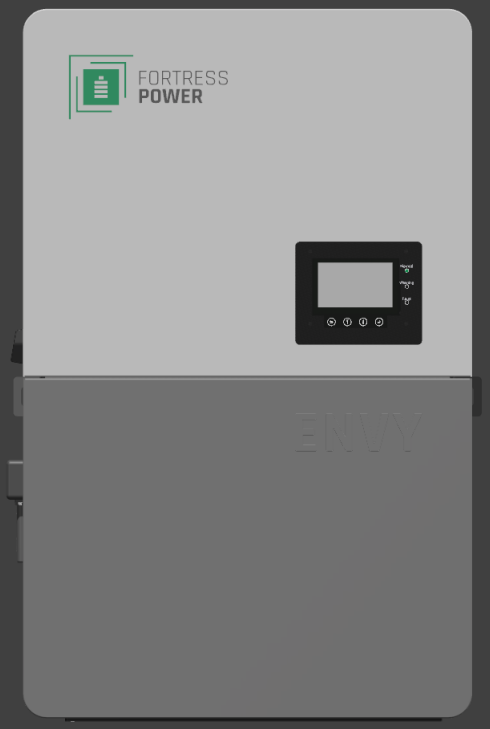
ENVY DUO 21

INSTALLATION MANUAL

Step 1



Important: Verify the system configuration before installing. A proper system design is required for warranty purposes. Improper system configuration will void the warranty.

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1. 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

EPS=Emergency Power Supply (Backup)
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)

2. Change Log

VERSION	CHANGE DESCRIPTION
	•
	•
	•
	•
	•
	•

3. Safety

3.1 Safety Instruction

General Safety Instructions

Safety regulations have been strictly observed in the design and testing of the inverter. Prior to any work, carefully read all safety instructions and always observe them when working on or with the inverter. The installation must adhere to all applicable national or international standards or regulations. Incorrect operation or work may cause:

- injury or death to the operator or a third party
- damage to the inverter and other properties belonging to the operator or a third party.

DANGER

Dangers of High Voltages and Large Current

- Beware of high PV voltage. Please turn off the DC switch of PV Panel output before and during the installation to avoid electric shock.
- Beware of high grid voltage. Please turn off the AC switch at the grid connection before and during the installation to avoid electric shock.
- Beware of large current of the battery output. Please turn off the battery module before and during the installation to avoid electric shock.
- Do not open the inverter when it's working to avoid electric shock and damage from live voltage and current from the system.
- Do not operate the inverter when it's working, only the LCD and buttons can be touched in limited cases by qualified personnel,
- Other parts of the inverter can be touched when the inverter is in a safe state (e.g., fully shutdown).
- Do not connect or disconnect any connections (PV, battery, grid, communication etc.) of the inverter when it's operating.
- Make sure the inverter is well grounded. An operator should make sure he is well protected by reasonable and professional insulation measurements (e.g., personal protective equipment (PPE).
- Inspect relevant existing wiring on-site of the installation is in good condition before installation, operation, or maintenance.
- Inspect that connections are good between the inverter and PV, battery, and grid during installation to prevent damage or injuries caused by bad connections.

Important Safety Notifications

There are various safety issues that must be carefully conveyed prior to and after the installation, as well as during future operation and maintenance. The following are important safety notifications for the operator, owner, and user of this product under normal conditions of use.

WARNING

Avoid Misoperation and Inappropriate Usage

- All the work of this product design, installation, operation, setting, configuration, and maintenance must be carried out by qualified personnel as required.
- All connections must be in accordance with local and national regulations and standards.
- The inverter and system can inter-connect with the utility grid only if the utility grid permits it.
- All the warning labels or nameplates on the inverter must be clearly visible and must not be removed, covered, or pasted.

- The installation should consider the safety of future users when choosing the right position and location as specified in this manual.
- Please keep the children away from touching or misusing the inverter and relevant systems.
- Beware of hot surfaces during inverter operation, the inverter and some parts of the system could be hot when working, please do not touch the inverter surface or most of the parts when they are working. During inverter working states, only the LCD and buttons could be touched.

Notice

- Please carefully read this manual before any work is carried out on this inverter, the installation, please keep this manual carefully stored and easy to access at any time.

- The qualified personnel should have had training in the installation and commissioning of the electrical system as well as dealing with hazards, knowledge of the manual and other related documents. As the installer or operator, they are required to be familiar with local regulations and directives.

- No Hardware alterations are allowed to the exterior or interior shell of the inverter. Doing so will void the warranty.

4. Introduction

4.1 About Fortress Power

Our mission is to provide compact, user-friendly, and affordable energy storage solutions using the latest technology for all homes and businesses. Fortress solar energy storage batteries can easily integrate with new and existing PV systems and work with a wide range of existing inverter and charge controller manufacturers for ease in system design.

Contact Information

Corporate Headquarter Address: 2010 Cabot Blvd West, STE L
Langhorne, PA 19047
United States

Website: www.fortresspower.com

Phone: US: (877) 497-6937
LATAM: (215) 710-8960

4.2 Warranty Support

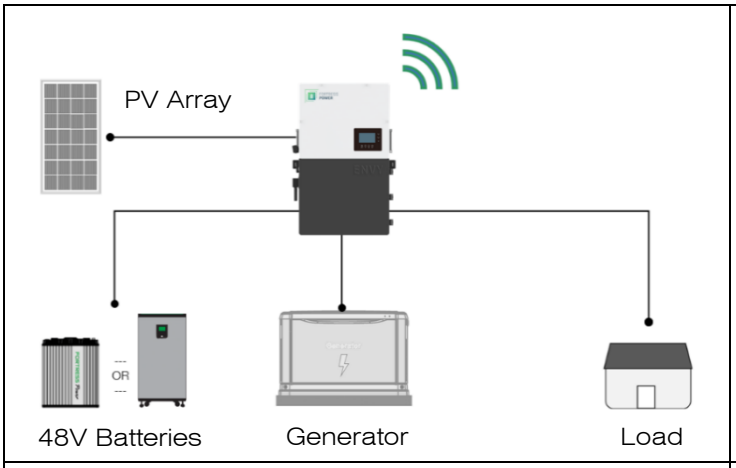
Unless otherwise submitting a Fortress warranty through the Guardian hub, please submit your Envy Duo 21 warranty here: https://fortresspower.com/warranty
Beyond this product manual, you may also find our inverter guides useful to system installation and commissioning: https://support.fortresspower.com/portal/en/kb/inverter-guides

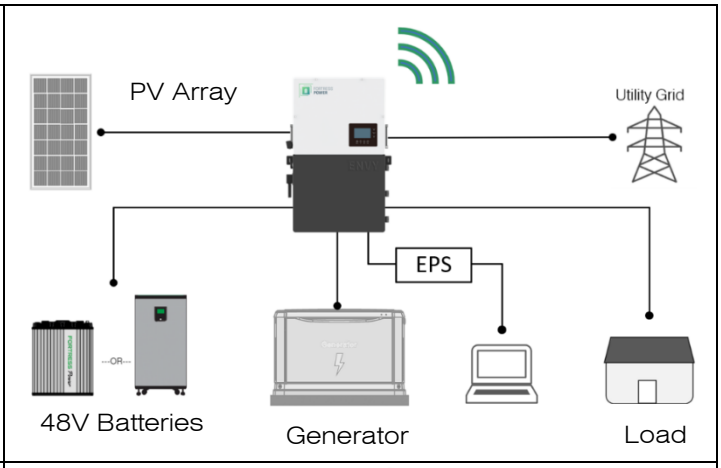
Beyond that, please find additional resources within our Support Portal https://support.fortresspower.com/portal/en/kb

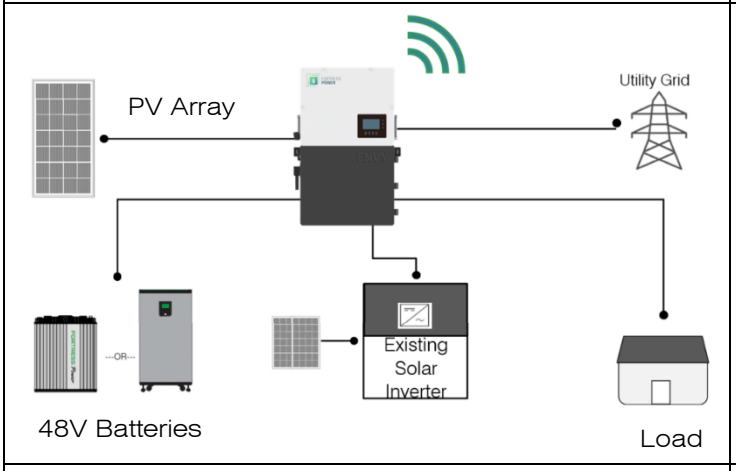
- Create a support ticket.
- Inverter Guides
- Product Manuals
- Firmware Updates
- Warranty Submittal
- System Design
- Application Notes
- Scheduled Meetings
- Accessories

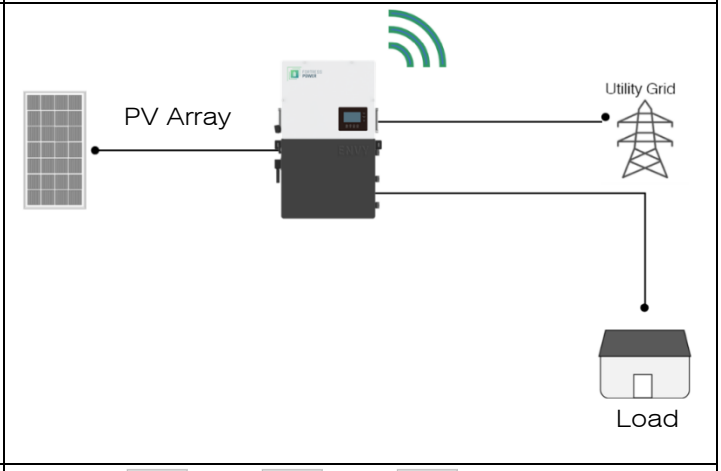
4.3 System Solution

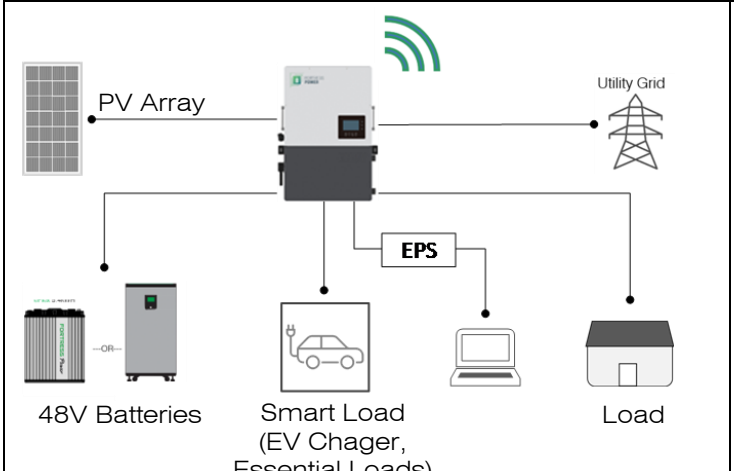
This product and its associated system are suitable for the following system applications (system diagram):











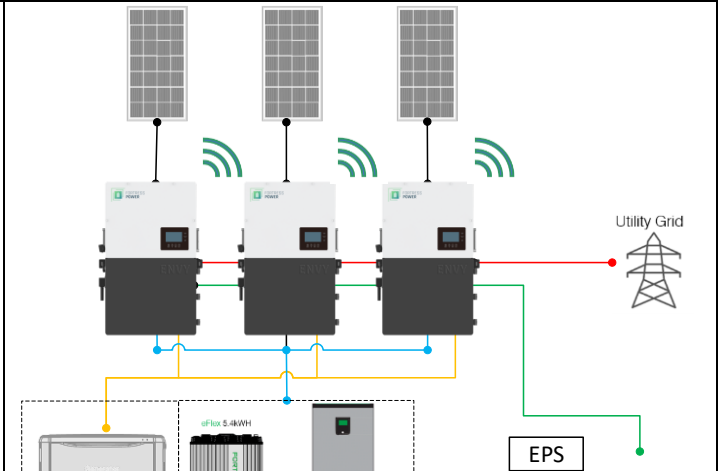


DIAGRAM NUMBER	APPLICATIONS
1	Off-Grid
2	On-Grid, Backup, Net-Metering, Zero-Export
3	AC Coupling, AC /DC COUPLING
4	No Battery
5	Smart Load
6	3 Phase/ Parallel System

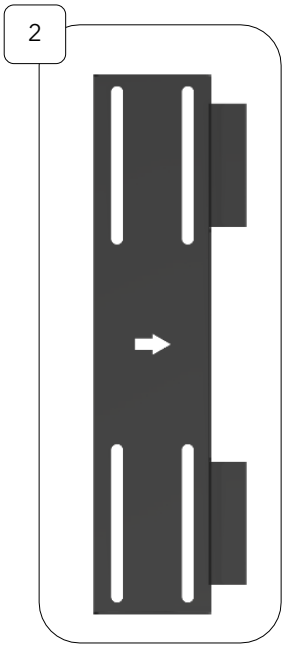
5. DATA SHEET

	FP-DUO-21
PV OUTPUT DATA	
NUMBER OF MPPT	3
INPUTS PER MPPT	2:2:1
MAX. USABLE INPUT CURRENT(A)	26/26/15
MAX. SHORT CIRCUIT INPUT CURRENT(A)	31/31/19
START INPUT VOLTAGE(V)	100
MPPT DC NOMINAL VOLTAGE(V)	360
DC VOLTAGE RANGE(V)	100-550
MPPT OPERATING VOLTAGE RANGE(V)	120-440
MAX. POWER(W)	21000
MAX.PV ARRAY POWER(W)	25000
AC GRID OUTPUT DATA	
MAX. OUTPUT CURRENT WITH PV(A)	66.7
MAX. OUTPUT POWER WITH PV(W)	16000@240V 13800@208V
CONTINUOUS POWER OUTPUT WITH BATTERY ONLY(W)	12000@240V, 12000@208V
RATED VOLTAGE(V)	120/240, 120/208
OPERATING VOLTAGE RANGE(V)	180-270
OPERATING FREQUENCY (HZ)	50/60
OPERATING FREQUENCY RANGE (HZ)	55-65
POWER FACTOR	0.99@full load
REACTIVE POWER ADJUST RANGE	-0.8~+0.8 leading Adjustable
THDI	<3%
SYNC INRUSH CURRENT(A)	35
BACKUP OUTPUT DATA	
NOMINAL OUTPUT CURRENT(A)	50@240V, 57.7@208V
NOMINAL OUTPUT VOLTAGE(V)	(120/240V), (120/208V)
CONTINUOUS OUTPUT POWER (VA)	12000@240V, 12000@208V
OPERATING FREQUENCY (HZ)	60
PEAK POWER (VA)	2xPn, 0.5s
THDV	<3%
SWITCHING TIME (ms)	<20
EFFICIENCY	
MAX. EFFICIENCY PV TO GRID	97.5%
MAX. EFFICIENCY BATTERY TO GRID	94%
CEC EFFICIENCY	96.9%
BATTERY DATA	
TYPE	Lithium battery/ No Battery
MAX. CHARGE CURRENT(A)	250
MAX. DISCHARGE CURRENT(A)	250
NOMINAL VOLTAGE(V)	48
VOLTAGE RANGE(V)	40-60
SAFETY	
PV REVERSE POLARITY PROTECTION	
DC SWITCH FOR EACH MPPT	
OUTPUT OVER-VOLTAGE PROTECTION VARISTOR	
OUTPUT OVER CURRENT PROTECTION	

PV GROUND FAULT MONITORING	
GRID MONITORING	
POLE SENSITIVE LEAKAGE CURRENT MONITORING UNIT	
AFCI	
RSD	
SURGE PROTECTION DEVICE (SPD): TYPE III DC PV , TYPE II AC	
REGULATION COMPLAINT AND CERTIFICATIONS	
RULE 21 PHASE I, II, III	
HAWAII RULE 14H & HECO SRD-IEEE-1547.1:2020 ED.2	
IEEE 1547.1: 2020; IEEE 1547: 2018, IEEE2030.5	
LUMA PR	
UL1741SA, UL1741SB	
UL1741: 2021 ED3 PCS CRD	
CSA C22.2#107.1	
CSA C22.2#330	
FCC PART 15, CLASS B	
GENERAL DATA	
PARALLELING CAPABILIY	Up to 10 units (120kW)
DIMENSIONS	22.3*35.2*11.2 in / 566*893*285mm
WEIGHT	125.7lbs / 57kg
DEGREE OF PROTECTION	NEMA4X / IP66
COOLING CONCEPT	Smart Cooling Fans
TOPOLOGY	High Frequency Transformer-less
RELATIVE HUMIDITY	0-100%
ALTITUDE(M)	<6561ft. (<2000m)
OPERATING TEMPERATURE RANGE (℃)	-25~60>40 Derating
NOISE EMISSION (dB)	<67
IDLE CONSUMPTION AVG (W)	60
DISPLAY	Touch color screen
COMMUNICATION INTERFACE	Rs485/ Wi-Fi/ CAN
STANDARD WARRANTY	10 Years
ALTITUDE LIMITATION PERFORMANCE *ALTITUDE LIMITATION PERFORMANCE INCLUDE MAX CHARGING, DISCHARGING, ACTIVE POWER AND BACKUP OUTPUT KW	0-2000M 12kW 2000-3000M 10.2kW 3000-4000M 8.4kW >4000M Not allowable

6. UNBOXING


1
FORTRESS
POWER
ENVY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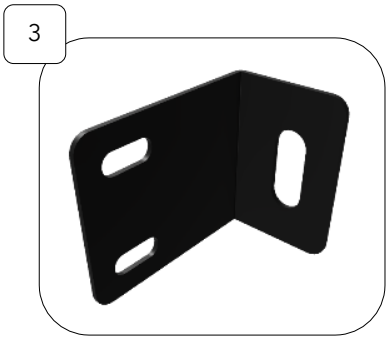
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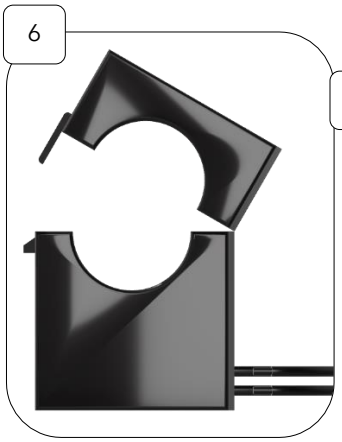
4


5
ENVY DUO 21
INSTALLATION MANUAL
Step 1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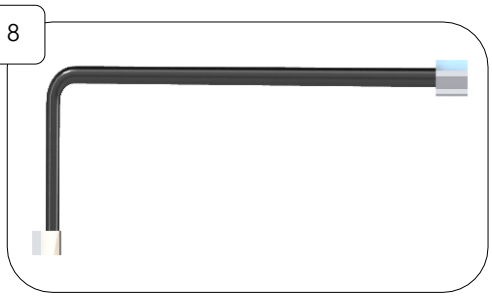
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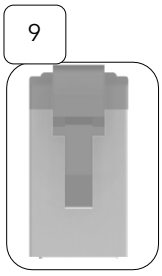
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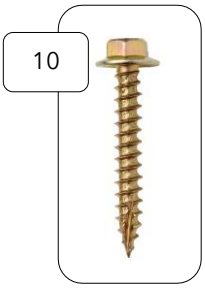
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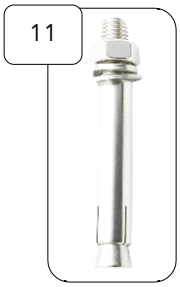
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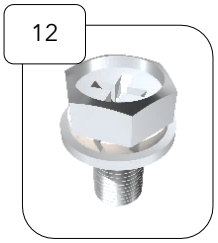
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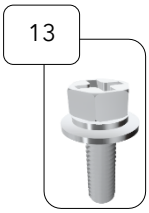
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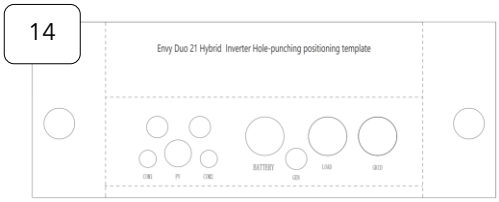

14
Envy Duo 21 Hybrid Inverter Hole-punching positioning template

PART NUMBER	PART NAME	QUANTITY
1	Envy Inverter with hole knockout caps	1
2	Wall Mount Bracket	1
3	L-shaped Brace	2
4	Battery RJ45 Adapter	1
5	Installation/ User Manual	1
6	Current Transformer (CT)	2 (connected by one cable)
7	Dongle	1
8	Battery To Inverter COMM Cable & Inverter to Inverter Communication Cable	2
9	RJ45 Terminals	4
10	Mounting Screw for Wooden Platform	6 each
11	Expansion Screw	6 each
12	Cross Head screws for L-Shaped Brace	4
13	Cross Head Screws for Dongle	4
14	Knockout Hole Template	1

7. REQUIREMENTS

7.1 BREAKER REQUIREMENTS

***Please include the following recommended breakers for each system connection in accordance with the local jurisdiction. Battery breakers and Load breakers are already integrated into the Envy inverter.**

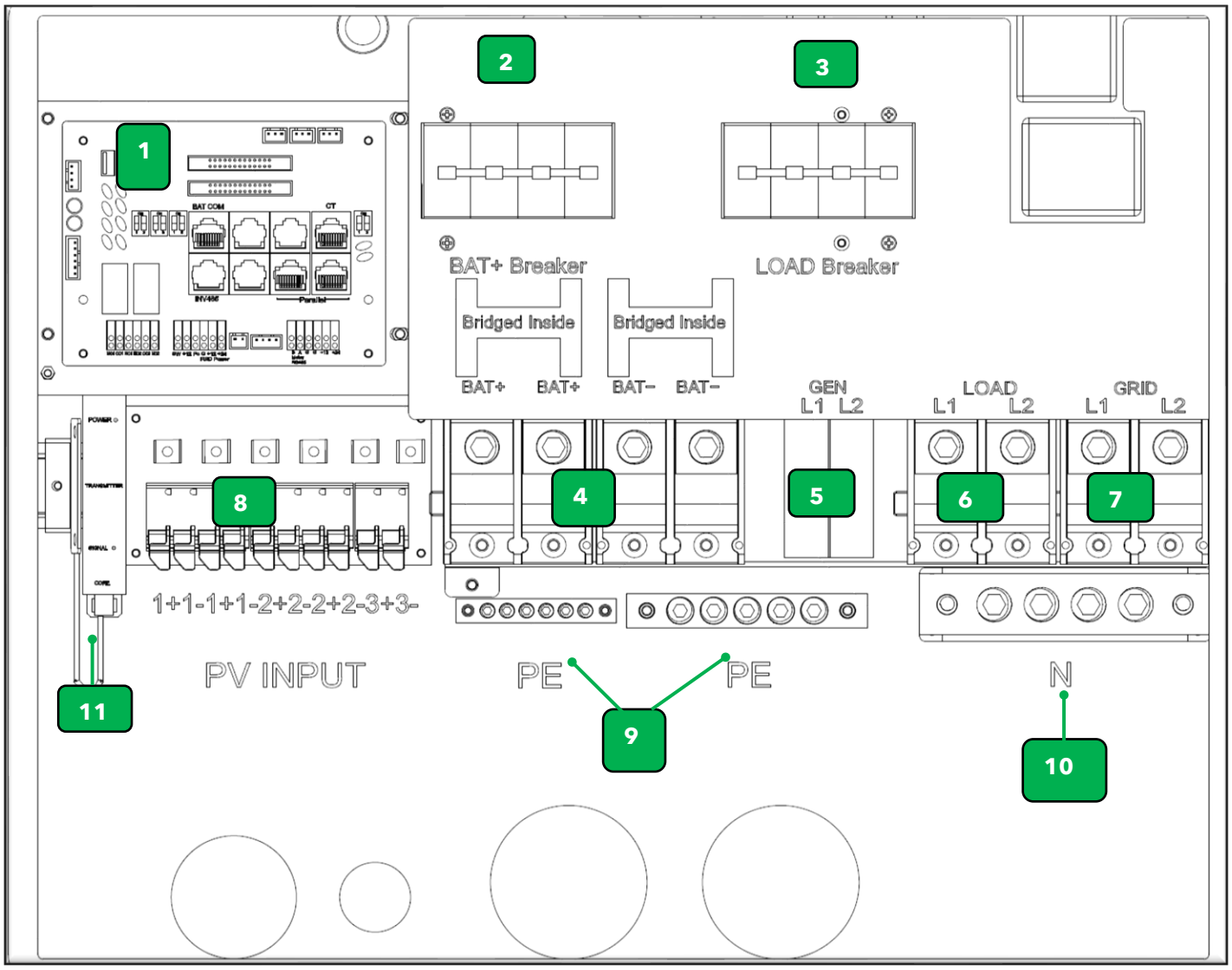
INVERTER MODEL	ENVY DUO 21
REQUIRED	
*PV FUSE BREAKERS (1 POLE) (OPTIONAL)	MPPT1 string 1: 550V/20Adc MPPT1 string 2: 550V/20Adc. MPPT2 string 1: 550V/20Adc. MPPT2 string 2: 550V/20Adc. MPPT3: 550V/20Adc
GRID BREAKER (2 POLE)	200Aac when Whole Home AC Passthrough and or Whole Home Backup on a 200A panel or 100Aac when Whole Home AC Passthrough and or Whole Home Backup on a 100A panel or 60Aac when EPS are used for Partial Backup and exporting power is less than 12kW or 80Aac when EPS are used for Partial Backup and exporting power is more than 12kW
GENERATOR OR AC COUPLING (2 POLE)	Up to 90Aac depending on generator size.
INCLUDED	
LOAD BREAKER (2 POLE)	1 qty 200Aac
BATTERY BREAKER	2 qty 200Adc

