

Backup-Mobile

Theory of Operation



The Backup-Mobile is a miniature UPS system which provides 12 volt DC (or 24 volt DC, depending on model) uninterrupted power by connecting the load terminal to either the main terminal or to the internal battery. Turn the switch "On" for normal operation. The switch should be turned "Off" for storage to avoid discharging the internal battery. When the switch is in the Off position the load terminal is directly connected (shorted) to the main terminal so accessories can still be run from the main battery.

There are 6 voltage settings used for this product:

- | | |
|------------------------------------|---------------------------------|
| 1) Main ON (12.5V) | 4) Charge OFF (12.4V) |
| 2) Main OFF (11.8V, The "N" value) | 5) Aux ON (not currently used) |
| 3) Charge ON (13.0V) | 6) Aux OFF (10V, The "P" value) |

The values can be set per customer request, default values are shown above. The Backup-Mobile continually monitors the voltage of the main battery (Main terminal) and internal battery (Aux terminal). When the voltage on the Main input goes above Main ON, then the Main battery is connected to the Load terminal. When the Main Input voltage falls below Main OFF, the Main Switch is turned off and the internal battery is connected to the load. The Aux switch remains on until the Aux voltage falls below Aux OFF, at which time the load is disconnected to save the battery from complete discharge, which would shorten the battery life (Note the unit has a quiescent current of 10mA) When the Main Input voltage rises above Main ON, then the Aux switch is turned off and the Main Switch is turned on. Please note that the Main and Aux switches are never on at the same time. The purpose of having different ON and OFF levels for the Main Input is to provide some hysteresis to prevent the device from switching back and forth (oscillating) between the Main and Aux inputs due to wire resistance.

Battery Charger: The battery charge function of this device is capable of charging the internal battery to 13.8 volts even if the Main Input voltage is as low as 12 volts. The charger turns on when the Main Input voltage is above Charge ON and is turned off when it falls below Charge OFF. Charge ON should always be chosen to be above Main ON, and Charge OFF should always be chosen to be above Main OFF. The internal battery may also be charged with an external charger: first turn the unit Off, then connect the Black (-) charger lead to the GND terminal and the Red (+) lead to the Aux terminal. We recommend PST-G60-12AS-A or PST-P2012-A12A. For maximum battery life, do not exceed 0.5 Amp charge current. Never store unit with a discharged battery.

An additional external 12V battery may be added to the GND (-) and Aux (+) terminals for increased capacity.

The LEDs indicate which source, Main battery or Auxilliary (internal) battery, is powering the load. Optionally a signal can be provided on a connector (per customer request) to be used to operate relays, remote LEDs, etc.

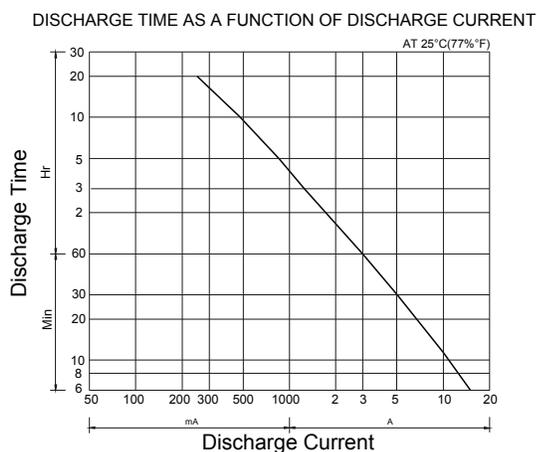
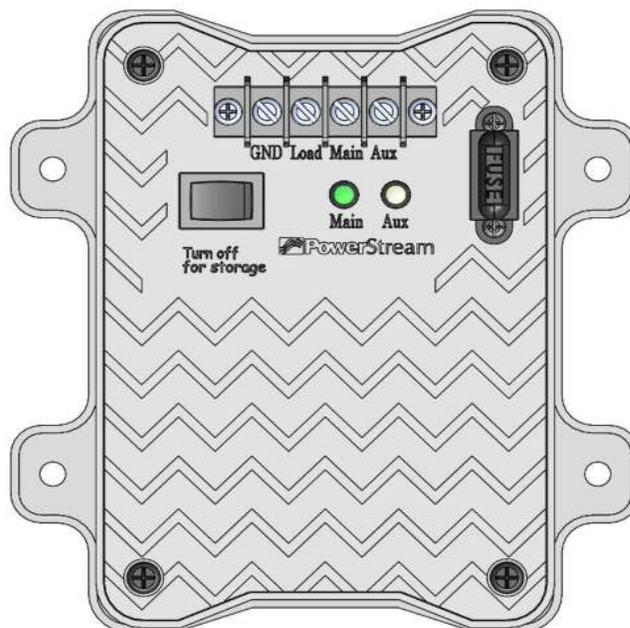


Fig. 1



Battery:

The ampere hour rating of a battery is based upon the current of a continuous discharge for 20 hours that will end in a battery voltage of 10.5 volts.

With moderate rates of discharge the battery acid is abstracted slowly enough to permit sufficient diffusion into the pores of the plates to keep up the supply needed for the chemical reactions. With increased rates of discharge the supply of acid is used up so rapidly that the diffusion is not fast enough to maintain the voltage.

