PTS PSU/Charger

Model C2195A 6Amp Solar Regulator/Power Supply

- A Complete solution for small solar powered instrument power systems.
- Works with 12V or 24V Solar panels.
- Ideal for Teleterm M2 RTU's, data-loggers, remote field instrumentation, alarm systems, remote access systems etc.
- Digital output to indicate charging

FEATURES

- **Charging characterised for sealed lead-acid cells.**
- **12Vdc or 24Vdc operation.**
- **Operates with up to 140W Solar Panels**
- **Under-voltage cut-out protects battery from deep discharge.**
- **Series regulator design for best efficiency.**
- **Solar charging output for system monitoring.**
- **DIN Rail mounting**
- **Temperature compensated battery charging for best standby time and battery life.**

Overview

The Powerterm PTS is a combined Solar Regulator and Power Supply system with integrated standby battery management for small solar powered applications.

Just connect a solar panel, sealed lead acid battery and load for an industrial grade solar powered system.

This DIN rail mounted product is ideal for providing dc power to Teleterm M2-series RTU systems when mains power is not available. Applications include RTU's, data-loggers, remote monitoring, and alarm systems.

Under-voltage Cut-Out

In the event of complete discharge of the battery, an under-voltage cut-out disconnects the load preventing the battery entering its "deep" discharge phase, which can cause irreparable damage to the battery, and reduce its capacity and life.

Fault Protection

Batteries are capable of delivering very large currents under system fault conditions that can damage wiring and equipment. The PTS incorporates an auto-resettable load cut-out, which disconnects the load under over-current fault condition.

Charge Control

The PTS controls the charging of the battery to ensure optimum life. When the battery is fully charged, the PTS will disconnect the solar panel to prevent overcharging.

System Monitoring

The PTS provides a Charge detect output. When the solar panel is connected and charging, this output is on. This output can be used to detect solar panel or charger failure, or to measure actual charging hours.

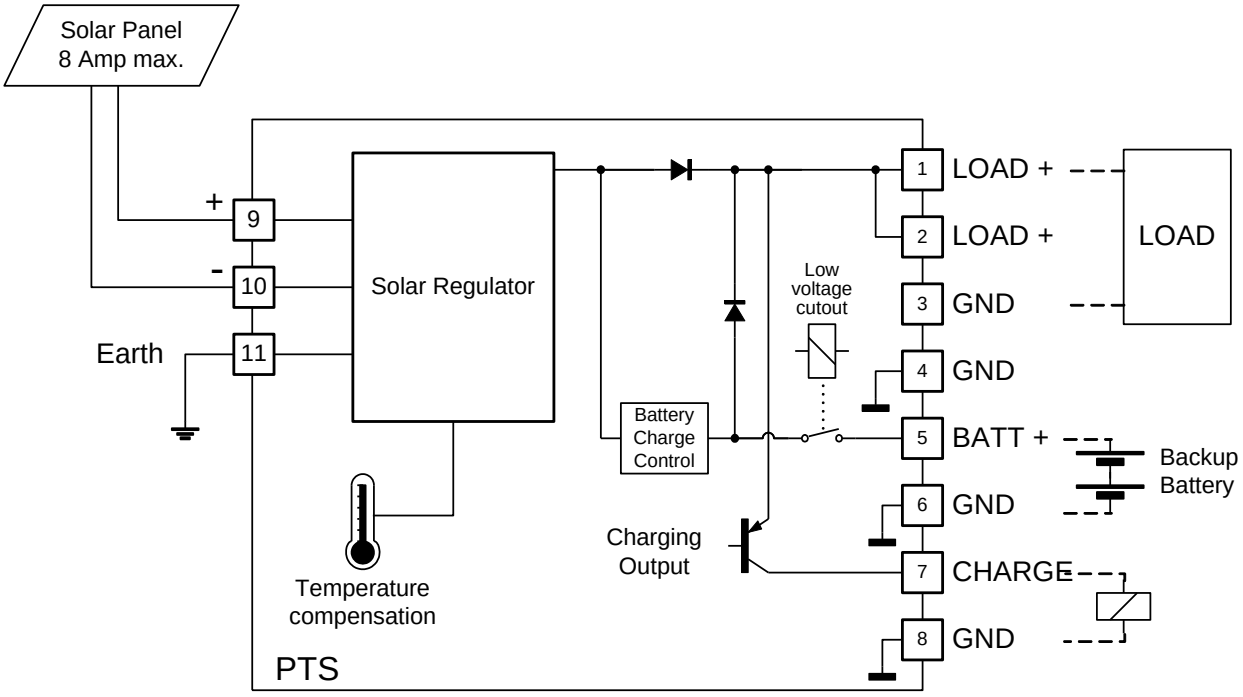
12/24V Selectable

The PTS can be used in 12V or 24V applications. The PTS can be switched to the correct battery voltage and adjusts the solar regulator and low voltage cut-out accordingly.

