

EML2322L – Design and Manufacturing Laboratory

Robot Testing Procedures

Administer the following instructions when each group begins testing for the first time:

1. **Explain how testing works.** Use battery switch boxes for simple motor testing and use control boxes once robots are fully assembled or when groups are performing mobile platform testing during office hours. Use empty control boxes for general fitment checks.
2. **Be careful & gentle with control boxes & joysticks.** Do not drop the control boxes, joysticks, or power adapters. Do not over-tighten the screws attaching control boxes to robot. Always use washers with the mounting screws used to attach the control boxes. And never place anything in contact with the clear lids on the control boxes.
3. **TA assistance is required the first time the control box is wired.**
4. **Always turn off power before making wiring changes.**
5. **Always check that no wires are exposed or inadequately secured before turning the control box on.**
6. **Give the students instruction on how to properly install WEGO connectors.**
7. **Never turn on the control box while the robot is on top of a lab table.**

Additional TA Notes:

1. Spread groups out for testing using the space between the Do-All and Roll-In bandsaws, the woodshop area, and the space in front of the garage door.
2. Ensure control boxes are transported carefully and mounted securely with at least one screw in each mounting flange and that the mounting flanges are not placed in bending.
3. When plugging in the charger leads or switching batteries, **NEVER pull directly on the wires**; if you aren't strong enough to separate the connectors properly, ask for assistance.
4. Place control boxes and switch box batteries on charge at the end of each lab session.
5. Put the joystick controllers away in the drawer underneath the charging station at the end of each lab.
6. Batteries should be swapped or recharged when the voltage display reads < 11V.
7. If a control box stops working, let Mike know so he can troubleshoot it; in the interim you can use another control box.
8. Make sure you know [the proper way to strip and twist wires](#).
9. If you think of anything else pertinent, please let me know so I can add it to these notes.

Motor Respect & Repair:

1. Check that motors are not overloaded with **excessive overturning moments** (it should never exceed the rated torque output of the motor)
2. **Require students to use ALL provided mounting holes when designing motor mounts.** The only exception is mounting the Globe motor to an 80/20 frame member, which has never caused an issue because the Globe motor housings are manufactured from high strength 6061-T6 aluminum versus the cheaper, weaker cast metals from which all the other motor housings are made.
3. **Be very cautious of the fragile motor wires and fastener threads.** The wires entering a motor's casing are easily broken if pulled on or bent tightly, and once broken they cannot be repaired. Similarly, threads in the motor housing are weak to begin with, so it is imperative to use the proper fasteners specified on the motor's spec sheet. **A simple rule of thumb to prevent fastener damage is to always ensure the mounting fasteners can be screwed together completely by hand before using a tool to apply the tightening torque.**
4. **Never give a motor to a group without testing it in front of the students** (which includes checking each threaded hole) and making a note on their weekly progress sheet.
5. All motors except Denso's should have **zip tie strain reliefs** to prevent wires from pulling out of their housings when accidentally pulled on.
6. Always make sure the flat on the motor shaft is aligned with the set screw holes. **To minimize this risk of the set screws slipping,** clean the oil remaining on the wheel hub using Simple Green and a cotton swab located in the cleaning supplies cabinet, tighten a second set screw down against the first one, and tighten the set screws using the long yellow handle Allen wrenches found in the bottom of drawer of the black TA tool box.
7. Always **repair damaged motor threads using [thread rolling / forming taps as opposed to normal thread cutting taps.](#)**
8. At the end of the semester **leave the motor fasteners in the Denso, Entstort, and Globe motors** when returning them to the bins / shelves.