3400W Solar Battery 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 12V / 28V / 58V $LiFePO_4$ batteries with the new low cost and high efficiency grid type panels.

MPPT60-1L Unit

PATENT APPLIED FOR - 2010901565

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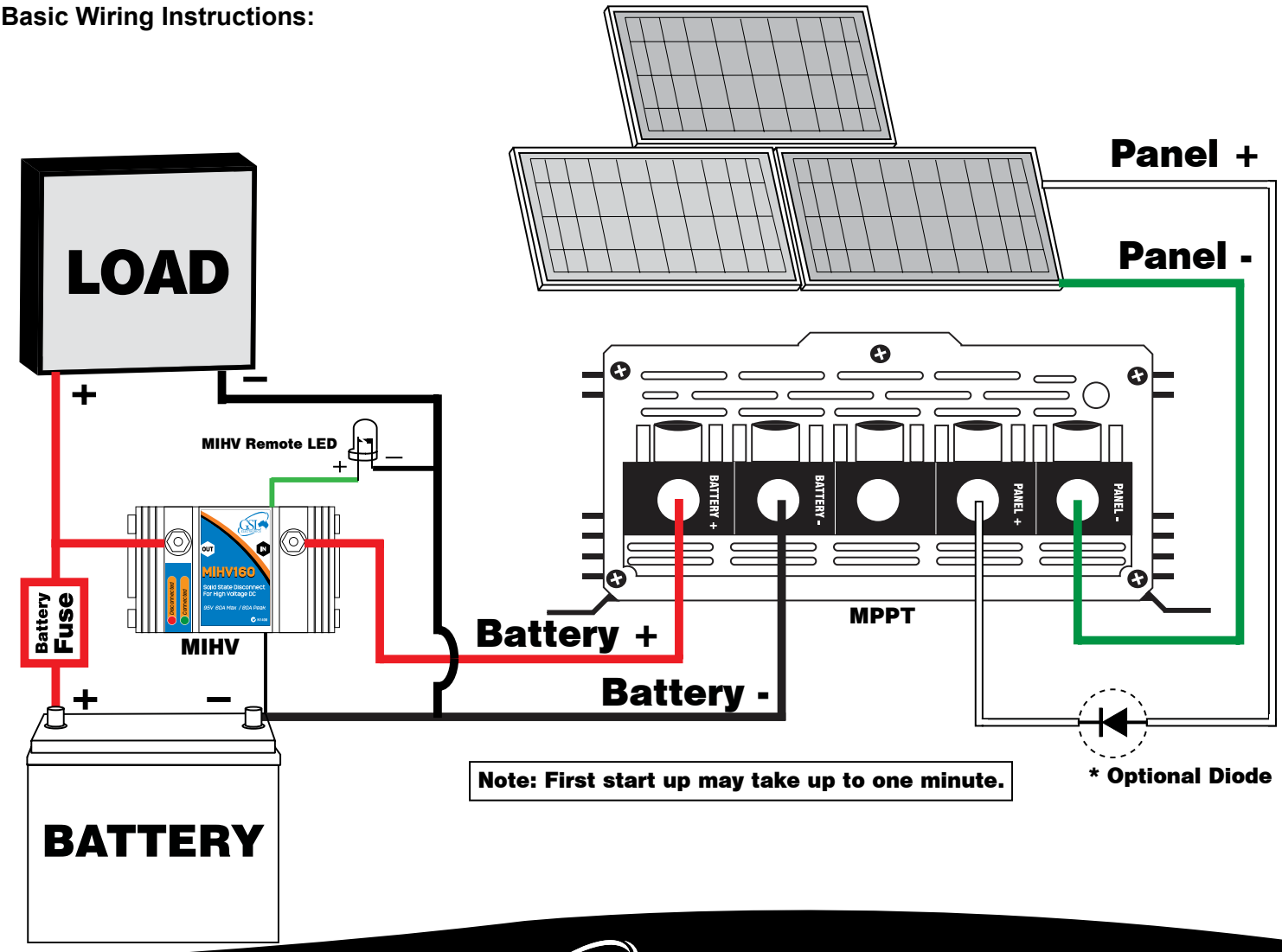
MPPT60-1L Specifications	
Efficiency typical	97%
Input voltage	16V to 95V
Saturation Voltage	Default 14.6V / 29.2V / 58.4V High Capacity Option 14.8V / 29.6V / 59.2V Long Life Option 14.3V / 28.6V / 57.2V
Maintenance Voltage	14.1V / 28.2V / 56.4V
Output power	3400W / 60A MAX
Quiescent current	0.05A
Thermal protection	Multilevel Type
Dimensions (mm)	185 X 145 X 67mm
Indications	LED display – OUTPUT STATUS

Basic Wiring Instructions:



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The MPPT60-1L is designed to charge $LiFePO_4$ from photovoltaic panels. Silicon based panels such as monocrystalline, polycrystalline and amorphous are suitable.

