

Owner's Manual

Redback Hybrid LV Battery System

SH5000-G3

SH6000-G3

SH-G3-BE

V2.2 10Oct24



HISTORY

VERSION	ISSUED	COMMENTS
1.0	24Jan24	First printed version
1.1	19Jul24	Second release
2.0	29Aug24	Third release
2.1	24Sep24	First printed version
2.2	10Oct24	Reformatted to A4

CONTACT INFORMATION

Phone: 1300 240 182
International phone: +61 7 3180 2325
Address: Building 1015, 80-120 Meiers Rd, Indooroopilly QLD 4068, Australia
Email: customersupport@redbacktech.com
Website: redbacktech.com

RBT NOTICE OF COPYRIGHT

Owner's Manual Redback Hybrid LV Battery System ©2024 Redback Operations.

All Rights Reserved. This work is copyright, apart from any use permitted under the Copyright Act 1968. No part may be reproduced by any process, nor may any other exclusive right be exercised without the permission of Redback Operations Pty Ltd. Table content

RBT PRIVACY NOTICE

Redback may collect information in accordance with our privacy policy available at redbacktech.com/privacy-policy

Table of Contents

1. Welcome	4
2. Introduction	4
3. Getting help	4
4. Other resources	4
5. Transfer of ownership	4
6. Features and benefits of your Redback system	6
7. System description	7
7.1. Parts and descriptions	7
7.2. Hybrid system functional overview	8
7.3. Control Panel features	8
7.4. Status Panel features	9
7.5. Batteries and Battery Enclosure	10
7.6. Backup circuit (optional)	11
8. System limitations	11
9. Getting the best from your system	12
9.1. Keep your system in good condition	12
9.2. Use Redback's Site Manager feature (if applicable)	13
9.3. Monitor performance	13
9.3.1. MYRedback app	13
9.3.2. Redback Portal	13
9.4. Getting the best from your batteries	14
9.5. Getting the best from your relays	15
9.5.1. Time based scheduling	15
9.5.2. Smart Load Control	15
9.6. Getting the best from your backup circuit	16
10. Inverter operation	17
10.1. Inverter – Changing bypass modes	17
10.2. Shutdown procedure	18
10.3. Inverter restart	19
11. Inverter operating modes	20
11.1. Auto mode	20
11.2. Standby mode	20
11.3. Charge Battery Mode	20
11.4. Discharge Battery mode	21
11.5. Backup mode	21
12. Getting your inverter back online	22
12.1. Ethernet	22
12.2. Bluetooth Low Energy (BLE)	22
13. Troubleshooting	23
13.1. Backup circuits have no power	23
13.2. Inverter unexpected shutdown	23
13.3. Inverter unexpectedly or frequently shutting down	24
13.4. Multi-inverter installations	24
13.5. Internet connection problems	24
13.6. Earth fault alarm	25
13.7. Energy Meter diagnostics	25
13.7.1. Energy Meter features	25
13.7.2. Energy meter troubleshooting	25
13.8. Inverter Status LEDs	26
14. Maintenance schedule	27
15. Specifications	28
16. Handover	31
17. Redback installation details	32

1. Welcome

Congratulations on purchasing your new Redback SH5000-G3 or SH6000-G3 Hybrid Inverter (your Inverter) and SH-G3-BE Battery Enclosure (your Battery Enclosure); collectively called "your system". Our products are designed and manufactured to our high quality-standards and will provide years of service.

The system's goal is to maximise the use of your self-generated solar energy while minimizing the amount of energy consumed from the grid.

This guide describes the features, use and maintenance of your Inverter and Battery Enclosure.

2. Introduction

Your Inverter and software coordinates with one or two solar arrays, battery storage, grid supply, your backup circuit, and one relay-controlled device.

The energy produced by the solar array is automatically directed to the battery, your property and/or the utility grid for the highest performance and best economic return.

The backup functionality enables users to have continued supply of electricity to the backup circuit in case of a utility power outage.

A relay connected device can be operated on a simple schedule or by using Redback's Smart Load Control to better harness solar generation. Typical relay-controlled devices are hot water systems or pool pumps.

The MYRedback app and Redback portal provide a comprehensive view of the energy consumed or generated at your place, supplying the information required to fine-tune your system settings or optimise your energy usage patterns.

3. Getting help

Contact your installer first. You can usually find their contacts details on the inverter, inside the meter box, or inside the back page of this booklet. If your installer is unable to assist, try one of the other resources below or open a case with our Customer Support Team at <https://portal.redbacktech.com/supportrequest>.

4. Other resources

SOURCE	COMMENT	LINK
Owner's Manual	Latest version of this document in pdf format	redback.link/shg3om
Redback Document Library	Password required	redback.link/docs

5. Transfer of ownership

If a Redback system is already installed in your new property, welcome to the Redback family. To get the best from your Redback system, and to receive important notifications from your system, you need to setup an account using a valid email address. You can then access the system using the Redback app or portal, see how the system is working for you, and gain insights to help maximise your consumption of self-generated energy.

When we setup your account, we'll also arrange for remaining warranty to be transferred to your name and we can answer any questions you may have about your system.

To get started, initiate a case with the Redback Customer Support Team at <https://portal.redbacktech.com/supportrequest>. We'll get back to you as soon as possible. We'll need some proof of ownership too, so be ready for that.

IMPORTANT SAFETY INSTRUCTIONS – PLEASE READ

This document contains 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 additional 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.

SYMBOL DEFINITION



WARNING. Lethal Voltage Inside!

Do not remove inverter or battery enclosure covers unless qualified to do so.
Do not perform any servicing other than that specified in the maintenance instructions.
Solar arrays may be energised even in low ambient light.



DANGER. Risk of electrical shock. Proceed with caution.



External and internal parts may be hot.

Do not remove covers during operation or touch any internal parts. The temperature of some parts may exceed 60°C during operation.



CAUTION. Hazard to Equipment.

Only use components or accessories recommended or sold by Redback Technologies or its authorised agents. Handle all parts with care and follow instructions provided.



WARNING. Fire hazard.

The Redback Smart Inverter contains relays and switches that are not ignition protected: Do not keep combustible or flammable materials in the same room as the equipment.

Do not allow storage of any item inside the inverter, or any items inside the battery enclosure other than batteries.

Ensure clearance requirements are strictly enforced. Keep all vents clear of obstructions that can prevent proper air flow around, or through, the unit.



DELAY. Wait specified time e.g., 10 minutes.



This symbol indicates the information provided is important for the correct operation and or maintenance of the equipment. Failure to follow the recommendations may result in annulment of the product warranty.



IMPORTANT. Only use the battery types recommended by Redback Technologies. Follow the battery manufacturer's recommendations for installation and maintenance.



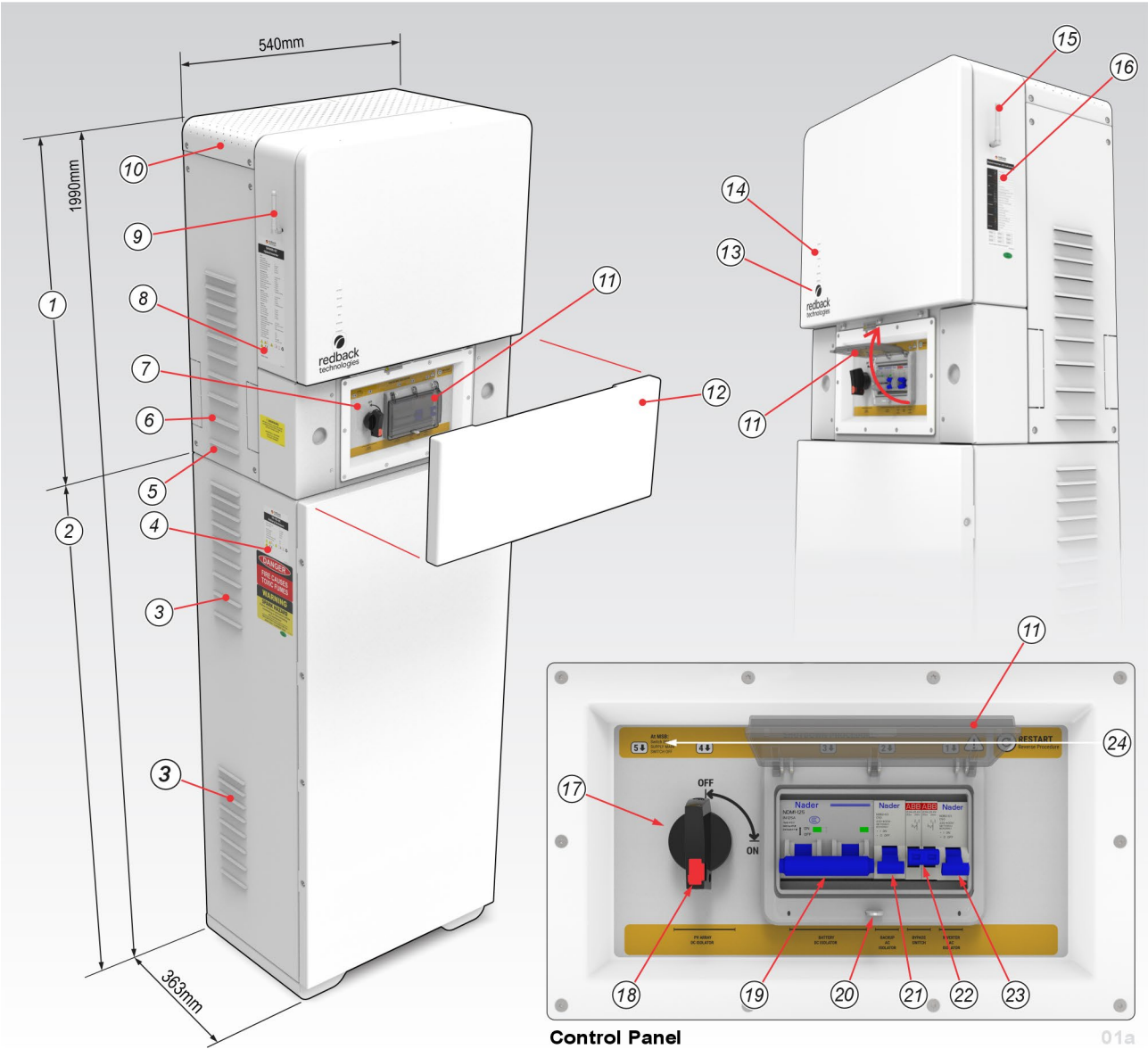
KEEP BATTERIES WARM. Insulate batteries appropriately against freezing temperatures. A discharged battery will freeze more easily than a charged one.

