

Inverter

LIBERPRO CAB ESS USER MANUAL

**SUPPORT**

If you are experiencing technical problems and cannot find a solution in this manual, please contact ECO-WORTHY for further assistance.



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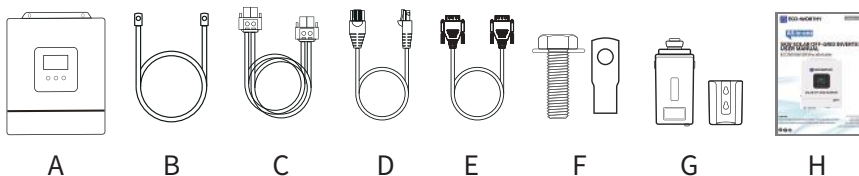
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I.Package Include

Inspect the Packages

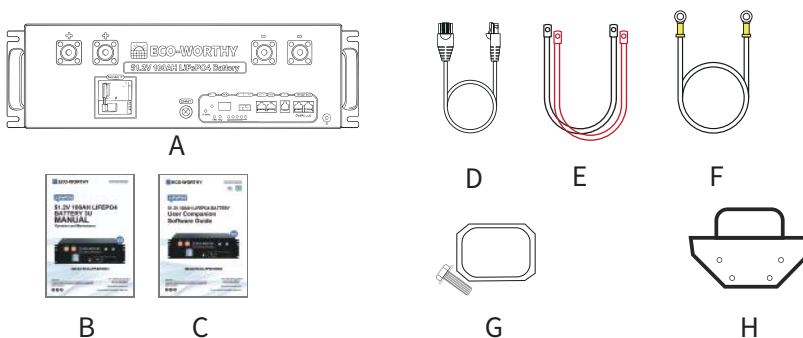
The package should include all the items shown in the Component Guide. If there is any damage or missing parts, please contact ECO-WORTHY's customer service team.

1. Eco 5KP Off-grid Inverter Package Include



Components	Description	Quantity
A	Eco 5KP off-grid inverter	1
B	Battery Connection Cables	1
C	Isopotential Cable	1
D	Battery-Inverter Communication Cable	1
E	Parallel communication Cable	1
F	Screw accessories	1
G	WiFi module	1
H	User manual	1

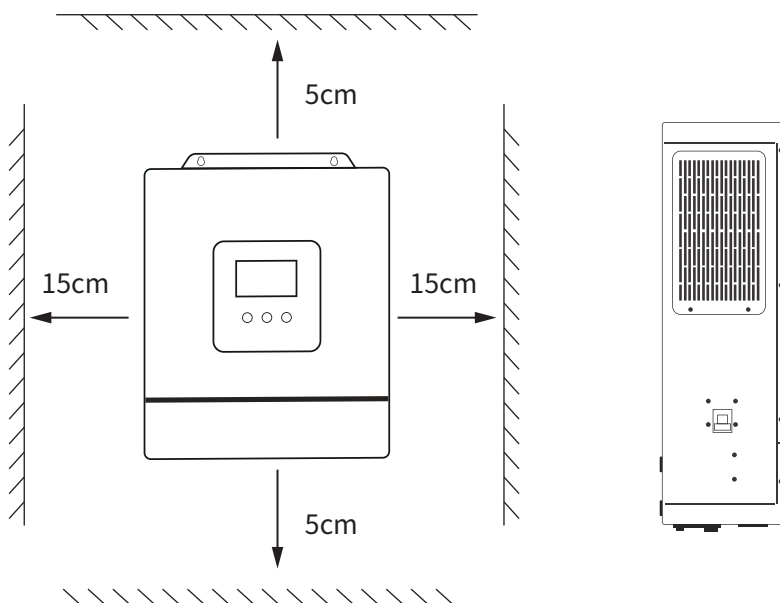
2.48V 100AH Server Rack Battery Package Include



Components	Description	Quantity
A	51.2V 100AH Server Rack Battery	1
B	User manual	1
C	APP & Host Computer Guide	1
D	Battery-Battery communication Cable	1
E	Battery positive and negative terminal connection wires	1
F	Grounding wire	1
G	Screws Bag& Terminal Cover	1
H	Handle	2

II.Eco 5KP off-grid inverter installation location

1. Consider the dimensions of the inverter and find a suitable location for the system. To ensure proper heat dissipation of the inverter, the vertical clearance should be at least 2 inches (5 cm), and the side clearance should be at least 6 inches (15 cm).