7.2 CABLE AND TORQUE REQUIREMENTS

SECTION	CABLE GAUGE (AWG)	MINIMUM VOLTAGE (V)	TORQUE (N.M)	LENGTH OF CABLE INSULATION REMOVAL	TERMINAL TYPE
GRID INPUT					
WHOLE HOME 100AMP AC PASSTHROUGH	3-2	600	5	5/16-3/8 in (8~10mm)	Included Mechanical Lug, Requires Allen 5/16 SAE
WHOLE HOME 200AMP AC PASSTHROUGH	2/0-3/0	600	9-18	5/16-3/8 in (8~10mm)	Included Mechanical Lug, Requires Allen 5/16 SAE
PARTIAL BACKUP	6-3/0	600	9-18	5/16-3/8 in (8~10mm)	Included Mechanical Lug, Requires Allen 5/16 SAE
LOAD OUTPUT					
INTEGRATED BREAKER 200AAC/240VAC	2/0-3/0	600	14	5/16-3/8 in (8~10mm)	Included Mechanical Lug, Requires Allen 5/16 SAE
BATTERY CABLE					
INTEGRATED BREAKER 200ADC	1/0-4/0	600	9-18	1/4-5/16 in (6-8mm)	Included Mechanical Lug, Requires Allen 5/16 SAE
GENERATOR CABLE					
UP TO 90A PORT	Up to 3	600	9	5/16-3/8inch(8~10mm)	Included Mechanical Lug, Requires Allen 5/16 SAE
PV CABLE					
PV INPUT	10-6	600	N/A	1/4-5/16 in (6~8mm)	Spring Clamp

Note: Cable gauge also will depend on connection distance

8. Inside the Envy Wire Cabinet

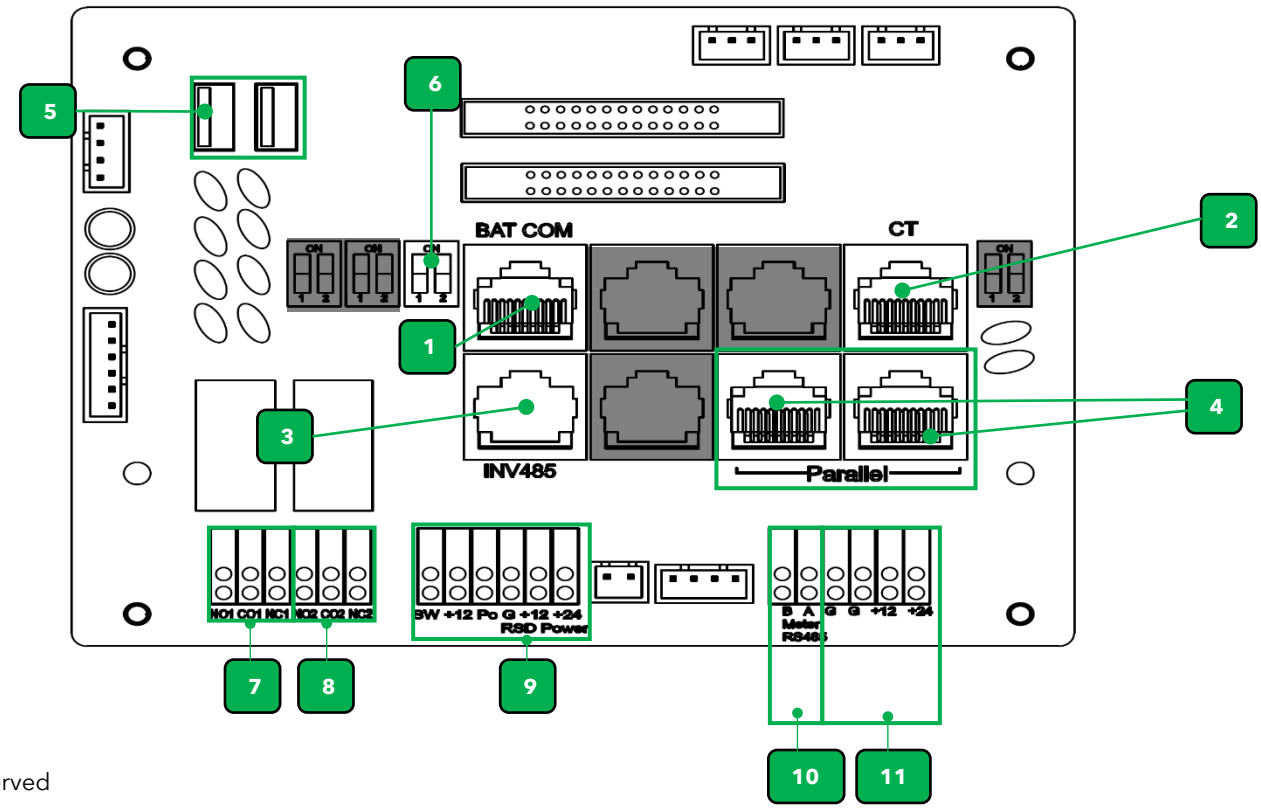


Do not use an impact driver to tighten or loosen fastener on any of the Envy port connections.

8.1 Connection Ports

AREA	DESCRIPTION
1	Communications Boards
2	2x 200A Battery Breakers included
3	200A Load Breaker included
4	Battery Connection Ports (Bridged)
5	Generator Connection Port (up to 90A) (AC Coupling Up to 12kW)
6	Load Connection Port
7	Grid Connection Port (Up to 200A)
8	PV Input Connection
9	Protective Earth or Ground Connection Bars
10	Neutral Connection Bar
11	Apsmart Transmitter (SUNSPEC Compliant)

8.2 Communication Board Ports Definition

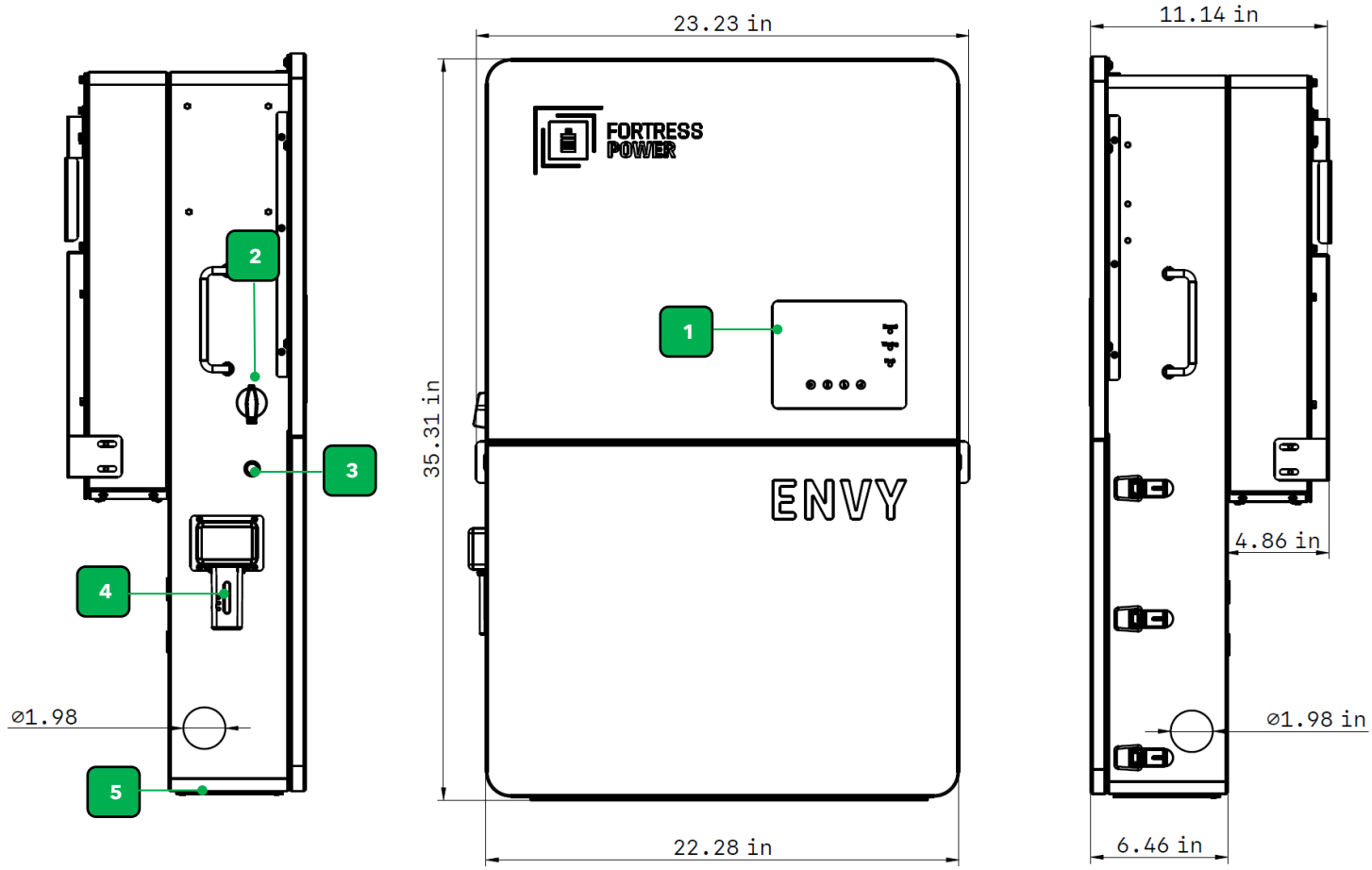


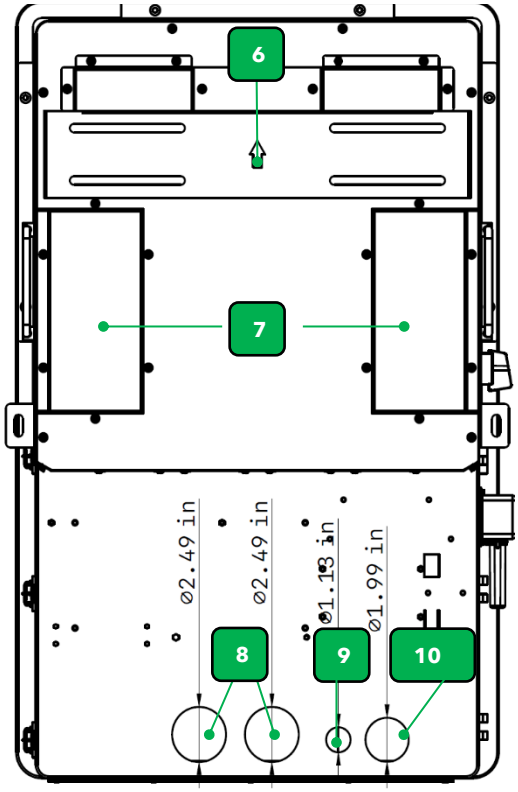
Reserved

PORT	DESCRIPTION
1	Battery communication Port (CAN&RS485)
2	CT Port
3	INV 485: External Monitoring and Debugging port
4	Parallel communication port
5	LCD update Port via USB thumb drive. (Max 8gb) Format Fat 32
6	CAN Matching resistance: Set DIP switch when use inverters in parallel
7	GEN (NO, NC): Connection for generator auto-start function 250Vac/30Vdc/5A
8	NO2, NC2) Reserved as a secondary Dry Contact for multiple use cases.
9	Rapid Shut Down Connections
10	External Current Meter Sensor port. It Cannot be used In combination with included CT
11	12Vdc,24Vdc: Reserved for customer to use, Max 500mA.

9. ENVY DIMENSIONS

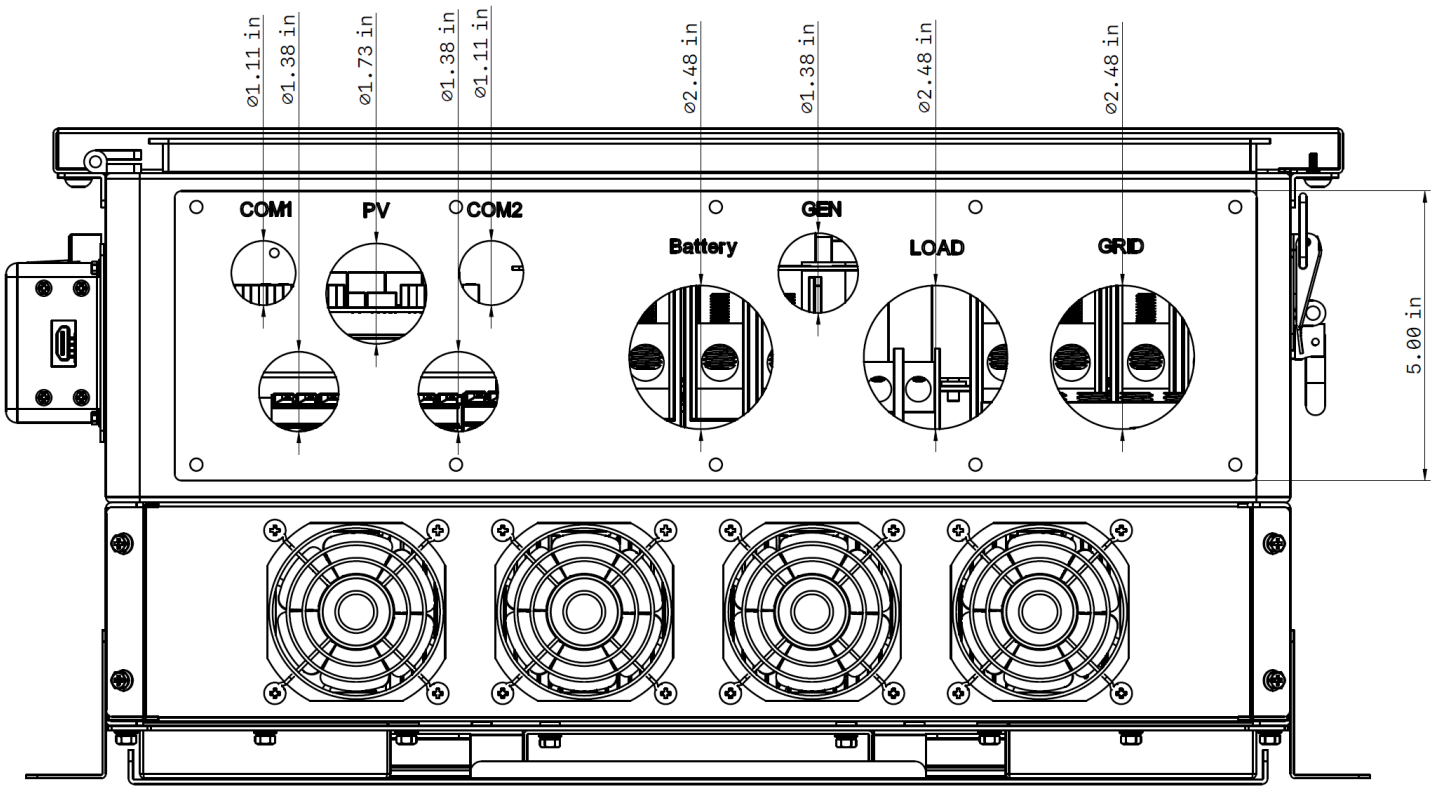
9.1 ENCLOSURE SPECIFICATIONS





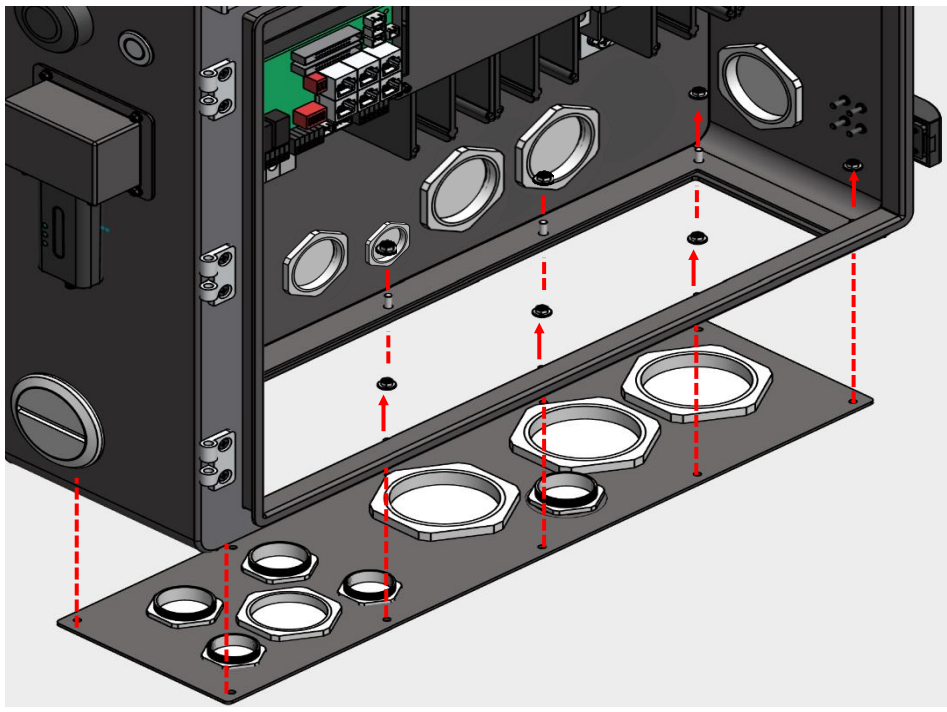
AREA	DESCRIPTION
1	Touch LCD
2	PV Switch
3	RSD STOP Push button
4	Dongle Connection Port and Dongle
5	Side knockout Hole for 1 ½ inch conduit
6	Leveling Wall Support
7	Back Support
8	Back side knockout hole for 2in. conduit
9	Back side knockout hole for 1in. conduit
10	Back side knockout hole for 1½in. conduit

9.2 KNOCKOUT PORT DIMENSIONS



The holes are labeled for a type of function only as guidance. You may the hole for other modular functions

HOLE DESCRIPTION	WHOLE SIZE (INCHES)	STANDARD CONDUIT SIZE NEEDED (INCHES)
COM 1& 2	1.11	¾
GEN	1.38	1
PV	1.73	1 ¼
BATTERY, LOAD, GRID	2.48	2



Referring to the provided drawing, the knockout section of the ENVY DUO 21 inverter has been redesigned to be removable, facilitating a more straightforward installation process. The detachable bottom panel can be used as a template for marking knockout holes or a rectangular opening on your wireway to guide cutting.

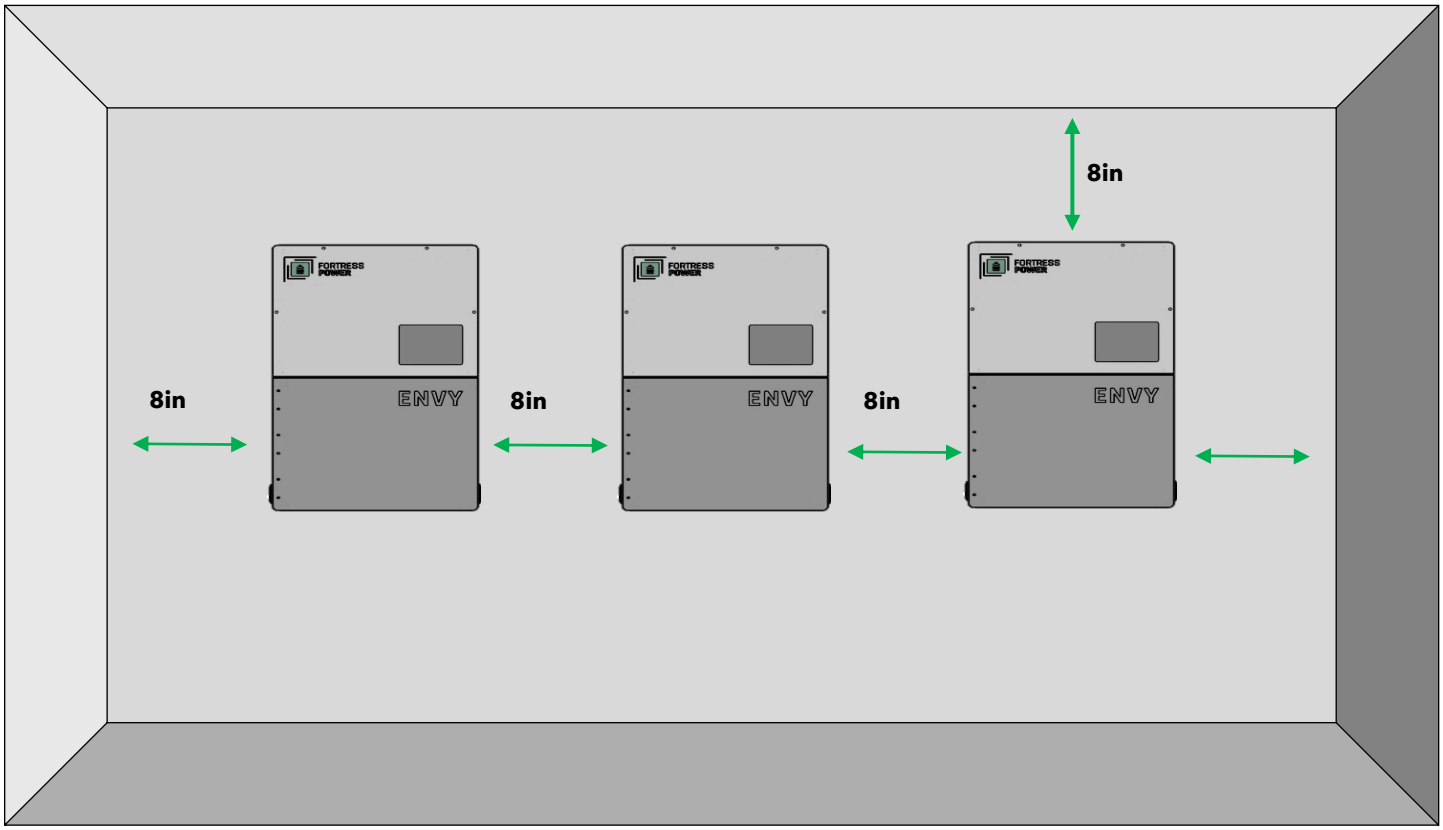
Please note that if the installation involves an outdoor setting do not create rectangular openings in the wireway but rather use the conduit that leads into the knockout hole section of the Envy.

10. INSTALLATION

10.1 MECHANICAL INSTALLATION

10.1.1 SPACING REQUIREMENTS

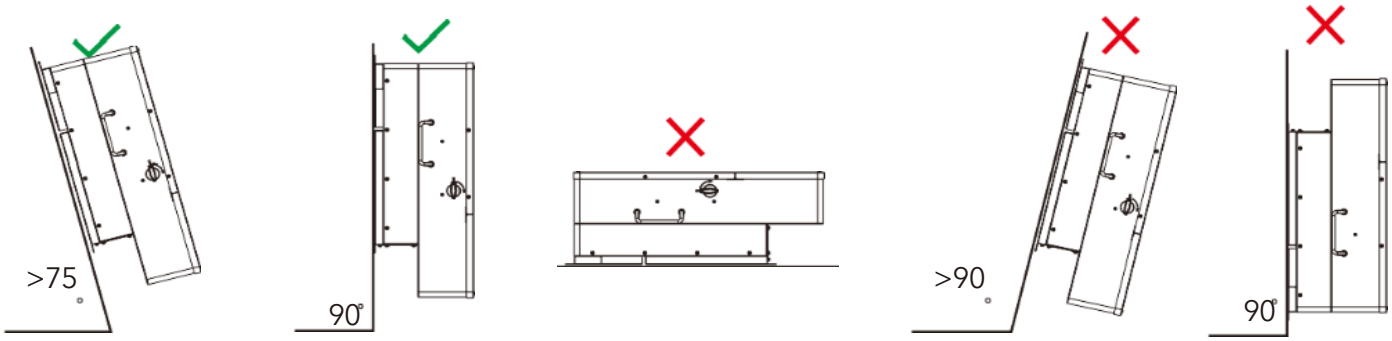
Please maintain the minimum clearances when using multiple inverters in parallel as presented below for adequate heat dissipation. Other electrical accessories such as the ENVY distribution Panel (EDP) may be mounted with a minimum 2-inch clearance on either side of the inverter. A wireway, cabinet, EDP or any sort of equipment can be mounted below the inverter's cabinet knockout section but not behind it to avoid obstructing the airflow from inverter's fans.



10.1.2 LOCATION AND ORIENTATION

The inverter is allowed to be installed outdoors if it is within operating temperature range. Never position the inverter in continuous sunlight, rain, or snow. To avoid continuous sunlight exposure, the inverter is allowed to be installed in the north, east, and west side orientation of the property (in reference to the sun) as this might damage the LCD screen due to excessive UV exposure. If installed in the south side orientation, choose a well shaded site or a shed to protect the inverter from direct sunlight, rain, and snow etc. Otherwise install in the correct property side orientation as described in the figure below. **Consider Using Fortress Power Enclosure to mitigate extreme weather conditions.**

a) The inverter should be installed upright on a vertical surface.

