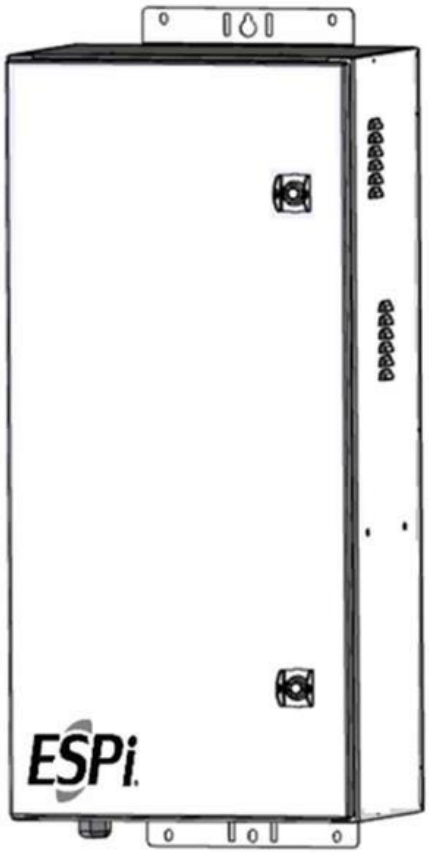
VOLTAR

3.0

USER'S MANUAL



ESPi

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Your Next Generation UPS

Publican Issue A

Table of Contents

Important Safety Instructions

Please keep this manual for future review.

This manual contains all instructions for the safety, installation and operation of the Voltar Impulse series Maximum Power Point Tracking (MPPT) controller ("the controller" as referred to in this manual).

General Safety Information

- Carefully read through all the instructions and warnings in the manual before installation.

- No user serviceable components are inside the controller. DO NOT disassemble or attempt to repair the controller. DOING SO MAY VOID THE WARRANTY.

- Avoid unnecessary exposure to the elements and do not allow water to enter the enclosure.

- Install the enclosure in a well-ventilated place.

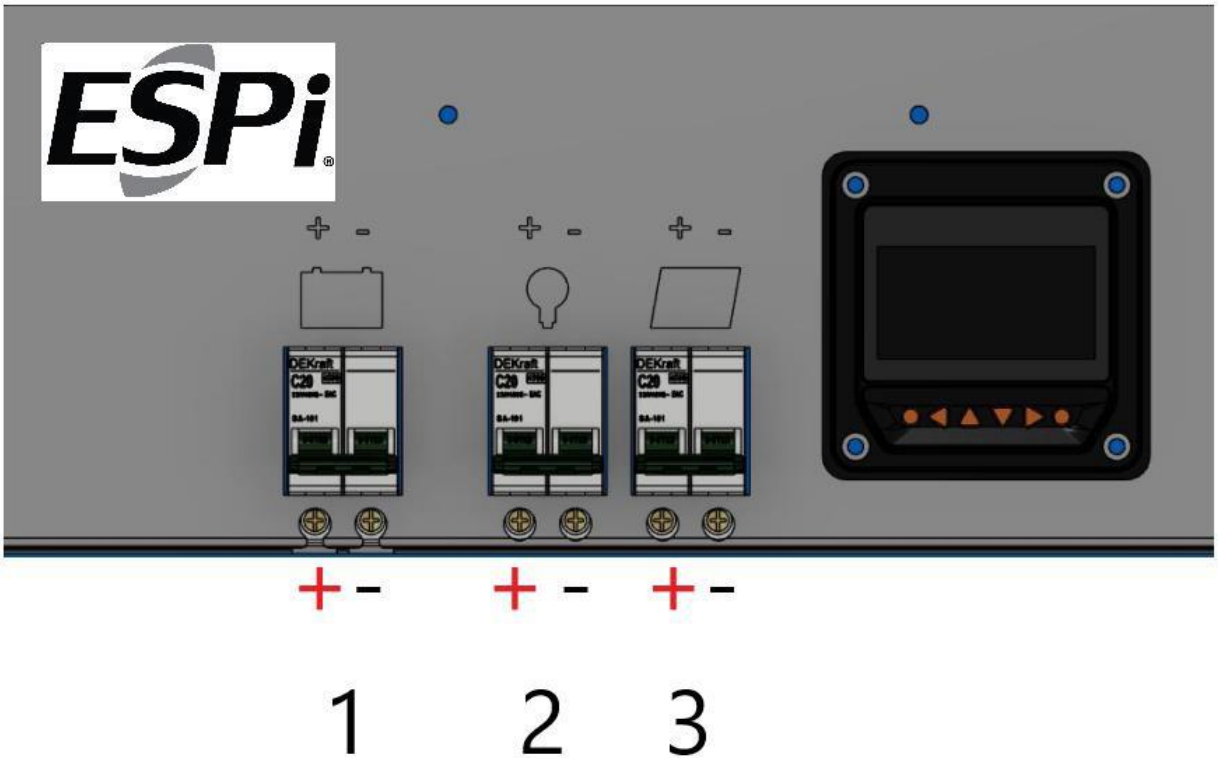
- Make sure to switch off all PV array connections and the battery breakers before controller installation and adjustment.

Quick Guide

The Voltar Impulse was designed to be user-friendly and simple to understand. This single-page Quick Guide provides most of the relevant information needed to connect the Voltar Impulse.

Connections: Always work left to right when connecting.

1. Make sure all of the breakers are in the off/down position.
2. Connect the Battery first.
3. Connect the Load second.
4. Connect the Solar Panel third.
5. Turn on the Battery breaker.
6. Turn on the Load breaker
7. Turn on the Solar Panel breaker.



Disconnection: Always work right to left when disconnecting.

1. Shut off the Solar Panel breaker
2. Shut off the Load breaker
3. Shut off the Battery breaker

Site Considerations

The solar panels should be placed in a location that has open exposure to the southern sky. Each panel is approximately 35” x 95” and can be mounted with the longer side running either up and down or across.

Care must be taken so that the solar panels get full sun throughout the day with no shadowing by trees or other structures.

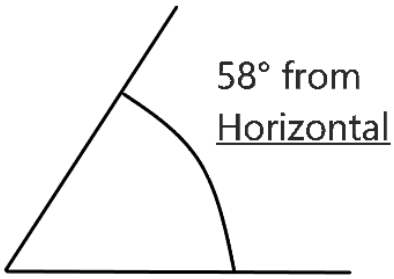
Determining Proper Solar Panel Angle

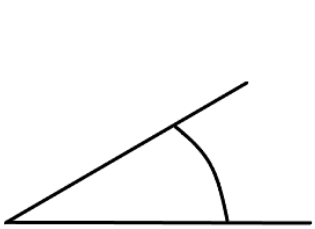
Several apps are available for your phone to help calculate the optimum tilt for your panel as well as Inclinometers to verify the correct panel angle has been set. Without an app, the information below will provide a method to calculate this for yourself.

Calculate the optimum tilt angle, based on the latitude -- your angular distance north or south from the equator expressed as degrees along a meridian -- of your location. To find your latitude, consult a map for your region or Google your town’s latitude.

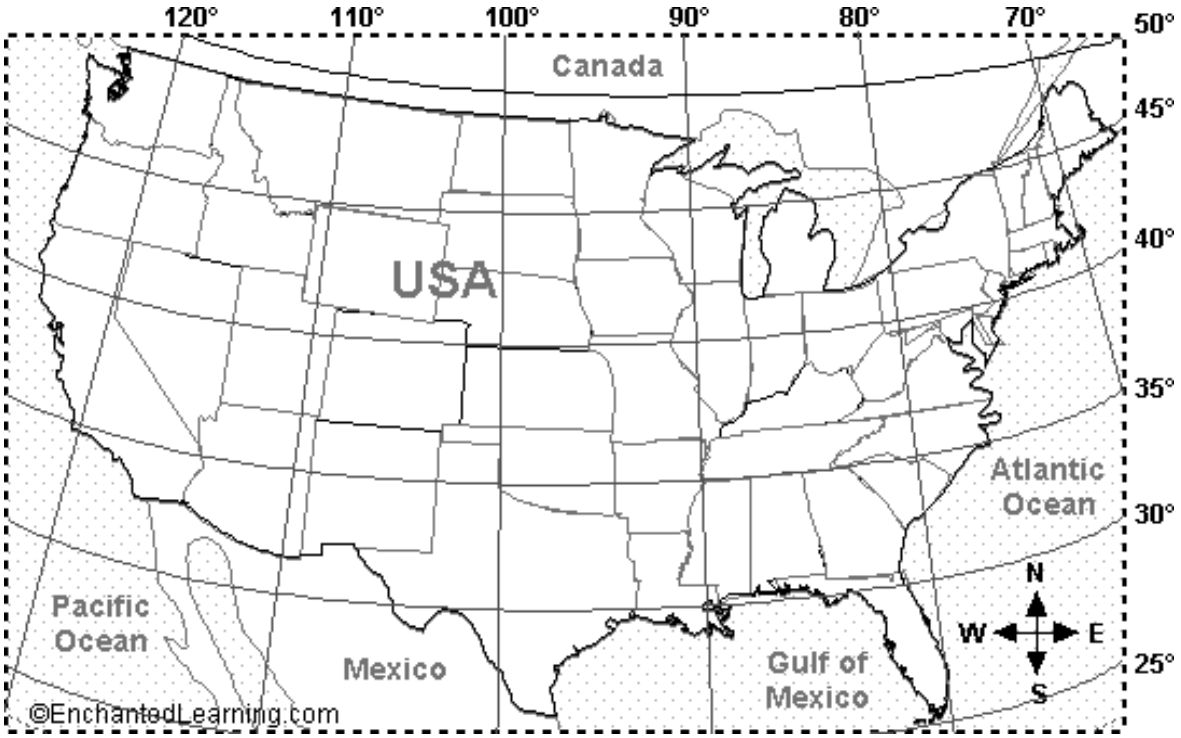
To find the best angle for optimizing solar collection during winter, when solar energy is most scarce, multiply your latitude by 0.89, and then add 24 degrees. For instance, if your latitude is 45 degrees: 45 x 0.89 = 40.05 + 24 = 64.05. In this example, you would tilt your solar panels at a 64-degree angle from a horizontal level.

Decide whether to leave your panels at the optimum winter tilt all year long, or adjust them for each season. Factors that might affect your decision include the accessibility of your PV array and whether you expect more sunlight than you can use during the summer months, in which case you need not adjust your tilt. If you do plan to optimize solar collection in every season, use the following calculations: For spring and fall, multiply your latitude by 0.98 and subtract 2.3 degrees. For summer, multiply latitude by 0.92 and subtract 24.3 degrees to get your solar panel tilt angle. The tilt is the degrees from horizontal.