MPPT60-1L General Information:

- Green LED On – Battery Ok.
- Green LED Flashing – Battery Low.
- This MPPT is designed to auto detect 12V, 24V or 48V battery systems and select a suitable charge regime.
- The MPPT60-1L is shipped set to the default (Nominal) setting which is the safest setting but if you require Long Life or High Capacity rate, **BEFORE** wiring the MPPT in, follow the **CHANGING BATTERY TYPE SETTING PROCEDURE.**.
- The Saturation phase is entered following a low battery condition at dawn and is maintained for the rest of the day. Otherwise Maintenance voltage is applied.
- Custom float and absorption voltages and thresholds 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 maximum continuous output power is 3400W in 48V systems, 1700W in 24V systems and 850W in 12V systems. The output current is limited to 60A.
- The threshold before the charger will enter a Saturation charge is 13.9V / 27.8V / 55.6V
- The load must always be connected directly , without any disconnecting devices, to either the battery or, if available, MPPT load wire. “
- Only loads that will not get damaged by surges up to the system Voc can be connected to the battery via a disconnecting device.”
- If using any battery disconnecting devices, such as a BMS or switches, those devices must be rated to the system Voc.
- This MPPT should always be used with a battery connected

Important Notes:

- Use only PV Systems with open circuit voltage below 95V and a V_{MP} of 18V for 12V Charging 36V for 24V Charging and 72V for 48V charging.
- This equipment must be installed by qualified personnel only and incorrect wiring can cause fire, injury or death – GSL will accept no responsibility for MPPT misconnection or misuse.
- Use only for 12V, 24V or 48V $LiFePO_4$ batteries and confirm the MPPT settings, charge voltages and currents are correct for your battery system – if in any doubt seek qualified advice!
- Use wires suitable for at least 80A, 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 80A 60VDC fuse would do.
- Before connecting the battery always check the battery and PV panel polarity.
- **Optional Diode** A suitably heatsinked 80A 60V schottky diode (its anode connected to the + panel and cathode to the MPPT + input white wire) may be used, see wiring diagram. This diode will protect against panel short and block any voltage on the panel but will slightly decrease the battery charge current.
- I**F** the optional diode is not installed then shorting the panels when the batteries are connected may damage the MPPT.
- To enhance Battery and Load protection the MIHV or equivalent and a suitable BMS rated to the maximum panel power and 170% of nominal battery voltage is highly recommended.

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For optimal performance from panel and MPPT please use the following table to determine the best setup for your situation.

Panel Configuration	V_{OC}	V_{MP}	12V Charging	24V Charging	48V Charging
"Battery Panel"					
1x12V Battery Panel	21	16			
2x12V Battery Panel	42	32	✓		
3x12V Battery Panel	63	48	✓	✓	
4x12V Battery Panel	84	64	✓	✓	
1x24V Battery Panel	42	32	✓		
2x24V Battey Panel	84	64	✓	✓	
Grid Connect Panel (size = no. cells in grid)					
1x18 Cell Grid	10	8			
1x48 Cell Grid	28	23	✓		
2x48 Cell Grid	56	46	✓	✓	
3x48 Cell Grid	84	69	✓	✓	
1x52 Cell Grid	31	25	✓		
2x52 Cell Grid	62	50	✓	✓	
3x52 Cell Grid	93	75	✓	✓	✓
1x54 Cell Grid	32	26	✓		
2x54 Cell Grid	64	52	✓	✓	
3x54 Cell Grid	96	78	✓	✓	✓
1x60 Cell Grid	36	29	✓		
2x60 Cell Grid	72	58	✓	✓	
1x72 Cell Grid	44	36	✓	✓	
2x72 Cell Grid	88	72	✓	✓	
1x96cgsp	65	55	✓	✓	

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Changing Battery Type Setting Procedure

1.Ensure all the MPPT wires are disconnected.

2.Remove 7 front panel screws and the front panel and slide out cover – **see Figure 1**.

3.Locate connector J4. By default this will be Jumperless (Nominal Setting) – **see Figure 1**.

4.Shift link on J4 to desired battery setting (High Capacity – **see Figure 2,** Long Life **- See Figure 3**) .

5.Slide back cover and fit in front panel carefully, ensuring led is still visible through the faceplate and screw back the 7 mounting screws.