6. Features and benefits of your Redback system

SYSTEM FEATURE	BENEFIT	REQUIREMENT
Internet connected	Inverter monitoring and management using the MYRedback app or Redback portal. Remote viewing of inverter status.	Stable internet connection using your Wi-Fi or ethernet based network.
MYRedback app and Redback portal	Monitor your energy performance in real time, using high quality, detailed charts. See your true usage patterns and tune your energy consumption, storage, export, and backup plan accordingly. Share system access with family, tenants etc.	Stable internet connection using your Wi-Fi or ethernet based network.
All-in-one design	Neat appearance; Easy to keep clean.	
LED array	Colour coded LEDs to display system status and aid diagnostics.	
EMS	The Energy Management System (EMS) is the inverter's internal Control Board.	Internet connection for occasional software updates.
Control Panel	Ability to shut down and restart inverter. Convenient control of backup circuit, and solar and battery connections.	
Low maintenance	Owners can complete essential annual maintenance. A service call is not needed.	
Internal battery capacity expansion	Improved management and consumption of self-generated energy. Start small, then increase the storage capacity to suit your actual usage patterns.	Ask your installer for advice on upgrading your system storage.
Backup functionality	Some devices stay available during a grid outage if solar power or battery are available.	Optional backup circuit needed and active; Battery needed.
Relay control	One relay-switched house circuit or device can be timer controlled using the Redback portal	A relay and connected circuit or device is optional. The triggering meter is included with your system.
Smart Load Control	Smart Load Control responds to solar power or excess power available for export: Increase energy self-consumption by switching a high consumption load ON or OFF at pre-set solar generation levels. High consumption loads are devices such as hot water systems or pool pumps.	Contact your installer to set up Smart Load Controlled devices. The triggering meter is included with your system.
Grid power quality monitoring	The inverter can self-protect from poor quality grid power and recover when quality improves.	
Internal overload protection	The inverter will self-protect if it detects excessive heat or excessive internal currents.	
Battery Management System	Batteries self-monitor to manage heat, State of Charge (SoC), and charge and discharge rates, to extend battery life.	
Critical setting protection	Critical system settings may only be changed by electrically qualified personnel.	
Solar array ground fault and insulation monitoring	Electrical safety for all parts of your system.	

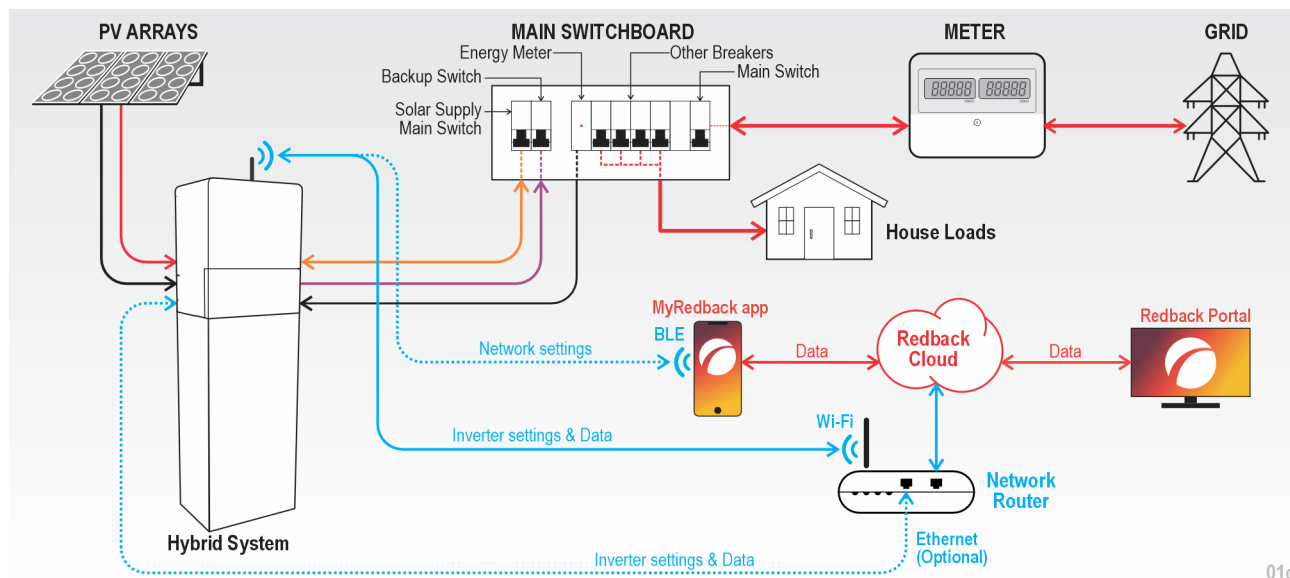
7. System description

7.1. Parts and descriptions

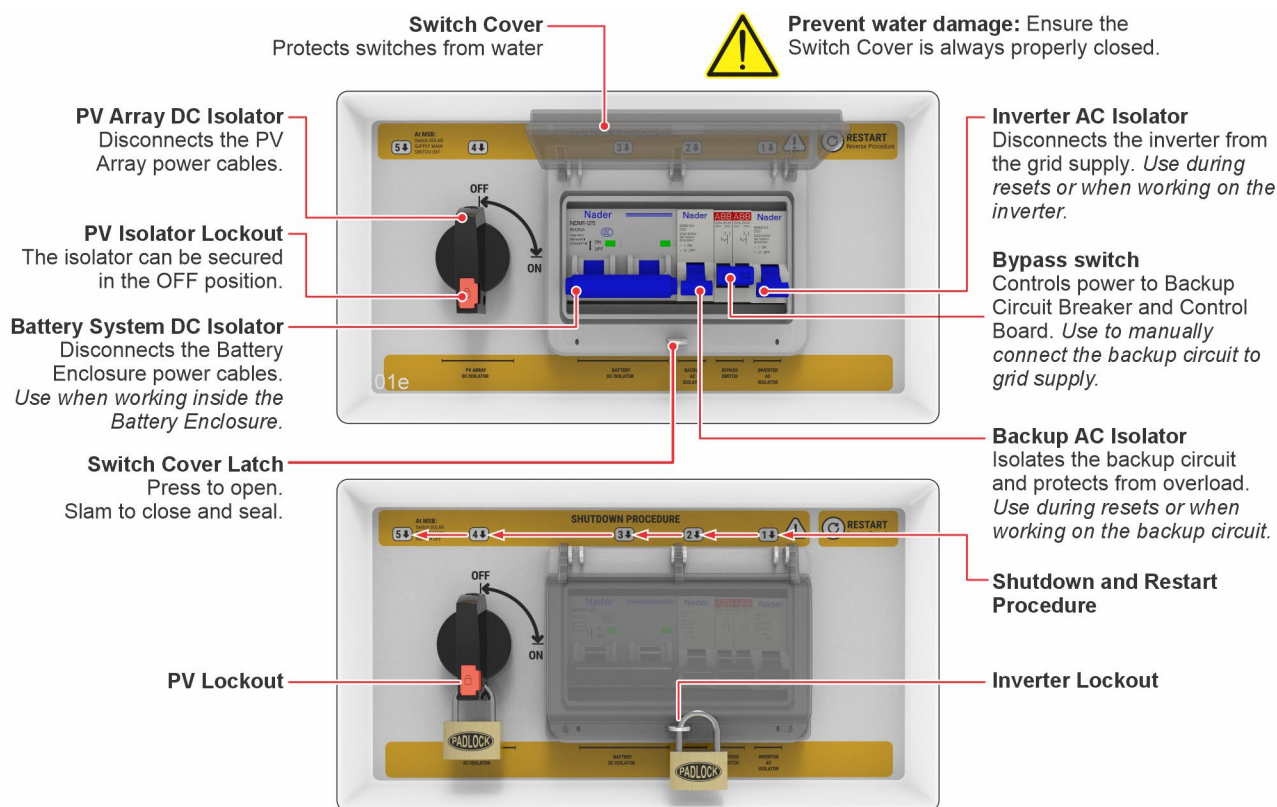


#	PART NAME	#	PART NAME	#	PART NAME
1	Inverter (INV)	9	Antenna 1	17	PV Array DC Isolator
2	Battery Enclosure (BE)	10	Inverter Top Cover	18	Isolator Lock-out Plunger
3	BE Cooling exhaust vents	11	Switch Cover	19	Battery DC Isolator
4	BE Serial Number Label	12	Control Panel Front Cover	20	Switch Cover Latch/Release Tongue
5	Inverter Side Cover	13	Logo	21	Backup AC Isolator
6	Inverter cooling inlet vents	14	Status Panel LEDs	22	Bypass Switch
7	Control Panel	15	Antenna 2	23	Inverter AC Isolator
8	Inverter Serial Number Label	16	Status Panel LED Legend	24	Emergency Shutdown Procedure

