NAPS MMINI PRO CHARGE CONTROLLER

OPERATION

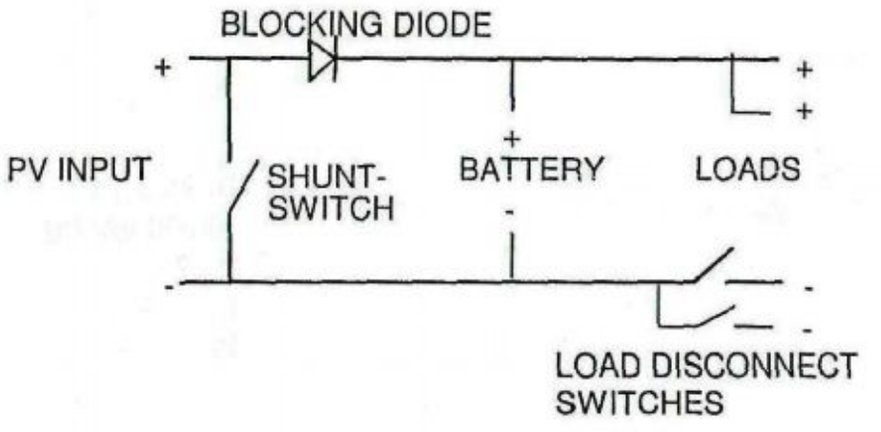
Charge control

MMini Pro's solid state charging circuitry provides fast and accurate charging and keeps batteries fully charged whenever possible. When necessary, MMini Pro gives flooded lead-acid batteries additional equalisation charging to improve recovery from deep discharges and to extend their life.

Temperature compensation of charge voltage

If the charge voltage is too high it increases battery water loss and corrosion, if it is too low it prevents the battery from being fully charged and may eventually damage the battery. The optimum charging voltage depends on temperature. MMini Pro has an internal temperature sensor, which will adjust the charge voltage according to ambient temperature. Thanks to this we can use a higher charging voltage during the winter without fear of overcharging during the summer.

MMINI PRO SIMPLIFIED SCHEMATIC



Load circuits and the low voltage disconnect

The controller has two load outputs, each for maximum current of 7A. Fully discharging the battery may damage it and may cause it to freeze in the winter. MMini Pro has a battery deep discharge protection, which disconnects loads from battery if there is a danger of deep discharge. Once the battery voltage has risen sufficiently the controller will automatically reconnect the loads. The deep discharge protection is indicated with a red indicator. To prevent nuisance tripping caused by switching on heavy loads the load disconnect function has a one-minute delay. The controller's load circuit 1 can be used for "dusk till dawn" lighting control. Load 1 will be switched on in the evening when the PV module ceases to produce electricity and will switch off again in the morning when the module again begins to produce electricity. Load 2 will always operate in normal load mode.

Overvoltage protection

The controller has a high battery voltage disconnect feature that protects the loads from abnormally high battery voltages. If the battery voltage exceeds approx. 15.7 (31.4) V the loads are disconnected immediately. The loads are automatically reconnected when the battery voltage decreases below 12.9 (25.8) V.

