FORTRESS POWER

Secure your energy

eForce Battery-Inverter Integration Guide

APsystems
ALTENERGY POWER

Schneider Electric

Sol-Ark
LIMITLESS POWER

ECOVAULT

victron energy
BLUE POWER

Important Notice

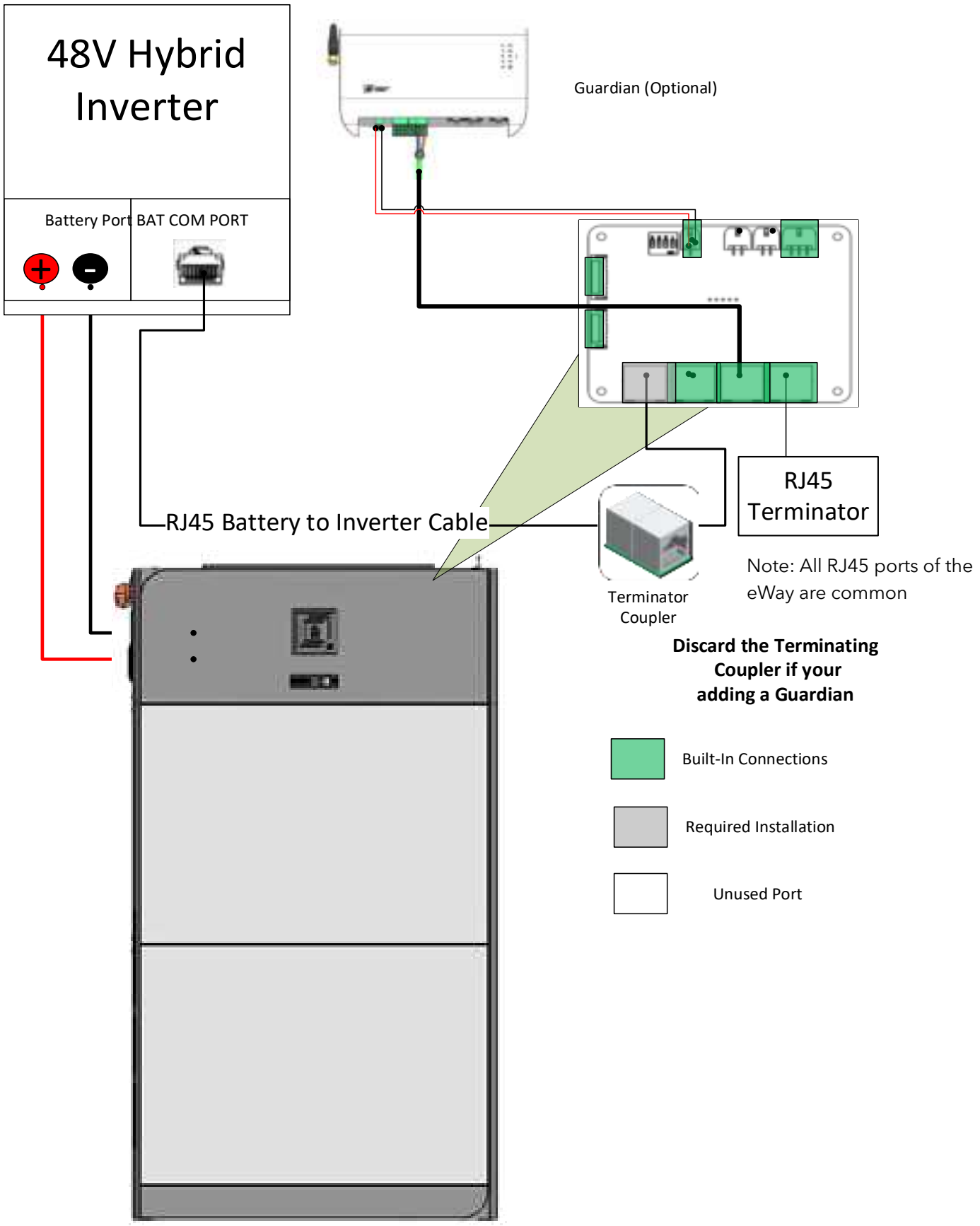
This Quick Guide does not exempt the installer or User from reading each product manual. Failure to do so may risk damaging both Fortress Power equipment and other manufacturers and void warranty.

Abbreviations

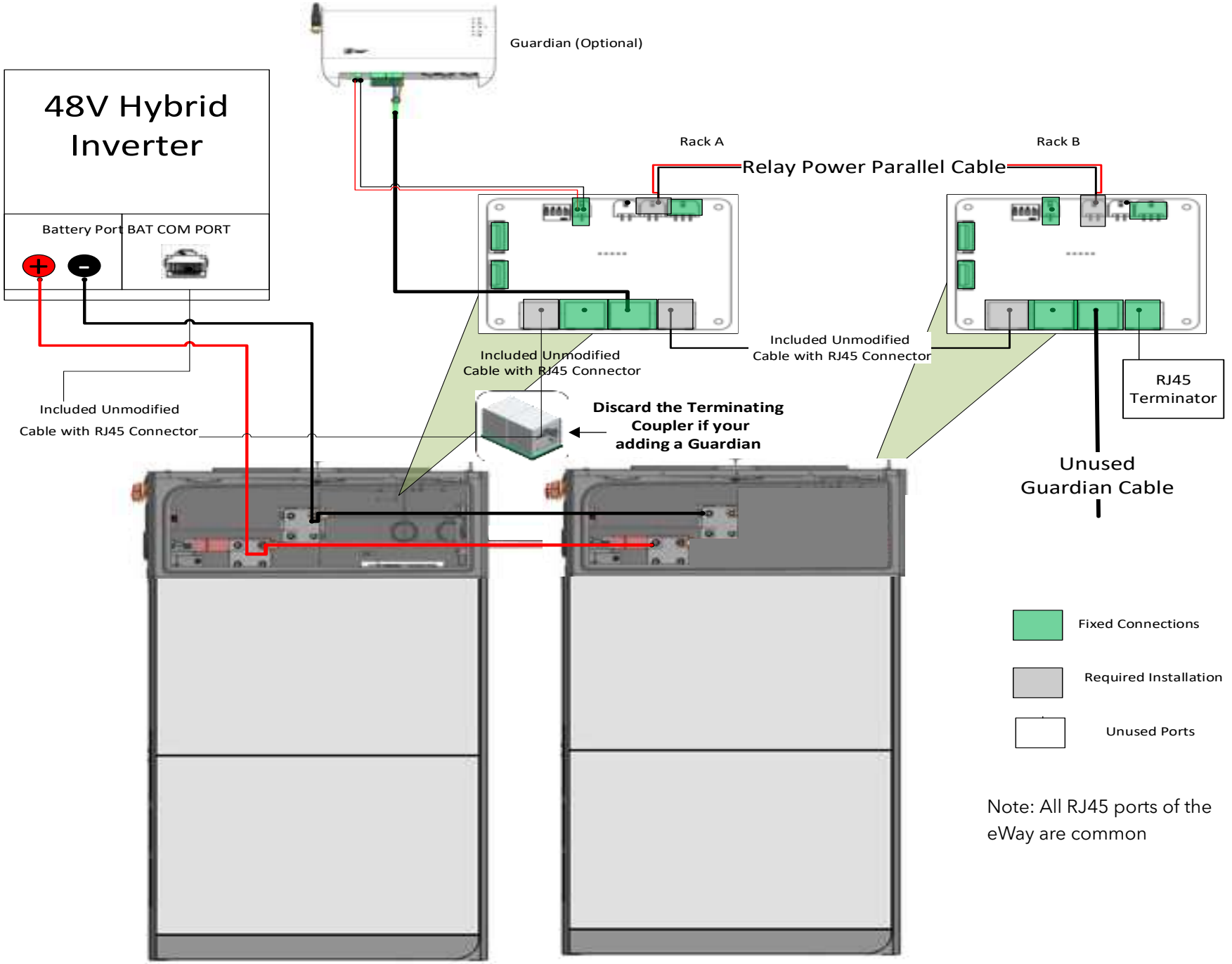
A = Amperes
AC = Alternating Current
Ah = Amperes hour(s)
AWG = American Wire Gauge
BAT = Battery
BMS = Battery Management System
CAN = Controller Area Network
CC = Constant Current (Bulk)
CCV = Closed Circuit Voltage
°C = Degrees Celsius
CT = Current Transformer
CV = Constant Voltage (Absorption)
DC = Direct Current
ESS = Energy Storage System
EOL = End of Life
°F = Degrees Fahrenheit
HV = High Voltage
HVCO = High Voltage Cut-Off
I/O = Input or Output
ISC = Short Circuit Current
IP-Ingress Protection
in = Inches
lb. = Pounds
LED = Light Emitting Diode
LFCO = Low Voltage Cut-Off
LFP = Lithium Ferro Phosphate
LN1 = AC Line 1
LN2 = AC Line 2
LV = Low Voltage
m = Meters
mA = milliamperes
mV = millivolts
N = Neutral
NEC = National Electric Code
NEMA = The National Electrical Manufacturers Association
NFPA = National Fire Protection Association
NO = Normally Open
NC = Normally Closed
OCV = Open Loop Voltage
OSHA = Occupational Safety and Health Administration
OT = Over Temperature
OV = Over Voltage
PE = Protective Earth (Ground)
PV = Photovoltaic
R = Electrical Resistance (Ohms)
RS485 = Recommended Standard 485
SOC = State of Charge
SOC = State of Health
UT = Under Temperature
UV = Under Voltage
V = Voltage
VAC = Volts Alternating Current
VDC = Volts Direct Current
VPP = Virtual Power Plant
W = Watts (Power)

Connection Diagrams

Connection Overview



PARALLEL CONNECTION OVERVIEW



Note: All RJ45 ports of the eWay are common

Closed loop and Pinout Definitions

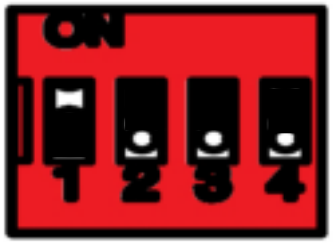
To ensure Closed Loop communication, please follow the process below. If making a communication cable, refer to the pin out diagram for an RJ45 cable below. Type B format ethernet cable may also be used.

eForce Communication Pinout Configuration	Protocol and cable	Envy Inverter-Battery communication port Pinout
 Firmware 6016 or above	Dip Switch :1110 Using the DIP switch on the eWay Select the following protocol for Closed Loop Communication. You must do this process only the primary eWay when in parallel. The primary eWay shall be the one that connects battery to inverter communication. 	 **Lithium Profile: 18 (Fortress)** **Inverter firmware shall be 1E1E or above** **LCD Firmware shall be V20**

PIN	COLOR (B FORMAT)	ASSIGNMENT
1	White Orange	CAN1_H
2	Orange	CAN1_L
3	White Green	CAN2_G
4	Blue	CAN2_H
5	White Blue	CAN2_L
6	Green	RS485G1
7	White Brown	RS485A1
8	BROWN	RS485B1

Included **Unmodified Normal Format B RJ45 Cable.** Any of the included cables will work.

