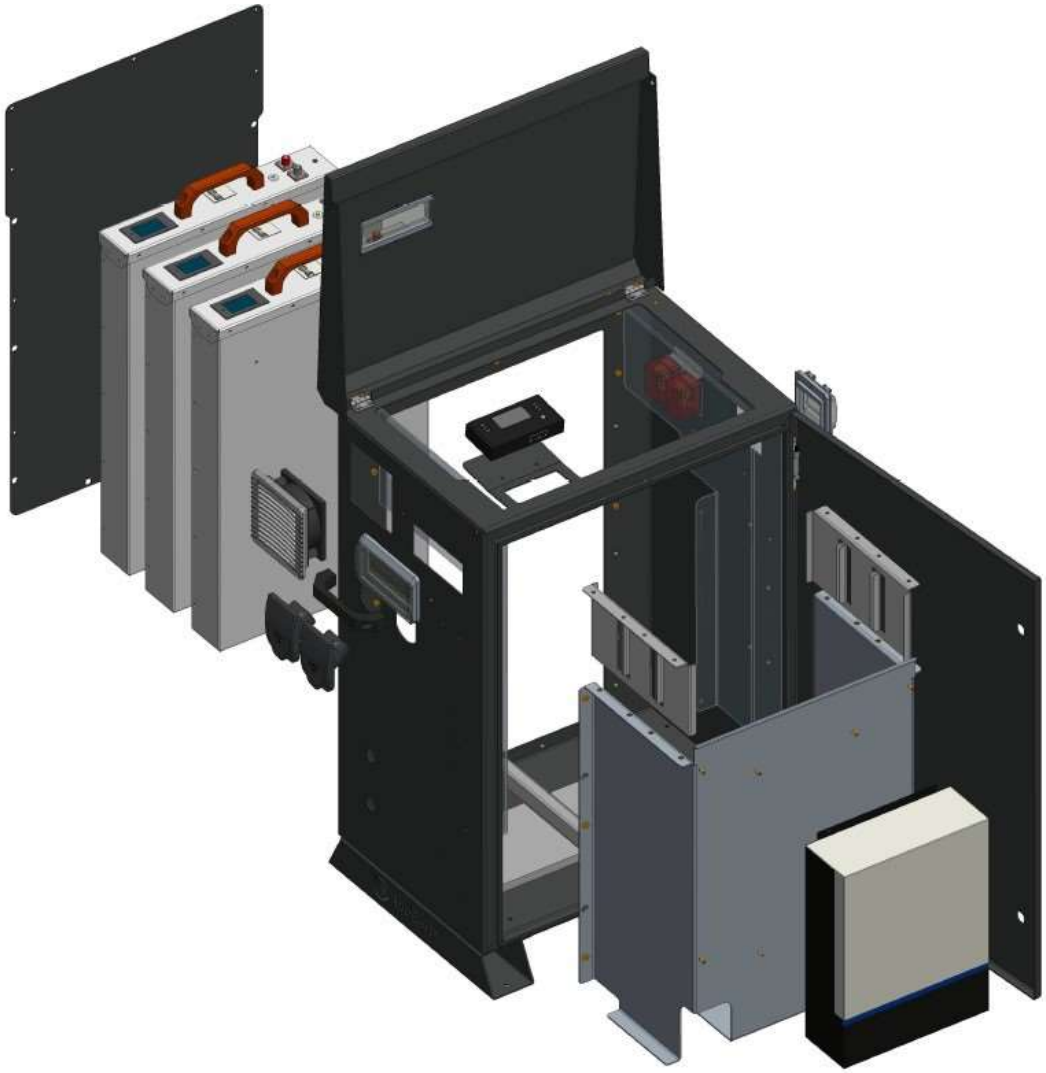
RedEarth ENERGY STORAGE

BlackMax

Off-Grid Battery System

Installation Manual



RedEarth Energy Storage Ltd
15 Fienta Place
Darra – QLD 4076
Australia
Tel: 1800 733 637
Email: info@redearth.energy
Web: www.redearth.energy

Contents

Safety 4
Components 7
Opening the BlackMax 7
Inside 7
Step 1. Transporting 11
Step 2. Positioning 12
Step 3. Solar Install 13
Step 4. Electrical connections 14
4.1. Solar 14
4.2. Battery 14
Removing or Installing a TROPPO: 15
Removing or installing a US3000: 16
4.3. Load 17
4.4. Generator Connection 17
4.5. Generator Auto-Start 17
4.6. MSB 18
Step 5. Monitoring 18
Step 6. Turn ON (Pylontech) 19
Powering ON Batteries 19
Turn ON (Troppo) 20
Step 7. Shutdown 21
Step 8. Commissioning 22
Fan Control Adjustment: 22
Step 9. Monitoring and Communication 23
Registering 24
Monitoring 24
Overview Tab 25
Performance Tab 26
Step 10. Finalising and Handover 27

Safety

WARNING: Working on the inside of the BlackMax system is restricted to qualified personnel.
RedEarth recommend installation by licensed electricians only.

The wiring diagrams and installation instructions are given as a guide only and compliance to appropriate standards is the responsibility of the installer. Relevant standards are listed below:

AS/NZS 3000:2018	Wiring rules
AS/NZS 5033:2014 (amdt 1&2)	Installation and safety requirements for photovoltaic (PV) arrays
AS/NZS 4509.2:2012	Stand-alone power systems-Design
AS/NZS 1170.2:2011	Structural design actions-Wind actions
AS/NZS1768:2007	Lightning protection
AS/NZS 3008.1.1:2017	Electrical installations – Selection of cables
AS/NZS 5139:2019	Electrical installations-Safety of battery systems for use with power conversion equipment

The BlackMax must only be installed by suitably qualified personnel who have read and are familiar with its operation and hazards.

CAUTION: The battery provided with this system must be charged only by the Sure Power inverter. Do not attempt to charge the batteries with any other charger device or connect any devices directly to the DC battery bus.
Attempt to do so will void warranty.

This manual covers all following model numbers: BMX-104, BMX-108, BMX-112, BMX-203, BMX-207,

In our efforts towards constant product enhancement, this document is subject to change at any time. Please visit www.redearth.energy and download the appropriate and latest version manual.

WARNING: Lithium Battery hazard

Fire

In the advent of fire evacuate the area and call emergency services. A dry agent fire extinguisher should be readily available and used. DO NOT use water. Evacuate the area and call emergency services. Toxic gas may be produced if the battery catches fire.

Note: SDS document is provided with the system and also can be found at www.redearth.energy

Damaged battery

Do not use a damaged battery. Batteries should only be disposed of at an appropriate recycling centre. Please contact RedEarth for advice.

Overview:

RedEarth's BlackMax battery system is a ready-to-run energy storage system for off-grid applications. It consists of a SurePower 5000 hybrid inverter and up to three (3) self-managed lithium batteries (12.4kWh total). It is fully assembled; factory tested and requires no programming.

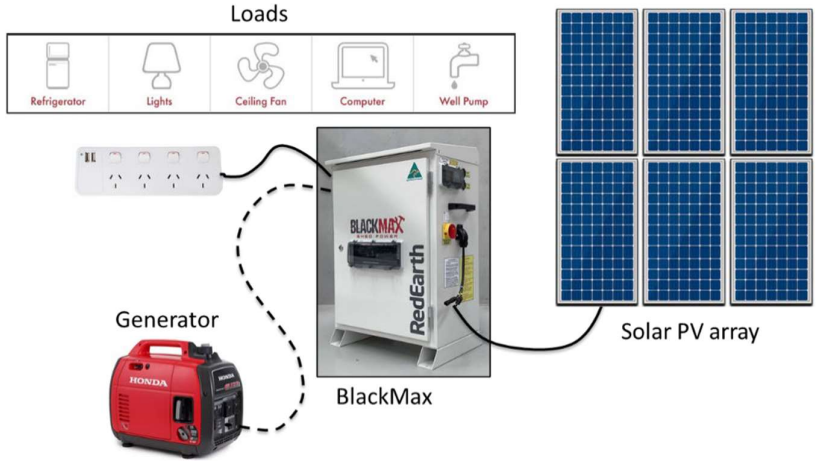
It is ready to connect a PV Solar array and a generator (either auto or manual start)

The BlackMax system is designed to be installed either inside or outside, ideally on a flat surface and in a shaded area against a wall.

RedEarth Energy Storage can also provide an optional remote monitoring service to ensure ongoing operation of the BlackMax battery system.

