.8 V). If your reading is not within this range, check the battery connections and take another reading. If the reading is still outside this range, recheck the individual battery voltages.

- Measure the voltage between the outer terminals and the center terminal.



Note

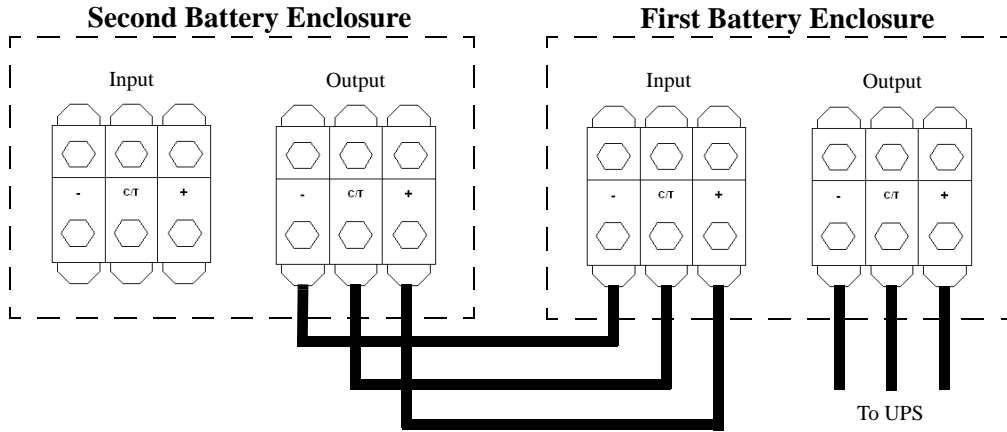
These readings should be about half the total system voltage, and nearly equal to one another. If more than a two-volt difference, check the battery connections and take additional readings. If readings are still bad, recheck the individual battery voltages.

2. Once the voltage readings are satisfactory, switch OFF (open) ALL DC circuit breakers.



Refer to the appropriate drawing on page 35 or page 37.

3. Remove the protective covers from both terminal blocks, and proceed as follows:
 - Connect two cables to each terminal (-, C/T and +) in the output terminal block of the second battery enclosure and torque to 31.0 Nm (275 lb-in). Re-attach the protective cover.
 - Connect these same cables to identical terminals (-, C/T and +) in the input terminal block of the first battery enclosure and torque to 31.0 Nm (275 lb-in). Re-attach the protective cover.

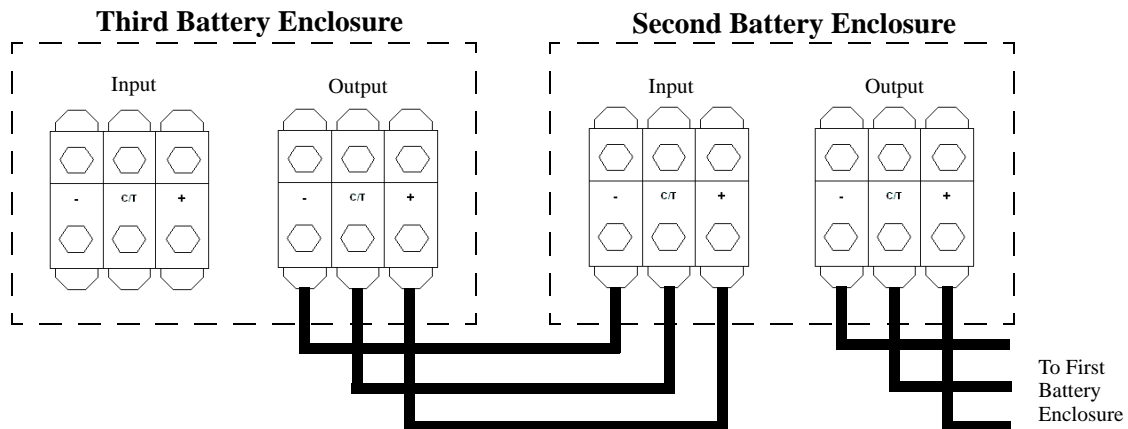


4. If more than two battery enclosures are being paralleled, follow the same test procedures outlined in step 1 on page 23. Once the voltage readings are satisfactory, switch OFF (open) ALL DC circuit breakers.



Refer to the appropriate drawing on page 35 or page 37.

