

Battery Balancer MkII

My original design for a battery balancer proved that the concept worked, but the design was not very practical for regular use. It was sometimes difficult to get a good contact to the battery casing and the method also damaged the cell wrappers.

I decided that an improved design was required and I looked for an easier method of electrical connection to the battery. My initial thought was to wire a small multi-pole connector to the cell pack until I spotted a new magnetic connector in the Maplin catalogue.



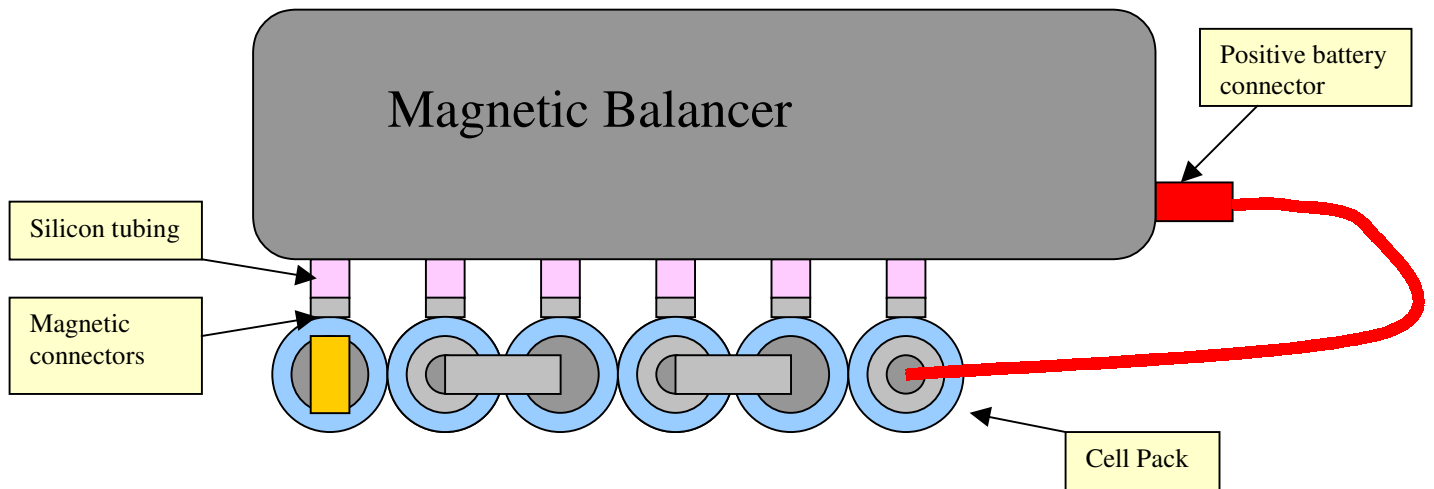
Photograph courtesy of <http://www.maplin.co.uk>

Magtrix Magnetic Connectors

Magtrix connectors are extremely versatile. Primarily designed for use as discreet battery connectors with a view to offering an alternative to flying leads, bulky carriers and reducing stress of circuit join

How it works

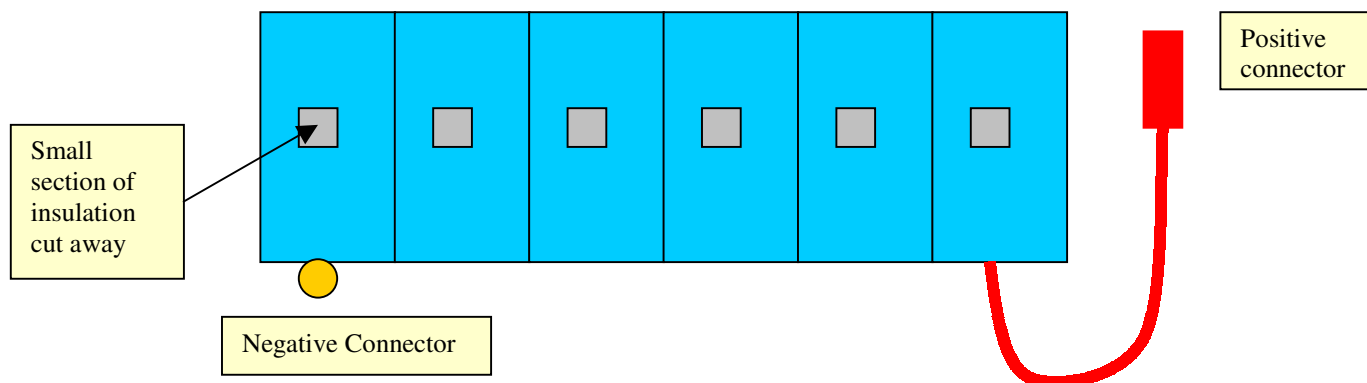
The electrical circuit is identical to the original Mk1 design but the method of connection is much different.



