

C4

EMERGENCY RESCUE DEVICE

VERSION 5.1

Document History

Date	Version	Summary of Changes
June 7, 2021	5.1	Deleted the doors close and working buttons from Sequence of Operation
March 30, 2021	5.0	Added the EGS002 board and LED warning status Added Troubleshooting section Updated Internal Wiring diagram
April 17, 2020	4.0	Added O3 signal information
April 8, 2020	3.0	Added additional caution statements Added additional safety information Added graphics to removal replacement procedure
March 19, 2020	2.0	Deleted parameter section Added removal and replacement procedure Added sequence of operation Added safety instructions
February 25, 2020	1.0	Initial Submittal

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1 Emergency Rescue Device

The Smartrise Emergency Rescue Device (ERD) is an emergency battery backup power supply that continuously monitors the mainline for power loss. If power loss is detected, the ERD disconnects the mainline from the elevator and generates enough power to move the elevator to the nearest floor (in the direction it is selected to run) and opens the door to rescue people.

The ERD consists of two contactors.

- **P** – This contactor is always picked during normal operation of the elevator. As soon as power loss is detected, the contactor opens to isolate the elevator from the mainline.
- **Q** – This contactor only picks during the rescue operation when the P contactor is open.

The ERD communicates with the elevator controller by means of three discrete signals.

- **O3** – When in rescue mode, a UPS mode output signal is sent from the controller to the drive to acknowledge the system is in rescue mode.
NOTE: O3 and O2 pick at the same time.
- **O2** – When a power loss is detected, a signal is sent to the controller that the rescue process has started.
- **O1** – When a fault has occurred, a signal is sent to the controller notifying about the fault.

The ERD is equipped with the mainline disconnect safety feature. When the main line disconnect switch (provided separately) is off, SF1-SF2 is open and the device does not activate.



Figure 1: Emergency Rescue Device

The batteries within the ERD must be charged for the ERD to operate. In order for the batteries to charge, the ERD switch must be set to 1 (ON).

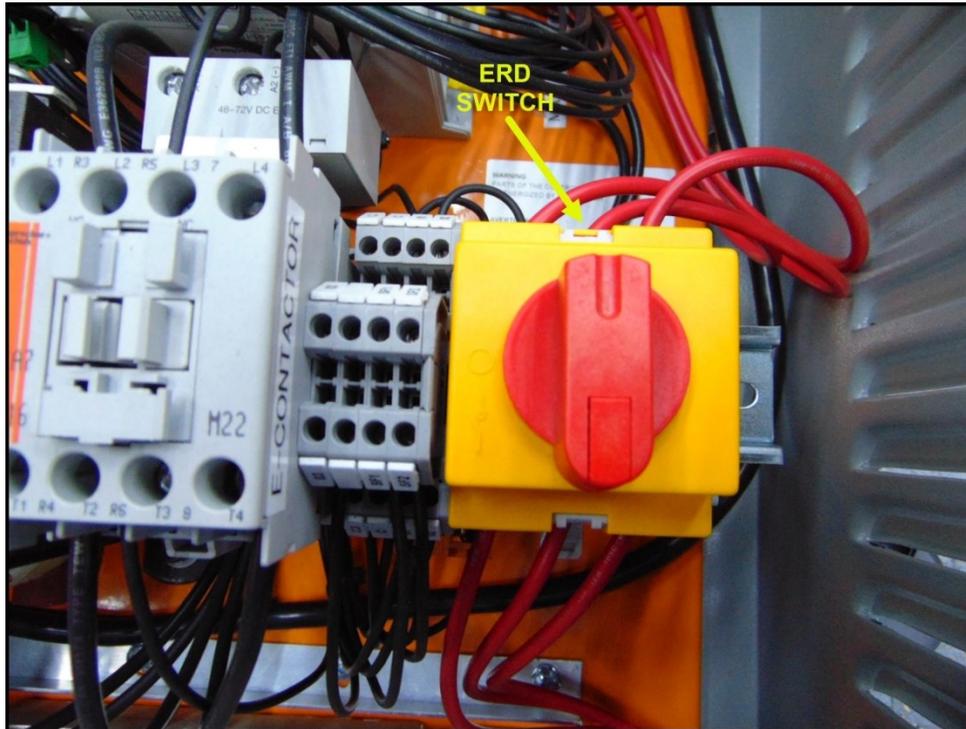


Figure 2: Power Switch

2 Components

The ERD consists of the following:

High Power (HP) Board – The HP board is the power controller. Powered by a battery, the power goes through a two-stage inverter on the HP board. The first stage converts the battery DC voltage to High Voltage DC (HVDC). The second stage converts the HVDC to 240 VAC. The AC voltage can be adjusted via a potentiometer.

