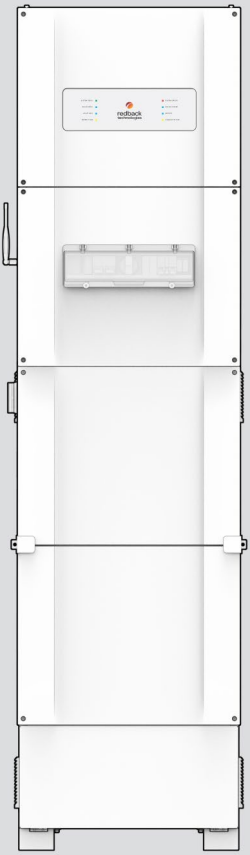
Installation Manual

Redback Smart Hybrid System
SH5000 Inverter and BE14000 Battery Enclosure

V2.1



History

VERSION	ISSUED	COMMENTS
1.0	10-Jul-20	Released for print production
1.1	05-Jul-21	Added Single Line Diagram; added Regional Setting notes; other minor edits
1.2	13-Sep-21	Updated; Re-organized; Rebranded
1.21	30-Sep-21	Spec Table Grid Interactive Port Rated Output Current AC 21.7A (was 24.5A)
1.22	19-Dec-21	Spec table updated; Firmware info added.
1.23	04-Mar-22	Wi-Fi compatibility update
1.3	11-Mar-22	Spec table updated- improved MPPT range; references to dual enclosures added.
2.0	10-May-22	P9 Added limitation due to not testing to AS/NZS 4777.2:2020 for multiple phase combinations; P24 Grid-side MCB info added: MCB Type C 40A; Backup CCT Sub-board RCD info added: MCB/RCD Type A 30mA; P29 BoS communications connection diagram redrawn; Ethernet cable assembly info improved; DRED section reformatted; P30 Relays section updated to match other documents; P34 Additional instruction added "Plug Cable A into Fan Controller BATT port"; P50 Earth fault alarm information added; P63 Reformat close-up and handover and move to inside back cover.
2.1	26-Apr-23	P22 Update pre-fitted bungs footnote. P32 Add requirement for new batteries to be balance charged and firmware updated. P59 Add I_{SC} Max footnote. P59 Add “Maximum PV Input Power” and footnote. P59 Correct Back feed (was Feedback). P59 Correct Battery Port>Max. Power (discharge) (was “charge”). P61 Qualify Inverter Noise Emissions. P61 Add BE Noise Emissions and footnotes.

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Privacy notice

Redback will use the personal information provided to us only for warranty purposes. Without this information we will not be able to process your warranty claim. If you require further information about our privacy policy, please visit our website at redbacktech.com.

Start here…

This manual describes the installation and commissioning of a Redback SH5000 Smart Hybrid Inverter (hereafter called the SH5000 or the "Inverter") and the Redback BE14000 Battery Enclosure (hereafter called the BE14000 or the "Enclosure").

The goal is to maximise solar energy usage and minimise energy consumed from the utility.

This manual is for use by Installers and Installer Companies.

Before you go to site…

1. **Read this manual.**

   The installation manual has all the information you will need for most installation scenarios.

2. **Book a support call**

   If you think you will need help, book Redback Technical Support 2 days before going to site. This ensures that technical support is reserved for you if you are on-site and need help. Redback support is in Brisbane, Australia and is available 8am-4pm (Brisbane time) Monday to Friday. There are three ways to book a support call:

   Web: redback.link/support

   SMS: +61 417 632 065

   Call from Australia: 1300 240 182

   Call from New Zealand: +61 7 3180 2325

3. **Register the installation**

   Early registration makes it possible to do a functional, testable installation even if some information is not available e.g., installation in a spec home where the owner's information is not available. You can also pre-assign the installation inspector.

   Register the installation at redback.link/register (+Add device).

Need something else?

1. **Visit the Redback Document Library**

   Installer and Owner documentation is available for our current products. Go to redback.link/docs

2. **Contact the Redback Customer Support Team (Monday to Friday, 8am-4pm AEST)**

   In Australia: 1300 240 182

   In New Zealand: +61 7 3180 2325

   Email: customersupport@redbacktech.com

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Symbols used in this manual

SYMBOL	DEFINITION	SYMBOL	DEFINITION
	LETHAL DANGER. Risk of electrocution.		**CAUTION!** Hazard to equipment
	DANGER. Risk of electrical shock.		**EXPLOSION HAZARD**
	WARNING! Hazard to human life		**LIGHTNING STRIKE HAZARD**
	WARNING! Burn hazard		**SHARPS HAZARD**
	TIPPING HAZARD. Do not leave unattended.		**FIRE HAZARD**
	HEAVY LIFT. Seek help.	10m	**DELAY.** Wait specified time.
	INFORMATION. The information supplied is important for the correct installation, operation and or maintenance of the equipment. Failure to follow the recommendations could result in a warranty claim being denied.		**PPE REQUIRED.** Use appropriate personal protective equipment.

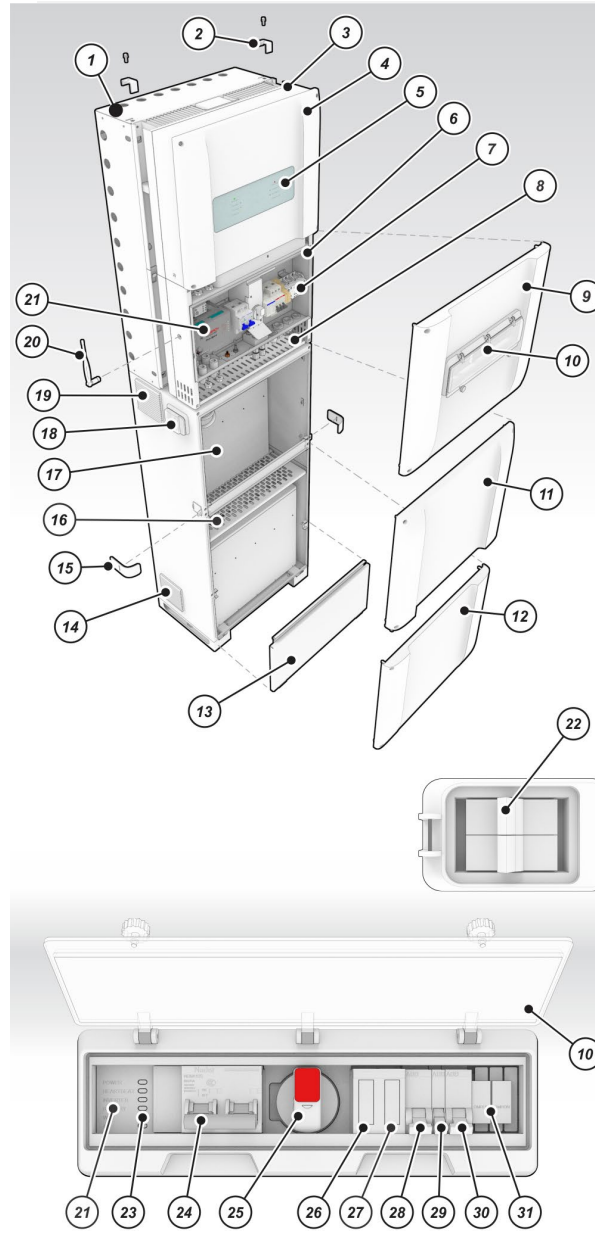
Symbols used elsewhere

SYMBOL	DEFINITION	SYMBOL	DEFINITION
	HEAVY! Bend knees to lift.	5min	**DELAY.** Wait specified time.
	HEAVY! Two-person lift needed.		**REFER TO DOCUMENTS.**
KG	**PACKAGE MASS.** In kilograms.		Do not dispose as household waste.
	THIS SIDE UP. The package must be transported, handled, and stored with arrows pointing up.		This product has recyclable parts. Dispose of correctly.
6	**STACKING LIMIT.** Stack packages six high or less.		**FRAGILE. Handle with care.** Do not tip. Do not sling.
	KEEP DRY The package/product must be protected from excessive humidity and must be stored under cover.		

1. Know your product

1.1 Major components

#	PART NAME
1.	Wall Mounting Frame
2.	Inverter Retainer Yokes & Screws
1.	Inverter Assembly
2.	Inverter Front Cover
3.	Inverter Status Panel
4.	Inverter Balance of System
5.	BoS switchgear on DIN rail
6.	BoS Slotted Cover
7.	BoS Front Cover
8.	BoS switchgear hatch
9.	Battery Enclosure front cover- Upper
10.	Enclosure front cover- Lower
11.	Enclosure kick panel
12.	Enclosure Air Inlet
13.	Enclosure Security Clamps
14.	Battery Shelf (Removable)
15.	Battery: Pylontech US2000 or US3000. Note: US3000C will not work.
16.	Enclosure Isolator Cover
17.	Enclosure Extractor Fan
18.	BoS Wi-Fi antenna
19.	EMS (Energy Management System)
20.	Enclosure DC Isolator
21.	EMS Status LEDs
22.	BATTERY SYSTEM DC isolator
23.	PV ARRAY DC isolator
24.	Backup power meter
25.	Grid interactive power meter
26.	BACKUP AC isolator
27.	BYPASS switch
28.	INVERTER AC isolator
29.	Relays



1.2 Dimensions and weights

ITEM	CAPACITY (NOMINAL)	WIDTH (MM)	HEIGHT (MM)	DEPTH (MM)	SHIPPING MASS (KG)	COMPONENT MASS (KG)	
Inverter	na	518	840	360	57	Mounting Frame:	3.5
						BoS:	12.3
						Inverter:	30.8
Enclosure	14.2kWh	545	1125 min	348	45	38.0●	
Combined	na	545■	1960 min♦	360	-	95-177	

PYLONTECH BATTERIES						
US2000	2.4kWh	482♠	440♠	89	-	24
US3000	3.55kWh	482♠	450♠	132	-	32

●Excluding batteries. ■Excludes Wi-Fi antenna and padlock hoops. ♦Installed height varies slightly. ♠Including rack mount angles and handles.

1.3 Installation space

1.4 Compatibility and limitations

The Redback SH5000 is a transformer-less Inverter; all other components of the PV system must be compatible with this type of Inverter architecture.

AC-coupled installations are possible, enabling an existing grid-tied inverter's output to charge a Redback controlled battery.

The Redback SH5000 Smart Hybrid Inverter and BE14000 Battery Enclosure are not suitable for:

- Batteries not specified by Redback.
- Off-Grid installations, where there is not normally a grid connection.
- Locations without internet access: the system can operate off-line but should normally have internet available – Redback requires data for warranty claims.
- Installation in full-sun locations: the inverter may overheat resulting in reduced efficiency and or automatic shutdown.
- Exposed locations where wind driven rain may penetrate the enclosure.
- Use with generators.
- Use with 5Ghz Wi-Fi networks

Multiple inverter energy systems

- SH5000 systems have not been tested for Section 5 of AS4777.2:2020—installation of SH5000s in a multiple inverter energy system requires they are installed & used as required by AS/NZS 4777.1.

WARNING. This equipment is NOT intended for use with life support equipment or other medical equipment or devices.

NOTE: This product supports combinations of Pylontech US2000 and US3000 batteries only. Other Pylontech and other batteries cannot work in this product.

WARNING. Installation in violation of these limitations may void the warranty (refer to the Warranty document).

1.5 Backup circuit design notes

The SH5000 includes one backup output activated during a grid outage and powered by the system batteries (4600VA max.) and or available PV (5000VA max). Loads on the backup circuit must be selected to extend the backup power availability, noting:

- Continuous battery-only power delivery up to 4600VA.
- Peak power delivery of 6900VA for up to 10 seconds (for high starting currents).
- System self-protects and shuts down if power limits are exceeded.
- Output is reduced above 45°C ambient temperature.
- System shuts down if 60°C ambient is exceeded.

WARNING. Batteries must be fitted if a backup circuit has been connected to the inverter. PV-only power is not satisfactory for backup circuits—backup load and PV power are variable and unpredictable—when backup load exceeds PV power the Inverter will automatically shut down and restart.

The backup circuit is suitable for low power or intermittent use devices such as refrigerators; freezers; LED or florescent lighting; small kitchen appliances; computers; radio or televisions.

High starting-current or high operating-current loads must not be connected to the Backup circuit e.g., hot water systems; air conditioners; ovens or cooktops; spas or saunas or pool pumps.

Backup circuit	New circuit needed?	☐ Yes	☐ No
	Backup circuit inclusions	☑ **Acceptable**	☒ **Not Acceptable**
		Refrigerators and freezers	Critical medical devices
		Fans	Air conditioners & heaters
		Small, occasional use, plug-in appliances e.g., microwaves, kettles	Ovens and cooktops
		TVs, radios, telephones	Home theatres & projectors
		Computers, tablets, routers	Hot water systems
		Mobile phone or small device chargers	Spas, saunas, pool pumps
		Soft-start household water pumps	Battery chargers & corded power tools
		Low energy LED or CCFL lighting	Incandescent or high-power lighting

2. System Installation

Important safety instructions – please read

This document has important safety instructions for products produced by Redback Technologies. Please read all the instructions and cautionary markings on the product and on any accessories or other equipment included in the installation. Failure to follow these instructions could result in severe shock or possible electrocution. Always use extreme caution to prevent accidents.

Audience

Installation, maintenance, and connection of inverters must be performed by qualified personnel, in compliance with local electrical standards, wiring rules and the requirements of local power authorities and/or companies (for example AS4777 and AS/NZS 3000 in Australia). The Redback Smart Hybrid strictly conforms to all related safety rules in design and test.

Safety regulations relevant to the location should be followed during installation, operation, and maintenance. Improper operation may cause electric shock, or damage property, inverter, or equipment.

These instructions are for use by skilled, qualified personnel who:

- Meet all local and governmental code requirements for licensing and training for the installation of electrical power systems with AC and DC voltage up to 600 volts
- Have CEC accreditation for installing grid-connected PV systems and energy storage systems
- Have knowledge of the functional principles and operation of grid-connected systems and knowledge of the installation of electrical devices
- Understand the risk associated with installing and using electrical devices and can implement appropriate risk management strategies
- During the preceding 12 months, have completed Redback approved training on the installation of the Redback SH5000 Smart Hybrid Inverter and BE14000 Battery Enclosure.

General safety

SYMBOL	DEFINITION
	WARNING: Limitations on use This equipment is NOT intended for use with life support equipment or other medical equipment or devices.
	CAUTION: Equipment damage Only use components or accessories recommended or sold by Redback Technologies or its authorised agents.
	IMPORTANT. Do not install this equipment if it appears be damaged in any way. See the Warranty document for instructions on returning the equipment.

Personal safety

SYMBOL	DEFINITION
	WARNING: PERSONAL INJURY • Use safe lifting techniques when handling this equipment. For guidance visit safeworkaustralia.gov.au or contact your local WHS authority. • Use standard safety equipment when working on this equipment such as safety glasses, ear protection, steel-toed safety boots, safety hard hats, etc. • Use standard safety practices when working with electrical equipment. (Remove all jewellery, use insulated tools, wear cotton clothing etc). • Never work alone when installing or servicing this equipment. Have an assistant to help if necessary. • Do not touch the inverter during operation. The temperature of some parts of the inverter may exceed 60°C during operation. Let it cool for at least 5 minutes after shutdown before touching it. • Ensure that children, pets, and other animals are kept away from the inverter, solar arrays, battery bank and utility grid components. • If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Battery safety

SYMBOL	DEFINITION
	IMPORTANT • Use the battery types recommended by Redback Technologies. Follow the battery manufacturer's recommendations for installation and maintenance. • Insulate batteries against freezing temperatures. Note: batteries freeze more easily when discharged. • Remote or automatic generator control systems: disable the starting circuit and/or disconnect the generator from its starting battery while performing maintenance.

Equipment safety

SYMBOL	DEFINITION
	WARNING: LETHAL VOLTAGE • Identify all sources of energy. Ensure ALL sources of power are disconnected before performing any installation or maintenance on this equipment. Confirm that the terminals are de-energised using a validated voltmeter (rated for a minimum 1000 VAC and 1000 VDC) to verify the de-energised condition. • Do not perform any servicing other than that specified in the installation instructions unless qualified to do so or have been instructed to do so by Redback Technologies technical support personnel. • Solar arrays may be energised even in low ambient light. Install a high voltage DC rated disconnect, breaker, or accessible fuse box to ensure a safe disconnect from the system (depending on local code requirements). • To avoid electric shock, disconnect the DC input and AC input of the inverter at least 5 minutes before performing any installation or maintenance. • Completely disconnect all sources of power before continuing with any maintenance. Do not open the upper inverter compartment of the system. • Do not tighten the AC and DC terminals or pull on the AC and DC wiring when the inverter is running.
	WARNING: BURN HAZARD • External and internal parts may be hot. Do not remove the cover during operation or touch any internal parts. Allow time for internal parts to cool down before performing any maintenance.
	WARNING: FIRE HAZARD • Do not keep combustible or flammable materials in the same room as the equipment. The Redback Smart Hybrid has relays and switches which are not ignition protected. • Ensure AC, DC and ground cable sizes conform to local codes and are fit for purpose. See product manuals for minimum size requirements. Ensure all conductors are in good condition. Do not operate the unit with damaged or substandard cabling.
	CAUTION: EQUIPMENT DAMAGE • When connecting cables from the inverter to the battery terminals, ensure the proper polarity is observed. Connecting the cables incorrectly can damage or destroy the equipment and void the product warranty. • Thoroughly inspect the equipment prior to energising. Ensure no tools or equipment have been left behind. • Ensure clearance requirements are strictly enforced. Keep all vents clear of obstructions that can prevent proper air flow around, or through, the unit. • Do not open the upper front cover of the inverter. Apart from performing work at the wiring terminals (as instructed in this manual), touching or changing components without authorisation may cause injury to people, damage to the inverter and annulment of the warranty. • Static electricity may damage electronic components. Take appropriate steps to prevent such damage to the inverter; otherwise, the warranty may be annulled. • Ensure the output voltage of the proposed solar array is lower than the maximum rated input voltage of the inverter; otherwise, the inverter may be damaged, and the warranty annulled. • Solar modules should have an IEC61730 Class A rating.
	CAUTION: LIGHTNING PROTECTION. PV arrays in the system should be protected by a Lightning Protection System as described in AS/NZS5033:2021.

2.1 Installation overview

Installation by non-approved installers may void the product warranty.
You are approved to install Redback products if you:

- Are a Redback registered and qualified installer, and
- Hold the required qualifications for installing grid-connected inverters, and
- Have a Redback Installer login.

Not sure?
Contact Redback on 1300 240 182 if you are unsure of your approval status.

2.1.1 BEFORE YOU GO TO SITE

Simple preparations will help the installation run smoothly.

