FlightPower V-Balance Module

Thank you for purchasing the FlightPower V-BALANCE MODULE, a modern high performance, software-driven, equalising, pass-through cell balancer system. The V-Balance system has been designed with two main functions in mind: Firstly to maintain peak performance of Lithium Polymer battery packs by equalising the charge-state of each cell within a pack. This process reduces the possibility of each cell becoming exposed to damaging overcharge and undercharged states during use and helps maintain useable charged-in capacity by balanced loading. Secondly the system has been designed as a high-current charge-through safety device that can intercept and halt a wide variety of product damage and safety scenarios that can be encountered during charging and bench-discharging. While no substitute for responsible observation, the V-Balance system (in pass-through operation) will halt overcharge resulting from incorrect charger settings, faulty or poorly calibrated charger, faulty or damaged cells and severely out-of-balance packs. The V-Balance will assist balanced discharging and in pass-through operation will also halt over-discharging of any cell.

The V-Balance has two main modes: Passive Balancing mode and Link Mode.

The V-Balance module has been designed in conjunction with FlightPower EVO and TrakPower Outrage product types but may also be used successfully with other brands of 2s-6s Lithium Polymer battery packs with the purchase of low-cost adapter cables.

FEATURES

- 2-6s Balancing capability (2,3 and 6s with included adapter cable)
- Up to 10 AMP charge-through /discharge-through balancing (Fused)
- Optically isolated charge state monitoring at the cell level / electronic charger disconection
- Link-Mode indicator, Cell Count/Balancing/Balanced indicators x 6, Active/Sleep indicator
- Fuel gauge to indicate overall pack voltage (can be toggled to indicate individual cell voltages).
- Multi function switch: Wake Up from Sleep Mode, Toggle Fuel Gauge, Link Mode On/Off
- Software functions: Overdischarged sleep, discharged disconnect Link Mode and sleep, balanced off charge then sleep, full disconnect Link Mode and sleep, overcharged discharge to safe and sleep.

INSTRUCTIONS FOR USE

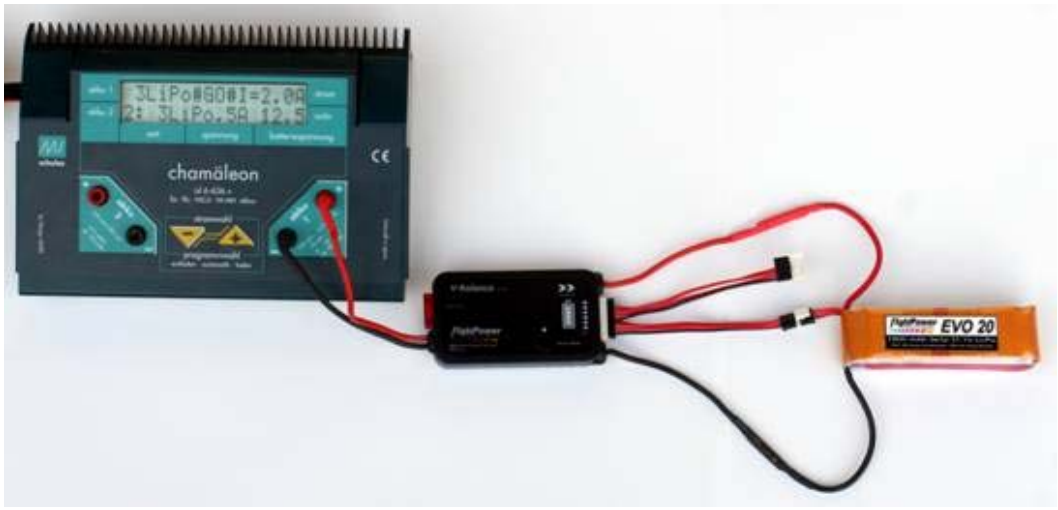
Remove the battery from your model and ensure your charging area is free from any flammable materials. Set your

Lithium Polymer capable charger to the correct settings for charging your battery pack being careful to set the number of cells and max charge current within the manufacturer's ratings for the battery.

