

# Relativities

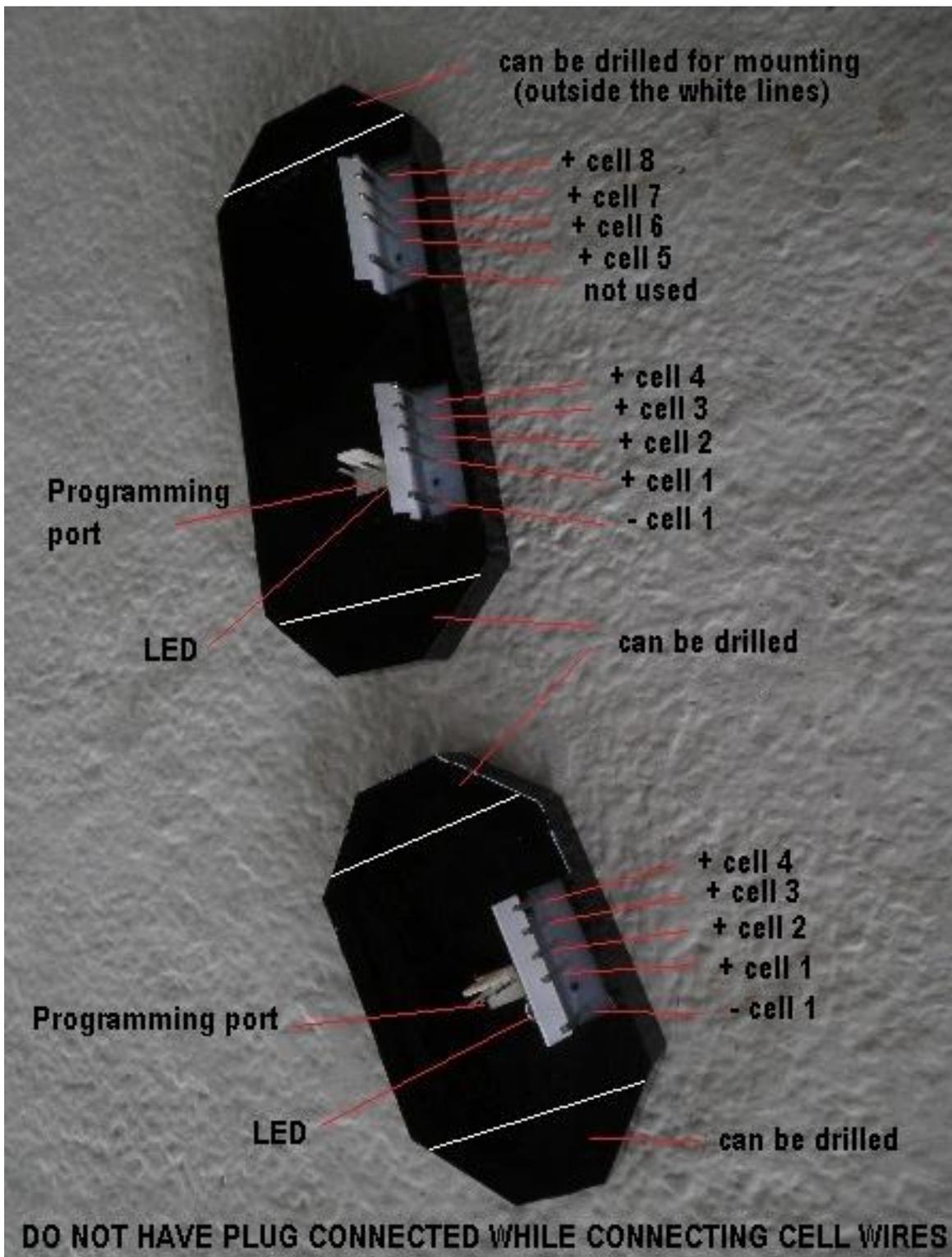
*Drive by Nature*

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# Relativities Specifications

This is an active balancing unit. It gets the cell voltages closer by taking power from a high voltage cell and transferring it to a lower voltage cell.

