SUN ⮂ SYNK

HYBRID PARITY (SUPER) INVERTER

COMMISSIONING & PROGRAMMING

INDEX

1. INTRODUCTION

This manual explains the steps you need to go through in order to connect a generator to a Sunsynk Hybrid Inverter. All the procedures described in this manual should be followed carefully. If you have questions or concerns about the operation and maintenance of this product, please contact our customer support.

All persons engaged in the installation, set-up, operation, maintenance and repair of the machines described in this manual should have read and understood the instructions including the highlighted safety instructions. Sub-standard performance, reduced working life, property -damage and personal injury may result from failing to follow these instructions.

2. SAFETY

- This manual covers several electrical devices that manage potentially high voltages. All activities (installation, maintenance and operation) should follow this instruction manual as well as relevant local, regional and national regulations. All persons engaged in installation, maintenance and operation of the electrical devices described in this manual, must have read and understood the manual. Please ensure this manual is included with these devices should they be passed or sold to a 3rd party.

- DO NOT allow minors, untrained persons, or persons suffering from physical or mental
  impairment that would affect their ability to follow and understand the contents of this manual to install, maintain or operate the devices described within.

- Any untrained persons who might get near the devices described in this manual while they are in operation MUST be informed that they are dangerous and instructed on how to avoid injury while they are in operation.

2.1. Symbols

⚠ **WARNING**	This symbol indicates information that if ignored, could result in personal injury or even death due to incorrect handling.
⚠ **CAUTION**	This symbol indicates information that if ignored, could result in personal injury or physical damage due to incorrect handling.
NOTICE	Indicates information that is considered important, but not hazard-related.

2.2. Safety Instructions

⚠ **WARNING**

HIGH LIFE RISK DUE TO FIRE OR ELECTROCUTION.
The Sunsynk Three-Phase Hybrid Inverter can only be installed by a qualified licensed electrical contractor. This is not a DIY product.

3. COMMISSIONING

3.1. Connecting the Batteries

When connecting a Lithium battery, follow the connection steps below and check 'Setting up a Lithium Battery' to connect with an inverter.

1) Connect the correct diameter of cable in accordance with the battery manufacture specifications along with recommended safety devices.

2) Connect a communication cable from the batteries to the inverter in compliance with the battery manufacturer guidelines. The cables have two ends, one to be specifically connected to the BMS and another to be connected to the inverter, do not connect them incorrectly.

3) Connect the power and communication cables to the inverter correctly.
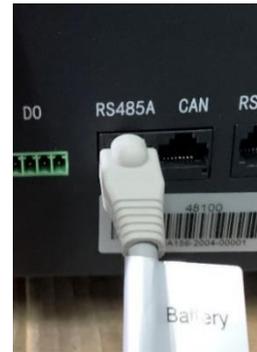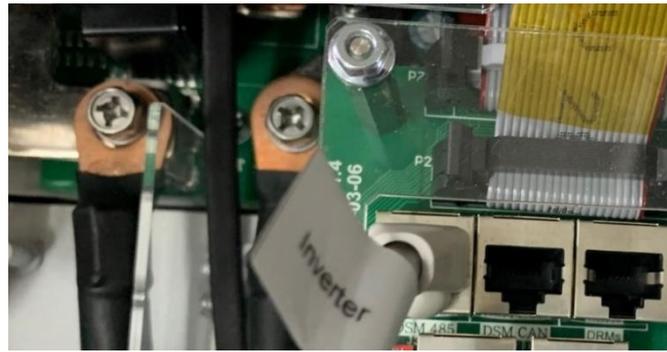
NOTICE
When connecting more than one battery, ensure they are set in the configuration of 'master and slave'.

For safe operation and compliance, an individual DC overcurrent protector or disconnection device is required for the connection of the battery and the inverter. Users are recommended to utilise a suitable fuse and DC isolator. In some applications, switching devices may not be required, but overcurrent protectors must be used.

3.2. Connecting the PV

The 3.6kW and 5.5kW Inverters are fitted with only one MPPT Controller with a maximum current of 9Amps.

Single String
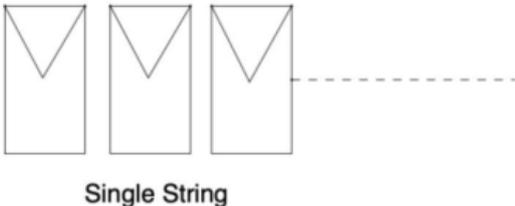
The 8.8kW Inverter has two built-in MPPT controllers (MPPT1 and MPPT2).That means two individual arrays can be connected to each MPPT for better performance. The maximum current of the array and connected to each MPPT is 18Amps.

Two Strings in
Parallel per MPPT
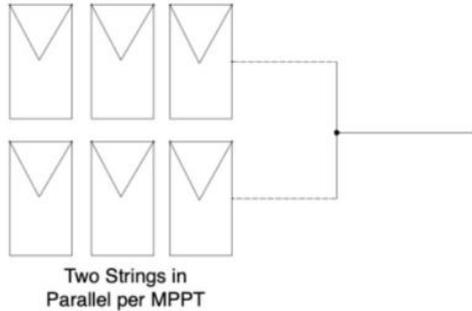
Before connecting to PV panels, install a separate DC circuit breaker between the inverter and PV modules. In addition, we request users install PV junction box with surge protection to protect the system from lightning strike.

To avoid any malfunction, do not connect any PV modules with possible current leakage to the inverter. For example, grounded PV modules will cause current leakage to the inverter.

8.8 kW PV Connection
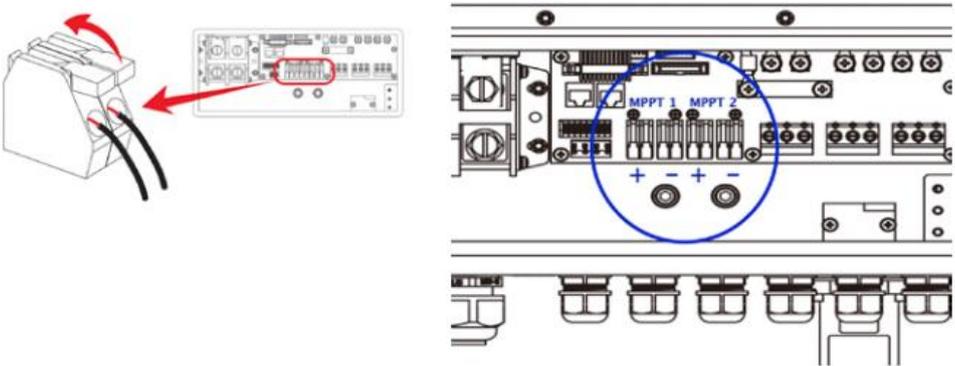
5.5kW PV panels are connected via the MC4 connectors located at the bottom of the inverter
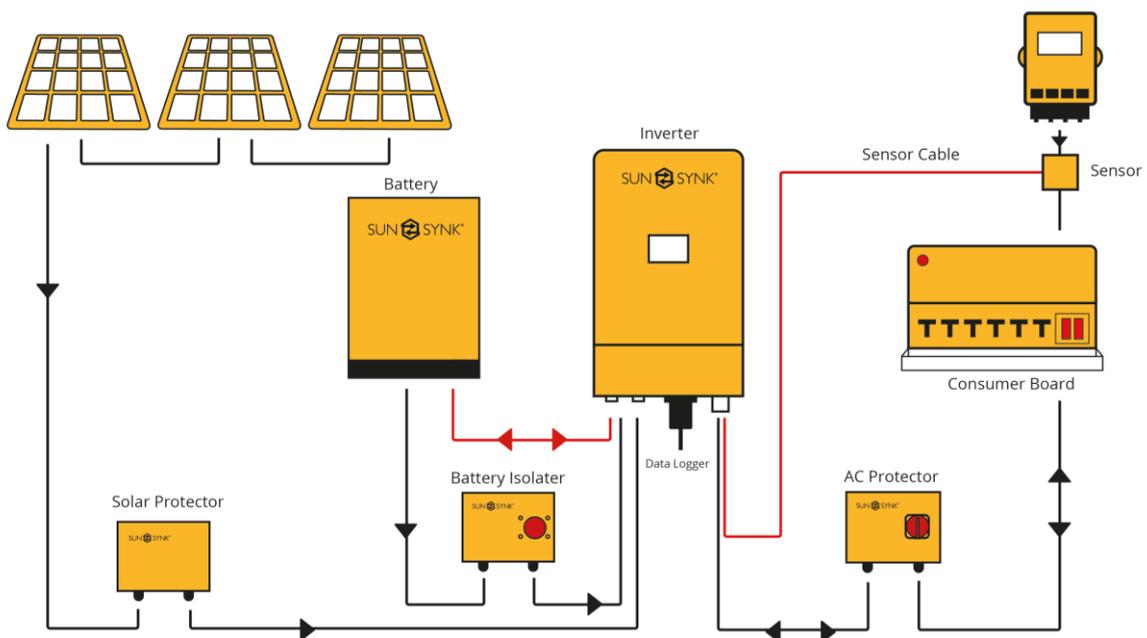
> ⚠️ **WARNING**
>
> **Ensure you have used appropriate safety devices in accordance with local wiring regulations.**

3.3. Power Up

1) Switch on the inverter by pressing the green start button.