1. Connect the balancers charger input leads (the red and black wires coming from the fuse end of the balancer) to your charger. Do this before connecting the battery main leads.

2. Connect the battery charge leads (the red and black wires coming from the wire harness end of the balancer) to your FlightPower pack.

3. Connect the balancer connector of your battery pack to the V-Balance module using the included (or other appropriate)* harness.



**Please note if you wish to balance a 4s or 5s FlightPower pack or you have a FlightPower pack that uses classic balancing connectors (or another brand of battery) then you may require an optional adaptor lead, please see section entitled Balancer Connection Guide to specify an appropriate lead.*

Immediately after connecting the battery, the V-Balance unit will turn on and commence counting through the number of cells in the pack in preparation for automatic balancing. If the pack is already balanced the V-Balance will flash all LEDs corresponding to cells in the pack 8 times slowly and go into sleep mode unless the Link Mode is activated first. If the pack is not fully balanced, one or more LEDs will flash indicating that balancing action is taking place and this will continue until the battery is balanced (unless in extreme cases a low voltage limit is detected first).

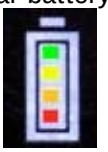
Balance Charging (Link Mode)
To commence balance-charging the V-Balance unit must be switched into Link Mode (Link Mode creates a connection through the balancer between the battery pack and the charger). To do this first make sure the unit is turned on. If all the LED's are off then you must press the reset/mode button momentarily to wake the unit. When you have done this press and hold the reset/mode button for 3 seconds, the Link LED's will light at the top of the unit. On some chargers this will automatically start the charging process whilst other chargers will require you to start the charge process manually. Once in Link Mode, the V-Balance will not go to sleep when the pack is balanced, instead it will monitor and correct imbalance throughout charging.

Whilst charging you may notice the cell status LED's blinking to indicate some balancing activity, if for example one cell in the pack has a slightly higher voltage than the others then the V-Balance will flash the corresponding LED as the V-Balance attempts to correct it.

Your charger should alert you that the charge is complete in its normal way, however, if the V-Balance detects that the whole pack, or any one cell is full, it will drop out of Link Mode and end the charge process.
If Link Mode is still active at the end of the charge process, simply press the Mode / Reset button for 3 Seconds to switch out of Link Mode, and then disconnect the pack from the V-Balance module. As with any charging system that has two male bullet connectors going to the charger, disconnect the battery first.

Other functions of the V-Balance unit.
The V-Balance unit can also be used as a stand alone cell balancer without connecting it to a charger, simply connect the pack to the V-Balancer by the balancer connector and the V-Balance will equalise the charge of your battery pack (as long as the pack is not over discharged). The V-Balance has a low voltage cut off of 3.0V per cell to prevent deep discharge. Your V-Balance unit also features a battery fuel gauge for checking the state of charge

of the total pack and of individual cells.
To access this feature simply connect your FlightPower pack to the V-Balance unit as described before, the V-Balance will automatically turn on and go into smart balancing mode. On the right hand side of the unit is a four bar battery fuel gauge; this will illuminate to indicate the state of charge of the connected battery.



Green = 75%-100% - Fully Charged
Yellow = 50 - 75% charged
Orange= 20 - 50% charged
Red = 10 - 20% charged

All bars flashing = Connection error, check wiring is correct.

Lowest Red Bar Flashing = All or one of the cells is critically under voltage (below 3V per cell). V-Balancer will flash to warn and then shut off to prevent charging.