PIN	COLOR (B FORMAT)	ASSIGMENT
1	White Orange	BAT RS485 B
2	Orange	BAT RS485 A
3	White Green	NC
4	Blue	BAT CAN H
5	White Blue	BAT CAN L
6	Green	NC
7	White Brown	NC
8	Brown	NC

eForce Communication Pinout Configuration	Protocol and Cable	SOL-ARK INVERTER-BATTERY COMMUNICATION PORT PINOUT
 Firmware 6016 or above	Dip Switch :1000 Using the DIP switch on the eWay Select the following protocol for Closed Loop Communication. You must do this process only the primary eWay when in parallel. The primary eWay shall be the one that connects battery to inverter communication. 	 **BMS Lithium BAT 00**

PIN	COLOR (B FORMAT)	ASSIGNMENT
1	White Orange	Can1_H
2	Orange	Can1_L
3	White Green	Can2_G
4	Blue	Can2_H
5	White Blue	Can2_L
6	Green	RS485G1
7	White Brown	RS485A1
8	BROWN	RS485B1

Modified Cable (not included). Installer may use extra cable included with the eForce or Inverter to crimp RJ45 cable to the following configuration

PIN	COLOR (B FORMAT)	ASSIGMENT
1	White Orange	BAT RS485 B-
2	Orange	BAT RS485 A+
3	White Green	NC
4	Blue	BAT CAN H
5	White Blue	BAT CAN L
6	Green	GND
7	White Brown	BAT RS485 A+
8	Brown	BAT RS485 B-

eForce Communication Pinout Configuration

Firmware 6016 or above

PIN	COLOR (B FORMAT)	ASSIGNMENT
1	White Orange	CAN1_H
2	Orange	CAN1_L
3	White Green	CAN2_G
4	Blue	CAN2_H
5	White Blue	CAN2_L
6	Green	RS485G1
7	White Brown	RS485A1
8	BROWN	RS485B1

Protocol and Cable

Dip Switch :1110

Using the DIP switch on the eWay Select the following protocol for Closed Loop Communication.

You must do this process only the primary eWay when in parallel. The primary eWay shall be the one that connects battery to inverter communication.

Included **Unmodified Normal Format B RJ45 Cable.** Any of the included cables will work.

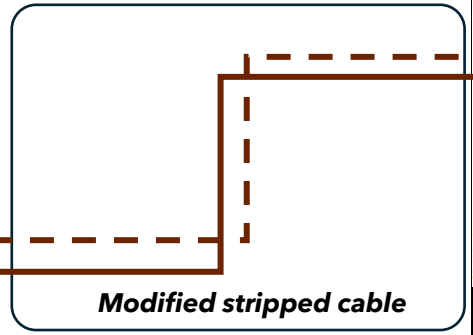
ECOVAULT INVERTER-BATTERY COMMUNICATION PORT PINOUT

BMS Communication: FOR

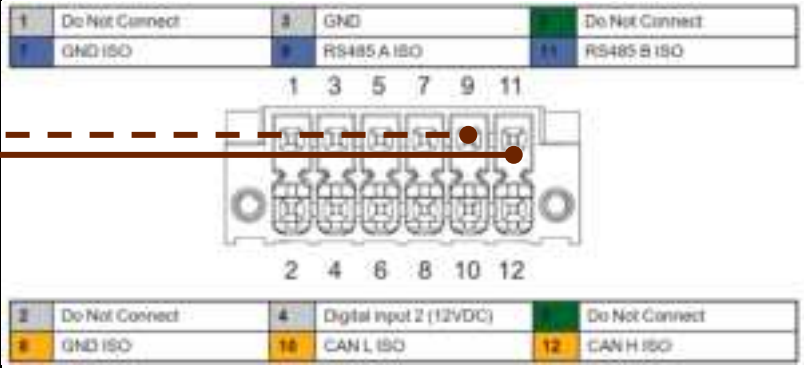
PIN	COLOR (B FORMAT)	ASSIGMENT
1	White Orange	RS485 B
2	Orange	RS485 A
3	White Green	NC
4	Blue	BAT CAN H
5	White Blue	BAT CAN L
6	Green	NC
7	White Brown	BAT RS485 A
8	Brown	BAT RS485 B

eForce Communication Pinout Configuration	Protocol and Cable	SCHNEIDER-BATTERY COMMUNICATION PORT PINOUT
 Firmware 6016 or above	Dip Switch :1100 Using the DIP switch on the eWay Select the following protocol for Closed Loop Communication. You must repeat this process for all eWay onsite. 	**Schneider 6848 XW PRO**  **Baud Rate 19200**

PIN	COLOR (B FORMAT)	ASSIGNMENT
1	White Orange	CAN1_H
2	Orange	CAN1_L
3	White Green	CAN2_G
4	Blue	CAN2_H
5	White Blue	CAN2_L
6	Green	D0
7	White Brown	RS485_A1
8	BROWN	RS485_B1



Insight Home



Schneider Gateway: 12 ISO1CAN L, 14 ISO1CAN H

eForce Communication Pinout Configuration

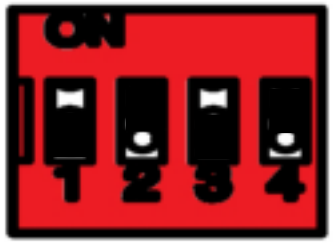
Firmware 6016 or above

Protocol and Cable

Dip Switch :1010

Using the DIP switch on the eWay Select the following protocol for Closed Loop Communication.

You must do this process only the primary eWay when in parallel. The primary eWay shall be the one that connects battery to inverter communication.

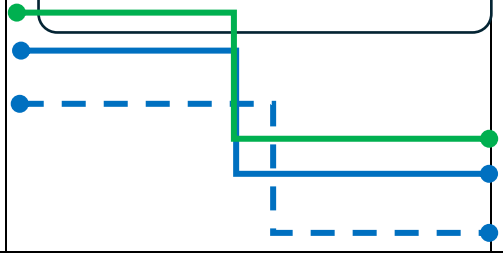


VICTRON-BATTERY COMMUNICATION PORT PINOUT

Victron Inverter

PIN	COLOR (B FORMAT)	ASSIGNMENT
1	White Orange	CAN1_H
2	Orange	CAN1_L
3	White Green	CAN2_G
4	Blue	CAN2_H
5	White Blue	CAN2_L
6	Green	D0
7	White Brown	RS485_A1
8	BROWN	RS485_B1

Modified Cable (not included). Installer may use extra cable included with the eForce or Inverter to crimp RJ45 cable to the following configuration

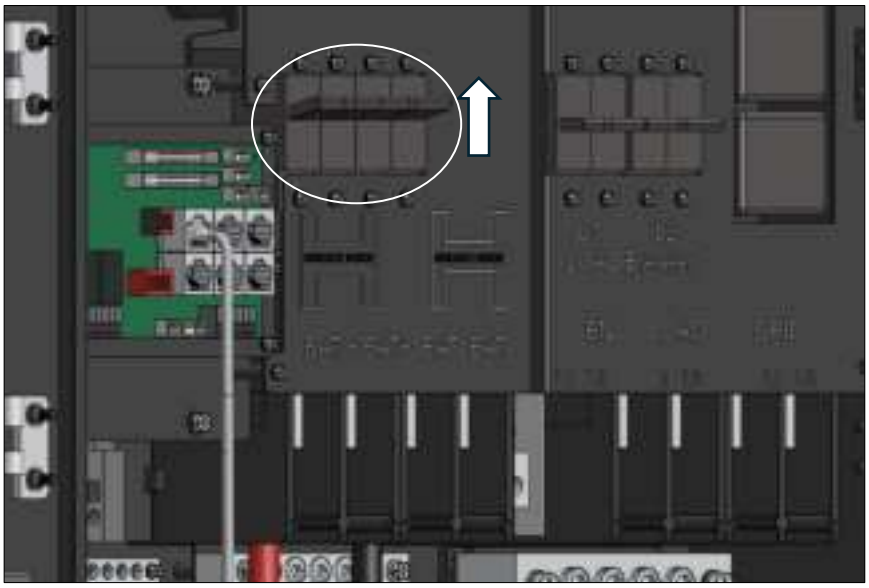


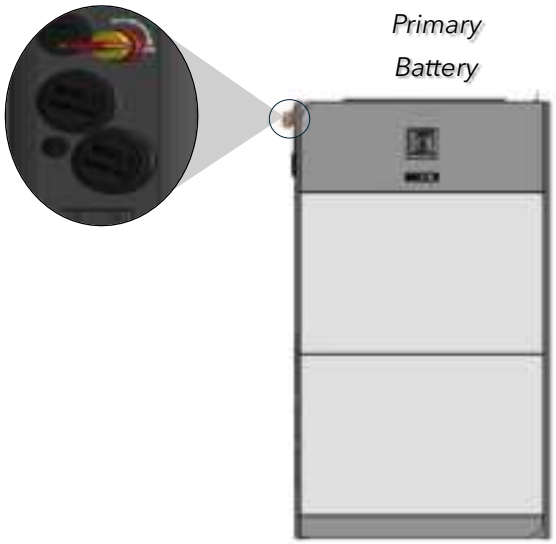
Connect Modified Cable to the Victron CERBO GX

PIN	COLOR (B FORMAT)	ASSIGNMENT
1	White Orange	
2	Orange	
3	White Green	
4	Blue	
5	White Blue	
6	Green	CAN2_G
7	White Brown	CAN2_H
8	BROWN	CAN2_L

