

# ***POWERTECH***



Solar System Controller

User Manual

MP-3731

These operating instructions come with the product and should be kept with it as a reference to all users of the product.

- Read these operating instructions carefully before use, Keep them over the
- entire life of the product,
- And pass them on to any future owner or user of this product.

This manual describes the installation, function, operation and maintenance of the solar system controller MP-3731.

These operating instructions are intended for end customers. A technical expert must be consulted in cases of uncertainty.

## **SAFETY**

1. The solar controller may only be used in PV systems for charging Lead-Acid type batteries. This includes: SLA, VRLA, Lead-Calcium, AGM and GEL.  
**Note: Users should always refer to battery manufacturer/supplier's recommended values for battery charging settings and float voltage setting.**
2. No energy source other than a solar panel (PV) may be connected to the solar charge controller.
3. Do not connect any defective or damaged measuring equipment.
4. Follow the general and national safety and accident prevention regulation.
5. Never alter or remove the factory plates and identification labels.
6. Keep children away from PV & Battery systems.
7. Never open the device. (No user serviceable parts inside).
8. One set solar module can connect with one controller only.
9. Never touch bare cables.

## **OTHER RISKS**

### **Danger of fire and explosion**

- ◆ Do not use the solar charge controller in dusty environments, in the vicinity of solvents or where inflammable gases and vapors can occur.
- ◆ No open fires, flames or sparks in the vicinity of the batteries.
- ◆ Ensure that the room is adequately ventilated.
- ◆ Check the charging process regularly.
- ◆ Follow the charging instructions of the battery manufacturer.

### **Fault behavior**

**Operating the solar charge controller is dangerous in the following situations:**

- ◆ The solar charge controller does not appear to function at all.
- ◆ The solar charge controller or connected cables are visibly damaged.
- ◆ Emission of smoke or fluid penetration.
- ◆ When parts are loose.

**If any of these occur, immediately disconnect the solar charge controller from the solar panels and battery.**

## FUNCTIONS

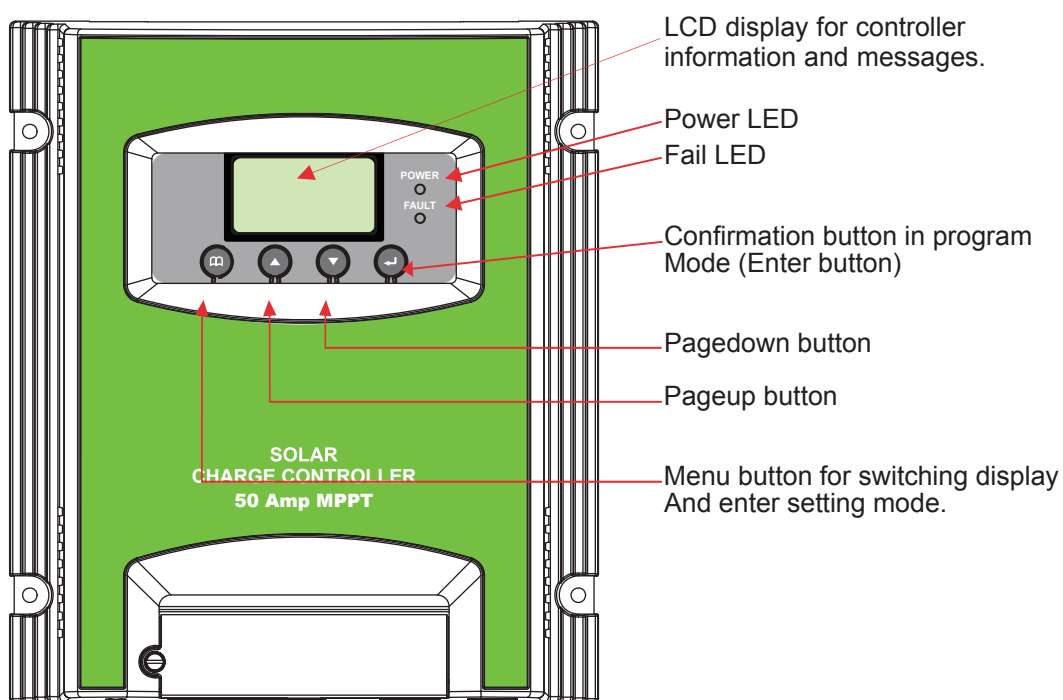
This solar system controller is designed to

- ◆ Monitor the state of charge of the battery;
- ◆ Controls the charging process,
- ◆ Charging Voltage is user programmable.
- ◆ Make sure Solar system works at proper condition.