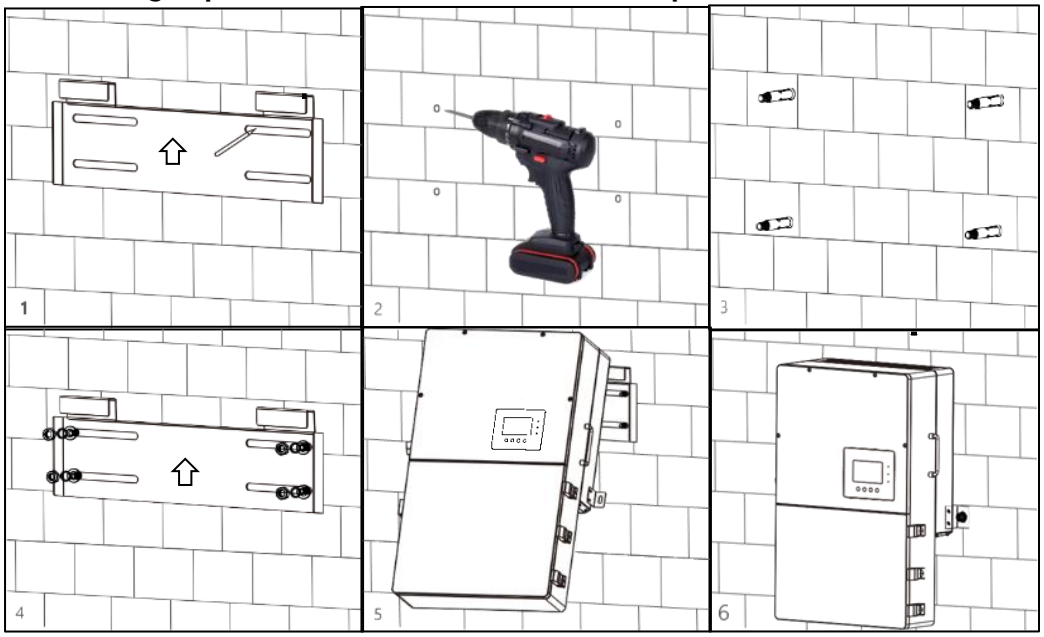


10.1.3 WALL MOUNTING THE ENVY

The mounting wall should be strong enough to bear the weight of the inverter.

The inverter is wall-mounted type and should be installed on a vertical, solid mounting surface, such as wood studs, brick, or concrete wall. Two or more people may be needed to install the inverter due to its weight. The slots on the mounting bracket can accommodate various stud spacings from 12inches(305mm) to 16inches(406mm).

The mounting steps are as below: (Use brick wall as example)



1. Mark the drill holes positions with the mounting bracket.
2. Drill four48mm(5/16inch) diameter holes, making sure the depth of the holes is deeper than 50mm(2inches).
3. Install and tighten the expansion bolts into the holes.
4. Then use the corresponding nuts and washers (packaged together with the expansion bolts) to install and fix the wall-mounting bracket on the wall.
5. Hang the inverter onto the wall-mounting bracket.
6. Lock the inverter on the wall using 2 self-tapping screws on the top of the inverter.

For installation on wood studs

Fasten the mounting bracket on the studs with 4 wood screws, then hang the inverter onto the bracket and lock the inverter on the wall with 2 self-tapping screws.

11. ELECTRICAL INSTALLATION

11.1 PV COMPONENTS AND CONNECTION

The PV connection of this hybrid inverter is the same as that of a traditional on-grid solar inverter (string inverter). The inverter has three MPPTs. For MPPT1 and MPPT2, users can connect two strings. For MPPT3, users can connect one string. All three MPPTs work independently. All these strings are to be connected directly to the Inverter.

Please double check the lowest ambient temperature of the installation location. The rated Voc on solar panel nameplate is obtained at 25℃. As the ambient temperature drops, the Solar panel Voc increases. Please ensure the Maximum solar string voltage corrected at the lowest temperature does not exceed the inverter's maximum recommended input voltage of 440V.

Over voltage will damage the inverter. Do not use a PV combiner. Using a PV combiner may affect or cause permanent damage to the inverter. Do not use a PV combiner as this may cause damage to the inverter.

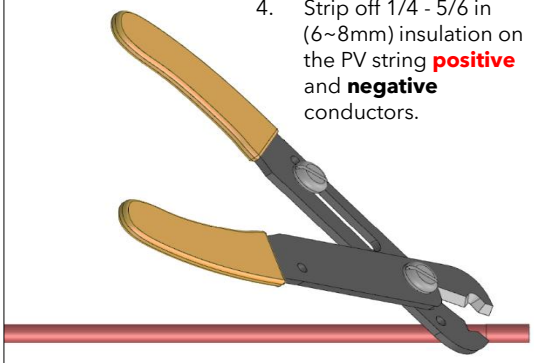
When users connect 2 strings to MPPT1, make sure the two strings have the same quantity of solar panels. The inverter will limit the total MPPT1/MPPT2/MPPT3 input current to 26A/26A/15A automatically. The inverter will limit the max solar input power to 21kW in total. It is optional to Protect the MPPT inputs by installing 20-amp fuse breakers

PV CABLE SIZE	MINIMUM VOLTAGE RATING
10-6AWG (DEPENDENT ON PV CURRENT)	600V

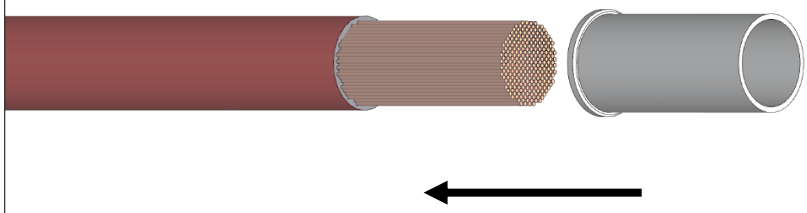
PV Connection Procedure

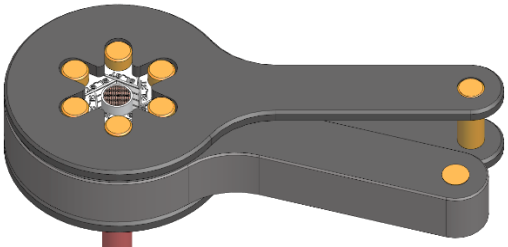
1. Take appropriate measures to ensure that the conduit and conduit fittings are fastened reliably and seal the cable entry holes.
2. Insert the conduit fitting into the opening for PV connection and tighten it from the inside using the counter nut.
3. Route the PV conductors through the conduit fitting and into the inverter.

4. Strip off 1/4 - 5/6 in (6~8mm) insulation on the PV string **positive** and **negative** conductors.

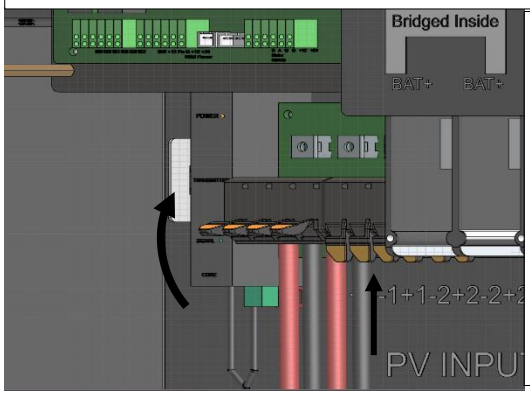


5. Use wire ferrules for PV string conductors if they are stranded wire type.





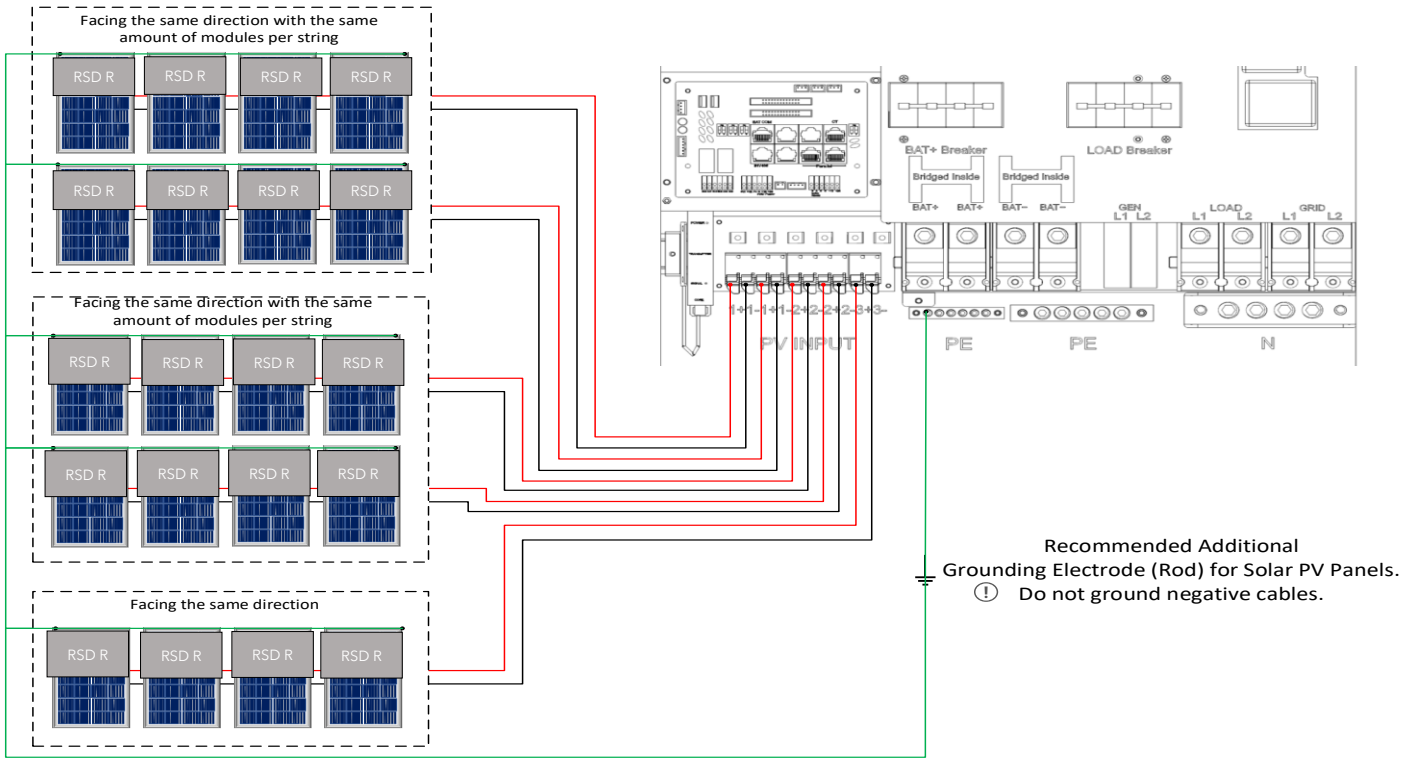
6. Use a hexagonal cable crimper to better secure the ferrule to the wire.



7. Unlock the PV input by lifting the levers up. Insert the ferruled cable into the circular port. Ensure that the cables are connected correctly and securely by slightly pulling the cables.

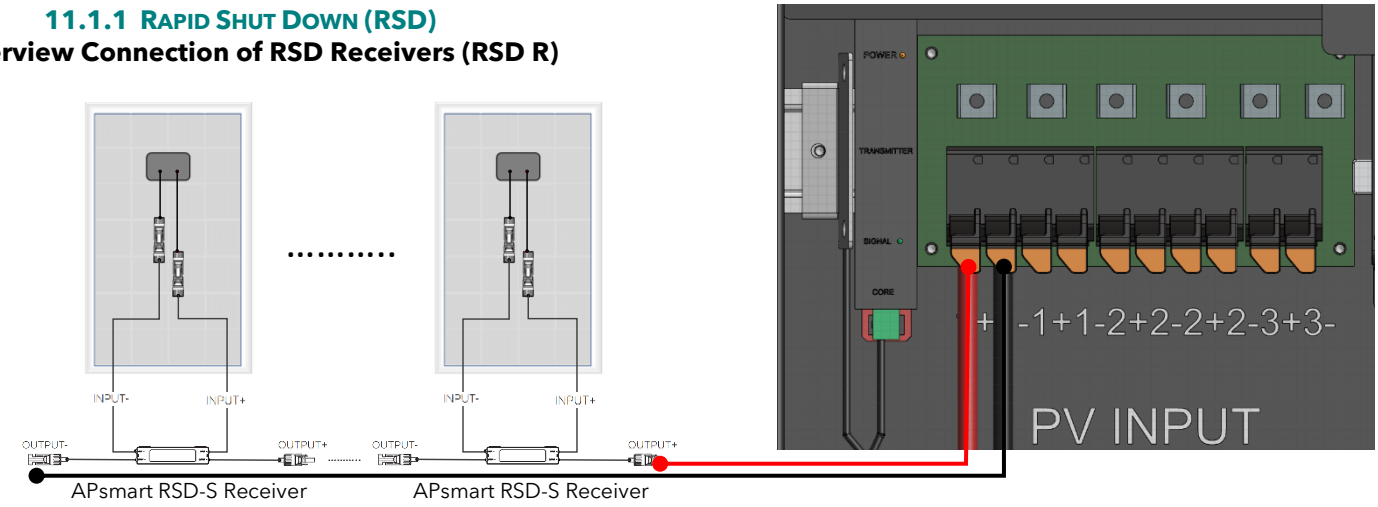
Improper connections may result in creating a hotspot or arcing point on the PV ports, damage the inverter and/or cause fire. Please double check that there are no loose fine stranded wires

PV Connection Diagram



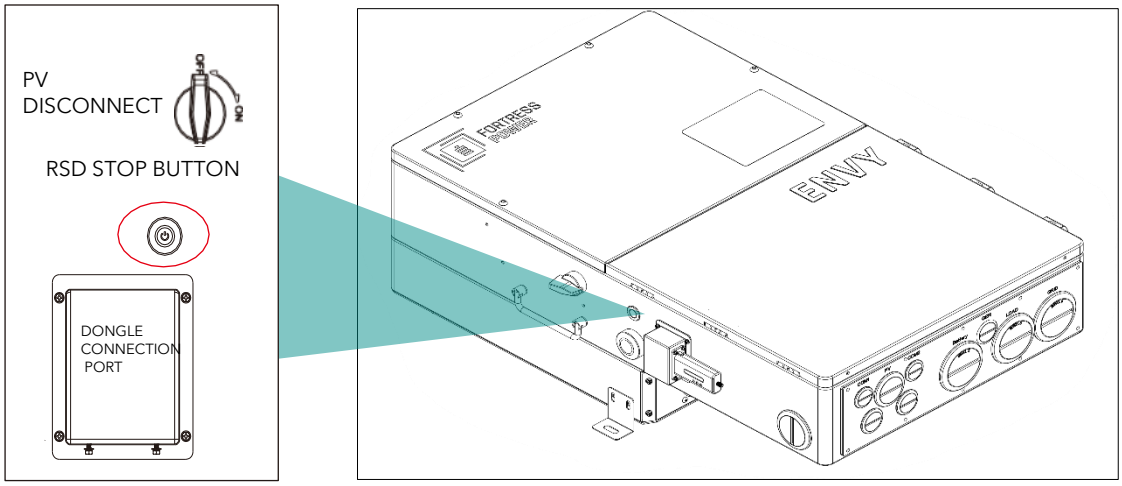
11.1.1 Rapid Shut Down (RSD)

Overview Connection of RSD Receivers (RSD R)



The Envy Inverter already includes an **APsmart Rapid Shutdown Transmitter** located to the left of the PV INPUT ports. The **APsmart Rapid Shutdown System Transmitter** and **APsmart RSD-S/RSD-D receivers** (not included) work together as a rapid shutdown solution for PV modules. For more information on how to connect the APsmart receiver please refer to the RSD-S and RSD-D Installation Quick guide. The Transmitter sends a signal to the RSD- receivers, enabling the PV modules to remain connected and continue supplying energy while the Transmitter is powered on. When the Transmitter is switched off by the Emergency RSD button, the RSD receivers automatically enter rapid shutdown mode, halting energy production. This solution is compliant with the **2017** and **2020** specifications of the **NEC 690.12** and supports **SUNSPEC** signaling for rapid shutdown.

If an emergency occurs, simply activate the **"RSD STOP"** button. This will immediately cease the RSD power supply, causing the inverter to shut down the AC output, and reducing the voltage of the PV conductor to below **30V** within a timeframe of **30 seconds.**



****Rapid Shut Down will be mandated depending on your jurisdiction.**

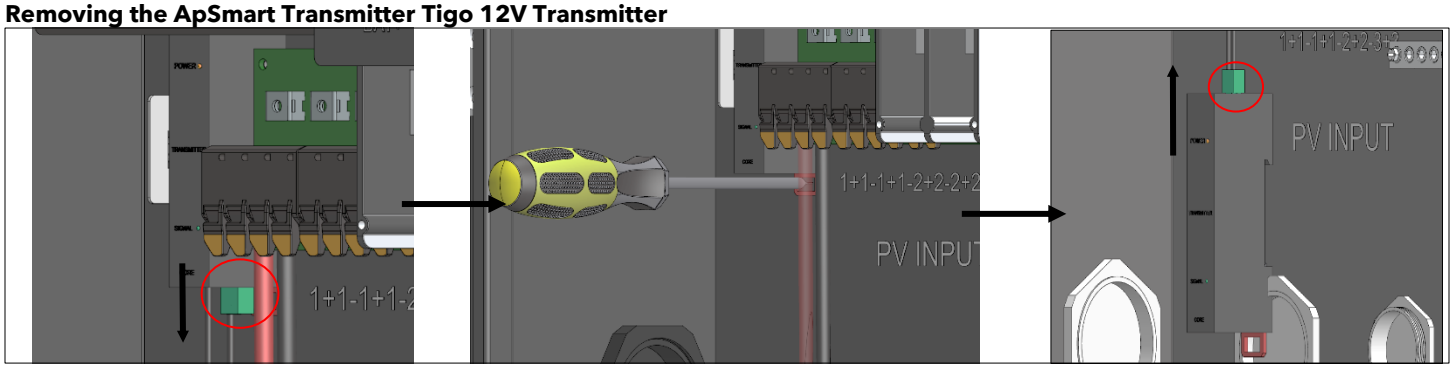
The APsmart Transmitter is connected to the inverter's internal 12V power supply. The output current limit is 1A (12W). **Do not exceed this limit as this may cause damage to the inverter. You may retrofit a Tigo Transmitter by simply disconnecting the 12V supply from the Apsmart Transmitter as shown in the picture below.**

Device	Voltage Rating (V)	Current (A)
APsmart Single Core Transmitter	12	0.5
Tigo RSS Transmitter	12	1

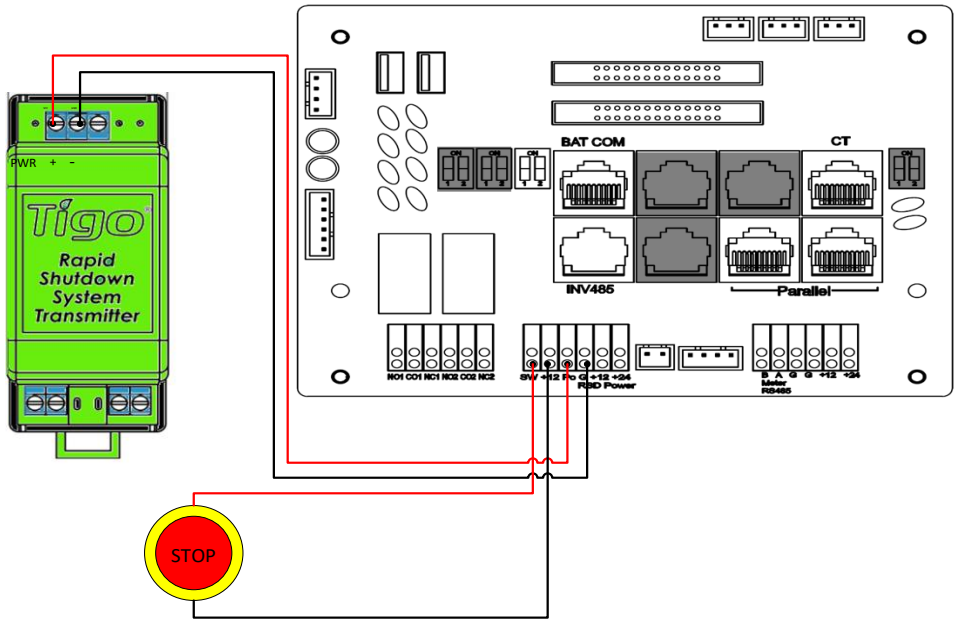
Retrofitting TIGO Products

When using TIGO products, remove the internal Apsmart Transmitter. Otherwise, PV will remain energized after RSD has been initiated.

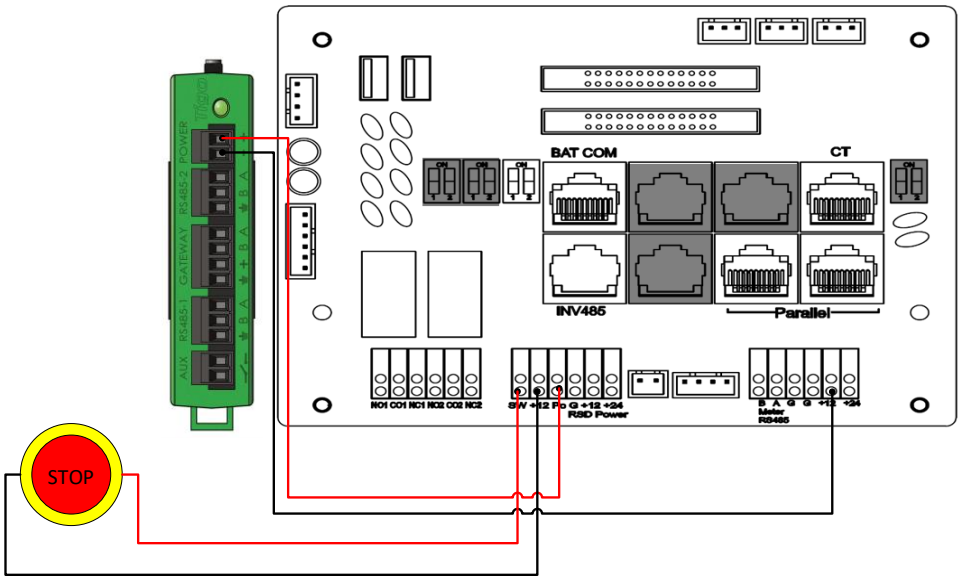
Removing the ApSmart Transmitter Tigo 12V Transmitter



Tigo Transmitter Connection



Cloud Connect Connection

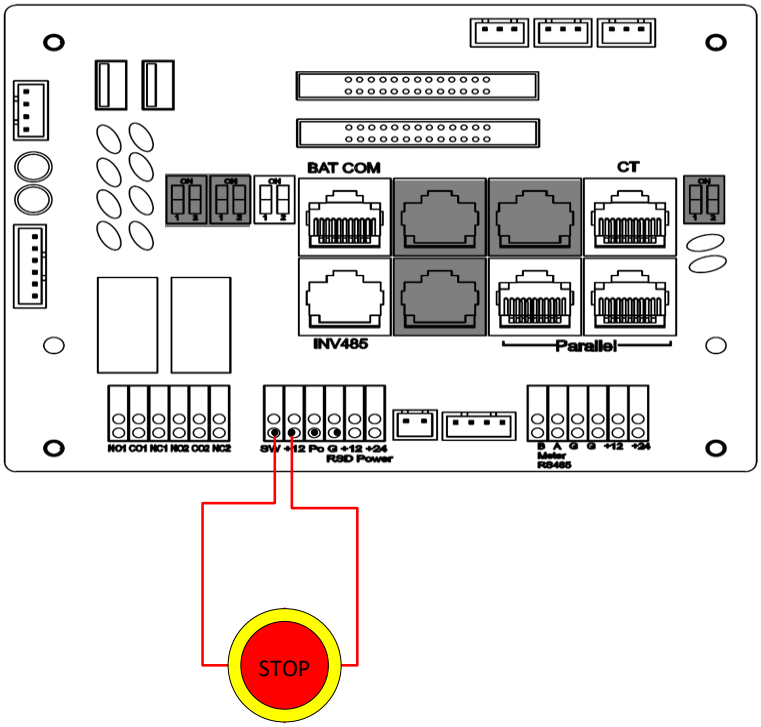


11.1.2 External RSD emergency Switch

The following images will describe the connection location of an added **normally closed** emergency switch for both standalone and paralleled inverters for external purposes. This device should be installed in an area that is accessible to first responders.

Standalone external RSD Button wiring instructions.

Connect a normally closed button to the SW and+12 port. If rapid shutdown is not required, then leave the included jumper.