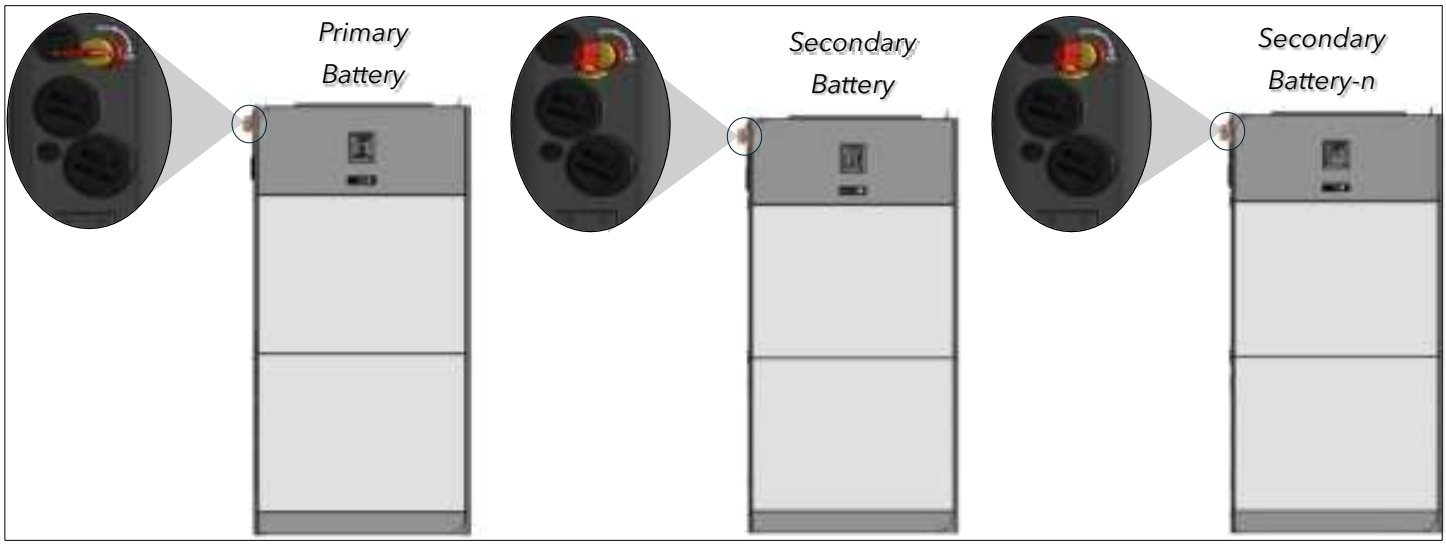
COMMISSIONING

1. Turn on the Inverter Battery Breaker on the Inverter





2. Turn ON the Disconnect on the eWay. For paralleled battery systems, **only** turn on the Primary Battery

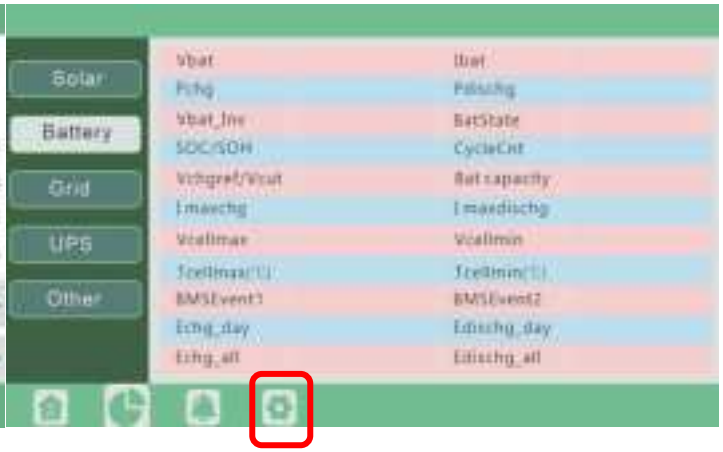


PROGRAMMING THE INVERTER

FORTRESS POWER ENVY

Before setting the parameters, make sure the system is in **Standby**. Make sure to press **SET** for each setup. Confirm the battery is doing Closed Loop Communications with the inverter under the **Battery** of the **Data Section.**

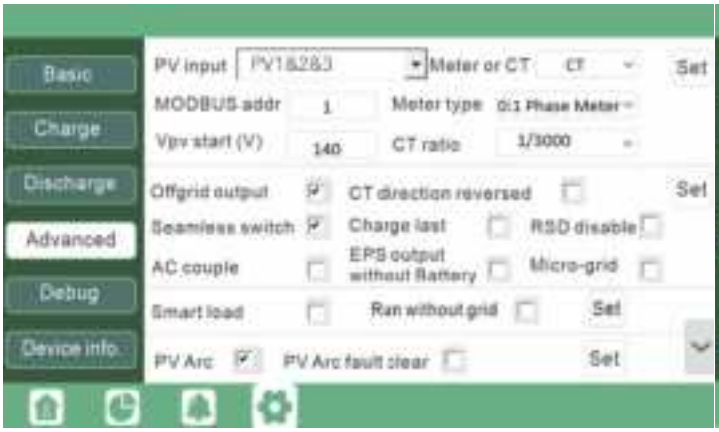
BATTERY SET UP



SELF-CONSUMPTION MODE

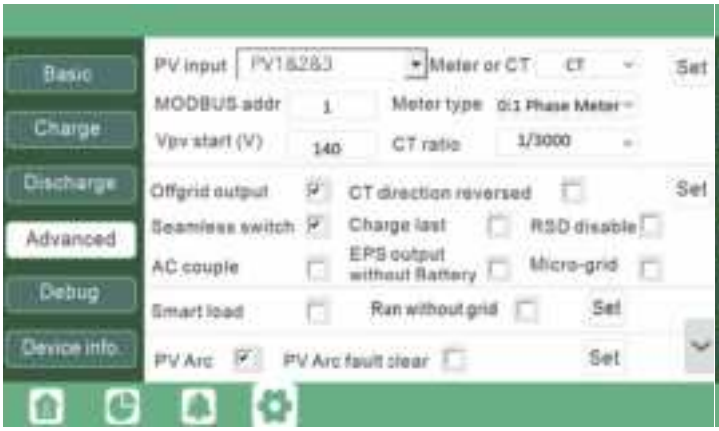

Basic
Charge
Discharge
Advanced
Debug
Device info
Generator
DC Current
Charge current limit(A) 100
Gen rated power(kW) 8
Set
Charge start Volt(V) 46.5
Charge start SOC(%) 25
Charge end Volt(V) 51
Charge end SOC(%) Adj*
AC couple
Start Volt(V) Default
Start SOC(%) Default
Set
End Volt(V) Default
End SOC(%) Default


Basic
Charge
Discharge
Advanced
Debug
Device info
Operating Mode
Use SOC %
Use Bat V
Set
Discharge current limit(A) 250
Discharge start power(W) 50
On-grid Cut-off(%) 20
Off-grid Cut-off(%) 15
On-grid Cut-off(V) 46
Off-grid Cut-off(V) 45
Forced discharge
Set
Time1 00 00 00 00
Discharge power(kW) 0
Time 2 00 00 00 00
Stop discharge SOC(%) 0
Time 3 00 00 00 00
Stop discharge Volt(V) 0


Basic
Charge
Discharge
Advanced
Debug
Device info
PV input PV1&2&3
Meter or CT CT
Set
MODBUS addr 1
Meter type 0:1 Phase Meter
Vpv start (V) 140
CT ratio 1/3000
Offgrid output
CT direction reversed
Set
Seamless switch
Charge last
RSD disable
AC couple
EPS output without Battery
Micro-grid
Smart load
Ran without grid
Set
PV Arc
PV Arc fault clear
Set


Basic
Charge
Discharge
Advanced
Debug
Device info
Export to Grid
Max Export to Grid(kW) 0
Set
Zero Export
Parallel system
Role 1 Phase Primary
Phase Default
Set
Parallel battery
Share battery
Set
Auto Detect Phase
Reset

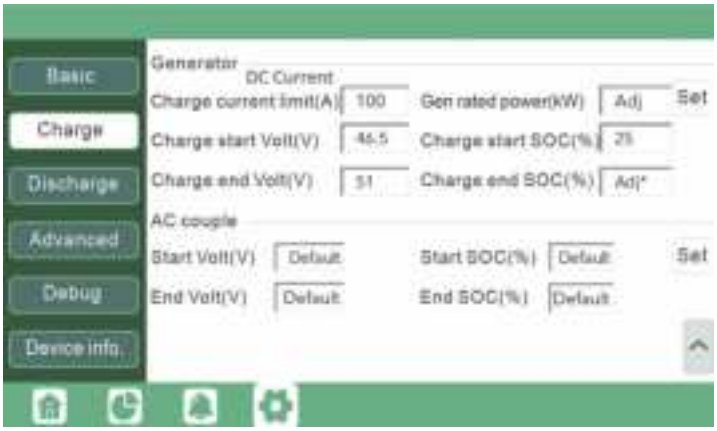
BACK UP


Basic
Charge
Discharge
Advanced
Debug
Device info
PV input PV1&2&3
Meter or CT CT
Set
MODBUS addr 1
Meter type 0:1 Phase Meter
Vpv start (V) 140
CT ratio 1/3000
Offgrid output
CT direction reversed
Set
Seamless switch
Charge last
RSD disable
AC couple
EPS output without Battery
Micro-grid
Smart load
Ran without grid
Set
PV Arc
PV Arc fault clear
Set


Basic
Charge
Discharge
Advanced
Debug
Device info
Export to Grid
Max Export to Grid(kW) Adj
Set
Zero Export
Parallel system
Role 1 Phase Primary
Phase Default
Set
Parallel battery
Share battery
Set
Auto Detect Phase
Reset


Basic
Charge
Discharge
Advanced
Debug
Device info
Operating Mode
Use SOC %
Use Bat V
Set
Bat charge current limit(A) 250
AC charge
According to SOC/Volt
Set
AC charge power(kW) Adj
Start AC charge SOC(%) 85
Time 1 00 00 00 00
Start AC charge Volt (V)
Time 2 00 00 00 00
Stop AC charge SOC(%) 100
Time 3 00 00 00 00
Stop AC charge Volt (V)


Basic
Charge
Discharge
Advanced
Debug
Device info
Charge first(PV)
Set
Time 1 00 00 23 59
Charge first power(kW) Adj
Time 2 00 00 00 00
Stop charge first SOC(%) 100
Time 3 00 00 00 00
Stop charge first Volt(V) 51
Lead-acid
Absorb voltage(V) 51.5
Float voltage(V) 51
Set
Start derate Volt(V) 46


Basic
Charge
Discharge
Advanced
Debug
Device info
Generator
DC Current
Charge current limit(A) 100
Gen rated power(kW) Adj
Set
Charge start Volt(V) 46.5
Charge start SOC(%) 75
Charge end Volt(V) 51
Charge end SOC(%) Adj*
AC couple
Start Volt(V) Default
Start SOC(%) Default
Set
End Volt(V) Default
End SOC(%) Default


Basic
Charge
Discharge
Advanced
Debug
Device info
Operating Mode
Use SOC %
Use Bat V
Set
Discharge current limit(A) 250
Discharge start power(W) 50
On-grid Cut-off(%) 90
Off-grid Cut-off(%) 20
On-grid Cut-off(V) 51
Off-grid Cut-off(V) 46
Forced discharge
Set
Time1 00 00 00 00
Discharge power(kW) 0
Time 2 00 00 00 00
Stop discharge SOC(%) 0
Time 3 00 00 00 00
Stop discharge Volt(V) 0

