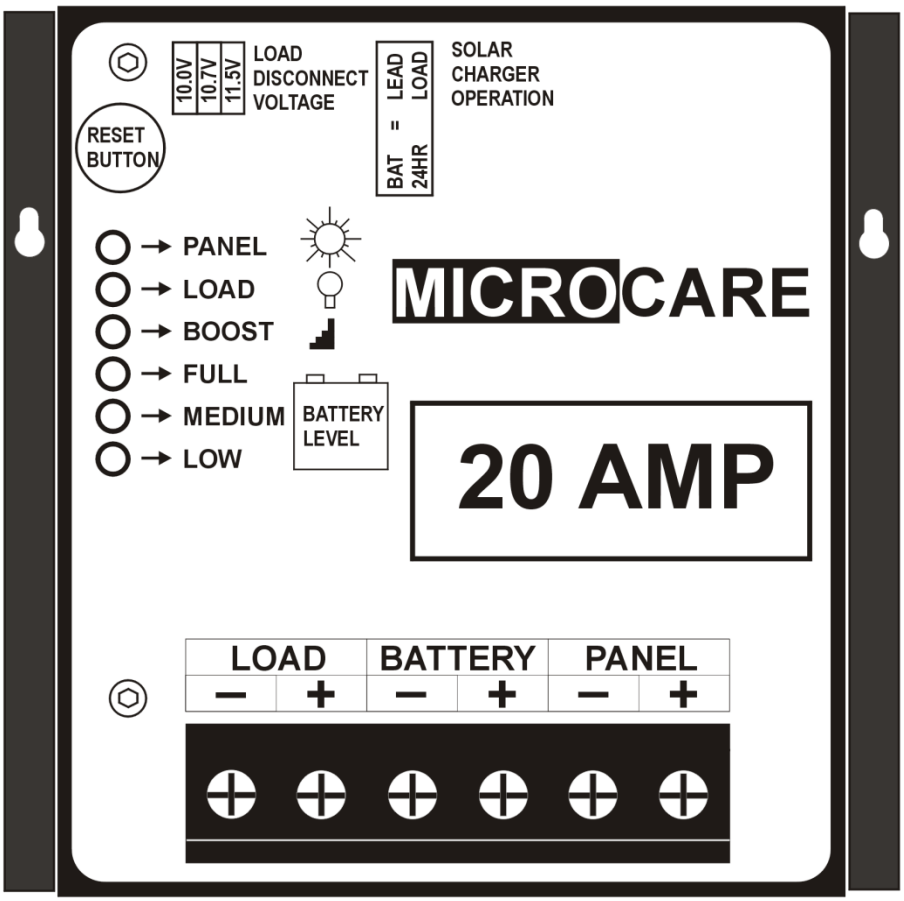
LED MPPT
10 / 20 / 30A
User Manual



Manual Version: LEDMPPT- 2023-1

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IMPORTANT INFORMATION AND SAFTEY INSTRUCTIONS

⚠ INFORMATION

Installers should be qualified electricians or technicians
The installation information in the manual is for information purposes only.
The monitoring and operation information in this manual is intended for anyone who needs to operate the MPPT.
Read the instructions carefully before installing and operating the MPPT.
MPPT connection and installation instructions must be followed.
The unit should only be opened by skilled personal.
Retain the load within in the rating of MPPT to prevent faults.
Keep the MPPT clean and dry.
The MPPT will not operate without batteries.
The MPPT should be installed indoors, in a ventilated and dry area.
Mount the MPPT vertically.
Do not install the MPPT on a rugged or inclined surface.
Do not install the MPPT near water or in damp environments.
Do not install the MPPT where it would be exposed to direct sunlight.
Do not remove the MPPT casing unless the unit needs to be programmed.
Keep the MPPT away from heat emitting sources.
Do not block the MPPT ventilation openings.
Do not leave objects on top of the MPPT
Do not expose the MPPT to corrosive gasses.
Install the MPPT away from any explosive gasses.
Ambient temperature: 0°C – 40°C
Sketches are intended for illustrative purposes only and are not intended to provide an electrical design.
Damage caused by reverse polarity is not covered by warranty.
Do not exceed the MPPT 50 Volt maximum input voltage (Voc) rating.
Refer to your solar module documentation for the worst-case (coldest) module temperature voltage, it should provide the Voc vs. temperature data.

⚠ WARNING

High AC voltage present and is capable of causing severe injury.
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1. INTRODUCTION

1.1 General Description

The Microcare Maximum Power Point Tracker (MPPT) Regulator is designed to interface between the Solar Panel, the Batteries and the Load. The tracker will always find the optimum power point of the solar panel system to ensure that maximum power is extracted from the solar panel and put into the batteries.

By using this system up to 30% more power can be extracted from the solar panel than using shunt or series pass voltage regulators. The Regulator is also able to charge batteries of a lower voltage than the solar panel. By means of LEDs it will show the status of the system. It also incorporates various charge modes which will automatically increase the charge level to the batteries when first starting up or if the battery voltage falls below the minimum volts, the Regulator will read the nominal battery voltage.

This unit is designed to run on a 12/24V battery set where it will then read the solar panel voltage and automatically find the optimum power point. The charging, battery values and boost modes are then automatically adjusted. Via jumpers the load voltage disconnect can be selected, whether the battery is lead acid or sealed, and whether the unit operates as a normal load shedding unit or as a day/night switch.

