Updated: 2026-08-09

SRO Mechanics Lab

Complete this lab to earn 4 league points.

Deadline: End of Monday session

1 Objectives

You have a large supply of robot-building materials, and this lab will see you transform that pile of “stuff” into an assembled robot, ready to be programmed.

Complete the tasks in this lab as a team; you’re working on the same robot, so splitting up and completing *different* parts at the same time will be a good idea.

The aim of this lab is to:

- build a sturdy frame for the robot you have designed,
- attach components to your frame such that your robot can move - this will likely include motors, wheels and one or more casters.

Note: You can have a battery once your robot has been inspected by your mentor.

2 Robot kit

The robot kit is made up of several custom hardware control boards. This video demonstrates how to assemble the kit, though your versions of the boards may look slightly different. If in doubt, ask a mentor!

2.1 Boards overview

The boards you have are:

- **Power Board** – plugs into the battery and provides power to the rest of the kit.
- **Brain Board** – runs your code to control all other parts of the robot.
- **Motor Board** – controls two brushed direct current (DC) motors.
- **Ruggedized Arduino** – provides general purpose input/output (GPIO) for talking to sensors.

The Brain Board controls all other boards via USB cables. The Ruggedized Arduino is also powered from the Brain via the USB A to C cable.

The Power Board powers all other boards (including the Brain, but **not** the Ruggedized Arduino) via cables that you will have to make.

- To get the correct wire lengths for the power and motor cables, lay out the parts of the kit roughly where you want them on the robot

2.2 Kit layout

There are some important kit layout considerations when you get to attaching your robot kit to your robot chassis:

- The Power Board, especially the red power button, must be **easily accessible** so that it can be powered off, even when the robot is moving.
- At least one empty USB port on the Brain Board or USB hub must be accessible to connect a memory stick – this is how you put your code on the robot.
- To get the correct wire lengths for the power and motor cables, lay out the parts of the kit roughly where you want them on the robot and measure the length of the wire path.

2.3 Power distribution cables

The Power Board distributes power to the Brain Board and Motor Board using custom cables. You can make these yourself using the instructions below. An example image is shown in Figure 1.

1. Always properly colour-code your wires according to Table 1. This helps when debugging problems and ensuring safety.

2. Use 18 AWG (thick!), stranded wire, found in the parts area of the lab.
3. Cut an appropriate length of wire and strip approx. half a centimetre of the insulation from each end.
4. Crimp each end in a ferrule. This step will keep the ends need and prevent stray strands.
5. Use a small flathead screwdriver to fasten the ferrule into the appropriate 7.5mm screw terminal connector (this is the largest size). Ensure that the polarity of the wires/connectors is correct.

If you need help crimping wire, ask a mentor!

Why do you think we use thicker 18 AWG wire for distributing power, particularly to the Motor Board?

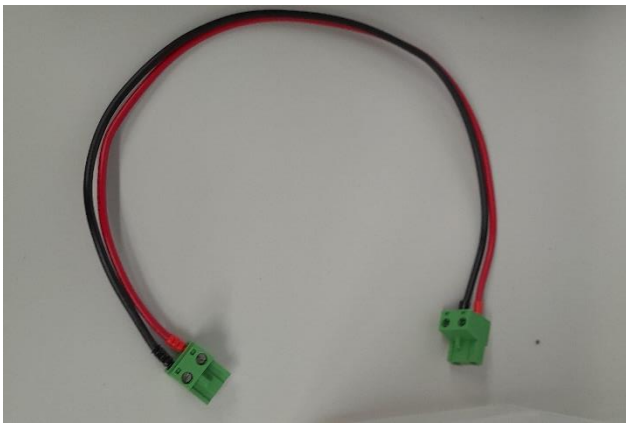


Figure 1. Power distribution cable with crimped ends.

Colour	Usage
Red	Positive voltage supply
Black	Ground
Blue	Motors

Table 1. Wire colour-coding.

2.4 Batteries

We use 3S lithium-polymer (LiPo) batteries, as in Figure 2.
You will get one once your robot has been inspected by your mentor.

They provide a voltage of roughly 12 volts (though this varies as the battery discharges). The XT60 connector is used for supplying high currents, e.g. for motors. The balance lead is only used for balance charging.

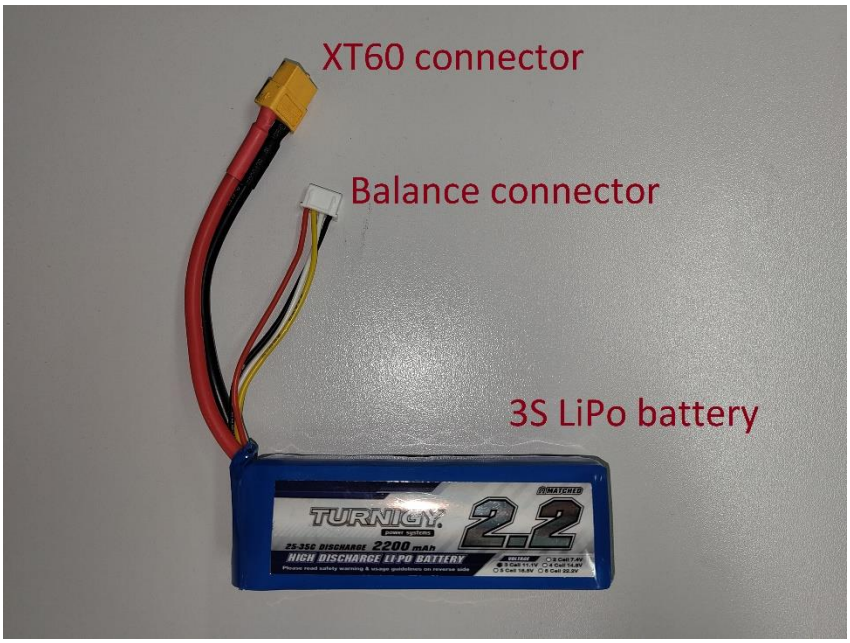


Figure 2. Lithium-polymer battery.

