

FRONT TERMINAL BATTERY RACKS

EFR63 / EFR53 SERIES

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL



This manual provides instructions regarding safety, storage, installation, operation and maintenance. Failure to observe the precautions as presented may result in injury or loss of life.

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1. INTRODUCTION

ESS Front Terminal Battery Racks are shipped partially assembled, internally pre-wired and come with an optional over current breaker. Refer to the battery rack's layout drawings and schematics at the end of this manual. Consult the battery manufacturer's battery operation and maintenance manual for complete instructions.

These battery systems are Hi-Pot tested to UL 1778 standards at the factory prior to shipment. All system settings are also adjusted at this time according to the specification sheet. Sales support for future equipment or upgrades is provided by our sales staff and qualified representatives. All technical questions and service issues should be directed to our office 972-272-2468.

2. PRECAUTIONS

-  **It is very important to read, understand and follow the instructions in this manual. Also note all SAFETY PRECAUTIONS before beginning the installation of this system.**
-  **Consult the Battery Manufacturer's Operation and Maintenance Manual for important battery information.**
-  **Battery rack systems are very heavy. Total weight can exceed 7,000 lbs while single cabinets can weigh up to 4,000 lbs. Use at least 3 people when unloading and setting equipment in place.**
-  **It is imperative that only qualified personnel work on this system and installation, maintenance or upgrades be performed with insulated tools and equipment.**
-  **When installing this battery system, follow all applicable federal, state and local regulations and industry guidelines to insure a proper installation.**
-  **DC power and battery supplies are dangerous and have extremely high short circuit currents. Severe burns or death can result from a system short. They also can leak potentially explosive gas (hydrogen). Never enclose batteries or battery racks in a sealed air tight room.**
-  **All jewelry and watches must be removed prior to installing or servicing this system.**
-  **Do not smoke or present flame near or around any battery rack system.**
-  **Never leave a panel off or door open and unattended.**

3. INSPECTION UPON RECEIPT OF GOODS

3.1 General

Special precautions and care have been taken to ensure the rack system arrives safe and undamaged. However, upon receipt, you should inspect the entire shipment, including the crate and any boxes for evidence of damage that may have occurred during transit.



3.2 Visible Damage

It is the responsibility of the person receiving the shipment to inventory and fully inspect all materials against the bill of lading or way bill IMMEDIATELY, while the carrier representative is still present. Ensure that all items are accounted for, including number of skids and quantity of boxes. Also note any visible external damage that may have occurred during transit. Make all applicable notations on the delivery receipt before signing and file a damage report with the carrier.

3.3 Concealed Damage

Within 30 days of receipt, unpack the rack system and check for any concealed damage. Check the materials received against the detailed packing list to verify the quantity and the condition as complete and satisfactory.

Note any damage to the internal packaging, then request an inspection by the carrier and file a concealed damage claim. If there is a material shortage, contact ESS at the number listed at the end of this manual.

Please contact your shipping company for all shipping damage. ESS is not responsible for any shipping damage.

3.4 Return of Damaged Goods

A RMA number must be obtained before returning equipment to ESS. Please contact an ESS representative or call the corporate number listed at the end of this manual.

4. SYSTEM OVERVIEW

The enclosed rack systems provide the necessary DC backup power required in UPS applications. Over-current breaker/fuse protection is supplied. DC connections are front accessible and made via terminal blocks and/or mechanical lugs. Refer to the drawings and schematics at the end of this manual for these connections. Racks are equipped with 3-pole breakers. There are 2 holes per polarity on 300 Amp to 600 Amp breakers. Breakers 30 Amps to 250 Amps have a single hole per polarity. **See table below for standard output lug sizes of breakers.**

BREAKER SIZING						
BREAKER SIZE AMPS	30A	40A	50A	75A	100A	125A
A.I.C. RATING, 500DC	20,000 A.I.C	20,000 A.I.C	20,000 A.I.C	20,000 A.I.C	20,000 A.I.C	20,000 A.I.C
OUTPUT LUG SIZE	(1)#14-3/0	(1)#14-3/0	(1)#14-3/0	(1)#14-3/0	(1)#14-3/0	(1)#4-3/0
BREAKER SIZE AMPS	150A	175A	200A	225A	250A	300A
A.I.C. RATING, 500DC	20,000 A.I.C	20,000 A.I.C	20,000 A.I.C	20,000 A.I.C	20,000 A.I.C	20,000 A.I.C
OUTPUT LUG SIZE	(1)#4-4/0	(1)#4-4/0	(1)3/0-350	(1)3/0-350	(1)3/0-350	(2) 2/0-500
BREAKER SIZE AMPS	350A	400A	450A	500A	600	
A.I.C. RATING, 500DC	20,000 A.I.C	20,000 A.I.C	20,000 A.I.C	20,000 A.I.C	20,000 A.I.C	
OUTPUT LUG SIZE	(2) 2/0-500	(2) 2/0-500	(2) 2/0-500	(2) 2/0-500	(2) 2/0-500	

During normal conditions the UPS supplies the load power and the necessary power required to keep the batteries at the proper float voltage. Verify that the charger is set to charge parameters within the approved float voltage range of the batteries, refer to manufacturer's battery operation and maintenance manual.

When AC fails, the batteries discharge in order to provide the necessary backup power. It is the responsibility of the customer to make sure the batteries are not discharged below the battery manufacturer's recommendations. Always recharge batteries per manufacturer's battery operation and maintenance manual. Batteries will be damaged if not recharged right away. See the UPS or DC system manual for more information.



5. GENERAL SYSTEM SPECIFICATIONS

5.1 DC Output Characteristics

- **Voltage:** (UPS Application) 48 to 480 VDC Nominal
- **Breaker:** Standard
- **Fuse Type:** Not standard, consult factory. If a fuse is provided, it is only to be replaced by a factory service technician.

CAUTION! Fire Hazard Warning:
Replace only with same type and rating of fuses supplied with the system.

- **Wire Size and Type:** Per NEC and/or local building and electrical codes.
- **Disconnect:** If a fuse has been provided in lieu of a breaker inside the rack, a disconnecting method must be provided per NEC code. This may be a fuse switch or circuit breaker. Size accordingly.

