

User Manual

- Installation
- Operation
- Maintenance



MPPT

(Maximum power point tracking)

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Introduction

Welcome to the ever-increasing family of satisfied user.

All **POWERLINE** products, like the one you have just purchased, Undergo a stringent quality check. The product is designed to provide you with an efficient performance with minimal care and maintenance at your end. This manual will facilitate you to not only understand the basic working of the MPPT but also facilitate the ease of its maintenance and use.

For readers

This manual is applicable for technicians of MPPT installation, operation and maintenance. The readers shall be familiar with electrical knowledge.

About this manual

Please read this manual carefully before using products. Operator using this manual must be qualified electronics engineer or he should know proper installation.

Applicable Models

This manual provides the installation, operation and maintenance of MPPT.

The following models are related:



- 24 volt
- 48 volt
- 96 volt
- 120 volt
- 180 volt

Product info

MPPT operates on Solar &Mains for charging purpose. The battery charger uses the solar power (2nd priority to mains) to keep the batteries at an optimal level. When solar supply fails, MPPT charges battery through main. MPPT supply current to the load if battery gets fully charged. If battery discharged upto 60% then MPPT shifts to charging function again and cycle continues.




Safety warnings and instruction

Safety Symbols

	DANGER OF ELECTRICALLY LIVE PARTS Related to potentially hazardous voltage which may cause a serious personal injury or death.
	SAFETY WARNING This symbol is used for Warnings, Cautions and Notes.

The text of this manual contains warnings to avoid risk to persons, to avoid damages to the MPPT system and the supplied critical loads. Do not proceed beyond these warnings if you do not fully understand or are not able to meet the mentioned conditions. The non-observance of the warnings reminding hazardous situations could result in human injury and equipment damage.

Safety Rules

	CAUTION! RISK OF ELECTRIC SHOCK The MPPT has an internal battery supply with a nominal voltage of 48-360 Vdc. The appliance outlets may be electrically live, even when the MPPT is disconnected from the mains. The MPPT contains potentially hazardous voltages. Do not open the unit; there are no user serviceable parts inside.
	CAUTION There may be damage to the equipment if procedures and practices are not strictly observed and followed.
	NOTE Do not attempt to service the MPPT unless you have had proper training. Refer all maintenance and servicing to properly qualified, skilled and competent service personnel.

Qualified, skilled personnel are persons who (because of their training, experience, and position as well as their knowledge of appropriate standards, regulations, health and safety requirements and working conditions) are authorized to be responsible for the safety of the equipment, at all times whilst carrying out their normal duties and are therefore aware of, and can report, possible hazards (observe IEC 60364 and national wiring regulations and accident prevention rules).

Transportation Safety



WARNING!

Please consider the weight of the MPPT. Lift the box with the help of a second person; never try to lift it by yourself!

- No liability can be accepted for any transport damage when the equipment is shipped in non-original packaging.
- Store the MPPT in a dry location with the batteries in a fully charged state. Storage temperature must be within -20 and +50 °C.

System Safety Instruction

Operation Safety

- Prior to the application, please read “Safety Instructions” carefully to ensure correct and safe application. Please keep the user manual.
- During operation, attention should be paid to all warning symbols and operations should be followed strictly as required.
- Equipment is not supposed to be used in environment that directly exposed to sunlight or rain or in a humid environment.
- The equipment should not be installed close to area of thermal sources or any area where there is presence of devices such as electric heaters and furnaces.
- Make sure the safety space should be left for proper ventilation and product maintenance when placing UPS. Refer to the instructions during installation.
- Dry and non-conductive items should be used for cleaning.
- In case of a fire hazard, dry powder extinguisher should be used properly. Using liquid fire extinguishers may result in electric shock hazard.

