renaissance superRack™ outdoor

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™ outdoor. 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 "1a Arc-Flash Calculation" for why Cat-1 is sufficient.

In some jurisdictions, additionally the following will be required:

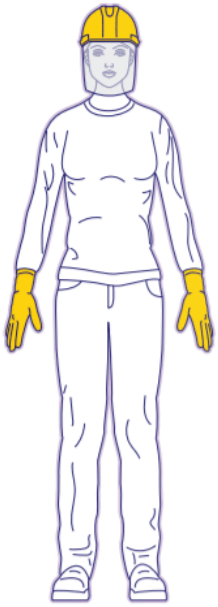
1. Person performing the work or person overseeing the work should have formal qualifications like electrician or electrical engineer.
2. Person performing the work or person overseeing the work and safety observer should hold a Cardiopulmonary Resuscitation (CPR) and Low-Voltage (LV) rescue certificate.

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

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.
- This outdoor BESS 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.
- 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.
- Ensure the equipment can be well grounded.
- 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™ outdoor dissipates 5% of its energy per cycle and must be installed in conditions not exceeding the 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™ outdoor 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™ outdoor.
- 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 62619:2022
- 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.**

IMPORTANT!

- Use the battery pack/superRack™ outdoor only as directed.
- Do not use the battery pack/superRack™ outdoor 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/superRack™ outdoor. The battery pack/superRack™ outdoor is not user serviceable.
- The main door of the superRack™ outdoor enclosure is not designed to be accessible by installers or end users. All points of attachment are located within the distribution boards mounted on the main door.
- To protect the battery pack/superRack™ outdoor and its components from damage when transporting, handle with care.
- Do not impact, pull, drag, or step on the battery pack/superRack™ outdoor. Do not subject it to any strong force.
- Do not insert foreign objects into any part of the battery pack/superRack™ outdoor.
- Do not use cleaning solvents to clean the battery pack/superRack™ outdoor.
- Do not pull out any cables when the battery rack is in operation.
- Do not damage the sheath of cables, wire harnesses or connectors.

Attention: The superRack outdoor will come pre-configured so cabling does not need to be accessed. If in the event of service or warranty works please contact your provider.

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 (Cat 1) when dealing with the battery pack. Safety boots are required when lifting packs. Insulating gloves, insulating mat, safety goggles and long sleeved/legged non-flammable 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™ outdoor are heavy enough to cause severe injury. Do not tilt the SuperRack™ outdoor as this may cause the unit to topple which may result in serious injury or death.

	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 ELECTRIC SHOCK**	Do not disassemble the superRack™ outdoor. Do not touch the battery pack/ superRack™ outdoor distribution boards with wet hands. Do not expose the battery pack/ superRack™ outdoor distribution boards to moisture or liquids.

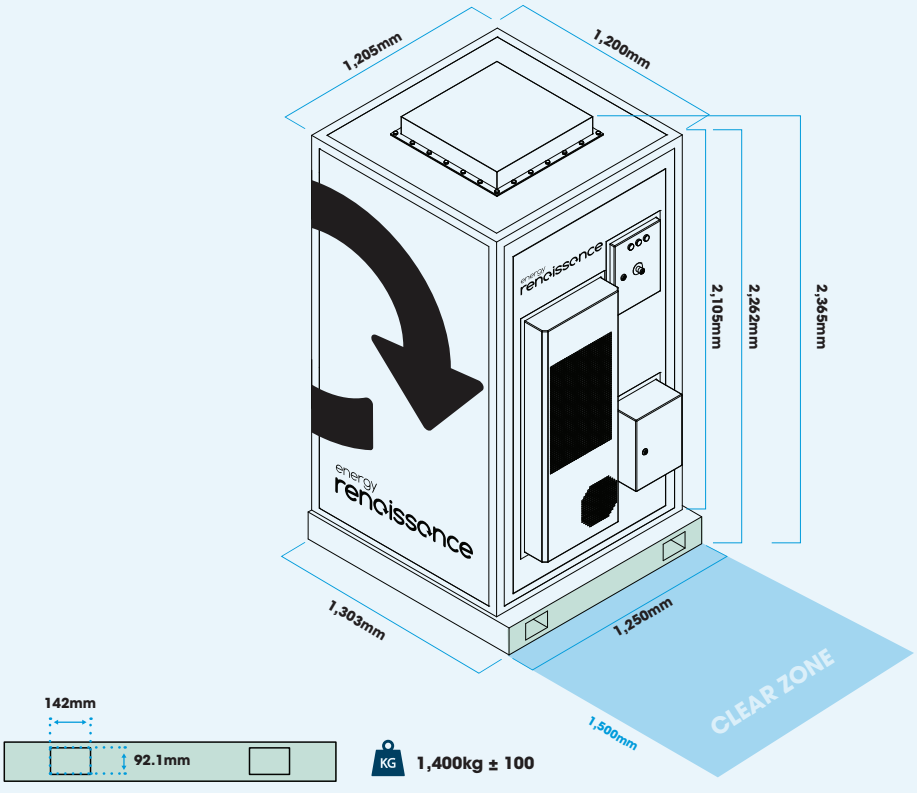
DANGER! Emergency situations

Risks of damage to the superRack™ outdoor

- X **Do not** tilt battery enclosure.
- X **Do not** allow the superRack™ outdoor distribution boards to come into contact with liquids.
- X **Do not** subject the superRack™ outdoor to high pressures.
- X **Do not** place any objects on top of the superRack™ outdoor pressure safety vent.
- X **Do not** expose superRack™ outdoor to high temperatures, high humidity or dust.
- X **Do not** subject the superRack™ outdoor 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 the fire brigade and follow your site procedures. • Contact your provider for further advice and information. **In case of a fire not related to the battery, make sure that an appropriately rated fire extinguisher is nearby.** • The superRack™ outdoor may catch fire when heated above 150 °C. **If a fire breaks out near the superRack™ outdoor, take these actions:** • Extinguish the fire potential before the superRack™ outdoor catches fire or if smoke is present. **If the superRack™ outdoor has caught fire, do not try to extinguish the fire.** • Evacuate people immediately and shut off any connected power systems. • Contact emergency services/call the fire brigade and follow your site procedures. **If the superRack™ outdoor 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 superRack™ outdoor is 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 superRack™ outdoor seems to be damaged, contact your provider for advice. Do not handle.

site considerations

IP rating	The superRack™ outdoor is rated to IP 55. This rating allows for installation outside without the requirement for additional protection from wind, rain or sunshine.
Installation environment	• Maintain control over vermin, insects and other pests in the battery location to avoid damage to battery enclosure. • The working environment of the superRack™ outdoor should be free of insulating gas and conductive dust or other hazardous elements. • Ensure the ground is level and has sufficient load-bearing capacity to support the full weight rating of the superRack™ outdoor configuration, or multiples of. The location should be a flat concrete base, or other non-flammable surface, free of corrosive materials, capable of preventing ground movement, landslides, or erosion, and designed to allow proper drainage without water pooling under the battery enclosure base. • Altitude must be <2,000m.
superRack™ outdoor installation position considerations	• The enclosure position and wiring need to be taken into consideration when installing, for maintenance, and easy access. • Recommended accessibility clearance is 1,500mm at the front of the enclosure. • Recommended clear zone to allow for the pressure safey vent to open is a minimum of 740mm from the top of the superRack™ outdoor. • Due to the position of the lifting points the outdoor products can only be lifted from the front or the rear of the battery enclosure, make allowances for side shifting if positioning batteries into tight spaces. 

logistics, unloading & lifting

WARNING! The superRack™ outdoor 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 superRack™ outdoor 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 enclosure	Check the exterior of the enclosure, 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.** **DO NOT** open the enclosure door unless instructed to do so by Energy Renaissance. Opening the door without authorisation may affect your warranty. Check the delivery check list to ensure all accessories delivered are complete according to the packaging list.
Use correct equipment to move the superRack™ outdoor	The superRack™ outdoor is built on a structural base that can only be moved with an appropriately rated forklift or craned with a sling set.

installation equipment

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

Insulated Flathead & Philips screwdriver

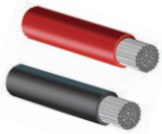
Insulation tester
Safety testing

Stanley knife
For boxes

Electricians key 8mm square

Forklift or similar
For positioning rack at site

OR



Single and 3 phase + NE cable

DC cable

Instrumentation cable*

Earth cable

Ethernet cable

Network connection

120ohm 0.5W resistor

M8 ring lug

Cable glands

*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.