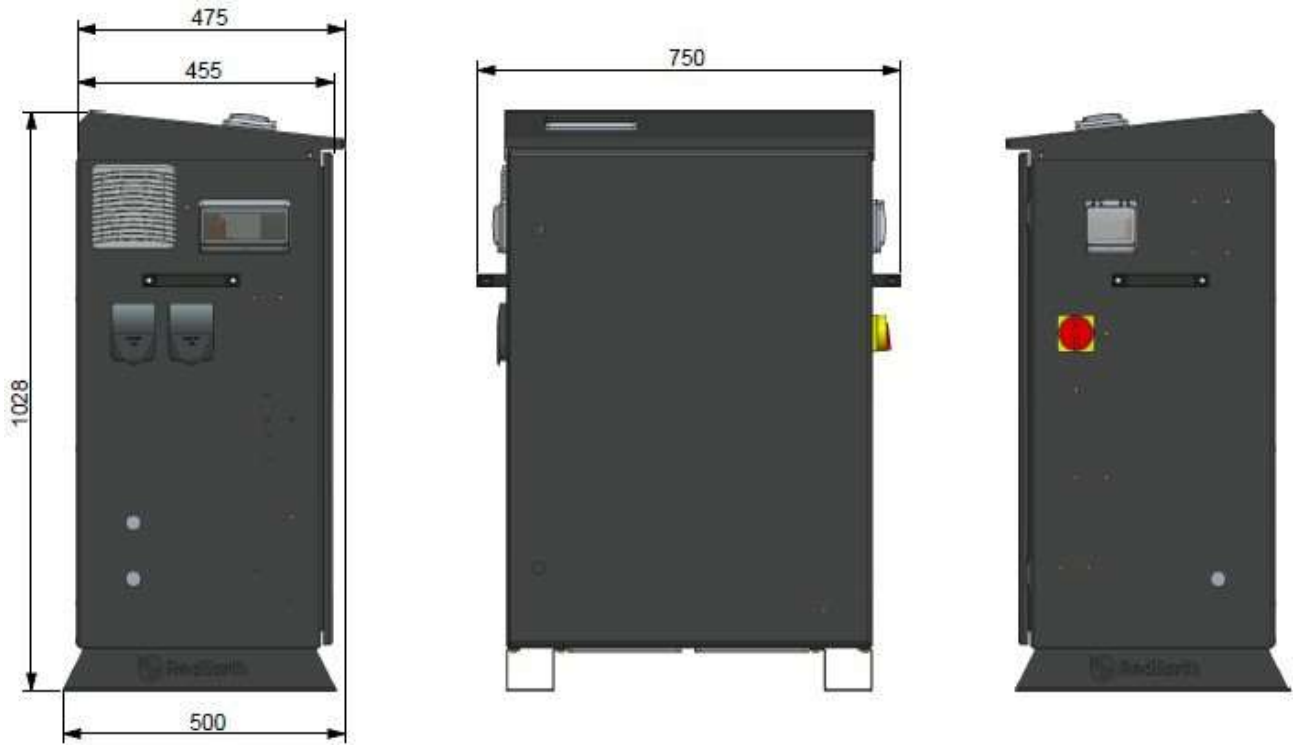
A typical complete installation of the BlackMax with solar panels, will require the electrical connection of:

- The customers load (via external GPO) or hardwiring toa terminal block.
- The array of PV solar panels – via MC4 connectors on theinside of the unit.
- Generator (via external GPO) or harwiring to a terminal block.

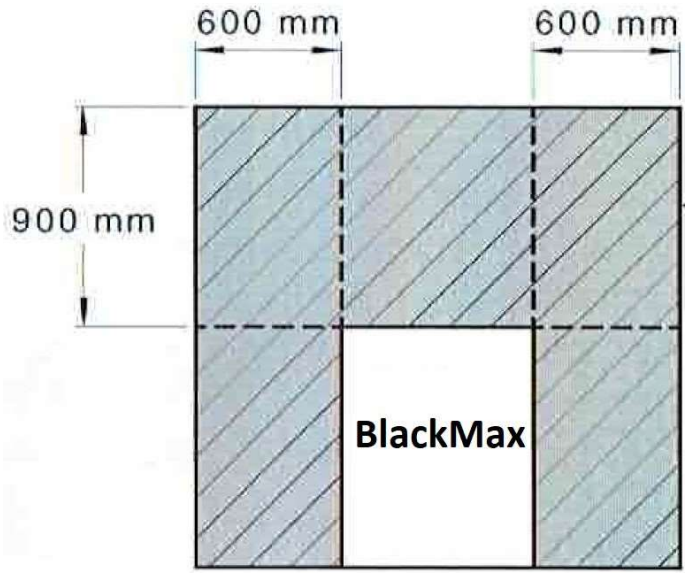


Note: *The BlackMax is not designed to act as a main switch board for the premises, as it does not include space for additional main & customer circuit breakers or RCDs. The MEN link and Earth connection need to be in place at the premises as required by national standards.*

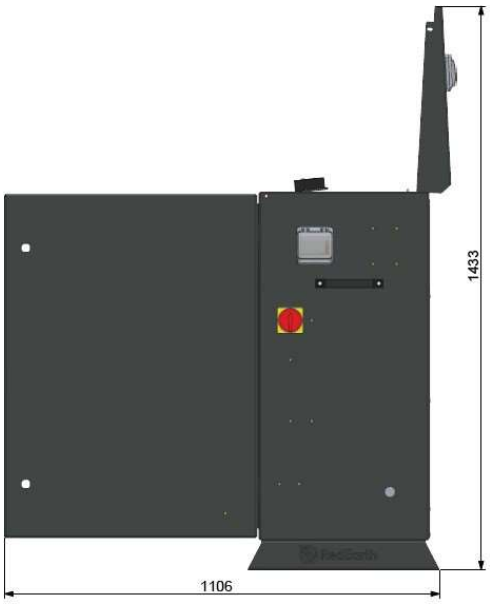
Dimensions & Clearance



BlackMax Weight: 176kg with 3x Troppo batteries (42kg per battery)
Or: 114kg with 2 Pylontech batteries (32kg per battery)
Dimensions w/ door and lid closed: 1028 H x 750 W x 475 D [mm]



BlackMax Minimum Clearance According to AS/NXS 5139



BlackMax Fully Open
1433 H x 750 W x 1106 D [mm]

Components

Opening the BlackMax

RedEarth's BlackMax energy storage system can be accessed via the top (lid) or the front door.

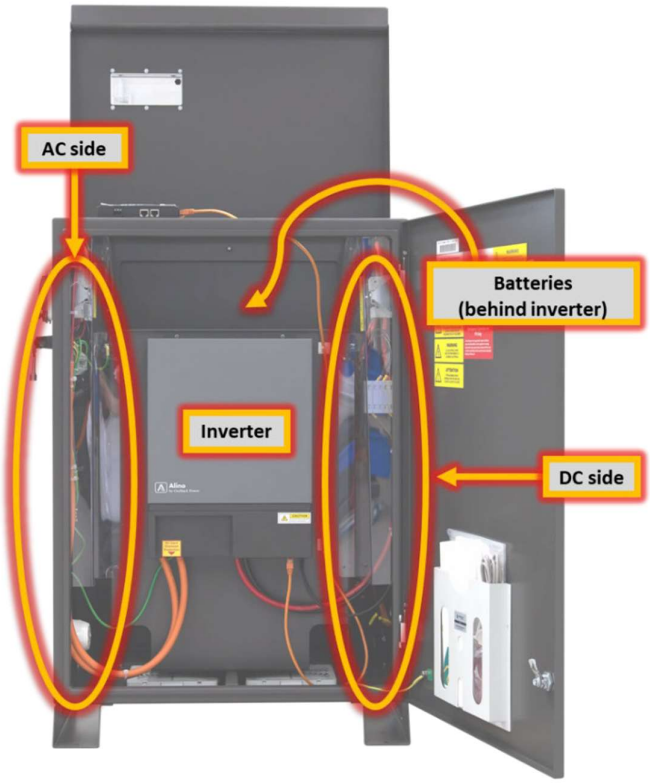
To open the lid, 2 screws (one from each side) must be removed and then the lid can be lifted and pivoted on the rear hinge similar to "popping the bonnet" of a car.

To access from the front, there are 2 locks that must be operated on the front door. The key to open these locks comes tied to the left handle and must be kept out of the reach from children.

Inside

The BlackMax can be divided into four main areas, The AC side, the DC side, the inverter, and the battery area. By opening the front door - as explained above – you will have access to the AC side, inverter area, and DC side. To access the AC or DC side, you will have to remove the acrylic barrier that is held in place by 3 nuts. Finally, to access the battery area, all you need to do is "pop the bonnet." This is procedure explained in "Opening the BlackMax".

