XLCM - Instruction manual

Powering Business Worldwide

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTUCTIONS

This manual contains important instructions that you should follow during installation and maintenance of the supercapacitor module energy storage cabinets. Please read all instructions before operating the equipment and save this manual for future reference.

This product is intended for commercial and industrial applications. Installation restrictions or additional measures may be needed to prevent disturbances.

Contents

Chapter 1: Introduction

The integrated supercapacitor module cabinet systems are housed in single free-standing cabinets. The XLCM family contains wired strings of Eaton's supercapacitor modules to meet discharging power needs of the power distribution system. Multiple cabinets can be wired in parallel to further meet the power or energy requirements. Furthermore, the XLCM product family is intended to be integrated into multiple different applications depending on the specific XLCM product.

A DC-rated circuit breaker within each cabinet provides disconnect capability, and isolation for servicing. Integrated high speed fuses offer current limitation to reduce let through currents and help reduce arc flash hazards.

1.1 Configuration and installation features

The XLCM supercapacitor module cabinet is designed to be installed in a standalone configuration using one to eight supercapacitor module cabinets. Power wiring is to be installed externally between each supercapacitor module cabinet or balance of power distribution system. The XLCM can be installed adjacent to the controlling system (UPS, inverter, etc) or in a separate location. Cabinets can be permanently bolted to the floor or on leveling feet. Power and control wiring can be routed through the top or bottom of the cabinet depending on the installation configuration and product selected. Connections are made to easily accessible terminals provided.

1.2 Customer interface

Circuit breaker shunt trip wiring is provided to connect the supercapacitor module cabinet to external controlling systems. The shunt trip is used to open the circuit breaker in the event of an emergency or rapid shutdown. Auxiliary contact terminals are provided to signal when the circuit breaker is closed or open. Optional open fuse indication paired with each string fuse can also be provided to signal when a fuse has opened.

1.3 Using this manual

This manual describes how to install the XLCM supercapacitor module cabinet. Read through and understand the procedures described in this manual to help ensure trouble-free installation. Read through each procedure before beginning the procedure. Perform only those procedures that apply to the cabinet system being installed.

1.4 For more information

Refer to the appropriate user manual and datasheet for additional detailed information pertaining to the specific Eaton supercapacitor module contained within the XLCM cabinet. This information can be found at www.eaton.com/supercapacitors. When integrating with other equipment, please consult the related equipment user manuals and installation guidelines.

Always conform to the applicable safe work practices relevant to the installation location.

1.5 Getting assistance

If assistance is needed for questions about this manual, a technical question this manual does not answer or regional locations or telephone numbers, please contact your local Eaton sales representative or contact Eaton at the following contacts:

Americas

Phone: +1-888-414-2645
Email: elx.americas@eaton.com

Europe, Middle East, Africa

Phone: +34-93-736-2813
Email: elx.emea@eaton.com

Africa-Pacific

China
Phone: +86 20 3585 9664
Email: elx.cn@eaton.com

Japan
Phone: +86 20 3585 9664
Email: elx.jp@eaton

Korea
Phone: +82 2 6380 4831
Email: elx.kr@eaton.com

South East Asia
Phone: +65 9477 1038
Email: elx.sea@eaton.com

Taiwan
Phone: +886 909 381 110
Email: elx.tw@eaton.com

If desiring Eaton's assistance for startup and commissioning, please contact Eaton Services at

United States: **1-800-843-9433**

Canada: **1-800-461-9166 ext 260**

All other countries: **Call your local service representative**

Please use the following link for user manual comments, suggestions or to report a technical error in this manual: Contact Us

Chapter 2: Safety warnings

2.1 Symbols on the equipment and manual

The following are examples of symbols used on the equipment or accessories to alert you to important information

RISK OF ELECTRIC SHOCK – Indicates that a risk of electric shock is present and the associated warning should be observed.

CAUTION: REFER TO OPERATOR'S MANUAL – refer to your operator's manual for additional information, such as important operating and maintenance instructions.

WEEE: this symbol indicates that you should not discard waste electrical or electronic equipment (WEEE) in the trash or send to landfill. For proper disposal, contact your local recycling, reuse or waste center.

2.2 General

The XLCM cabinet contains components that carry high potential fault currents and voltages. Only qualified personnel should be allowed to install and service the cabinet. The intended audience of this manual is people who plan the installation, commissioning and use of the equipment. The manual provided guidelines for verifying the delivery, installation and operation of the supercapacitor module cabinet. The reader is expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols. This manual is written for a global application.

DANGER

This supercapacitor module cabinet contains lethal voltages. All repairs and service should be performed by authorized service personnel only. There are no user serviceable parts inside the supercapacitor module cabinet.

WARNING

- This cabinet contains its own energy source. The internal wiring and output terminals may carry live voltage even when the cabinet is not connected to a grid source.
- To reduce the risk of failure, install this system in a temperature and humidity controlled, indoor environment, free of conductive contaminants. Ambient temperatures should not exceed between -40 °C to +55 °C. Do not operate near water or excessive humidity (95% maximum). The system is not intended for outdoor use.
- Ensure all power is disconnected and that supercapacitor modules are completely discharged before performing installation or service
- Although supercapacitors are intended to be transported completely discharged, they can present a risk of electrical shock or burn if not shorted out. The following precautions should be observed:
    1. Remove watches, rings or other metal objects
    2. Use tools with insulated handles
    3. Do not lay tools or metal parts on top of supercapacitor modules
    4. Wear rubber gloves and boots
- **ELECTRIC ENERGY HAZARD.** Do not attempt to alter any wiring or connections as this can cause injury.
- Do not open, puncture, crush or mutilate supercapacitor modules.