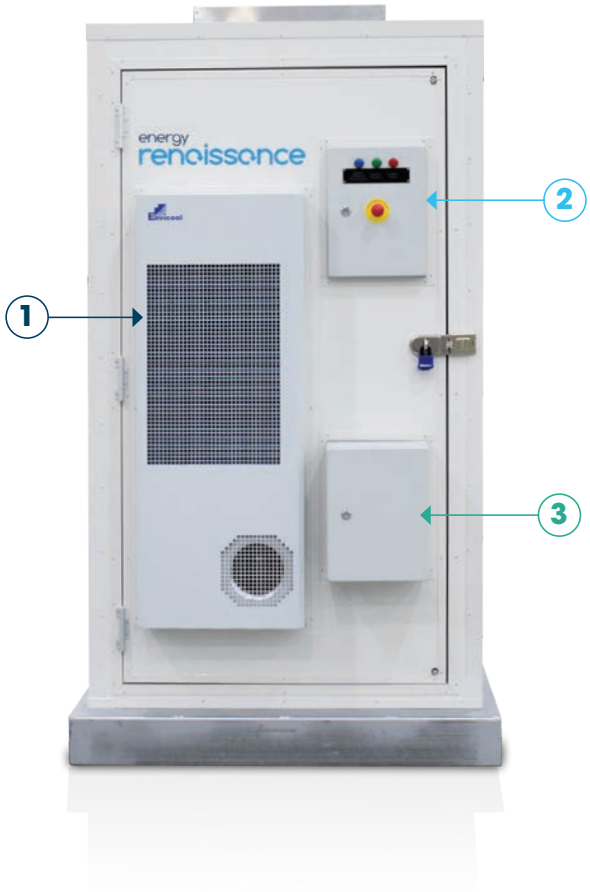
At least two qualified personnel are required to install the superRack™ outdoor, and all electrical installations must comply with electrical installation standards.

installation instructions

superRack™ outdoor AC connection

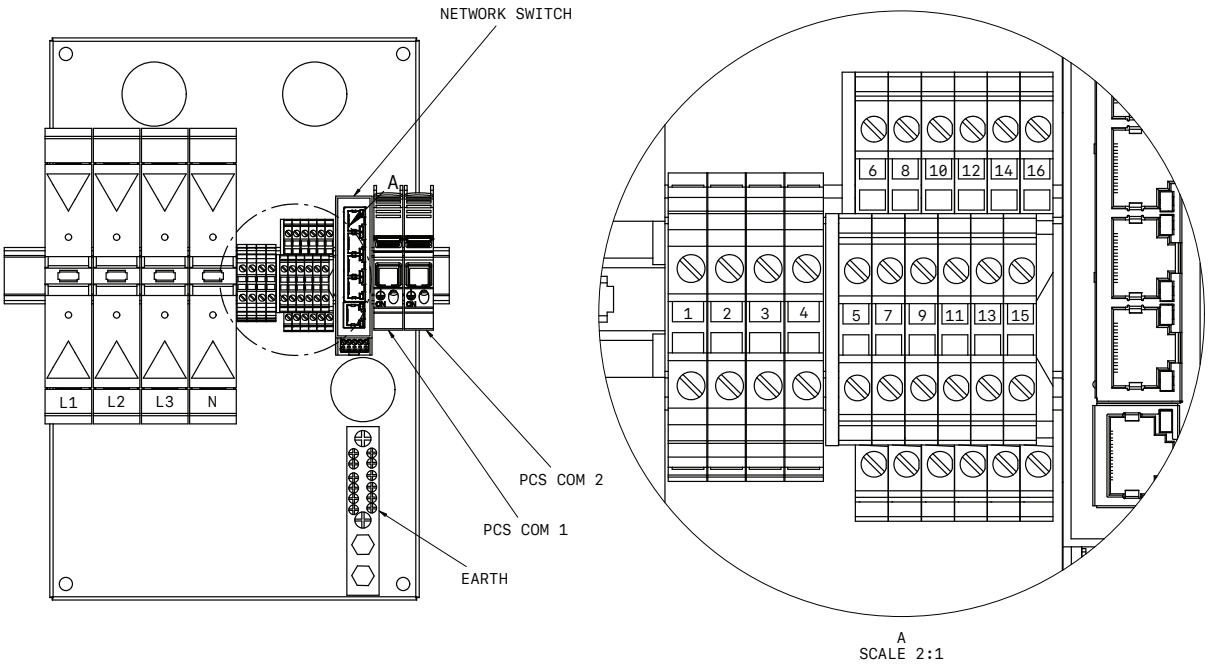
The superRack™ outdoor comes fully configured with an integrated HVAC system, control and point of attachment enclosures. It can be fitted with up to 18 battery packs, 2 switchgear units and 2 in-rack inverters (depending on site requirements).

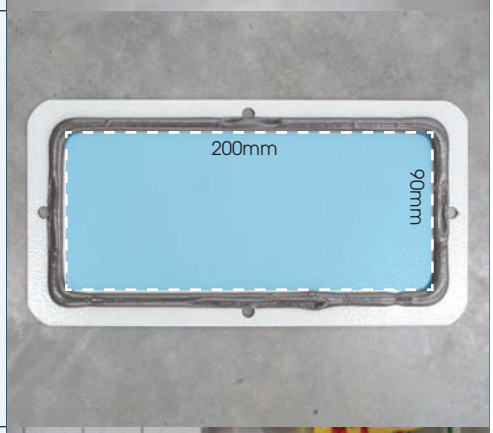
For example basic configurations and installation SLDs see appendix 2 and appendix 3.

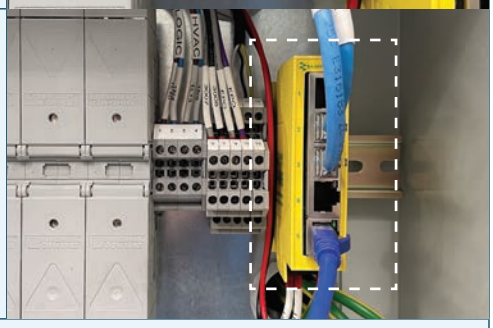


1. HVAC
2. control enclosure
3. point of attachment

3 point of attachment



Check electrical isolation	Using the 8mm electricians key, open the control enclosure. Ensure all circuit breakers are in the off position and personal isolation is applied. NOTE: Circuit breaker configuration may vary depending on customer system requirements.	
Cable gland plate	Using the 8mm electricians key, open the point of attachment door. Using a screwdriver, remove the cable gland plate on the base of the point of attachment.	
	Drill holes for cable glands to be installed onto the gland plate. Ensure glands are installed appropriately to maintain the IP rating.	
Equal Potential Earth	**Very Important!** **Ensure the electrical equal potential earth cable is fitted to the Main Earth Bar on the superRack™ outdoor before proceeding further.** For multiple superRack™ outdoor enclosures, each individual enclosure must be earthed. **Note:** M8 Ring lug required for incoming earth cable.	