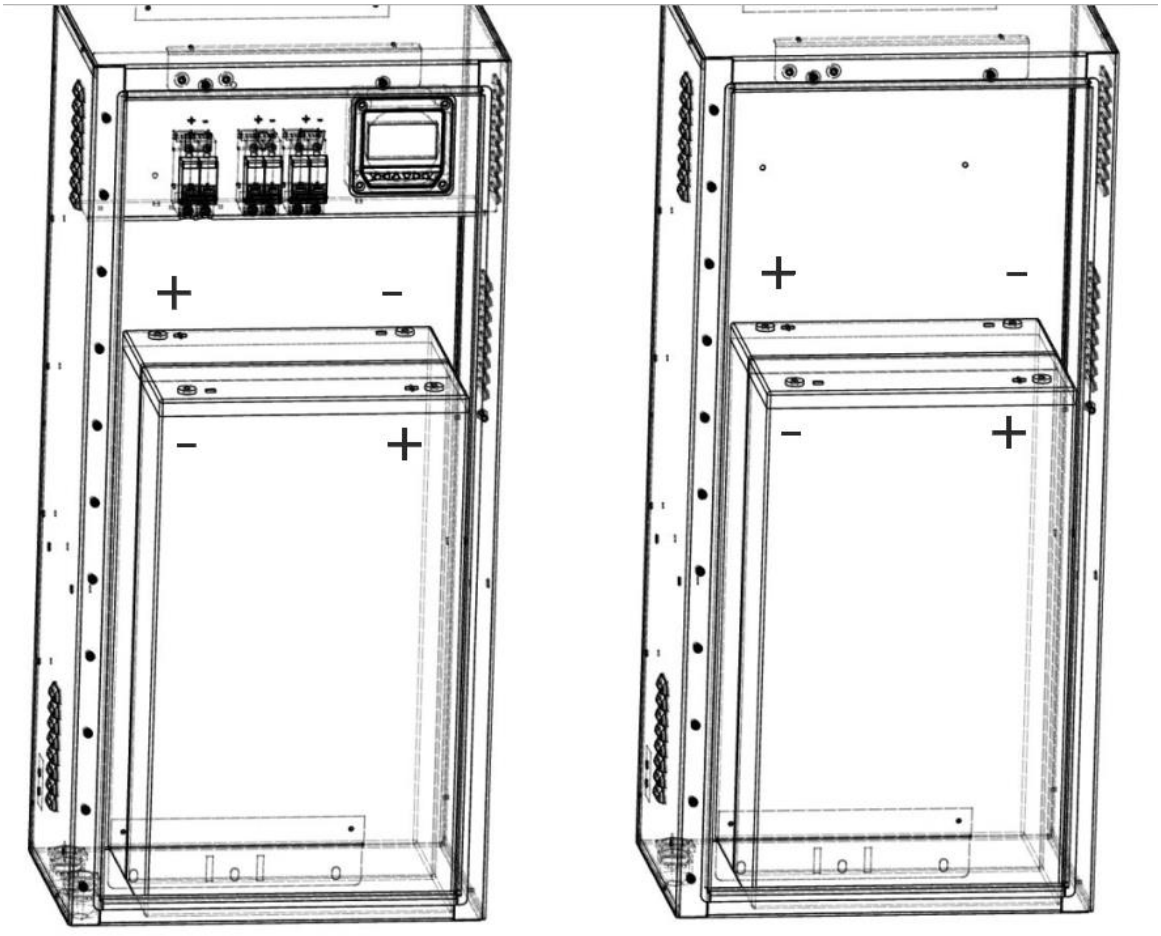


An easier and more basic method is to angle the solar panel to the same degree as the latitude where the panel is to be mounted.

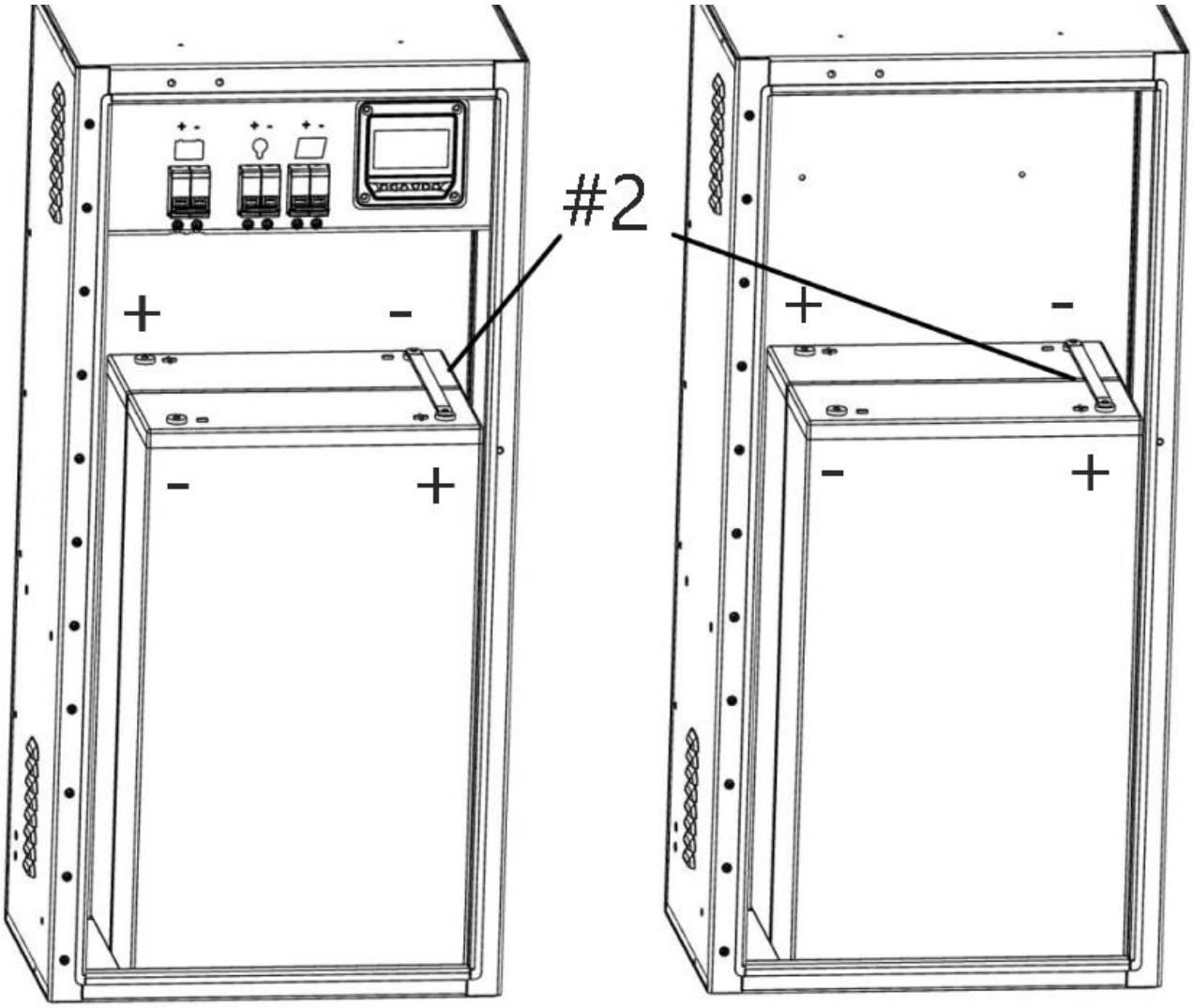


Battery Connection for 48V Output

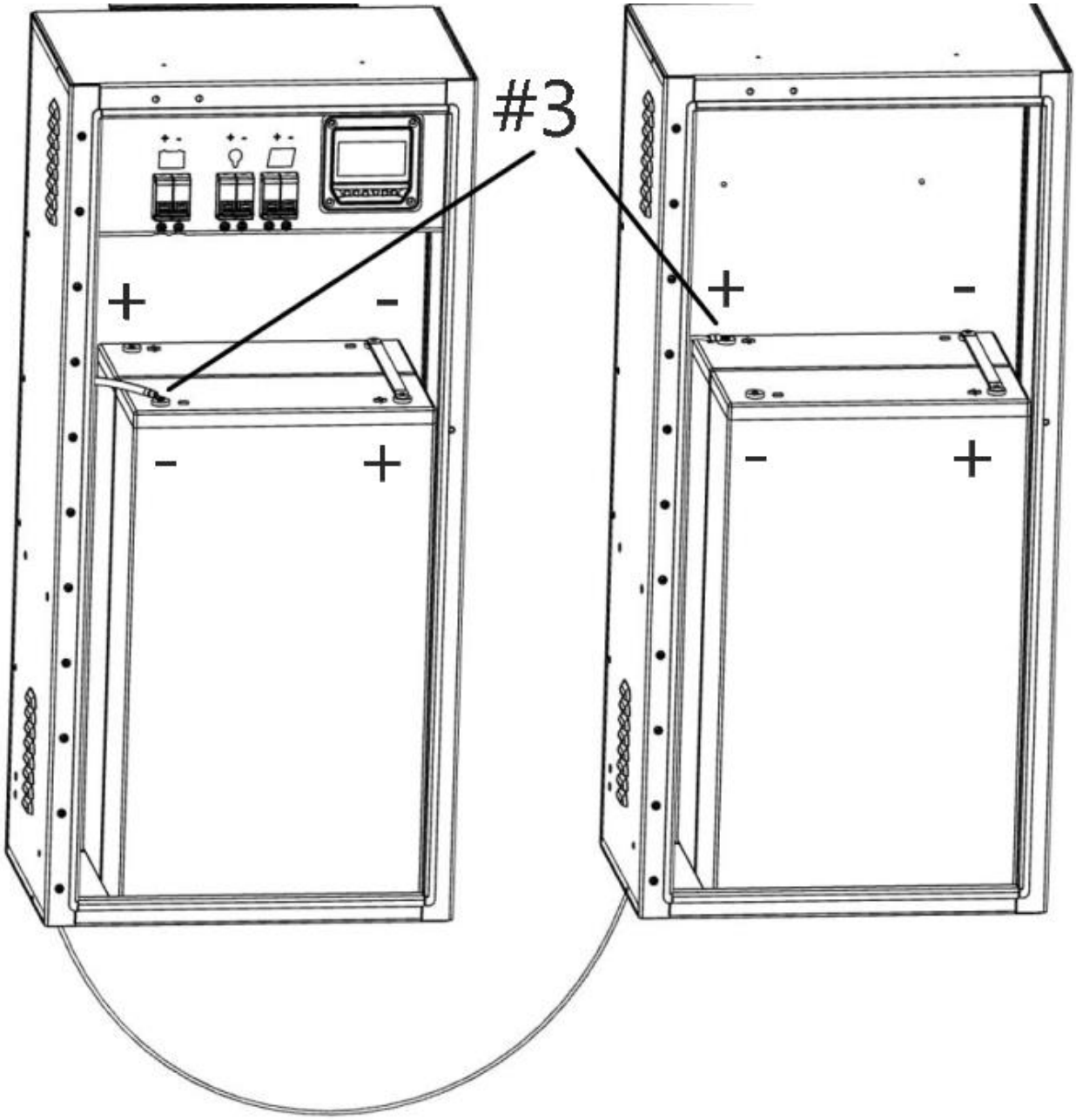
1. After the enclosures are mounted, place two batteries in each enclosure. The batteries should be installed that the positive terminal of one battery aligns with the negative terminal of the second battery.



