renaissance superRack™ indoor

Installation manual
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energy renaissance

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contents

safety

The purpose of this manual is to guide an accredited installer on how to install a system safely and securely.

These instructions detail the appropriate procedure for the assembly of the superRack™ indoor. Proper attention to these instructions will help ensure safe, trouble-free assembly.

Read these instructions, and other related documents, carefully and observe all warnings and instructions before installation.

Warning!

This installation needs to be carried out by skilled accredited personnel. Only carry out work for which you are sufficiently qualified and for which you have received instruction concerning local and operational conditions. With expansions, conversions, repair, or other work not specified in these instructions, specifically trained professional and service personnel is obligatory.

DANGER

There are dangerous voltages in the equipment. Accidental contact may lead to a fatal shock hazard. When working with this equipment always:

- **Follow procedural safety instructions**
- **Wear personal protective equipment (eg. insulating gloves, safety shoes etc)**
- **Have at least two persons working on-site to ensure safety**

DANGER!

If this equipment is used in a manner not specified by the manufacturer as contained in this manual and other operational documents and instructions, then the protection provided by the equipment may be impaired and could increase fire risk, damage to property and person, risk of electric shock, risk of chemical exposure and result in warranty issues.

safety equipment

In accordance with AS3000 only people deemed competent by the installer should make power connections. Personal Protective Equipment (Cat-1 PPE of 4 cal/cm2) of: should be worn and a safety observer should be present.

See "Appendix 1: Arc-Flash Calculation" for why Cat-1 is sufficient.

In some jurisdictions, additionally the following will be required:

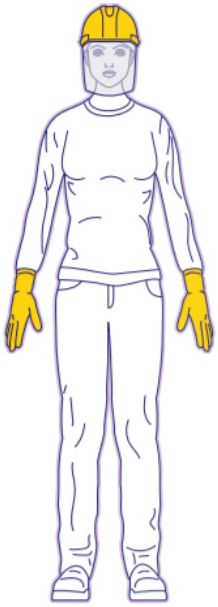
1. Person performing the work or person overseeing the work should have formal qualifications like electrician or electrical engineer.
2. Person performing the work or person overseeing the work and safety observer should hold a Cardiopulmonary Resuscitation (CPR) and Low-Voltage (LV) rescue certificate.

The installation should be in accordance with both AS3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) and AS5139 Electrical installations - Safety of battery systems for use with power conversion equipment.

4 cal/cm²

PPE CATEGORY

1



- Arc-rated long sleeve shirt
- Arc-rated pants or overalls
- Arc-rated face shield with hard hat
- Safety glasses
- Hearing protection
- Leather & voltage rated gloves (as needed)
- Leather work shoes

safety

Every possible precaution should be taken to ensure the safety of personnel and the system.

- Only professional electricians or qualified personnel that are deemed competent by the installing entity can install and operate this product.
- Warning signs and safety signs need to be set up in installation area.
- Ensure there is a clear path for staff or persons to leave the battery location quickly in case of an emergency.
- Do not place combustible or explosive materials around battery packs.
- Do not obstruct the escapeway route or occupy the escape way in any form.
- This rack has been designed and tested strictly according to international safety regulations.
- This installation manual and the tasks and procedures described herein are intended for use by skilled workers only.
- A skilled worker is defined as a trained and qualified electrician or installer (deemed competent by the installing entity) who has all the following skills and experience:
    - Knowledge of the functional principles and operation of the whole energy storage system.
    - Knowledge of the dangers and risks associated with installing and using lithium-ion battery modules, electrical connectors, BMS and power conversion systems.
    - Knowledge of the installation of electrical wiring and on grid systems.
    - Knowledge of and adherence to this manual and all safety precautions, international standards, and best practices.
- Installers and users are responsible for familiarising themselves with this manual. All descriptions in this manual, especially safety related items, must be complied with.
- The superRack™ indoor dissipates 5% of its energy per cycle and must be installed in conditions not exceeding the temperature, humidity and elevation specifications (see product data sheets).
- Operators should have comprehensive understanding of the structure, working principle of the battery modules and the whole energy storage system.
- This superRack™ indoor product and the individual components are extremely heavy. Ensure that all elements are lifted, transported, placed with care and lifting best practises are used.
- A mechanical lift is required to lift and position the superRack™ indoor.
- Operators should be familiar with the relevant standards of the country/region where the project is located.

Installation must be according to at least the following standards:

- Building Code of Australia
- IEC 62619 Ed. 1.0
- AS/NZS 5139
- AS/NZS 3000
- AS/NZS 4509.1
- AS/NZS 4777.1/.2/.3
- AS1768 Lightning Protection
- AS/NZS1170.2 Wind Loads

The installation also needs to comply with safety and electricity legislation in the relevant state or territory in Australia. Best Practice guides should be followed.

https://www.cleanenergycouncil.org.au/industry/installers/compliance-toolkit/standards

Installers must meet the relevant safety gear requirements of international standards, such as IEC 60364 or domestic legislation.

The safety instructions outlined in this document cannot cover all precautions that need to be followed.

It is important that operations are performed considering actual onsite conditions.

Energy Renaissance shall not be held liable for any damage caused by the breach of the safety instructions in this manual. **Failure to observe the precautions described can cause serious injury to persons or damage to property.**

Safe Battery Handling Guide

IMPORTANT!

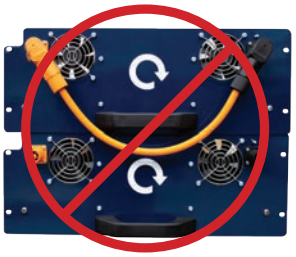
- Use the battery pack/rack only as directed.
- Do not use the battery pack/rack if it is defective, appears cracked, broken or otherwise damaged, or it fails to operate.
- Do not attempt to open, disassemble, repair, tamper with, or modify the battery pack/rack. The battery pack/rack is not user serviceable.
- To protect the battery pack/rack and its components from damage when transporting, handle with care.
- Do not impact, pull, drag, or step on the battery pack/rack. Do not subject it to any strong force.
- Make sure battery rack has been placed on level ground and bolted down into position as per installation requirements below (only indoor racks are required to be bolted down)
- Do not insert foreign objects into any part of the battery pack/rack.
- Do not use cleaning solvents to clean the battery pack/rack.
- The battery pack/rack should be stored in a weatherproof location prior to installation into its final operating location. Do not expose the packaging/crates or pack/rack to rainfall or inclement weather (including temperatures over 60°c) at any time.
- The superRack™ indoor dissipates 5% of its energy per cycle and must be installed in conditions not exceeding the temperature, humidity and elevation specifications (see product data sheets and heat load spreadsheet).
- Do not pull out any cables when the battery rack is in operation.
- Do not damage the sheath of cables, wire harnesses or connectors.
- Do not use pack handle as a lifting point. The pack handle is not a rated lifting point and is intended for maneuvering the pack only. Full pack weight should never be lifted by the handle alone.

Failure to follow these instructions could result in voiding warranties and potential safety issues.

Attention: The superRack™ indoor will come pre-configured so battery cabling does not need to be accessed. If in the event of service or warranty works please be aware of the following.

DANGER! DO NOT SHORT PACKS OR CONNECT PACKS IN PARALLEL

Incorrect connector cabling will short packs and cause warranty and potentially dangerous safety issues.

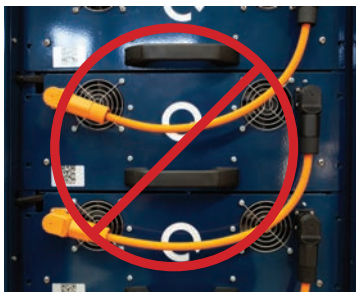


DANGER! DO NOT MAKE ANY MODIFICATIONS TO BATTERY PACKS OR SWITCHGEAR

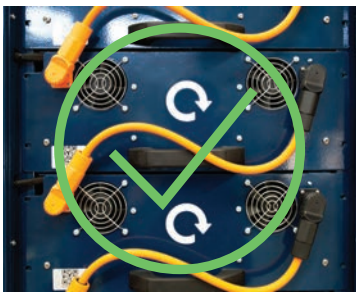
Under no circumstances should battery packs or Switchgears be opened or modified. This may result is safety hazards and void warranties.

DO NOT COVER FANS WITH CONNECTOR CABLES

The battery interconnect cables must not obstruct the airflow to the fans. Check cables have not moved during transportation and are blocking fan inlets.



INCORRECT Cable is covering fan



CORRECT Cable does not cover fan

Specific battery safety

	An extremely dangerous power hazard exists during battery energy system installation and connection. Take extreme caution during this process. Failure to do so may cause serious injury or death. Batteries are a constant power supply and should always be deemed to be a live source of energy.
	The battery pack should not be disposed of with household waste at the end of its working life.
	Read the manual before installing and operating the battery pack.
	Keep the battery module away from open flame or ignition sources.
	Wear appropriate personal protective equipment when dealing with the battery pack. Safety boots are required when lifting packs. Insulating gloves, insulating mat, safety goggles and long sleeved/legged non-flamable clothing for electrical connection.
	Keep the battery pack away from children.
	Under fault conditions, the battery pack may leak corrosive electrolyte.
	Under fault conditions, the battery pack may explode.
	The battery packs and superRack™ indoor are heavy enough to cause severe injury. Safety boots are required for installation, connection and are required at all times in the work area.

	The battery pack should be disposed of at an environmentally safe recycling facility.
 **EXPLOSIONS**	Do not subject the battery pack to strong impacts. Do not crush or puncture the battery pack. Do not dispose of the battery pack in a fire. Only use insulated tools when dealing with batteries.
 **RISKS OF FIRE**	Do not expose the battery pack to temperatures in excess of 60°C. Do not place the battery pack near a heat source, such as heating systems. Do not expose the battery pack to direct sunlight. Do not allow the battery connectors to touch conductive objects such as wires or moisture or liquids. Do not short circuit battery packs. Ensure vermin, insects or other pests do not inhabit battery rooms or battery enclosures
 **RISKS OF ARCING**	Do not allow battery connectors (pack or rack) to touch conductive objects such as wires or moisture or liquids.
 **RISKS OF ELECTRIC SHOCK**	Do not disassemble the battery pack/rack. Do not touch the battery pack/rack with wet hands. Do not expose the battery pack/rack to moisture or liquids. Keep the battery pack/rack away from children and animals.