Connecting AC wiring	Lift terminal covers (L1, L2, L3, N) on the left-hand side of the enclosure. Terminate three phase and neutral cables (4x M8 ring lug required, 12Nm tightening force)	
	Logic (control) supply terminations to be installed in terminals 1 and 2.	
	HVAC supply terminations to be installed in terminals 3 and 4.	
Connecting Control, Communications & Network Cables	Emergency Power Off/EPO (bridge if NOT required) - terminals 9 and 11 RS485-2 (if required) - terminal 10 (A+), terminal 12(B-), terminal 14 (screen)	
	Connect an ethernet cable to any available TCP/IP port in the network switch. This will connect to your superEMS™ controller and have a connection to any other superRack™ outdoor unit within your installation.	
Reinstallation of cable gland plate	Secure the cable gland plate back into position on the base of the point of attachment and tighten cable glands to ensure the IP rating is not compromised.	

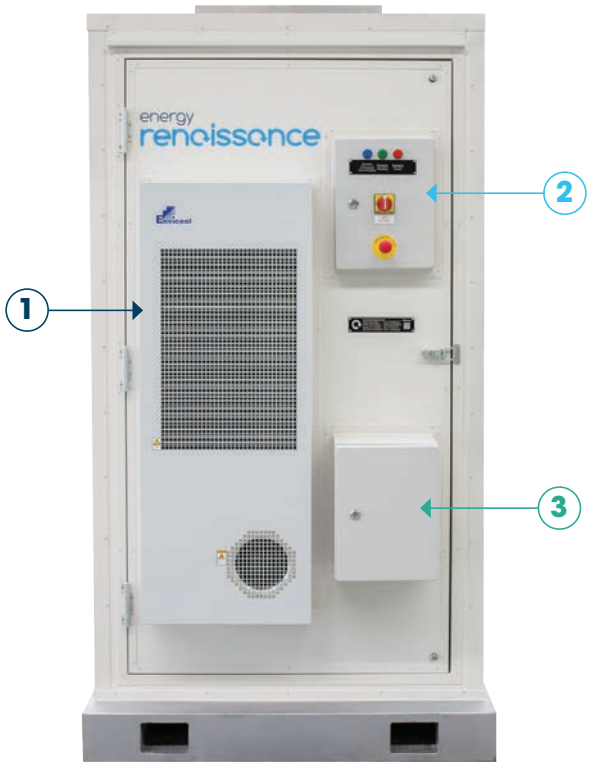
installation instructions

superRack™ outdoor DC connection

The superRack™ outdoor DC connection can be used with either a superEMS™ or superModbus™.

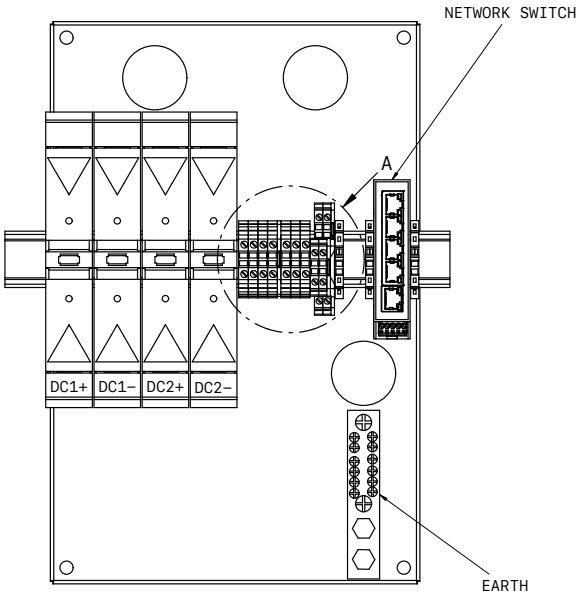
If using a superEMS™ you will be required to connect at least 1 approved inverter to each superRack™ outdoor unit. Or alternatively, 1 inverter to each DC output in your point of attachment (POA). You are not able to connect multiple superRack™ outdoor DC connection units to a single inverter when using a superEMS™

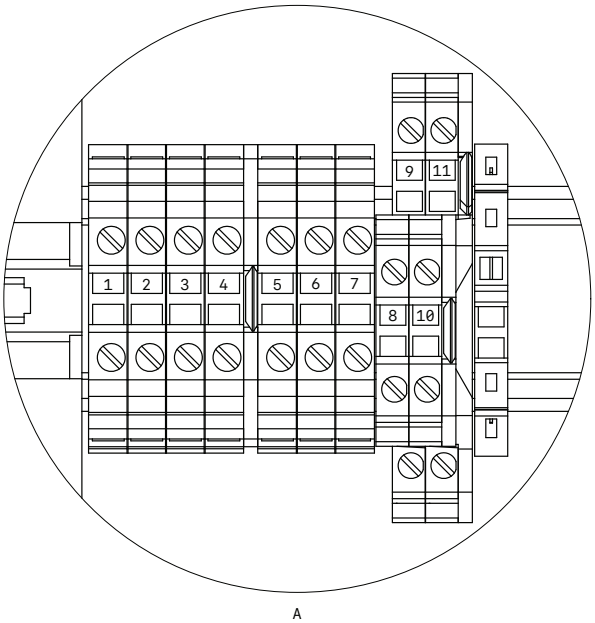
For example basic configurations and installation SLDs see appendix 2 and appendix 3.



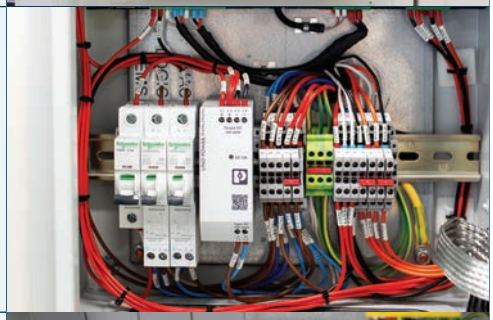
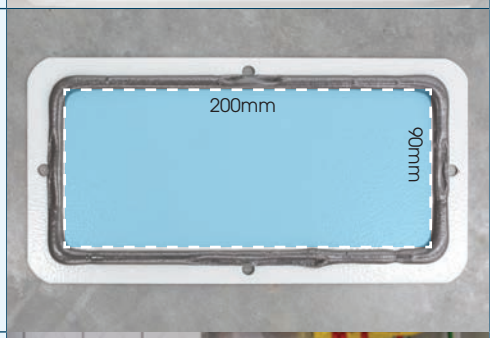
1. HVAC
2. control enclosure
3. point of attachment