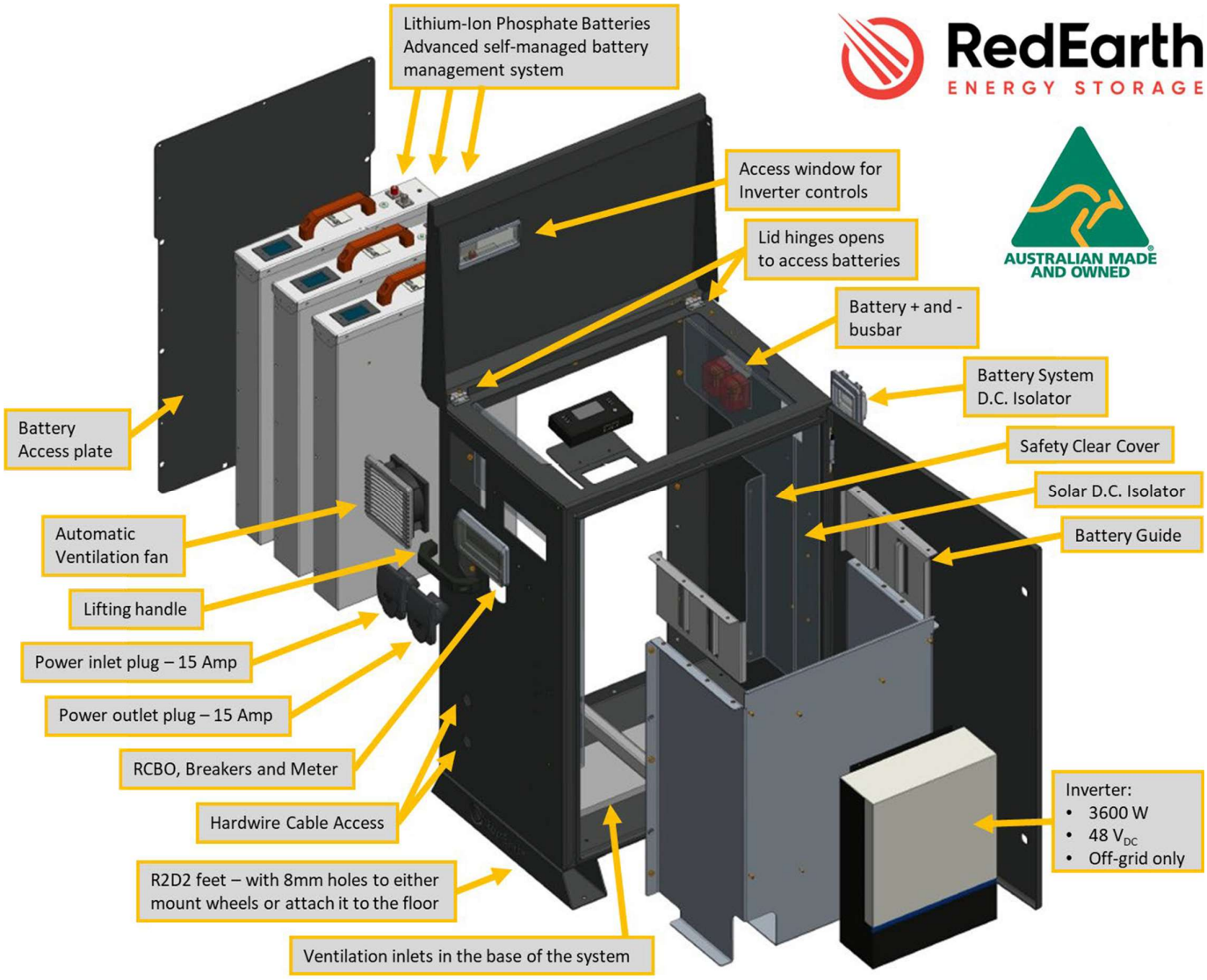
Note: *When closing, do not over tighten the nuts holding the clear cover in place as it will crack under pressure*.



Components

The main components of the BlackMax are the hybrid inverter (SurePower 5000 by RedEarth), one, two or three Lithium batteries and several other small devices that are shown in the picture below.

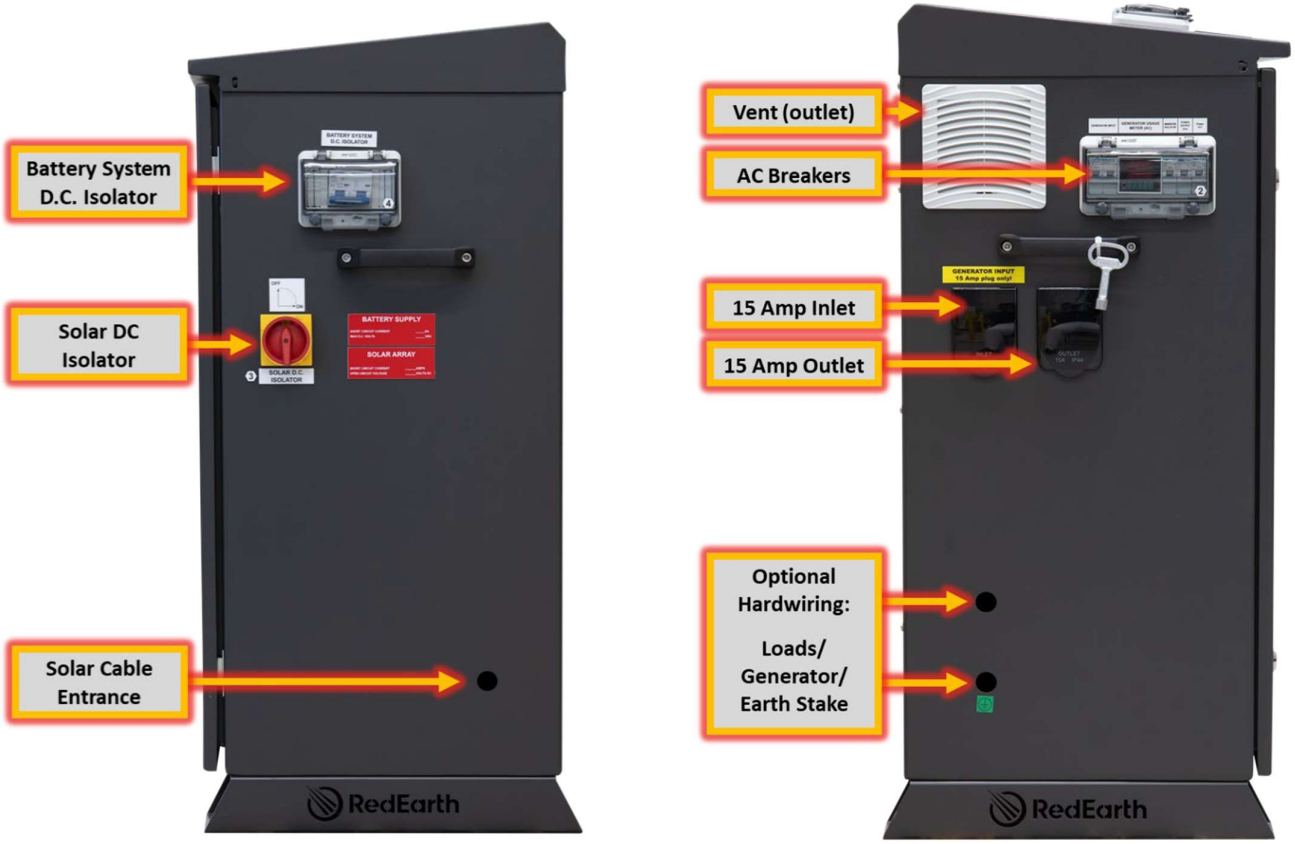
All electrical connections can be made via plugs, making the system user friendly and extremely quick to install.



Earth Fault Alarms

RedEarth recommend using AERL Earth Guard for Earth Fault Alarms when available. Please contact AERL https://www.aerl.com.au/ for details.

Components


Battery System D.C. Isolator
Solar DC Isolator
Solar Cable Entrance
Vent (outlet)
AC Breakers
15 Amp Inlet
15 Amp Outlet
Optional Hardwiring:
Loads/ Generator/ Earth Stake
RedEarth
RedEarth

Components

The BlackMax comes fully equipped with the following items.

- BlackMax pre-wired enclosure
- RedEarth - SurePower inverter
- Up to 3x Troppo Batteries
- Installation Manual
- User Manual

Kit Dimensions:
1.6 W 1.116 H 1.14 D [m]
360 ~ 530kg

Many customers request the Solar Power Kit which is shown at the left and can include:

- Pallet (1.6W 1.16D 0.15H [m])
- BlackMax (with 1 or 2 batteries)
- Solar Panels (between 8 and 16)
- Clenergy PV mounting hardware and rails for tin roof (custom length)
- 15A lead for generator
- Optional
  - Honda EU22i (registered in the customer's name)
  - Hand trolley to help with the transporting the BlackMax

Installation

7 steps to complete your BlackMax installation:

1. Transporting
2. Positioning
3. Solar Install
4. Electrical connections
   - 4.1. Solar
   - 4.2. Battery
   - 4.3. Load
   - 4.4. Generator
   - 4.5. Generator Auto-Start
   - 4.6. MSB
   - 4.7. Monitoring
5. Turn ON/Commissioning
   - 5.1. Turn ON
   - 5.2. Shutdown
   - 5.3. Commissioning
   - 5.4. Fan Control Adjustment
6. Monitoring and Communication
7. Finalizing and Handover

Step 1. Transporting

The BlackMax system is supplied on a pallet in one of two configurations (just unit or kit) as shown on right. It is fully set-up and ready to run. The systemweighs around 176kg with 3x lithium batteries and should be handled with proper lifting equipment.RedEarth's BlackMax comes fitted with two handles to help with handling. However, it is a heavy unit and should be managed with a transportation device such as a hand trolley. This is available as an option from RedEarth.

As a last resort, the lithium batteries can be removed and replaced once the system is in position. Each Troppo battery module weighs 42kg and should be lifted with the extreme caution.

WARNING: Personal Injury
Use safe lifting techniques and standard safety equipment when working with this equipment.

Installation

Step 2. Positioning

The BlackMax is designed to be a freestanding weatherproof system (suitable for wet locations). However, we strongly recommend it to be placed close (minimum 100mm) to a wall. The system must be in a shaded area to reduce the chances of overheating. It should also be placed as close as possible to the solar panels and MSB to minimise voltage drop/power loss (<10m).

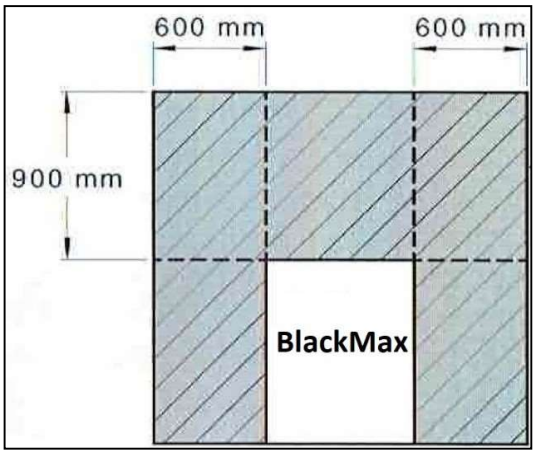
Cooling air flow passes up through the base of the system and then out the top left-hand side.