Off-Grid

Time of Use

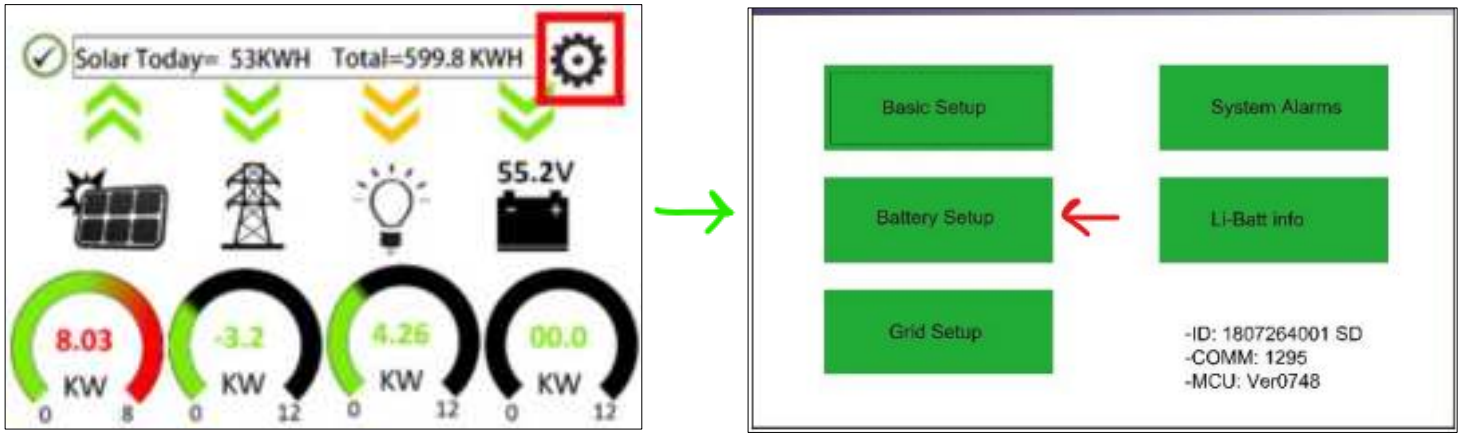
SOL-ARK

Share Sol-Ark Monitoring w/Fortress

Set up Wi-Fi with Sol-Ark Inverter using Sol-Ark's My Sol-Ark App and have your site name and Wi-Fi dongle serial number handy to register the system online with Sol-Ark. After registering, use a laptop to log into MySolArk via a web browser at http://mysolark.com

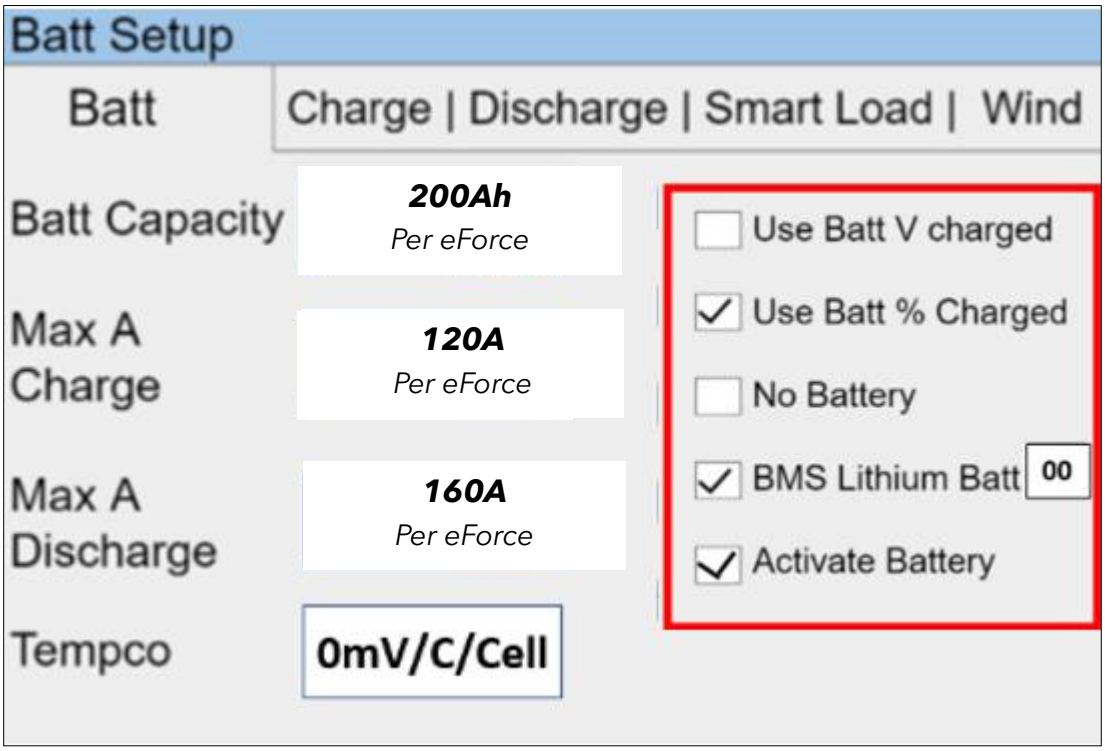
Note: For certain circumstances, temporarily use the batteries in open-loop communication mode, please follow the following link for open-loop settings:

1. To program the inverter using the Sol-Ark inverter screen, go to battery setup menu:

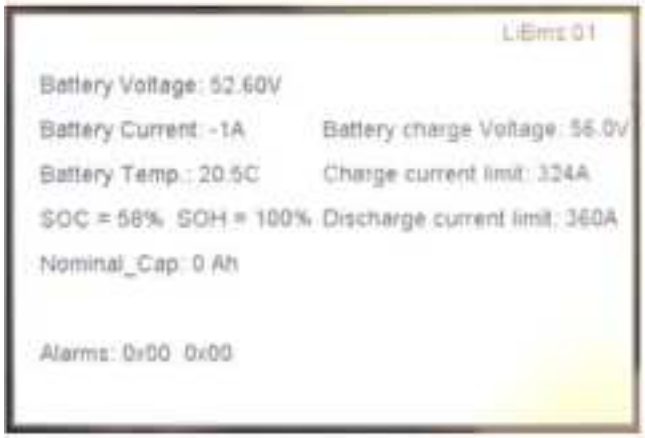


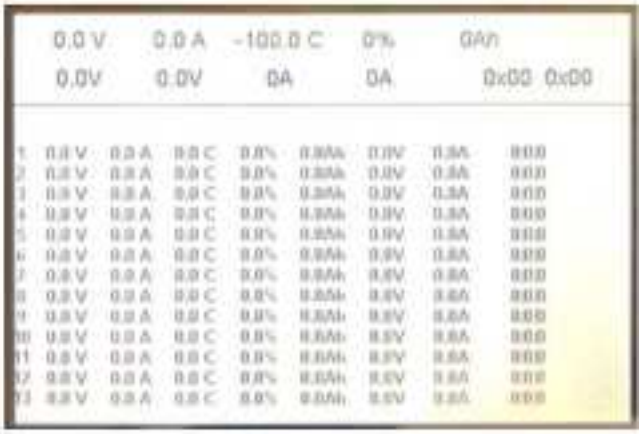
2. Program the 'Batt' tab first. Enter the settings as shown below and tap on 'OK' in the bottom of the menu afterwards:

Closed Loop Settings

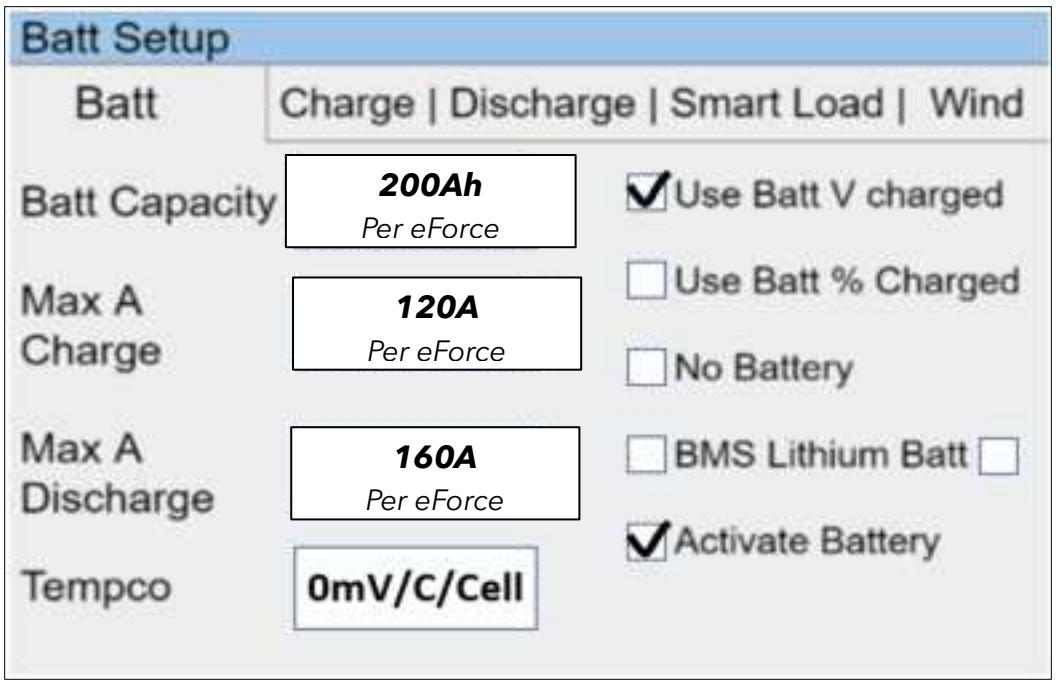


Confirm closed loop communication was established by going to the Home screen and selecting **Li-BATT INFO**





Open Loop Settings



Note:

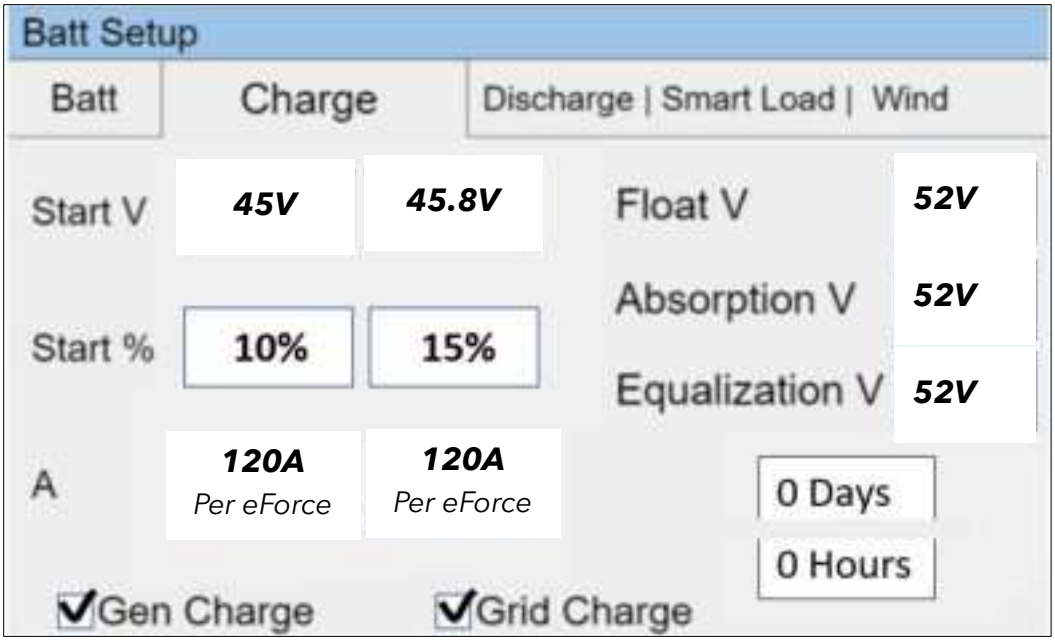
a) If closed loop communication is set up correctly, enabling '**BMS Lithium Batt 00**' will adjust some values automatically. In this tab, those would be 'Batt Capacity' and 'Tempco'.

b) If the total charge/discharge current capacity of the batteries exceeds the inverter's capabilities, use the maximum current settings of the inverter.

