HUMLESS 5 KWH BATTERY

INSTALLATION GUIDE V1.0(CA2023)



ATTENTION: This guide is for qualified users only. Strictly follow this user manual and pay close attention to all warnings. Please **DO NOT** operate or install this product before reading this entire **INSTALLATION GUIDE.**

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Customer Support support@humlessafrica.co.za. 1

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CHAPTER 1

1.1 IMPORTANT INFORMATION

Read and save these instructions - DO NOT DISCARD!
This guide contains important safety instructions for the Humless Universal that must be followed during operation and troubleshooting. Read and keep this Installation Guide for future reference. Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it.

Customer Support : SUPPORT@HUMLESSAFRICA.CO.ZA

A. Purpose
The purpose of this installation Guide is to provide explanations and procedures for installing the Humless 5 kWh Battery.

B. Scope
This guide provides safety and installation guidelines. Complete balance of system installation is not covered.

C. Audience
This guide is intended for use by anyone who plans to install the Humless 5 kWh Battery. The information in this manual should only be used by qualified personnel; those who have training, knowledge, and experience in:

1. Installing electrical equipment and PV power systems,
2. Applying all applicable installation codes.
3. Analyzing and reducing the hazards involved in performing electrical work.
4. Selecting and using Personal Protective Equipment (PPE).

D. General Safety
Take all necessary precautions when working with batteries. Lay out the plan of the install, and make sure you have all needed safety equipment to accompany install.

1.2 DANGER AND WARNING LABELS

The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

NOTICE: Indicates a potentially hazardous situation, which, if not avoided, can result in equipment damage.

⚠ **CAUTION:** Indicates a potentially hazardous situation, which, if not avoided, can result in moderate or minor injury.

⚠ **WARNING:** Indicates a potentially hazardous situation, which, if not avoided, can result in death or serious injury.

⚠ ⚠ **DANGER:** Indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.

1.3 FCC INFORMATION TO THE USER

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in an installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult with a qualified Humless Universal Dealer or an experienced radio/TV technician for help.

1.4 DEFINITIONS

AC: Alternating Current refers to voltage produced by the inverter, utility, grid, or generator.

Active Frequency Shift Power Curtailment: Curtailing PV inverter generation by raising the line frequency, and in turn causing compatible PV inverters to reduce their power output in an orderly manner, is called Active Frequency Shift Power Curtailment.

AGS: Auto Generator Start

Autonomy: Period of time the batteries will run unaided at the average base-load.

Architecture: As used in this context, means the way the electrical system is put together using different components, inputs/outputs to make a system created to fit specific electrical micro-grid needs.

Base Load: Base load, on an electrical grid, is the average level of power demand over a span of time. With respect to photovoltaic systems, base load is exceeded at crucial times which causes an overproduction situation for the grid. This has proven problematic for Utility Companies on the grid as they have more electricity than they need.

DC: Direct Current refers to voltage produced by the batteries or other renewable source, like photovoltaics.

Electrical distribution system: The wires from the grid, through your meter to your main panel and the rest, if any, of your electrical sub-panels which distribute your electricity throughout your home and buildings.

ESS: Energy Storage System

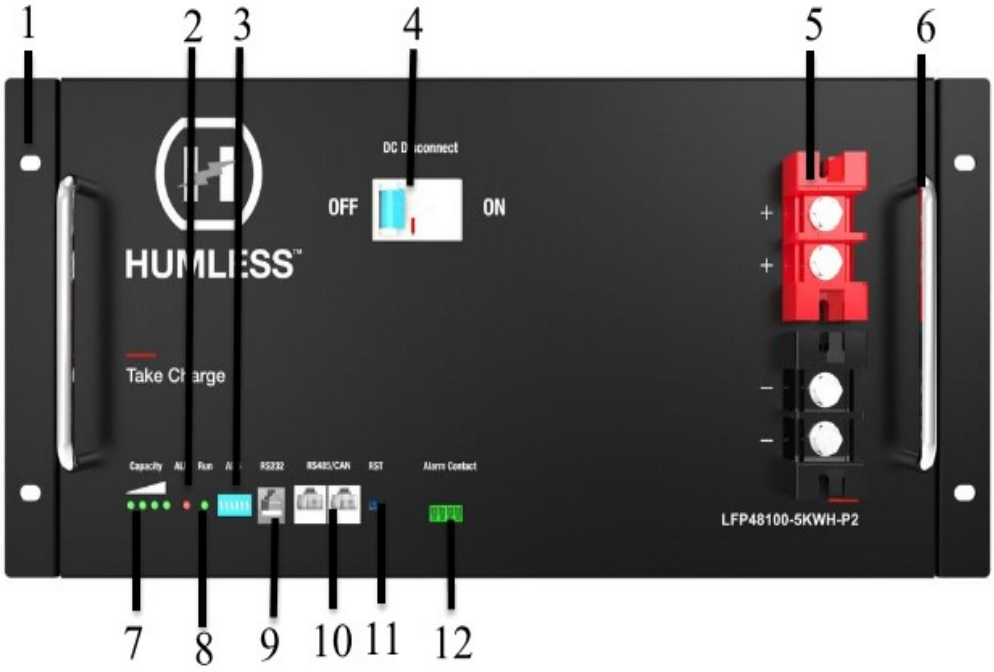
Off-grid: A system where Utility Grid power is not available for use.

Utility Grid: The electrical service and infrastructure supported by the electrical or utility company: also called “mains”, “utility service,” or “grid.” The conventional power supply, including its distribution lines, sub-stations, power plants, etc., where you and your community buy your power from.