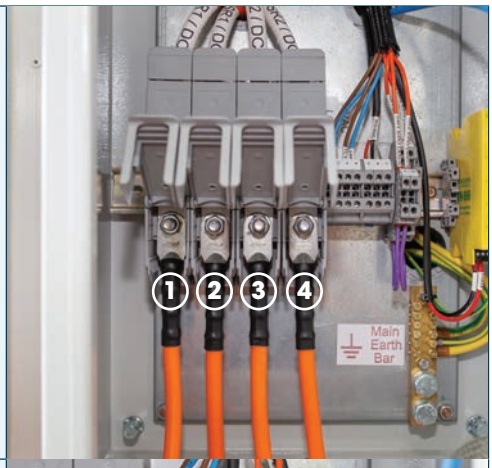
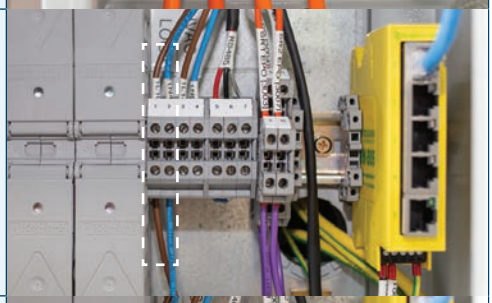
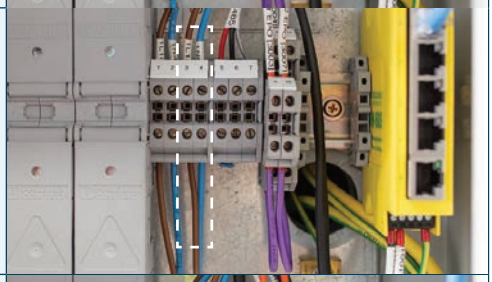
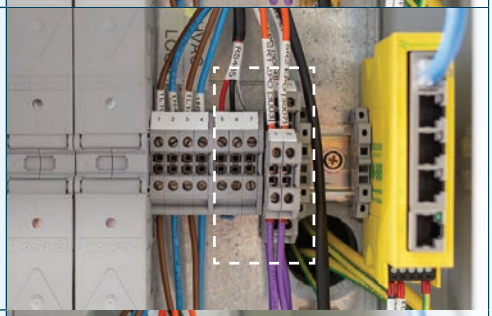
3 point of attachment





A
SCALE 2:1

Check electrical isolation	Apply personal isolation to the DC isolator on the front of the control enclosure.	
	Using the 8mm electricians key, open the control enclosure. Ensure all circuit breakers are in the off position and personal isolation is applied. NOTE: Circuit breaker configuration may vary depending on customer system requirements.	
Cable gland plate	Using the 8mm electricians key, open the point of attachment door. Using a screwdriver, remove the cable gland plate on the base of the point of attachment.	
	Drill holes for cable glands to be installed onto the gland plate. Ensure glands are installed appropriately to maintain the IP rating.	
Equal Potential Earth	**Very Important!** **Ensure the electrical equal potential earth cable is fitted to the Main Earth Bar on the superRack™ outdoor before proceeding further.** For multiple superRack™ outdoor enclosures, each individual enclosure must be earthed. **Note:** M8 Ring lug required for incoming earth cable.	

Connecting DC wiring	Lift terminal covers on the left-hand side of the enclosure. Terminate the dual positive and negative incoming DC cables (4x M8 ring lug required, 12Nm tightening force). ① Incoming DC1 Positive - SR1/DC+ ② Incoming DC1 Negative - SR1/DC- ③ Incoming DC2 Positive - SR2/DC+ ④ Incoming DC2 Negative - SR2/DC-	
	Logic (control) supply terminations to be installed in terminals 1 and 2.	
	HVAC supply terminations to be installed in terminals 3 and 4.	
Connecting Control, Communications & Network Cables	RS485-2 (used to connect inverter if applicable) - terminal 5 (A+), terminal 6 (B-), terminal 7 (screen) Emergency Power Off/EPO (bridge if NOT required) SR1 - terminals 8 and 9 SR2 – terminals 10 and 11	
	Connect an ethernet cable to any available TCP/IP port in the network switch. This will connect to your superEMS™ controller or superModbus™ controller.	
Reinstallation of cable gland plate	Secure the cable gland plate back into position on the base of the point of attachment and tighten cable glands to ensure the IP rating is not compromised.	

connecting the superEMS™

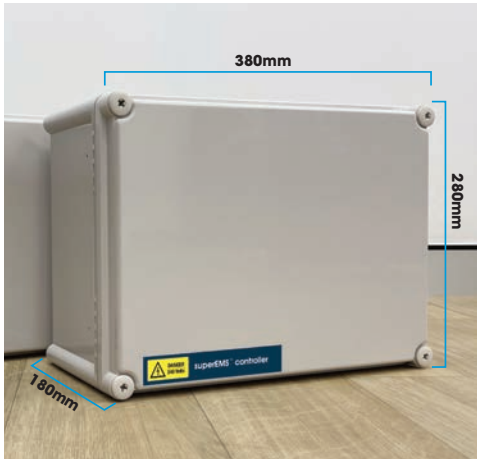
The superRack™ outdoor comes with an integrated **secondary controller** within the control enclosure mounted on the front panel of the unit.

If the superRack™ outdoor was sold with a **superEMS™ controller** this section provides detailed steps on how to connect your superEMS™ controller to your superRack™ outdoor units and other devices (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.

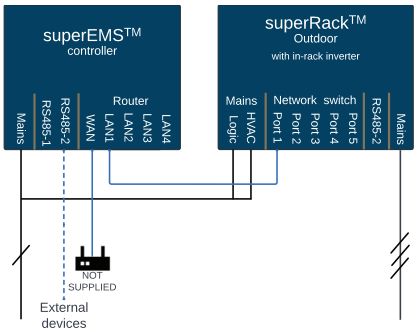


You can have up to eight secondary controllers connected to one main controller. You must have at least one inverter dedicated to every superRack™ outdoor. Multiple superRack™ outdoor's cannot share an inverter.

connecting the superEMS™ controller

Example communications connection

For examples of basic configurations and installation SLDs see appendix 2 and appendix 3.

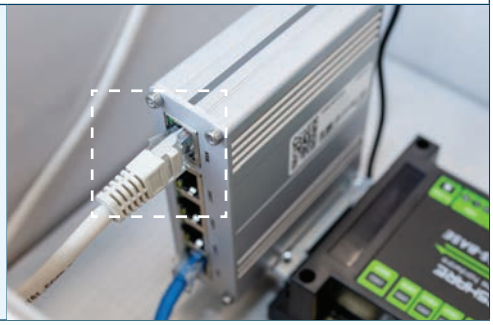


Connecting your network to the router

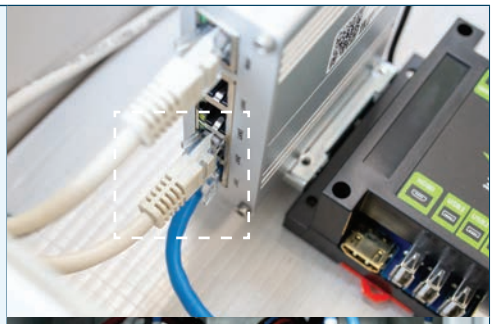
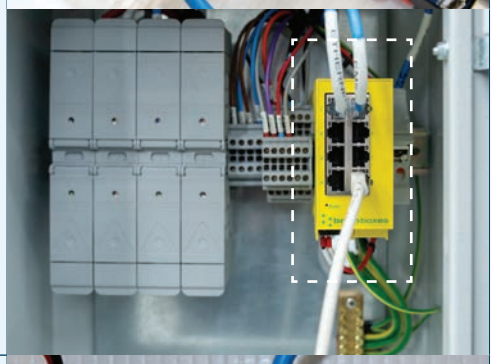
You need to provide an internet connection for your installation.