EGS002 – The EGS002 plugs into the HP board. The red LED blinks in cycles to display if the ERD is functionally properly or if a failure has occurred.

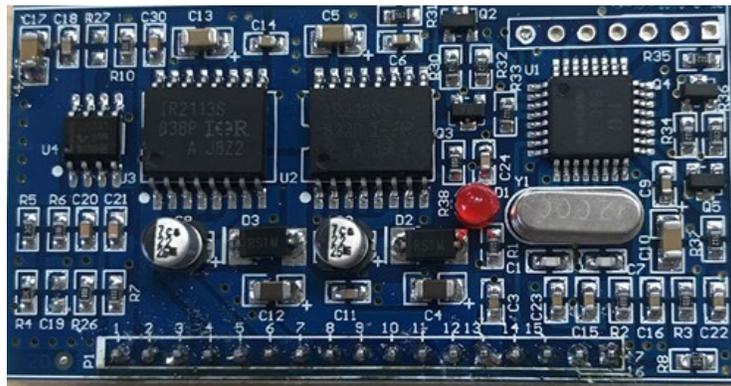


Figure 3: EGS002 Board

LED warning display:

Normal:	
Over current:	
Over voltage:	
Below voltage:	
Over temperature:	

Figure 4: EGS002 Red LED Warning Display

Low Power (LP) Board – The LP board is the logic controller that contains a power monitor, battery charge circuits, and operational control processor. The LP board controls the HP board by monitoring line voltages and turns the HP board on when interrupted to generate 240 VAC. It also charges and tests the batteries and controls the fan when heatsink temperature rises.

Battery Disconnect Switch

- Has lockable handle

Contactors – There are two contactors.

- P: 48 VAC coil
- Q: 48 VDC coil

Transformers – There are two transformers.

- Step-up transformer
- Step-down transformer

Battery Test Resistor

- Resistance: 16.0 OHM
- Power: 200 W

Enclosure and Heatsink

- Custom-made

Battery

- Battery Type: Power Sonic PS-12200NB
- Number of batteries: 4 (connected in series)
- Nominal voltage of total battery string: 48V
- Nominal capacity of total battery string: 20AH

3 Wiring

The following sections show the internal and external ERD wiring.

3.1 Internal Wiring

Step-Up Transformer – The primary side is connected to the output of the HP board. The secondary side of the transformer is configured in series or parallel according to the mainline voltage and connects to isolating contactor Q. The secondary side of the transformer is configured as follows:

- For 208 VAC and 240 VAC mainlines, the secondary side of the transformer is in parallel.
- For 480 VAC mainlines, the secondary side of the transformer is in series.

Step-Down Transformer – The primary side is connected to the mainline and configured in series or parallel according to the mainline voltage. The secondary side is 60VAC (need a \pm) and is used to charge the batteries through the battery charger circuit. The primary side of the transformer is configured as follows:

- For 208 VAC and 240 VAC main lines, the primary side of the transformer is parallel.
- For 480 VAC mainlines, the primary side of the transformer is in series.
- The primary side of the transformer connects to the L1, L2 mainline, and the secondary side connects to the board.