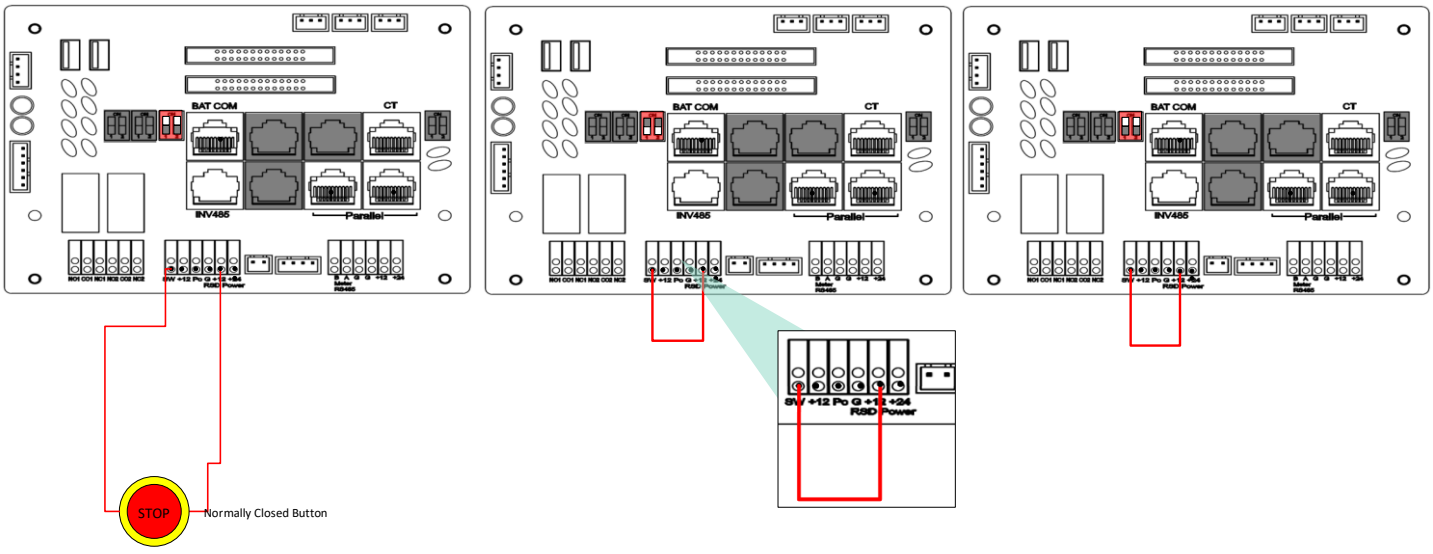
For Multiple inverters in parallel

RECOMMENDED JUMPER CABLE SIZE

22-14 AWG

When parallel multiple inverters RSD function, ensure to install 2 short jumper cables on all the secondary inverters on the following ports. **Only Turn on DIP switches of the Primary and Last Inverter.**

FROM	TO
SW	+12 port



11.2 BATTERY CONNECTION

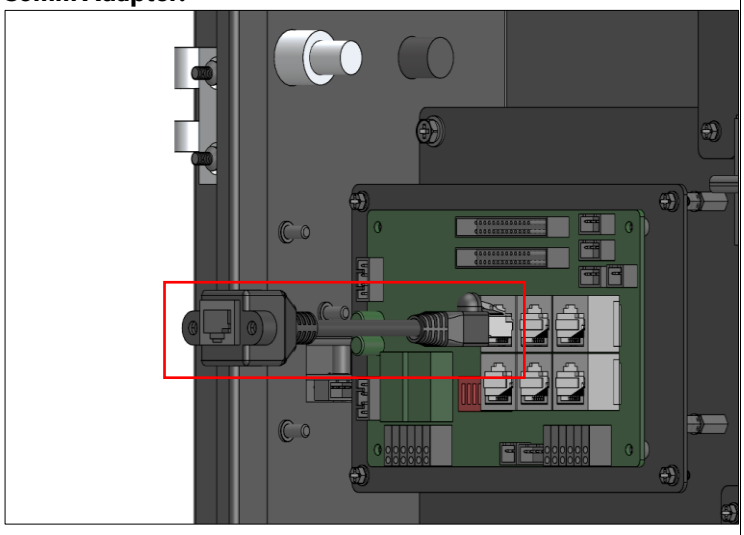
All batteries must be installed as a single battery bank when parallel multiple inverters unless you use the **Do not share battery** feature

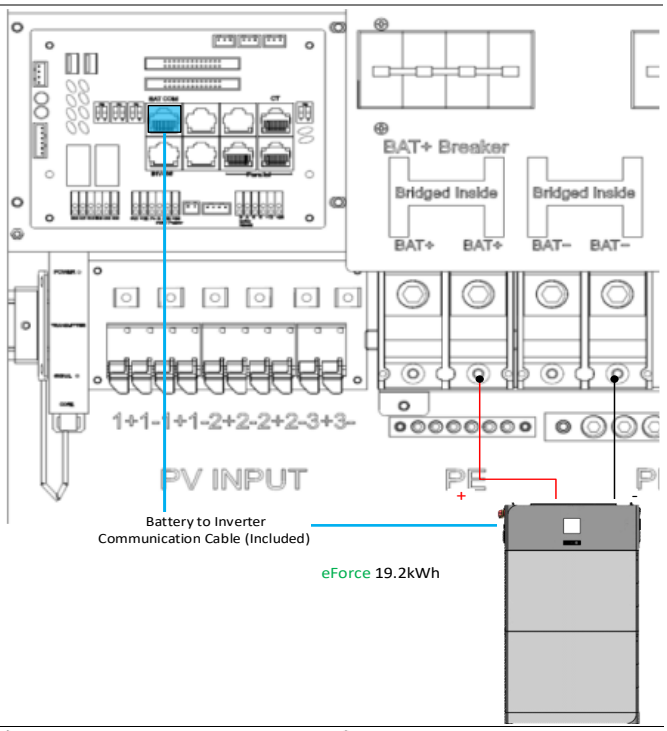
11.2.1 CONNECTION REQUIREMENTS:

1. Strip 1/4-5/16inch(6-8mm) insulation from the cable end and crimp a ferrule to the cable ends.
2. Route the battery power cable, connect positive to BAT+, negative to BAT-.
3. Secure the conduit fitting to the enclosure using the lock nut.
4. Fasten the battery positive and negative crimped cables into the battery bus according to the markings.
5. Fix the cable gland in place.

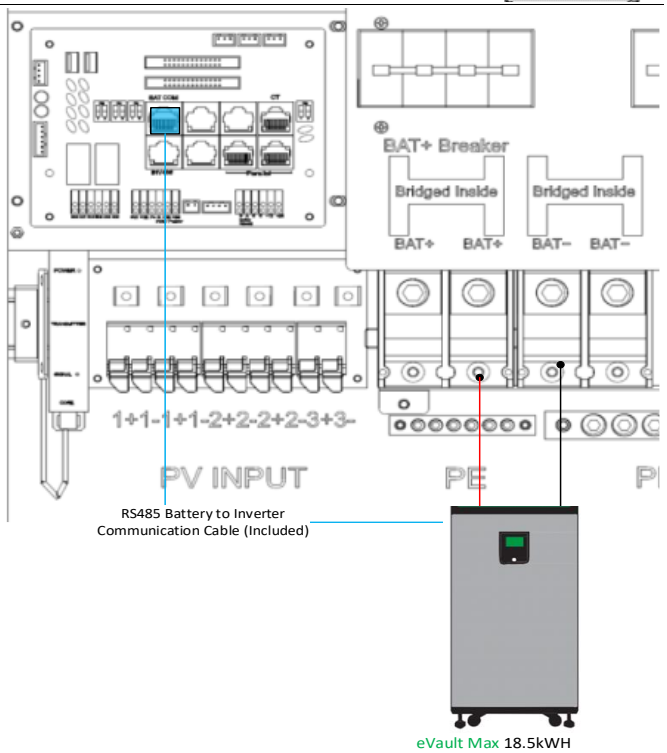
For best practice, install a Copper Busbar when paralleling more than two lithium batteries. The internal Envy's internal Battery Busbar is bridged to provide the full 250A charge and discharge capability of the Envy DUO 21 in any of the two ports.

Connect the included adapter to the BAT COM port **ONLY when using eVault Max**. Then connect the cable with the side labeled **battery** to the battery and **inverted side** to the **Battery Comm Adapter.**

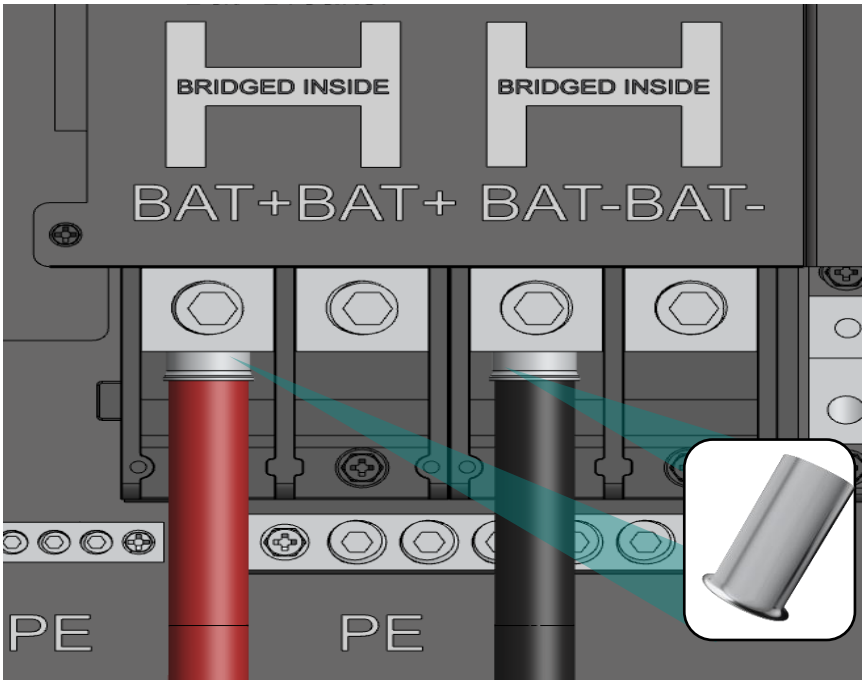




Use the included **SOL-ARK/CAN comm cable** When Using **eFlex MAX**



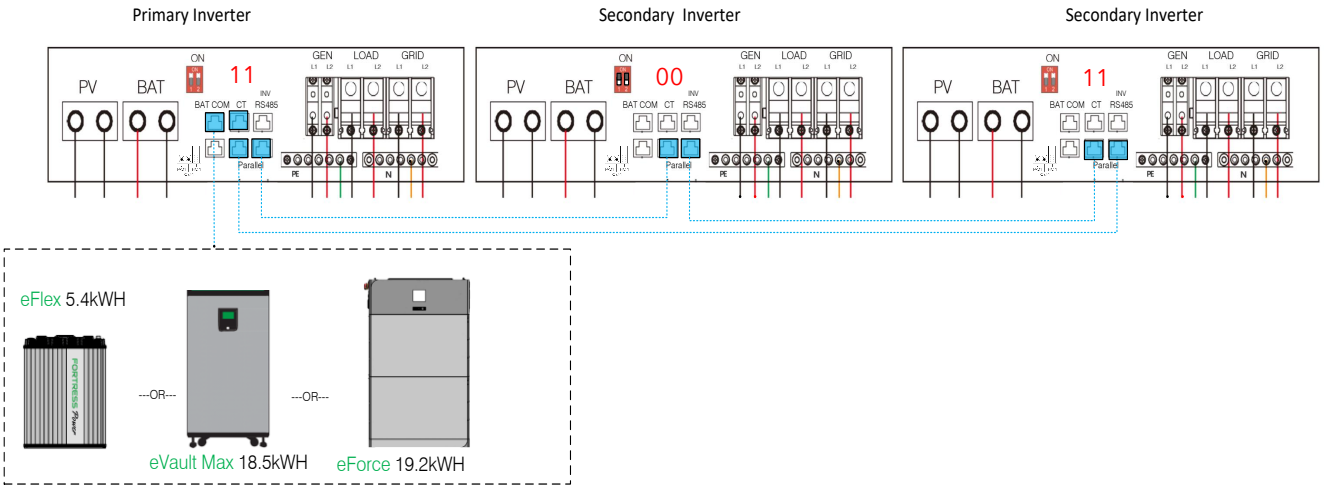
Reverse Polarity may damage the inverter. Do not make connections with battery breaker on or battery energized



The battery communication port on inverter is an Rj45 socket, Pin for the RJ45 plug of the communication cable is as below. If there is a need to make a longer cable use the inverter pinout according to the table below. The inverter supports both CAN and RS485 communication. Use the communication cable included in the Envy Inverter packaging when using **eFlex 5.4kWh or eForce 9.6kWh** batteries. Use the communication cable included in the **eVault Max 18.5kWh** packaging to establish batteries-inverter communication.

11.2.2 Paralleling Multiple Inverters

Use the **Communication Cables** included in the Envy Inverter along with those of the eFlex5.4kWh, eVault Max 18.5kWh or **eForce 9.6kWh** battery - Envy paralleling communication cables. Installers might need to provide an extra longer communication cable to be able to make parallel connections if installed further apart. The battery communicates only with the Master Inverter through Modbus RS485 or CAN. Connect the communication cable to the BAT COM port. Proceed to the Advanced Section under the LCD programming segment to finish paralleling process.



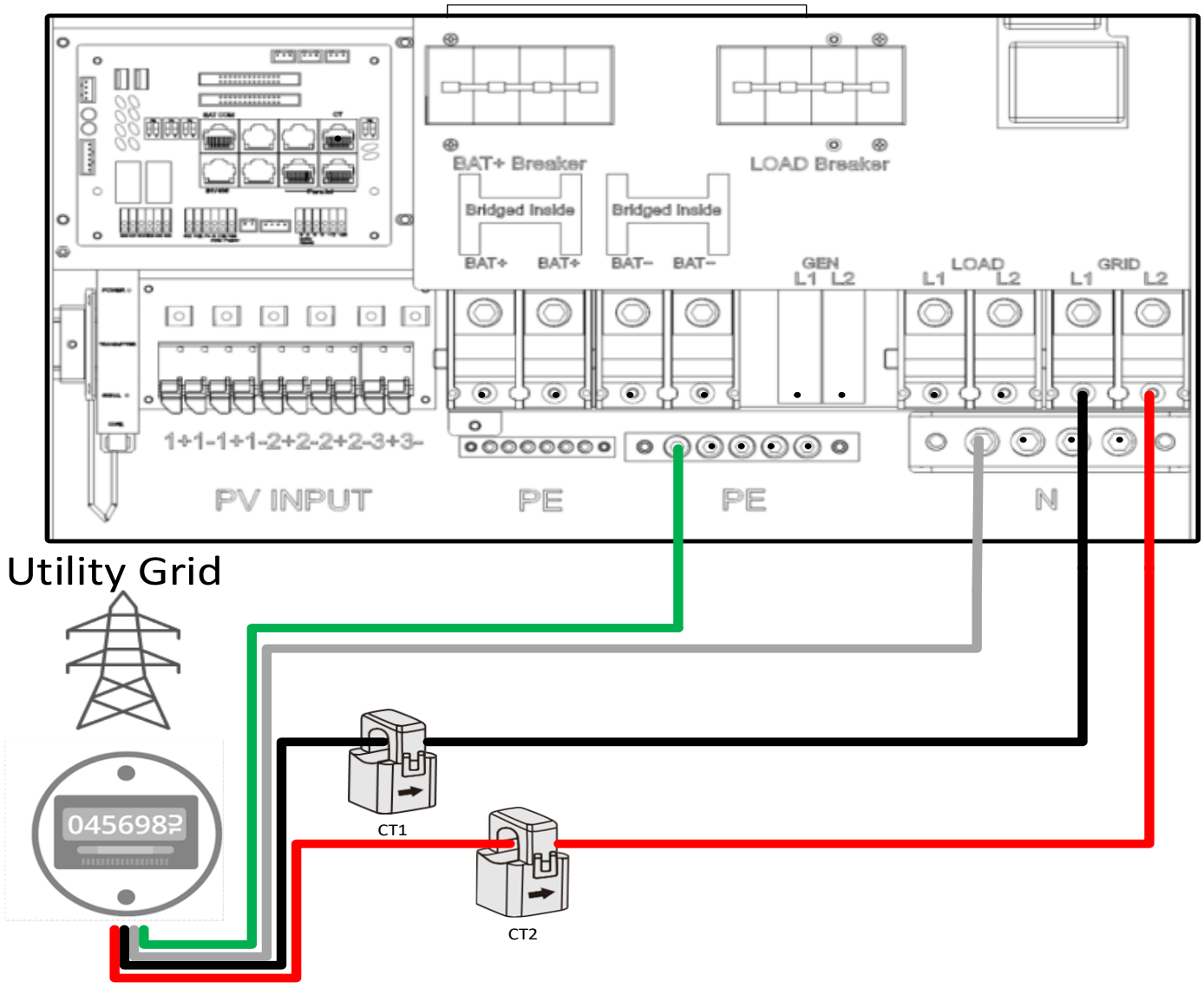
11.2.3 Envy Battery Communication Port Pinout

PIN	DESCRIPTION
1	BAT RS485 B
2	BAT RS485 A
3	NC
4	BAT CAN H
5	BAT CAN L
6	NC
7	NC
8	NC

Please Refer to our minimum Battery Sizing Standard when sizing with the ENVY Inverter. Please Refer to the eFlex Max, eForce, and eVault Max installation manual for more details.

11.3 AC CONNECTION

11.3.1 GRID CONNECTION



1. Strip off 5/16-3/8inch(8~10mm) insulation sleeve on the cables.
2. Use wire ferrules if the cables are made of fine stranded wires.
3. Secure the conduit fitting to the enclosure using the counter nut of the fitting.
4. Fasten the grid and EPS load cables to the terminal block in accordance with the markings.
5. Secure conduit to the conduit fitting.
6. Check that the cables are connected correctly and securely, then take appropriate measures to ensure that the conduit and conduit fitting are secured reliably and seal the cable entry holes.

Ground Neutral Bond

Make a bond connection between the Neutral and Ground at the Main Breaker Panel or you may also only make the bond once at the Utility Meters with breaker attached if applicable.

11.3.2 CT CONNECTION

To measure the power imported from and exported to the grid, a pair of CTs must be installed at the service entry point in or near the main service panel. We standardly supply a pair of CTs per inverter. The CT interface for 2 CTs connection is an RJ45 port. We have made an RJ45 plug on those 2 CTs in advance, so you can connect it to the port directly. **Never put the CTs on the Load side, nor on the generator side or inverter will not function properly. For Off Grid application, disregard the CTs.**

CT Clamp Ratio

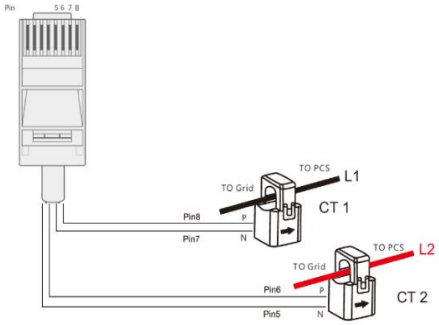
SUPPORTED CT RATIO	INPUT CURRENT	OUTPUT CURRENT
1000:1	100	100mA
2000:1	200	100mA
3000:1 (INCLUDED)	300	100mA
4000:1	400	100mA
6000:1	600	100mA

The inverter supports 5 ratios of CT clamp- 1000:1, 2000:1 and 3000:1. 4000:1,6000:1The CT ratio of the CTs in the accessory bag is 3000:1. If you are using a 3rd party CT, please ensure the CT ratio is one of them, and select the correct CT ratio setting in the inverter monitor page or on the inverter LCD.

CT Clamp Cable Extender (Not Included)

The CT wires can be extended with a common ethernet cable if the length is not enough. An RJ45 adapter is needed for the extension. The CT The wires can be extended up to 300ft (around 100m).

Please refer to the connection diagram for the correct positions of CTs and clamp the 2 CTs on the L1 and L2 wires at the service entry point in the main service panel. CT1(label L1) should go to L1 and CT2(label L2) should go to L2. The arrow on the CT is pointing to the inverter. **(*** Incorrect install of the CT will cause The Display to show incorrect information's and features of the inverter will not function correctly)** If the CT are in a wrong direction, there is an option you can change the direction of the CT on your inverter call: **CT Direction Reversed** (Only for Direction not CT1 or CT2 Placement) in Advanced Tab of the LCD. You would not need to go change it physically.



CT Port Pin Definition

PIN	DESCRIPTION
1-4	Reserved
5	CT2N
6	CT2P
7	CT1N
8	CT1P

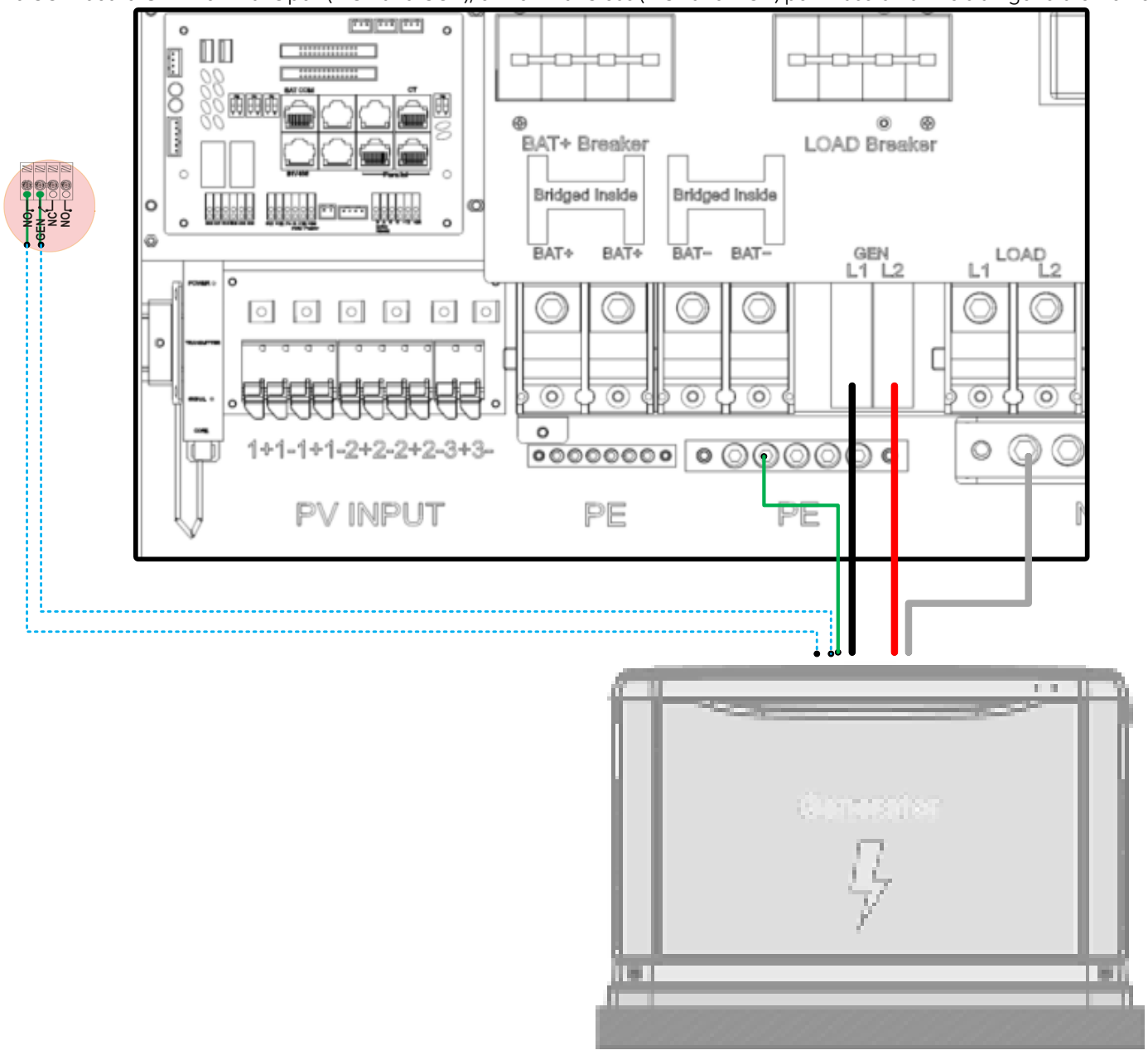
11.4 GENERATOR PORT

11.4.1 GENERATOR CONNECTION

This hybrid inverter can work with a generator. There are Gen ports on the inverter for generator connection. Generator requirements: the generator should be neutral bonded type, with **240V/120V**, **120/208V** or **120/208V 3 phase** output.
When the generator starts, all the loads connected to EPS Load will be supplied by the generator while simultaneously charging the batteries.

When Using the Generator Connection, do not connect to an AC Coupled system unless you are AC coupling on the Grid Side. Damage will occur to Inverter and Generator

The pass-through relay on the generator port is 90A. When the generator is on, please ensure the total load and charge current will not exceed 90A. Fortress Power recommend the Max continuous current to be 80A.The generator start signal shall be connected to the COM board GEN Nominal Open (NO1 and CO1), or Nominal Close (NC1 and NO1) port if users want to start generator remotely.



DRY CONTACT CONDUCTIVITY RATINGS

Port	Max Voltage	Max Current
Generator Dry Contacts NO1-Com-NC1/ NO2-Com-NC2	250/VAC/30VDC	5A

11.4.2 AC COUPLING CONNECTION

The inverter supports AC coupling connection with the existing grid-interactive solar system. The existing solar system is connected to the inverter's GEN port. **Make sure to add a fused disconnect switch between the Envy Gen Port and the Ac Coupled system. It is forbidden to connect the Generator in Gen Port when AC Coupled. Damage to the Generator or Inverter will occur.** To ensure optimal performance and energy distribution, it is imperative that the solar installation connected to each i**nverter does not exceed 12kW.** This precautionary measure is to facilitate the efficient allocation of surplus solar energy production to the battery storage systems when frequency shifting during instances of grid power interruptions. It is essential to adhere to this specification to maintain system integrity and to promote effective energy management.