7.2. Hybrid system functional overview

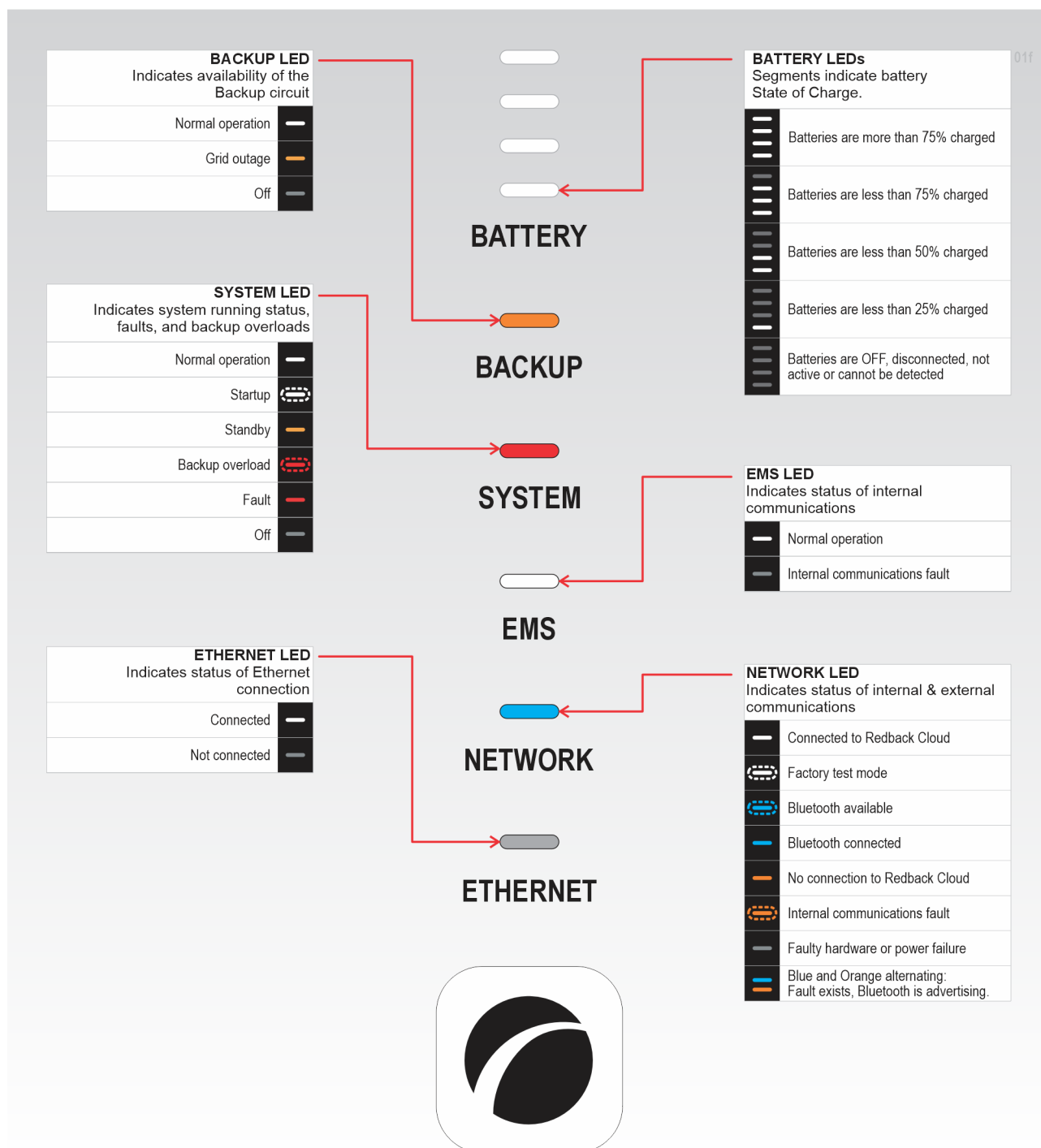


7.3. Control Panel features



7.4. Status Panel features

The Redback SHG3 inverter has an LED array to show system status and aid diagnosis. The table below lists LED indications. Section 13.6 lists LED indicated problems that may be owner solvable.



7.5. Batteries and Battery Enclosure

Your Redback system has a storage capacity of up to 9.6, 14.4 or 19.2kWh using 2, 3 or 4 Pylontech US5000 batteries

Usable battery capacity is typically 95% of the nominal capacity.

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

Your installer may identify batteries as Master, 2, 3 or 4. This refers to the position of individual batteries in the BMS chain of command, where the first connected battery is the Master, which controls subsequent batteries.

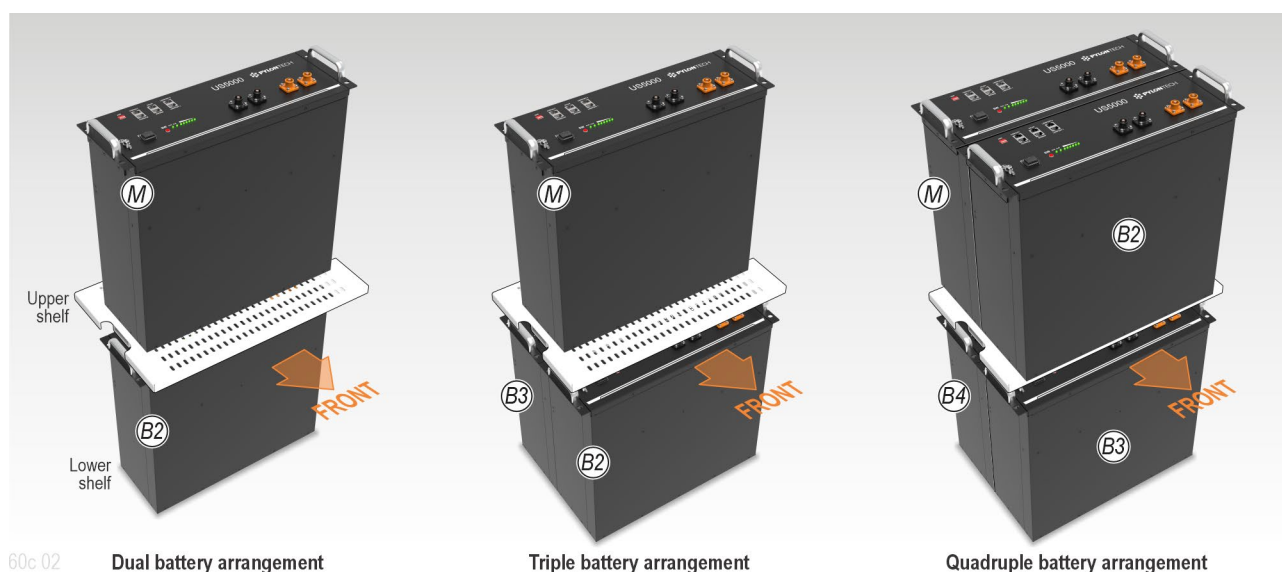
The battery identity may also indicate the physical position of the battery within the enclosure, though this is an installer preference. The diagram below shows the BMS battery naming convention and recommended battery locations.



NOTE: Use Pylontech US5000 batteries only. No other battery products are supported.



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.



60c 02

Dual battery arrangement

Triple battery arrangement

Quadruple battery arrangement

7.6. Backup circuit (optional)

Your Inverter can directly control and power one circuit, known as the backup circuit. This feature extends the run time of a small number of low power or occasional use devices that you have prioritised for use during a power outage.

- During a grid outage, your inverter powers the backup circuit from batteries and or solar.
- If grid supply is available, your inverter chooses the power source from solar, batteries or grid.

Adding a backup circuit to your property requires planning to maximise the benefits of your investment. A new, dedicated circuit will give a better result than re-purposing an existing circuit. Your system designer can help you specify an affordable system that balances cost and performance, based on your expected usage patterns and your backup expectations i.e., what you expect to run, and for how long.

Loads on the backup circuit must be carefully selected to extend the backup power availability, noting:

- Battery storage capacity and availability.
 - Up to 5000W continuous (6000W for SH6000-G3).
 - Up to 7000W for up to 60 seconds (8000W for SH6000-G3)
- Inverter behaviour during overload events.
- Inverter behaviour during high temperature events.
 - Above 45°C ambient, power output is reduced.
 - Above 60°C, the inverter will shut down.