2) Switch on the Battery Isolator.

3) Switch on the Solar Isolator if solar is used.

4) The system should now start running.

> ⚠️ **WARNING**
>
> **The start-up should be performed by a qualified engineer since there is a high risk of electruction while the covers are off.**

3.4. Setting Up a Lithium Battery

The first step to take after the system powers-up is to check that the lithium battery is communicating correctly with the inverter. If it is not communicating with the inverter, you need to set-up the battery via the Battery Setup screen before continuing with the installation process.

1) On the Home page, press the gear icon on the top-right corner.
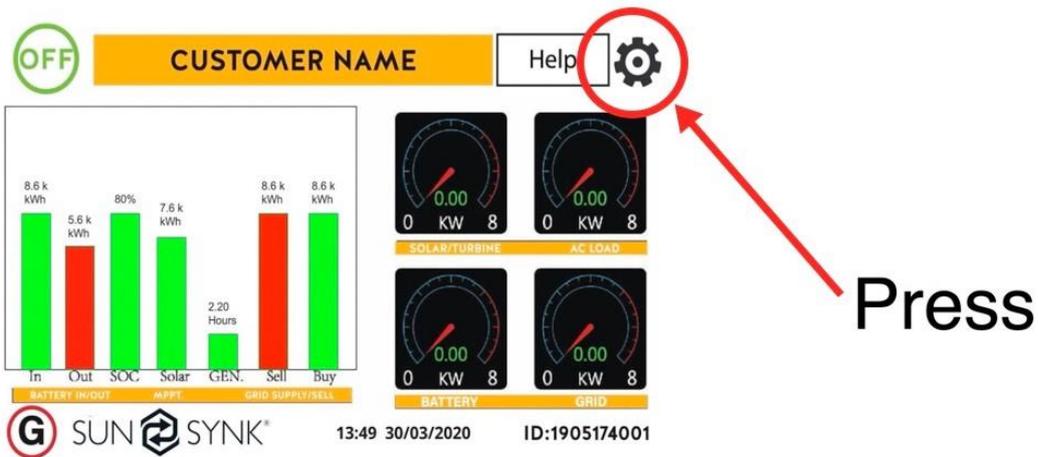
2) Click on the Battery icon.
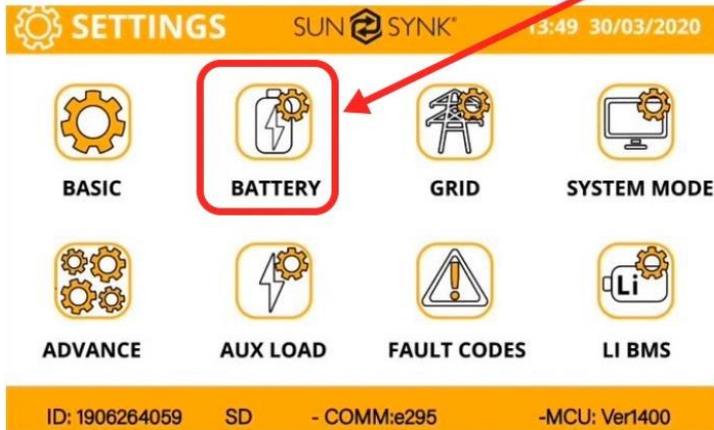
3) On the Battery Setup screen:
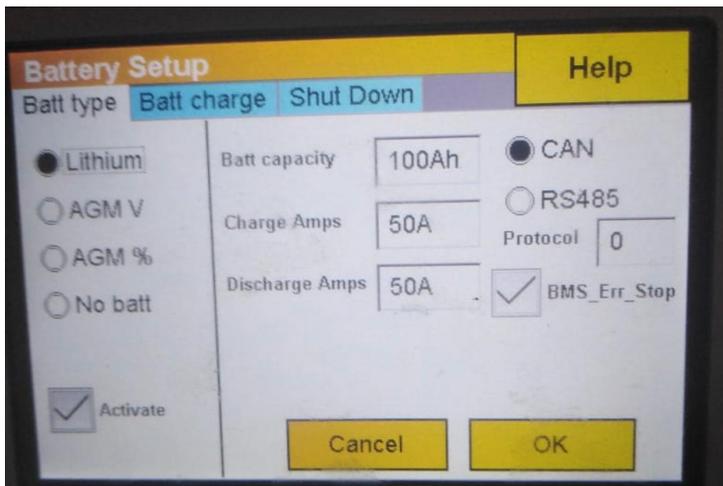
a) Select 'Lithium';

b) Select the communication protocol specified by the manufacturer guide or select from the list below;

c) Press 'OK'.

Brand	Model	48V Storage Inverter	RS485 or CAN	Inverter Setup	Notes
PYLON	US2000	✓	CAN	0	
			RS485	5	
	US20000-PLUS	✓	CAN	0	
			RS485	5	
DYNESS	B4850	✓	CAN	0	
	B48100	✓	CAN	0	Short Lione 6&7 at inverter side
	POWERBOX F	✓	CAN	0	
	POWERBOX 9.6	✓	CAN	0	
SolarMD	SS4037	✓	CAN		To be used with V2 Logger http://solarmd.co.za/inverter-compatibility-solarmd/sunsynk-and-solar-md/
	SS4074	✓	CAN		
	SS202	✓	CAN		
Freedomwon	Freedom Lite Commercial 52V and LV Models	✓	CAN		www.freedomwon.co.za/storage/2019/09/freedom-lite-commercial-installation-manual-rev-2-september-2019.pdf
SHOTO			No		Voltage Base Charge settings must be used.
HUBBLE			No		Voltage Base Charge settings must be used.
CCGX	48Vxxxx	✓	CAN	0	Need confirm CAN_H CAN_L
SACRED SUN	48Vxxxx	✓	RS485	1	Cut Line 3, 6, 8
SOLAX	48Vxxxx	✓	CAN	0	
KOK	48Vxxxx	✓	RS485	2	
UZ ENERGY	UZ-EB51.2-100-A11	✓	CAN	0	
Topakpower	48Vxxxx	✓	RS485	4	
Hai Ying	HY48050	✓	CAN	0	
Re-Power	LS4850	✓	CAN	0	
Herewin Technology	HY48050	✓	CAN	0	
GenixGreen		✓	RS485	6	
Sunwoda	H4850M	✓	RS485	7	
X-ratong	48Vxxxx	✓	RS485	8	

Enershare Technology	BMS48150	✓	RS485	9	
PYLON 3.0		✓	RS485	12	
Murata		✓	RS485	11	
GS10000		✓	RS485	3	
BPE		✓	CAN	0	
ABOET		✓	CAN	0	
VISION Group		✓	CAN	13	
Alpha Ess		✓	CAN	0	
Backbone	B-LFP51.2V 100Ah and B-LFP51.2V 125Ah	✓	CAN	0	• Float voltage 54.5V • Absorption V 55.00V • Disable equalisation 0 Days • Shutdown 20% • Low Batt 35% • Restart 50%
GSL ENERGY	48Vxxxx	✓	CAN	0	
GBS	GBS	✓	CAN	0	
Wattsonic		✓	CAN	14	
jihonghui		✓	CAN	0	
KODAK		✓	CAN	0	
Anchitech		✓	CAN RS485	0/12	
TOPBAND		✓	CAN	0	
Oliter		✓	CAN	0	
Fox ess	LD-18100P	✓	RS485	1	
Woo-power		✓	RS485	12	
Shoto		✓	CAN	0	
SYL		✓	CAN	00	
Weco		✓	CAN	00	
DOWELL	IPACK C3.3 IPACK C6.5 IPACK C10	✓	CAN	0	
Batterich/ Greenrich	Up3686	✓	CAN	00	
Giter	G2500-48V G5040-48V	✓	CAN	0	
CF Energy	GFE2400 CFE5100 CFE5100S	✓	CAN	0	
Hubble	AM-2 5.5KW	✓	CAN	00	

4) Go back to the Settings page and click on 'LI BMS':

5) You should see a screen with the LI BMS information, like the figure below:

If some information is not displayed correctly on the screen a communication error has occurred and the following remedial steps should be taken:

a) Check your data cable is the correct type.

b) Check the cables are plugged into the correct sockets. Usually, RS485 connection is employed. However, some battery manufacturers use other types.