5. Remove the protective covers from both terminal blocks, and proceed:
 - Connect two cables to each terminal (-, C/T and +) in the output terminal block of the third battery enclosure and torque to 31.0 Nm (275 lb-in). Re-attach the protective cover.
 - Connect the same cables to identical terminals (-, C/T and +) in the input terminal block of the second battery enclosure and torque to 31.0 Nm (275 lb-in). Re-attach the protective cover.
 - Repeat this process when paralleling additional battery enclosures (maximum of six).



Installing the Battery Charger

The battery enclosures are designed to include the optional SLBC1000 (384 VDC, 5 Amp) charger. This charger is used to reduce the recharge time when employing multiple (3+) enclosures.



Refer to “Safety” on page 1, and pay strict attention to all safety warnings and relevant safety instructions before installing the charger. Failure to follow the recommended safety measures could result in serious injury or death!



Refer to “SLBC1000 charger specifications” on page 32.



The charger DOES NOT support 200 V installations.

Mechanical installation of charger in SLB80XRL enclosures

The SLBC1000 is mechanically connected at the rear of the *SLB80XRL* battery enclosure, where six holes have been provided above the power distribution block.

1. Insert two supplied 8 mm (5/16 in)-18 thread-forming screws into the uppermost holes at the rear of the enclosure. DO NOT tighten the screws at this time.
2. With two people lifting, hang the charger from these screws using the keyholes at the top of the charger plate.
3. Insert the other four supplied 8 mm (5/16 in)-18 thread-forming screws through the plate and into the remaining holes provided for attachment of this assembly.
4. Tighten all six screws.

Mechanical installation of charger in SLB80XR or SLB80XR-E enclosures

The SLBC1000 is mechanically connected at the top of both the *SLB80XR* and *SLB80XR-E* battery enclosures, where two mounting rails are provided behind the circuit breaker plate. The SLBC1000 must be installed from the rear of these enclosures.

1. Open the circuit breaker plate at the top of the enclosure to gain access to the mounting rails.
2. With two people lifting, lay the charger flat onto the rails in such a way that its transformer is facing up.
3. Slide the charger along the rails until the four holes in its plate line up with the four holes on the mounting rails.
4. Insert the four supplied 8 mm (5/16 in)-18 thread-forming screws through the matching holes and tighten.

Electrical installation of charger

The SLBC1000 charger is electrically connected in exactly the same way in all of these battery enclosure models. After the batteries have been installed and wired inside the enclosure, the charger must be electrically connected to the utility supply and the battery string.

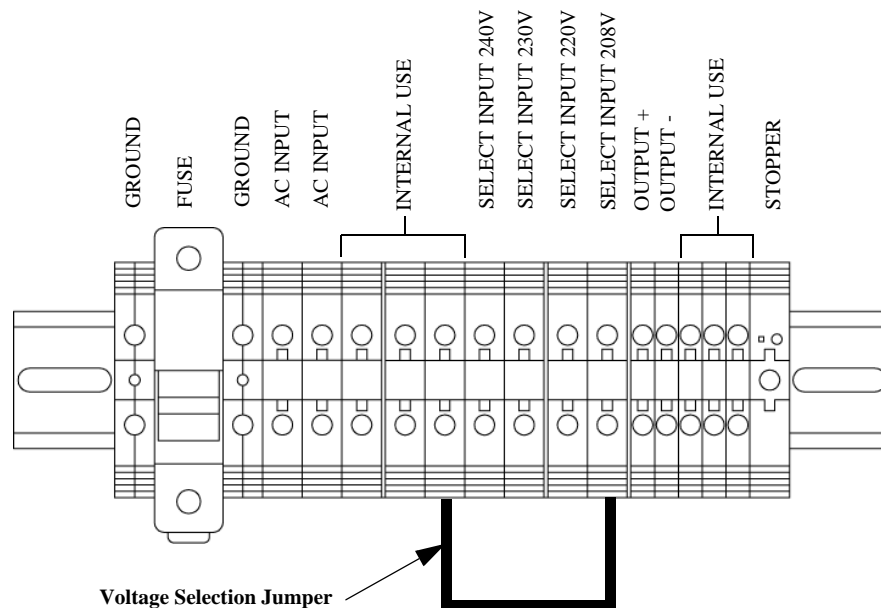


The charger DOES NOT support 200 V installations.

