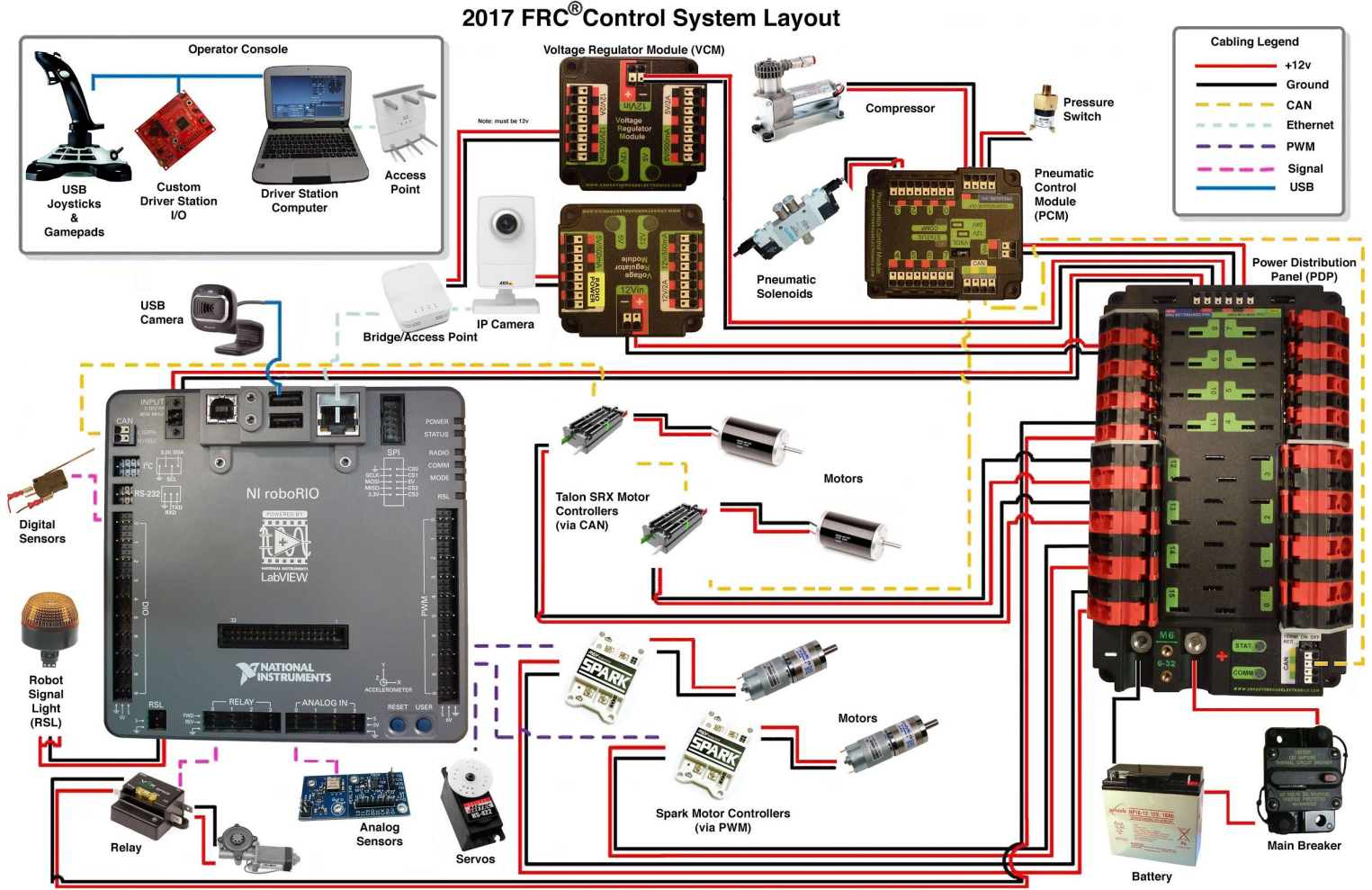
2890 The Hawk Collective

Electrical Level 2 - Assembly of components.



