Applications Guide

Building Low Voltage Uninterruptible Power Supplies Using Lawtronics Open Card Chargers

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

They can be made employing the following battery types:

1. 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.

1) Seal 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 Lawtronics can also offer special versions of open card chargers to suit)

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 let's assume that an application circuit can be powered by 12V dc.
A typical SLA 12V battery voltage 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 a 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 the good battery suppliers can provide information on the best way of choosing a battery with sufficient capacity for the application. As a rule of thumb, allowing an extra 50% of battery capacity is a good starting point, e.g., if you are expecting 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 PCB charger to meet the power requirements of your application. The appropriate battery Ampere-hour sizes are shown in brackets.

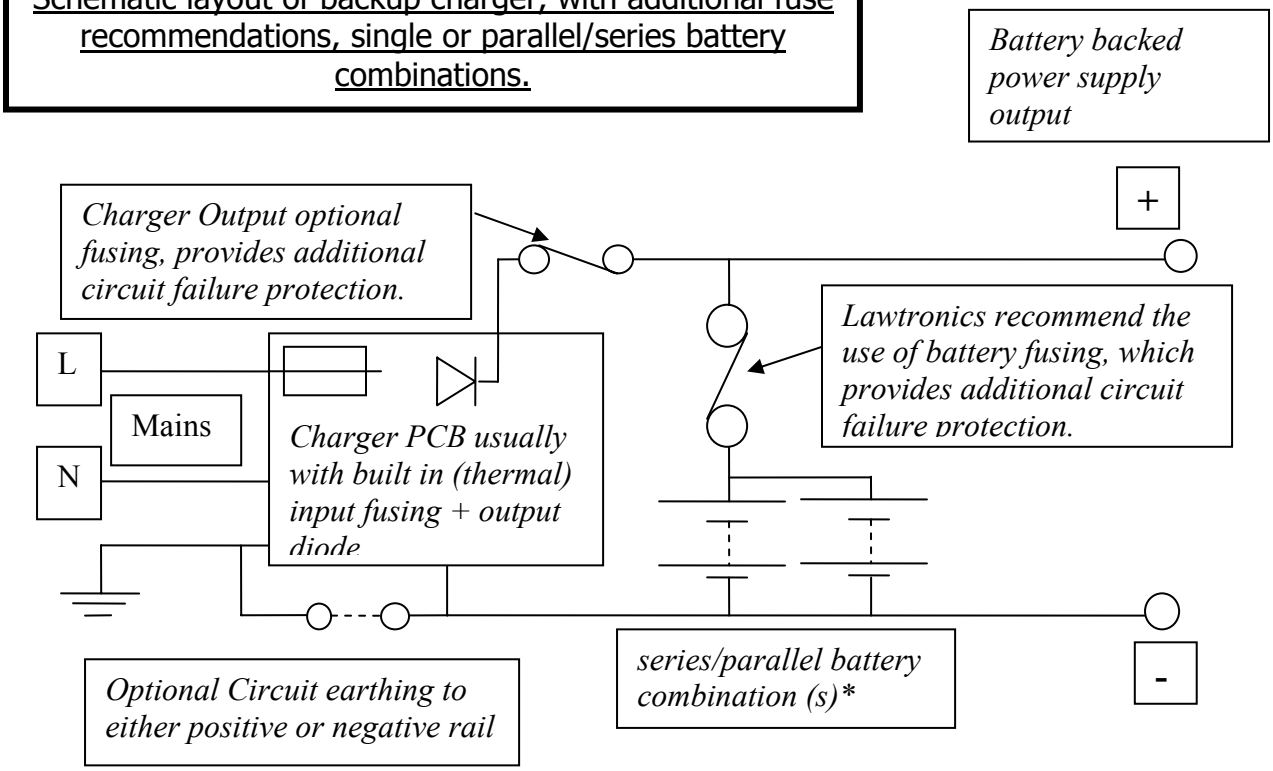
Model	6V	12V	24V	30V
SLA250PCB	320mA (>1.25Ah)	200mA (>0.8Ah)	150mA (>0.6Ah)	Not available
SLA500MPCB	650mA (>2.6Ah)	500mA (>2.0Ah)	350mA (>1.4Ah)	Not available
SLA800MPCB	1200mA (>4.8Ah)	800mA (>3.2Ah)	600mA (>2.4Ah)	Not available
SLA900MPCB	1400mA (>5.6Ah)	1200mA (>4.8Ah)	800mA (>3.2Ah)	600mA (>2.4Ah)
SLA1500PCB	1500mA (>6.0Ah)	1500mA (>6.0Ah)	1000mA (>4.0Ah)	Not available

As a rule of thumb, one should not charge a SLA battery at 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. For example, 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.