Note

1. Ensure the AC input voltage is properly configured.

The SLBC1000 can be powered by 208, 220, 230, or 240 VAC (50 or 60 Hz). Jumper settings for each of these four voltages are provided. Check the charger terminal block to make sure the jumper is configured for the proper voltage. If not, connect the jumper to its proper voltage setting and torque to 0.8 Nm (7.1 lb-in).



2. Switch the battery breaker OFF.

If the battery enclosure was already connected to the UPS, switch OFF (open) the circuit breaker in the enclosure.



Plan for the fact that the UPS will no longer have the same run-time capability due to its broken connection with the battery enclosure.

Note

3. Connect the “50 A connectors with cables” to the batteries.

The charger is supplied with two grey-colored “50 A connectors with cables” for connecting the battery string to the charger. Connect the positive cable to the “+” terminal on battery #1, and then connect the negative cable to the “-” terminal on battery #32.



Note

When connecting the cables to the battery terminals, make sure you also re-attach the cables that were previously connected to these terminals. Torque the battery terminal connections to 13.5 Nm (120 lb-in).

4. Measure the voltage on the 50 A connectors.

Use a voltmeter to measure the voltage on the cables that were just connected to the battery terminals. Pay particular attention to the polarity of the reading.



Note

This reading should be +/- 198.4 to +/- 206.4 VDC (396.8 to 412.8 V), provided the string is off-line and the voltages have stabilized. The voltage may be slightly higher if the batteries were only recently taken off-line from the UPS.

If your reading is not within this range, check the battery connections and take another reading. If the reading is still outside this range, check the individual voltages.

5. Connect the 50 A connectors to the charger.

Connect the 50 A “female” connectors to their matching “male” connectors on the charger.

6. Install the indicator lamp on the enclosure.

The indicator lamp can be found at the end of two long cables extending from the charger circuit board. The cables are attached to the lamp with fast-on tab connectors.

- Pull the tab connectors off the lamp to free it from the cable ends.
- Insert the lamp through the 13 mm (1/2 in) diameter hole on the breaker plate, with its lens facing toward the front of the cabinet. Snap into position.
- Route the previously disconnected cables back to the lamp and reconnect.

7. Connect AC power cables to the charger.

Check to make sure the AC input circuit uses the same voltage as selected in step 1 on page 26. Also make sure the circuit is able to meet the necessary current rating.



See also

Refer to the specifications provided with the charger.



De-energize the AC circuit before making any power connections to the charger.

- Run the input cables into the battery enclosure using the most convenient access points. Refer to “Cable access” on page 5.
- Connect these cables to the two terminals marked “AC INPUT” on the charger terminal block. Refer to the step 1 graphic on page 26 for proper termination points. Torque both connections to 0.8 Nm (7.1 lb-in).

8. Verify the electrical connections.

Once all connections have been made, re-energize the AC input circuit to the charger.

- The indicator lamp should light within a few seconds after power up.
- Use a voltmeter to measure battery voltage. The reading should be higher than the open circuit value measured in Step 4 on page 27, and should continue to rise. It will stop rising when it reaches the float voltage setting provided on page 32.



Note

The actual value may vary slightly due to the temperature compensation of the charger. If the voltage varies greatly from the setting provided in the charger specifications, contact APC for assistance.



Refer to the contact list on the back cover of this manual.

9. Switch the battery breaker ON.

To place the battery enclosure in service, switch ON (close) the DC circuit breaker.

System Startup

Start-up Procedure

1. Make certain the DC circuit breaker in all battery enclosures is OFF (open).



Note

If using multiple battery enclosures with optional SLBC1000 chargers, the “charging” light on one or more of these enclosures may go out when the batteries are fully charged. This should NOT be considered a problem, unless all charging lights go out or a light fails to turn on after the batteries have been discharged.

2. Using a voltmeter, measure the voltage at the terminal blocks of each battery enclosure in accordance with steps 2 and 3 starting on page 21.
3. Once the voltages are satisfactory, switch the DC circuit breaker(s) ON (closed).
4. If the optional SLBC1000 charger is used in one or more battery enclosures, follow all start-up procedures relating to the charger. If not, proceed to step 5.



See also

Refer to the instructions provided with the charger.



Note

Startup of the charger(s) must take place before start-up of the Symmetra PX80 UPS.

5. Start the UPS.



See also

Refer to the start-up instructions provided with the UPS. Refer specifically to start-up instructions in instances when the UPS is using external batteries.