FRC Robot Wire Guide

Battery

FRC battery is a 12 volt battery that is used to power **everything** on the bot. First has Strict requirements about the type of battery that can be used .

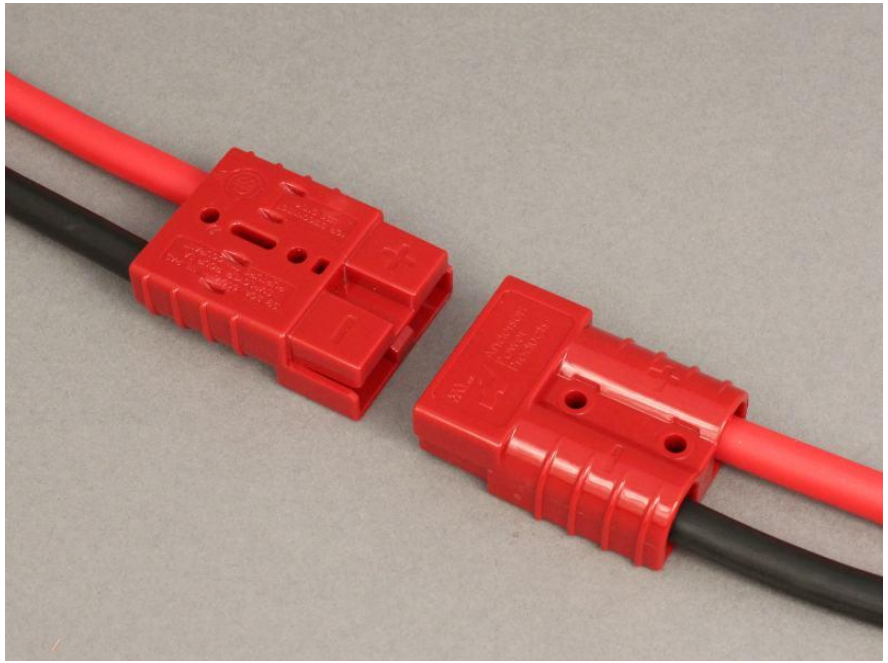
1. Nominal Voltage - 12 Volts
2. Nominal discharge rate 20 hours
   a. Min 17Ah
   b. Max 18.2 Ah
3. Nominal Dimensions 7.1”x3”x6.6” +/- .1”
4. Weight
   a. Min 11 Lbs
   b. Max 14 Lbs
5. Terminal = Nut and Bolt Style

(2018 game manual)

SB-50 Anderson Connector

-Can handle up to 120 amps.