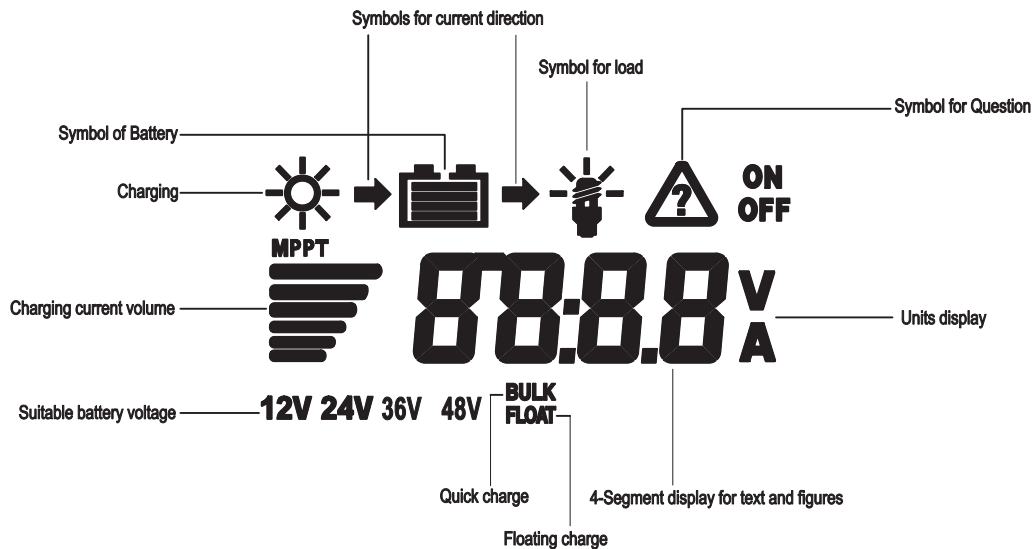
## OPERATING THE CONTROLLER

The display shows a variety of system data by symbols and digits. Both buttons control all settings and display windows.

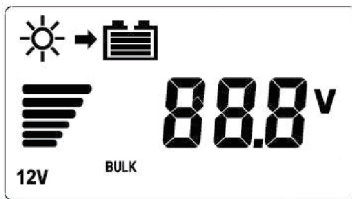
### **1. Display and operation elements.**



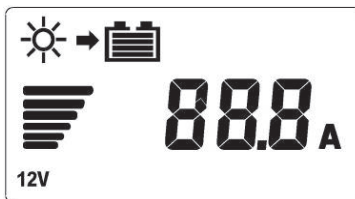
## 2. Display window.



Change the display windows with the “Menu” button; (e.g. for 12V battery)



1. The default window will show like below, battery voltage/capacity volume of the battery.



2. Press “menu” button once to check charging current.

## 3. How to set up BULK/FLOAT voltage and DC load output function.

### 1. Charging Voltage Check & Program

Press “menu” button 3 times. Window will switch to show BULK voltage setting. To change this setting; Press “enter” button once, you can program charge voltage via Pageup/Pagedown button:

12V Battery(14.0V-14.8V);24V Battery(28.0V-29.5V);36V Battery(42.0V-44.3V);48V Battery(56.0V-59.0V)

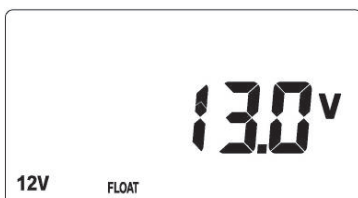
Press “enter” or “menu” button to save setting.