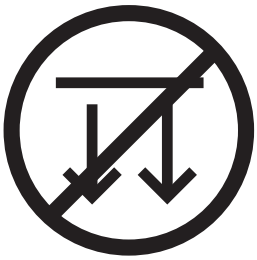
CHAPTER 2

2.1 PRODUCT OVERVIEW

Dimension: Panel width 483mm *(Include ear)* × box length 450mm × high 223mm *(5U)*
Weight: 47.7KG/105.16 lbs. *(51.2V 100Ah single weight)*



1		MOUNTING BRACKET
2		ALM LED
3		ADD
4		BREAKER
5		TERMINAL
6		HANDLE
7		SOC INDICATOR
8		RUN INDICATOR
9		RJ11
10		RJ45 CAN/RS485
11		RST
12		DRY CONTACT



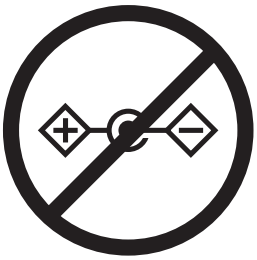
DO NOT Install Upside Down



KEEP AWAY From Water



HANDLE WITH CARE



DO NOT Reverse Polarity

⚠ WARNING: HEAVY EQUIPMENT & PRODUCT SAFETY

- Warning the Humless 5 kWh Battery weighs approximately **105 lbs**. A minimum two-person lift is required. To prevent personal injury, always use proper lifting techniques during installation.
- The battery should be handled with care during transportation and placement. **DO NOT** drop, impact, throw, or knock the battery. Doing so can damage or create potential safety hazards.
- Avoid using sharp tools that could come in contact with the surface of the battery case, as this could scratch or damage it.
- **DO NOT** Disassemble the battery box, this is strictly prohibited, and will void any warranty.

Failure to follow these instructions can result in moderate to server injury to individuals & equipment.

2.2 BATTERY BANK PREPARATION

A: Battery Bank Requirements

The DC voltage of the Humless Universal Control Box must match the nominal voltage of the system and battery connected devices. The battery bank and battery–connected devices in the system must be configured for **48 volts**.

B: Battery Cable Requirements

⚠ WARNING: OVERHEATING OF DC TERMINALS AND CABLES

- Overheating of the DC terminals or DC cables to dangerous temperatures may occur due to improper installation.
- **DO NOT** put anything between the cable lug and the terminal surface.
- **DO NOT** over-tighten connections; observe all recommended torque values.
- **DO NOT** apply any type of anti-oxidant paste until after the cable connection is tightened.
- **DO NOT** under size cables; install cables sized in accordance with the National Electric Code requirements

- DC cables must have crimped copper compression lugs or crimped and soldered copper compression lugs; soldered connections alone are not acceptable. Lugs must be rated for use with fine-stranded cable.
- **DO NOT** use coarse-stranded cable for battery cabling; the lack of flexibility may influence the integrity of the DC terminal connection.

Failure to follow these instructions can result in moderate or minor injury.

C: Battery Cable Length

No battery cables are included with the unit, installers will need to provide a #4/0 cable with equal length of their choosing to reach from batteries (or bus bar).

Battery cable runs should be kept as short as is possible. Length should not exceed 10 feet. Run the positive and negative cables alongside each other. Avoid looping the cables.

All positive (+) battery cables should be equipped with a fuse/breaker. The maximum fuse/breaker size should be 250A.

⚠ WARNING: DC OVER CURRENT

- The NEC/CEC requires both overcurrent protection and a DC disconnect switch for residential and commercial electrical systems. Fuses and disconnects must be sized to protect the wiring in the system and are required to open before the wire reaches its maximum current carrying capacity.

Failure to follow these instructions can result in moderate or minor injury.

NOTE: *The NEC/CEC requires both overcurrent protection and a disconnect switch for residential and commercial electrical systems. These items are not supplied. The overcurrent protection and disconnect must be installed in between the battery and other systems components. Failure to do so will result in an unsafe installation, which will not be to code.*

CHAPTER 3

3.1 INSTALLATION OVERVIEW

Obtain all necessary permits prior to starting the installation. Installations must meet all local codes and standards. Installation of this equipment should only be performed by skilled and qualified personnel such as qualified electricians and Certified Renewable Energy (RE) System Installers. Refer to your local licensing agency for verification of credentials.

It is important to have a logical layout for your system and components; this concept is the second step in the anatomy of a successful installation. Each part of your system needs to be placed so that it has enough ventilation, and routing clearances to electrically connect the components in a way which meets local codes and best practices for the installation area.

⚠ WARNING: HEAVY EQUIPMENT

- Warning the Humless Universal Control units weigh approximately **105 lbs**. A minimum two-person lift is required. To prevent personal injury, always use proper lifting techniques during installation.

3.2 PLANNING THE INSTALLATION

Read this entire chapter before beginning the installation. It is important to plan the installation from beginning to end, involving the customer, sales person, and installers to insure the system functions as the customers intended, providing the best experience possible.

Unpack the Humless 5 kWh Battery from the shipping crate and determine that you have received all components. Also inspect for any damage which may have occurred during shipping, or transportation to the worksite.

NOTE: *Assemble all tools and materials prior to the installation.*

3.3 INSTALLATION TOOLS AND MATERIALS

1. Socket wrench, appropriate sockets
2. Appropriately sized Philips head screw drivers
3. Level
4. Measuring tape

Depending on your installation, the following additional items may be needed:

1. Grounding Wire, or Grounding Rod
2. Lag bolts to secure mounting plate
3. Additional wire and appropriately sized breaker panels, sub-panels, and breakers for the grid interconnection and Smart Outputs.
4. Additional materials and hardware for additional wall-mount support
5. Additional materials for battery cabling

NOTE: Tools and materials are not included!

3.4 INSTALL LOCATION

The Humless 5 kWh Battery is rated **IP21** and certified for dry, indoor heated or unheated installations only.

Locate any electronic equipment susceptible to radio frequency and electromagnetic interference as far away from the battery.

3.5 CLEARANCE REQUIREMENTS

Provide at least **36 inches** of clearance in front of the batteries, and a minimum of **6 inches** of clearance at the top and bottom ventilation. Ensure the area remains unobstructed and that the batteries have adequate room to be installed and there is room to make the appropriate connections coming to and from the batteries.

3.6 INSTALLATION STEPS

STEP 1: Prior to installation. Open the box and verify that the battery is in proper condition.

STEP 2: Dialing and network cable production. Ensure that dialing is done before the group is connected.

STEP 3: Connect the power cord. If connecting multiple groups, use a bus bar.

STEP 4: Switching power supply setting; Set according to recommended parameters.

STEP 5: Perform testing and debugging. Before testing, make sure to disconnect the AC power.