1.2 Key Features of the Microcare 10-30A LED MPPT Regulator:

- Automatically measures the battery voltage and then sets up the charge parameters (12-24V)
- Operates the Solar Panels at the maximum efficiency
- Can improve power extracted from the solar panels by up to 30% over normal shunt/series pass PWM regulators
- LED Display
- Temperature controlled Cooling Fan
- Selectable low voltage disconnect
- 24 hour load shed or Street Light mode
- Charges batteries by tracking the best power point of the solar panels.

1.3 Maximum PV Array Sizes

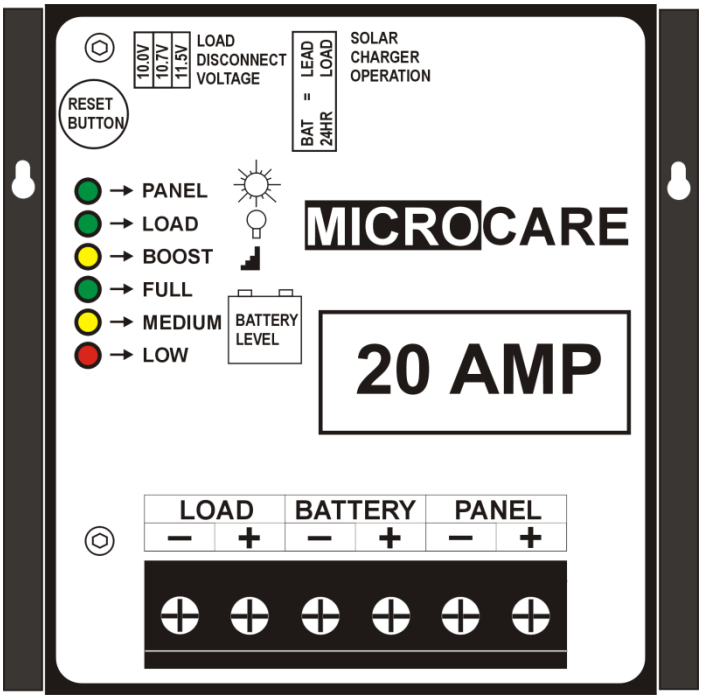
The following should be used as a guide to the maximum array size that can be connected to the MPPT. The current limits to the specified level of the MPPT model so any array larger than these will damage the MPPT.

Table 1.1: Maximum PV Array Sizes

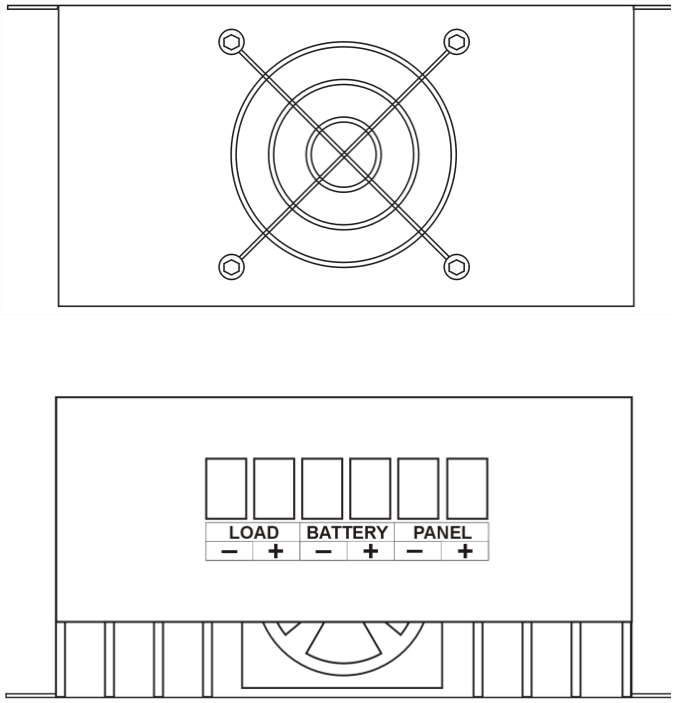
Maximum Photovoltaic Array Sizes in Watts			
Battery Set	10 Amp MPPT	20 Amp MPPT	30 Amp MPPT
12V	120W	240W	360W
24V	240W	480W	720W

2. MPPT OVERVIEW

MPPT Front View



MPPT Top View



MPPT Bottom View

2.1 LED MPPT Status LED's

PANEL LED	Status	Panel LED Description
Panel	Flashing	No PV Panel Connected or PV Power LOW
	Steady ON	PV Connected and Producing power
	OFF	Battery Disconnected

LOAD LED	Status	Load LED Description
Load	Steady ON	Load Connected
	OFF	No Load Connected

BOOST LED	Status	Boost LED Description
Boost	Steady On	MPPT is in Battery Boost charge mode
	Flashing	MPPT is in Battery Float charge Mode

CHARGE LED	Status	Battery State of Charge Level LED Description
Full	Steady ON	Battery fully charged
Med	Steady ON	Battery is half charged
Low	Steady ON	Indicates a low battery condition

2.2 Audible Buzzer

- When the batteries are connected for the first time the buzzer will sound:
  - 2 times for a 12V battery set
  - 3 times for a 24V battery set.
- The buzzer will beep when the battery voltage has reached within half a Volt of the battery load disconnect voltage for a 12V system and within 1Volt of load disconnect for a 24V battery set.
- The Buzzer will give 4 beeps twice when the load disconnect is about to trip and 10 times when the load disconnect has occurred.