2. Press “menu” button 4 times. Window will switch to show FLOAT voltage setting. To change this setting; Press “enter” button once; you can program Float voltage via Pageup/Pagedown button:

12V Battery(13.0V-13.8V);24V Battery(26.0V-27.5V);36V Battery(39.0V-41.3V);48V Battery(52.0V-55.0V)

Press “enter” or “menu” button to save setting.




3. Note: When the "Sensor Temp" port is inserted into the temperature sensor, Float voltage will vary accordingly to the ambient temperatures stated below:

12V system:  $\leq 0^{\circ}\text{C}$  (14.1V),  $0^{\circ}\text{C} - 20^{\circ}\text{C}$  (13.8V),  $\geq 20^{\circ}\text{C}$  (13.5V);

24V system:  $\leq 0^{\circ}\text{C}$  (28.2V),  $0^{\circ}\text{C} - 20^{\circ}\text{C}$  (27.6V),  $\geq 20^{\circ}\text{C}$  (27.0V);

36V system:  $\leq 0^{\circ}\text{C}$  (42.3V),  $0^{\circ}\text{C} - 20^{\circ}\text{C}$  (41.4V),  $\geq 20^{\circ}\text{C}$  (40.5V);

48V system:  $\leq 0^{\circ}\text{C}$  (56.4V),  $0^{\circ}\text{C} - 20^{\circ}\text{C}$  (55.2V),  $\geq 20^{\circ}\text{C}$  (54.0V);

4. When the unit is in the default display mode, Pressing the "enter" button will turn the load ON or OFF manually. The arrow/lamp symbol  will be displayed when the load terminal is ON.

## **FEATURES**

1. Use with 12V/24V/36V/48V battery bank, the controller will detect voltage of battery automatically. With 3 charging stage: MPPT, constant voltage charging, and float charging, they are automatically performed.

2. MPPT function - Implementing the latest MPPT technology the controller is able to harness the panels maximum available output at all times.

3. Temperature Compensation

ISC5040 has an internal ambient temperature sensor that compensates during the float mode.

4. DC Load Output

12/24/36/48V Max Output Current 50 A.

## **INSTALLATION**

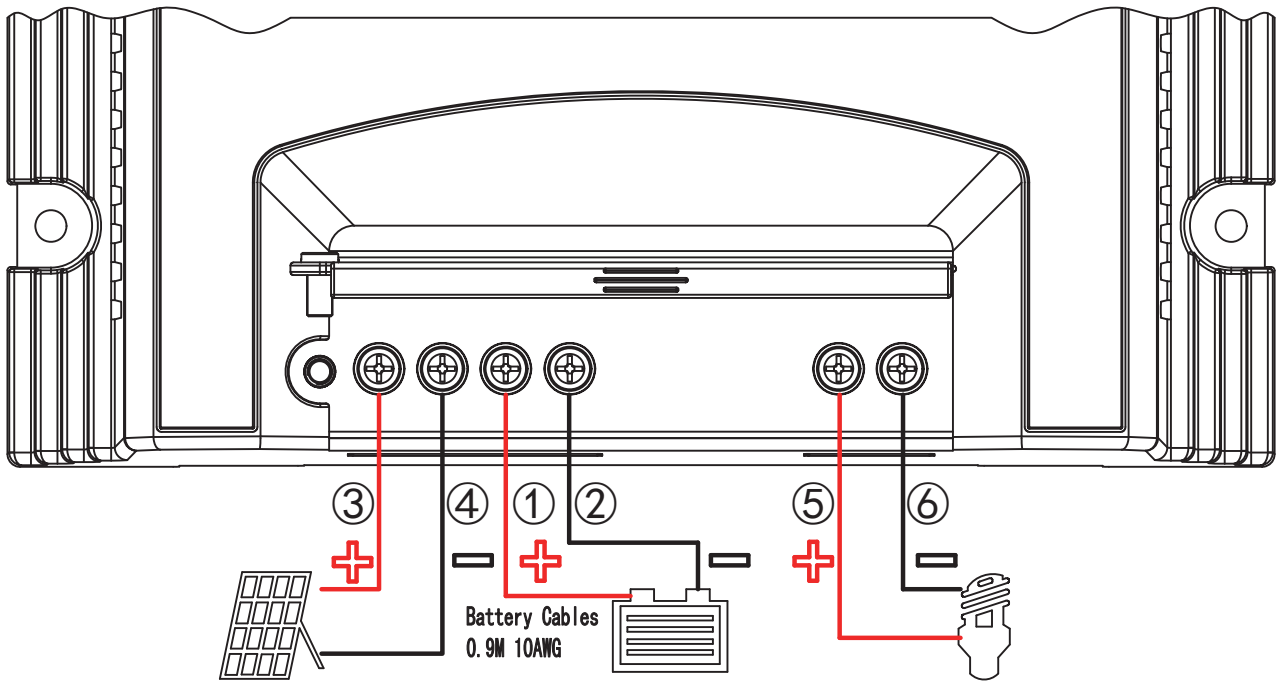
- Install the controller in a ventilated area away from flammable materials and gases.
- The surface should be solid, even, dry and nonflammable.
- The battery to controller cable should be as short as possible (1-2mtrs is ideal) and be of a suitable diameter to minimize voltage loss.
- Do not assemble outdoor, the unit should be installed in the way to be protected against humidity, dripping, rainwater as well as direct and indirect heat (sunlight).
- To ensure the air circulation for cooling an area of 15cm on each side of the unit must be kept free.
- The LCD display should be protected against UV rays (e.g. sunlight). Long time exposure to UV rays can permanently discolor the LCD.
- Follow the installation and operating instructions for all components of the PV system.
- Ensure that no cables are damaged.
- Ensure that polarity of Solar panel/battery/load is correct and use only insulated tools.