DANGER! Emergency situations

Risks of damage to the battery pack/rack

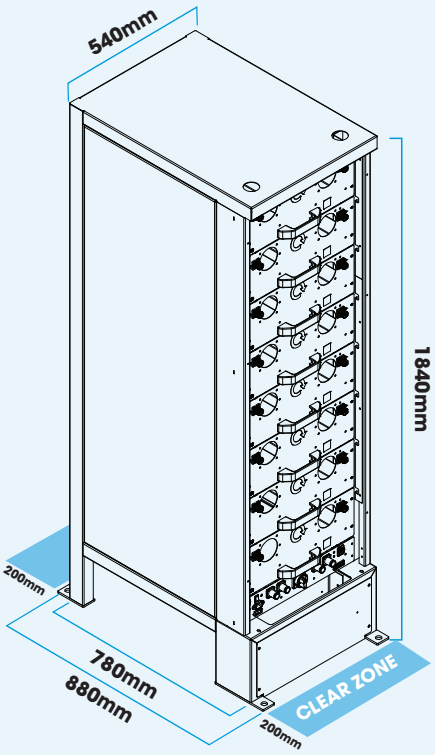
- X **Do not** tilt battery rack/battery enclosure
- X **Do not** allow the battery pack/rack to come into contact with liquids.
- X **Do not** subject the battery pack/rack to high pressures.
- X **Do not** place any objects on top of the battery pack/rack.
- X **Do not** expose battery pack/rack to high temperatures (the product is warranted for use at 25 ± 5 °C), high humidity or dust
- X **Do not** subject the battery pack/rack to short circuiting

Leakages	**CAUTION!** Damaged batteries may leak electrolyte or produce flammable gas. **If you suspect a gas leak, take these actions:** • Immediately quarantine the location and do not allow any personnel near the potentially damaged battery. • Contact emergency services / call fire brigade and follow your site procedures. • Contact your provider for further advice and information. **In case of a fire, make sure that an appropriately rated fire extinguisher is nearby.** • The battery pack/rack may catch fire when heated above 150 °C. **If a fire breaks out near the battery pack/rack installation:** • Extinguish the fire potential before the battery pack/rack catches fire or if smoke is present. **If the battery pack/rack has caught fire:** • **Do not try to extinguish the fire**. • Evacuate people immediately and shut off any connected power systems. • Contact emergency services / call fire brigade and follow your site procedures. **If the battery pack/rack leaks electrolyte**, avoid contact with the leaking liquid or gas. Electrolyte is corrosive and contact may cause skin irritation and chemical burns. If anyone is exposed to the leaked substance, take these actions: **Inhalation:** Evacuate the contaminated area and seek medical attention immediately. **Eye contact:** Rinse eyes with flowing water for 15 minutes and seek medical attention immediately. **Skin contact:** Wash the affected area thoroughly with soap and water for 15 minutes and seek medical attention immediately. **Ingestion:** Induce vomiting and seek medical attention immediately.
Wet batteries	If the battery pack/rack is wet or submerged in water, do not try to access it. Contact your provider for technical assistance.
Damaged batteries	Damaged batteries are dangerous and must be handled with extreme caution. They are not fit for use and may pose a danger to people or property. If the battery pack seems to be damaged, contact your provider for advice. Do not handle.

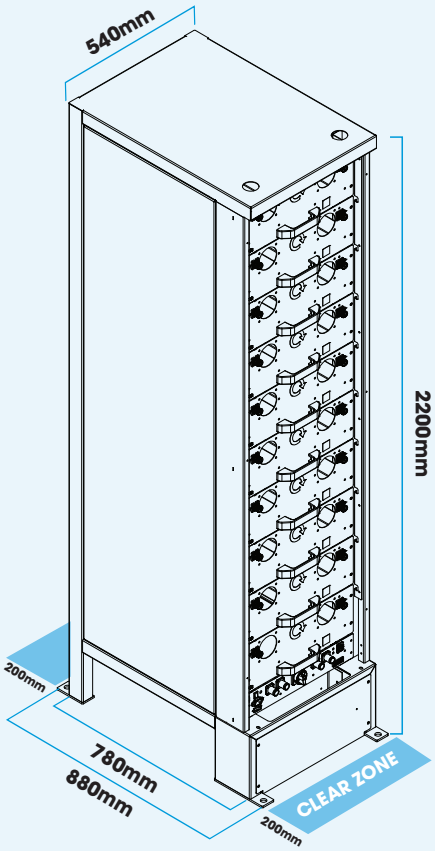
site considerations

IP rating	superRack™ indoor configurations are rated to IP 20. This rating requires the superRack™ indoor to be kept in a location that protects the batteries from all inclement weather conditions, dust, rodents and other pests including during transportation, pre, and post installation.
superRack™ indoor installation position considerations	• Consider available floor space, including aisles for rack installation, maintenance, and possible rack replacement. • Racks should be placed with minimum 200mm ventilation space behind where it is installed. Ventilation space of minimum 200mm should also be given in front of the rack. • The rack position and wiring need to be taken into consideration when installing, for maintenance, and easy access. Recommended accessibility clearance is 600mm at the rear and 1,500mm at the front of the rack. • Consider the postion of the superRack™ indoor in relation to the inverter. The PCS cables provided are 3m in length.

superRack™ indoor 8 pack



superRack™ outdoor 10 pack



site considerations

Installation environment	• Ensure temperature and humidity are within acceptable range before installing. 25 ± 5°C and less than 95% relative humidity in a non-condensing atmosphere. The heat loading estimate spreadsheet is useful in estimating air conditioning load. The installer needs to fill in on the spreadsheet the inverter efficiency, number of inverters, power of each inverter, number of packs per rack, and number of racks. In addition to the calculated losses in the spreadsheet the room will also have a heat loading and this too needs to be added. • When installed in an enclosed space, there needs to be good ventilation. No excessive humidity, or high temperature source, no corrosive gas, explosive or hazardous materials. It must meet fire protection requirements. See AS/NZS 5139 installation standards and Building Code of Australia. • Avoid direct sunlight or rain. • Altitude must be <2,000m. • superRack™ indoor installations should take place on a flat concrete base or other non-flammable surface. It should have enough load bearing capacity to hold the superRack™ indoor configuration, or multiples of. • The four holes located on the feet of the superRack™ indoor are used to anchor the system to the floor. Usually fixed with M16 expansion bolts or similar.

logistics, unloading & lifting

WARNING! The superRack™ indoor is heavy.

Batteries are required to be unloaded carefully with mechanical lifting equipment on a level surface so not to allow the rack or pallet to tilt. Forklift tines must be fully engaged to prevent battery tipping.

All Energy Renaissance battery products must be transported via Dangerous Goods certified logistic providers

WARNING!

Your product comes with shock and tilt sensors. If either sensors have been activated, contact your provider prior to accepting the delivery.

shock sensor

tilt sensor

Avoid tilting	If tilting occurs there is a high risk of the rack falling and crush danger. Forklift tines must be fully engaged to prevent battery tipping.
DANGER fallen rack	If the rack/enclosure has fallen it is immediately deemed unsafe, warranty voided, and all safety risks should be observed.
Avoid violent vibration	Violent vibration, impact or extrusion needs to be avoided.
Inspect the package	Check packaging, including shock and tilt sensors, for any visible damage. Look for liquid leakage or residue and be aware of peculiar smells, rattling sounds or loose parts. **If there is any sign of damage do not install and contact your provider.** Check the delivery check list to ensure all accessories delivered are complete according to the packaging list.
Use correct equipment to move the superRack™ indoor	The superRack™ indoor arrives on a pallet base and can be moved with an appropriately rated narrow base pallet jack.

installation equipment

Before working to assemble the superRack™ indoor, ensure that you have the tools and equipment listed below. **Make sure you are wearing the correct personal protective equipment (as detailed above).**

Power drill and drivers

Insulated Flathead & Philips screwdriver

Stanley knife
For boxes

Hammer drill and expansion bolts
For anchoring rack to the ground

Insulation tester
Safety testing

Socket set

Electricians key 8mm square

Tamper-proof key T25
For fixings to attach front panel to rack

Forklift or similar
For positioning rack at site

IEC cable

Instrumentation cable*

Earth cable

Ethernet cable

Expansion bolts

Network connection

USB to micro USB cable

120ohm 0.5W resistor

*impedance of between 100 and 130 Ω, a capacitance between conductors of less than 100 pF per meter, and a capacitance between conductors and shield of less than 200 pF per meter.

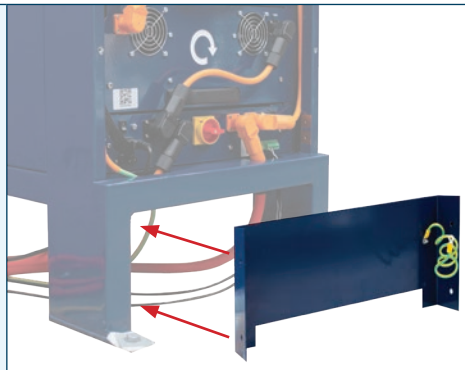
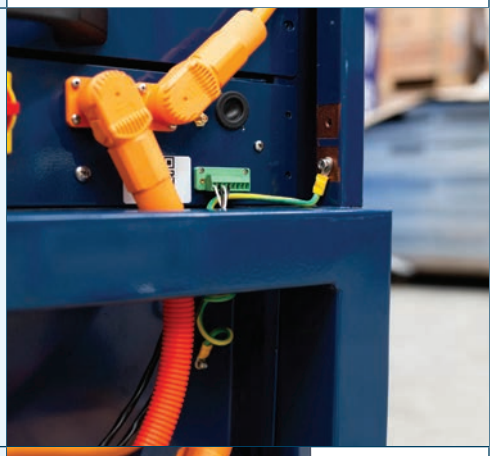
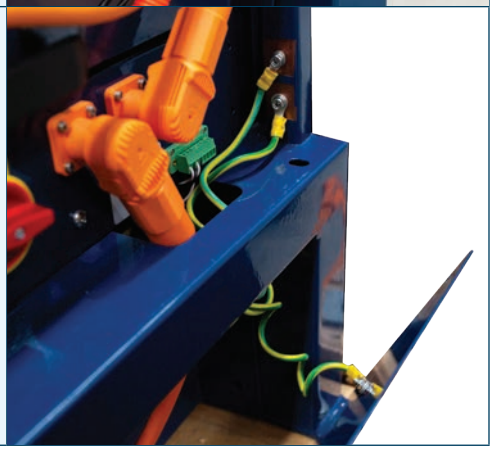
At least two qualified personnel are required to install the superRack™ indoor, and all electrical installations must comply with electrical installation standards.

The superRack™ indoor must be anchored to the ground for seismic events.

mechanical protection

Once all cabling works have been completed, the mechanical protection plates can be installed.

The superRack™ indoor has been designed to have clearance underneath the rack so that the cable tray can be used to secure and manage cables. Mechanical protection plates have been designed to protect cables and minimise ingress of vermin into the rack.

Install rear mechanical protection plate	Install rear mechanical protection plate to the inside back of the front legs, using fixings provided, taking care not to damage any cables. Thread cables through the gap provided. It is advised to use fire caulking (rated to be used with electrical cables) or similar to enclose the rear panel penetration once all cabling has been completed.	
Connect rear mechanical protection plate earthing cable	The rear mechanical protection plate comes with an earthing cable. This needs to be electrically connected to the main earthing point on the right hand side of the rack.	
Connect front mechanical protection plate earthing cable	The front mechanical protection plate that attaches to the front of the rack comes with an earthing cable. This needs to be electrically connected to the remaining main earthing point on the right hand side of the rack.	

mechanical protection

Install front mechanical protection plate	Engage the front mechanical protection plate using fixings provided, taking care not to damage any cables.	
Reinstall mesh front panel and Switchgear door (if required)	Using security fixings provided install mesh front panel to the front of the rack. Install and lock Switchgear door.	

installation instructions

superRack™ indoor

The superRack™ indoor consists of a Switchgear unit and up to 10 battery packs and can also be fitted with an in-rack inverter. Other inverters can be supplied separately, or provided by the installer and mounted external to the rack.

