

# Owner's Manual

## EcoTrek\_Battery\_Guide



# EcoTrek Power Module Guide

## The EcoTrek Power Modules



EcoTrek 400 dual controls



Jump starting an EcoTrek 200; note the left bank is off

EcoTrek Power Modules are installed in increments of 200. Each EcoTrek 200 Power Module is roughly the equivalent of a pair and a half of golf-cart batteries; however there are significant differences between the lead-acid batteries and lithium batteries. Lead-acid batteries typically lose voltage and current as they get depleted. You see lights dim, or fans turn slower as the batteries discharge. Lithium batteries provide relatively steady voltage and current across much of their usable range. Lead-acid batteries should not be discharged below about 50% of their capacity on a regular basis as this will shorten their life. Lithium batteries can be discharged to about 10% or 20% of their capacity on a regular basis. In practical terms this means that an EcoTrek 200 Power Module holds almost twice the usable energy of a pair of golf cart batteries. Lastly, lead-acid batteries have a life cycle of about 200-500 charge-discharge cycles; lithium batteries have a life cycle of up to 2000 charge-discharge cycles.

This means that for RV owners who trade every few years, lithium batteries are a lifetime investment as they will last over 6 years in typical use. Much like tires, they are still a maintenance item, and a long term owner should budget for replacement.

## Using the EcoTrek Power Modules

Lithium batteries require a battery management system. This system protects the batteries from overcharging, excessive discharge, and operation outside of their operating temperature range. The best way to think about the EcoTrek Power Modules is to consider them an appliance, much the same as a toaster or a TV. **Turn on only the modules you need, and turn them off when you don't need them.**

In other words, if all you need is to run some lights, you only need one EcoTrek Power Module powered up. If you need a high-power appliance, turn on more modules as you need them.

- Turn off the EcoTrek Power Modules when you don't need them.
- Turn on the EcoTrek Power Modules when you want to charge them or use them.

## EcoTrek control panel

Each EcoTrek 200 Power Module has its own control. A single EcoTrek 200 will have one rocker switch at the bottom and one pushbutton switch at the top of the panel. An EcoTrek 400 will have two sets of switches, and so on.

The lower rocker switch turns on the bank. In normal operation this switch should be on when you want to use the module. This powers the battery management system, which manages all functions of the EcoTrek 200, including charging, voltage protection, and the battery heaters when it gets cold.

The battery management system will turn off the batteries when they are run down to near empty. The system will still accept charge, but will no longer provide power.

## Switch positions for using the EcoTrek Power Modules

### Driving

While driving, you have plenty of power from the underhood generator. Normally, you can turn on all battery banks to charge them. If the modules are depleted, charge one at a time. You can have the battery disconnect switch on to power the coach if needed. The inverter does not need to be on for the modules to charge while driving.

### Boondocking

Turn on only the modules you need. If you're running just lights or watching TV, turn on one EcoTrek module. If you want to run the airconditioner or microwave, turn on at least 2 EcoTrek Power Modules. The battery disconnect has to be on to power the coach. The inverter does not need to be on unless you need household appliances.

### Shore Power

Turn on the inverter. The inverter must be on to charge the modules from shore power. It is best if you turn on only one module at a time for fastest charging. If the modules have shut off due to high discharge, you must first turn them on by starting the engine. See **If the batteries will not turn on** below.

### Turning on the Power Modules

Press the lower rocker switch to turn it on. If the Power Module does not turn on, press the reset button for about 30 seconds to power up the Battery Management System.

## If the Power Modules will not turn on

Start the engine. Turn on the EcoTrek Power Modules. Allow about 30 seconds for the modules to start. If necessary, press the Reset button on top of the panel. Once the modules are on, plug into shore power if desired and turn off the engine.

When not in use, turn the Power Modules off. When storing the Power Modules for extended periods, lithium batteries should be stored at about half state of charge, about 13.1V resting voltage.



In cold weather, the battery management system will start the battery heaters first to warm up the batteries. Depending on the temperature, it could be a while until the batteries are at a temperature where they can operate. Feedback from our owners indicates that at about -15°C or 0°F it takes between 60 - 90 minutes to warm up the batteries if the modules have been shut off, however this could vary quite a bit.



If you have more than one EcoTrek 200, and all have been depleted, start one first, allow it to charge for 30 minutes or an hour, then bring up the others. The current draw is the highest when you start charging, and this allows the charging system to keep up. Strictly speaking this is not necessary, but it is a useful guideline.

## Protections built into the Battery Management System

The Battery Management System will turn off the Power Module under specific conditions, designed to protect the batteries from damage. These conditions are:

### Overtemperature

If the battery temperature exceeds 130-140 degrees F the Power Module will turn off.

### Undertemperature

If the battery temperature falls below 32 degrees F the Power Module will turn off. Note that normal use of the Power Module will provide heating to keep the batteries operating. If the Power Modules are turned off and allowed to freeze, the battery heaters will turn on once the engine is running and the Power Modules are turned on. It may be several hours before the Battery Management System allows charging and discharging.

## **Undercharge or excessive discharge**

The Power Module will shut off and prevent further discharge if their state of charge falls below approximately 20% (80% discharged).

## **Overcharge**

If the Battery Management System detects an overcharge condition, it will shut off the Power Module and prevent further charging. Normal discharge will still occur.

## **Charging the EcoTrek Power Modules**

By far the fastest and most efficient way to charge your EcoTrek Power Modules is by driving at normal highway speeds.

At idle, the Power Modules will charge somewhat slower than at driving speeds.

Charging from shore power is the slowest method.



If you have an EcoTrek 800 or EcoTrek 1600 (warp core) package, you must connect to an RV 30 amp outlet. A 15 or 20 amp outlet cannot provide the power needed to charge the Power Modules.