POWERTECH

20A MPPT Solar Charge Controller for Lithium or SLA Batteries

MP3741

User Manual

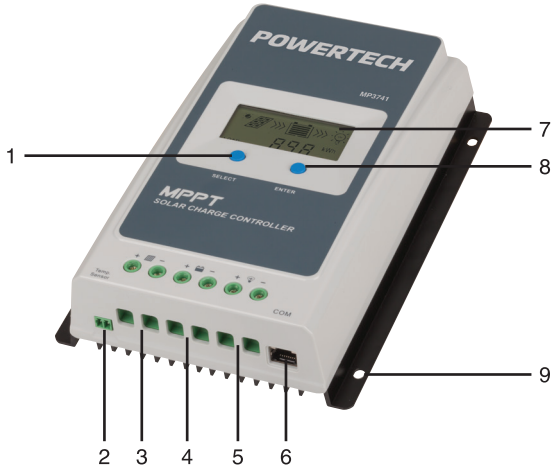
SAFETY INSTRUCTIONS

Please reserve this manual for future review. This manual contains all instructions for safety, installation and operation for the product.

- Read carefully all the instructions and warnings in the manual before installation.
- No user serviceable component inside the product. DO NOT disassemble or attempt to repair the controller.
- Mount the product indoors. Prevent exposure to the elements and do not allow water to enter the product.
- Install the product in well ventilated places, the product's heat sink may become very hot during operation.
- Suggested to install appropriate external fuses/breakers.
- Make sure switching off all connections with PV array and the fuse/ breakers close to battery before product installation and adjustment.
- Power connections must remain tight to avoid excessive heating from a loose connection.

CONTENTS

1.1 PRODUCT DIAGRAM



1. Select Button
2. RTS Port*
3. PV Terminals
4. Battery Terminals
5. Load Terminals
6. RS-485 Port*
7. LCD Display
8. Enter Button
9. Mounting Holes

* RTS Port: Connection for a Remote Temperature Sensor to remotely detect battery temperature.
RS-485 Port: Monitor controller by PC, remote meter MT50 or APP and update controller software via RS485 (RJ45 interface).

1.2 FEATURES

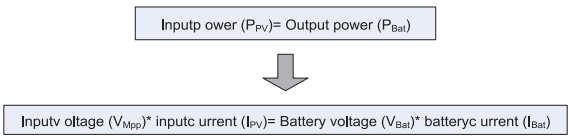
- Advanced MPPT control technology
- High tracking and conversion efficiency
- Supports Sealed, Gel or flooded lead acid and Lithium batteries
- 3-stage intelligent charging
- Multiple load work modes
- Extensive electronic protection
- Backlit LCD display
- RS485 communication

1.3 MAXIMUM POWER POINT TRACKING TECHNOLOGY

Due to the nonlinear characteristics of solar array, there is a maximum energy output point (Max Power Point) on its curve. Traditional controllers, with switch charging technology and PWM charging technology, can't charge the battery at the maximum power point, so can't harvest the maximum energy available from PV array, but the 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 of our company continuously compares and adjusts the operating points to attempt to locate the maximum power point of the array. The tracking process is fully automatic and does not need user adjustment.

As the Figure 1-2, 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:



Normally, the VMpp is always higher than VBat, Due to the principle of conservation 4 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 charging range of traditional solar charge controller (PWM Charging Mode), it can obviously diagnose that 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 the PWM controller. (Value may be fluctuant due to the influence of the ambient circumstance and energy loss.)

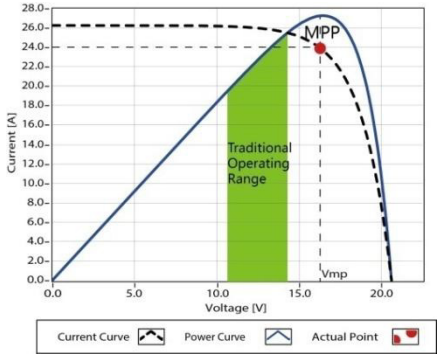


Figure 1-2 Maximum Power Point Curve

In actual application, as shading from cloud, tree and snow, the panel maybe appear Multi-MPP, but in actually there is only one real Maximum Power Point. As the below Figure 1-3 shows:

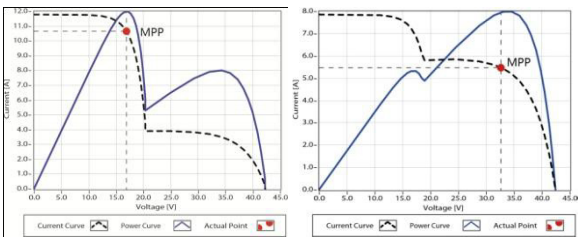


Figure 1-3 Mutil-MPP Curve

If the program works improperly after appearing Multi-MPP, the system will not work on the real max power point, which may waste most solar energy resources and seriously affect the normal operation of the system. The typical MPPT algorithm, designed by our company, can track the real MPP quickly and accurately, improve the utilization rate of the array and avoid the waste of resources.

1.4 BATTERY CHARGING STAGE

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

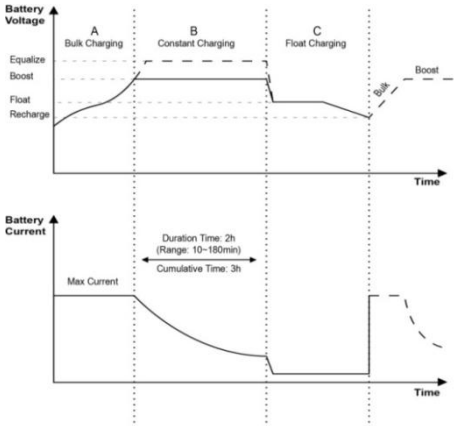


Figure 1-4 Battery changing stage Curve

A) 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).

B) 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 process is not the MPPT charging. The Constant Charging has 2 stages, equalize and boost. These two stages are not carried out constantly in a full charge process to avoid too much gas precipitation or overheating of battery.

Boost Charging
The Boost stage maintain 2 hours in default, user can adjust the constant time and preset value of boost voltage according to demand. The stage is used to prevent heating and excessive battery gassing.

Equalise Charging
WARNING:

Explosive Risk! Equalizing flooded battery would produce explosive gases, so well ventilation of battery box is recommended.

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.

Over-charging and excessive gas precipitation may damage the battery plates and activate material shedding on them. Too high an equalizing charge or for too long may cause damage. Please carefully review the specific requirements of the battery used in the system.

Some types of batteries benefit from equalizing charge on a regular basis, which is able to stir electrolyte, balance battery voltage and accomplish chemical reaction. Equalizing charge increases battery voltage, higher than the standard complement voltage, which gasifies the battery electrolyte.

The controller will equalize the battery on 28th each month. The constant 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 constantly in a full charge process to avoid too much gas precipitation or overheating of battery.

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

C) Float Charging
After the Constant voltage stage, the controller will reduce charging current to Float Voltage setpoint. This stage will have no more chemical reactions and all the charge current transforms into heat and gas at this time. Then the controller reduces the voltage to the floating stage, charging with a smaller voltage and current. It will reduce the temperature of the battery and prevent the gassing and charging the battery slightly at the same time. The purpose of 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 Float charging stage, loads are able to obtain almost all power from solar panel. If loads exceed the power, the controller will no longer be able to maintain battery voltage in Float charging stage. If the battery voltage remains below the Recharge Voltage, the system will leave Float charging stage and return to Bulk charging stage.

2.1 INSTALLATION INSTRUCTIONS

- Before installation, please read through the entire installation instructions to get familiar with the installation steps.
- Be very careful when installing the batteries, especially flooded lead-acid battery. 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 short circuit of the battery.
- Explosive battery gases may come out from the battery during charging, so make sure ventilation condition is good.
- Gel, Sealed or Flooded batteries are recommended, other kinds please refer to the battery manufacturer.
- Ventilation is highly recommended if mounted in an enclosure. Never install the controller in a sealed enclosure with flooded batteries! Battery fumes from vented batteries will corrode and destroy the controller circuits.
- 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.
- Battery connection may be wired to one battery or a bank of batteries. The following instructions refer to a singular battery, but it is implied that the battery connection can be made to either one battery or a group of batteries in a battery bank.
- Multiple same models of controllers can be installed in parallel on the same battery bank to achieve higher charging current. Each controller must have its own solar module(s).
- Select the system cables according to 5A/mm2 or less current density in accordance with Article 690 of the National Electrical Code, NFPA 70.

