

# The FRC Control System - A Primer

Laying out and explaining the Integral control system hardware that is needed to make an FRC Robot run.

Please consult the Regular FRC Control System Diagrams for a more complete implementation of the system.

**Robot Signal Light**  
An industrial-grade light that allows a robot to visually communicate its status either to your drive team, or field staff.

RSL Wiring  
Minimum 22 AWG  
"La" and "Lb" terminals connected to each other.

CAN wires should be a twisted pair with a twist per 1 inch or denser.

**Ethernet Cable**  
Must be connected to the radio using the port labeled "RIO".  
It is Recommended that you use a new ethernet cable to ensure reliability of the connection.

Radio Power  
Minimum 22 AWG

## Radio

Enables wireless communication from your robot to the field, and to your team's Driver's Station.

Robot Communication

Main Power and Distribution

## High Current Channels

Up to 40A continuous load for these.  
Used for motors, pneumatics controllers, and everything else

## Low Current Channels

Up to 15A continuous, 20A peak load for these.  
Used for the RoboRIO, Radio and other low current devices.

12V40A

12V20A

12V30A

12V10A

ATO Breakers

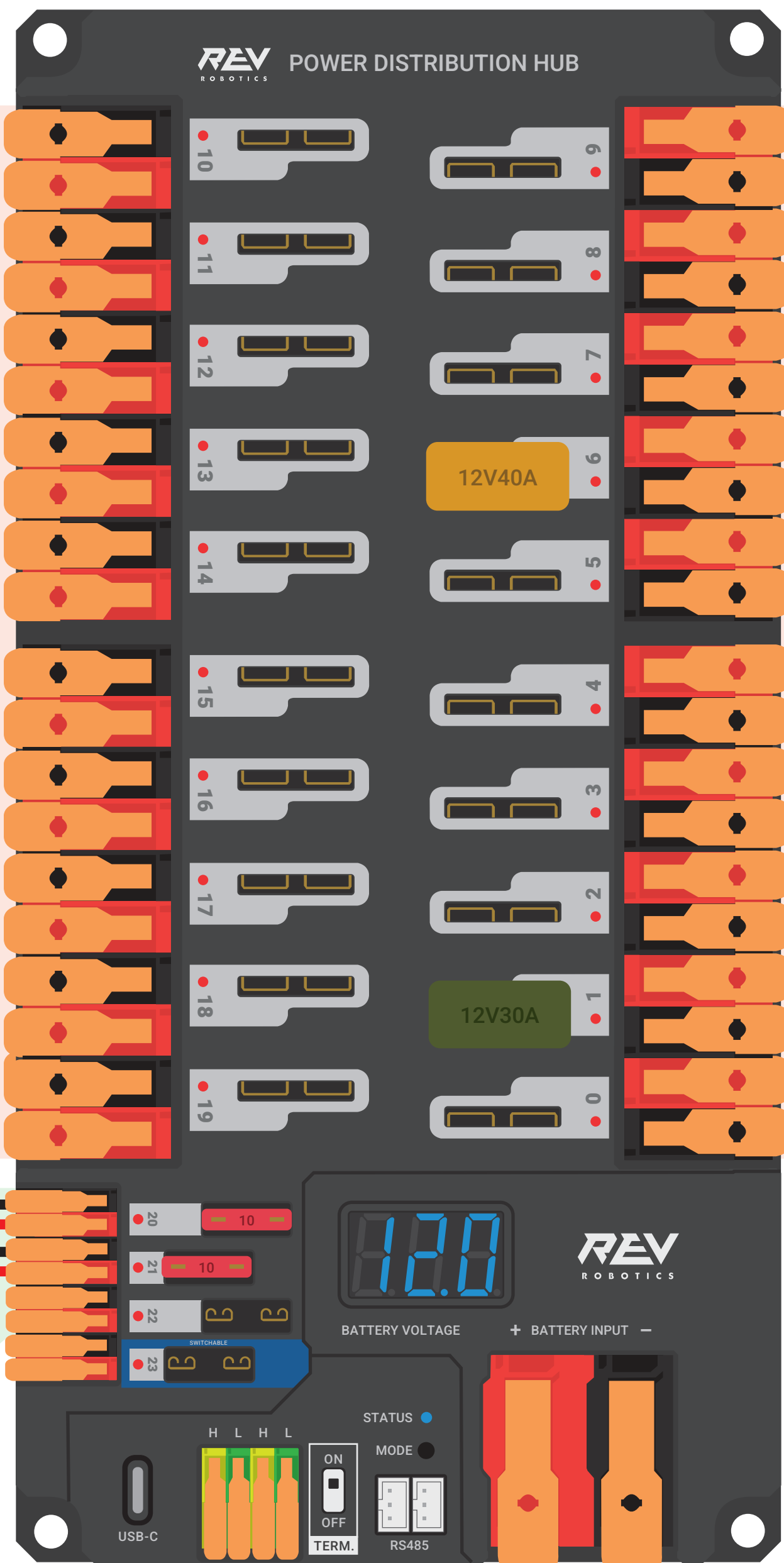
ATM Fuses

## Circuit Breakers / Fuses

Comes in ATO (High Current) or ATM (Low Current) form factors. These slot in to allow supplying power but also to give current protection to the channel its connected to.