CAUTION

- Installation or servicing should be performed by qualified service personnel knowledgeable of energy storage systems and required precautions. Unauthorized personnel should stay away from cabinets. Consider all warnings, caution and notes before installing or servicing supercapacitor modules. **DO NOT DISCONNECT** the supercapacitors while charging or discharging.
- If requiring replacement, replace the supercapacitor module with the same number and type of module as originally installed in the cabinet.
- Disconnect the charging source prior to connecting or disconnecting terminals.
- Determine if any module is inadvertently grounded. If it is, remove the source of the ground. Contacting any part of a grounded module can cause a risk of electrical shock. An electrical shock is less likely if you disconnect the grounding connection before you work on the modules.
- Proper disposal of supercapacitors is required. They may be disposed of by a specialized waste processor or by incineration by a qualified waste facility. Refer to local codes for complete disposal requirements.
- Keep the cabinet door closed to protect personnel from dangerous voltages inside the unit.
- Do not install or operate the supercapacitor module cabinet close to gas or electric heat sources.
- The operating environment should be maintained within the parameters stated in this manual. Operating environments outside the recommended range may result in decreased energy storage life and performance.
- Keep surroundings uncluttered, clean and free from excess moisture
- Observe all **DANGER, CAUTION** and **WARNING** notices affixed to the inside and outside of the equipment.

Chapter 3: Installation plan and unpacking

The following sequence of steps should be followed for installation of the XLCM cabinet:

1. Create an installation plan for the cabinet (Chapter 3.1)
2. Prepare your site for the cabinet (Chapter 3.2)
3. Inspect and unpack the cabinet (Chapter 3.3)
4. Unload and install the cabinet, and wire the system (Chapter 4.1 – 4.5)
5. Complete the installation checklist (Chapter 4.6)
6. Perform preliminary operational checks and startup

These lists of steps should be completed by qualified and authorized service personnel if to comply to the warranty outlined in this manual. If system is accompanied by a longer-term warranty, these steps should comply to the terms and conditions outlined in the sales agreement.

3.1 Creating an installation plan

Before installing the supercapacitor module cabinet, read and understand how this manual applies to the system being installed. Use the procedure and illustrations throughout Chapter 3 and 4 to create a logical plan for installing the system.

3.2 Preparing the site

For the supercapacitor module cabinet system to operate at peak efficiency, the installation site should meet the environmental parameters outlined in this manual. The operating environment must meet the weight, clearance and environmental requirements specified.

3.2.1 Environmental and installation considerations

The cabinet system installation should meet the listed guidelines:

- The system must be installed on a level floor.
- If perforated floor tile is required for ventilation, place them in front of the cabinet.
- The system must be installed in a temperature and humidity controlled indoor area free of conductive contaminants.

The system environment must support the weight requirements shown in Table 3-1 and the size requirements listed in Figures 3-1 through 3-8 and accommodating the clearances listed in Table 3-2. The weight shown in Table 3-1 is the maximum weight of a fully configured cabinet and may weigh less depending on your configuration.

Table 3-1.

Model	Weight (kg)
20 module cabinet PN	545
30 module cabinet PN	730

The standard XLCM cabinet uses convection air cooling to regulate internal component temperature. Air inlets are located in the cabinet walls and top to help provide air flow. Allow clearance in the front and above each cabinet for proper air circulation. Recommended clearances around each cabinet are shown in Table 3-2. These should be taken as a minimum as there may be more space desired for serviceability or more convection cooling.

Table 3-2.

Cabinet Location	Recommended clearances
Top	18" for working space
Front	36" for working space
Back	None required (36" in seismic applications)
Right Side	None required
Left Side	None required

The basic environmental requirements of the XLCM family for operation are to be within -40 °C to +55 °C and less than 95% relative non-condensing humidity. To maximize optimal supercapacitor life and discharge performance, keep the ambient temperature between +20 °C and +30 °C. Please consult the specific project terms and conditions of sale if there are additional operating environment conditions that must be followed for compliance to warranty conditions.