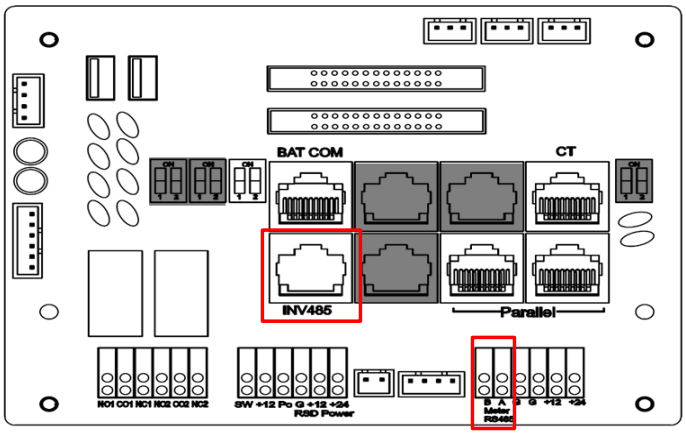
What is frequency shifting power reduction?

All UL1741SA compliant grid-interactive inverters have the Frequency-Watt feature, which requires the grid-interactive inverter to reduce power with the increasing of grid frequency. The power will drop to zero before the over frequency trip threshold is reached. When the Fortress Power hybrid inverter requires the grid interactive inverter to reduce power, it simply shifts the output frequency up a bit, the grid-interactive inverter will limit its output power accordingly after sensing this frequency shift.

11.4.3 THIRD PARTY RS485 COMMUNICATION

Meter 485B&485A: are used when the Meter is not connected. These two pins can be used to communicate with the inverter using our Rs485 Modbus protocol.

INV485: This interface is shared with the WIFI module. If the WIFI module is not in use, users can use this interface to communicate with the inverter.



PIN	DESCRIPTION
1	485B
2	485A
3-8	/

12. COMMISSIONING AND POWERING DOWN SEQUENCE

THERE ARE MULTIPLE LOCATIONS for these Breakers / Switches

- **Battery and Load breakers are inside the Envy Wire Bay**.
- **PV disconnect switch is on the side of the Envy**.
- **Grid and Generator/AC coupled PV are external breakers.**

12.1 START UP THE INVERTER

Before proceeding, place all AC and DC breakers off

1. Switch ON the Battery Breaker inside the inverter.
    a. Turn on the battery system.
    b. Inverter will power up.
        i.If the Inverter does not power up, Stop and correct the issue until it powers up
2. Perform Firmware Inverter Update using the Envy Fortress Power APP.
3. Place the Inverter in Standby mode.
    a. LCD screen - Basic section
4. Confirm the Inverter is set up and running.
    a. Inverter Programming
        i.The last settings are stored therefore reprogramming may not be necessary.
        ii.LCD programming is detailed in the user manual.
    b. Battery communication
        i.Confirm battery voltage, SOC.
    c. PV connection
        i.Prior to turning it on, make sure there is no reverse polarity. Confirm PV voltage per MPPT.
5. Switch ON the Load Breaker inside the inverter.
6. Exit Inverter standby mode.
    a. LCD screen - Basic section
    b. Confirm Loads are being powered.
8. Turn on the Grid Breaker
9. If AC Coupling or Generator is integrated, Turn on the breaker. Ac Coupling will connect after 5 minutes.

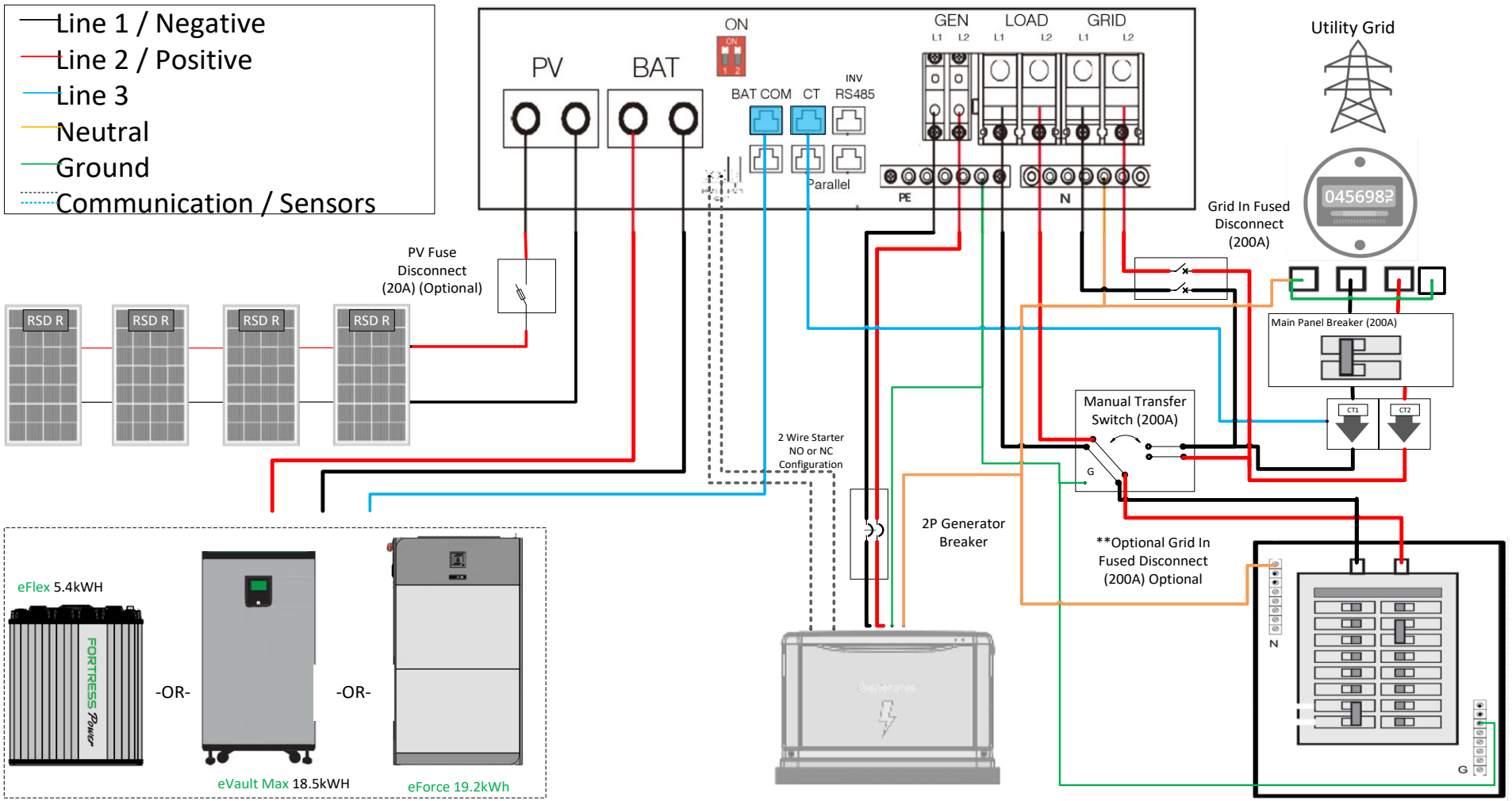
12.2 SHUT DOWN THE INVERTER.

Danger: Do not disconnect the battery, PV, and AC input power under load. If there is an emergency issue, and you must shut down the inverter, please follow the steps below.

1. Set the System in Standby:
    a. LCD screen - Basic section
2. Turn Off Generator/Ac Coupled PV external breaker.
2. Turn OFF the Grid breaker that feeds inverter.
3. Switch OFF the Load breaker inside the inverter.
4. Turn OFF PV Switch on the side of the inverter.
5. Switch OFF the Battery breaker inside the inverter.
    a. wait for the LCD to turn off.

13. WIRING DIAGRAMS AND LCD PROGRAMMING

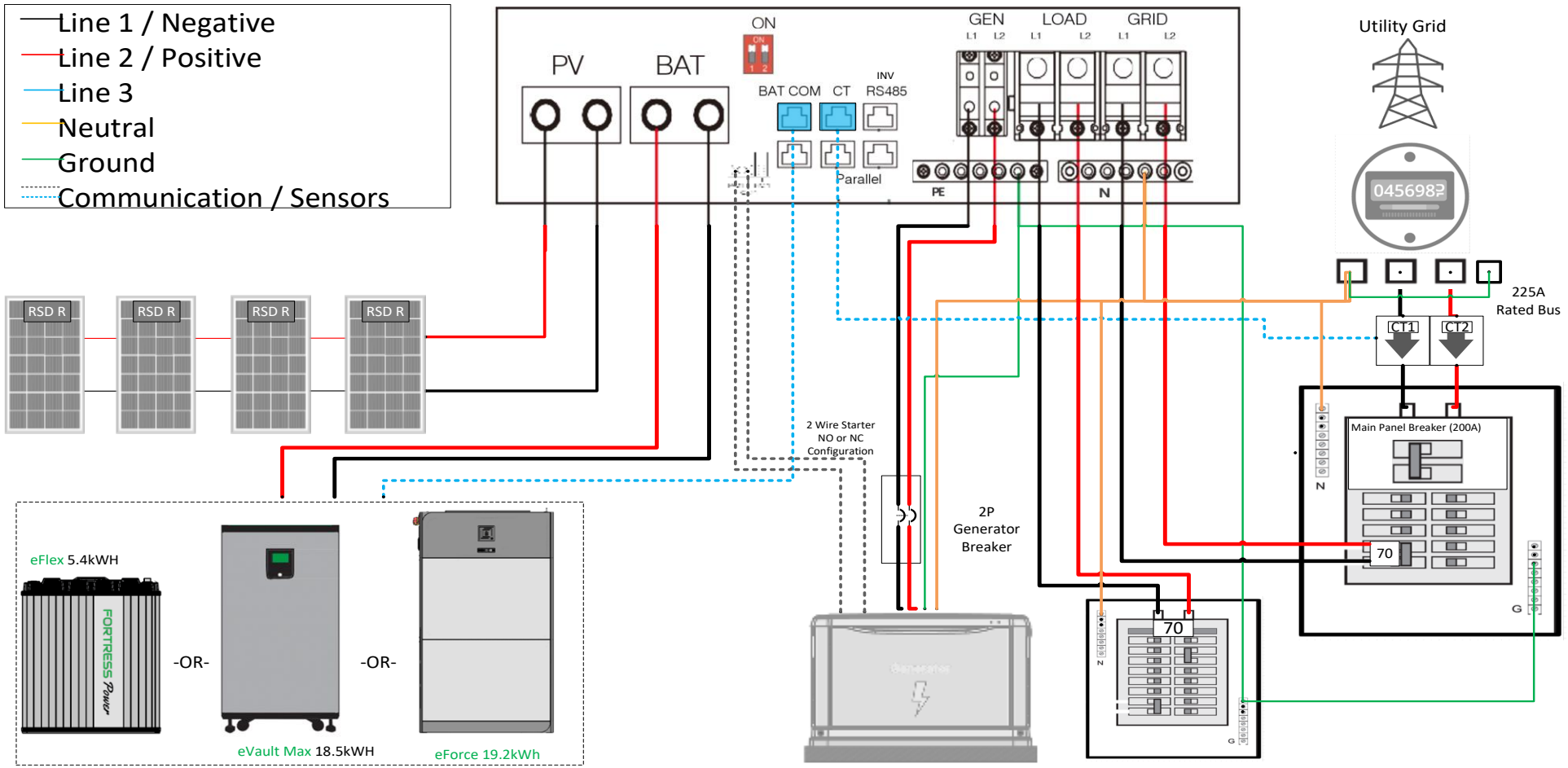
13.1.1 WHOLE HOME AC PASSTHROUGH WITH FEEDER TAP CONNECTION (SPLIT-PHASE SERVICE 120/240V)



There should be only one Neutral to Ground Bond established on the supply side of the electrical system.
For requirements of connection safety, please refer 2020/2023 NEC 705.11 or 2017 NEC 705.12A
Always adhere to your local jurisdiction guidelines and make sure that an Electrician makes all electrical connections.
This Schematic is only a depiction of the functional ports.

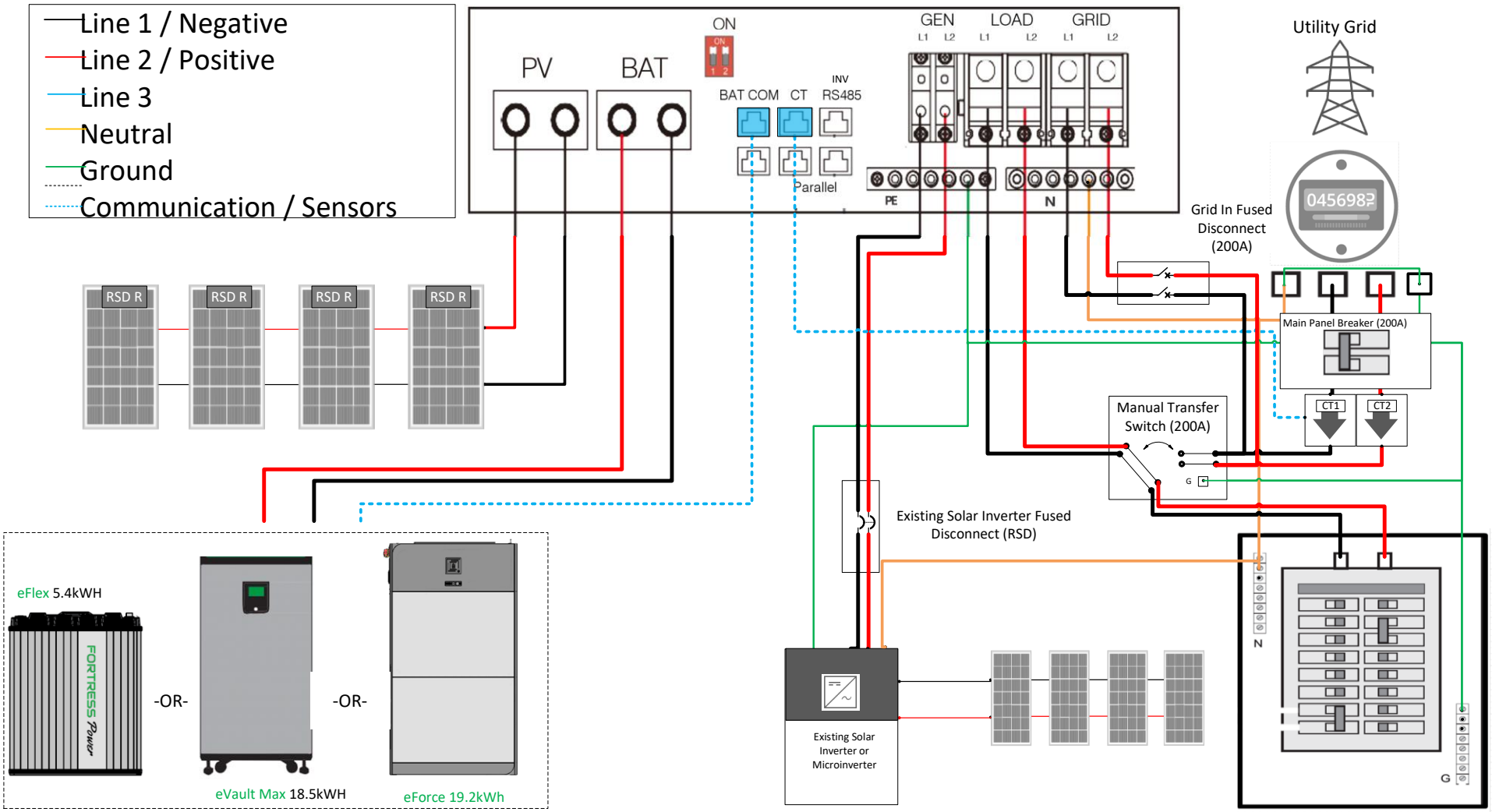
13.1.2 Backup Applications with Backfeeder Connection (split-phase service 120/240V & 120/208V)

Connection diagram for 120/240V is as below. The connection diagram for 120/208V split phase service is roughly the same except that generator is not supported.



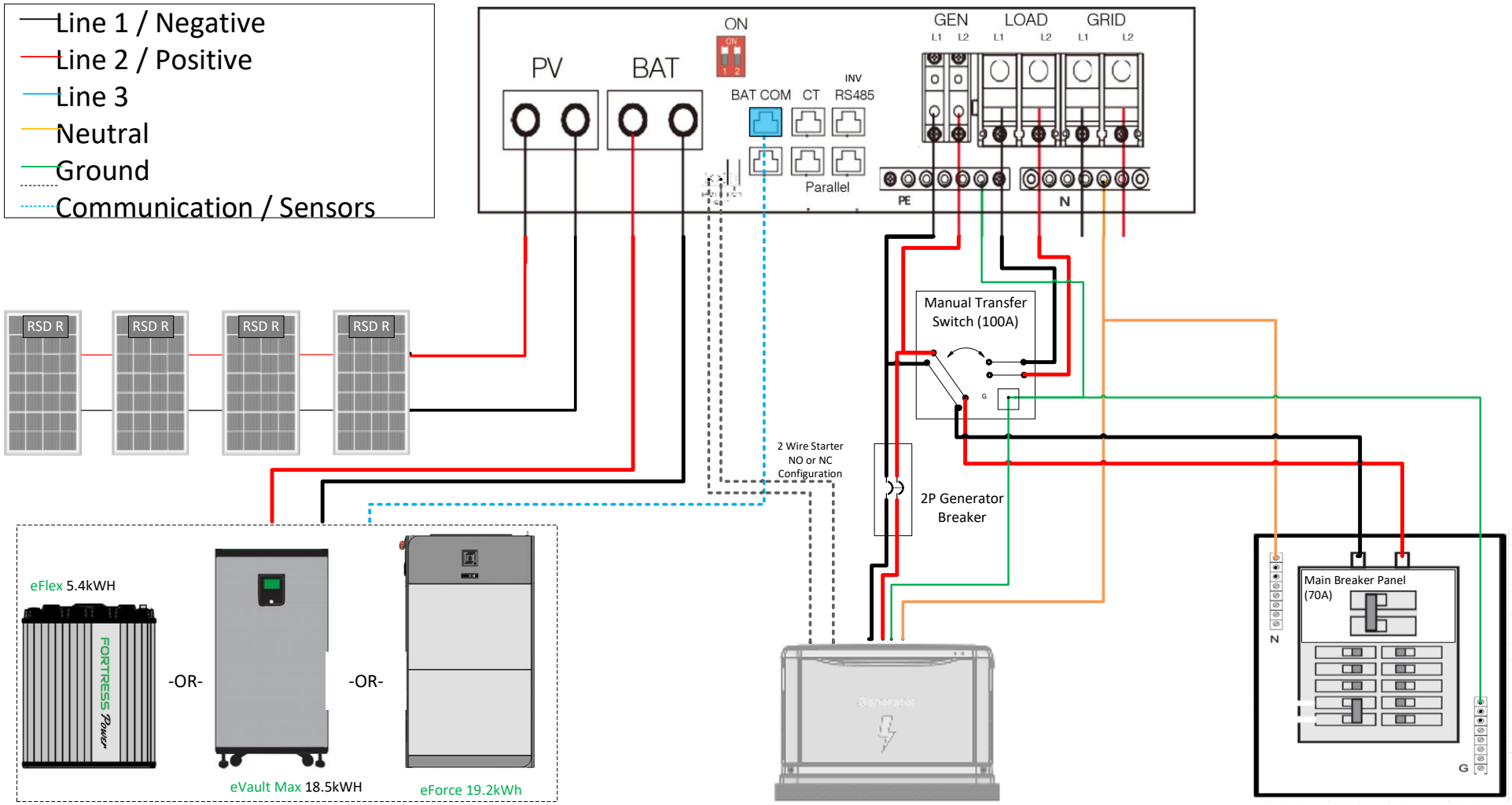
There should be only one Neutral to Ground Bond established on the supply side of the electrical system.
For requirements of connection safety, please refer 2020/2023 NEC 705.11 or 2017 NEC 705.12A
Always adhere to your local jurisdiction guidelines and make sure that an Electrician makes all electrical connections.
This Schematic is only a depiction of the functional ports.

13.1.3 Combined or Individual AC Coupling/DC Coupling Applications with a Feeder tap Connection (split-phase service 120/240V)



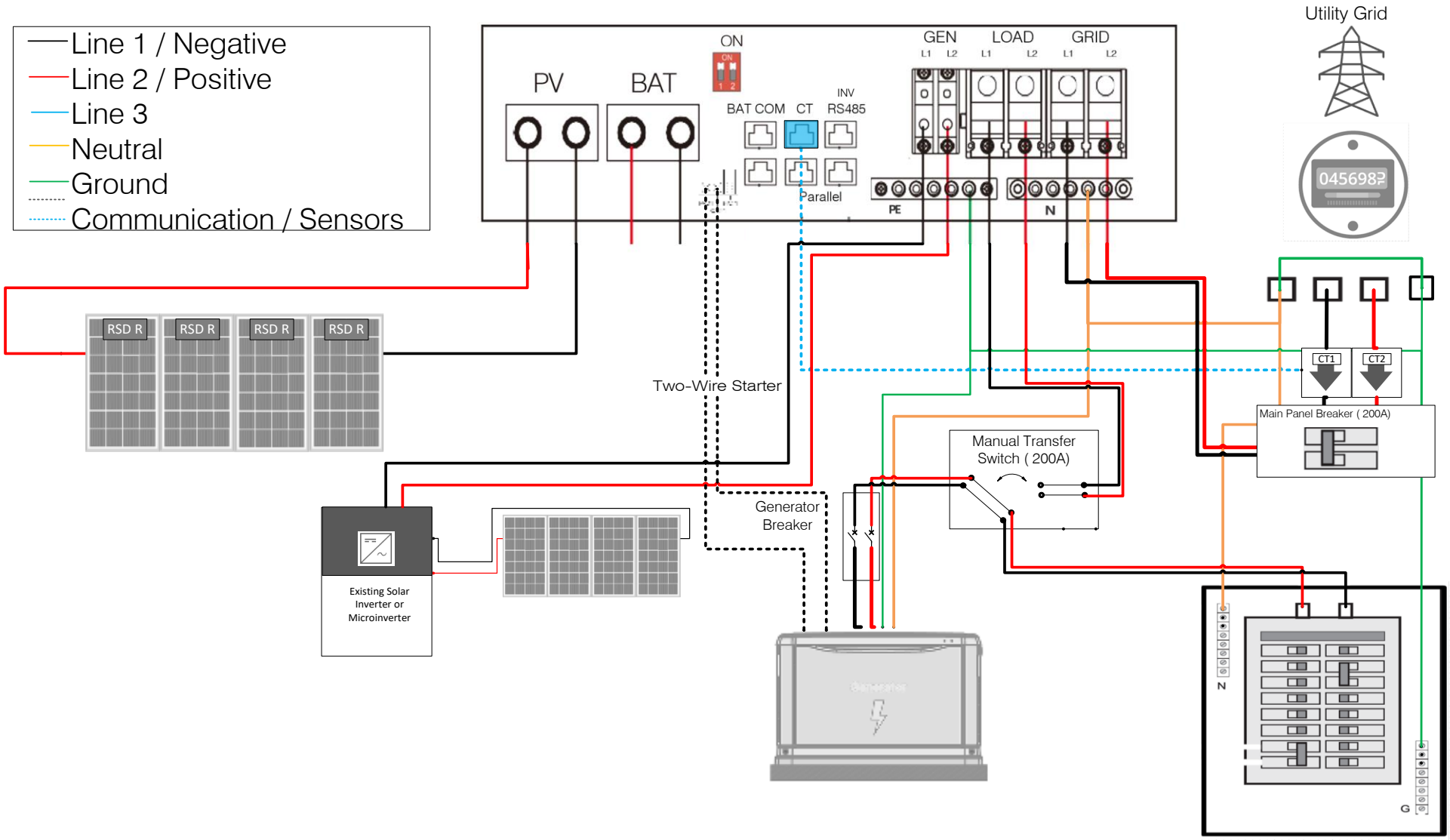
There should be only one Neutral to Ground Bond established on the supply side of the electrical system.
Always adhere to your local jurisdiction guidelines and make sure that an Electrician make all electrical connections.
Depending on your Local Jurisdiction a feeder tap breaker might be required between the Manual Bypass Switch and the feeder tap.
For requirements of connection safety, please refer 2020/2023 NEC 705.11 or 2017 NEC 705.12A.
This Schematic is only a depiction of the functional ports.

13.1.4 Off Grid Applications Connection (split-phase service 120/240V)



There should be only one Neutral to Ground Bond established at the Load panel of the electrical system.
Always adhere to your local jurisdiction guidelines and make sure that an Electrician make all electrical connections.
For requirements of connection safety, please refer 2020/2023 NEC 705.11 or 2017 NEC 705.12A
This Schematic is only a depiction of the functional ports.