The balancer attaches to the battery pack by a row of magnetic connectors which provide both a mechanical and electrical connection to each cell. A lead from the positive battery connector completes the circuit. There is no need to connect the negative battery connector as the case on the last cell provides a negative connection point.

The connectors are mounted on silicon tubing, which flexes to allow for any small irregularities in the construction of the cell pack. The balancer will individually discharge each cell to a common cut off voltage optimising the amount of charge that that each cell will accept (*for a more detailed description of the balancing process read the article for the original balancer*).

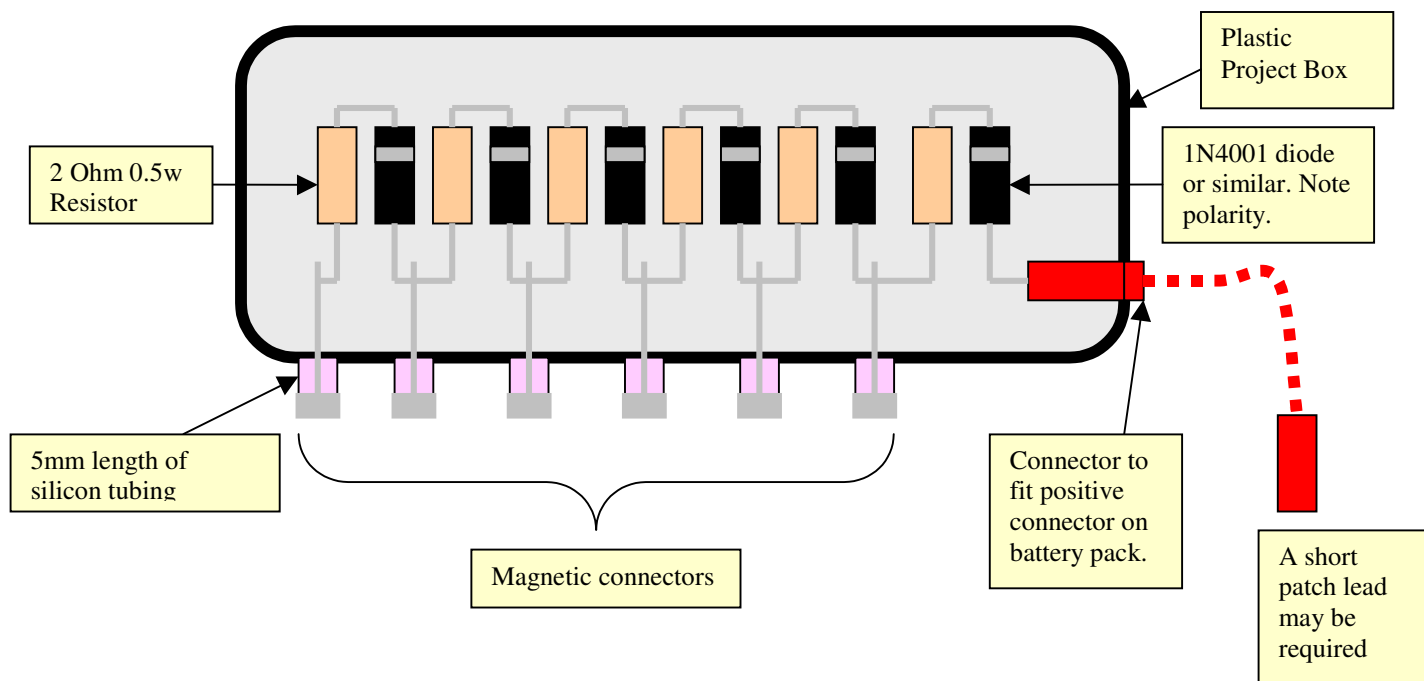
Step 1. Preparing the cell pack



To use this balancer you will need to prepare your packs by cutting away a small square of cell wrapper from each cell using a craft knife or scalpel as shown above. Cut off enough insulation so the Magtrix connectors can make a good contact with the metal case of each cell. The method of connecting the power pack to your boat will depend on your personal preference and may vary from the illustration.

Step 2 . Obtaining the parts

You can obtain all the parts from <http://maplin.co.uk> although the only item that might be difficult to obtain from other suppliers is the Magtrix connectors . The design is scaleable so can be modified to handle larger cell packs by the addition of extra resistors, diodes and connectors.