A battery is needed for best performance. Solar-only power is not satisfactory—backup load and solar power are variable and unpredictable—when backup load exceeds the available solar power the inverter will automatically shut down and restart.

To ensure predictable backup, part of the battery storage can be reserved, powering the backup circuit until the battery reaches the minimum State of Charge (SoC). The size of the reserve can be varied according to your needs e.g., more for backup means less for daily use. See Section 9.4.

8. System limitations

Your Redback SH-G3 Hybrid System is not suitable for:

- Batteries other than Pylontech US5000.
- Off-Grid installations (the grid is intentionally disconnected). Lithium-ion batteries have a finite number of charge/discharge cycles available. Off-grid installations cycle more often, reducing battery life.
- Locations without internet access: the system can work off-line but is unable to send fault notifications to you or Redback. You will be unable to review consumption or performance; make informed decisions about system settings or consumption patterns; change settings; or remote control the system. You, the owner, must maintain a stable connection to the Redback Cloud otherwise warranty support will be affected.
- Prediction of your energy bills. The Redback meter is a Class 1 meter: it provides a good indication of energy consumption; however, readings may vary slightly from the Network meters used for billing.
- Use with generators.
- Use with 5Ghz Wi-Fi networks.



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

9. Getting the best from your system

Your Redback system is designed to work autonomously – the level of interaction is up to you.

A set-and-forget approach will work fine, and occasional maintenance is all that is needed.

Alternatively, you can dive deep into your data and make informed decisions to optimise your system and maximise the return on your investment.

Either way, the first step to getting the best from your system is to look after it.

9.1. Keep your system in good condition

Keeping your system in good condition maintains efficiency, increases longevity, and helps us help you, if the need arises. There are three key items requiring your attention.

COOLING

Your system uses fresh air to cool the inverter and batteries. If your system becomes too hot its efficiency decreases, and it may even shut down.

There must always be 150mm of clear space beside, above and in front of your system. Vents on sides and top of the system are easily identified, and there is also a hidden intake on the bottom of the system.

Ensure no items are left near the base of the system or placed on top of the inverter, as vents will be obstructed.

The system must not be enclosed i.e., do not build a cabinet around it.

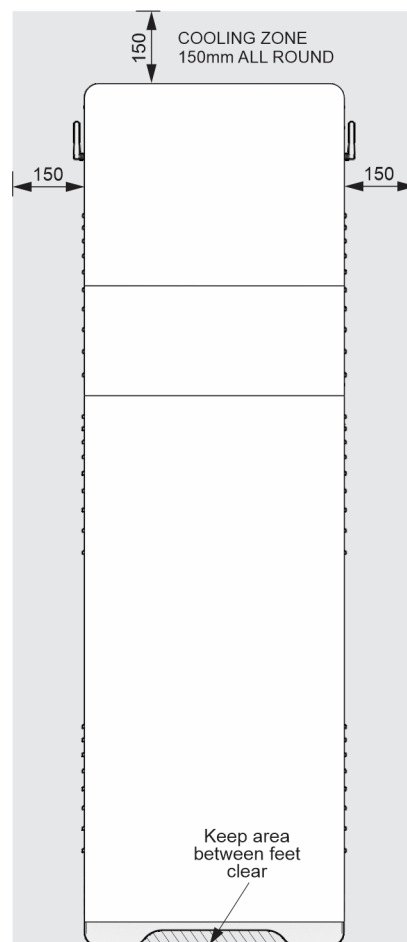
MAINTENANCE

Complete the annual maintenance items in Section **Error! Reference source not found.** In very dusty conditions you may need to clean the system more often.

INTERNET CONNECTION

Data is needed to get the best out of your inverter. A permanent internet connection enables the inverter to send data to the Redback cloud, where the MYRedback app or Redback portal present helpful charts, enabling you to understand your system's performance. Your installer or Redback can also use the data to diagnose problems or suggest improvements to settings, based on your actual usage.

 Your inverter will continue to function without an internet connection, but you will be unable to receive any fault notifications, no data will exist for the period of disconnection, and remote support will be limited. You, the owner, must maintain a stable connection to the Redback Cloud otherwise warranty support will be affected.



9.2. Use Redback's Site Manager feature (if applicable)

Introduced in 2023, Redback's Site Manager enables the installation of multiple, cooperative Redback inverters behind the meter, at one site. Correctly configured, the charging and discharging of batteries is balanced across all Redback systems on site to ensure the equal use of each system, thereby improving performance and longevity of all your systems.

Site Manager requires that your systems have the latest software, communicate by ethernet, and are configured as Master and Workers. When implemented, Site Manager works autonomously, with no intervention needed unless there is a hardware problem.

Contact your installer for advice on implementing Site Manager at your site. If you have multiple inverters, setting up Site Manager may require little or no hardware changes, and it may be possible to implement remotely.

9.3. Monitor performance

Redback offers two choices for checking the energy performance of your household.

9.3.1. MYREDBACK APP

MyRedback provides a simple, up-to-date view of what's happening at your place – it's great for quickly checking the energy flow at your property. MyRedback is available from your app store, for Android 7 or higher, or iOS 12.1 or higher. Use the app to:

- Check your energy usage.
- Reconnect your system to the internet.
- Review your system performance – but you will need to contact your installer if changes are needed.



9.3.2. REDBACK PORTAL

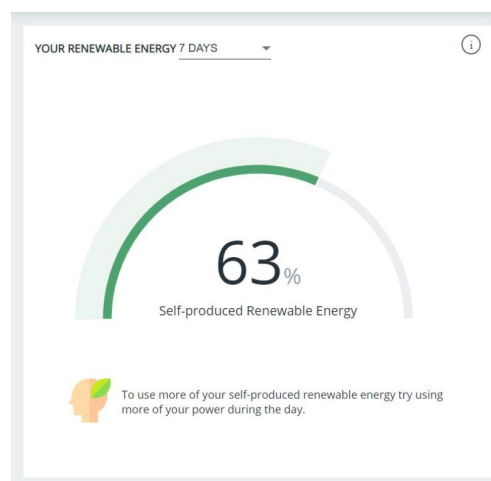
The Redback portal portal.redbacktech.com offers all the features of the MyRedback app plus a comprehensive history of your systems performance, much greater detail about your system, and direct access to support documents.

DASHBOARD

The dashboard view provides an overview of your system:

- Energy consumption trends
- Power demand
- Power being bought or exported
- Power from solar
- Power to/from batteries
- Stored energy

If nothing else, you should view the Renewable Energy Meter regularly; it shows the system's impact on your energy consumption during the past 7, 30 or 90 days. If it falls below 60%, it's worth reviewing your usage habits or your system size and settings.



9.4. Getting the best from your batteries

Your batteries will do a great job of looking after themselves, with no intervention required if they have the correct State of Charge (SoC) settings for your needs.

SETTING NAME	COMMENT
Minimum SoC %*	In day-to-day use, your batteries may discharge down to this % of total capacity.
Minimum SoC Offgrid %*	This is the deep discharge limit: it protects the battery from damage due to over-discharge during a backup event i.e., during a blackout.

*State of Charge: The battery manufacturer will specify the lowest acceptable value (also known as Depth of Discharge).



Frequent deep discharging will shorten the life of your battery. If you experience frequent blackouts in your area, ask your installer to set the Minimum SoC higher than usual. This extends your backup run-time and reduces the number of deep discharge events.

BACKUP RESERVE

Your system configuration and backup requirements will guide your settings, which create the Battery Usage Plan, as shown right.

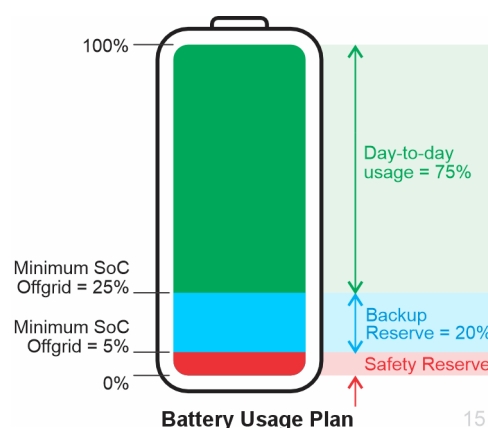
The Backup Reserve is the energy withheld for use by the backup circuit during a grid outage event.

$$\text{Backup Reserve} = (\text{Minimum SoC} - \text{Minimum SoC Offgrid}) \%$$

The Backup Reserve is a balancing act: A large reserve increases the backup run-time when needed but may decrease the everyday use of self-generated energy.

Put another way, it's blackout security v. energy cost.

Think about your own needs, then ask your installer to adjust the Minimum SoC according to your priorities.



