400W Solar Charger
Maximum Power Point Tracker

Operating Instructions
Please read these instructions before use

This revolutionary maximum power point tracker solar charger was designed using the technology that won GSL Electronics the prestigious "2008 EDN Innovation award". A simple, compact and low cost alternative. Ideal for charging batteries with the new low cost high efficiency grid type panels.

MPPT10HV Unit

PATENT APPLIED FOR - 2010901565

MPPT10HV Specifications	
Efficiency Typical	96%
Input Voltage	15V to 90V
Float Voltage (Maintanence)	Lead Acid - 13.5V / 27V / 54V $LiFePO_4$ - 14V / 28V / 56V
Charge Voltage	14.6V / 29.2V / 58.4V
Max Panel Power	400W on 48V Battery / 200W on 24V Battery 150W on 12V Battery
Quiescent Current	0.04A
Thermal Protection	Multilevel type
Dimensions (mm)	35 X 75 X 143mm
Indications	LED – Battery OK / LOW

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MPPT10HV General Information:

- Green LED: ON - Battery Charged , FLASHING - Battery Charging, OFF - Fault
- If the LED is OFF the Over Voltage protection has tripped. This protection disconnects the load and battery from the panel. It is latched and will only be reset at dawn or when the panels are disconnected.
- This MPPT is designed to auto detect 12V, 24V and 48V battery systems and select a suitable charge regime.
- The absorption phase is entered following a low battery condition and is maintained for the rest of the day
- Custom voltages are possible but minimum orders apply.
- This MPPT has a built in multilevel over temperature protection to improve product reliability while maximising output power availability.
- The MPPT will efficiently charge 12V batteries from 24V/24V panels and 24V batteries from 48V panels
- The panel voltage limit for the MPPT10HV is a maximum open circuit voltage below 90V.
- If used, this fuse is optional, locate the output fuse (OF) as close to the MPPT as possible (15A 24VDC rating).

Important:

- A suitable BMS rated to the maximum panel power and open circuit voltage must be used with Lithium batteries
- Use wires suitable for at least 15A, but if wire runs are over 3m then larger wires are recommended to limit voltage drop and losses.
- Install the unit in a dry place out of direct sunlight and away from flammable liquids or gases.
- Battery fuse (BF) is always required and must be located as close to the battery as possible, its sizing depends on the wire size and load ratings. Typically a 15A 60V fuse would do.
- Before connecting battery always check battery and PV panel polarity.
- When used with panels that sigificantly exceed the MPPT10HV raitings the PVF fuse must be fitted. Locate this fuse as close as possible to the MPPT. A 10A 100V fuse is recommended.

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Settings And Configurations:

The MPPT10HV is set via the Rear Switch (LEFT - Lead Acid, RIGHT - Lithium) and is shipped by default with the BLUE (Negative Load) wire set as a Low Voltage Disconnect.
The various operating modes can be configured with a combination of the ORANGE and GREY wires and the Rear Switch.

Always ensure that the Rear Switch is set for the Correct Battery Type:

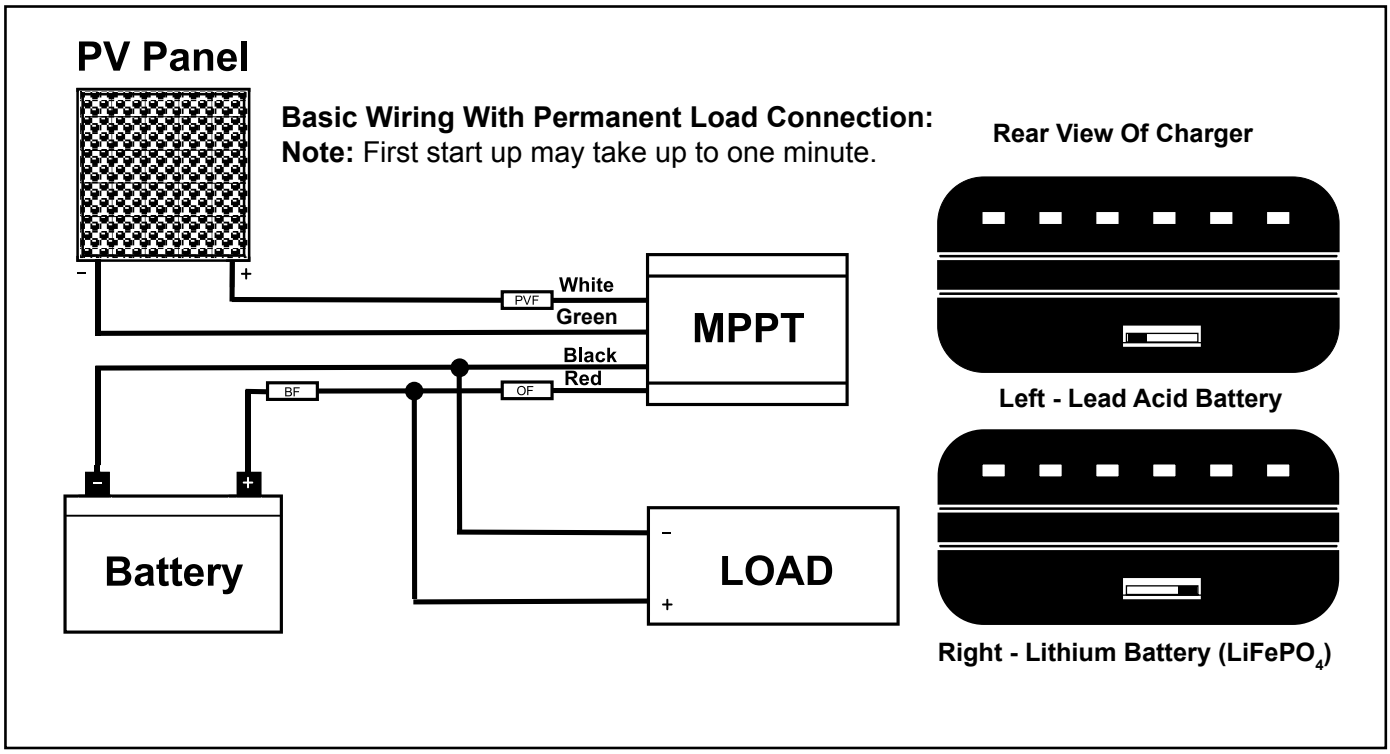
The ORANGE and GREY wires should either be left floating(ensure they are insulated from any other point) or connected to the GREEN wire only. Do not connect them to any other source or point.

To set the correct mode for the Load Wire for your application. Follow the table below.

ORANGE	GREY	MODE (BLUE Wire)
Floating	Floating	Low Voltage Disconnect
Floating	To GREEN	Dawn to Dusk Mode
To GREEN	Floating	Remote Load Control ON
To GREEN	To GREEN	Remote Load Control OFF

NOTE : The Remote Control Function Overrides the Low Voltage Disconnect and Dawn to Dusk Functions

For simplicity in the following drawings unconnected wires are not depicted.



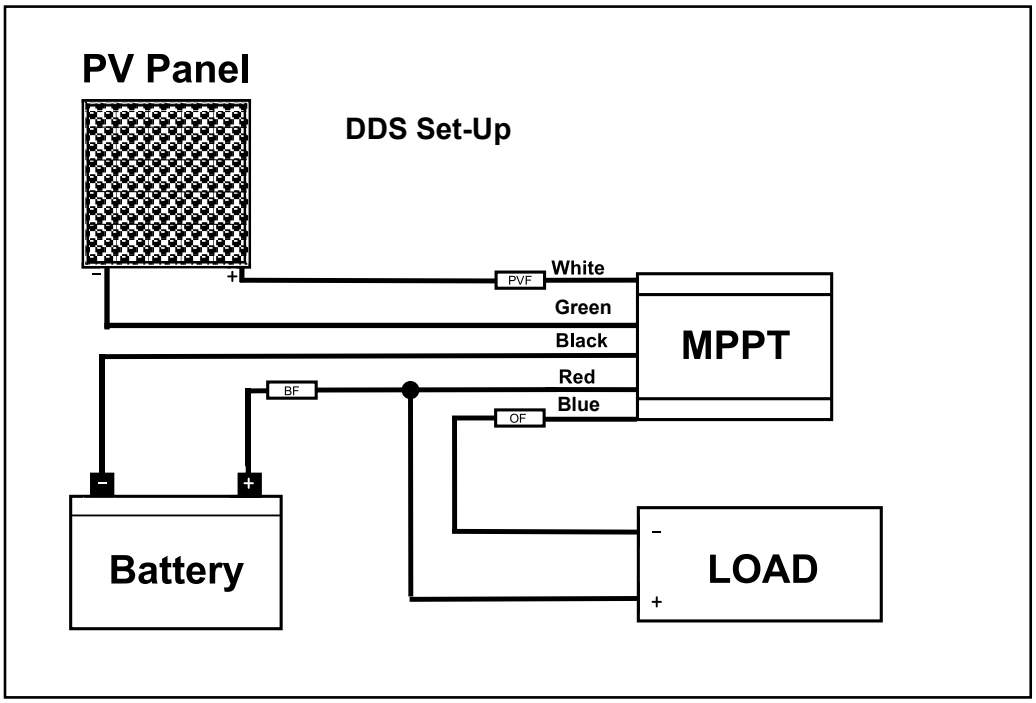
Wiring With Dawn To Dusk Switch:

The DDS option is intended to power up loads during night-time only.

This feature will not trigger during short periods of low light, it is an approximation only to actual ambient light levels and if precise ambient light levels are required then light sensors must be used.

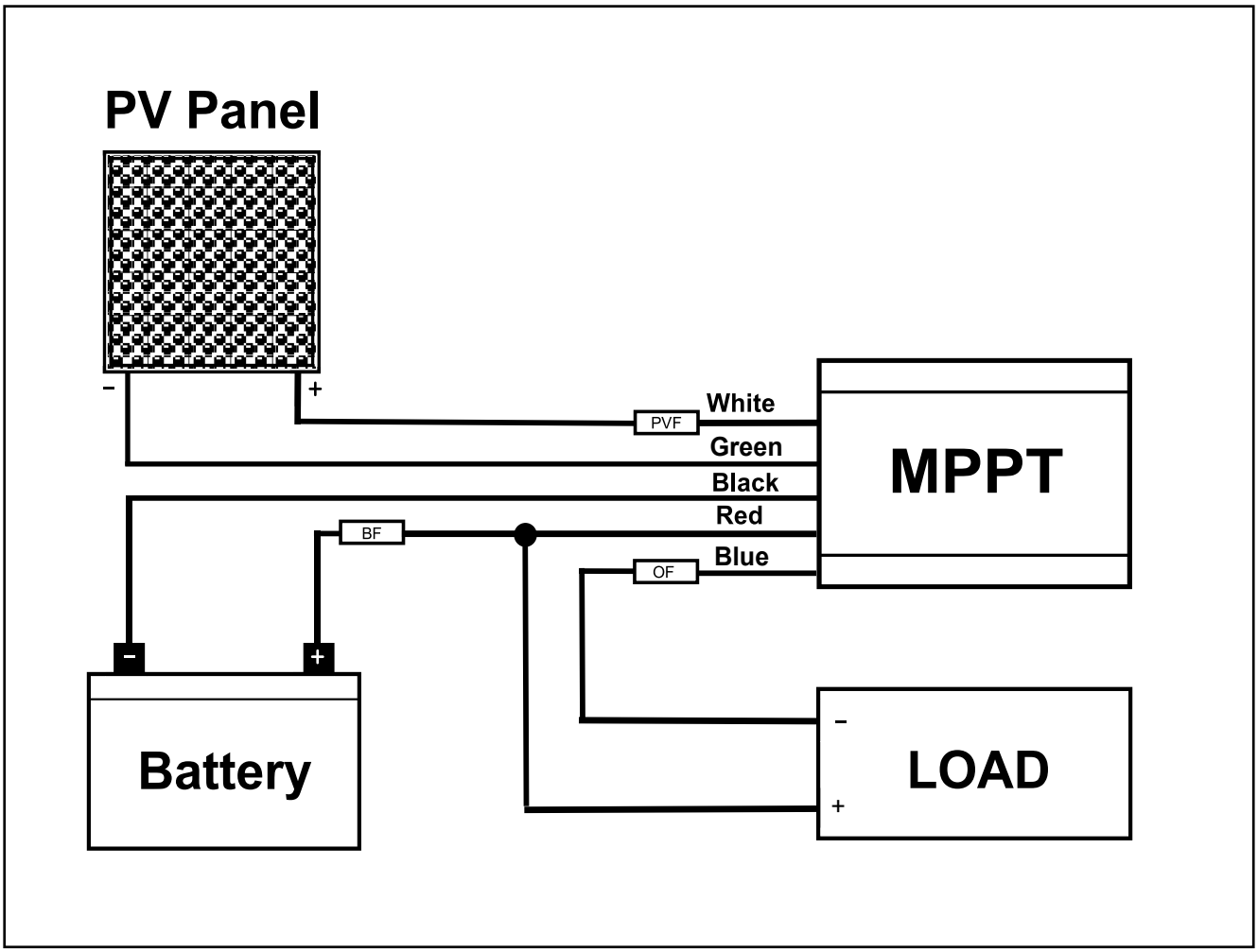
The maximum DDS load current is 10A continuous or 20A transients.

