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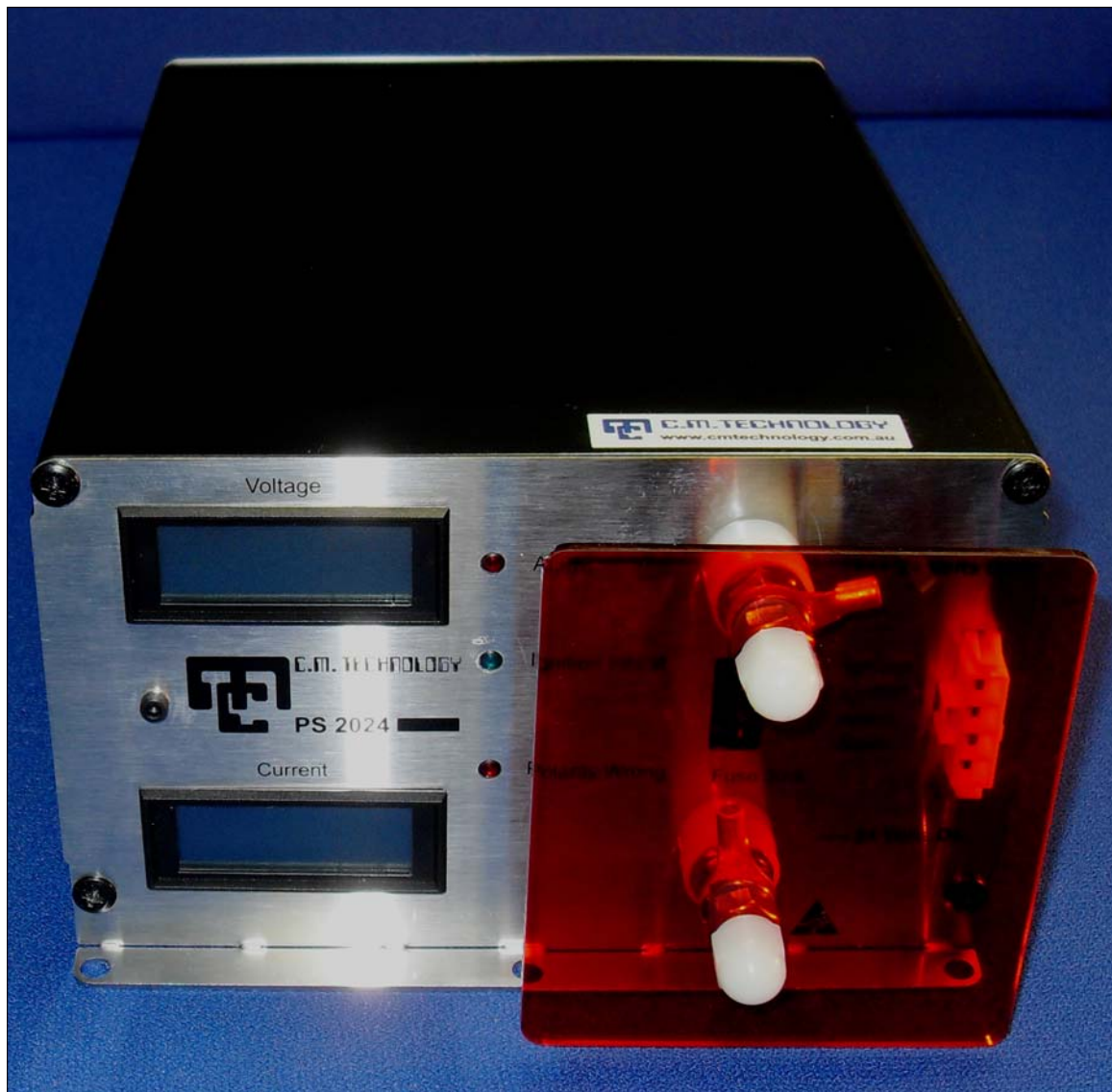
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FULL DATA SHEET

Rev. A

Tel: +61 (2) 9764 5655

EMERGENCY VEHICLE BATTERY MANAGER



PS2024



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The PS2024 (Fig. 1) is designed as a on-vehicle battery charger / battery charge state monitor. While the vehicle is at its base or station, the charger is connected to the Mains AC supply. An ignition interlock relay on the charger prevents starting the vehicle when the Mains AC supply is on. The charger first applies a fast charge to bring the battery up to nominal capacity and then applies a trickle charge to maintain that state. The charger cannot overcharge or cause loss of electrolyte like simple automotive chargers do.