2. Under certain conditions, the National Electrical Code® specifies larger clearances. Ensure that the clearances comply with the National Electrical Code.

3. The Eco 5KP off-grid inverter is for indoor installation only. Do not install it outdoors or in areas where it is likely to get wet.

4. Prevent the LCD screen from being directly exposed to ultraviolet light.

5. Use screws or anchors that are suitable for the supporting surface and can support the weight of the inverter (30.9 pounds/14 kilograms).

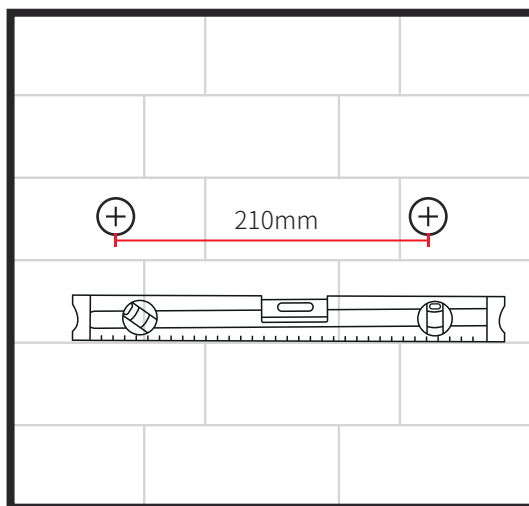
a. Concrete or masonry installation: Use 2 M6*50 expansion anchors (not included).

b. Wood frame installation: Use 2 3/8-inch self-tapping screws. (Not included)

III. Installation Steps

1. Measurement of installation hole positions:

Use a level (not included) to measure two center points on the mounting surface, with a center-to-center distance of 210 mm.



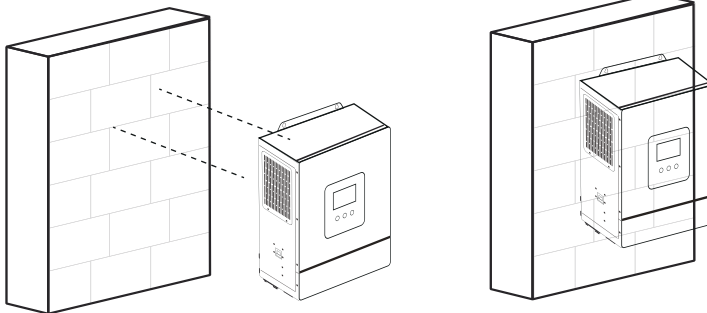
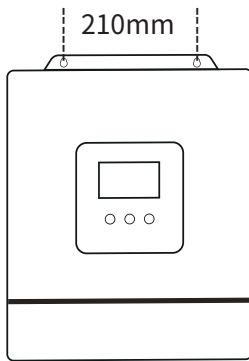
2. Drilling and installation:

a. Concrete or masonry installation:

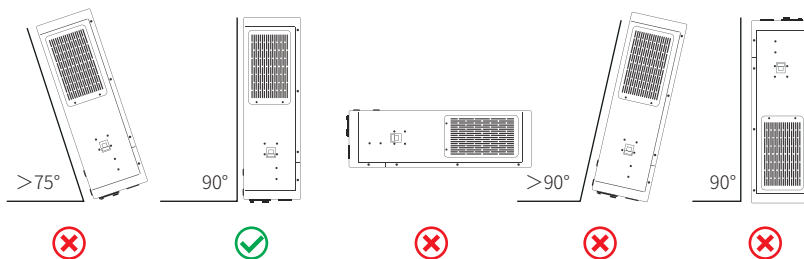
① Use 2 M6*50 expansion anchors, with the horizontal spacing as measured at the center points above, drill holes with a diameter of 8 mm and a depth of 50 mm.

② Place the inverter over the holes and tighten the screws.

b. Wood frame installation: Use 2 3/8-inch self-tapping screws, align the inverter's holes with the center points, and use a drill to drive the self-tapping screws into the wood frame.