2.2 PV ARRAY REQUIREMENTS

Serial connection (string) of PV modules

As the core component of PV system, controller could be suitable for various types of PV modules and maximize converting solar energy into electrical energy. According to the open circuit voltage (Voc) and the maximum power point voltage (VMpp) of the MPPT controller, the series number of different types PV modules can be calculated. The below table is for reference only.

System voltage	36cell Voc＜23V		48cell Voc＜31V		54cell Voc＜34V		60cell Voc＜38V	
	MAX.	Best	MAX.	Best	MAX.	Best	MAX.	Best
12V	4	2	2	1	2	1	2	1
24V	4	3	2	2	2	2	2	2

System voltage	72cell Voc＜46V		96cell Voc＜62V		Thin-Film Module Voc＞80V
	MAX.	Best	MAX.	Best	
12V	2	1	1	1	1
24V	2	1	1	1	1

NOTE: The above parameter values are calculated under standard test conditions (STC (Standard Test Condition): Irradiance 1000W/m2, Module Temperature 25°C, Air Mass1.5.)

PV Array Maximum Power

This MPPT controller has a limiting function of charging current, the charging current will be limited within rated range, therefore, the controller will charge the battery with the rated charging power even if the input power at the PV exceeds. The actual operation power of the PV array conforms to the conditions below:

1) PV array actual power ≤ controller rated charge power, the controller charge battery at actual maximum power point.
2) PV array actual power > controller rated charge power, the controller charge battery at rated power.

If the PV array higher than rated power, the charging time at rated power to battery will be longer, more energy to battery yields.

WARNING:

Controller will be damaged when the PV array straight polarity and the actual operation power of the PV array is three times greater than the rated charge power! Controller will be damaged when the PV array reverse polarity and the actual operation power of the PV array is 1.5 times greater than the rated charge power!

When the PV array straight polarity, the actual operation of the PV array must NOT exceed three times of rated charge power; When the PV array reverse polarity, the actual operation must NOT exceed 1.5 times. For real application please refer below:

Rated Charge Current:	20A
Rated Charge Power:	260W/12V, 520W/24V
Max. PV Array Power:	780W/12V, 1560W/24V
Max. PV Open Circuit Voltage:	92V@25°C, 100V@ minimum operating temp.

2.3 WIRE SIZE

The wiring and installation methods must conform to all national and local electrical code requirements.

PV Wire Size

Since PV array output can vary due to the PV module size, connection method or sunlight angle, the minimum wire size can be calculated by the Isc of PV array. Please refer to the value of Isc in PV module specification. When the PV modules connect in series, the Isc is equal to the PV module's Isc. When the PV modules connect in parallel, the Isc is equal to the sum of PV module's Isc. The Isc of PV array must not exceed the maximum PV input current, please refer below:

Max. PV Input Current:	20A
Max. PV Wire Size (mm^2/AWG):	6/10

NOTE: When the PV modules connect in series, the open circuit voltage of the PV array must not exceed 92V (25°C).

Battery and Load Wire Size
The battery and load wire size must conform to the rated current, the reference size as below:

Rated Charge Current:	20A
Rated Discharge Current:	20A
Battery Wire Size (mm2/AWG):	6/10
Load Wire Size (mm2/AWG):	6/10

NOTE: The wire size is only for reference. If there is a long distance between the PV array and the controller or between the controller and the battery, larger wires can be used to reduce the voltage drop and improve performance.

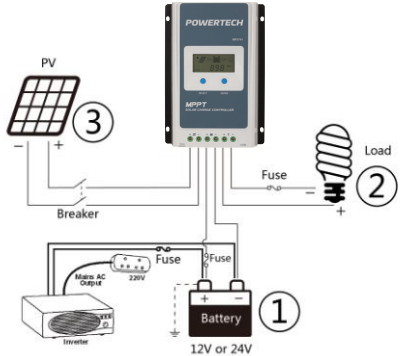
2.4 MOUNTING

CAUTION:

The controller requires at least 150mm of clearance above and below for proper air flow. Ventilation is highly recommended if mounted in an enclosure.