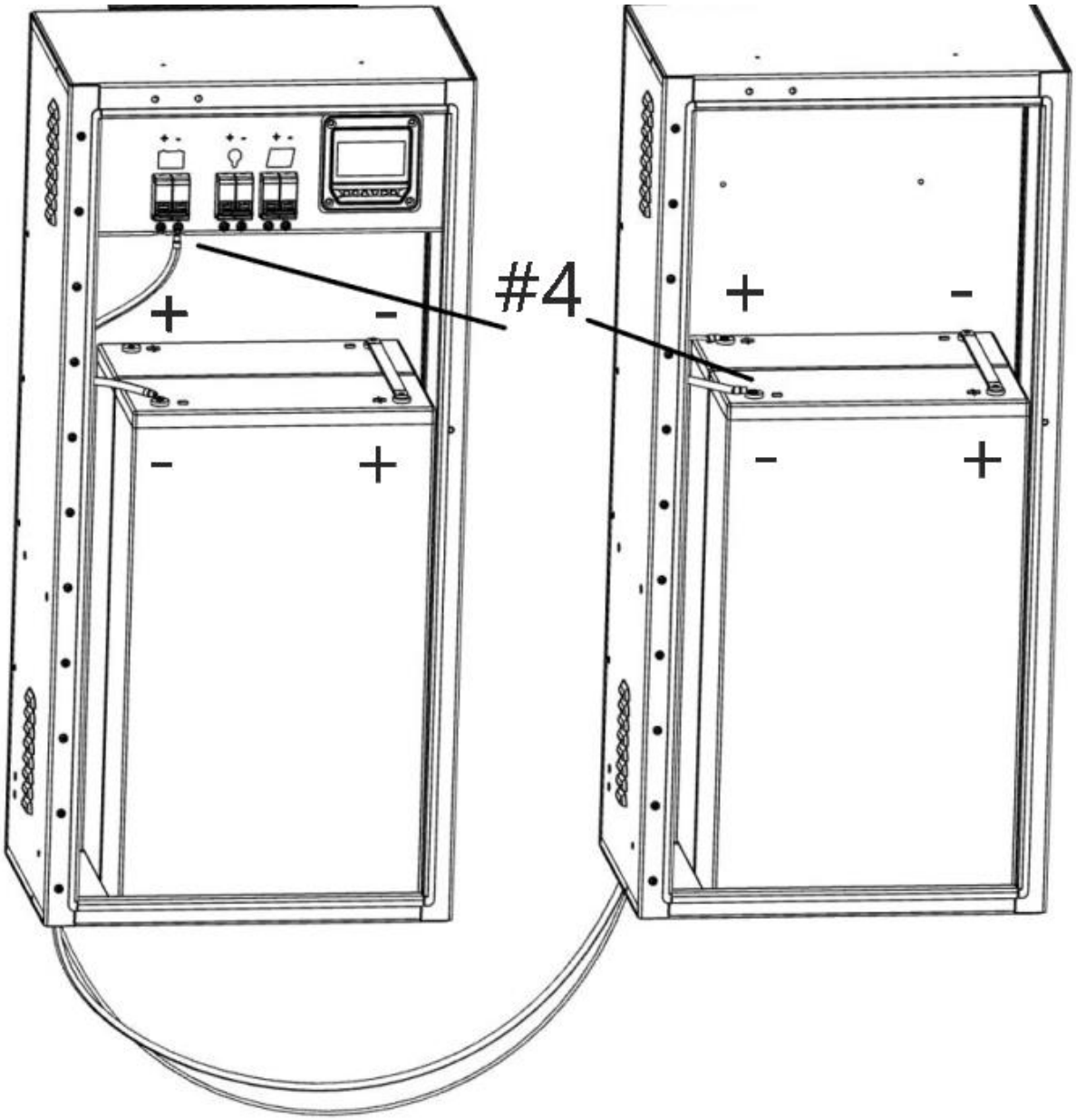
2. Attach the included series connecting bar from the negative post of one battery to the positive post of the second battery in each enclosure.



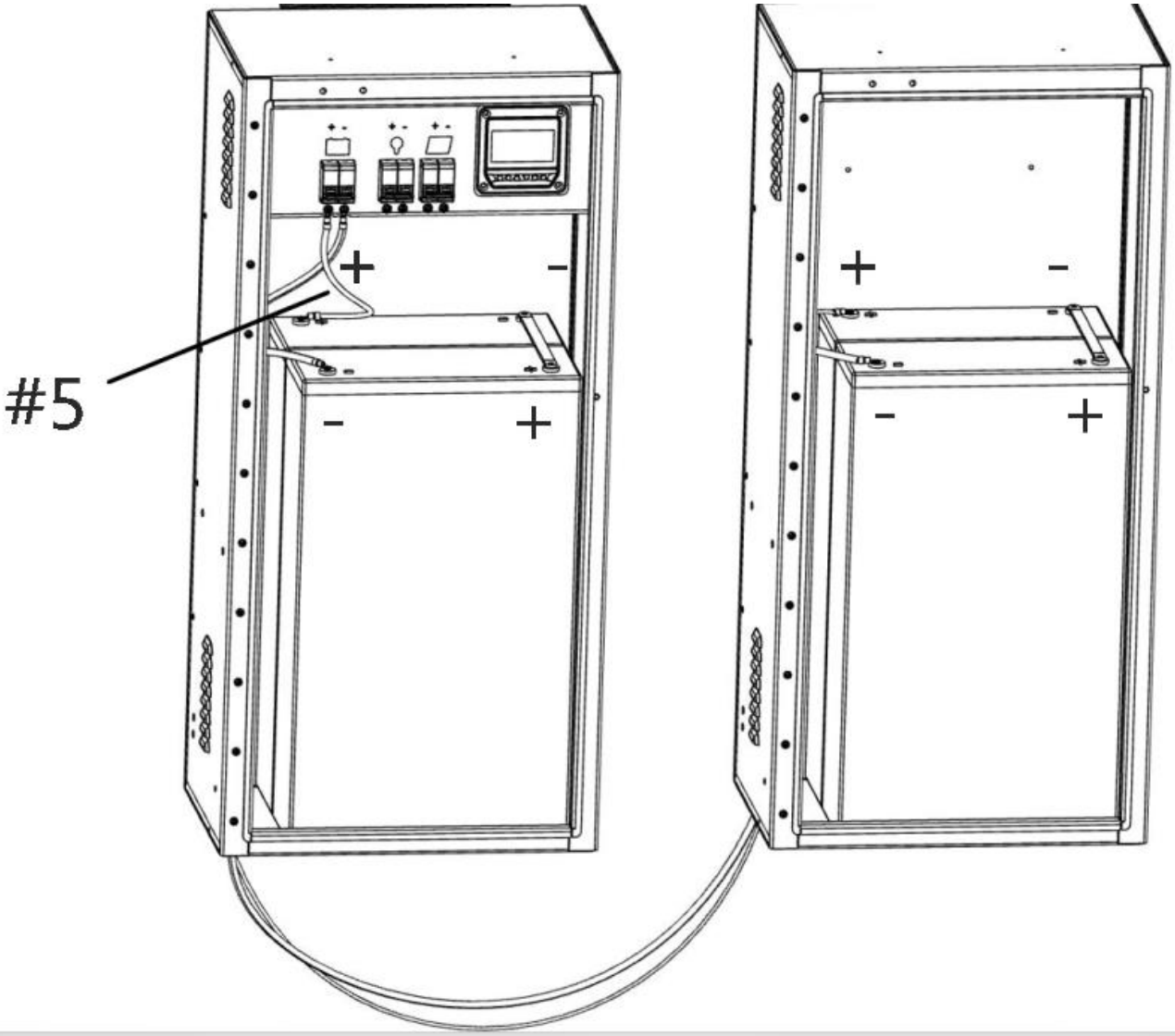
3. Attach the included green jumper wire from the negative post of the front battery in enclosure #1 to the positive post of the back battery in enclosure #2.



4. Attach the included black wire from the negative post in the second enclosure to the battery input breaker. (Make sure breaker is in the down/off position.)



5. Attach the short red wire to the positive post of the battery to the positive side of the battery breaker. (Make sure the breaker is in the down/off position.)



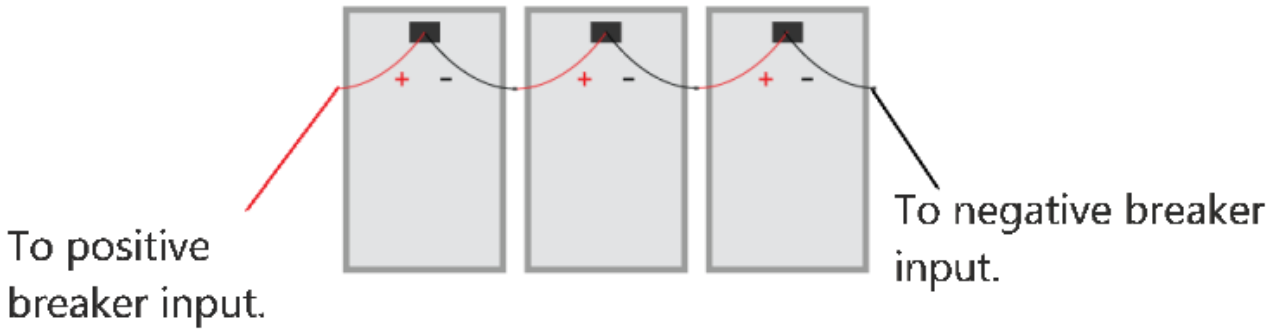
After step #5 is complete you should have 48V at the bottom or input side of the battery breaker You can verify this with a volt meter if you choose to.

Connecting the load

Attach the wires from your load to the load breaker. Make sure the breaker is in the down/off position. IF YOUR LOAD REQUIRES A NEGATIVE 48V POWER SOURCE YOU WILL HAVE TO CONNECT THE WIRES IN REVERSE.

Connecting the Solar Panels

The Voltar Impulse can handle up to 150VDC input from the solar panels. To avoid the least amount of line loss from the solar panels to the charge controller you should wire the solar panels in series if possible.



40 feet or each red and black 12 AWG PV wire has been included with your unit to run from the solar panels to the solar panel breaker in the first enclosure. If you don't need the full 40' of wire trim the unterminated end to the desired length.

You are now ready to activate the charge controller.

1. Turn on the battery breaker.
2. Turn on the load breaker.
3. Turn on the solar panel breaker.

General Information

Overview

The Voltar Impulse series controller is based on a common negative design and advanced MPPT control algorithm and is equipped with an LCD display. The MPPT control algorithm can minimize the maximum power point loss rate and loss time, quickly track the maximum power point of the PV array and obtain the maximum energy from solar modules under any conditions. This can increase the ratio of energy utilization in the solar system by 20%-30% compared to PWM charging.

Limiting the charging power and current as well as reducing charging power functions ensure the system will remain stable with PV modules in high temperature environments. This further improves the reliability and meets different application requirements.

The Voltar Impulse series controller uses a self-adaptive three-stage charging mode based on a digital control circuit, which can effectively prolong the lifespan of the battery and significantly improve the system performance. It also has comprehensive electronic protection for overcharge, over discharge, PV & battery reverse connection protection, to ensure the system is more reliable and durable. This controller can be used for a variety of applications including RV, communication base stations, household systems, field monitoring and many other uses.

Features：

- 100% charging and discharging in working environment temperature
- LCD Display and High quality components(ST/IR/Infineon) to ensure long service life
- Advanced MPPT technology, with efficiency no less than 99.5%
- Maximum DC/DC conversion efficiency of 98%
- Ultra-fast tracking speed and guaranteed tracking efficiency
- Advanced MPPT control algorithm to minimize the MPP loss rate and loss time
- Accurate recognition and tracking of multiple-peaks maximum power point
- Wide MPP operating voltage range
- Limit charging power & current over rated range
- Power reduction automatically over temperature range
- Comprehensive electronic protection

Maximum Power Point Tracking Technology

Due to the nonlinear characteristics of solar arrays, there is a maximum energy output point (Max Power Point) on its curve. Traditional controllers, with switch charging technology and PWM charging technology, are unable to charge the battery at the maximum power point, so they can't harvest the maximum energy available from the PV array. This solar charge controller

with Maximum Power Point Tracking (MPPT) Technology can lock on the point to harvest the maximum energy and deliver it to the battery.

The MPPT algorithm continuously compares and adjusts the operating points to attempt to locate the MPP of the array. The tracking process is fully automatic and does not need user adjustment.

As Figure 1-2 shows, the curve is also the characteristic curve of the array, the MPPT technology will 'boost' the battery charge current through tracking the MPP. Assuming 100% conversion efficiency of the solar system, in that way, the following formula is established:

Input power (P_{PV})= Output power (P_{Bat})

↓

Input voltage (V_{Mpp}) *input current (I_{PV}) =Battery voltage (V_{Bat}) *battery current (I_{Bat})

Normally, the VMpp is always higher than VBat, Due to the principle of conservation of energy, the IBat is always higher than IPV. The greater the discrepancy between VMpp &VBat, the greater the discrepancy between IPV & IBat. The greater the discrepancy between array and battery, the bigger reduction of the conversion efficiency of the system, thus the controller's conversion efficiency is particularly important in the PV system.