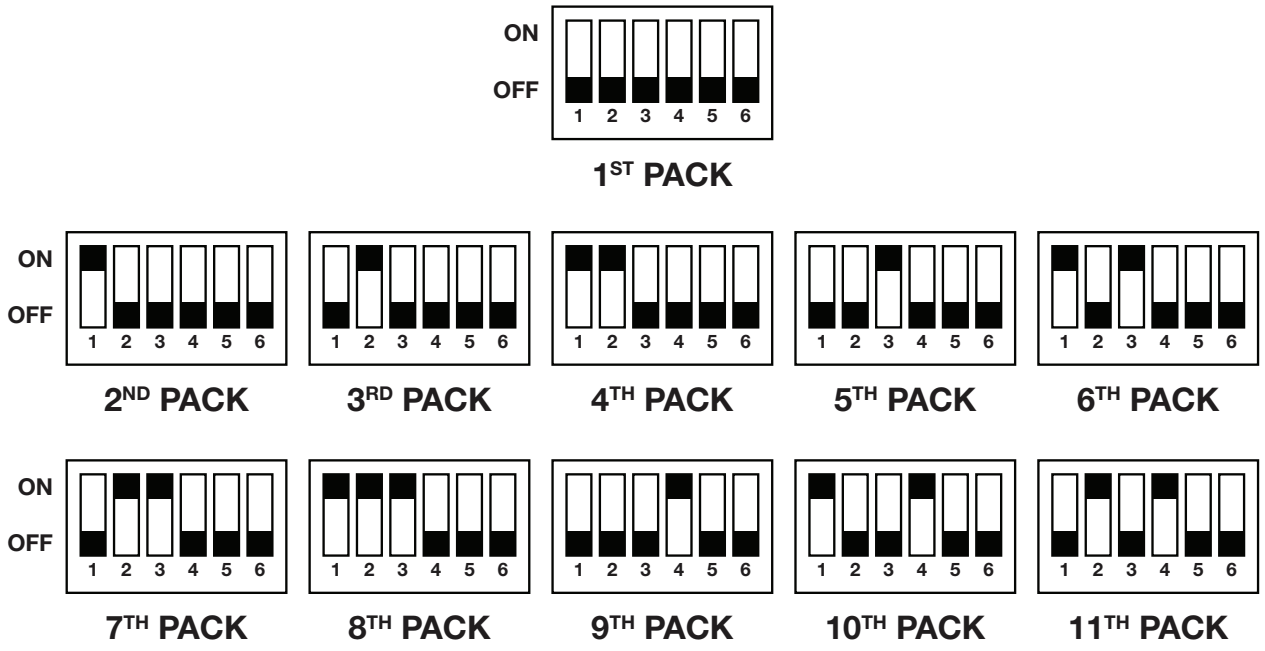
A. Prior to installation

Unpack the product and press the reset button to turn it on. Check whether the indicator is normal. (The ALM alarm indicator is abnormal and the others are normal.)

When multiple sets of parallels are required, please measure the positive and negative voltages with a multimeter. It is recommended to use a battery pack with a differential pressure of less than 2V. Please take care when transporting to the installation site, and do not invert it.

B. Adjust ADDR dialing codes

First sort the batteries, refer to the following figure in the order, do not confuse. The dialing code should be made without the power cord connected.



After dialing the code has been set, press the reset button to turn on the power, then press and hold the reset button until the marquee lights up, shut down, and the dialing code is completed.

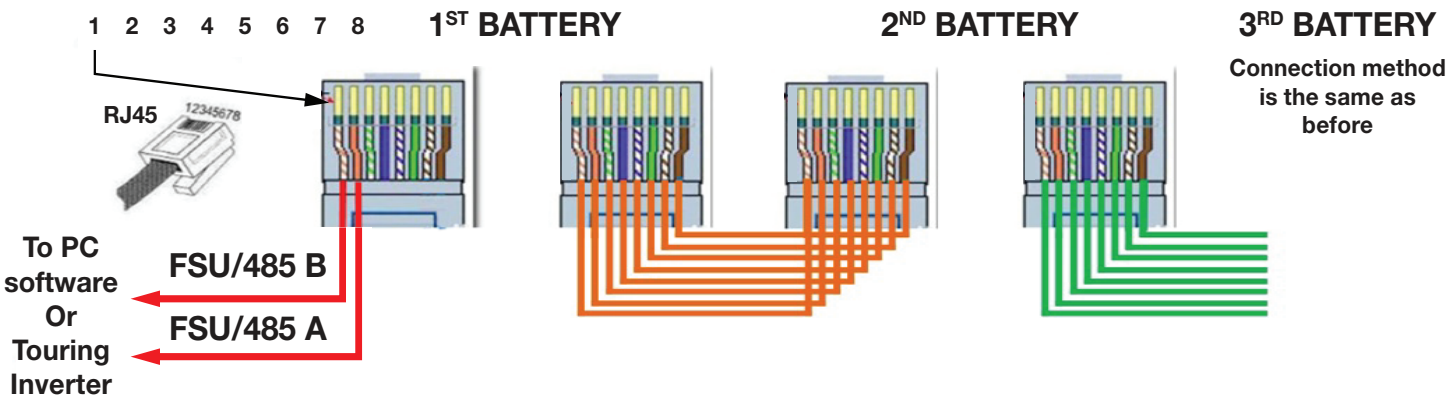
NOTE: Failure to follow these instructions can result in battery damage.

3.7 485 PORT WIRING METHOD

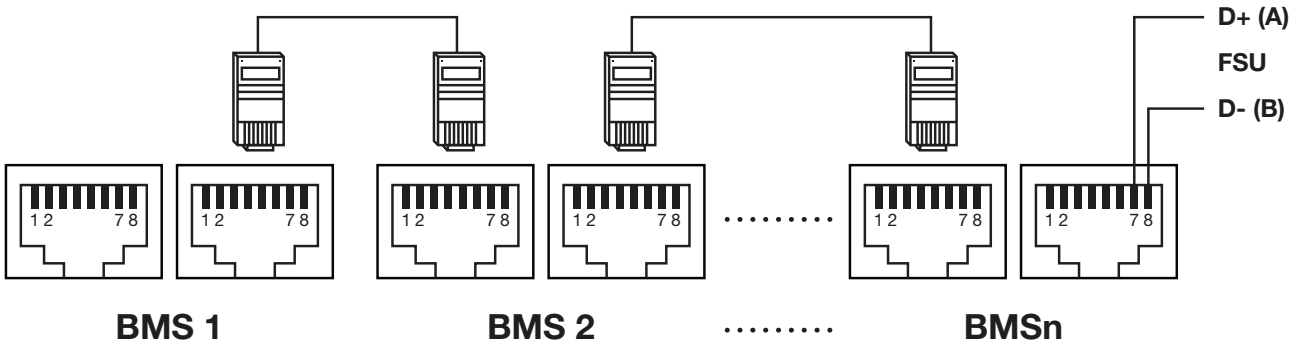
A. 485 port network cable way, pin 1,2 connect reliable request

The first set of batteries connected to the FSU is now required to be 1B2A.