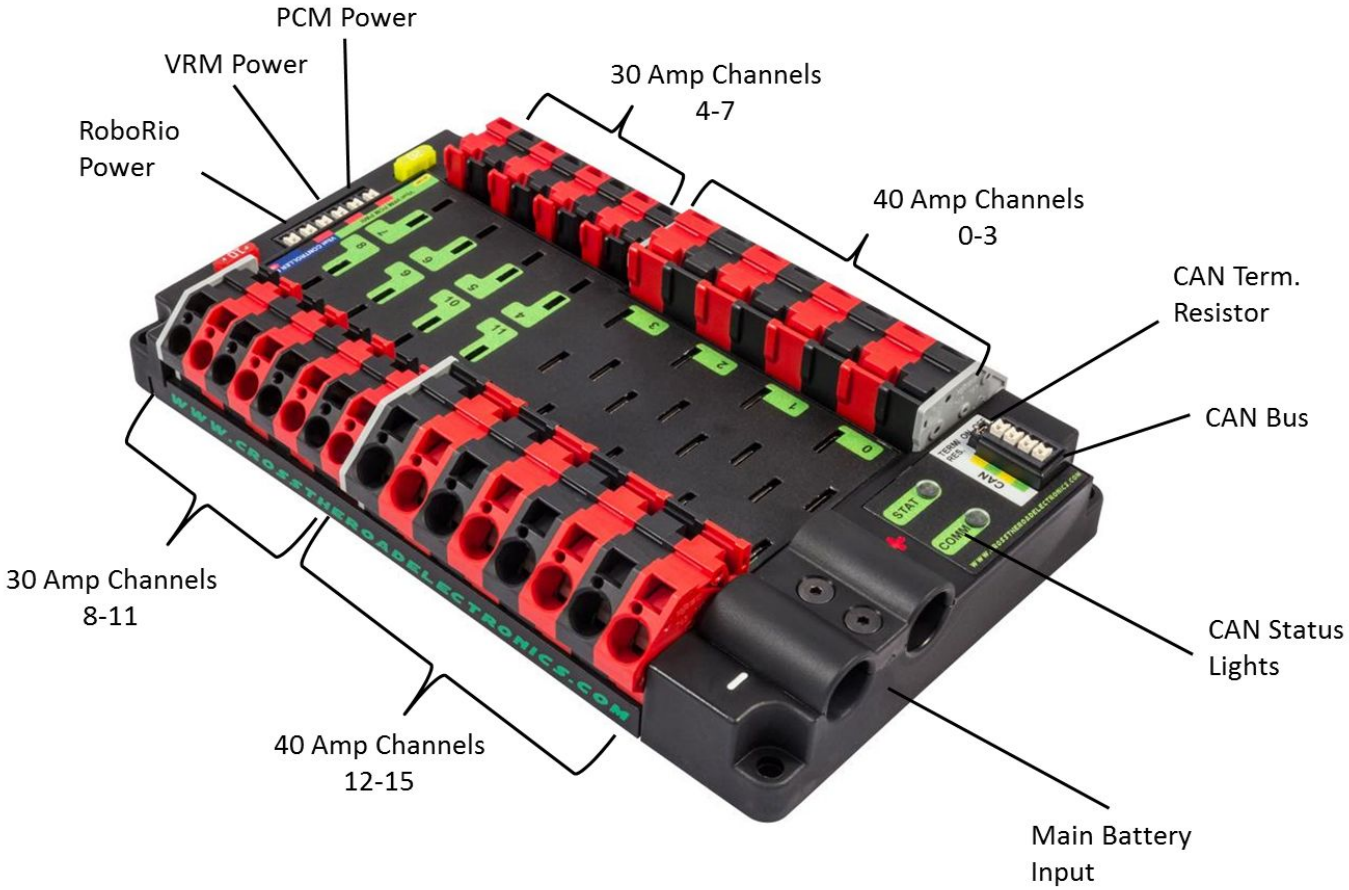
- Polarized to prevent connecting backwards.



Main Breaker

-This has to be accessible from the top of the robot, and not buried under or inside anything.
-It acts as the main power switch for the eintre robot.
-Pressing the red button on top shuts **OFF** the robot and causes the “lever” to pop out on the side.
-Pushing the lever in turns the robot **ON**.
-6 gauge wire in and out with “ring type” connectors

Power **D**istribution **B**oard



[PDB manual]

PDB-Power

At one end of the PDB there are two barrel like bumps. Use an Allen Key to remove the two bolts. Under that you will find two **METRIC 6** Bots and lockwasher. The posts accept a ring connector at the end of 6 Gauge wire.

Crimping

Add details about crimping systems.

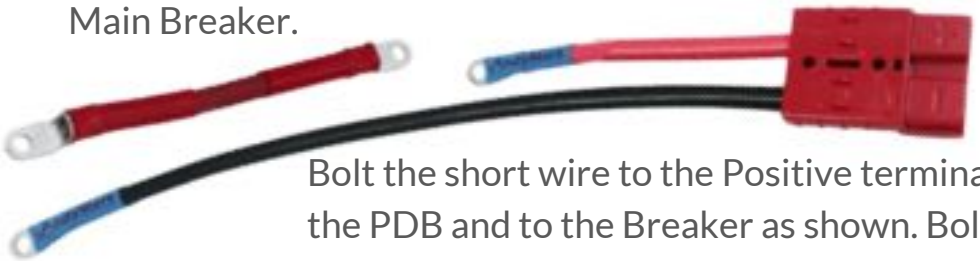
Soldering

Add details about crimping systems.