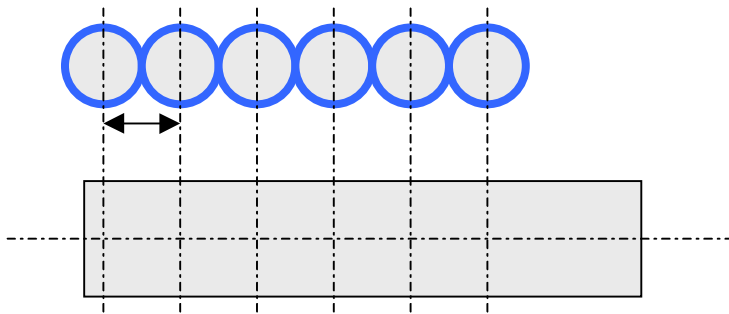
Choose a plastic box that is longer than the cell pack you are intending to discharge. Your choice of positive connector will depend on the type of connector installed on the positive connector on your battery pack.

Parts List for a 6 Cell Discharger

<u>Item</u>	<u>Quantity</u>	<u>Maplin part Number</u>
Plastic Project Box	1	BZ74R
1N4001 (or any 1N400* series diode)	6	QL73Q
2.2 Ohm 0.6w resistor	6	M2R2
Length of silicon tubing	1 (available from model shops)	
Magtrix magnetic connectors	6 (sold in packs of 10)	N51AK
Positive power connector	1 (may also require a short length of connecting wire)	

Construction

These instructions are for a balancer to discharge 6 cells in a side by side arrangement, but can be adapted for other cell configurations.



1. Carefully measure the distance between the centres of adjacent cells in your packs.
2. Mark the holes to be drilled in your case starting from the left allowing for any internal mouldings within the case.
3. Drill 6 x 2mm holes at the points marked.
4. Drill the hole for the positive connector and mount as shown.
4. Cut 6 x 5mm long pieces of silicon tubing and thread each one onto a Magtrix connector.
5. Glue the tubing to the connector and insert the connectors into the drilled holes in the box.
6. Glue the opposite end of each tube to the box and leave to dry.
7. Solder the diodes and resistors direct to each other and the connectors as shown in the diagram.