2.3 Reset Button

- Pushing the reset button cancels the buzzer.
- If the unit is in **Load Shed** the reset button will reset the load but if the voltage is too low then the load disconnect will operate

2.4 Jumper Selection

2.4.1 Low Voltage Load dis-connects:

Jumpers 1-3

Battery Bank Voltage	Jumper 1	Jumper 2	Jumper 3
12V Battery Bank	10.0V	10.7V	11.5V
24V Battery Bank	20.0V	21.4V	23.0V

2.4.2 Battery Type

Jumper 4 (Lead Acid or Gel Battery)

12V Battery Bank charging values

Battery Type	Float Voltage	Boost Voltage
Lead Acid	13.8V	14.8V
Sealed Gel	13.6V	14.2V

24 V Battery Bank charging values

Battery Type	Float Voltage	Boost Voltage
Lead Acid	27.6V	29.6V
Sealed Gel	27.2V	28.4V

2.4.3 Daylight Switch off

Jumper 5

- When the PV Voltage is **higher** than the battery voltage, the MPPT Regulator will assume that it is currently day time (Dawn).
- When the PV Panel voltage is **lower** than the battery voltage the MPPT Regulator will assume that it is night time (Dusk).
- In this mode the unit is factory set to switch on at night time and switch OFF during daytime.
- A time delay may be introduced to turn on the load either immediately, 0.5 hours, 1.0 hours or 1.5 hours after Dusk

2.5 Programming

To access the Jumpers, disconnect the load, battery and panel wires from the MPPT.
Remove the MPPT cover by removing the 2 screws located on the sides of the MPPT.
Reconnect the Battery wires.

- If any of the JUMPERS are changed, it is necessary to press and release the reset button, the buzzer will sound confirming the change.

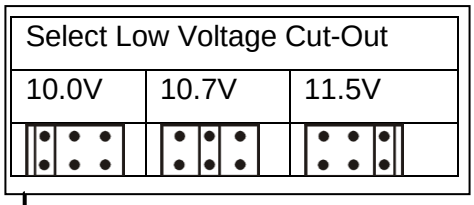
2.5.1 Low Voltage Cut Out

- Select the desired low cut out voltage by inserting the JUMPER, then push the reset button.

2.5.2 If the daylight switch is selected, the turn on time must also be selected.

- Remove the jumper from the 24 hour load position and using the load disconnect voltage terminal block select 0, 1/2 hour, 1 hour or 1.5 hour. (if no jumper is connected the load will switch on immediately when the panel voltage goes below the battery bank voltage) Insert the jumper on the required connection.

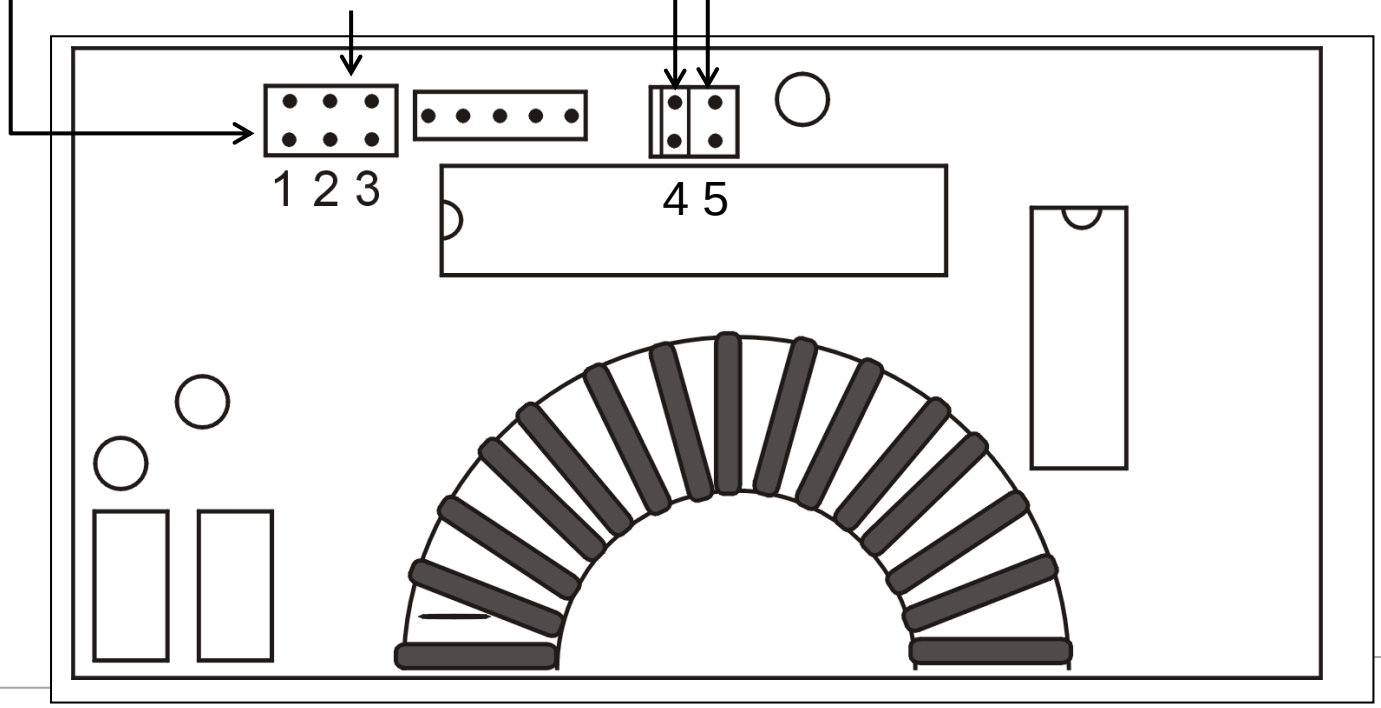
- To carry out the program, press the reset button until the buzzer beeps 3 times the buzzer then stays on and the reset button may be released. Replace the jumper for the low voltage cut out, press the button and the buzzer will beep once.