Relativities **Power consumption** varies with cell voltage. The 24v unit consumes more than the 12v units. The 24v unit was measured to consume just under 10mA when the battery is at 3.6V/cell and under 3mA at 3.0V/cell. The 12V units would have slightly lower consumption.

The **transfer rate** (amps) varies with cell voltage difference. The closer the cells are in voltage to each other, the lower the balance current achievable. Relativities works harder when the cell voltages are further apart. Testing of Relativities with the lowest cell at 3.2v and highest cell at 3.9v (700mV imbalance), the transfer rate measured was 360mA.

It is suspected that **efficiency** will also vary. One test revealed efficiency at around 82% efficient.

## Important

Do not connect the wires to the cells with Relativities connected/plugged in. Check all wires are correct before plugging in the Relativities. Any error will destroy the Relativities.

Disconnect/unplug Relativities before doing any maintenance on cell terminals or connections.

For any long term cell storage when no recharging is available, disconnect all loads, including Relativities.

Relativities does **not** control charging or discharging equipment. There are no contacts to shut down a charger or disconnect loads. There are no alarms.

Be aware that anything connected to individual cells can pull the cells out of balance. The 8 cell Junsii logger (cell log 8) draws power from cells 1-6, so cells 7 & 8 creep higher. But still best to monitor, so you know that all is working as it should be.

## General information

Plugs supplied pre-wired with 250mm of wire. These can be lengthened or shortened as required, but best kept as short as possible.

Relativities has a single LED. Slow blink are full volts & fast blinks are one decimal volts. Eg. 3 slow blinks and 4 fast blinks is 3.4v. Relativities does not display individual cell voltages.

Relativities is on all the time, and balances whether charging/discharging or resting.

Relativities cannot have fuses in any wires.

Easy DIY Job. Just follow instructions in the photo. Don't do it when you are rushed. Take time and check you have done it the right way.

Both 4 and 8 cell units are 50mm wide and 10mm thick in polyurethane, but with plug and wires 30mm high. The 4 cell unit is 80mm long and the 8 cell unit is 120mm long.

Relativities does not need air circulation. There is minimal heat generated.

Relativities does not produce RFI switching noise, but may sometimes make a faint audible tone.

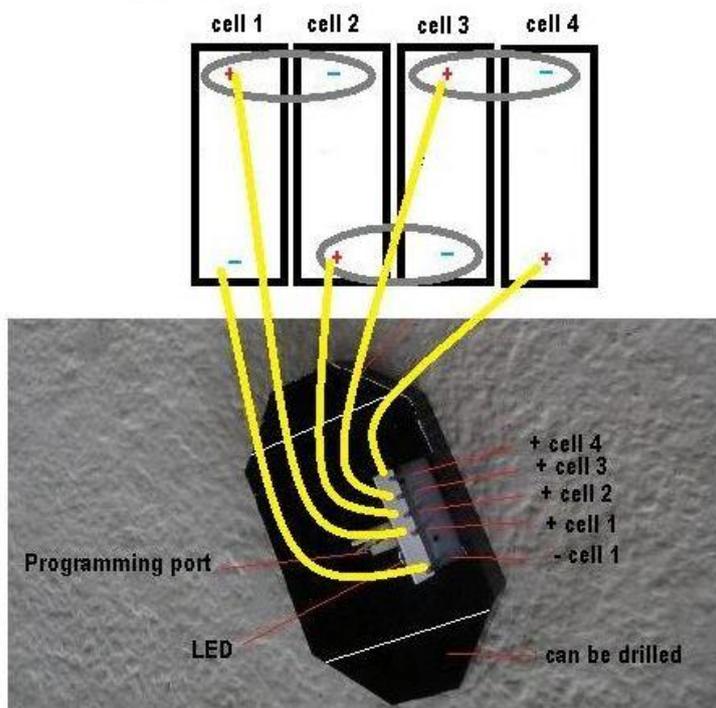
Relativities is not affected by other equipment connected to the battery, and does not affect other equipment.