## Power Distribution Hub

Distributes battery power, and provides fused low and high current channels towards various components in the robot.



## The Battery

A Sealed SLA-type battery, it stores and provides the power needed for a robot to run for a Full Match (2:30 Minutes). **Replaced with a recharged one every match.**

## Motor Controllers

Controls the motors that your robot has. Only 1 motor is allowed per controller in most cases. Motor Controllers come in different types.

## Integrated Controllers

Example Shown is a Kraken X60 Motor + Talon FX

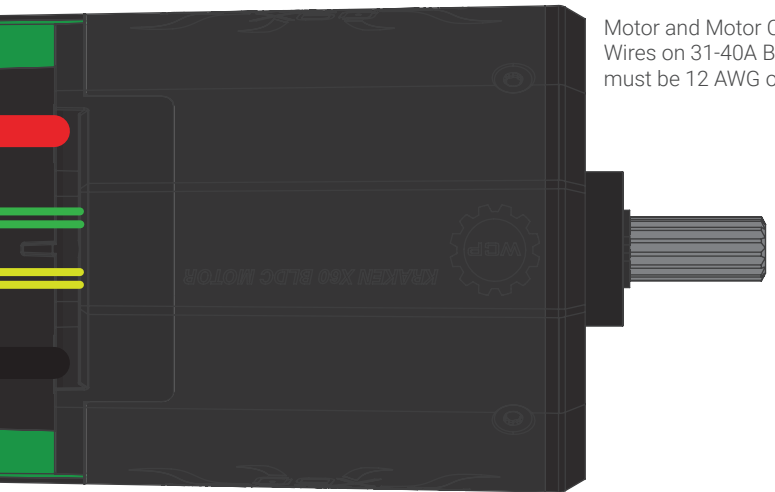
These controllers are integrated into their motor, making it either inseparable, or separable as an installable module. These controllers can either be controlled through CAN or PWM.

## Discrete Controllers

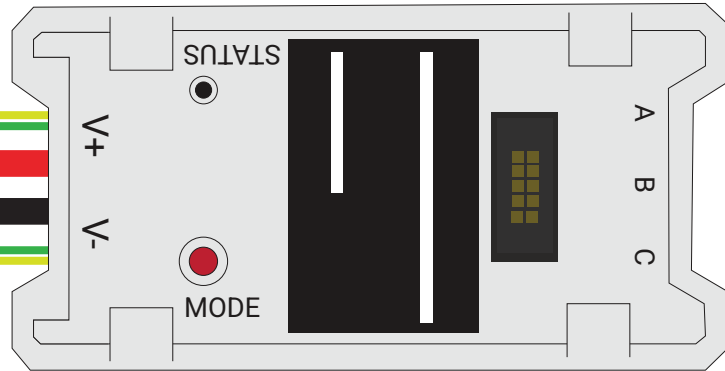
Example Shown is a Spark MAX motor controller

These controllers are separate from their motors, meaning you can pair any of these with any compatible motor. These controllers can either be controlled through CAN or PWM.

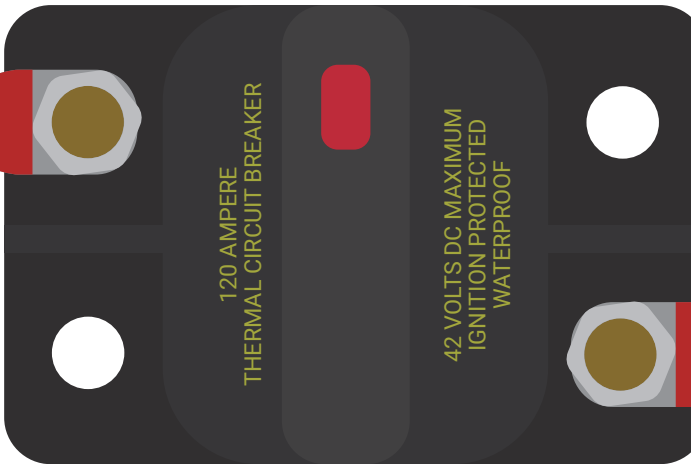
Motor Control



Motor and Motor Controller Wires on 31-40A Breakers must be 12 AWG or larger



Motor and Motor Controller Wires on 21-30A Breakers must be 14 AWG or larger



## 120A Main Breaker

Protects the robot from drawing too much current at the battery level. Also acts as the robot's power switch.

## Making your robot aware

Sensors detect movements or certain changes in your robot or its surroundings, so that you can utilize them for your robot's functionality.

Read more on the different types of sensors and how you could utilize them at: <https://docs.wpilib.org>

Limit Switch Example

Analog Encoder Example

USB Camera Example

Sensors

## BASIC FRC CONTROL SYSTEM

V.3.10.PR

TEAM 3161



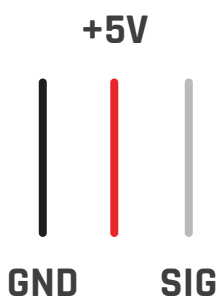
## Power

12V DC Main



## PWM

26 AWG Minimum



## CAN

28 AWG Minimum



## Wires

American Wire Gauge (AWG)

Minimum Gauge per connection type shown.



Always practice proper safety precautions and practices when working with electrical systems.

More Information about the FRC Control System can be found at <https://docs.wpilib.org>

KEEP IN MIND