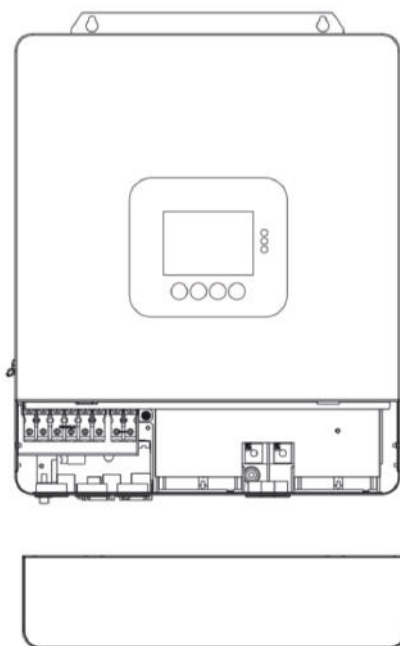


3. Inverter placement angle



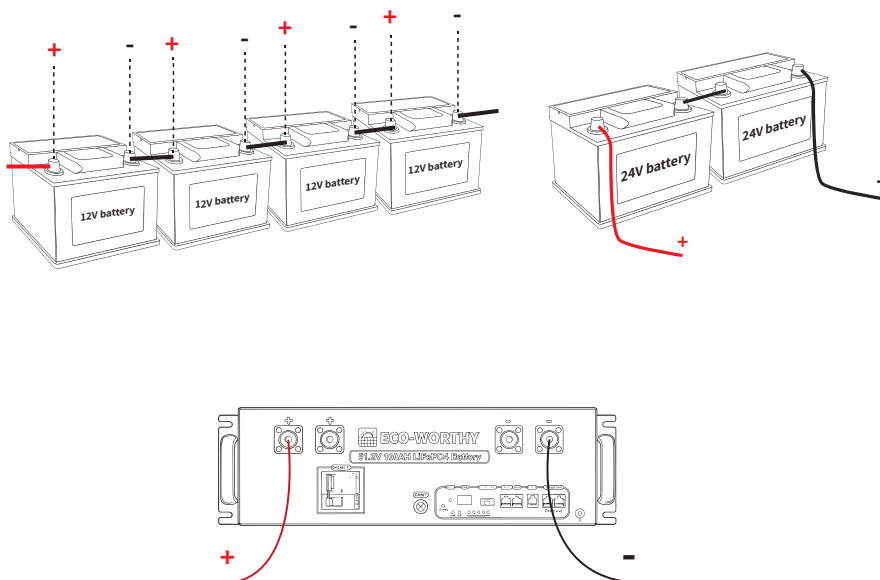
IV. Connection Overview

1. Remove the cover plate.



2. Battery Connection

The Eco 5KP off-grid inverter can use lithium batteries or lead-acid batteries. The battery pack voltage can be divided into 2 strings of 24V, 4 strings of 12V, 48V parallel, etc...



Please follow the steps below to correctly connect the battery wires.

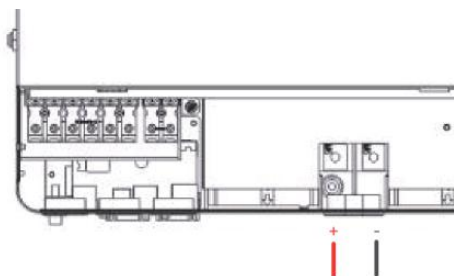
Step 1: Before connecting or disconnecting the wires, place all circuit breakers in the (off) position. Ensure that the voltmeter shows no DC voltage.

Step 2: Use the recommended battery cable and terminal sizes for the connections (see table below).