For example, if you have four eForce batteries and one Sol-Ark 12K inverter, based on the size of the battery bank, 'Max A Charge' and 'Max A discharge' should be 240A each. But Sol-Ark 12K can only carry 185A DC going to or coming from the battery. So, in this case, both 'Max A Charge' and 'Max A Discharge' would be set to 185A.

c) If recovering a deeply discharged battery, adjust the above charge amps to 10A.

3. Next, program the 'Charge' tab in the 'Battery Setup' menu:



Note:

a) The settings shown in the latter screenshot are the most conventional ones, hence, adjustments may be required (please see the table below).

The approach described in the note "2b" applies while programing this tab as well. Additionally, current set point (A) **must not exceed the generators' capability.**

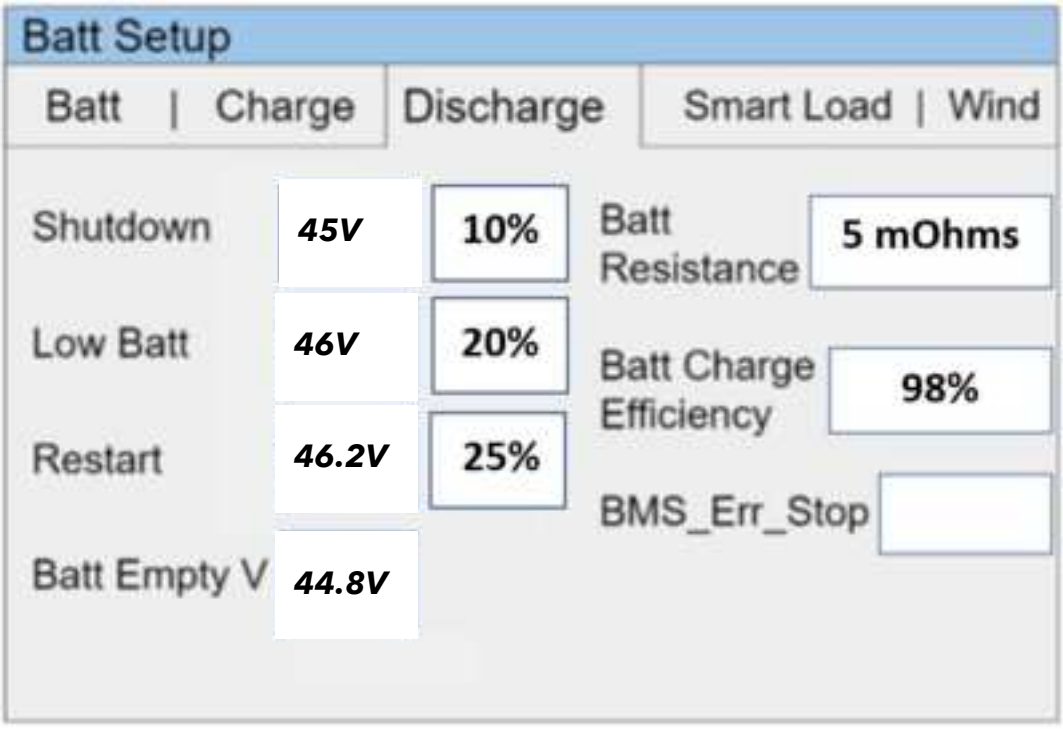
Grid-tied	Portable Generator	Stationary Generator	Gen Charge	Grid Charge	Time of Use
Y	N	N	uncheck	15%	20%
Y	Y	N	10%	15%	20%
N	Y	N	20%	uncheck	n/a
N	N	Y	uncheck	20%	n/a
N	Y	Y	10%	20%	n/a

b) Larger generators are commonly tied into the grid side of the inverter rather than the dedicated generator input. Make check-marks and current adjustments accordingly. This fact was kept in mind while creating the last two rows of the table above.

c) Fortress batteries may be discharged to its full rated capacity without voiding the warranty, but for best overall experience and battery life, limit the discharge to 80% except for very rare occasions. Here is a list of our suggested triggers:

d) It is acceptable to raise the grid or generator start triggers to increase the reserve capacity of the system.

4. Program the Discharge tab:



Note:
a) At 'Shutdown' state of charge (battery bank charge percentage), inverter prevents battery from powering the loads. The battery(s) will renew/continue providing power to the loads when the battery bank is recharged to 'Restart' state of charge. 'Shutdown' and 'Restart' state of charge set-points can be increased to increase the "reserve capacity" of the system, but that will cause less battery charge usage. The correct shutdown level is specific to the project site.
b) Low battery is an alarm also specific to the project site, integrated with the Sol-Ark monitoring app. We suggest a 20% state of charge as a low battery alarm level. But it is a good idea to increase it if the 'Shutdown' and 'Restart' set-points are increased.
c) The battery empty voltage should not be lower than **44.8V.** The last statement from the previous note applies to the 'Batt Empty V'. Usually this set-point does not exceed **45.5V.**

Grid Setup / Time-of-Use

Time-of-use settings are specific to each end user but also important to having system behavior meeting customer expectations. system to behave as the end user wants it to behave. There are a few important things to know when programming Sol-Ark's time-of-use settings:

1) Checking the "charge" column boxes will force a grid charge to that battery.

2) Leaving the "charge" column boxes unchecked will act as a low battery cut-off.
3) Enabling "grid-sell" will allow the battery to sell back to the grid when it is otherwise 100% full.

4) Solar will charge the battery to 100% if there is enough sunlight available and all the loads are otherwise met.

5) Additional settings worth exploring in the Grid Setup Menu are the frequency ranges and grid profile settings useful for generator compatibility.

<u>Back-up Only Customers:</u>

Batteries work better and last longer if they are used, rather than staying 100% full. Our recommendation is to allow the battery to drop to 70% during the early morning hours and then have it go to 100% during the day. You do not need to enable a grid-charge for this functionality. You may want to increase the grid start % or voltage in the battery setup menu.

Time-of-use Customers:

1) To maintain solar tax credit compliance, you will want to prioritize battery charging in the hours before the time-of-use period so that the battery is 100% going into the time frame.

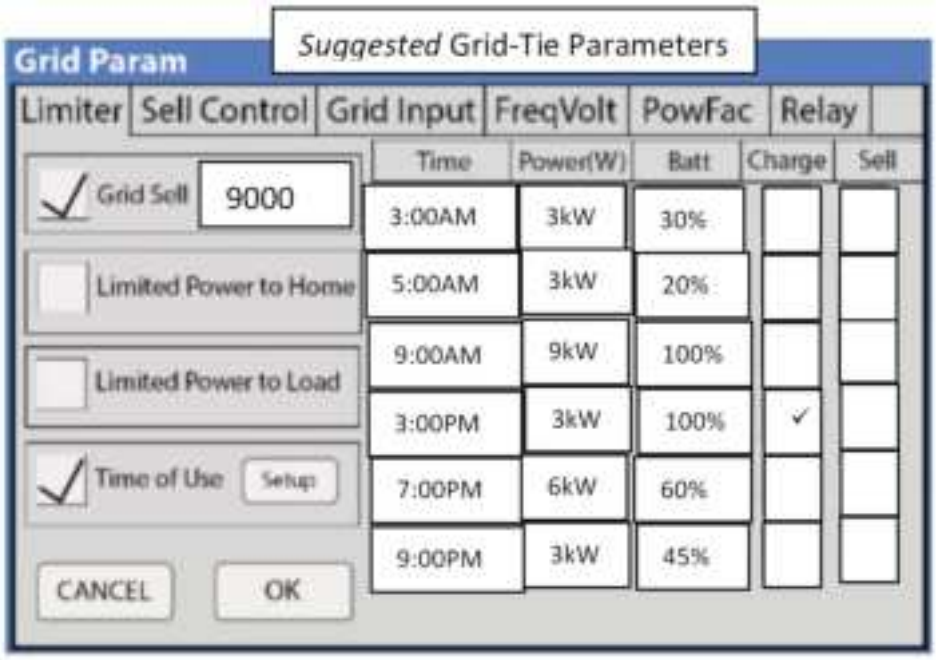
2) You may also want to enable a grid charge the hour before the time-of-use period to ensure the battery reaches 100%

3) You may not want to discharge the battery too aggressively. Sticking to no more than 9kW per eVault or 3.3kW per eFlex Max is optimal for maximizing battery life under time-of-use grid sell-back. Likewise, selling back at less than the full rated value of the inverter is healthy for inverter life. So for example, if you can identify that the battery and inverter will be fully utilized over the time of use rate period by discharging at 5kW rate instead of the full rated capacity of the inverter, it will extend battery life.

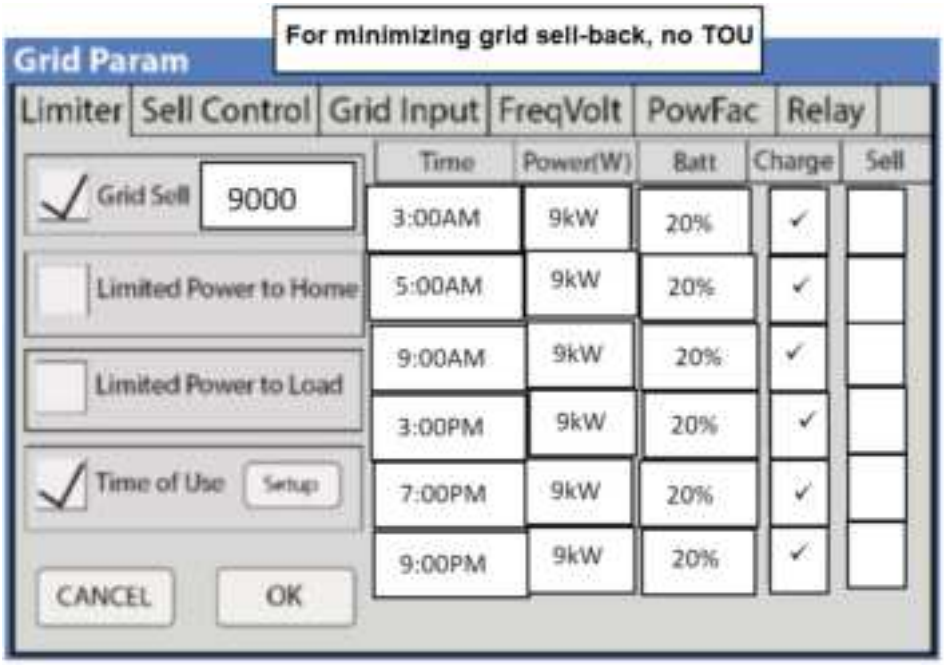
4) That said, the mantra is "use it or lose it" - it is more economically advantageous for the end user to use the battery when it is financially advantageous to do so, rather than to keep the battery at 100% always.