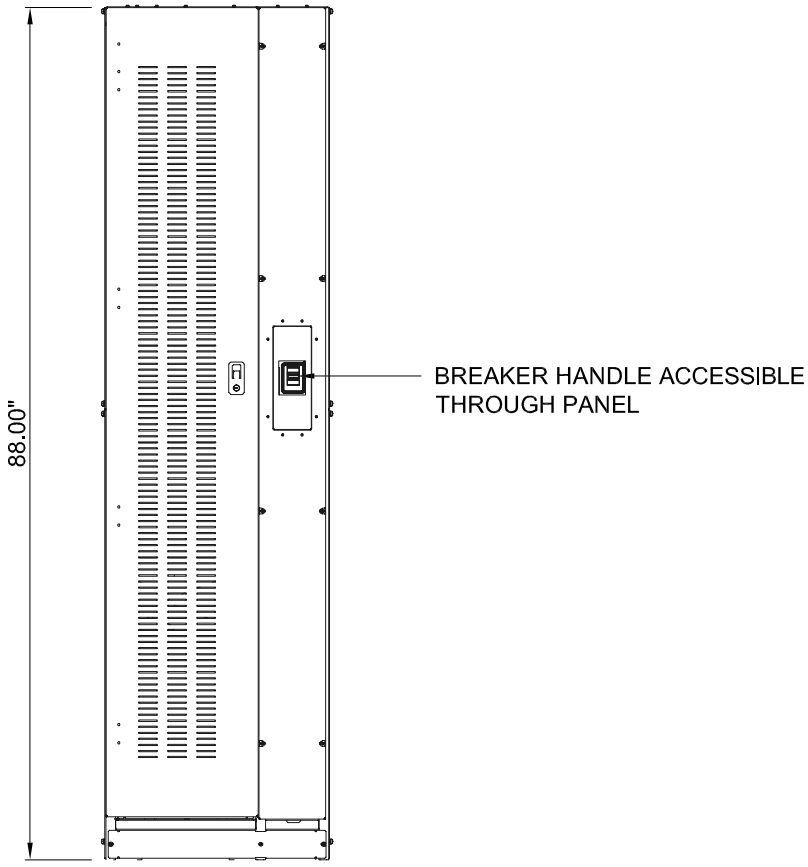

Figure 3-1: Front view of 20 module cabinet

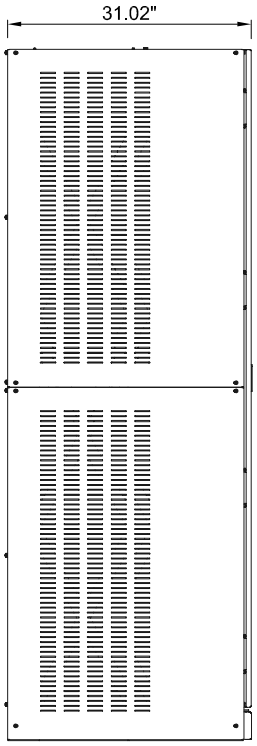

Figure 3-2: Side view of 20 module cabinet

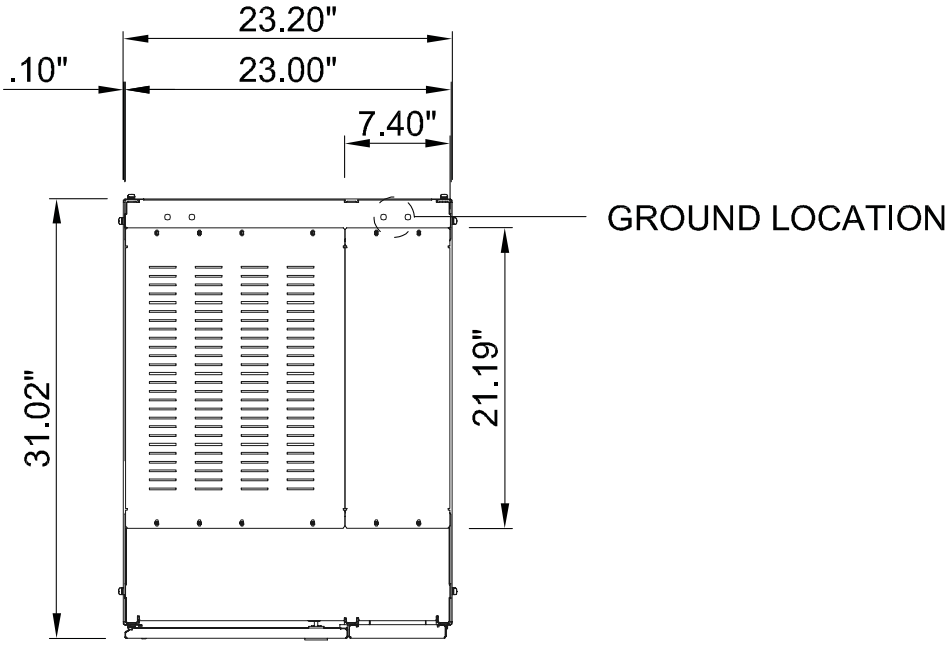

Figure 3-3: Top view of 20 module cabinet

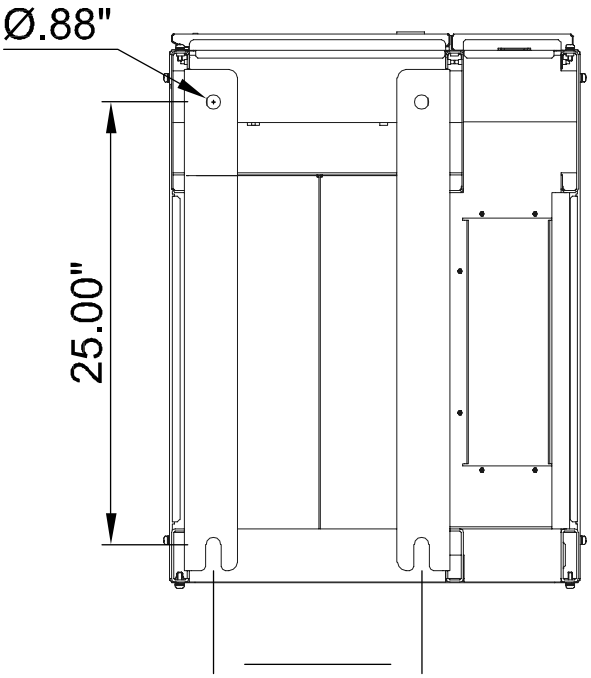

Figure 3-4: Bottom view of 20 module cabinet

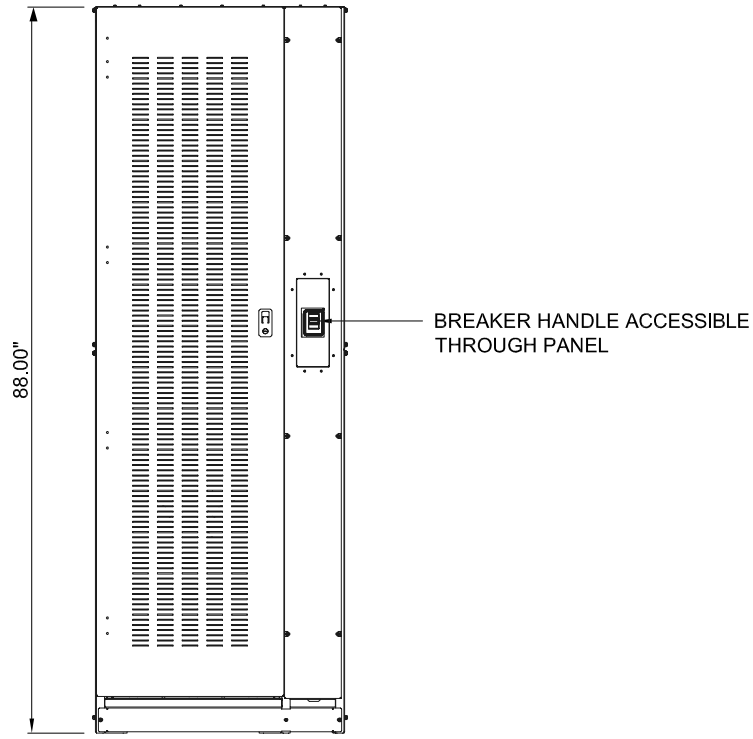

Figure 3-5: Front view of 30 module cabinet

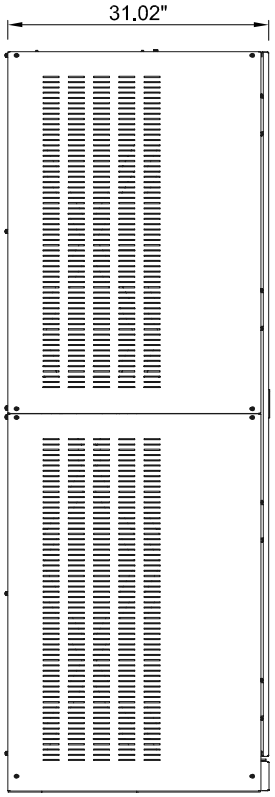

Figure 3-6: Side view of 30 module cabinet

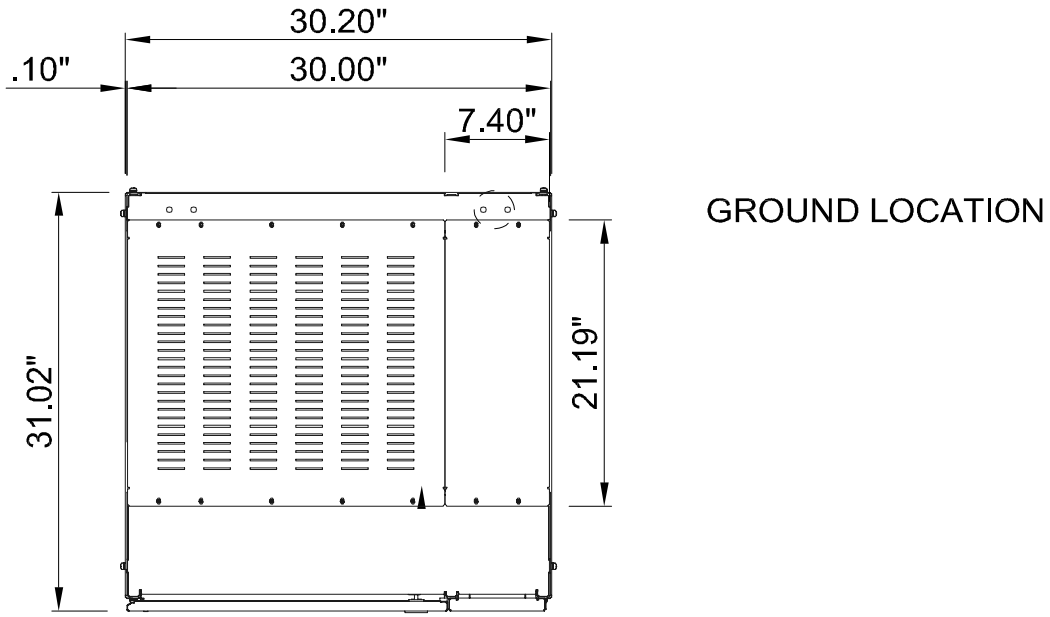

Figure 3-7: Top view of 30 module cabinet

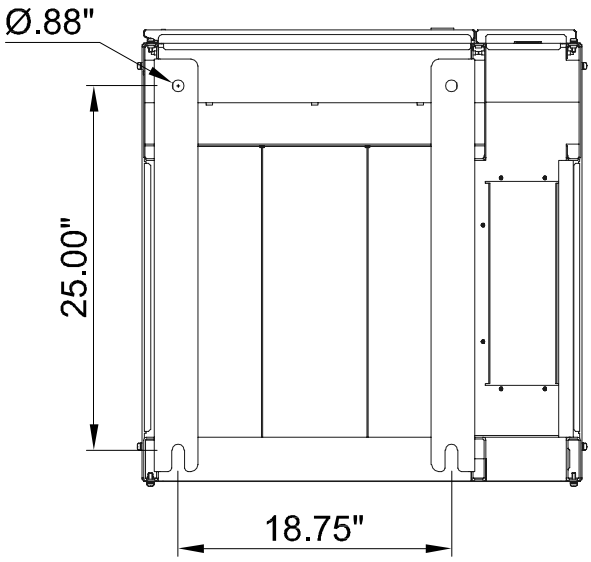

Figure 3-8: Bottom view of 30 module cabinet

3.2.2 Power wiring preparation

Read and understand the following notes while planning and performing the installation. It should be noted that the XLCM cabinet is capable of both top and bottom cable entry. See Figure 3-3, Figure 3-4, Figure 3-7 and Figure 3-8 for panel removal.

WARNING

This supercapacitor module cabinet contains **lethal voltages**. All repairs and service should be performed by **authorized service personnel only.** There are **no user serviceable parts** inside the supercapacitor module cabinet.

- Refer to national and local electrical codes for acceptable external wiring practices.
- Material and labor for external wiring requirements are to be provided by the customer.
- For external wiring, use +75 °C copper wire. Wire sizes listed in Table 3-3 are for copper wiring only. If wire is run in an ambient temperature greater than +40 °C, higher temperature wire and/or larger size wire may be necessary. Wire sizes are based on using the specified circuit breakers.
- Recommended wire seizes are based on NFPA NEC 70 Table 310.15(B)(16) +75 °C ampacity with +40 °C ambient correction factors.
