



Enerdrive

Lithium Power Pack



LITHIUM-ION BATTERY SYSTEM

With ePRO Plus Battery Monitor

LITHIUM-ION BATTERY SYSTEM

After 2 years of research, testing and proving, and a further 5 years of infield sales, Enerdrive has designed and created a COMPLETE Lithium Battery & Installation System so your Li-Ion battery bank is fully protected. Most importantly, our system is designed to give the maximum performance, longevity and SAFETY in your valuable installations.

Be aware that the market is abuzz with the hot topic of Lithium Ion Batteries; and we can tell you from our testing to date that all the hype of their performance and capabilities is TRUE. However what we can also inform you is that all the stories of their 'Issues' are unfortunately also true. However the so called "issues" of lithium can be avoided with some very basic rules about protection.

- Never go over voltage whilst charging them
- Never let them go 'Dead' Flat
- Keep the individual cells 'Balanced'

What this lesson taught us is if we were to develop our lithium program – IT HAD TO BE DONE RIGHT.

So we developed our own Lithium Power Pack for the Australian market with the emphasis on 'built like a tank' and even to the extent of being a little bit 'overkill' on the packaging and protection.

So how does our system actually work?

The Advance BMS relay driver is designed to take a loop signal wire from the ePRO Plus battery meter for low state of charge (SOC%)/Voltage & Hi system voltage and a loop signal cable from the batteries Active Cell balancer for Hi/Low cell voltage cut-out circuitry.

System Program Selection Switch;

The Enerdrive Advanced BMS Relay Driver has 2 pre-programmed settings.

STANDARD PROGRAM

This program isolates the charging sources (solar/vehicle/mains charger) in the event of a battery cell voltage being too high without turning the whole electrical system off. The Enerdrive Advanced BMS Relay Driver will activate the output contact that will cut out all charging sources for 10 minutes. If the cell has not come back within range before 10 minutes, it will stay active for another 10 minutes and repeat until the cell/s are within range. This setup allows the system loads to still be powered.

In the event of low SOC%, the main battery relay will disengage to protect the battery. All charging sources (solar/vehicle/mains charger) will still be active to recharge the battery providing the sun is up or the chargers are plugged in. To re-engage the main battery relay, press in the Yellow button on top of the main battery relay. The Enerdrive Advanced BMS Relay Driver will turn the main battery relay OFF every 6 minutes if the SOC% on the battery monitor is still below the set point. So this may need to be reset a few times before the SOC% set point reaches its re-engagement point.

The "Standard Program" is selected when there is no ePRO Inverter/Charger (COMBI) installed in the system.

COMBI PROGRAM

This program is used when the system incorporates the ePRO Combi Inverter/Charger. This program isolates the charging sources (solar/vehicle/mains charger) in the event of a battery cell voltage being too high without turning the whole electrical system off. The Enerdrive Advanced BMS Relay Driver

will activate the output contact that will cut out all charging sources for 10 minutes. If the cell has not come back within range before 10 minutes, it will stay active for another 10 minutes and repeat until the cell/s are within range. This setup allows the system loads to still be powered.

In the event of low SOC% and/or voltage reaches the pre-set level, the program will shut down the charging sources (solar/vehicle) and the inverter/charger before disengaging the main battery relay, turning off the whole electrical system to protect the battery. The program will then switch on the signal for all charging sources. When AC power is applied to the Combi, the AC charger will start once the main latching relay is re-engaged. To re-engage the main battery relay, press in the Yellow button on top of the main battery relay. The Enerdrive Advanced BMS Relay Driver will turn the main battery relay OFF every 6 minutes if the SOC% on the battery monitor is still below the set point. So this may need to be reset a few times before the SOC% set point reaches its re-engagement point.

Active Cell Balancing:

Cell balancing is designed to equalise the charge on every cell in the pack and prevent individual cells from becoming over stressed thus prolonging the life of the battery.

The Enerdrive Lithium battery packs incorporate Active Cell Balancing across the range. The balancing method used is Dynamic Energy Transfer. This allows for automatic balancing of the cells during charging, discharging and storage. Any cells with higher voltage density will transfer energy to the lower cells in the pack. This method of cell balancing utilises the energy within the battery pack to balance the cells unlike passive balancing systems which bleed this excess energy off as heat to keep the battery balanced, wasting energy already stored within the battery.

The Enerdrive Active Balancing System also incorporates individual cell “Hi-Voltage & Low-Voltage” disconnect feature for signal switching (off/on) of charging sources & consumer loads.



Main Battery Relay & Active Cell Balancer.

