

# 6.270 Autonomous Robotics Design Competition

## Hawker Lead-Acid Battery Pack Assembly

### 1 Necessary Items

- 3 Hawker Lead-acid batteries
- Heat shrink (should be initially wrapped around the batteries)
- 1 Red 12-guage battery cable
- 1 Black 12-guage battery cable
- 1 Male molex connector
- 2 Metal molex crimps
- 1 Switch

### 2 Directions

1. You have enough material for two battery packs—this allows you to use one pack on your robot while charging the other. Think about what configuration you would like your battery packs to be in (a row of three batteries, a triangle shape, etc).
2. The three Hawker cells need to be connected in series. Using a pair of pliers, bend the leads of each cell outwards toward the edge of the battery. Tin each lead with some solder. Place the batteries in your chosen configuration, in series with each other (so that you will connect the [+] lead of one battery to the [-] lead of the next battery).
3. Cut off, strip, and tin two small (1-inch should do the trick) lengths of battery cable. You want to have the following configuration of battery leads:
  - Battery 1:
    - [+] lead: free
    - [-] lead: connect to [+] lead of battery 2
  - Battery 2:
    - [+] lead: connect to [-] lead of battery 1
    - [-] lead: connect to [+] lead of battery 3
  - Battery 3:
    - [+] lead: connect to [-] lead of battery 2
    - [-] lead: free

Use the two small lengths of cable to connect the batteries as described. The two free leads will be used for the wires that connect your battery pack to the Handy Board or battery charger.

4. Take the remaining battery cable—one length of red cable and one length of black cable. Strip and tin a small (1-cm) section of one end of each cable. Slide the metal crimps onto the tinned section of exposed wire, and crimp them over the wire with a pair of pliers. For extra strength, use some solder to bond the wire to the metal crimp.
5. Read this step carefully before proceeding. Please be very careful to note the orientation of the molex plug; it is polarized. Be sure that you insert the positive and negative crimps in the correct hole. They don't come back out! Examples of proper orientation can be found in the included figure or you can ask an organizer if you're not sure. Insert the two crimps into the male molex plug. You may need to use pliers to insert the crimps—you should feel the crimp snap into place when it is in far enough.

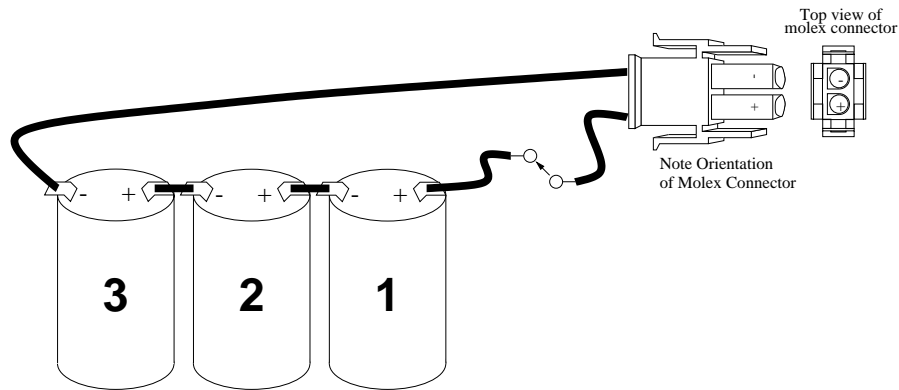


Figure 1: Battery Connection Diagram

6. Look at your battery cables, and decide where you want your on/off switch to be. Cut one of the cables at that location, and strip and tin the cut ends of the cable. Solder these ends to the leads on the switch, making sure that they do not touch each other in their final position. Cover the terminals and wires with hot glue, to make sure that the wires do not pull out of the switch, and to make sure that they do not touch each other if they pull out. If there is any exposed wire left, cover it with hot glue or electrical tape.
7. Strip and tin the remaining ends of the battery cable, and solder each end to one of the free leads in the battery pack. Again, please note the cable orientation carefully!
8. Slide the heat shrink over the whole battery pack. Heat with a heat gun (these are available in lab) until the heat shrink is snug over the batteries.
9. You're done! You can plug the batteries into the battery charger or the connector on the Handyboard. There are multimeters in lab available for testing the battery pack voltage. Be very careful with the batteries—improperly stored batteries that accidentally short can do things like catch a backpack on fire.