# Basic Terminology

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# Terminology

**Basic Electrical Terminology**

Volts (Power), V

The potential difference in charge between two points

The size of the force that sends the electrons through a circuit

Amperes (Current), Amp, I

The unit used to measure electric current

The number of electrons flowing through a circuit.

Watts, W

A measure of the rate of energy transfer of an appliance

The rate of energy generated or consumed

Ohms (Resistance), □□

A measure of the opposition to current flow in an electrical circuit

Circuit:

A closed loop of conductive material.

Continuous flow of electric current. Positive to negative or ground. (+, -)

Series:

Components are chained together from positive to negative to positive, etc.

Parallel:

Negative to Negative and Positive to Positive

CANchain -

The chain of CAN devices and their connections gives information to each other. Also referred to as CAN bus, there may be multiple for different parts of a robot.

Electrically, the FRC CAN network is a two-wire bus, designed to allow dozens of devices to talk to each other with a single network.

Needs two 120-ohm resistors to terminate the ends of the bus.

Bandwidth:

the ability to measure a signal

Multimeter:

- Electronic measurement tool
- Used to measure various electrical values
- Analog vs Digital

# Must-Knows

**FRC Electrical Must-Knows:**

| COMMON TERMS | |
|---|---|
| TERM | DEFINITION |
| CAN | "CONTROL AREA NETWORK" A COMMUNICATION PROTOCOL USED BY DEVICES FOR BIDIRECTIONAL COMMUNICATION ON A CHAIN. COMMONLY FOUND AS A 22AWG GREEN AND YELLOW TWISTED PAIR. MUST BE TERMINATED USING 1200 RESISTOR BETWEEN HIGH AND LOW (YELLOW AND GREEN RESPECTIVELY) |
| PDH | "POWER DISTRIBUTION HUB" WHICH CONNECTS DIRECTLY TO BREAKER AND BATTERY AND DISTRIBUTES POWER. BREAKERS AND FUSES FOR OVERCURRENT PROTECTION. CONNECTS TO CAN FOR DIAGNOSTIC INFORMATION |
| ROBORIO | MAIN ROBOT COMPUTER |
| RSL | "ROBOT SIGNAL LIGHT" USED TO INDICATE STATUS OF ROBOT |
| VRM | VOLTAGE REGULATOR MODULE" USED TO SUPPLY SENSORS AND DEVICES WITH REGULATED 12V OR 5V POWER RATHER THAN RAW BATTERY VOLTAGE |
| PWM | "PULSE-WIDTH MODULATION" SIMPLE UNIDIRECTIONAL SIGNALING USED TO TRANSMIT A VALUE BETWEEN 0-100% |

| | |
|---|---|
| AWG | "AMERICAN WIRE GAUGE" AMERICAN STANDARD FOR WIRE DIAMETER. PRONOUNCED GAUGE.<br>SMALLER NUMBER MEANS LARGER DIAMETER, DOUBLING WIRE DECREASES AWG BY 3 |
| FUSE | OVERCURRENT PROTECTION DEVICE WITH COLORFUL PLASTIC HOUSING. PERMANANTLY DAMAGED WHEN TRIPPED |
| BREAKER | OVERCURRENT PROTECTION DEVICE WITH COLORFUL METAL HOUsING. AUTOMATiCALLY RESETS AFTER COOLING WHEN TRIPPED, TRIP INDICATED BY BLINKING LIGHT ON PDH |
| FALCON 500 | BRUSHLESS MOTOR WITH BUILT IN MOTOR CONTROLLER. CONTROLLED OVER CAN |
| KRAKEN X60 | NEWER BRUSHLESS MOTOR WITH BUILT IN MOTOR CONTROLLER. CONTROLLED OVER CAN, REPLACABLE LEADS |
| SPARK MAX | STANDALONE MOTOR CONTROLLER, COMPATIBLE WITH WIDE RANGE OF BRUSHED AND BRUSHLESS MOTORS |

# Tips

**Tips:**

- Generally, follow your subsystem leader before acting on anything
- Have someone pull test your connections after you've done them (you can save so much time in the pits)
- Work closely with the programming and mechanical subteams to make sure that what you're doing aligns with team goals and mechanisms
- Follow the safety guidelines mentioned in What is Electrical?
- Always sanity check (you never know)
- Always cross-check with leaders, resources, or mentors if you are stuck or unsure about anything
- Have a system for batteries whilst in the pits to maximize organization, time, and battery output
- Always say no to pneumatics (just kidding)
- Try and keep wire connections outside of hidden locations and easy to access if needed in a situation
- Always make sure you have enough crimps, wire, whatever before and/or during the season to prevent a shortage of what can be done
- Be sure to mount your devices with actual mounts and not zipties if you can. Using zipties can be helpful if used properly.