Electrical Safety

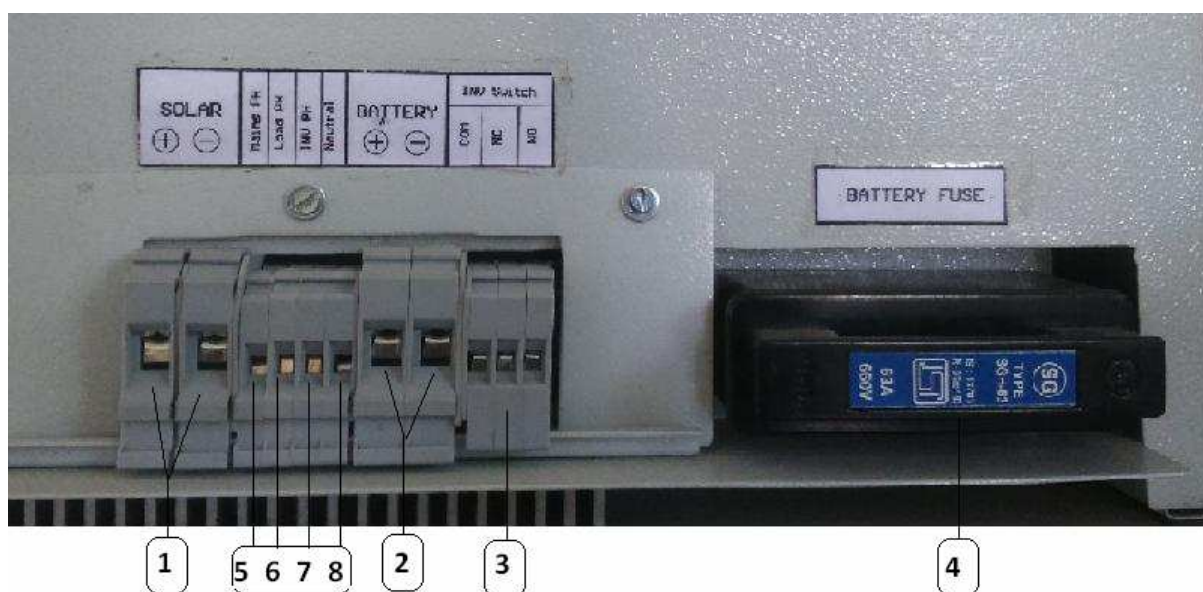
- Before electricity is switched on, make sure earthing is properly done and wire and battery polarity are correctly connected.
- When MPPT relocation or wire reconnection is necessary, AC and battery should be switched off and UPS should be completely turned off, otherwise there might be a danger of electric shock because output terminal might be still electrified.

INSTALLATION

Precautions during installation

- 1) Install the system on the wall from where the batteries are not so far (maximum permissible distance is 6 feet).
- 2) Do not install the system in closed or dusty space. Ventilation for heat is a must.
- 3) Use PVC insulated copper wire of proper gauge, as per the capacity of the system.
- 4) Connect the battery cables first to proper battery polarities. Do not invert polarity.
- 5) Connect the solar cables to proper solar polarities. Do not invert polarity.
- 6) Connect the mains phase and neutral properly
- 7) Then connect the IPS connections (in case of IPS) according to the connection diagram given.
- 8) Avoid installing the system in an excessively humid place or where there is water.
- 9) Care must be taken to ensure that the system is kept away from heat emitting appliances such as heater, blower, oven etc. The system must also be placed in manner that it avoids direct exposure to sunlight.
- 10) To switch off the system in an emergency, use the Key3 (long time) on the front side. Also disconnect the mains/power cord connected to mains phase point (in case of IPS) and remove at least one cable from battery and solar.

Connections



1. Solar

These wires should be connected to solar PV panel. Check the polarity before connecting wires. Connect red wire to solar positive and black wire to solar negative.

Negative terminal is to be connected first and then positive.