1. If you think you will require assistance, book a support call at redback.link/support
2. Register the installation at redback.link/register (+Add device)
3. Gather the required tools
   - Normal electrician's tools including crimping kit and Cat 5 cable tools
   - Electric drill/driver with 4mm Hex bit; Phillips head screwdriver bit; drill bits suitable for drilling walls
   - Tape measure and spirit level
   - Internet connected device with RedbackINSTALL app
4. Gather required information

Gather the following information for use during registration, installation, onboarding, and commissioning.		
System serial number:		
Your Redback Installer Login:		Apply at redback.link/apply
Homeowner details (required)	Full name:	
	Installation address:	
	Email:	
	Mobile:	
Homeowner Wi-Fi details	Wi-Fi Name:	
	Wi-Fi Password:	
Installation configuration		
Regional Safety Zone		
Soft Export Limit		
Hard Export Limit		
Soft Generation Limit		
Hard Generation Limit		
Compliance Inspector		
Relay Assignments	Relay 1	
	Relay 2	
	Relay 3	
	Relay 4	

2.1.2 AT SITE

Conduct a risk assessment

Redback recommends installers complete a risk assessment of the proposed works, to the standard required by relevant authorities.

Ensure Wi-Fi availability (if to be used)

Measure the home Wi-Fi strength at the proposed installation site. Review installation plan if Wi-Fi strength is less than -70dBm, otherwise ongoing connection problems may occur.

Wi-Fi Strength[1]:	☐None[2]	☐Weak (< -70dBm)[3]	☐Good (approx. -70dBm)	☐Strong (> -70dBm)

1. Test inverter location before installation
2. Mandatory: Request Redback Customer Service to set the inverter to “Off Comms”
3. Find an installation site with Good or better Wi-Fi strength

Review the proposed inverter location.

- Does it meet the requirements of AS/NZS5139? See section 2.2.
- Is it out of direct sunlight?
- Will it be exposed to heavy rain and wind, or is there a flood risk?
- Is it a coastal environment? Will it be exposed to salt spray?
- Is the mounting wall flat (to prevent distortion) and structurally sound (to carry 47kg load)? Are spacers needed?
- Is the floor surface flat? Do you need packers?
- Is there 150mm clearance all-round (for cooling) and at least 2150mm height available?

Hardware

SH5000 ONLY	INVERTER + BE14000	SH5000 + 2X BE14000
Install Wall Mounting Frame Install BoS Install Inverter	Install Battery Enclosure Install Wall Mounting Frame Install BoS Install Inverter Install batteries & cables	Install Battery Enclosures & Connection Kit* Install Wall Mounting Frame Install BoS Install Inverter Install batteries & cables * Refer to redback.link/shck

Electrical

- Run and connect LV cables and conduits to the BoS from PV and main or sub-board
- Install any non-standard accessories e.g., relays or new backup circuit
- Install an energy meter and run ethernet from meter to BoS
- Run ethernet from home network router to BoS (recommended)
- Complete connections to BoS (switchboard, PV, backup circuit)

Commissioning

- Test the electrical installation
- Power ON the inverter
- Commission using RedbackINSTALL
- Fit covers and clean worksite
- Document the installation
- Handover to homeowner

2.2 Guide to AS5139 installation requirements for BE14000

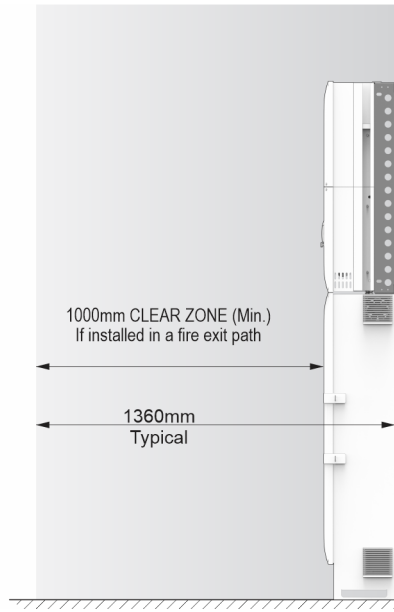
For AS5139:2019 compliance, the BE14000 is defined as a pre-assembled battery system. AS5139 prescribes allowable battery system locations and fire-proofing requirements. AS5139 is referenced in AS4777.1, AS3000 and the BCA, and all new or modified battery system installations must comply.

The installer is responsible for completing installation in accordance with all relevant standards and regulations. The key AS5139 requirements for BE14000 installation are:

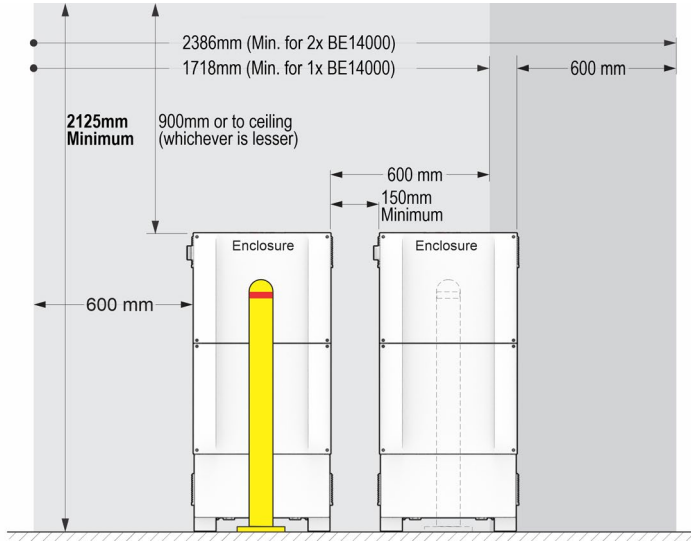
- Install the BE14000 against a wall in a clear-zone having no windows, doors, exits, vents, or appliances not related to the BE14000. The clear-zone extends 600mm from the sides and 900mm above the BE14000.
- Fireproof any combustible wall in the clear-zone if a habitable room exists on the opposite side of that wall. Fire-proofing materials must comply with AS1530.1.
- Fireproof any structure e.g., ceiling or eave less than 900mm above the BE14000 to the full width of the clear-zone and the lesser of 960mm from the wall or to the edge of the structure.
- Use fire-retardant sealant to seal all penetrations through the wall that exceed 5mm internal diameter.
- Ensure 1m clearance in front of the BE14000 if it is located on a fire exit path.
- Protect the BE14000 from vehicle impact if this is a likely occurrence- use a bollard or similar device.

The most likely installation scenarios are illustrated below: any clear zone may need to be fireproofed. Note: the second enclosure is optional.

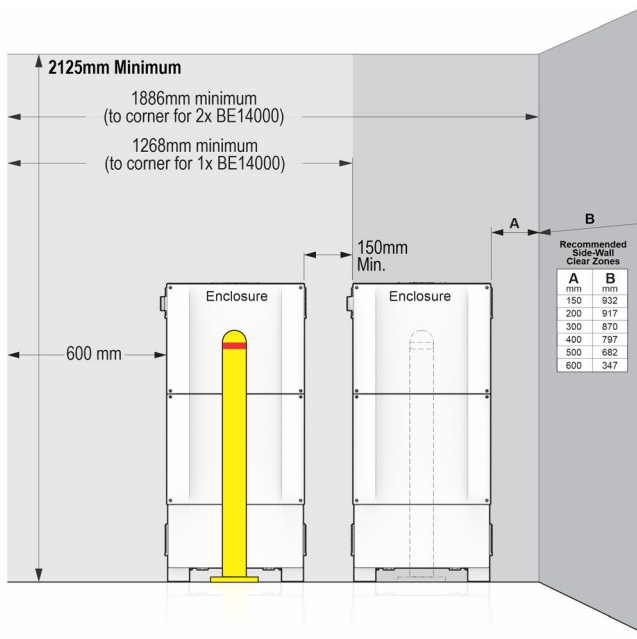
2.2.1 INSTALLATION ON AN EXIT PATH



2.2.2 INSTALLATION ON A BLANK WALL



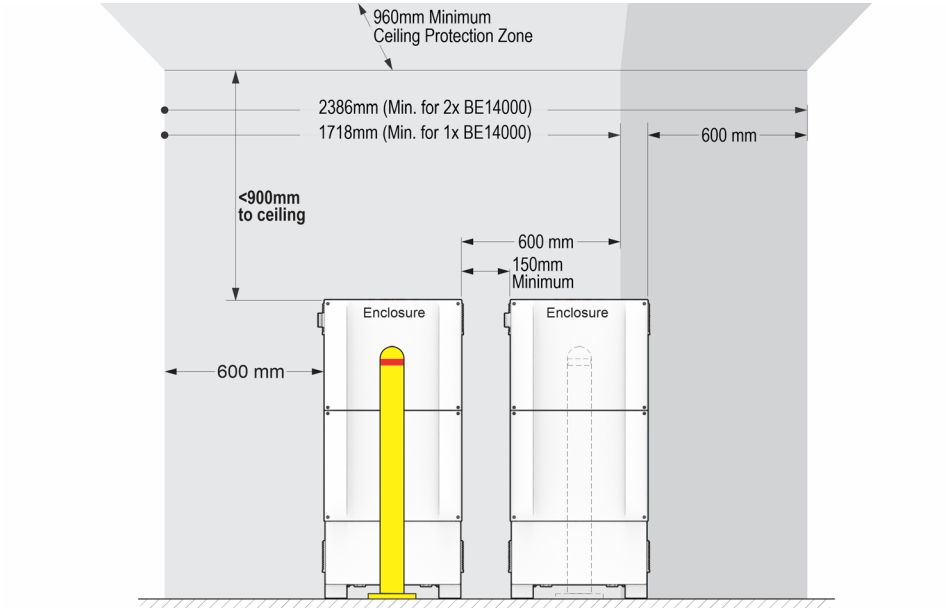
2.2.3 INSTALLATION NEAR A CORNER



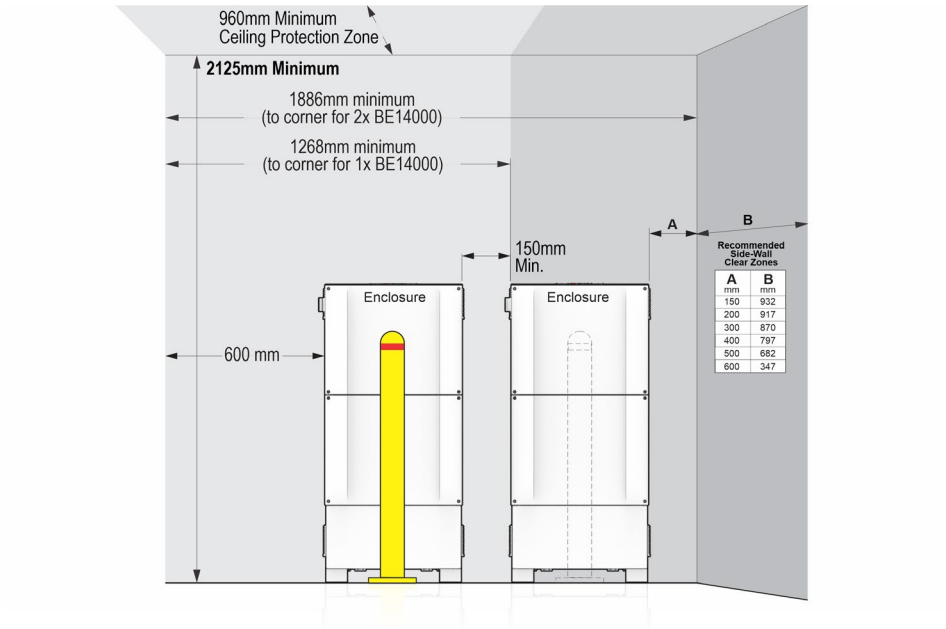
Recommended Side-Wall Clear Zones

A mm	B mm
150	932
200	917
300	870
400	797
500	682
600	347

2.2.4 INSTALLATION WITH A LOW CEILING



2.2.5 INSTALLATION NEAR A CORNER, WITH LOW CEILING



A mm	B mm
150	932
200	917
300	870
400	797
500	682
600	347

2.3 Preliminary electrical installation

The Inverter and Balance of System (BoS) are hung on the Wall Mounting Frame. When hung, the BoS and Inverter restrict access to the internal conduit space.

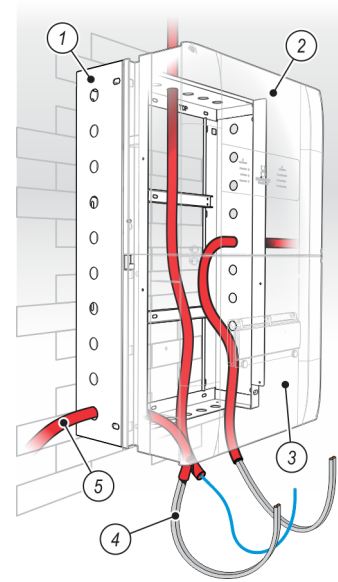
It may be faster (but not essential) to run cables and conduits before hanging the BoS or inverter. Ensure that the cable tails have generous bend radii, are long enough to reach the BoS and form effective drip loops.

The Wall Mounting Frame has numerous pass-throughs to accommodate rigid or flexible conduit up to ϕ25mm. Do not use the lower pass-throughs as this will affect future battery enclosure installation. Typical conduit routing is shown at right.

Cables that can be run in advance include:

- Solar array output
- Grid connection to main or sub-board, using 2-core + earth (Flat, TPS-cable or Orange Circular cable preferred)
- Cable to Backup Circuit isolator (2-core + earth)
- Communications cable (to energy meter)
- Ethernet cable (to home network router)

All connections between inverter, BoS and batteries are internal, using supplied cables.



#	PART NAME
1.	Wall Mounting Frame
2.	Inverter Front Cover
3.	BoS Front Cover
4.	Cables
5.	Conduits

2.4 Installing the BE14000 Battery Enclosure

	If you are installing an inverter-only system, go to section 2.5.
	WARNING TIPPING HAZARD. Keep children and animals out of the worksite. Do not leave the enclosure unattended during installation. Fasten enclosure to the wall as soon as practical.

2.4.1 OVERVIEW

The BE14000 Battery Enclosure is designed for AS5139 compliant Redback SH5000 Smart Hybrid Inverters. The enclosure is not designed for older or non-Redback inverters.

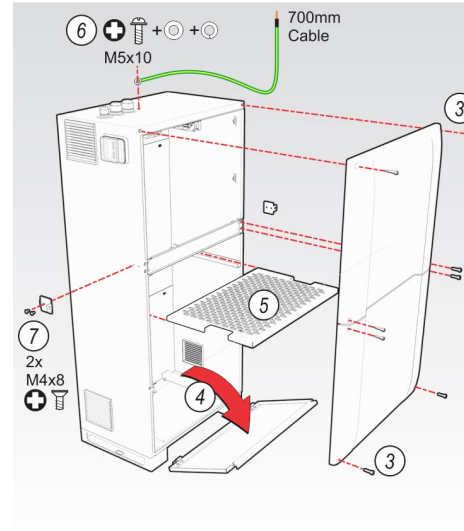
The enclosure can house up to four Pylontech US2000 and or US3000 batteries.

The installation process is:

- Review the Packing List. Verify all parts have been supplied.
- Remove front covers.
- Remove battery shelf and cross braces (optional).
- Fit padlock hoops.
- Position and install the enclosure.

2.4.2 PRE-ASSEMBLY

1. Open the BE14000 carton and locate the packing list. Verify all parts are supplied.
2. Remove the cabinet from the transport carton. Place on a protective surface, front-side up.
3. Remove the upper and lower front covers and set aside. The covers are retained using 4mm hex-drive screws. Take care not to damage the internal seal.
4. If batteries are to be fitted, remove the kick panel. The kick panel is hinged at the bottom edge and secured at the top corners – remove the screws, tilt the panel forward and slide it off the hinge pins. Take care not to damage the internal seal.
5. Remove the upper shelf.
6. Attach the 700mm earth bonding cable to the top of the enclosure using a M5x10 screw, and spring and flat washers, as shown.
7. Attach the two padlock hoops using two M4x10 countersunk screws.



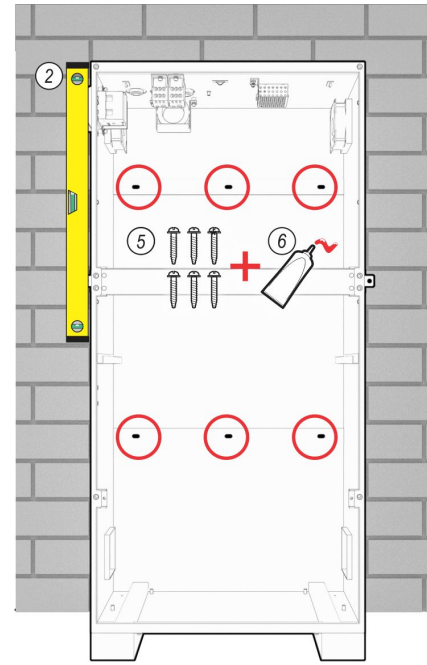
2.4.3 INSTALLATION

Installation notes

- The BE14000 Battery Enclosure is pre-wired for use with an AS5139 compliant SH5000 inverter.
- Reduce heat load by installing out of full sun: ideally, the installation will be against a south facing external wall, and under eaves.
- Ensure the location is not flood prone from water across ground, nearby downpipes, or guttering.
- Stand the enclosure on a stable, level surface. Use packers under feet if needed.
- Fasten the enclosure to a flat, structurally sound wall. Waterproofing will be affected if the enclosure is twisted or damaged. Use spacers if needed.
- The enclosure features fan-assisted cooling. Ensure 150mm clear space either side. Do not block the cooling intakes or exhaust vents.
- Ensure at least 1000mm clear height is available above the enclosure (for inverter fitting).

Installation process

1. Place the enclosure in the required location: on the floor; against the wall; 150mm clear space both sides.
2. Set the enclosure level. Use a spirit level as needed. Add packers under feet if necessary.
3. Check that the wall is flat. Use spacers as needed to ensure the enclosure does not distort when fastened to the wall.
4. Six mounting points are provided, as shown at right.
5. Fix the enclosure to the wall using suitable fasteners.
6. Seal around the fasteners using the supplied sealant.
7. Preliminary installation is complete.