Do not block the air vents otherwise the system will overheat and shutdown. Once the system cools down again it can be restarted. The flow of air is assisted by an electric fan connected to one of the rear vents. It is controlled by an adjustable temperature switch set to 30ºC in the factory.

- Allow 600 mm spacing on both sides of the system.

With the help of a hand trolley, you can roll the system into place and secure it to the floor.

The BlackMax has four holes in the base to allow for securing. This can be done with dynabolts or material appropriate screws.



BlackMax Minimum Clearance According to AS/NZS 5139

Step 3. Solar Install

The PV Array should be designed and installed in accordance with AS/NZS 5033 and the latest CEC Installation guidelines. Caution should be taken in selecting PV panels and wiring method to ensure Open Circuit Voltage (V_{OC}) and Short Circuit Current (I_{SC}) is not exceeded.

Due to the transformerless inverter and potential for leakage between AC and DC the BlackMax and PV array MUST be earthed at all times while live and should be completely de-energised before being moved.

Ensure that the array is within the inverter specification and polarity of the array is correct.

PV modules must have an IEC61730 Class A rating

WARNING: The Solar DC Isolator on the BlackMax must be in the off position before any solar panels are connected

Installation

Step 4. Electrical connections

Before any electrical connections are made, check all internal connections are secure and have not come loose during transport.

Ensure that all breakers and isolators, as well as those supplying power to the unit, are turned OFF.

BlackMax is designed to be a plug and play unit. However, this limits the output to 15A (approximately 3kW). To unleash the full power of the BlackMax, it must be hardwired to a remote switchboard, which contains a MEN and earth stake. To do so, open up the unit as explained in "Opening the BlackMax", remove the clear cover on the AC side by undoing the 2 screws holding it in place. This allows access to the terminal blocks, GPO's, breakers, earth and neutral bars.

Earthing the Unit: The unit should be earthed to an appropriate earth stake. The earth cable can be connected to the earth bar (or terminal block) inside the unit.

MEN Link: There is a MEN link installed in the BlackMax. If an external switchboard contains a MEN link, then the one inside the BlackMax should be removed & the BlackMax hard wired to the main switchboard.

4.1. Solar

For ease installation, the BlackMax comes with its own PV isolation device and pre-terminated MC4 connectors on the inside of the unit.

To connect the solar power, insert the unterminated cables (coming from the PV array) into the system and then terminate the correct MC4's on the cables. With the BlackMax PV isolator still in the off position, connect the PV cables to the unit, check for correct polarity and V_{OC} on the isolator terminals.

When exposed to light, photovoltaic (PV) array supplies D.C. voltage to the PCE

Installing an PV array with voltage or current values above the inverter rating will damage the BlackMax unit and will void warranty.

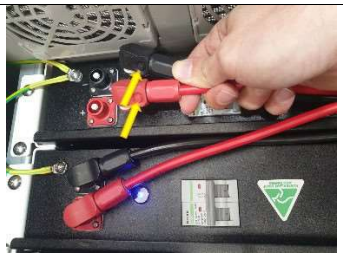
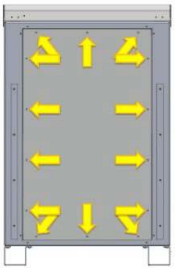
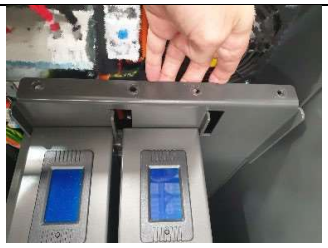
4.2. Battery

The batteries are shipped inside the unit and can be found in the rear section. For transportation or maintenance purpose, the batteries can be accessed from the top by lifting the lid or the rear by removing the back-plate.

Installation

Removing or Installing a TROPPO:

To remove or install a battery, you will need to follow these steps:

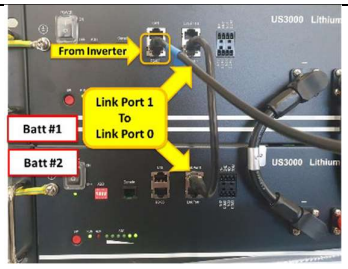
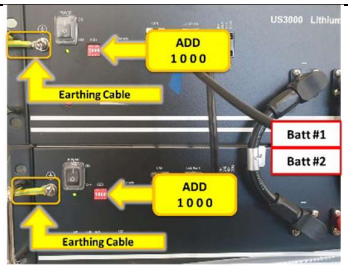
• Remove the battery cables by pressing the button on the side of the terminal and pull it straight up. *NOTE: When installing the battery cable, simply push it onto the terminal until you hear a click.*	
• Remove the bolt that holds the earth cable to the battery.	
• Remove the bolts the hold the back-plate in place.	
• Remove the battery locating plates.	
• Slide out one battery at a time. Be careful handling as each battery weighs 42 kilograms.	

ATTENTION: If the battery polarity is connected incorrectly, it will damage the BlackMax system.

Installation

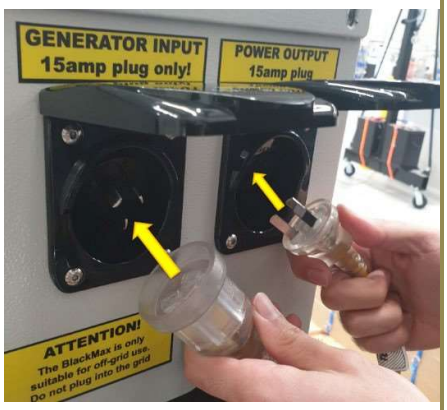
Removing or installing a US3000:

To remove or install a battery, you will need to follow these steps:

• Remove the battery cables by pressing the button on the side of the terminal and pull it straight up. *NOTE: When installing the battery cable, simply push it onto the terminal until you hear a click.*	
• Remove the CAT5 cables	
• Remove the bolt that holds the earth cable to the battery.	
• Remove the bolts the hold the lid down.	
• Lift out one battery at a time. Be careful handling as each battery weighs 32 kilograms.	
To install a battery, follow this process in reverse.	

Installation

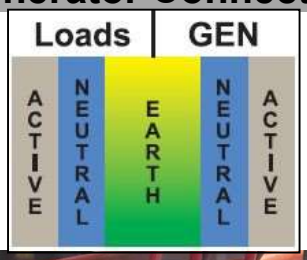
4.3. Load



Power to the loads is supplied via the external Power Point or by hardwired connection. If hardwiring, simply attach the Active, neutral and earth to the terminal's blocks labelled “Loads” on theinside of the unit. Alternatively, plug in a device to the GPO labelled Power Output.

Note that this output is limited to 15 Amps (approximately 3kW).

4.4. Generator Connection



Power to the BlackMax can be supplied via the external power inlet or hardwire connection.

If connecting the generator via power inlet, simply attach the device to the power inlet labelled “GENERATOR INPUT”.

NOTE: *A 15A rated cable must be used for this input.*

The following specifications must also be met for a guaranteed compatibility with the inverter.

- Generator waveform THD: < 10%.
- Generator Vrms range: 180 ~ 264Vac
- Generator voltage crest factor (Vpeak/Vrms): < 1.6
- Generator peak voltage: <380V
- Frequency range: 45Hz ~ 55Hz
- Frequency slew rate: <0.3Hz/sec

To hardwire the generator, the leads from the Gen inlet must be removed from the terminal block and terminated. Then secure the active neutral and earth to the terminal blocks.

NOTE: *If the system is hardwired, there are stickers in the parts kit to be placed on the power inlet lead as well as the power inlet.*

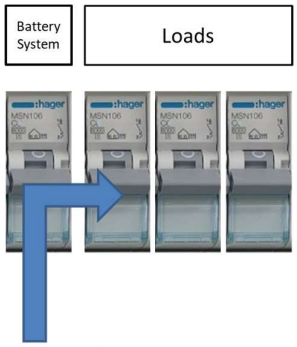
4.5. Generator Auto-Start

BlackMax contains three terminals (NO, C and NC) on the bottom of the display. These terminals are connected to a dry contact that can be programmed to automatically start a generator, or it can be used to activate a signal light indicating that the manual start generator is required. To learn how to configure this relay, please refer to the SurePower Manual

Tip: When using an AutoStart generator, install a small battery charger on the generators battery so it does not discharge over time.

Installation

4.6. MSB



If the BlackMax is hardwired into a Switchboard, RedEarth recommendsit to be connected to an appropriately rated circuit breaker on the far left-hand side as shown below.

Note: this Switchboard must contain all necessary stickers and traffolytes i.e. PV and ES. These can be found in the Parts Kit Box.

Note: If required, Sunrise is compatible with RCD type A and must be triggered at a current of 300mA or higher

Step 5. Monitoring

There are currently two ways to install monitoring/communication.

- Display
- Remote Monitoring (Optional)

The first option does not require any installation as the display is already installed on the lid of the unit. However, there is the option of relocating the display within 20 meters of the unit. In this case, installation of a longer CAT5 cable is required (CAT5 cable not supplied).

The remote monitoring option uses a RedEarth hardware. Apart from positioning the antenna in a good 4G reception area, this also does not require installation as it is done and tested in factory.

If purchased from factory, the BlackMax will come with a weatherproof gland in the parts kit box.

The antenna must pass through it and then the gland must be tightened on the unit.