12V panel	for 12V system max DC input 14-24 V
24V panel	for 24V system max DC input 30-80V
36V panel	for 36V system max DC Input 40-72V
48V panel	for 48Vsystem max DC input 55-110V
72V panel	for 72Vsystem max DC input 85-145V
96V panel	for 96V system max DC input 110-200V
120V panel	for 120V system max DC input 140-250V
180V panel	for 180V system max DC Input 210-360V
240V panel	for 240V system max DC input 280-480V
360V panel	for 360V system max DC Input 420-720V

2. Battery Cables

These wires are to be connected to the batteries. Red wire is to be connected to the positive (+) terminal of the battery and the black wire is to be connected to the negative (-) terminal of the battery. **Negative terminal is to be connected first and then positive.**

3. Inverter switch

If MPPT worked as IPS, two wires from the inverter ON/OFF switch are connected in COM& NO terminals.

4. Battery fuse

Remove battery fuse before battery connection. Connect battery negative and then battery positive wire and then insert fuse.

5. Mains phase

Connect mains phase in the connecter and neutral in the neutral connecter

6. Load phase

Connect load phase wire in connecter.

7. Inverter phase

Connect inverter phase in connector (only if MPPT worked as IPS)

8. Neutral

Connect neutral of mains is here. Neutral of inverter and load is internally short here.

Installation steps

- 1) Connect the batteries (in series or in parallel) as per system rating and check the battery voltage. The voltage must be matched with system battery rating.
- 2) Connect the battery negative wire first and then battery positive.
- 3) Check, the display of system will be ON.
- 4) Connect the solar panels (in series or in parallel) as per system rating and check the panel voltage. The voltage must within systems solar voltage range.
- 5) Connect the solar negative wire first and then solar positive wire.
- 6) Plug in mains cable in mains socket.

Front Panel



1. MPPT Display



Different technical data is shown on the display which is as follows:

- 1) On the 3rd line we can see the date and time the date is shown in the format as dd/mm/yy while the time is shown as hh:mm:ss.
- 2) **SV:** SV means Solar Voltage; it is shown on the 4th line left side.
- 3) **BV:** BV means Battery voltage; it is shown on the 4th line right side.
- 4) **SC:** SC means Solar Current, it is the current drained from the solar panel. It is shown on the 5th line left side.
- 5) **LD:** LD means load status. It shows that load is driven by solar, mains/grid or inverter. It is shown on the 5th line right side.
LD: SOLAR: - This means your load is driven by the inverter though the mains are present. This condition occurs when the sufficient solar power is present.
LD:Mains:- This means your load is driven by the mains/grid because there is no sufficient power in battery or battery are not fully charged to required level.
LD:Inverter: - This means your load is driven by the inverter because there is no mains/grid supply available.
- 6) **Wattage:** This shows the current power that is generated by the solar panel. It is shown on the 6th line of the display.
- 7) **Energy:** This shows the amount of energy that is generated from the solar panel from the date of installation. It is shown on the 7th line of the display.
- 8) **Tem. Ene:** This also shows the amount of energy generated from the solar panel, but here you have facility to make this count zero. So you can have the track of energy generated for a specific period of time. It is shown on the last line.

2. Keys (Functions)

MPPT Keys functions:

Key1: UP (backup).

Key2: DOWN (Esc).

Key3: OK (yes).

Key4: ENTER (NO).

1. Off:

To turn off the system press key 3 till buzzer will not ring. This will turn off the system and shows the message **"MPPT IS TURNED OFF PRESS KEY4 TO RESTART"**.

2. On:

To turn on the system press key4 till buzzer will not ring. This will turn on the system and system will be reset to its initial condition.

3. Trip:

The trip condition is used to trip or reset the value of temporary wattage. Pressing the key 1 and key 2 at the same time will trip the temporary wattage. Once you have trip the value of temporary wattage it will start to show the total wattage generated from that instant. So it will help you to have track of data for some specific period of time such as for an hour or hours or some days.

Note: The temporary wattage also trip whenever you turn off and on the system.