The DDS is set to approx. “All Night” (actual night duration and up to 15 hours max.).



Wiring With Low Voltage Disconnect :

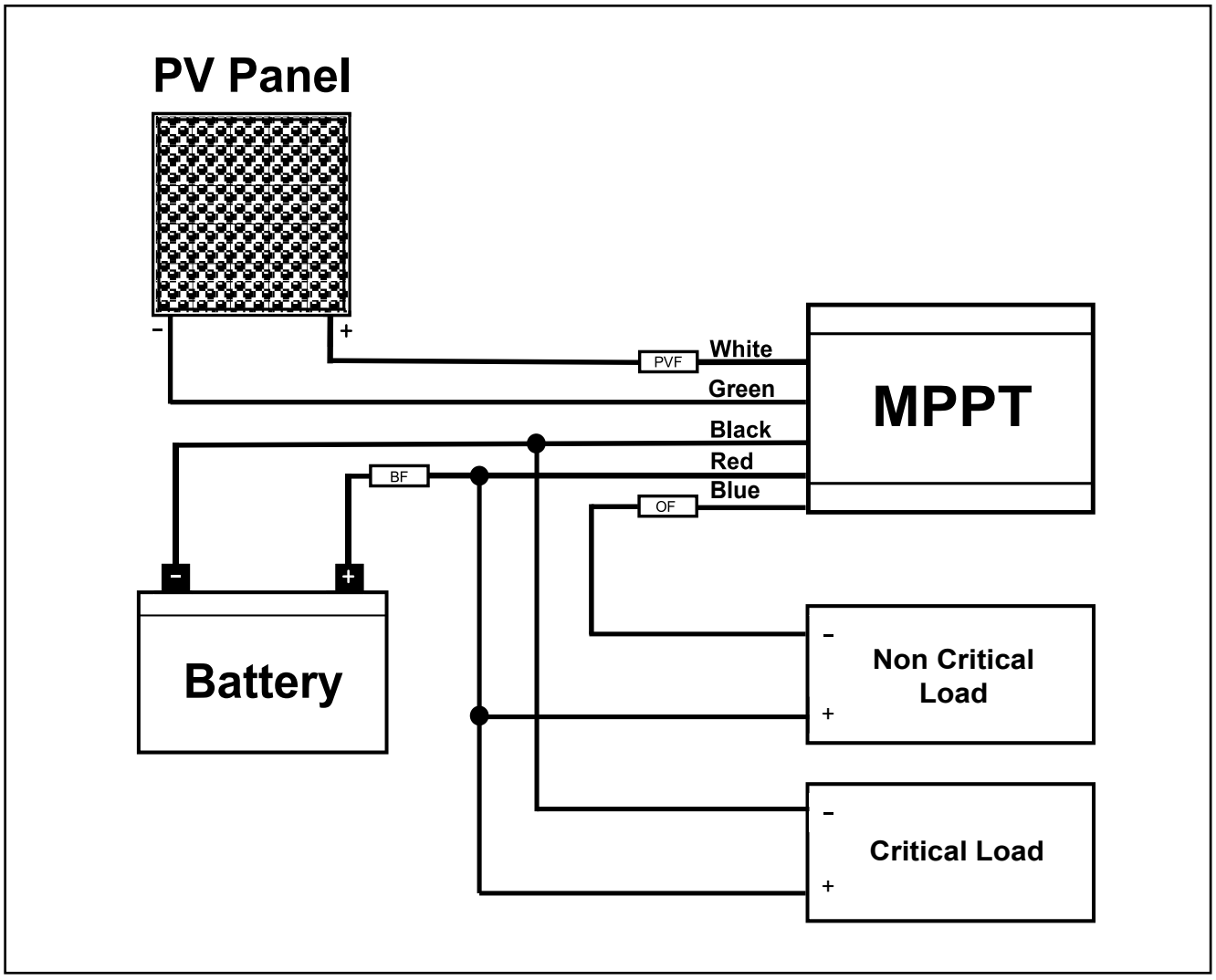
The LVD option disconnects the load when the battery voltage drops below 0.85 of nominal voltage to protect the battery from damage. The load reconnects when the battery voltage exceeds 0.9 of nominal voltage. This feature will not trigger during short transients. LVD load is 10A continuous or 20A transient.