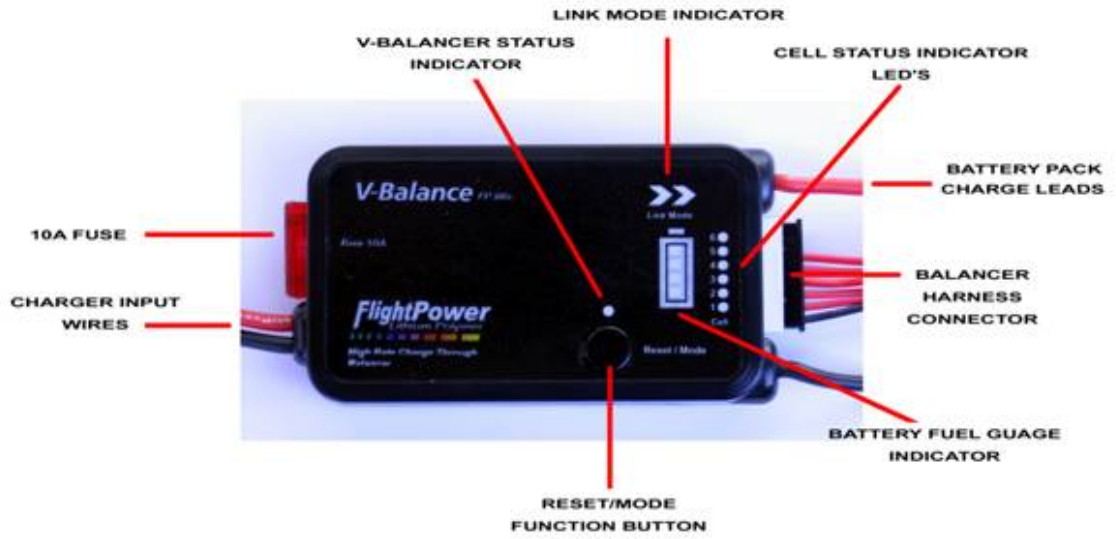
Highest Green Bar Flashing = All or one of the cells is over voltage (4.21V) V-Balance will attempt to bring voltage down to below 4.21V and then commence 'smart' balancing.

Using the Battery Fuel Gauge to check individual cells in the pack
To use the battery fuel gauge to check the voltage status of one cell in the pack press the reset/mode button momentarily from 'smart' balance mode, this will show a reading for the first cell in the pack, to check the next cell press the reset/mode button again and so on to check every cell in the pack. When you have checked all the cells, the balancer will go back into smart balancing mode automatically.

The V-Balance can also be used in Link Mode as part of a discharge process using a charger with this feature or another load, although it is not generally recommended to cycle Lithium Polymer batteries in this way it can be useful to measure total battery capacity. The V-Balance will make sure the cells in the pack are discharged evenly and that the load is disconnected before any cell is overdischarged, it is important however to make sure you **do not exceed** the 10 Amp rating of the balancer.

Safety Features and Specifications

The V-Balance system adds an element of safety to the charging system and will prevent:
Over-charging above 4.21V per cell (highest cell), over-discharging below 3.00V per cell (lowest cell).



Technical Specifications:		
Parameter	***Description***	***Spec:***
Operating Voltage	Input Battery Voltage	6.0V to 30V
	Charger input voltage	55V
Max no of cells	Smart balancing mode and Link mode (charge/discharge balancing mode).	2 to 6 cells Lithium Polymer

Max through Current	During link mode	10 Amps max
Voltage resolution	During Smart balancing mode and Link mode	+- 5mV
Display type	6 Cell balancing indicators	Green ,Yellow LED's
	Status indicator	Red LED
	Battery & Cell fuel gauge display	4 level Red, Orange Yellow & green LED's
	Link mode indicator	Red LED's
Casing	Black plastic casing	Injection moulding with built in ventilation. Maximum 135 Degrees Celsius
Voltage Protection	Over Charge Protection Voltage	4.21V+-0.010V
	Over Discharge Protection Voltage	3.00V+-0.010V

IMPORTANT. FlightPower V-Balance has been designed and manufactured to be an asset to maintenance and safety when handling Lithium Polymer batteries for RC use. It is not a substitute for responsible observation and good practice. Lithium Polymer batteries should be regarded as solid fuel and charge-safety regimes must anticipate the possibility of fire in the event of equipment failure (including failure of the V-Balance system) and mistakes made when using charging apparatus.