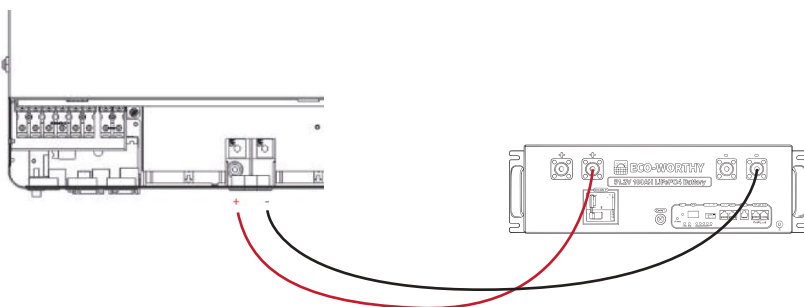
Maximum amperage	Wire gauge size	Terminal size
125A	35mm ² /2awg	Inverter end:M6 Battery end:M8

Step 3: Connect all batteries according to the device requirements.
Note: The recommended battery capacity for a 5KP inverter is $\geq 200\text{AH}$.

Step 4: Connect the positive battery cable (red) to the positive battery terminal (BAT+), and connect the negative battery cable (black) to the negative battery terminal (BAT-).



Step 5: Ensure that the polarity is not reversed, as this will damage the equipment (the following is an example of incorrect connection).



Warning:

- * Do not reverse the connections, connect to an unsuitable voltage range, or fail to disconnect the battery circuit breaker before connection.
- * If using parallel inverters, ensure they are connected to the same battery

3. Lithium Battery Communication

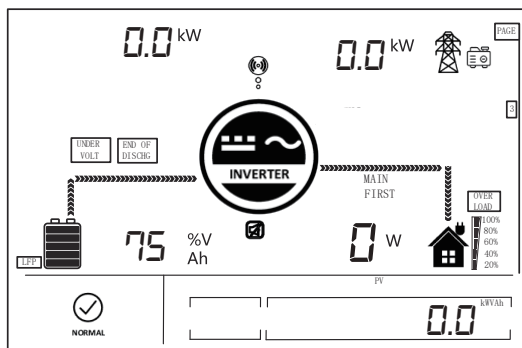
After successfully installing the battery, please follow the steps below to enable closed-loop communication between the battery and the inverter (using a compatible battery module).

1) Connect the ECO-WORTHY custom dual-end RJ45 Ethernet cable between the inverter and the battery. See the figure below.



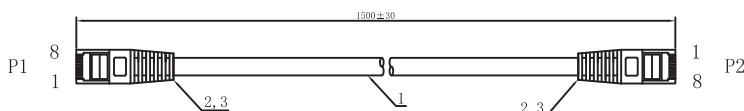
2) To enable communication between the inverter and the battery BMS, setting 32 must be adjusted to 485/BMS, and setting 33 to PYL.

* Successful communication: By using the page-turning key on the home page, you can see the SOC data displayed in the lower left corner of one of the pages.



Note: Custom communication cable for inverter-battery.

PIN	1	2	3	4	5	6	7	8
Pin Description	RS485-B	RS485-A	GND	NC	NC	GND	RS485-A	RS485-B



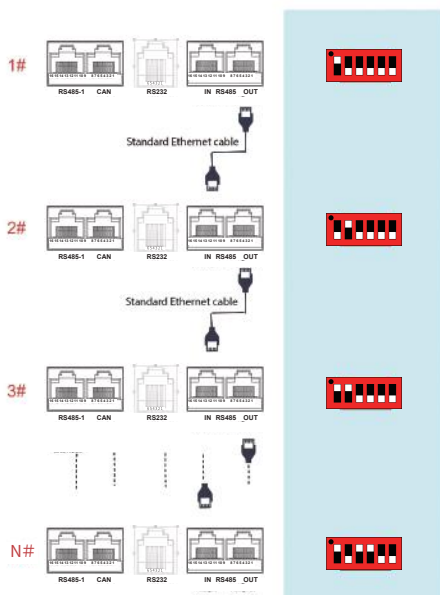
4. Multiple Battery Connection and Communication

If multiple batteries are connected in parallel and then connected to the inverter for connection and communication, please follow the steps below for connection and configuration.