Bad Utility Buyback Rates aka "no net-metering" aka "bad net-metering":

Allow the battery to discharge to a 20% state-of-charge over night, so that it can absorb as much solar power as possible during the day rather than having that energy sold back to the grid. Staggering the step down percentages throughout the night so that the battery so that the battery hits 20% right in the early morning will mitigate the risk of power outage between sun up and sun down. Maintain the final 20% time-of-use step with a grid charge to make sure the battery does not go below 20% (which would trigger a full grid recharge at 15% per prior steps). During the day, it does not matter if you prioritize the grid or the battery first when recharging with solar power.



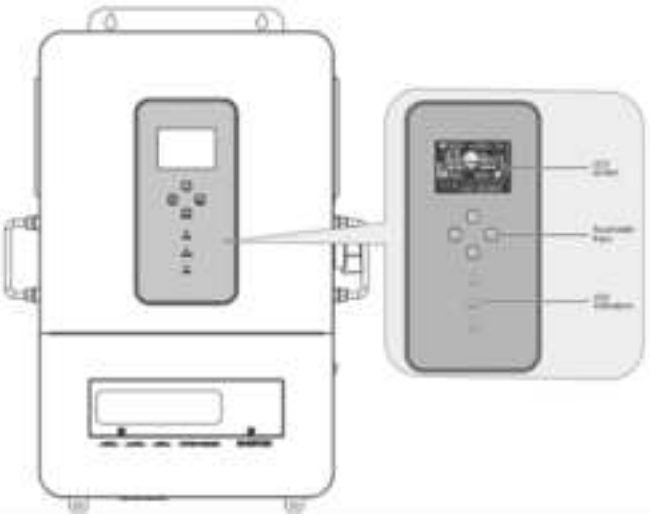
Note: Change the programming from Percentage to Voltage in the Battery setup menu. (Use Batt % Charge / Use Batt V charge)
Here are more aggressive settings for minimizing sell-back to the grid (but allowing grid-sellback when the batteries are full).


For minimizing grid sell-back, no TOU
Grid Param
Limiter
Sell Control
Grid Input
FreqVolt
PowFac
Relay
Grid Sell
9000
Limited Power to Home
Limited Power to Load
Time of Use
Setup
CANCEL
OK
Time
Power(W)
Batt
Charge
Sell
3:00AM
9kW
20%
5:00AM
9kW
20%
9:00AM
9kW
20%
3:00PM
9kW
20%
7:00PM
9kW
20%
9:00PM
9kW
20%

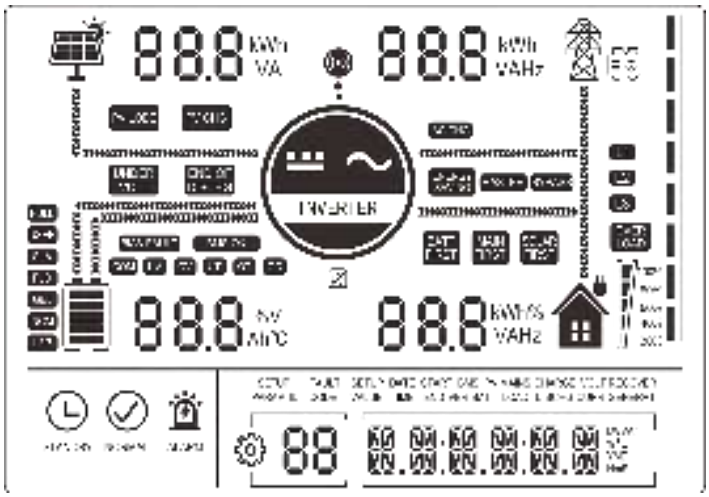
ECOVAULT

Operation and Display Panel

The operation and display panel of the inverter includes one LCD screen, three indicators, and four physical buttons.



Inverter



Display

Physical button	
Physical button	**Description**
SET	Enter/Exit the setup menu
UP	Go to the next option
DOWN	Go to the previous option
ENTER	Confirm/Enter the option in setup menu

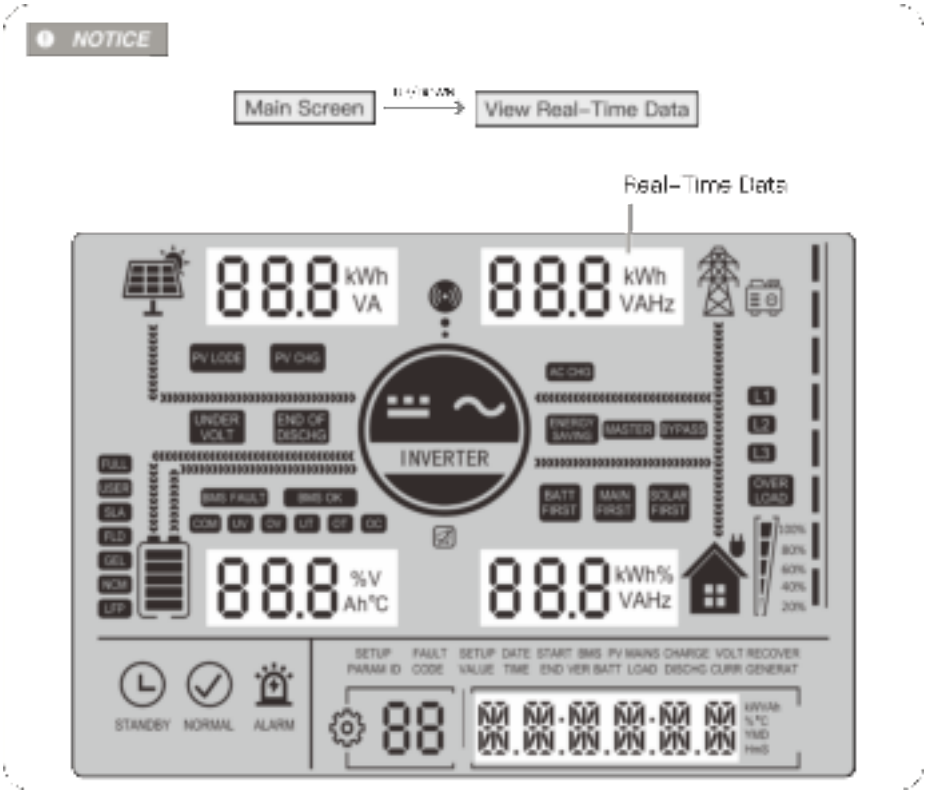
LED Indicator		
Indicator	**Color**	**Description**
AC/INV	Green	Normally ON: Grid bypass output
		Flash: inverter output
CHARGE	Yellow	Normally ON: charging completed
		Flash: charging
FAULT	Red	Normally ON: level-1 fault Flash: level-2 fault OFF: level-3 or level-4 fault

ICON	DESCRIPTION	ICON	DESCRIPTION
	PV panel		Grid
	Battery		Generator
	The inverter is working		Load
	The inverter is communicating with the data collector		The buzzer is in mute mode
	Power flow direction		
	The inverter is in standby mode		The inverter is working normally
	There is a fault		Settings
	Load power: 80%–100%		SOC: 80%–100%
	Load power: 60%–79%		SOC: 60%–79%
	Load power: 40%–59%		SOC: 40%–59%
	Load power: 20%–39%		SOC: 20%–39%
	Load power: 5%–19%		SOC: 5%–19%
UNDER VOLT	Battery under-voltage	END OF DISCHG	Battery over-discharge
OVER LOAD	Overload	BMS FAULT	BMS fault
COM	System communication error	UV	System undervoltage
OV	System overvoltage	UT	System under temperature
OT	System overtemperature	OC	System overcurrent
FULL	Battery full power	USER	User-defined battery
SLD	Sealed lead-acid battery	FLD	Flooded lead-acid battery
GEL	Gel lead-acid battery	NCM	Ternary Li-ion battery
LFP	LFP Li-ion battery	**ECO**	Energy-saving mode
PVLOAD	PV power is loading	**PVCHG**	PV power is charging the battery

ACCHG	AC input power is charging the battery	**GRID FIRST**	The output mode of the inverter is Grid first
BYPASS	The output mode of the inverter is Grid bypass	**SOLAR FIRST**	The output mode of the inverter is PV first
BATT FIRST	The output mode of the inverter is battery first		

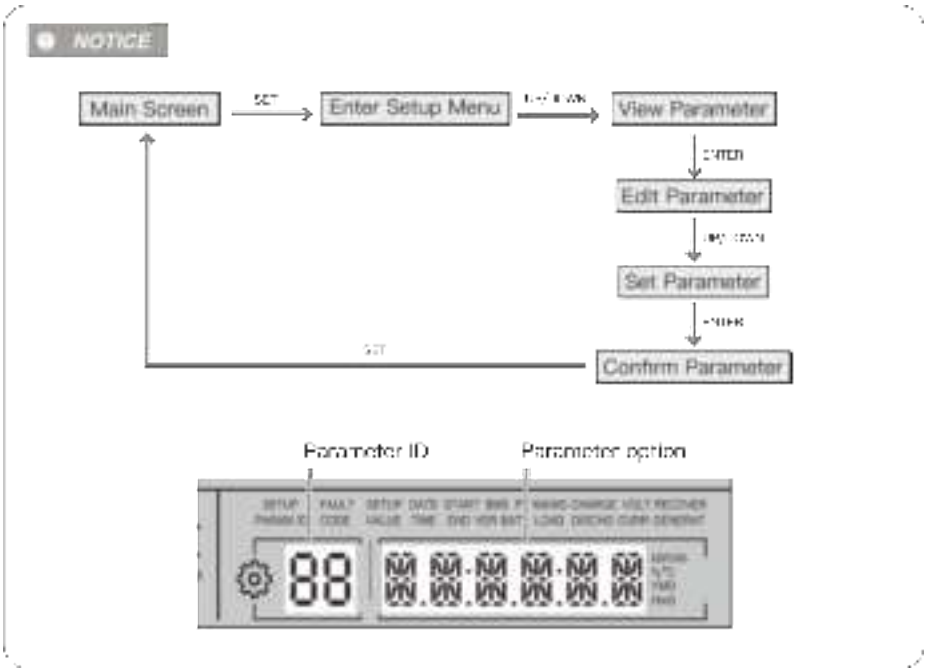
REAL-TIME PARAMETERS VIEW

On the screen, press the UP/DOWN button to view real-time data of the inverter in operation



PAGE	PV	BATTERY	AC INPUT	LOAD	GENERAL
1	PV input voltage	Battery voltage	Grid input voltage	Single-phase voltage	Current time
2	PV input current	Battery current	Grid input current	Single-phase current	Current date
3	PV input power	Battery voltage	Grid total input power	Single-phase active power	PV gross generation
4	PV generation for the day	Battery current	Grid charging capacity for the day	Single-phase apparent power	Total load consumption
5	PV heat sink temperature	Heat sink temperature	Grid frequency	Inverter output frequency	RS485 address
6	Rated open circuit voltage	Rated battery voltage	Bus voltage	Rated output frequency	Software version
7	Maximum PV charge current	Maximum battery charges current	Maximum Grid charge current	Total output active power	/
8			/	Total output apparent frequency	/

SETTINGS



NOTICE

If you use lithium battery which has communication with Inverter, please skip all Battery Voltage setting (04~07)

INVERTERT MODE OF OPERATION DESCRIPTION

00	Exit	ESC	Exit the setup menu
01	ESS Operation Mode	UTI (default) Backup Mode	Backup Mode (Load Source Priority: PV → Grid → Battery) If PV power is insufficient, the system uses both PV and grid power to support the load. When PV power exceeds the demand, the excess energy charges the battery. Grid power is only used for charging when the battery is over-discharged (if setting 06 is PV-only charging, the grid will not charge the battery). The battery discharges only in off-grid mode
		SBU Self-Consumption Mode (Recommend)	Self-Consumption Mode (Load Source Priority: PV → Battery → Grid) PV Power Priority – The system first uses solar (PV) power to supply the load. Battery Backup – If PV power is insufficient, the system draws power from the battery to support the load.