Figure 1: The PS2024 Emergency Vehicle Battery Manager

Should the Mains AC supply fail for an extended period, the PS2024 monitors the battery condition for a low battery state. The charger sounds an audible warning and closes a relay contact pair that can be used to warn remotely of this state, for example, by a radio link.

When the vehicle is required, the PS2024 is unplugged from the Mains AC supply via the IEC connector and the vehicle can be driven away to the emergency site. Here the battery drain can be considerable when work lights, hazard lights and radio loads are considered. The PS2024 monitors the battery condition and sounds an audible warning and closes a relay contact pair that can be used to warn operators to start the main vehicle engine, recharging the battery via the vehicle alternator.

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1.0: General Information:

The PS2024 is enclosed by a black anodized custom-made aluminum case (Fig. 2) 255mm (length) by 190mm (width) by 115mm (height). Laser cut stainless steel ends are fixed to the case. The PS2024 must be mounted without obstructing the air ventilation holes, in a free air circulation environment it may be mounted in any position.



Figure 2: PS2024 Enclosure



Figure 3: IEC Cable

2.0: Mounting:

The PS2024 is not waterproof and should be mounted in a vented, waterproof equipment locker or inside the crew cab itself. Do not mount in engine bays or next to exhaust stacks that radiate heat.

The input AC socket is supplied with a matching female 3-pin IEC cable. Use of an earth current circuit breaker is strongly recommended on the supply circuit. An independent connection to earth is provided below the IEC power inlet. It is connected to separately ground the case if required.

The output to the battery is through two stainless steel \varnothing 8mm front panel bolts. The ignition interlock relay and the alarm contact pair use a 4-pin locking type connector (Fig. 4), also mounted on the front. The mating socket attached to a wiring loom (Fig. 5) is also provided.



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**Figure 4: Ignition Interlock
Relay & Alarm Contact Pair**



Figure 5: PS2024 Wiring Loom

Two suitable spanners should be used when tightening the terminal securing nut and the locknut holding the terminal assembly into the charger (Fig. 6).



Figure 6: PS2024 Terminal Assembly

The mounting base is predrilled with six \varnothing 7mm holes (Fig. 7). The charger is fan cooled and must be mounted with all the air vent holes clear and with unrestricted air circulation available. Care must be taken that loose equipment and clothing do not obstruct airflow.

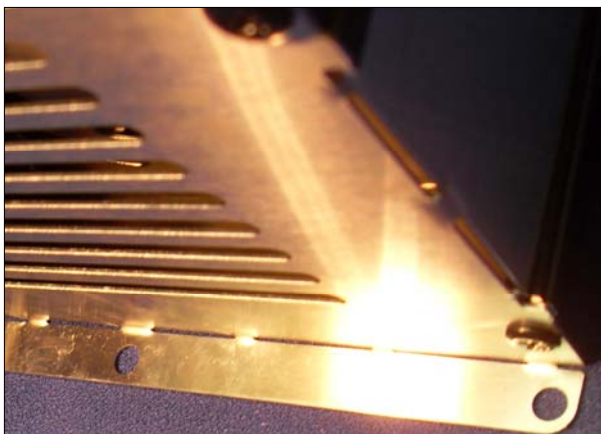


Figure 7: Pre-drilled 7mm holes



Figure 8: Fuse Holder

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3.0: Electrical Specifications:

The PS2024 is a switch mode forward converter of the constant current mode type. The PS2024 features built-in active PFC (Power Factor Correction), with input inrush current limiting. Operation involves initially supplying a constant current to bring the battery up to its charged state, and then a constant voltage to trickle charge the battery.