To Actively Prevent a Fire:
- **Always use a correctly specified Lithium Polymer charger.**
- **Charge packs in accordance with the safety instructions provided by the battery maker.**
- **Do not attempt to charge damaged battery packs or cells.**
- **Ensure that your charging environment is free of flammables and valuables.**
- **Never charge unattended.**

TERMS OF USE:

The purpose of this document is to warn you of the safety considerations surrounding products of this type so that you are better informed when making decisions and taking precautions concerning their use. Because RC modelling invariably requires decisions about preparation and deployment to pass beyond our control (and that of our retailers or agents) your decision to use this product incorporates your agreement that you have read and understood the safety precautions printed here and that you agree to accept full responsibility for any injury, loss or damage resulting from all circumstances surrounding your use or misuse of this product. You are also responsible for inspecting and detecting any signs of damage or defect before and after flight and prior to charging and to discontinue use immediately if any such issue arises. If you do not agree to these terms of use, you are under no obligation to proceed, instead you may contact us for the return of this product to us in its original condition for a full refund.

WARRANTY

This product is warranted to be free of defects in material and workmanship for 12 months from the date of purchase.

Detailed guide to V-Balance operation

Mode & Reset button	Press < 2 sec will wake up V-Balancer if V-Balancer is in sleep mode. Press > 2 sec will place V-Balancer in 'Link' mode or will remove V-Balancer from 'Link' mode.		
Balancer status LED	Status LED (Red)	On Off	Balancer in operating mode Balancer in sleep mode
Cell status indicators	6 Green/Orange LED's	Individually Flashing Simultaneously Flashing	Cell Voltage differential >0.015 Balancing complete

Link mode indicator	LED (red)	Off On	Balancer in Disconnection Mo Balancer In Link Mode
Battery fuel gauge indicator	4 Level LED display	1st LED =Red ,2nd LED=Orange,3rd LED=Yellow, 4th LED=Green	
	i)1st LED	on	3.4<cell voltage <=3.6V
	ii)1st and 2nd LED's	on	3.6<cell voltage <=3.7V
	iii) 1st ,2nd and 3 rd LED's	on	3.7<cell voltage <=3.8V
	iv) 1st,2nd,3rd and 4th LED	on	3.8<cell voltage <=4.2V
	If 1st LED (Red)	Flashing	cell voltage below 3.0V
	If 4th LED (green)	Flashing	cell voltage above 4.21V
Power up Mode and Link Mode	V-Balancer will check for any wiring connection error if so it will blink the battery fuel gauge LED's. V-Balancer will then check for any cell below 3.0V, If any cell below 3.0V is found then 1st LED of battery fuel gauge will blink and V-Balance will go to sleep mode until reset/mode button is pressed.		
	V-Balancer will check any cell above 4.21V, if any cell is above 4.21V the V-Balancer will try to bring down the cell voltage to below 4.21V (4.21V) by discharging that particular cell. When cell(s) are below 4.21V balancer will go into smart balance mode and balance all cells.		
Pressing the reset button for 3 seconds	V-Balancer will go into 'Link' mode having connected the charger input wires to an external charger or discharger).		
	Balancer will then continue to check for any cell condition whilst charging/discharging.		
	i) During a discharging process, balancing mode will be triggered if cell voltage differential is more than 15mV. when cell(s) reach 3.0V balancer will go into sleep mode		
	ii) During a charging process, balancer will switch to disconnecting mode and then go into cell balancing process if any cell(s) voltage reaches 4.21V		
Smart Balancing Mode	Balancer will check the individual cell voltage and if any cell has a voltage difference of more than 15mV compared to the lowest voltage cell, balancing will start to bring the voltage of the related cell down to the lowest cell.		

FlightPower Lithium Polymer

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