* Installer to supply suitable fasteners (up to ϕ7mm)

2.5 Installing the SH5000 inverter hardware

2.5.1 OVERVIEW

The installation process is:

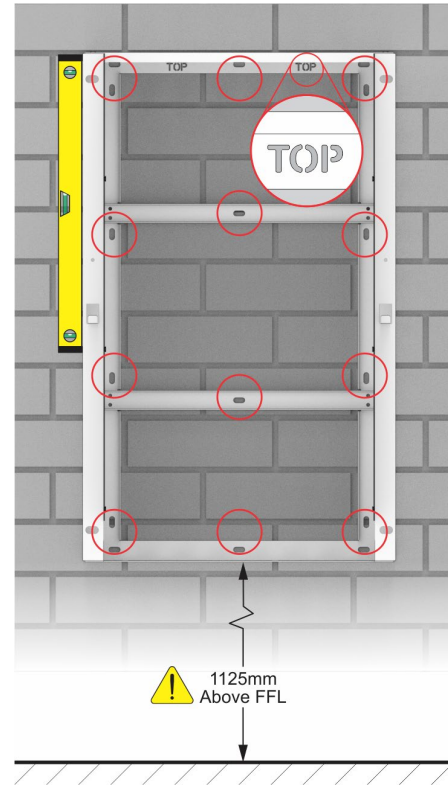
- Review the Packing List. Verify all parts have been supplied.
- Install the Wall Mounting Frame.
- Install BoS hardware.
- Install associated hardware.

2.5.2 WALL MOUNTING FRAME

WARNING: STRUCTURAL REQUIREMENTS!
The wall and fasteners should be suitable to secure the hung weight of the system. Please ensure that the selected wall is made from a suitable material (e.g., solid brick) and you use at least the recommend number of fasteners.

Installation notes

- Install the Wall Mounting Frame correctly - observe "TOP" markings.
- The inverter is convection cooled: provide 150mm clearance to top and sides to ensure airflow.
- If a BE14000 is in place, stand the frame on top of the BE14000, and fix in position.
- Otherwise, install the frame at 1125mm above the finished floor line (FFL): this enables easy retrofitting of BE14000 enclosure.



Fasten the Frame to the wall.

1. The Wall Mounting Frame is secured by eight fasteners at any of 16 points. Choose fastener locations that will spread loads to the structural part of the wall.
2. Use the frame as a template for fasteners.
3. Fix the enclosure to the wall using eight (8) suitable fasteners.
4. Check the frame is level (use a spirit level). Tighten the fasteners.

2.5.3 BALANCE OF SYSTEM (BOS)

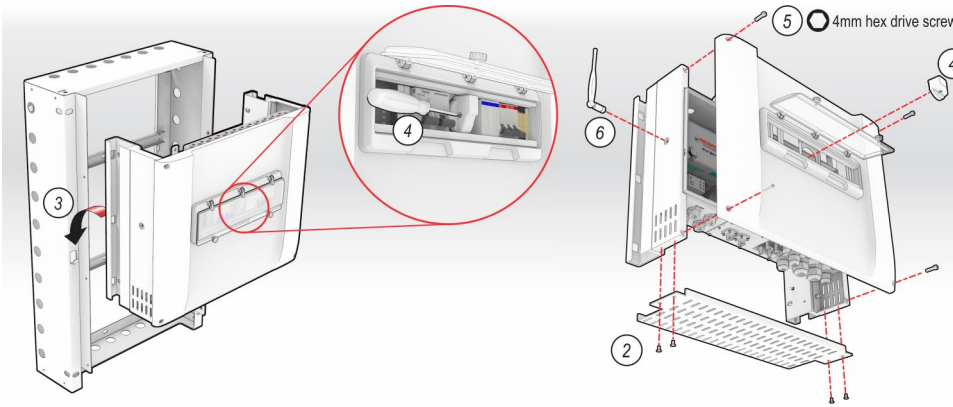
If you are installing dual enclosures, install the Secondary Enclosure now. Review the BE14000 Secondary Enclosure Installation Manual found in the Connection Kit box, or online at redback.link/shck

Installation notes

- The BoS is supported on the Wall Mounting Frame using two integrated hooks.
- The PV ARRAY DC isolator must be OFF, and the knob removed before the BoS front cover can be released.

Prepare and mount the BoS

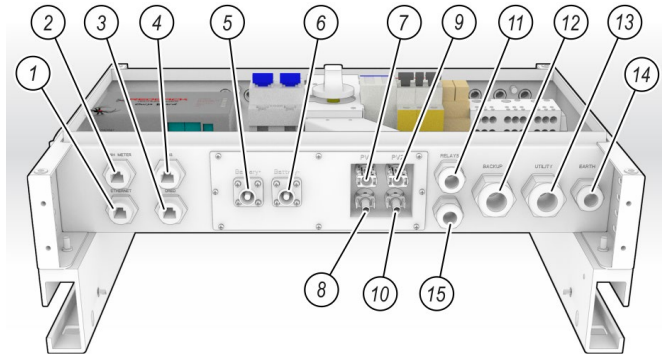
1. Remove the BoS assembly from the shipping carton.
2. Remove the BoS Slotted Cover (4 screws).
3. Lift the BoS assembly onto the hooks in Wall Mounting Frame as shown – use the middle slots. This is a temporary location: it provides better access and visibility when connecting cables.
4. Rotate the PV ARRAY DC isolator knob to ON position (12 o'clock). Loosen the grub screw, rotate the knob to the OFF position (9 o'clock). Remove the knob.
5. Loosen the four 4mm, hex-drive screws. Remove the BoS front cover and set aside.
6. Screw in the Wi-Fi antenna.



2.6 Inverter electrical connections

2.6.1 OVERVIEW

All connections to the BoS/Inverter are through dedicated sockets or glands in the BoS, as shown.



#	CONNECTOR
1	Ethernet (to home network)
2	Energy Meter (kWh Meter)
3	DRED
4	BMS
5	Battery Connector +ve
6	Battery Connector -ve
7	PV1 Connector +ve
8	PV1 Connector -ve

#	CONNECTOR
9	PV2 Connector +ve
10	PV2 Connector -ve
11	Relays Cable Gland #1
12	Backup Circuit Cable Gland*
13	Utility Grid Supply Cable Gland
14	Battery Cabinet Earth Cable Gland*
15	Relays Cable Gland #2

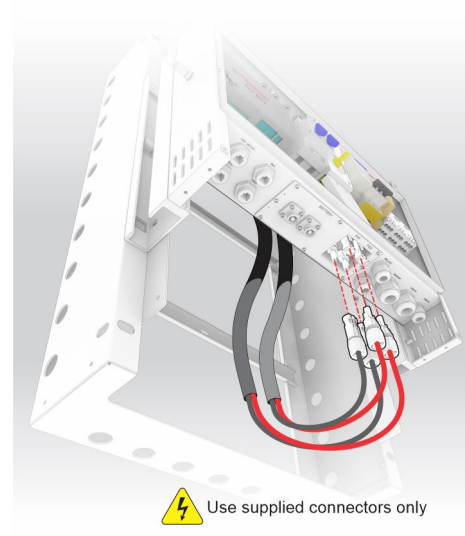
*Bungs are pre-fitted to Relay, Backup and Earth cable glands, to exclude water and insects. Remove as required.

2.6.2 SOLAR ARRAY CONNECTIONS

	ONLY USE THE SUPPLIED PV CONNECTORS. AS/NZS5033:2021 prohibits mixing of PV connector types and brands.
	WARNING: SHOCK HAZARD. Solar arrays generate energy even in low light. Handle cables and connectors carefully to avoid shock or arcing.
	WARNING: ELECTRICAL DAMAGE RISK Solar arrays must be electrically isolated from each other: Do not bridge arrays, connect in parallel or serial, or share isolator switches. Do not connect or disconnect PV while the inverter is ON.
	CAUTION: LIGHTNING PROTECTION PV arrays in the system should be protected by a Lightning Protection System as described in AS/NZS5033:2021.

The SH5000 inverter accepts power from one or two solar arrays, using dedicated MC4-style connectors on the BoS.

1. Shorten the PV cable as needed, and form drip loops.
2. Terminate the PV cables using the supplied connectors. Note polarity assignments: Red is positive; Black is negative.
3. Plug the PV cables into the sockets as shown, ensuring that cables are still paired.
4. Gently push any excess cable into the cavity behind the BoS, forming a drip loop.



2.6.3 SINGLE-PHASE GRID CONNECTION

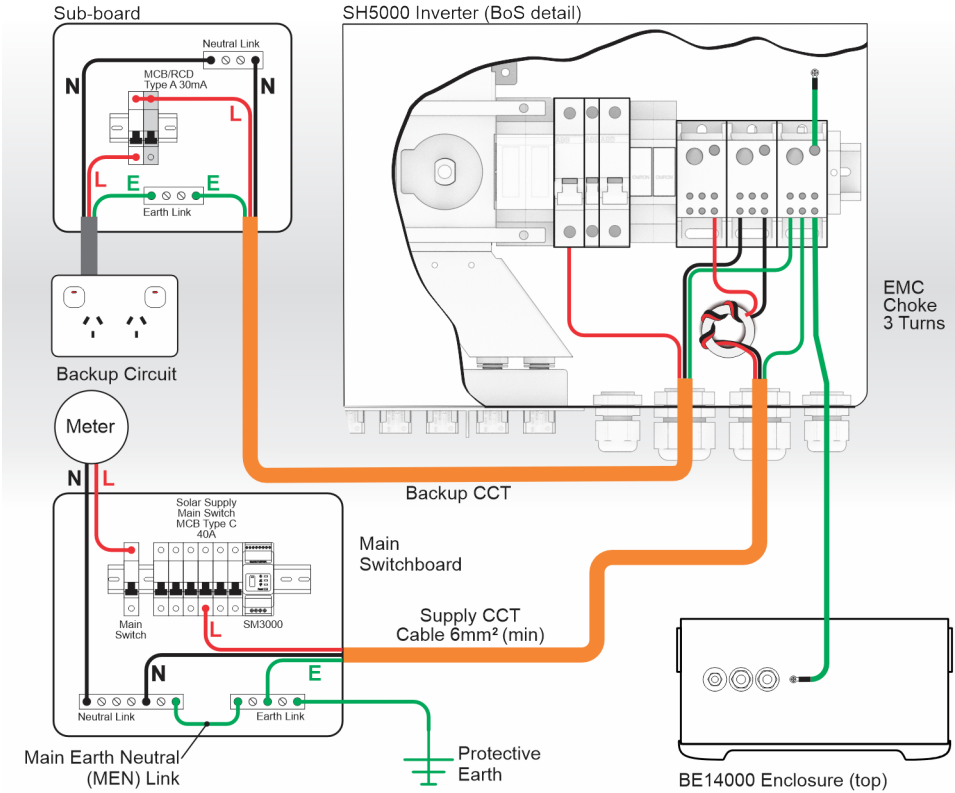
Connect the BoS and 240VAC supply and backup circuits.

Connection notes:

1. Installer to select cable sizes to suit the installation—following applicable wiring rules—and accounting for voltage drop.
2. Three cables are to be connected inside the BoS:
   - Supply cable (Active, Neutral, Earth).
   - Backup circuit (Active, Neutral, Earth) (optional).
   - Battery Cabinet earth.
3. Multi-port terminal blocks are provided in the BoS with individual ports for each cable.
   - Wire size: 16mm² max.
   - Strip wires: 10mm
   - Screw torque: 3.5Nm max.
4. Strip outer sheath from cables before winding the EMC choke.
5. Bungs are pre-fitted to Backup and Earth cable glands, to exclude water and insects. Remove as required.

ELECTROCUTION HAZARD. Lethal voltages may be present. Isolate all sources of power and test before starting work inside the BoS.

MINIMUM CABLE SIZE. Grid connect cables to be minimum of 6mm²



2.6.4 NON-STANDARD INSTALLATION

The Redback SH5000 inverter connects to a single-phase only but can work effectively in a two- or three-phase environment, or AC-Coupled to an existing grid connected inverter.

TWO OR THREE PHASE ENVIRONMENTS

A SM3000 Energy Meter is required to monitor multiple phases — informing the inverter of total grid consumption— and enabling the inverter to deploy self-generated energy as required. The SM3000 aggregates energy data from each phase and reports the net energy flow and the inverter manages energy accordingly.

To install the inverter in a multi-phase environment

1. Install the inverter as described in the preceding sections. The inverter and CT "1" must be on the same phase.
2. Connect the SM3000 Energy Meter as described in section 2.7.

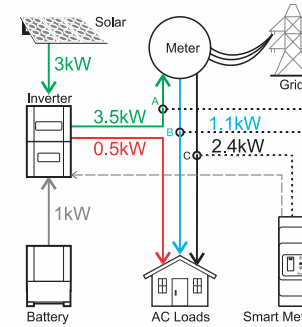
Example: Compensatory export in a 3-phase installation

In this situation the self-generated energy offsets grid consumption.

Generation $= P_{PV} + P_{BAT}$
$= 3.0 + 1.0$
$= 4kW$

Loads $= P_A + P_B + P_C$
$= 0.5 + 1.1 + 2.4$
$= 4kW$

Metering $= P_{CT1} - P_{CT2} - P_{CT3}$
$= 3.5 - 1.1 - 2.4$
$= 0kW$ (net balance)



Multi-Phase Energy Aggregation

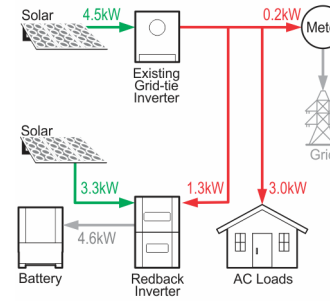
AC-COUPLED ENVIRONMENT

The SM3000 monitors the activity of the grid-connected inverter enabling battery charging from that inverter, or export from the Redback to the grid in accordance with the site's allowable Export Power Limit.

Example: Battery charging in an AC-Coupled environment

In this example the intent is to obtain the greatest economic benefit from the battery.

The SM3000 informs the Redback that the grid-connected inverter is exporting energy to the grid (possibly at a low export tariff). The Redback inverter diverts power to charge the battery as quickly as possible for later use (when a high import tariff applies). When the battery is fully charged, excess energy can be exported (up to the site export power limit).



AC-Coupled Energy Flow

To install the inverter in an AC-Coupled configuration

1. Install the inverter as described in the preceding sections.
2. Connect the SM3000 Energy Meter as described in section 2.7. CTs must be attached exactly as shown in 2.7.
3. Using RedbackINSTALL, configure the installation as AC-Coupled.

2.7 Installing the Energy Meter & CTs

WARNING. Connect the Energy Meter as shown in the following sections. Ensure that Current Transformers (CTs) and corresponding supply cable are connected to the same phase. Incorrect connection will cause incorrect data and may damage the meter.

2.7.1 OVERVIEW

The Redback Smart Hybrid System includes a Redback SM3000 energy meter suitable for single, two or three-phase installations or AC-Coupled configuration.

The energy meter uses a “split core” type current transformer (CT). The CT installation is non-intrusive: it simply clips onto the target cable. The meter directly indicates if the system’s net energy flow—whether importing or exporting. The installation process is:

- Install the energy meter to meter box or suitable location.
- Attach CTs, hook up supply, and run communication cable to the inverter.
- Use RedbackINSTALL to configure the installation.

2.7.2 INSTALLATION NOTES

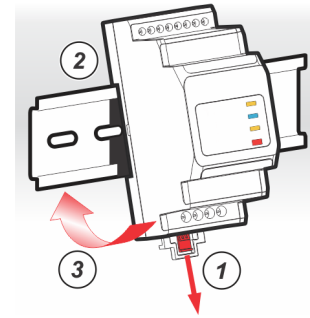
1. No two installations are the same; variations occur due to age, equipment, technology, local regulations, and work practices. This manual supplies a general guide to installation. Installers must adapt the information provided to the current installation, adhering to all local regulations and standards, and good electrical practice.
2. Isolate ALL sources of power before beginning installation.
3. Inspect the meter box or other installation site. Identify:
    - Mounting options for new meter (typically on 35mm DIN rail; 36mm width needed)
    - Attachment points for Current Transformers (CTs) on L1, L2, L3
    - Supply take-off point (L1, L2, L3, N)
    - Communications cable routing options (to the Redback inverter)
4. The meter is not waterproof and must be mounted in a weatherproof enclosure, preferably inside a meter box.
5. The meter does not generate significant heat. It may be mounted next to other equipment that is not a heat source.
6. The meter and CTs are mated and calibrated at the factory. Ensure disconnected CTs are reconnected to the original terminals.
7. CTs have a 2m long cable. The cable can be shortened or coiled if necessary.
8. The communication cable is a straight-thru Cat 5 ethernet cable, using the supplied adaptor.

2.7.3 METER INSTALLATION ON A DIN RAIL

The meter has a 35mm DIN rail mount. If no DIN rail position is available, the meter may be installed in a weatherproof enclosure.

To mount **the energy meter on a DIN rail:**

1. Press the unlock lever. Release the clip
2. Hook meter onto DIN rail
3. Rotate so that body is flush against the rail
4. Push clip up until there is a “Click!”. The Meter should be secured to the rail.



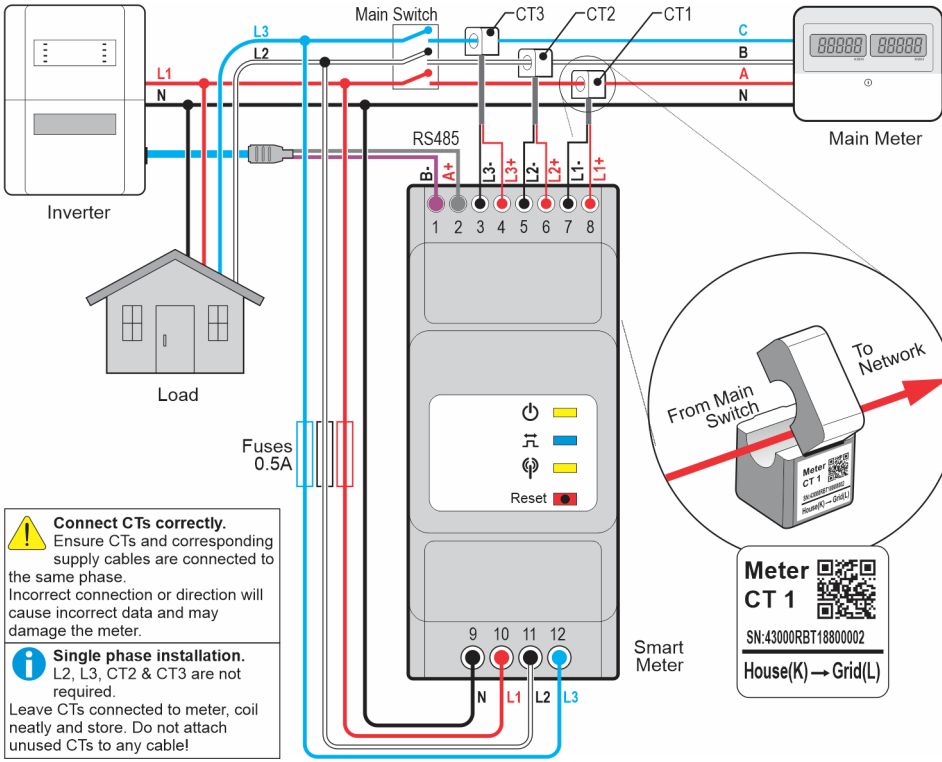
2.7.4 ONE, TWO OR THREE PHASE INSTALLATIONS

Note: Follow these instructions when the Redback is the only inverter at the site.