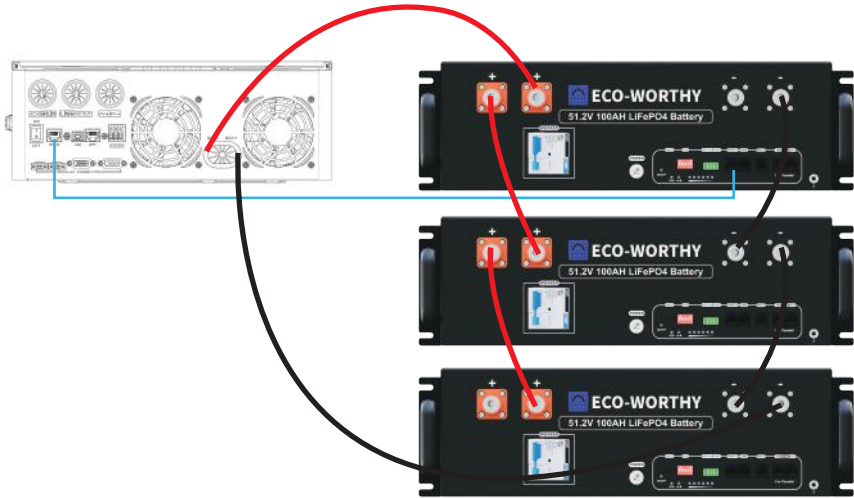
Step 1: For n ($n \geq 2$) batteries, use grounding wires to connect the casings in series, then use positive and negative cables for parallel connection, and connect the battery communication cables (draw the communication cables from the second diagram onto the first diagram).



Step 2: Set the battery DIP switch addresses, set the master battery to 1, and set the slave batteries sequentially from 2 to n . (For specific DIP switch definitions, refer to the user manual.)



Step 3: Connect the positive terminal of the master battery and the negative terminal of the last slave battery to the inverter, and establish communication through the communication port connected to the master battery and the inverter.



Note:

- * Each battery must be fully charged separately before paralleling to ensure consistent voltage and prevent reverse current between batteries.
- * The positive and negative terminals of the inverter need to be connected to the positive terminal of Battery 1 and the negative terminal of the last battery to maintain balance.
- * If communication is unsuccessful, the communication protocol of the master battery needs to be modified to match that of the inverter to ensure communication between the battery bank and the inverter.

5. ESM100 Display Connection

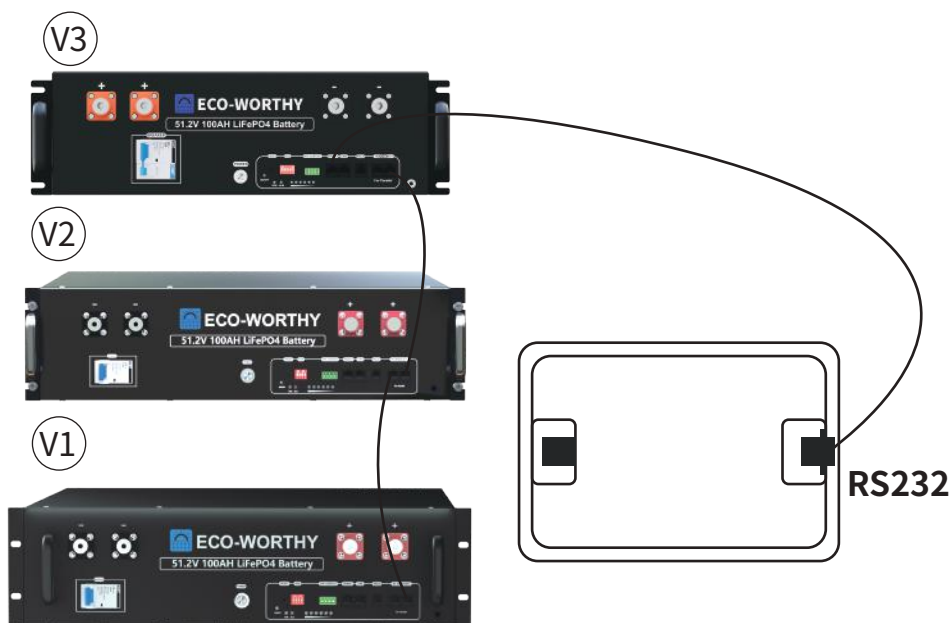
Compatible batteries:

1. 48V 100Ah Server Rack Battery V3
2. 48V 50Ah Server Rack Battery
3. 48V 100Ah Server Rack Battery V1/V2 (Can be monitored through V3 as the master device without firmware upgrade)

For the 48V 100Ah Server Rack Battery V1/V2, although it is not directly compatible with the ESM100 display, if there is a 48V 100Ah Server Rack Battery V3 in the battery bank as the master battery, the display monitoring can be achieved through the V3 battery without firmware upgrade.