How close in balance Relativities keeps the cells depends on, number of cells in series, the size of the cells, the max pack voltage, time held at max pack voltage, how low the pack is discharged,

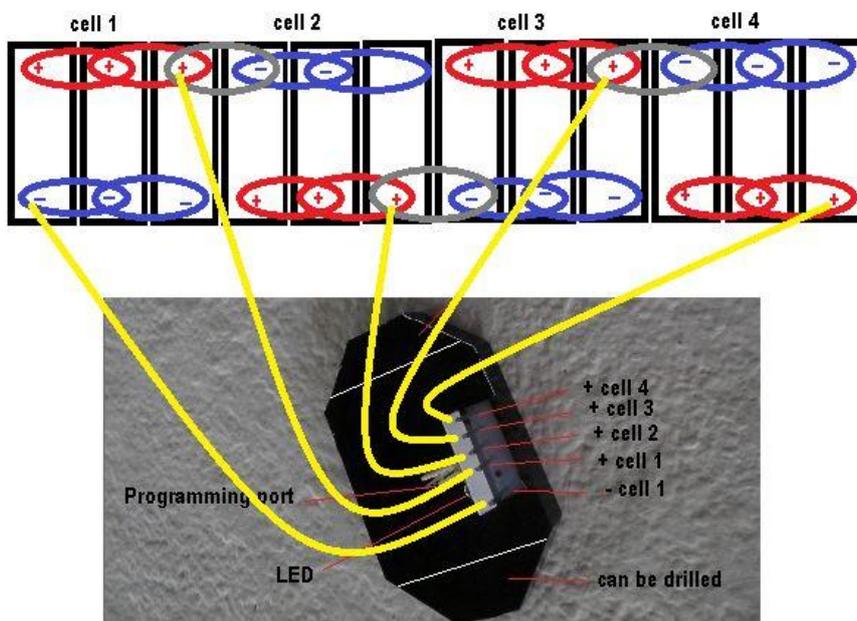
You shouldn't see much cell drift at 3.5v/cell. This is the ideal top end voltage for LYP battery cells. Relativities are optimised for LYP cells.

If you are unsure about anything, email us [DrivebyNature@gmail.com](mailto:DrivebyNature@gmail.com)

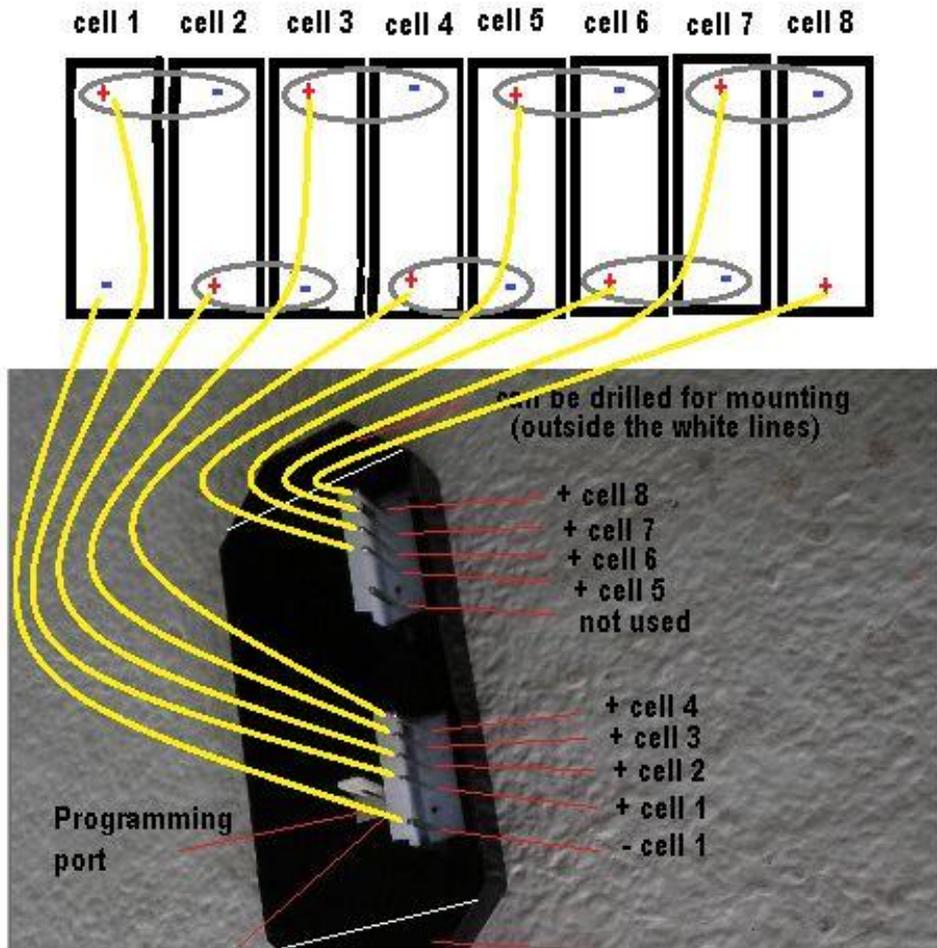
### Wiring diagram for 4 cell 12v Relativities



