

ELECTRICAL TIPS FOR FIRST TEAMS

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1. **Include electrical components in overall design.** Many times teams just assume that they will be able to find space for electrical components at the end. Adding the placement of these components to the design early makes it easier and neater. It helps avoid precariously positioned speed controllers, relays, batteries, controllers, etc. Also remember to keep this subsystem in mind when estimating weight.
2. **Have a test board and basic program ready early.** These should be enough to at least run the drive system as soon as they are completed.
3. **Make sure battery is easy to replace but secure.** During competition, there is often very little time between matches (especially during eliminations). Easy battery change outs are therefore very important but it's also important that the battery won't fall out during a match so make sure it is secure.
4. **Charge batteries.** Make sure to always have extra batteries charged. A fully charged battery should be used in each match. The best way to make sure batteries are always charging is to assign that responsibility to someone in the pit. Have a battery just for testing in the pit so you are not using the match battery.
5. **Keep ports on robot controller clear.** The tether, radio, and programming ports are all necessary throughout the competition so it's important to make sure they are easy to access. Should also be able to see the LEDs on the controller easily to facilitate problem diagnosis.
6. **Protect components from debris.** Make sure to cover speed controllers and relays to protect them from metal shavings when working on the robot.
7. **Use a good crimper.** Good crimps on all connectors are very important to make sure the robot continues to run. Many robots have become disabled on the field because of connections coming loose.
8. **Organize wiring.** Make sure to label all wiring so that if components need to be replaced, rewiring is faster and easier. Also make sure to keep wiring neat and out of the way of moving components. Use wire ties, Velcro, etc to tie down wiring. Judges love to see a neat wiring job.
9. **Make sure all connections are insulated.** Use insulated connectors, electrical tape, or adequate heat shrink for all connections. Be careful of this especially on the battery terminals and the 120 amp fuse, inspectors will be checking those carefully.
10. **Reduce wiring.** Wiring adds quite a bit of weight. Make sure to use as little as needed. Long lengths of wiring also add resistance which decreases the effectiveness of the battery. Do make sure that you leave some slack.
11. **Keep several copies of your program.** You can't get the program back off the robot controller, so make sure you keep copies. Also, never save changes on top of an old program, save it as a new copy and make sure to name it appropriately (example: program_rev3).
12. **Start work on autonomous early.** Autonomous code typically takes a lot of tweaking so the earlier you start and the more testing you are able to do, the better.
13. **Have a multimeter.** This is often forgotten on the list of useful tools. Many electrical problems can be diagnosed using this all around tool.
14. **Use appropriate gauge wire.** The manual is very clear when it comes to this. Follow the diagram provided in the manual. Inspectors will be checking this closely.