The meter measures the instantaneous voltage, current, power and energy of each phase of a grid supply system. The power data is transmitted to the Redback inverter and used to manage grid inputs from solar or battery power sources.

Connecting the SM3000

1. Connect the SM3000 as shown below, ignoring phases missing from the installation.
2. To ensure correct readings, ensure CTs are clipped onto cables as shown below.
3. Do not remove unused CTs – Leave connected to meter, coil cables neatly, and store. Do not clip unused CTs to any cable.



2.7.5 AC-COUPLED CONFIGURATION

SH5000 inverters may be fitted to an existing grid-connected system in an AC-Coupled configuration—the Redback system can charge its battery using excess power from the grid-connected inverter.

In an AC-coupled installation the Redback inverter requires DC power to automatically restart flat batteries after a grid outage. At least one PV string should be connected to the inverter otherwise a competent person will be needed on site, to conduct manual restarts.

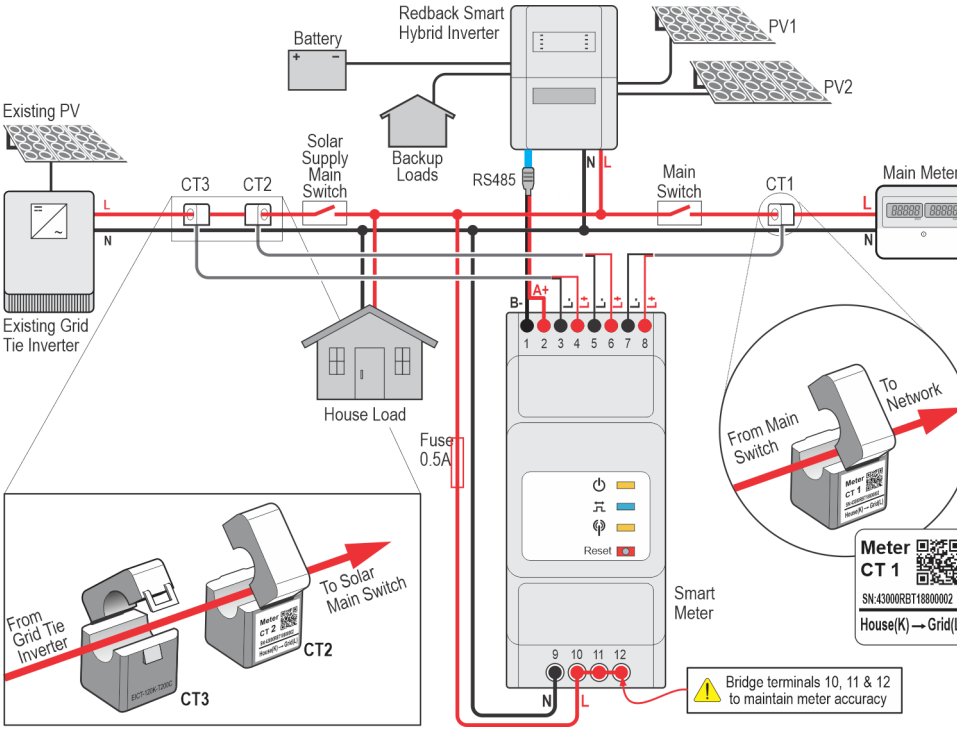
> ⚠ The installer must ensure that the homeowner understands that manual restarts must be conducted on-site by a competent person, and this will be required if PV is not connected to the Redback system.

A competent person may be the homeowner, if trained.

The SM3000 measures energy flow at the grid-connected inverter and at the grid connection, enabling the calculation of house loads and the regulation of SH5000 output to ensure compliance with the Grid Export Limit (specified using RedbackINSTALL).

Connecting the SM3000

1. Connect the SM3000 as shown below.
2. To ensure correct readings, ensure CTs are clipped onto cables as shown below.
3. Attach CT1 to the grid connection, between switchboard and the Main Meter.
4. Attach CT2 and CT3 to the grid-connected inverter output: CT2 and CT3 must oppose each other on this cable (arrows are pointing away from each other).



2.8 Inverter communications connections

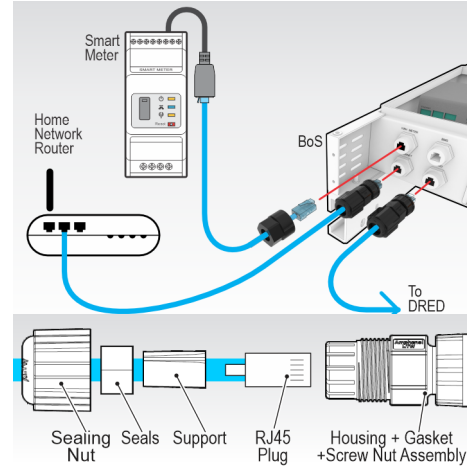
2.8.1 ENERGY METER

If not already installed, run the Energy Meter Communications cable to the inverter and insert the RJ45 plug into the KWH METER port at the bottom of the BoS.

2.8.2 ETHERNET (RECOMMENDED)

The Ethernet port is used if the inverter is to be connected to the home network using ethernet cable (not Wi-Fi). If not already installed, run ethernet cable from the home network to the inverter.

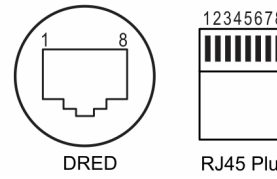
Terminate using Amphenol RCP-00BMMs-SLM7001 configured straight-thru. Connect to the ETHERNET port.



Amphenol RCP-00BMMS-SLM7001 Assembly

2.8.3 DRED

An RJ45 socket is provided at the BoS to enable Demand Response Enabled Device control. Run the DRED cable from the DRED device to the BoS. Terminate using 8-pin RJ45 and Amphenol RCP-00BMMs-SLM7001 gland. Assign pins as below.

PIN	ASSIGNMENT	ILLUSTRATION
1	DRM 1 / 5	
2	DRM 2 / 6	
3	DRM 3 / 7	
4	DRM 4 / 8	
5	RefGen	
6	COM / DRM 0	
7	NC	
8	NC	

METHOD FOR ASSERTING DRM

MODE	RJ45 SOCKET ASSERT BY SHORTING PINS		FUNCTION
DRM 0	6	5	Operate the disconnection device

2.8.4 RELAYS

The SH5000 includes two Omron G2R-1-SND-5VDC relays. Contact Redback for help to install up to two more relays (4 in total) using RK-1 Relay Kits. Each relay enables the programmed or remote control of one connected circuit and attached devices: for example, pumps can be scheduled to run during daylight hours, consuming excess solar power.

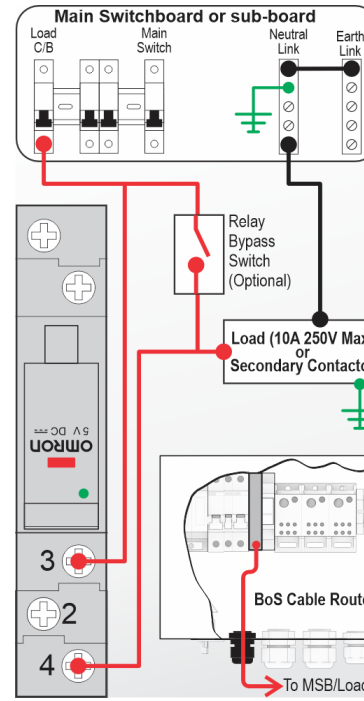
Relays may be software configured Normally OFF or Normally ON. Setup, schedule, and control relays as described in Section 4.7.

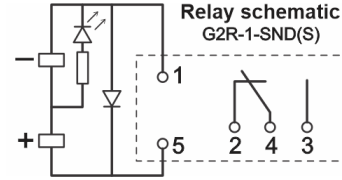
Loads up to 10A@240V AC

- Connect the load directly as shown right.
- During installation, in the RedbackINSTALL app, rename the relay to include its default state e.g., HWS Normally OFF, and set the default state to match—changing the default state will change the scheduling from ON/OFF to OFF/ON.

Loads over 10A@240V AC

- Loads over 10A@240v AC must be controlled using a secondary contactor (installer to supply).
- At the secondary contactor, mechanically configure or select the contactor to be Normally ON or Normally OFF as required. This will ensure the relay returns to the normal state if the inverter is off.
- Connect the relay as shown right.
- In the app, configure the relay to match the secondary relay i.e., Normally OFF or Normally ON.
- Set the schedules as required.



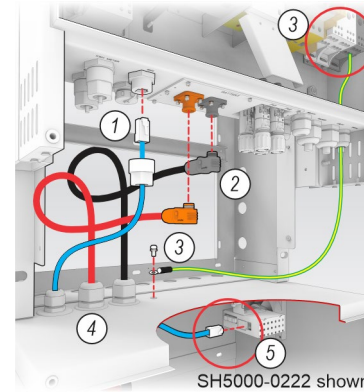


2.9 Battery enclosure connections (if fitted)

The enclosure is pre-wired with leads for up to four batteries. The external leads pass via waterproof glands and are terminated with Amphenol Surlock connectors.

The Battery Management System (BMS) "**Fan Controller to BoS"** cable is pre-fitted to the enclosure. It passes from the enclosure to the BoS via a waterproof gland and is fitted with a waterproof cap at the BoS end.

1. Plug the BMS cable into the BMS port as shown. Tighten the waterproof cap.
2. Connect battery power cables to the BoS as shown.
3. Attach earth cable as shown.
4. Check all glands on the top of the battery enclosure. Tighten if needed.
5. Check that the BMS cable is plugged into the Fan Controller "Ouija" Port (inside the enclosure).



2.10 Installing the SH5000 Inverter

WARNING: HEAVY LIFT- 31kg. The Inverter is heavy: 2-person lift needed.

2.10.1 MOVE BOS TO FINAL LOCATION

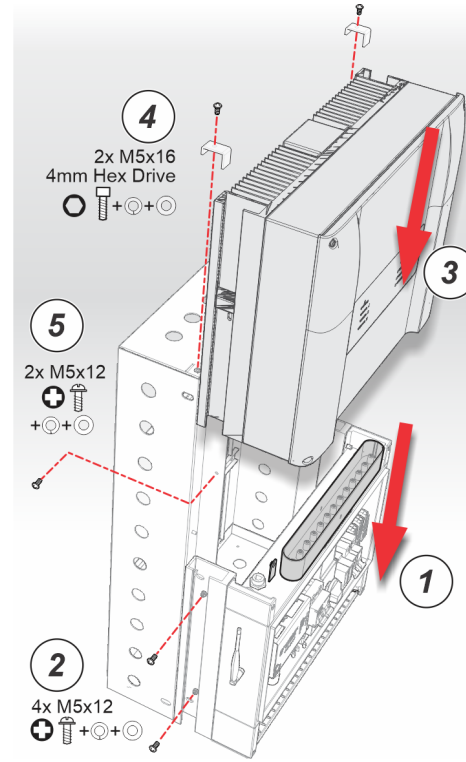
1. Lift BoS from the Wall Mounting Frame and re-attach using the upper slots in the aluminium sides. If there is any resistance check that cables are not binding, being pulled on, bending excessively, or being stressed in any way. Rearrange cables as needed – ensure all cables are still correctly fitted.
2. Fasten BoS to Frame using the screws, flat and spring washers supplied (2x M5x10 each side).

2.10.2 INSTALL INVERTER

The Inverter sits on top of the BoS, engaging the large connector, and is secured to the Wall Mounting Frame using two yokes at the top, one screw at each side, and one internal screw.

Install the inverter

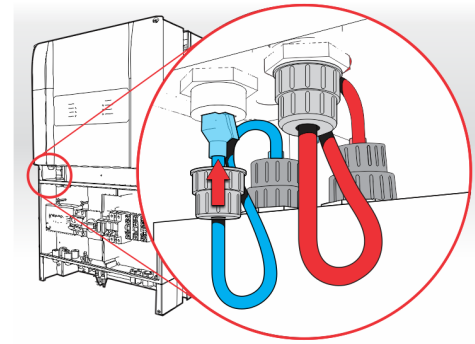
1. With an assistant, lift Inverter on top of the BoS. Align the large connector and pull the inverter down until the connector is fully engaged.
2. Fit the upper yokes using the M5x16 socket head screws supplied, including flat and spring washers. Ensure the inverter is flush to the Wall Mounting Frame.
3. Fit the two M5x12 side retainer screws, including flat and spring washers.



2.10.3 BOS TO INVERTER COMMUNICATIONS

The BoS is pre-wired with two communications cables to the inverter. The cables are found at the left-hand top of the BoS.

1. Plug the Energy Meter cable into socket
2. Plug the RS485 cable into socket
3. Fit the captive waterproof caps



*Colours added for clarity only

3. Battery installation

3.1 Overview

The Redback system has a storage capacity of up to 28.4kWh using one or two BE14000 enclosures and 4-8 batteries. Each enclosure holds up to four batteries and a second enclosure is always required for five or more batteries. Batteries are connected in parallel.

Any combination of Pylontech US2000, US2000 Plus or US3000 is allowed, provided the newest-model-is-master rule is applied.

NOTE: US3000C batteries do not work in this product and future support is not planned.

WARNING: SHOCK HAZARD. New batteries have some charge. Turn the BoS Battery System DC isolator OFF during installation. Also turn the individual battery enclosure isolators OFF. Do not activate batteries during installation.

INFORMATION FOR FUTURE USE. When replacing or adding batteries, all batteries must be charge balanced and firmware must be updated, otherwise performance will be affected.

3.2 Allowable battery combinations and storage capacities (kWh)

Number of US2000 and or US3000 batteries		Number of US3000[X] batteries @3.55kWh each●								
		0	1	2	3	4	5	6	7	8
Number of US2000[Y] batteries @ 2.4kWh each●	0	0	■	7.10	10.65	14.20	17.75	21.30	24.85	28.40
	1	■	5.95	9.50	13.05	16.60	20.15	23.70	27.25	♦
	2	4.80	8.35	11.90	15.45	19.00	22.55	26.10	♦	♦
	3	7.20	10.75	14.30	17.85	21.40	24.95	♦	♦	♦
	4	9.60	13.15	16.70	20.25	23.80	♦	♦	♦	♦
	5	12.00	15.55	19.10	22.65	♦	♦	♦	♦	♦
	6	14.40	17.95	21.50	♦	♦	♦	♦	♦	♦
	7	16.80	20.35	♦	♦	♦	♦	♦	♦	♦
	8	19.20	♦	♦	♦	♦	♦	♦	♦	♦

●Usable capacity is typically 90% of total capacity ■Battery installations must include a minimum of two batteries per cabinet of any listed model ♦Insufficient space in enclosure for this combination. [X]Pylontech US3000. [Y]Pylontech US2000 or US2000 Plus.

Pylontech batteries use an integrated Battery Management System (BMS) to manage ultimate charge and discharge rates (protecting the batteries from heat damage) and to inform the Smart Hybrid System of status. The BMS also protects the batteries from total discharge, improving system reliability and longevity.

Batteries are identified as Master, 2, 3, 4 etc up to 8. This refers to the position of individual batteries in the BMS chain of command, where the first connected battery is the Master battery.

The battery identity may also indicate the physical position of the battery within the enclosure, as shown in section 3.14.4.

3.3 Battery installation notes

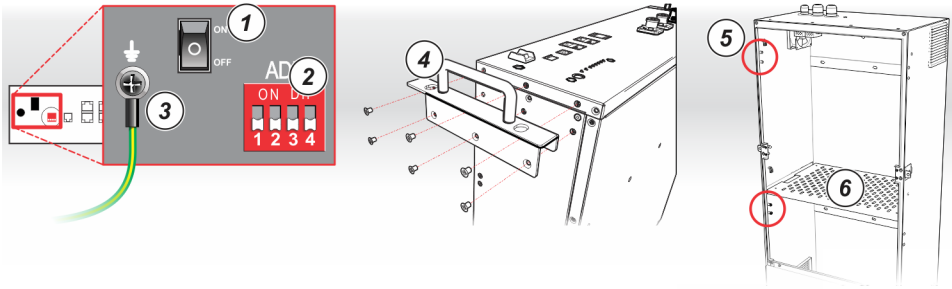
- The Master battery is always the newest model in the combination, in the 1st enclosure (Newest-is-Master rule).
- The Newest-is-master rule always applies.
- To ensure even cooling, batteries must be installed in the approximate positions shown. They must not touch the rear or sides of the enclosure, or each other.
- Batteries are unrestrained on the enclosure shelves, held in place by their own mass.
- Batteries must be independently earthed to the enclosure as shown in section 2.11.5.

3.4 Installing US2000 and or US3000 batteries

3.4.1 PREPARING THE BATTERIES FOR INSTALLATION

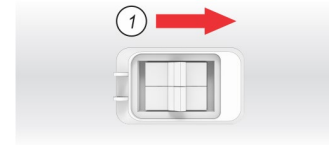
Each battery must be earthed to the enclosure cabinet.

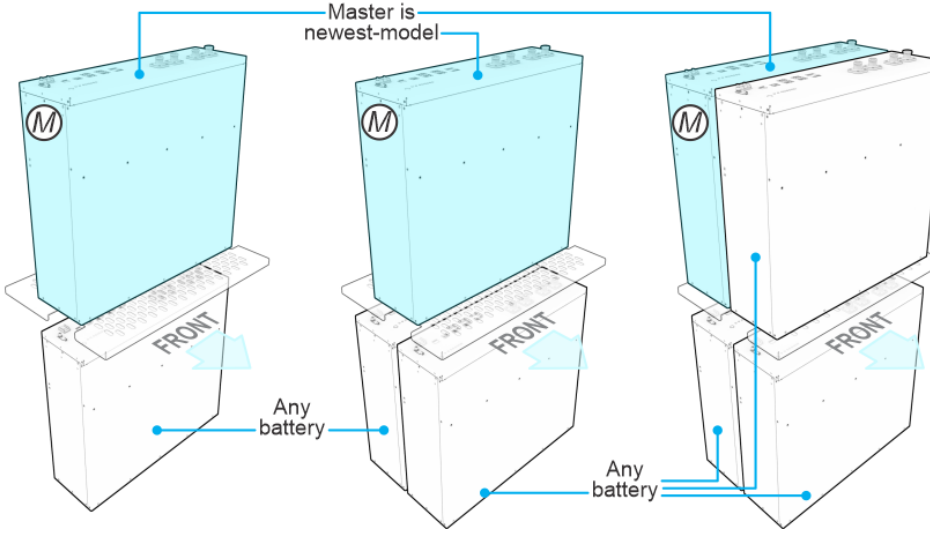
1. Turn all batteries OFF.
2. Set all battery DIP switches down, as shown, to ensure correct communication.
3. Connect a 350mm Earth Cable to the Earth terminal of each battery.
4. Optional: Remove all battery handles, as shown.
5. Note the location of enclosure battery earth studs.