For example, a 5 Ah battery will discharge to 10.5 volts in 30 minutes at a current draw of 5 amps — not a full hour, see Fig. 1. This is assuming constant discharge current, however, and if the battery were allowed to rest the voltage would soon rise sufficiently to allow a 0.5 amp load to run for almost five more hours. See Fig. 2 for voltage vs. discharge time for various discharge currents.

BATTERY DISCHARGE CHARACTERISTICS 25°C (77°F)

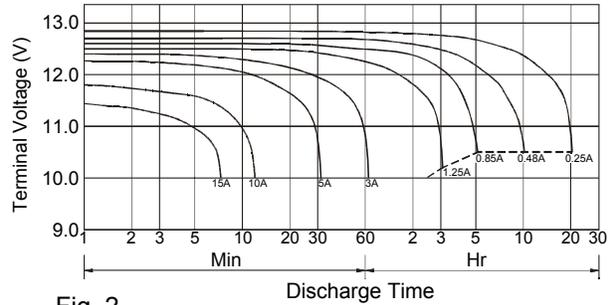


Fig. 2

BATTERY SELF DISCHARGE CHARACTERISTICS

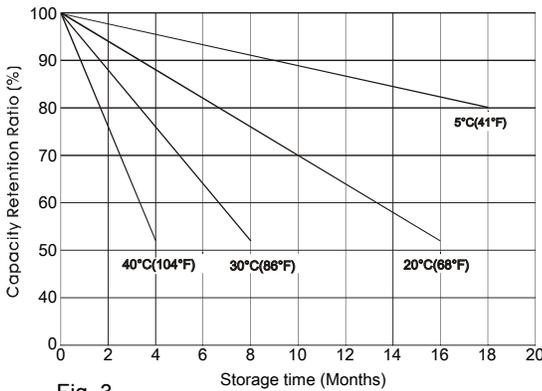


Fig. 3

TEMPERATURE EFFECTS IN RELATION TO BATTERY CAPACITY

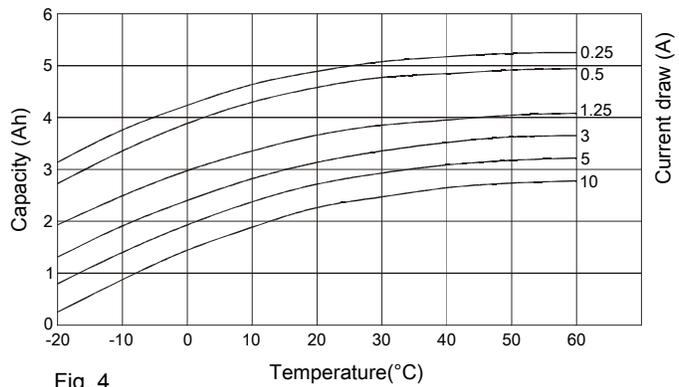


Fig. 4

When lead acid batteries of any type are stored for extended periods of time, lead sulphate is formed on the negative plates of the batteries. This phenomenon is referred to as "sulphation." Since the lead sulphate acts as an insulator, it has a direct detrimental effect on charge acceptance. Sulphation occurs more rapidly in discharged batteries. Batteries are also susceptible to self discharge, see Fig. 3. Self discharge occurs without any load due to chemical reactions. Note that colder temperatures result in a sluggish battery of diminished capacity due to the lower diffusion rate of the acid, See Fig. 4. High temperatures on the other hand lead to corrosion of the plates. Ideally batteries should be stored at cooler temperatures to reduce sulfation and self discharge but used at moderate temperatures around 20°C to 40°C. Always turn the unit off before storing and never store the unit with a discharged battery, Ideally store in a cool, dry place.

Temperature	Shelf Life
Below 20°C (68°F)	9 months
21°C (70°F) to 30°C (86°F)	6 months
31°C (88°F) to 40°C (104°F)	3 months
41°C (106°F) to 50°C (122°F)	1.5 months

Troubleshooting

No Output when connected to main battery:

Make sure main voltage is above "Main On" setpoint

Green LED should be lit

No output from internal battery:

Switch should be "on"

Amber LED should be lit

Check the fuse

Battery voltage measured at GND and AUX terminals should be above "Aux On" setpoint

Battery not charging:

Main voltage should be above "Charge On" setpoint

BATTERY OPEN CIRCUIT VOLTAGE VS. REMAINING CAPACITY

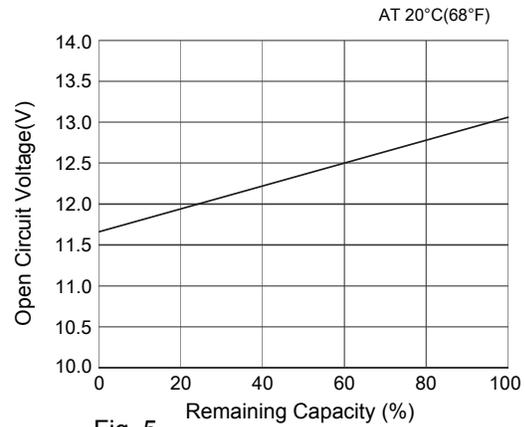


Fig. 5

Remaining internal battery capacity can be approximately determined by turning the unit off for at least 24 hours and measuring the voltage at the GND and AUX terminals. Refer to Fig. 5. For example, a measured voltage of 12.4 volts would indicate 50% remaining capacity or 2.5 Ah.