WARNING:

Risk of explosion! Never install the controller in a sealed enclose with flooded batteries! Do not install in a confined area where battery gas can accumulate.
Risk of electric shock! Exercise caution when handling solar wiring. The solar PV array can produce open-circuit voltages in excess of 100V when in sunlight. Pay more attention to it.



1) Connect components to the charge controller in the sequence as shown above and pay much attention to the “+” and “-”. Please don”t turn on the fuse during the installation. When disconnecting the system, the order will be reserved.
2) After installation, power the controller and check the LCD on. If it”s not on, please refer to chapter 4. Always connect the battery first, in order to allow the controller to recognize the system voltage.
3) The battery fuse should be installed as close to battery as possible. The suggested distance is within 150mm.
4) The Tracer A series is a positive ground controller. Any positive connection of solar, load or battery can be earth grounded as required.

CAUTION:

Unplug the RTS, the temperature of battery will be set to a fixed value 25 ºC.
Please connect the inverter to the battery rather than to the controller, if the inverter is necessary.

3.1 LCD DISPLAY & BUTTON FUNCTION

Button Function

SELECT Button: Browse interface, setting parameter

ENTER Button: Load ON/OFF, clear error, enter into set mode, save data

LCD Display

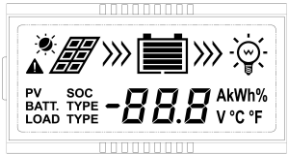


Figure 3-1 LCD

Status Description

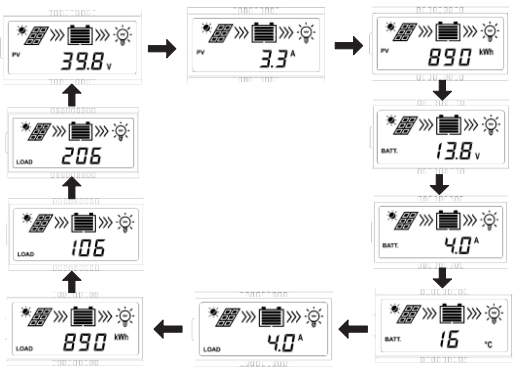
Item	Icon	Status
PV Array		Day
		Night
		No Charging
		Charging
	PV	PV Voltage, Current, Power
Battery		Battery Capacity, In Charging
	BATT.	Battery Voltage, Current, Temp.
	BATT. TYPE	Battery Type
Load		Load ON
		Load OFF
	LOAD	Load Voltage, Current, Load Mode

3.2 FAULT INDICATION

Status	Icon	Description
Battery over discharged	⚠	Battery level shows empty, battery frame blink, fault icon blink
Battery over voltage	⚠	Battery level shows full, battery frame blink, fault icon blink
Battery over temperature	⚠	Battery level shows current value, battery frame blink, fault icon blink
Load failure	⚠	Load overload*, Load short circuit

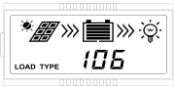
* When load current reaches1.02-1.05 times 1.05-1.25 times, 1.25-1.35 times and 1.35-1.5 times more than nominal value, controller will automatically turn off loads in 50s, 30s,10s and 2s respectively.

Browse Interface



NOTE:

1) When no operation, the interface will be automatic cycle, but the follow two interfaces not be display.



2) Accumulative power zero clearing: Under PV power interface, press ENTER button and hold on 5s then the value blink, press ENTER button again to clear the value.
3) Setting temperature unit: Under battery temperature interface, press ENTER button and hold on 5s to switch.

3.3 PARAMETERS SETTING

Load Mode Setting

Set Load modes under below interface.

Operating Steps:

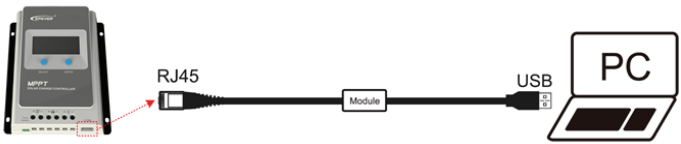
Under load mode setting interface, press ENTER button and hold on 5s till the number begin flashing, then press SELECT button to set the parameter, press ENTER button to confirm.

