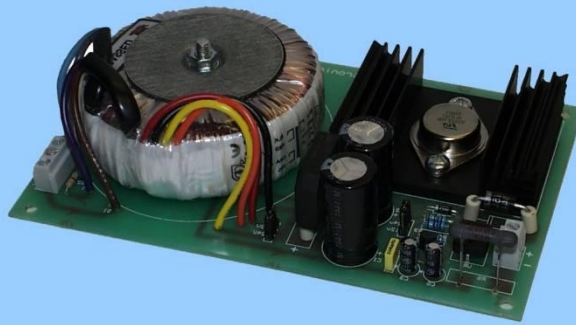


# Astrosyn

## Guide to Building a UPS using Lawtronics Open PCB Chargers



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## Introduction

This application guide explains how to use Lawtronics open PCB chargers to make battery-backed low voltage dc power supplies.

They are suited to the following battery types:

Sealed Lead Acid, Gel or Cyclon cells

Typically an application requires a direct current (dc) power source derived from the mains alternating current (ac) power line using a power supply or power adapter to step the voltage down and rectify the ac power to dc.

This is fine until there is a mains power failure, ranging from a momentary glitch in supply to storm damage bringing down cables. The application may be required to stay on during this power failure to support systems like alarms, monitors or remote communications equipment. The application might only need to keep running for a matter of seconds or many hours.

In this situation a battery backed supply is required, where the battery sources power to the application during periods of mains failure. The length of time that power can be sustained is thus defined by the amount of power that can be stored by the battery.

### Sealed Lead Acid (SLA), GEL or Cyclon Batteries

Commonly these batteries are available in 6V, 12V, 24V or 30V versions. (They are also available in multiples of 2V, for which Astrosyn can also offer special versions of open card chargers).



Your application will specify the main requirements of your battery backed-up supply:

- Operating voltage range
- Current drain
- Time for which supply must be maintained

As an example, assume that an application circuit can be powered by 12V dc. A typical SLA 12V battery ranges from around 13.8V fully

charged dropping to around 10.5V when discharged.

While the mains supply is present the charger circuit should be capable of supplying enough current to power the application and keep the battery topped up with charge. The amount of power that battery can provide is rated by its ampere - hour capacity (C).

It is always advisable to over-specify the battery capacity to provide sufficient headroom for inefficiencies in power storage and life expectancy of the battery.

All major battery suppliers can provide information on the best way to choose a battery with sufficient capacity for the application.

As a guideline, allowing an extra 50% of battery capacity is a good starting point. For example, if you expect to draw 1A for 1 hour, the battery capacity should be at least 1.5Ah.

The following table should help you to specify the size of open card charger to meet the power requirements of your application.