Connection method:

Connect the RS485-2 interfaces between batteries to establish communication between batteries and set master and slave addresses, and connect the RS232 interface between the battery and the screen.



6. PV Connection

Install a separate DC circuit breaker/isolator between the inverter and the PV module. The recommended DC circuit breaker is a 2-pole 500V/25A. The recommended cable size for PV connection is 8 AWG (8mm²).

1) PV Parameters

PV input parameters	Range
Maximum open-circuit voltage	500Vdc
PV operating voltage range	120-500Vdc
MPPT operating voltage range	120-450Vdc
Maximum PV input power	5500W
Maximum PV input current	22A
Number of MPPT channels	1

2) Wiring Instructions

Step 1: Before connecting the PV wiring to the inverter, ensure that all circuit breakers and disconnect switches are in the off position, and use a multimeter to confirm that the PV string is not live, ensuring there is no DC voltage on the line. Once confirmed, proceed to the next step.

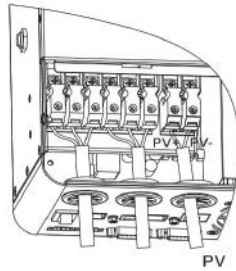
Step 2: Strip 1/4 - 5/16 inches (6 - 8 mm) of insulation from the positive and negative conductors of the PV string.

Step 3: Thread the PV wires through the conduit fitting and into the inverter.

Step 4: Locate the PV input terminal (see figure below).

Step 5: Insert the conduit fitting into the PV terminal and tighten the screws.

Step 6: Ensure that the conduit and fittings are securely fastened and that the cable entry holes are sealed.



Step 7: If using parallel inverters, the PV inputs of the two inverters need to be independent (see illustration).

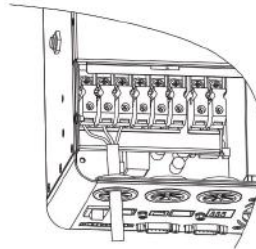
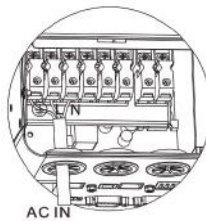
7. AC Wiring

1) AC Cable Requirements

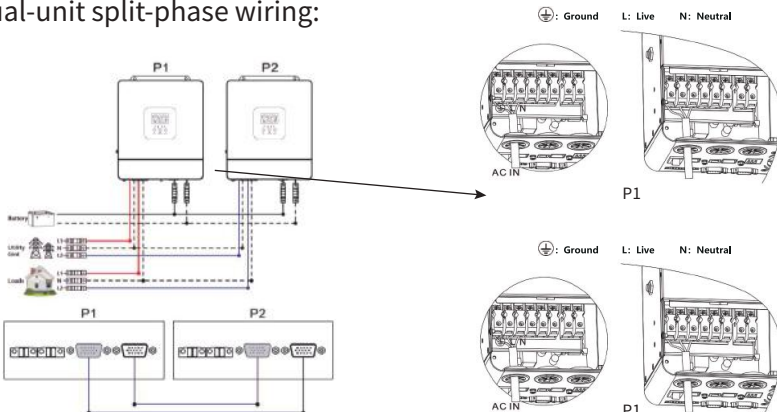
Port	Recommended wiring size	Recommended circuit breaker
Input	10mm ² /7AWG	2P-63A
Output	10mm ² /7AWG	2P-63A

2) Wiring Diagram Single-unit wiring:

Single-unit wiring:  : Ground L: Live N: Neutral



Dual-unit split-phase wiring:



2) Wiring Steps

Step 1: Before installing any wiring, ensure that all circuit breakers are in the off position before making any connections. Use a multimeter to confirm that the AC input lines (L1, L2, and neutral) are not live.

Step 2: Strip 5/16-3/8 inches (8-10 mm) of insulation from the AC cable.