1**	Time 1	2**	Time 2
100	Light ON/OFF	2 N	Disabled
101	Load will be on for 1 hour since sunset	201	Load will be on for 1 hour before sunrise
102	Load will be on for 2 hours since sunset	202	Load will be on for 2 hours before sunrise
103~113	Load will be on for 3~13 hours since sunset	203~213	Load will be on for 3~13 hours before sunrise
114	Load will be on for 14 hours since sunset	214	Load will be on for 14 hours before sunrise
115	Load will be on for 15 hours since sunset	215	Load will be on for 15 hours before sunrise
116	Test mode	2 N	Disabled
117	Manual mode(Default load ON)	2 N	Disabled

NOTE:
Please set Light ON/OFF, Test mode and Manual mode via Timer1. Timer2 will be disabled and display 2 N

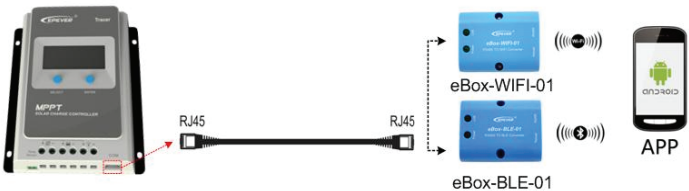
Setting the battery parameters by PC software

Connect the controller's RJ45 interface to the PC's USB interface via a USB to RS485 cable (model: CC-USB-RS485-150U). When selecting the battery type as "USE," set the battery voltage parameters by the PC software. Refer to the cloud platform manual for detail.



Setting the battery parameters by APP

Connect the controller to the WIFI module through a standard network cable or connect to the Bluetooth module by Bluetooth signal.
When selecting the battery type as "USE," set the battery voltage parameters by the APP. Refer to the cloud APP manual for details.



Setting the battery parameters via the LCD

Step 1: On the battery voltage interface, press and hold the ENTER button to enter the battery type interface.

Step 2: Press the SELECT button to change the battery type, such as selecting the “GEL”; and then press the ENTER button to confirm and back to the battery voltage interface automatically.

Step 3: On the battery voltage interface, press and hold the ENTER button to enter the battery type interface again.

Step 4: Press the SELECT button to change the battery type to the "USE". Under the "USE" battery type, the battery parameters that can be set via the LCD are shown in the table below:

Parameters	Default	Range	Operation Steps
SYS★	12VDC	12/24 VDC	1) Under the " **USE**" interface, press the **ENTER** button to enter the "SYS" interface. 2) Press the **ENTER** button again to display the current "SYS" value. 3) Press the **SELECT** button to modify the parameter. 4) Press the **ENTER** button to confirm and enter the next parameter.
BCV	14.4V	9~17V	5) Press the **ENTER** button again to display the current voltage value. 6) Press the **SELECT** button to modify the parameter (short press to increase 0.1V, long press to decrease 0.1V). 7) Press the **ENTER** button to confirm and enter the next parameter.
FCV	13.8V	9~17V	
LVR	12.6V	9~17V	
LVD	11.1V	9~17V	
LEN	NO	YES/NO	Press the **SELECT** button to modify the switch status. **Note: It exists automatically from the current interface after no operation of more than 10S.**

*The SYS value can only be modified under the non-lithium "USE" type. That is, the battery type is Sealed, Gel, or Flooded before entering the "USE" type, the SYS value can be modified; if it is lithium battery type before entering the "USE" type, the SYS value cannot be modified. Only the above battery parameters can be set on the local controller, and the remaining battery parameters follow the following logic (the voltage level of 12V system is 1, the voltage level of 24V system is 2).

3.4 BATTERY TYPE

Operating Steps

Under Battery Voltage interface, long press ENTER button enter into the interface of Battery type setting. After choosing the battery type by pressing SELECT button, waiting for 5 seconds or pressing ENTER button again to modify successfully.

Battery Type

Sealed Gel Flooded User

Battery Voltage Parameters (parameters is in 12V system at 25°C, please use double value in 24V.)