Select Battery Type:
ON: Lead Acid Battery.
OFF: Sealed Gel Battery

Select 24 Hour Run Time
Or day night switching
ON: 24 Hour
OFF: Day/Night

Day/Nigh Switch Jumper Position				
1	2	3		Result
OFF	OFF	OFF		0 Hr Delay
ON	OFF	OFF		0,5 Hr Delay
OFF	ON	OFF		1 Hr Delay
OFF	OFF	ON		1,5 Hr Delay



2.6 Load Connection

The Load Connection can only support a Load equal to the MPPT size. Therefore a 10A LED MPPT can only support a maximum 10 Amp Load.

2.7 Connecting The Unit

Ensure that all cabling used is kept as short as possible as volt drops caused by long cables will reduce the efficiency of the Tracker. Minimum recommended wire diameter = 4 mm²
First connect the **Load** and then the **Battery**.

The LED display will show the Tracker checking the battery. The Medium LED will flash once for a 12V battery and twice for a 24V system. At the same time the buzzer will sound once for a 12V and twice for a 24V system.

Connect the solar panel. The panel LED will come on if there is sufficient panel power.
The Regulator will now read the solar panel voltage and select the optimum power point. If there is sufficient power in the solar panel the Tracker will now start charging.

2.8 Charging The Batteries

Boost Mode: The batteries are charged until they reach the boost voltage 14.8V for a 12V battery set or 29.6V for a 24V battery set. When the batteries reach this level the MPPT will hold this rate for a minimum of 1/2 hour indicated by the flashing BOOST LED and then switches to Float Mode.

If the batteries fall below the BOOST voltage then the timer is reset i.e. at night or during cloudy days. This ensures that the batteries are fully Boosted.

FLOAT MODE: Boost light flashes - The batteries are now essentially in trickle charge mode.

2.9 Maximum Panel Voltage (Voc) and (V_{MP}) Per Battery Bank

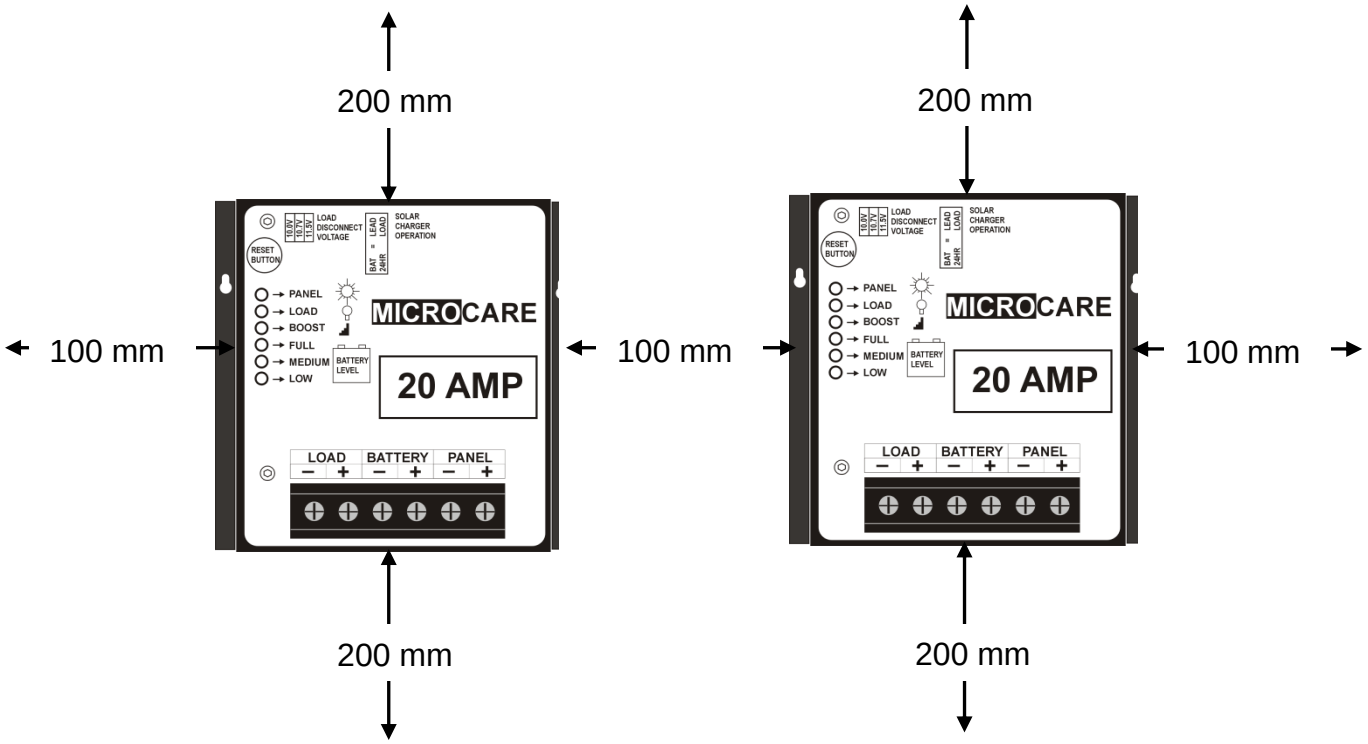
Suggested Maximum Panel Voltage for a 12V Battery Set	
V_{MP} (Max Power Point Voltage) "Min Charge Voltage"	15V
V_{OC} (Max Open Circuit Voltage) "Max Charge Voltage"	24V

