

Hymotion Manual Balance Procedure

Purpose of this document

This procedure is meant to be used by qualified technicians when servicing a used Hymotion L5 PCM in the field that is far out of balance, appears to be low on capacity, or is sending the 11-flash error code (a cell is so low the pack will no longer charge).

Be sure orange MSD (Manual Service Disconnect) is removed from the L5 pack before removing cover of unit. Always wear necessary PPE and obey safety rules for working with high Voltage anytime you have a battery pack open.

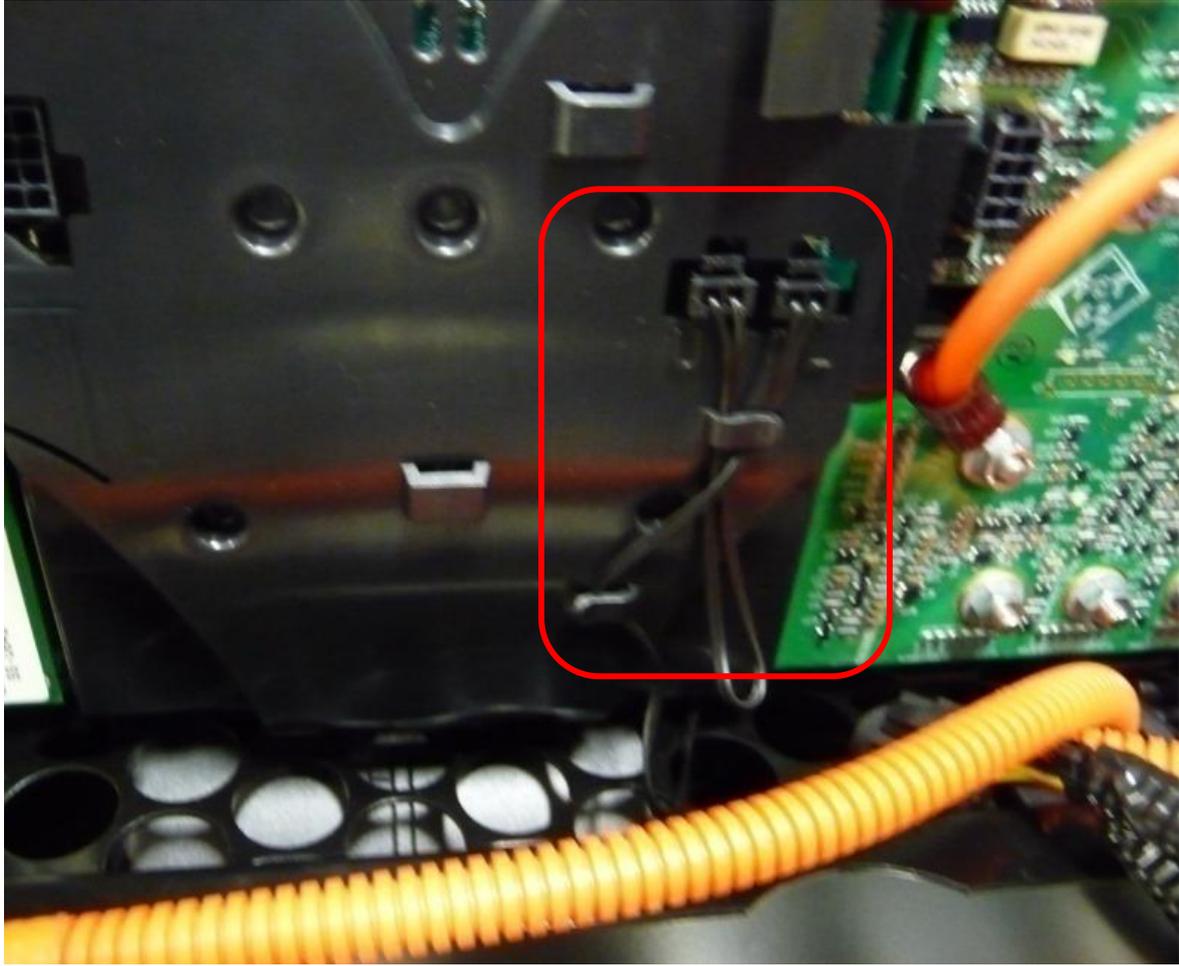
It is also highly recommended that technicians take precautions to eliminate risk of damage to the pack electronics from Electro Static Discharge (ESD). The many FET's on the MBB's are particularly vulnerable to damage from ESD.

Procedure

Remove the pack from car and place in a clean indoor work area, right-side-up. Remove top cover. When looking at the correct side of the pack, you should see what is pictured below. Cut all cable ties holding harnessing in place in the area encircled in red. Unplug the black daisy-chained communications harness from each module's electronic Measurement and Balance Board (MBB) and route the com harness out of the way. Each of the black plastic covers on the ends of the modules will need to be removed to accomplish measurement of the pack's individual cell groups.