Battery charging setting	Sealed	Gel	Flooded	User
Over Voltage Disconnect Voltage	16.0V	16.0V	16.0V	9~17V
Charging Limit Voltage	15.0V	15.0V	15.0V	9~17V
Over Voltage Reconnect Voltage	15.0V	15.0V	15.0V	9~17V
Equalise Charging Voltage	14.6V	-	14.8V	9~17V
Boost Charging Voltage	14.4V	14.2V	14.6V	9~17V
Float Charging Voltage	13.8V	13.8V	13.8V	9~17V
Boost Reconnect Charging Voltage	13.2V	13.2V	13.2V	9~17V
Low Voltage Reconnect Voltage	12.6V	12.6V	12.6V	9~17V
Under Voltage Warning Reconnect Voltage	12.2V	12.2V	12.2V	9~17V
Under Volt. Warning Volt.	12.0V	12.0V	12.0V	9~17V
Low Volt. Disconnect Volt.	11.1V	11.1V	11.1V	9~17V
Discharging Limit Voltage	10.6V	10.6V	10.6V	9~17V
Equalize Duration (min.)	120	-	120	0~180
Boost Duration (min.)	120	120	120	10~180

NOTE:

1) When the battery type is sealed, gel, flooded, the adjusting range of equalize duration is 0 to180min and boost duration is 10 to180min.
2) The following rules must be observed when modifying the parameters value in user battery type (factory default value is the same as sealed type):

a. Over Voltage Disconnect Voltage > Charging Limit Voltage ≥ Equalize Charging Voltage ≥ Boost Charging Voltage ≥ Float Charging Voltage > Boost Reconnect Charging Voltage.
b. Over Voltage Disconnect Voltage > Over Voltage Reconnect Voltage
c. Low Voltage Reconnect Voltage > Low Voltage Disconnect Voltage ≥ Discharging Limit Voltage.
d. Under Voltage Warning Reconnect Voltage > Under Voltage Warning Voltage ≥ Discharging Limit Voltage.
e. Boost Reconnect Charging voltage > Low Voltage Disconnect Voltage.

CAUTION:

Please refer to user guide or contact with the sales for the detail of setting operation.

Lithium Battery voltage parameters

Battery charging setting	LFP		LNCM			
	LFP4S	LFP8S	LCNM 3S	LCNM 6S	LCNM 7S	User*
Over Voltage Disconnect Voltage	14.8V	29.6 V	12.8 V	25.6 V	29.8 V	9~17V
Charging Limit Voltage	14.6 V	29.2 V	12.6 V	25.2 V	29.4 V	9~17V
Over Voltage Reconnect Voltage	14.6 V	29.2 V	12.5 V	25.0 V	29.1 V	9~17V
Equalize Charging Voltage	14.5 V	29.0 V	12.5 V	25.0 V	29.1 V	9~17V
Boost Charging Voltage	14.5 V	29.0 V	12.5 V	25.0 V	29.1 V	9~17V
Float Charging Voltage	13.8 V	27.6 V	12.2 V	24.4 V	28.4 V	9~17V
Boost Reconnect Charging Voltage	13.2 V	26.4 V	12.1 V	24.2 V	28.2 V	9~17V
Low Voltage Reconnect Voltage	12.8 V	25.6 V	10.5 V	21.0 V	24.5 V	9~17V

Under Voltage Warning Reconnect Voltage	12.2 V	24.4 V	12.2 V	24.4 V	28.4 V	9~17V
Under Voltage Warning Voltage	12.0 V	24.0 V	10.5 V	21.0 V	24.5 V	9~17V
Low Voltage Disconnect Voltage	11.1 V	22.2 V	9.3 V	18.6 V	21.7 V	9~17V
Discharging Limit Voltage	11.0 V	22.0 V	9.3 V	18.6 V	21.7 V	9~17V

NOTE:

*The battery parameters under the "User" battery type is 9-17V for LFP4S. They should x2 for LFP8S.

- **When the battery type is "USE," the Lithium battery voltage parameters follow the following logic:**

a. Over Voltage Disconnect Voltage>Over Charging Protection Voltage (Protection Circuit Modules(BMS) +0.2V;
b. Over Voltage Disconnect Voltage>Over Voltage Reconnect Voltage ＝Charging Limit Voltage ≥ Equalize Charging Voltage＝Boost Charging Voltage ≥ Float Charging Voltage> Boost Reconnect Charging Voltage;
c. Low Voltage Reconnect Voltage > Low Voltage Disconnect Voltage ≥ Discharging Limit Voltage.
d. Under Voltage Warning Reconnect Voltage>Under Voltage Warning Voltage≥ Discharging Limit Voltage;
e. Boost Reconnect Charging voltage> Low Voltage Reconnect Voltage;
f. Low Voltage Disconnect Voltage ≥ Over Discharging Protection Voltage (BMS)+0.2V

4.1 PROTECTION

- PV Over Current: The controller will limit charge power in rated charge power. An over-sized PV array will not operate at maximum power point.
- PV Short Circuit: When PV short circuit occurs, the controller will stop charging. Clear it to resume normal operation.
- PV Reverse Polarity: Fully protection against PV reverse polarity, no damage to the controller will result. Correct the miswire to resume normal operation.