Suggested Maximum Panel Voltage for a 24V Battery Set	
VMP (Max Power Point Voltage) "Min Charge Voltage"	30V
V_{OC} (Max Open Circuit Voltage) "Max Charge Voltage"	45V

50Voc is the absolute maximum. Systems should be designed for a max of 45Voc due to the increase in panel voltage due to colder Panel Temperatures. Refer to your solar module documentation for the worst-case (coldest) module temperature voltage, should provide Voc vs. temperature data

3. MPPT INSTALLATION

3.1 MPPT minimum installation clearance distance



Maintain a minimum clearance of 20cm below and above, 10cm on the sides of the MPPT to ensure unhindered air circulation. Mount the solar charge controller as close as possible to the batteries.

3.2 MPPT Installation Instructions:

- Read the installation instructions before installing the MPPT.
- The MPPT is designed for indoor applications only.
- The mounting position should allow for sufficient ventilation and the minimum clearance distance between MPPT's and other objects, trunking as above.
- Mount the MPPT at eye level in order to allow the user to read the LED indicators.
- The MPPT must be mounted in a vertical position against a solid wall.
- Do not install the MPPT in a sealed container.
- Do not install the MPPT near water or in damp environments.
- Do not install the MPPT where it would be exposed to direct sunlight or near heat.
- Do not install the MPPT on a wooden surface. Only install the MPPT on flat concrete, stone or metal surfaces.
- Do not block off the aluminium heat sink and don't leave objects on top of the MPPT.
- Do not expose the MPPT to corrosive battery gases. Corrosion is not covered by warranty.
- MPPT operating environment temperature should not exceed: 0˚C - 40˚C.
- Ensure that connecting cables are of adequate size.

4. WIRING INFORMATION

4.1 Cable Connections

The PV (Photo Voltaic) panels should always be connected in the highest voltage configuration, yet do not exceed the voltages as in section 2.9. The advantage of this is that panel current will always be at its minimum so that thinner connecting wires may be used which reduces voltage drops with loading and improves cost efficiency.

The cable length from the batteries to the MPPT should not exceed 3m. The cable lengths connecting the PV panels to the MPPT should not exceed 30m.

As an example, if there are two 40 volt panels rated at 5 amps each and they are connected in parallel, then the output voltage would be 40 volts at 10 amps. If they were connected in series the output would be 80 volts at 5 amps. In both cases the power would be the same but in the parallel configuration a thicker power cable must be used to reduce the volt drop from the array to the MPPT as well as from the MPPT to the batteries.

Cable thicknesses listed are recommended thicknesses that have voltage drops accounted for up to a distance of 3m for connecting the MPPT and the batteries together and the bottom table lists recommender cable thicknesses for cables connecting the MPPT to the panels up to a distance of 30m.

Table 4.1 Recommended cable size connecting Cables up to 30m between MPPT and PV panels (Single Stranded Copper Specifications)

MPPT Type	Cable Core Area	Overall Cable
10 Amp	6mm²-10mm²	5.4mm-6.3mm
20 Amp	6mm²-10mm²	5.4mm-6.3mm
30 Amp	10mm²-16mm²	6.3mm-7.5mm

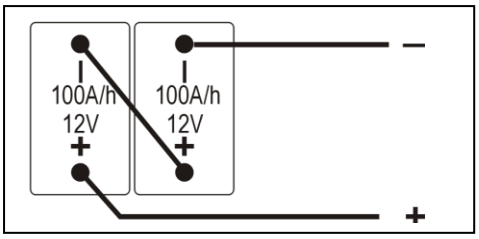
Table 4.2: Recommended cable size connecting Cables up to 3m between MPPT and batteries. (Single Stranded Copper Specifications)

MPPT Type	Cable Core Area	Cable Core
10 Amp	3mm²-4mm²	1.8mm-2.2mm
20 Amp	3mm²-4mm²	1.8mm-2.2mm
30 Amp	6.8mm²-9mm²	2.8mm-3.2mm

4.2 Battery Connection Methods

4.2.1 Series Connection

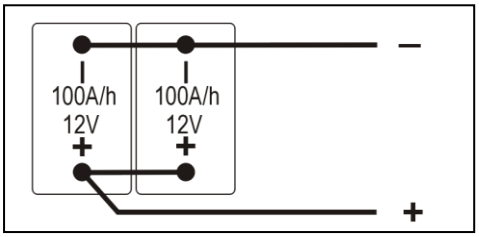
12V + 12V = 24V Ah remain at 100 Ah



Series Connection (Voltage increases, amperage stays the same as a single battery)

