

# MidKnight University: Electrical Components and Tools



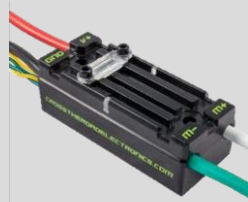
**Battery:** The battery provides electricity for the electrical components. The metal contacts on the battery are referred to as terminals or 'leads'.

**Circuit Breaker:** The circuit breaker connects the battery and the PD board and serves as a switch to turn the robot off and on. Always make sure to turn the robot off before attempting to change anything.



**PD Board:** The power distribution board distributes electricity to all of the electrical components by drawing energy from the battery.

**Speed controllers:** Each speed controller controls the speed of the motor it is connected to. There are several speed controllers on the market: we use the Talon SRX.



**roboRIO:** The roboRIO is the 'brain' of the robot and stores all of the robot's code.

**PCM:** The PCM is the pneumatics control module. It controls the pneumatic components on the robot.

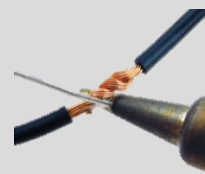


**VRM:** The VRM is the voltage regulator module. It regulates the voltage of the electricity that travels to any cameras or sensors on the robot.



**Wires:** Wires allow electricity to flow to each component on the electrical board, giving them the power they need to function.

**Wire Gauging:** As the gauge of the wire increases, the thickness of the wire decreases.



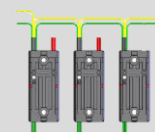
**Soldering:** Soldering is the process of melting solder (a lead alloy) to connect separate pieces of wire. While melting solder, fumes are released - make sure there is good ventilation if anyone is soldering.

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**Crimping:** Crimping is the process of attaching a crimp terminal to a wire.



Crimp terminals are connectors, so wires can easily be disconnected if something needs to be changed.

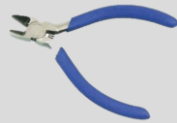


**CAN:** CAN stands for controller area network. CAN wires allow raw information to travel from the speed controllers to the roboRIO.

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Wire Cutters: Also known as diagonal cutters or usually as 'dikes' for short, these are used to cut wire.



Wire Crimpers: Wire crimpers are used to attach crimp terminals to wires.



Wire Strippers: Wire strippers are used to remove the insulation off of a wire, usually to crimp it, solder it, or connect it to an electrical component.

Electrical tape:  
Electrical tape acts as makeshift insulation to cover any exposed wire or leads.



Battery beak: This tool is used to determine whether a battery is fully charged and if it is of an acceptable quality to use.

Our batteries are fully charged when the beak reads 130%.

If you would like to know more about the electrical components and the FRC control system, the following links may be helpful:

<https://wpilib.screenstepslive.com/s/4485/m/13503/l/144968-2015-frc-control-system-hardware-overview>

<https://wpilib.screenstepslive.com/s/4485/m/24166/l/144971-wiring-the-2015-frc-control-system>

## Guiding Questions and Exercises

Robot is to human body as roboRIO is to \_\_\_\_\_.

Which is thicker, 6 gauge wire or 20 gauge wire?

What is the purpose of the PD board?

What is a Talon and what does it do?

You need to connect two wires temporarily, but the connection between them needs to be secure. What do you do?

What is the difference between a PCM and a VRM?

What does CAN transport from the speed controllers to the roboRIO?

You need to get a battery for the robot to use during drive practice. What tool do you need?

You see an exposed wire on the electrical board. What should you do?

The programmers crash the robot into a wall and, because the electrical board is poorly designed, you see a few wires come loose. What do you do?

Label the following\*:

\*This image is in no way an accurate representation of an acceptable or complete electrical board.