For example basic configurations and installation SLDs see appendix 2 and appendix 3.

Rack cables configurations & connections

Danger! Do not short packs or connect packs in parallel.

The image to the right shows the superRack™ indoor with all battery packs in place (and all power and internal communications cables connected).

The fully assembled superRack™ indoor should have arrived with cable configurations as shown in the image to the right. The Switchgear is at the bottom. All battery packs have the orange positive DC connector plug on the left-hand side.

If the assembled superRack™ indoor does not arrive with the cables in this configuration, contact your provider immediately.

Pre-installed main link connections

WARNING
Prior to all cabling works ensure equal potential earthing has been connected to the rack. If multiple racks are being installed ensure each rack has been earthed.

PRE-INSTALLED

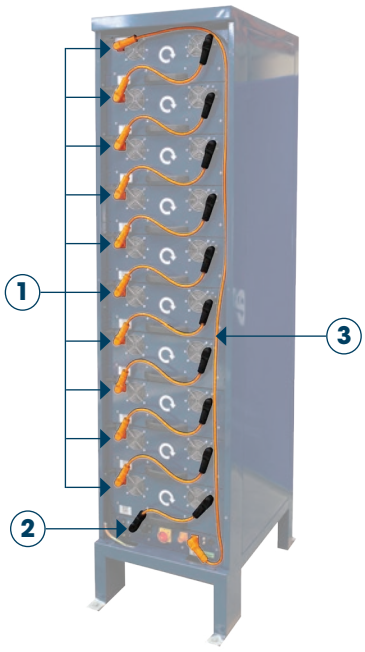
1. **Pack to Pack link cables.** Starting from the bottom pack, link cables run from the bottom packs positive terminal and connect to the second from bottom packs negative terminal. This process repeats until all pack have been connected in series.

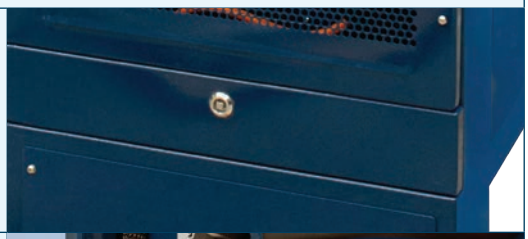
PRE-INSTALLED

2. **1 x medium length link with two black connectors** for connecting the Switchgear to the bottom pack negative.

PRE-INSTALLED

3. **1 x long link with two orange connectors.** Running from the Switchgear positive terminal to the top pack positive terminal.



Use appropriate safety equipment	Ensure Cat-1 PPE is worn. See page 4 for full list of equipment.	
Remove switchgear door	Unlock and remove the switchgear door.	
Ensure the electrical equal potential earth cable is connected to the superRack™ indoor	**Very Important!** **Ensure the electrical equal potential earth cable is fitted to the rack before proceeding further.** The earthing cable is terminated at the bottom of the rack. For racks bundled together in multiples **each individual rack must be earthed**.	
Ensure the superRack™ indoor has been isolated	The isolation switch is located on the Switchgear unit in the lowest slot of the rack behind the bottom door panel. **Ensure the isolation switch is engaged in the OFF position.**	
Connect the Switchgear PCS+ and PCS- to the inverter	For **external inverter solutions** two 3,000mm cables are provided to be run from the Switchgear to the battery inverter (PCS), PCS+ (cable with an orange plug) and PCS- (cable with a black plug). Each of the cables provided come with a ring lug. This lug can be cut off if bespoke lug or cable terminal is provided with the battery inverter. Energy Renaissance takes no responsibility for faulty or incorrect termination if the provided ring lug is removed. Ensure the cables run down through the penetration at the bottom of the rack (inside terminals). **NOTE: If you purchased an in-rack inverter, this step comes pre-assembled.** **If you are supplying your own inverter, please refer to their product installation instructions.**	

Connecting AC to optional pre-installed in-rack inverter	If the superRack™ indoor was purchased with a pre-installed in-rack inverter (PCS), then an AC connection to the PCS is required. Note the cables run down through the penetration at the bottom of the rack (inside terminals). **Ensure sufficient isolations are in place to avoid electric shock.**	
	Remove cable termination cover and connect AC mains and earth.	
Provide power supply	The installer is required to provide a 230V single phase general power outlet/isolator for each Switchgear unit. The installer is required to provide an IEC plugged cable. This cable is used to power the rack logic. **Important!** **Ensure all relevant testing procedures are completed on incoming cables prior to operation.**	

installation instructions

superRack™ indoor twin

The superRack™ indoor twin consists of a Switchgear unit and up to 11 - 17 battery packs and can also be fitted with an in-rack inverter. Other inverters can be supplied separately, or provided by the installer and mounted external to the rack.

For example basic configurations and installation SLDs see appendix 2 and appendix 3.

Pre-installed main link connections

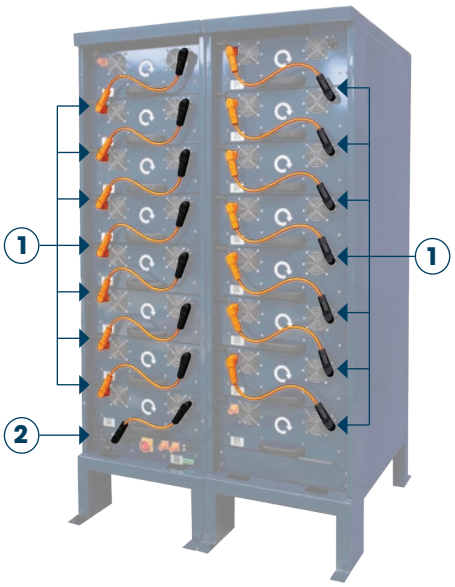
WARNING
Prior to all cabling works ensure equal potential earthing has been connected to the rack. If multiple racks are being installed ensure each rack has been earthed.

When installing superRack™ indoor twin racks, ensure the paired racks are installed hard against each other to avoid cables unable to reach destinations stated below. Install the rack with the Switchgear unit on the left-hand side, this will be referred to as the primary rack. The rack without the Switchgear will be referred to as the secondary rack.

PRE-INSTALLED

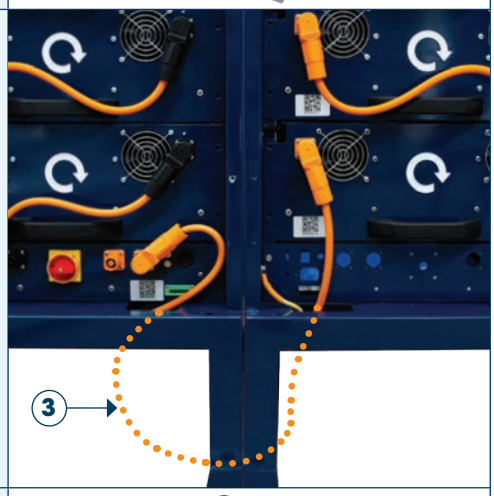
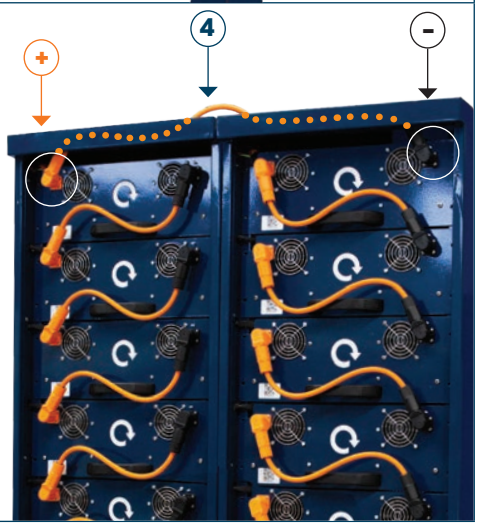
1. **Pack to Pack link cables**. Starting from the bottom pack on the primary rack, link cables run from the bottom packs positive terminal and connect to the second from bottom packs negative terminal. This process repeats until all packs in the primary rack have been connected in series.

   In the secondary rack, starting from the bottom pack, link cables run from the bottom packs negative terminal and connect to the second from bottom packs positive terminal. This process repeats until all packs in the secondary rack have been connected in series.



PRE-INSTALLED

2. **1 x medium length link with two black connectors** for connecting the Switchgear to the bottom pack negative in the primary rack.

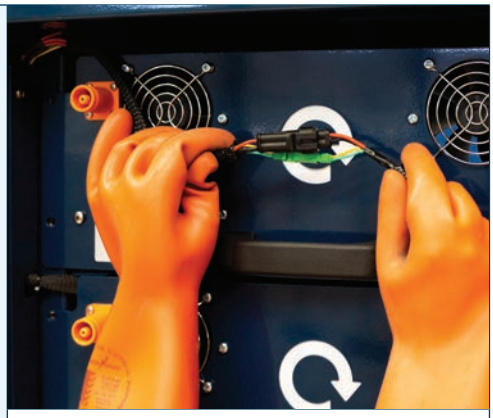
Use appropriate safety equipment	Ensure Cat-1 PPE is worn. See page 4 for full list of equipment.	
Main link connections are to be done by installer **WARNING** **Prior to all cabling works ensure equal potential earthing has been connected to the rack. If multiple racks are being installed ensure each rack has been earthed.**	**Remove the mesh front panel and Switchgear door on both racks** using a tamper proof and an electricians key.	
	③ **1 x long link with two orange connectors** This cable is to be run from the Switchgear positive terminal on the primary rack, down through the penetration in the rack frame underneath the Switchgear and enter through the bottom of the secondary rack and plug into the positive terminal of the bottom pack in the secondary rack.	
	④ **1 x Pack bridging cable with orange and black connectors** Run cable from the positive plug on the top pack of the primary rack through the penetration on the top right-hand side of the primary rack and through the left hand side penetration of the secondary rack down to the **negative plug** on the top pack of the secondary rack. Ensure the snap in bushing remains in place to protect cable integrity.	

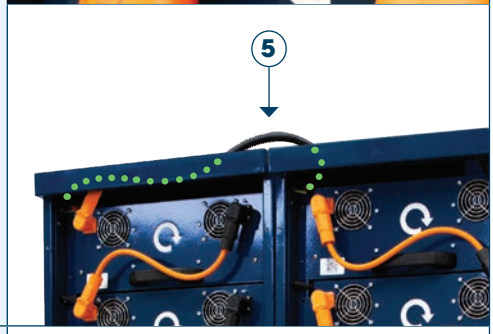
Main link connections are to be done by installer

WARNING
Prior to all cabling works ensure equal potential earthing has been connected to the rack. If multiple racks are being installed ensure each rack has been earthed.

(5) 1 x Bridging loom connector

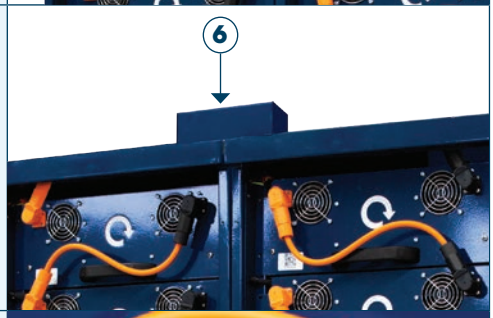
Connect the provided loom bridging cable to the top of the wiring loom on the left-hand side of the primary rack and run in the same path as the pack bridging cable above.
Use the right hand side penetration on the primary rack and feed through the left hand side penetration of the secondary rack and connect the bridging cable to the top of the wiring loom on the left hand side of the secondary rack.





