



Dear Customer,

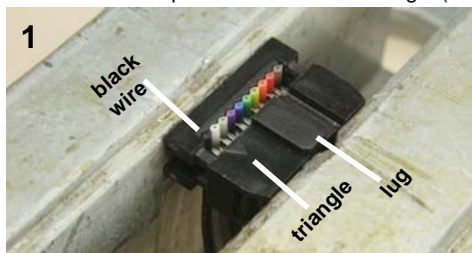
In principle you can charge any Lithium-Ion, Li-Polymer or (on *LiPoCardV7up*) Li-Iron-Phosphate batteries with up to four cells using the **Schulze-LiPoCard** without the balancer socket. Lithium batteries with a conventional balancer socket can also be connected to the **Schulze-LiPoCard**, if necessary using a balancer adaptor. However, if you use either of these methods it is essential to set the **Schulze-LiPoCard** to the permissible charge current for the pack in question, and - if no balancer cable is connected - you must set the cell count (number of cells) manually for reasons of safety.

To avoid having to re-configure your **Schulze-LiPoCard** separately for each battery, the **Schulze-LiPoCard** features a quasi-automatic function: a special Schulze-LiPoCard Balancing Cable is used to inform the **Schulze-LiPoCard** of the battery-specific data.

The cable can easily be assembled using the parts in this **BalCab10-Set** (10-pole BalancingCable-Set). This cable features three more connectors than usual. The electronics of the **Schulze-LiPoCard** use these additional terminals to detect the type of battery connected to it, and the permissible charge current for that battery type. These instructions describe how the completed Balancer Cable should look, and how the three configuration connectors have to be wired.

1 Assembly instructions of the *BalCab10* (for the *LiPoCard* & *LiPoBalancer*)

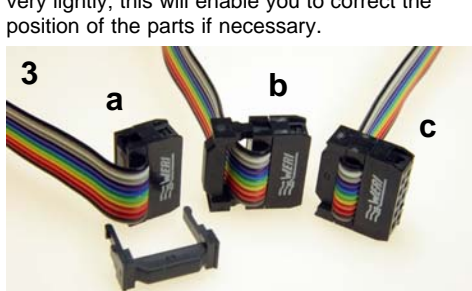
Slide the end of the ribbon cable out through the opening of the socket, working from the unmarked end of the socket, and position it flush with the top of the socket housing. The black wire must coincide with the point marked with a triangle (to the left of the large polarising lug).



-1- Fit the prepared cable in a vice with an open bottom, as shown above, and tighten the vice very lightly; this will enable you to correct the position of the parts if necessary.



-2- Very carefully tighten the vice, so that the gap between the parts of the socket just disappears.



-3- Remove the "rainbow" ribbon cable from the vice, a) bend it forward over the socket, and b) press the U-shaped strain relief into place to secure it - c) it must snap distinctly into place.



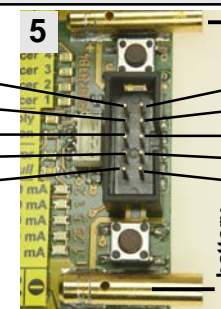
-4- The ribbon cable can now be cut down to the required length. The cable should be glued to the pack using contact cement in order to provide strain relief, but this must be carried out later, i.e. after assigning the cable connections correctly.



1.5.2 Pin assignment *BalCab10* (picture of pin assignment *BalCab20* see chapter 4)

<i>LiPoCard</i> Balancerplug 10 poles			+ battery ('+' of last cell: 1,2,3 or 4)		
Cable colour	Assignment	Pin	Pin Assignment	Cable colour	
brown	battery +	10	9	'+' batt. ('+' last cell: 1,2,3 or 4)	red
orange	cell type	8	7	'+' cell 3 (no connect at 2s pack)	yellow
green	charge curr.(2)	6	5	'+' cell 2 (no connect at 1s pack)	blue
lilac	charge curr.(1)	4	3	'+' cell 1	grey
white	battery -	2	1	'-' cell 1 (battery -)	black

Note: pins 1 (black) and 2 (white) are always connected to the negative charge lead terminal; pin 10 is connected to the positive terminal of the charge lead.



This makes it possible to charge small batteries at low charge currents (max. 1 A) using the **Schulze-Balancer Cable** directly, i.e. without using a charge lead.

1.5.2 Cell type detect:	10-poles connector	20-poles connector
a) Li-Io	Please connect: pin 8 (ora.) & pin 4 (lilac, current1)	pin 18 (ora.) & pin 17 (yellow, current1)
b) Li-Po	Please connect: pin 8 (ora.) & pin 6 (green, curr.2)	pin 18 (ora.) & pin 16 (green, current2)
c) Li-Fe („Saphion“)	pin 8 (orange) leave unconnected	pin 18 (orange) leave unconnected
Prepare the ends of the rainbow coloured ribbon cable wires as shown in Figs. 6 - 17.		
1.5.3 Charge current det.:	10-poles connector	20-poles connector
Solder resistor between: pin4(lilac,curr.1) & pin6(green,curr.2) pin17(yellow,curr.1) & pin16(green,curr.2)		
The charge current for the battery pack is determined by a resistor. The value of the resistor is one Ohm per milli-Amp (mA) of charge current and has to be soldered between the above listed pins.		