Figure 1-2 is the maximum power point curve; the shaded area is the charging range of traditional solar charge controllers (PWM Charging Mode). The MPPT mode can improve the usage of the solar energy resource. According to our test, the MPPT controller can raise 20%-30% efficiency compared to a PWM controller. (Value may fluctuate due to the influence of the ambient circumstance and energy loss.)

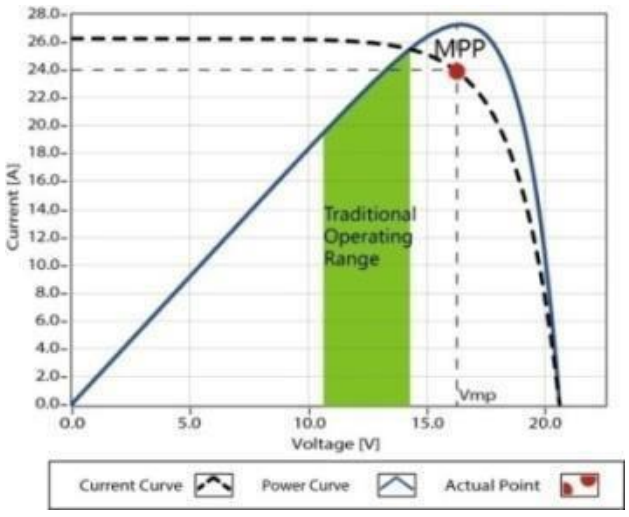


Figure 1-2 Maximum Power Point Curve

In an actual application, such as shading from a cloud, trees or snow, the panel may appear Multi-MPP, but in actuality there is only one real Maximum Power Point. As the below Figure 1-3 shows::

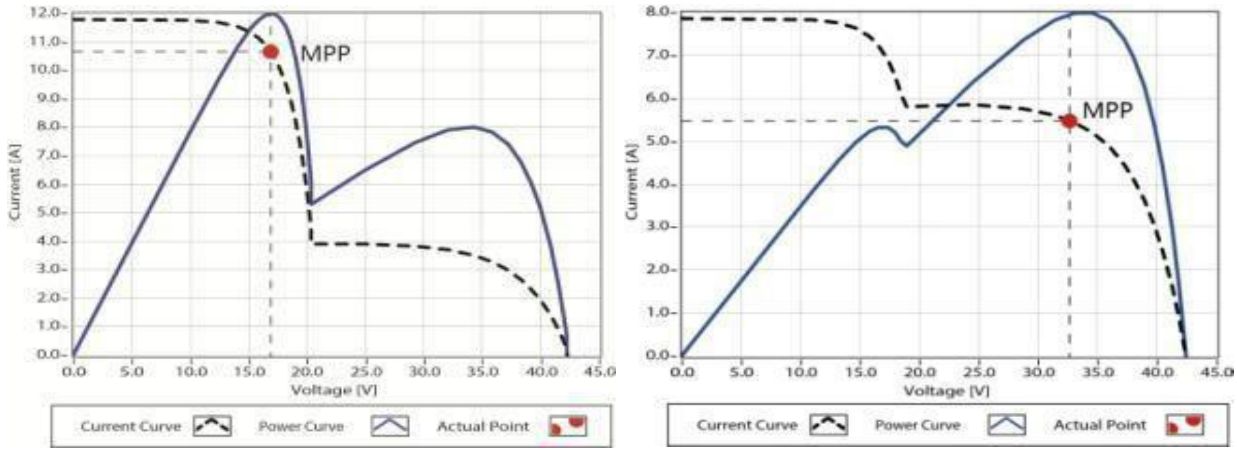


Figure 1-3 Multi-MPP Curve

1.1 Battery Charging Stage

The controller has a 3 stage battery charging algorithm (Bulk Charging, ConstantCharging and Float Charging) for rapid, efficient, and safe battery charging.

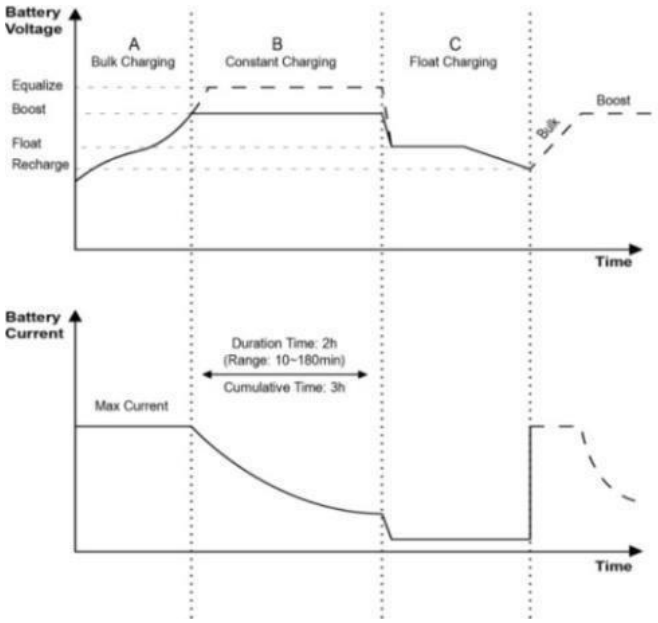


Figure 1-4 Battery changing stage Curve

Bulk Charging

In this stage, the battery voltage has not yet reached constant voltage (Equalize or Boost Voltage), the controller operates in constant current mode, delivering its maximum current to the batteries (MPPT Charging).

Constant Charging

When the battery voltage reaches the constant voltage setpoint, the controller will start to operate in constant charging mode, this process is no longer MPPT charging, and in the meantime the charging current will drop gradually. The Constant Charging has 2 stages, **Boost** and **Equalize**. These two stages are not carried out continuously in the full charge process to avoid overheating the battery.

Boost Charging

The Boost stage is set for 2 hours by default, The user can adjust the time and preset value of the boost voltage based on the load demand.

This stage is used to prevent heating and excessive battery gassing.

Equalize Charging

CAUTION: Equipment damage!
Equalization may increase battery voltage to the level that damages sensitive DC loads. Verify that all load allowable input voltages are 11% greater than the equalizing charging set point voltage.

CAUTION: Equipment damage!
Over-charging and excessive gas precipitation may damage the battery plates and activate material shedding on them. Too high of an equalizing charge or too long of period may cause damage.

Please carefully review the specific requirements of the battery used in the system.

Some types of batteries benefit from an equalizing charge on a regular basis. This is because during the equalizing the electrolyte is stirred, balancing battery voltage and accomplishing a chemical reaction. Equalizing charge increases battery voltage, higher than normal, which gasifies the battery electrolyte.

The controller will equalize the battery on the 28th of each month. The default equalization period is 0~180 minutes. If the equalization isn't accomplished in one-time, the equalization recharge time will be accumulated until the set time is finished. Equalize charge and boost charge are not carried out continuously in a full charge process to avoid too much gas precipitation or overheating of the battery.

NOTE:

1. Due to the influence of ambient circumstance or the size of the load, the battery voltage can't be held steady. The controller will accumulate and calculate the time of constant voltage working. When the accumulated time reaches 3 hours, the charging mode will turn to Float Charging.
2. If the controller time is not adjusted, the controller will equalize the charge of the battery once every month following the inner time.

Float Charging

After the Constant voltage stage, the controller will reduce the charging current to the Float Voltage setpoint. At the float stage the controller reduces charging with a lower voltage and current. This will reduce the temperature of the battery and prevent battery gassing while slightly charging the battery at the same time. The purpose of the Float stage is to offset the power consumption caused by self-consumption and small loads in the whole system, while maintaining full battery storage capacity.

In the Float charging stage, loads are able to obtain almost all power from the solar panel. If loads exceed the amount of power coming from the solar panel, the controller will no longer be able to maintain battery voltage in the Float charging stage. If the battery voltage remains below the Recharge Voltage, the system will leave the Float charging stage and return to the Bulk charging stage.

PV Array Requirements

MAXIMUM PV OPEN CIRCUIT VOLTAGE

At 77°F environment temperature 138V
At minimum operating environment temperature 150V

PV modules

As the core component of the PV system, the controller is compatible with various types of PV modules. ESPi recommends using the 300W solar panels from ESPi.

Maximum PV array power

The MPPT controller has the function of current/power-limiting during the charging process. When the power exceeds the rated current, the controller will automatically limit charging. This can effectively protect the charging components of the controller, and prevent damage to the controller due to the connection of some PV modules. The actual operation of the PV array is as follows:

Condition 1:
Actual charging power of PV array ≤ Rated charging power of controller

Condition 2:
Actual charging current of PV array ≤ Rated charging current of controller when the controller operates under "**Condition 1**" or "**Condition 2**", it will carry out charging as per the actual current or power; at this time, the controller can work at the maximum power point of PV array.

WARNING: When the power of PV is not greater than the rated chargingpower, but the maximum open-circuit voltage of PV array is more than 100V (at the lowest environmental temperature), the controller may be damaged.

Condition 3:
Actual charging power of PV array＞Rated charging power of controller

Condition 4:
Actual charging current of PV array＞Rated charging current of controller

When the controller operates under "**Condition 3**" or "**Condition 4**", it will carry out the charging as per the rated current or power.

WARNING: When the power of PV module is greater than the rated charging power, and the maximum open-circuit voltage of PV array is more than 100V (at the lowest environmental temperature), the controller may be damaged.

The maximum power of the PV array shall not be greater than 1.5 x the rated charging power of the controller. If the maximum power of PV array exceeds the rated charging power of controller too much, it will not only cause the waste of PV modules, but also increase the open-circuit voltage of PV array due to the influence of environmental temperature, which may make the probability of damage to the controller rise. Therefore, it is very important to configure the system reasonably. **For this reason, we have supplied three 300W solar panel for you**. The maximum power of PV array for the controller is:

Model	Rated Charge Current	Rated Charge Power	Max PV Array Power	Max. PV open circuit voltage
Voltar Impulse 48V	50A	2,500W	3,750W	138V at 25°C
				150V at minimum operating temp.

Protections, Troubleshooting and Maintenance

1.2 Protection

PV Over Current/power	When the charging current or power of the PV array exceeds the controller's rated current or power, it will be charged at the rated current or power. **NOTE: When the PV modules are in series, ensure that the open-circuit voltage of the PV array does not exceed the "maximum PV open-circuit voltage" rating. Otherwise the controller may be damaged.**
PV Short Circuit	When not in PV charging state, the controller will not be damaged in case of a short-circuiting in the PV array.
PV Reverse Polarity	When the polarity of the PV array is reversed, the controller may not be damaged and can continue to operate normally after the polarity is corrected. **NOTE: If the PV array is reverse connected to the controller,1.5 times rated controller power (watts)from the PV array, will damage the controller.**
Night Reverse Charging	Prevents the battery from discharging through the PV module at night.
Battery Reverse Polarity	Fully protected against battery reverse polarity; no damage will occur for the battery. Correct the miswire to resume normal operation. **NOTE: Limited to the characteristic of lithium battery, when the PV connection is correct and battery connection reversed, the controller will be damaged.**
Battery Over Voltage	When the battery voltage reaches the over voltage disconnect voltage, it will automatically stop battery charging to prevent battery damage caused by over-charging.
Battery Over Discharge	When the battery voltage reaches the low voltage disconnect voltage, it will automatically stop battery discharging to prevent battery damage caused by over-discharging. (Any controller connected loads will be disconnected. Loads directly connected to the battery will not be affected and may continue to discharge the battery.)
Battery Overheating	The controller can detect the battery temperature through an external temperature sensor. The controller stops working when its temperature exceeds 65 °C and restart to work when its temperature is below 55 °C.
Lithium Battery Low Temperature	When the temperature detected by the optional temperature sensor is lower than the Low Temperature Protection Threshold(LTPT), the controller will stop charging and discharging automatically. When the detected temperature is higher than the LTPT, the controller will be working automatically (The LTPT is 0 °C by default and can be set within the range of 10 ~ -40 °C).
Load Short Circuit	When the load is short circuited (The short circuit current is ≥ 4 times the rated controller load current), the controller will automatically cut off the output. If the load reconnects the output automatically five times (delay of 5s, 10s, 15s, 20s, 25s), it needs to be cleared by pressing the Load button, restarting the controller or switching from Night to the Day (nighttime > 3 hours).
Load Overload	When the load is overloading (The overload current is ≥ 1.05 times the rated load current), the controller will automatically cut off the output. If the load reconnects automatically five times (delay of 5s, 10s, 15s, 20s, 25s), it needs to be cleared by pressing the Load button restarting the controller, switching from Night to Day (nighttime > 3 hours).
Controller Overheating★	The controller is able to detect the temperature inside the battery. The controller stops working when its temperature exceeds 85 °C and restart to work when its temperature is below 75 °C.
TVS High Voltage Transients	The internal circuitry of the controller is designed with Transient Voltage Suppressors (TVS) which can only protect against high-voltage surge pulses with less energy. If the controller is to be used in an area with frequent lightning strikes, it is recommended to install an external surge arrester.