- The wiring used between the supercapacitor cabinet and the UPS for standalone installations should be a maximum of 20 meters (65 feet) with a voltage drop of less than 1% of nominal DC voltage at rated supercapacitor current.
- Refer to NEC Article 250 and local codes for proper grounding practices.
- Each supercapacitor cabinet has its own overcurrent protective device.
- Internal supercapacitor strings are to be connected by an authorized Eaton Customer Service Engineer or trained electrician experienced with supercapacitors.

Table 3-3. External power cable terminations - XLCM

Model	Terminal	Function	AWG wire range and # of terminations	Tightening Torque
20 module cabinet PN	Bus bar Pos.	Positive	2 – 500 kcmil (2)	42
	Bus bar Neg.	Negative	2 – 500 kcmil (2)	42
30 module cabinet PN	Bus bar Pos.	Positive	2 – 500 kcmil (2)	42
	Bus bar Neg.	Negative	2 – 500 kcmil (2)	42
	Ground	Ground	#14 – 1/0	5

3.2.3 Interface wiring preparation

Control wiring for features and options should be connected at the customer interface terminal blocks located inside the cabinet.

Read and understand the following notes while planning and performing installation:

- Use Class 1 wiring methods (as defined by the NEC) for interface wiring from 30 V to 600 V. The wire should be rated for 600 V, 1 A minimum. 12 AWG maximum wire size.
- Use Class 2 wiring methods (as defined by the NEC) for interface wiring up to 30 V. The wire should be rated for 24 V, 1 A minimum.
- The 48 Vdc shunt trip wiring should be a minimum of 18 AWG.
- Use twisted pair wires for each input and return or common.
- All interface wiring and conduit is to be supplied by the customer.
- Interface wiring can be installed by routing wiring through conduit between cabinets.
- Install the interface wiring in separate conduit from the power wiring.