4.2.2 Parallel Connection

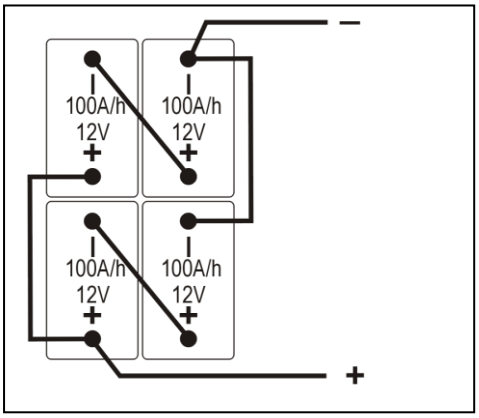
Voltage remains 12V, 100 Ah + 100 Ah = 200 Ah



Parallel Connection (Voltage stays the same as a single battery, amperage increases)

4.2.3 Series and Parallel Connection

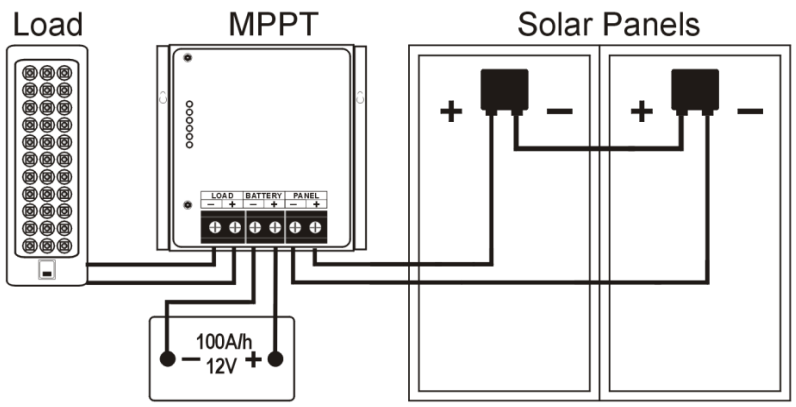
Voltage increases to 24 V Ah increases to 200 Ah



2 Strings of batteries in series, connected in parallel
Series/Parallel Connection (both voltage and amperage increase)

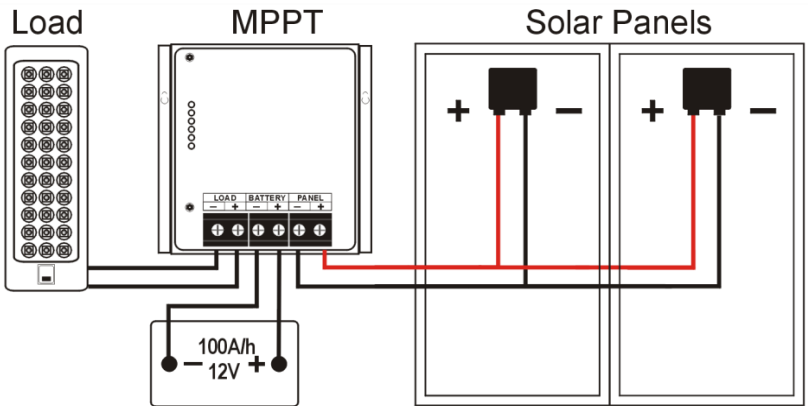
4.3 Basic MPPT Wiring Diagram

4.3.1 2 x 60W Panels Connected in Series



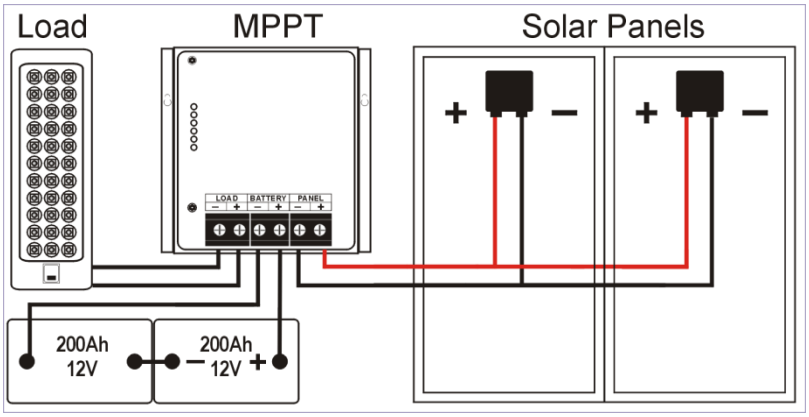
2 x 60 Watt Panels in series
1 x 12 V Battery
1 x 10A LED MPPT
Max 120W panel for a 10A regulator charging a 12V battery
Max load output 10A

4.3.2 2 x 180W Panels Connected In Parallel



2 x 180 Watt Panels in parallel
1 x 12 V Battery
1 x 30A LED MPPT
Max 360W panel for a 30A regulator charging a 12 battery
Max load output 30A