3.4.2 POSITION BATTERIES IN THE ENCLOSURE

1. Turn the on-enclosure Battery Isolator to the OFF position (right).
2. Position batteries in the cabinet as shown below, to provide optimal cooling and cabinet stability. Note: Newest-model is always the master, and is located on the top shelf.
3. All terminals and sockets face toward top of cabinet.
4. For convenience, populate the bottom shelf first; connect cables; then refit the battery shelf.





3.4.3 BMS CABLE CONNECTIONS

BMS cables connect the Fan Controller to the first battery, and between subsequent batteries.

> Cable A is directional. Failing to match Plugs and Ports will cause functional errors.

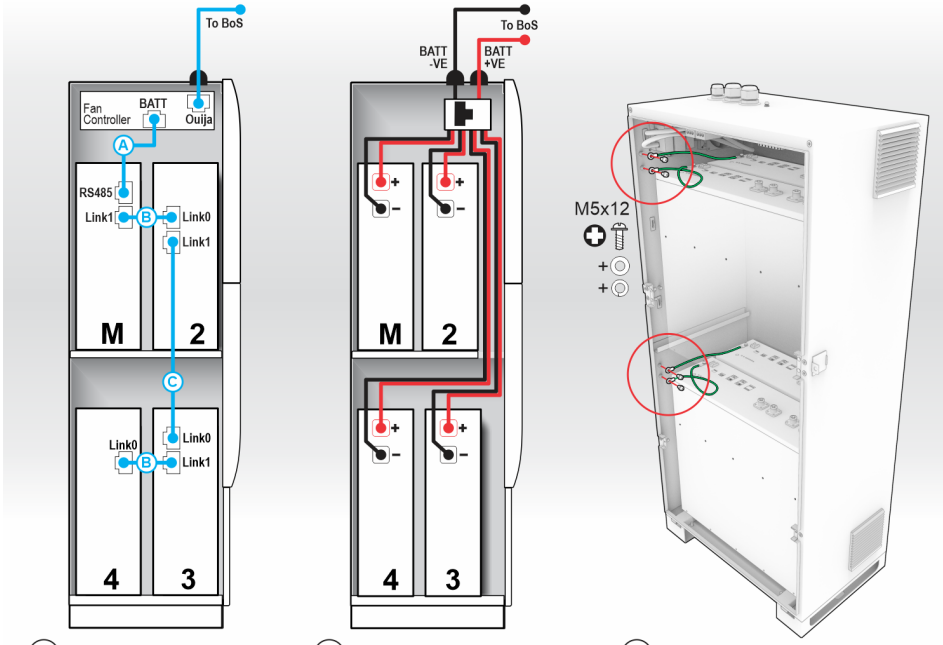
1. Plug Cable A “Cabinet to Battery”— “RS485” plug into the Master Battery “RS485” port.
2. Plug the Cable A “Cabinet to Battery”— “Battery Port” into the Fan Controller “BATT” port (on right hand side).
3. Connect BMS “Link” cables (B, C) in the logical sequence shown. Note: the
4. number and position of batteries may vary.

3.4.4 DC POWER AND EARTH CONNECTIONS

1. Connect one red and one black battery cable to each battery. Observe polarity and labelling.
2. Connect the earth cable from each battery to a nearby earth post.

Notes:

- The batteries are connected in parallel. DC cables connect to a junction box just after the Battery DC Isolator.
- The battery leads are coiled and zip-tied in place for transport. Use end cutters to release the required cables.
- Each battery has two positive and two negative terminals. Each pair (positive or negative) is linked internally.
- Route cables via the portals at sides of the Battery Shelf. Do not pinch cables.



4 **BMS connections**
Note: Install batteries terminal side up.

Cable tags Ⓐ Cabinet to battery
Ⓑ LINK (short)
Ⓒ LINK (long)

5 **Power connection**

6 **Battery Earth Connections**

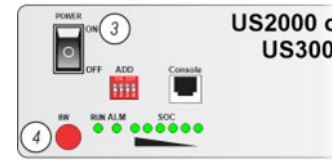
4. Commissioning

4.1 Overview

The system commissioning process is:

- Register the installation.
- Commission the batteries.
- Start the inverter, onboard, and initialise settings.

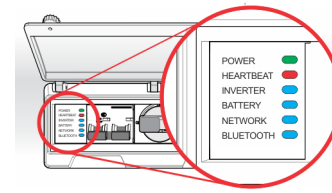
4.2 Commission Pylontech batteries



1. At the BoS, turn the BATTERY SYSTEM DC isolator OFF (down).
2. At the enclosure(s), turn the Battery Isolator(s) OFF (to right).
3. All batteries: toggle the Power switch ON.
4. On the Master battery only, press and hold the red SW button until the SoC LEDs flash, in sequence, on all connected batteries i.e., M, 2, 3, 4. All connected batteries are now active.

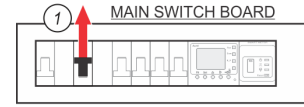
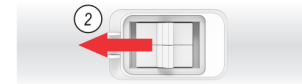
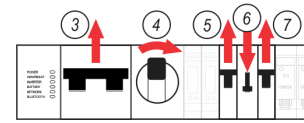
4.3 Inverter start-up

4.3.1 INVERTER START-UP NOTES



1. The EMS LED labelling changed in 2019 to reflect changes in the way the control system uses the LEDs: newer EMS are labelled NETWORK (was Wi-Fi) and BLUETOOTH (was 4G). The EMS are otherwise unchanged.
2. Wait 10 minutes for the inverter to boot-up and advertise Bluetooth (Bluetooth LED is flashing).
3. Ethernet connected systems will automatically connect to the internet, if available, indicated by the NETWORK LED being continuously ON.
4. Do not turn power OFF during start-up. This will delay start-up or may crash the system.

4.3.2 INVERTER START-UP PROCEDURE

#	PROCEDURE	ILLUSTRATION
1.	At the main switchboard, turn the Solar Supply Main Switch ON (Up)	
2.	At the enclosure(s), turn the Battery Isolator(s) ON (to left)	
3.	Switch the BATTERY SYSTEM DC isolator ON (up)	
4.	Turn the PV ARRAY DC isolator ON (clockwise to 12 o'clock)	
5.	Switch the BACKUP AC isolator ON (up)	
6.	Switch the BYPASS to Backup (down)	
7.	Switch the INVERTER AC isolator ON (up)	

4.4 Onboarding the inverter

Onboarding is the process of setting up the inverter's permanent connection to the internet, using the owner's home network. Permanent connection to the owner's network is by Wi-Fi or Ethernet cable.

Onboarding is automatic when an ethernet connection to the home network is used.

When connection to the home network is by Wi-Fi, complete onboarding using the RedbackINSTALL app and a Bluetooth connection to the inverter.

If no internet or home network is available at site, the inverter can be pre-configured with all major settings except site registration i.e., it can be left functional but not onboarded.

Before onboarding, ensure the following communication cables are correctly installed:

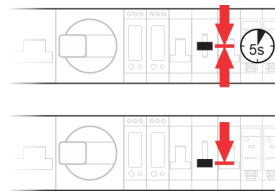
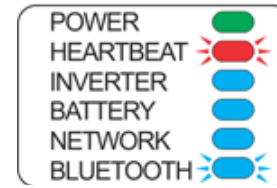
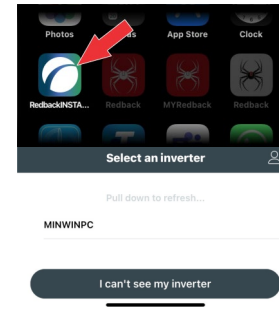
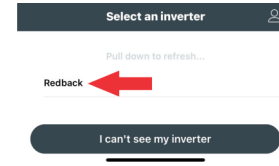
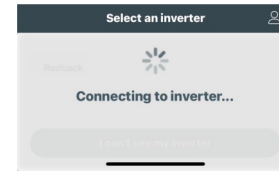
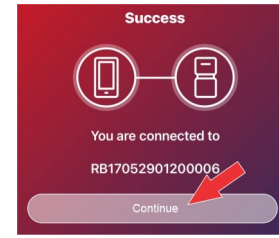
- SM3000 to Bos KWH Meter (3.11.1)
- BoS to Inverter (section 2.10.3)
- Fan Controller to BoS BMS (3.14.4)

4.4.1 CONNECTION NOTES (TO HOMEOWNER'S NETWORK)

METHOD	COMMENT	INDICATIONS	REDBACKINSTALL IMPACT
Ethernet	Preferred and automatic if LAN is detected	COMM'S LED is Yellow and NETWORK LED is Blue: Inverter is connected to the Redback Cloud.	The app will request confirmation that LAN is the preferred connection method.
		COMM'S LED is flashing: Connected to home network using ethernet but Redback Cloud not found. See 6.3.	The app will request confirmation that LAN is the preferred connection method.
		COMM'S OFF: Not connected to home network. Onboarding required.	The app requires you to specify the connection method.
Wi-Fi	Onboard using Bluetooth and Wi-Fi	The EMS BLUETOOTH LED must be flashing. Restart the EMS if needed (Section 4.3).	Connection to home network is needed, including password.
		Time is of the essence! Bluetooth onboarding must start within 30 minutes.	If Bluetooth times-out the EMS must be restarted as described in Section 4.3.
		Unable to connect message	Ensure Password is correct, and that connection is to a 2.4Ghz network (5Ghz is not supported).
None	System can be set up but not registered.	The EMS BLUETOOTH LED must be flashing to connect.	The app will request confirmation of this choice. A limited menu of setup options will be available.

4.4.2 CONNECT REDBACKINSTALL TO THE INVERTER

The RedbackINSTALL app is user friendly… it requires little guidance, and there is in-app information.

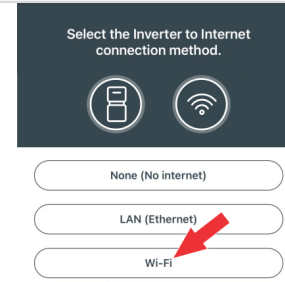
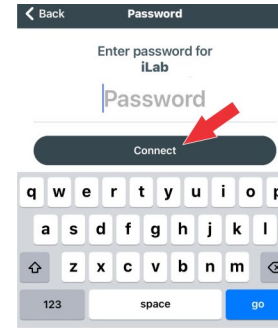
#	PROCEDURE	ILLUSTRATION
1.	Ensure the EMS Bluetooth LED is flashing, indicating that Bluetooth is available. If not flashing, restart the EMS by moving the BYPASS switch to the MIDDLE position for 5 seconds, then return it to the DOWN position.	 
2.	Open RedbackINSTALL and login. RedbackINSTALL will scan for products advertising Bluetooth. Wait up to five minutes. Do not select MINWINPC if it appears in the inverter list. Wait a few minutes for the EMS to restart and REDBACK to appear in the list.	
3.	REDBACK will appear. Tap to continue.	
4.	Wait up to two minutes.	
5.	A success message will appear. Tap Continue to begin onboarding.	

4.4.3 ONBOARDING (CONNECT TO THE LOCAL NETWORK)

RedbackINSTALL will advance to this stage after establishing a Bluetooth connection to the Inverter.

Note: if a local network is not available it is possible to temporarily connect the Inverter to a Wi-Fi hotspot, such as your phone. This is useful for configuration but is not an acceptable long-term solution.

> This equipment is not compatible with 5Ghz Wi-Fi network or hotspots. Use 2.4Ghz networks.

#	PROCEDURE	ILLUSTRATION
1.	Select the preferred method to connect to the local network and internet. Options are: • None • LAN (must be hardwired, will connect automatically) • Wi-Fi (usually requires network name and password)	
2.	Select the required network or swipe down to refresh the list.	
3.	Enter the password. Tap Connect to continue.	
4.	A Success message will appear. Tap Continue to go to the Inverter Configuration page.	

4.5 Notes on regional settings

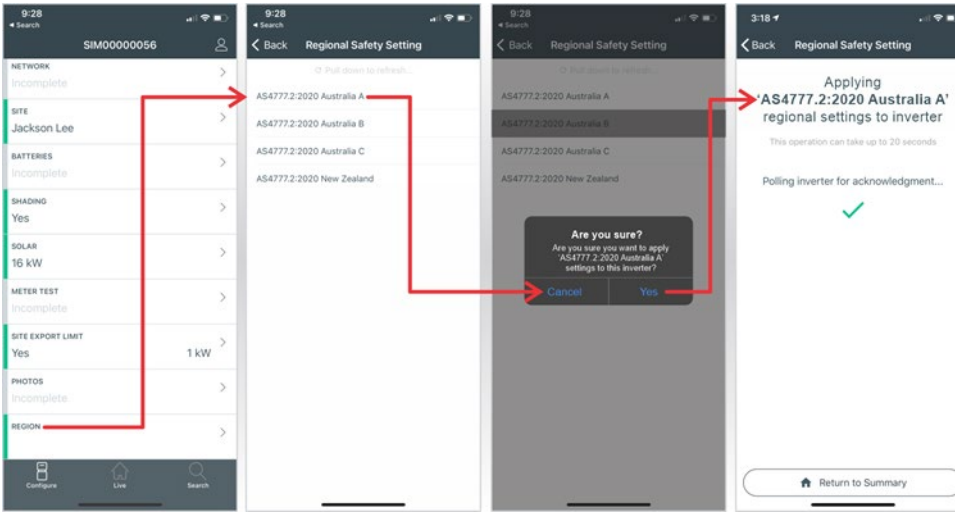
Regional Safety Setting is a mandatory choice when configuring the system—the system will not operate if a Regional Safety Setting has not been selected.

You may be prompted to update the inverter software. Do this if asked.

For convenience, the Regional Safety Settings are set by selecting the Region from the list provided in the RedbackINSTALL app. The list is maintained with the latest settings required by AS4777.2:2020. Choosing a region automatically selects Power Quality Response Mode settings, including:

- Voltage balance mode (where available)
- Voltage and frequency limits
- Sustained operation for frequency variations
- Grid Protection
- Power Rate Limits
- Frequency Response Limits
- Voltage Disturbance Band Withstand
- Volt-Var response
- Volt-Watt response
- Fixed Power Factor Mode
- Reactive Power mode

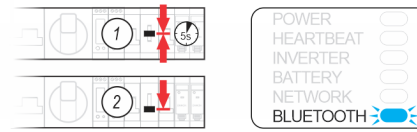
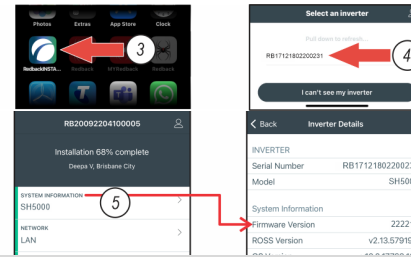
INFORMATION. The local grid operator may request a non-standard safety setting for an installation. To adjust power quality response mode setpoints from default values please contact Redback Technical Support.



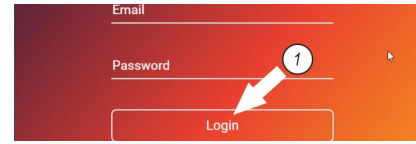
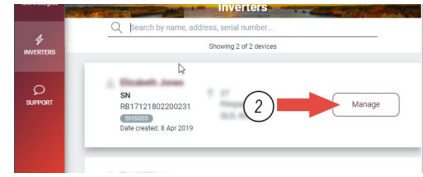
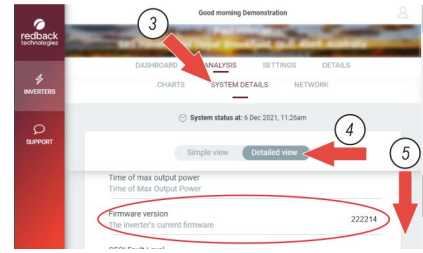
4.6 Redback product firmware version

Redback Smart Hybrid inverter firmware version is 222214.

4.6.1 IDENTIFY USING REDBACKINSTALL

#	PROCEDURE	ILLUSTRATION
1.	Ensure the EMS Bluetooth LED is flashing, indicating that Bluetooth is available. If the LED is not flashing, restart the EMS by moving the BYPASS switch to the MIDDLE position for 5 seconds, then return it to the DOWN position.	
2.	Wait for the Bluetooth LED to begin flashing steadily.	
3.	If not already open, start RedbackINSTALL and sign in.	
4.	The app will display a list of nearby Redback products that are advertising Bluetooth. Select the required Redback product from the list. Settings page will open.	
5.	Touch SYSTEM INFORMATION to view the firmware version.	

4.6.2 IDENTIFY USING THE REDBACK PORTAL

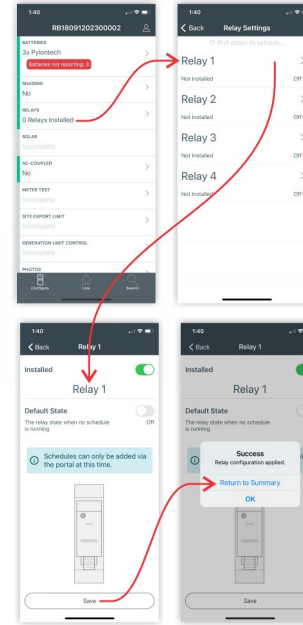
#	PROCEDURE	ILLUSTRATION
1.	On the internet go to portal.redbacktech.com and login. The Inverters list will open (showing accessible inverters). Note: You will be unable to view the firmware of offline or unregistered inverters.	
2.	Find the target inverter and select MANAGE. The Analysis page will display.	
3.	Select SYSTEM DETAILS.	
4.	Select DETAILED VIEW as shown.	
5.	Scroll to the Firmware version or find using your browser's search function.	

4.7 Notes on Relay configuration

The Redback system supports up to four relays, each controlling a dedicated circuit and attached loads. Each relay has its own switching schedule, enabling the owner to move energy consumption to times of solar generation.

Typical app and portal screens are shown on the right.

Relay configuration rights vary.



Installers can:

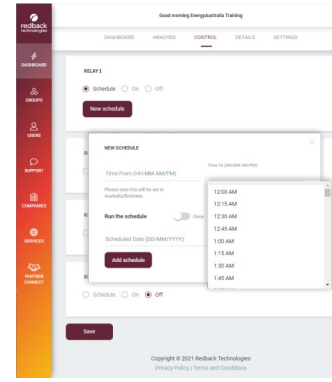
- Enable relay visibility (RedbackINSTALL)
- Configure as normally ON or normally OFF (RedbackINSTALL)
- Schedule single or multiple relay events (Redback Portal).
- Schedule single or multiple daily relay events (Redback Portal).

Owners can, using the Redback Portal:

- Turn relays ON and OFF manually
- Schedule single or multiple relay events.
- Schedule single or multiple daily relay events.