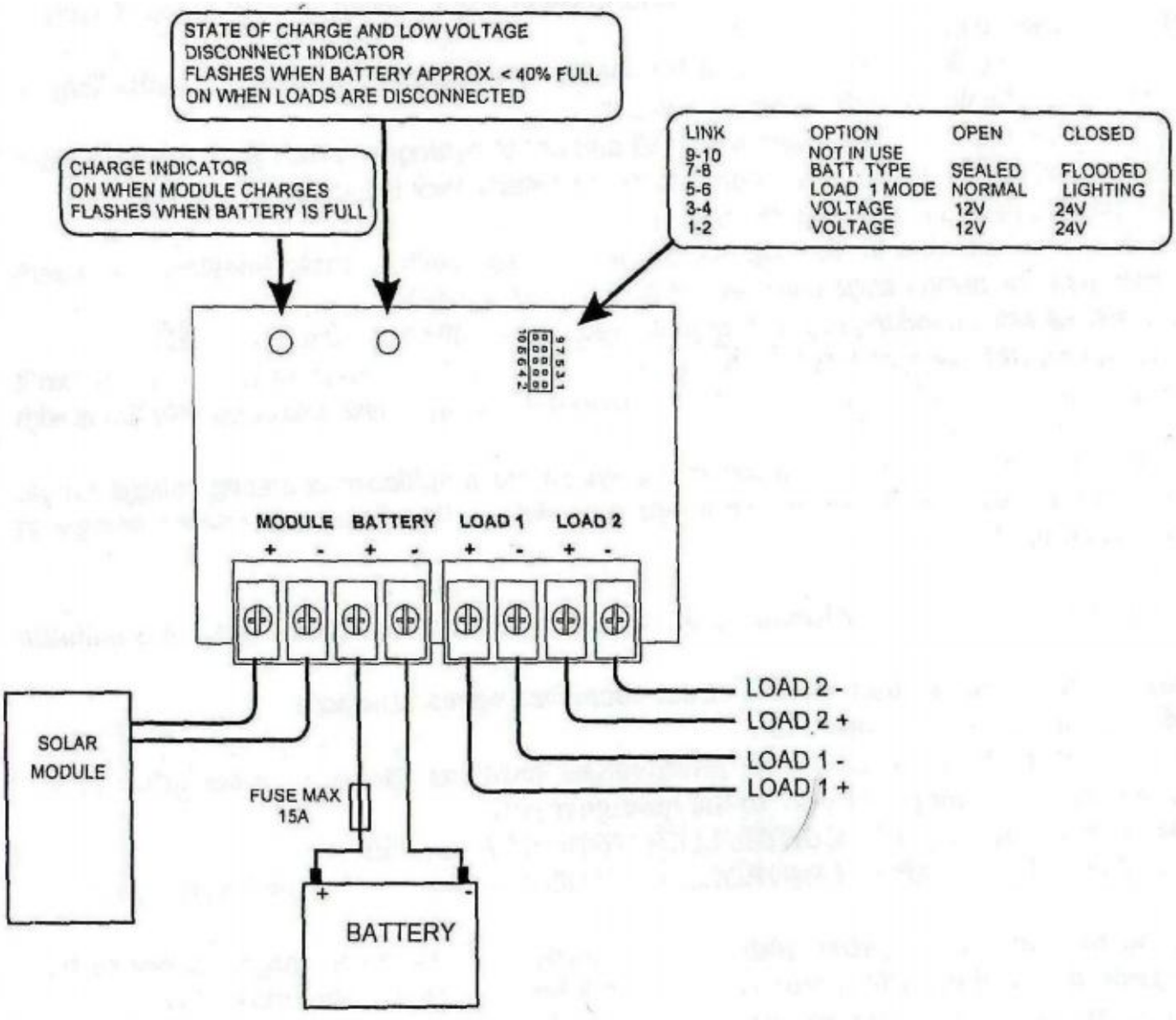
Indicator lights

Charging indicator, yellow lamp: lights up when PV module produces electricity. It will start to flash when the battery becomes fully charged and the controller starts to limit charging.

Battery state of charge and low voltage disconnect indicator, red lamp: the lamp will flash when battery state of charge is below approximately 40%. It will stay continuously on when the loads have been disconnected by the low or high voltage disconnect.

Selecting operating options

To access the option jumpers remove the two re-useable plastic rivets that hold box top and bottom together. Remove the plastic rivets at the bottom of the box carefully e.g. with a knife. Short circuit jumpers can be used to change the following operating options:



The factory settings are:
12V operation, load 1 normal operation, sealed battery.

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INSTALLATION

GENERAL

MMini Pro has a warranty period of two (2) years from the date of the purchase. The warranty covers defective parts and workmanship. The warranty is void if these instructions are not followed. If you have problems installing or using the system contact your dealer.