4. Time and cut off setting Mode:

- Whenever you turn on the system initially (or you can turn off (key3) and turn on (key4) system) it will show you **company logo**.
- Presskey2 and key3 simultaneously.
- Message displays "Want to set time?"
"Press key3 if yes"
"Press key4 if no"
- Press key3 to set date and time or press key4 to set voltages.
- Press key3 message displays *****set the time*****
"Set seconds: 0 "
"Set minutes: "
"Set hours: "
- Set the seconds by key1 & key2 and press key3 for next. Set minutes and hours same and press key4 for next function.
- Message displays *****set the date*****
"Set day: 0 "
"Set date: "
"Set month: "
"Set year: "
- Set the day by key1 & key2 and press key3 for next. Set date, month & year same and press key4 for next function.

- You need not to set the time and date every time after turning on the system.
- Next settings is for IPS so set it as per below settings.

6. Cut off Setting Mode (in case of IPS):

- In this mode you can set the cut off voltages i.e. lower cutoff (11.50v) and higher cutoff (13.8v) voltages by using key1 and key2.
- Lower cutoff vary from 10.8 v to 13 v
- Higher cutoff vary from 10.5 v to 14.2 v
- Press key for next operation.
- You need not to set the cut off voltages every time after turning on the system.

7. Buzzer off: (ERRER)

In case of error message the buzzer will beep continuously so to stop this beeping press key3 (turn off MPPT)

Note: In case of error message before restarting the system **OR** before changing any settings please do concern with your system supplier.

NOTE:

- All cutoffs are set by engineer itself. So no need to change the values.
- Change the cutoffs which you want to change, otherwise skip steps by key4.

MPPT Buzzer Code:

- 1) 3 Beeps:** To indicate that the load is shifted on solar.
- 2) 2Beeps:** To indicate that the load is shifted on inverter.
- 3) 1 Beep:** To indicate that the load is shifted on mains.
- 4) Continuous Beep:** To indicate that an error has occurred and the error message is displayed on the LCD screen.

MPPT Working

➤ **What is MPPT:**

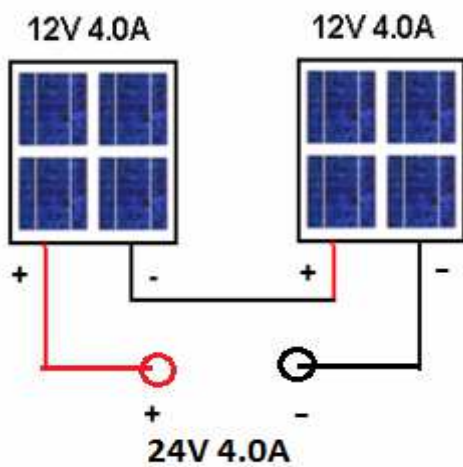
MPPT or Maximum Power Point Tracking is an algorithm included in this system which used for extracting maximum available power from solar panels under certain conditions. The voltage at which solar panels can produce maximum power is called 'maximum power point' (or peak power voltage). Maximum power varies with solar radiation, ambient temperature and solar cell temperature

➤ **How MPPT Works:**

The major principle of MPPT is to extract the maximum available power from solar panel by making them to operate at the most efficient voltage (maximum power point). That is to say: MPPT checks output of solar panels, compares it to battery voltage then fixes what is the best power that panels can produce to charge the battery and converts it to the best voltage to get maximum current into battery