Step 3: Connect the cables to the corresponding terminals as indicated in the diagram above, and secure the AC input and output wires to their respective terminals using the appropriate torque rating.

Note:

* For single-unit, connect L1 (black) to the L1 terminal and N (white) to the neutral terminal. Ensure that PE (ground) is securely connected to the PE terminal.

* For dual-unit split-phase, connect L1 (black) and L2 (red) to the respective terminals marked L1 and L2, and connect N (white) to the neutral terminal. Secure the PE (ground) wire (green/yellow) to the PE terminal, ensuring proper grounding.

3) For multiple single-phase parallel units and multiple split-phase parallel units, refer to the user manual.

Section 2.4.3: Single-phase Parallel Wiring Diagram

Section 2.4.4: Split-phase Parallel Wiring Diagram

8. Whole Machine Power-On Test

Battery Voltage Check

- 1) Check the battery voltage, which must be between 43V and 63V.
- 2) If applicable, turn on the internal switch of the battery. Measure the voltage of each battery.
- 3) Verify that the voltage of the battery pack at the terminals is sufficient.

PV Voltage Check

- 1) The input voltage must not exceed 500V.
- 2) The input voltage must be higher than the start-up voltage of 125V.
- 3) Do not ground PV+ or PV-.
- 4) Check the polarity of each PV string. If the polarity is reversed, inverter will measure 0Vdc, which can cause long-term damage.
- 5) When only PV is connected, the LCD screen will light up, but the inverter will not operate.

Grid Input Voltage Check

- 1) Use a multimeter to measure the AC voltage at the “GRID” terminals.
- 2) Measure the voltage from line (L) to neutral (N) at the “GRID” terminals. Ensure that all phase voltages are 120V.
- 3) Measure the line voltage (L) at the “GRID” terminals. Ensure that the voltage is 240V. (If the voltage reading is close to 220V or 210V, confirm whether the grid is single-phase or three-phase.)
- 4) Verify that the voltage between the neutral and ground is 0V.
- 5) Confirm that the voltage between “Grid” L1 and “Load” L1 is 0V. Do the same for L2.

9. Power On

Turn on the toggle switch

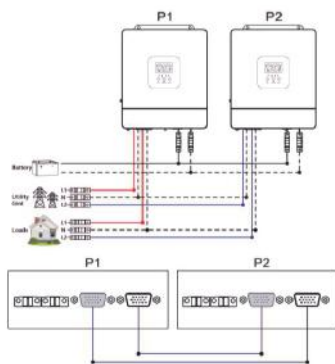
1) Inverter Parameter Settings

- * The default battery communication protocol is Pylontech.
- * Modify option 32 of the inverter to “485”.
- * Modify option 33 of the inverter to “PYL”.

2) Battery Parameter Settings

- * The default battery communication protocol is Pylontech.
- * Adjust the 485 communication protocol of the battery to Pylontech.

3) Split-phase Parallel Inverter



- * Set the option 31 of Inverter 1 to 2P0, and the option 31 of Inverter 2 to 2P2.

Note: After startup, you should immediately enter the inverter settings page to modify option 31, otherwise it will not be possible to modify after the inverter starts working; if the inverter has already started, please restart to enter the settings.

1) Recommended Use of Charging Mode

Mode Name	Working Principle	Advantages	Disadvantages	Applicable Scenarios	Important Prerequisites
PV and Grid Hybrid Charging	Primarily charges using PV power, and the grid automatically supplements when PV power is insufficient; the grid stops charging when PV power is sufficient.	Flexible complementarity, ensures battery charge, good economic efficiency.	Some grid electricity costs will still be incurred.	For occasions with unstable sunlight or significant load changes, balancing economy and reliability.	PV/grid hybrid charging is only possible when there is a load on the bypass output; PV charging can only be initiated when there is a load on the inverter output.
Grid Priority Charging	Prioritizes grid power for battery charging; switches to PV charging only when the grid power fails.	Fast and stable charging speed, unaffected by weather, simple and reliable system.	No use of green energy, highest electricity cost.	For occasions with stable grid power and low electricity prices, or when the PV system capacity is small.	/
PV Priority Charging	Prioritizes PV charging; grid charging is only initiated when PV charging fails.	Energy-saving and environmentally friendly, low operating costs.	Charging speed is subject to lighting conditions.	For occasions where green energy is to be used as much as possible.	/
PV Only Charging	Supports only PV charging, completely rejecting grid charging.	Zero electricity bills, zero grid dependence, 100% green energy.	Completely dependent on the weather, unable to charge without sunlight.	For completely off-grid scenarios with extreme environmental requirements (requires large-capacity PV and batteries).	Supports only PV charging, completely rejecting grid charging.