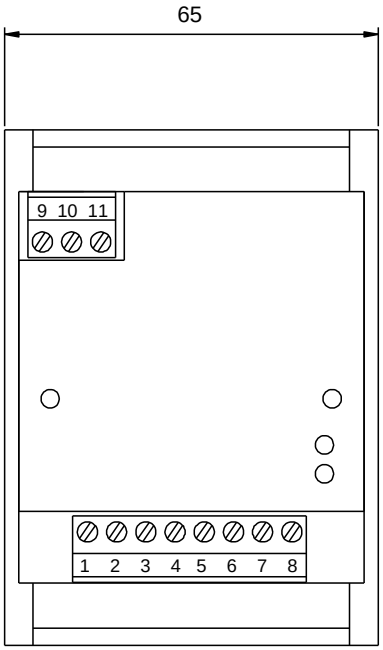
Temperature Compensation

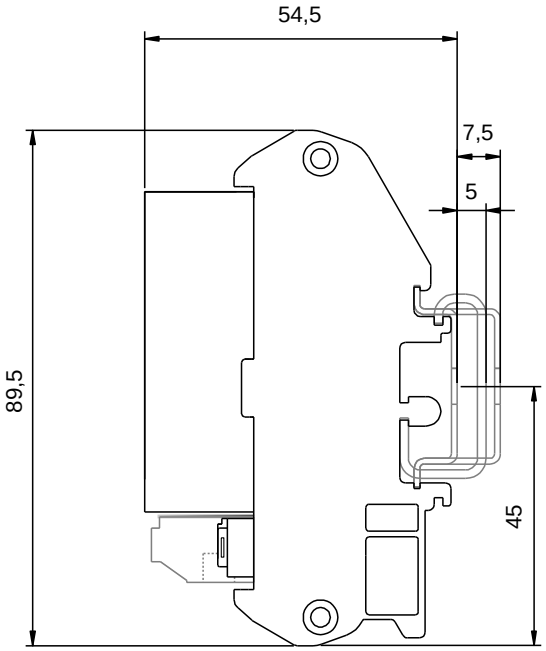
In outdoor environments, the ideal battery voltage will vary with temperature. The PTS has a temperature sensor that compensates for changes in ambient temperature to keep the battery at its optimum.

Typical System Connection Diagram



Mechanical Details





SPECIFICATIONS

Solar Input	
Solar Panel Charge Current	6 Amps maximum
Solar Panel Nominal Voltage	12V or 24V (switchable)
Surge withstand	2kV 1.2/50microsecond pulse (+/- to earth)
Fast Transients	2 kV

Load Output	
Output Voltage	13.0V – 14V on 12V switch position 26.0V-28.0V on 24V switch position
Average rated load	3 Amps average (continuous)
Peak rated load	8 Amps maximum (5% duty cycle)
Overload protection	≅ 10 Amps

Battery Charger	
Charging method	Constant voltage
Float Voltage (at 20°C)	13.5V – 13.8V with 12V battery 27.0V-27.6V with 24V battery
Maximum Charging Current	6 Amps

Under-voltage cutout		
Voltage Selection	**12V operation**	**24V operation**
Cut out Voltage	10.5 +- 0.4 Volts	21.0 +-0.6 Volts
Restore Voltage	11.5 +- 0.4 Volts	23.0 +-0.6 Volts

AC Detect Output (OK)	
Type	Switch to + Voltage output On when Solar voltage is above battery voltage
Max. operating voltage	30V dc
Max. operating current	50mA

Environmental	
Operating Temperature	0°C-60°C (+32°F-140°F) at full load
Storage Temperature	-10°C – 70°C (+14°F – 158°F)

Mechanical	
Width	62mm
Height	90mm
Depth	57mm

Weight	
Unpacked	160g approx.
Packed	210g approx.

Compliance to Standards	
Safety Conformance	Conforms to IEC950; EN60950
Emissions	EN 55011 and EN50081-2:1994 Group I, Class A
Immunity – ESD	IEC 61000-4-2:1995, level 3
Immunity – RF Fields	IEC 61000-4-3:1995, level 3
Immunity – Fast Transients	IEC 61000-4-4:1995 2 kV – DC power port 1 kV – input/output lines
Supply Variations	IEC 61000-4-7:1991
Design Life	50 000hours at 50°C full load

Ordering Information

ORDER CODE	DESCRIPTION
C2195A	Powerterm PTS 12/24Volt 6A Solar Regulator

APPLICATION NOTES

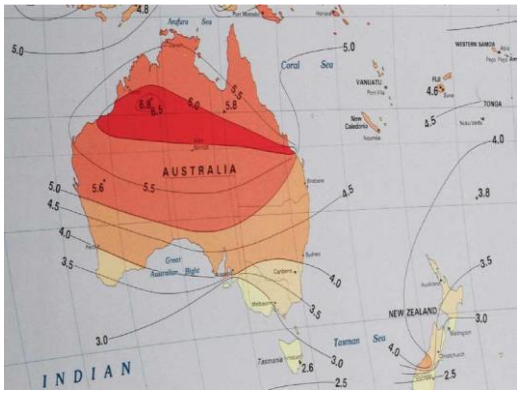
SOLAR PANELS

Solar panels are usually classified by their rated power output in Watts, determined by multiplying rated voltage by rated current. This rating is the amount of power the solar panel would be expected to produce in peak sunlight conditions.