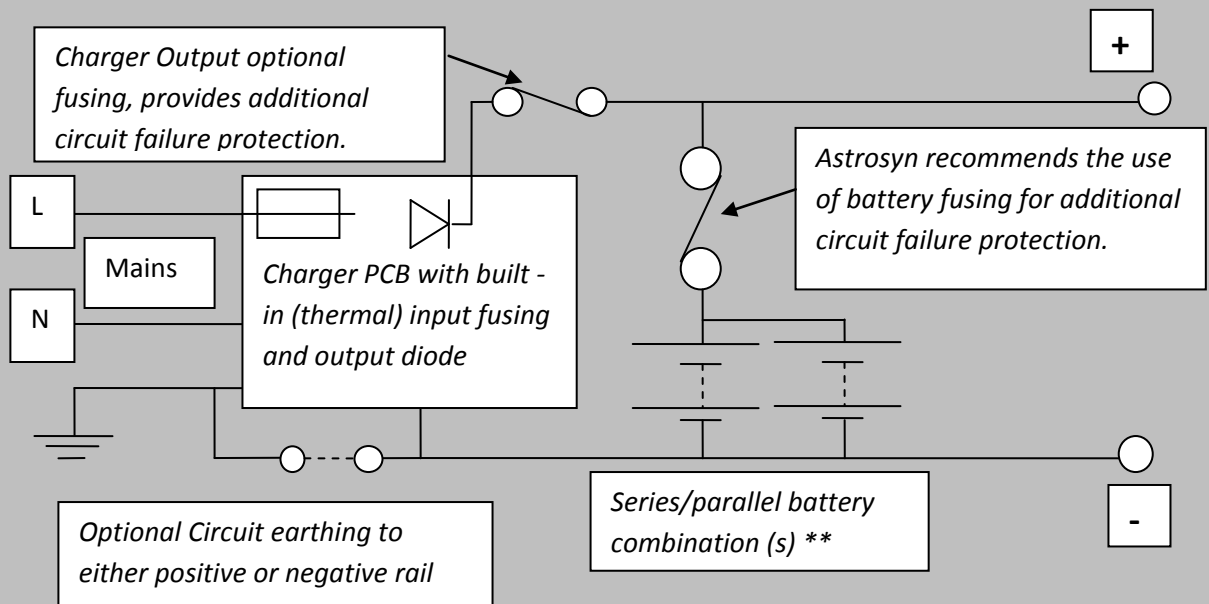
The appropriate battery Ampere-hour sizes are shown in brackets.

**Astrosyn Open PCB Battery Chargers**

Table shows peak charging current (mA) and suitable battery capacity (Ah) for each charger model.

Model	6V	12V	24V	30V
<b>SLA250PCB</b>	320mA (>1.25Ah)	200mA (>0.8Ah)	150mA (>0.6Ah)	Not available
<b>SLA500MPCB</b>	650mA (>2.6Ah)	500mA (>2Ah)	350mA (>1.4Ah)	Not available
<b>SLA800MPCB</b>	1200mA (>4.8Ah)	800mA (>3.2Ah)	600mA (>2.4Ah)	Not available
<b>SLA900MPCB</b>	1400mA (>5.6Ah)	1200mA (>4.8Ah)	800mA (>3.2Ah)	600mA (>2.4Ah)
<b>SLA1500PCB</b>	1500mA (>6Ah)	1500mA (>6Ah)	1000mA (>4Ah)	Not available

**Schematic layout of a backup charger, with additional fuse recommendations, and single or parallel/series battery combinations.**



**\*\* Series/parallel battery combinations:**

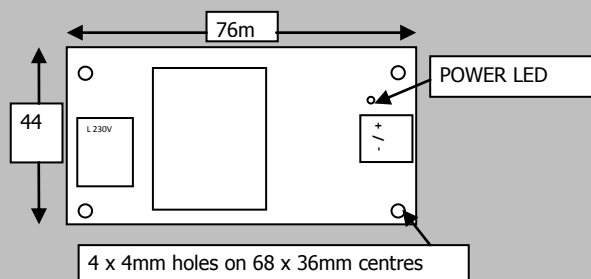
Note that only batteries from the same manufacturer, capacity, state of charge, and age should be combined in parallel/ series combinations. Refer to the manufacturers' battery specification and datasheet and the Astrosyn product /operation datasheets for more detail.

To prevent damage, an SLA battery should not normally be charged at a rate greater than  $C/4$ .

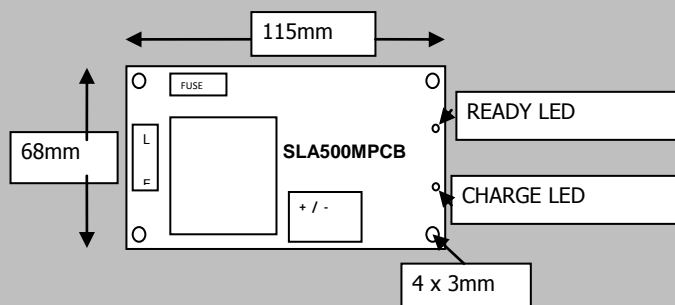
Conversely, even a very small trickle charger can keep a relatively large ampere-hour capacity battery fully charged, depending upon the duty cycle of power drawn by the application. e.g. an application that only draws current from the battery when the mains power fails might only require a very small trickle charger that can compensate for the self discharge of the battery used.