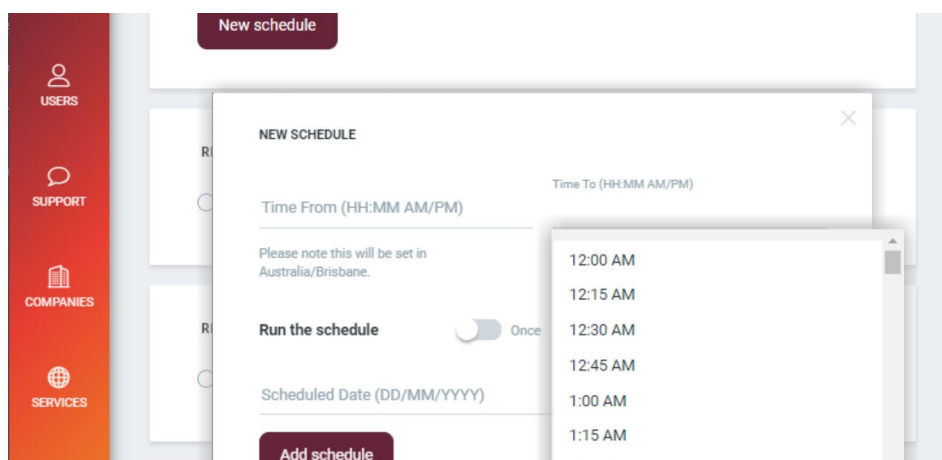
9.5. Getting the best from your relays

9.5.1. TIME BASED SCHEDULING

Your inverter can control one relay- usually used to turn specific equipment ON or OFF remotely, or ON and OFF according to a once-off or daily schedules. The aim is to move power usage into daylight hours, after batteries have charged, and when excess solar power is being exported or not used at all. Typical applications are pool or water tank pumps, and hot water systems.

To use this feature, ask an electrician to install a dedicated, relay-controlled circuit for the equipment.

The schedules are created in the Redback portal, under the CONTROL tab. Multiple daily events are allowed excepting that they may not overlap and must start and finish on the same day. Manual control is also possible, using the ON and OFF controls.



9.5.2. SMART LOAD CONTROL

Redback's Smart Load Control feature enables you to make the most of your self-generated energy by only operating your large loads (such as a hot water system) when there is excess solar energy available. Smart Load control aims to:

- Run the load using only when excess PV energy is available.
- Avoid switching the load excessively (e.g., when a small cloud passes in front of the sun, and the PV output dips).
- Optionally, the system will ensure that the load runs for a nominated number of hours each day. This is useful for equipment such as water systems, which require a minimum daily run time.

The Smart Load Control triggering relay is included with your system however extra installation and equipment is required to connect a circuit or device. Ask your installer for advice regarding setting up a Smart Load Controlled device at your place.

SMART LOAD CONTROL NOTES

- The Smart Load Control can be over-ridden using Portal ON/OFF or time-based scheduling commands or bypassed completely using an optional hardware switch.

9.6. Getting the best from your backup circuit

Your inverter includes one backup circuit. In normal running, the backup circuit is powered by solar, battery or grid, as directed by the inverter. During a grid outage, the backup circuit is powered by the system batteries and or solar. The inverter can supply power to the backup circuit if:

- Power is available from batteries or solar, and
- Total household, continuous power demand is less than 5000W for SH5000 (6000W for SH6000), and
- Total power demand is less than the power available from batteries and solar, and
- The Bypass Switch is in the down position.

AVOID INVERTER SHUTDOWNS
The total power load matters: simultaneously running a kettle, toaster, microwave, large fridge, TV, and a few lights can easily exceed the allowable power delivery, and an inverter shutdown will occur.
Solution: Minimise devices in use



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

The backup function is not intended to run your entire house during a power outage. Generally, you should connect and use the minimum number of devices at any one time, to extend the backup run-time.

Only essential or low consumption devices or appliances should be connected to the backup circuit. Devices that require high currents should not be connected as they may trip the inverter or rapidly discharge the batteries. The table below lists the suitability of common devices.

The S5000-G3 inverter can fulfil demand of 7000W for up to 60 seconds (8000W for SH6000-G3): this is useful for devices that have high starting power, but low power demand when running.

The inverter will reduce power output above 45°C ambient and shut down above 60°C.

If the system battery reaches minimum SoC during a grid outage the inverter will try to fulfil the backup circuit demand from solar- if demand exceeds available solar power the inverter will shut down automatically. Solar is unpredictable—it varies with cloud cover—so this situation is best managed by minimizing devices in use.

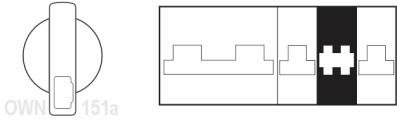
 SUITABLE	 NOT SUITABLE
Refrigerators and freezers	Critical Medical Devices
Fans	Air conditioners & heaters
Small, occasional use, plug-in appliances e.g., microwaves, kettles, toasters	Ovens & cooktops
TVs, radios	Home theatres and Projectors
Computers, tablets, routers	Hot water systems
Telephones	Spas, saunas, pool pumps
Household tank water pumps	Battery chargers & corded Power tools
Low-energy LED or CCFL lighting	Incandescent or high-power lighting

10. Inverter operation

Your inverter has sophisticated software controls available in the MYRedback app or the Redback portal, however there are some physical controls or functions at the unit.

10.1. Inverter – Changing bypass modes

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 working reliably. If grid supply is lost the inverter will not supply the backup circuit.
	Middle Backup circuit is isolated (depowered).	No power is sent to the backup circuit. Energy Management System (EMS) and inverter continue to run.
	Down Power to the backup circuit is supplied and managed by the inverter, from any source.	This is the recommended operational mode. 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 SoC.

10.2. Shutdown procedure

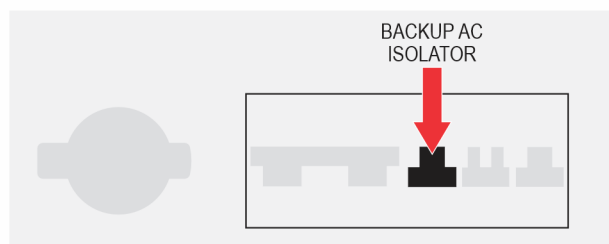
Occasionally, it may be necessary to shut down the inverter interrupting all inverter functions, noting that PV, battery, and grid supplies are still energised to the isolators.

**At your inverter
Control Panel**

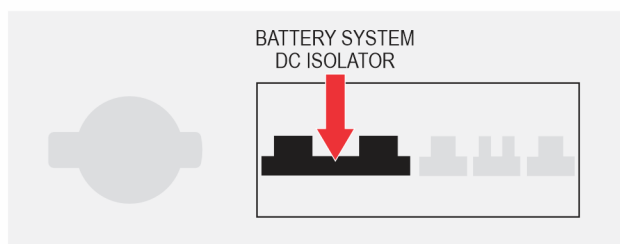
①



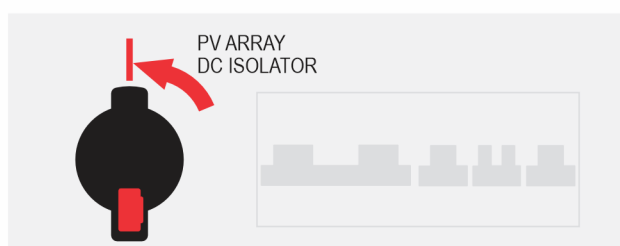
②



③

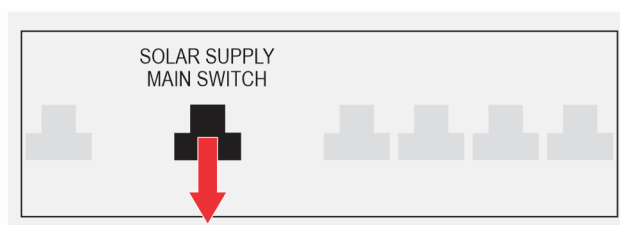


④



**At your main
switchboard**
Your switchboard may vary in
appearance

⑤



All done ⑤ Your system is now shutdown

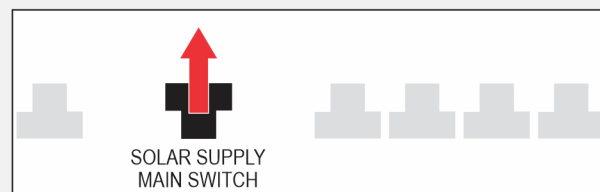
10.3. Inverter restart

Occasionally, it may be necessary to cold boot the inverter, to restart all software, or to change Wi-Fi settings (Bluetooth advertising required). A restart briefly interrupts all inverter functions, noting that PV, battery, and grid supplies are still energised to the isolators. After restarting, the inverter will advertise Bluetooth for 30 minutes.