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 superEMS™

Connecting your superEMS™ controller to your superRack™ outdoor units	You need to provide an ethernet connection to each superRack™ outdoor unit/s. Connect an ethernet cable from a LAN port on your superEMS™ controller's router to the network switch located in the point of attachment of your superRack™ outdoor unit. If you have multiple superRack™ outdoor units you can connect from the first units network switch to the second unit's, the second to the third, and so forth. Or connect each back to the router if there are sufficient ports on the router. You will be required to provide your own cabling suitable to the run length.	 
Connecting other approved devices to your superEMS™ controller	External devices can either be connected to: **RS485-2 port on your superEMS™ controller** (not secondary) or, if ethernet ensure the device is **connected to your own network with a static IP address** and inform us of such. 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 your superEMS™ controller	You are required to connect mains power to your superEMS™ controller. You will be required to provide your own cabling suitable to the run length.	

Once cabling works are compete, ensure the control and point of attachment doors are closed to maintain IP protection. Then the superRack™ outdoor is ready for commissioning.

If you are attempting an initial start of your system, **you MUST book in a time for commissioning with Energy Renaissance**. You **MUST NOT** leave the system on without having it commissioned by Energy Renaissance as this risks damaging your batteries and voiding your warranty.

connecting the superModbus™

The superRack™ outdoor comes with an integrated **secondary controller** within the control enclosure mounted on the front panel of the unit.

If the superRack™ outdoor was sold with a **superModbus™ controller** this section provides detailed steps on how to connect your superModbus™ controller to your superRack™ outdoor units and external management systems (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.

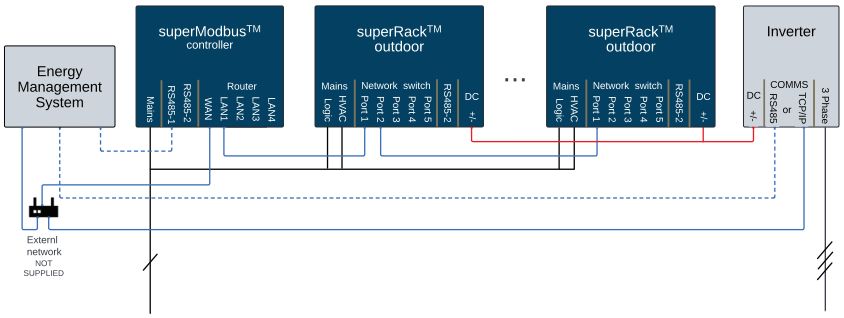
Do not mount controller enclosure in direct sunlight.

You can have up to eight secondary controllers connected to one main controller. You must have at least one inverter dedicated to every superRack™ outdoor. Multiple superRack™ outdoor's cannot share an inverter.

connecting the superModbus™ controller

Example communications connection

For examples of basic configurations and installation SLDs see appendix 2 and appendix 3.

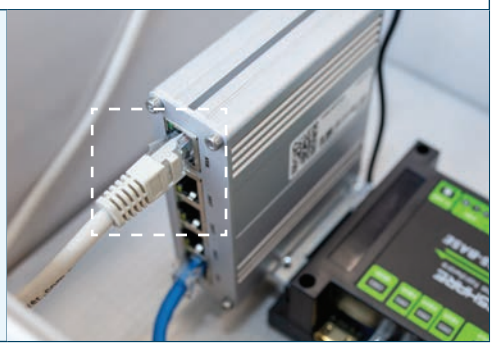


Connecting your network to the router

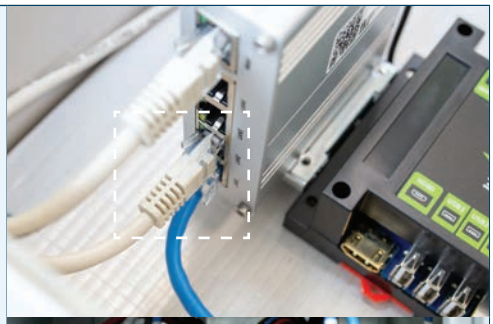
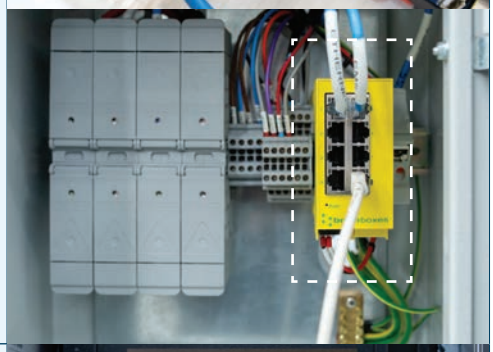
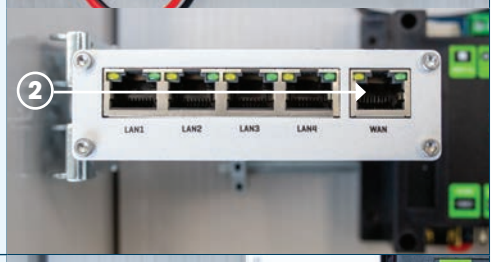
You need to provide an internet connection for your installation.

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 superModbus™

Connecting your superModbus™ controller to your superRack™ outdoor units	You need to provide an ethernet connection to each superRack™ outdoor unit/s. Connect an ethernet cable from a LAN port on your superModbus™ controller's router to the network switch located in the point of attachment of your superRack™ outdoor unit. If you have multiple superRack™ outdoor units you can connect from the first units network switch to the second unit's, the second to the third, and so forth. Or connect each back to the router if there are sufficient ports on the router. You will be required to provide your own cabling suitable to the run length.	 
Connecting your external management system	External management systems can either be connected to: ① **RS485-1 port on your superModbus™ controller** (not secondary) ② or port forwarding via your **WAN connection on the router** You will be required to provide your own cabling suitable to the run length.	 
Connecting Power to your superModbus™ controller	You are required to connect mains power to your superModbus™ controller. You will be required to provide your own cabling suitable to the run length.	

Once cabling works are compete, ensure the control and point of attachment doors are closed to maintain IP protection. Then the superRack™ outdoor is ready for commissioning.

If you are attempting an initial start of your system, **you MUST book in a time for commissioning with Energy Renaissance**. You **MUST NOT** leave the system on without having it commissioned by Energy Renaissance as this risks damaging your batteries and voiding your warranty.

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 circuit breakers inside the control enclosure,
- 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.
- Visually inspect ground conditions to ensure stability is maintained.
- Visual inspection for damage of the over pressure relief vent on the roof.

Cleaning of enclosure:

- Carefully remove any loose surface deposits by gently rubbing with a wet sponge/cloth.
- Carefully rub the surface with a soft brush (non-abrasive) and a dilute solution of a mild detergent, e.g. pH-neutral liquid hand or dishwashing detergent in warm water to remove dust, salt and other deposits. Do not use other aggressive solvents.
- Rinse the surfaces with clean fresh water to remove all remaining residues.

HVAC maintenance

Part	Step Description	Maintenance Cycle
Fan	Check for abnormal noise during operation of fan.	One year
Condenser	Check the cleanliness of the condenser and clean it with compressed air or water. Ensure drain hose is connected and free from blockages.	Six months

appendices

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:

    $AFB_{5139} = AFB/0.980$ = 0.0650 m or 6.50 cm.