6. After completing startup, close all the battery enclosures:
 - Re-attach the rear panel and secure it with previously removed bolts.
 - Close and bolt in place the breaker plate on the XRL enclosure(s).
 - Close and lock the front door.

Specifications

System Specifications

Power specifications

| UPS Power Rating | | | Battery System | | | |
|---------------------|------------|----|----------------|----------------|--------------------------|--------------------------|
| kW | kVA | pf | VDC [V] | Full Load [kW] | IDC [A] | IDC [A] |
| | | | Nominal (1) | Power (2) | Discharge Nominal (3) | Discharge Maximum (4) |
| 50 | 50 | 1 | 2 x 192 | 53.0 | 138.6 | 166.3 |
| 50 (n + 1) | 50 (n + 1) | 1 | 2 x 192 | 53.0 | 138.6 | 166.3 |
| 60 | 60 | 1 | 2 x 192 | 63.4 | 166.2 | 199.4 |
| 60 (n + 1) | 60 (n + 1) | 1 | 2 x 192 | 63.4 | 166.2 | 199.4 |
| 70 | 70 | 1 | 2 x 192 | 74.0 | 194.5 | 233.4 |
| 70 (n + 1) | 70 (n + 1) | 1 | 2 x 192 | 74.0 | 194.5 | 233.4 |
| 80 | 80 | 1 | 2 x 192 | 84.6 | 222.8 | 262.4 |
| 80 (n + 1) | 80 (n + 1) | 1 | 2 x 192 | 84.6 | 222.8 | 262.4 |

(1) Nominal battery voltage assumed to be 2 V/cell (lead technology).

(2) Battery power takes into account the DC-AC efficiency of the main inverter for linear load.

(3) Battery nominal discharge current is based on nominal cell voltage of 2 V/cell (or a total voltage of 2 x 192 V).

(4) Battery maximum discharge current is based on cell end voltage of 1.67 V/cell (or a total end voltage of 2 x 160 V).

| UPS kW Rating | Battery kW Rating | Nominal Current | Maximum Current | Float Voltage* | Open Circuit Voltage* | End Voltage* |
|------------------|----------------------|--------------------|--------------------|-------------------|--------------------------|-----------------|
| 50 | 56.2 | 146.2 | 177.2 | 216-220.8 | 198.4-206.4 | 168 |
| 55 | 61.8 | 160.9 | 183.9 | 216-220.8 | 198.4-206.4 | 168 |
| 60 | 67.5 | 175.6 | 200.6 | 216-220.8 | 198.4-206.4 | 168 |
| 65 | 73.0 | 190.2 | 217.3 | 216-220.8 | 198.4-206.4 | 168 |
| 70 | 78.6 | 204.8 | 234.0 | 216-220.8 | 198.4-206.4 | 168 |
| 75 | 84.3 | 219.4 | 250.8 | 216-220.8 | 198.4-206.4 | 168 |
| 80 | 89.9 | 234.0 | 267.6 | 216-220.8 | 198.4-206.4 | 168 |

* Voltage is measured in half strings from the midpoint to the positive and negative terminals.

UPS

| | |
|----------------|-------------------|
| Input Voltage: | 200 V/208 V/400 V |
|----------------|-------------------|

Battery

| | |
|-------------------------------|--|
| Nominal Voltage: | +/- 192 VDC |
| Float Voltage: | +/- 219 VDC |
| Boost Charge Voltage: | n/a |
| End of Discharge Voltage (1): | +/- 160 VDC |
| Temperature Compensation: | -320 mV per degrees C for T > 25° C 0mV per degrees C for T < 25° C |
| Battery Charging (2): | 8 kW |
| Battery Charging (3): | 9 kW |

(1) May be higher or less than full load.

(2) N system = 8 power modules. May drop to lower values at low AC Mains.

(3) N + 1 system = 9 power modules. May drop to lower values at low AC Mains.