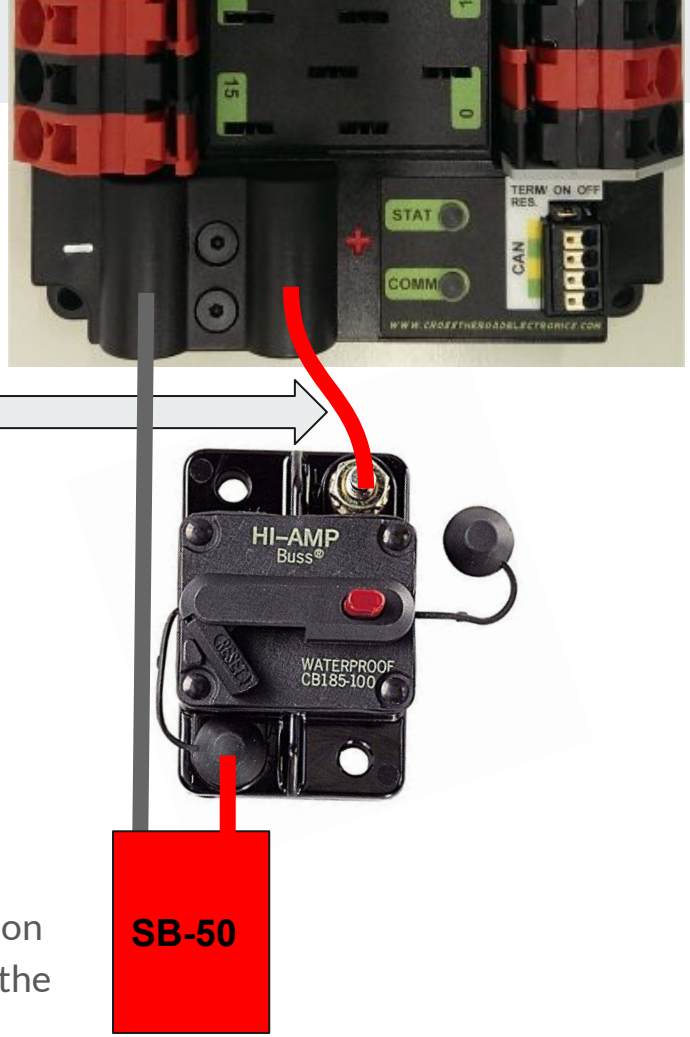
PDB-Power

Use 6 gauge wire and 2 crimp on connectors. To make a wire to go here. Use the Hydraulic crimper in the yellow box to make this connection. Cover ends in shrink wrap leaving the loop exposed