(6) Bridging cable cover

Once both pack and loom bridging cables have been installed use the provided cable cover to encase both cables protecting them from mechanical damage.



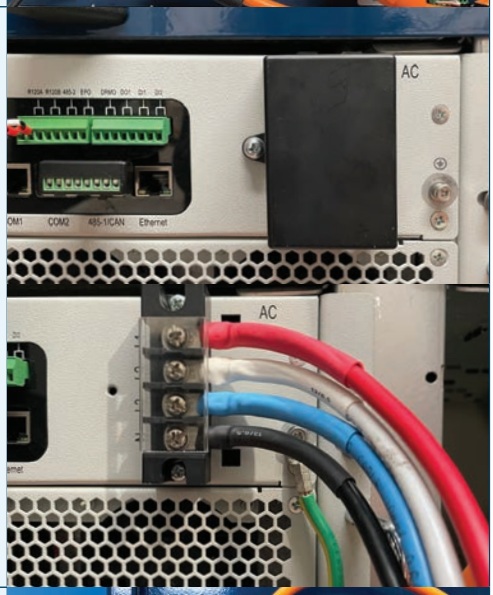
Connect the Switchgear PCS+ and PCS- to the inverter

For **external inverter solutions** two 3,000mm cables are provided to be run from the Switchgear to the battery inverter (PCS), PCS+ (cable with an orange plug) and PCS- (cable with a black plug). Each of the cables provided come with a ring lug. This lug can be cut off if bespoke lug or cable terminal is provided with the battery inverter. Energy Renaissance takes no responsibility for faulty or incorrect termination if the provided ring lug is removed.

Ensure the cables run down through the penetration at the bottom of the rack (inside terminals).

NOTE: If you purchased an in-rack inverter, this step comes pre-assembled.

If you are supplying your own inverter, please refer to their product installation instructions.

Connecting AC to optional pre-installed in-rack inverter	If the superRack™ indoor twin was purchased with a pre-installed in-rack inverter (PCS), then an AC connection to the PCS is required. Note the cables run down through the penetration at the bottom of the rack (inside terminals). **Ensure sufficient isolations are in place to avoid electric shock.**	
	Remove cable termination cover and connect AC mains and earth.	
Provide power supply	The installer is required to provide a 230V single phase general power outlet/isolator for each Switchgear unit. The installer is required to provide an IEC plugged cable. This cable is used to power the rack logic. **Important!** **Ensure all relevant testing procedures are completed on incoming cables prior to operation.**	

connecting the superEMS™

If the superRack™ indoor was sold with a superEMS™ controller and secondary controller(s) their installation is described in this section (for systems using a superModbus™ controller see next section).

Controller dimensions (mm): 280h x 380w x 180d

Controller enclosure is IP 66 ensure any penetrations made in to the unit must retain the IP rating with appropriately rated glands or conduit fixings.

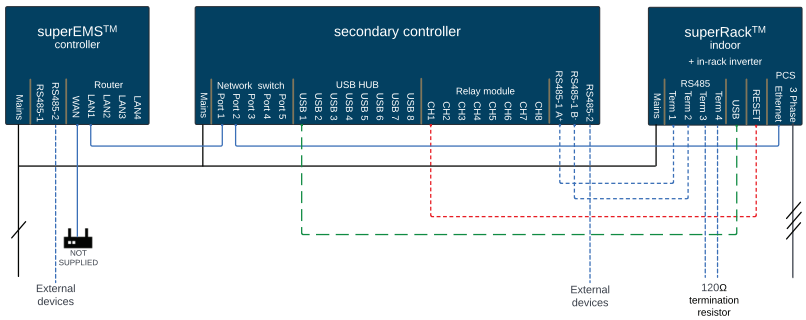
Do not mount controller enclosure in direct sunlight.

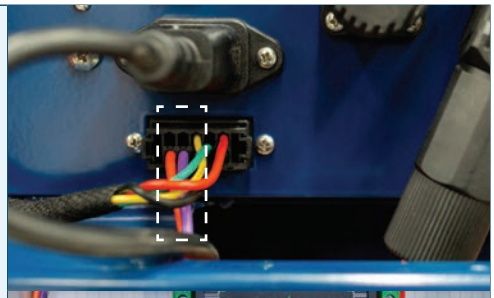
You can have up to eight secondary controllers connected to one superEMS™ controller. You can have up to eight superRack™ indoor's connected to one secondary controller and up to three inverters. You must have at least one inverter dedicated to every secondary controller. Secondary controllers cannot share an inverter.

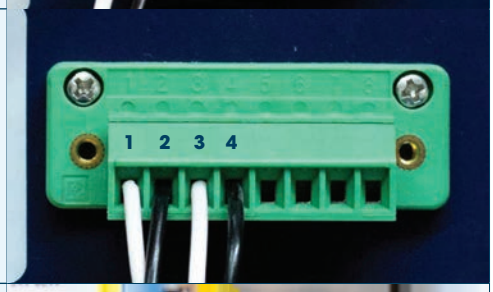
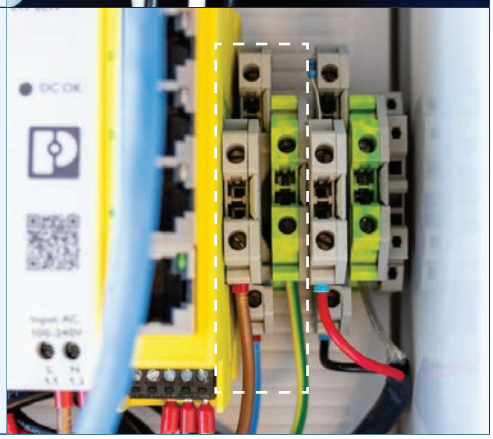
connecting the secondary controller

Example communications connection

For example basic configurations and installation SLDs see appendix 2 and appendix 3.

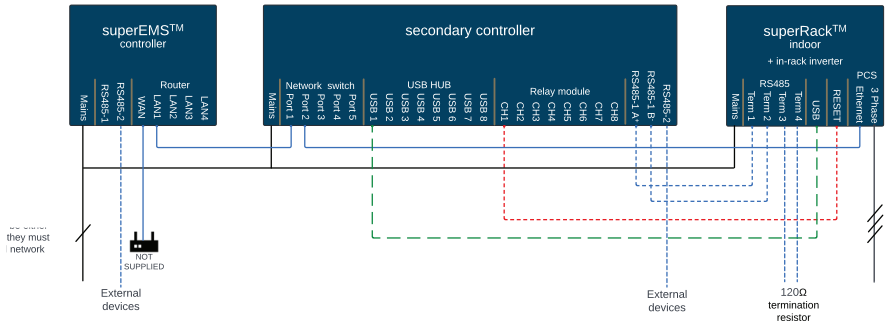


Connecting the rack reset	The superRack™ indoor will come with two fly leads terminated into Com1 of the switchgear. These are to be terminated into the relay module of the secondary controller. You can extend these using your own cabling. **Note:** It is imperative that you terminate them in ascending order from the lowest ID rack going into relay 1 (normally open contact), the next ID rack going into relay 2 (normally open contact), etc.	 
Connecting the superRack™ indoor USB	The micro-USB port of the superRack™ indoor needs to be connected to the USB hub within the secondary controller. You will be required to provide your own cabling suitable to the run length. The micro-USB of the lowest numbered rack will go into USB1 of the bottom USB Hub, the next numbered rack into USB2, etc. with the top USB hub being numbered 5-8.	 
Connecting the inverter	Current pre-installed in-rack inverters require an ethernet connection between the ethernet port of the inverter and the network switch inside the secondary controller. If the inverter requires RS485, you are able to connect it to the RS485-2 terminals of your secondary controller. If you have purchased your own inverter and it communictes via TCP/IP you will need to connect it to your own network with a static IP and notify us of the IP and port number. Note that devices connected to your own network will not protected by ER cyber security. Wiring examples can be found in Appendix 2 and 3. You must have at least one inverter dedicated to every secondary controller. Secondary controllers cannot share an inverter.	  

Connecting the superRack™ indoor to the secondary controller	When connecting the superRack™ indoor's communication to the secondary controller, connect RS485-1 A+ and B- cables located on the terminal strip inside your secondary controller to 1 and 2 on the green plug located on the Switchgear faceplate. If there is only one rack in the installation connect a 120Ω resistor into terminals 3 and 4. Ensure the polarity of your communications cable is consistent to each device.	 
	If the installation has multiple racks, terminals 3 and 4 must be used to daisy chain to the other racks. 3 and 4 of rack one would connect to 1 and 2 of rack two and so forth. Ensure the last rack in the line has a 120Ω termination resistor in terminals 3 and 4.	
Connecting power to the secondary controller	You are required to connect power to the secondary controller. The secondary controller comes fitted with a 230VAC to 24VDC power supply. You will be required to provide your own cabling suitable to the run length. Ensure your circuit is protected with a 230V circuit breaker.	

connecting the superEMS™ controller

Example communications connection



Connecting your network to the router

You need to provide an internet connection for your installation.

Connect an ethernet cable from your network to the WAN port on the superEMS™ controller's router.

You will be required to provide your own cabling suitable to the run length.

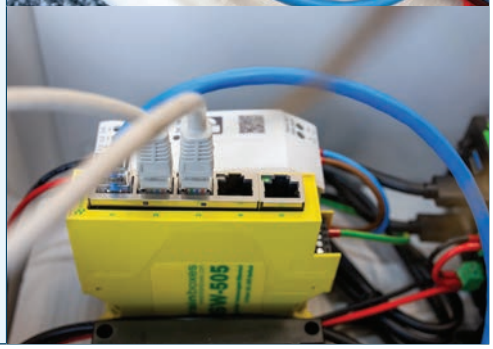
Connecting the router to the secondary controller

single or multiple

You need to provide an ethernet connection to all of the secondary controllers.

Connect an ethernet cable from a LAN port on the router inside the superEMS™ controller to the network switch located inside the secondary controller.

You will be required to provide your own cabling suitable to the run length.



Connecting other approved devices to the superEMS™ controller	External devices can be connected to the RS485-2 port on your superEMS™ controller (not secondary controller) or if ethernet connected to your own network with a static IP, you will be required to notify us of the static IP and port number so the superEMS™ is able to communicate with the device. Note that devices connected to your own network will not protected by ER cyber security. Wiring examples can be found in Appendix 2 and 3. For more information on how to configure these devices please see the superEMS™ user manual. You will be required to provide your own cabling suitable to the run length.	
Connecting power to the superEMS™ controller	You are required to connect power to the superEMS™ controller. The superEMS™ controller comes fitted with a 230VAC to 24VDC power supply. You will be required to provide your own cabling suitable to the run length.	

You can now install the mechanical protection and then the superRack™ indoor is now ready for commissioning

For service and support:

1300 472 020

or please visit
energyrenaissance.com/service

connecting the superModbus™

If the superRack™ indoor was sold with a superModbus™ controller and secondary controller(s) their installation is described in this section (for systems using a superEMS™ controller see previous section).