## **WARNING**

MP-3731 can work with input voltage up to 95 Vdc maximum; when installing at this voltage, particularly with regard to module open circuit voltage (Voc), the entire solar energy system must be installed with protection class II. Cover solar modules during installation and use only insulated tools.

DC load external power supply or battery is prohibited.

## CONNECTING / DISCONNECTING SYSTEM SEQUENCE



Max. 650W PV array for 12V battery

Max. 1300W PV array for 24V/36V/48V battery

- Connect the wires in the sequence from 1 to 6 according to the above diagram; when Disconnect the wires in the REVERSE sequence from 6 to 1 according to the above diagram.
- Use with 12V/24V/36V/48V battery bank, (controller will detect voltage of battery automatically).
- Never exceed the nominal ratings (see below technical data for reference).
- Suggested cable length, 10m solar panel connection cable/2m battery connection cable.

**Note: Solar input is disconnecting and then reconnection, It need more than 5 seconds.**

### **1. Attention when connection:**

A: you need confirm the battery if it is 12V/24V/36V/48V, the unit just can use 12V/24V/36V/48V Lead-Acid battery and can't for other specifications of the battery now.

B: Solar panels open circuit voltage (VOC):  
the system of 12V battery for 16-95VDC solar panel  
the system of 24V battery for 32-95VDC solar panel  
the system of 36V battery for 48-95VDC solar panel  
the system of 48V battery for 64-95VDC solar panel

### **2. How to choose each connection cable:**

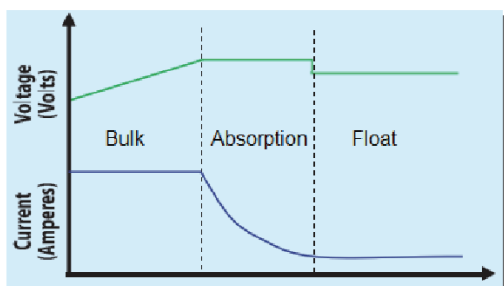
A: The requirements of PV panel to controller cable: PV1-F cable, PV TUV 2PFG 1169 length less than 8 meters, diameter 8-10 mm<sup>2</sup>

B: The requirements of battery to controller cable: UL1015 or same specification. Pure copper cable, length of 8AWG cable is 1.45 meters or length of 10AWG cable is 0.9 meter. Length tolerance of cable allowed only 5 mm. otherwise there will be big effect to charging voltage.

