# Field Replacement of Internal Batteries in FERRUPS FE/QFE 1.8 - 3.1 KVA Units

This Technical Information Publication describes the procedure for replacing the batteries in FERRUPS FE 1.8 - 3.1 KVA units. A qualified technician, who is familiar with the FERRUPS unit, must install the batteries. If you encounter any problems during this procedure, contact BEST's Technical Support Center at 1-800-356-5737.

**Tools Needed — Use Insulated Tools:**

| | | |
|---|---|---|
| Phillips Screwdriver | Standard Screwdriver | Digital Voltmeter |
| 7/16 in. Open-end Wrench | 3/8 in. Open-end Wrench | Electrical Tape |
| Torque Wrench | Petroleum Jelly or Battery Terminal Spray | |

**WARNING!**

These procedures must be performed by a qualified service technician ONLY!
UPS units are designed to provide power under a variety of operating conditions.
Dangerous voltages may be present even if AC line or DC voltage is removed.
**TEST BEFORE TOUCHING!**
UPS batteries are high current sources. Shorting battery terminals can cause severe arcing, equipment damage and injury. A short circuit can cause a battery to explode. Always wear protective clothing and eye protection and use insulated tools when working near batteries.

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## IMPORTANT SAFETY INSTRUCTIONS - SAVE THESE INSTRUCTIONS

### WARNING!

Full voltage and current are always present at the battery terminals. The batteries used in this system can produce dangerous voltages, extremely high currents and a risk of electric shock. Batteries may cause severe injury if the terminals are shorted together or to ground (earth). You must be extremely careful to avoid electric shock and burn caused by contacting battery terminals or shorting terminals during battery installation. Do not touch uninsulated battery terminals.

A qualified electrician who is familiar with battery systems and required precautions must install and service the batteries. Any battery used with this UPS shall comply with the applicable requirements for batteries in the standard for emergency light and power equipment, UL 924. Cabinets are designed to be used with, and batteries must be replaced with, BEST battery number BA-XX or equivalent. The installation must conform to national and local codes as well. Keep unauthorized personnel away from batteries.

The electrician must take these precautions:

1. Wear protective clothing and eye wear. For 120-volt battery systems, wear rubber gloves and boots. Batteries contain caustic acids and toxic materials and can rupture or leak if mistreated. Remove rings and metal wristwatches or other metal objects and jewelry. Don't carry metal objects in your pockets where the objects can fall into the battery cabinet.

2. Tools must have insulated handles and must be insulated so that they will not short battery terminals. Do not allow a tool to short a battery terminal to another battery terminal or to the cabinet at any time. Do not lay tools or metal parts on top of the batteries, and do not lay them where they could fall onto the batteries or into the cabinet.

3. Install the batteries as shown on the drawing provided with the batteries. When connecting cables, never allow a cable to short across a battery's terminals, the string of batteries, or to the cabinet.

4. Align the cables on the battery terminals so that the cable lug will not contact any part of the cabinet even if the battery is moved. Keep the cable away from any sharp metal objects.

5. Install the battery cables so they cannot be pinched by the battery cabinet or UPS doors.

6. Make sure the fuse is positioned so that it will not contact any cabinet parts or other battery posts if the batteries should move. Make sure that there is enough clearance when the cabinet door closes.

7. Battery cabinet chassis ( ground or earth) must be connected to the UPS chassis (ground or earth). If you use conduit, this ground conductor must be routed in the same conduit as the battery conductors.

8. Where conductors may be exposed to physical damage, protect the conductors in accordance with NEC NFPA 70.

9. If you are replacing batteries or repairing battery connections, follow the procedure in the FERRUPS User Manual to shut off the UPS and remove both AC and DC power.

## Section 100: Removing the Cover

101. Power down all load equipment plugged into (or hard-wired to) the UPS.

102. Turn off the UPS. If it has an AC input plug, unplug it. If not, make sure the unit cannot receive AC power.

> **WARNING!**
>
> Make sure the ON/OFF switch on the back of the UPS is OFF, and that all AC and DC power to the unit is OFF.

103. Remove the grounding screw on top of the UPS. See Figure 1.

104. Next, locate the sticker in the lower right corner of the BEST logo on the front panel. Remove and save the sticker. Loosen (but not remove) the screw behind the sticker by turning it counter-clockwise for only 5 to 8 turns. Now, slide the cover forward until it is completely off the UPS.