SLBC1000 charger specifications

SLBC1000 Charger

| | |
|---------------------------------|-------------------|
| Weight: | 68.2 Kg [150 lbs] |
| Height*: | 178 mm [7 in] |
| Width*: | 730 mm [28.75 in] |
| Depth*: | 444 mm [17.5 in] |
| Float Voltage: | 441.6 VDC |
| Max DC Current: | 5 Amps |
| Max AC Current (208 VAC): | 18.7 Amps |
| Max AC Current (220 VAC): | 16.8 Amps |
| Max AC Current (230 VAC): | 16.6 Amps |
| Max AC Current (240 VAC): | 16.3 Amps |
| Heat Output (at max current): | 900 BTU |
| Heat Output (at float current): | 40 BTU |

* Dimensions are based on charger laying flat on its back.

Battery run times

The chart below contains general approximations (in minutes) of battery run times* for the *SLB80XRL*, *SLB80XR*, and *SLB80XR-E* battery enclosures. These approximations are based on using from one to six enclosures containing the specified batteries.



Refer to “Enclosures” on page 5.



Note

Be aware that battery run time can be affected by environmental conditions and the age of the batteries.

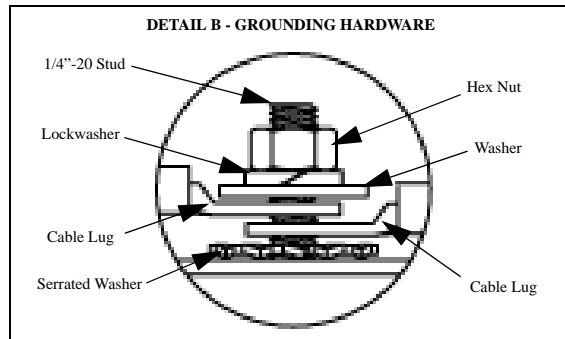
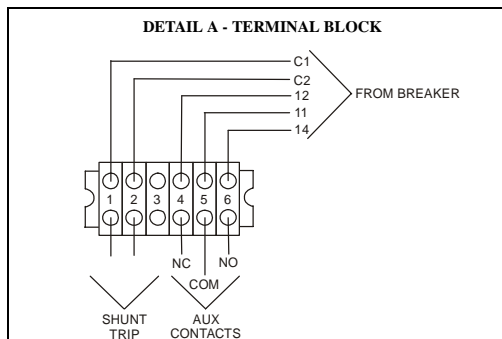
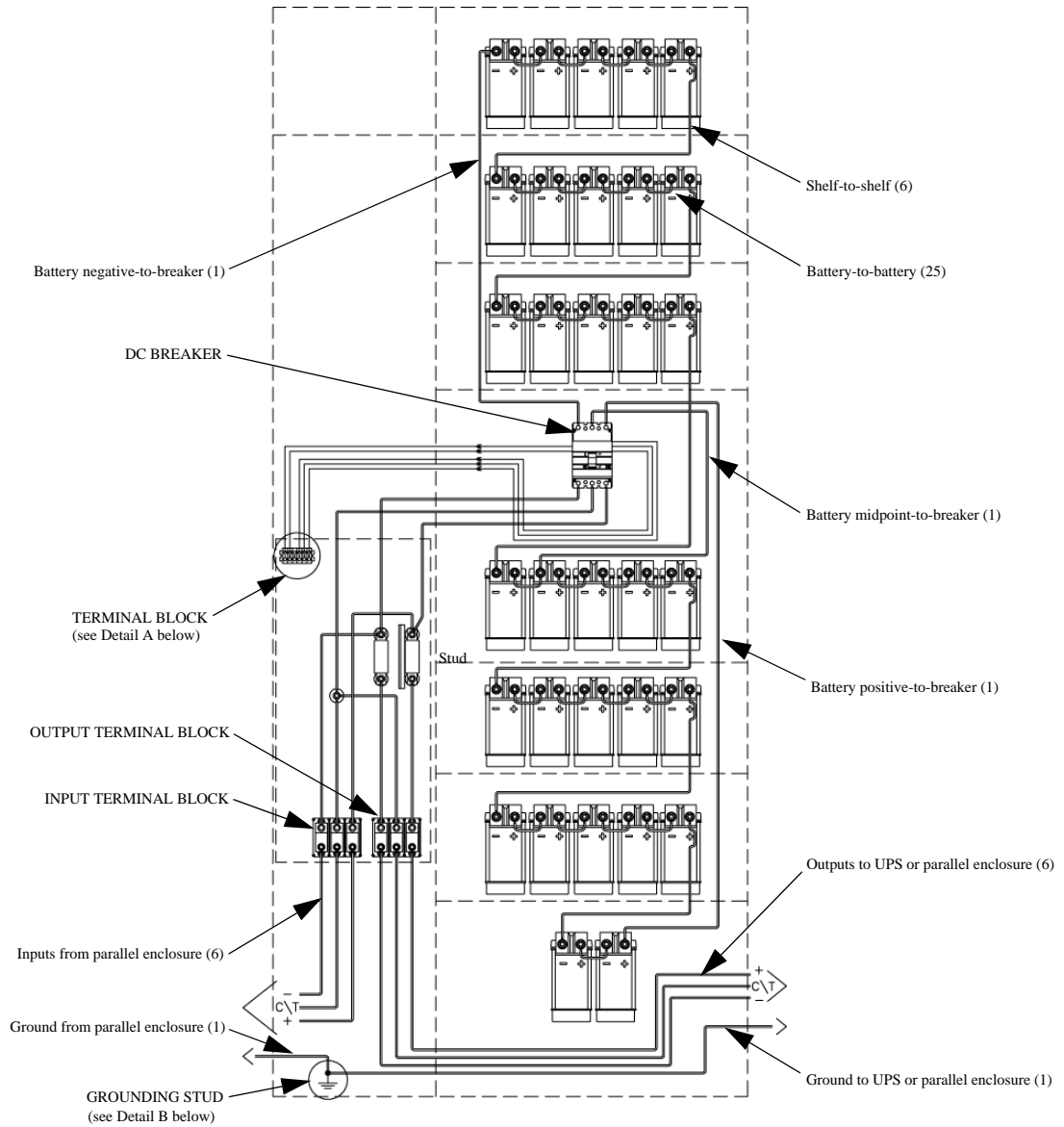
Number of XRL, XR, or XR-E Battery Enclosures