Connect the battery to the battery and install the standard 6-string serial interface to make the crystal head.

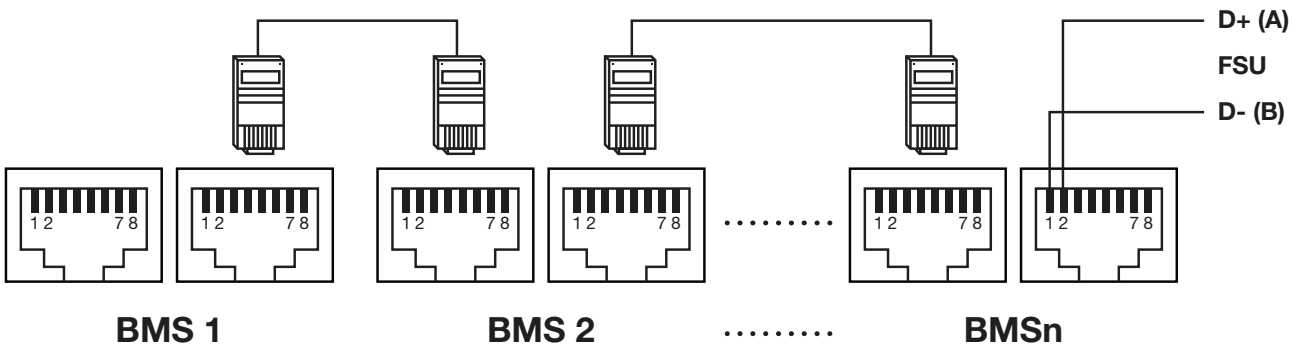


B. Touring 485 port wiring method



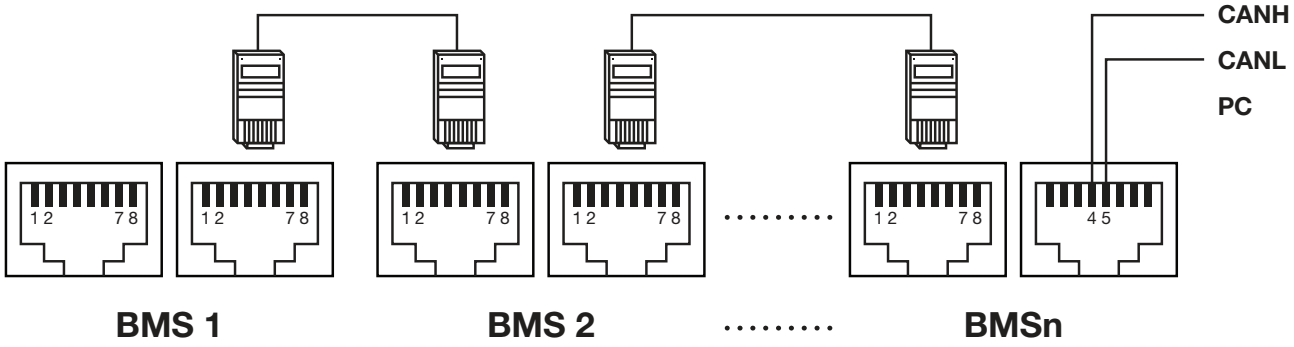
RJ45, PIN 7,8 For parallel between slave & Master (Addr 0)
battery; PIN 7,8 for PC software monitor also

C. Master 485 port wiring method



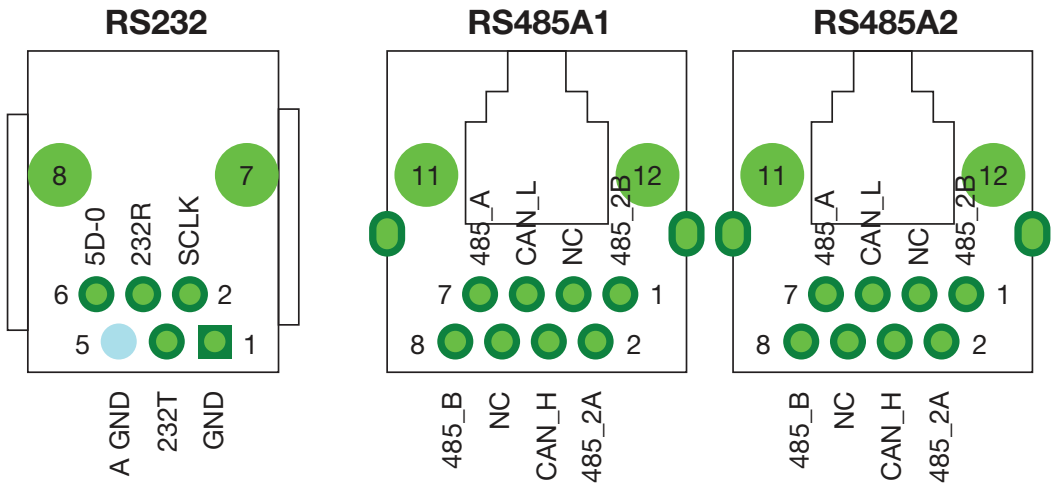
Pin 1,2 for Master battery connect with Inverter