Refer to the manufacturers' battery specification and datasheet and the Lawtronics product /operation datasheets for more detail.

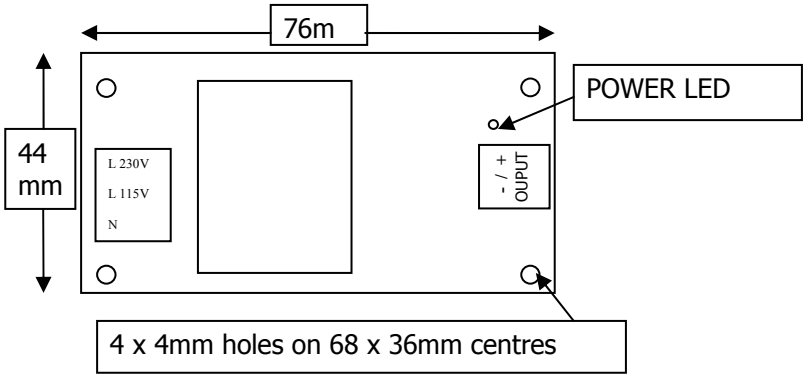
Schematic layout of backup charger, with additional fuse recommendations, single or parallel/series battery combinations.



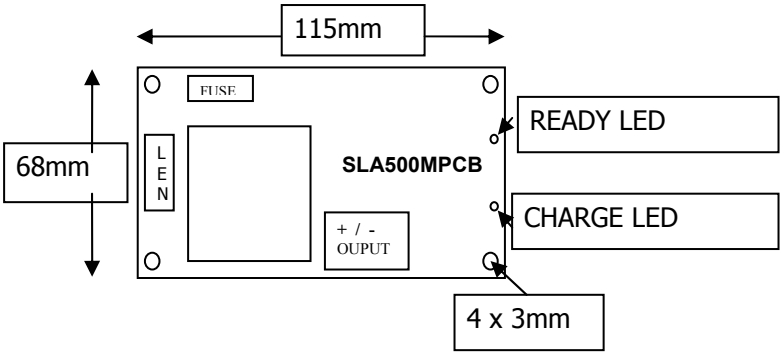
*Series/parallel battery combinations; note ONLY batteries of the same manufacturer, capacity, age and weight should be combined in parallel/ series combinations. They should also be in a similar state of charge. Refer to manufacturers recommendations for details.

Mounting details for the various open card SLA chargers:

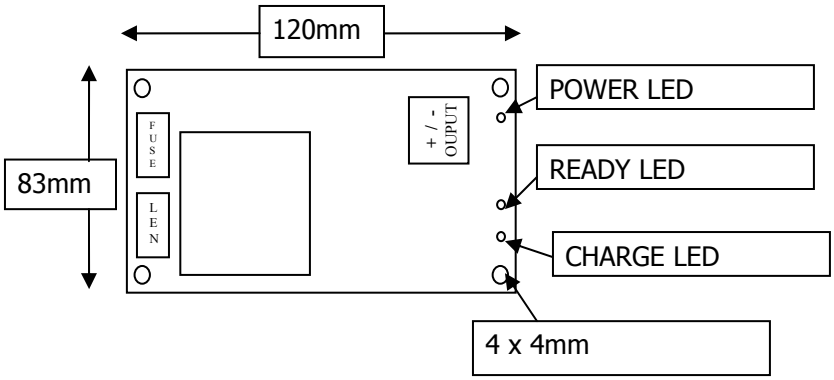
SLA250PCB



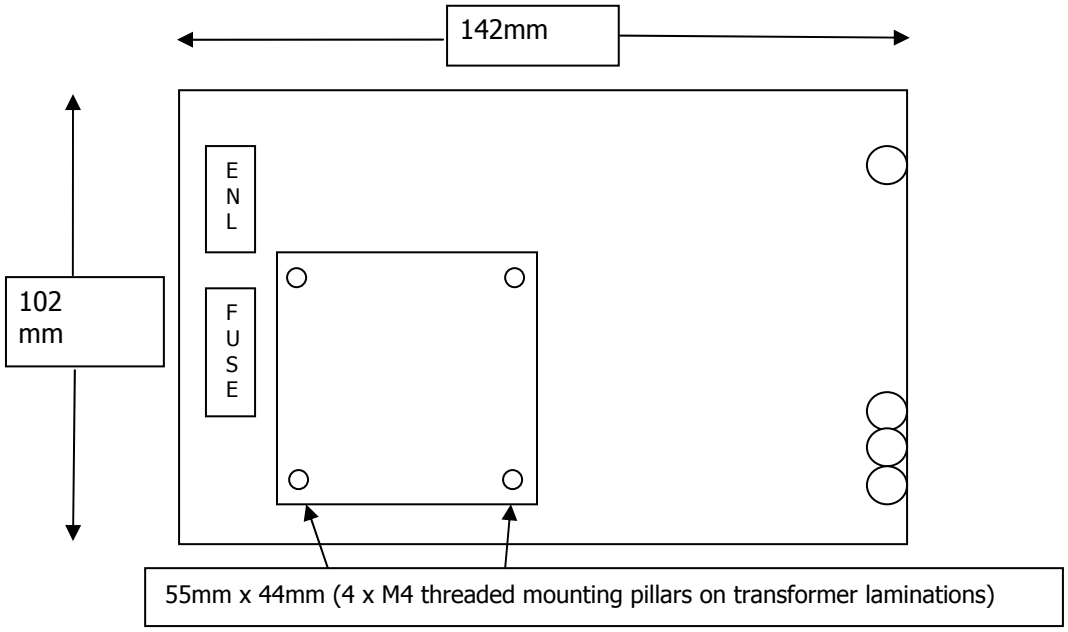
SLA500MPCB:- PCB size 116mm x 68mm with mounting centres at 103mm x 56mm (4 x 3mm holes). LED centres are 5mm from pcb edge. Maximum component height above pcb: 40mm; below pcb: 5mm.



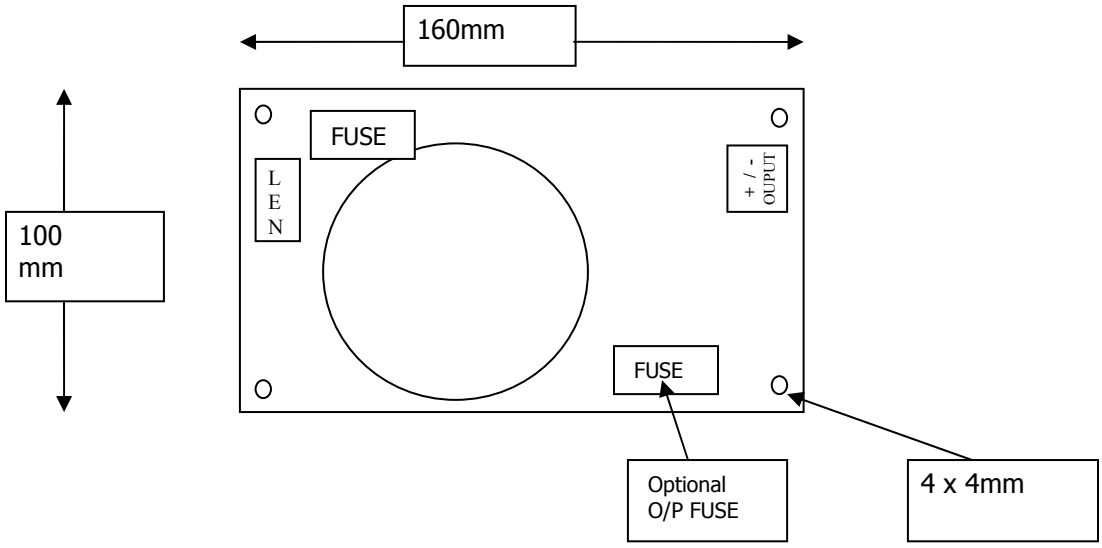
SLA800MPCB:- PCB size 120mm x 83mm with mounting centres at 105mm x 68mm (4 x 4mm holes). LED centres are 4mm from pcb edge. Maximum component height above pcb: 50mm, below pcb: 5mm.



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, below pcb: 5mm (isolation gaps must be added).



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

The charger cards can be mounted using the four corner holes, except for the SLA900MPCB.

Open PCB's are designed for indoor use unless protected inside suitable housing.

It is the responsibility of the system integrator to meet all safety and functional requirements, in relation to standards in force, installing these open card PCB's into suitable enclosures with suitable system wiring, electrical isolation and fusing. All units are CE compliant and provide sufficient creepage/ clearance on the PCB for their application typically in compliance with EN60950.

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

The card must be mounted to provide adequate insulation requirements for the application.

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; they also have reverse polarity and short circuit protection.

Protective Earth Operation (recommended): Where possible, laminations of standard 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 / 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.