Configuration notes:

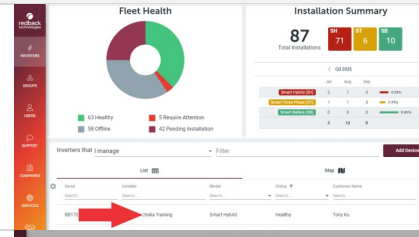
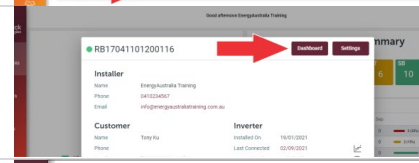
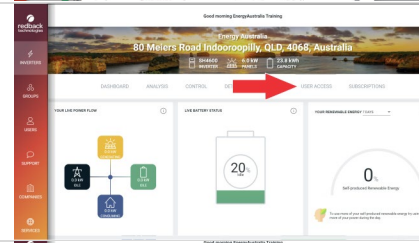
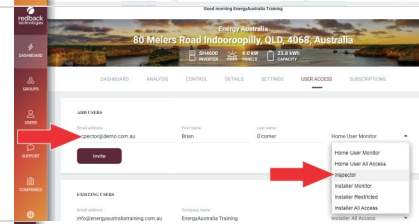
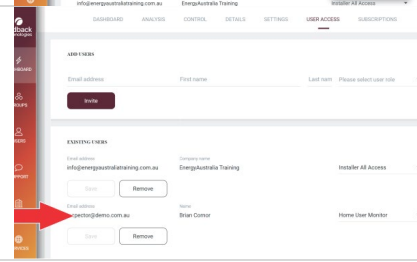
- Scheduled events must activate and deactivate the Relay i.e., ON and OFF (this is software enforced).
- The inverter must be internet connected to receive new or changed schedules. When received, the schedules are stored on the inverter: events occur even if the internet is not available.
- The relays are OFF when the power supply is lost. When power is restored, the device reads the configuration from memory, and restores the correct state.
- The relay control system is software based: features are often added or improved, and the latest documentation is accessible in the Redback Apps or Portal.



4.8 Compliance inspections

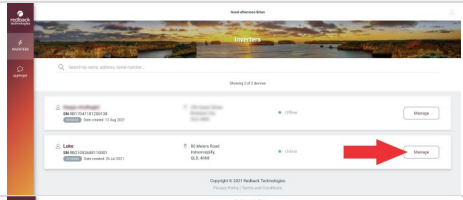
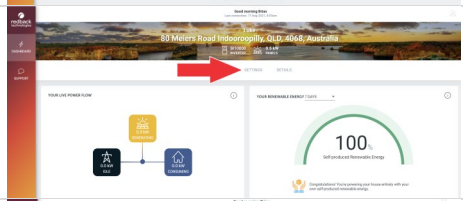
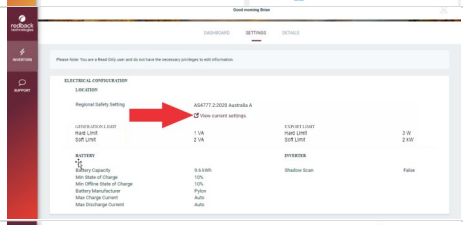
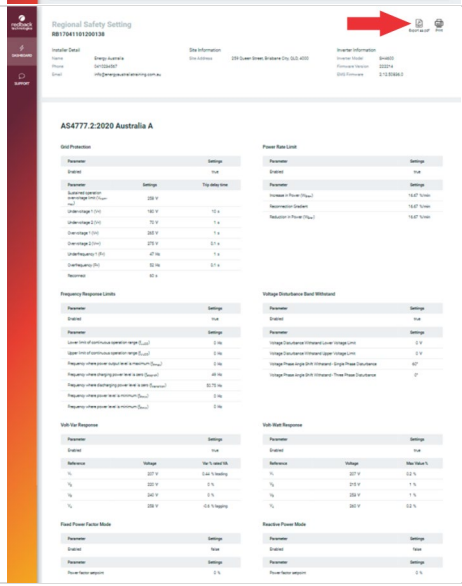
4.8.1 ASSIGNING AN INSPECTOR

Installers may assign a Compliance Inspector to each new product installation. Assignment is completed on the Redback Portal. Products must be registered in the installer's fleet prior to assigning an inspector.

#	PROCEDURE	ILLUSTRATION
1.	Login to the Redback portal at portal.redbacktech.com Search for the required product serial number from the list. Click the **required product** to open the product properties.	
2.	Click **Dashboard**.	
3.	Navigate to the Inverters tab and select **User Access**.	
4.	Add a new user. Enter Inspector's email and name. Select **Inspector** from the drop-down list. Select **Invite** to save. Notification emails will be sent to the email address provided.	
5.	The Inspector will now appear in the list of users of this inverter.	

4.8.2 COMPLIANCE INSPECTION

Nominated Compliance Inspectors receive notifications when added as a product user. Their first notification will supply a link to complete their user registration.

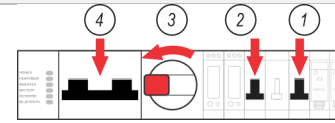
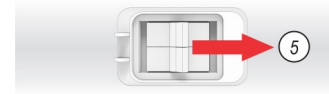
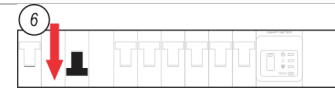
#	PROCEDURE	ILLUSTRATION
1.	Login to the Redback portal at portal.redbacktech.com If necessary, search for the required product serial number. Select **Manage** to open the product dashboard. Note: the first login will require acceptance of the Redback T&Cs.	
2.	Select **SETTINGS** to open the products general settings.	
3.	Select **View current settings** to see the Detailed Regional Safety Settings.	
4.	The Detailed Regional Safety Settings are read only. Scroll the page to see all settings. The settings may be **Printed** or **Exported to PDF** for record keeping.	

5. Inverter operation

The SH5000 has physical controls available at the inverter. All sophisticated functions are managed using RedbackINSTALL or the Redback portal.

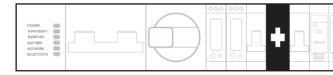
5.1 Shutdown procedure

Occasionally, it may be necessary to shut down the inverter interrupting all inverter functions, noting that PV, battery, and grid supplies remain energised to the isolators.

STEP	PROCEDURE	COMMENT/ILLUSTRATION
1.	Open the BoS switchgear hatch. Switch the INVERTER AC isolator OFF (down).	
2.	Switch the BACKUP AC isolator OFF (down).	
3.	Turn the PV ARRAY DC isolator OFF (anticlockwise to 9 o'clock).	
4.	Switch the BATTERY SYSTEM DC isolator OFF (down).	
5.	At the enclosure(s) switch the Battery Isolator(s) OFF, if fitted.	
6.	Turn the Solar Supply Main Switch OFF (on the main switchboard or sub-board). The inverter is now OFF: all software and communications are stopped, and no energy is being imported or exported from the inverter.	
	WARNING: PV and battery supplies remain energised to the isolators.	

5.2 Bypass switch operation

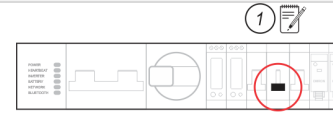
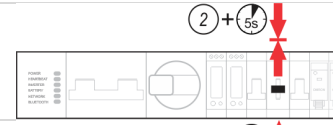
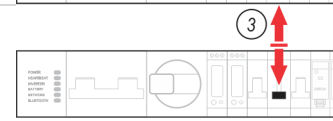
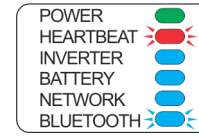
The Bypass switch controls the power to the Backup AC isolator and the EMS. Its primary use is to manually connect the backup circuit directly to grid supply, when needed.



POSITION		FUNCTION	COMMENTS
	Up	Power to the backup circuit is from the grid supply only. The inverter no longer controls the backup circuit.	This mode ensures grid supply to the backup circuit if the inverter is not available or not operating reliably. If grid supply is lost the inverter will not supply the backup circuit.
	Middle	Backup circuit and EMS are isolated (depowered).	Used to restart the EMS. No power is sent to the backup circuit.
	Down	Power to the backup circuit is supplied and managed by the inverter, from any source.	This is the recommended mode of operation. If grid supply is lost the inverter will continue to supply the backup circuit from the batteries and PV- the entire system will shut down when the batteries reach the minimum state of charge.

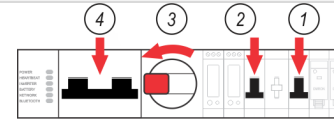
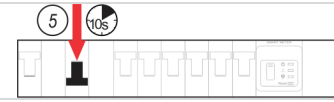
5.3 EMS restart

Occasionally, it may be necessary to restart the EMS software. A restart will reboot the EMS, without needing to restart the whole inverter, noting that the backup circuit will be briefly interrupted.

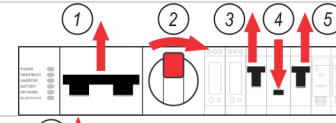
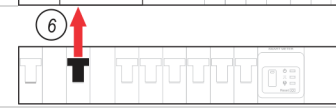
STEP	PROCEDURE	COMMENT/ILLUSTRATION
1.	Open the BoS switchgear hatch. Identify the three-position Bypass switch. Note the position of the switch. ☐ Up ☐ Down *Note: The switch is usually returned to the original position during restart.*	
2.	Set the Bypass switch to the middle position (OFF). Wait 5 seconds.	
3.	Return the Bypass switch to its original position (if noted) otherwise place in the default DOWN position. The EMS will restart in approximately 10 minutes, indicated by the EMS LEDs stabilising to: POWER — Green; ON HEARTBEAT — Red; FLASHING INVERTER — Blue; ON BATTERY — Blue; ON (if batteries are connected) NETWORK — Blue; ON (if Network is OK) BLUETOOTH — Blue; FLASHING (for 30 minutes)	 

5.4 Inverter restart

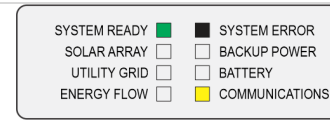
Occasionally, it may be necessary to cold boot the inverter, to restart all software. A restart briefly interrupts all inverter functions, noting that PV, battery, and grid supplies remain energised to the isolators.

STEP	PROCEDURE	COMMENT/ILLUSTRATION
1.	Open the BoS switchgear hatch. Switch the INVERTER AC isolator OFF (down).	
2.	Switch the BACKUP AC isolator OFF (down).	
3.	Turn the PV ARRAY DC isolator OFF (anticlockwise to 9 o'clock).	
4.	Switch the BATTERY SYSTEM DC isolator OFF (down).	
5.	Turn the Solar Supply Main Switch OFF (on the main switchboard or sub-board). Wait 10 seconds.	

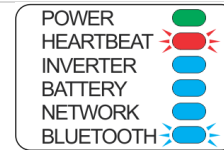
To restart the system:

1-5.	Working left to right, turn the BoS isolators and switches ON as shown.	
6.	Turn the Solar Supply Main Switch ON.	
7.	The inverter will resume normal operation in about 2 minutes, indicated by:	

Inverter Status Panel LEDs	
SYSTEM	Green; ON
COMMUNICATIONS	Yellow; ON
SYSTEM ERROR	OFF
OTHER LEDs:	Varies with configuration



EMS LEDs	
POWER	Green; ON
HEARTBEAT	Red; FLASHING
INVERTER	Blue; ON
BATTERY	Blue; ON (if batteries are connected)
NETWORK	Blue; ON (if Network OK)
BLUETOOTH	Blue; FLASHING (for extra 30 minutes, then OFF)



5.5 Inverter operating modes

The inverter operating modes are summarised below. Select modes using the Redback app or portal.

5.5.1 AUTO MODE

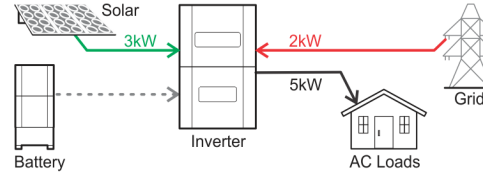
AUTO is the default operating mode, maximizing consumption of self-generated and stored energy. If the inverter mode has been changed, AUTO can be reselected from the portal.

If AC loads (House) exceeds solar generation, energy sources are prioritised as follows:

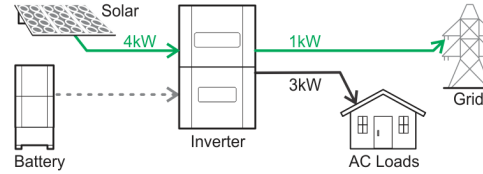
1. Solar
2. Battery
3. Grid

If solar production exceeds AC loads, destinations for self-generated energy are prioritised as follows:

1. AC Loads
2. Battery (storage)
3. Grid (if enabled)



AUTO Mode: AC Load exceeds Solar Generation

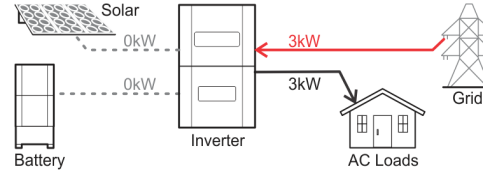


AUTO Mode: Solar Generation exceeds AC Load

5.5.2 STANDBY MODE

STANDBY mode is invoked automatically when no solar or battery energy is available. The SH5000 directs grid power directly to the AC Loads thereby minimising energy losses in the inverter e.g., heat.

The SH5000 automatically reverts to the previous mode of operation when solar or battery energy is available.



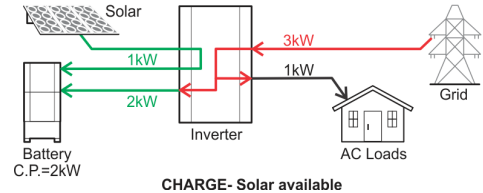
STANDBY MODE- No Solar or Battery energy available

5.5.3 CHARGE BATTERY MODE

CHARGE mode may be used to prepare for a severe weather event, and prioritises charging the battery at the nominated rate, from the grid.

Any available solar will supplement the grid charging up to a maximum charge rate of 4.6kW.

AC Loads are fulfilled by the grid.



CHARGE- Solar available

5.5.4 DISCHARGE BATTERY MODE

DISCHARGE mode is user selectable on the portal.

DISCHARGE mode prioritises battery discharge to the following:

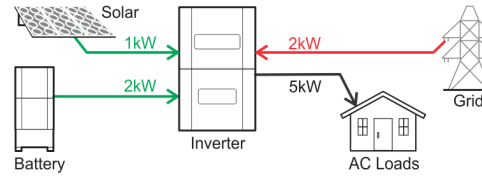
1. AC loads
2. Grid

Battery discharge is at the nominated Discharge Power, supplemented by solar.

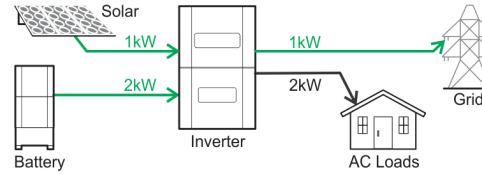
If AC Loads exceed (Battery + Solar), energy is imported from the grid.

If (Battery + Solar) exceed AC Loads, excess energy may be exported to the grid.

If (Battery + Solar) exceeds (AC Loads + LEP) the battery discharge is prioritised, at the maximum possible rate, up to the nominated Discharge Power.



DISCHARGE- Solar + Battery is less than AC Load



DISCHARGE- Solar + Battery is greater than AC Load

5.5.5 BACKUP MODE

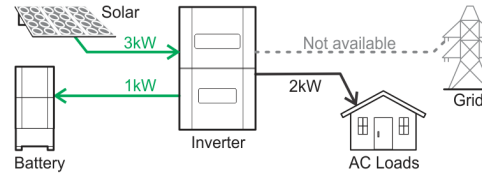
BACKUP mode starts automatically when the grid supply is interrupted (default setting).

In BACKUP mode, the SH5000 supplies energy to the AC backup circuit only. Energy consumption from solar is prioritised and excess solar charges the batteries.

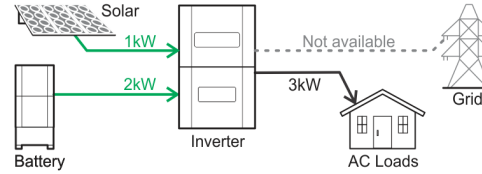
To maximise the effectiveness of the AC backup circuit, the circuit should only support essential appliances such as refrigerators, or low energy devices such as fans, computers, tablets, or phones.

BACKUP mode is invoked within 0.05 seconds of a grid interruption. BACKUP mode reverts to the previous mode when the inverter detects grid supply has been restored for over one minute.

BACKUP mode may also be known as “Stand-alone Mode”.



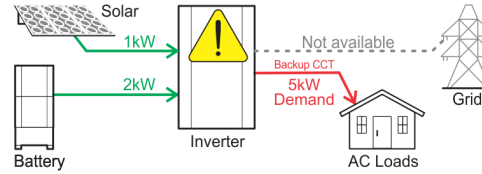
BACKUP Mode- Solar generation is greater than Backup Load



BACKUP Mode- Backup Load is greater than Solar

Note: If available battery and solar power is less than the detected backup load the inverter will consider this an overload and will automatically shut down.

The inverter will restart after approximately one minute. If overload persists, the cycle will repeat.



Solar+Battery < Backup Load

6. Troubleshooting

6.1 Earth fault alarm

If the Redback system detects an earth fault:

1. An audible alarm will sound in the inverter.
2. The System Error LED will be solid (see next page).
3. An email will be sent to Redback customer service, the installer, and the system owner.

An email is also sent when the alarm is cleared.

6.2 Inverter Status LEDs

The Redback inverter has with an LED array to show system status and aid diagnosis. The table below lists LED indications, probable cause, and rectification steps. If the problem is not solved contact Redback Technologies for help.

☑ Indicates the Homeowner may complete this activity.

☒ Indicates the activity may only be completed by an Electrically Certified person.

LED NAME	COLOUR & PATTERN	MEANING AND OR PROBABLE CAUSE		SOLUTION(S)			
SYSTEM READY		System ready		OK			
		System starting	☑	Wait up to 15 minutes after a restart- this may be normal behaviour. The system may cycle several times during start-up. Completion of start-up process is indicated by the LED stabilising to ON.			
		Grid is not available	☑	Check the **UTILITY GRID** LED	OFF: Grid is not connected	☑	Turn INVERTER AC isolator ON (up).
						☒	Check cables
					FLASH	☒	The grid is available - the inverter is not connected yet.
		PV or batteries are not installed or are connected correctly.	☑	If daylight, Check **SOLAR ARRAY** LED	OFF	☑	Turn PV ARRAY DC isolator ON (clockwise).
						☒	Check cables
			☑	Check **BATTERY** LED	OFF, and batteries are installed.	☑	Switch BATTERY SYSTEM DC isolator ON
						☒	Check cables; Check battery DIP switches; Restart batteries.
		System is not operating	☑	Contact Redback.			
SOLAR ARRAY		**Array1**	**Array2**				
		Active	Active	OK. No action needed.			
		Active	Not Active	At night, both arrays indicate Not Active. If only one array is installed, the other array will show as Not Active. During daylight, perform the following checks if a connected array shows as Not Active:			
		Not Active	Active				
		Not Active	Not Active	☑	Ensure PV ARRAY DC isolator is ON (clockwise to 12 o'clock).		
				☒	Ensure PV cables are correctly connected to the inverter (pairing & polarity).		
				☒	Ensure that solar output is within the capabilities of the MPPT trackers i.e., 125 – 550V DC @ 11A/array.		