The ideal positioning of the antenna is on top of the unit or somewhere with good mobile reception. Once this is done as well as the start-up procedure, call RedEarth – Tech Support to confirm its operation.

Installer login is available in addition to customer logins. Contact Tech support for information.

NOTE: This option must be requested as it is not part of the standard BlackMax

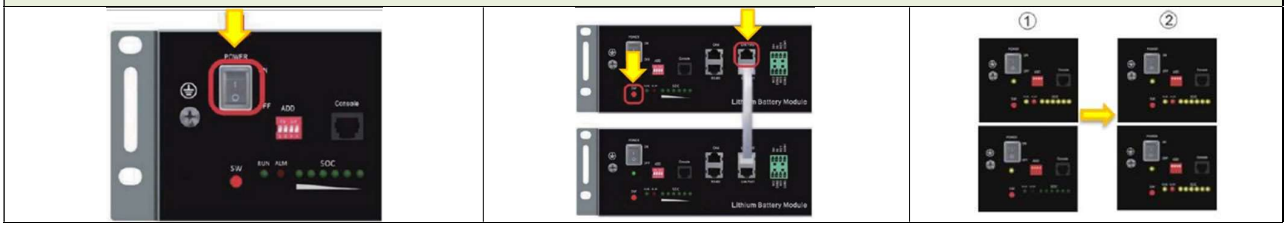
Installation

Step 6. Turn ON (Pylontech)

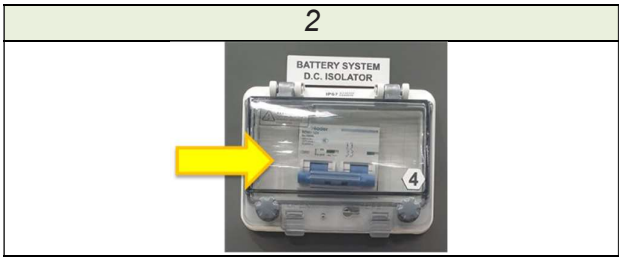
To **turn on** the unit you must follow the steps below:

1 Under the lid, switch ON the batteries and press the SW button on the master battery The LED on each battery will come on.
2 Switch ON the BATTERY SYSTEM D.C. ISOLATOR (#4), found on the RHS of the unit;
3 Switch ON the SOLAR D.C. ISOLATOR (#3), found on the RHS of the unit;
4 Turn ON all AC circuit breakers (#2), found on the LHS of the unit;
5 Press the “On/Off” button (#1) on the display, found on the lid of the unit;

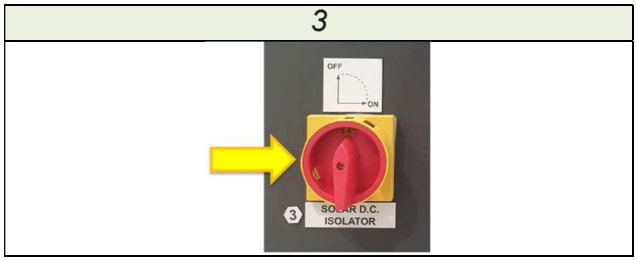
1



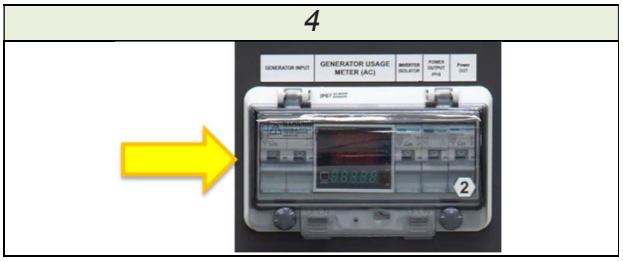
2



3



4



5

Powering ON Batteries

A. Switch on all the battery modules:
B. The one with **empty Link Port 0** is the **Master Battery** Module, other is a slave
C. Press the **red button** of **master battery** to power on, all the battery LED light will be on one by one from the Master battery

NOTE: *For more information on this battery, see Manual – US3000 on RedEarth download page.*
Use the table below to check correct operation of the battery.

Installation

Turn ON (Troppo)

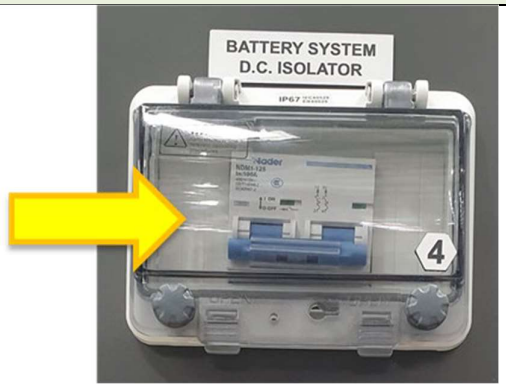
To **turn on** the unit you must follow the steps below:

1 Under the lid, switch ON the battery breakers on the top of each Troppo battery. The LED on each battery will come on.
2 Switch ON the BATTERY SYSTEM D.C. ISOLATOR (#4), found on the RHS of the unit;
3 Switch ON the SOLAR D.C. ISOLATOR (#3), found on the RHS of the unit;
4 Turn ON all AC circuit breakers (#2), found on the LHS of the unit;
5 Press the “On/Off” button (#1) on the display, found on the lid of the unit;

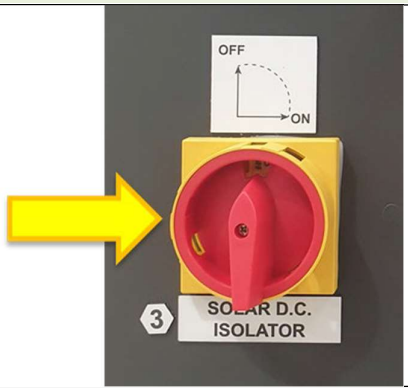
NOTE: *The numbers on the equipment are in descending order. The ascending sequence is the Shutdown procedure.*

1

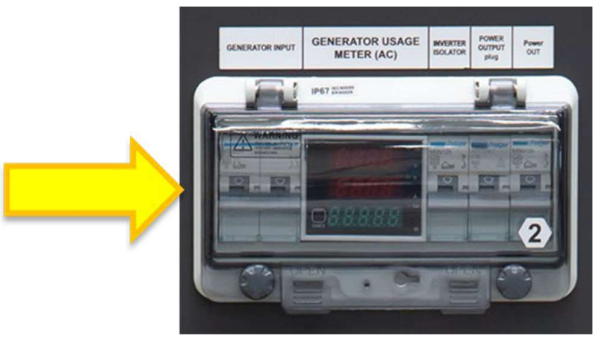
2



3



4

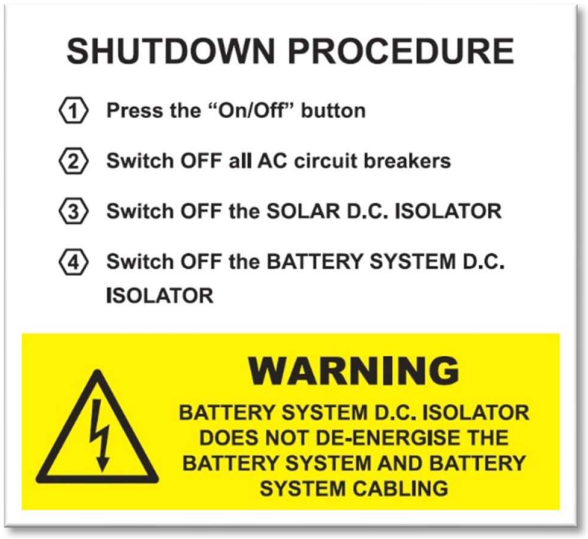


Installation

Step 7. Shutdown

The **shutdown procedure** is the reverse of the "turn on" procedure and is shown below. This procedure can be found on the unit.

1 Press the "On/Off" button (#1) on the display, found on the lid of the unit;
2 Turn OFF all AC circuit breakers (#2), found on the LHS of the unit;
3 Switch OFF the SOLAR D.C. ISOLATOR (#3), found on the RHS of the unit;
4 Switch on the BATTERY SYSTEM D.C. ISOLATOR (#4), found on the RHS of the unit;



The battery breaker on top of each battery does not have to be turned off if the BATTERY SYSTEM D.C.ISOLATOR is already off. However, we do recommend turning them off for long term storage (up to 6 months).

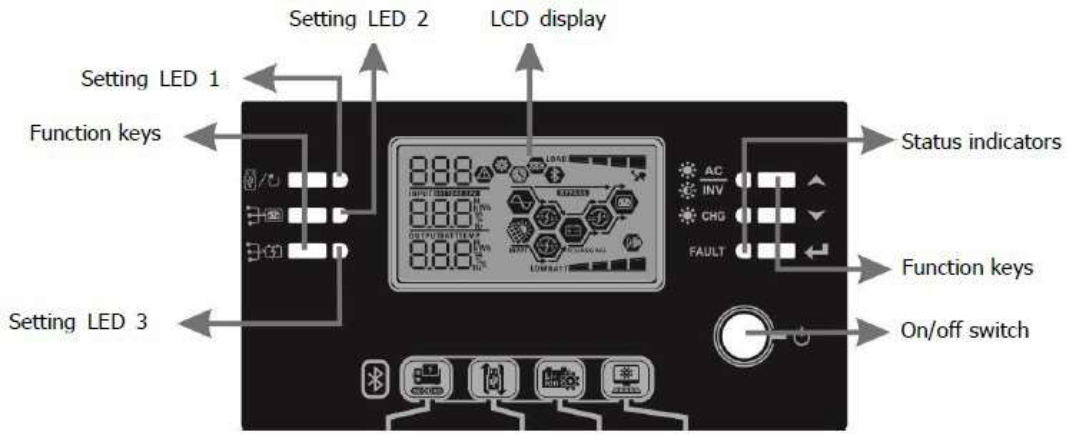
After 6 months the system should be restarted to recharge the batteries (e.g. via the generator).