After the cable ties are gone and com harness out of the way, you can move on to *carefully* working the temp sensor wires out from under the plastic clips built into the MBB covers. Take care to note which sensor plugs into which receptacle, mark them if needed. Unplug the temp sensors from each MBB and thread the harnesses out of the way. Carefully snap the plastic cover out of position and set aside. *Note: The plastic covers are not all exactly the same. Take care to reunite them with the same module they came from or you may encounter problems putting all harnessing back in position during reassembly.*



When all harnessing is out of the way and MBB covers removed, your pack should look something like this:

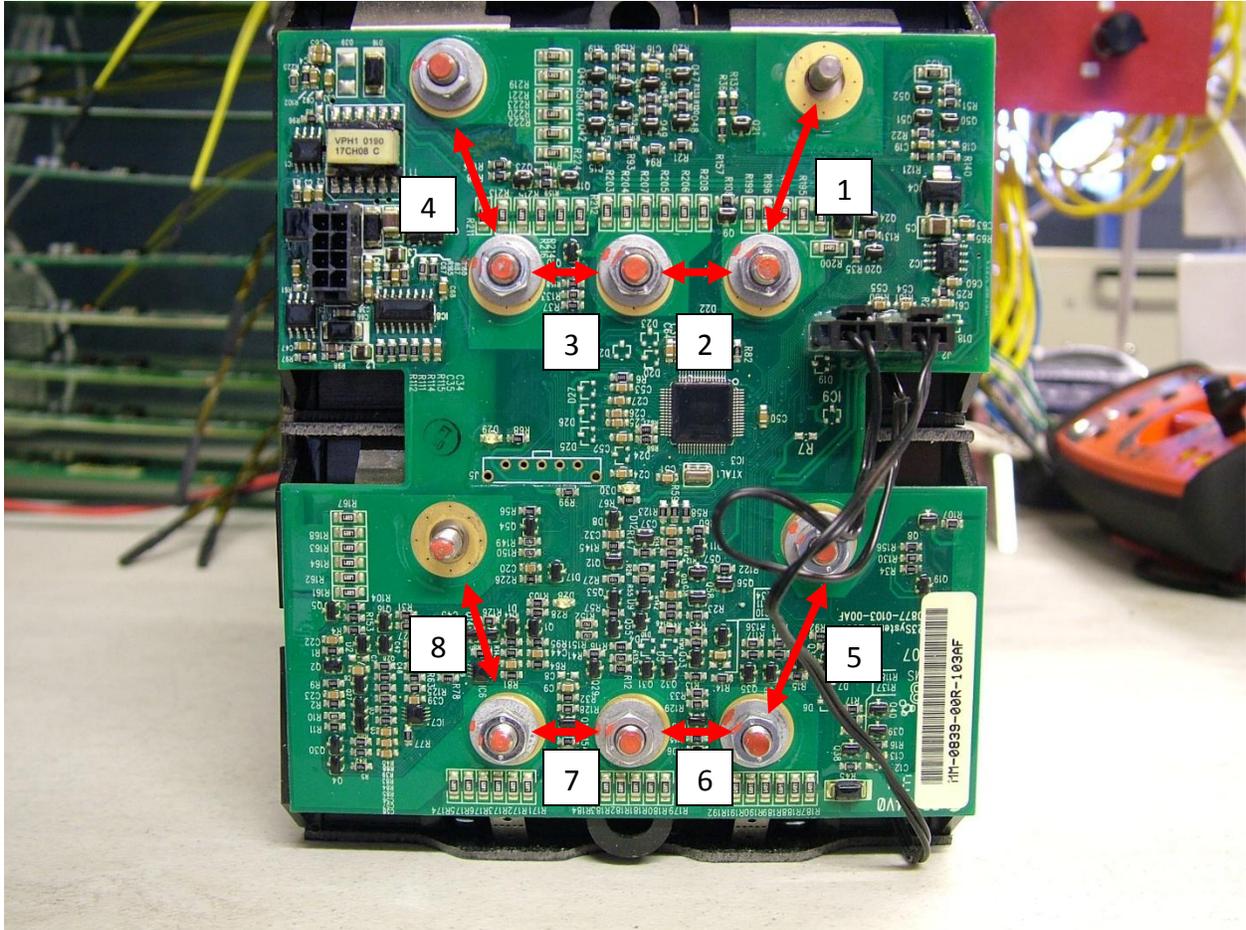


NOTE: Even with the MSD disconnected, each half of the pack (3 and 4 modules connected in series) has a potential of roughly 80 and 100 Volts from end to end, respectively.

If your problem is only imbalance (and not a more serious cell defect), you should not need to tear down the pack any further than this.

To determine the condition of your cells, you will first need to measure the Voltage across each separate group of 11 parallel cells. This represents a total of 56 Voltage measurements.

The photo below shows the MBB as mounted on a single L5 module. The measurement points for each of the 8 cell groups in the module are marked with arrows and numbered, starting with the negative end of the module. Measure and record all 56 Voltages in the pack.



Initial cell health assessment

There are a few ways to identify cells that need to be replaced. The simplest comes when you measure the cell Voltages as described above. Any cell groups that measure <0.5 Volts MUST be replaced. Any cells that have been allowed to discharge to below 0.5 Volts very likely have low capacity and, more seriously, can experience potentially hazardous thermal excursions during recharging. NEVER attempt to reuse any cells that have been overdischarged. Replace any module containing a cell group that has been overdischarged.

Restoring pack balance

Balancing a pack that is far out of balance is generally a simple procedure. The most common scenario is that all cell groups but one or two will be right around the same Voltage and one or two will be

significantly lower than the others. Provided these low cell groups have not been overdischarged, simply connect a bench power supply to the low cell group(s), one at a time until they come to rest (about 10 minutes after charging has stopped) in the vicinity of the majority of the other cell groups. Once balance is restored to that extent, carefully reconnect harnessing, replace MSD, and plug in pack to see if it powers and charges normally. If it does, unplug, and put the cover back on before plugging the pack back in to fully recharge and balance under the control of the L5's BMS.