NOTICE

With some types of lithium batteries, the BMS cannot be controlled by the Sunsynk Inverter. In these cases, treat the battery as a Lead-Acid type and set the charging and discharging protocol by following the battery manufacturer specification

3.5. Software Update

Check if you need to update the software running the inverter. For this manual, the appropriate updates are:

MCU 2159 - 3.6K
MCU 3160 - 5.5K
MCU 3878 - 8.8K

UI Version E417

The software version is shown on the navigation page:
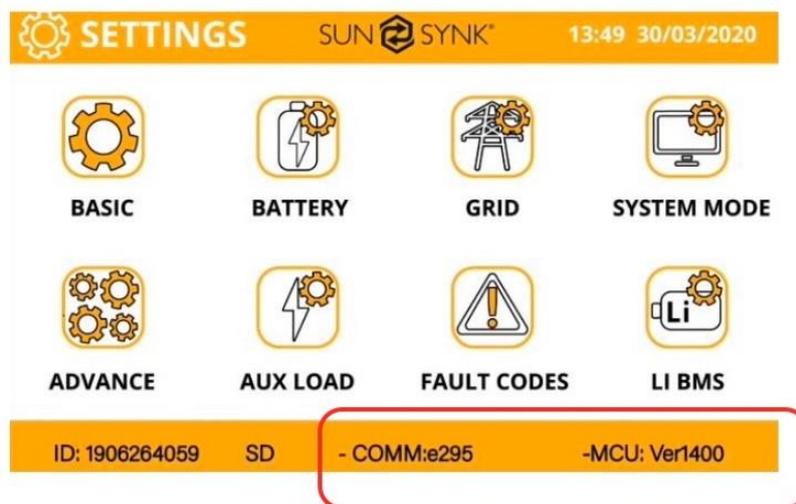
Before going on site, check if your software is already up-to-date. If not, we recommend you update it. This can be done in three ways:

1) Wi-Fi data logger.

2) GSM data logger.

3) Hand held programmer.

The easiest method is to use a GSM data logger, which is simply plugged into the bottom of the unit, and there is no need to carry out any setup. The only drawback with the GSM data logger is that the updating time is long and can typically take up to 2 hours.

The Wi-Fi data logger relies on a good Wi-Fi signal and needs to be set up. Please refer to the data logger setup procedure.

If an update is required, then please contact one of the Sunsynk Service Centres with the data logger number, and the update can be done remotely. When carrying out an update, please be patient as it can take some time.

> ## NOTICE
>
> Appropriately qualified engineers can conduct an update using a handheld programmer. However, extra care should be exercised when using this instrument so as not to damage the inverter.

4. PROGRAMMING

4.1. Setting Up Time and Date

In order to ensure efficient power generation, the Date and Time must be set correctly. The below diagrams explain the correct step:

1) On the Settings page, press the BASIC icon.
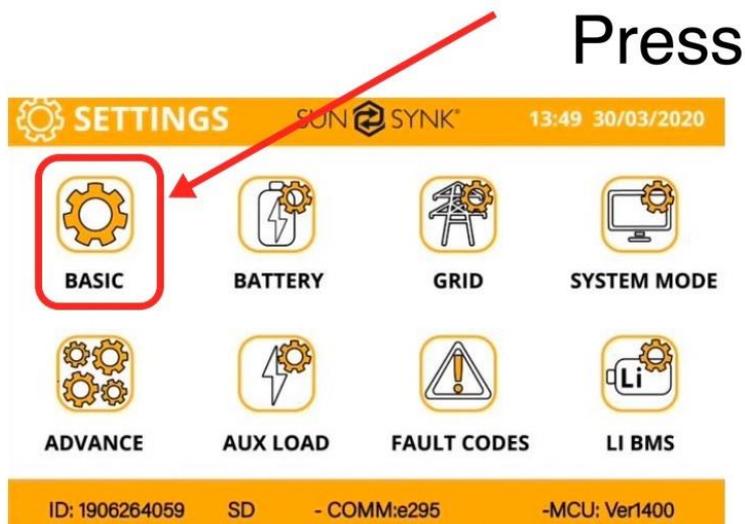
2) The Basic Setup page will appear on the screen.
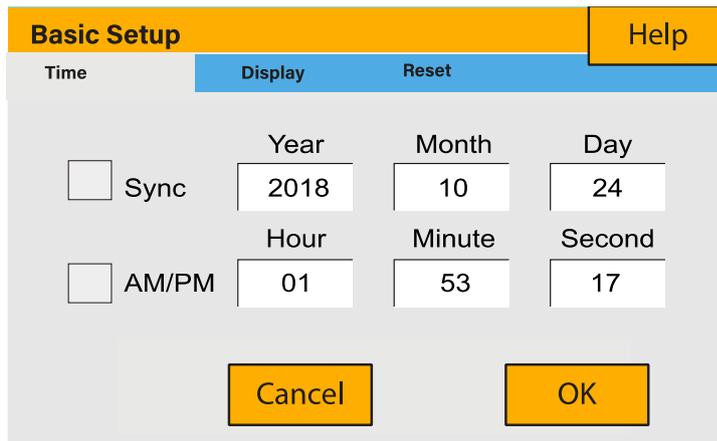
3) Touch the screen on the variable that you wish to adjust.

4) Increase or decrease the numbers by pressing the UP and DOWN buttons.

5) Press 'OK' to set the changes.

We suggest that you do not use the 'Sync' button as this function can set the inverter to the wrong time zone.

4.2. Setting Up the Grid

On the navigation page, click on the GRID icon to set up the grid.

Generators operate with wide tolerance, so we suggest you to select:

a) Higher frequency limit: frequency 51.5 Hz or higher

b) Lower frequency limit: 47.5 Hz or Lower

c) Lower voltage limit: 185V

d) Higher voltage limit: 265V

The inverter will then lock into the generator. If the generator frequency or voltages are outside of your recommended settings the system will not work.

Please note that the generator needs to provide enough power for the load and charge the batteries at the same time. Therefore, the user should ensure they have a generator powerful enough for both.
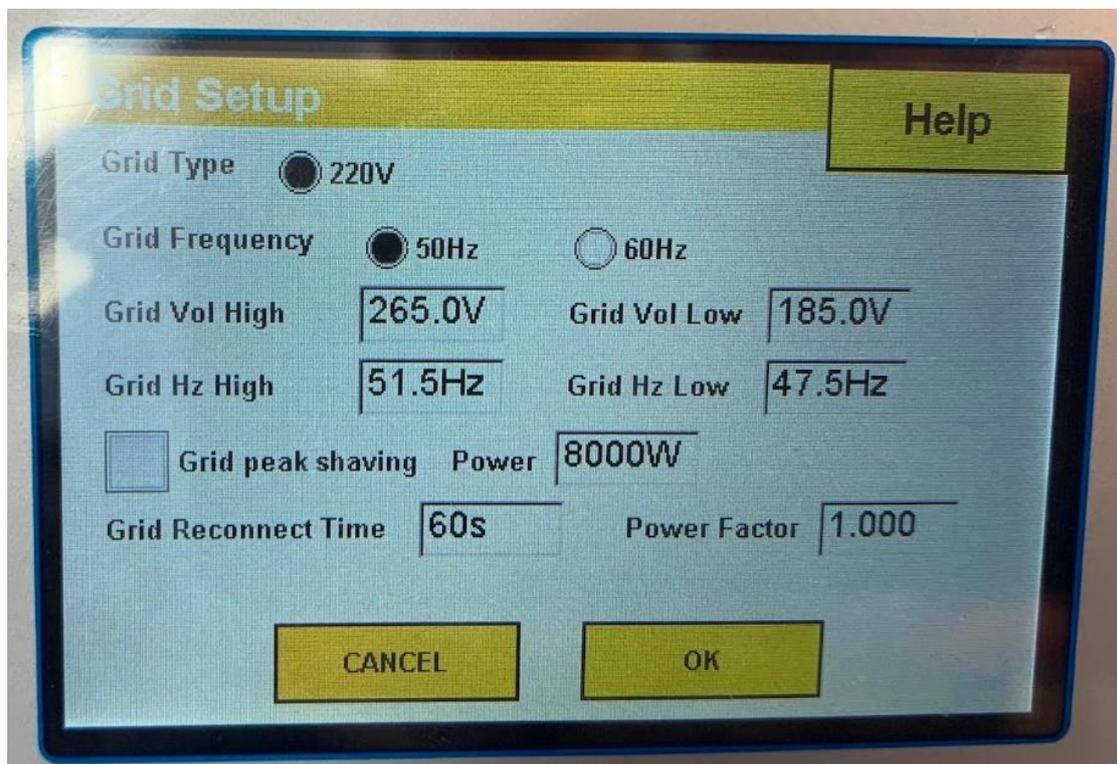
4.3. Setting Up the Batteries