- The above procedure can be repeated to return to Nominal Setting by removing the jumper.

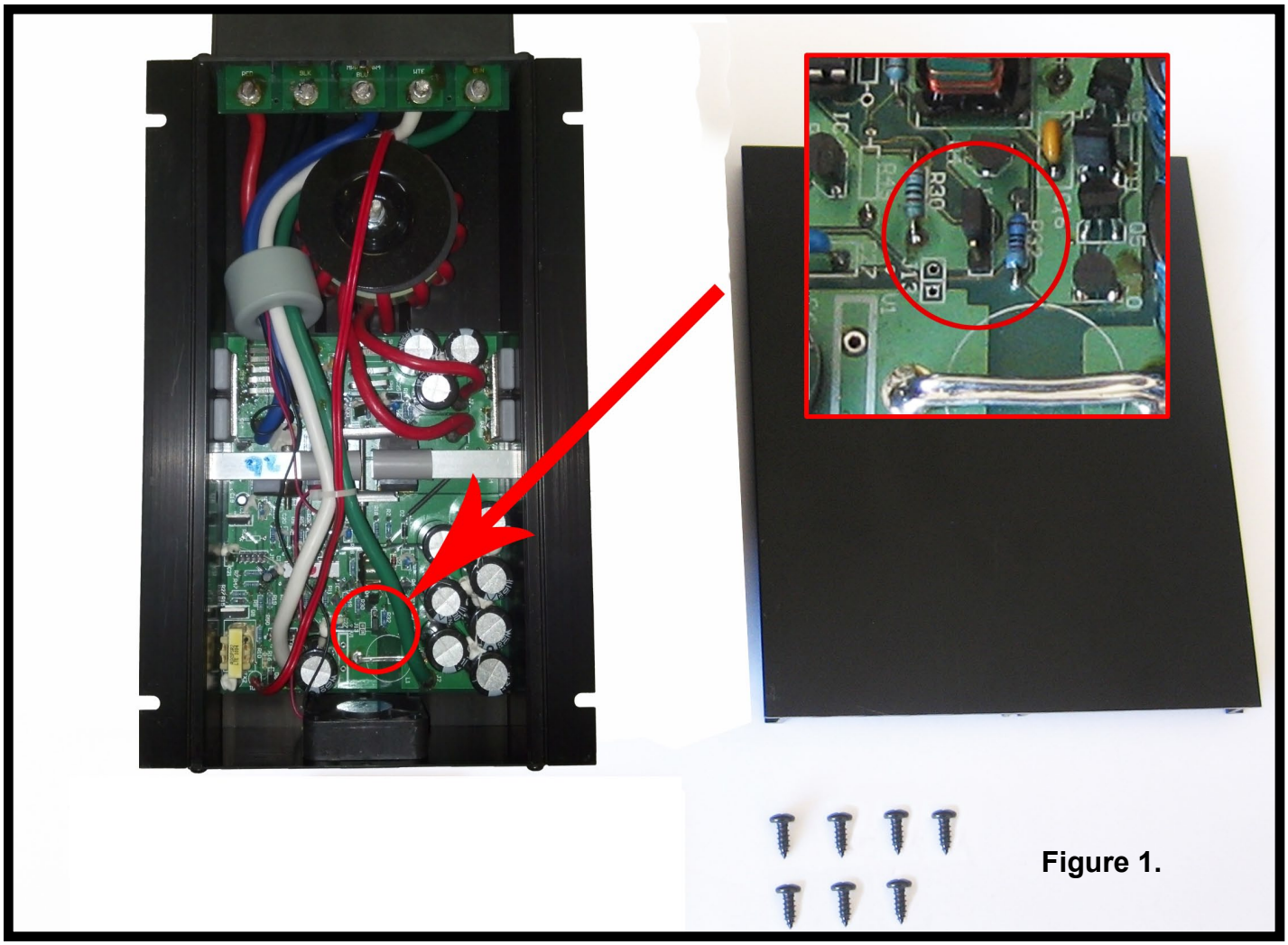

Figure 1.