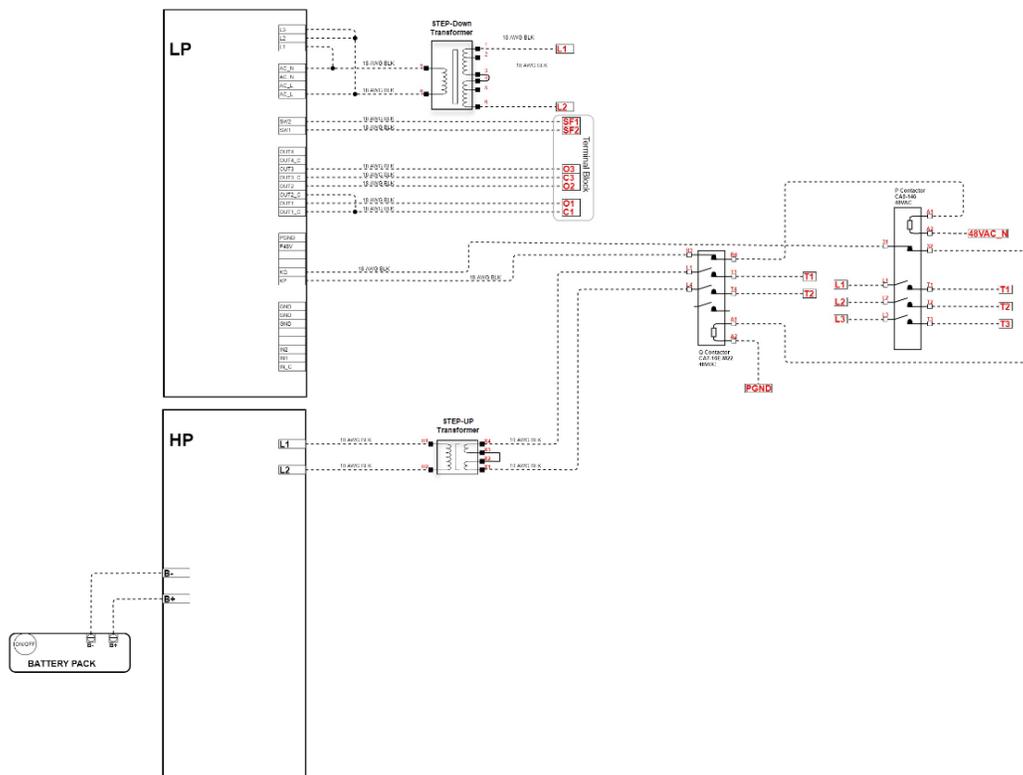


Figure 5: ERD Internal Wiring

3.2 External Wiring

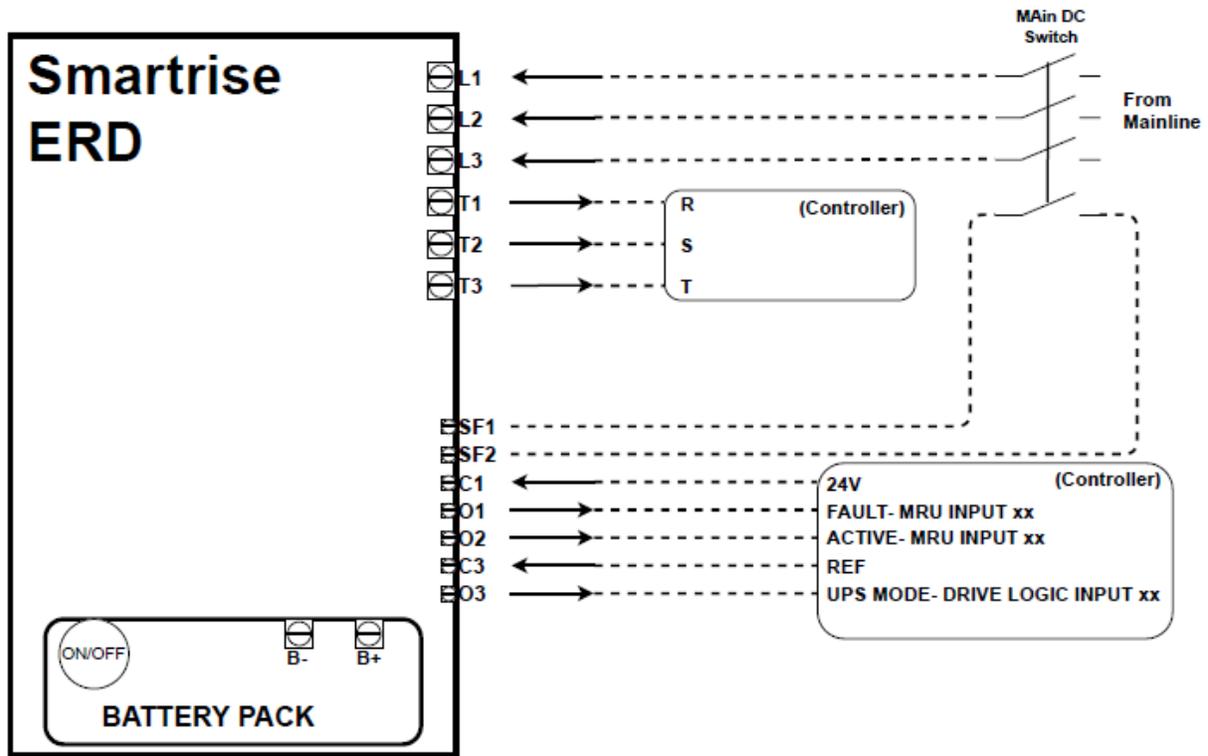


Figure 6: ERD External Wiring

CAUTION: To reduce the risk of fire, connect only to a circuit provided with 140 amperes maximum allowable branch circuit overcurrent protection in accordance with the National Electrical Code, ANSI/NFPA 70. The ERD shall be connected only to a dedicated branch circuit.