To set up your batteries, click on the BATTERY icon on the Settings page.
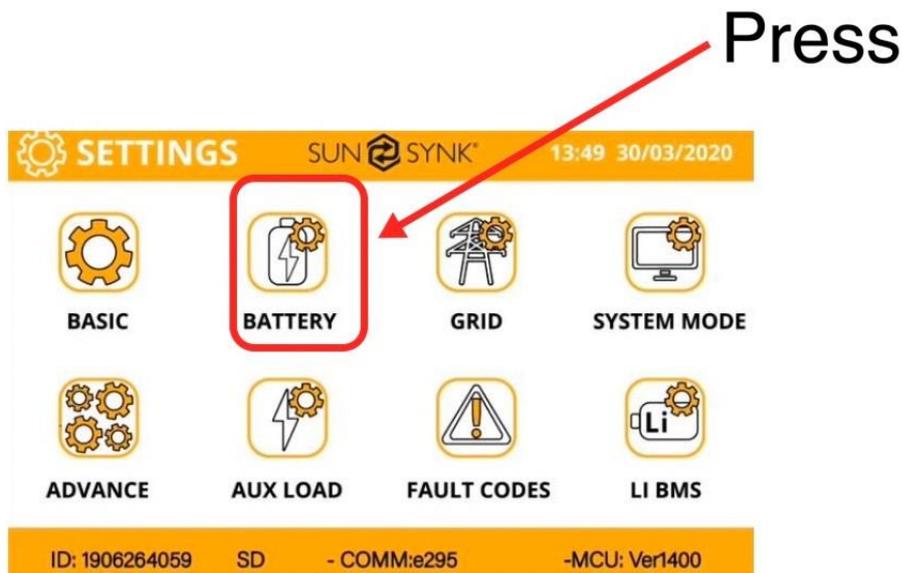
On the Battery Setup page you can configure many settings:

a) Select battery size (if not auto-set) and the maximum charge and discharge of the batteries
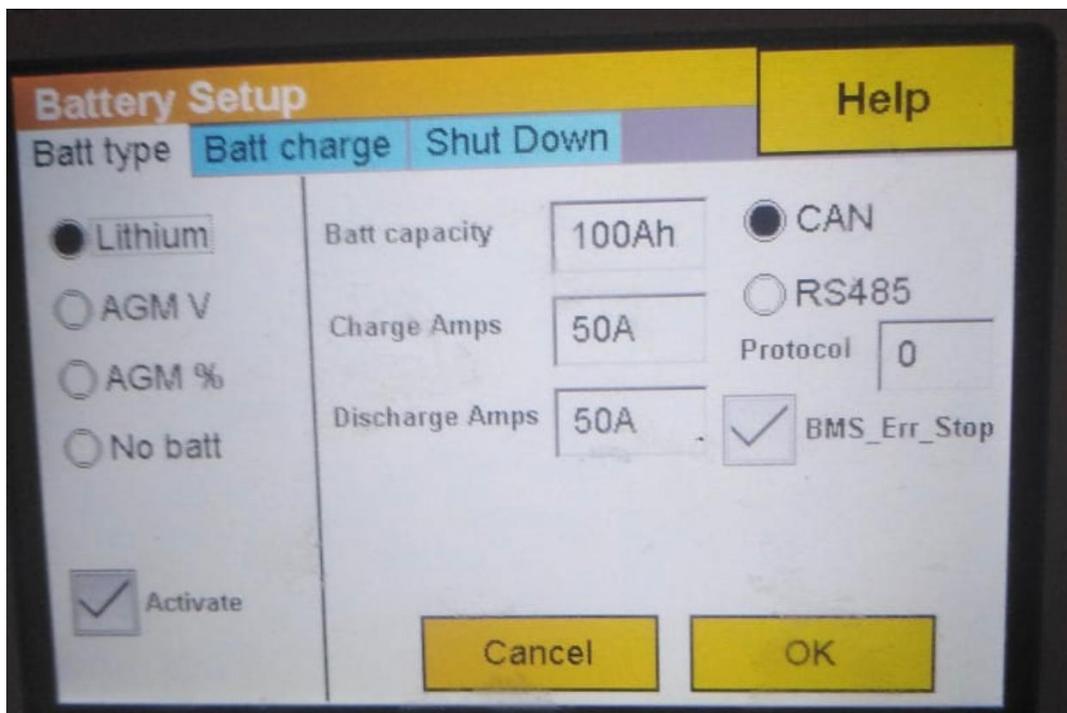
b) On the 'Batt Charge' sub-page, select 'Gen Charge' and 'Gen Signal'.
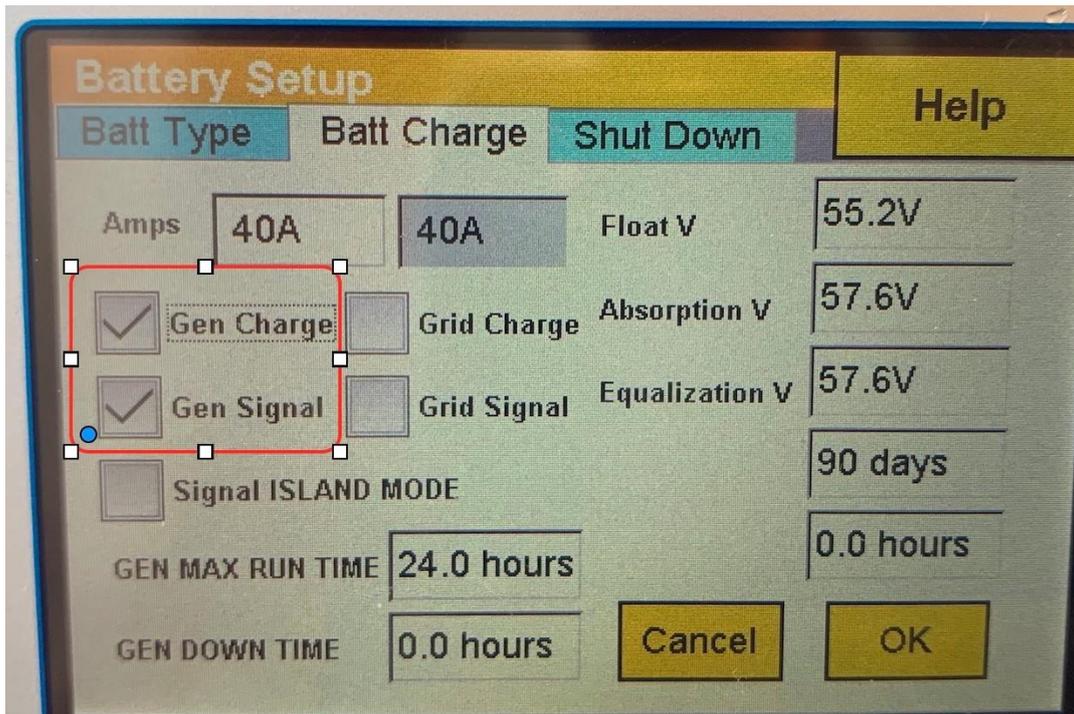
c) Set up the battery charging current.
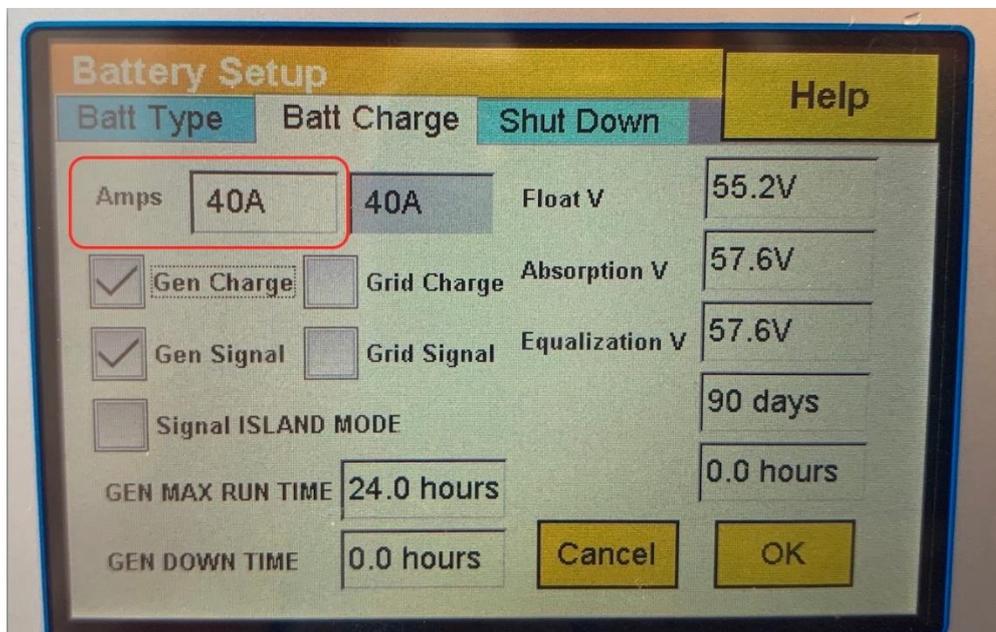
The battery charging current cannot exceed the maximum power of the inverter, otherwise it will shut down. You also need to be aware of the following settings:

a) C-rating of the battery (charge and discharge).
b) Battery cables (normally 100Ah per stack).