At your main switchboard

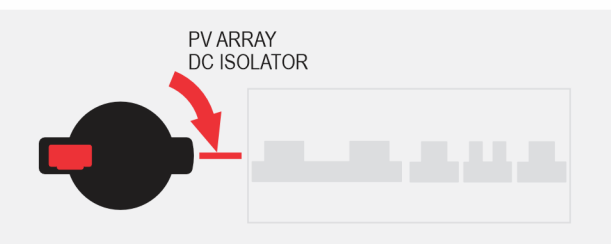
Your switchboard may vary in appearance

1

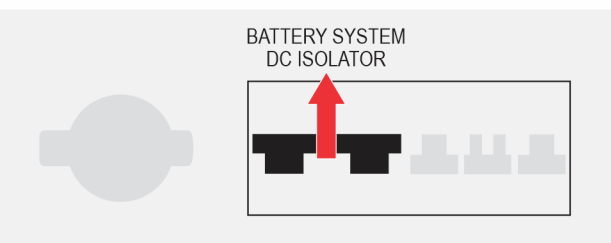


At your inverter Control Panel

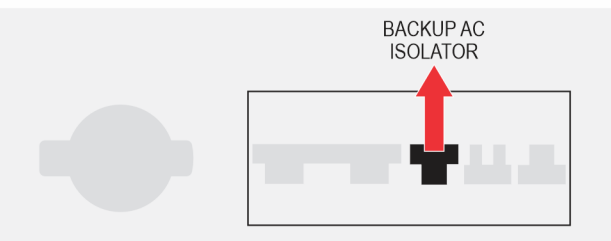
2



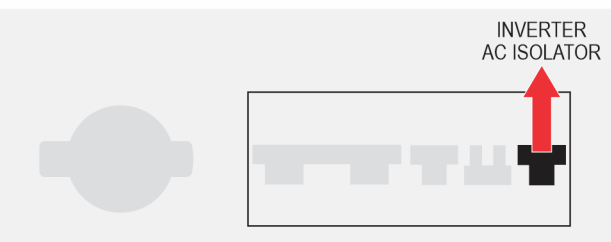
3



4



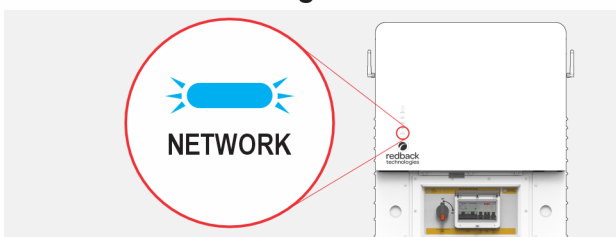
5



All done 6 **Your system will now restart.**

7

Bluetooth advertising will continue for 30 minutes.



11. Inverter operating modes

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

11.1. Auto mode

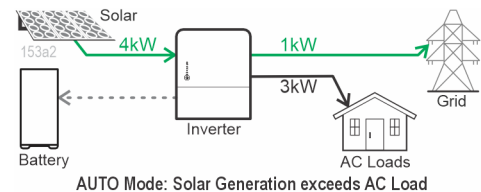
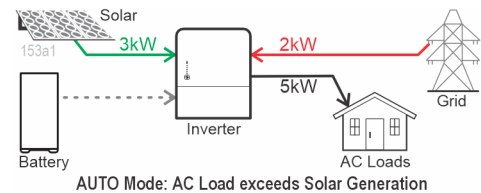
AUTO is the default operating mode, maximizing consumption of self-generated and stored energy. If the inverter mode has been changed, AUTO can be reselected from the portal.

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)

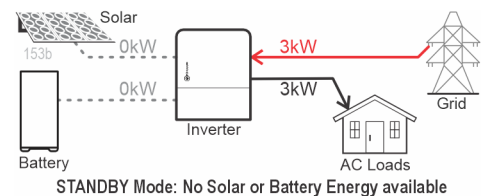


11.2. Standby mode

STANDBY mode is invoked automatically when no solar or battery energy is available. The SHG3 directs grid power directly to the AC Loads thereby minimising energy losses in the inverter e.g., heat.

The SHG3 automatically reverts to the previous mode of operation when solar or battery energy is available.

The backup circuit is RCD protected when installed according to 2.10.4. This is not optional.

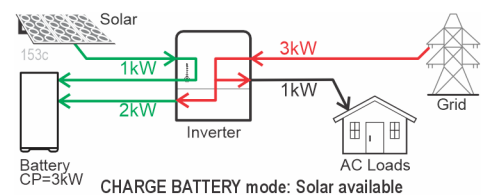


11.3. Charge Battery Mode

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 charge rate of 5kW (6kW for SH6000-G3).

AC Loads are fulfilled by the grid.



11.4. Discharge Battery mode

DISCHARGE mode is user selectable on the portal.

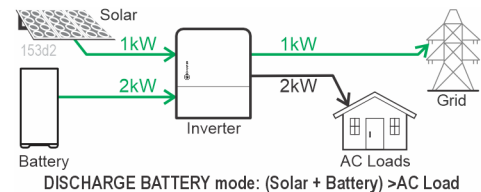
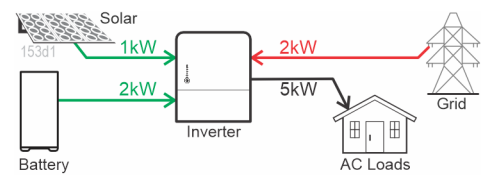
DISCHARGE mode prioritises battery discharge to the following:

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.

*LEP= Export Power Limit.



11.5. Backup mode

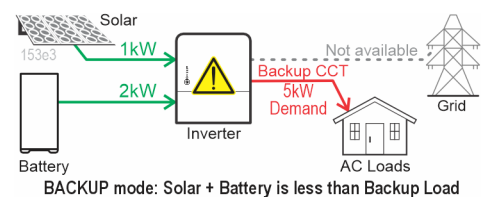
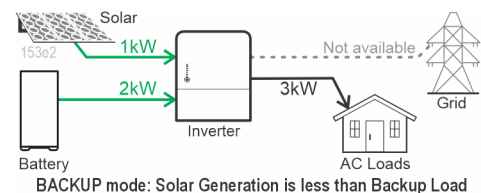
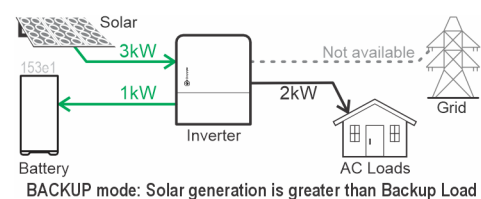
BACKUP mode starts automatically when the grid supply is interrupted (default setting).

In BACKUP mode, the SHG3 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.

NOTES:

- BACKUP mode is invoked within 0.05 seconds of a grid interruption.
- 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.
- The backup circuit is RCD protected when installed according to 2.10.4. This is not optional.
- 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".



12. Getting your inverter back online

Onboarding connects your inverter to the internet using your network. Your system is onboarded if you can login to the Redback portal and your system is "Online". Connection to your network is by Ethernet cable or Wi-Fi.

Occasionally, it may be necessary to reconnect your inverter to the internet. This most often occurs after a significant disruption to your network such as replacing your router, changing passwords, or changing internet providers.

There are two onboarding methods: Ethernet or Bluetooth Low Energy.

12.1. Ethernet

Ethernet is the preferred method of connection: onboarding occurs automatically, confirmed on the Status Panel if:

- ETHERNET LED is ON (White, continuous), and
- EMS LED is ON (White, continuous), and
- NETWORK LED is ON (White, continuous) noting that blue flashing after a restart indicates BT is advertising.

12.2. Bluetooth Low Energy (BLE)

BLE onboarding is needed if ethernet is not available—a Bluetooth connection is set up between the inverter and the MYRedback app, and the app will guide you through the process of connecting the inverter to your Wi Fi network.

To onboard using Bluetooth:

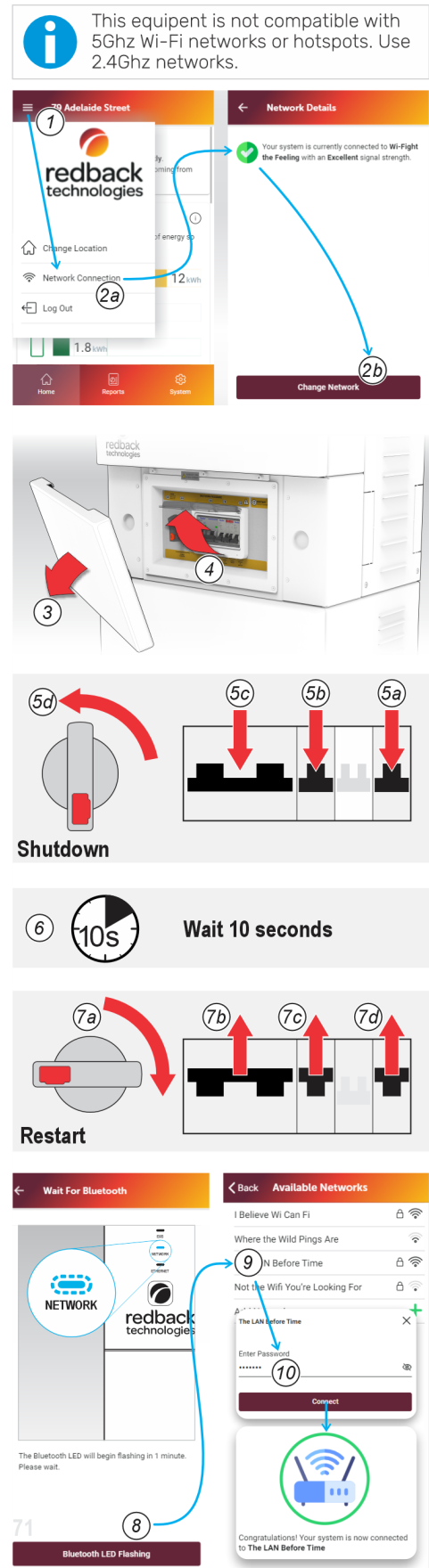
1. Go to your inverter. On your device, open the MyRedback app and login. Touch the Hamburger to display the flyout menu.
2. Select Network Connection. Note your system status and select Change Network.