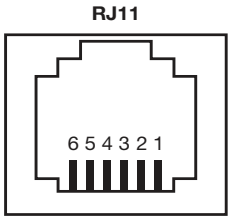
D. CAN BUS wiring method



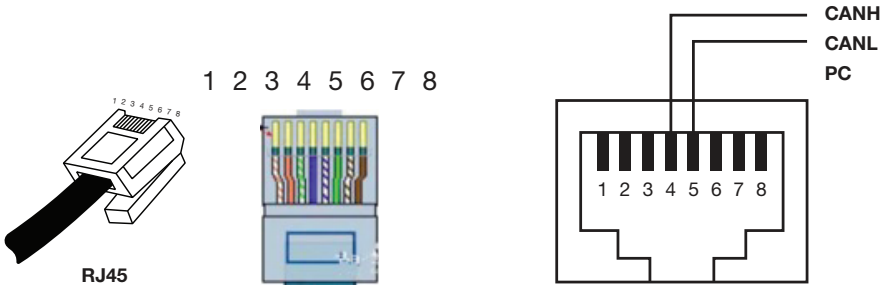
Pin 7,8 for slave battery group and PIN 4,5(CAN BUS) in Master(Addr 0) battery connect to Inverter

3.8 COMMUNICATION PORT DEFINITION

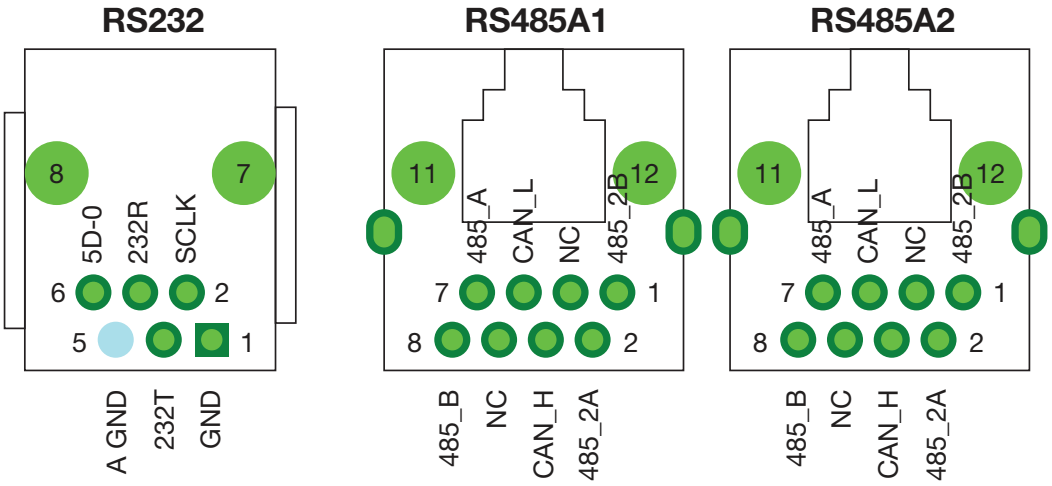




6P6C vertical RJ11 socket RS232	
PIN	**DEFINITION**
1	GND
2	SCLK
3	BMS TX
4	BMS RX
5	AGND
6	SDIO



8P8C vertical RJ45(A1&A2) socket RS485/CAN		
PIN	**DEFINITION**	**REMARKS**
1	RS485-2B	For PC software & master battery inverter
2	RS485-2A	
3	NC	
4	CAN-H	For inverter CAN BUS communication
5	CAN-L	
6	NC	
7	RS485-A	For slave battery parallel and group inverter
8	RS485-B	



3.9 INVERTER COMMUNICATION PIN

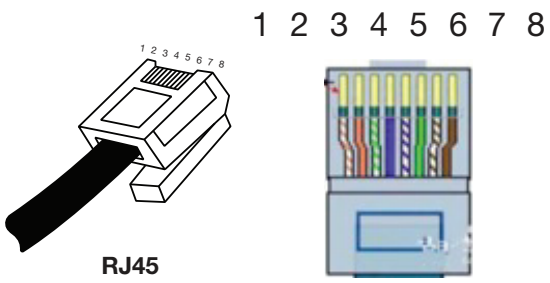
Voltronic InfiniSolar 6kW Inverter. Set voltronic protocol.

Pin Assignment for BMS Communication Port	
PIN	**DEFINITION**
1	RS232TX
2	RS232RX
3	RS485B √
4	NC
5	RS485A √
6	CANH
7	CANL
8	GND

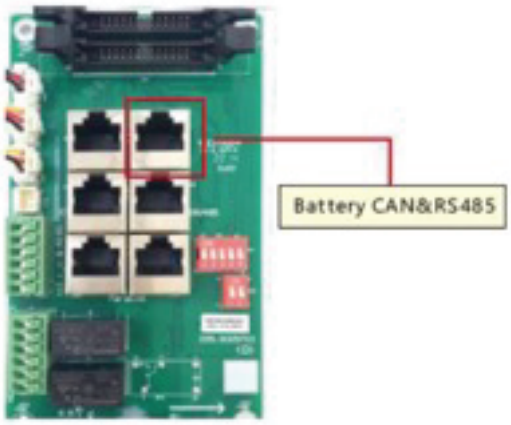
According to the invert manual (above) the communication port is defined to connect to the corresponding BMS interface definition (below):

Luxpower select pylon/Pengcheng protocol. Inverter selecet Lithium/Lux protocol.

Pin Assignment for BMS Communication Port	
PIN	**DEFINITION**
1	NC
2	GND
3	NC
4	BAT CAN H √
5	BAT CAN L √
6	NC
7	BAT RS485 A
8	BAT RS485 B





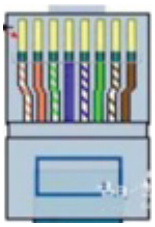


MEGAREVO
Use CAN BUS, Megarevo protocol.

BMS PIN Definition
Communication interface between inverter and batter is RS485 or CAN with RJ45 connector. The wiring sequence of the crystal head conforms to the 568B Standard: orange, white, orange, green white, blue, blue white, green, brown white and brown.

	PIN	1	2	3	4	5	6	7	8
CAN	Definition	X	X	X	BMS_CANH	BMS_CANL	X	X	X
RS485	Definition						GND	BMS_485A	BMS_485B

1 2 3 4 5 6 7 8



SACOLAR/ GROWATT INVERTER

Pin Assignment for BMS Communication Port		
PIN	**RS485 PORT**	**CAN PORT**
1	RS485B	-
2	RS485A	-
3	-	-
4	-	CANH
5	-	CANL
6	-	-
7	-	-
8	-	-

LCD Setting

To connect battery BMS, need to set the battery type as “LI” in program 05. After “LI in Program 05, it will switch to Program 36 to choose communication protocol. You can choose RS485 communication protocol which is from L01 to L50, and you can also choose CAN communication protocol which is from L51 to L99.