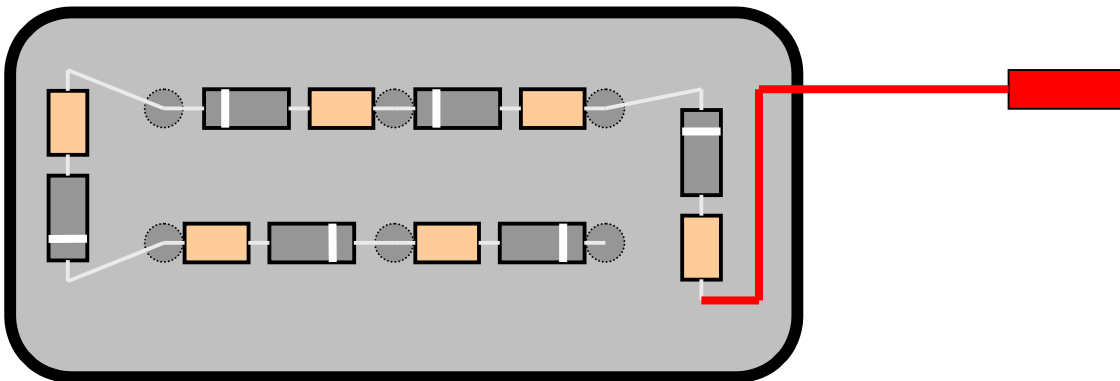
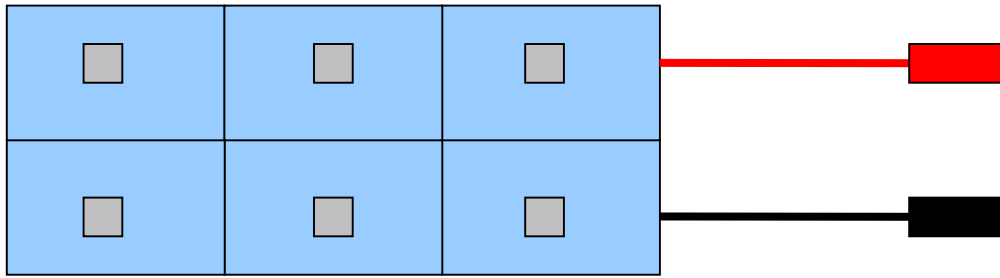
Important: Check that the diodes are the correct way around. Note the position of the stripe on the case.

Testing

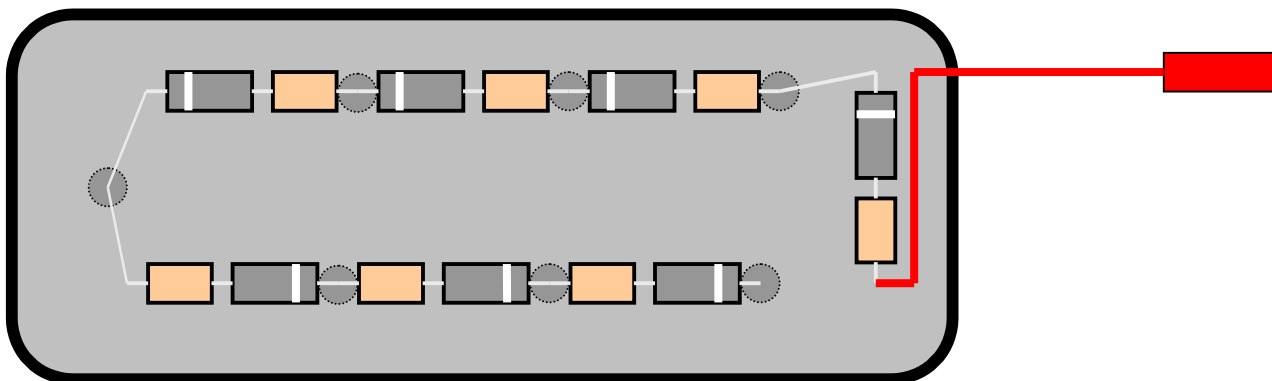
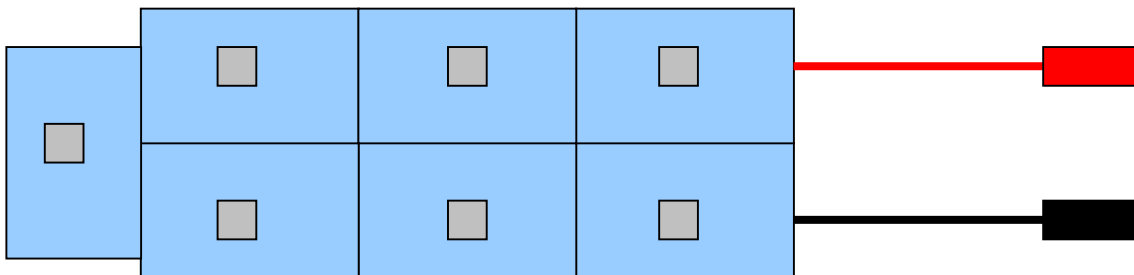
Connect the balancer to a charged battery and measure the voltage across each diode. You should measure around .6v . If the voltage is significantly higher or lower check your circuit for construction errors.