Installation

Step 8. Commissioning

The BlackMax is commissioned and tested in RedEarth's factory to guarantee correct operation of the system as ordered. However, last-minute parameter adjustments may be required (eg. generator size/ charging rate or increasing energy storage). Carefully follow the procedure in the SurePower Quick Start Guide on how to make these alterations without compromising the existing configuration.

***NOTE**: This must be done by a qualified person.*



Indicators

LED Indicator		Color	Solid/Flashing	Messages
Setting LED 1		Green	Solid On	Output powered by utility
Setting LED 2		Green	Solid On	Output powered by PV
Setting LED 3		Green	Solid On	Output powered by battery
Status indicators	**AC / INV**	Green	Solid On	Output is available in line mode
			Flashing	Output is powered by battery in battery mode
	CHG	Green	Solid On	Battery is fully charged
			Flashing	Battery is charging.
	FAULT	Red	Solid On	Fault mode
			Flashing	Warning mode

The original SurePower, display and battery manuals are included in the system. These may need to be referred to for additional details required during setup and programming.

Fan Control Adjustment:

The thermostat is located inside the unit next to the GPO's. This automatically starts the fans once the temperature rises above the set-point. This set-point can easily be adjusted with a small screwdriver. It is set to 30º Celsius in the factory.

Installation

Step 9. Monitoring and Communication

OPTION 1- On the Display:

The SurePower display in the lid is designed to be as user-friendly as possible. With icons representing various stages of the power and arrows to indicate the direction of power flow. Below you will find a few pictures illustrating some of the most common situations. A detailed explanation of the display icons can be found in theeco SurePower Quick Start Guide included with your system.

Day Time – Solar power charging battery and powering the loads	Day Time – Solar power helping the battery to power the loads
	

Night Time – Battery powering the loads	Night Time – Generator powering the loads and charging battery
	

Installation

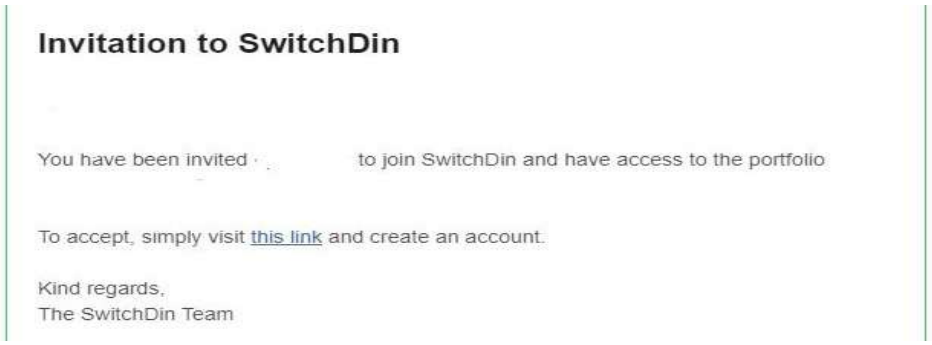
OPTION 2 – Remote monitoring via RedEarth's Portal

The BlackMax can be monitored online through the SwitchDin platform. If this option is available, contact RedEarth Tech Support and request a Installer and User login.

Registering

1. If you haven't already received this email from us, please email support@redearth.atlassian.net with the following information:
    1. full name, address, unit's serial number with subject: Setup online monitoring

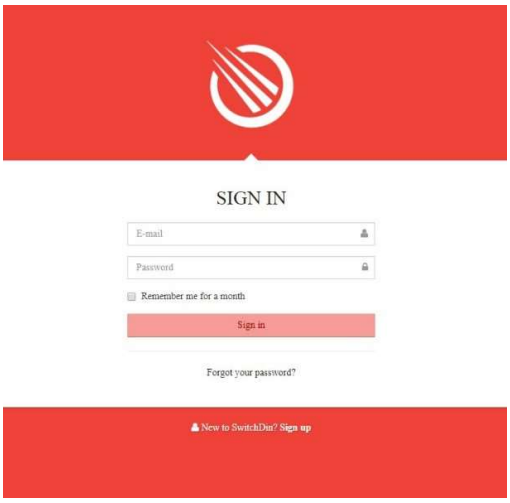
1. During testing and commissioning, RedEarth will setup an account for the end user and send out the following invitation.
2. Click on the link to create an account.



3. In a web browser, visit https://app.switchdin.com/accounts/sign-in?profile=redearth and log in to view your system.

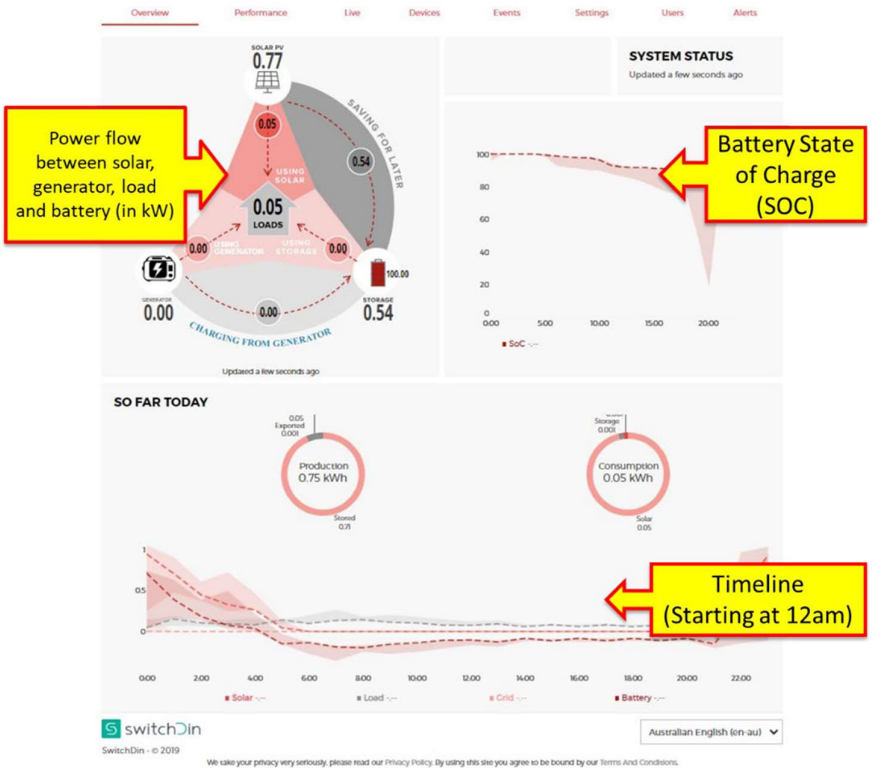
Monitoring

Once signed in, you will see the following page.



Installation

Overview Tab



In this example the solar PV is producing 0.77kW of power, there is 0.05kW of load and solar PV is charging the battery with 0.54kW. The battery is providing 0kW to the loads.

Performance Tab

The performance tab can be customised to see several historical data about the system.

Installation

Step 10. Finalising and Handover

Before handing over the system, go through the following items and be sure that they have been completed.

- Check screws holding the lid down are in place. Pull on the vents and fans to check that they are properly attached and will not come loose.
- If the loads have been hardwired in, check for proper weatherproof seal on the exit gland from the BlackMax.
- If the Generator has been hardwired in, check for proper weatherproof seal on the entrance gland from the BlackMax.
- Check for proper weatherproof seal on the PV entrance gland from the BlackMax.
- Check that the system is correctly earthed, either via the customer's local earth or through a locally installed earth stake.
- A MEN link is installed as required.
- The PV cables have the correct polarity and are correctly connected to the MC4s provided.
- The battery terminal connections are tight. (Check after transportation)
- Attend to any last-minute commissioning details (See Commissioning in this manual).
- Explain to the customer how the system operates and how to operate it (see user manual)
- Provide all Manuals, documents, and spare parts to the customer.
- The system is now ready for Start-up.

Services and options available for your BlackMax

RedEarth can provide several options for the BlackMax that will help you optimize power consumption and monitoring benefits.