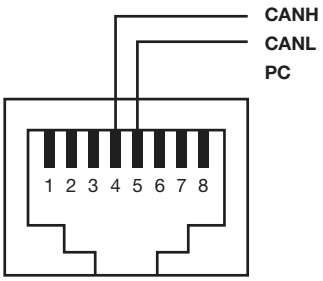
NOTE: You can only use one communication type RS485 or CAN at a time.

VICTRON RJ45 to Battery for CAN

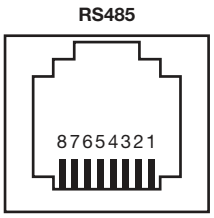
3.1 Type A		
FUNCTION	**VICTRON VE. CAN SIDE**	**BATTERY SIDE**
GND	Pin 3	Pin 6
CAN-L	Pin 8	Pin 5
CAN-H	Pin 7	Pin 4

3.2 Type B		
FUNCTION	**VICTRON VE. CAN SIDE**	**BATTERY SIDE**
GND	Pin 3	Pin 2
CAN-L	Pin 8	Pin 5
CAN-H	Pin 7	Pin 4

Battery RJ45 to VICTRON



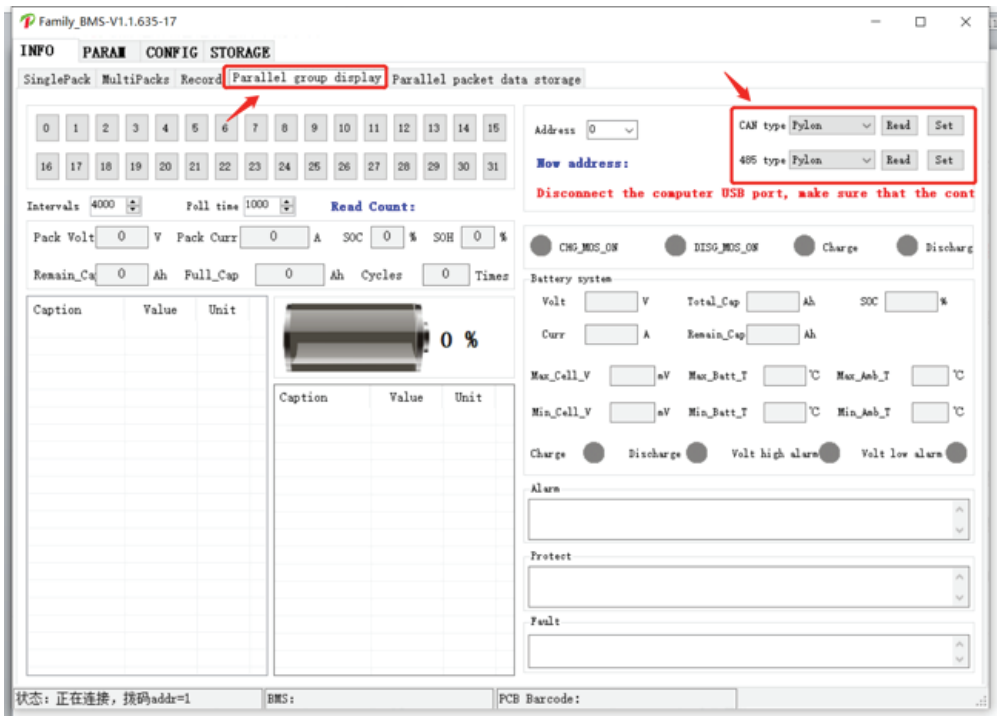
Battery RJ45 define

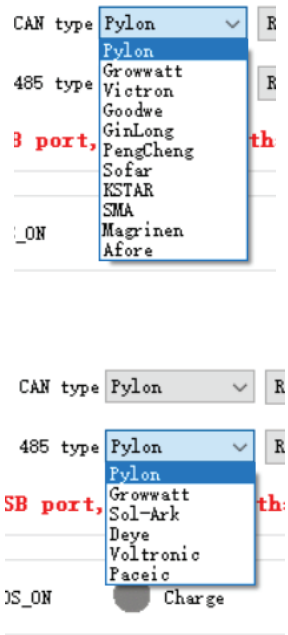


8P8C RJ485 SOCKET	
PIN	**DEFINITION**
1-3	RS485-B
7	RS485-A
2-6	GND
4	CANH
5	CANL
8	NC

3.10 PC SOFTWARE PROTOCOL SELECT

Voltronic InfiniSolar 6kW Inverter. Set voltronic protocol.



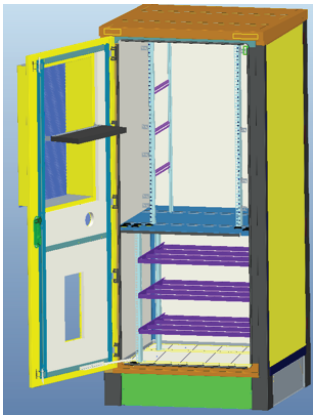


3.11 INVERTER LIST

List of compatible inverters		
Item#	Brand	Communication port
1	Pylon	485
		CAN
2	Deye	485
		CAN
3	Growatt	485
		CAN
4	SNRI	485
5	VOLTRONIC	485
6	GOODWE	CAN
7	Afore	CAN
8	Victron	CAN
9	Solis	CAN
10	SOL-ARK	CAN
11	SMA	CAN
12	MEGAREVO	CAN
13	Luxpower	CAN
14	Kstar	CAN
15	SOROTEC	CAN
16	Sofa	CAN
17	NVT	CAN
18	YIYEN	CAN

3.12 STEPPED BATTERY PACK PLACEMENT ENVIRONMENT REQUIREMENTS

Place the battery pack in a 19-inch standard cabinet or battery rack.