How to calculate the maximum charge or discharge of the battery:

$$Max.\,charge/discharge = \frac{C\,Rating * Battery\,Power}{Battery\,Voltage}$$

Example:
2 sets of batteries of 5 kWh / 48V:

$$Max.\,charge/discharge = \frac{0.5\,(Lithium) * (2 * 5,000)}{48} \approx 100A$$

If you are using AGM then the C-Rating may only be 0.1 or lower.

The second step is to check if the inverter can withstand these values:

a) 3 kW Max 50 Amp
b) 5.5 kW Max 80 Amp
c) 8.8 kW max 100 Amp

d) Set up generator run time and cool-down time:

Some generators, especially in enclosed areas, can only run for a maximum time, otherwise they may overheat. This can be set as follows:
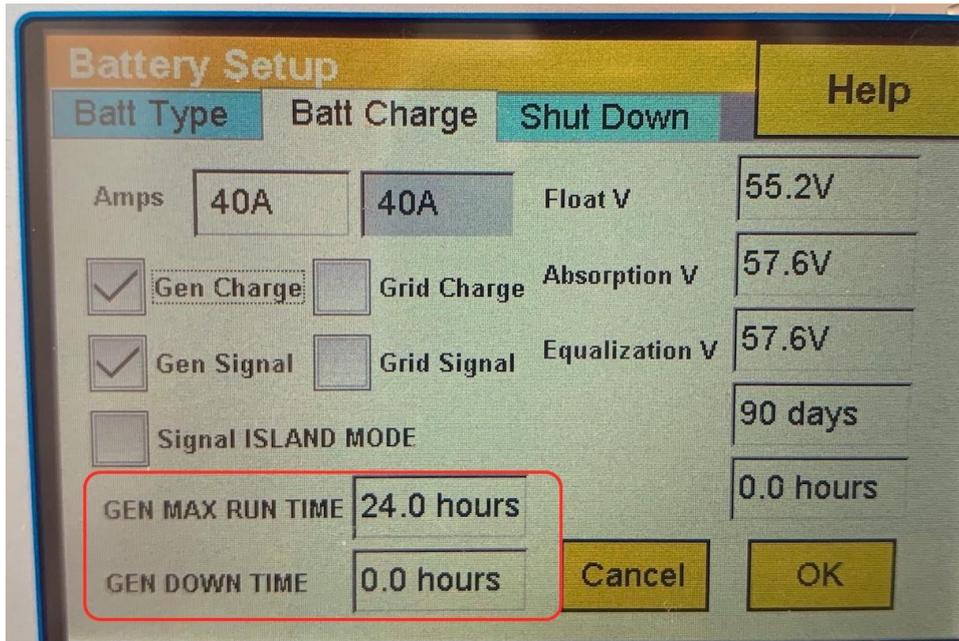
e) Select the battery shutdown voltage / percentage:
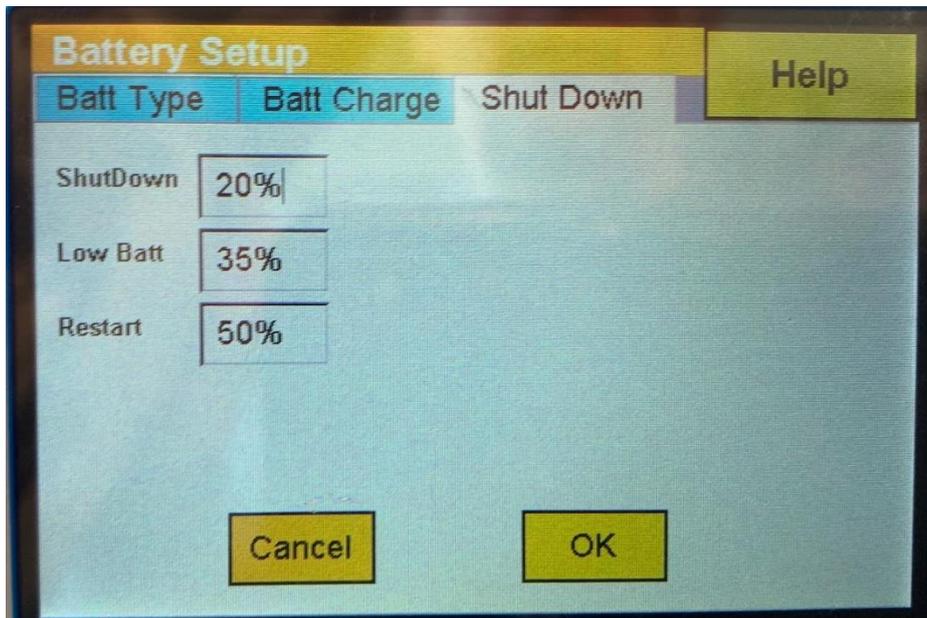
a) 'Shutdown' refers to the battery 'Sate of Charge' (SOC) which is expressed as a %. This setting will cause the inverter to switch-off the Grid but not shut down completely.

b) 'Low Batt' is the setting at which the low battery level warning sound will activate

c) 'Restart' is the battery level the battery needs to reach before the battery will re-start the inverter again.

4.4. Select System Mode

On the navigation page press 'System Mode'. This is the heart of the Sunsynk Inverter.

What this page displays:

■ A setting to prevent the inverter exporting power to the grid - 'Zero Export'.

■ The ability to limit power supply to only the household loads - 'Solar Export'.

■ Set the power limits to supply only the loads connected to the LOAD port - 'Priority to Load Only'.

What you can do from this page:

■ Set a real time to charge or discharge the battery.

■ Choose to charge the battery from the grid or generator.

■ Limit export power to the grid.

■ Set the unit to charge the battery from the grid or generator ticking 'Grid' or 'Gen' and set what times this needs to occur.

■ Set the time to discharge the unit to the load or export to the grid by unticking 'Grid' and 'Gen'.

Real Time   Power Limit   Battery % or voltage when an action is to happen   Charge from Grid   Charge from Gen   No Tick = Discharge

SYSTEM MODE   Help

Time   Power   SOC/V   Grid Gen

1 — Zero Export
2 — Solar Export
3 — Limit to Load Only
4 — Zero Export Power
Max Sell Power
5

Use Timer   Priority Load   6

Cancel   OK

Use controller

1) Select the maxiumum power of the inverter.

SYSTEM MODE   Help

Time   Power   SOC/V   Grid Gen

Zero Export
Solar Export
Limit to Load Only
Zero Export Power
3500   Max Sell Power

Use Timer   Priority Load

Cancel   OK
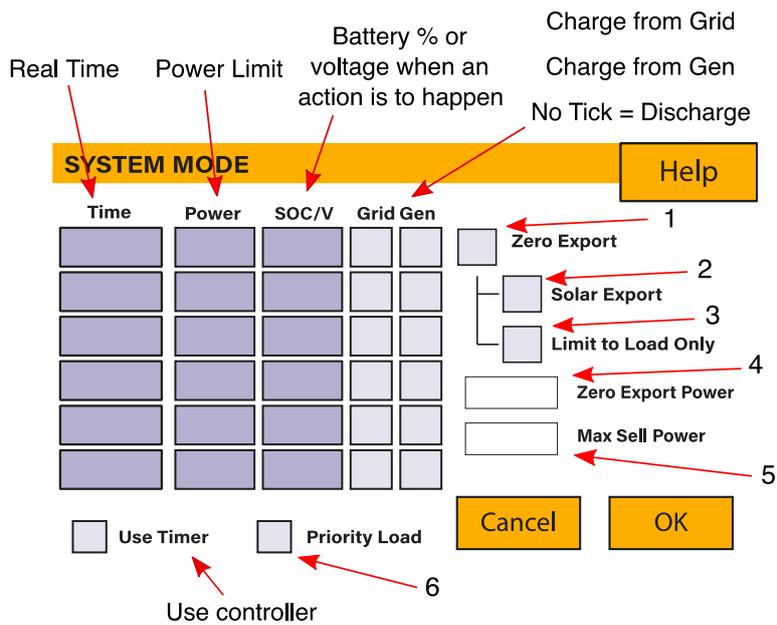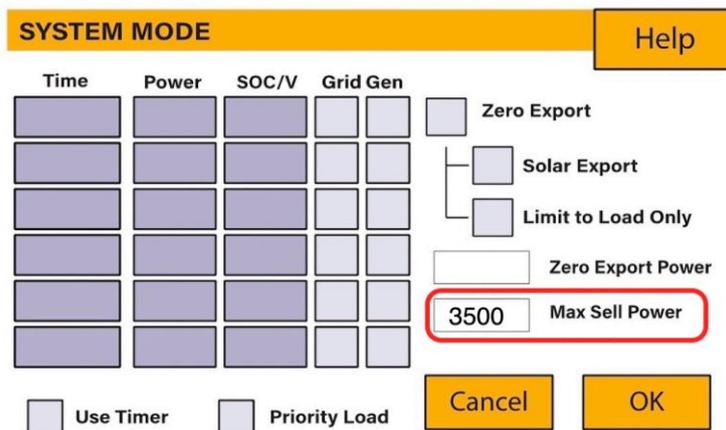
    a)   3.6kW inverter maximum power: 3.6kW

    b)   5.5kW inverter maximum power: 6kW

    c)   8.8kW inverter maximum power: 9kW

2) Select 'Zero Export' and 'Limit to Load Only'.