Different cell layouts

6 Cell Stick Pack



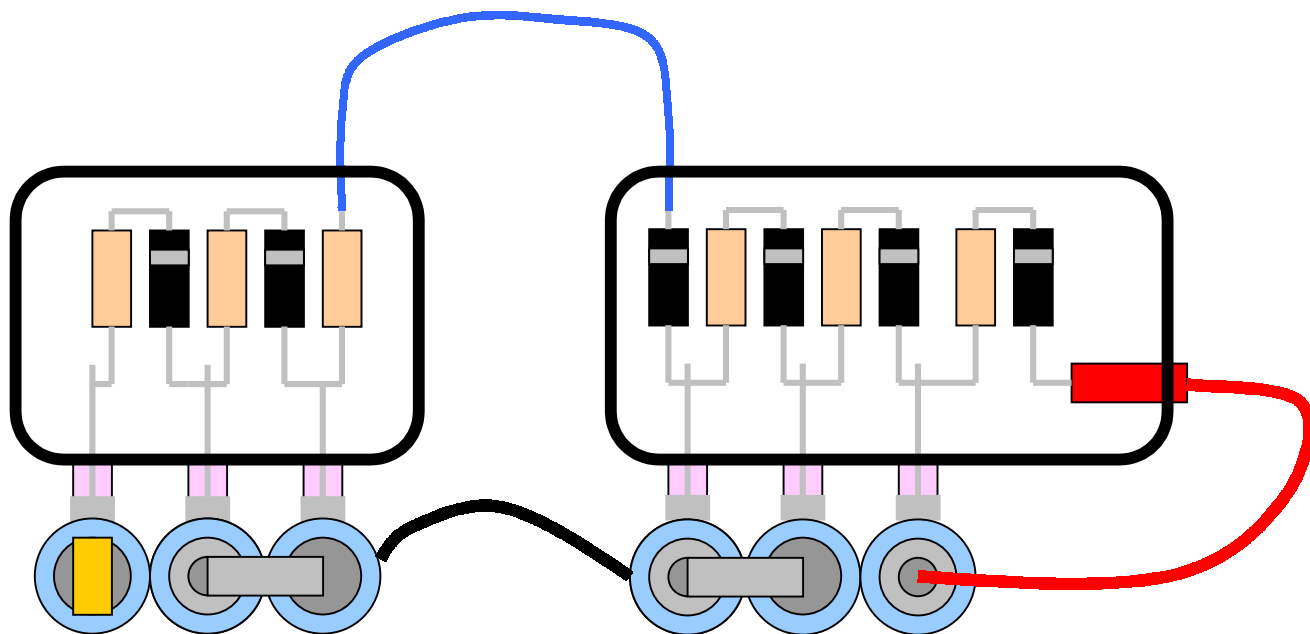
7 Cell Stick Pack



Important note

When constructing a balancer for a stick pack it can sometimes be difficult to correctly identify the first cell connected to the positive connector. Check that there is 1.4v or less between the positive lead and the outer casing of the cell you think is the first one before connecting the balancer.

Saddle Pack



Using the Balancer

It is not necessary to rebalance your cells after every charge/discharge cycle but it is certainly recommended if your cells have not been used for a while. This balancer will discharge and balance a fully charged pack if it is left connected overnight, but I tend to discharge the pack quickly using my fast discharger and then attach the balancer. This method will balance most packs in less than 1 hour.

To check that your pack is balanced, measure the voltage between adjacent cells. If all cells show less than 1v the pack is balanced.

Neil McGrath
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