LED NAME	COLOUR & PATTERN	MEANING AND OR PROBABLE CAUSE	SOLUTION(S)
UTILITY GRID		Grid active and connected	OK. No action needed.
		Grid is active but not connected	This may be normal behaviour following a restart- Wait up to 90 seconds. The LED stabilises to ON when connected.
		Grid power does not comply with AS4777.2	The inverter checks the grid quality prior to- and following connection and will disconnect if Grid voltage, frequency or harmonics are outside the allowable range.
		Grid is not active	Normal behaviour during a Grid outage. If grid is available: ☑ Turn Grid isolator ON. ☒ Check cables
ENERGY FLOW		Consuming energy from grid (a.k.a. buying)	No action needed- this is normal operation. When (Instantaneous PV + Battery power) exceeds House Demand, the shortfall is met by the grid.
		Sending energy to grid/zeroing	No action needed- this is normal operation: The house demand is being fulfilled by the battery and or PV.
		Supplying energy to grid (a.k.a. selling)	No action needed- this is normal operation when PV exceeds (Battery charging + House demand), the excess power is exported to the grid.
		Grid not connected or system not operating	Check **UTILITY GRID** LED. OFF: ☑ Turn Grid isolator ON OFF: ☒ Check cabling ON: ☑ Contact Redback Technology
SYSTEM ERROR		Grid voltage and frequency outside range.	☒ Check grid quality using the Grid Interactive Power Meter- Press the blue button to find the Voltage and Frequency. ☒ Ensure all grid, PV and battery cabling is correct. Check the voltage and polarity of the batteries.
		Solar array overvoltage	☒ Check the PV voltage and ensure solar voltages are within the specified inverter PV input range.
		Over temperature inside the inverter.	Investigate the incident. *The performance of the inverter will be reduced above 45°C. If the temperature rises above 60°C the inverter will automatically shut down.*
		Ground fault alarm.	☑ Turn PV ARRAY DC isolator OFF immediately (anticlockwise to 9 o'clock). Investigate fault.
		Inverter failure.	☑ Move the Bypass switch to UP position to maintain grid supply to the backup circuit.
		Backup circuit overload (exceeds 4.6kW continuous or 6.9kW for 10s, at <45°C)	☑ Reduce simultaneous plug-in loads on the backup circuit. Contact your installer if overloads persist. ☑ Ensure plug-in devices on the backup circuit are as listed in section 1.5. ☒ Review/reduce permanent devices on the backup circuit.
		No fault	OK. No action needed.
BACKUP POWER		Backup is ready	OK. No action needed. Battery power is available for the backup circuit (may take up to 10m after a restart).
		Backup is off / no power available	☒ Open the Redback app or portal. Set "Backup output" to ON.

LED NAME	COLOUR & PATTERN	MEANING AND OR PROBABLE CAUSE	SOLUTION(S)
BATTERY		Battery is charging	OK. No action needed.
		Battery is discharging	OK. No action needed.
		Battery low / SoC low	☑ Wait for the battery to charge to a value above the minimum State of Charge (SoC).
		Batteries are disconnected or not active	☑ Ensure BATTERY SYSTEM DC isolator is ON (up).
			☒ Ensure all Battery and BMS cables are installed correctly. Pylontech batteries: Ensure DIP switches are set correctly Ensure batteries been started correctly.
COMMUNICATIONS		The Communications LED is controlled by the EMS. If the EMS is not operational, the LED will remain in the last known state.	
		Online	OK. Connected to the Redback cloud. No action needed.
		Unable to connect to the Redback cloud.	☑ Internet connection lost. Ensure the local network is operating correctly.
			☒ The inverter has not been registered. Register the inverter on the Redback app or portal.
			☒ The Redback server is not available. Contact Redback.
		Onboarding required. BT available.	☑ Inverter is Bluetooth (BT) discoverable. Connect your phone to begin onboarding.
			☑ Bluetooth connection set up. Continue onboarding.
		Onboarding required. BT timed out	☑ Restart Bluetooth. Set the Bypass switch to the middle position for 5 seconds then return to the original position. Bluetooth times-out after 30 minutes of inactivity.
		No active comm's (Local network not connected)	☑ Ensure the local network is operating correctly. *Changes to router or passwords will require re-onboarding.*
			☑ If communications do not re-establish, restart the EMS.
			☑ If communications do not re-establish within 10 minutes of a restart, the inverter requires re-onboarding.

LEGEND: OFF ON Flashing Double Flash

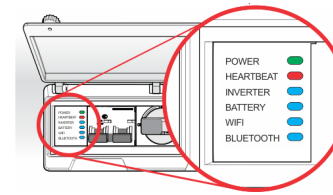
6.3 EMS Status LEDs

The EMS (Energy Management System) is in the Balance of System (BoS). The EMS Status LEDs are visible in the BoS switchgear hatch.

The EMS controls the inverter functionality, and all internal and external communications.

☑ Indicates the Homeowner may complete this activity.

☒ Indicates the activity may only be completed by an Electrically Certified person.



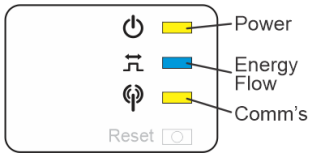
LED	COLOUR & PATTERN	MEANING AND OR PROBABLE CAUSE		SOLUTION(S)
ALL LEDs OFF POWER HEARTBEAT INVERTER BATTERY NETWORK BLUETOOTH		No Power available	☑	Inverter is Isolated from Grid Supply. Turn Grid Supply ON
			☑	Grid outage is occurring, and no PV or backup power exists. Wait for grid or PV power to be restored.
			☑	Bypass is incorrectly set. Try the Bypass switch in the UP and DOWN positions- the EMS should power up from grid or battery, if available.
			☒	EMS PSU problem (internal). Check for disconnected DC power cable or PSU failure.
ALL LEDs ON POWER HEARTBEAT INVERTER BATTERY NETWORK BLUETOOTH		EMS is in start-up phase	☑	Wait two minutes. EMS should stabilise to: Power ON ; Heartbeat flashing ; Inverter ON .
			☑	If all EMS LEDs stay ON, restart the EMS. Set Bypass switch to the middle position for 5 seconds then return to the original position. Wait two minutes.
			☒	If all LEDS remain ON, contact Redback for help.
POWER		EMS has power		OK. No action needed.
		EMS does not have power	☑	See ALL LEDs OFF, above.
			☒	EMS Power Supply failure- Replacement needed.
			☒	EMS failure- Replacement needed.
HEART BEAT		OK		No action needed. EMS is running normally.
		EMS is frozen or updating	☑	Wait 5 minutes. If no change, restart the EMS.
			☒	If still frozen, contact Redback for help.
		No Power	☑	See ALL LEDs OFF, above.
		Inverter is off	☑	Start inverter as described in section 0.
INVERTER		OK	☑	Wait 5 minutes. Settings are being applied.
		OK		No action needed. EMS is connected to inverter.
		EMS is not connected to the inverter	☒	Check internal communications cables- contact Redback for information.

LED	COLOUR & PATTERN	MEANING AND OR PROBABLE CAUSE	SOLUTION(S)
BATTERY		Battery detection error, or detection does not match the Installer created configuration.	☑ Restart the EMS.
			☒ Check inverter settings.
			☒ Check batteries and ensure internal cables are properly connected.
		OK	The EMS & BMS are communicating. No action needed.
		Battery detection error	☒ Turn batteries OFF. Ensure all battery Power and BMS cables are correctly installed. Ensure Pylontech DIP switches are correct. Restart batteries.
		Batteries do not match saved configuration	☒ See Battery detection error above. Note batteries present Review configuration in the Redback app or portal.
NETWORK		OK	Connected to the Redback Cloud. No action needed.
		Connected to local network but Redback Cloud not found.	☑ Ensure the local network is internet connected.
			☑ Log in to portal.redbacktech.com
			☑ **Login success:** Indicates the home network is preventing the inverter from connecting to the internet. Ask the homeowner to change their network and or firewall settings.
			☑ **Login failed:** Indicates a Redback server issue. Contact Redback for advice.
		Inverter not connected to local network	☑ Ensure the local network is working correctly.
			☑ Inverter requires onboarding.
BLUE TOOTH		Bluetooth is discoverable	☑ If required, connect to the inverter using your phone and the Redback app.
		Bluetooth is connected	☑ Proceed with onboarding or setup.
		Bluetooth OFF	☑ BT deactivates 30 minutes after EMS restart. Restart the EMS to activate discoverable Bluetooth.
LEGEND:		OFF	ON	Flashing

6.4 SM3000 Energy meter diagnostics

6.4.1 SM3000 FEATURES

The SM3000 detects the grid energy of up to 3 phases and indicates it the site overall is importing or exporting energy.

IMAGE	LED	ACTIVITY	MEANING
	Power		ON: Meter has power
			OFF: Meter does not have power or has failed
	Energy Flow		ON: Site is consuming energy from the grid
			Flashing: Site is exporting energy to the grid
			OFF: Energy flow is not detectable
	Comm's		Flashing: Transmitting data
			5x Flash: Reset in progress

6.4.2 ENERGY METER/CT TROUBLESHOOTING

INDICATION	CAUSE	REMEDY
No Energy Meter LEDs are illuminated	No power to meter	Check all connections. Check switchboard Main Switch is ON On the meter, measure voltage between Neutral and each phase (Terminals 10, 11, 12, 13)
	Meter faulty	Replace meter
Power flow direction is not as expected (any phase)	CT installed incorrectly (reversed)	Reverse polarity of CT by reversing direction of K->L relative to cable.
Power readings for two or more phases are incorrect	CTs have been attached to the incorrect phase at meter (L1, L2, L3).	Identify the true phase identity for each cable. Ensure the attached CTs are connected to the correct phase on meter i.e., the voltage measurement and the CT must match.
Batteries charging at night when inverter is in Auto mode.	CT installed incorrectly (reversed)	Reverse polarity of CT by reversing direction of K->L relative to cable
	CTs have been attached to the incorrect phase at the meter (L1, L2, L3)	Identify the true phase identity for each cable. Ensure the attached CTs are connect to the correct phase at energy meter
No data on portal & SM3000 Comm's LED flashing	Cable fault (no signal)	Test data cable with data tester and check data terminations

6.5 Internet connection problems

The Redback inverter will perform best when it is permanently connected to the internet. An internet connection enables the inverter to send data to the Redback cloud, where you can use the Redback app or portal to view performance and fine tune the system.

Occasionally, the inverter may lose internet connection and be reported as “offline”. Ethernet connected systems usually self-repair after a system restart. Wi-Fi problems usually require that the installation details be updated.

The most common causes of “offline” reports are:

INDICATION	CONNECTION AFFECTED		REMEDY
	ETHERNET	WI-FI	
Change of Internet Service Provider e.g., Telstra, Optus, TPG, Dodo etc	✓	✓	Ethernet: Restart the system Wi-Fi: Restart and re-onboard
New router or modem	✓	✓	
Change of Network name or SSID	✓	✓	
Change settings in ADSL modem	✓	✓	
Changed Wi-Fi or Network password		✓	Wi-Fi: Restart and re-onboard
Too many users or devices on your home Wi-Fi network		✓	Limit users or devices; upgrade Wi-Fi router; connect using ethernet.
Wi-Fi signal is weak or variable due to obstructions or distance between the inverter and your Wi-Fi router’s antenna.		✓	Experiment with Wi-Fi router locations; use a Wi-Fi extender; connect using ethernet.
Attempting connection to a 5Ghz Wi-Fi network		✓	This equipment is not compatible with 5Ghz Wi-Fi networks. Use a 2.4Ghz network or ethernet.

6.6 Inverter unexpected shutdown

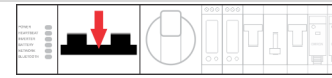
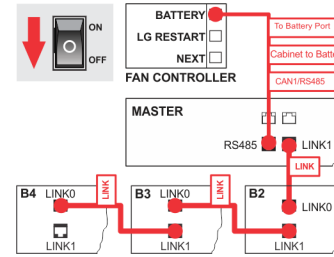
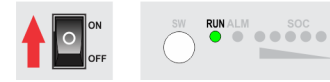
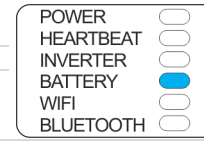
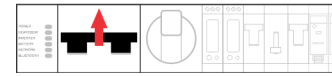
The inverter may shut down or isolate itself from the grid if it detects conditions that may cause damage to the inverter or batteries; or create an unsafe situation. Incident causes can be diagnosed by examining the data available on the portal. Unexpected shutdowns may occur in the following circumstances:

CAUSE	RELEVANT CHARTS FOR DIAGNOSIS (IN PORTAL)	COMMENT
Continuous backup circuit load exceeds 4600W.	Backup Load- Power	May occur when too many devices are active on the backup circuit.
Backup circuit load exceeds 6900W for more than 10 seconds.	Backup Load- Power	May occur when too many high current appliances are used simultaneously, or when a large load starts up, such as a pump.
Backup load exceeds available Battery + Solar power.	Backup Load- Power Battery- Power PV- Power	
If internal temperature is greater than 60°C.	Inverter- Temperature Battery Cabinet-Temp.	Output is reduced above 45°C.
Grid supply did not comply with local or DNSP requirements.	Grid- Voltage Grid- Frequency Grid- Status	Check Region setting is correct. Check voltage-drop calculations. Tap setting on transformer may be incorrect. Contact DNSP. The EMS and backup circuit will operate if power is available from PV or batteries.

6.7 Reset Pylontech batteries

Occasionally, it may be necessary to reset the Pylontech batteries. This should only be done if instructed by Redback Technical Support.

For more information about Pylontech battery features refer to the OEM documentation included in the carton.

STEP	PROCEDURE	COMMENT/ILLUSTRATION
1.	Open the BoS switchgear hatch. Switch the BATTERY SYSTEM DC isolator **OFF**.	
2.	Turn all batteries **OFF**. Ensure that the newest model battery is the Master battery e.g., US3000 is newer than US2000. In mixed installations configure cables to make a US3000 the master. Check that the Fan-Controller-to-Master-Battery cable and all Link cables are plugged in correctly.	
3.	Ensure all battery DIP switches are toward numbers, as shown	
4.	Switch all batteries **ON**. The “RUN” LED will flash green.	
5.	On the Master battery, **press the Red SW button for 3 seconds** or until the SoC LEDs flash on all connected batteries, in sequence M, 2, 3, 4. All connected batteries are now active, and the EMS BATTERY LED will illuminate as shown below.	
	FLASHING: Battery detection error, or detection does not match the Installer created configuration. ON: The EMS & BMS are communicating. OFF: Battery is disconnected, or The EMS & BMS are not communicating or, Batteries do not match saved configuration.	
6.	Switch the BATTERY SYSTEM DC isolator **ON**. Observe the Inverter Status LEDs. After 30 seconds the BATTERY LED will Illuminate as shown below.	
	ON: Battery is charging FLASHING: Battery is discharging DOUBLE FLASHING: Battery low / SoC low OFF: Battery is disconnected or not active	

7. Maintenance

The Redback SH5000 is a low maintenance product. Annual maintenance is needed.

Note: Filters, fans and heatsink fins may require more frequent cleaning in dusty conditions.

WARNING: ELECTROCUTION HAZARD. Lethal voltages may be present. Isolate all sources of power and test before removing covers.

ITEM	NAME	REASON	PROCEDURE	BY SERVICE PERSON	BY OWNER
1	Battery enclosure vents and filters	Airflow is reduced when dust accumulates on the vents, or the filter is clogged. The lower intake vents are more likely to be affected.	Use a small pry tool to release the vent covers - gently pry next to the notches at top or bottom of cover. Blow or brush the vents clean. Wash the filter pads in soapy water and squeeze dry. Refit all parts ensuring the vents face downward.	☑	☑
2	Battery enclosure fan blades	Fan efficiency is reduced when dust accumulates on the fan blades.	Remove the Upper Vent Cover and filter pad. Gently blow, brush, or wipe off fan blades. Do not overspeed the fan. Replace all parts.	☑	☑
3	Cabinet	Cabinet may become soiled	Wipe down outside of cabinet with a just-damp cloth. Immediately wipe dry with a microfibre cloth. Do not use cleaning agents as they may damage the finish.	☑	☑
4	Inverter heatsink fins	Cooling efficiency is reduced when dust, dirt or debris accumulate on the heatsink.	Clean the heatsink fins using a small brush or compressed air.	☑	☒
5	Battery connections	Battery efficiency may reduce if connections or terminals become dirty or corroded.	Unplug and inspect battery cable connections. Remove corrosion or debris. Spray with contact cleaner.	☑	☒
6	Cabinet seals	Concealed seals ensure cabinet water resistance	Remove covers and inspect seals for hardening, tears, or other damage. Look for signs of water in cabinets.	☑	☒
7	Cable seals and caps	Seals and caps prevent water and insects entering the inverter or connections.	Remove BoS front cover and tighten all cable glands and waterproof caps.	☑	☒

8. Specifications

PV PORT	VERSION 022X	VERSION 024X
Number of MPPTs	2	2
Strings per MPPT Input	1/1	1/1
MPPT Operating Voltage (range)	DC 125 - 550V	DC 125 - 550V
MPPT Full Load (range)	DC 215 – 500V	DC 190 - 500V
Maximum Input Voltage (Vmax)	DC 580V	DC 580V
Maximum Current (Imp)	DC 11/11A	DC 14/14A
Maximum PV Input Power	8000Wp	10000Wp[1]
Short Circuit Current (Isc)	DC 18/18A[2]	DC 18/18A[2]
Maximum Back Feed Current	0A	0A
Decisive Voltage Class (DVC)	DVC-C	DVC-C

[1] Based on 12x 415W per string [2]Manufacturer's declared and tested Max Short Circuit Current (I_{SC} Max)