	Grid as Last Resort – The system switches to grid power only when the battery voltage drops below the set threshold (Parameter ④). Return to PV/Battery – Once the battery voltage recovers above the set threshold (Parameter ⑤), the system switches back to PV or battery power for load supply.
SOL	Self-Consumption Mode (Load Source Priority: PV → Battery → Grid) The PV mode is to be applied first and when the PV power is unavailable or the battery voltage is lower than the set value in the item 4, it will switch to the Grid mode
SUB	PV and Grid prioritize Charging the Battery
Battery	
Charging Priority Mode	PV Priority for Charging – The system prioritizes PV power to charge the battery. Grid-Assisted Charging – If PV power is insufficient, the system uses both PV and grid power for charging (except when Parameter 06 is set to PV-only charging, in which case the grid will not charge the battery). Grid Powers the Load – While the battery is charging, the grid supplies power to the load when PV alone is not sufficient. Hybrid Load Supply – If PV power is enough for charging but insufficient for the load, the system will use both PV and grid power to support the load. Battery Discharges Only in Off-Grid Mode – The battery does not discharge when the system is connected to the grid; it is reserved for off-grid operation only.

FN	PARAMETER	EFORCE	EFLEX MAX/EFLEX	EVAULT MAX
04	**Battery Low Cut of Voltage**	**48V**	**51.2V**	**51.2V**
WHEN PARAMETER ITEM 01 IS SET TO SBU (SOLAR-BATTERY UTILITY) OR SOL (SOLAR ONLY) MODE, THE SYSTEM PRIORITIZES PV AND BATTERY POWER. HOWEVER, IF THE BATTERY VOLTAGE DROPS BELOW THE SET CUT-OFF POINT, THE POWER SOURCE AUTOMATICALLY SWITCHES FROM THE INVERTER TO THE GRID TO PREVENT BATTERY OVER-DISCHARGE				
06	**Grid Charge Setting**	**SNU (RECOMMENDED)**	**SNU (RECOMMENDED)**	**SNU(RECOMMENDED)**
SNU (DEFAULT): BOTH PV AND GRID CAN CHARGE THE BATTERY, WITH PV AS THE PRIORITY CHARGING SOURCE OSO: GRID POWER WILL NOT CHARGE BATTERY				
07	**Battery Charge Current**	**120Adc per eForce**	**60Adc per eFlex MAX/eFlex**	**140Adc per eVault MAX**

08	**Battery Type**	**L14/15/16**	**L14/15/16**	**L14/15/16**
09	**Battery boost charge voltage (Bulk & Absorption)**	**51.4V**	**55.2V**	**55.2V**
10	**Boost Charge duration**	**60min**	**60min**	**60min**
11	**Battery floating charge voltage**	**51V**	**54V**	**54V**
12	**Battery over-discharge Protection voltage (delayed shutdown)**	**44.8V**	**48V**	**48V**
13	**Battery over-discharge delay time**	**50s**	**50s**	**50s**

WHEN THE BATTERY VOLTAGE DROPS BELOW THE THRESHOLD SET IN PARAMETER ITEM 12, THE INVERTER WILL WAIT FOR THE DELAY TIME SET IN THIS PARAMETER BEFORE SHUTTING OFF THE OUTPUT.

SETTING RANGE: 5S – 50S

ADJUSTMENT STEP: 5S

PURPOSE: THIS DELAY PREVENTS UNNECESSARY SHUTDOWNS DUE TO TEMPORARY VOLTAGE DIPS, ENSURING STABLE SYSTEM OPERATION WHILE STILL PROTECTING THE BATTERY FROM OVER-DISCHARGE

14	**Battery under-voltage alarm threshold**	**46**	**51.2**	**51.2**

WHEN THE BATTERY VOLTAGE IS LOWER THAN THE THRESHOLD, IT WILL GIVE AN UNDER-VOLTAGE ALARM AND THE OUTPUT WILL NOT SHUT DOWN. SETTING RANGE: 40 V–52 V, WITH A STEP OF 0.4 V

15	**Battery over discharge protection voltage**	**44.8**	**48**	**48**
16	**Battery equalization charge**	**DIS (Default)**	**DIS (Default)**	**DIS (Default)**

DIS: DISABLE EQUALIZATION CHARGE

ENA: ENABLE EQUALIZATION CHARGE, ONLY AVAILABLE FOR FLOODED LEAD-ACID BATTERIES, SEALED LEAD-ACID BATTERIES, AND USER-DEFINED ONES

32	**RS485 Communication Function**	**CAN**	**CAN**	**CAN**
33	**BMS communication**	**FOR**	**FOR**	**FOR**
35	**Battery under-voltage recovery threshold**	**46**	**51.2**	**51.2**
37	**Battery Recharge Voltage**	**48**	**51.2**	**51.2**
39	**Charge current limit** **(Communicate with BMS)**	**LCBMS (default)**	**LCBMS (default)**	**LCBMS (default)**

LCSET: THE MAXIMUM BATTERY CHARGE CURRENT IS NOT GREATER THAN THE SET VALUE OF "07"

LCBMS (DEFAULT): THE MAXIMUM BATTERY CHARGE CURRENT IS NOT GREATER THAN THE MAXIMUM BMS ALLOWED CURRENT

LCINV: THE MAXIMUM BATTERY CHARGE CURRENT IS NOT GREATER THAN INVERTER ALLOWED CURRENT

40-45	**Start and End Charge time 1,2,3,**	**00:00:00**	**00:00:00**	**00:00:00**
46	**Timed battery charge function**	**DIS**	**DIS**	**DIS**

DIS (DEFAULT): DISABLE THE FUNCTION

ENA: WHEN THE TIMED GRID CHARGING/LOAD SUPPLY FUNCTION IS ENABLED, THE POWER SUPPLY MODE WILL OPERATE BASED ON THE CONFIGURED TIME PARAMETERS AND BATTERY STATE (RANGE 0:00:00–23:59:00)

1. OPERATING MODES

SBU MODE ACTIVATION:

THE SYSTEM WILL OPERATE IN SBU MODE WHEN TIMED GRID CHARGING IS ENABLED. THE INVERTER WILL PRIORITIZE SOLAR (S) AND BATTERY (B) POWER, SUPPLYING LOADS FROM THESE SOURCES. WHEN THE SYSTEM REACHES THE CONFIGURED CHARGING PERIOD OR THE BATTERY ENTERS AN OVER-DISCHARGE STATE, IT WILL SWITCH TO GRID (U) POWER FOR BATTERY CHARGING.

UTI MODE ACTIVATION (WITH TIMED DISCHARGE ENABLED): IF THE TIMED DISCHARGE FUNCTION IS ALSO ENABLED, THE SYSTEM WILL SWITCH TO UTI MODE. IN THIS MODE, THE INVERTER: USES GRID POWER FOR BATTERY CHARGING ONLY DURING THE SET CHARGING PERIOD. SWITCHES TO BATTERY INVERTER OPERATION DURING THE CONFIGURED DISCHARGE PERIOD OR IF THE GRID POWER IS LOST.

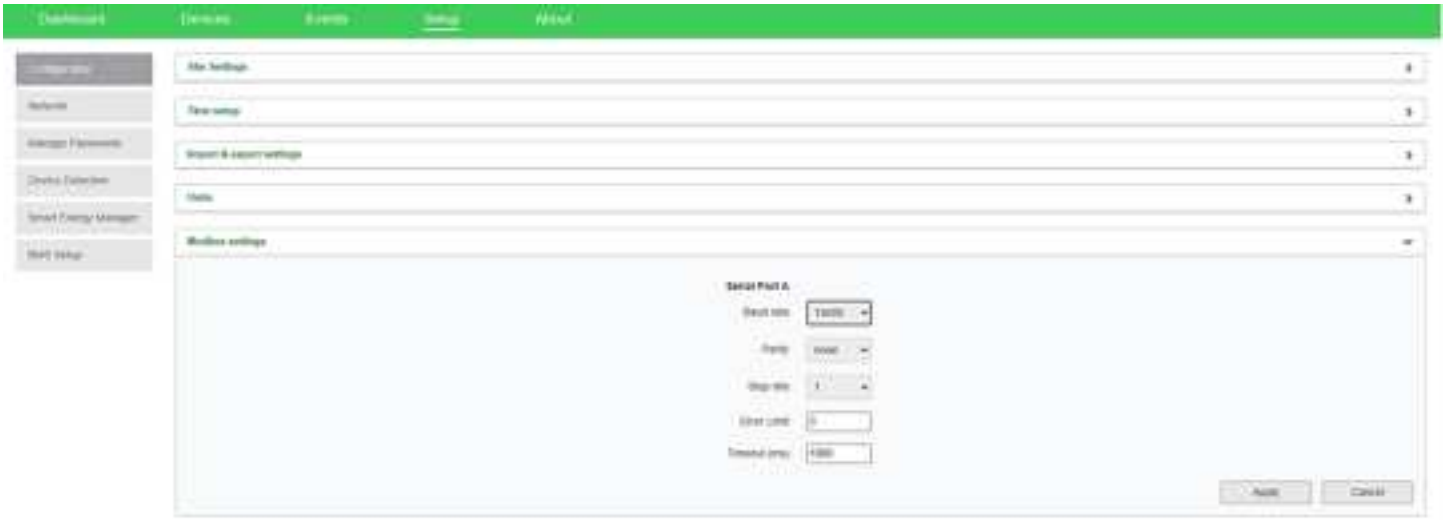
47-52	**Start and End discharge time 1,2,3**	**00:00:00**	**00:00:00**	**00:00:00**
53	**Timed battery discharge function**	**DIS**	**DIS**	**DIS**