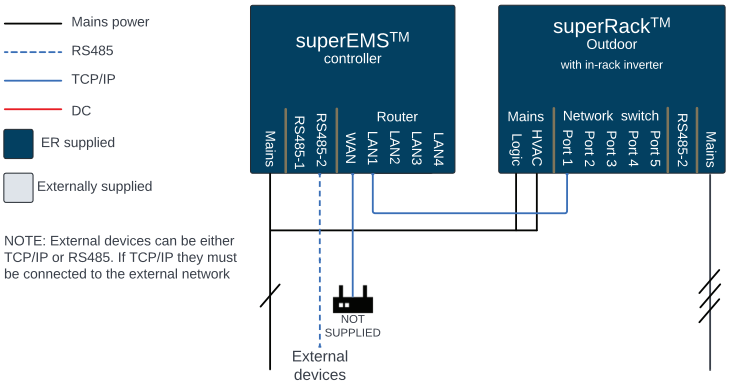
This incident energy surface density of 0.0252 cal/cm² is well below the rating of 4 cal/cm² for PPE Cat-1 and therefore the lowest level, Cat-1, of safety gear is sufficient.

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™ outdoor installations

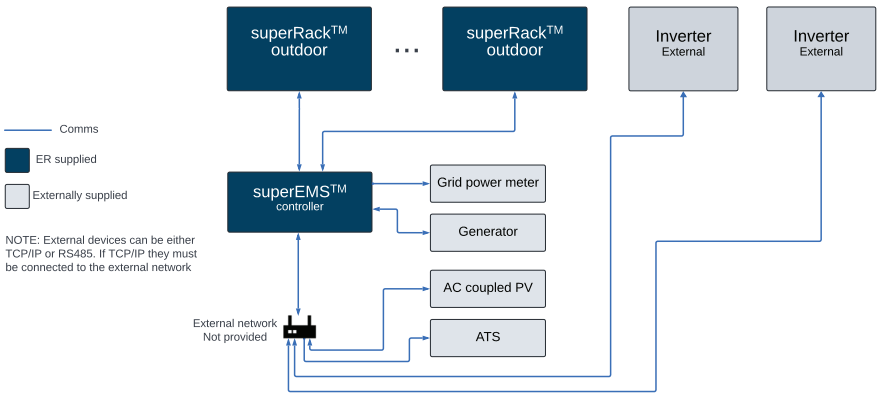
i.
Single superRack™ outdoor with in-rack inverter and superEMS™ Block diagram



appendix 2: example basic configurations

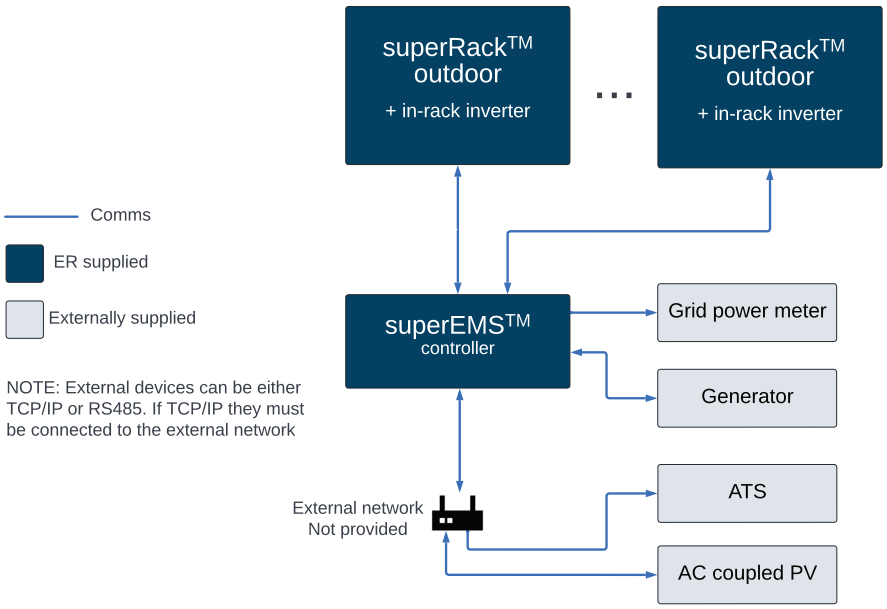
2b. Multiple superRack™ outdoor installations

i.
Multiple superRack™ outdoor with externally supplied inverters and superEMS™ block diagram



NOTE: You must have at least one inverter designated to every superRack outdoor. Multiple superRack outdoor's cannot share the same inverter. Ensure you connect the appropriate inverter comms cables to the correct superRack outdoor if RS485 or to your external network if TCP/IP

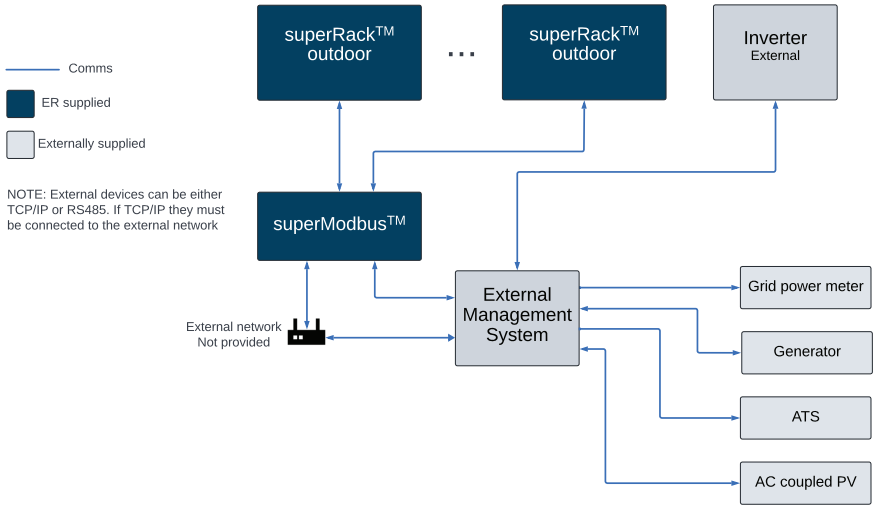
ii.
Multiple superRack™ outdoor with in-rack inverters and superEMS™ block diagram



appendix 2: example basic configurations

2b. Multiple superRack™ outdoor installations

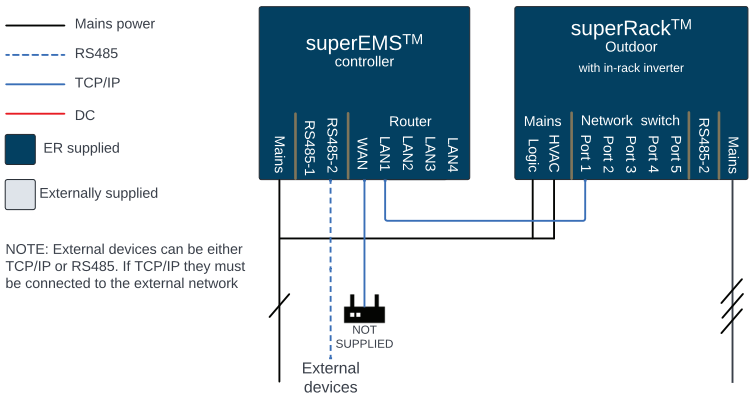
iii. Multiple superRack™ outdoor with superModbus™ block diagram