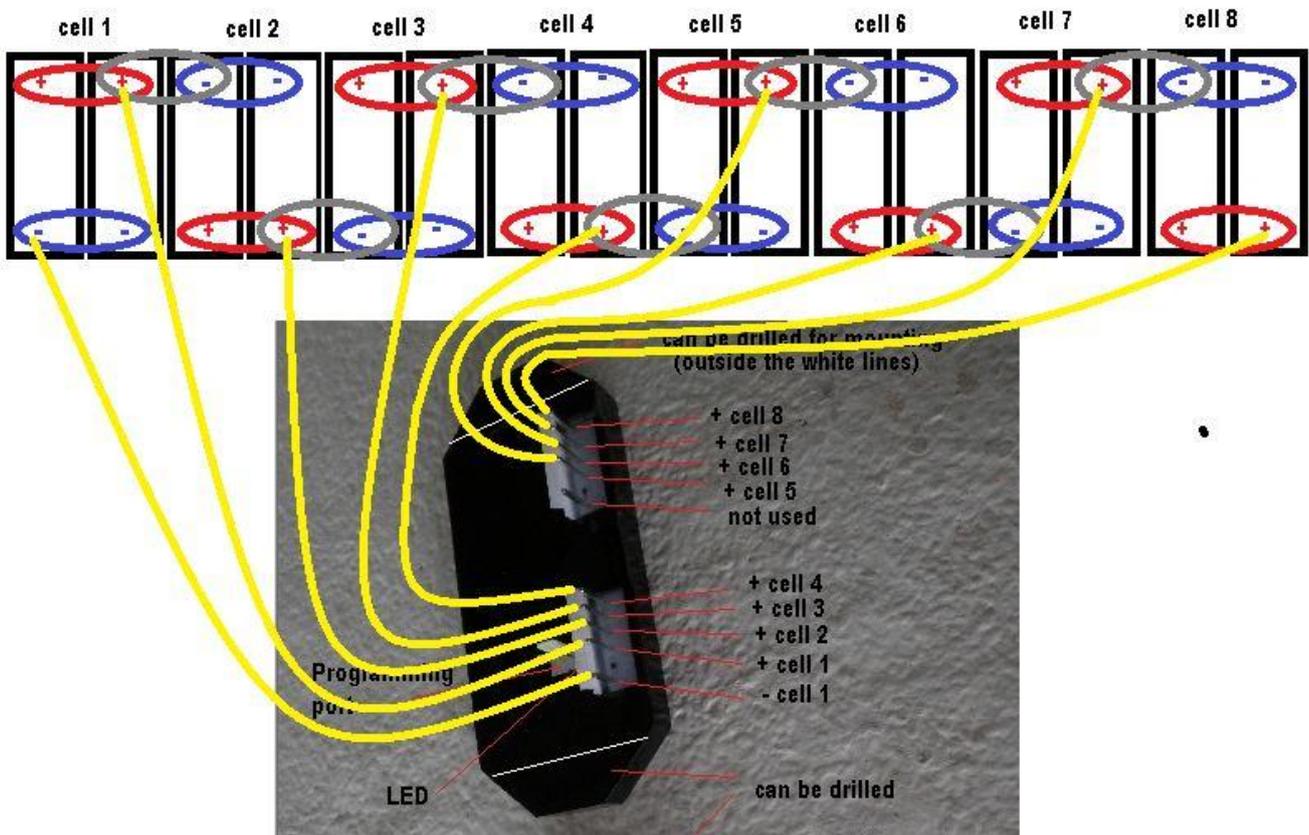
### Wiring diagram for multi cell 12v Relativities