5.2 Batteries

- **Type:** Valve Regulated Lead Acid (VRLA), sealed, non-spillable.
- **Voltage:** 12 Volt DC Nominal, Front Terminal Design.

5.3 Grounding

- All grounding should be derived from the main building ground source.
- **Note:** All rack systems require grounding.

5.4 Environmental Conditions

Breakers are located at the top of the Battery Rack. EFR5x racks have a maximum battery configuration of 8 wide by 5 tiers high. EFR4x racks have a maximum battery configuration of 8 wide by 4 tiers high.

Rack Dimensions:

EFR63, Top Breaker is 67.5" W x 27.1" D* x 84.0" H (Consists of one 4 x 6 and one 3 x 6 cabinets)
EFR53, Top Breaker is 76.0" W x 27.1" D* x 78.7" H (Consists of two 4 x 5 cabinets)

For mounting hole dimensions, please refer to the rack layout drawing at the end of this manual.



Max Rack Weights: (Assembled)

Reference the drawings in this manual for weights of racks.

- **Temperature:** Normal operating temperatures are between 68°F -77°F. **Note:** Batteries typically should be at 77°F for optimum battery life and performance.
- **Clearance:** A minimum of four inches is required in both the front and the rear of the Battery Rack. This refers to obstruction of ventilation only. Clearance around rack sides is suggested by NEC and local codes.

CAUTION! Explosion/Fire Hazard Warning:
Batteries can generate potentially explosive gas (hydrogen).
Never enclose batteries or battery racks in a sealed, airtight room.

6. INSTALLATION PRODEDURES

BEFORE PROCEEDING WITH INSTALLATION READ THE FOLLOWING:

6.1 Preparation

6.1.1 Necessary Equipment and Tools

- Rigging tools for moving Racks. Narrow pallet jack and forklift of 8,500 lbs. minimum capacity when moving fully loaded racks.
- Heavily insulated assortment of hand tools.
- Digital Voltmeter

6.1.2 Equipment Inspection

Remove the packaging material from the rack and inspect for any concealed shipping damage that may have been overlooked upon receipt of goods. Use the packing list to verify the system has all components and cables for installation.

6.1.3 Safety Precautions

DC VOLTAGE WARNING!
Hazardous DC Voltages are present in the battery rack. This hazard will always be present, even when the battery system is off-line. Accidental short circuit of the positive and negative terminals will cause tremendous currents to flow resulting in severe burns, fire and possible death. Use extreme caution!

IMPORTANT SAFETY INSTRUCTIONS. SAVE THESE INSTRUCTIONS!!



All disconnecting means should be in the open/off position before servicing.



All installation drawings and schematics should be reviewed and clearly understood before hooking up this system.



- ⚠ Only qualified DC power technicians or electricians should attempt to work on and install this equipment.
- ⚠ All jewelry, rings and watches should be removed when working on this equipment.
- ⚠ All tool handles and shafts must be heavily insulated.
- ⚠ Do not rest any tools or loose cables on top of batteries.
- ⚠ Make sure all connections are properly torqued and secure. Torque values are provided on battery label.
- ⚠ Do not smoke or present flames near or around any battery system.
- ⚠ Always wear safety glasses and gloves and use insulating mats to stand on when working on this system.
- ⚠ Do not allow bare skin to come into contact with battery rack, as this could result in an electrical shock.
- ⚠ Do not install any cable terminations until it has been verified that such a termination will not create a short circuit.

7. INSTALLATION STEPS

7.1 Rack Location

Prior to installation, verify floor loading requirements and all applicable codes pertaining to the related equipment. Environmental conditions should also be reviewed. Proper ventilation and cooling must be adequate for optimum battery life and performance. A clearance of 4" is recommended at the front and rear of the rack. This refers to obstruction of ventilation only. Clearance around the rack sides should be as suggested by NEC and local codes. Ambient temperature should be between 68°F -77°F.

7.2 Rack Mounting

1. Remove any remaining packaging materials (cardboard, plastic).
2. Remove the kick plate from the base of the rack. Save this kick plate for re-installation later.
3. Unbolt the rack from the pallet. Remove the rack from the pallet using a forklift rated for at least 8,500 lbs.
4. The battery rack is equipped with narrow pallet jack or forklift access openings in the front and rear of the rack. Move the equipment into the desired location and set in place.
5. In order to meet Zone 4 requirements, refer to the Zone 4 ANCHORING drawings included with this manual. The following steps detail the necessary actions needed to meet Zone 4 mounting requirements. Check applicable building codes for length and style of anchors to be used with the flooring substrate. Install anchors per manufacturer's instructions.
6. On the floor, mark the location of the 6 mounting holes found at the bottom of the rack legs.
7. Use the floor template or hole location drawing provided with each shipment to mark holes for anchors. Use ½" or 12mm anchors. Install anchors per manufacturer's instructions.
8. Move the rack into place, align holes, check levelness, and tighten hardware. **Note:** Should any drilling be performed on this equipment, make sure all exposed batteries and connections are completely covered using insulated type mats. Prevent dust from entering racks and clear any debris that has collected.
9. Re-install the front kick plate on the rack.
10. If multiple battery racks are installed, repeat above steps. Check height and levelness with adjoining racks.



7.3 DC Connections

CAUTION!
PLEASE READ ALL SAFETY INSTRUCTIONS BEFORE PROCEEDING.

1. Remove the cardboard box from the rack. Use the packing list to verify all bus bars, cables, battery covers and hardware required for assembly is available.
2. Review the installation drawing and schematic diagram included in this manual. Cables and bus bars have been left off in the battery string for safety and will need to be installed later.
3. Connect main cables to the circuit breaker, when applicable, inside the rack from the UPS or charger source. All cables should be sized per NEC and any other local codes pertaining to this equipment. Refer to the UPS or charger manual for wiring external batteries. **Note:** Make sure charging source is disconnected before making these connections; also verify the battery rack breaker is turned off.
4. Connect the battery interconnect bus bars that were left off during shipment and install as shown on the installation drawing included in this manual. Torque connections properly. Torque values are provided on battery label.
5. Install plastic covers onto batteries. Some covers may need to be notched for locations with bus bars and/or cables in upward orientation.