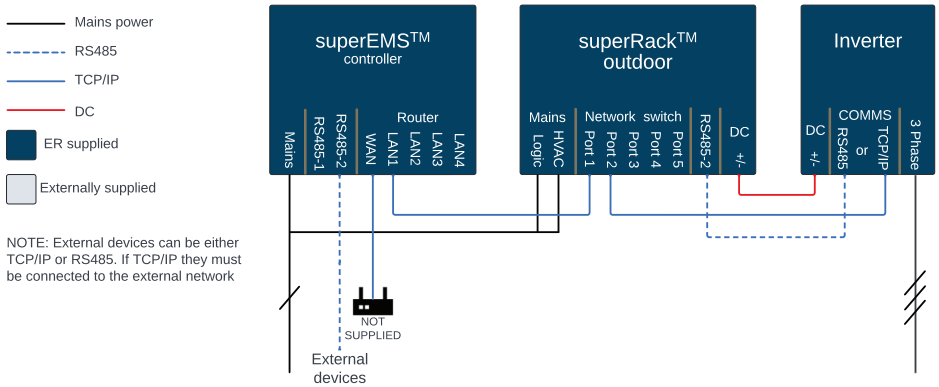
appendix 3: installation SLDs

3a. Single superRack™ outdoor installations

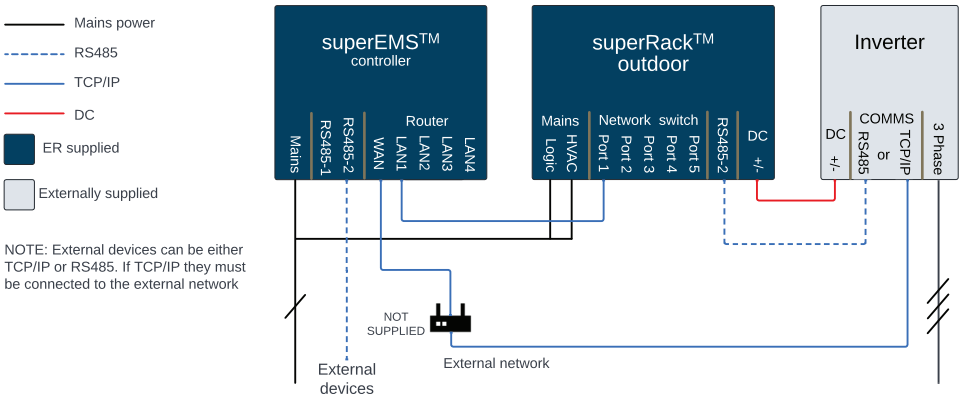
i.
Single superRack™ outdoor with in-rack inverter and superEMS™



ii.
Single superRack™ outdoor with superEMS™ and ER supplied inverter



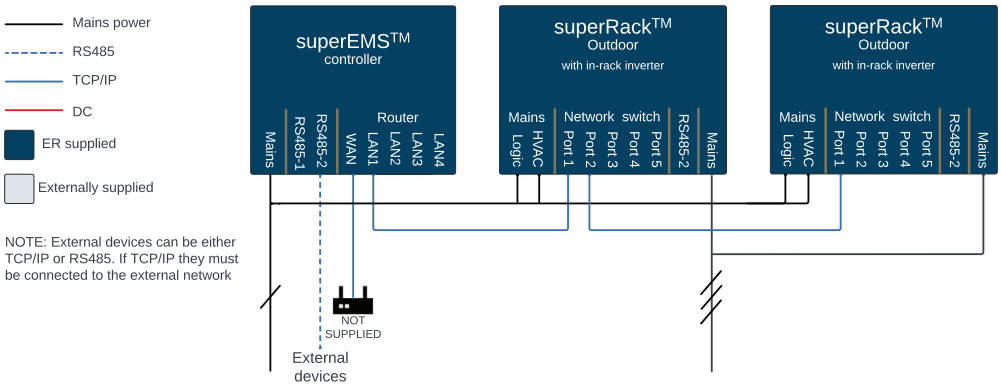
iii.
Single superRack™ outdoor with superEMS™ and externally supplied inverter