Controller dimensions (mm): 280h x 380w x 180d

Controller enclosure is IP 66 ensure any penetrations made in to the unit must retain the IP rating with appropriately rated glands or conduit fixings.

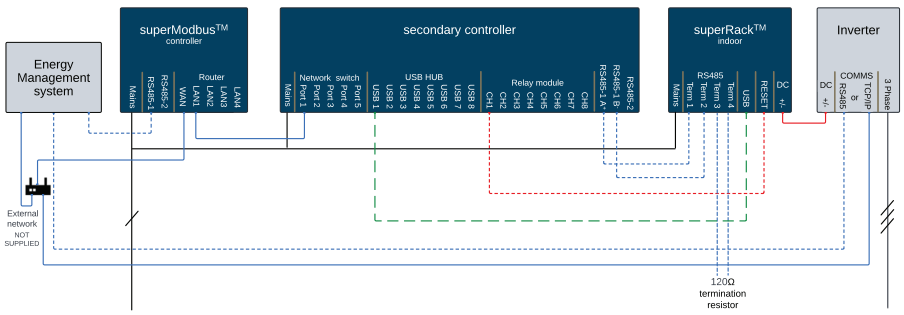
Do not mount controller enclosure in direct sunlight.

You can have up to eight secondary controllers connected to one superModbus™ controller. You can have up to eight superRack™ indoor's connected to one secondary controller.

connecting the secondary controller

Example communications connection

For example basic configurations and installation SLDs see appendix 2 and appendix 3.

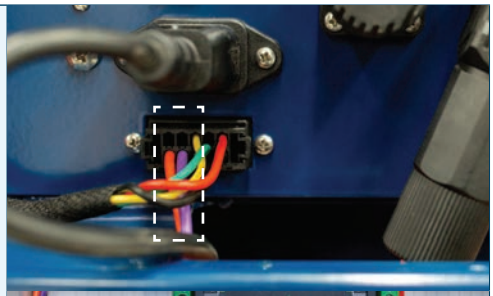


Connecting the rack reset

The superRack™ indoor will come with two fly leads terminated into Com1 of the switchgear.

These are to be terminated into the relay module of the secondary controller. You can extend these using your own cabling.

Note: It is imperative that you terminate them in ascending order from the lowest ID rack going into relay 1 (normally open contact), the next ID rack going into relay 2 (normally open contact), etc.



Connecting the superRack™ indoor USB

The micro-USB port of the superRack™ indoor needs to be connected to the USB hub within the secondary controller.

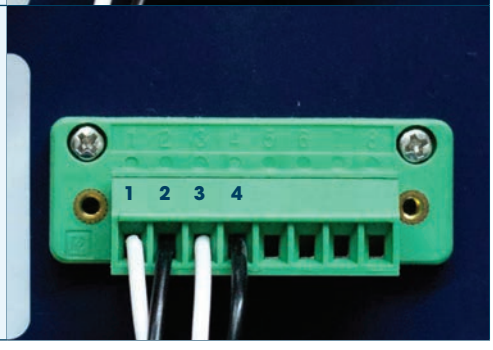
You will be required to provide your own cabling suitable to the run length.

The micro-USB of the lowest numbered rack will go into USB1 of the bottom USB Hub, the next numbered rack into USB2, etc. with the top USB hub being numbered 5-8.

Connecting the superRack™ indoor to the secondary controller

When connecting the superRack™ indoor's communication to the secondary controller, connect RS485-1 A+ and B- cables located on the terminal strip of the main processor inside your secondary controller to 1 and 2 on the green plug located on the Switchgear faceplate. If there is only one rack in the installation connect a 120Ω resistor into terminals 3 and 4. Ensure the polarity of your communications cable is consistent to each device.

If the installation has multiple racks, terminals 3 and 4 must be used to daisy chain to the other racks. 3 and 4 of rack one would connect to 1 and 2 of rack two and so forth. Ensure the last rack in the line has a 120Ω termination resistor in terminals 3 and 4.



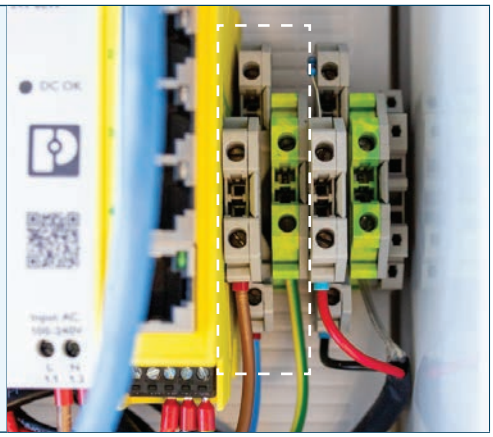
Connecting power to the secondary controller

You are required to connect power to the secondary controller.

The secondary controller comes fitted with a 230VAC to 24VDC power supply.

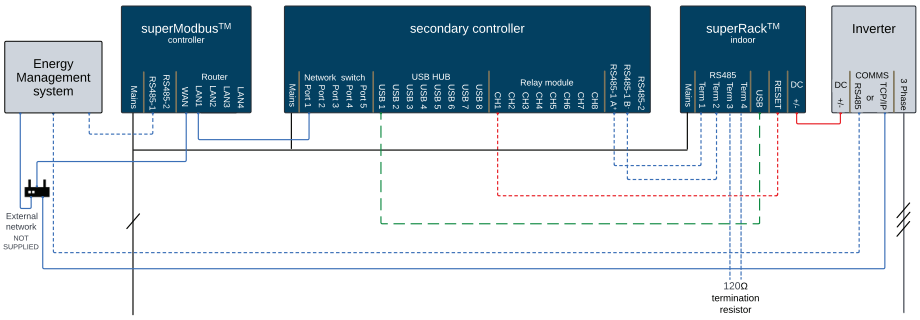
You will be required to provide your own cabling suitable to the run length.

Ensure circuit is protected with a 230V circuit breaker.



connecting the superModbus™ controller

Example communications connection

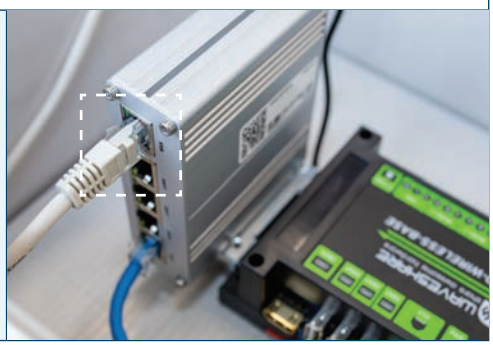


Connecting your network to the router

You need to provide an internet connection for your installation.

Connect an ethernet cable from your network to the WAN port on the superModbus™ controller's router.

You will be required to provide your own cabling suitable to the run length.



Connecting the router to the secondary controller single or multiple	**You need to provide an ethernet connection to all of the secondary controllers.** Connect an ethernet cable from a LAN port on the router inside the superModbus™ controller to the network switch located inside the secondary controller. You will be required to provide your own cabling suitable to the run length.	 
Connecting your external management system to the superModbus™ controller	External management systems can be connected to the RS485-1 port on your superModbus™ controller (not secondary controller) or if ethernet connected through your connection to the WAN port with port forwarding. For more information on how to configure these devices please see the superModbus™ user manual. You will be required to provide your own cabling suitable to the run length.	  
Connecting power to the superModbus™ controller	You are required to connect power to the superModbus™ controller. The superModbus™ controller comes fitted with a 230VAC to 24VDC power supply. You will be required to provide your own cabling suitable to the run length.	

You can now install the mechanical protection and then the superRack™ indoor is now ready for commissioning

For service and support:

1300 472 020

or please visit
energyrenaissance.com/service

maintenance schedule

There are no serviceable parts in the battery. If any replacement is required, please contact our after-sales personnel.

energyrenaissance.com/service
or phone 1300 472 020

All maintenance should be completed by professionals. Professionals should be:

- Approved engineer by the factory or its agent,
- Professionally trained,
- Have fully read the Installation and User Manual and have knowledge of safe operation matters for electrical and electronic equipment,
- Familiar with relevant safety specification of electric system.

Improper equipment maintenance and operation might cause personal injury or equipment damage. Before any maintenance operation, users should strictly abide by the following steps:

- Turn off and padlock the DC breaker of the battery Switchgear (bottom tray behind electrical cabinet door),
- Use detecting device to check and ensure that there are no voltage and current on the device.

Stop unauthorised personnel from entering the maintenance site!

- During electrical maintenance, temporary warning signs should be posted and barriers should be set up to prevent unauthorised personnel entering electrical maintenance area.

Routine inspection on the following items is recommended every three months. A record for each inspection should be made.

- Equal potential earthing connection.
- DC output connection for racks without inverters and AC output connections for racks with.
- Communication(s) connection.
- Red isolation and auxiliary logic switches (both behind lower door panel that can be removed using an electricians key).
- Fans on indoor units.
- Visually inspect ground conditions and mounting feet to ensure stability is maintained.

CAUTION

Dust on the fan can block ventilation and cause the battery rack to shut down or reduce performance due to over-temperature. Cleaning is recommended every three months on indoor units only.

- Regularly clean the dust with a vacuum in battery room/enclosure, check ventilation and air exhaust facilities.

appendix

appendix 1: arc-flash calculation

The arc-flash incident-energy-surface-density and boundary-distance for the DC power from the superRack™ protected by the switchgear is estimated by calculation, not experimentation, below. It is usual to use calculation and AS5139 specifies the calculation. The arc flash calculations are also worst-case for AC from an inverter (PCS), since the inverter cannot supply more current than it is supplied with!

The arc flash calculations below are as defined in AS5139:2019 Appendix F which in turn are a pessimistic version of the calculation defined in DR Doan, "Arc Flash Calculations for Exposures to DC Systems", *IEEE Transactions on Industry Applications,* Vol. 46, No. 6, November/December 2010. AS5139 only covers up to 1,000 V, however the underlying equations from Doan have no such restriction and are therefore applied in this appendix to a 1,500 V battery below.

Note: The calculations are pessimistic since they are at the maximum possible configuration, assuming worst case conditions, and AS5139 has a factor of 3 safety.

Inputs to calculation following Doan:

1. Maximum battery voltage:
   V_{sys} = 1,489 V (from superRack™ twin datasheet).
2. Battery impedance at 1 kHz:
   R_{sys} = 0.1632 Ω (from cell and superRack™ twin datasheets).
3. Fuse time at I_{arc} is 50 *μs* from fuse the fuse datasheet (see I_{arc} calculation below), however the impedance of the cell is given at 1 kHz which has a period of 1 ms. The steady-state response, R_{sys} above, is given at 1 kHz, which implies an L/R time constant of at most 200 *μs* (5 time-constants to reach stead-state). Therefore 250 *μs* is taken as the arcing time (sum of the two time-delays):

   T_{arc} = 250 x 10^{-6} s (see discussion above).
4. Multiplying (safety) factor from AS5139. AS5139 has an additional multiplying safety factor compared to Doan, which is given in examples as 3.

   MF = 3 (from AS5139).
5. Working distance:

   D = 0.45 m (from AS5139).