This constant voltage point is very precise so the battery cannot “boil” or lose electrolyte as happens with simple automotive chargers. The PS2024 can therefore be left permanently connected to the battery. They have a number of built-in microprocessor controlled alarm features.

- | | |
|--|--|
| 3.1: Output Voltage and Current Rating: | 27.8 V DC at 20 Amp
These are the factory set points for voltage, measured at 1-Ampere load. They can be factory trimmed with an internal preset. |
| 3.2: Rated Power: | 600 Watts Constant |
| 3.3: Ripple & Noise: | 240 mV Peak to Peak
Ripple & Noise are measured at 20MHz of bandwidth by using a 12" (30.48 cm) twisted pair-wire terminated with a 47µF & 0.1µF parallel capacitor. |
| 3.4: Voltage Adjustment Range: | 24 - 30 V
Factory Set |
| 3.5: Voltage Tolerance: | ± 1.0 % |
| 3.6: Line Regulation: | ± 0.5 % |
| 3.7: Load Regulation: | ± 0.5 % |
| 3.8: Setup, Rise Time: | 1500 ms, 50 ms at full load |
| 3.9: Hold Up Time: | 20 ms at full load (typical) |
| 3.10: Efficiency: | 86 % (typical) |
| 3.11: Leakage Current: | < 1.3mA/240VAC |
| 3.12: Over Voltage: | 31 ~ 36.5 V
Protection type: Constant current limiting, recovers automatically after fault condition is removed |


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3.13: Case Grounding:

In addition to the ground wire within the IEC cable, a case grounding point is available for use (Fig. 8)

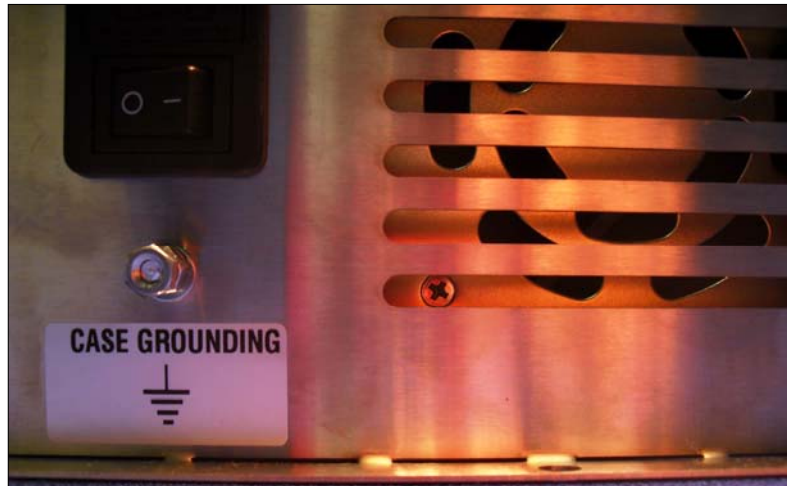



Figure 8: Case Grounding

3.14: C-Tick Compliance:

The PS2024 carries the “C-Tick” Compliance mark. 

3.15: Working Temperature:

-20 ~ +60 °C

3.16: Working Humidity:

20 ~ 90 % non-condensing

3.17: Storage Temperature:

-40 ~ +80 °C

3.18: Storage Humidity:

10 ~ 95 % Room Humidity

3.19: Vibration:

10~500Hz, 2G 10 min./1 cycle, period for 60 min., along X, Y & Z axis

3.20: Safety Standards:

UL60950-1, TUV EN60950-1
Approved

3.21: Withstand Voltage:

Input to Output: 3000 VAC

Input to Case: 1500 VAC

Output to Case: 500 VAC



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3.22: Isolation Resistance:

(Input-Output, Input-Case, Output-Case)

100M Ω ,500V DC, 25 °C, 70% Room
Humidity

3.23: EMI Conduction & Radiation: EN55022 (CISPR22)

Class B compliant

3.24: Harmonic Current:

EN61000-3-2,-3 compliant

3.25: EMS Immunity:

EN61000-4-2,3,4,5,6,8,11 compliant
ENV50204 (Light industry, Criteria A)
Compliant

3.26: MTBF:

(Mean Time Between Failure)

116,400 hrs min.
(MIL-HDBK-217F, 25 °C).

