Making Robust FRC Robots

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About this guide:

This guide is a collection of methods to make FRC robots more robust and serves as a living document that will be added to over time. This should serve as a central location to link to deeper guides on the specifics of each technique listed.

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Electronics:

1.1 Mounting:
- All electronic components should be isolated and mounted on some sort of vibration damping, for components with mounting holes, [these](#) can be used.

1.2 Components:

1.2.1 Wifi Module:
- The wifi modules have an issue where under impact the PCB board can flex enough to touch a metal shield. Fixing this is a fairly simple process of taking it apart and placing electrical tape over the metal shield a guide to doing this can be found [here](#).
- It is always recommended to have the module isolated from any solid surfaces to reduce any impacts this can be accomplished through mounting to vibration damping pads like [these](#).
- For supplying power it is recommended to use POE injectors and the barrel jack for redundant radio power.
- More useful information can be found in this chiefdelphi post [here](#).

1.2.2 power switch:
- It is recommended to use non-corrosive nuts on the power switch which can be found here

1.2.3 Battery:
- When putting the wire onto the battery terminal using Nord-Lock Lock washers and nylock nuts the washers can be found [here.](#)
- It is recommended to change the wires on the battery from 6 gauge to 4 gauge this may show some larger effects if you are having a higher power draw (i.e lots of falcons) a guide to how to this can be found [here](#)
- Before each match, zip-tie the battery connector together

1.3 Wiring:

1.3.1 canbus
- On canbus wires use soldered connections

1.3.2 Heatshrink
- Use clear heat shrink so it is easy to inspect connections.

1.3.2 Gromets
- When passing wiring through any metal the holes should be designed to use grommets like [these](#).

Software

Mechanical

Driver Station

1.1 Guidelines
- Run from an SSD
- When considering the tier of laptops many use business-grade laptops although there is no real need for a powerful laptop the main benefit would be faster booting times.
- Dedicate use as a driver station, and don't ever connect to the Internet (other than perhaps Windows updates several days ahead of the competition)
- Run an updated version of Windows 10, or maybe Windows 11 (W11 is not fully officially supported -- yet)
- No extra software on the driver station that isn't related to being a driver station
- Disable/uninstall everything you can, including firewall, 3rd party antivirus, etc. Rely only on Windows Defender. (Could be done by installing a clean build of Windows, perhaps)
- Have an identical backup (or two)
- Install software to push code, "just in case" you are on the field and the robot suddenly has no code
- Enable automatic, password-less login for those emergency situations
- Adjust power saving settings to always remain on
- Disable updates by setting the Windows "Active Hours"
- Disable WiFi at competitions (i.e., when not using it at home)

1.2 save the ports
- Install (even semi-permanently with electrical tape) right-angle USB connectors to avoid wear-and-tear on USB ports, like [these](#).
- Avoid hinged Ethernet ports if you can, and use an Ethernet port saver to avoid wear-and-tear on the port such as [this.](#)
- Alternatively, use a USB hub and/or USB-to-Ethernet adapters like [this.](#)

Bumpers

1.1 guidelines
- A great resource on creating effective bumpers can be found [here](#)
- Avoid cutouts in bumpers
- If possible make single-piece bumpers
- Have a goal of 8 mounting points with a minimum of 4 to spread the load

- Bumpers will always be used to pick up the robot so design with that in mind
- Use these quick-release clips here