2) Recommended Use of Discharge Mode

Mode Name	Working Principle	Advantages	Disadvantages	Applicable Scenarios
AC Grid Priority	When the grid power is normal, it directly supplies power to the load; when the grid power fails, it automatically switches to the inverter (battery) for power supply.	High power supply stability, less battery usage, longer battery life.	High electricity cost, not fully utilizing solar energy, not energy-saving.	Areas with stable grid power and low electricity prices; daily use scenarios with high requirements for power supply continuity.
Inverter Priority	Prioritizes using the battery (inverter) to supply power to the load; automatically switches back to grid power when the battery voltage is too low.	Full utilization of energy storage, saving electricity costs (especially during peak electricity prices).	Increased battery cycle count, which may affect lifespan; if battery capacity is small, frequent switching may occur.	Areas with a large difference between peak and off-peak electricity prices; scenarios where maximum electricity cost savings are desired.
Solar Priority	Prioritizes using solar power to supply the load; switches to grid power when PV fails or battery voltage is too low.	Maximizes the use of green energy, energy-saving and environmentally friendly, low operating costs.	Power supply stability is greatly affected by weather, and power supply may be insufficient on cloudy or rainy days.	For occasions with sufficient sunlight and installed PV systems; off-grid or weak grid areas.

10. WiFi Configuration

1) Due to certain limitations of the Wi-Fi Dongle, please ensure that the signal and security settings of your home Wi-Fi network meet the following requirements:

The Wi-Fi adapter only supports wireless networks on the 2.4GHz band. If the router supports 5GHz or 6GHz network frequencies, please confirm that the router supports the 2.4GHz network band and that it is enabled.

2) The Wi-Fi dongle is only compatible with WPA1, WPA2, and WPA3 security protocols on the 2.4GHz network.

3) Ensure that the home Wi-Fi router has DHCP (Dynamic Host Configuration Protocol) settings enabled to allow the Wi-Fi dongle to obtain an IP address.

2) It is recommended that the home Wi-Fi network name be no more than 19 characters long and the password be no more than 24 characters long. The following special characters are not recommended in the password: @, #, \$, %, &, *, ?, <, >, /, or spaces (keyboard space bar).

***For detailed instructions on using the Wi-Fi Dongle, please refer to the relevant manual.**

V. Technical Support

1) Customer service email:



E-mail: ESSVIP SUPPORT@eco-worthy.com.cn

2) Company address: USA/Germany



Address(US): 4411 East State Hwy D Suite C Springfield, Missouri 65809



Address(DE): ECO-Worthy Europe GmbH Otto-Hahn-Str. 20 61381 Friedrichsdorf - Köppern Germany

3) Customer service telephone numbers:

Tel(US&CA): +1 866 939 8222

Tel(UK): +44 7553 406 988

Tel(DE): +49 6175 6514 999

Note:

Customer Service Hours:

US: Mon-Fri 8:30 AM - 6:00 PM (CST)

UK: Mon-Fri 9 AM - 5 PM (GMT)

DE: Mon-Fri 9 AM - 5 PM (CET)

4) Official website address:



Web: <https://www.eco-worthy.com/>

5) Official social media:



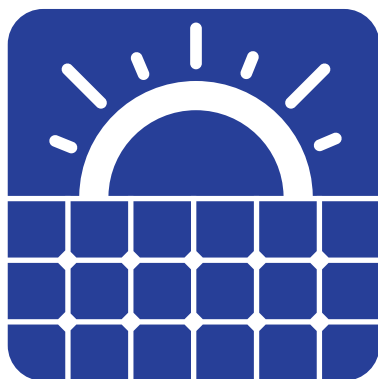
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