3.2.4 Inspecting and unpacking the XLCM cabinet

The cabinet is shipped on a wooden pallet and covered with outer protective packaging materials.

WARNING

The XLCM cabinet is heavy (See Table 3-1). If unpacking and unloading instructions are not closely followed, the cabinet may tip and cause serious injury or death.

1. Carefully inspect the outer packaging for evidence of damage during transit.

CAUTION

Do not install a damaged cabinet. Report any damage to the carrier and contact your Eaton service representative immediately

2. Arrange for a forklift or pallet jack rated to handle the weight of the cabinet (see Table 3-1).
3. Use this forklift or pallet jack to move the packaged cabinet to the installation site, or as close as possible, before unpacking. If possible, move the cabinet using the pallet. Insert the forklift or pallet jack forks between the supports on the bottom of the pallet.

CAUTION

Do not tilt the cabinet more than 10 degrees from vertical or the cabinets may tip over and cause serious injury or death.

4. Set the pallet on a firm, level surface, allowing a minimum clearance of 3 meters (10 feet) on each side for removing the cabinet from the pallet.
5. Remove the protective packaging material from the cabinet and recycle in a responsible manner.
6. Inspect the contents for any evidence of physical damage. If damage has occurred or shortages are evident, contact your Eaton service representative immediately to determine the extent of the damage and its impact on further installation.

Note: While waiting for installation, protect the unpacked cabinet from moisture, dust and other harmful contaminants. Failure to store and protect the cabinet properly may impact performance.

Chapter 4: Installation

4.1 Preliminary installation information

WARNING

Installation should be performed only by qualified personnel knowledgeable of supercapacitors and the required precautions.

Observe these precautions while installing the XLCM:

- Remove watches, rings or other metal objects.
- Use tools with insulated handles.
- Wear voltage rated gloves and electrical hazard footwear
- Do not lay tools or metal on top of supercapacitors or cabinets.
- Review Chapter 3 for cabinet dimensions and equipment weight.

4.2 Unloading the cabinet from the pallet

WARNING

- The XLCM is heavy (see Table 3-1 for cabinet weight.
- Do not tilt the cabinet more than 10 degrees from vertical.
- Lift the cabinets only with a forklift or pallet jack or damage may occur.
- Ensure forklift is rated to handle the weight of the cabinet.

Failure to follow these instructions may result in severe injury or death.

The XLCM is bolted to a pallet though the holes on the bottom slats on the cabinet. To remove the pallet:

1. If not already accomplished, use a forklift or pallet jack to move the cabinet to the installation area, or as close as possible, before unloading from the pallet. Insert the forklift or pallet jack forks between the supports on the bottom of the pallet.
2. Remove the hardware that fastens the cabinet to the pallet. Recycle responsibly.
3. Place the forks between the bottom slats illustrated in Figures 3-1 and 3-5. Lift the cabinet with a forklift carefully. Do not tilt the cabinet more than 10 degrees from vertical.
4. Carefully lower the cabinet evenly to the floor.
5. Level the cabinet using leveling hardware.
6. Secure cabinet to the floor with externally provided hardware.
7. Recycle the pallet responsibly.

Note: The XLCM may be located to either the right or left of the downstream power distribution system. The recommended location is to the right of the system.

4.3 Install power wiring

Use this procedure to wire the standalone XLCM cabinets. To install wiring connections:

1. Verify the system is turned off and all power sources are removed.
2. Remove the screws on the safety shield (dead front) on the side car and remove the panel to gain access to the power terminals. Retain the hardware for later use.
3. Remove the top or bottom conduit plate in the side car (see Figures 3-3, 3-4, 3-7 or 3-8) depending on the desired top or bottom feed configuration. Identify all conduit requirements and mark their location. Create all conduit holes in the conduit plate prior to mounting on the XLCM. Install the conduit plate and install all conduit runs into the plate. Pull the wiring through the conduit into the wiring areas.
4. Route the supercapacitor wiring (positive, negative and ground) from the main system DC Input terminals through the top or bottom of the XLCM to the XLCM DC output and ground terminals. See Section 3.2.2 for wiring and termination requirements.
5. Connect the positive and negative power wiring to the XLCM DC (+) and DC (-) output terminals on the XLCM. Connect the ground wiring to the ground terminal on the XLCM.
6. Connect the positive, negative and ground DC power wiring from the XLCM terminals or main circuit breaker to the downstream power distribution system terminals.
7. If installing more than one XLCM, repeat step 3 through step 6 for each XLCM.

Note: Internal supercapacitor strings are to be connected by the factory or by an authorized Eaton Customer Service Engineer at system startup.

4.4 Install interface wiring

XLCMs offer both top and bottom feed capability but will feed the same interface wiring terminal block. Using the top or bottom feed is left to the customer. For a detailed view of the XLCM terminal block, see Figure 5-3 and 5-4.

To install wiring:

1. Remove the top or bottom conduit plate (see Figure 3-3, 3-4, 3-7, 3-8) from the XLCM side car. Identify all conduit requirements and mark their location. Drill and punch all conduit holes in the conduit plate prior to mounting on the XLCM. Install the conduit plate and install conduit runs into the plate. Pull wiring through the conduit into the wiring area.

Note: in multiple XLCM installations, route the interface wiring between XLCMs through the specified conduit plate to the adjacent TB1 and daisy chain as needed. The terminal blocks are dual wire rated.

2. Route the detect interface wiring from the power distribution system detect interface terminals to the XLCM sidecar terminal block.
3. Route the circuit breaker shunt trip interface wiring from the power distribution system shunt trip interface terminals to the XLCM sidecar terminal block.
4. Route the supercapacitor overvoltage alarm interface wiring from the power distribution system overvoltage alarm interface terminals to the XLCM sidecar terminal block.

4.5 Instantaneous trip setting for main cabinet DC circuit breaker

Where adjustable, place the instantaneous trip setting of the DC circuit breaker at the midpoint. The pre-installed string level fuses will provide the fastest current limitation and fastest opening time in a short circuit condition.

4.6 Initial startup and commissioning

Startup and operation checks must be performed by an authorized Eaton Customer Service Engineer or the warranty terms listed in Chapter 7 become void. This service is offered as part of the sales contract for the system. Contact an Eaton service representative in advance (minimum two-week notice) to reserve a preferred start date.