**Mounting details for Astrosyn Open PCB SLA chargers****SLA250PCB**

PCB size 76mm x 44mm with mounting centres at 68mm x 36mm (4 x 4mm holes). Maximum component height above pcb: 35mm; below pcb: 5mm.

**SLA500MPCB**

PCB size 116mm x 68mm with mounting centres at 103mm x 56mm (4 x 3mm holes). LED centres are 5mm from pcb edge. Maximum component height above pcb: 40mm; below pcb: 5mm.



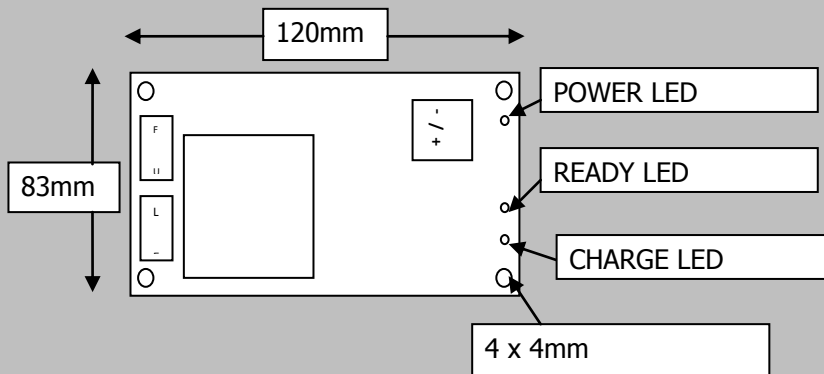
**SLA800MPCB**

PCB size 120mm x 83mm with mounting centres at 105mm x 68mm (4 x 4mm holes).

LED centres are 4mm from pcb edge.

Maximum component height above pcb: 50mm;

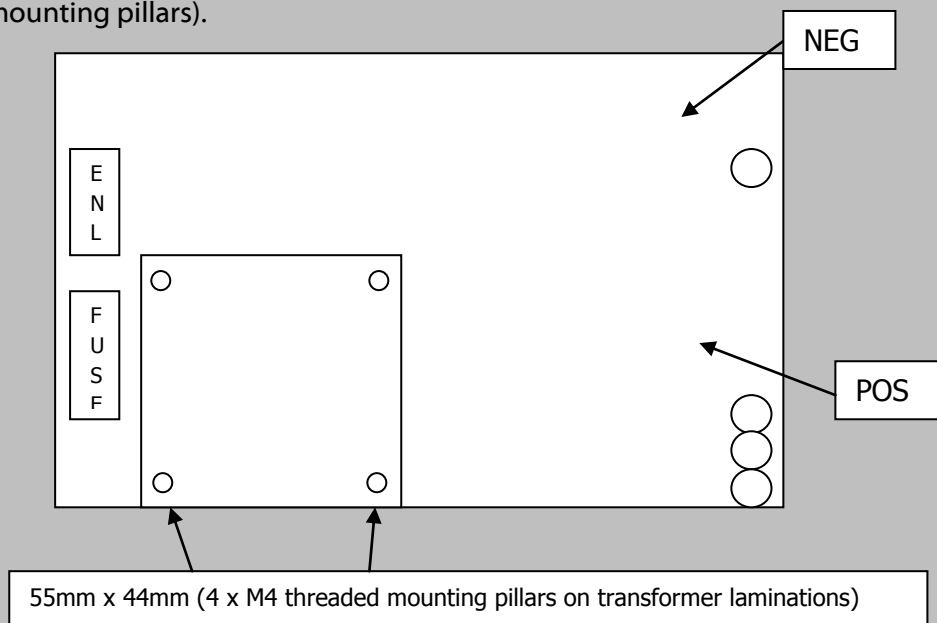
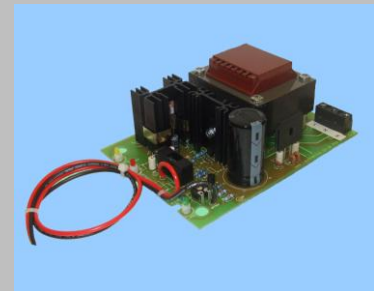
Maximum component height below pcb: 5mm.