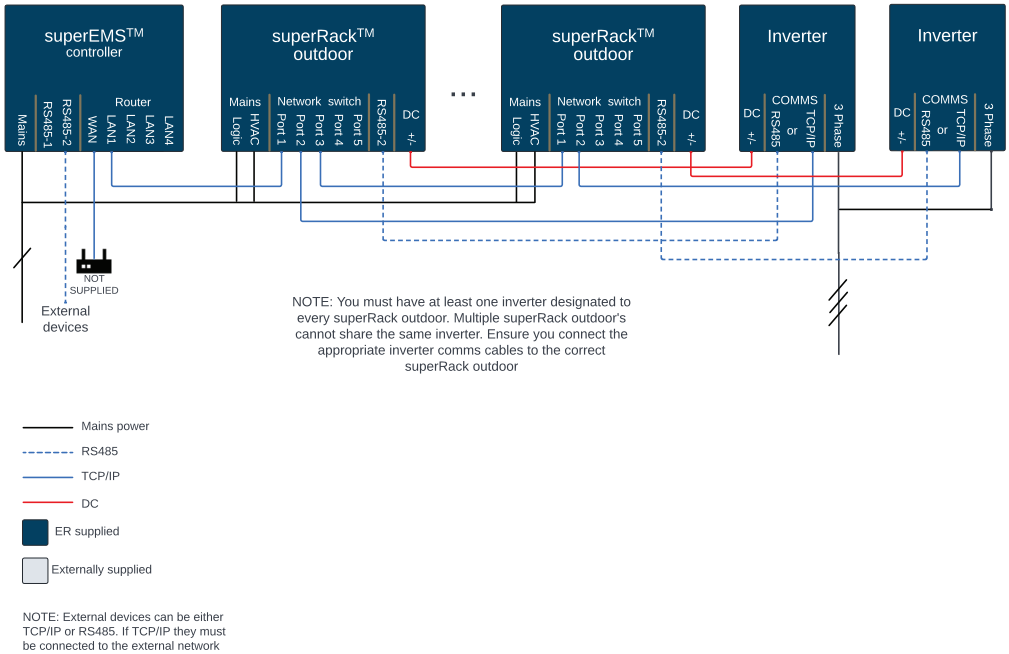
appendix 3: installation SLDs

3b. Multiple superRack™ outdoor installations

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



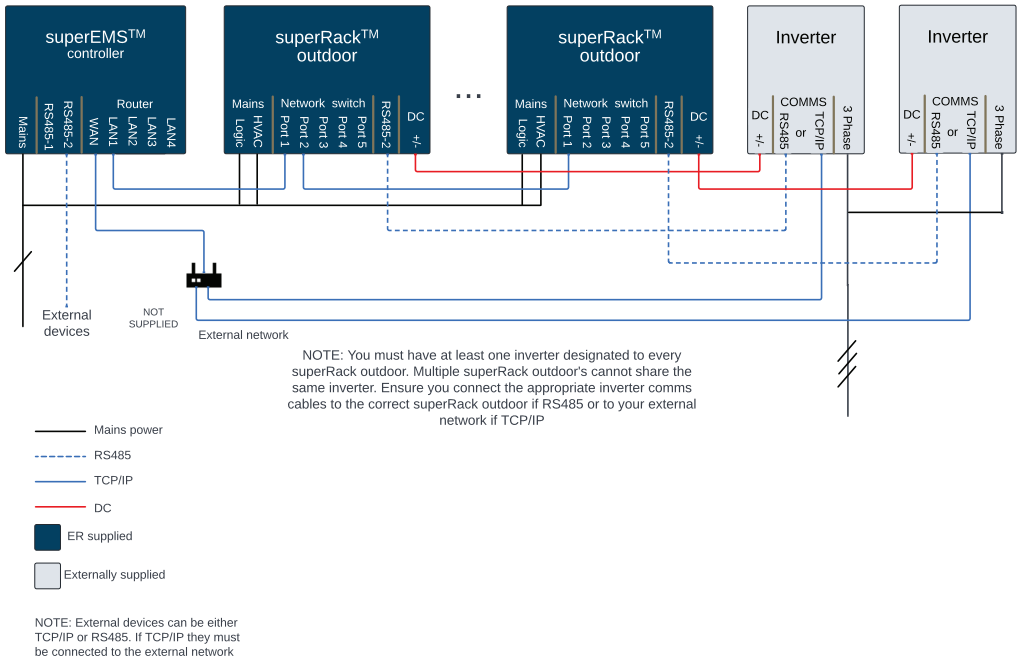
ii.
Multiple superRack™ outdoor with superEMS™ and ER supplied inverter



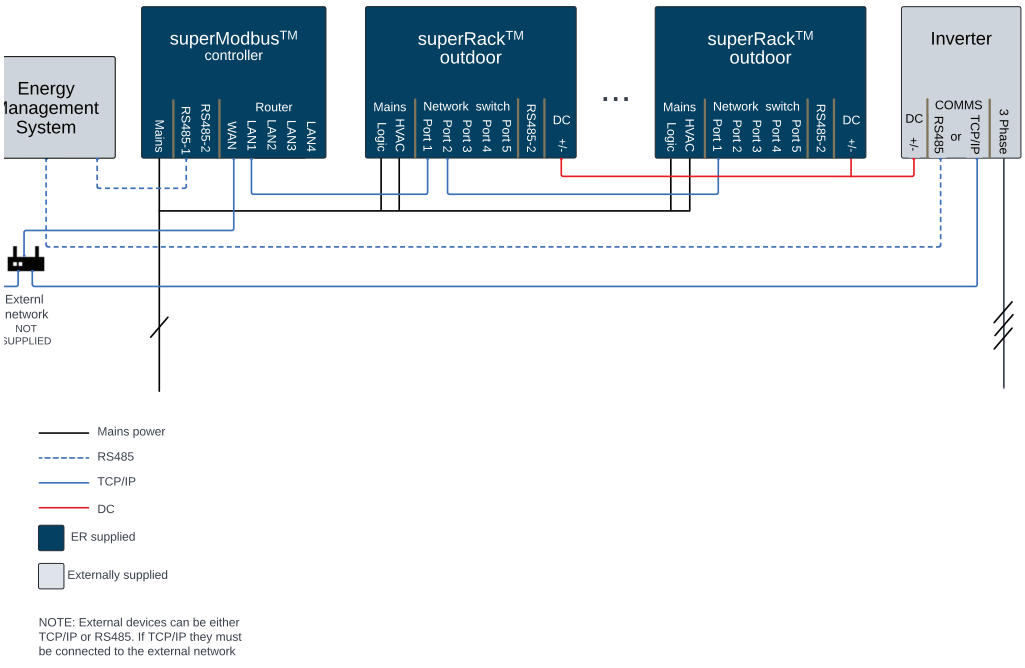
appendix 3: installation SLDs

3b. Multiple superRack™ outdoor installations

iii.
Multiple superRack™ outdoor with superEMS™ and externally supplied inverter



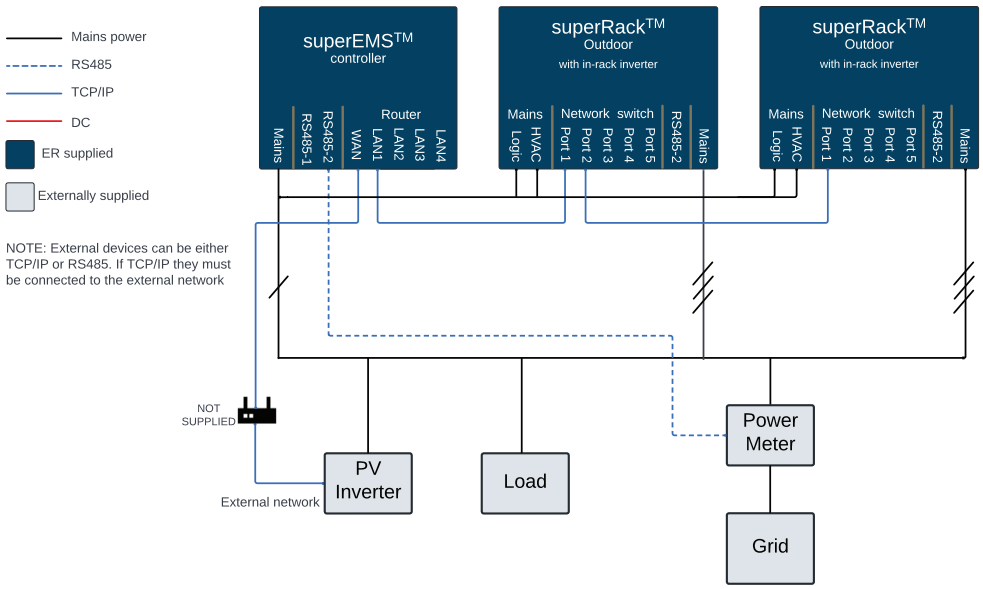
iv.
Multiple superRack™ outdoor with superModbus™



appendix 3: installation SLDs

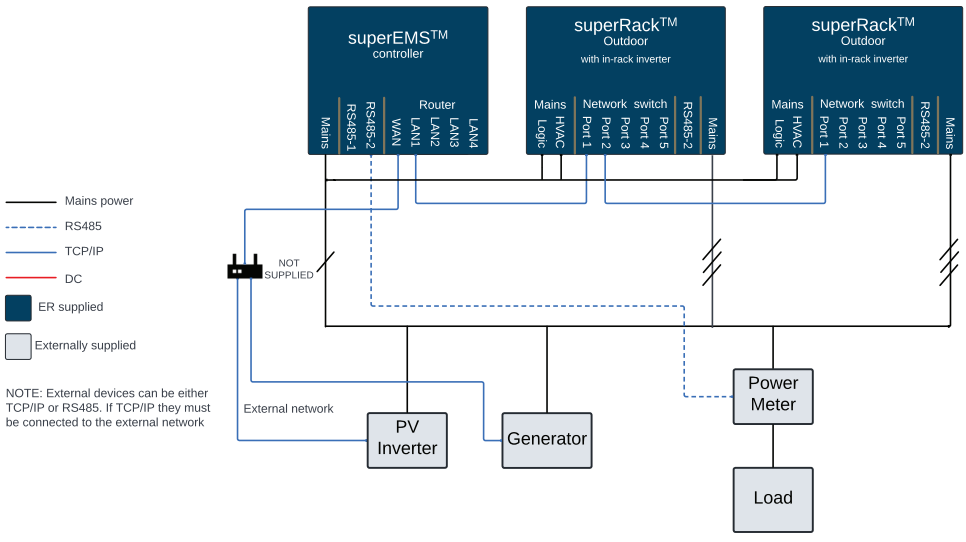
3c. Example on-grid installation

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



3d. Example off-grid installation

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



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