★When the internal temperature is 178°F, the reduced power charging mode will engage. This reduces the charging power of 5%,10%,20%,40% for every increase of 1.8°F. If the internal temperature is greater than 185°F, the controller will stop charging. When the temperature declines below 185 ºF, the controller will resume.

2. Operation of LCD Screen Monitor

General Information

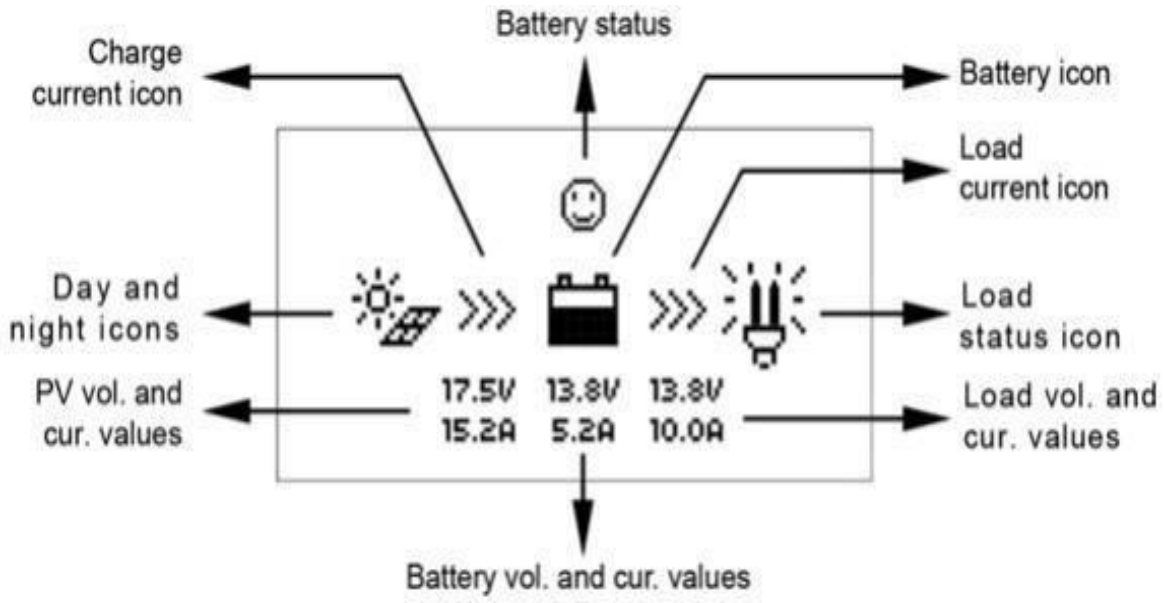
Features of Monitor

- Automatically identify and display the relevant parameters of controller
- Large-screen multifunction LCD provides real-time dynamic display of system data
- Direct, convenient, and rapid operation of six navigation function keys
- Powered by the controller directly, no need for external power
- Real-time data monitoring, remote controlling, data browsing, and modification of the related parameters
- Visual failure information, timely notification of warnings and faults

Main functions

Main functions include real-time monitoring of system data, browsing, modification related parameters, and restoring factory defaults are based in the LCD and functional key operation.

LCD Screen

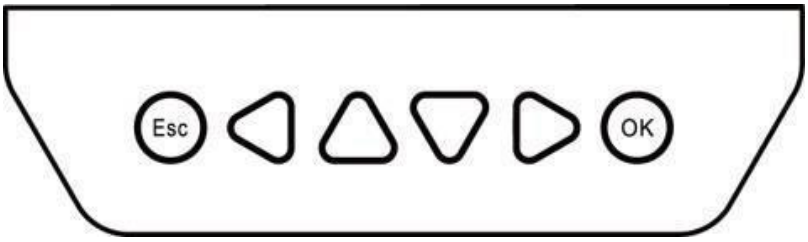

Battery status
Charge current icon
Battery icon
Load current icon
Day and night icons
Load status icon
PV vol. and cur. values
17.5V
15.2A
13.8V
5.2A
13.8V
10.0A
Load vol. and cur. values
Battery vol. and cur. values

Name	LCD Display	Instruction
Day and night icons		Night
		Day **Note: The threshold voltage is 1V. When it goes higher than 1V, it is daytime.**
Charge current icon		The icon is dynamically running if there is a charge current.
Battery icon		The battery capacity is dynamically displayed. **Note: When the battery is over-discharged, this icon is displayed as "  ."**
Battery status icons		Normal voltage
		Under voltage
		Over-discharge
Load current icon		The icon is dynamically running if there is a discharge current.

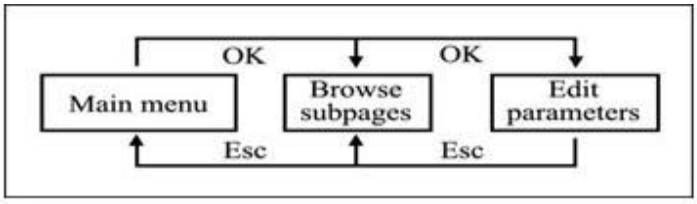
Load status icon		Load On
		Load Off **Note: In the Manual Mode, pressing the "OK" button to switch on/off the load.**
PV vol. and cur. values		Display the PV voltage and current values.
Battery vol. and cur. values		Display the battery voltage and current values.
Load vol. and cur. values		Display the load voltage and current values.

Operation

1.1 Buttons



The buttons are respectively (from left to right) "ESC," "Left," "Up," "Down," "Right," and "OK "buttons. The operation is described in the schematic operation diagram below:



The default entry page is the browse mode. Press the OK button and input the correct password to enter the modification mode. ◁ ▷ buttons could be used to move the cursor. △ ▽ buttons could be used to modify the parameter values when the cursor is located at the current place. OK Esc and buttons could be finally confirm and cancel the modification of the control parameters.

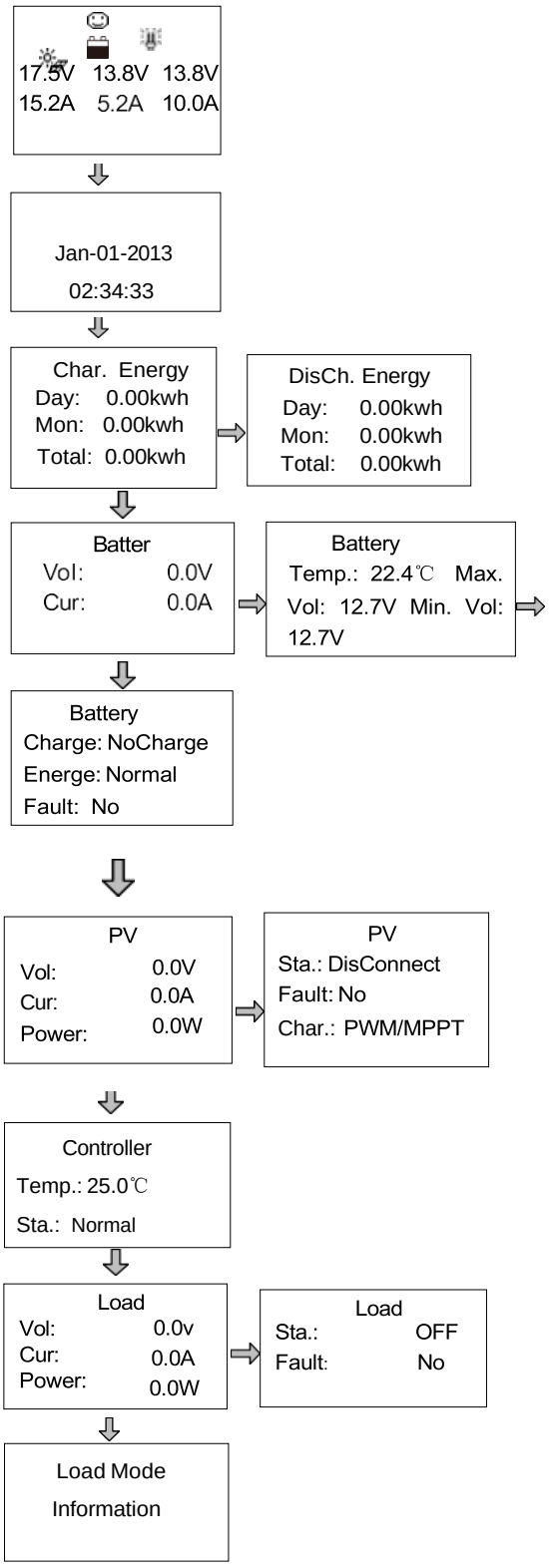
Main menu

Enter the Main Menu by pressing "Esc." The "Up" and "Down" buttons are respectively used to move the cursor to select the menu items, "OK," and "ESC" buttons are respectively used to enter or exit the corresponding pages.

1. Monitoring 2. Device Info. 3. Test Operation 4. Control Para.	→	5. Load Set 6. Device Para 7. Device PSW. 8. Factory Reset
→		9. Failure Info. 10. Meter Para.

Real-time monitoring

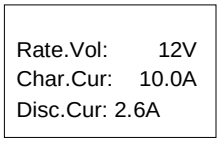
Please see screen shots below:



Operational tips: Move between rows by pressing the "Up" or "Down" buttons. Move along a row by pressing the "Right" or "Left" buttons.

Device information

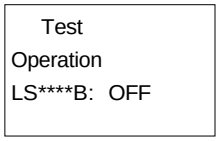
The controllers' parameters are displayed below:



Operational tips: △ and ▽ buttons are respectively used to turn the browse page upward and downward.