3.27: Voltage and Current Metering:

Both the voltage and current provided by the PS2024 are metered by two front panel mounted LCD 3.5 digit panel meters (Fig. 9). Allowances must be made for circuit drops in the wiring when measuring the battery volts however.



Figure 9: LCD Panel Meters





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3.28: Standing Loads and Battery Charging:

It is suggested that the standing load on the charger be less than 75% of its current rating to keep the recharge time within reasonable bounds, i.e. a 15 Amp maximum on the 20 Amp PS2024.

3.29: Ignition Interlock:

A relay shuts to provide a closed floating contact pair when the 240V mains are applied. The pair should be used to shut an interlock relay on the vehicle ignition to stop it being driven away with the PS2024 still connected.

3.30: Reverse Polarity Protection:

If a charged battery should be reverse polarity connected to the charger, the PS2024 protects itself by blowing an easily replaced front panel accessed blade 30A fuse (Fig. 10). A Red "Polarity" LED is lit (Fig. 11) and an internal audible alert sounds.



Figure 10: Front panel fuse

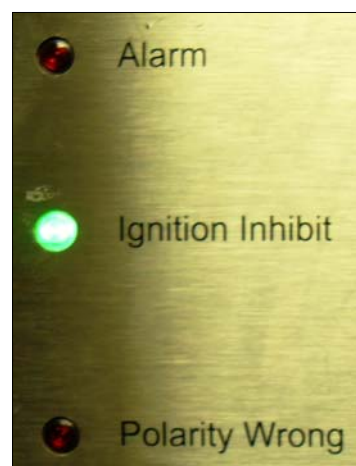


Figure 11: Front Panel LEDs


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3.31: Low Voltage Warning:

The PS2024's microprocessor monitors the battery condition and sounds an audible warning whilst closing a relay contact pair that can be used to warn operators via an external horn to start the main engine to recharge the battery. The detection circuits have software time delays to eliminate short transient dips and hysteresis to stop hunting.

Once the battery terminal voltage comes up, the alarm condition is cleared automatically.

- Threshold: 22 Volts
- Contact Rating: 10 Amps
- Alarm: Pulsating

3.32: Using Alarm Contacts:

The floating alarm contacts can be used in many ways. One way is to warn of the low battery state on the vehicle when it is at the emergency site. The contacts shut and operate a warning siren or strobe before the battery is unable to start the vehicle.

Another use would be in remote locations, for example Country Fire Service garages. If the power fails for some time and the site is unmanned, the contacts could be used to activate a remote telephone dialer, operate a CB Radio, or again trip an alarm sound or light.

3.33: Alarm Summary:

- **AC On**

When the 240V mains is first connected to the charger, the internal audible alarm gives 4 short beeps to indicating all is well. When the charger is off the contacts are open. When the Mains AC supply is turned on the contacts close.

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- **Battery Low**

The alarm sounds and the alarm contacts shut. This happens when the battery voltage drops to < 20 Volts.

- **Polarity Wrong**

The PS2024 protects itself by blowing a front panel blade type fuse. A Red "Polarity" LED is lit. There is an audible alert.

4.0: Maintainability and Warranty:

The PS2024 is manufactured from discrete components soldered to a double sided PCB.

Within warranty (12 months) return to factory freight paid applies. The unit will be returned freight paid. Outside warranty, the units can be returned freight paid to the factory for maintenance for a fixed fee + freight (if the unit is in good mechanical condition).

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