3) Select what to do with solar power.

    a) If you are working Off-grid, then you should prioritise the battery.
    b) If you are On-grid and the generator is just a backup, then prioritise the load.

4) Select 'Use Timer'. This is the real time in which the inverter will charge or discharge from the generator.

Example of setting:

Time: This is the real time in which the function will be activated.
Power: This is the maximum power this function will control.
SOC: This is the SOC the battery must reach.
Grid: The charge from the grid.
Gen: Makes the generator to charge the batteries.
(Tick the Gen box or Grid box to either charge or if discharge required, do not tick.)

5. FINAL CONSIDERATIONS

Once you are happy that everything is fully functional or connections are made correct and secure:

1) Shut the inverter Down

    a) Switch off the Solar isolator.

    b) Switch off the Inverter.

    c) Switch off the Battery Isolator.

2) Ensure that:

    a) All cable glands are tightened.

    b) The inverter cooling system is not obstructed.

    c) You have completed all mandatory cable tests (do not carry out any earth leakage or bond tests with the wires as it will damage the inverter).

    d) All cables are secure.

3) Replace waterproof covers and fix mandatory warning labels.

4) Tidy up the site.

5) Reboot the inverter

    a) Switch on the Solar Isolator

    b) Switch on the Inverter

    c) Switch on the Battery Isolator

If you have followed this simple guide, the system will be set-up and running normally

Key Points:

1) The generator-set must be powerful enough to power the load and charge the battery at the same time. Typical sizes of generator are as follows (Normally Generators are twice the size of an inverter):

   a) 3.6kW inverter = 7 KVA Gen Set
   b) 5.5kW Inverter = 10 KVA Gen Set
   c) 8.8kW Inverter = 15 KVA Gen set

If you are using two inverters in parallel, then you will need to double the requirement. However, there is an exception to the rule if using two or more inverters in parallel, then one of the inverters can be used as a charger and another as a discharger.

To discharge the inverter that is used as a charger, it cannot be connected to the parallel circuit. This will simply charge the battery when required and the second inverter will constantly discharge from the battery.

2) Always be aware of the C rating of the battery and the battery cabling. This is the maximum charge and discharge you can use. As a rule of thumb, AGM batteries are much lower than lithium.

3) Always test each part of the circuit individually before completing the whole system.

4) Always check if your inverter requires an update before you go on-site. A good Internet connection will help when seeking an update.

5) Always keep your wires neat and tidy.

6) If using multiple batteries ensure all the battery cables of the same length.