| UPS kW Rating | Battery kW Rating | 1 | 2 | 3 | 4 | 5 | 6 |
|--------------------------|------------------------------|----------|----------|----------|----------|----------|----------|
| 50 | 56.2 | 15 | 42 | 72 | 107 | 145 | 180 |
| 55 | 61.8 | 13 | 37 | 64 | 93 | 129 | 162 |
| 60 | 67.5 | 11 | 33 | 57 | 83 | 114 | 150 |
| 65 | 73.0 | 10 | 30 | 51 | 74 | 100 | 135 |
| 70 | 78.6 | 8 | 27 | 46 | 67 | 91 | 120 |
| 75 | 84.3 | 7 | 24 | 42 | 62 | 83 | 105 |
| 80 | 89.9 | 6 | 22 | 39 | 57 | 76 | 95 |

* Run times do not include any existing battery modules in the UPS.

Appendix A: SLB80XRL Electrical

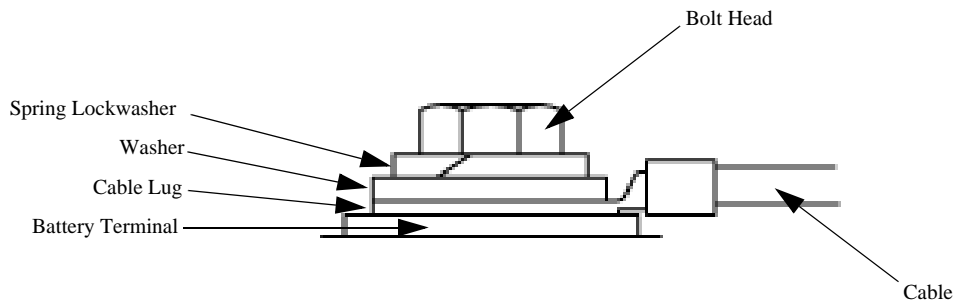
Wiring Diagram



Cabling

Battery terminals

The batteries in the *SLB80XRL* contain “insert” terminals. Cable lugs are secured to this type of terminal by inserting a bolt into a hole. Moving away from the battery, the hardware is placed in this order over the hole: cable lug, washer, spring lockwasher, and bolt.