19 inch standard cabinet



Using lead acid battery rack



Purchasing standard battery rack

NOTICE: DO NOT CHARGE BELOW 32°F

- Working Temp: 32°F - 113°F
- Storage Temp: -23°F - 122°F

Failure to follow these instructions can result in damage to battery.

3.13 RECOMMENDED ACCESSORIES AND ACCESSORIES

Suggested installation items (not provided with purchase).

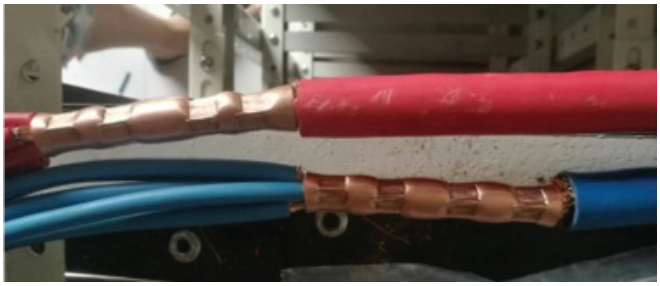
- Top Post Battery Cables with Leads: JG16
- Top Post Battery Cables with Leads: DT25
- Copper Connecting Tube: GT-G-70 MM
- Busbar
- Wire: 16-35 square red and blue cable (four in each group)
- Etc…
- Etc…

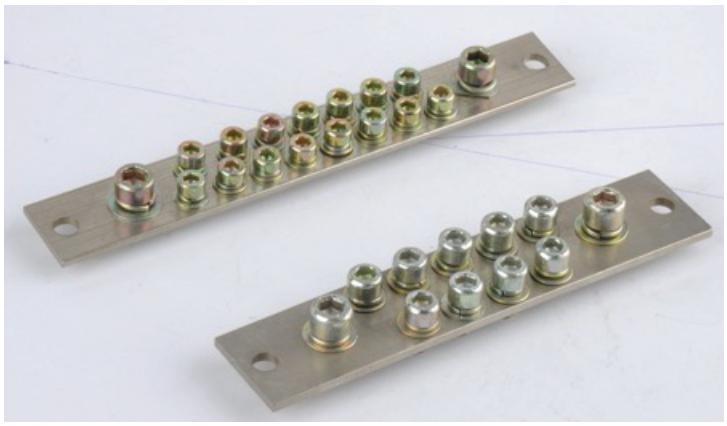








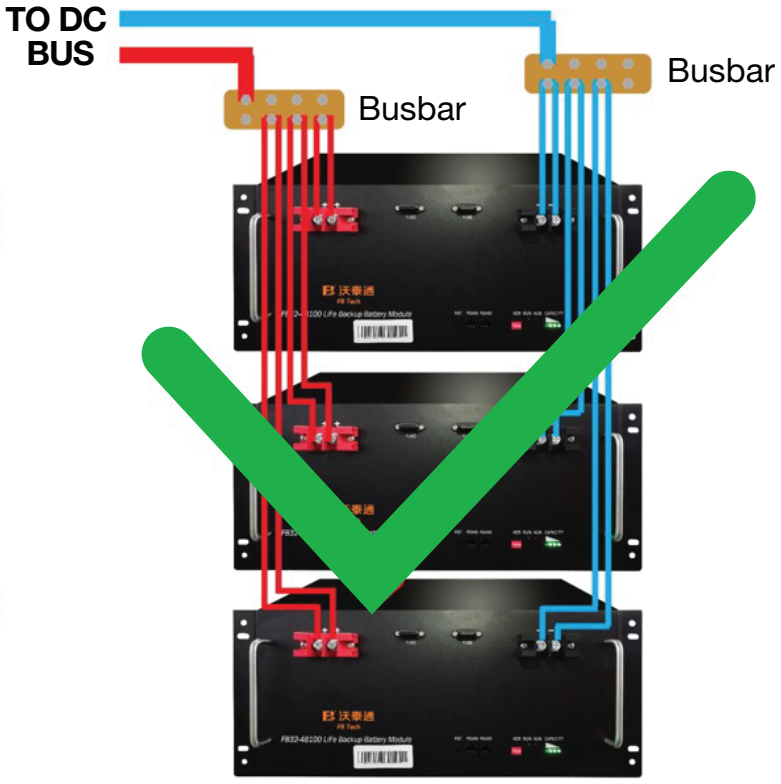




3.14 MULTIPLE SETS OF PARALLEL

When multiple groups are connected in parallel, they should be connected to the bus bar or main line for confluence.





NOTICE: DO NOT CHARGE BELOW 32°F

- Working Temp: 32°F - 113°F
- Storage Temp: -23°F - 122°F

Failure to follow these instructions can result in battery damage.

3.15 SWITCHING POWER SETTING

Each loop sets the number of hours according to the actual number of battery packs.

#	Setting Item	51.2V Battery	48V Battery	Remarks
1	Average Charge Voltage	54.4V~55V	52-54.75V	-
2	Floating Charge Voltage	54.4V~55V	51.75V	-
3	Charge Limit	0.1C~0.5C	0.1C	<0.3C recommended

3.16 ON-SITE INSTALLATION CASE

Each loop sets the number of hours according to the actual number of battery packs.



Outdoor one cabinet two parallel



Indoor equipment room two parallel



Indoor equipment room three parallel



Outdoor one cabinet three sets stacked in parallel

Do not stack more than three batteries directly



Standard battery rack six sets of parallel installation



Indoor five sets of parallel installation



Indoor six sets of parallel vertical installation

CHAPTER 4

4.1 BASIC WIRING CAUTIONS AND WARNINGS

⚠ ⚠ DANGER: ELECTRIC SHOCK, EXPLOSION OR ARC FLASH HAZARD

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- The equipment must only be installed and serviced by qualified electrical personnel.
- Never operate energized with covers removed
- Energized from multiple sources. Before removing covers identify all sources, de-energize, lock-out, and tag-out and wait 2 minutes for circuits to discharge.
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.

Failure to follow these instructions can result in death or serious injury.

⚠ ⚠ DANGER: ELECTRIC SHOCK, EXPLOSION OR ARC FLASH HAZARD

- Remove watches, rings or other metal objects.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Keep sparks and flames away from the batteries.
- Use insulated tools.
- Wear protective boots, gloves and glasses.
- **DO NOT** lay tools or other metal parts on top of batteries.