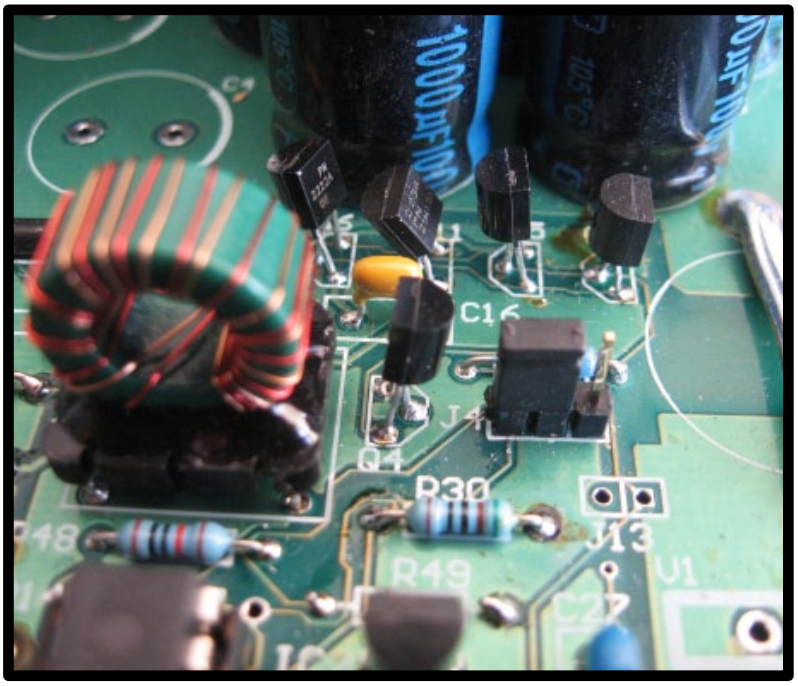

Figure 2 (*Above*): High Capacity Setting

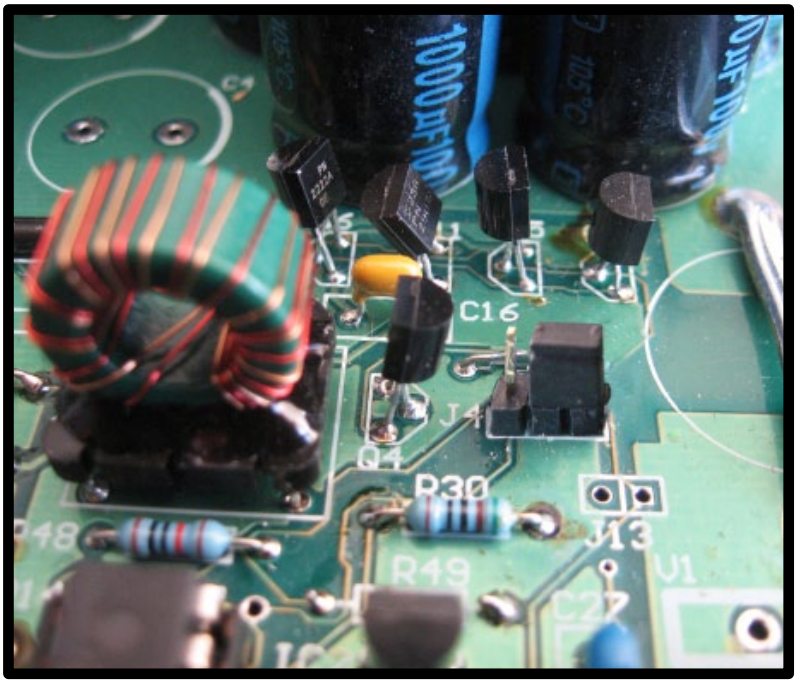

Figure 3 (*Above*): Long Life Setting

MPPT FAQs

Q: What is an MPPT?

MPPT stands for Maximum Power Point Tracker and is a specialized converter designed to maintain the PV voltage at the level in which it delivers maximum power to the load or battery. The panel's nominal output power can only be obtained 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 saturation and maintanence.

Q: What sorts of loads can I power with the MPPT60?

1. The maximum bulk charge current with the MPPT60-1L on a 12V battery and 800W panel is approximately 60A, so you can expect about 200AH per day which means a 200W load for about 10 hours daily.

2. Following the same reasoning with a 24V 1700W panel the MPPT60-1L will supply a daily load of 400W for about 10 hours.

3. Following the same reasoning with a 48V 3400W panel the MPPT60-1L will supply a daily load of 800W for about 10 hours.

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

GSL's MPPTs produce far less interference than a conventional solar regulator during the absorption and float stages, that is during most of its operating time, and it is 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.

Q: Why are MPPT not more common in standalone solar systems?

Until now and despite their overwhelming advantages MPPTs have not been commonly used in standalone solar systems because of cost. The new GSL MPPT specifically addresses this issue making economic sense in a wide range of solar systems.

Q: What sort of batteries should I use?

1. A deep cycle battery is a must due to the cyclical nature of the solar system with a recommended battery capacity of at least 360AH.

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 maintenance stage.

Q: How do 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 3% of nominal panel power. Below 3%, about 10W in a 400W panel, the MPPT will have a slightly lower output current than a non MPPT.