Calculation following Doan:

6. Worst-case arc current (factor of 2 is to give most possible energy in the arc – i.e., source impedance and arc impedance equal):

   $I_{arc} = V_{sys}/(2\ R_{sys})$ = 4,563 A (from Doan).
7. Worst-case arc power:

   $P_{max} = I_{arc}^2\ R_{sys}$ = 3,397,154 W (from Doan).
8. Worst-case arc energy:

   $E_{max} = P_{max}\ T_{arc}$ = 849 J (from Doan).
9. Worst-case incident energy surface density:

   $IE_m = MF\ E_{max}/(4\ \pi\ D^2)$ = 1,001 J/m2 or 0.0239 cal/cm² (from AS5139 which includes MF).

   AS5139 rounds conversion factors up by 5% therefore to get the same result as AS5139 add 5%:

   $IE_{m5139} = IE_m/0.951$ = 1,053 J/m² or 0.0252 cal/cm².
10. Arc-flash boundary is when the incident energy surface density is 50,000 J/m2 (2nd degree burn):

    $AFB = \sqrt{(MF\ E_{max}/4/\pi/50{,}000)}$ = 0.0637 m or 6.37 cm (from AS5139).

    AS5139 rounding is 2% for AFB:

    AFB5139 = AFB/0.980 = 0.0650 m or 6.50 cm.

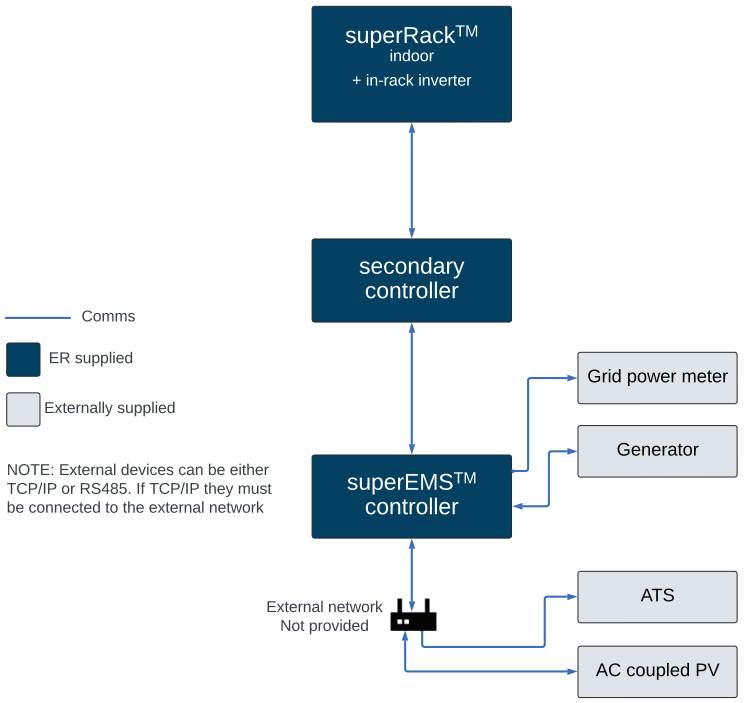
This incident energy surface density of 0.0252 cal/cm² is well below the rating of 4 cal/cm² for PPE Cat-1 and therefore the lowest level, Cat-1, of safety gear is sufficient.

All the calculations above are for a single superRack™; if multiple are paralleled, multiply IEm by number of racks and AFB by the square root of number of racks.

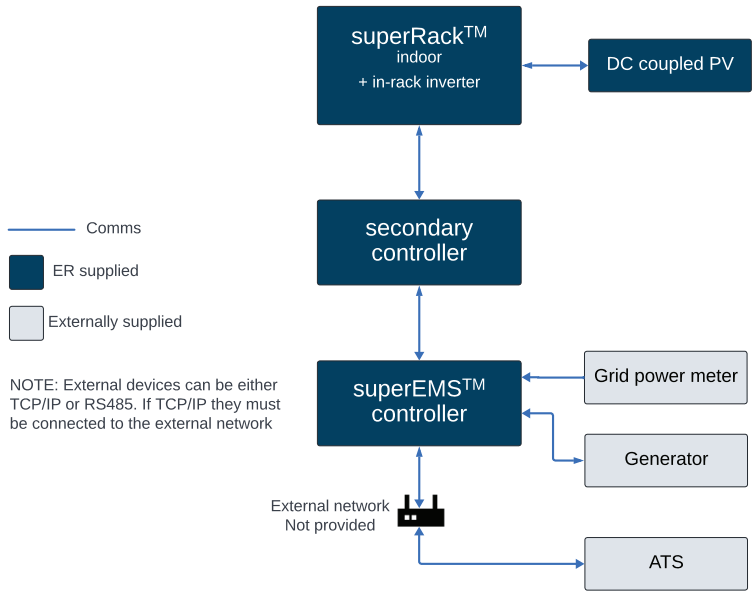
appendix 2: example comms diagrams

2a. Single superRack™ indoor Installations

i.
Single superRack™ indoor with in-rack inverter and superEMS™ block diagram



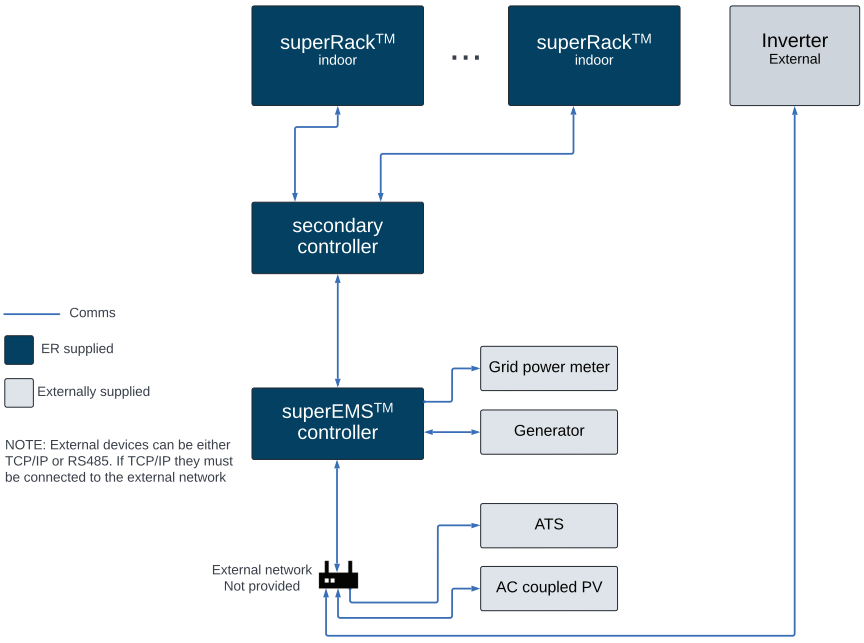
ii.
Single superRack™ indoor with in-rack inverter, superEMS™ and DC coupled PV block diagram



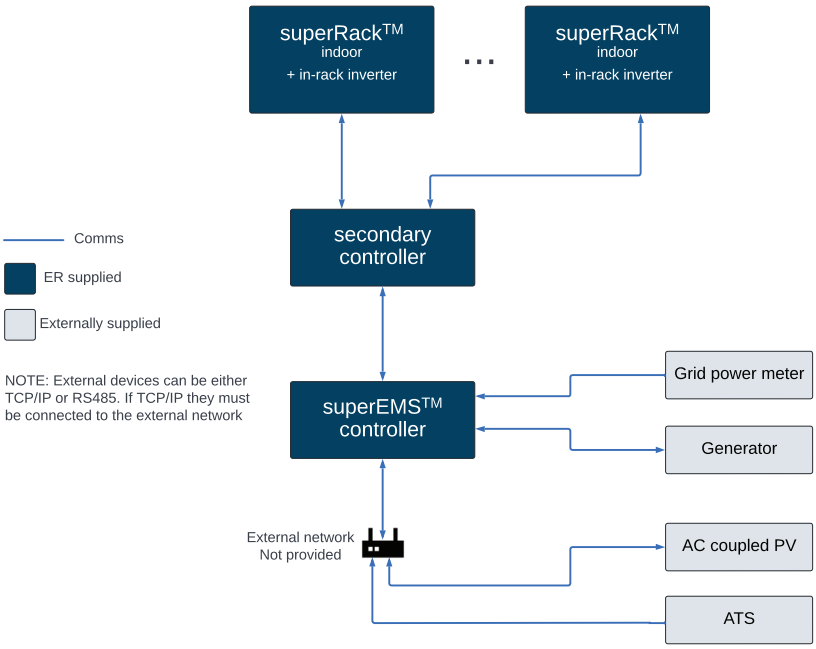
appendix 2: example comms diagrams

2b. Multiple superRack™ indoor Installations

i.
Multiple superRack™ indoor with external supplied inverter and superEMS™ block diagram



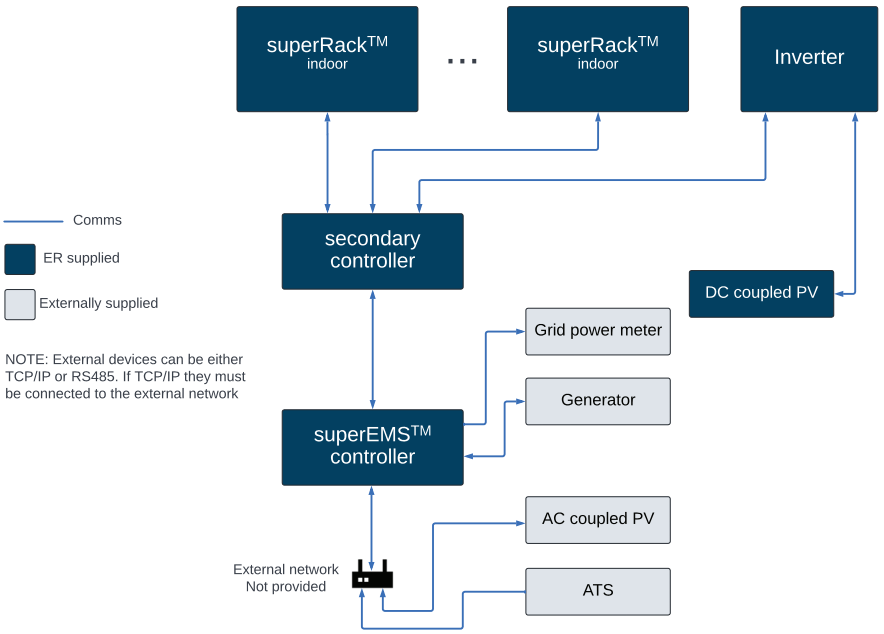
ii.
Multiple superRack™ indoor with in-rack inverter and superEMS™ block diagram