7.4 Grounding

Ground the battery rack to the main building ground. A ground stud inside the breaker enclosure is provided for this.

7.5 System Operation

Refer to the UPS or charger manual for start up and operation of system.



8. SYSTEM MAINTENANCE

CAUTION!
PLEASE READ ALL SAFETY PRECAUTIONS BEFORE PROCEEDING

8.1 Blown Fuse Replacement

If a fuse has blown in the system, contact an authorized factory technician to replace it.

CAUTION! Fire Hazard Warning:
Replace only with same type and rating of fuses supplied with the system.

8.2 Battery Replacement Steps

Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions. When replacing batteries, replace with the same type and number of batteries.

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

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

- Remove jewelry, rings, watches or other metal objects.
 - Use tools with insulated handles.
 - Wear rubber gloves and boots. Wear safety glasses.
 - Do not lay tools or metal parts on top of batteries.
 - Disconnect charging source prior to connecting or disconnecting battery terminals.
 - Determine if the battery is inadvertently grounded. Remove string from buss and check voltages to 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 (applicable to equipment and remote battery supplies not having a grounded supply circuit).
1. Prepare the new battery for installation. Check to make sure the battery is the same type and power rating. Use a non-metallic brush or scotch brite pad to clean the terminals. Apply a light coat of No-ox grease to the terminal to avoid corrosion "per battery manufacturer's recommendation".
 2. Disconnect the charger or UPS from the battery string by opening the breaker.
 3. Remove the center jumper on the battery string to reduce the voltage. If replacing all batteries, continue reducing the voltage in this manner.
 4. Disconnect the interconnect bus bars and/or cables from the battery to be replaced.
 5. Remove the old battery.
 6. Install the new battery. Make sure the new battery is installed the same way regarding polarity orientation and verify with drawing.

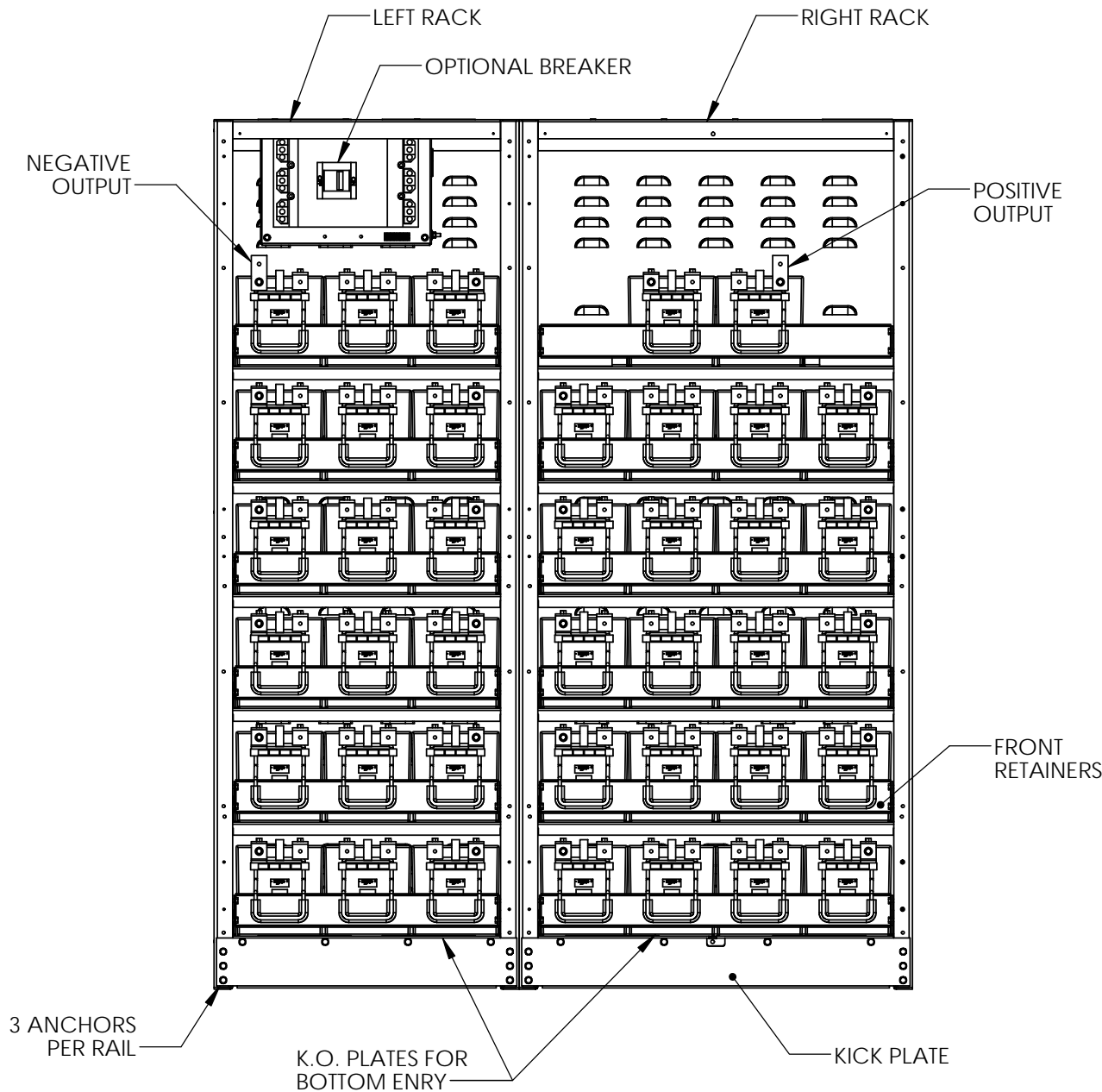


7. Reconnect bus bars and/or cables to the battery. Make sure connections are properly torqued. Torque values are provided on the battery label.
8. Reconnect the center jumper. Make sure connections are properly torqued. Torque values are provided on the battery label.
9. Check voltage at terminal block.
10. Close breaker when ready.