Failure to follow these instructions can result in death or serious injury.

⚠ ⚠ DANGER: ELECTRIC SHOCK, EXPLOSION OR ARC FLASH HAZARD

- Battery Circuit Breakers must be installed according to the specifications and requirements defined by The National Electric code.
- Servicing of batteries must only be performed by qualified personnel knowledgeable of batteries and the required precautions. Keep unqualified personnel away from batteries.
- Disconnect the charging source prior to connecting or disconnecting battery terminals.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING: EQUIPMENT MUST BE GROUNDED

- The Humless home microgrid should be grounded in accordance with all local jurisdictional codes and laws and cannot be considered safe if the unit is not appropriately grounded.

4.2 DC SYSTEM GROUNDING

⚠ WARNING: UNGROUNDED EQUIPMENT

- Equipment ground terminals must be reliably connected to ground by appropriately sized grounding conductors. All installations must comply with national and local codes. Consult local and national codes for specific grounding and bonding requirements.

Failure to follow these instructions can result in death or serious injury.

The Humless Universal Control Box is provided with ground terminals that must be reliably connected to ground (protective Earth) by appropriately sized equipment grounding conductors. System grounding for the AC and DC systems must be done according to all applicable NEC and local installation codes.

To connect the Humless Universal Control to the DC grounding system, use the large ground lug at the bottom of the inverter inside the Humless Universal Control Box. This system should also be connected to earth in only one location, and typically involves bonding (electrically conductive connection) the battery negative circuit to ground and is dependent on the system configuration.

A. Safety During Electrical Connection

A safe installation will include a constant understanding of where electrical power is present. Knowing where the electricity is, is the first step in insuring you keep all concerned parties safe during the installation of the system.

B. Overview of the Connection Area

Equipment likely to require examination, adjustment, servicing, or maintenance while energized shall have clear working space in the direction of access to live parts of the electrical equipment and shall be not less that specified in NEC table 110.34(A), or an equivalent specification for your installation location. Distances shall be measured from the live parts, if such are exposed, or from the enclosure front or opening if such are enclosed.

NOTICE: OVERLOADING THE DISTRIBUTION PANEL

- The amount of power that can be fed into a distribution panel and the means and location of feed-in, must be in accordance with NEC 2008 article 690.64 or the current requirements of the local electrical code.

Failure to follow these instructions can result in death or serious injury.

4.3 MAKING DC CONNECTIONS

A. Battery Connections

⚠ ⚠ DANGER: ELECTRIC SHOCK, EXPLOSION OR ARC FLASH HAZARD

- Apply appropriate Personal Protective Equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Never operate energized with covers removed
- Energized from multiple Sources. Before removing covers identify all sources, de-energize, lock-out, and tag-out and wait 2 minutes for circuits to discharge
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.

Failure to follow these instructions can result in death or serious injury!

⚠ ⚠ DANGER: ELECTRIC SHOCK, EXPLOSION OR ARC FLASH HAZARD

- Remove watches, rings or other metal objects.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Keep sparks and flames away from the batteries.
- Use insulated tools.
- Wear protective boots, gloves and glasses.
- **DO NOT** lay tools or other metal parts on top of batteries.

Failure to follow these instructions can result in death or serious injury!

⚠ ⚠ DANGER: ELECTRIC SHOCK, EXPLOSION OR ARC FLASH HAZARD

- Battery Circuit Breakers must be installed according to the specifications and requirements defined by The National Electric code.
- Servicing of batteries must only be performed by qualified personnel knowledgeable of batteries and the required precautions. Keep unqualified personnel away from batteries.
- Disconnect the charging source prior to connecting or disconnecting battery terminals.

Failure to follow these instructions can result in death or serious injury.

⚠ WARNING: OVERHEATING OF DC TERMINALS AND CABLES

- Overheating of the DC terminals or DC cables to dangerous temperatures may occur due to improper installation.
- **DO NOT** put anything between the cable lug and the terminal surface.
- **DO NOT** over-tighten connections, set all connections to recommended torque values.
- **DO NOT** apply any type of anti-oxidant paste until after the cable connection is tightened.
- **DO NOT** under size cables. Install cables sized in accordance with national electrical code requirements.
- DC cables must have crimped copper compression lugs or crimped and soldered copper compression lugs; soldered connections alone are not acceptable. Lugs must be rated for use with fine-stranded cable.
- **DO NOT** use coarse-stranded cable; the lack of flexibility may pull DC terminal connections loose.

Failure to follow these instructions can result in death or serious injury.

NOTICE: DC REVERSE POLARITY

- Before making the final DC connection or closing the DC breaker or disconnect, check cable polarity at both the battery and the inverter/charger. Positive (+) must be connected to positive (+). Negative (-) must be connected to negative (-).

Failure to follow these instructions can result in death or serious injury.

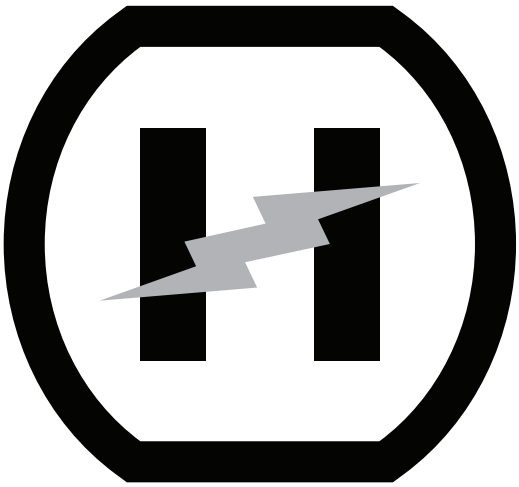
Battery cable may or may not be included in with your Humless Battery. Depending on your installation requirements, you will need to supply at least one pair of battery cables.

Table 4-1 Recommended Battery Cable Size Versus Length

Inverter Model	Up to 5 feet (90C Wire)	Up to 10 feet (90C Wire)
Humless Control 8.5	#4/0 AWG	#4/0 AWG

Table 4-2 Battery Cable (in conduit) to Max Breaker/Fuse Size

Cable Size Required	Maximum Breaker/Fuse Size
#4/0 AWG	250 Amps



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