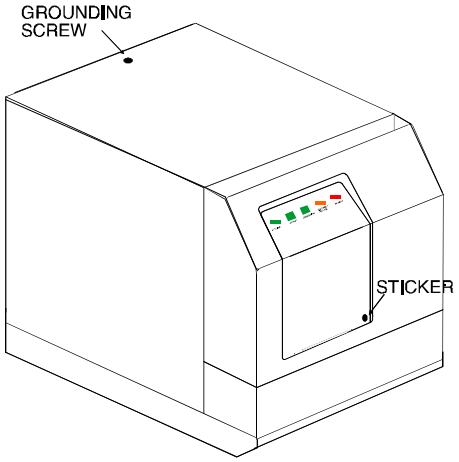


**Figure 1**

## Section 200: Before Installing the Batteries

**Caution:** A battery can present a risk of electrical shock and high short circuit current. A qualified electrician who is familiar with battery systems should service the batteries.

Review all of the safety instructions on page 2 before you replace any batteries; then follow the instructions below.

**Use the Same Number and Type of Battery.**

To ensure continued superior performance of your UPS and to maintain proper charger operation, you must replace the batteries in the UPS or its battery cabinets or racks with the same number of batteries. These batteries must be the same type as the original batteries: valve-regulated, low maintenance. The replacement batteries should have the same voltage and ampere hour rating as the original batteries.

**Do You Need to Remove Ground from the Battery Terminal?**

If your local or national code requires you to ground either battery terminal, remove the connection from the terminal to ground (earth) before you work on the batteries. If any battery terminal is inadvertently grounded, remove the source of the ground. Contacting any part of a grounded battery can cause a risk of electric shock. An electric shock will be less likely if you disconnect the grounding connection before you work on the batteries.

**Handle Used Batteries with Care!**

Assume that old batteries are fully charged. Use the same precautions you would use when handling a new battery. Do not short battery terminals or the battery string with a cable or tool when you disconnect the batteries! Batteries contain lead. Please dispose of old batteries properly. For help, call BEST's Technical Support Center at 1-800-356-5737 or call your local BEST office.

Caution: Do not dispose of batteries in a fire because the batteries could explode. Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.

**Dispose of Batteries Properly.**

Caution: Batteries contain lead. Many state and local governments have regulations about disposing of used batteries. Please dispose of the batteries properly. For held, call BEST's Technical Support at 1-800-356-5737 or your local BEST office.

## Section 300: Replacing Batteries with Less Than 50 Amp-Hour Capacity

**Note: Read the data tag (if available) on the battery to determine its capacity.**

301. Wrap both 7/16 in. wrenches in electrical tape to prevent them from arcing.

302. Refer to Figure 2. Disconnect the positive (+) battery cable from the main DC fuse on the right side of the unit. Disconnect the negative (-) battery cable from the batteries.

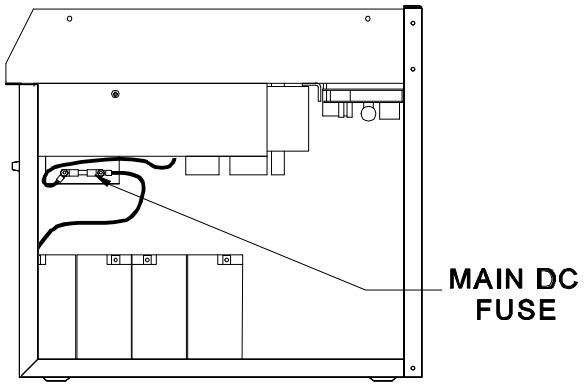


**Figure 2**

303. Remove all four batteries together; arrange the new batteries in same polarity layout. Relocate the cables to the new batteries; place the new batteries in the unit. Install the battery cables; tighten the bolts to 30-45 inch-pounds (3.4 - 5.09 Newton-meters). Observe proper battery polarity to avoid damage to the batteries and UPS. Refer to Figure 3 for cabling of batteries with less than 30 amp-hour capacity or Figure 4 for cabling of batteries with more than 30 amp-hour capacity.

Cabling of Batteries with Less Than 30 Amp-Hour Capacity.

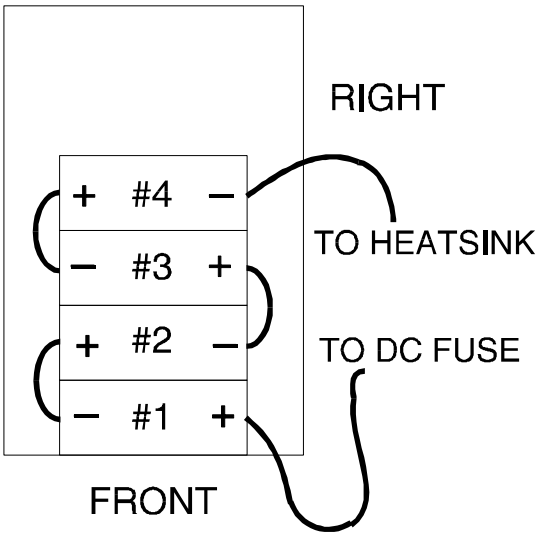


FIGURE 3

Cabling of Batteries with More Than 30 Amp-Hour Capacity.