6. ALTERNATIVE WIRING CONFIGURATIONS

6.1. Sunsynk Microinverter
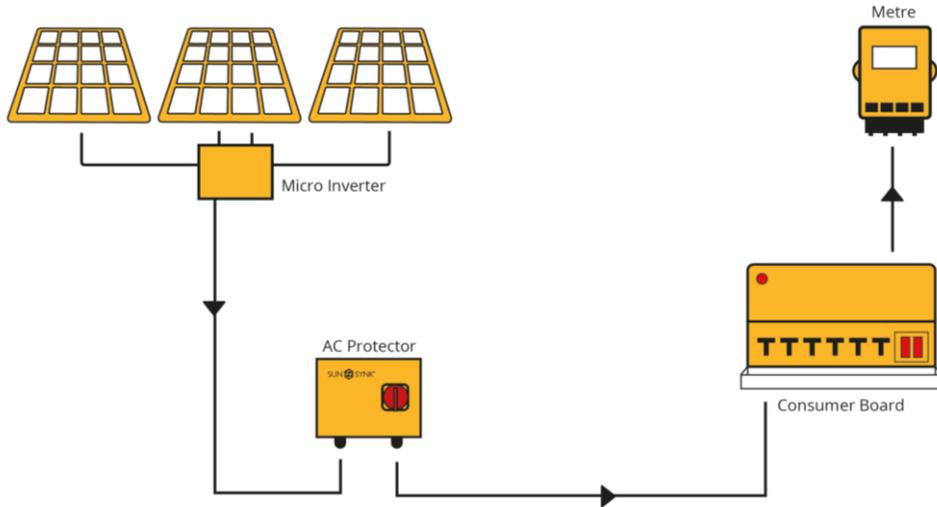
6.2. Sunsynk Microinverter with Storage
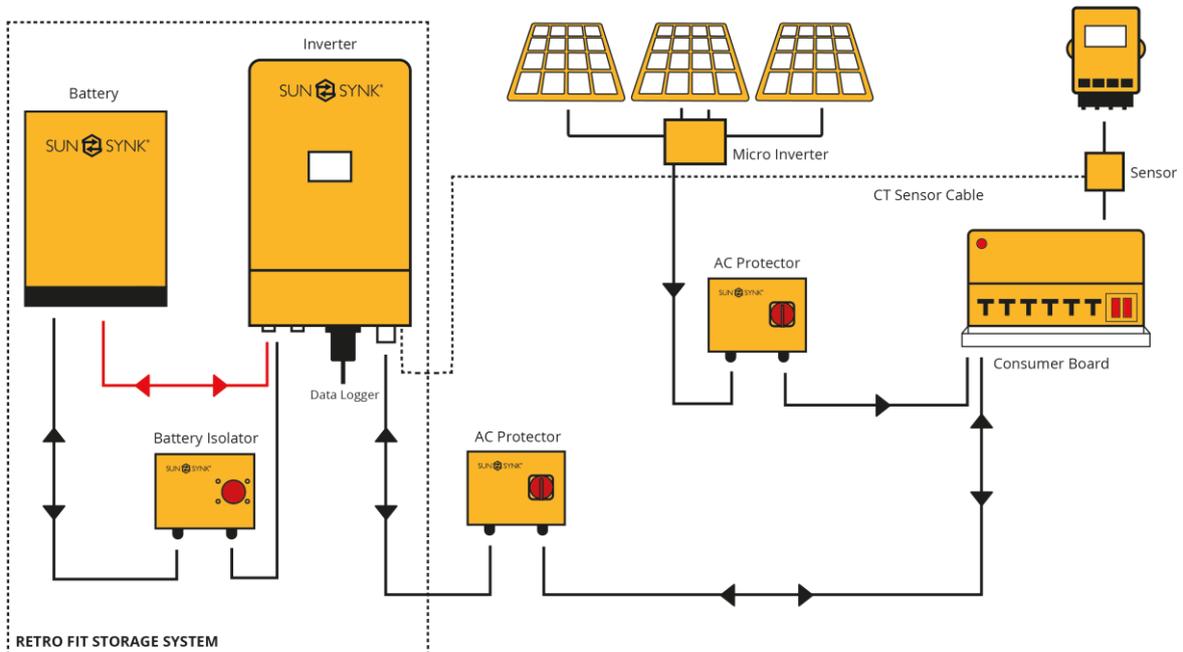
6.3. Basic Configuration with Batteries
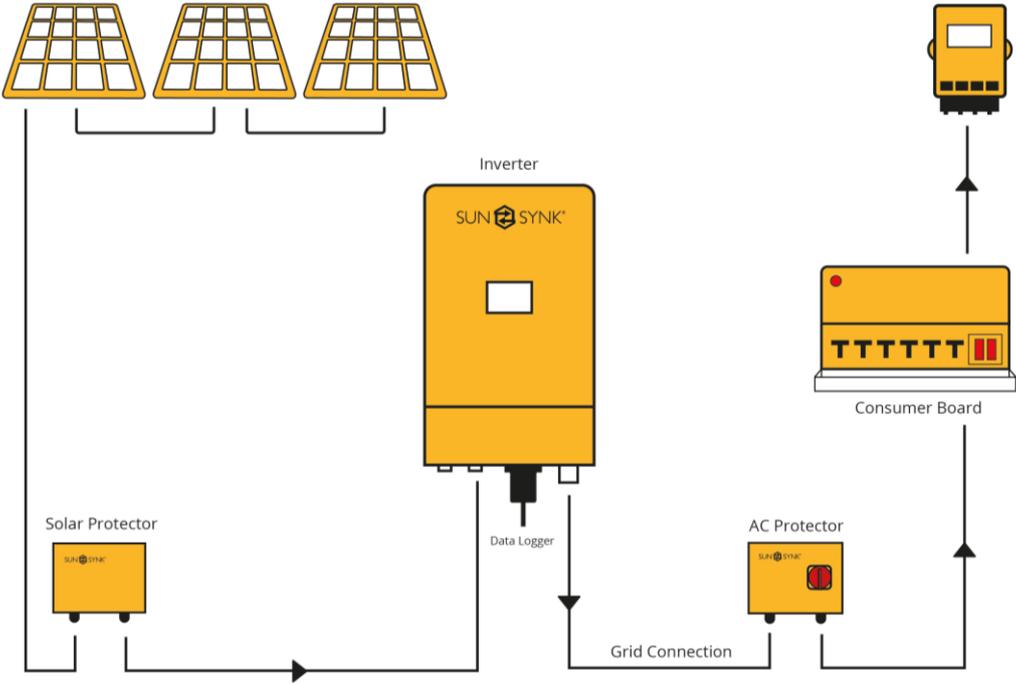
6.4. Three-Phase Configuration without Batteries
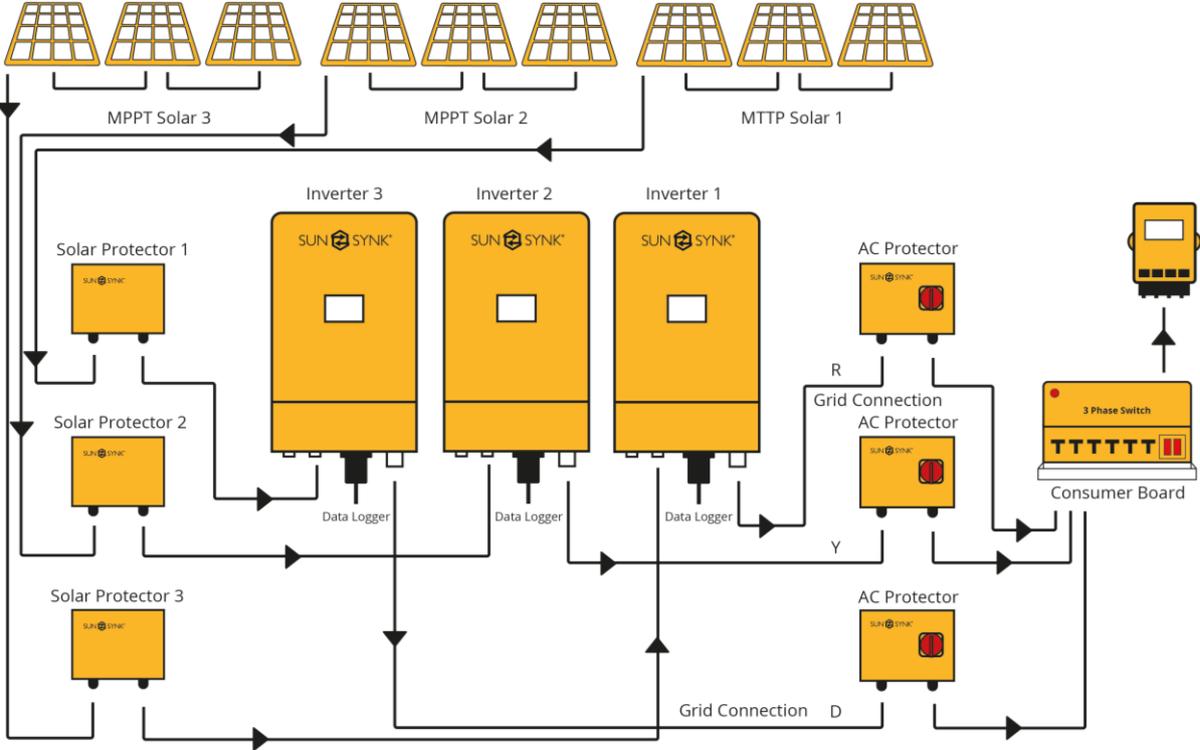
6.5. Basic Configuration with Batteries and Microinverter
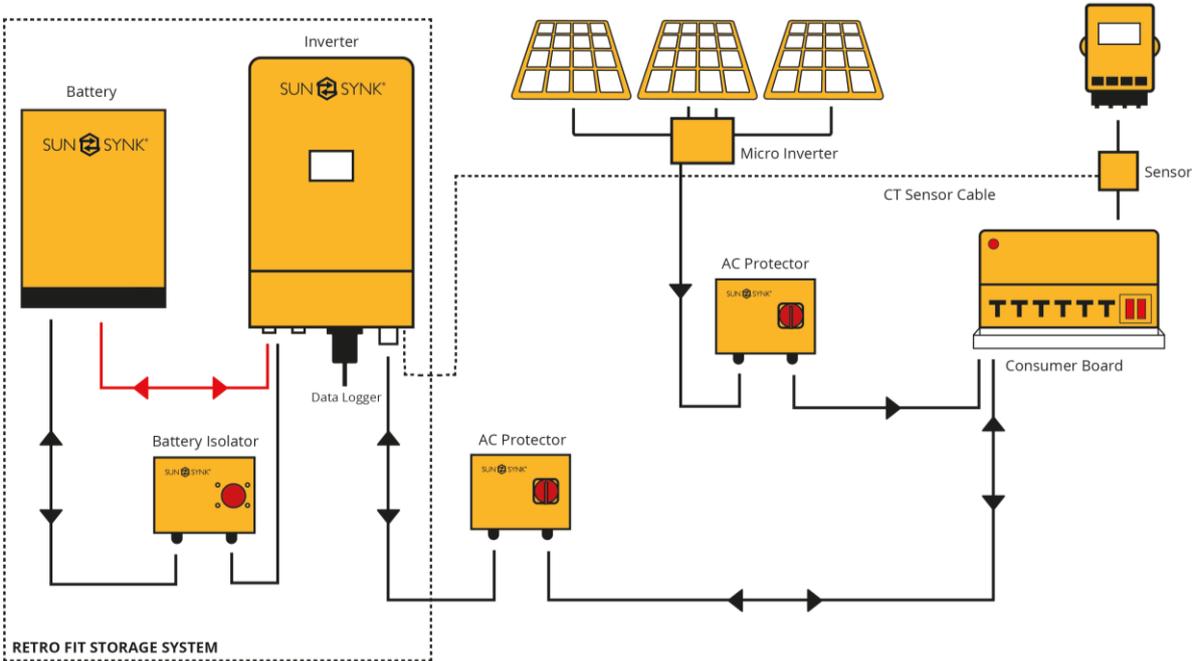
6.6. Three-Phase Configuration with Batteries
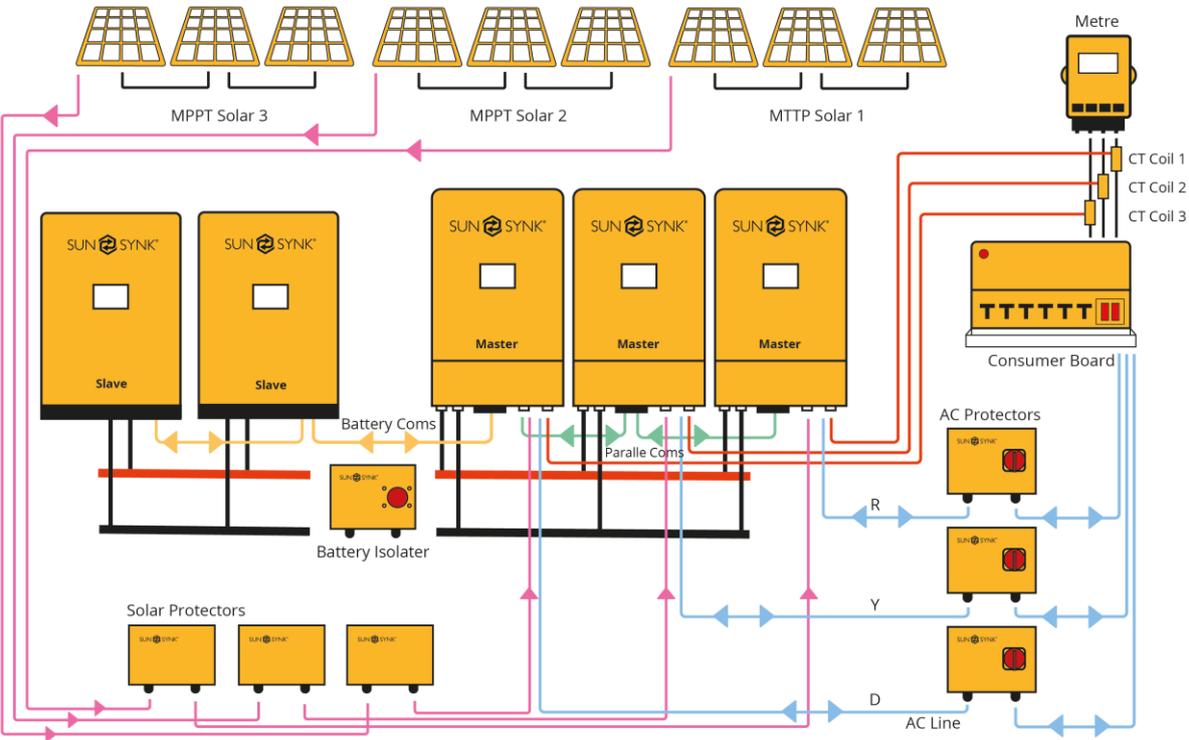
6.7. Using a Generator
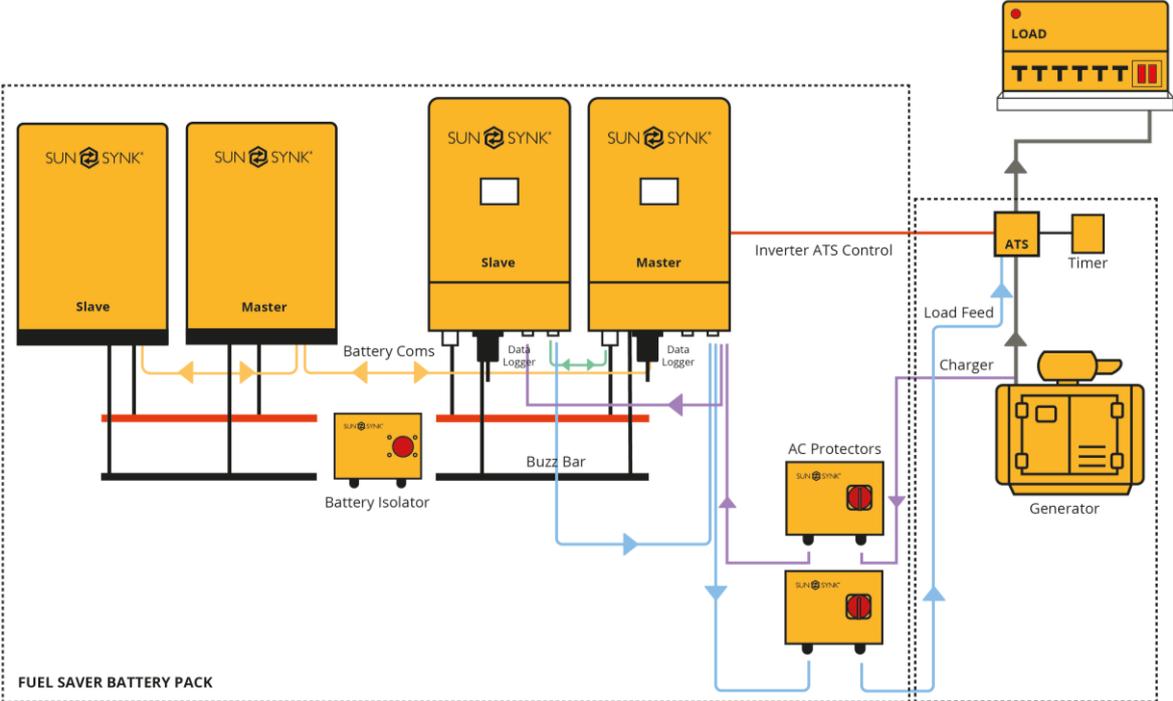
6.8. Fuel Saver
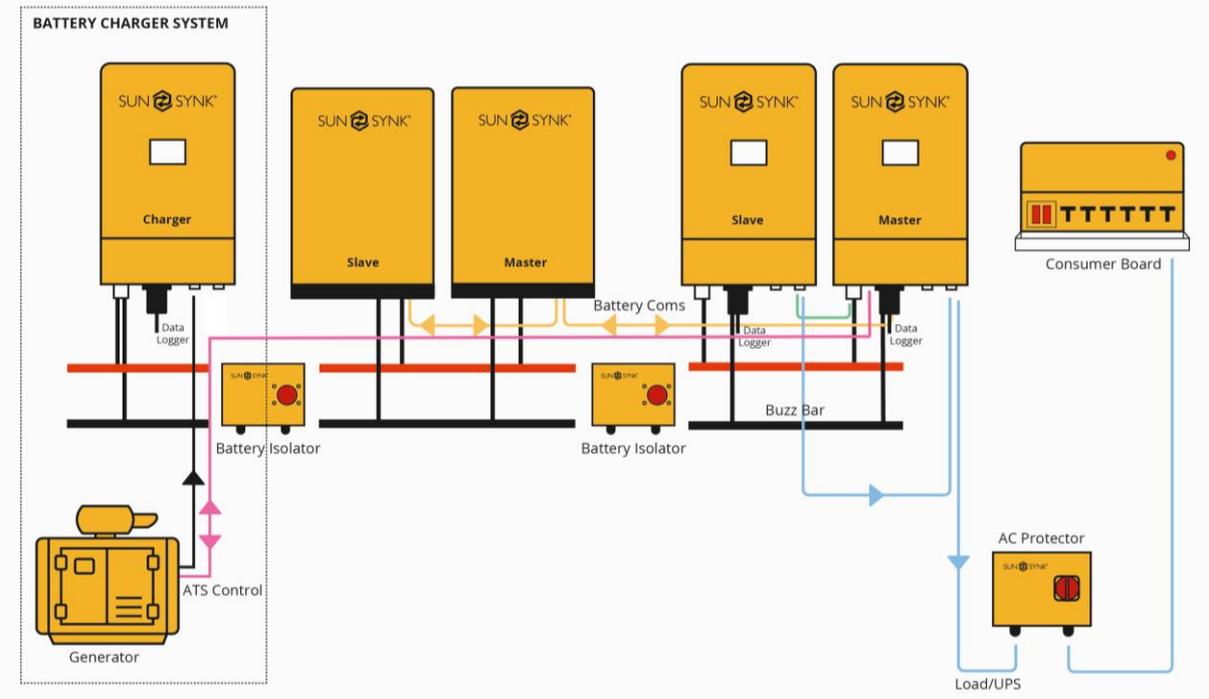
Using a separate inverter as a charger is good when the generator is undersized.

