**Enerdrive Lithium-Ion Battery System**

After 2 years of research, testing and proving, and a further 2 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 SAFTEY 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 overvoltage whilst charging them
- Never let them go 'Dead' Flat
- Keep the individual cells 'Balanced'

What this lesson taught us was that to do Lithium – 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 Enerdrive Advance BMS relay driver is designed to take a loop signal wire from the Enerdrive ePRO battery meter for low state of charge (SOC%)/Voltage & Hi system voltage and a loop signal wire from the batteries Cell balancers Hi/Low Volt cut-out circuit.

**System Program Selection Switch;**

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

**Output 1-4 Enabled** - is programmed to utilise the output contacts. Using this program allows you to have the charging sources run through external relays allowing the BMS to isolate the charging source in the event of a cell voltage being too high without turning the whole electrical system off. In the event of low SOC% the main battery relay will be disengaged to protect the battery. **Enerdrive strongly recommend this option for all installations.**

**Output 1-4 Disabled** - is programmed to bypass the output contacts. If the battery SOC% is low or cell voltage is high, the main battery relay will be disengaged, turning off the whole electrical system to protect the battery. **Subject to specific requirements, this option may only be suitable for certain applications. If unsure, please contact Enerdrive for further details.**
So how does the “Advance Enabled Setting” operate?

If a battery cell goes “Hi Voltage” and “opens” the hi voltage loop wire, then the Enerdrive Advanced BMS Relay Driver will activate the output contactors that will drive the installed relay/contactors to cut out all charging sources (solar/vehicle/main charger) 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.

If the ePRO Battery monitor sees a LOW SOC% or overall low voltage, then the main battery relay will trip out. You will need to start a charging source and re-engage the main battery relay by pressing 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 6min 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 it re-engagement point.

Main Battery Relay

**PLEASE NOTE:**

The battery has a self-discharge rate of 5% per month @ 25°C. When storing the battery with the main latching relay dis-engaged, the ePRO Battery Monitor and Advance Relay Driver will still be powered, adding a further drain on the battery.

It is the responsibility of the end user to maintain the battery in a charged state. The battery should not be left for more than 30 days without checking its charge state. Enerdrive recommend that a battery left in a “storage state” should be checked and charged as often as possible (maximum 30 days) to maintain maximum life expectancy of the battery. Failure to follow these requirements will see an early failure of the battery which is not covered under warranty.
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.
- Our Enerdrive Advance BMS controller board which includes
  - The Advance BMS Relay Driver box
- The ePRO Battery Monitor for accurate monitoring and control of the battery pack’s state of charge. This monitor also logs historical data on the batteries usage and provides the trigger switch for a low SOC% or Low Overall voltage. The monitor is pre-programmed by Enerdrive with all of the alarm set points to match the specific installation. The meter will show all of the relative information like Volts, Amps, Amp-hours, Percentage State of Charge & Time to go. It will also record all of the history data of the Lithium battery, Deepest Discharge, Battery Cycles, Hi/Low Voltage & Amps, All Alarm History Etc. This is a critical part of the Lithium battery installation kit.
- A Blue Sea 500amp main battery latching relay which is activated by the ePRO 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.
The ePRO 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 Battery Monitor, please refer to the detailed instruction manual included in your Caravan documentation package.

So what’s so advanced about our Enerdrive 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
Troubleshooting the Lithium Battery System

Q: If the battery monitor reads 24% or less or the battery voltage has reached 12.4v or less, and the power has gone out in the van?

A: The battery has reached its maximum discharge and the main battery relay has dis-engaged to protect the battery. Turn off all loads and turn on the charging sources. Once the percentage on the ePRO Meter reaches 28%, you can push the yellow button on the main battery relay to re-engage the main battery switch and start turning on your loads. Keep charging sources connected until the battery reaches maximum charge 100%

Q: What if I see red lights on, on the “outputs” of the Advance Relay Driver Box

A: If a battery cell goes Hi Voltage and cuts the HI Voltage loop wire then the Enerdrive Advanced BMS Relay Driver will activate the output contactors (turning red) and will drive the installed relay/contactors to cut out all charging sources (solar/vehicle/main charger) for 10min. If the cell has not come back within range before 10min, it will stay active for another 10min and repeat until the cell/s are within range.

Q: What if the main battery switch has tripped out, but all the lights on the Advanced BMS Relay Driver box are green and the battery monitor is 26% or higher in capacity?

A: This has happened because the ePRO monitor has registered a “hi voltage” (15.2v or higher) and has tripped out the main battery switch. Push the yellow button on the main battery relay to re-engage the main battery switch. If the battery switch continues to disengage, contact the manufacture for assistance.

Q: What if I see “no lights” on the Advance Relay Driver Box

A: If this happens, please check the inline 1amp fuse connected to the “DC Power” input on the Advance Relay Driver Box. If this fuse is intact, contact the manufacture for assistance.

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The Enerdrive Advanced BMS Relay Driver programed to Enabled Output 1-4 Enabled - is programmed if you wish to utilise the Output contacts. Using the program allows you to have the charging sources run through external relays allowing the BMS to isolate the charging source in the event of a cell voltage being too high without turning the whole electrical system Off. In the event of low SOC%, the Blue Sea relay will still be disengaged to protect the battery.

The system is designed to disconnect the battery if it has been drained to a pre-set capacity. When the monitor registers the low SOC% set point, it will disengage the Blue Sea Latching Relay to prevent further discharge and/or damage to the battery. To charge the battery from this state, turn off all loads, manually engage the latching relay by pressing the Yellow button on top of the relay and turn on the charging source/s. If the ePRO monitor does not register a minimum 1% increase in the SOC% within 6 minutes, the relay will disengage again to protect the battery. If this happens, re-engage the relay and continue charging. When the monitor registers 1% SOC% increase above the pre-set low capacity point, the system will stay active. Keep the charging source/s running to fully charge the battery. Once the capacity reaches 30% SOC, you may reactive the loads.

1Amp
10Amp
10Amp
2Amp
10Amp
10Amp

**High Cell Voltage Situations - 4 Contacts are supplied to use for External Relay Control of Charging Sources.**

- 2 x Normally Open Contacts (1amp Max) each - used to operate Relays connected to Chargers, Solar or a DC/AC relay connected to Combi Units.
- 1 x Normally Closed/Open Contacts (10amp Max) - used to operate Relays connected to Chargers, Solar or a DC/AC relay connected to Combi Units.
- 1 x Normally Closed/Open Contacts (10amp 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.

**NOTE:** Prior to commissioning system, Please verify the System Program Selection Switch is correctly set for the installation. If unsure please contact Enerdrive.

System Program Selection Switch

- Connect Relay as Normally Closed
- In to 30
- Out to 87A

When Green light is ON Cell Voltage is within Range

When Red Light is ON Contact is Open Due to Hi Cell Voltage

When Green light is ON Blue Sea Relay is engaged