4 Layout

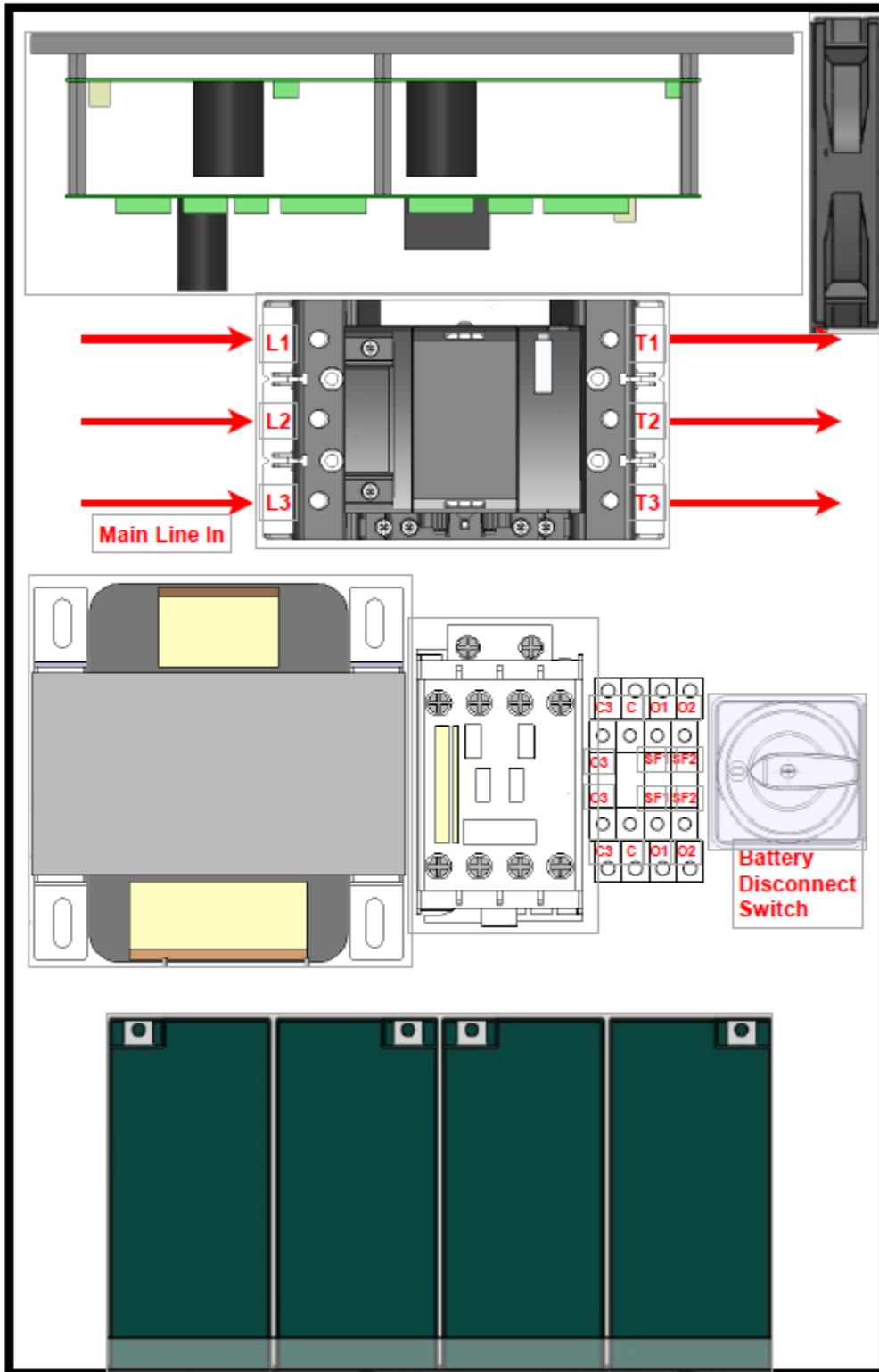


Figure 7: ERD Layout

5 Sequence of Operation

The following is the sequence the ERD follows:

- The ERD will constantly monitor the mainline and activate as soon as it detects a power loss.
- When a power loss is detected, the O2 and O3 output will turn on and send a signal to the controller and drive that the ERD is going to start.
- After two seconds, the P contactor will drop, and isolate the elevator from the mainline.
- After two seconds, the Q contactor will pick, and connects the controller to the ERD.
- After 10 seconds, the ERD starts outputting enough power to move the car.
- The controller knows which direction to move and starts moving in the easiest moving direction.
- As soon as the car reaches the floor level and opens the door, the controller will go to idle mode.
- After 15 minutes, the ERD will cut the power from the controller and waits for the mainline to be restored.
- When the mainline is restored, the P contactor will pick, the Q contactor will drop, and the O2 and O3 output will turn off.
- The ERD will go into idle mode and continue charging the batteries.

6 Safety

Safety precautions must be taken when removing and replacing batteries.

CAUTION: Risk of explosion if a battery is replaced by an incorrect type.

CAUTION: A battery can present a risk of electrical shock and high short-circuit current.

CAUTION: Do not disconnect the battery when the battery is under a load condition.

IMPORTANT SAFETY INSTRUCTIONS The following precautions should be observed when working on batteries. **SAVE THESE INSTRUCTIONS**

1. **SAVE THESE INSTRUCTIONS** - This manual contains important instructions that shall be followed during installation and maintenance of the inverter.
2. Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions.
3. Remove watches, rings, or other metal objects.
4. Use tools with insulated handles.
5. Wear rubber gloves and boots.
6. Do not lay tools or metal parts on top of batteries.
7. Disconnect charging source prior to connecting or disconnecting battery terminals.
8. Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance.
9. When replacing batteries, replace with a sealed lead acid battery, rated at 12 VDC each.
10. Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes and may be toxic.

Maximum ambient temperature rating: **104°F or 40°C. Intended for a controlled environment.**

For use in restricted access locations only.

A 4-pole main line disconnect switch or auxiliary dry contact must be provided and installed.

6.1 Disposal

Dispose used batteries according to the instructions of your local codes.

CAUTION: Do not dispose of batteries in a fire. The batteries may explode.

7 Battery Removal and Replacement

This section contains important instructions that shall be followed during installation and maintenance of the ERD unit.

NOTE: Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions.

The batteries used in the ERD are rechargeable but eventually, a battery needs to be replaced.

Batteries must be replaced with **Power Sonic PS-12200NB** or equivalent.

WARNING: Damage to equipment may result if the polarity of the battery terminals are reversed.

CAUTION: Risk of explosion if battery is replaced by an incorrect type.

CAUTION: Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes and may be toxic.

The following procedure describes how to remove and replace a battery.