13.1.5 BATTERY LESS CONNECTION (SPLIT-PHASE SERVICE 120/240V, 120/208V)

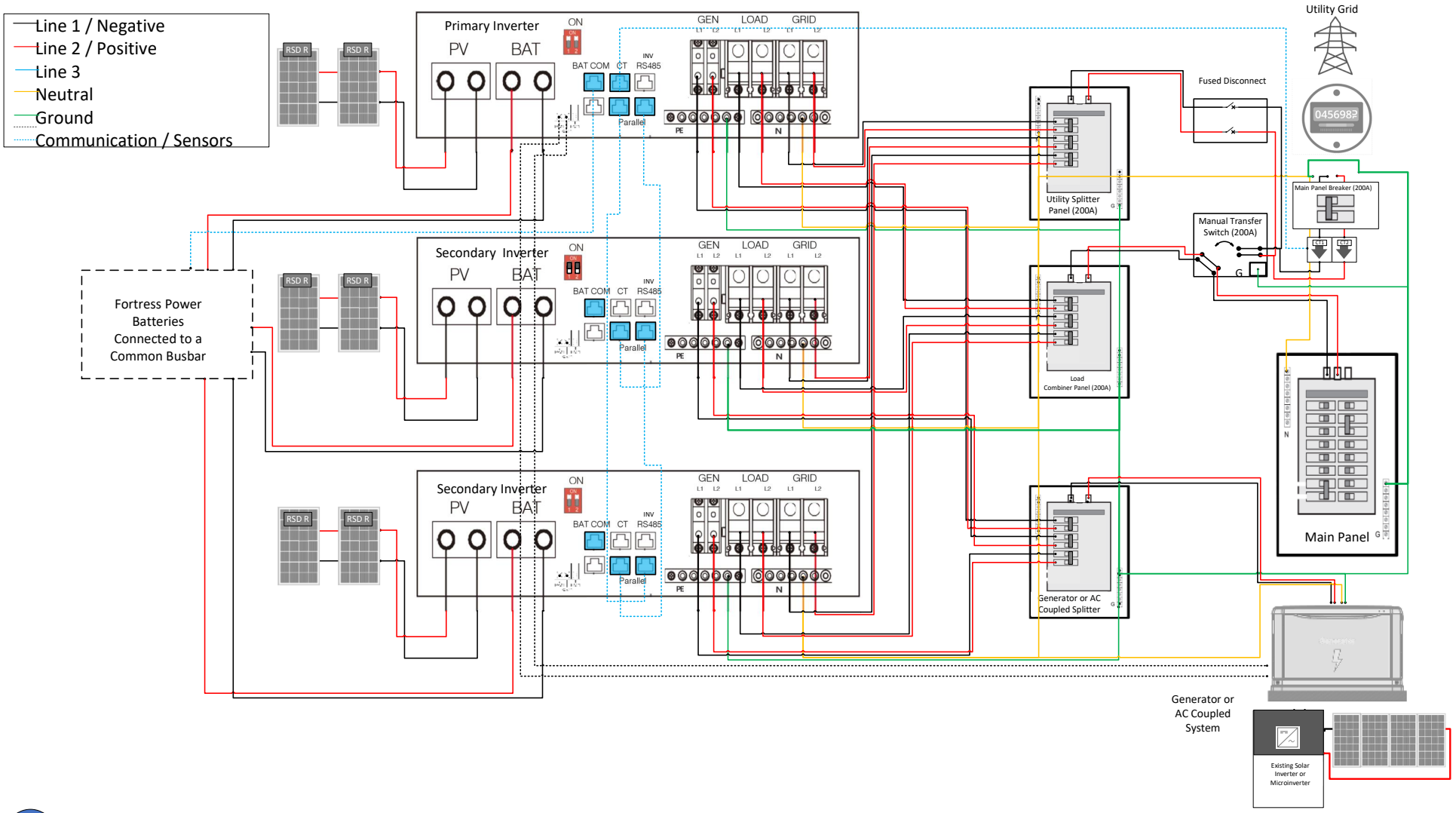


This schematic includes an optional generator addition in the case of grid outage. Note: the internal RSD transmitter is powered by a 12V source that is converted and supplied by grid connection or battery connection. Grid outage will deactivate the RSD transmitter. There should be only one Neutral to Ground Bond established on the supply side of the electrical system.

Always adhere to your local jurisdiction guidelines and make sure that an Electrician make all electrical connections.

For requirements of connection safety, please refer 2020/2023 NEC 705.11 or 2017 NEC 705.12A. This Schematic is only a depiction of the functional ports.

13.1.6 PARALLELED SYSTEMS APPLICATIONS WITH A FEEDER TAP CONNECTION (SPLIT-PHASE SERVICE 120/240V, 120/208V)



CT1 and CT2be allocated after the Utility Grid Feed before arriving to the Splitting subpanel. Only use 1 pair CT1 and CT2 and connect it to the primary inverter.

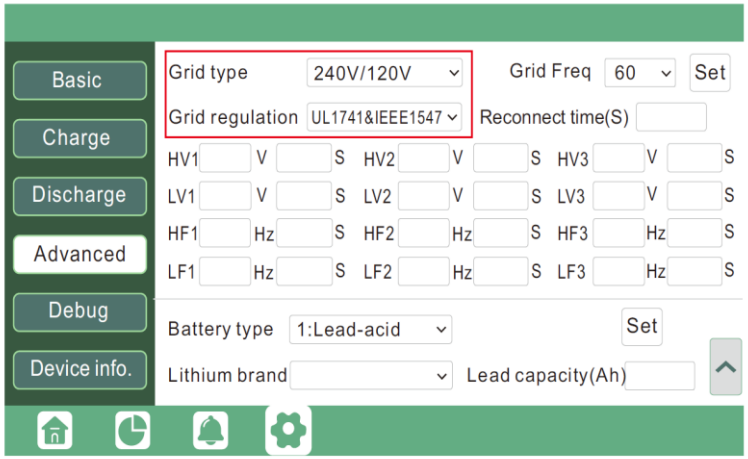
CT	*LOCATION*	*CT RS45 CONNECTION*
CT1 & CT2	LINE 1 (BLACK) & LINE 2 (RED) Respectively	**PRIMARY INVERTER**

There should be only one Neutral to Ground Bond established on the supply side of the electrical system.

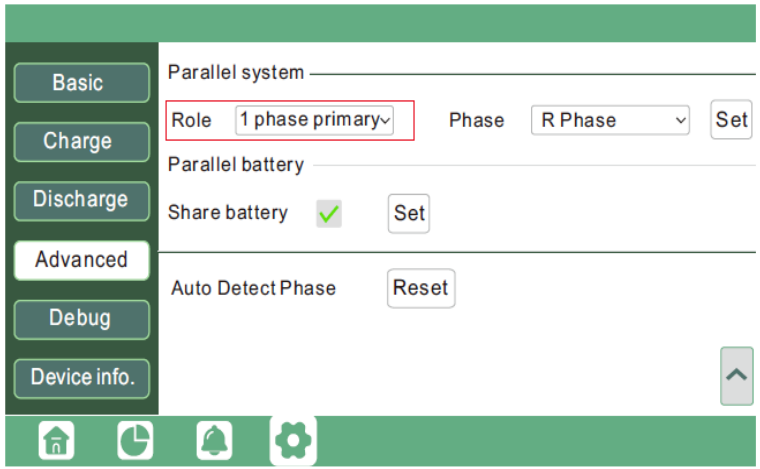
Always adhere to your local jurisdiction guidelines and make sure that an Electrician make all electrical connections.
Depending on your Local Jurisdiction a feeder tap breaker might be required between the Manual Bypass Switch and the feeder tap.
For requirements of connection safety, please refer 2020/2023 NEC 705.11 or 2017 NEC 705.12A

Single Split Phase 120/240V Paralleling.

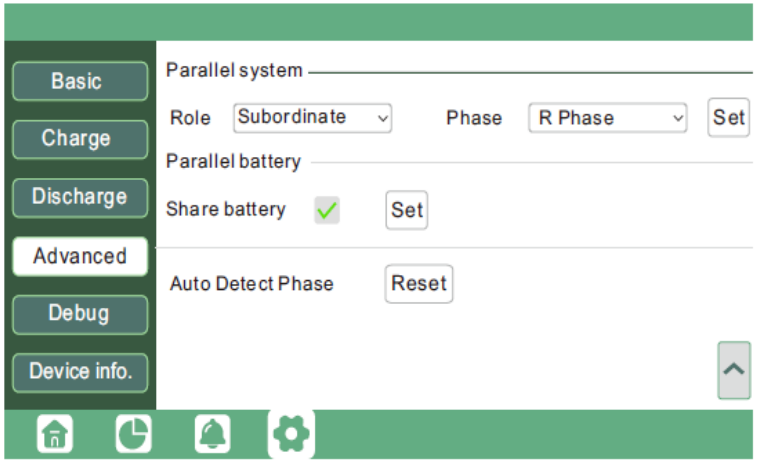
Utility Voltage Setup



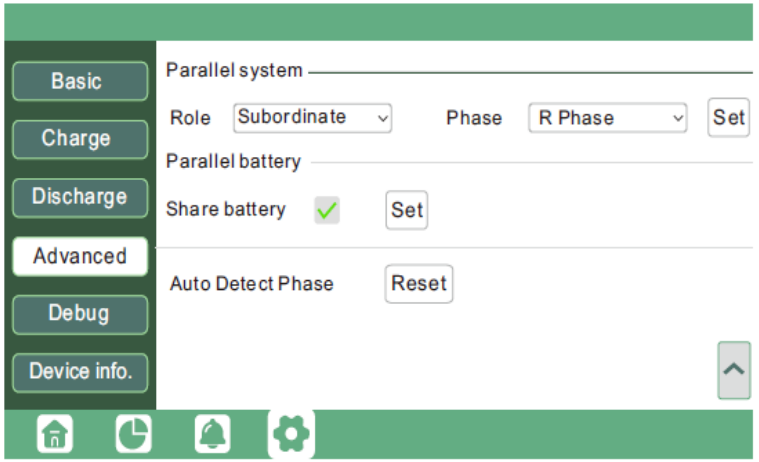
Primary Inverter



Secondary Inverter

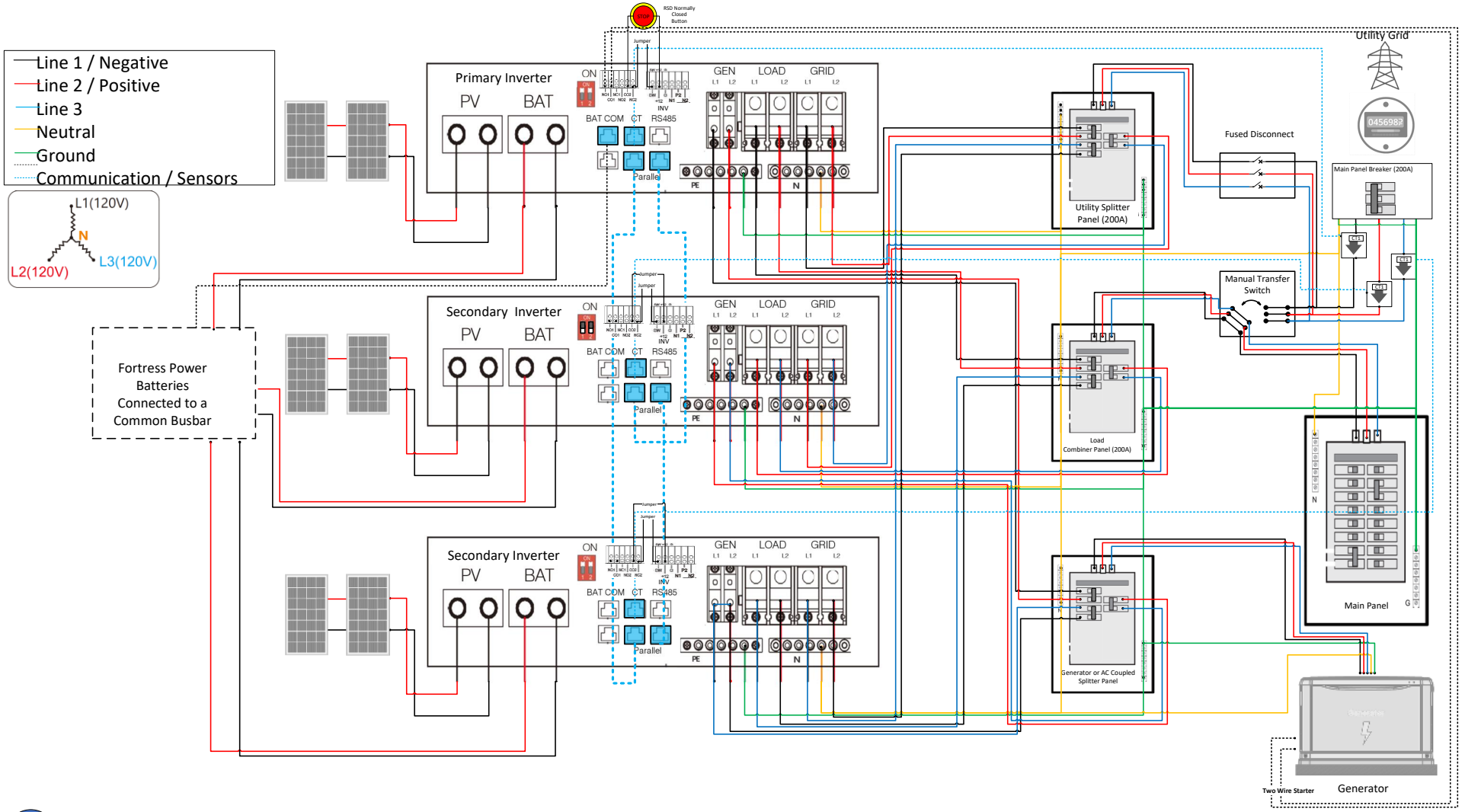


Secondary Inverter



When paralleling multiple Inverters, make sure to complete paralleling process by identifying which is the Primary inverter and the secondary on Parallel System area under the Advance Section. You can confirm by Selecting the Home Icon and view how many inverters are in connection **(PNUM)** and which **Role** each has (**P=Primary, S=Subordinate)**

13.1.7 3 Paralleled Systems Applications with a Feeder tap Connection (3 Phase-phase service 120/208V)



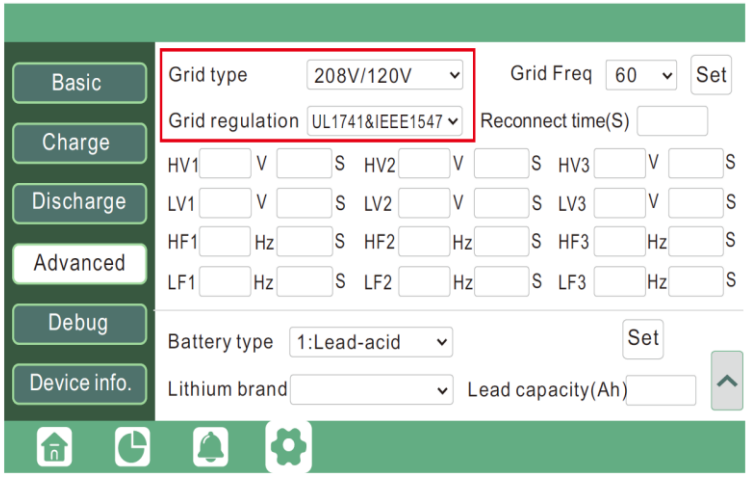
CT1 shall be allocated after the Utility Grid Feed before arriving to the Splitting subpanel. Only Use CT1 from the included CTs of the inverter. Each CT1 is to be installed in each line respectively and connected to each inverter. Only use three CT1 installations with more that require more than 3 inverters in 3PHASE.

CT	***LOCATION***	***CT RS45 CONNECTION***
1ST CT1	LINE 1 (BLACK)	**PRIMARY INVERTER**
2ND CT1	LINE 2 (RED)	**SECONDARY INVERTER**
3RD CT1	LINE 3 (BLUE)	**2ND PRIMARY INVERTER**

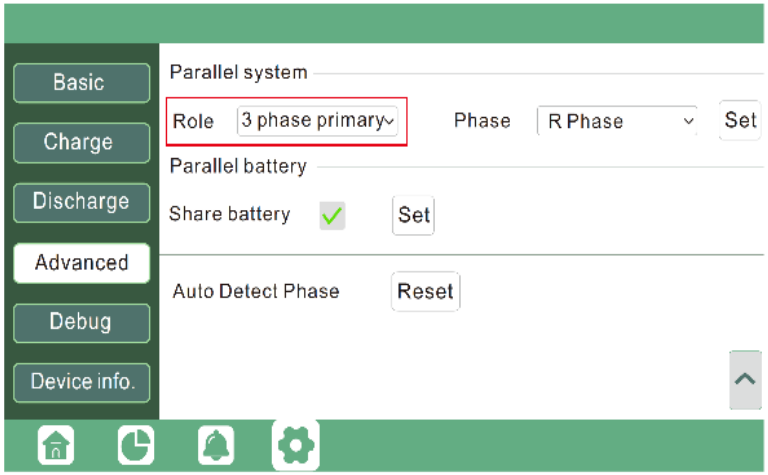
There should be only one Neutral to Ground Bond established on the supply side of the electrical system.
Always adhere to your local jurisdiction guidelines and make sure that an Electrician make all electrical connections.
Depending on your Local Jurisdiction a feeder tap breaker might be required between the Manual Bypass Switch and the feeder tap.
For requirements of connection safety, please refer 2020/2023 NEC 705.11 or 2017 NEC 705.12A. Follow the Commissioning Sequence.
Make sure that all the inverters are programmed identically when it comes to functionality, charge & discharge times, power, voltage, current etc. Otherwise, the systems may malfunction.

3Phase 120/208V Paralleling (3 inverters)

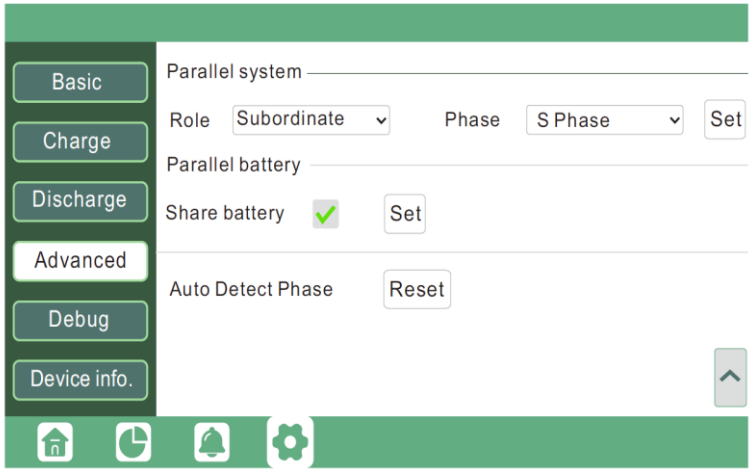
Utility Voltage Setup Primary Inverter



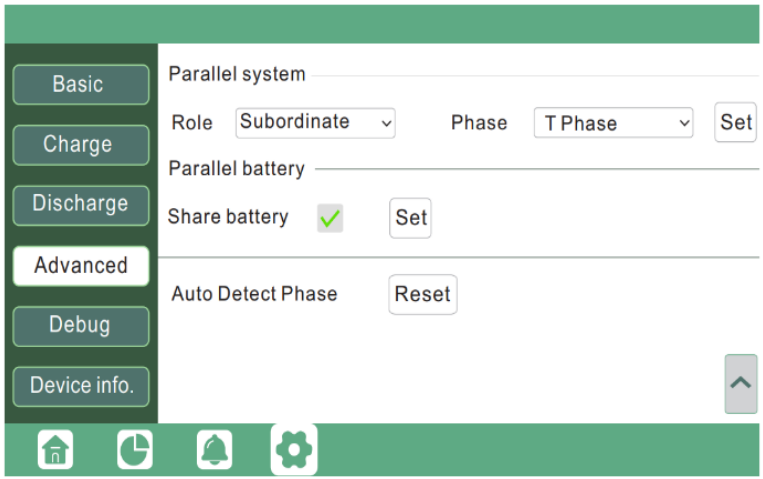
Primary Inverter



Secondary Inverter

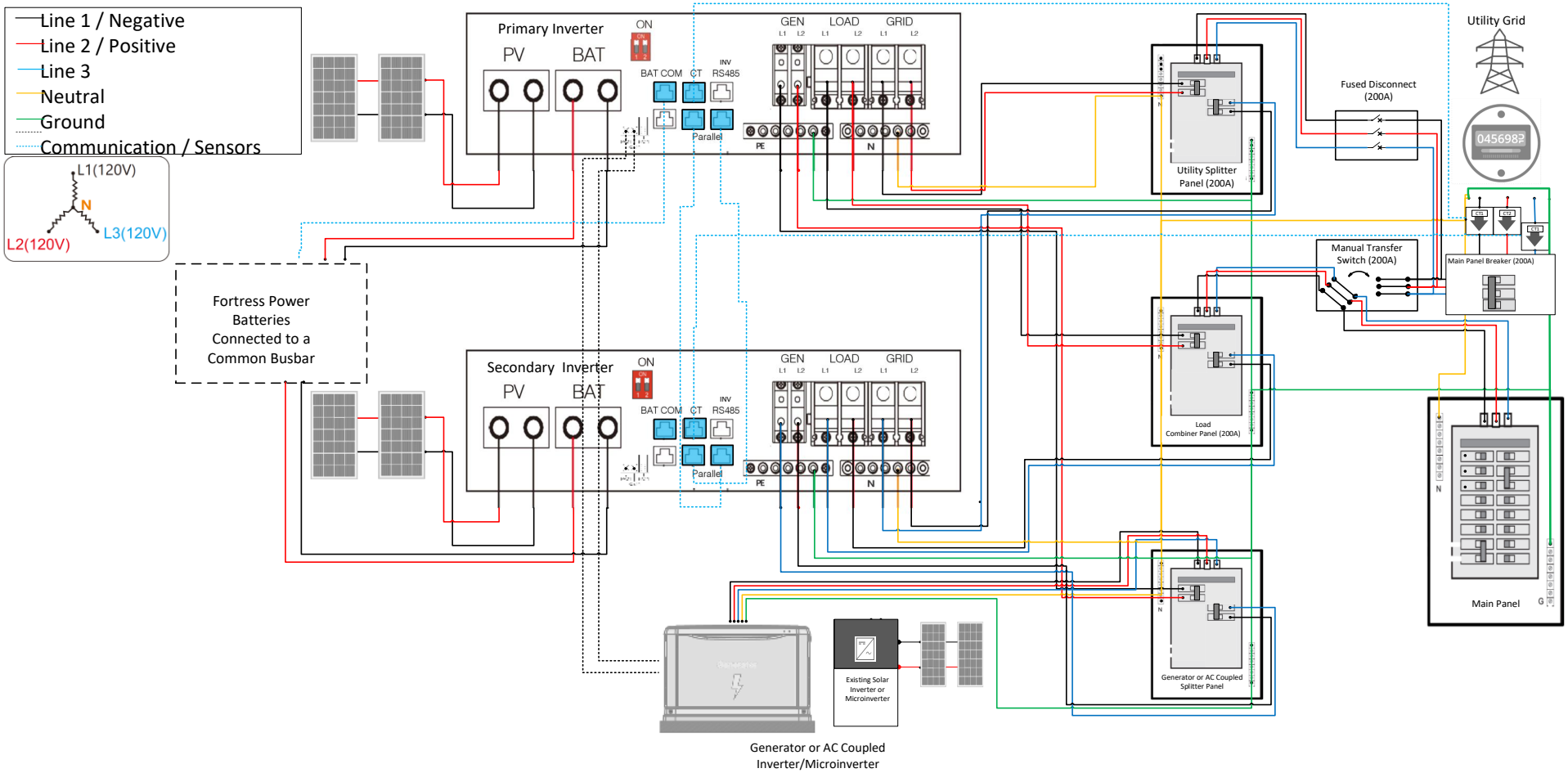


2nd Secondary Inverter



When paralleling multiple Inverters, ensure the paralleling process is completed by correctly identifying the Primary inverter and the secondary on Parallel System section under the **Advance** menu. You can confirm the configuration by selecting the **Home** Icon and reviewing the number of connected inverters **(PNUM)** and the assigned **Role** each has (**P=Primary, S=Subordinate)**

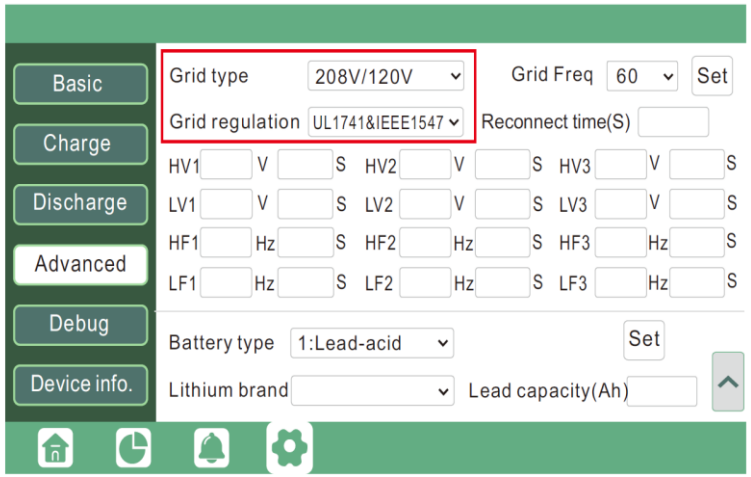
13.1.8 2 Paralleled Systems Applications with a Feeder tap Connection (3 Phase 120/208V)



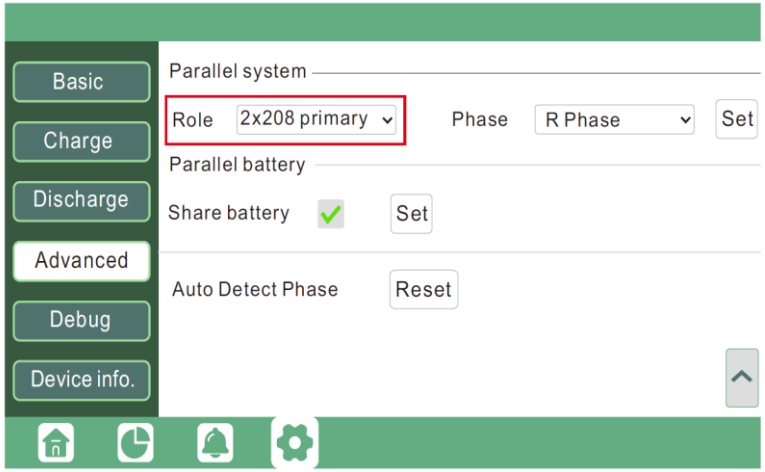
There should be only one Neutral to Ground Bond established on the supply side of the electrical system.
Always adhere to your local jurisdiction guidelines and make sure that an Electrician make all electrical connections.
Depending on your Local Jurisdiction a feeder tap breaker might be required between the Manual Bypass Switch and the feeder tap.
For requirements of connection safety, please refer 2020/2023 NEC 705.11 or 2017 NEC 705.12A
Follow the Commissioning Sequence on page 19 and the Paralleling Setup at page 31.
Make sure that all the inverters are programmed identically when it comes to functionality, charge & discharge times, power, voltage, current etc. Otherwise, the system may malfunction. Use CT1&CT2 for the Primary inverter and only CT1 for the Secondary inverter as described in the image.