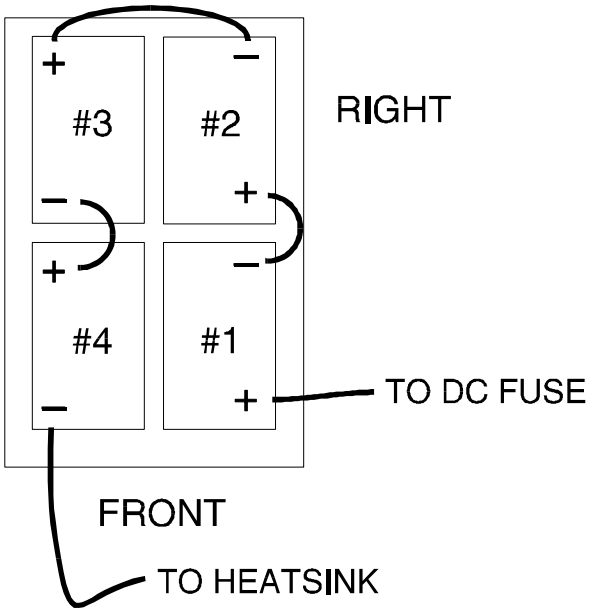


FIGURE 4

304. Connect the positive (+) battery cable to the positive (+) battery pack terminal and the negative (-) battery cable to the negative (-) battery pack terminal.

305. Replace all brackets.

306. Continue with Section 500.

## Section 400: Replacing Batteries with More Than 50 Amp-Hour Capacity

**Note: Read the data tag (if available) on the battery to determine its capacity.**

401. Wrap both 7/16 in. wrenches in electrical tape to prevent them from arcing. Refer to Figure 2 on page 4 in order to disconnect the positive (+) battery cable from the main DC fuse on the right side of the unit. Disconnect the rest of the battery cables.

402. Remove the nuts holding both of the battery straps across the batteries in place. Pry on the left edge of the cross-straps until they clear the bolts. This allows enough movement to remove the cross-straps.

403. Remove the battery perimeter bracket from the slots in the front of the unit and drop the bracket to the bottom of the unit.

**CAUTION: Do not allow the straps to short across the battery terminals.**

404. Remove the rear cross-strap from the unit. Slide the front cross-strap to the back of the unit then remove it in the same manner.

405. Refer to Figure 4. Locate the receptacle above battery #2 and disconnect the ground wire. Tip battery #2 out of the unit; then, slide battery #1 into the same position and remove it from the unit. Following the same procedure, remove battery #3 and then battery #4.

406. Install the replacement batteries in the following order: #4, #3, #1, #2 (reverse order of step 405).

407. Reconnect the ground wire you disconnected in step 405.

**CAUTION: Do not allow the straps to short across the battery terminals.**

408. Replace the cross-straps across the batteries.

409. Insert the perimeter bracket into the slots in the front of the unit. Install the cross-straps and secure them with the nuts on the left side of unit. Push down on the right side of the cross-straps until they slip over the bolts on the perimeter bracket. Secure with the nuts that were removed in step 402.

**Note:** If you have difficulty getting the straps in place, verify that the notch on the perimeter bracket (back edge) is aligned into the rear bracket, allowing enough elevation for the cross straps to reach the perimeter bracket. If you still have difficulty, bend the strap slightly out from the right side of the unit; then, push down on the strap at the top of the battery. This allows more movement in the cross-straps, allowing easier replacement.

410. Install the battery cables according to Figure 4 on page 5. Torque the bolts to 30-45 inch-pounds (3.4 - 5.09 Newton-meters). Observe the proper battery polarity to avoid damage to the batteries or the UPS.

411. Continue with Section 500.

## Section 500: Testing the Replacement Batteries

501. Use the voltmeter to measure DC voltage on battery cables to the heatsink. Your meter should indicate approximately 50VDC; if not, return to either step 304 or step 410 and verify all battery cable connections.

502. Apply petroleum jelly or battery terminal spray to all battery terminals to avoid corrosion.

## Section 600: Putting the Cover on the UPS

601. Slide the outer shell on the unit using the side rails on each side of the unit. Tighten the screw by the lower right corner of the BEST logo on the front panel. Replace the sticker you removed in step 104 over the top of this screw.

602. Replace the grounding screw at the top center rear of the unit.

603. Apply AC input voltage; switch the unit on. The UPS should have at least two green lights illuminated. Remove AC input power for one minute (so the unit will run on inverter). Reapply AC input voltage and verify that three green lights are illuminated. If you do not have three green lights, repeat this step. If the problem continues, contact BEST's Technical Support Center at 1-800-356-5737 for assistance.

604. Connect all load equipment and return the UPS to normal operation.