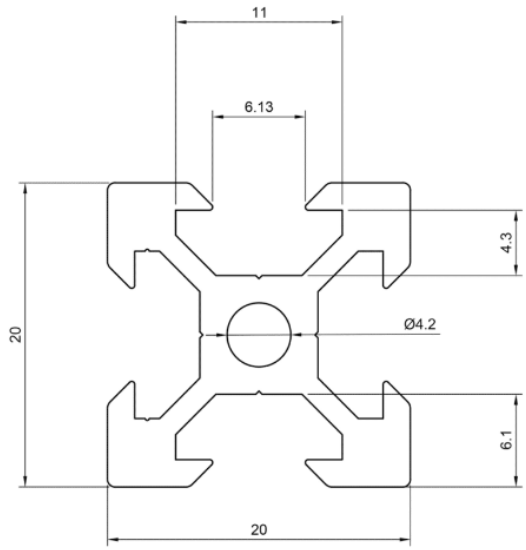
While on your robot, the battery **must** be inside the **red battery box**. At all other times, the battery **must** be inside a fire-proof battery bag. This is to protect it from physical damage.

THE BATTERY SHOULD ONLY EVER BE PLUGGED INTO THE XT60 CONNECTOR ON THE POWER BOARD OR A LIPO CHARGER.

3 Chassis

The main building materials at your disposal are aluminium extrusion and card. The card can be cut with scissors to make base plates.

3.1 Aluminium extrusion



Be careful! The ends of the aluminium extrusion may be sharp.

You can construct a solid frame for your robot chassis using aluminium extrusion. There are three lengths available: 400 mm, 250 mm, and 150 mm. 90-degree corner pieces can be bolted to the extrusion using **M5 bolts** and T-nuts. To do this, loosely bolt through the aluminium cast corner piece into the T-nuts making sure the raised part of the T-nuts are pointing away from the corner on both bits of the corner. Then, slide the nuts into the grooves on the extrusion to the required place before tightening.

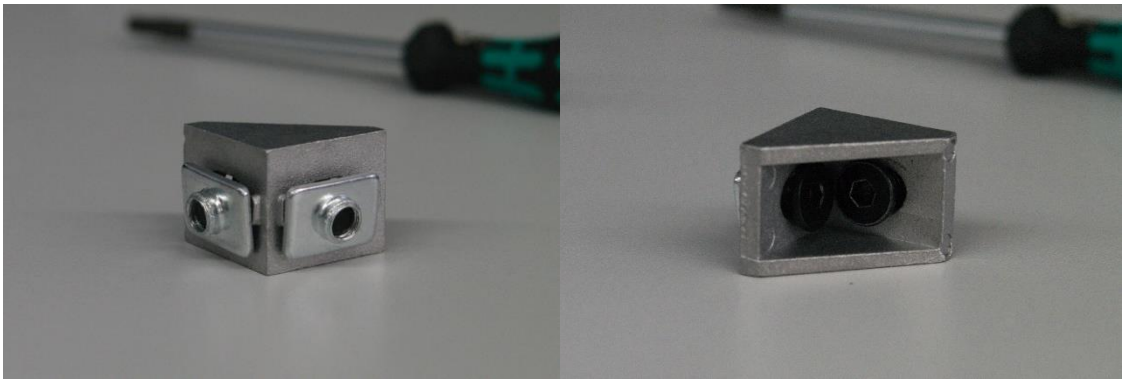


Figure 3A and B: Loose bolts and T-Nuts in corner

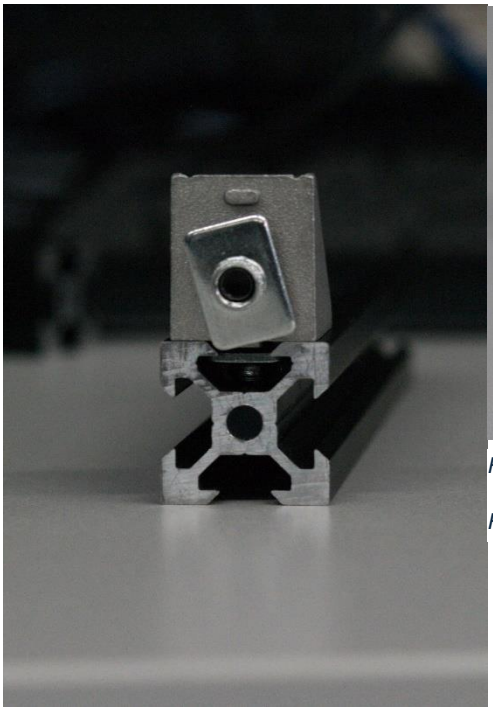


Figure 4 (left): First extrusion attached to corner

Figure 4 (above): Fully connected extrusions

3.2 Card

The card is strong enough to support most components. The scissors in the tool bags should be strong enough to cut and make holes (be careful!). Card is useful for making base plates and protective panels.

3.3 Motors and wheels

Your robot will need to drive around to complete the challenge, for which we have provided two DC motors and wheels. We have other materials such as casters but if you have different ideas for movement, ask your mentor.

The motor mounts need **M3 bolts** which are in the **parts area**. The motors can be attached directly onto the extrusion, and we recommend a **minimum of 3 bolts** to attach it. Motors can be installed at the front or back of the chassis – what differences would this make?

Once the motors are attached and secure, the wheels can be added. Push the wheel onto the hub, then add a circlip (as seen below) with the circlip pliers.