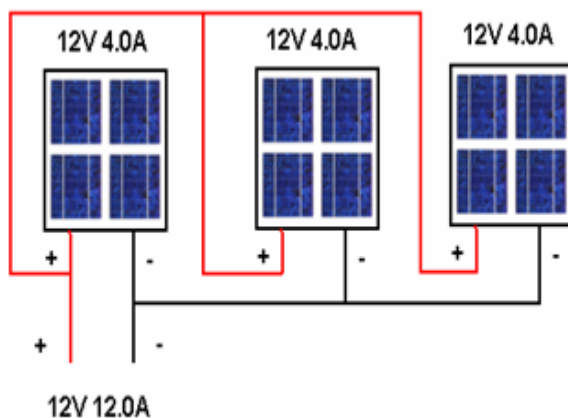
Connections of Battery and Solar panels

1. Series connection of solar panels



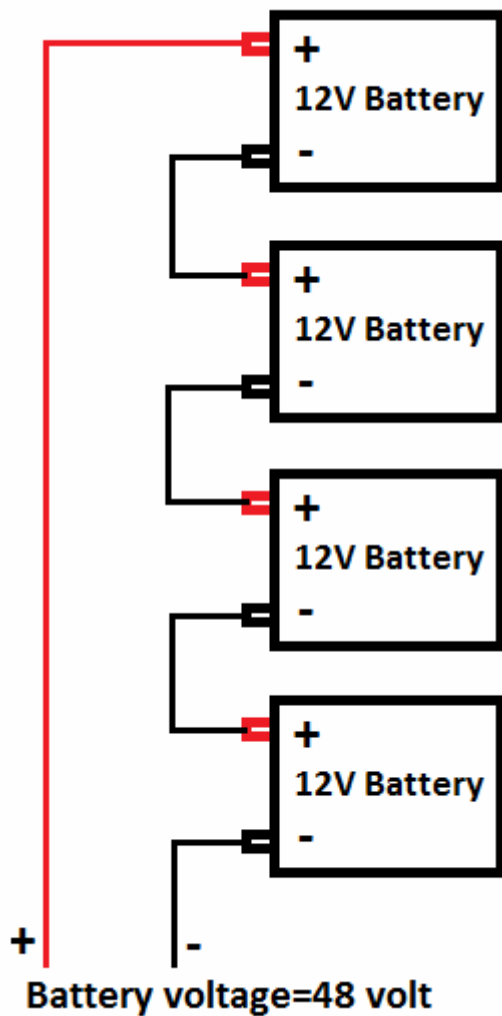
- Series connection of solar panels
- Ex. If 10 no of panels, each of 12V & 4A connected in series gives 120 volt and 4 amp panel combination

2. parallel connection of solar panels



- Parallel connection of solar panels Increases solar current and voltage remains same
- Ex. If 10 no of panels, each of 12V & 4A connected in parallel gives 12 volt and 40 amp panel combination