1. Disconnect main power to the ERD.
2. Open the ERD cabinet.
3. Turn off the battery disconnect switch.

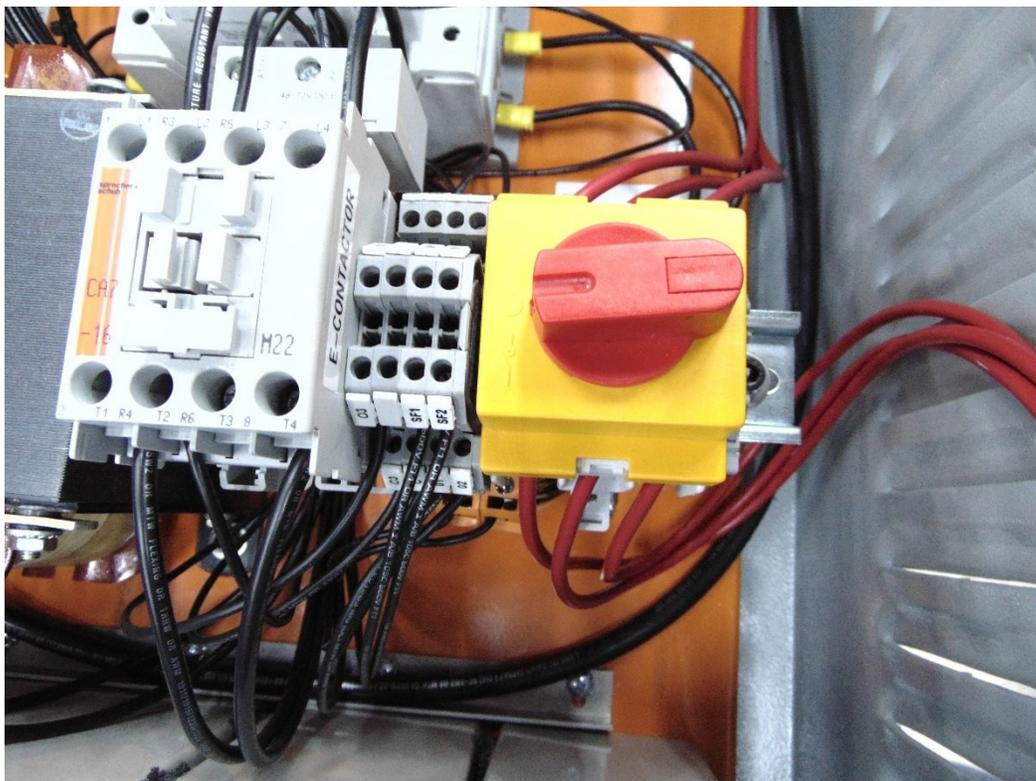


Figure 8: Battery Disconnect Switch – Off

4. Remove screws, lock washers, washers, and nuts from the power and ground cables.



Figure 9: Remove Power and Ground Cable

5. Move the battery power and ground cables up and away from the set of batteries and side of cabinet.

CAUTION: Risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the instructions.

6. Remove screws and bus bar from both sides of the batteries.



Figure 10: Bus Bar Connecting Both Sides of Batteries

7. Remove nuts, lock washers, and washers on top bracket.



Figure 11: Top Bracket

8. Remove top bracket from the top of the batteries.
9. Pull the side with the bad battery out of the cabinet.
10. Remove screws and bus bar holding the two batteries together.



Figure 12: Bus Bar Holding Two Batteries

11. Remove and replace the bad battery.
12. Attach 2 strips of foam on the battery if the old battery that was replaced had foam.



Figure 13: Battery Replacement

13. Install screws and bus bar holding the side with the replacement battery and secure the bus bar.
14. Install the side of the batteries back inside the cabinet.
15. Install top bracket on the screws attached to the cabinet.
16. Install washers, lock washers, and nuts on the top bracket and secure the bracket.
17. Install screws and bus bar holding both sides of the batteries and secure the bus bar.
18. Place power and ground cables back in position on the batteries.
19. Install nuts, washers, lock washers, and screws and secure the battery power and ground cables.