9. WARRANTY RELATED MAINTENANCE

1. The purchaser (user) shall give freshening charges to the battery a minimum of every six (6) months for Lead-Calcium batteries after shipment from the factory and until final installation. Refer to the installation and maintenance instructions for maximum storage intervals at different environmental situations. Extreme heat could cause more frequent freshening charges.
2. At least once every twelve (12) months, purchaser (user) must take readings and record information per battery manufacturer's installation/maintenance instructions. These records must be maintained for warranty claim purposes. If warranty records are not kept, the warranty shall be null and void.
3. Parallel strings should be limited to five (5) strings
4. Movement of batteries from original point of installation shall immediately void the product warranty, except with the expressed written consent from ESS.
5. Any storage shall be in a dry area having ambient temperature of 77° F (25° C), or less, and in accordance with battery manufacturer published installation, operation and maintenance instructions. Failure to follow the battery manufacturer's published guidelines and/or instructions may invalidate the product warranty, at the sole discretion of ESS.
6. During service or extended storage, a battery system monitor is recommended to be used to record temperatures, voltages, AC ripple, Float currents, Discharge and more to provide more accurate battery and environmental data for warranty with battery manufacturer's claims.

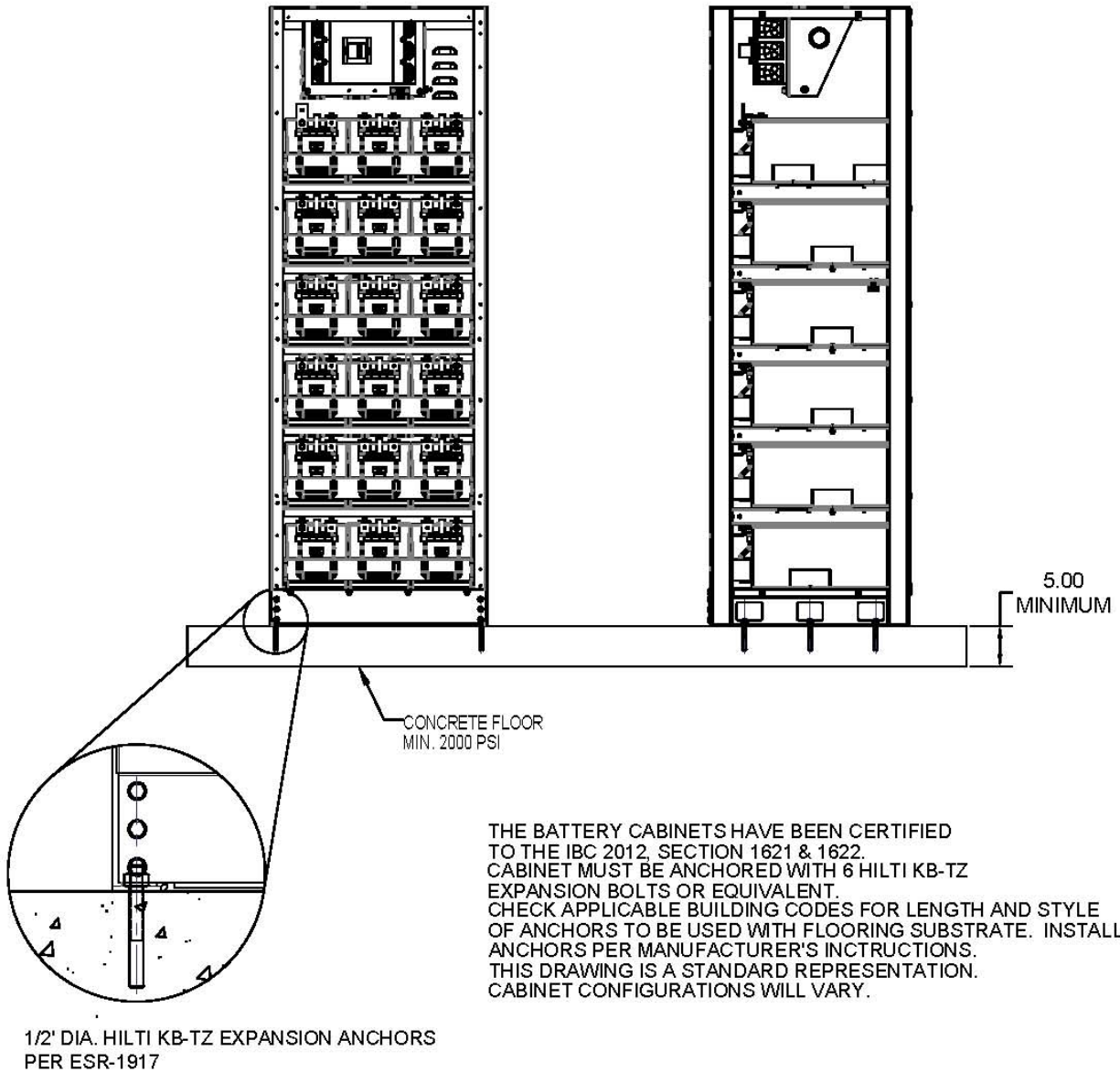
10. DRAWINGS / SCHEMATICS





RACK FRONT VIEW

RACK SIDE VIEW



TITLE: FRONT TERMINAL BATTERY RACK, EFR63/EFR53 SERIES
GENERAL SEISMIC ANCHORING

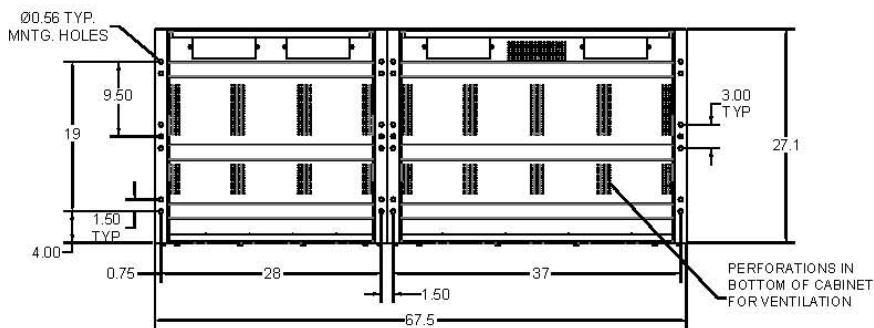


	NAME	DATE
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APPR.		
SHEET 1 OF 2		