6.9. Wiring Two Inverters and Two Batteries
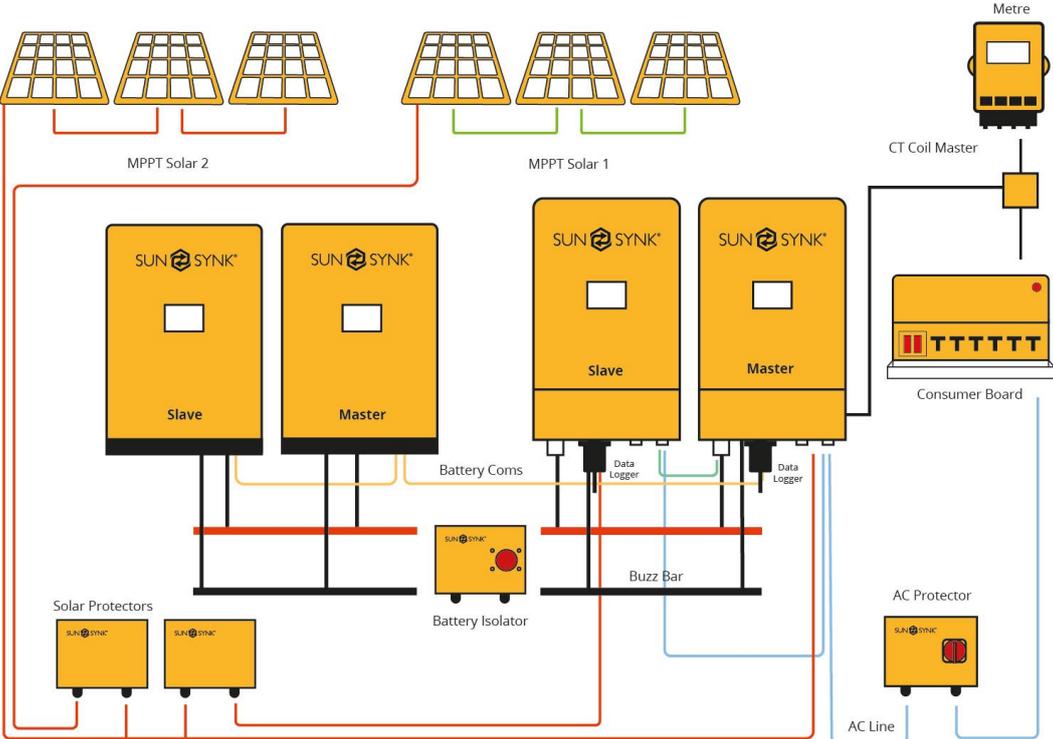
For more information, training videos, software upgrades, help line, forum please refer to http://www.sunsynk.com - Tech Support (Do not forget to register first on the website).

▶️ Sunsynk

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