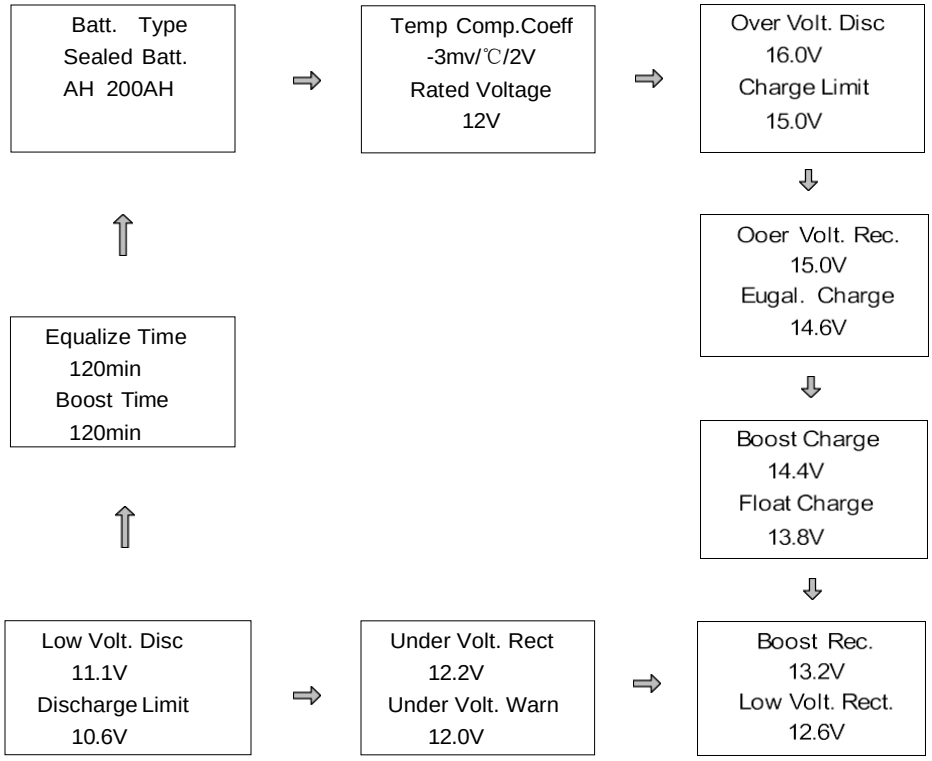
Test operation

Load switch test is conducted to see if the load output is normal. The test operation does not affect the working settings under actual load, which means that the solar controller will exit from the test mode when exiting the Test Operation page.



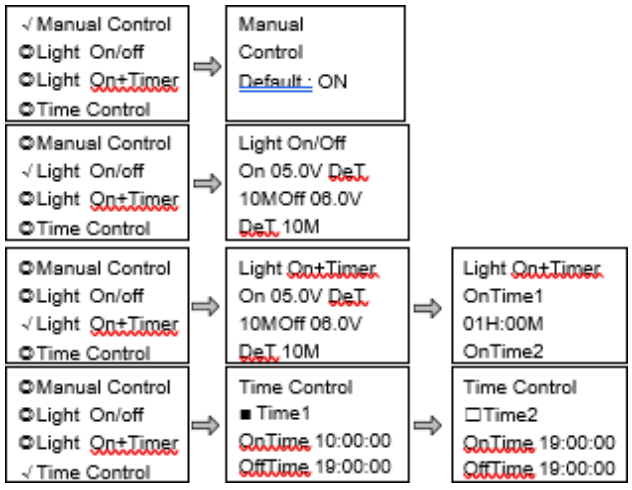
Operational tips: Enter the page and input the correct password; use △ and ▽ buttons to modify the On/Off status. Press OK to confirm and press Esc to cancel the test operation.

Control parameter



Load setting

The page of load setting could be used to set the four load working modes of the connection solar controller (Manual, Light on/off, Light on + timer, Time control)



1. Manual control

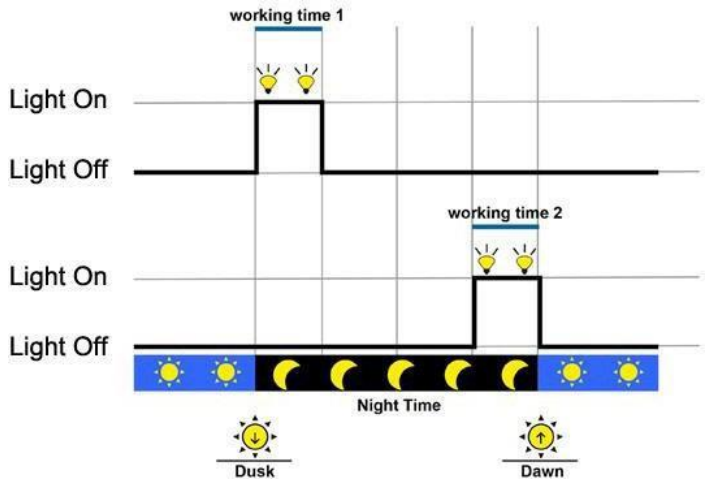
Mode	Introductions
ON	The load is on if the battery capacity is enough and no abnormal conditions happen.
OFF	The load is off all the time.

2. Light On/Off

Light On voltage(Night threshold)	The load output is automatically turned on when the bellows occur at the same time: 1. The solar module's input voltage is lower than the Light On voltage. 2. The battery capacity is enough. 3. No abnormal conditions happen.
Light Off voltage(Day threshold)	When the solar module's input voltage is higher than the Light Off voltage, the load output is automatically turned off.
Delay time	It means the confirmation time for the light signal. During this period, if the light signal voltage continues matching the Light On/Off voltage, the controller will perform corresponding actions (the time adjustment range: 0~99mins).

3. Light On+ timer

Working time 1 (T1)	Load working period after light control turns on the load	Any working time is set as "0"; it means this time will stop working. The real working time of T2 depends on the night-time and the length of T1, T2.
Working time 2 (T2)	Load working period before light control turns off the load	
Night-time	Total night-time controller get from calculation(≥3h)	

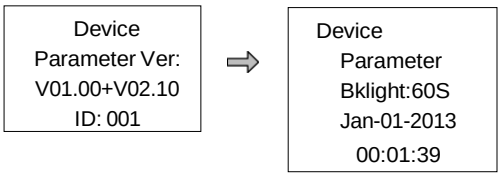


4. Time control

Working time1 (T1)	Control on/off time of load thethrough real-time clock mode.	Working time 1 is thecompulsory load working time interval. Working time 2 is optional.
Working time2 (T2)	Realize the dual timer function of theload control through real-time clock mode.	

Device Parameter

The solar controller's software version can be checked via the device parameter page. And device data like device ID, device LCD backlight time, and device clock could also be checked and modified. The device parameter page shows in the diagram below:

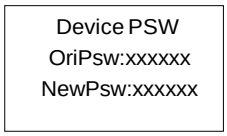


Note: the bigger the connection device's ID value, the longer the communication identification interval will be (the maximum interval<6 minutes).

Type	Notes
Ver	It indicates the Solar controller's software and hardware version numbers.
ID	It indicates the Solar controller's communication ID numbers.
Bklight	It indicates the Solar controller's LCD backlight time.
Month-Day-Year H: M: S	It indicates the Solar controller's internal clock.

Device Password

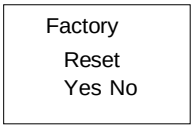
The solar controller's password could be modified via the device password page. The device password is a 6-digit figure which is required before entering the modification mode of "Control parameter," "Load setting," "Device parameter," "Device password," "Factory reset" pages. The page of the device password in the diagram shows as below:



Note: The default password of the solar charge controller is" 000000".

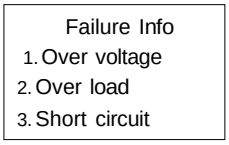
Factory reset

The solar charger controller's default parameters could be restored via the Factory reset page. Including the "Control parameter," "Load setting," "Charge mode," and "Device password" could all be restored to the factory defaults (the factory default password of the devices is "000000").



Failure information

The solar controller's failure information could be checked via the Failure information page (a maximum of 15 failure messages could be displayed). After the solar controller's failures are eliminated, the corresponding failure information will also be automatically eliminated.

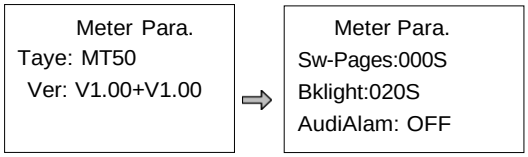


Failure information	Details
Load MOS-Short	The MOSFET of the load driver is shorted.
Load Circuit	The load circuit is shorted.
Load O. cur.	The load circuit is over current.
Input O. cur.	PV input current is over rate.
RPP Short	The MOSFET of reverse polarity protection is shorted
RPP Break	The MOSFET of reverse polarity protection is a break.

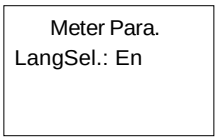
Char.MOS-Short	The MOSFET of the charge driver is shorted
Input O. Cur.	Input current is over rate.
Disc.O.O.Ctrl.	The discharge operation is out of control.
Ctrler O.Temp.	The controller is over-temperature.
Comm. Timeout	The communication hastimed out.

Meter Parameter

The meter's model, software, and hardware version can be checked via the meter parameter page. The two parameters (Switch pages, Backlight) can be browsed and modified as well.



On the above page, a long-press ◁+ ▷+ △+ ▽ at the same time to enter the language selection page:



Parameters	Default	Range	Remark
Sw-Pages	0	0~120S	The automatic switchover inverter for real-time monitoring page
BKlight	20	0~999S	LCD backlight time
LangSel.	Cn	Cn/En	Switch the page display language between Chinese and English.

Enclosure Features and Dimensions

QUARTER TURN LOCKING DOOR LATCHES

The cabinet door is equipped with (2) quarter-turn pad-lockable latches. The latch is secured by turning the 7/16" hex security bolt one quarter turn clockwise until the stop is reached. A convenient security locking hasp is factory installed to allow for a standard Master lock padlock (or equivalent) to be installed. With a padlock inserted, the security bolt cannot be accessed. Thus, protecting the cabinet from undesired intrusions.