4.3.3 2 x 300W Panels Connected in Parallel

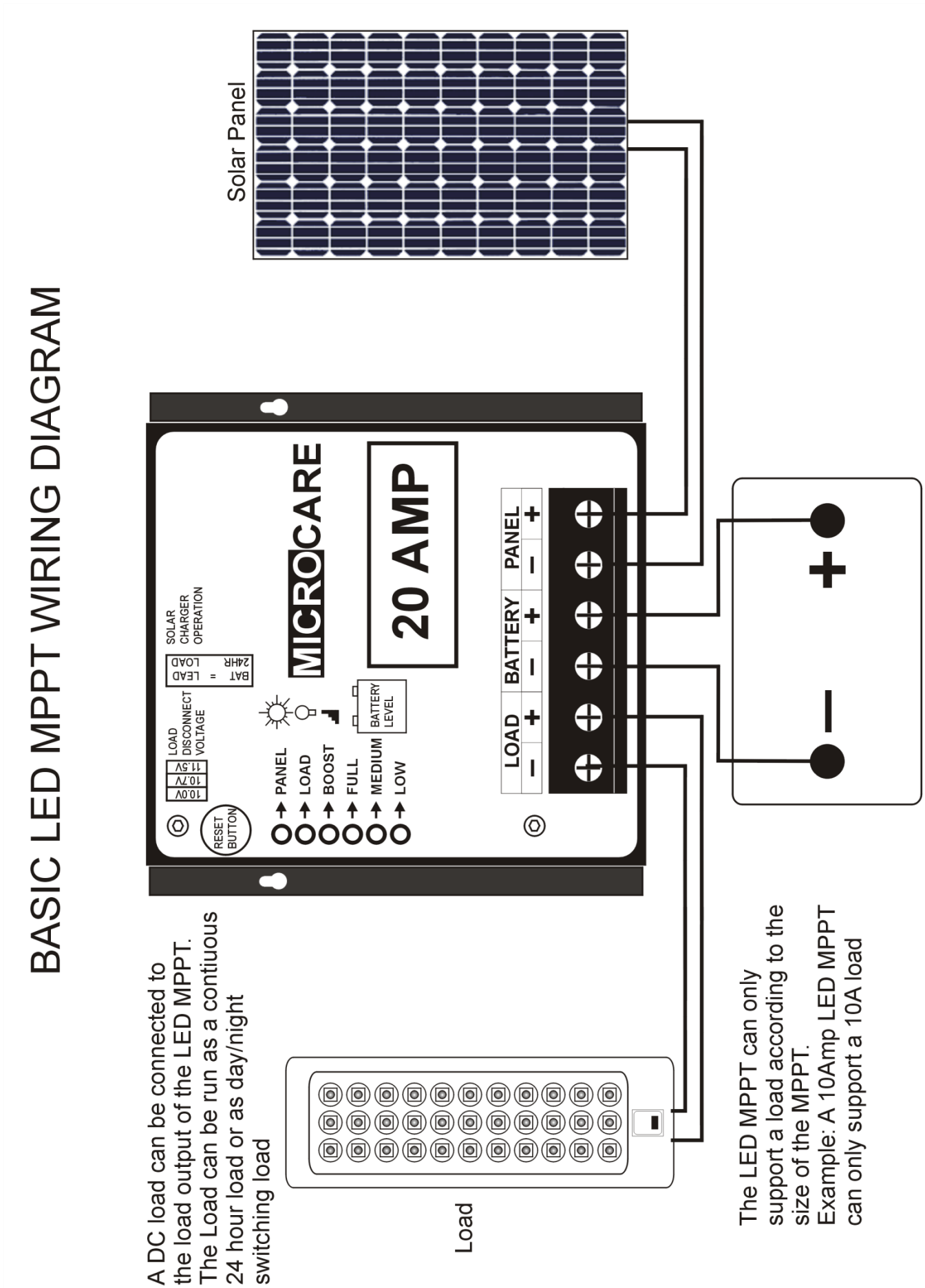


2 x 300 Watt Panels in Parallel
2 x 12 V Batteries in series = 24V
1 x 30A LED MPPT
Max total of 720W panel power when charging a 24V battery system with a 30A regulator
Max load output 30A

4.4 Maintenance and service

Caution – Risk of Electric Shock.
Batteries may cause electric shock and have a high short-circuit current.
Please take the precautionary measures specified below and any other measures necessary when working with batteries.
Remove wristwatches, rings and other metal objects.
Only authorized personnel should perform maintenance, inspection, and replacement operations.

4.5 Basic LED MPPT Wiring Diagram



5. LED MPPT SPECIFICATIONS

LED MPPT Type	10A	20A	30A
Maximum Panel Array Size	12V–120W PV Max 24V-240W PV Max	12V – 240W PV Max 24V – 480W PV Max	12V – 360W PV Max 24V – 720W PV Max
Nominal Battery Voltage	Multi-Voltage 12 or 24VDC (Automatic selection of voltage)		
PV Input Voltage	Absolute Maximum 50VOC		
Output Load Rating	10A	20A	30A
Charge Algorithm	2-stage Boost/Float		
Boost Voltage	Charges to 14.8V (12V) or 29.6V (24V system) for minimum of 3 hours		
Float Voltage	13.8V per battery (12V system) or 27.6V (24V system)		
Power Conversion	DC/DC Switch Mode		
Output Efficiency	>95% Typical @ 14 VDC		
Voltage Step Down	Can charge a lower voltage battery from a higher voltage PV array		
Status Display	6 LED display: Panel, Load, Boost, Full, Medium, Low		
Power Consumption	Less than 1W		
Environmental rating	0-40 ºC		
Cable Entry	Connector (Max Cable size 16mm)		
Dimensions	0.5kg 110mm x 110mm x 70mm		

6. LIMITED CARRY- IN WARRANTY

The following Warranty is conditional that the relevant Microcare product has been installed by an approved Microcare Installer, the required paperwork has been submitted to Microcare and that the Client is in receipt of our acknowledgement of this. Our products are innovative pieces of equipment and incorrect installation has been the overriding cause of failure in the past. No exception to this condition will be considered.