4.7 Installation checklist

The final step in installing the XLCM is completing the following Installation checklist. This checklist ensures that you have completely installed all hardware, cables and other equipment. Complete all items listed on the checklist to ensure a smooth installation. Make a copy of the Installation checklist before filling it out and retain the original.

If an Eaton Customer Service Engineer is to provide startup services, the installation must be complete. The service representative cannot perform any installation tasks other than verifying operating setup parameters. Service personnel may request a copy of the completed Installation checklist to verify all applicable equipment installations have been completed.

- All packing materials and restraints have been removed from each cabinet
- Each cabinet is installed on a level floor in its correct location
- A cabinet grounding/mounting kit is installed between any cabinets that are bolted together
- All conduits and cables are properly routed to the supercapacitor module cabinets
- A ground conductor is properly installed to the control system
- Shunt trip and auxiliary contact signal wiring is connected from the cabinet circuit breaker to the relevant system logic
- Cables for the cabinet are sized properly and connected properly
- Ventilation and air conditioning equipment is installed and operating properly
- The area around the installed system is clean and dust-free
- Adequate workspace exists around the system and other cabinets
- Adequate lighting is provided around the equipment
- A separate service outlet is available within 7.5 meters of equipment (not wired to cabinet)
- Alarm relays, open fuse indication and signal inputs are wired appropriately (OPTIONAL)
- A remote cabinet disconnect control is mounted in its installed location and its wiring is terminated inside the cabinet (OPTIONAL)
- Accessories are mounted in installation locations and wiring is terminated inside the cabinet
- The ventilation vents on the side walls are clear of debris
- Startup and operational checks are performed by authorized service personnel (contact Eaton service engineer for additional information)

Chapter 5: Technical data

5.1 Power wiring diagram

Figures 5-1 and 5-2 show the electrical illustrations of the 20 and 30 module XLCM cabinets. External wiring is to be supplied by the customer. See paragraph 3.2.2 for wiring installation notes for wiring recommendations.