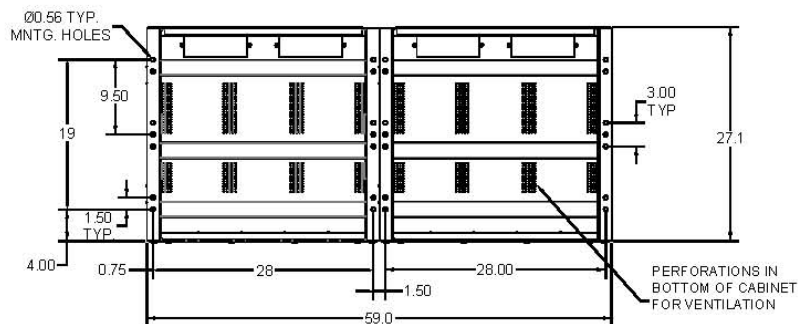
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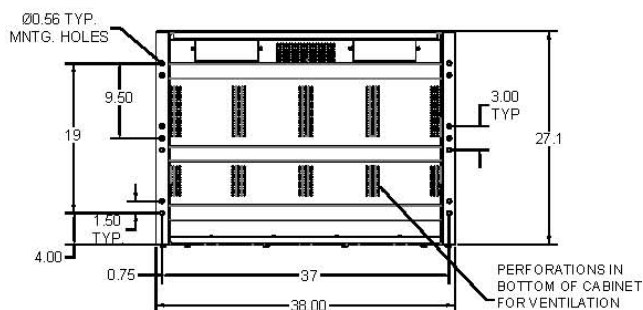
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A



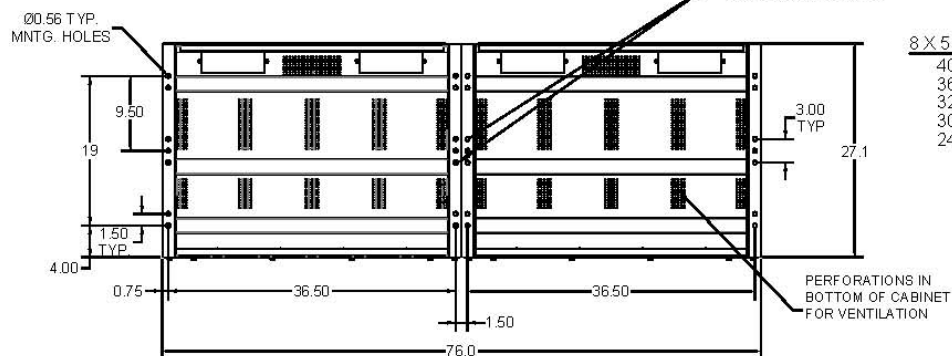
7 X 6 FOOTPRINT FOR:
41 BLOCS, 492V
40 BLOCS, 480V



6 X 6 FOOTPRINT FOR:
36 BLOCS, 432V
32 BLOCS, 384V
30 BLOCS, 360V



4 X 6 FOOTPRINT FOR:
24 BLOCS, 288V

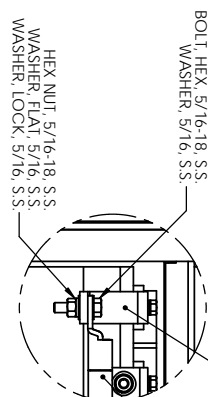
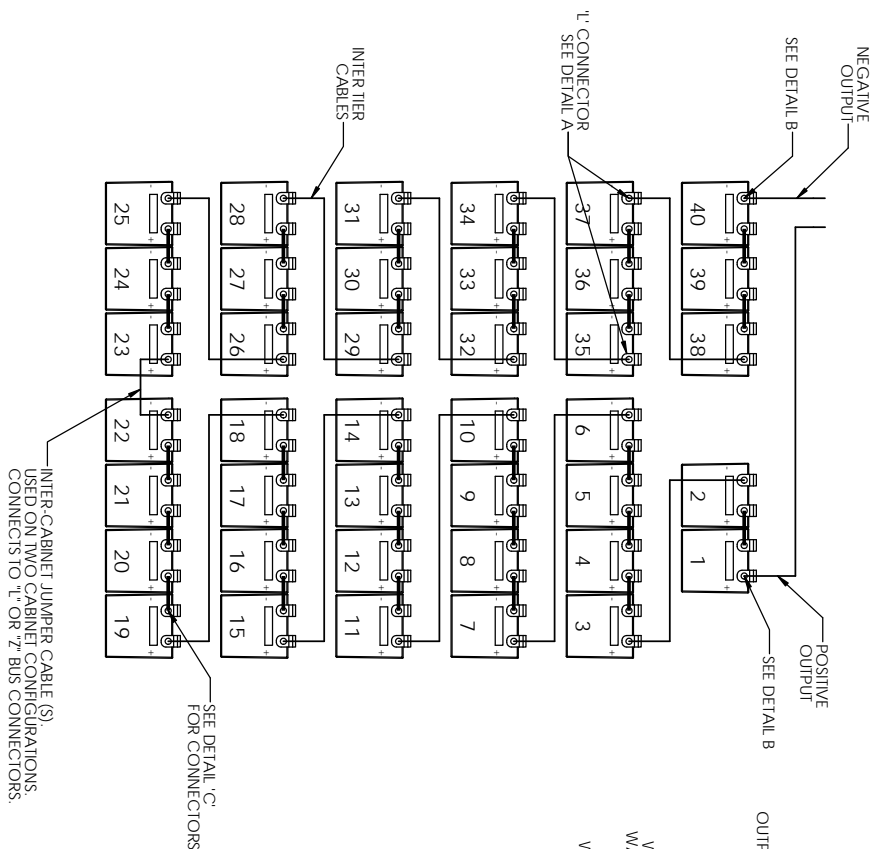


8 X 5 FOOTPRINT FOR:
40 BLOCS, 480V
36 BLOCS, 432V
32 BLOCS, 384V
30 BLOCS, 360V
24 BLOCS, 288V

TITLE: FRONT TERMINAL BATTERY RACK, EFR63/EFR53 SERIES
GENERAL SEISMIC ANCHORING

NOTES:

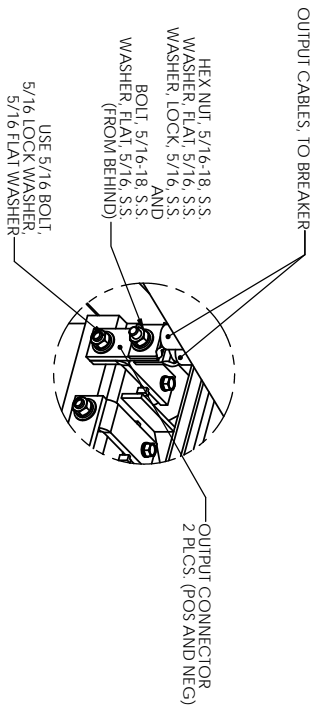
1. THIS DRAWING IS A REPRESENTATION OF TYPICAL CONNECTIONS FOR THE ESS EFR63 AND EFR53 FRONT TERMINAL BATTERY RACKS.
2. FOR CABLE WIRING DIAGRAMS, REFERENCE THE INDIVIDUAL DRAWINGS IN THE CABINET MANUAL.
3. CORRESPONDING TO THE CABINET STRING VOLTAGE.
4. VIEW 'A' IS SHOWING THE INTER TIER CONNECTIONS. AN 'I' CONNECTOR IS PROVIDED. THE 'I' CONNECTIONS WILL MAKE THE INTER TIER CONNECTIONS EASY, ESPECIALLY WHEN DOUBLE CABLE IS USED AND BACK CONNECTIONS TO THE NEGATIVE SIDE.
5. MAKE A DOUBLE CABLE CONNECTION BACK TO BACK WHEN NECESSARY.



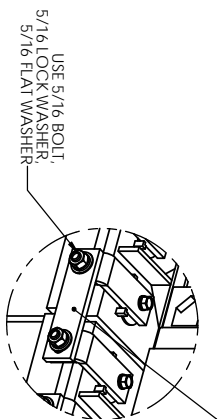
DETAIL A
SCALE 1 : 3

FASTEN 'I' CONNECTORS TO BATTERIES PRIOR TO LOADING BATTERIES IN CABINET. REFERENCE DIAGRAM FOR 'I' CONNECTOR LOCATIONS. USE HARDWARE PROVIDED IN INSTALL KIT. 5/16-18 BOLT, 5/16 LOCK WASHER AND 5/16 FLAT WASHER

INTER TIER CABLES. THERE WILL BE SINGLE OR DOUBLE CABLES DEPENDING ON AMPERAGE OF BREAKER. IF SINGLE CABLE, PLACE ON TOP OF THE COPPER CONNECTOR. SEE TABLE FOR CABLE CONFIGURATIONS.



DETAIL B
SCALE 1 : 3



DETAIL C
SCALE 1 : 3

125 ° CABLE AMPACITY TABLE	
AWG	AMPS
DBL 2/0	600
DBL 3/0	500
DBL 3/0	450
4/0	400
4/0	350
2/0	300
1/0	250
1/0	225
2	200
2	175
4	150
4	125
1	100
1	75
1	50
1	40
1	30

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES

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ESS Electronic Systems Support