Microcare warrants its full range of products against defects in workmanship and materials, fair wear and tear accepted, for a period of three years (Inverters manufactured from the 1st July 2020 onwards carry a five year warranty) from the date of collection for all equipment and is based on a carry-in basis. Where the installation of the product makes it impractical to carry-in to our workshops, Microcare reserves the right to charge for travel time and kilometres travelled to and from the site where the product is installed.

During this warranty period, Microcare will, at its own discretion, repair or replace the defective product free of charge. This warranty will be considered void if the unit has suffered any physical damage or alteration, either internally or externally, and does not cover damages arising from improper use such as, but not exclusive to:

- Reverse of battery polarity.
- Inadequate or incorrect connection of the product and/or of its accessories.
- Mechanical shock or deformation.
- Contact with liquid or oxidation by condensation.
- Use in an inappropriate environment (dust, corrosive vapour, humidity, high temperature, biological infestation)
- Breakage or damage due to lightning, surges, spikes or other electrical events.
- Connection terminals and screws destroyed or other damage such as overheating due to insufficient tightening of terminals.
- When considering any electronic breakage except due to lightning, reverse polarity, over-voltage, etc. the state of the internal control circuitry determines the warranty.

This warranty will not apply where the product has been misused, neglected, improperly installed, or repaired by anyone else than Microcare. In order to qualify for the warranty, the product must not be disassembled or modified. Repair or replacement are our sole remedies and Microcare shall not be liable for damages, whether direct, incidental, special, or consequential, even caused by negligence or fault. Microcare owns all parts removed from repaired products. Microcare uses new or re-conditioned parts made by various manufacturers in performing warranty repairs and building replacement products. Microcare repairs or replaces a part of a product; its warranty term is not extended. Removal of serial numbers may void the warranty.

All remedies and the measure for damages are limited to the above. Microcare shall in no event be liable for consequential, incidental, contingent or special damages, even if having been advised of the probability of such damages. Any and all other warranties expressed or implied arising by law, course of dealing, course of performance, usage of trade or otherwise, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited in duration to a period of three years (five years for Inverters manufactured from the 1st July 2020 onwards) from the date of purchase.

Life Support Policy

As a general policy, Microcare does not recommend the use of any of its products in life support applications where failure or malfunction of the Microcare product can be reasonably expected to cause failure of the life support device or to significantly affect its safety or effectiveness. Microcare does not recommend the use of any of its products in direct patient care. Microcare will not knowingly sell its products for use in such applications unless it receives in writing assurances satisfactory to Microcare that the risks of injury or damage have been minimised, the customer assumes all such risks, and the Liability of Microcare is adequately protected under the circumstances.

Caution

While all care is taken by us to dispatch goods with adequate packaging, Microcare is not responsible for any damaged caused to products after they have left our premises. Semi-sealed batteries have to be transported

upright and must not be put on their side. Please ensure that your transport company or delivery team is aware of the sensitivity of the products they are collecting.

Goods return policy

The following terms apply to returns of items purchased from Microcare, and we require the following information:

1. Details of the item(s) you would like to return.
2. Our invoice number.
3. The reason for the return.
4. Microcare must be notified within 7 days of your intention to return the goods which were purchased.
5. All items returned will be inspected prior to refund. If our technicians are not immediately available, the goods will have to be left with us until such time as a technician is available to check the items.
6. Proof of purchase is required for all returns.
7. The price paid by the customer is the price on which the refund is based.
8. Items purchased can be returned for a refund, replacement or exchange, provided proof of purchase is provided and subject to all other conditions as set down here.
9. All returns may be subject to an administration and handling fee of 10% of purchase price plus VAT.
10. Returns are based on a carry-in basis.
11. Returns will be refused in the following circumstances:
    a. Where an item has been tampered with, altered or damaged in any way, or
    b. Where a return is deemed unreasonable, this will be referred to management.

Severability

If a part of the terms and conditions set out above is held invalid, void, or unenforceable due to any particular national or international legislation, it shall not affect other parts of the terms and conditions remaining.

7. REGISTRATION OF MY MICROCARE PRODUCT

Product Serial Number: _____

Product Description: _____

Date Purchased _____

From Whom was the Inverter Purchased:

Company Name _____

Contact Person _____

Contact Number _____

E-mail Address _____

Installation Company Information:

Company Name _____

Contact Person _____

Contact Number _____

E-mail Address _____

Details of Product Owner

Name & Surname _____

Address _____

City & Province _____

Contact Number _____

E-mail Address _____

Date Installed _____

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Registration by e-mail: support@microcare.co.za
Online Registration: www.microcare.co.za/register-my-product