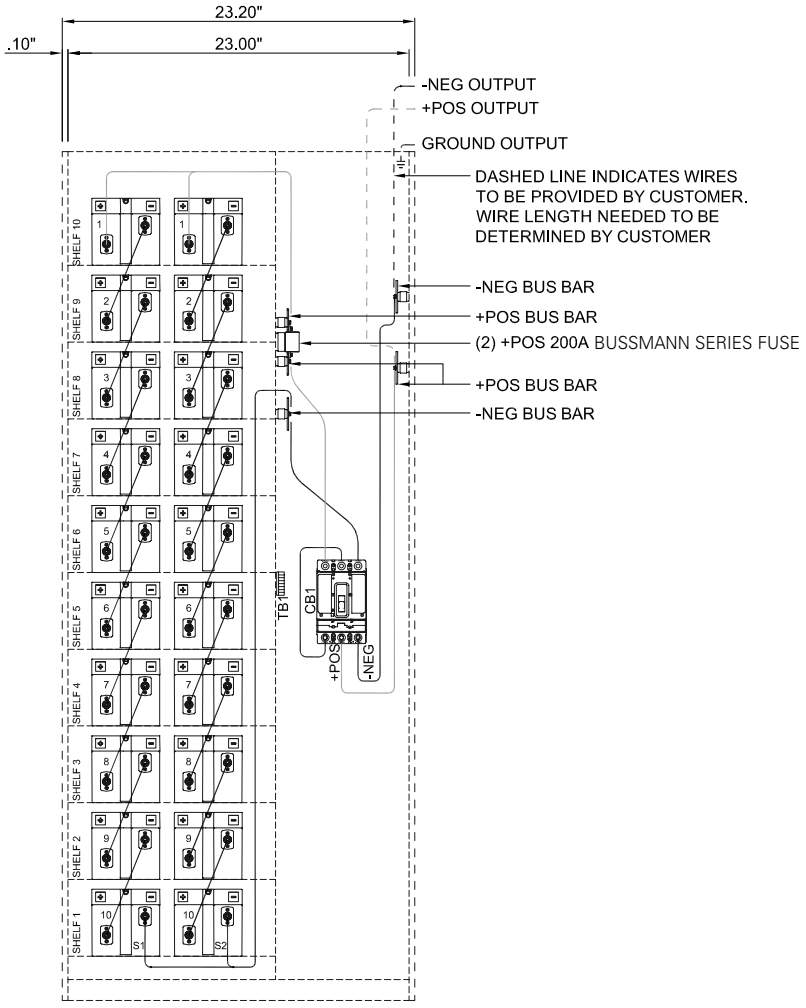

Figure 5-1: 20 Module cabinet electrical illustration

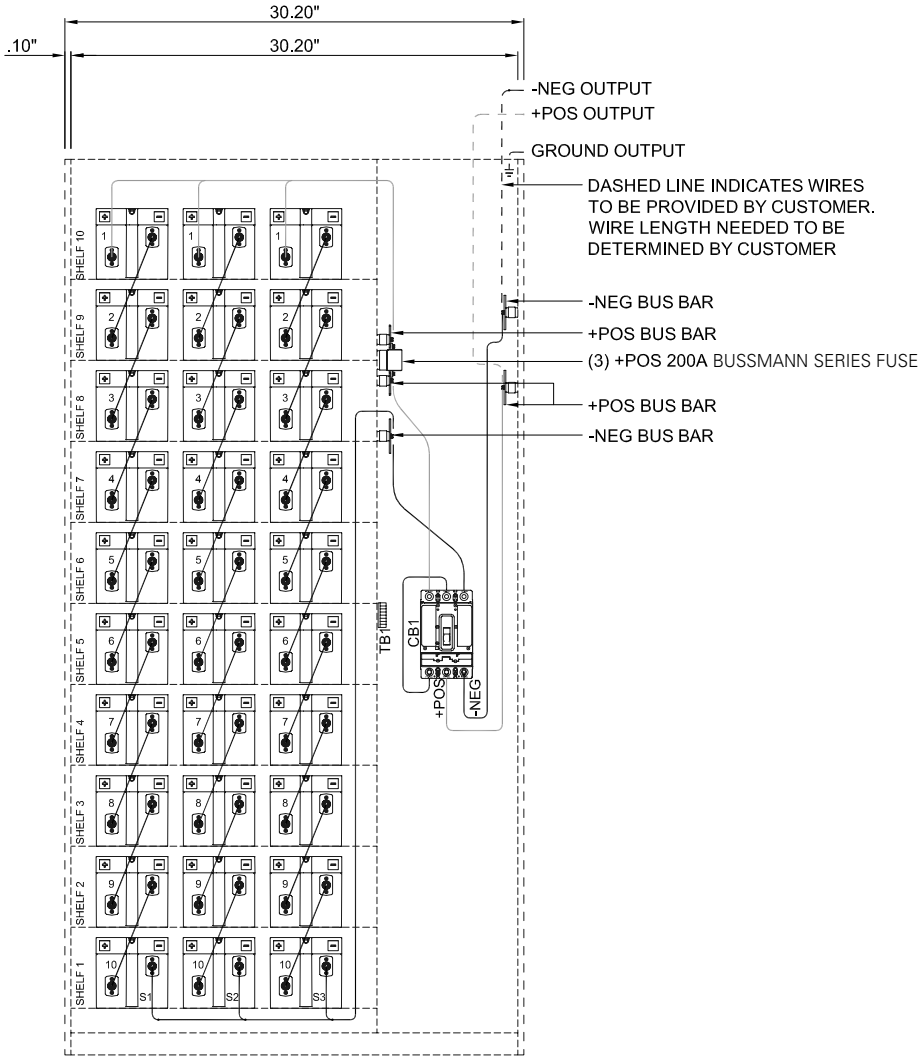

Figure 5-2: 30 Module cabinet electrical illustration

5.2 Interface wiring diagram

The interface wiring terminal block is a Bussmann Series TB200 family terminal block. The TB200 accepts a copper wire range of # 12 – 22 AWG and dual wire rated for parallel cabinet configurations. Each termination can accept bare copper wire, ring or fork terminals and a 1.0 Nm (9 in-lb) torque rating. Each screw type is a philshot screw. External interface wiring is supplied by the customer.

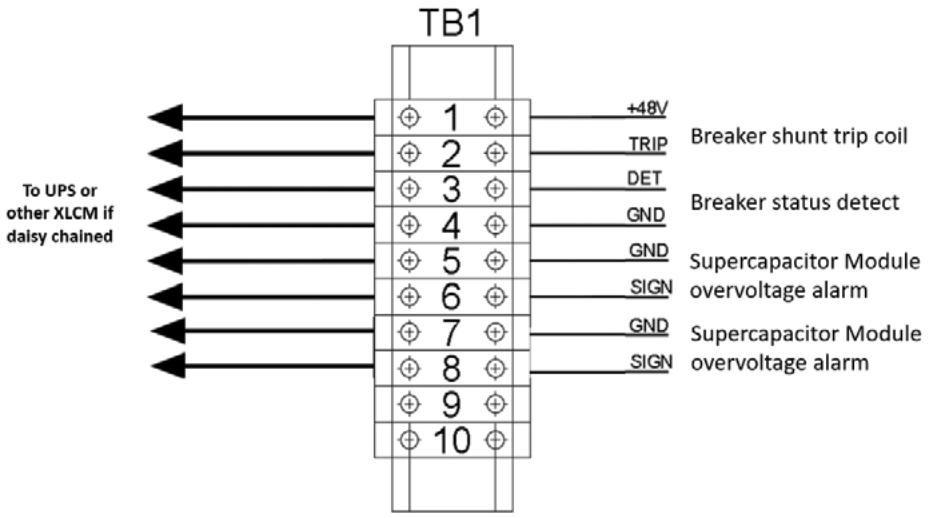

Figure 5-3: 20 Module cabinet terminal block

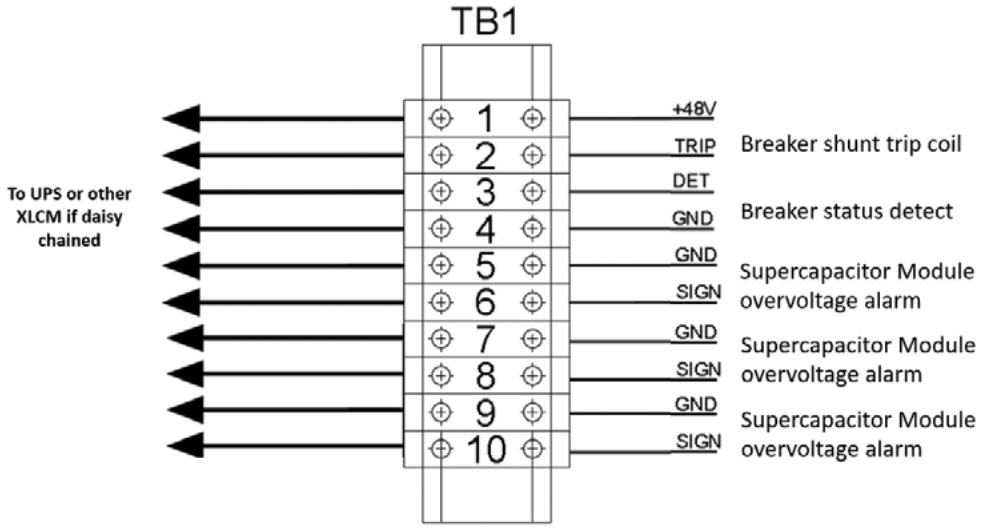

Figure 5-4: 30 Module cabinet terminal block

5.3 Supercapacitor module specification

Each supercapacitor module within the XLCM cabinet conforms to the following:

Ratings

Capacitance	130 F
Maximum working voltage	62.1 V
Capacitance tolerance	0% to +20% (+20 °C)
Operating tempreature range	-40 °C to +65 °C

Capacitance[1] (F)	Part number	Maximum initial ESR[1] (mΩ)	Nominal leakage current[2] (mA)	Stored energy[3] (Wh)	Peak power[4] (kW)	Pulse current[5] (A)	Typical thermal resistance[6] Rth (°C/W)
130	XLM-62R1137-R	6.7	128	69.6	143.9	2157	0.5