3Phase 120/208V Paralleling (2 inverters)

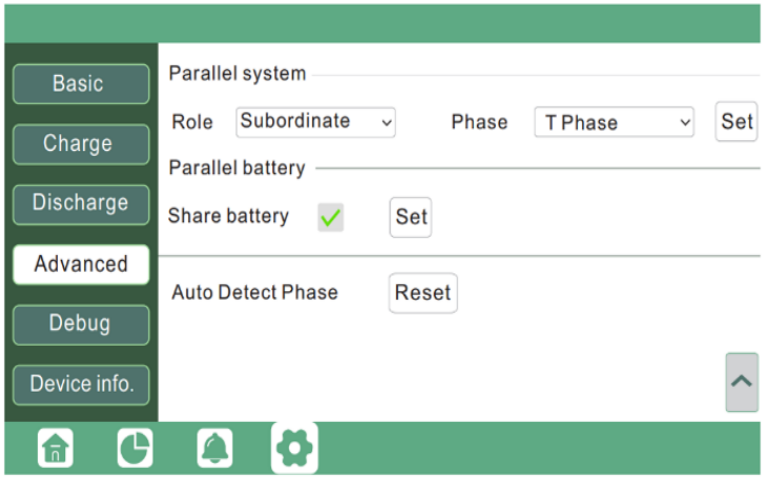
Utility Voltage Setup Primary Inverter



Primary Inverter



Secondary Inverter



When paralleling multiple Inverters, make sure to complete paralleling process by identifying which is the Primary inverter and the secondary on Parallel System area under the Advance Section. You can confirm by Selecting the Home Icon and view how many inverters are in connection **(PNUM)** and which **Role** each has (**P=Primary, S=Subordinate)**

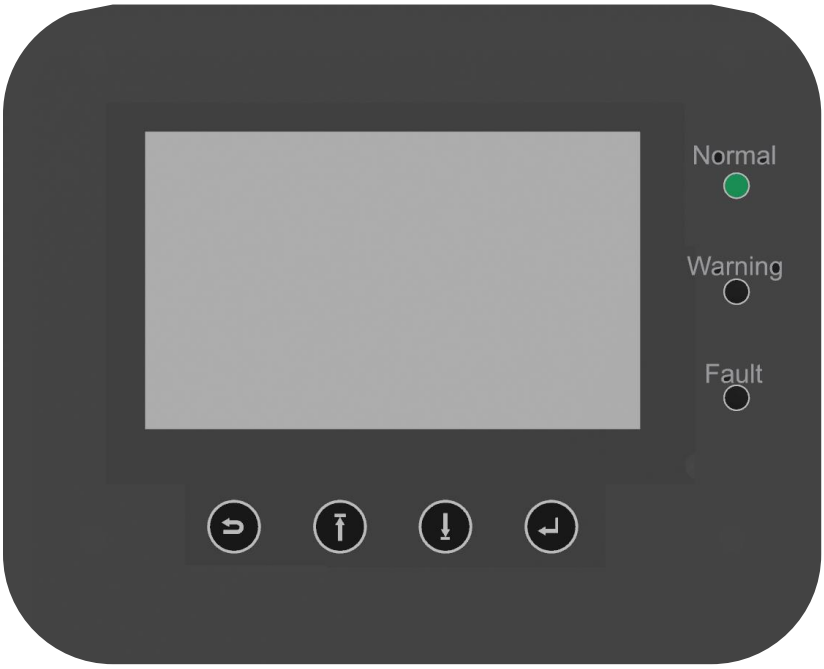
14. ENVY PROGRAMMING THROUGH LCD INTERFACE

14.1 TOUCH LCD DISPLAY

14.1.1 LED FUNCTION

LED	DISPLAY	DESCRIPTION	SUGGESTION
NORMAL	Solid lit	Working normally	N/A
	Flashing	Firmware upgrading	Wait for the firmware upgrade to be completed
ALARM	Solid lit	Alarm, inverter is working but needs checked.	Wait for it to be clear up, If Alarm, remains it might need troubleshooting
FAULT	Solid lit	Fault, inverter stopped working	Need troubleshooting
PASSTROUGH OR NO OPERATION	None	System is not Inverting nor using charging power nor has those functions activated	Assign a function to the inverter.

14.1.2 TOGGLE BUTTONS

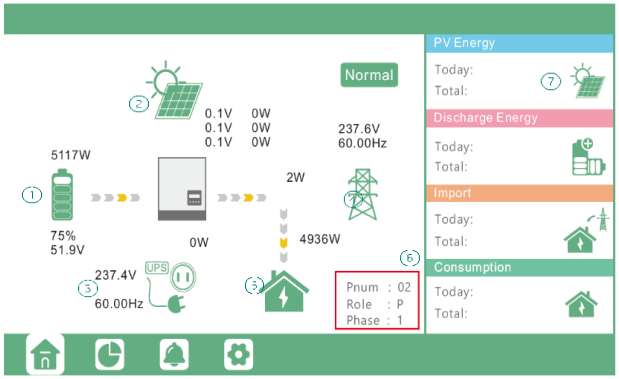


BUTTON	FUNCTION
	Return
	Scroll Up
	Scroll Down
	Enter Selection

14.2 SETTING PARAMETERS

- Always enable **Standby** when adjusting parameters and changes to the Inverter settings.
- Make sure to press **SET** on every change made, otherwise the value will revert to the default/previous parameter.
- **Password** to make Changes is **00000**
- Touch the screen to light it up if it's in sleep mode.
- Settings must be the same on all inverters when paralleled.
- Make sure that the Primary Battery is connected to the Master inverter when paralleling multiple inverters.
- Note: there are up to 3 time periods for Time of Use Settings (TOU) for each configuration. If used, always start with Time 1, use Time 2 then Time 3. Leave Time 2 and 3 blanks if only a single time period is needed.

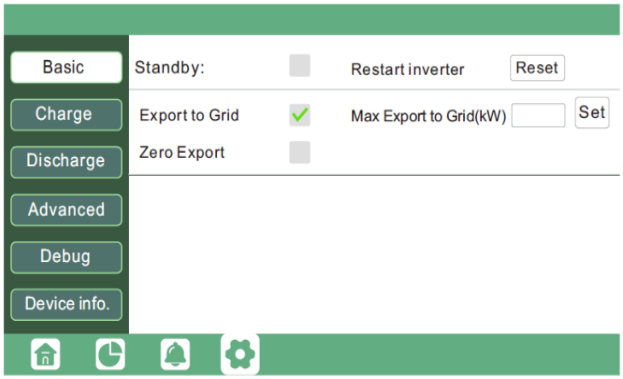
Clicking on the Home icon at the bottom of the screen, you'll get into the Home Screen page of the inverter.



FIGURE#	NAME	DISPLAYS
1	Battery	Voltage, SOC
2	Solar	MPPT Voltage & Power Production
3	Backup	Voltage, Power, and Frequency
4	Grid	Voltage, Power, and Frequency
5	Loads	Power
6	Inverter Identification	Qty. of Inverters, Role, and Phase (1~3, 1: R Phase, 2: S Phase, 3: T Phase)
7	Energy Usage Data	Daily and Historical Energy Production and Consumption, Import and Export Power

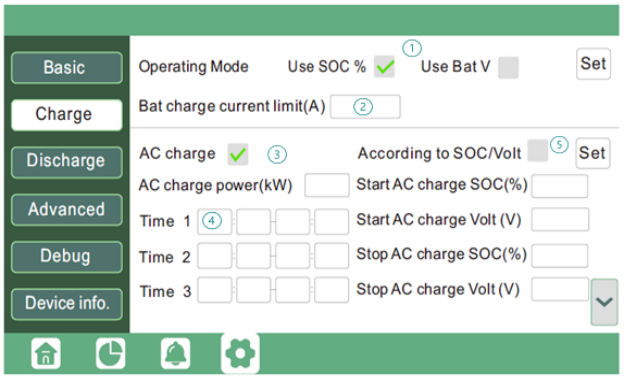
Clicking on the gear icon at the bottom of the screen, you'll get into the parameter setting page of the inverter.

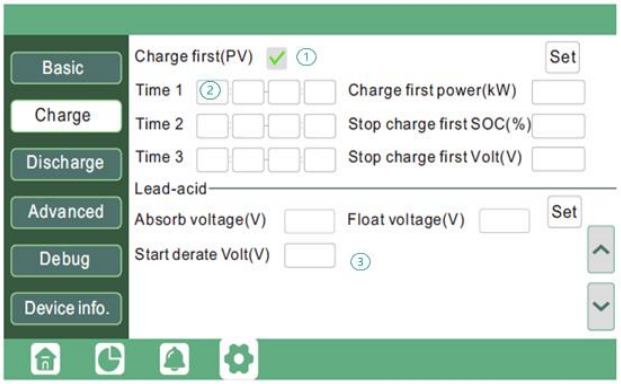
14.3 BASIC SECTION



FIGURE#	NAME	FUNCTION
1	Restart Inverter	Restart the system, please note the power maybe interrupted when restarted.
2	Standby	For users to set the inverter to normal status or to standby status. In standby status, the inverter will stop any charging or discharging operations, as well as solar-feed-in and will allow AC passthrough if Grid-tied.
3	Export to Grid	When enabled, Inverter will export excess energy production back to Utility using the set kW.
4	Zero Export (Self Consumption)	When enabling, Inverter will sense voltage and current every 20ms to prevent any solar being exported and at the same time allow solar production to supply power to the loads connected in the main panel and critical load panel. **Disable Export to Grid when using this function**

14.4 CHARGE SECTION





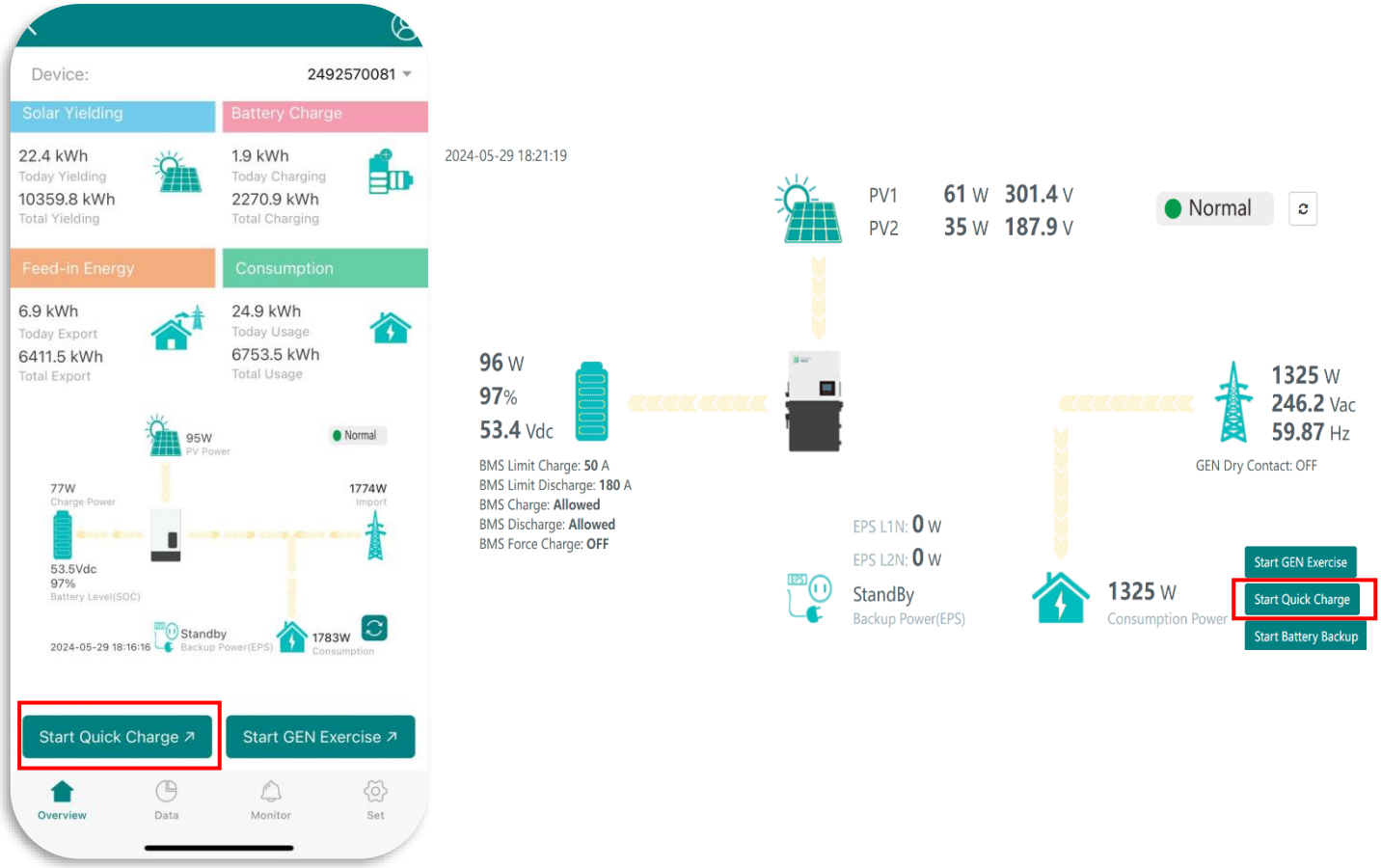
FIGURE#	NAME	FUNCTION
1	Operating Mode	Enabling SOC or Bat V to control charge and discharge logic depending on battery type. Always use percentage settings when in Closed Loop Using lithium batteries
2	Bat Charge Current Limit(a)	Use to set the maximum charging current recommended by the battery manufacturer.

3	14.4.1	AC CHARGE	By enabling, inverter will use available AC to charge the battery. AC Charge power(kW) to limit utility charging power,
4	14.4.2	TOU (TIME OF USE)	AC Charge will obey the time ranges. Users can charge batteries with grid power when electricity prices are cheap, and discharge battery power to supply load or export to the grid when electricity prices are high.
5	According to SOC/Volt		AC Charge will adhere to charging based on SOC/Volt settings rather than TOU.
SCROLL DOWN			
1	14.4.3	CHARGE FIRST (PV)	Charge first: PV charge configuration. When using enable Charge first, PV will charge the battery as a priority, set time periods when PV charge can happen, charge first power(kW) to limit PV charge power, and "Charge first SOC (%)" as the target SOC for PV charge first. "Charge first Volt(V)" as the target battery voltage for PV Charge first
2	14.4.4	TOU (TIME OF USE)	AC Charge will obey the time ranges. Users can charge batteries with grid power when electricity prices are cheap, and discharge battery power to supply load or export to the grid when electricity prices are high.
3	14.4.5	LEAD ACID /OPEN LOOP SETTINGS	When using Open Loop Settings, you need to set parameters in these programs, Follow the battery manufacture recommendations. **Lead Acid batteries are no longer compatible with Envy Inverters**

Quick Charge Feature (Available in Envy APP and Web Portal):
With a single click, you can set up the battery to charge using Grid power. After an hour, it will automatically stop and revert to its default settings. Users also have the option to stop it manually at any time. You must have inverter firmware update 1919 or newer and LCD firmware update #14 or newer.

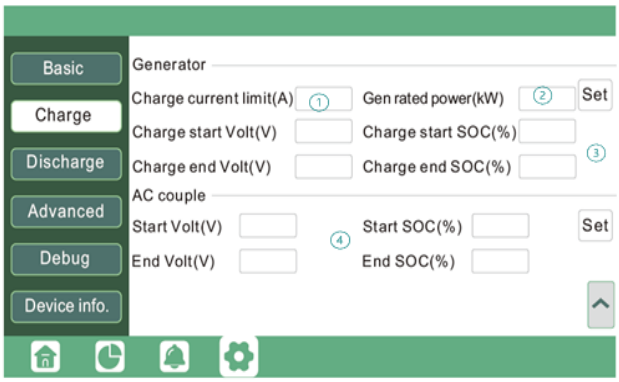
Start Gen Exercise (Only available for Off-grid applications)
Allows to manually start the Generator. If Battery SOC/V is withing the Gen Start charge range, the inverter will switch the loads to the Generator and simultaneously charge the batteries.

Generator Exercise button (Available in Envy APP and Web Portal)
Note: You must have an inverter firmware update 1919 or later and LCD firmware update #14 or later



SCROLL DOWN

14.4.6 GENERATOR



Generator Start Conditions

1. When utility fails and
2. When battery is discharged to cut-off settings or there is force charge request from battery or when the battery voltage or SOC is lower than the Generator Charge start Volt/SOC settings,

Generator Stop Conditions

1. When battery voltage or SOC is higher than Charge end Volt/SOC settings value.

AC Coupling

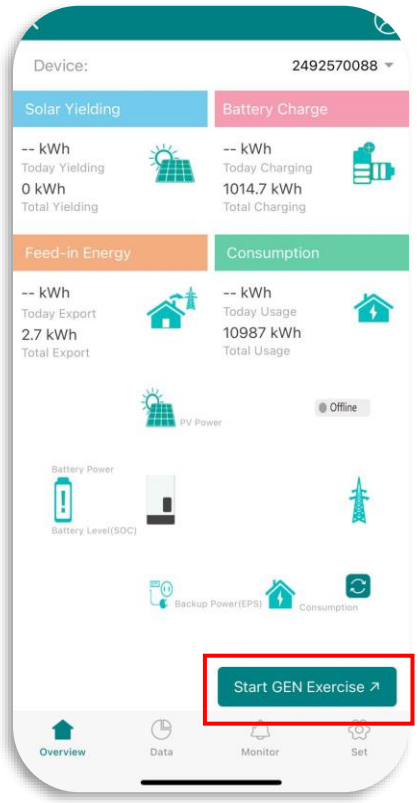
Users need to enable AC coupling function. The inverter supports AC coupling connection with the existing grid-interactive solar system. The existing solar system is to be connected to the inverter's GEN port. AC Coupling power generation in an OFF-Grid scenario will be active when the batteries Start SOC%/V is reached and will power off when End SOC%/V is reached.

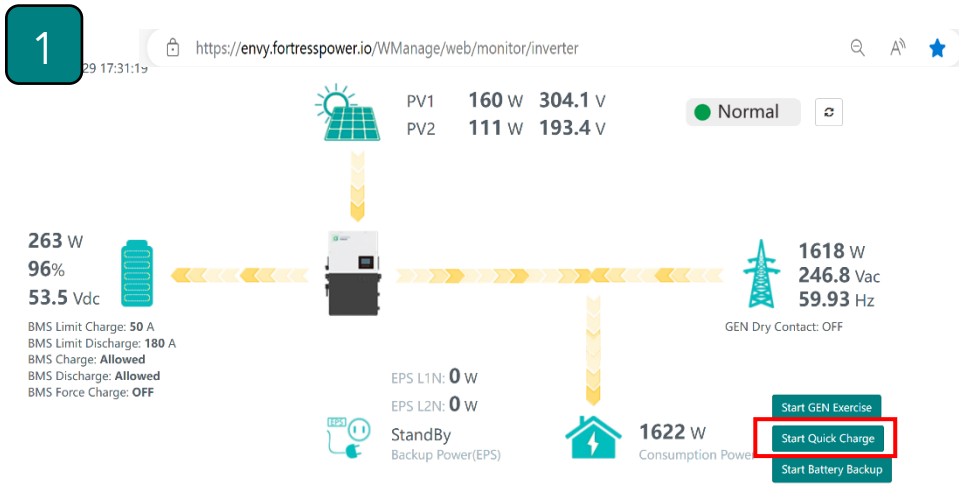
FIGURE#	NAME	FUNCTION
1	Charge Current Limit (A)	Set the Max. battery charge current from the Generator. The Generator will start charging according to the Charge start Volt/SOC and stop charging when the battery voltage or SOC reaches the Charge end Volt/SOC value.
2	Gen rated power	Stipulate Generator Power Rating
3	Charge Start & End SOC/Volt	Depending on the Bat operating mode setting; The system will use either battery SOC or battery voltage to determine whether the system needs to start or stop the generator.
4		When the Grid is on, the GEN terminal is connected to the grid terminal inside the inverter. In this case the hybrid inverter will bypass the interactive inverter AC to the grid and EPS. When On-Grid and Export to Grid are enabled, the AC-coupled inverter will always be on, and it will sell any extra power back to the grid. Ensure you are allowed to sell power to your utility provider. When export to Grid is disabled, the AC-coupled inverter will stay at off mode and could not work at on-grid mode to sell power. When grid is off, The GEN terminal is connected to the EPS terminal inside the inverter. In this case, the loads will be supplied by solar power first. If solar panels are generating more power than load consumption, the excess solar power will be stored in the battery. When solar power exceeds the sum of load power and max battery charging power, e.g. when battery is nearly full. The inverter will signal the grid interactive inverter to reduce power via the frequency shifting power reduction mechanism, thus, to maintain the balance of generation and consumption of the micro grid system.

14.4.7 AC COUPLE

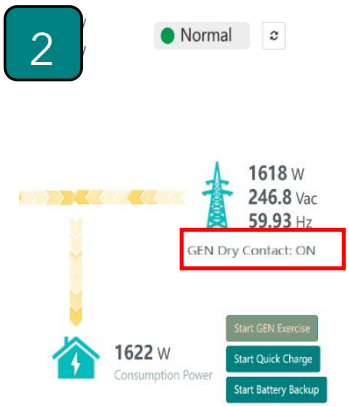
End SOC (%): The SOC at which the AC coupled inverters are shut down when in off-grid mode.
90% recommended.
Start SOC (%): The SOC at which the AC coupled inverters are turned on when in off-grid mode.
50%~70% recommended

1. When selecting the" Start Gen Exercise" button on either the APP or Web portal



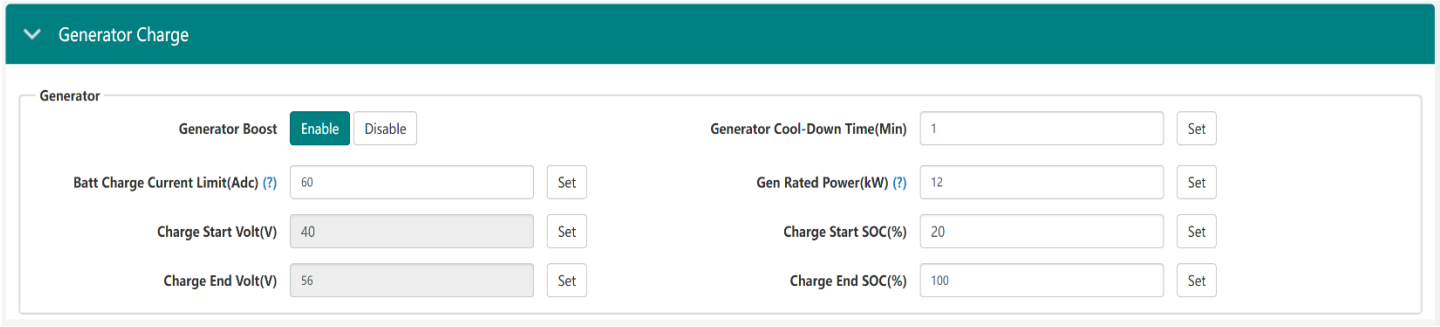


2. When enabled, the generator will start a 20-minute cycle. If the SOC/Volt is below the Generator Charge end SOC/Volt, the generator will warm up for 2 minutes before charging the battery. Once the Battery SOC/Volt reaches the Generator Charge end SOC/Volt, the relay on the generator side will open, stopping power generation. After a 2-minute cool-down period, the dry contact will stop.



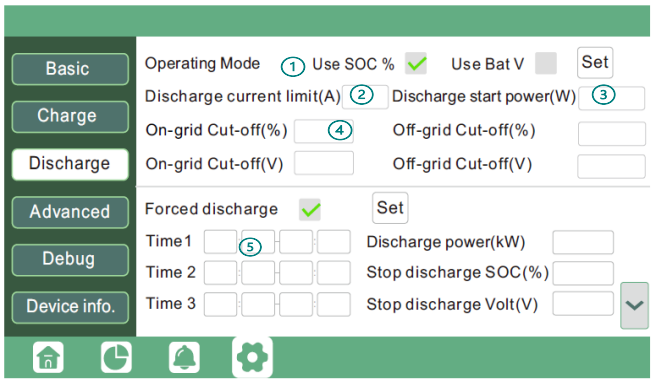
Gen Boost Feature (Available in Web Portal)

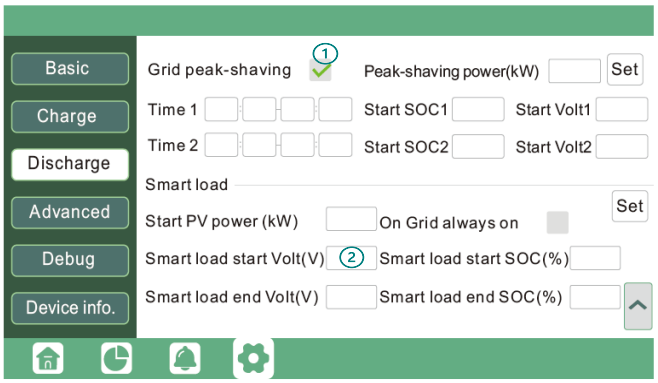
When stipulating the Gen Rated Power and enabling Gen Boost, the generator will prioritize the loads and supply the surplus energy to charge the batteries. Make sure to subtract anywhere from 5% to 15% of the generator's nominal rating to avoid any over throttling. If PV energy is present, the generator will share charge energy with PV power. If Loads exceed that of the capability of the generator rating, the inverter will discharge from the battery and PV to compensate power being drawn until battery SOC/V cut-off is reached.