Example: 360 mA = 360 Ohm; 1250 mA = 1250 Ohm, 3200 mA = 3.2 kiloOhm. Any value above 3.9 kOhm is possible (e.g. for a 6000 mAh pack = about 6 kOhm); the LiPo Card then charges at the maximum possible current of 3850 mA. Permissible resistor values are from 25 Ohm to 15 kOhm.



-6- Strip about 8 mm of insulation from pins 4, 6 and 8 (lilac, green, orange), taking care not to nick or cut the conductors when removing the insulation.



-7- For Li-Po batteries: twist together the wires of pins 8 and 6 (orange and green).



-8- Tin the wire ends with electronic grade (resin-cored) solder.



-9- Cut down the tinned wire ends to 2 mm.



-10- Shorten the pins of the 5kOhm potentiometers supplied in the set, and bend them flat as shown.



-11- Use a crocodile clip (3rd hand) to fasten the pot or apply one or two layers of adhesive tape to the jaws of a vice to act as a buffer; the tape also helps to prevent

the pot tilting. Very carefully clamp the pot in the vice, using the minimum of pressure. An alternative method, which avoids mechanical loads on the pot, is to use double-sided adhesive tape (Fig. 18) applied to a heat-resistant surface. The pot, or fixed resistors, can then be stuck.



Making the BalCab10/20 balancer cable



-13- 360 Ohm = 360 mA, e.g. 1 C charge current for 360 mAh cells.
-14- 2100 Ohm = 2100 mA, e.g. 1 C charge current for 2100 mAh cells.
-15- 5 kOhm pot set to right-hand end-stop = 3850 mA = maximum current for the **LiPoCard**. This is less than 1 C for the 3s7p pack shown, which consists of 1020 mAh cells.

-12- Connect the pot to an ohm-meter* using small crocodile clips**. Adjust the pot using a small screwdriver (i.e. 1.5 mm blade width) to set the desired resistance = charge current value. Values with a tolerance of 5% generally represent no problem for the the lithium battery. (*) digital multimeter set to the kOhm measurement range. (**) or an assistant who can hold the test probes.



-16- Tin the two long pins of the potentiometer, applying solder only to the outermost tip of the pins. If you solder too close to the plastic, the pot will be ruined.

-17- For Li-Po batteries: solder the wires to the points as shown above (orange/green and lilac). For Li-Io batteries: solder the green wire separately, and solder the lilac wire together with the orange wire.

-18- As an alternative to the trim pot supplied it is also possible to solder fixed resistors between the lilac and green wires. These fixed resistors (in the centre an SMT type, on the right a wire-ended version) can be insulated after soldering simply by slipping a piece of heat-shrink sleeve over them.



5% carbon film resistors are adequate, but the resistance values which come closest to the desired charge currents are only to be found in the ranges designated E24 or E96.

The SMT resistor's 681 designation means that the digits 6 and 8 are followed by one (1) zero (680 Ohm). The meaning of the three red rings on the wire-ended resistor are as follows: red = 2, gold = 5% tolerance. Red = 2, red = 2, red = 00, gold = 5% -> 2200 Ohm = 2.2 kOhm, 5%.

Important: If the orange wire is soldered neither to the green wire, nor to the lilac wire, the **Schulze-LiPoCard** (from firmware version 7 up) will be set to the Li-Fe (Li-Iron-Phosphate „Saphion“) cell-type.

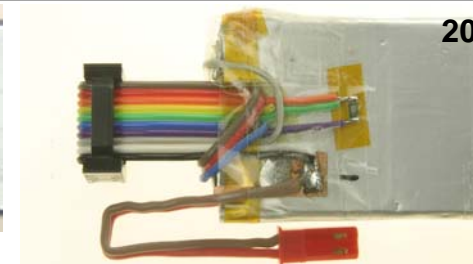
Making the BalCab10/20 balancer cable



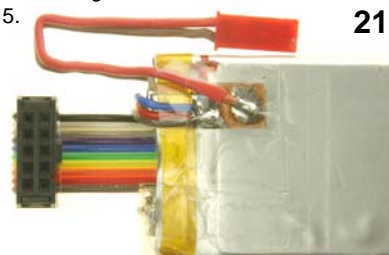
2.1 Typical wiring arrangement 1: early Kokam 1020 without conductor board



-19- Glue the ribbon cable to the cells using contact cement (see also Fig. 4). Cut all wires to the appropriate length, strip the ends, twist the conductors and tin the bare ends. Battery type and current configured. Now wire as shown in picture 5.



-20- All cables soldered, insulation stripped and taped in place. The pack is ready for use.



-21- View of the underside of the finished, configured pack.



-22- Test charge using the **Schulze LiPoCard**: Li-Po = blue, cell count = 2 (red), 1000 mA = yellow. Note charge lead omitted for the test.

2.2 Typical wiring arrangement 2: 3s7p Kokam 1020 without conductor board

-23- View of the pack (Eolo helicopter) without balancer socket.