GENERAL SAFETY INSTRUCTIONS

- A lead acid battery is filled with sulphuric acid. The acid is corrosive and should be handled with great care.
- Protect your hands, eyes and clothes against accidental splashes.
- If acid spills onto your skin, wash it away immediately with plenty of clean water. Should it get into your eyes, wash for a long time with plenty of clean water. Failing to wash the acid away at once can cause damage.
- If the battery is installed indoors use a battery box or tray to prevent acid spilling to the floor. If acid spills onto the floor, wash it away with water.
- Open lead-acid batteries will generate a small amount of hydrogen, which is an explosive gas. Avoid smoking and open fire in the room where the battery pack is located!
- Allow sufficient ventilation around the batteries.
- Avoid accidental shorting of the batteries by metal objects such as tools, jewellery, etc. Lead-acid batteries can deliver large currents in a short circuit condition.
- Do not smoke while handling the acid, or in the room where the batteries are located.
- The system must have a battery fuse to protect against dangerous overcurrents. If it is blown it is **a sign** of a fault, find the cause and repair it before installing **a** new fuse. Use only fuses with correct rating.
- Make sure that the appliances you use in the system have sufficient operating voltage range. In the summer battery voltage can rise to approximately 15.0 V during equalisation charge, in the winter up to 15.5 V.

- **This charge controller is for indoor use only, never install it outdoors without a suitable enclosure.**
- **Install the controller so that there is about 10cm free space around it.**
- **Do not cover the charge controller.**
- **MMini Pro is to be used only with photovoltaic modules. Never connect other power sources such as wind generators to the module input.**
- **DO NOT USE THE CHARGE CONTROLLER WITHOUT A BATTERY**
- **DO NOT USE THE CHARGE CONTROLLER WITHOUT A BATTERY FUSE (MAX 15A)**

Connecting the battery to system with wrong polarity will cause very high current to flow into the system. Therefore MMini Pro systems must have a battery fuse, max. 15A. Take also care when connecting the module to the charge controller, extended wrong polarity may damage the charge controller.

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If necessary change the battery type setting and other operation settings prior to intallation.
To prevent sparking during installation cover the module e.g. with a tarpaulin.

1) Choose a location close to the battery and install the controller on the wall.
2) Connect load cables to the charge controller.
3) Connect battery cable with battery fuse removed first to MMini Pro and then to battery.
PAY SPECIAL ATTENTION TO CORRECT POLARITY!
4) Put battery fuse in place, the red indicator on the right should blink briefly. If it does not blink check cabling immediately.
6) Remove battery fuse.
7) Cover the PV modules e.g. with a tarpaulin.
8) Connect the module cable to controller solar input, pay attention to correct polarity!
10) Put the battery fuse in place. Remove the tarpaulin. The left yellow indicator should be lit or blink. The controller is now ready to use.

Specification

Nominal voltage	12/24 V
Maximum PV panel current	10 A
Maximum PV panel open circuit voltage	47 V
End-of-charge voltage @ +25°C	14.2/28.4 V
EOC temperature compensation approx.	-30/60 mV /°C
Maximum load current	2 x 7 A
Low voltage disconnect LVD	11.3/22.6 V
LVD reconnect	12.9/25.8 V
Operating temperature range	-40...+45 °C
Typical current consumption	4 mA

Accuracy of setpoints typically better than 1.5%.

EMC

MMini Pro complies with the requirements of the 89/336/EEC Electromagnetic Compatibility Directive, amended by 93/95/EEC, 96/58/EC, by meeting the following standards:

Generic standard	EN 50082-1
Conducted Emission	EN 50081-1 Class B
Radiated Emission	EN 55013 CISPR 22
RF Radiated Immunity	IEC 1000-4-3 3V/m
Fast Transient	IEC 1000-4-4 0.5kV +/-
ESD	IEC 1000-4-2 8kV air
Surge	IEC 1000-4-5 1.0 kV