You may be notified to start Bluetooth. At your inverter:

3. Remove the Control Panel Front Cover
4. Open the Switch Cover.
5. Shutdown your inverter as shown on the Control Panel label.
6. Wait 10 seconds.
7. Restart your inverter (reverse of Shutdown procedure).
8. Wait for the NETWORK LED to begin flashing blue.

Continue onboarding:

9. In MyRedback, touch NETWORK LED Flashing to continue.
10. Select your Wi-Fi network from the list. Ensure that the network signal is strong.
11. Enter Password if asked, and touch Connect. A success message will appear.
12. Wait a few minutes and then confirm onboarding success:
 - On the app, check that flow tiles are coloured, and data is refreshing every 60 seconds.
 - On the Portal, check that your system is online; flow tiles are coloured; and refresh every 60 seconds.
13. If onboarding fails, try again, or contact Redback for help.



13. Troubleshooting

13.1. Backup circuits have no power

The most common causes are overloaded circuit isolators tripping OFF (anytime), or the battery being fully discharged (during a grid outage). Troubleshoot using the guide below.



The total power load matters, and it adds up fast: a kettle, toaster, large fridge, TV, iron, and a few lights may exceed the backup circuit's allowable power delivery.

INDICATION	PROBABLE CAUSE	ACTION	
No power on any backup circuit (during a grid outage)	BATTERY DC isolator is OFF (down)	Turn BATTERY SYSTEM DC isolator ON. Contact your installer if you suspect the Battery DC isolator is tripping.	
	Battery is depleted.	On a partly cloudy day, minimise the loads on the backup circuits—the inverter shuts down if demand exceeds the supply available from solar e.g. when the panels are shaded. Otherwise, wait for grid power to be restored.	
	Battery depletes prematurely.	As above, and contact your installer if you suspect the battery is not charging correctly.	
The <u>House</u> Backup Circuit isolator is tripping	Faulty appliance, overload, or electrical fault.	Identify and deactivate any suspect or excess appliances. Reset the house Backup Circuit isolator at the switchboard or sub-board. If the problem persists, contact your installer for help.	
The <u>Inverter</u> BACKUP AC isolator has tripped	The inverter Backup circuit was overloaded	Reset the BACKUP AC isolator (move up). If it trips immediately, reduce loads on the backup circuits and try again.	
The <u>Inverter</u> BACKUP AC isolator trips repeatedly.	A more complex problem exists.	Place the inverter in Bypass mode (Bypass Switch UP). This supplies power to the backup circuit from the switchboard. Contact your installer for help.	
Solar Supply Main Switch trips	There is a wiring or inverter fault.	Contact your installer for help. Note: The Solar Supply Main Switch is usually located on the main switchboard.	

13.2. Inverter unexpected shutdown

The inverter may shut down or isolate itself from the grid if it detects circumstances 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 due to:

CAUSE	RELEVANT CHARTS FOR DIAGNOSIS (IN PORTAL)*	COMMENT
Continuous Backup Load above 5kW (SH5000) or 6kW (SH6000).	Backup Load- Power	May occur when too many devices are active on the backup circuit.
Backup Load exceeds 7kW (SH5000) or 8kW (SH6000) for more than 60s.	Backup Load- Power	May occur with too many devices or when a high start-up current device turns on.
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 is not of acceptable quality, as defined by AS/NZS 4777.2.	Grid- Voltage Grid- Frequency Grid- Status	The EMS and backup circuit will work if power is available from PV or batteries. Ask your installer or electricity provider to investigate if grid supply is often poor.

* Charts offer comprehensive detail about your system's status and performance and are somewhat complex to use. By default, charts are hidden. Contact Redback if you would like permission to view charts. There may be a significant delay when retrieving stored data.

13.3. Inverter unexpectedly or frequently shutting down

The inverter may shut down or isolate itself from the grid if it detects supply conditions that may cause damage to the inverter; 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
A grid outage (blackout) is occurring	Grid-Status	Wait for the grid to be restored. Your system will restart automatically.
Grid supply is not of acceptable quality, as defined by AS/NZS 4777.2.	Grid-Voltage Grid-Frequency Grid-Status	Ask your installer or electricity provider to investigate if grid supply is often poor.
If internal temperature is greater than 60°C.	Inverter- Temperature Battery Cabinet-Temp.	Output is reduced above 45°C.

*You may not have access to all chart parameters. Contact your installer or Redback if you require access.

13.4. Multi-inverter installations

Your installation may include 1-3 inverters, and these inverters operate independently except in two situations:

1. The inverters collectively observe site export limits
2. If any inverter encounters a fault and needs to shut down, then the other two inverters will also shut down immediately. When the first inverter recovers, or is isolated from PV and the Grid, the other two inverters will restart.

13.5. Internet connection problems

Occasionally, your inverter may lose internet connection and be reported as "offline". Ethernet connected systems usually self-repair after a system restarts. Wi-Fi problems usually require that the system is re-onboarded. The most common causes of "offline" reports are:

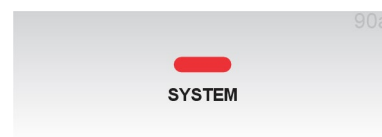
INDICATION	CONNECTION AFFECTED		REMEDY
	ETHERNET	WI-FI	
Change of Internet Service Provider e.g., Telstra, Optus, TPG, Dodo etc	✓	✓	Ethernet: Restart the system. Wi-Fi: Restart the system and re onboard.
New router or modem	✓	✓	
Change of Network name or SSID	✓	✓	
Changed settings in router or modem	✓	✓	
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 inverter 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.

13.6. Earth fault alarm

If the Redback system detects an earth fault:

1. The Status Panel System LED will be solid (see also page 26).
2. An email will be sent to Redback customer service, the registered installer, and the system owner.

An email is also sent when the alarm is cleared.



13.7. Energy Meter diagnostics

13.7.1. ENERGY METER FEATURES

The meter detects the grid energy of one phase and provides this information to the inverter EMS module. The LED indicates if the meter has power. Normally, the meter LED flashes five times per second, indicating data transmission is occurring. The meter can control one external relay.

The energy meter is usually installed in the main Switchboard. Only the front face and LED will be visible.

13.7.2. ENERGY METER TROUBLESHOOTING

LED	INDICATION	CAUSE	REMEDY
	 Flashing rapidly	Meter communicating	No action required. This is the normal operating mode.
	 ON continuously	Fault	Contact your installer.
	 OFF	Fault	Contact your installer.
	Batteries charging at night when inverter is in Auto mode.	CT installed incorrectly	Contact your installer.

13.8. Inverter Status LEDs

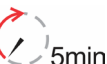
The Redback SHG3 inverter has an LED array to show system status and aid diagnosis. The table below lists LED indications of errors or alerts, probable cause, and possible remedies. There are some remedies Owners can attempt themselves. If the problem is not solved contact your installer for help.

LED NAME	COLOUR	MEANING	REMEDY(S)
ETHERNET	 OFF	Ethernet not detected	If ethernet is required and installed, check the cable and plugs at the modem and LAN wall sockets.
NETWORK	 Blue Flashing	Bluetooth available	The system can be accessed using MyRedback, to change Wi-Fi network settings. Flashes for up to 30 minutes. Note: Bluetooth will advertise automatically if the system restarts or if internet connection is lost for more than 30 consecutive minutes.
	 Blue ON	Bluetooth connected	Phone connected. Proceed to Wi-Fi network settings.
	 Orange ON	No connection to Redback Cloud	Internet connection lost. Ensure the local Wi-Fi or Ethernet network is operating correctly.
	 Orange Flash	Internal communications fault	Contact your installer.
	 White Flashing	Factory test mode	Contact your installer.
	 OFF	Faulty hardware or power failure	Are other LEDs ON? If Yes, contact your installer, otherwise restart the system. If the LED remains OFF contact your installer.
EMS	 OFF	Internal communications fault	Contact your installer.
SYSTEM	 White Flashing	Startup in progress	Wait for LED to stabilise to White ON.
	 Orange ON	Standby	OK. Indicates no PV or no Battery interaction with grid.
	 Red Flashing	Backup overload	Reduce loads on Backup Circuit and restart system.
	 Red ON	Fault	A fault has occurred. Wait until fault clears or restart system. If fault persists, contact your installer.
	 OFF	Faulty hardware or power failure	Are other LEDs ON? If YES, contact your installer. If NO, restart the system. If the LED remains OFF after restart contact your installer.
BACKUP	 OFF	OFF	Indicates Backup Circuit is disconnected. Switch Backup AC isolator ON (up).
BATTERY	 All OFF	Batteries are disconnected or not active.	Ensure battery System DC isolation is ON (up). Ensure all Battery and BMS cables are installed correctly. Restart system.

14. Maintenance schedule



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



WARNING: HEATSINK MAY BE HOT The inverter heatsink may be hot to touch if the inverter has recently been operating at high power. Turn inverter OFF and allow five minutes to cool before starting maintenance.

Your Redback Smart Inverter is a low maintenance product. You should undertake the minor annual maintenance listed below. Internal maintenance must be conducted by a qualified person, such as your installer.