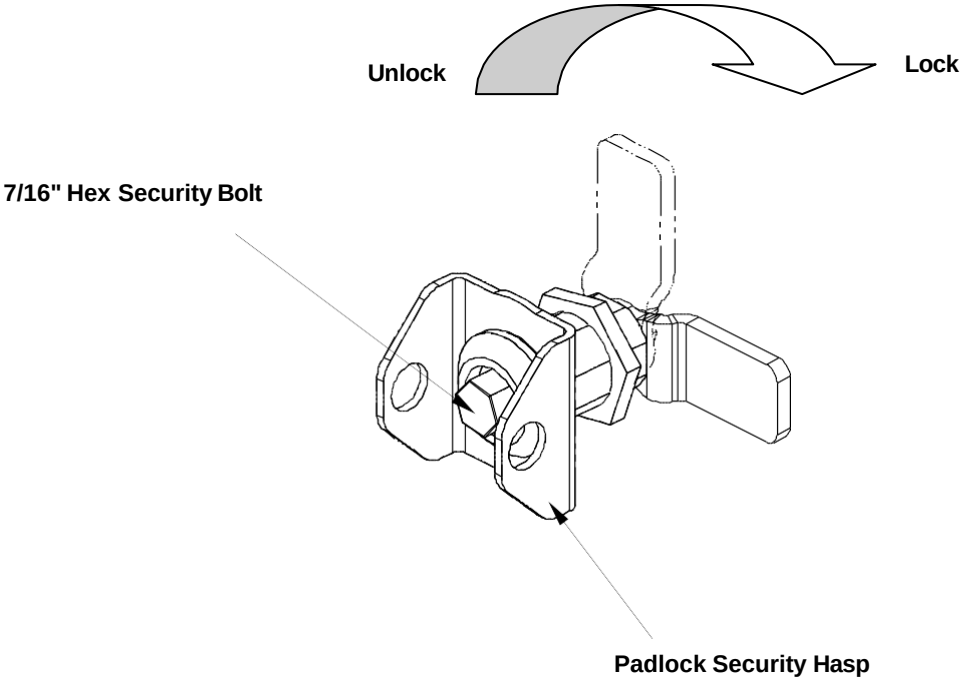


Figure A – Quarter Turn Locking Door Latch

ENCLOSURE OVERVIEW

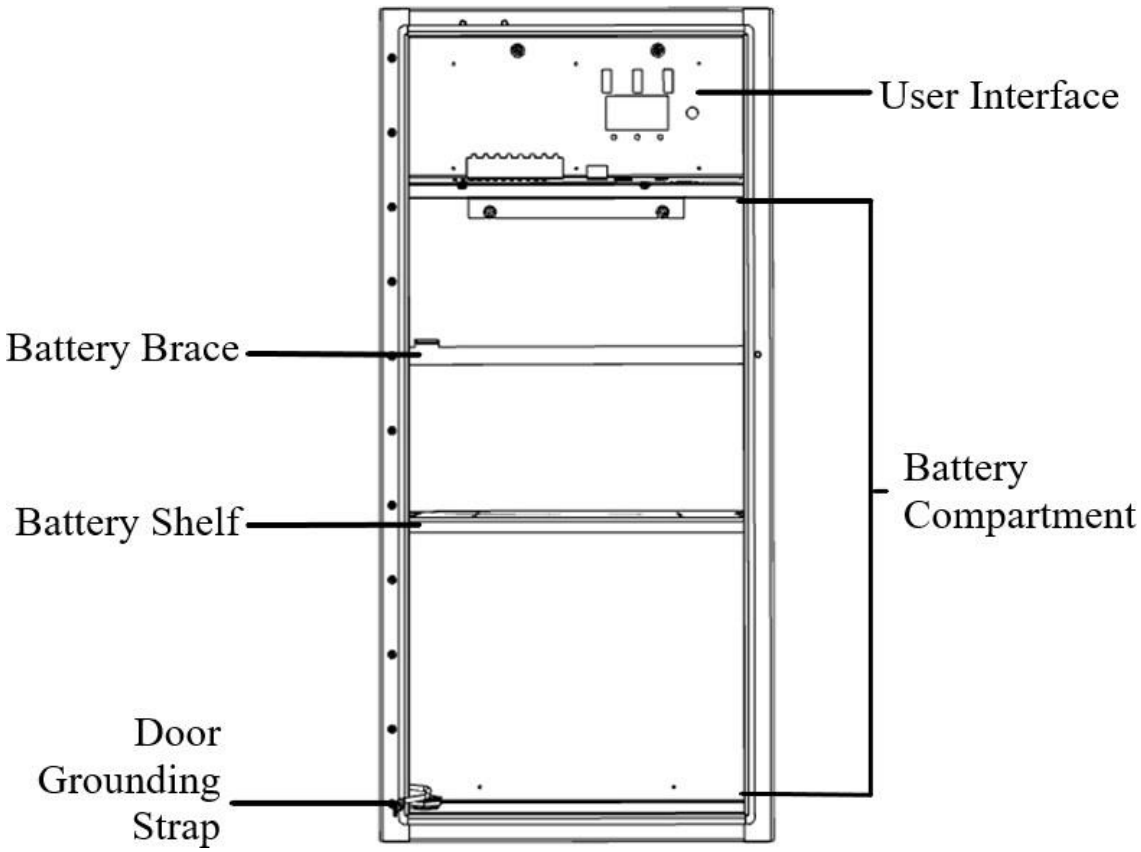


Figure B – Front View of Enclosure

Door is not shown. Image is for reference only.

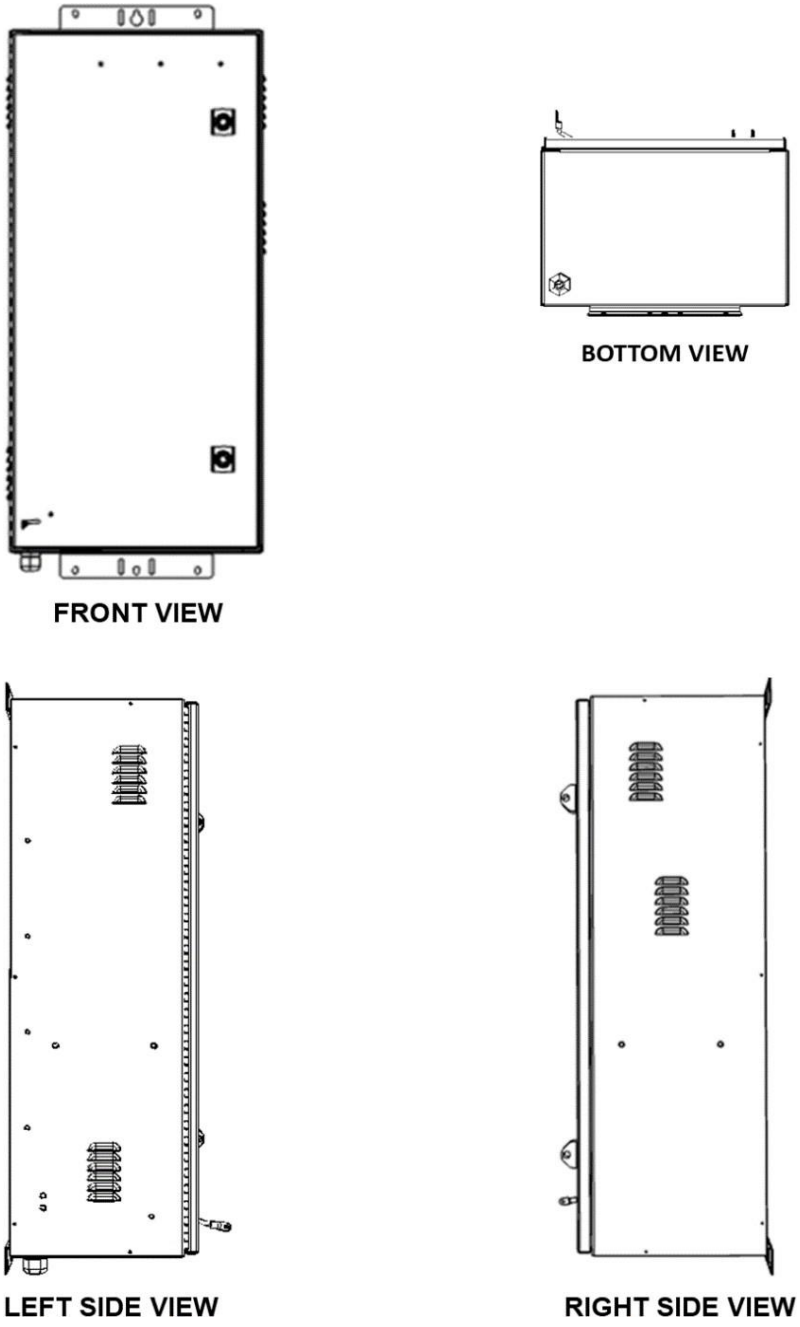


Figure C – Enclosure Overview

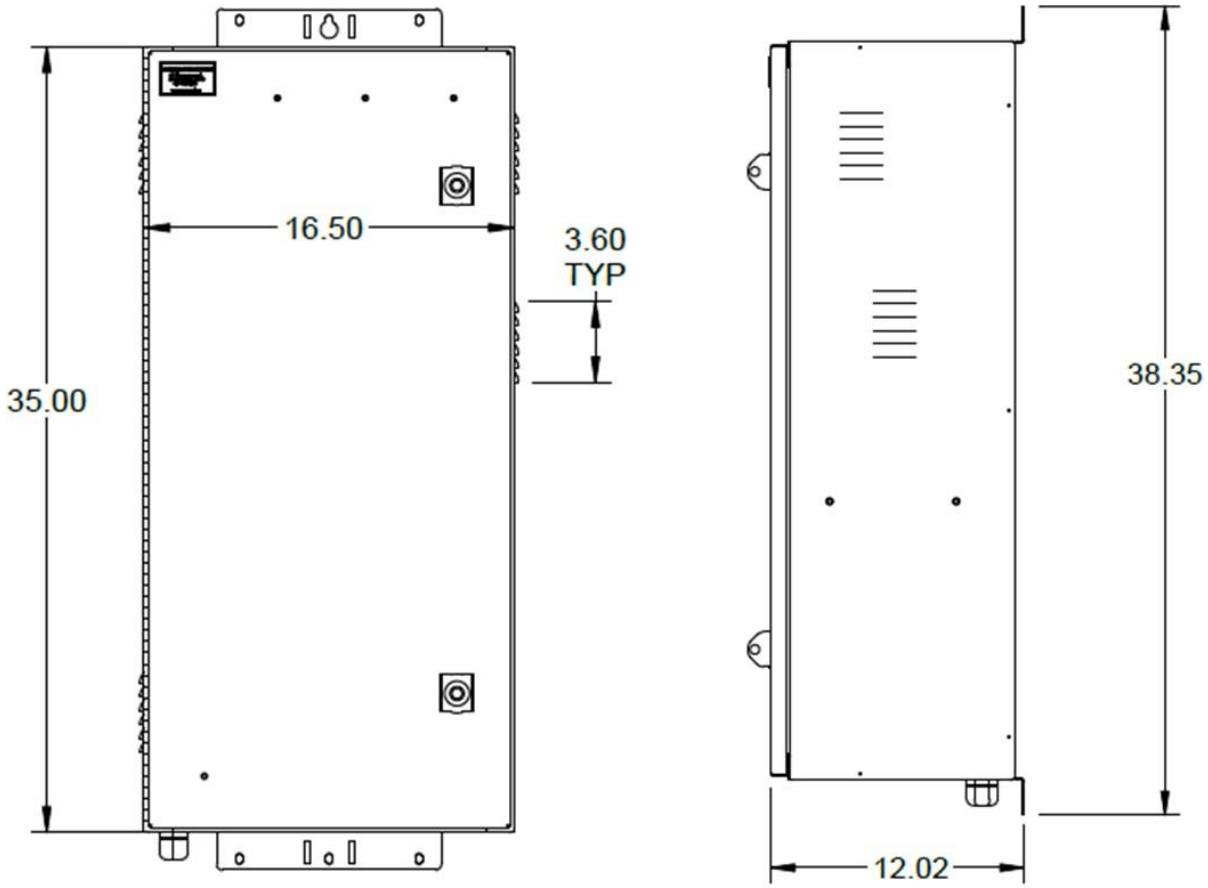


Figure D – Enclosure Overall Dimensions

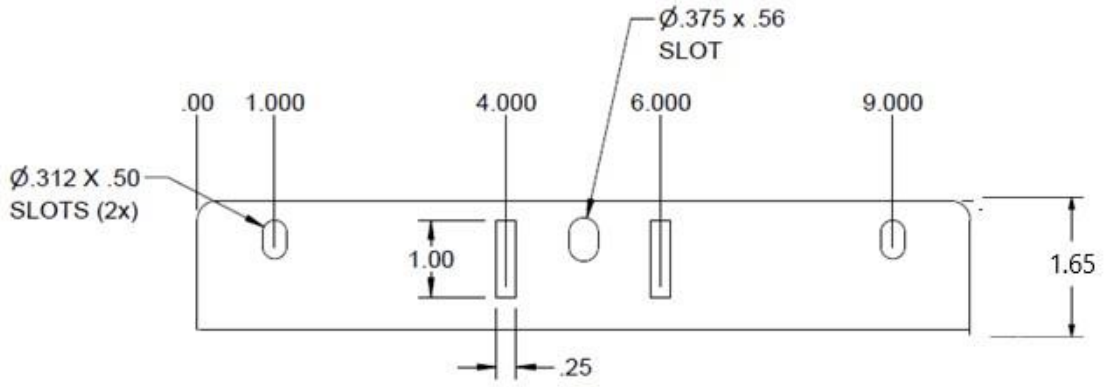
General Installation Notes

- Please read through the entire installation instructions to become familiar with the installation steps before installing the unit.
- Be very careful when installing the batteries. Please wear eye protection, and have fresh water available to wash and clean any contact with battery acid.
- Keep the battery away from any metal objects, which may cause a short circuit of the battery.
- Loose power connections and corroded wires may result in high heat that can melt wire insulation, burn surrounding materials, or even cause fire. Ensure tight connections and use cable clamps to secure cables and prevent them from swaying in mobile applications.