- Membership of the RedEarth Customer Community
- Additional batteries for system expansion
- Remote and ongoing monitoring option
- Miscellaneous spare parts (including indicator lights for Generator start)
- BlackMax Power Kit: PV panels, racking and pre-terminated PV cables
- Generator with 2-wire auto start
- Generator backup kit (for on-grid applications)

RedEarth's Monitoring and Customer Community Monitoring

Visit us in Brisbane

SunRise
RESIDENTIAL ON-GRID HOMES

BlackMax
SHEDS, WEEKENDERS & HOMES

S Series
REMOTE HOMES & SMALL ENTERPRISES

DropBear
LARGE REMOTE HOMES & SMALL TO LARGE ENTERPRISES

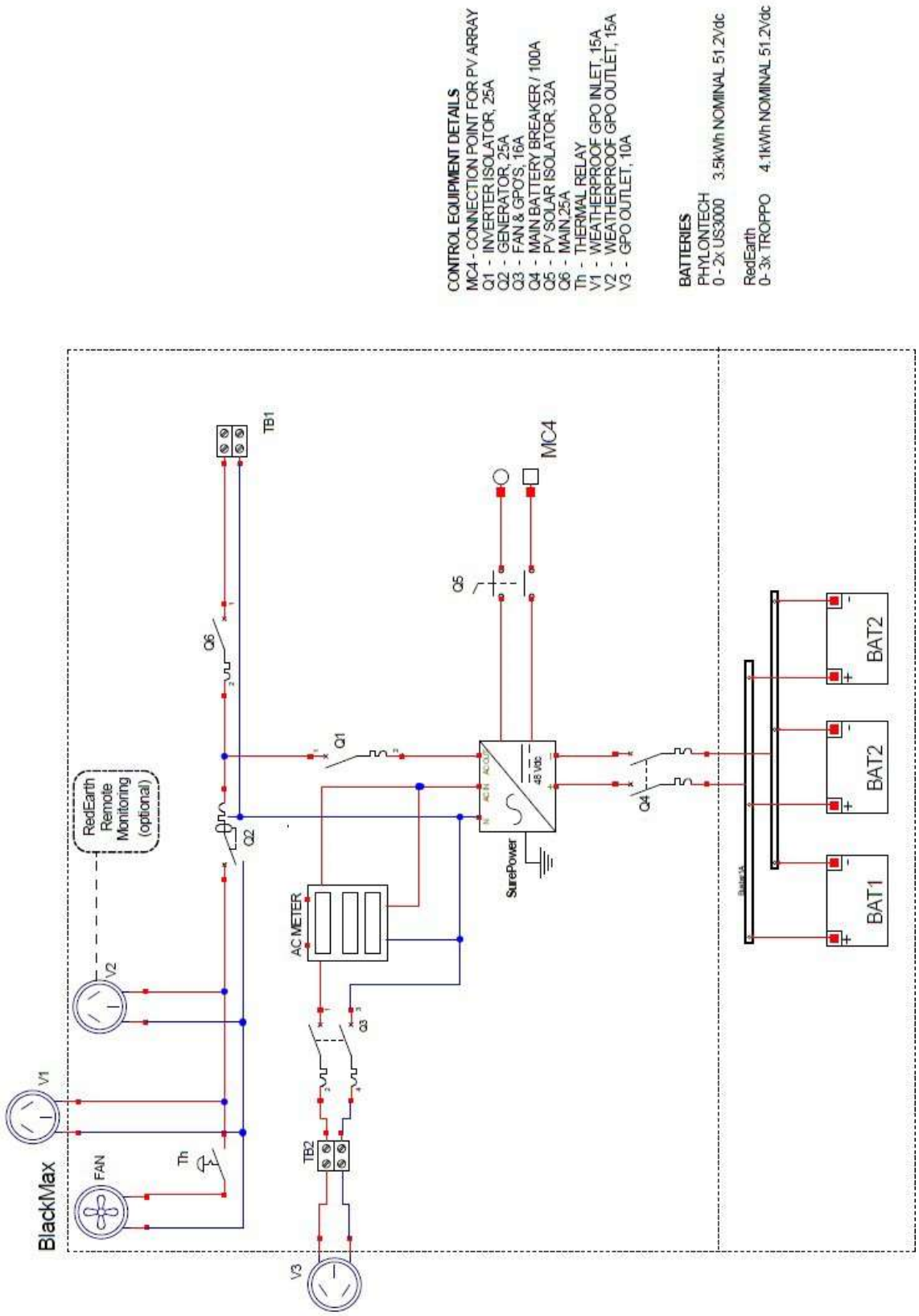
BushPig
OFF-GRID FOR REMOTE STATIONS, INDUSTRIAL PROPERTIES & LARGE RESIDENTIAL