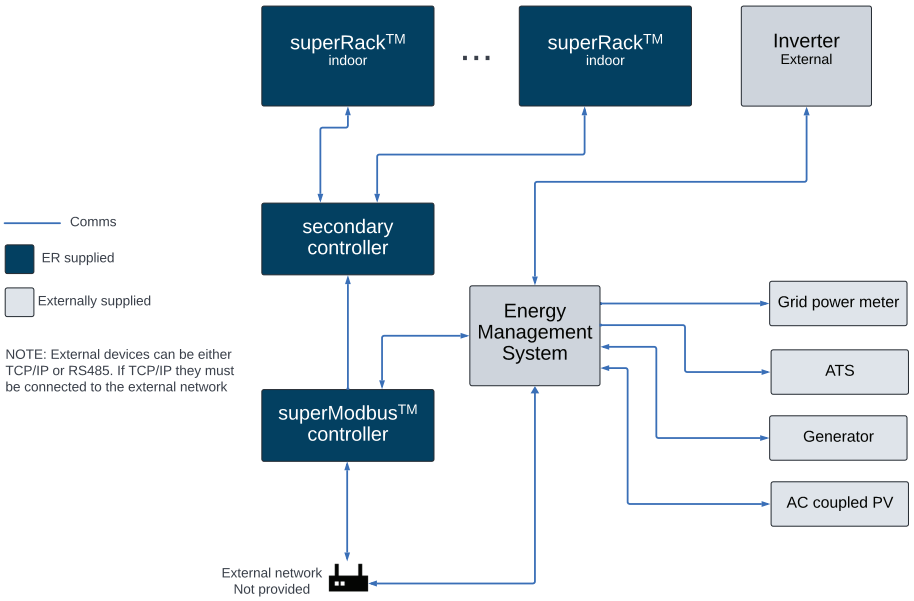
appendix 2: example comms diagrams

2b. Multiple superRack™ indoor Installations

iii.
Multiple superRack™ indoor with superEMS™, ER supplied inverter and DC coupled PV block diagram



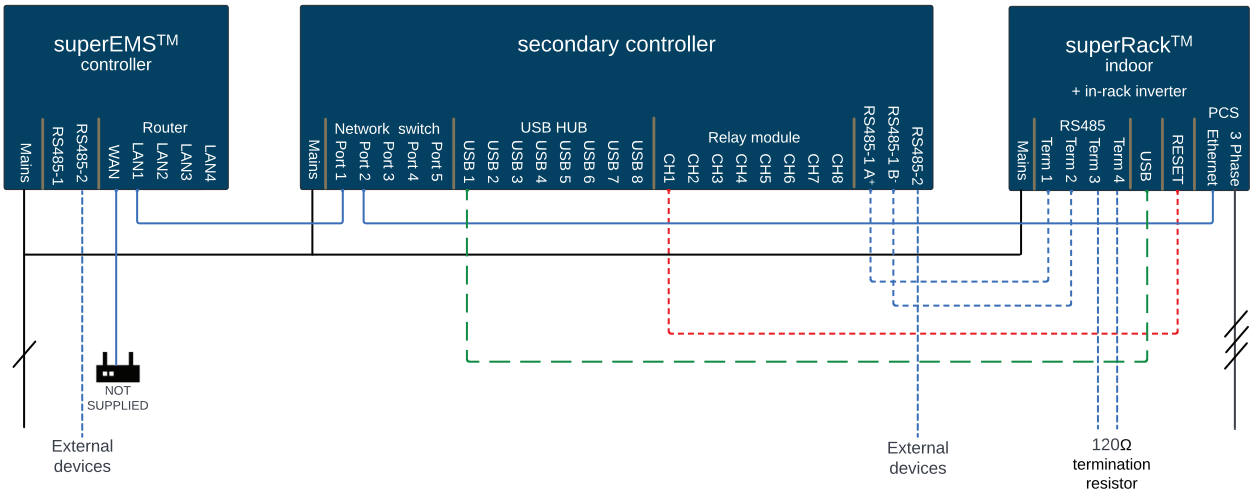
v.
Multiple superRack™ indoor with superModbus™ block diagram



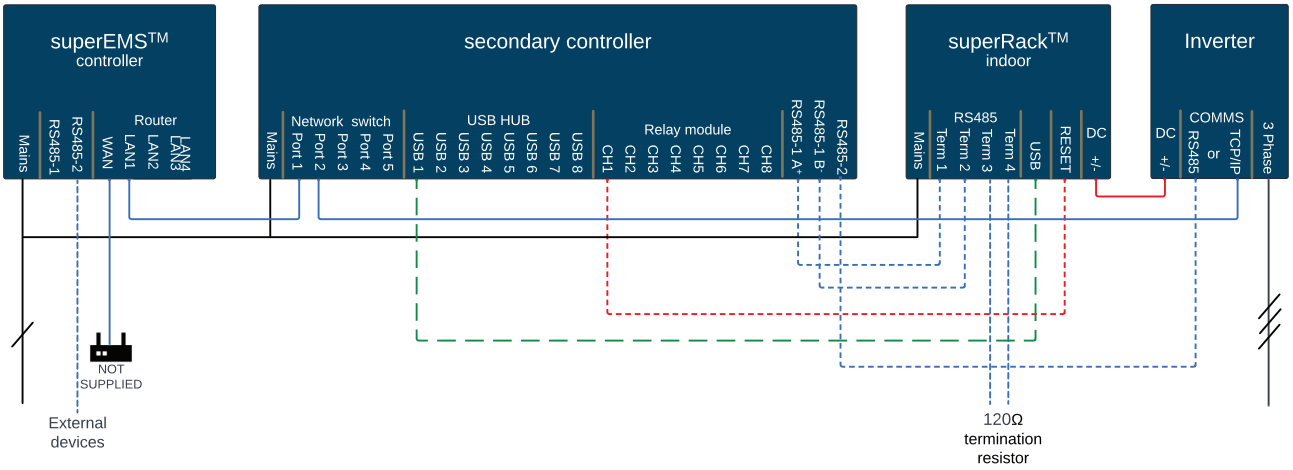
appendix 3: installation SLDs

3a. Single superRack™ indoor installations

i. Single superRack™ indoor with in-rack inverter and superEMS™



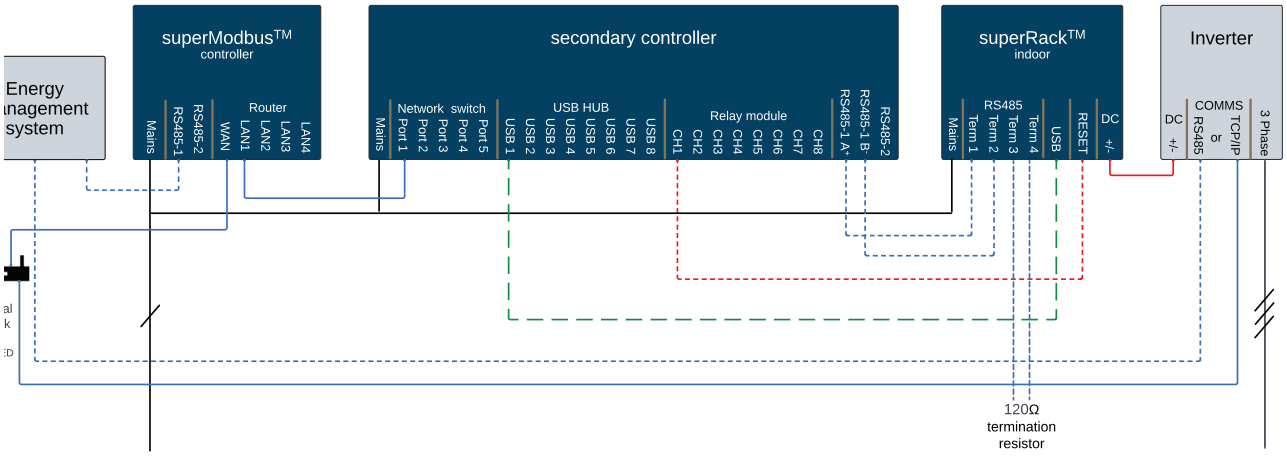
ii. Single superRack™ indoor with superEMS™, DC out and ER supplied inverter

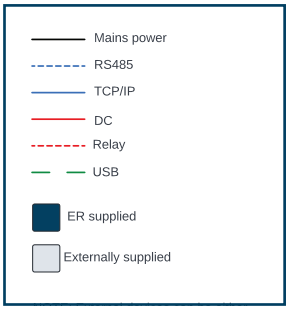


appendix 3: installation SLDs

3a. Single superRack™ indoor installations

iii. Single superRack™ indoor with superModbus™

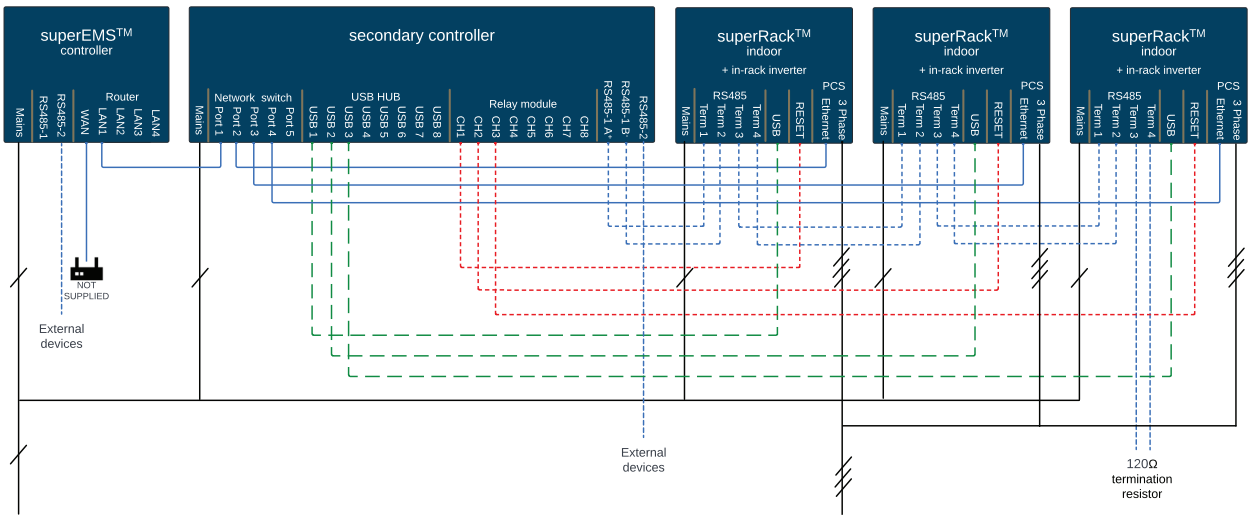




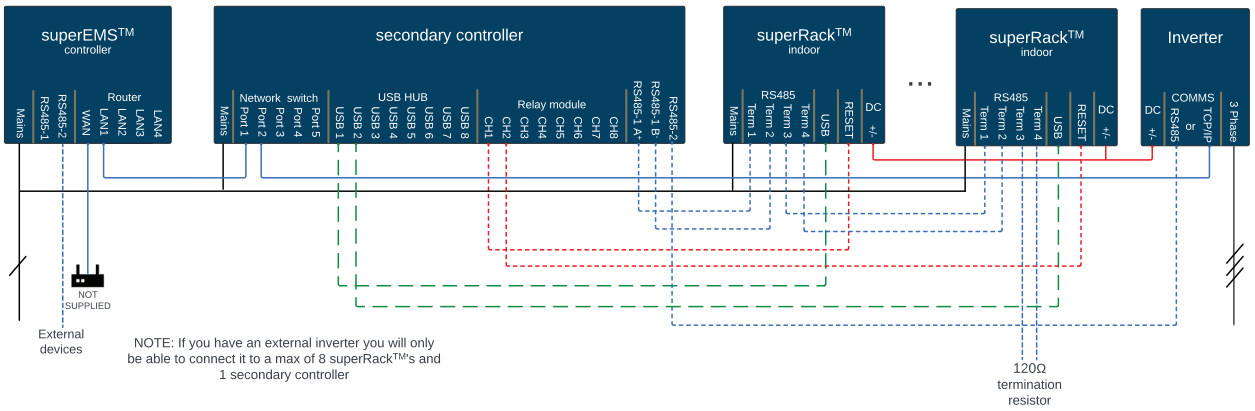
appendix 3: installation SLDs

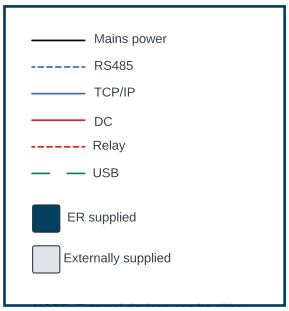
3b. Multiple superRack™ indoor installations