Please ensure that your MPPT has been correctly configured for your application.
Refer to the Settings and Configurations section for more information.

Wiring With Critical And Non Critical Loads:

Critical loads are generally light loads which are powered under any condition. Non critical loads are loads which can be disconnected to ensure maximum on time for critical loads as well as to extend the life expectancy and reliability of the system. The non critical load can be set up as LVD, DD all night configuration using the ORANGE and GREY Wires detailed earlier.



Please ensure that your MPPT has been correctly configured for your application.
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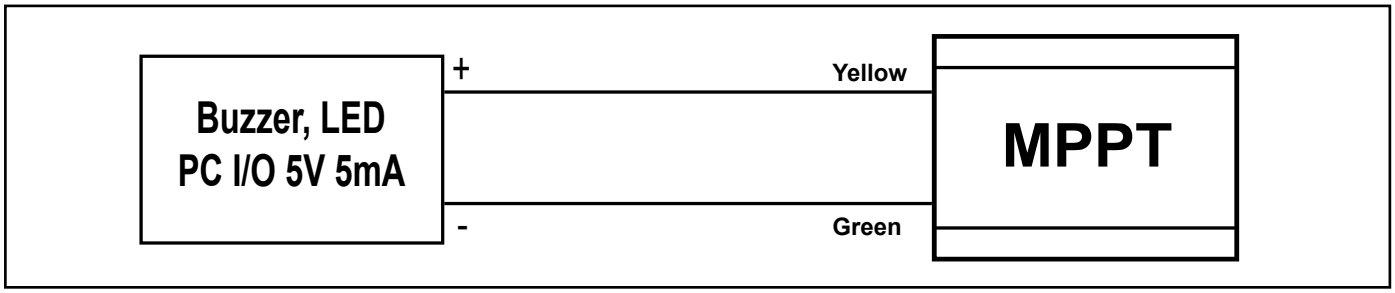
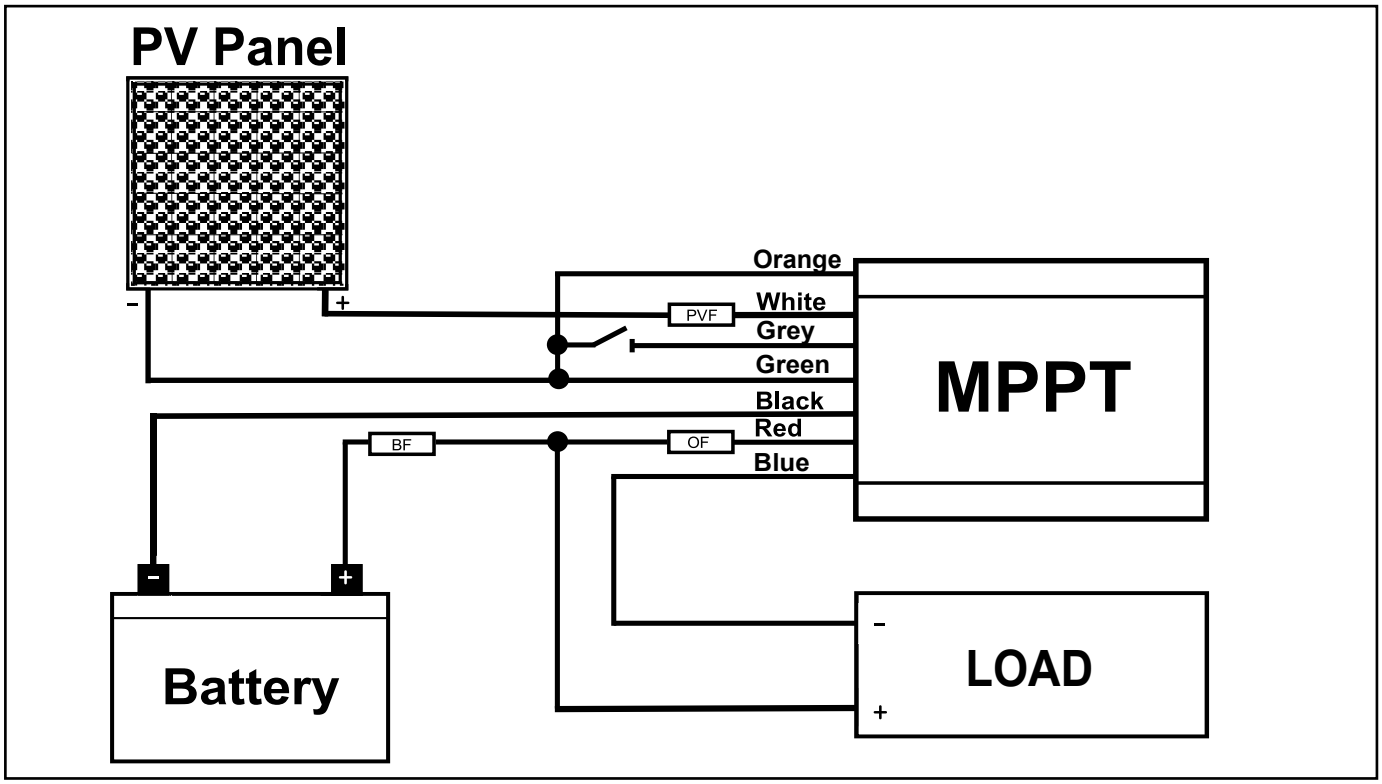
Wiring The Remote Alarm:

The remote alarm is a normally low, 5V digital signal that goes high when the battery voltage drops below 0.9 of nominal voltage, the LVD disconnects or over temperature trips. It has a 5mA source capability and can be used to remotely monitor system status.



Wiring With Load Remote Control:

This option enables the remote load connection and disconnection via the load remote control, GREY wire. When the GREY wire is grounded the load is disconnected otherwise the load is connected. To configure this mode the ORANGE wire must be grounded. This option overrides the LVD or DDS function but has the same load limitations of 10A continuous or 20A transient.



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MPPT FAQs

Q: What is an MPPT?

MPPT stands for Maximum Power Point Tracker and is a specialised converter designed to maintain the PV voltage at the level in which it delivers maximum power to the load or battery. The nominal panel output power can only be ensured with the use of an MPPT.

Q: What are the GSL MPPTs advantages compared to standard solar regulators?

1. Suitable for new lower cost high efficiency grid type panels since the GSL MPPT can efficiently charge the batteries from relatively high voltage, say 12V batteries from 36V MPP panels.
2. Less interference and more accurate voltages during absorption and float.

Q: What output can I expect from a 150W or 200W MPPT?

1. The maximum bulk charge current with a 12V battery and 150W panel is approximately 12A, so you can expect about 40AH per day which is a 40W load for about 10 hours.

2. The maximum bulk charge current with a 24V battery and a 200W panel is about 8A so you can expect about 30AH which is a 40W load for about 15 hours.

Q: Why are MPPT used mainly in high power systems?

Until now and despite their overwhelming advantages MPPTs have been excluded from low power systems because of cost. The new GSL MPPT specifically designed for low power makes economic sense even in small systems.

Q: What sort of batteries should I use?

1. A deep cycle battery is a must due to the cyclical nature of solar systems with a recommended battery capacity of at least 60AH.

2. A larger battery will not only give longer run time during low light but also will be able to avoid available PV power being unstored such as when the battery reaches the float stage.

Q: How does PV temperatures affects charge current?

Temperature increase brings down the PVs maximum power point voltage reducing the MPPTs current gain available. In principle at 25C it is possible to achieve 30% gain but at 40C (A more realistic average temperature) about 20% is still available.

Q: What happens at low PV currents?

The MPPT will outperform the conventional regulator above 4% of nominal panel power. Below 4%, 6W in a 150W panel, the MPPT will have a slightly lower output current than a non MPPT.

Q: Is interference possible? and If so what do I do?

GSL's MPPTs produce far less interference than conventional solar regulator during the absorption and float stages, that is during most of its operating time, and its designed to comply with local and international EMI standards however some interference is still possible. If interference occurs first try and reorient the aerial or move the sensitive equipment away from the MPPT wires. Ensure the MPPT chassis is grounded. Grounding a battery terminal may also help and finally you can try adding ferrite clamps.