20. Turn on the battery disconnect switch.

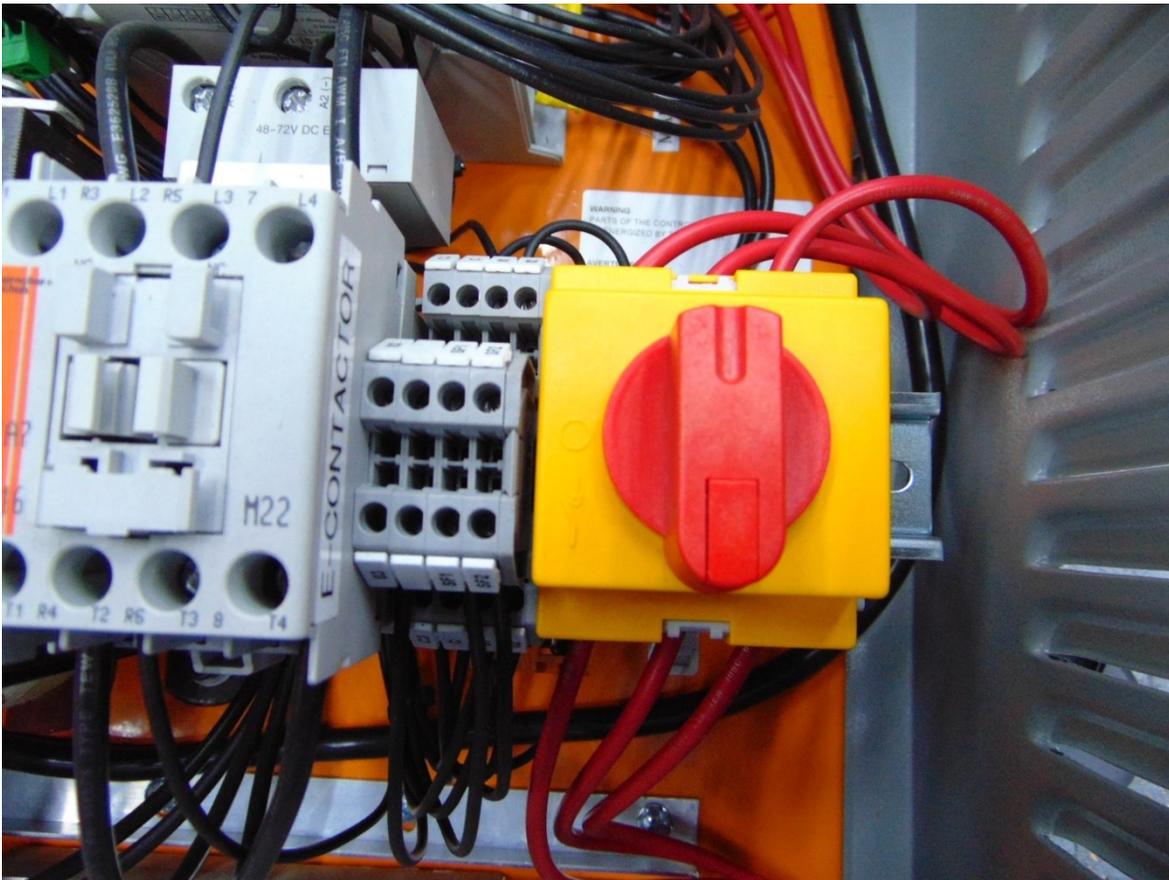


Figure 14: Battery Disconnect Switch – On

21. Close the ERD cabinet.
22. Restore power to the ERD.
23. Dispose bad battery according to local code.

8 Troubleshooting Tips

Perform the following if the controller is not powering on when the main line is disconnected:

- Check if ERD switch is ON.
- BAT+ and BAT- measured values needs to be ~48VDC.
- T1 and T2's measured value needs to be the same as the main line on the LP board.
- Monitor red LED blinking codes on EGS002 plug in board. See Figure 4.
- Check for controller 24 VDC on terminal C1.
- Check for proper battery connection.
- Check for proper incoming main line voltage.
- Check for proper outgoing wiring to control transformer.
- Check the 80A fuse has not blown.
- Check the 15A fuse has not blown.
- Verify the P contactor is open and the Q contactor is closed.

9 Specifications

The table below lists the ERD Power Rating.

Table 1: ERD Power Rating

Specification	Value
Charge Mode	
AC Input Voltage	208/240/480 VAC
Input Frequency	60 Hz
Input Current	350 mA/300 mA/150 mA max
DC Input (From External Battery Pack)	48 VDC nominal, 20 AH
DC Output (To External Battery Pack - Charge)	53 VDC nominal, 1.5 A max
AC Output Voltage	208/240/480 VAC
Output Frequency	60 Hz
Output Power	150 VA / 150 W
Inverter Mode	
DC Input (From External Battery Pack)	48 VDC nominal, 20 AH
DC Output (To External Battery Pack - Charge)	48 VDC nominal, 7 A max
AC Output Voltage	208, 240, 480 VAC
Output Frequency	60 Hz
Output Power	1.5KW

The table below lists the Physical Size and Weight.

Table 2: Physical Size and Weight

Size and Weight	Value
Size of Unit	15" x 12.5" x 14"
Weight of Unit	85 lbs
Weight of all Batteries	50 lbs