3233 W. Kingsley Rd.
Garland, Texas 75041
PH: 972-272-2468
FAX: 972-276-9844

MANUAL DRAWING, GENERAL CONNECTIONS, FRONT TERMINAL BATTERY RACKS, EFR63/EFR53

SIZE: DWG. NO. DOC-016500

SCALE: 1:12

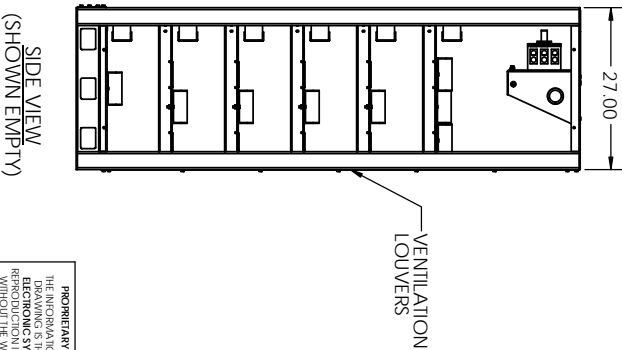
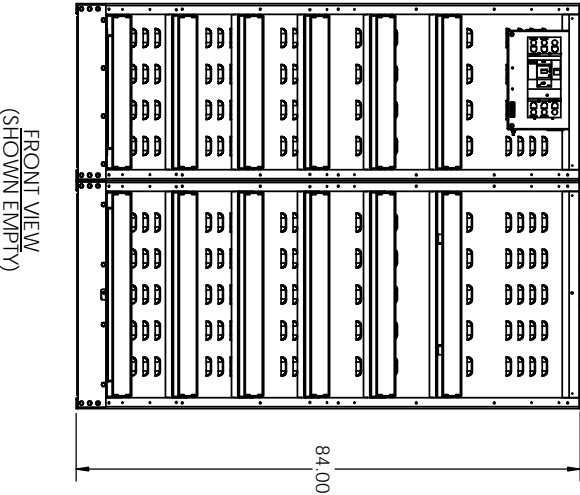
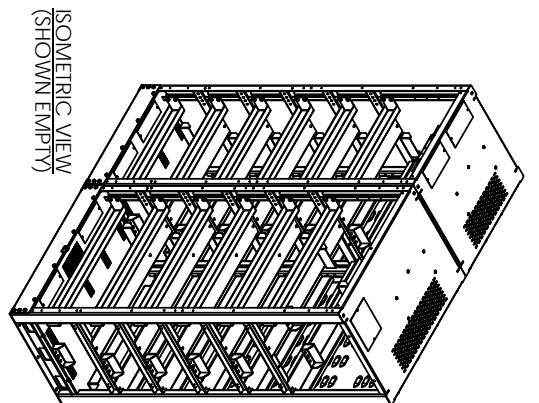
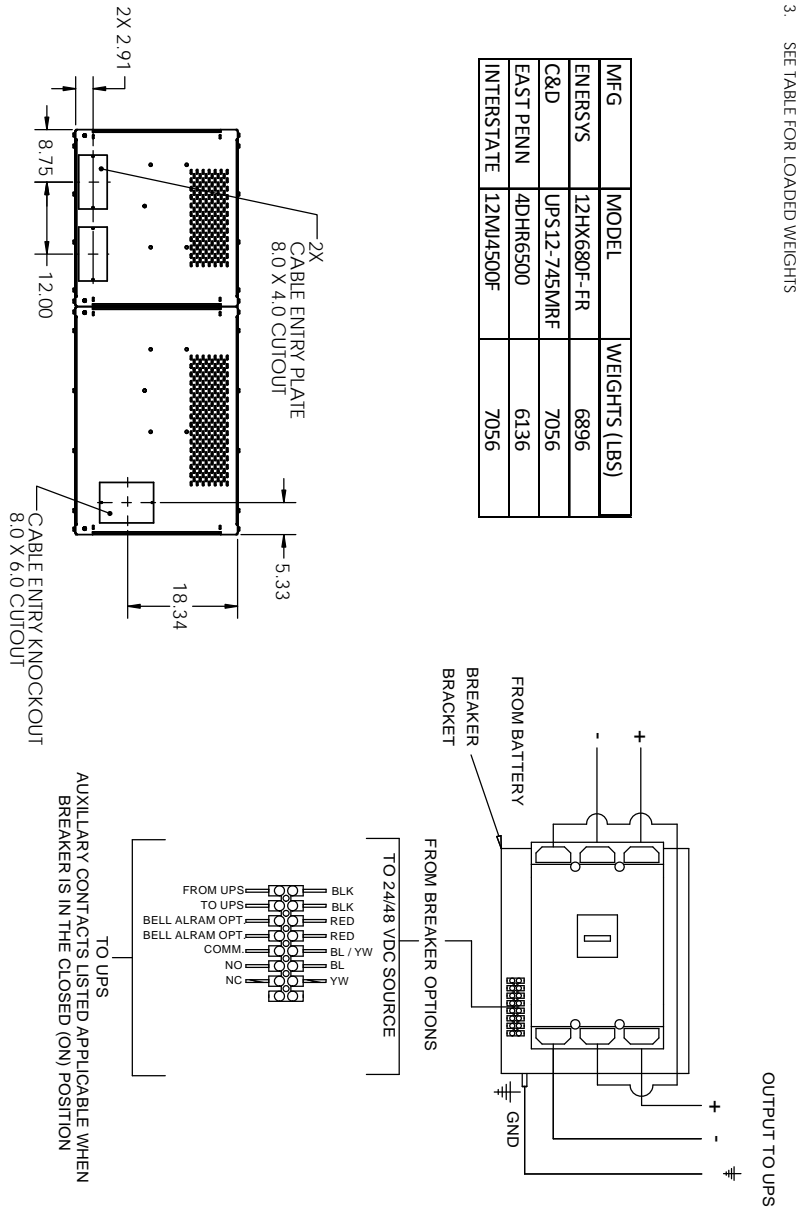
SHEET 1 OF 1

CABINET NOTES:

1. NEMA 1 DESIGN
2. EMPTY CABINET WEIGHT: 876 LBS (397 KG) TOTAL FOR 2 CABINETS FOR 480V STRING.
3. SEE TABLE FOR LOADED WEIGHTS

MFG	MODEL	WEIGHTS (LBS)
ENERSYS	12HX680F-FR	6896
C&D	UPS12-745MRF	7056
EAST PENN	4DHR6500	6136
INTERSTATE	12MJ4500F	7056

BREAKER DETAIL



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DIMENSIONS ARE IN INCHES

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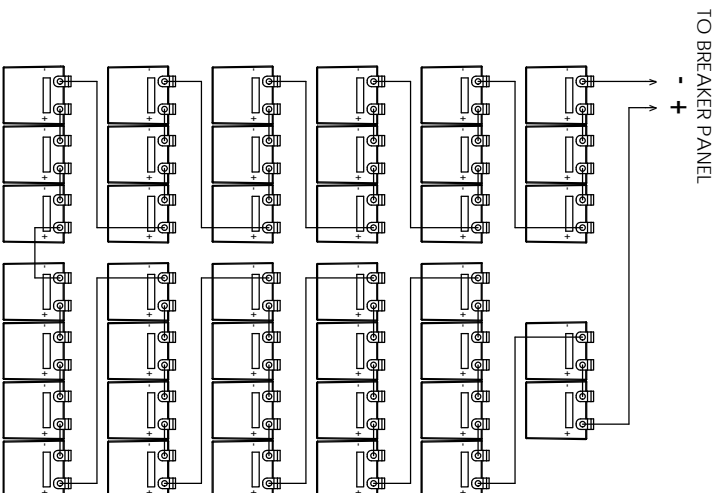
ESS Electronic Systems Support
3233 W. Kingsley Rd.
Garland, Texas 75041
PH: 972-272-2468
FAX: 972-272-9844