i. Multiple superRack™ indoor with in-rack inverter and superEMS™



ii. Multiple superRack™ indoor with superEMS™, DC out and ER supplied inverter

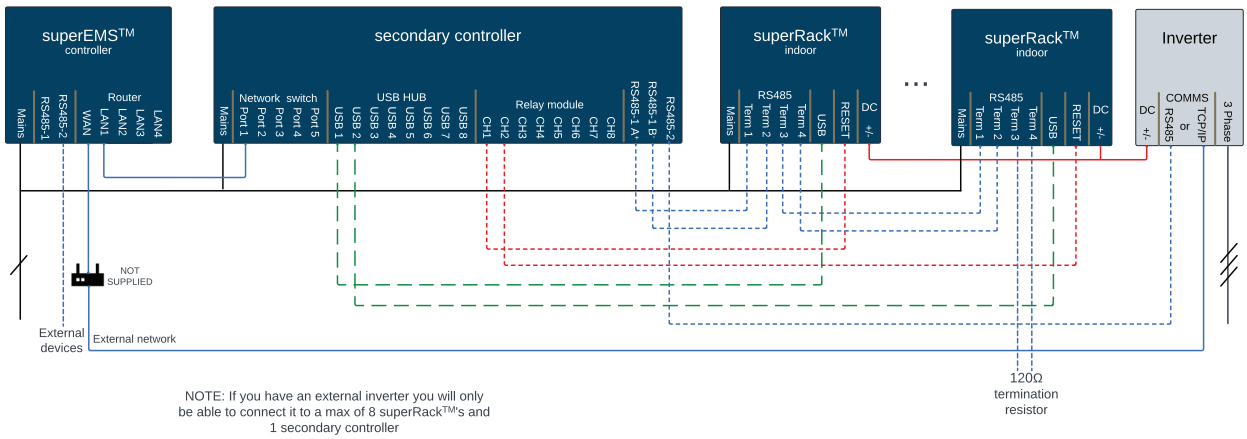




appendix 3: installation SLDs

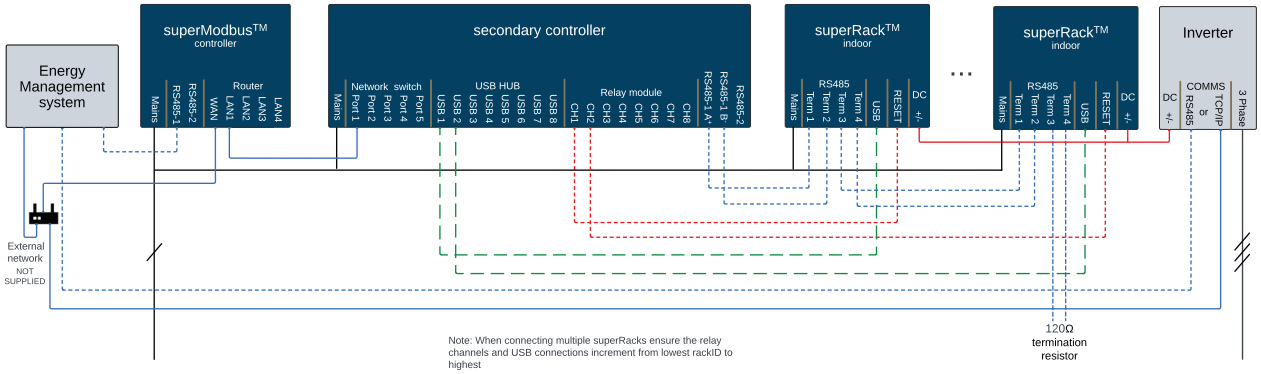
3b. Multiple superRack™ indoor installations

iii. Multiple superRack™ indoor with superEMS™, DC out and externally supplied inverter

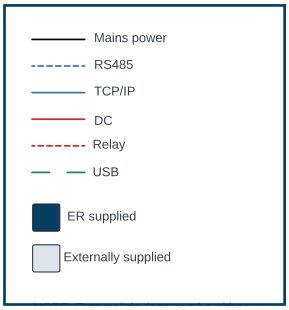


NOTE: If you have an external inverter you will only be able to connect it to a max of 8 superRack™'s and 1 secondary controller

iv. Multiple superRack™ indoor with superModbus™



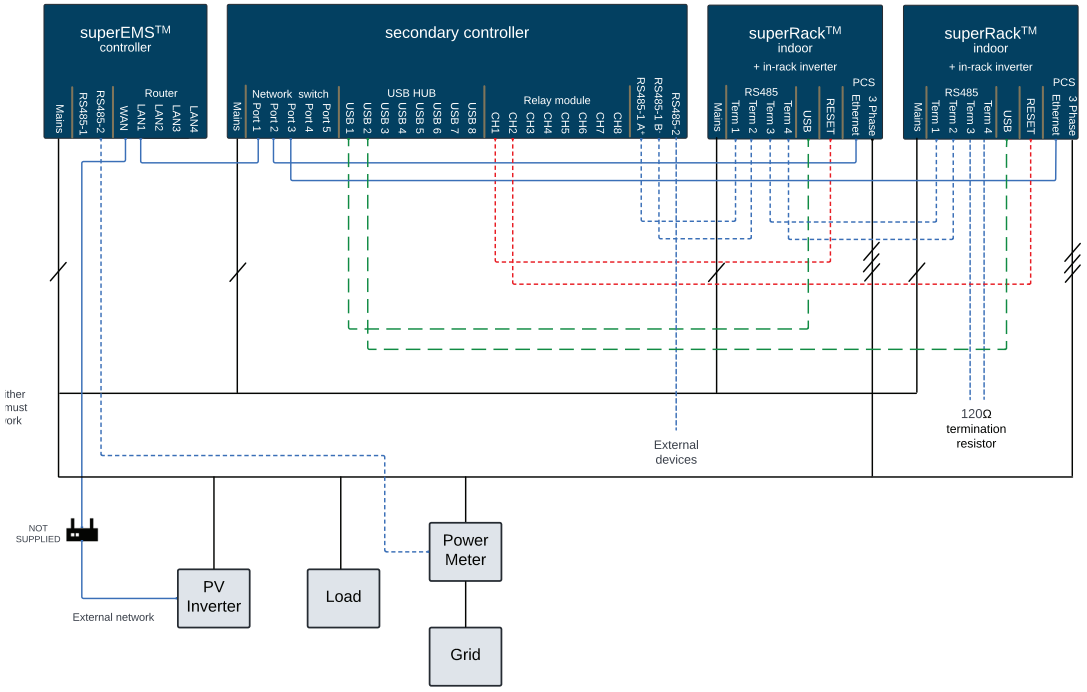
Note: When connecting multiple superRacks ensure the relay channels and USB connections increment from lowest rackID to highest



appendix 3: installation SLDs

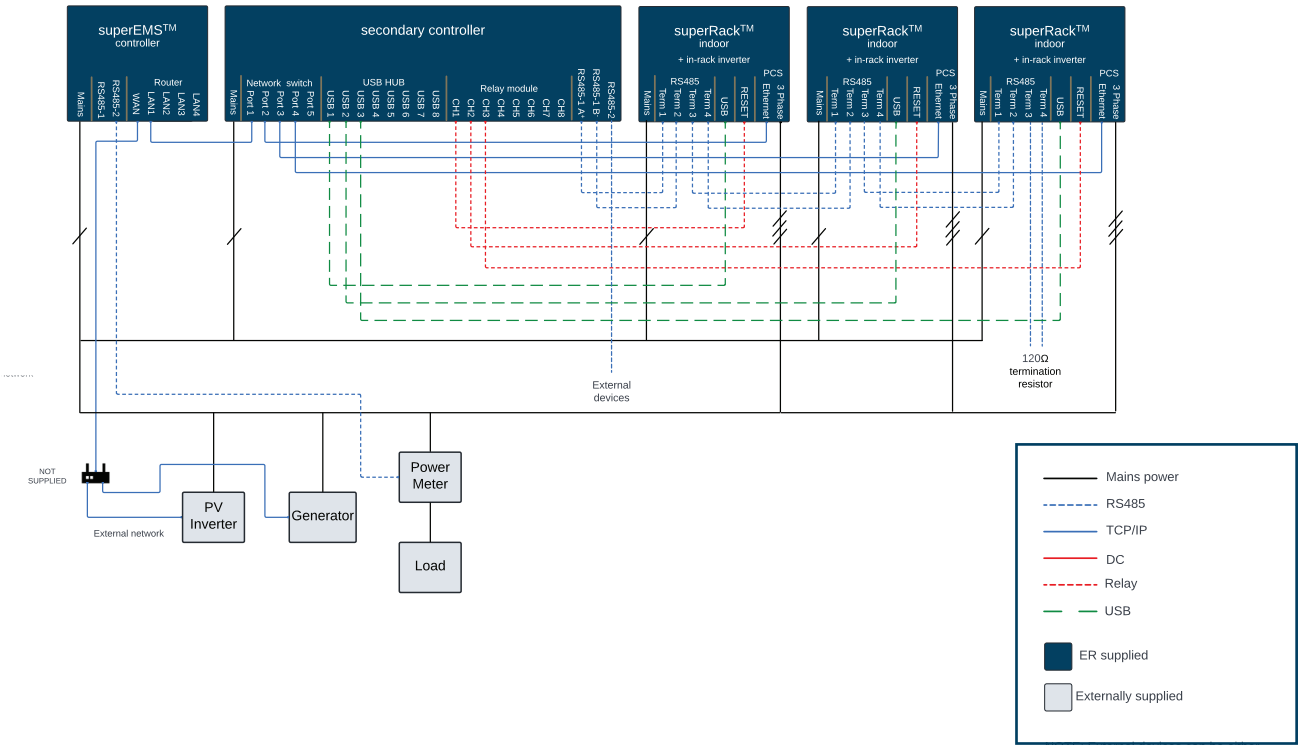
3c. Example on-grid installation

i. Multiple superRack™ indoor on-grid wiring with in-rack inverter and superEMS™



3d. Example off-grid installation

i. Multiple superRack™ indoor off-grid wiring with in-rack inverter and superEMS™



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