## Wiring diagram for 8 cell 24v Relativities



## Wiring diagram for multi cell 24v Relativities



## Relativities history and other information

This is an active balancing unit. It gets the cell voltages closer by taking power from a high volt cell and giving it to a low volt cell.

Here are some links to prototype testing.

The very first original Relativities is tested on my 12v battery in the EV Hilux.

[http://www.thebackshed.com/forum/forum\\_posts.asp?TID=1127&PN=3&TPN=1](http://www.thebackshed.com/forum/forum_posts.asp?TID=1127&PN=3&TPN=1)

The first small batch of Relativities are potted in green. Towards the bottom of the page, the very first original one is boxed.

[http://www.thebackshed.com/forum/forum\\_posts.asp?TID=1127&PN=3&TPN=2](http://www.thebackshed.com/forum/forum_posts.asp?TID=1127&PN=3&TPN=2)

Some charts from Gordon

[http://www.thebackshed.com/forum/forum\\_posts.asp?TID=1127&PN=3&TPN=3](http://www.thebackshed.com/forum/forum_posts.asp?TID=1127&PN=3&TPN=3)

There is some graphs provided by Gordon (Relativities designer) about half way down this page.

[http://www.thebackshed.com/forum/forum\\_posts.asp?TID=2790&PN=1&TPN=4](http://www.thebackshed.com/forum/forum_posts.asp?TID=2790&PN=1&TPN=4)

Protoype testing. Some later prototypes and the green one towards the bottom of the pack is one of the first protoypes

[http://www.thebackshed.com/forum/forum\\_posts.asp?TID=2790&PN=1&TPN=5](http://www.thebackshed.com/forum/forum_posts.asp?TID=2790&PN=1&TPN=5)

Testing double layer on my big pack in the EV Hilux. It was discovered that the new circuits had a fault and pulled the pack out of balance.

[http://www.thebackshed.com/forum/forum\\_posts.asp?TID=5991&PN=1&TPN=1](http://www.thebackshed.com/forum/forum_posts.asp?TID=5991&PN=1&TPN=1)

One of the first prototype 4 cell unit in my EV Hilux

[http://www.thebackshed.com/forum/forum\\_posts.asp?TID=5991&PN=1&TPN=2](http://www.thebackshed.com/forum/forum_posts.asp?TID=5991&PN=1&TPN=2)

A later 4 cell prototype unit fitted to the electric 4 wheeler

[http://www.thebackshed.com/forum/forum\\_posts.asp?TID=6186&PN=1](http://www.thebackshed.com/forum/forum_posts.asp?TID=6186&PN=1)

A new set of postings have been made this morning

In my EV Hilux [http://www.thebackshed.com/forum/forum\\_posts.asp?TID=5991&PN=1&TPN=2](http://www.thebackshed.com/forum/forum_posts.asp?TID=5991&PN=1&TPN=2)

In my solar light [http://www.thebackshed.com/forum/forum\\_posts.asp?TID=6322&PN=1&TPN=1](http://www.thebackshed.com/forum/forum_posts.asp?TID=6322&PN=1&TPN=1)