1800 733 637
sales@redearth.energy
redearth.energy

RedEarth
ENERGY STORAGE

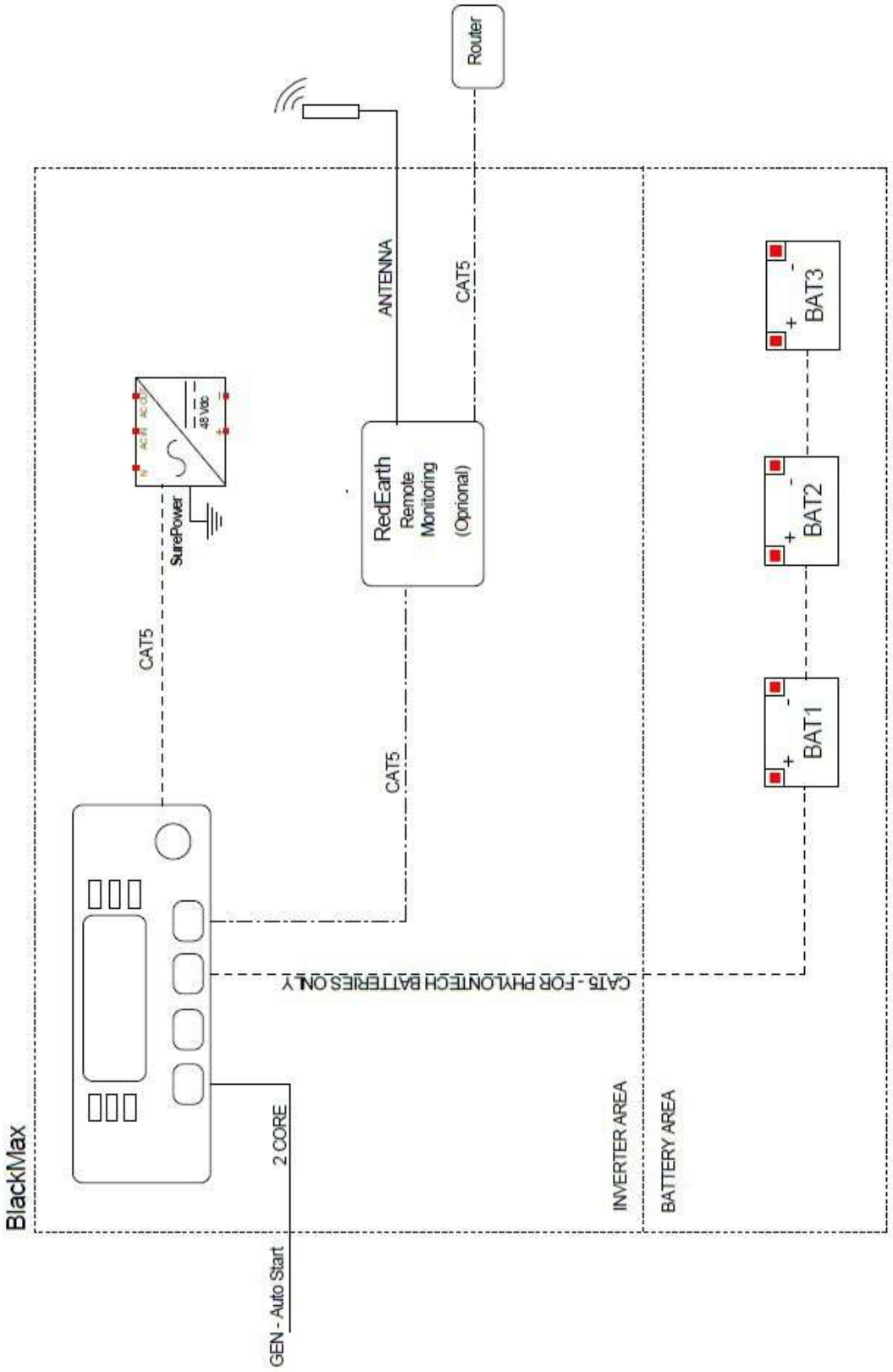
Appendix A

Single Line Diagram - Power



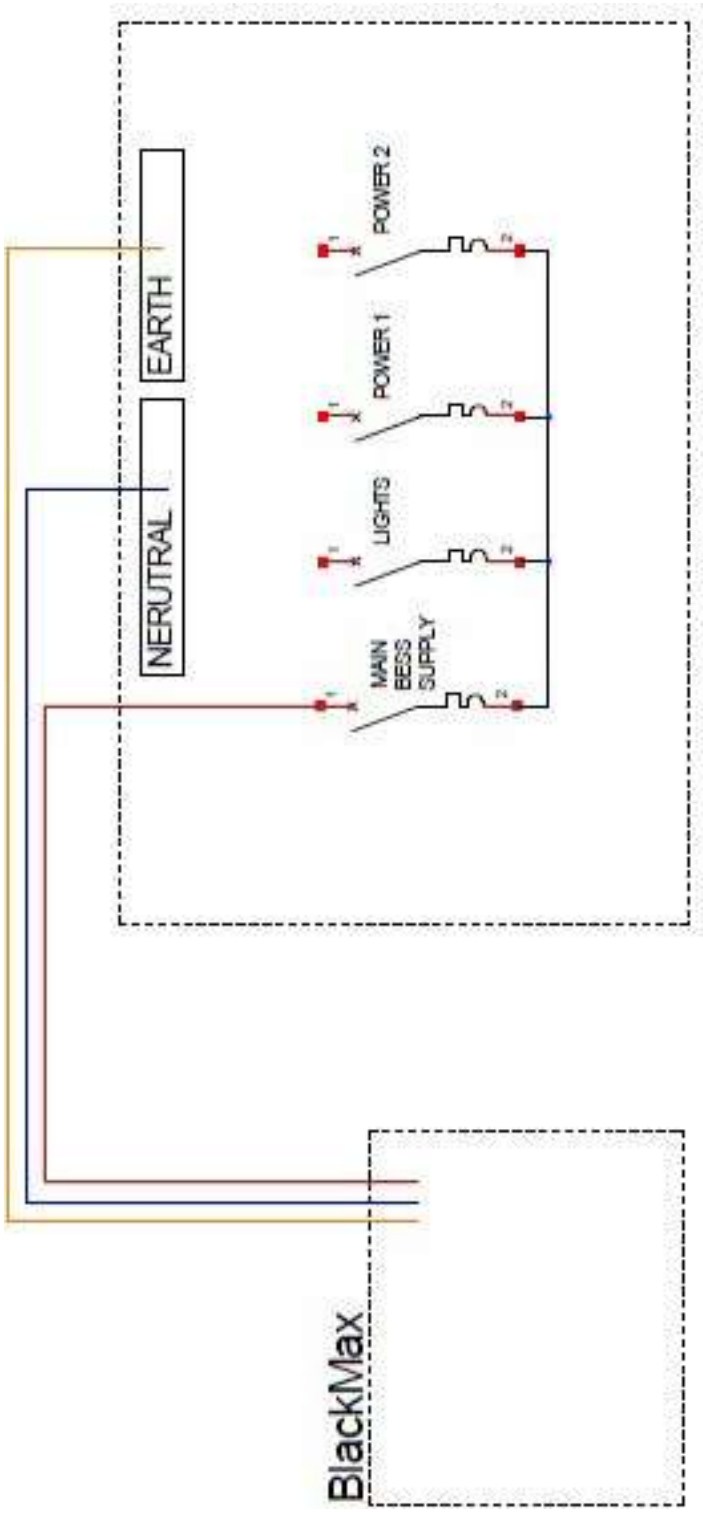
Appendix A

Single Line Diagram - Communications



Appendix A

Single Line Diagram – Generic Main Switchboard



Appendix B

Technical Specifications – BlackMax

PV Input	
MPP Voltage Range	120V_{DC} – 450V_{DC}
Max. Input Voltage (V_{OC})	500V_{DC}
Max. Input Current	18A_{DC}
Short Circuit Current (I_{SC})	22.5A_{DC}
Battery	
Battery type	Lithium-Ion Phosphate
Nominal Energy Capacity	4.1kWh per Troppo (4.1 / 8.2 / 12.3) 3.5kWh per US3000 (3.5 / 7.1)
AC Input and Output	
Rated AC Voltage	230V
Rated AC Frequency	50Hz
Max.Continuous Output Power	3600 W
Max.Continuous Output Current	15.6 A_{AC}
Peak Output Power	5000 W
Peak Output Current	21.7 A_{AC}
Max.Continuous Input Power	4600 W
Max.Continuous Input Current	20 A_{AC}
Power Factor	1.0

Safety Class/Enclosure	Class I – IP 44
Topology (Solar/Battery)	Transformerless Non-isolated / Transformerless Non-isolated
Pollution degree (PD)	2
Ambient Temperature	-25ºC … +40ºC
Maximum Altitude	1500m
Overvoltage Category	III (GENERATOR), II (PV)(BATTERY)
Decisive Voltage Class	DVC-C

Appendix B

Technical Specifications – SurePower 5000

Parameters	
Type	Single-phase transformerless solar charge controller and inverter/charger
Nominal DC Input Voltage	48VDC
Maximum Continuous Power Rating	5000W (pf of 1.0)
Surge Maximum Power Rating (at 5 sec)	10000VA
Nominal Output	230VAC ± 5% 50/60Hz (auto-sensing)
Electrical—Solar	
Charger Technology	MPPT
PV Charge Controller Rating	5000W
Battery Input Range	46 to 63VDC
Absolute Maximum VOC	450VOC @ 25°C 500VOC @ Minimum temperature
MPPT Voltage Limit	120 to 450VDC
Panel High Voltage Cut-Off	>450VDC
Recommended PV Panel	72 & 60 cells
Recommended PV Panel Configuration	6 to 10 panels per string and up to 2 strings in parallel
Maximum Battery Charging Current	80ADC
MPPT Tracking Efficiency	>99.5%
Charging Modes	Four modes (bulk/absorption/float/equalization)
Battery Type Selection	Default flooded or sealed maintenance-free (VRLA/GEL/AGM); Lithium-ion battery ready
Battery High Cut-Off	>63VDC
Maximum PV Current	**18A**
Short-circuit current	**22.5A**
Electrical—AC Source	
Input Voltage Range	170 to 280VAC
Input Frequency Range	40 to 65Hz
Frequency (Nominal)	50/60Hz Auto-sensing
Battery Charging Current @ Nominal AC Input	60ADC
Transfer Time (AC Source to Inverter)	<15ms for electronic loads and <20ms for heavy loads
Electrical—Inverter	
Output Voltage Regulation	230VAC
Frequency	60 ± 0.5Hz Auto-sensing
Output Wave Form	Pure sinewave
Load Regulation	±2%
Peak Efficiency	93%
THD (Linear Load)	<5% and <10% non-linear load at Vbat >50VDC
Electrical—PCU	
Mode of Operation	Solar/AC/Battery, Solar/Battery/AC, AC/Solar/Battery, Solar Only, UPS, Bypass
Self Consumption	<50 W
Mechanical	
Dimensions L × W × D (mm/in)	400 × 300 × 115 4.5 × 11.8 × 17.3
Net Weight (kg/lb)	10/22
Communications Interface	USB / RS232 / RS485 / Dry Contact
Environmental	
Operating Temperature	–10° to +50°C
Relative Humidity Range (Non-Condensing)	5% to 95%
Storage Temperature	–15° to +60°C
Altitude	1,500m above sea level
Operating Environment	Indoor/protected. IP21.

Appendix B

Technical Specifications – RedEarth – TROPPO

Electrical Characteristics			
Nominal Capacity	4.1kWh / 79.8Ah	Recommended Operating Voltage Range	48.0 - 57.6 V_{DC}
Useable Capacity	3.28kWh @ 80%	Charge / Discharge Cycles of certified 3,800mAh cells at 1C rate (to 80% Residual Capacity)	2,000@100% DoD / 4,000@80% DoD / 7,000@50% DoD @ 25°C operating temp.
Nominal DC Voltage	51.2V	Projected MWh delived over battery lifetime	10.2 mWh at 80% DoD
Maximum Discharge Current	63A (Limited by circuit breaker)	Round Trip Efficiency	>96%
Lifetime Continuous Discharge Current	40A (C2)	Parallel connection	from 4.1kWh to 100kWh+
Maximum Charge Current	63A (Limited by circuit breaker)	Series connection	Not designed for series connection
Lifetime Continuous Charge Current	16A*	Expected calendar Life @25°C	>10 years when used as per warranty terms
Maximum Power on Discharge (kW)	approx. 3kW		
Environmental Characteristics			
Operating Temperature Range - Discharging	Discharge: -20°C to 60°C (+/-5°C)	Cooling	Natural convection
Operating Temperature Range - Charging	Charge: 0°C to 50°C (+/-5°C)		
Physical Characteristics			
Battery Mounting Options	Standard 19" Rack + Horizontal, Vertical or on either side	Battery Dimensions	725mm D x 438mm W x 88mm H
Battery Terminal Connections	Amphenol Surlok 100A non-keyed	Battery Weight	42.5kg
Battery Circuit Breaker	2-Pole 63A 360VDC (Z-curve)	IP Rating	IP20
Safety Parameters and Certification			
Short-circuit current	400A per battery in prallel	Certification - TROPPO 4841 Battery	IEC62619:2017 & AS/NZS 60950.1:2015
Lithium Composition	Lithium Ferro Phosphate (LiFePO4 or LFP)	Certification - LiFePO4 3,800mAh Cell	IECL62619:2017 & UN38.3
Battery Management System (BMS) Protection Settings			
Battery type and number of cells in series	LiFePO4 (16S)	High temperature - discharge protection	60±5°C
BMS Over-Volt cut off	58.4VDC	High temperature - charge protection	50±5°C
BMS Under-Volt cut off	40V	Low temperature - discharge protection	-20±5°C
Charging over-current protection	78±8A	Low temperature - charge protection	Activated below 0°C
Discharge over-current protection (2 levels)	250±60A(20-400mS) & 400±100A(10-100mS)	Cell balancing method	Passive equalisation at 57.6V_{DC}
Inverter capacitors - starting capability	14,600uF		

*Recommended average charging amps per battery over the warranty period.

Short-circuit Current (I_{SC})	
1x	0.4 kA
2x	0.8 kA
3x	1.2 kA

UN Number	
ES UN: 3481	3481

Appendix B

Technical Specifications – Pylontech – US3000

Basic Parameters	US3000
Nominal Voltage（V）	48
Nominal Capacity (Wh)	3552
Usable Capacity (Wh)	3200
Dimension（mm）	442*420*132
Weight（Kg）	32
Discharge Voltage（V）	45~53.5
Charge Voltage（V）	52.5~53.5
Charge / Discharge Current（A）	37 (Recommend)
	74 (Max)
	100 (Peak@15s)
Communication Port	RS485，CAN
Single string quantity(pcs)	8
Working Temperature/℃	0~50
Shelf Temperature/℃	-20~60
Humidity	5%~85%
Altitude (m)	<2000
Design life	15+ Years（25℃/77℉）
Cycle Life	>6000, 25℃
Authentication Level	IEC62619/CE /UN38.3

Short-circuit Current (I_{SC})	
1x	0.4 kA
2x	0.8 kA

UN Number	
ES UN: 3481	3481