

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 Distribution

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

Low Current Channels
Up to 15A continuous, 20A peak.
Used for the RoboRIO, Radio and other low current devices.

The RoboRIO

The robot's brain, it stores and executes code that is written by your team so that your robot can be controlled and perform commands.

Controlling Devices

At a basic level, the RoboRIO can control devices in 2 ways; the CAN bus or PWM Control.

The CAN Bus

A message-based network of interconnected devices that can communicate with each other.

PWM Control

Uses signals with varying power levels to control a specific device.

PDH Wire Strip Guide
Following these strip lengths for the Power Distribution Hub wire connections ensures that your connections are robust and reliable. Illustrated Lengths are 1:1 scale if the diagram is printed at 24 x 36.

Low Current Channel, Switchable, and CAN Wires
0.33"
High Current Channel Wires
0.5"
Battery Input Wires
0.75"

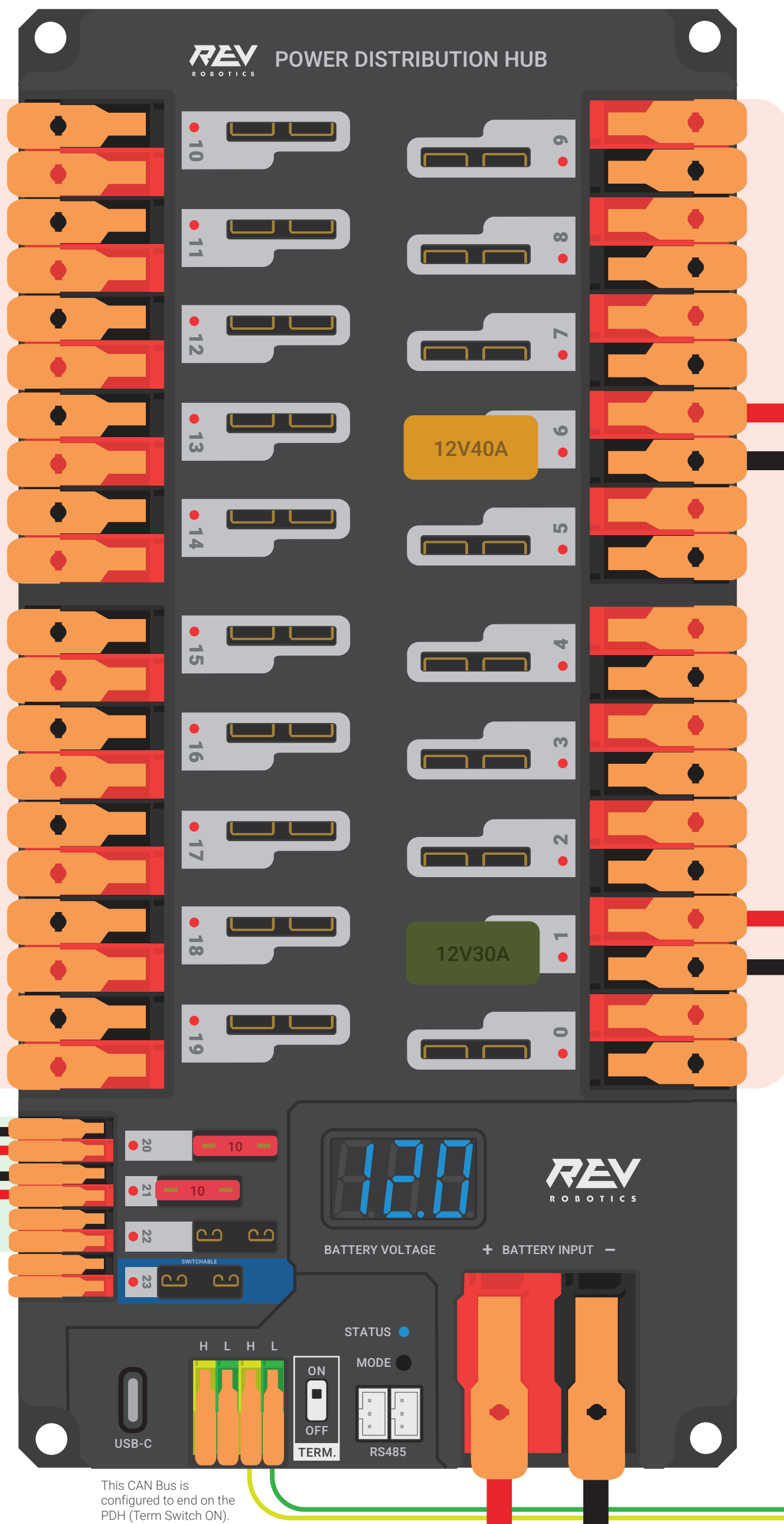
12V40A 12V20A 12V30A
ATO Breakers (10A Not Shown) ATM Fuses

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.



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

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.3.21.PR

TEAM 3161



Power

12V DC Main
LIVE (+) (-) GND

PWM

26 AWG Minimum
+5V
GND SIG

CAN

28 AWG Minimum
HI LO

Wires

American Wire Gauge (AWG)
Minimum Gauge per connection type shown.

6 AWG 12 AWG 14 AWG 18 AWG 22 AWG 26 AWG 28 AWG

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