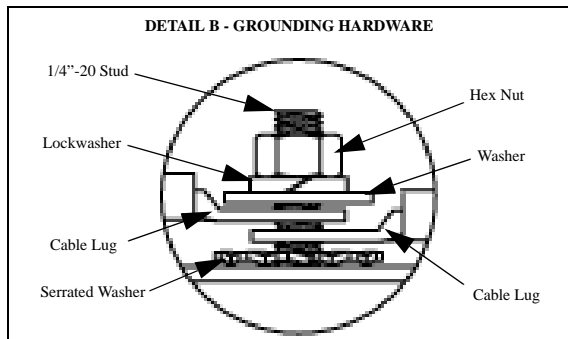
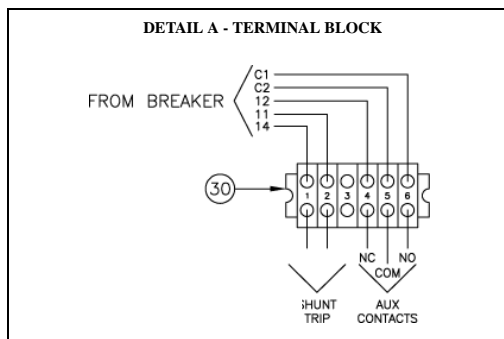
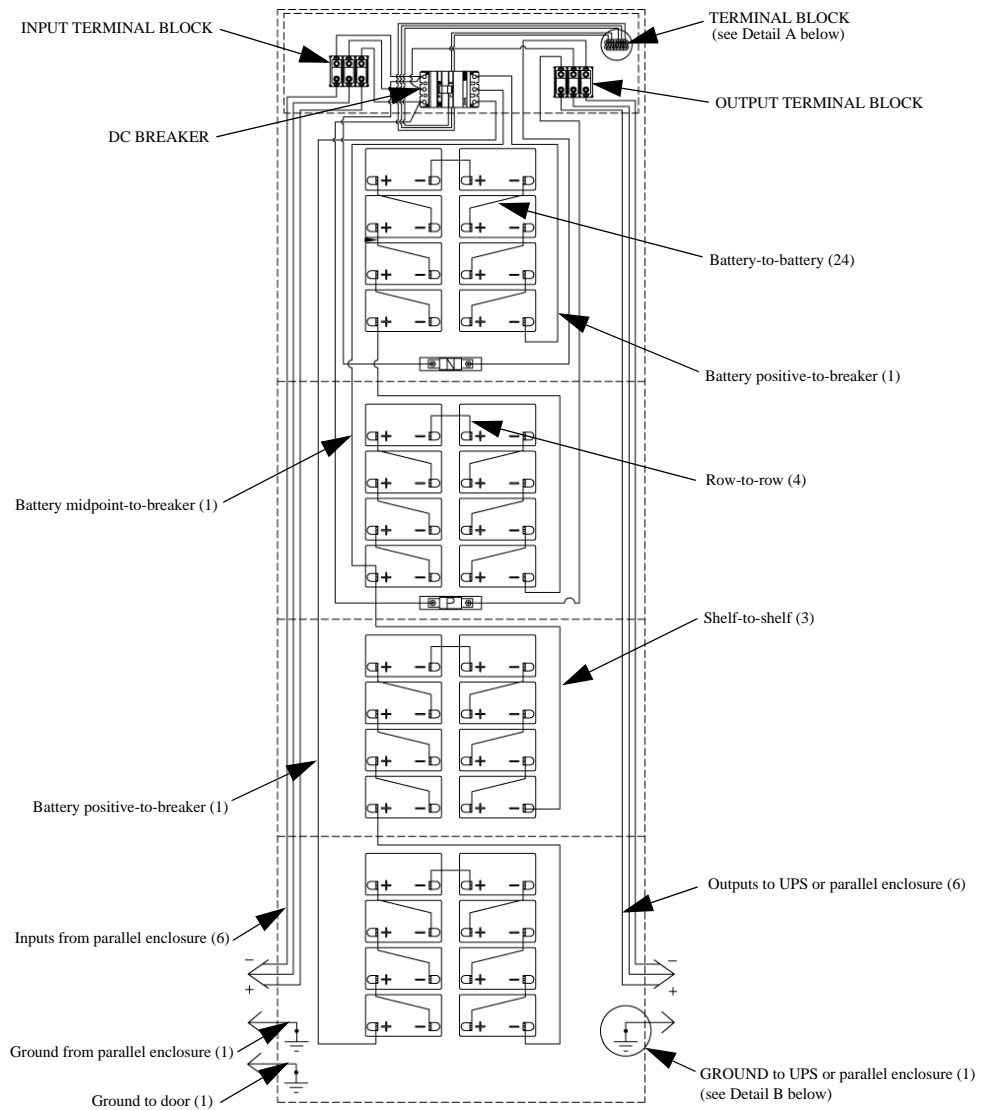
Cable connections