3. Battery series connection

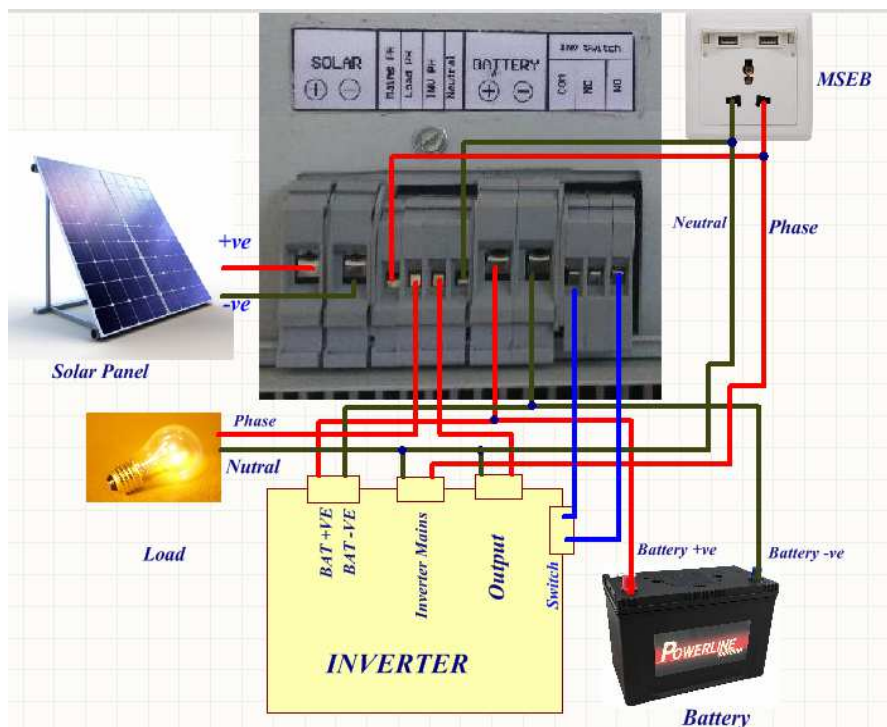


- For higher voltage multiple batteries are connected in series
- Figure shows 48 volt battery connection (four 12 volt batteries in series)
- Battery voltage combinations
 - 1) 24 volt: 2 batteries in series
 - 2) 48 volt: 4 batteries in series
 - 3) 72 volt: 6 batteries in series
 - 4) 120 volt: 12 batteries in series
 - 5) 180 volt: 15 batteries in series
- Batteries are connected in series by using wire link (at least 4mm² gauge)

Connection Diagrams in case of IPS

There are two ways to connect the MPPT IPS with inverter and grid.

1) Connection Diagram Type 1 :



- 1) In this type of connections the output load neutral, mains neutral and the inverter output neutral is made common and is connected to the neutral point at IPS terminal strip.
- 2) The live or phase signal coming from grid is connected to mains phase point.
- 3) The live or phase signal coming from inverter output is connected to inv phase point.
- 4) The live or phase signal going to load is connected to load phase point.
- 5) Connect the inverter on/off switch wires to COM and NO terminal points at wega's connector (Not compulsory).
- 6) Do not connect the grid supply to input of the inverter.

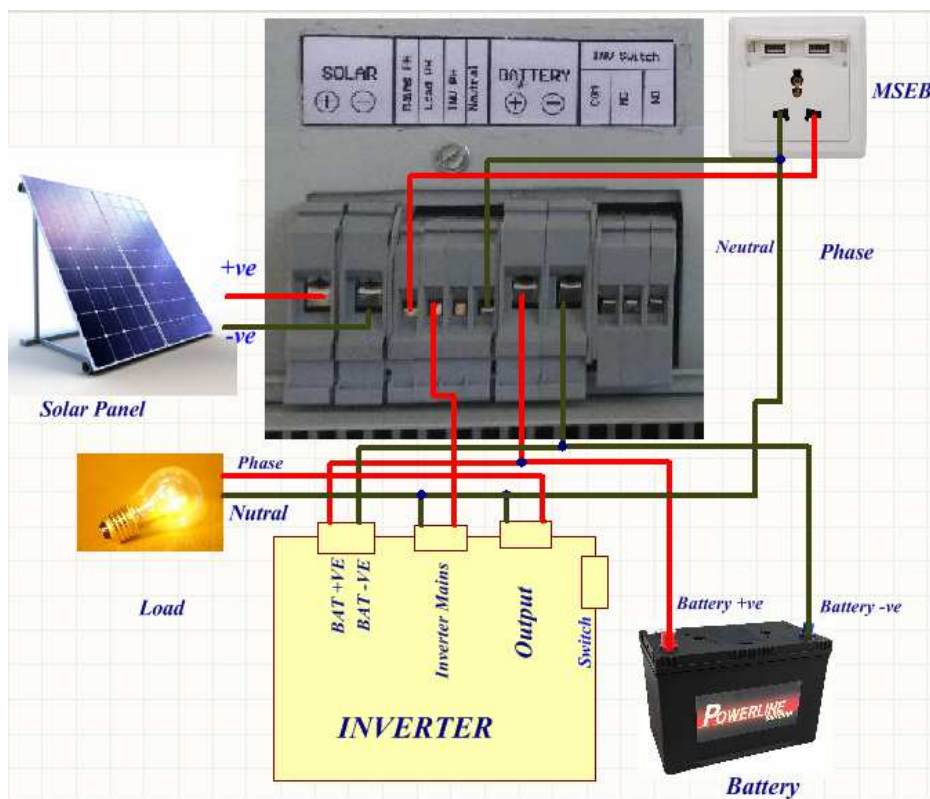
- **Advantages of this type of connection:**

- 1) Battery will never charge from the grid.
- 2) The inverter on/off switch is also operated automatically which will not have on state loss of inverter.
- 3) Battery will only get charged from the solar power.
- 4) Useful where there is no load shading or regular power cut.