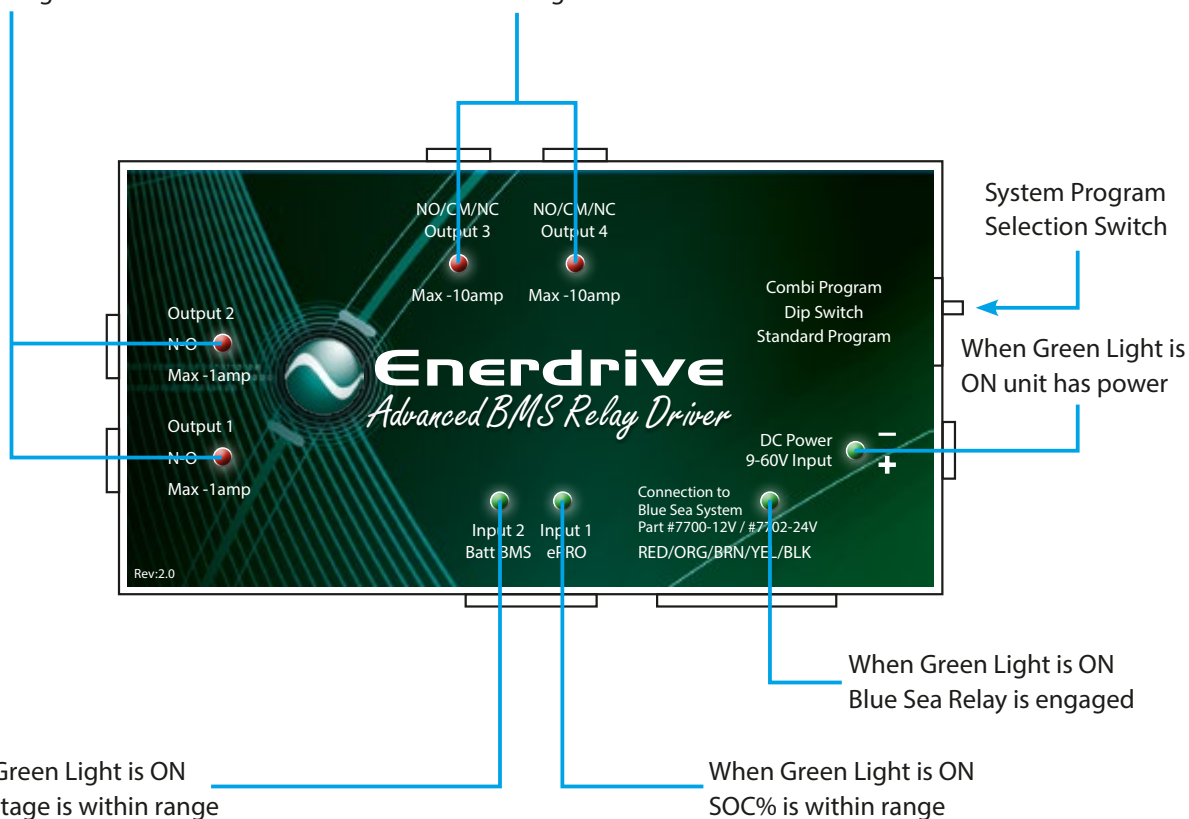


So what's so advanced about the Advance BMS Relay Driver?

- 2 x Normally Open Contacts (1 amp Max) each - used to operate Relays connected to Chargers, Solar or a DC/AC relay connected to Combi Units (HV protection)
- 1 x Normally Open/Closed Contact (10 amp Max) - used to operate a relay connected to Chargers, Solar or a DC/AC relay connected to Combi Units. (HV protection)
- 1 x Normally Open/Closed Contact (10 amp Max) - used to operate Field wire of Alternator, Requirements of Alternator must be assessed to see if this is suitable as will not suit all applications

When Red Light is ON
Contact is closed due
to hi cell voltage

When Red Light is ON
Contact is open due
to hi cell voltage



What's in the Enerdrive Lithium System?

To use the Enerdrive Lithium Power Pack you need to use two items together. These are:

- The actual lithium power pack battery box including Active Balancing System.
- The Advance BMS controller board which includes
- The Advance BMS Relay Driver box
- The ePRO Plus is our latest generation, highly advanced battery monitor. It consists of an intelligent active shunt and a remote control and display unit (CDU). The shunt has a Grid Optimized footprint for perfect integration with our DC Modular series of high current busbars and fuse holders.

The ePRO Plus battery monitor can measure DC currents up to 600Amps (500Amp continuous) and voltages up to 70Vdc. So any lead- or lithium based battery from 12V up to 48V can be monitored.

- A Blue Sea 500amp main battery latching relay which is activated by the ePRO Plus Battery Monitor when the low state of charge (percentage is reached).
- A Class T Fuse for system protection.
- 95mm² Battery cable from the battery to the Connection Kit.



- 1 Left key (<) or Previous value
- 2 Menu or Enter key
- 3 Right key (>) or Next value
- 4 7 character multipurpose information field
- 5 Alarm indicator
- 6 Selected battery input indicator
- 7 Value section for SoC (also for Function, Status and History parameter numbers)
- 8 State of Charge (SoC) bar. The five segment 0 – 100% grid will show an animation when there is a charge current (turning clockwise) or a discharge current (turning counter clockwise). The animation speed will also increase when the charge or discharge current increases.



State of charge (%)

Status or history readout

Volt, Amp, Ah, time remaining,
temperature, Watts, and
maintenance hours.

Alarm activated (low battery
state of charge)

The ePRO Plus Battery Monitor has been pre-programmed at the factory to suit the selected Lithium system and is software locked. There is no setup interaction required by the end user. For more user information on the ePRO Plus Battery Monitor, please refer to the detailed instruction manual included in your Caravan documentation package.

Voltages for Lithium batteries have a very narrow window compared to lead acid batteries. With all of our testing over the last 4-5 years, the Enerdrive Lithium battery standing voltage when fully charged (with no loads running) will be between 13.35v-13.45v at 100% capacity.

When discharged to near 25% capacity remaining, the standing voltage will be between 12.90v-13.00v

As you can see, the voltage variance between 100% full and 25% full is only 0.55v. This is quite different to lead acid batteries where voltage can range from 12.72v at 100% to 11.88v at 20% capacity.

With Lithium, it is better and more accurate to work on the State of Charge Percentage (SOC%) to determine your remaining battery capacity.



BMS Installation kit for a parallel system shown above