**SLA900MPCB**

PCB size 142mm x 102mm with mounting centres at 55mm x 44mm (4 x M4 threaded mounting pillars on transformer laminations).

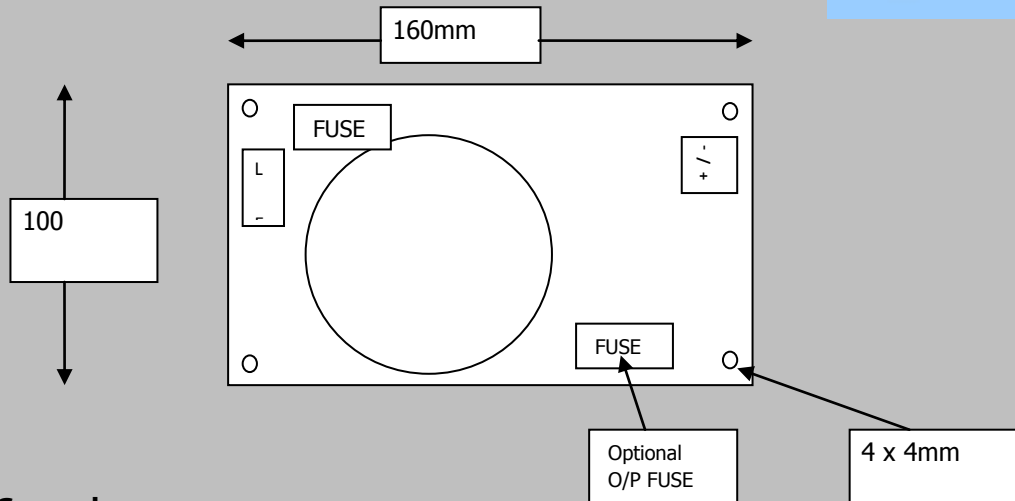
Maximum component height above pcb: 50mm;

Maximum component height below pcb: 15mm (bottom of mounting pillars).



**SLA1500PCB**

Where toroidal transformers are employed, as in the SLA1500PCB, it is important that under no circumstances should both ends of the toroid mounting screw contact a metal chassis as this would constitute a shorted turn, causing irreparable damage.

**General**

Open PCB's are designed for indoor use unless protected inside suitable housing. All models of Lawtronics open pcb charger cards are CE compliant and provide sufficient creepage and clearance on the PCB for their application typically in compliance with EN60950.

With the exception of the SLA900MPCB model, all units can be mounted using the four corner holes. The card must be mounted to provide adequate insulation requirements for the application.

Attention should be paid to allowing sufficient cooling and ventilation around the PCB in all eventualities of operation as the heatsink can get very hot.

Ensure correct input voltage. Most models can be hardwired for either 115V or 230V operation. Observe output polarity when making battery connection.

All models have mains fuse and/or thermal fuse, as well as reverse polarity and short circuit protection.

It is the responsibility of the system integrator to meet all safety and functional requirements in relation to standards in force, in particular with respect to suitable system wiring, electrical isolation and fusing.

**Recommended Protective Earth Operation**

If possible, laminations of E-I core (non-toroidal) transformers should be connected to protective earth. Most of the PCB's offer a connection between laminations and earth via the PCB tracking.

**Non-Earthed Operation:**

These units provide suitable creepage and clearance for non-earthed 'double insulated' application if mounted in a suitable housing with suitable mounting insulation. In this instance transformer laminations must be left floating.