- **Disadvantages of this type of connection:**

- 1) As the batteries are only getting charged from solar, in winter or rainy season when the solar power reduce to less than half, you will not get the required backup when there is power cut.
- 2) If you did not connect the inverter switch connections you have to keep the inverter in always ON condition which will cause the ON state or no load loss of the inverter to discharge the batteries slowly.

2) Connection Type 2 :



- 1) In this type of connections mains neutral and the inverter input neutral is made common and is connected to the neutral point at IPS terminal strip.
- 2) The live or phase signal coming from grid is connected to mains phase point.
- 3) The live or phase signal going to the inverter input is connected to the load phase point.
- 4) The load is connected directly at the output of the inverter.
- 5) The inverter switch is kept in its normal position.

- **Advantages of this type of connection:**

- 1) Battery will charge from both solar and grid power.
- 2) In case of power cut, due to fully charged battery you will get proper required backup.
- 3) Inverter switch is not required to be connected to MPPT IPS.

- **Disadvantages of this type of connection:**

- 1) As the battery will get charged from grid also, we will not have fully solar based operation which in turn will not save the required amount of grid power.

Note: If you are using the POWERLINE inverter you will have mains charger on/off option. So you can externally on or off the mains charging, then connection diagram type 2 is more preferable. Otherwise if there is no regular power cut at your location then you should go with connection diagram type 1.

Error Messages and Troubleshooting:

1) High Temperature:

Error: If the temperature of the system or IGBT goes high, the system will go off and you will see the message on LCD display as “System Temperature is high. Please DO Check Cooling System”.

Troubleshooting: In such case turn off the system and remove one of the battery wires and wait for some time and then again connect it.

2) High solar voltage:

Error: If by mistake you connect the wrong panel combination (more panels in series than allowed), the voltage generated goes high, then the system will go off and you will see the message on display as “I/P Voltage is high. Please Do Check It and Panel Combination”.

Troubleshooting: In such case according to your system capacity make the combination of panels such that voltage generated from it should not exceed the maximum permissible value.

3) High Battery voltage:

Error: If the battery wires are not connected properly, they are loose or if the batteries are placed at longer than 6 feet then output of MPPT may increase more than battery voltage, if this happened the system will go off and the output will not be available and you will see the message on display as “O/P Voltage Is High. Please Turn Off The System”.

Troubleshooting: If this happened remove one of the battery wires to turn off the system supply check for any loose contact at battery terminals or at terminal strip.

Note: while installing the system make sure that the battery is not placed more than 6 feet long and there is no loose contact at battery terminals because if there is a loose contact, then it may damage your inverter.

4) High Solar Current:

Error: If by mistake you connect the wrong panel combination (more panels in parallel than allowed), the current generated goes high, then the system will go off and you will see the message on display as “Excess Current Flowing through the System. Please Do Check It and Panel Combination”.

Troubleshooting: In such case according to your system capacity make the combination of panels such that current generated from it should not exceed the maximum permissible value.

5) High Wattage:

Error: If you try to connect the no. of panels than the system capacity, the system will go off and you will see the message on display as “System Capacity Exceed. Please Do Check It or Panel Combination”.

Troubleshooting: To avoid this error never try to connect the more no. of panels than the system capacity.

6) Other errors and how to troubleshoot them (in case of IPS):

- A. **Error:** Some time it may happen that before shifting the load from solar to mains/grid at lower cut off value (if set nearly 10.8V/Battery) your load may go off.

Troubleshoot: In such case take a multi-meter and check the actual battery voltage and the same displaying on MPPT, if they match then there is no problem with the MPPT.

Now check the AC voltage and check the voltage at IPS terminal strip at Main PH, InvPH and Load PH with respect to neutral then you may come to know that what is actually happened.

- B. **Error:** Mains/grid supply is present but not coming to IPS terminal strip.

Troubleshooting: In this case check whether mains cord is loose, wall socket is dead or mains input is too high or low.

- C. **Error:** Voltages are coming to the terminal strip but operation is not going correctly.