INSTALLATION PROCEDURE

The installation of the unit must be performed by skilled technicians and electricians familiar with electrical equipment. Do not allow unqualified personnel to handle, install, or operate the equipment. Install this unit in a location away from gas, fire, and potential sparks. The VOLTAR Impulse series cabinet is shipped ready for equipment and battery installation. The following pages will provide information on mounting, grounding procedure, alarm connection guide, solar panel installation and more.

Note: Due to the heavy weight of the enclosure and batteries, we recommend using through bolts instead of lag bolts when installing the unit on a wooden utility pole.



CLEARANCE REQUIREMENTS

When selecting a location to mount the cabinet, ensure that proper clearance is available to allow adequate ventilation and to allow the cabinet door to fully open. See figure below for top view of cabinet footprint.

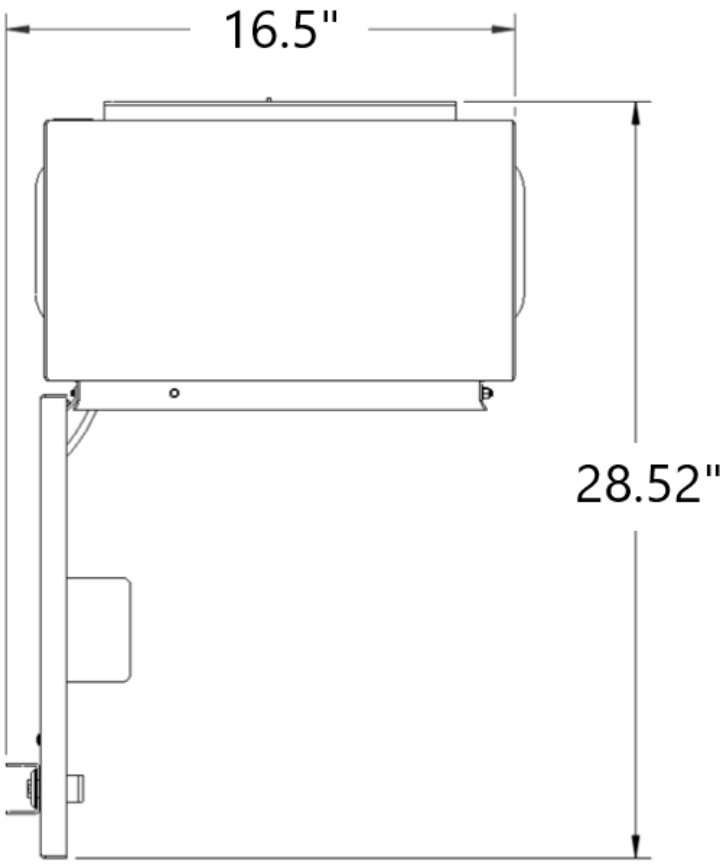


Figure F – Cabinet Footprint

CABINET GROUNDING INFORMATION

Bonding and grounding should be done in accordance with the operating telephone company's standard procedures and comply with local electrical codes.

GROUND WIRE

The ground wire protects the electronics from voltage surges. A #6 ground wire must be properly grounded to provide lightning surge protection for the cabinet. Please follow this practice for attaching the ground unless local policies dictate otherwise.

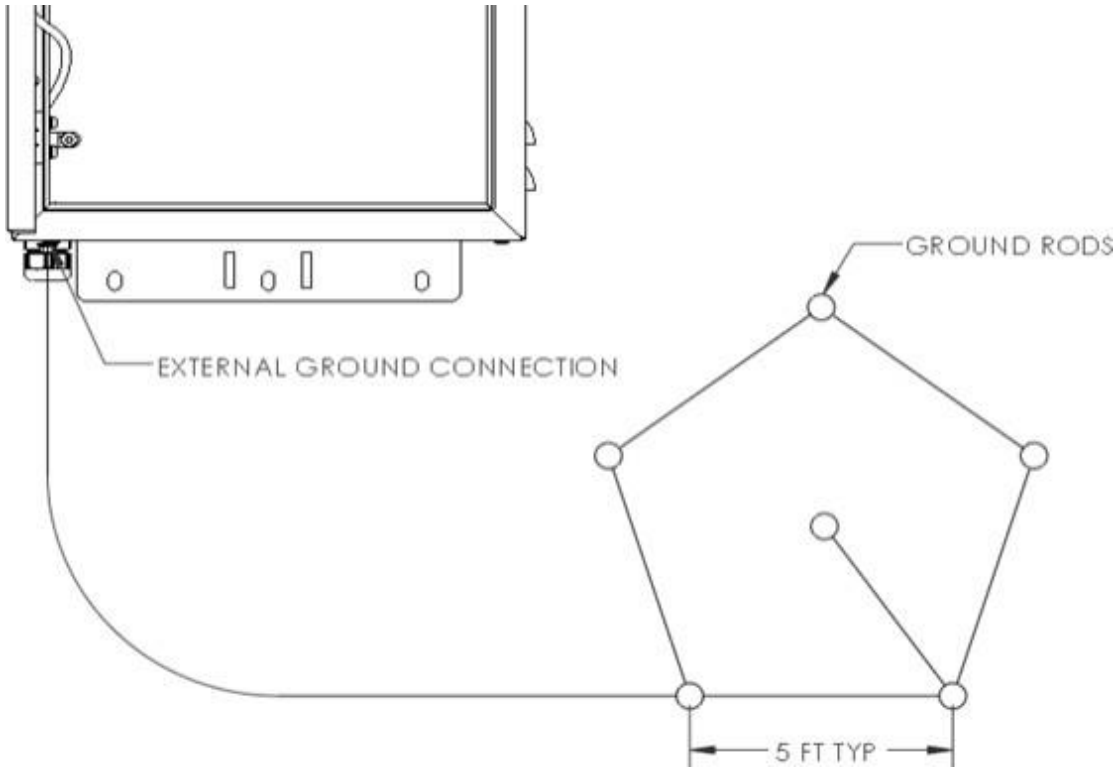
For safety and performance reasons it is imperative that a cabinet be properly grounded. The following guidelines should be used to ground the cabinet unless local practices, rules, or regulations dictate otherwise.

Each door and equipment rack is grounded to the cabinet frame. The cabinet frame is connected to the internal grounding bus by a stranded wire. A similar ground wire must be used to connect the ground bus to each equipment ground lug. These ground wires may need to be removed temporarily to troubleshoot ground faults. The wire may be removed by unscrewing the screws that secure the green wire to the ground bus. **Be sure to reattach these wires after troubleshooting and resolving any ground conflicts.** Ground the cabinet before connecting power to the cabinet. This grounding must be in effect at all times to safeguard personnel.

GROUNDING DIAGRAM AND PROCEDURE

Grounding Procedure:

1. Drive the ground rods into the ground near the cabinet location.
2. Use a Megger-type ohmmeter to measure the resistance between cabinet ground and the ground rods. The resistance must be 25 ohms or less.
3. If the ohm requirement in step 2 is met, proceed to step 4. Otherwise, follow local practices to lower the resistance to ground to comply with step 2 before proceeding to step 4.
4. Connect a #6 ground wire to the ground rods.
5. Install the battery inside the enclosure being careful not to short the terminals to any metal object.
6. Connect the alarms to the RJ-45 terminal using the color code in Figure J.
7. Connect the wire from the DC terminal block to your device.
8. Connect the black battery terminal to the negative battery post.
9. Connect the red battery terminal to the positive battery post



APPENDIX A

TECHNICAL SUPPORT

Technical assistance is available 8 AM to 5 PM Central Time. Contact ESPi at:

Telephone 877-799-3774 (*toll free*)

ORDERING PROCEDURE

You may place orders by telephone or email:

Telephone: 877-799-3774 (Toll Free)
Email: sales@espicorp.com
Mail: ESPi
630 Lincoln St
Clay Center, Kansas 67432

When placing an order, please provide the following information:

- Customer purchase order number
- Ship-to and bill-to addresses
- Part numbers and quantities required
- Requested delivery date
- Preferred method of shipment

APPENDIX B

RETURN FOR REPAIR POLICY AND PROCEDURE

CORPORATE POLICY

ESPi warrants this product to be free of defects and to be fully functional for a warranty period beginning from the date of original shipment, given correct customer installation and regular maintenance. ESPi will repair or replace any unit without cost during its warranty period if the unit is found to be defective for any other reason other than abuse or incorrect use or incorrect installation. ESPi is not liable for any labor or repair costs incurred by the customer.

Do not try to repair the unit. If it fails, replace it with another unit and return the faulty unit to ESPi for repair. Any modification of the unit by anyone other than an authorized ESPi representative voids the warranty.

RMA PROCEDURE

If a unit needs repair, call ESPi at 877-799-3774 (toll free) for an RMA Number and return the defective unit, freight prepaid to:

ESPi
Shipping & Receiving
630 Lincoln
Clay Center, KS 67432
Attn: Repair Dept.

When preparing the unit for shipment:

- Use the original packaging
- Provide the following information (required):
    - The RMA Number posted on outside of shipping container

(ESPi will not accept return shipments without an RMA)

- Statement inside the shipping container with the following details:
- RMA Number
- Description and quantities of equipment being returned
- Brief description of the problem
- Your billing address
- Your shipping address

You will be notified of the repair status of the returned equipment within 2 weeks of receipt of your shipment at the address listed above. ESPi will provide needed equipment repair beyond the warranty period for a nominal charge. Contact your ESPi sales representative for details and pricing.

APPENDIX C

ESPi STANDARD TERMS AND CONDITIONS

ALL QUOTATIONS AND SALES ARE SUBJECT TO THE FOLLOWING TERMS AND CONDITIONS AS WELL AS THOSE CONTAINED ON THE ORIGINAL QUOTATION.

Warranty: ESPi LLC is very proud of the product we have created. Should you need support please call 877 -799-3774 or visit our website at espicorp.com.

ESPi LLC warrants to you, the Initial Purchaser, that the Product will be free from defects in material and workmanship for one year from the date of original purchase, subject to the terms of this Limited Warranty. This Limited Warranty gives you specific rights, and you may have other rights, which vary from State to State or Province to Province Any Implied Warranty of Merchantability or for Fitness for a Particular Purpose, if applicable to the Product, is limited in duration to two years. This provision shall NOT create any Implied Warranty or Merchantability or of Fitness for a Particular Purpose that would not otherwise apply to the Product. NOTE: Some States and provinces do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. To be covered you must still be the owner of the Product at the time of the failure that results in the claim made under this Limited Warranty. Your sole and exclusive remedies are those provided by this Limited Warranty. This exclusion of other express warranties applies to written and oral express warranties. ESPi excludes any liability for personal injury. ESPi excludes any liability for direct, indirect, special, incidental, or consequential damages, whether for damage to or loss of property, loss of profits, business interruption, information or data. This exclusion ap plies even though damage or loss is caused by negligence or other fault. NOTE: Some States or Provinces do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you.
DO NOT USE FOR MEDICAL OR LIFE SUPPORT EQUIPMENT OR OTHER HIGH RISK ACTIVITIES.
ESPi does not sell the PRODUCT for use in high-risk activities. The PRODUCT is not designed or intended for use in hazardous environments requiring fail-safe performance, including the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, weapons systems, life support or medical applications or for use in any circumstance in which the failure of the PRODUCT could lead directly to death, personal injury, or severe physical or property damage, or that would affect operation or safety of any medical or life support device (collectively, "High Risk Activities").
ESPi LLC expressly disclaims any express or implied warranty of fitness for High Risk Activities. ESPi LLC does not authorize use of any of our products in any High Risk activities.
ANY SUCH USE IS IMPROPER AND IS A MISUSE OF An ESPi PRODUCT.
The Limited Warranty is governed by the laws of the United States and the State of Kansas, without reference to conflict of law principles. The application of the United Nations Convention of Contracts for the International Sale of Goods is expressly excluded.

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Your Next Generation UPS™

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Toll-Free (877) 799-3774
www.espicorp.com

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