All recommended cable gauges are based on NEC Table 310-16 using 75°C cable.

| Connection | No. | Cable | Length |
|--|-----|-----------------------------|-----------------|
| Battery-to-Battery | 25 | 35 mm ² [2 ga] | 152 mm [6 in] |
| Shelf-to-Shelf | 6 | 35 mm ² [2 ga] | 889 mm [35 in] |
| Battery Midpoint-to-Breaker | 1 | 35 mm ² [2 ga] | 1143 mm [45 in] |
| Battery Positive-to-Breaker | 1 | 35 mm ² [2 ga] | 1778 mm [70 in] |
| Battery Negative-to-Breaker | 1 | 35 mm ² [2 ga] | 1524 mm [60 in] |
| Parallel Cabinet-to-Input Terminal Block | 6 | 70 mm ² [2/0 ga] | 1524 mm [60 in] |
| Output Terminal Block-to-UPS or Parallel Enclosure | 6 | 70 mm ² [2/0 ga] | 1524 mm [60 in] |
| Ground from Parallel Enclosure | 1 | 45 mm ² [1 ga] | 762 mm [30 in] |
| Ground to UPS or Parallel Enclosure | 1 | 45 mm ² [1 ga] | 762 mm [30 in] |

Appendix B: SLB80XR/SLB80XR-E Electrical

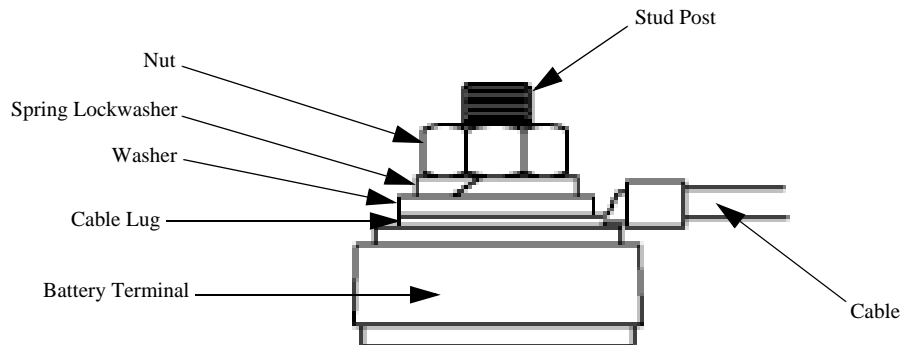
Wiring Diagram



Cabling

Battery Terminals

The batteries in the *SLB80XR* and *SLB80XR-E* contain “stud” terminals. Cable lugs are secured to this type of terminal by screwing a nut onto a stud. Moving away from the battery, the hardware is placed in this order on the stud: cable lug, washer, spring lockwasher, and nut.



Cable connections

All recommended cable gauges are based on NEC Table 310-16 using 75°C cable.

| Connection | No. | Cable | Length |
|--|-----|-----------------------------|------------------|
| Battery-to-Battery | 24 | 35 mm ² [2 ga] | 305 mm [12 in] |
| Row-to-Row | 4 | 35 mm ² [2 ga] | 254 mm [10 in] |
| Shelf-to-Shelf | 3 | 35 mm ² [2 ga] | 1143 mm [45 in] |
| Battery Midpoint-to-Breaker | 1 | 35 mm ² [2 ga] | 1524 mm [60 in] |
| Battery Positive-to-Breaker | 1 | 35 mm ² [2 ga] | 2794 mm [110 in] |
| Battery Negative-to-Breaker | 1 | 35 mm ² [2 ga] | 889 mm [35 in] |
| Parallel Cabinet-to-Input Terminal Block | 6 | 70 mm ² [2/0 ga] | 3810 mm [150 in] |
| Output Terminal Block-to-UPS or Parallel Enclosure | 6 | 70 mm ² [2/0 ga] | 3810 mm [150 in] |
| Ground to Front Door | 1 | 35 mm ² [6 ga] | 889 mm [35 in] |
| Ground from Parallel Enclosure | 1 | 35 mm ² [6 ga] | 1778 mm [70 in] |
| Ground to UPS or Parallel Enclosure | 1 | 35 mm ² [6 ga] | 1778 mm [70 in] |

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