Troubleshooting: If such thing happens check if there is any loose contact at output end or at terminal strip.

GSM(Optional):

1) GSM Installation:

- 1) Insert the SIM card that you have in the small box given with the Solar PCU.
- 2) Connect the box with proper connection to the Solar PCU.
- 3) Connect the antenna to the box.

2) GSM User instructions:

1) To know the generation details:

To know the generation details at any particular instant of time you just have to send a SMS as “DATALOG” in capitals to MPPT via registered mobile number.

2) To turn on the system:

- To turn on the system if needed you have to send a SMS as “ON” in capitals to MPPT via registered mobile number.
- This SMS will similarly act as key4 to turn on the system.
- At any time before restarting the system please do confirm that there is no solar current present.

Note: Never try to turn on the system, if it is not in off condition.

3) To turn off the system:

- To turn off the system if needed you have to send a SMS as “OFF” in capitals to MPPT via registered mobile number.
- This SMS will act as key3 to turn off the system.

4) Error message:

In case if any error occurs you will receive the message for same.

The SMS that you will receive is:

- High Temperature Trip.
- Input Voltage High Trip.
- Output Voltage High Trip.
- Excess Current Trip.
- System Capacity Exceeds Trip.

Note: If you not receive the SMS reply in answer, just send the same SMS again after few minutes. Till you are unable to receive the reply please check GSM module at MPPT is in range or not and also check balance in the SIM card that you have inserted in GSM module.

Warranty card

Warranty registration card

Customer information	Name : Address : Mobile no : E-mail : Zip code :
Product information	Name : Model no : Serial no : Invoice no : Purchase date :

Stamp and signature of authorized dealer

Warranty period months(12/24/36)

Customer signature

Warranty statement

To insure a delightful product experience vitronics recommends reading the user guide carefully and contacting our customer care helpline to understand the product warranty period and conditions. In the unlikely event that your vitronics product requires any support, please call our customer care number **020-26962548** or **09404731535**, or email us at service@vitronicscontrols.com .please visit our website www.vitronicscontrols.com for further support details.

Vitronics warrants that the product at the time of its original purchase is free of defects in material and workmanship.

Terms and conditions

1. *The warranty is given to the original purchaser (“customer”) of the product.*
2. *For the entire warranty period vitronics controls or its authorized dealer will be at their discretion, without any charges repair/replace a defective part. Repair or replacement may involve the use of same or equivalent reconditioned unit. Vitronics will return the repaired system or can replace with another same or equivalent product to the customer in full working conditions. All replaced faulty parts or components will become the property of vitronics controls*
3. *For any product repaired or replace during the warranty period, the period of replaced product shall continue to be within warranty period for the remaining time of the original warranty period of original product.*
4. *The warranty will be automatically terminate on the expiry of warranty period, even in case of the product not being in use for specified period*
5. *The warranty will be invalidated if defects arising in company’s opinion by reason of accident, rough handling, exposure to any kind of liquid(water, sweat, oils etc) exposure to moisture, dampness or exposure to extreme thermal or environmental conditions, neglect improper installation (if not taken by company or it’s authorized dealer) fire flood or act of god or any other natural calamities or any other unauthorized repairs or done or carried out will have to be born by the purchaser*
6. *The company will not be held liable in any conditions for any loss or injury or damage caused to line or property or death and disability caused in any form of life for any reason whatsoever*
7. *The warranty will not apply if the original seals are found broken or tampered*
8. *Customer will get site service during warranty period from where he has originally purchased the system. In case if the customer has purchased system along with batteries from Mfgr. then & then the Mfgr. will provide on site service during warranty period only with ref. to the details mentioned in original invoice. In all other conditions at actual charges will be applicable.*
9. *For any claim under the warranty is subject to notifications to vitronics controls or vitronics controls authorized dealer for the alleged defect within a reasonable time of it’s occurrence and in no event not later then expiry of warranty period.*
10. *All claims will be settled in pune jurisdiction only.*