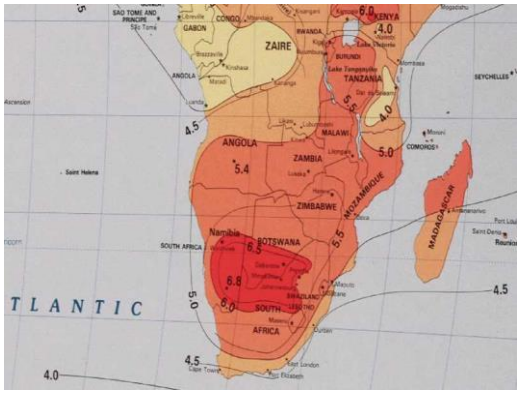
Of course in any location the sun is not at its peak for very long, and charging is slower at sunrise and sunset, and during cloudy or rainy conditions.

For charge calculation purposes, the available sunlight in any location can be converted into the equivalent number of “Peak Sun Hours”. There are a number of sources for this information available on the Internet.

As an example, the following sun-hour maps are reprinted from the website http://www.solar4power.com/solar-power-global-maps.html



Australia and New Zealand Low Peak Sun Hours



Southern Africa Low Peak Sun Hours

SOLAR PANEL MOUNTING

The optimum angle to mount a solar panel is to point the panel exactly due “solar” north or “solar” south (depending upon your hemisphere) at an angle from vertical equal to your latitude + 10 to 15 degrees. “Solar” north or south can easily be found by the position of the sun at the time half way between sunrise and sunset. (This is often NOT noon). The offset of about 10 degrees from the angle of latitude biases the solar panel angle for better solar pickup during winter when the sun is lower, and worse during summer, in an attempt to get a year round optimum.

SOLAR PANEL SIZING

The minimum solar panel size in Watts required for your application can be calculated from the following formula:

$$W \geq \frac{I_{AVE} \times V_{AVE} \times 24 \times 1.2}{S}$$

where:
W = minimum solar panel size in Watts
S = estimated low Peak Sun Hours
I_{AVE} = Average load current over a 24 hour period
V_{AVE} = Battery Voltage in Volts (generally 13.8V or 27.6V)

(Note: The 1.2 adds a factor of 20% to take into account system wiring and charger inefficiency

BATTERY SELECTION

The PTS is designed to operate with sealed lead acid type batteries also known as Valve Regulated Lead Acid (VRLA) batteries. This type of battery is sealed except for a valve that opens when the internal gas pressure exceeds the design limits. (That is why it is important not to overcharge VRLA batteries). Generally, these batteries can be used in confined areas and can be mounted in any orientation. (see the specific manufacturer’s data for details.)

There are two types of VRLA batteries on the market: Absorbent Glass Mat (AGM) and Gel-Cell. This refers to the method used to immobilise the electrolyte in the battery. Either of these two types of battery may be used with these chargers.

The battery chosen should have sufficient Amp-hour capacity to supply needed power during the longest expected period of "no sun" or extremely cloudy conditions. A lead-acid battery should be sized at least 20% larger than this amount. A typical period to use for this calculation would be 3 days.

Battery size can therefore be calculated from the following formula:

$$B = I_{AVE} \times D \times 24 \times 1.2$$

where:
B = minimum battery size in Ampere-hours
D = no. of days of standby time required.
I_{AVE} = Average load current over a 24 hour period

If the battery is required to provide full standby time at temperatures lower than 20°C, then increase this capacity by a further 10% for each 10°C below 20°C.

CHARGE DETECT OUTPUT

A logic output across terminals 7 and 8 is provided to detect the presence/absence of solar charging.

A High output (output on) confirms that the Solar Panel voltage is above the battery voltage, and that charge current is going into the battery from the solar panel. The output load could still be greater than this current in off-peak sun conditions, and so this does not always indicate net positive charging of the battery.

A green light labelled ‘CH’ on the front of the PTS is a visual indication of the state of this output. When this light is on, the output is on.

LOW VOLTAGE CUTOUT

When the battery voltage drops during discharge to a preset cut-off point, a cut-off circuit in the PTS will disconnect the battery from the load. This prevents the battery from entering into a state of deep-discharge, protecting it from permanent damage.

When the solar charging resumes, the cut-out circuit will automatically reconnect the battery to the charger and load only if the battery is above the (lower) restore voltage point. This protects against danger or damage from reverse connected or dead batteries.

A red lamp labelled ‘DC’ on the front of the PTS when on, indicates that there is DC supply to the load. During battery backup, the Green lamp will be off and the Red lamp will be on. After the battery has been disconnected by the cut-out, both lamps will be off.