Battery Pack Welding Guide

For the battery shop. Please build exactly these packs with **spot welding only**.

NEVER solder onto the cells. Heat from a soldering iron damages 18650 cells and can make them unsafe.

What to make

Pack	Cells	Layout	Goes in	Lead exit
Torso pack	4 x LG INR18650 MJ1	2S2P (7.2 V nominal, 8.4 V full)	robot body (torso)	as on the drawing
Left shoe pack	2 x LG INR18650 MJ1	2S1P	left foot	**OUTBOARD end** (outer side of the foot)
Right shoe pack	2 x LG INR18650 MJ1	2S1P	right foot	**OUTBOARD end** (outer side of the foot)

Materials

Item	Spec
Nickel strip	PURE nickel, 0.15 x 8 mm (not nickel-plated steel)
Main leads	silicone wire, 14 AWG, red (+) / black (-)
Balance (middle) lead	silicone wire, 22 AWG
Insulation	fish-paper rings on every + end, Kapton tape, PVC heat-shrink wrap
Cells	supplied by the owner: 8 x LG MJ1 (all must be from the same batch)

Steps

1. Check every cell: voltage within 0.05 V of each other (charge or discharge to match first). Reject any dented cell or torn wrap.
2. Fit fish-paper insulator rings on all + ends.
3. Arrange the cells as on the drawing (next page). Keep the cell orientation exactly as drawn.
4. Spot-weld the nickel strip: at least 2 good welds per cell end. Test by gently pulling the strip.
5. Weld or attach the main + and - leads and the balance lead at the positions shown. Leads must leave the pack on the side shown (shoe packs: OUTBOARD end).
6. Cover all strip edges with Kapton tape, then heat-shrink the whole pack. Leave the lead exits free.
7. Measure: torso pack and each shoe pack must read 7.2-8.4 V, and the balance lead must read half the pack voltage (+/- 0.05 V).
8. Label each pack: TORSO / LEFT SHOE / RIGHT SHOE.

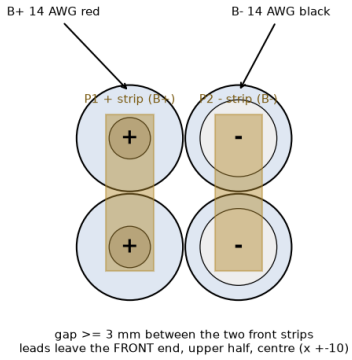
Final check before handing over

- No bare metal visible, no sharp strip edges.
- Pack fits the size on the drawing (the robot's battery bays have little spare room).
- Leads are on the correct end and long enough as drawn.
- No connector is soldered to the cells - only to the leads.

Pack drawing (from the robot CAD)

THARVIN robot - battery packs for the battery shop (spot-welded) - 3 packs, 8 x LG MJ1 18650

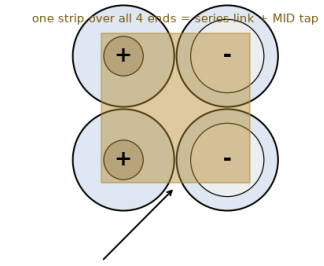
PACK T (torso) 2S2P - FRONT end (leads)



gap >= 3 mm between the two front strips
leads leave the FRONT end, upper half, centre (x +-10)

PACK T - BACK end (series link)

(seen from the back: P1 column now on the right)

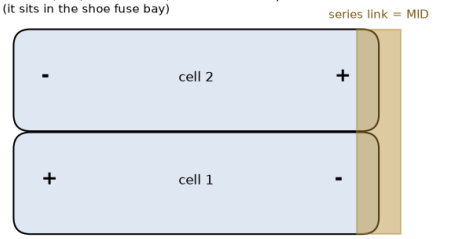


MID 22 AWG (balance)
along the side to the front

FISH-PAPER sheet over the whole back end:
the 300 W buck sits right behind the printed lid

PACK S-L and PACK S-R (shoes) 2S1P, 2 cells stacked

3-wire lead, 400 mm, from the OUTBOARD end (drawn left; L and R packs a
+ (cell 1) and - (cell 2) 14 AWG -> XT30 male (kit spare R28)
MID 22 AWG -> one pin of a JR servo lead (R32)
PTC 5 A (R35) in the + lead, 30 mm from the pack
(it sits in the shoe fuse bay)



Cells	8 x LG MJ1 INR18650 3,500 mAh 10 A (owner supplies, R20): same batch, all at the same voltage (+-0.02 V) before welding
Pack T (torso)	2S2P, 4 cells side by side (2 x 2, axes parallel). Max size 36.8 x 36.8 x 66.2 mm (cells 18.4 + 2 strip layers per end). No heat-shrink over the whole pack (the cage is 37.2 wide): fish-paper rings on the + ends, fish-paper sheet on the back end
Strip	Pure nickel 0.15 x 8 mm, 2 layers on every joint (we allow +0.3 mm per layer at each end). Spot-weld only
Pack T leads	B+ and B- 14 AWG silicone, MID 22 AWG, 150 mm, to the 2S 20 A BMS (R21: B-, BM, B+). BMS output P+ / P- 14 AWG silicone, 200 mm, ending in an XT60 FEMALE (this plug is the robot's power switch: plug out = no power)
Shoe packs	2 x 2S1P (S-L, S-R): 2 cells stacked, max 18.4 x 36.8 x 66.2 mm, 3-wire lead as drawn. At the torso: + / - in parallel with pack T at the BMS B+ / B-; MID to BM through a 0.5 A PTC (R36, mounted on the BMS)
Do NOT	solder directly to any cell (spot-weld nickel only; solder wires to the nickel strips). No exposed nickel at the pack sides. Check: pack T and each shoe pack 6.4-8.4 V, MID = half, before handing over