WARNING: Controller will be damaged when the PV array reverse polarity and the actual operation power of the PV array is 1.5 times greater than the rated charge power!

- Battery Reverse Polarity: Fully protection against battery reverse polarity, no damage to the controller will result. Correct the miswire to resume normal operation.
- Battery Over voltage: When battery voltage reach to the voltage set point of Over Voltage Disconnect, the controller will stop charging the battery to protect the battery overcharge to break down.
- Battery Over discharge: When battery voltage reach to the voltage set point of Low Voltage Disconnect , the controller will stop discharging the battery to protect the battery over discharged to break down.
- Battery Overheating: The controller detect the battery temperature through the external temperature sensor. If the battery temperature exceeds 65ºC, the controller will automatically start the overheating protection to stop working and recover below 55 ºC.
- Load Overload: If the load current exceeds the maximum load current rating 1.05 times, the controller will disconnect the load. Overloading must be cleared up through reducing the load and restarting controller.
- Load Short Circuit: Fully protected against load wiring short-circuit. Once the load shorts (more than quadruple rate current), the load short protection will start automatically. After five automatic load reconnect attempts, the fault must be cleared by restarting controller.
- Damaged Remote Temperature Sensor: If the temperature sensor is short-circuited or damaged, the controller will be charging or discharging at the default temperature 25°C to prevent the battery damaged from overcharging or over discharged.
- Controller Overheating: If the temperature of the controller heat sinks exceeds 85°C, the controller will automatically start the overheating protection and recover below 75°C.
- High Voltage Transients: PV is protected against small high voltage surge. In lightning prone areas, additional external suppression is recommended.

4.2 TROUBLESHOOTING

Faults	Possible Reasons	Troubleshooting
The LCD is off during daytime when sunshine falls on PV modules properly	PV array disconnection	Confirm that PV and battery wire connections are correct and tight
Wire connection is correct, LCD not display	Battery voltage is lower than 9V	Please check the voltage of battery. At least 9V voltage to activate the controller
⚠  Interface blink	Battery voltage higher than over voltage disconnect voltage(OVD)	Check if the battery voltage is too high, and disconnect the solar module
⚠  Interface blink	Battery under voltage	Load output is normal, charging LED indicator will return to green automatically when fully charged
⚠  Interface blink	Battery low voltage disconnect	The controller will cut off the output automatically, LED indicator will return to green automatically when fully charged
⚠  Interface blink	Over load or Short circuit	Remove or reduce the load and press the button, the controller will resume to work after 3 seconds

4.3 MAINTENANCE

The following inspections and maintenance tasks are recommended at least two times per year for best performance.

- Make sure controller firmly installed in a clean and dry ambient.
- Make sure no block on air-flow around the controller. Clear up any dirt and fragments on radiator.
- Check all the naked wires to make sure insulation is not damaged for serious solarisation, frictional wear, dryness, insects or rats etc. Repair or replace some wires if necessary.
- Tighten all the terminals. Inspect for loose, broken, or burnt wire connections.
- Check and confirm that LCD is consistent with required. Pay attention to any troubleshooting or error indication .Take corrective action if necessary.
- Confirm that all the system components are ground connected tightly and correctly.
- Confirm that all the terminals have no corrosion, insulation damaged, high temperature or burnt/discolored sign, tighten terminal screws to the suggested torque.
- Check for dirt, nesting insects and corrosion. If so, clear up in time.
- Check and confirm that lightning arrester is in good condition. Replace a new one in time to avoid damaging of the controller and even other equipments.

WARNING:

Risk of electric shock! Make sure that all the power is turned off before above operations, and then follow the corresponding inspections and operations.