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

ITEM	NAME	REASON	PROCEDURE	BY SERVICE PERSON	BY OWNER
1	Enclosure	Enclosure may become soiled.	Wipe down the outside of the enclosure with a just-damp cloth. Immediately wipe dry with a microfibre cloth. Do not use cleaning agents as they may damage the finish.	✓	✓
2	Battery Enclosure side vents and filters	Airflow is reduced when dust accumulates on the vents and filters.	Brush and vacuum the vents, including visible parts of the internal filter.	✓	✓
3	Inverter side and top vents	Airflow is reduced when dust or debris accumulates on the vents.	Brush and vacuum the vents.	✓	✓
4	Isolators	Ensures Isolators stay operable	Shut down and restart the inverter as described in sections 10.2 and 10.3.	✓	✓
<i>Items 4-9 are to be completed by a qualified person. In all cases, the system must be fully shut down and all sources of power isolated before commencing work.</i>					
5	Fasteners	Screws are used to ensure the structural integrity of the system assembly and fitment.	Check all cover retainer screws. Tighten as necessary.	✗	✓
6	Inverter heatsink fins	Cooling efficiency reduces when dust, dirt or debris accumulate on the heatsink.	1. Shutdown the system. 2. Remove the Inverter Top and Cover to access the heatsink. 3. Clean the heatsink fins using a small brush, cloth, or compressed air. 4. Replace covers and restart the system.	✗	✓
7	Battery Enclosure Inlet vent and filter	The inlet vent is accessible only from inside the Battery Enclosure, with lower batteries removed. Airflow is reduced when dust accumulates on the vents.	1. Shutdown the system. 2. Remove Battery Enclosure front cover. Disconnect and remove Batteries from the lower shelf. 3. Brush and vacuum the internal filter. 4. Replace and connect batteries. 5. Replace the Front Cover. 6. Restart the system.	✗	✓
8	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.	✗	✓
9	Battery Enclosure seal	Concealed seal ensures enclosure water resistance.	Remove covers and inspect seals for hardening, tears, or other damage. Look for signs of water in cabinets.	✗	✓
10	Cable seals	Cable seals prevent water and insects entering the Inverter or Battery Enclosure.	Remove Inverter Side Covers and Connector Covers tighten all cable glands and waterproof caps.	✗	✓

15. Specifications

PV PORT	SH5000-G3	SH6000-G3
Number of MPPTs	2	2
Strings per MPPT Input	1/1	1/1
MPPT Operating Voltage (range)	DC 90 - 520V	DC 90 - 520V
Start-up voltage	DC 90V	DC 90V
MPPT Full Load (range)	DC 175 - 520V	DC 210 - 520V
Maximum Input Voltage (Vmax)	DC 600V	DC 600V
Maximum Current (Imp)	DC 16/16A	DC 16/16A
Maximum PV Input Power	8000Wp	9600Wp
Short Circuit Current (Isc)	DC 24/24A	DC 24/24A
Maximum Back Feed Current	0A	0A
Decisive Voltage Class (DVC)	DVC-C	DVC-C
GRID INTERACTIVE PORT	SH5000-G3	SH6000-G3
Nominal Output Voltage	AC 220/230/240V	AC 220/230/240V
Nominal Output Frequency	50Hz	50Hz
Rated Output Current	AC 21.7A	AC 26.1A
Max. Output Current	AC 21.7A	AC 26.1A
Rated Output Active Power	AC 5000W	AC 6000W
Rated/Max Output Apparent Power	5000VA	6000VA
Rated Input Current	AC 32A	AC 40A
Rated Input Apparent Power`	7360VA	9200VA
Power Factor (range)	0.8 lagging to 0.8 leading	0.8 lagging to 0.8 leading
Output Voltage THD	<3%	<3%
Inrush Current	65A, 10 µs	65A, 10 µs
Maximum Output Fault Current	65A, 10 µs	65A, 10 µs
Maximum Output Overcurrent Protection	AC 21.7A	AC 26.1A
Decisive Voltage Class (DVC)	DVC-C	DVC-C
BACKUP PORT	SH5000-G3	SH6000-G3
Nominal Output Voltage	AC 220/230/240V	AC 220/230/240V
Nominal Output Frequency	50 Hz	50 Hz
Max Output Current	AC 21.7A	AC 26.1A
Rated Active Power	AC 5000W	AC 6000W
Rated Apparent Power	5000VA	6000VA
Peak Apparent Power	7000VA (60 sec max)	8000VA (60 sec max)
Output Voltage THD	<3%	<3%
Inrush Current	65A, 10 µs	65A, 10 µs
Maximum Output Fault Current	65A, 10 µs	65A, 10 µs
Maximum Output Overcurrent Protection	AC 21.7A	AC 26.1A
Decisive Voltage Class (DVC)	DVC-C	DVC-C
BATTERY PORT	SH5000-G3	SH6000-G3
Voltage (nominal)	DC 42 - 58V	DC 42 - 58V
Max. Current (charge)	DC 105A	DC 125A
Max. Power (charge)	DC 5000W	DC 6000W
Max. Current (discharge)	DC 105A	DC 125A
Max. Power (discharge)	DC 5000W	DC 6000W
Battery Type	Li-ion	Li-ion
Battery Depth of Discharge	95%	95%
Short Circuit Current	<8000A/1ms	<8000A/1ms
Decisive Voltage Class (DVC)	DVC-A	DVC-A

GENERAL INFORMATION	ALL MODELS
Operating Temperature	-25°C to 60°C
Operating Temperature Derated Output	below 10°C and over 45°C
Operating Relative Humidity	0 - 100%
Operating Altitude	2000m
Protective Class	I
Ingress Protection Rating	IP66 (Outdoors)
AC Overvoltage Category	OVC III
DC Overvoltage Category	OVC II
Active Anti-islanding Method	Active Frequency Shifting
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	<20W
Noise Emissions	<35 dBm ¹
Warranty	10 Years
EFFICIENCY	
Maximum Efficiency	97.50%
Maximum Battery to Load Efficiency	93.51%
European Efficiency	96.20%
PHYSICAL DATA	
Installed Weight	63-223kg
Dimensions (W x D x H) (Inverter and Mounting Frame)	540 x 363 x 720mm
Material	Aluminium
Finish	Sealed and powder coated
SH-G3-BE Battery Enclosure Data	US5000
Number of Battery Units	4
Storage Capacity	4x 4.8kWh
Maximum Capacity	19.2kWh
Nominal Voltage	DC 48V
Rated Current	DC 120A
Protective Class	I
Ingress Protection Rating	IP54
Dimensions (W x D x H)	540x363x1270 mm
Material	Aluminium
Finish	Sealed and powder coated

1.Measured in Redback laboratory at 1m in front of Battery Enclosure.

ISOLATORS (ALL VERSIONS)		PV PORT	GRID INTERACTIVE PORT	BACKUP PORT	BATTERY PORT
Manufacturer Part Number		NDG3V- 50/4/1/01/M/AS	PEM1- 63/50A/1/PC	PEM1- 63/50A/1/PC	PEBS-L- 125/125A/2P/160VC
Rated Insulation Voltage		1500V	440V	440V	500V
Rated Impulse Withstand Voltage		8kV	6kV	6kV	6kV
Suitability for Isolation		C	C	C	B/C
Rated Operational Current		55A	50A	50A	125A
Utilisation Category		DC-PV2	NA	NA	NA
Rated Short-time Withstand Current (Icw)		700A	NA	NA	NA
Rated Short-circuit Making Capacity (Icm)		1400A	NA	NA	NA
Rated Breaking Capacity (Isc)		5kA	7.5kA	7.5kA	7.5kA
COMMUNICATIONS PORTS AND PROTOCOLS.					
Ethernet	RJ45; Straight-thru				
BMS	RJ45; Custom configuration				
Meter/DRED	Meter: Shared RJ45; RS485 MODBUS				
	Relay: One supported; Connected to kWh Meter.				
	DRED: Shared RJ45; DRED				
Wi-Fi	802.11b/g/n/ac; 2.4GHz				
USER INTERFACE					
Front Panel Display	Coded, coloured LEDs				
Communications	Bluetooth for commissioning				
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			

16. Handover

To get you started with Redback ownership, your installer should complete this checklist with you and complete the installation details below.

ITEM	PROCEDURE	COMPLETED
1	Walk through the installation, ensuring the owner understands what has been installed (and where), including any backup circuits.	
2	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.	
3	Demonstrate how to recover after a BACKUP circuit overload.	
4	Demonstrate how and explain when to use the BYPASS switch.	
5	Help the owner to complete their Redback account setup, if not already done.	
6	Help the owner to download the app, demonstrate features, and answer questions.	
7	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	
8	Handover to the owner, including: • Owner's Manual • Warranty Booklet • Installation Manuals (optional)	

17. Redback installation details

SUPPLIER	INSTALLER
Company:	Company:
Address:	Address:
Telephone:	Telephone:
Email:	Email:
	Date Installed:

INSTALLATION DETAILS				
	YES	NO	Model	Serial number
Redback Inverter	☒			RB_ _ _ _ _
Battery Enclosure	☒			
Battery 1	☒			
Battery 2	☒			
Battery 3	☐	☐		
Battery 4	☐	☐		
Backup circuit	☐	☐	Inclusions	
Relay enabled	☐	☐	Controlled equipment	
PV Array 1	Number of Panels/Power each/Total Power			
PV Array 2	Number of Panels/Power each/Total Power			

OTHER INSTALLATION NOTES	