1. Capacitance and equivalent series resistance (ESR) measured according to IEC62391-1 at +20 °C, with current in milliamps (mA) = 8*C*V 2.
2. Leakage current at +20 °C after 72 hour charge and hold
3. Stored energy (Wh) = $\frac{½*C*V^2}{3600}$
4. Peak power (W) = $\frac{V^2}{4*ESR}$
5. Pulse Current in Amps (A), 1 second discharge from rated voltage to half rated voltage = $\frac{½*C*V}{(1+ESR*C)}$
6. Thermal resistance (Rth) cell body temperature to ambient in open air in degrees C per watt (°C/W)
7. Cycling between rated voltage and half voltage, 3 seconds rest at +25 °C

Performance

Parameter (F)	Capacitance change (% of initaial value)	ESR (% of maximum initaial value)
Lifetime (1500 @ +65 °C), 62.1 Vdc)	≤ 20%	≤ 200%
Lifetime (10 years @ +25 °C, 62.1 Vdc)	≤ 20%	≤ 200%
Charge/discharge cycles[7] (1,000,000, +25 °C)	≤ 20%	≤ 200%
Storage (3 years, ucharged, < +30 °C)	≤ 3%	≤ 10%

Standards and certifications

Agency information	CE & UL810A file number: MH46887 on XLM-62R1137A-R
Shock and vibration	Telcordia GR-63 Zone 4
Environmental	IP30, RoHS
Altitude, Operating	10,000 ft/ 3,000 meters
Altitude, Non-operating	40,000/ 12,000 meters
Shipping	No restrictions per UN3499 with all cells <0.3 (Wh), ship with shorting wire

5.4 Overcurrent devices (fuses and DC circuit breaker)

Each string within the XLCM has a current limiting fuse to help reduce let through currents during a short circuit condition. If the fuse opens, it is recommended to replace with the same fuse part number to ensure proper short circuit protection.

Table 5-1

String level fuse	Bussmann Series 170M3744
20 module Circuit Breaker	Eaton 3-pole LGEDC; 600 Vdc; 400 A; 48 Vdc shunt trip; 1A/1B aux
30 module Circuit Breaker	Eaton 3 pole LGEDC; 600 Vdc; 600 A; 48 Vdc shunt trip; 1A/1B aux

Note: If desiring an IEC rated DC circuit breaker, the LGEDC can be replaced with an Eaton NZMN3, of the same nominal current rating. Please contact Eaton in Section 1.5 during specification of the XLCM cabinet if desiring different circuit breaker or overcurrent protection listed in Table 5-1.

Chapter 6: Maintenance

The components inside the cabinet are secured to a sturdy metal frame. All supercapacitor modules are located for easy removal with very little disassembly. This design allows authorized personnel to perform routine maintenance and servicing quickly.

Schedule periodic performance checks of your supercapacitor system to keep it running properly. Regular routine checks of supercapacitor parameters enable your system to function efficiently for many trouble-free years.

WARNING

Because each supercapacitor string is an energy source in itself, opening the circuit breaker does not de-energize the voltage within the supercapacitor string. **DO NOT ATTEMPT TO ACCESS ANY INTERNAL AREA OF THE SUPERCAPACITOR STRING YOURSELF. VOLTAGES ARE ALWAYS PRESENT IN THE SUPERCAPACITOR STRING**. If you suspect that a supercapacitor string needs service, you should contact your service representative.

If the string requires service, refer to the supercapacitor manufacturer's operating manual for instructions on maintenance or contact your service representative. Observe these precautions when working on or around supercapacitor modules:

- Remove watches, rings or other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of supercapacitor modules or cabinets.
- Disconnect the charge source prior to connecting or disconnecting terminals.
- Determine if the supercapacitor module is inadvertently grounded. If it is, remove the source of the ground. Contact with any part of a grounded supercapacitor module can result in electric shock. The likelihood of such shock is reduced if such grounds are removed during installation and maintenance.

Discharging practices

Any supercapacitor maintenance is recommended to be performed on completely discharge modules. Discharging can be performed through the normal distribution system or through a separate resistor circuit and/or load bank. Proceed as follows to discharge the modules:

- Measure the string voltage with a voltmeter.
- If the string voltage is above 1V, the string can be discharged through the balance of power distribution system or through a resistive or electronic load bank. Proper care should be taken to design and construct such a load bank. This can be calculated through $V=V_o*e^{(-t/RC)}$
- Once the string voltage is under 1 V, a shorting wire (minimum 18 AWG) can be connected to the + and – connections. Due to the low ESR, there may be a small spark and warming of the wire when first connecting the shorting wire.
- The module string is now safe for handling. Leave the shorting wire connected at all times until the string is ready to be recharged.

Routine maintenance

- If any dirt or grime, use a cleaning cloth dampened with a water/soap solution. Do not use high-pressure sprays or immersion
  - Frequency - Annually
- Check mounting fasteners for proper torque
  - Frequency – Annually

- Inspect housing for signs of damage
  - Frequency - Annually
- Check signal/ground connections
  - Frequency - Annually
- Other maintenance is not required or recommended. If there are questions on maintenance, please contact Eaton with the contact information in Section 1.5.

Disposal

- Do not dispose of module in the trash. Dispose of according to local codes or regulations for general electronics waste. The disposal method should be compatible with aceontrile. Do not puncture or mutilate the supercapacitor modules.

Chapter 7: Warranty

The XLCM cabinet is warranted against defects in materials and workmanship for a period of 12 months from date of install or 18 months from date of purchase, whichever occurs first. This warranty applies to the original end-user and is not transferrable. The limited warranty covers the cost of cabinet material replacement only. It is up to Eaton's discretion to repair or replace the defective item. The repair or replacement does not extend the original warranty.

Eaton is not responsible for:

- Any costs resulting from a failure if the installation, commissioning, repair, alteration or ambient conditions of equipment do not fulfill the requirements specified in the documentation delivered with the cabinet and other relevant documentation.
- Equipment subjected to misuse, negligence or accident.

Eaton may grant or sell a warranty period different than above and the warranty on the supercapacitor modules is specific to the individual project. Refer to the specific sales terms and conditions. Contact your Eaton sales representative for the module specific information.

Under no circumstances shall the manufacturer be liable for special, indirect, incidental or consequential damages, losses or penalties.

The technical data, information and specifications are valid at the time of the latest printing revision. The manufacturer reserves the right to modifications without prior notice.

Contact your local Eaton Service Engineer to schedule installation, startup and commissioning to the manufacturer's requirements.

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