5. SPECIFICATIONS

Voltage: 12/24V, 20A
Max. PV Voltage: 100V
Max. PV Input Power: 260W (12V), 520W (24V)
Battery support:
Sealed, gel or flooded Lead-acid (9~17V/12V; 18~34V/24V)
LiFePO4 (12V/24V)
Li(NiCoMn)O2 (12V/24V)
Weight: 940g
Dimensions: 221(H) x 155(W) x 52(D)mm

Environmental Parameters:

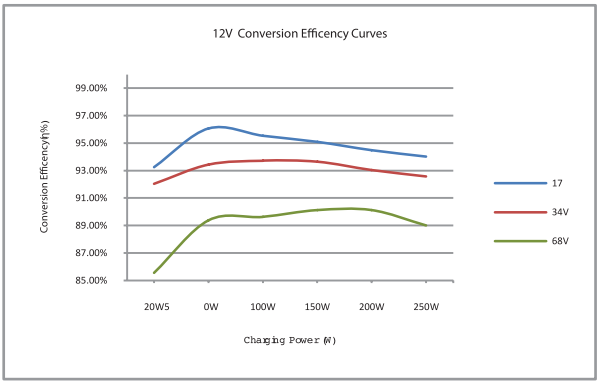
LCD Temperature Range -	-20°C ~ +70°C
Working Environment Temperature Range*:	-25°C ~ +45°C
Storage Temperature Range:	-35°C ~ +80°C
Humidity Range:	≤95% (N.C.)
Enclosure IP Rating:	IP30

*Please operate controller at permitted ambient temperature. If over permissible range, please derate capacity in service.

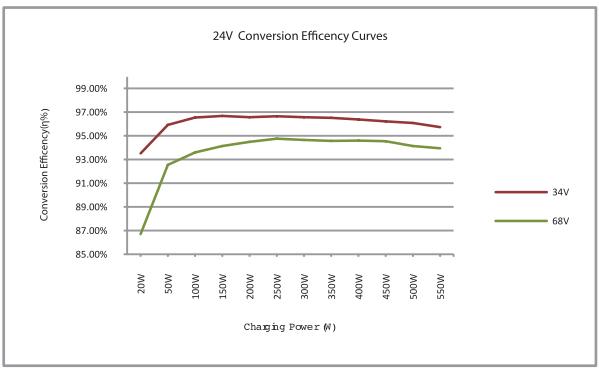
ANNEX I CONVERSION EFFICIENCY CURVES

Illumination Intensity: 1000W/m2 Temp: 25°C

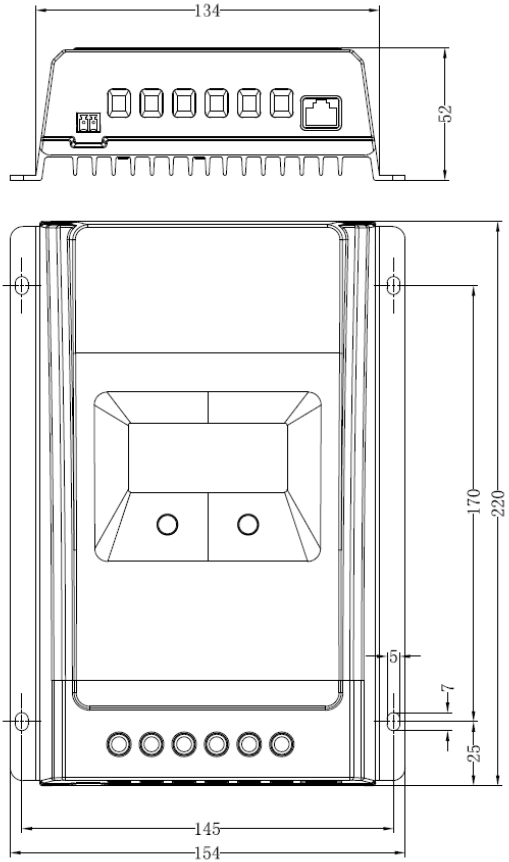
Solar Module MPP Voltage(17V, 34V, 68V) / Nominal System Voltage(12V)



1. Solar Module MPP Voltage(33V, 68) / Nominal System Voltage(24V)



ANNEX II DIMENSIONS



Distributed by:
TechBrands by Electus Distribution Pty. Ltd.
320 Victoria Rd, Rydalmere
NSW 2116 Australia

Ph: 1300 738 555
Int'l: +61 2 8832 3200
Fax: 1300 738 500

www.techbrands.com

Made in China