DIS (DEFAULT): DISABLE THE FUNCTION

ENA: AFTER THE TIMED BATTERY DISCHARGE FUNCTION IS ENABLED, THE POWER SUPPLY MODE WILL BE CHANGED INTO UTI, WHERE THE SYSTEM ONLY SWITCHES TO THE POWER SUPPLY OF BATTERY INVERTER DURING THE SET DISCHARGE PERIOD OR GRID FAILURE				
58	**SOC setting for discharge alarming**	**25%**	**25%**	**25%**
WHEN THE CAPACITY IS LESS THAN THE SET VALUE, THE SOC ALARMS (UNIT: %, ONLY AVAILABLE DURING NORMAL BMS COMMUNICATION)				
59	**SOC setting for discharge cutoff**	**20%**	**20%**	**20%**
WHEN THE CAPACITY IS LESS THAN THE SET VALUE, THE DISCHARGE STOPS (UNIT: %, ONLY AVAILABLE DURING NORMAL BMS COMMUNICATION)				
60	**SOC setting for charge cutoff**	**100%**	**100%**	**100%**
WHEN THE CAPACITY IS GREATER THAN THE SET VALUE, THE CHARGE STOPS (UNIT: %, ONLY VALID DURING NORMAL BMS COMMUNICATION)				
61	**SOC setting for switching to grid**	**25%**	**25%**	**25%**
WHEN THE CAPACITY IS LESS THAN THE SET VALUE, IT SWITCHES TO GRID (UNIT: %, ONLY AVAILABLE DURING NORMAL BMS COMMUNICATION)				
62	**SOC setting for Switching to inverter Output**	**100**		**100**
WHEN THE CAPACITY IS GREATER THAN THE SET VALUE, IT SWITCHES TO THE INVERTER OUTPUT MODE (UNIT: %, ONLY AVAILABLE DURING NORMAL BMS COMMUNICATION)				
73	**Max charging current by generator**	**80Adc**	**80Adc**	**80Adc**

SCHNEIDER

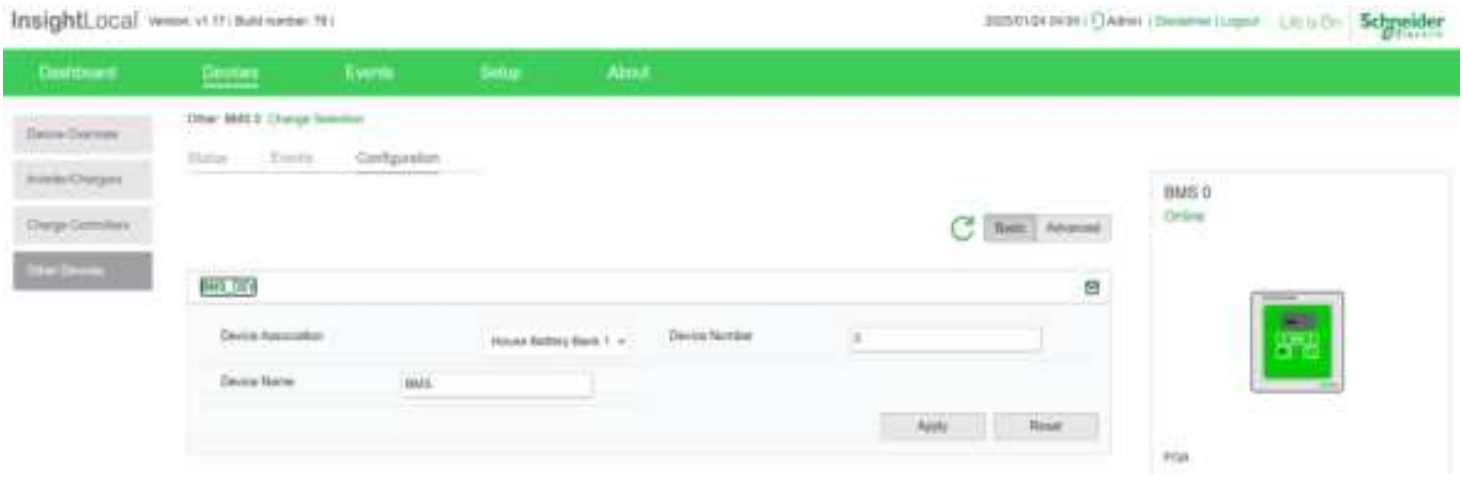
1. Connect to Schneider's Insight Local
2. Go to SETUP>CONFIGURATION>MODBUS SETTINGS and select **19200 Baud Rate. Click Apply**



3. Go to SETUP>Device Detection> input range 1-10. Click Detect.

4. Make sure that Insight Home is reading the battery internal parameters

5. Associate Battery as House Battery Bank 1



Parameter Settings

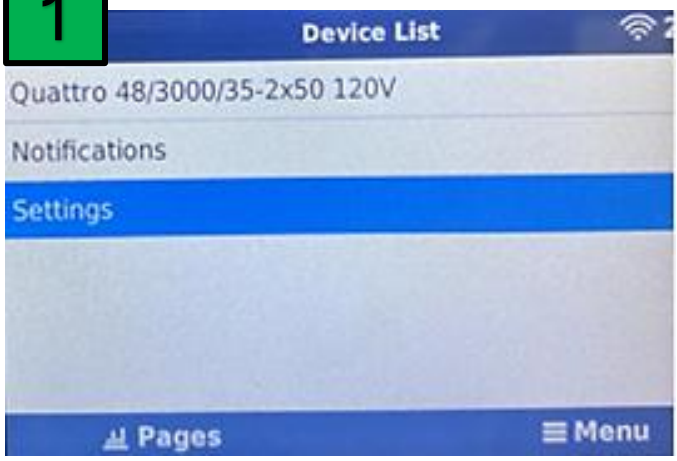
PARAMETER	VALUE
CHARGER SETTINGS	
RECHARGE VOLTAGE	46V
RECHARGE SOC	20%
RECHARGE DELAY	60s
BATTERY SETTINGS	
BATTERY TYPE	LI-ION
CHARGE CYCLE	EXTERNAL BMS
SOC CONTROL ENABLE	ENABLED

BATTERY BANK CAPACITY	200aH per eForce
MAXIMUM CHARGE RATE	100%
MAXIMUM BULK CHARGE CURRENT	120A per eForce
MAXIMUM ABSORPTION CHARGE CURRENT	120A per eForce
MAXIMUM FLOAR CHARGE	120A per eForce
DEFAULT BATTERY TEMPERATURE	WARM
ABSORPTION TIME	3600
BULK/BOOST VOLTAGE	51.5
ABSORPTION VOLTAGE SET POINT	51.5
MAXIMUM DISCHARGE CURRENT	160A per eForce
MAXIMUM DISCHARGE TIME INTERVAL	8
LOW BATTERY CUT OUT	44.8V
LOW BATTERY CUT OUT DELAY	10s
LOW BATTERY CUT OUT HYSTERESIS	2
LOW BATTERY CUTOUT WARNING OFFSET	2
HIGH BATTERY CUT OUT	58V
CHARGE CYCLE TIMEOUT	1440s
HIGH SOC CUT OUT	99%
HIGH SOC CUT OUT DELAY	2s
LOW SOC CUT OUT	15%
LOW SOC CUT OUT DELAY	60s

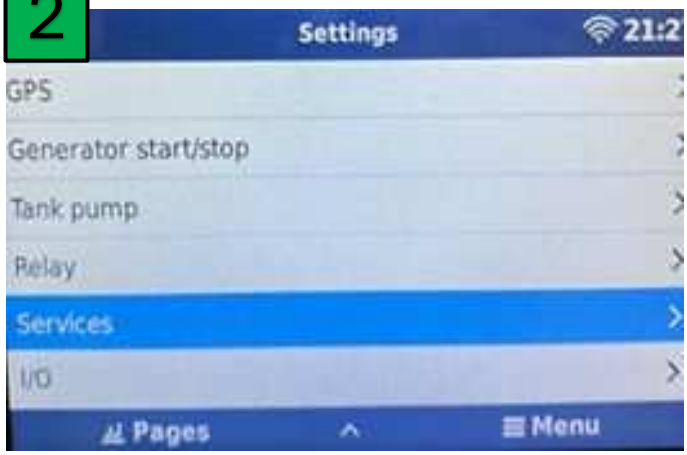
VICTRON

Setup Steps

1


Device List
Quattro 48/3000/35-2x50 120V
Notifications
Settings
Pages
Menu

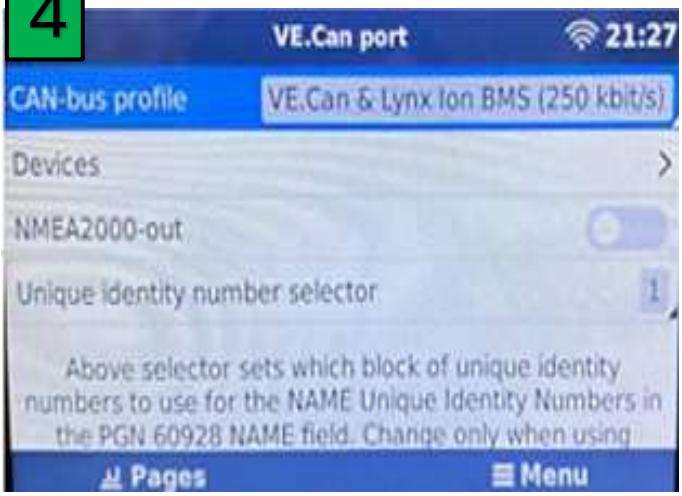
2


Settings
21:2
GPS
Generator start/stop
Tank pump
Relay
Services
I/O
Pages
Menu

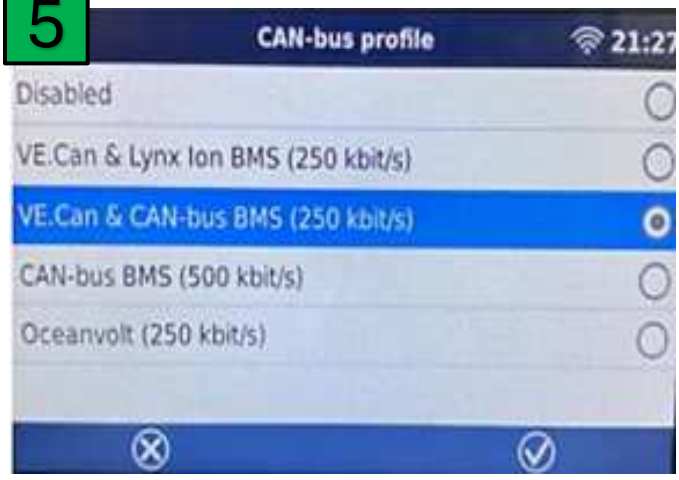
3


Services
21:27
Modbus TCP
Disabled
MQTT on LAN (SSL)
VE.Can port
BMS-Can port
Pages
Menu

4


VE.Can port
21:27
CAN-bus profile
VE.Can & Lynx Ion BMS (250 kbit/s)
Devices
NMEA2000-out
Unique identity number selector
1
Above selector sets which block of unique identity numbers to use for the NAME Unique Identity Numbers in the PGN 60928 NAME field. Change only when using
Pages
Menu

5


CAN-bus profile
21:27
Disabled
VE.Can & Lynx Ion BMS (250 kbit/s)
VE.Can & CAN-bus BMS (250 kbit/s)
CAN-bus BMS (500 kbit/s)
Oceanvolt (250 kbit/s)

6


Device List
21:29
AN-bus BMS battery
84%
52.40V
-3.5A
uattro 48/3000/35-2x50 120V
lotifications
ettings