GRID INTERACTIVE PORT	ALL VERSIONS
Nominal Output Voltage	AC 230V
Nominal Output Frequency	50 Hz
Rated Output Current	AC 21.7A
Max. Output Current	AC 24.5A
Rated Output Active Power	AC 5000W
Rated Output Apparent Power	5000VA
Rated Input Current	AC 40A
Rated Input Apparent Power	9200VA
Power Factor (range)	0.8 lagging to 0.8 leading
Output Voltage THD	<4.5%
Inrush Current	60A, 3 µs
Maximum Output Fault Current	43A, 0.2s
Maximum Output Overcurrent Protection	60A, 3 µs
Decisive Voltage Class (DVC)	DVC-C
BACKUP PORT	
Nominal Output Voltage	AC 230V
Nominal Output Frequency	50 Hz
Rated Current	AC 20A
Rated Active Power	AC 4600W
Rated Apparent Power	4600VA
Peak Apparent Power	6900VA (10 sec max)
Power Factor (range)	0.8 lagging to 0.8 leading
Output Voltage THD	<4.5%
Inrush Current	55A, 2µs
Maximum Output Fault Current	43A, 10s
Maximum Output Overcurrent Protection	30A
Decisive Voltage Class (DVC)	DVC-C
BATTERY PORT	
Voltage (nominal)	DC 40 - 60V
Max. Current (charge)	DC 100A
Max. Power (charge)	DC 4600W
Max. Current (discharge)	DC 100A
Max. Power (discharge)	DC 4600W
Battery Type	Li-ion
Battery Depth of Discharge	90%
Short Circuit Current	1600A
Decisive Voltage Class (DVC)	DVC-A

GENERAL INFORMATION	ALL VERSIONS
Operating Temperature Unconditioned without solar effects	-25°C to 60°C
Operating Temperature Derated Output	below 10°C and over 45°C
Operating Relative Humidity	0 - 95%
Operating Altitude	0 - 3000m
Protective Class	I
Ingress Protection Rating	IP65
AC Overvoltage Category	OVC III
DC Overvoltage Category	OVC II
Active Anti-islanding Method	Active Frequency Drift
Moisture Location Category	4K4H
External Environment Pollution Degree	Grade 1, 2 and 3
Inverter Topology	Non-isolated
Country of Origin	China
Demand Response Modes	DRM 0
Standby Self-Consumption	<13W
Noise Emissions	<30 dBm (Inverter only)
Warranty	10 Years
EFFICIENCY	
Maximum Efficiency	97.60%
Maximum Battery to Load Efficiency	94%
European Efficiency	97%
PHYSICAL DATA	
Installed Weight (including SH5000, BE14000 and Batteries)	132-203kg
Dimensions (including PCE and BoS) (W x D x H)	518 x 360 x 840mm
Material	Aluminium
Finish	Sealed and powder coated
BE14000 SMART HYBRID BATTERY ENCLOSURE DATA	**US2000 AND OR US3000●**
Number of Battery Units	2 to 4
Storage Capacity	4x 2.4kWh or 4x 3.55kWh
Maximum Capacity	14.2kWh
Nominal Voltage	DC 48V
Rated Current	DC 100A
Fan Specification	DC 48V / 0.13A x2
Protective Class	I
Ingress Protection Rating	IP54
Noise emissions	<42dBA♦
Dimensions (W x D x H)	545x348x1125 mm
Material	Steel cabinet; Aluminium covers
Finish	Powdercoat and internal sealants

●US2000 and US3000 can be mixed provided that a US3000 is configured as the Master Battery. ♦Measured in Redback laboratory at 1m in front of Battery Enclosure.

ISOLATORS (ALL VERSIONS)	PV PORT	GRID INTERACTIVE PORT	BACKUP PORT	BATTERY PORT	BATTERY CABINET
Manufacturer Part Number	XBE+3410/2	S201M-C40	S201-C25	NDB1-125	NDB1-125
Rated Insulation Voltage	1100V	440V	440V	500V	500V
Rated Impulse Withstand Voltage	8kV	4kV	4kV	4kV	4kV
Suitability for Isolation	C	C	C	C	C
Rated Operational Current	16A	32A	25A	125A	125A
Utilisation Category	DC-PV2	A	A	A	A
Rated Short-time Withstand Current (Icw)	700A	NA	NA	NA	NA
Rated Short-circuit Making Capacity (Icm)	1000A	NA	NA	NA	NA
Rated Breaking Capacity (Isc)	5kA	15kA	10kA	10kA	10kA

COMMUNICATIONS PORTS AND PROTOCOLS	ALL VERSIONS
Ethernet	RJ45; Straight-thru
DRED	RJ45; DRED
Relays	RJ45; 4x Digital I/O; +DC5V & GND
kWh Meter	RJ45; RS485 MODBUS
RS485	RJ45; Factory Use Only
Wi-Fi	802.11b/g/n/ac; 2.4GHz
LTE	NA
Interlock	NA
USER INTERFACE	
Front Panel Display	Coded, coloured LEDs
Communications	Bluetooth for commissioning; Wi-Fi or ethernet for remote access
Remote access	Web Portal or MYRedback app (Android or iOS)
Remote Firmware Updates	Supported
Power/energy monitoring	Includes 1 x utility grade energy meter (class 1)

CERTIFICATIONS, STANDARDS AND APPROVALS			
AS/NZS 4777.2:2020	IEC 62116:2014	IEC 60529	RCM
IEC 62109-1:2010	EC 62040-1:2017	EN 61000	CE Mark (LVD, EMC, RoHS directives)
IEC62109-2:2011	IEC 62477-1:2012		
DESIGNED WITH INSTALLATION STANDARDS CONSIDERED			
AS/NZS 3000:2018	AS/NZS 5139:2019	AS/NZS 5033:2021	

9. Related links and documents

DOCUMENT	COMMENT	LINK
SH5000 + BE14000 Installation Manual	This document in PDF	redback.link/shim
SH5000 Installation Quick Start	Memory booster for experienced installers	redback.link/shqs
BE14000 Connection Kit and Secondary Enclosure Installation Manual	For brand new dual-enclosure installations, read this first!	redback.link/shck
SH5000 Single Line Diagram	For single or dual battery enclosures	redback.link/shsld
SH5000 Homeowner's Guide	Day-to-day usage of the inverter	redback.link/shog
Redback SM3000 Smart Meter Installation Manual	Comprehensive installation manual	redback.link/smim
Application form	Apply for Redback Authorised Installer Status	redback.link/apply
Redback Document Library	Password required	redback.link/docs
Pylontech	Battery manufacturer website	pylontech.com.cn
SafeWork Australia	Safe work procedures	safeworkaustralia.gov.au

10. Close-up and handover

10.1 Close-up

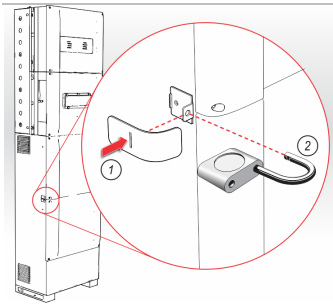
After the Inverter is commissioned:

ITEM	PROCEDURE	COMPLETED
1.	Replace all covers.	
2.	Replace and secure PV ARRAY DC isolator knob.	
3.	Clean worksite and dispose of rubbish appropriately.	

10.2 Handover

With the homeowner:

ITEM	DESCRIPTION	COMPLETED
4.	Walk through the installation, ensuring the homeowner understands what has been installed (and where), including any Backup circuits.	
5.	Have the owner fit the Security Clamps and padlocks (Optional; 2x padlocks per enclosure required). Ensure the owner has the keys.	
6.	Explain the limitations of the system, including the possibility of overloading the backup circuit by using too many devices simultaneously, even when the grid is connected.	
7.	Demonstrate how to recover after a BACKUP circuit overload.	
8.	Demonstrate how and when to use the BYPASS switch.	
9.	Help the owner to compete their Redback Account setup, if not already done.	
10.	Help the owner to download the app, demonstrate features, and answer questions.	
11.	Help the owner to log on to portal and demonstrate, including how to: • Review performance • Setup battery charge/discharge schedules • Setup relay schedules • Raise an on-line support request	
12.	Handover to the homeowner, including: • Homeowner's Guide • Warranty Booklet • Padlock keys (if fitted) • Installation Manuals (optional)	



Fit Security Clamps and Padlock

INSTALLATION DETAILS
ADDRESS

INVERTER
RB

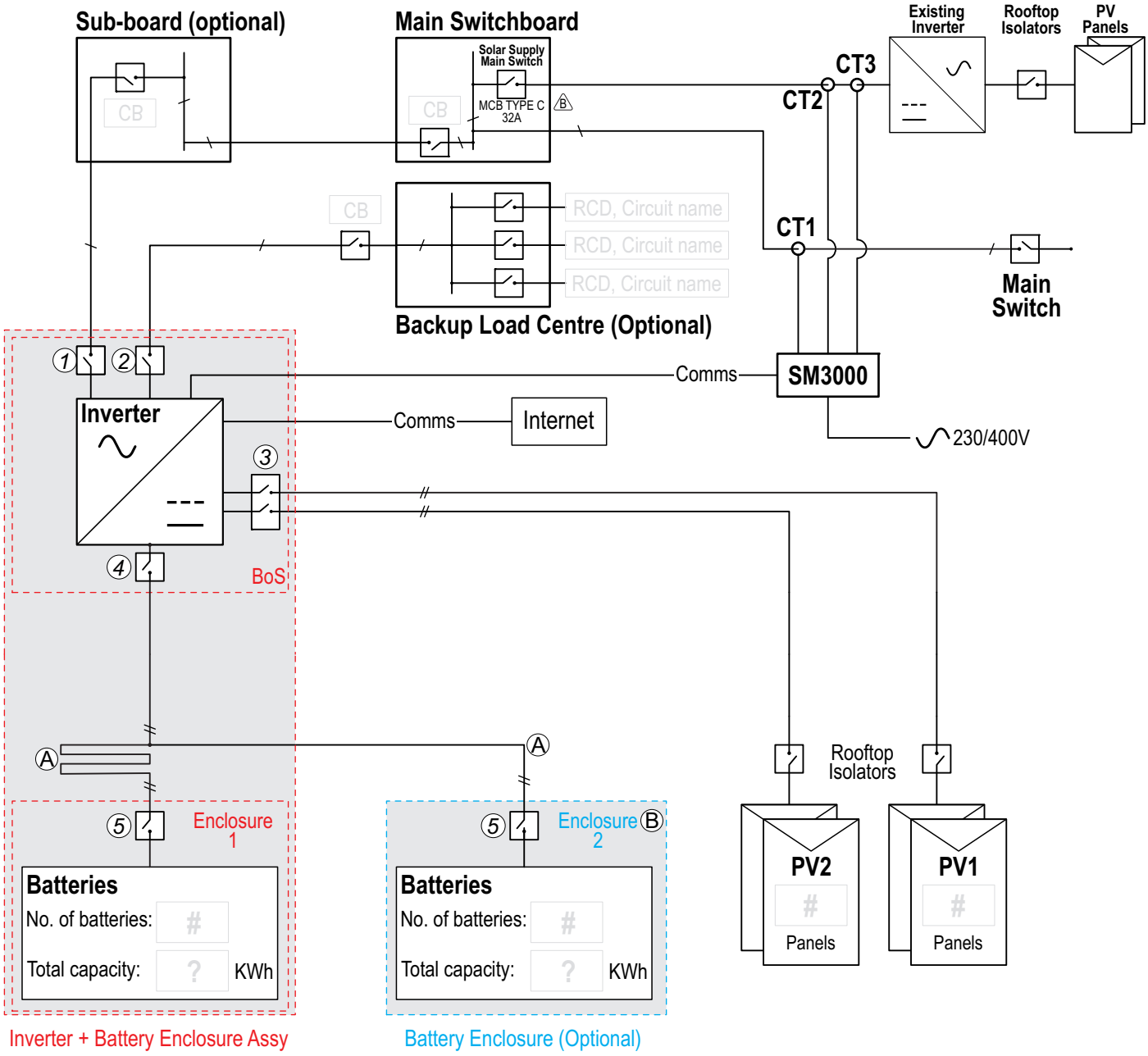
INSTALLATION DATE
/ / 2 0 2

BATTERY ENCLOSURE 1 (OPTIONAL)
RB

BATTERY ENCLOSURE 2 (OPTIONAL)
RB

SH5000 SINGLE LINE DIAGRAM - AC-COUPLED INSTALLATION

Installer: Complete and retain for your site documentation



SH5000/BE14000 Integrated Isolators

1. Inverter AC Isolator 40A
2. Backup AC Isolator 25A
3. PV Array DC Isolator 6P 12.5A @800V
4. Battery System DC Isolator 2P 125A
5. Battery Enclosure DC Isolator 2P 125A

Other devices
Record details of installer selected devices (in grey boxes provided).

Notes:

A. Dual DC Power cables must be equal length.
B. 2nd enclosure requires Connection Kit
C. This product is not warrantied for off-grid installation which is defined to be an installation at a premises that is intentionally unable to receive energy from a low voltage distribution Network.

ITEM	CHANGE DETAILS	DRAWN BY	APPROVED	DATE
B	SOLAR SUPPLY MAIN SWITCH added "MCB TYPE C 32A"	AS	AK	07MAR2023
A	Formatted to centrefold layout.	AS	AK	30APR2021

SCALE NA		MATERIAL	DESCRIPTION SH5000 SINGLE PHASE INVERTER SINGLE LINE DRAWING AC-COUPLED INSTALLATIONS
DRAWN AS	DATE 07MAR2023		
CHKD AK	DATE 07MAR2023	FINISH	DRAWING NUMBER File:SH5000 Single Line Diagram r4.des
APPD	DATE		PART NUMBER 340-00602-00 · REVISION 4 · SHEET 2 OF 2 · A4

redback technologies
Building 1015, 80 Meiers Rd,
Indooroopilly, QLD 4068 Australia
1300 240 182 www.redbacktech.com

INSTALLATION DETAILS
ADDRESS

INVERTER
RB

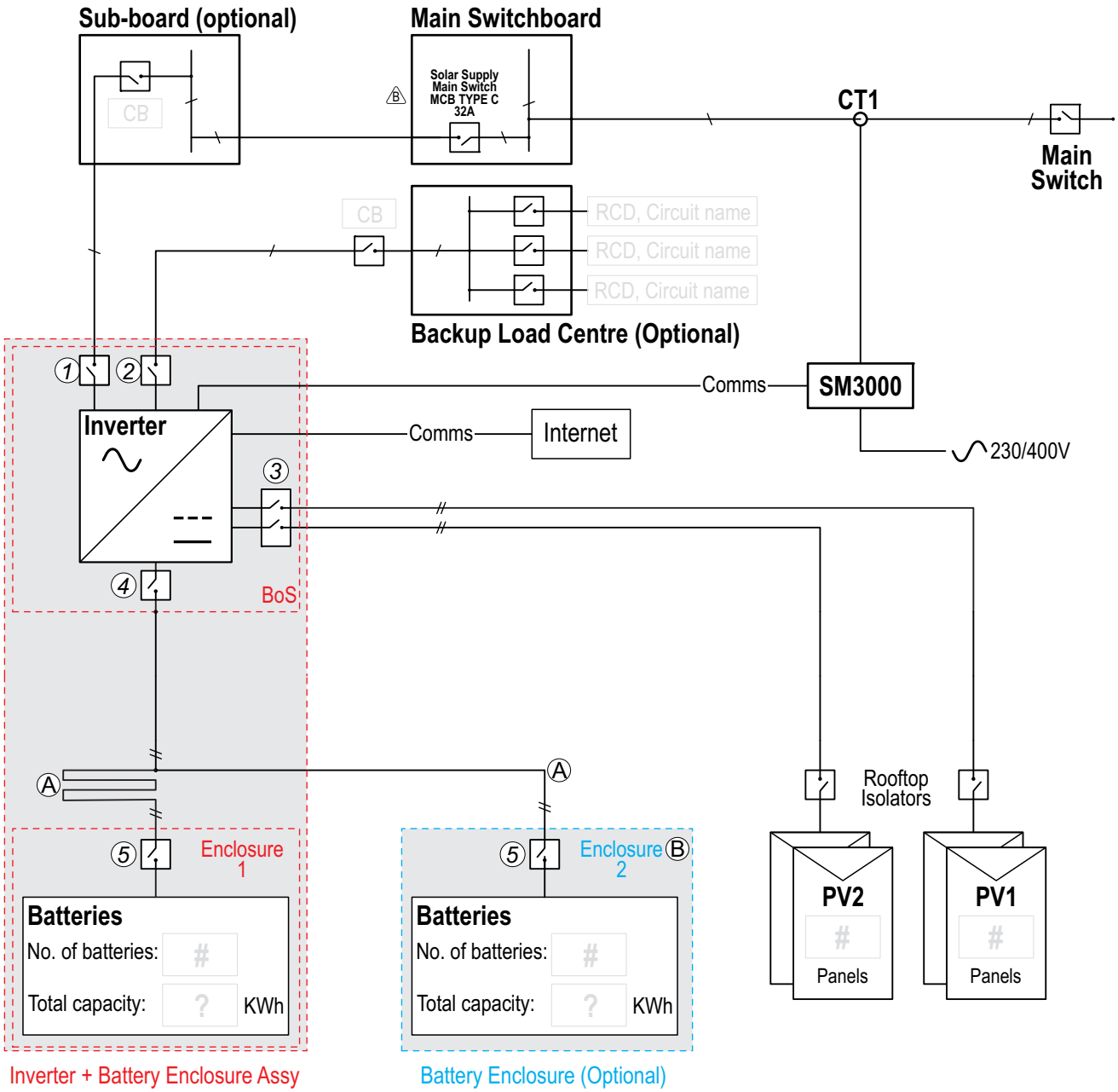
INSTALLATION DATE
/ / 2 0 2

BATTERY ENCLOSURE 1 (OPTIONAL)
RB

BATTERY ENCLOSURE 2 (OPTIONAL)
RB

SH5000 SINGLE LINE DIAGRAM - INDEPENDENT INSTALLATION

Installer: Complete and retain for your site documentation



SH5000/BE14000 Integrated Isolators

1. Inverter AC Isolator 40A
2. Backup AC Isolator 25A
3. PV Array DC Isolator 6P 12.5A @800V
4. Battery System DC Isolator 2P 125A
5. Battery Enclosure DC Isolator 2P 125A

Other devices
Record details of installer selected devices (in grey boxes provided).

Notes:

A. Dual DC Power cables must be equal length.
B. 2nd enclosure requires Connection Kit
C. This product is not warrantied for off-grid installation which is defined to be an installation at a premises that is intentionally unable to receive energy from a low voltage distribution Network.

ITEM	CHANGE DETAILS	DRAWN BY	APPROVED	DATE
B	SOLAR SUPPLY MAIN SWITCH added "MCB TYPE C 32A"	AS	AK	07MAR2023
A	Formatted to centrefold layout.	AS	AK	30APR2021

SCALE NA		MATERIAL	DESCRIPTION SH5000 SINGLE PHASE INVERTER SINGLE LINE DRAWING INDEPENDENT INSTALLATION
DRAWN AS	DATE 07MAR2023		
CHKD AK	DATE 07MAR2023	FINISH	DRAWING NUMBER File:SH5000 Single Line Diagram r4.des
APPD	DATE		PART NUMBER 340-00602-00 · REVISION 4 · SHEET 1 OF 2 · A4

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