-24- View of the pack with completed balancer socket fitted.



-25- Test of the BalancingCable:

Connect the **LiPoCard** to the power supply. Connect your balancing cable, but not the charge cable (for this test).

This example detects/shows: LiPo = blue, cell count = 3 (red), 3850 mA (maximum current) = yellow.

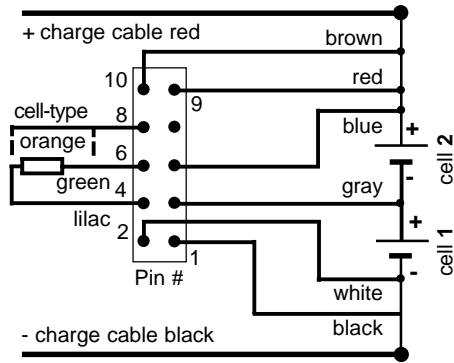
The cable configuration has been carried out correctly.





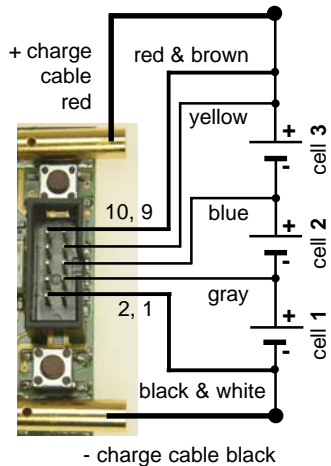
3 *BalCab10* wiring arrangement for 2s, 3s and 4s batteries

3.1 Connecting a 2s battery

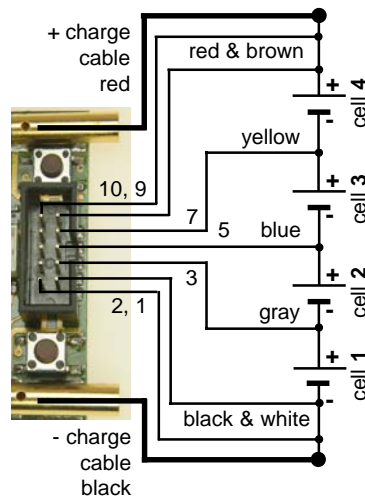


! Don't forget to connect the lilac, green and orange lead (connector pins 4, 6 and 8) to the pot or the fixed resistor.

3.2 Connecting a 3s battery



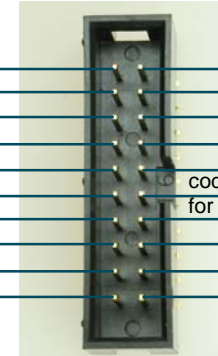
3.3 Connecting a 4s battery



4 *BalCab20* wiring arrangement for (2s ...) 5s ... 14s batteries

- 4.1 - Pinout for 20-pins *Schulze-BalCab20* smart balancer cable for the *Schulze LiPoBalancer*

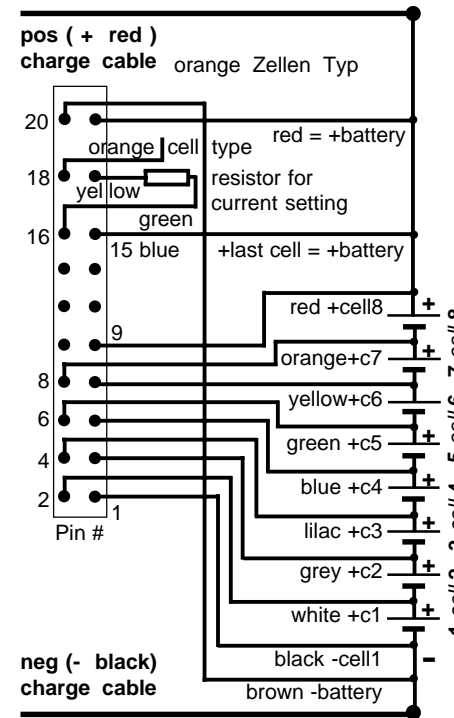
Cable colour	Assignment	Pin	Pin Assignment	Cable colour	
brown	battery - (-cell1)	20	19	battery +	red
orange	cell type	18	17	charge curr.(1)	yellow
green	charge curr.(2)	16	15	'+' 14 resp. batt.+	blue
lilac	'+' cell 13	14	13	'+' cell 12	grey
white	'+' cell 11	12	11	'+' cell 10	black
brown	'+' cell 9	10	9	'+' cell 8	red
orange	'+' cell 7	8	7	'+' cell 6	yellow
green	'+' cell 5	6	5	'+' cell 4	blue
lilac	'+' cell 3	4	3	'+' cell 2	grey
white	'+' cell 1	2	1	'-' cell 1 (battery -)	black



Note about Pin 19 resp. Pin 15 (battery +): Both Pins must have the same +batt.-pack-voltage: Connect the '+' pole of cell no.5 in a 5s-pack resp. connect '+' pole of cell no.12 in a 12s-pack.

Examples

4.2 Connecting a 8s battery



4.3 Connecting a 14s battery