If Gen boost is disabled, the inverter will prioritize loads and charge batteries simultaneously using the Gen Charge ADC parameter until the End Charge SOC/V is met. Generators should be sized correctly when used in this way.

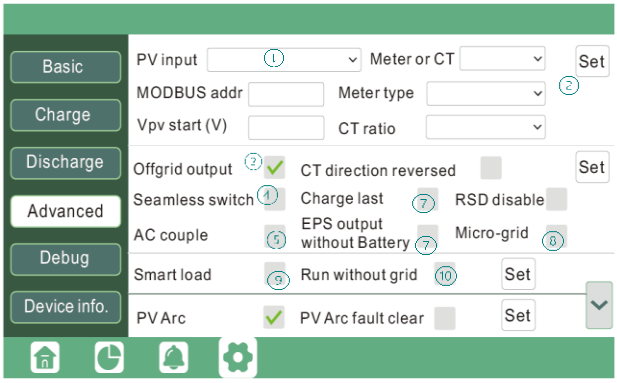
14.5 DISCHARGE SECTION

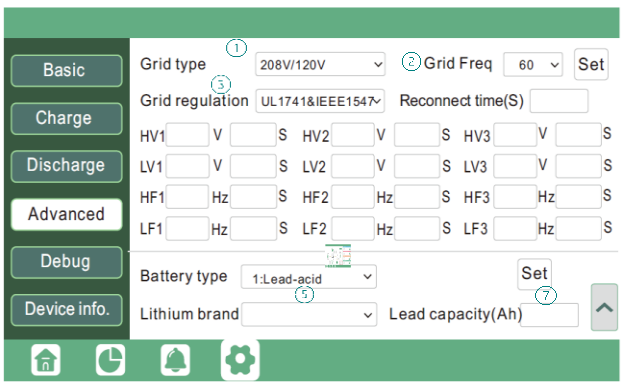




FIGURE#	NAME	FUNCTION
1	Operating Mode	You can choose "Use SOC %" or Use Bat V" to control the battery discharge state
2	Discharge current limit(A)	Discharge current limit(A): The Max. discharge current from battery
3	Discharge start power(W)	The Min. value can be set to 50. When the inverter detects the import power is higher than this value, battery start discharging, otherwise battery will keep standby.
4	On-grid Cut-off (%)/V & Off-grid Cut-off (%)/V	When the On-grid value is reached. Inverters will stop discharging batteries and switch to grid power to supply loads. The maximum set value is 90%. When Off Grid value is reached, the inverter will stop discharging the battery. **Make sure to have an external power source like a generator so that the home does not lose power.**
5	Forced discharge	Settings for battery force discharge within a certain time period. The inverter will discharge battery to the loads and excess will sell back to the grid at set power rate until time or Stop SOC is reached.
SCROLL DOWN		
1	Grid peak-shaving & Grid peak-shaving power(kW):	Is used to set the maximum power that the inverter will draw from its grid power. The rest will be supplied with available solar and battery power.
2	Smart Load	This function is to make the Gen input connection point as a load connection point, if you enable it, inverter will supply power to this load when the battery SOC and PV power is above a user setup value. e.g. Smart load start SOC=90%, Smart load end SOC=85%, Start PV power=300W, it means: When the PV power exceeds 300W, and the battery system SOC gets to 90%, the Smart Load Port will switch on automatically to supply the load which is connected on this side. When the battery reaches SOC<85% or PV power<300w, the Smart Load Port switch off. **Note:** **If you enable the Smart load function, it's forbidden to connect the generator at the same time, otherwise the device will be damaged!**

14.6 ADVANCED SECTION





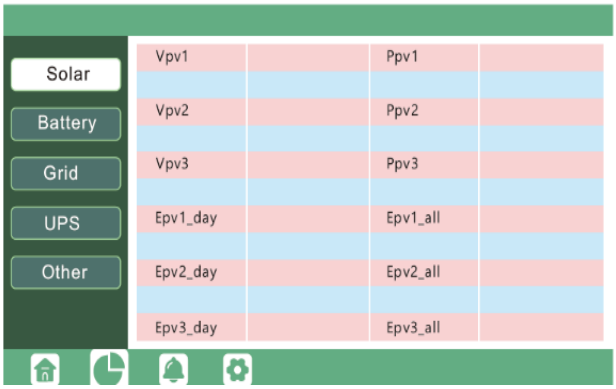
FIGURE#	NAME	FUNCTION

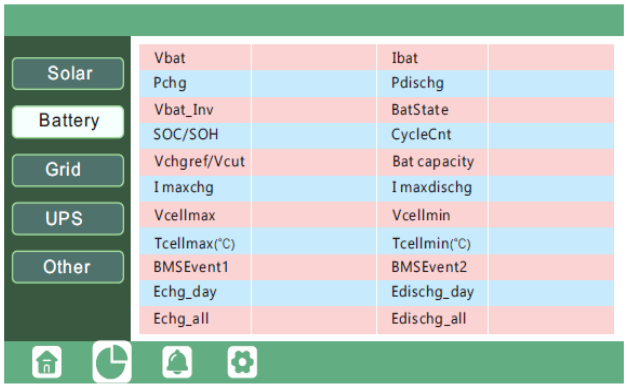
1	PV Input	Provides Selection of the quantity of MPPTS being used
2	CT Configuration	The supported CT ratio is 1000:1, 2000:1, 3000:1. The Default **CT ratio** that is provided with your inverter is 3000:1. If 3rd party CT is to be used, please. ensure its CT ratio is one of them and set it accordingly. **CT direction reverse** is to correct the direction of energy flow if installers placed the CTs in the wrong orientation. **Meter type** should be 0:1 phase.
3	**14.6.1 OFFGRID OUTPUT**	Enable to turn on Backup mode.
4	Seamless Switch	When enabled, the inverter will start inverting in less than 20ms when grid outage. Otherwise, it will inverter in less than 50ms.
5	**14.6.2 AC COUPLE**	Enable when user has AC coupling. AC coupled systems must always be connected in the Generator Port.
6	**14.6.3 CHARGE LAST**	When enabled, solar will supply energy first to Loads>Export to Grid and charge battery with the remaining power.
7	**14.6.4 EPS Output Without Battery**	When enabled, it will use solar power to supply load when the grid fails, or load-shedding happens.
8	**14.6.5 MICRO-GRID**	Only needs to be set when the generator is connected to the inverter's grid port. With this option enabled, the inverter will use AC power to charge the battery and won't export any power through the grid.
9	**14.6.6 SMART LOAD**	Enable to Turn ON Smart Load function. **Do not connect an AC source when this function is enabled, or you may damage the inverter**
10	**14.6.7 RUN WITHOUT GRID**	Enable when in Off Grid application. Do not place any AC Source on the grid port when this function is enabled.
SCROLL DOWN		
1	Grid Type	Choose 120/240V or 120/208V
2	Grid Frequency	Choose 60 Hz (US, PR, MX) 50Hz
3	Grid Regulation	UL1741 & IEEE, CA RULE21, HAWAII HECO, PR-LUMA. Voltage and Frequency codes will generate automatically.
4	**14.6.8 BATTERY TYPE**	NO, BATTERY, LEAD-ACID (Open Loop), LITHIUM
5	Lithium Brand	**LITHIUM 18 (FORTRESS POWER Protocol).** Confirm batteries are communicating in the Detailed System information Section.
6	Lead Capacity (Ah)	Set battery bank capacity for open loop settings. Leave default value if Closed Loop.

14.7 LCD DETAILED SYSTEM INFORMATION SECTION

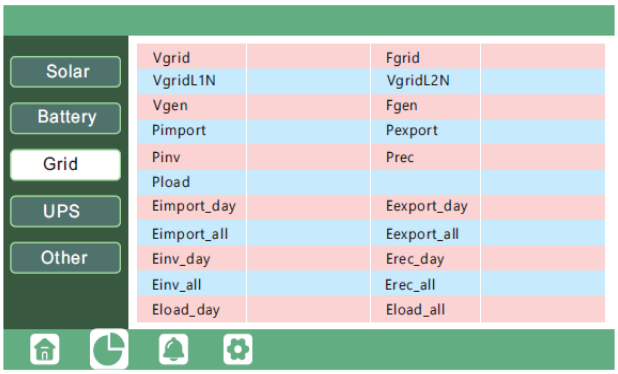
To access the Detailed System Information, click on the pie icon at the bottom of the screen and you'll be able to view the detailed real time solar information, battery information, grid information and EPS output information.

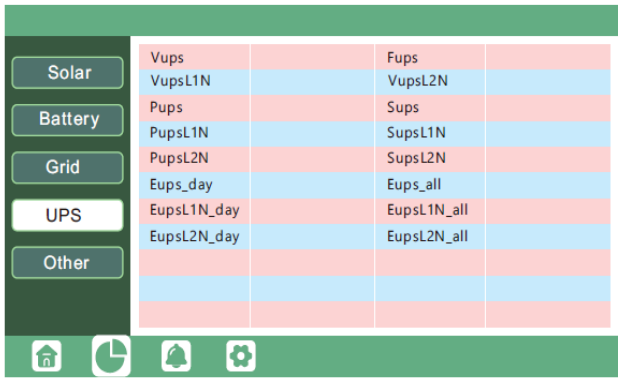
To confirm Batteries have been installed correctly and are communicating with the inverter, please refer to the Battery side of this section and note the **"BAT CAPACITY"**. For each **eFlex 5.4kWh** installed the value should be 105AH. For each **eVault 18.5kWh** installed, the value should be 360AH.



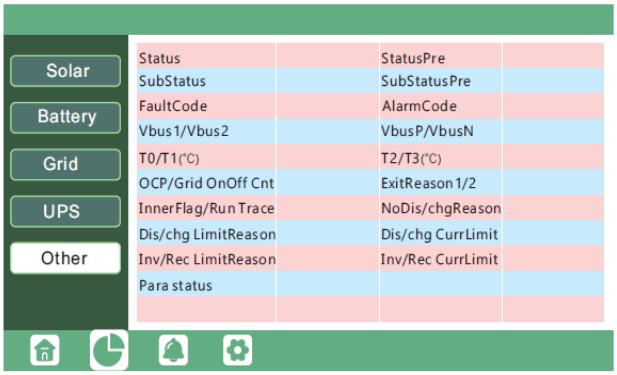


Section	DATA POINT	Description
SOLAR	VPV1	Voltage Input on MPPT1
	VPV2	Voltage Input on MPPT2
	VPV3	Voltage Input on MPPT3
	PPV1	Power production on MPPT1
	PPV2	Power production on MPPT2
	PPV3	Power production on MPPT3
	EPV1_DAY	Daily Energy Production on MPPT1
	EPV2_DAY	Daily Energy Production on MPPT2
	EPV3_DAY	Daily Energy Production on MPPT3
	EPV1_ALL	Entire Energy Production on MPPT1
	EPV2_ALL	Entire Energy Production on MPPT2
	EPV3_ALL	Entire Energy Production on MPPT3
Section	**DATA POINT**	**Description**
BATTERY	VBAT	Voltage Reported from the BMS of the battery/ies
	IBAT	Total Current being discharged or charging the battery/ies
	PCHG	Battery charging Power
	PDISCHRG	Battery discharge Power
	VBAT_INV	Voltage measured at the battery port of the inverter
	BATSTATE	Status of the Battery
	SOC/SOH	State of Charge of the battery / State of Health.
	CYCLECNT	Average Cycle Count
	VCHGREF/VCUT	Battery Charge Voltage/Battery Voltage Cutoff.
	BAT CAPACITY	Battery Capacity per Battery: **105 per eFlex Max** **200 per eForce** **360 per eVault Max**
	IMAXCHG	BMS max charge per battery.
	IMAXDISCHG	BMS max discharge per battery.
	VCELLMAX(V)	Maximum Cell Voltage (Bank)
	VCELLMIN(V)	Minimum Cell Voltage (Bank)
	TCELLMAX(°C)	Maximum Cell Temperature (Bank)
	TCELLMIN(°C)	Minimum Cell Temperature (Bank)
	BMSEVENT1	Battery Fault 1
	BMSEVENT2	Battery Fault 2
	ECHG_DAY	Daily Charged Energy
	EDISCHG_DAY	Daily Discharged Energy
	ECHG_ALL	Entire Charged Energy
	EDISCHG_ALL	Entire Charged Energy





Section	DATA POINT	Description
GRID	Vgrid	Grid L1-L2 Voltage reading (Vrms)
	Fgrid	Grid Frequency reading (Hz)
	VgridL1N	Grid L1-N Voltage reading (Vrms)
	VgridL2N	Grid L2-N Voltage reading (Vrms)
	Vgen	Generator L1-L2 Voltage reading (Vrms)
	Fgen	Generator Frequency reading (Hz)
	Pimport	Power import from Grid (W)
	Pexport	Power export to Grid (W)
	Pinv	inverting power from DC to AC (W)
	Prec	Rectifying power from AC to DC (W)
	Pload	Load power reading (W)
	Eimport_day	Today imported energy from grid (kWh)
	Eexport_day	Today exported energy to grid (kWh)
	Eimport_all	Total imported energy from grid (kWh)
	Eexport_all	Total exported energy to grid (kWh)
	Einv_day	Today Inverted energy (kWh)
	Erec_day	Today Rectified energy (kWh)
	Einv_all	Total Inverted energy (kWh)
	Erec_all	Total Rectified energy (kWh)
	Eload_day	Total Load consumption (kWh)
	Eload_all	Total Load consumption (kWh)
Section	**DATA POINT**	**Description**
UPS	Vups	UPS L1-L2 output voltage (Vrms)
	Fups	UPS output Frequency (Hz)
	VupsL1N	UPS L1-N output voltage (Vrms)
	VupsL2N	UPS L2-N output voltage (Vrms)
	Pups	UPS L1-L2 output active power (W)
	Sups	UPS L1-L2 output apparent power (VA)
	PupsL1N	UPS L1-N output active power (W)
	SupsL1N	UPS L1-N output apparent power (VA)
	PupsL2N	UPS L2-N output active power (W)
	SupsL2N	UPS L2-N output apparent power (VA)
	Eups_day	Today UPS L1-L2 output energy (kWh)
	Eups_all	Total UPS L1-L2 output energy (kWh)
	EupsL1N_day	Today UPS L1-N output energy (kWh)
	EupsL1N_all	Total UPS L1-N output energy (kWh)
	EupsL2N_day	Today UPS L2-N output energy (kWh)
	EupsL2N_all	Total UPS L2-N output energy (kWh)



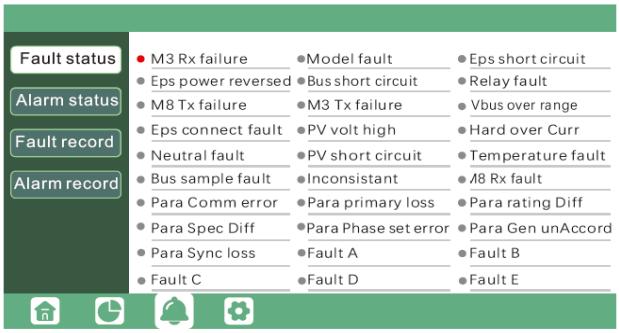
Section	DATA POINT	Description
OTHER (DEBUGGING DATA)	Status	Inverter status (Decimal data, converted to hexadecimal
	StatusPre	
	Substatus	
	SubStatusPre	
	FaultCode	Fault code (Refer to Fault page directly)
	AlarmCode	Warning code Refer to Fault page directly)
	Vbus1/Vbus2	BUS1 Voltage / BUS2 Voltage
	VbusP/VbusN	Positive half Voltage of BUS1/Negative half Voltage of BUS1
	T0/T1(℃)	Temperature readings of Radiators
	T2/T3(℃)	
	OPC/Grid On Off Cnt	Count for on-grid and off-grid switching
	ExitReason1/2	Reserved Data
	InnerFlag/Run Trace	
	NoDis/chgReason	
	Dis/chg LimitReason	
	Dis/chg CurrLimit	
	Inv/Rec LimitReason	
	Inv/Rec CurrLimit	
	Para status	

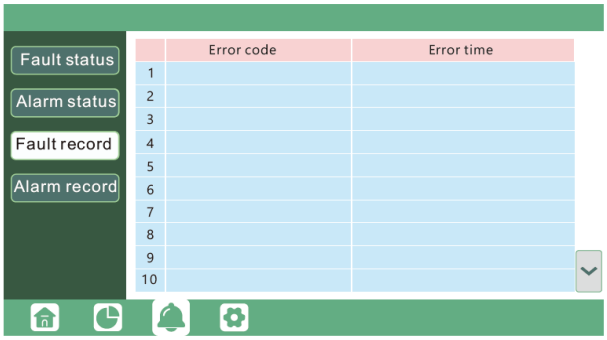
14.8 TROUBLESHOOTING BASED ON LCD DISPLAYS

Once there is any warning or fault occurring, users can troubleshoot according to the LED status and the warning/fault information on the LCD. **Touching the bell icon at the bottom of the screen, you'll see all the current and historical fault & warning information on this page.**

14.8.1 FAULT ON THE LCD

If the dot on the left of fault item is red, it means the fault is active. When it is grey, it means the fault is inactive.



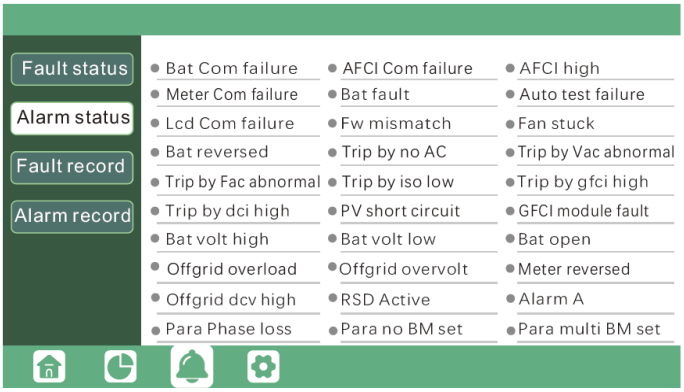


Code	Fault	Meaning	Troubleshooting
E000	M3 Rx failure	M3 microprocessor fails to receive data from DSP	1. Check if the firmware is the latest version, and if not, update it. 2. Restart the inverter to check. Contact Fortress Power service or your inverter supplier.
E001	Model fault	Incorrect model value	Contact Fortress Power Tech Support. A factory reset may be needed.
E008	Para Comm error	Parallel communication abnormal	1. Check whether the connection of the parallel cable is loose. 2. Make sure the CAN communication cable is correctly inserted from the first to the last inverter.
E009	Para primary loss	No primary is detected in the Parallel system	1. If a primary is configured, the fault will automatically be cleared. 2. If not, set the primary inverter. Note: Single systems must be set as "1 phase primary."
E010	Para rating Diff	Rated power of parallel inverters are inconsistent	Confirm that the rated power of all inverters is the same or contact Fortress Power.
E012	EPS short circuit	Inverter detected short-circuit on EPS Load output terminals	Check if L1, L2, and N are connected correctly at the EPS Load output port. Disconnect EPS Load breaker to see if fault remains.
E013	EPS power reversed	Power is flowing into EPS Load port	Check for LN reverse connection or whether both units are set as primary.
E014	Bus short circuit	DC Bus is short circuited	Restart the inverter. If the issue persists, contact Fortress Power.
E015	Para Phase set error	Incorrect phase setting in parallel system	Ensure wiring is correct. Connect each inverter to grid so system can auto-detect phase sequence.
E016	Relay fault	Relay abnormal	1. Lightly tap 200A relay and listen for click. 2. Restart the inverter. 3. Contact Fortress Power if the problem recurs.
E017	M8 Tx failure	DSP fails to receive data from M8 microprocessor	1. Check firmware version. 2. Restart the inverter.
E018	M3 Tx failure	DSP fails to receive data from M3 microprocessor	
E019	Vbus over range	DC Bus voltage too high	Check PV string voltage is within spec. Contact Fortress Power if within range and issue persists.
E020	EPS connect fault	EPS Load and Grid port are mixed up	Check if wires are correctly connected. Contact Fortress Power if the issue persists.
E021	PV volt high	PV input voltage is too high	Check if PV string voltage is within DC input range.
E022	Hard over current	Over current protection at hardware level triggered	Restart the inverter. Contact Fortress Power if the issue persists.
E023	Neutral fault	Grid N and PE voltage >30V indicates poor PE connection	Check if neutral wire is connected correctly.
E024	PV short circuit	Both MPPTs shorted (Vpv < 30V & Ipv > 5A)	Disconnect all PV strings. If a fault persists, contact Fortress Power.
E025	Temperature fault	Heat sink temperature too high	Ensure good ventilation and no direct sunlight. Check NTC connector inside.
E026	Bus sample fault	BUS1 voltage too low compared to PV or BUS2	1. Check firmware. 2. Restart the inverter. Contact Fortress Power if issue persists.

E027	Inconsistant	DSP and M8 sampled grid voltages inconsistent	
E028	Para Gen un-Accord	Generator input inconsistency in parallel system	Confirm whether all inverters are either connected to generators or not.
E029	Para sync loss	Loss of synchronous signal between inverters	1. Use T568B Ethernet cable. 2. Restart inverters.
E031	M8 Rx fault	M0/M8 fails to receive DSP data	1.Check if the firmware is the latest version, and if not, update it.

14.8.2 ALARM ON THE LCD

If the dot on the left of the alarm item is yellow, it means the alarm is active. When it is grey, it means the alarm is cleared.



CODE	ALARM	MEANING	TROUBLESHOOTING
W000	Bat com failure	Inverter fails to communicate with battery	Check communication cable and selected battery brand. If all is correct, contact Fortress Power or your inverter supplier.
W001	AFCI com failure	Inverter fails to communicate with AFCI module	Restart inverter. If the error persists, contact Fortress Power.
W002	AFCI high	PV arc fault detected	Check each PV string for correct Voc and Isc. If good, clear fault on LCD.
W003	Meter com failure	Inverter fails to communicate with meter	Check the cable connection and condition. Restart the inverter. Contact Fortress Power if fault persists.
W004	Bat Fault	Battery cannot charge or discharge	1.Check the battery communication cable for correct pinout on both inverter and battery end. 2.Check if you have chosen an incorrect battery brand. 3.Check if there is fault with the battery's indicator. If there is fault, please contact your battery supplier.
W005	Auto test failure	Auto test failed of CEI0-21 regulation	–
W006	RSD Active	Rapid shutdown activated	Check if the RSD switch is pressed.
W007	LCD com failure	LCD fails to communicate with M3 microprocessor	1. Restart the inverter to check. 2.Check if the flat cable between the LCD board and M3 board is well connected.
W008	FWM mismatch	Firmware version mismatch between microprocessors	
W009	Fan stuck	Cooling fan(s) are stuck	
W012	Para phase loss	Phase missing in parallel system	Confirm correct wiring. Based on mode, ensure correct number of inverters and grid connections (L1, L2, L3).
W013	Para no BM set	Primary not set in parallel system	Set one inverter as Primary.
W014	Para multi-BM set	Multiple masters set in parallel system	There are at least two inverters set as Primary in the parallel system, please keep one Primary and the other set as Subordinate.
W016	Trip by no AC	No AC connection	Check that AC input is properly connected.
W017	Trip by Vac abnormal	AC voltage out of range	Check that AC voltage is within spec.
W018	Trip by Fac abnormal	AC frequency out of range	Check that AC frequency is within spec.
W021	Trip by GFCI high	Inverter detected leakage current on AC side	Check for ground fault. Restart the inverter. Contact Fortress Power if fault remains.

W022	Trip by DCI high	Inverter detected high DC injection current on grid port	Restart the inverter. Contact Fortress Power if fault remains.
W023	PV short circuit	One MPPT PV input detected as shorted	Check PV strings. Restart the inverter. Contact Fortress Power if needed.
W025	Bat volt high	Battery voltage too high	Check if the battery exceeds 59.9V. Ensure voltage is within spec.
W026	Bat volt low	Battery voltage too low	Check if voltage is under 40V. Ensure it is within spec.
W027	Bat open	Battery disconnected from inverter	Check the battery breaker or fuse.
W028	Offgrid overload	Overload on EPS port	Check EPS load is within inverter spec. Ensure battery input is sufficient.
W029	Offgrid overvolt	EPS voltage too high	Restart the inverter. Contact Fortress Power if the issue persists.
W030	Meter reversed	Meter is connected in reverse	Check the meter cable connections on both sides.
W031	Offgrid DCV high	High DC voltage component on EPS output in off-grid	Restart the inverter. Contact Fortress Power if the issue persists.

15. CONTACT INFORMATION

FORTRESS POWER
Secure your energy

For Technical Support Please Contact us at
Tech-Support Contact Information

Useful Links

- Phone:

Tech Support (877) 497-6937
Tech Support (Spanish) (215) 710-8960

- Support Tickets: https://www.fortresspower.com/support/

Warranty Submittal: https://www.fortresspower.com/warranty/

System Design Tool
SCAN HERE

Updated Documentation
SCAN HERE
https://www.fortresspower.com/products/envy-12kw/