## SPECIFICATIONS

PV Input	Max. PV Array Power(Pmax) @12V Battery	650W
	Max. PV Array Power(Pmax) @24/36/48V Battery	1300W
	Max. PV Array Voltage (VOC)	95VDC
	PV Array MPPT Voltage Range	16-76VDC
	PV Array open circuit Voltage Range @12V Battery	16-95VDC
	PV Array open circuit Voltage Range @24V Battery	32-95VDC
	PV Array open circuit Voltage Range @36V Battery	48-95VDC
	PV Array open circuit Voltage Range @48V Battery	64-95VDC
	MPPT efficiency	≥99%
Output	Battery Rated Voltage	12V/24V/36V/48V DC
	12V Battery Charging Current	50ADC
	24V Battery Charging Current	50ADC
	36V Battery Charging Current	35ADC
	48V Battery Charging Current	25ADC
	Adjustable Charge Voltage(Bulk)	14. 0-14. 8V/28. 0-29. 5V/42. 0-44. 3V/56. 0-59. 0V
	Adjustable Charge Voltage(Float)	13. 0-13. 8V/26. 0-27. 5V/39. 0-41. 3V/52. 0-55. 0V
DC Load Output	Max. Load Current	50A
	DC Load output voltage	Battery Voltage
	Over Discharge Voltage	11.3/22.6/34.2/45.6
Max. Night standby current		60mA
Operating Temperature Range		-10° C/+50° C

## CHARGING CURVE



**Bulk:** This is the first stage (MPPT) where the battery is in a low charge state. During this stage the controller delivers all of the available solar power to the Battery system.

**Absorption:** In this stage (Constant Voltage) the controller charges at a constant voltage as the amount of current required to charge the battery is decreasing. The constant voltage regulation prevents overheating and excessive battery out-gassing; this stage will end when the battery charge current reduces to below 4 Amps OR after 4 hours of entering absorption mode.

**Float (Maintenance):** After the battery is fully charged, the controller reduces to a lower Constant Voltage setting to maintain the Battery (also called trickle charge).

## PROTECTION FUNCTIONS

- ◆ Overcharge protection
- ◆ Battery under-voltage protection
- ◆ Solar panel reverse current protection

The following installation faults do not destroy the controller. After correcting the fault, the device will continue to operate correctly:

- ◆ Overcharge protection
- ◆ Reverse polarity protection of panel and battery
- ◆ Automatic electronic fuse
- ◆ Open circuit protection without battery
- ◆ Reverse current protection at night

## MAINTENANCE

The controller is maintenance-free. We strongly suggest that all components of the PV system must be checked at least annually,

- ◆ Ensure adequate ventilation of the cooling element
- ◆ Check the cable strain relief
- ◆ Check that all cable connections are secure
- ◆ Tighten screws if necessary
- ◆ Terminal corrosion









## ERROR MESSAGES

Caution! Please do not open the controller or attempt to replace components when troubleshooting. Improper maintenance can be hazardous to the user and the system.

If the controller detects errors or unauthorized operating states, it shows error codes on the display. Error codes can generally be differentiated, whether there is a temporary malfunction, e.g. regulator overload or a more serious system error that can be remedied by appropriate external measures.

Since not all errors can be simultaneously displayed, the error with the highest error number (priority) is displayed. If several errors are present, the second error code is displayed after remedying the more significant error.

The following meaning is assigned to the different error codes:

1.  Meaning: Battery reverse polarity warning, Red LED is shining.  
  
Remedy: Reconnect battery correctly.
2.  Meaning: Battery Voltage (Too high or too low), Red LED is shining.  
  
Remedy: Check battery voltage it might be too low or too high, possible recharge battery manually. If battery can't be recharged, Replace battery & re-check.
3.  Meaning: Over current at the load output.  
 Red LED is shining
4.  Meaning: Temperature is too high for the unit.  
 Red LED is shining  
Remedy: Stop charging for a while to cool down the unit.

**Remark:** When PV connected into the system, while battery disconnected, E1 and E2 may occur. This is normal.



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