TITLE: EFR63 BATTERY RACK
480V, 40 BLOCS, 7 X 6

SIZE: DWG. NO. DOC-016800
SCALE: 1:12

PROJECTION: FIRST ANGLE
DATE: 11/17/17
DRAWN BY: RNU
REV: A

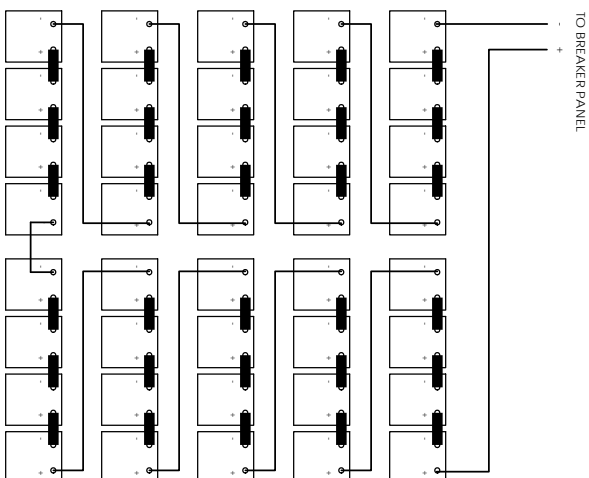
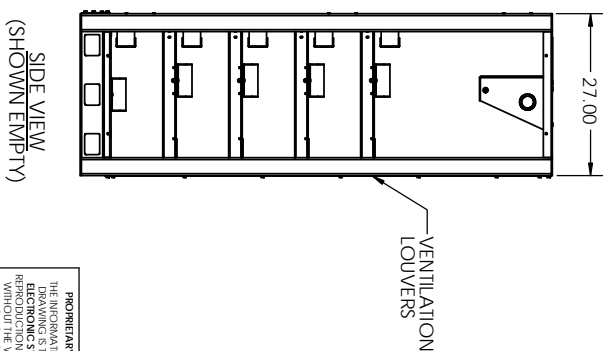
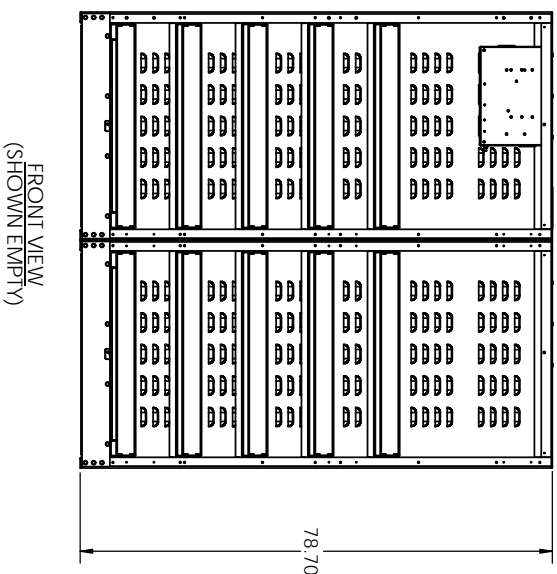
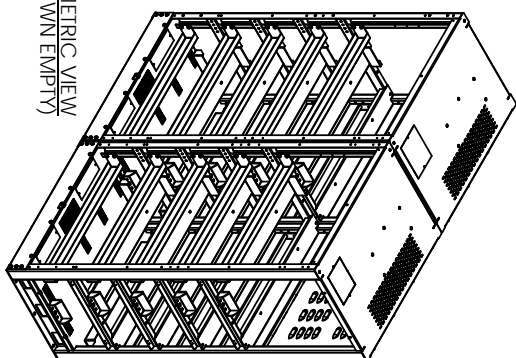
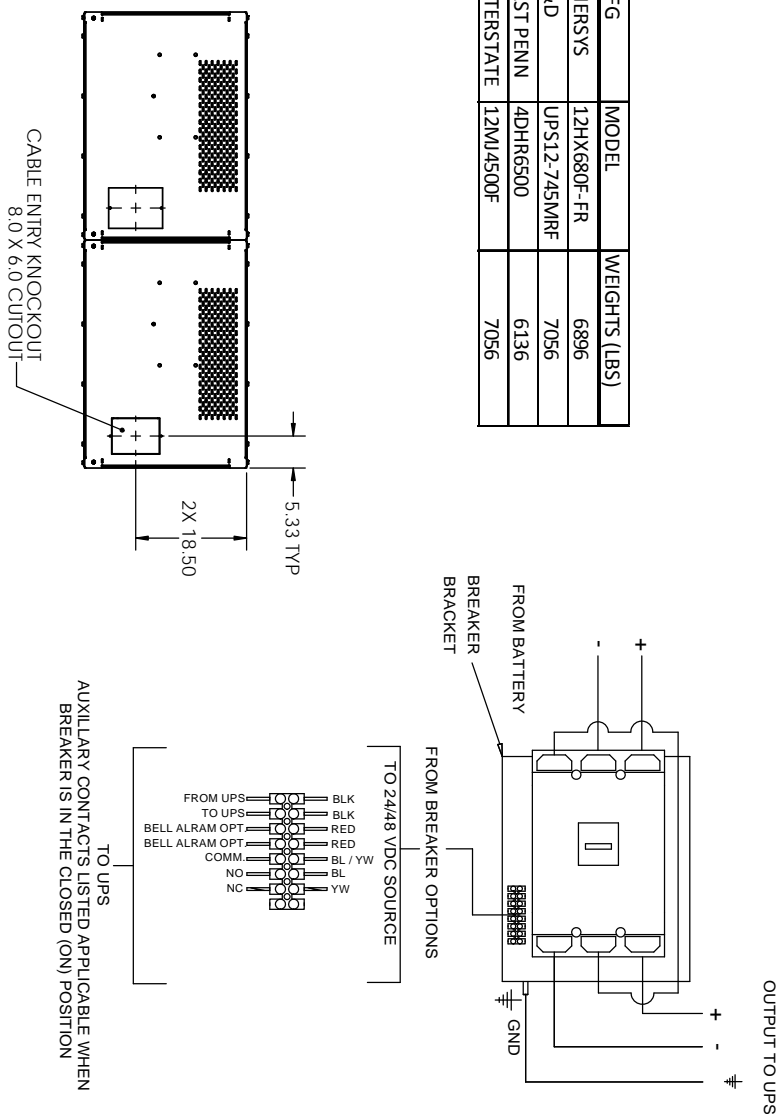
SHEET 1 OF 1



1. NEMA 1 DESIGN
2. EMPTY CABINET WEIGHT: 876 LBS (397 KG) TOTAL FOR 2 CABINETS FOR 480V STRING
3. SEE TABLE FOR LOADED WEIGHTS

	MODEL	WEIGHTS (LBS)
IMC		
ENERSYS	12HX680F-RR	6896
C&D	UP512-745/MRF	7056
EAST PENN	4DHR6500	6136
INTERSTATE	12MJ4500F	7056

BREAKER DETAIL



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FAX 972-276-9844

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3233 W. Kingsley Rd.
Garland, Texas 75041
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TITLE: EFR53 BATTERY RACK
480V, 40 BLOCS, 8 X 5

PROJECTION:		
DRAWN BY	NAME	DATE
	RNJ	11-17-17

SIZE	DWG. NO.	REV
C	DOC-016900	A
SCALE: 1:12	SHEET 1 OF 1	



NOTES



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