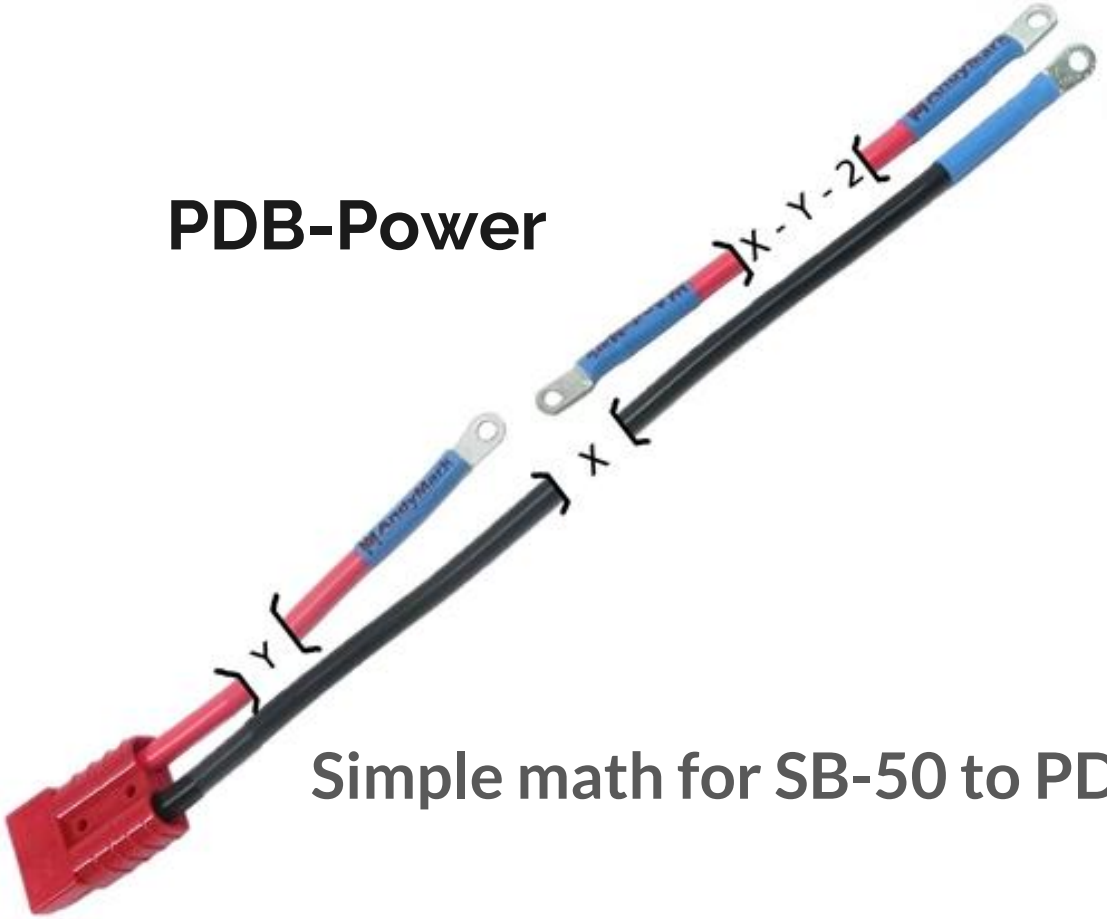
If the SB-50 has the same length legs you might have to make shorten the red this to accommodate the Main Breaker.



Bolt the short wire to the Positive terminal on the PDB and to the Breaker as shown. Bolt the SB-50 to the breaker and PDB.



PDB-Power



2 inches

SB-50

Simple math for SB-50 to PDB

PDB- CAN

CAN connectors have 2 wires. While there is nothing special about these wires they are often colored yellow and green to distinguish them from the other power & signal wires.

CAN is a daisy chain system. Each device in the network can talk to every other device over the same two wires.

Order of devices is not critical on the CAN network is not critical however, CAN networks need an “end of chain” indicator. This is the **terminator**. The PDB has a terminator built in. Its default position is **ON .** Which makes the PDB the last thing on the CAN network.

At this level you need to be able to match the colors of wires Yellow always goes to yellow, green to green and the nominal wire size is **20 gauge.**

PDB- Power

There are 16 power “channels”

-8 channels up to 30 amps
    Smaller items
    10-24 gauge wire

-8 channels at 40 amps
    Mostly used to control motors
    6-12 gauge wire

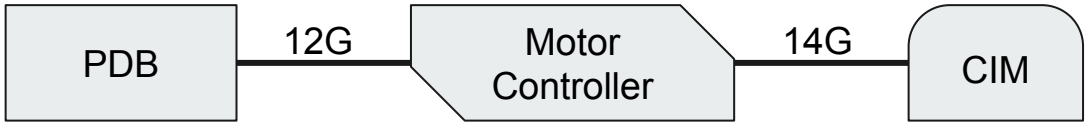
PDB- Power

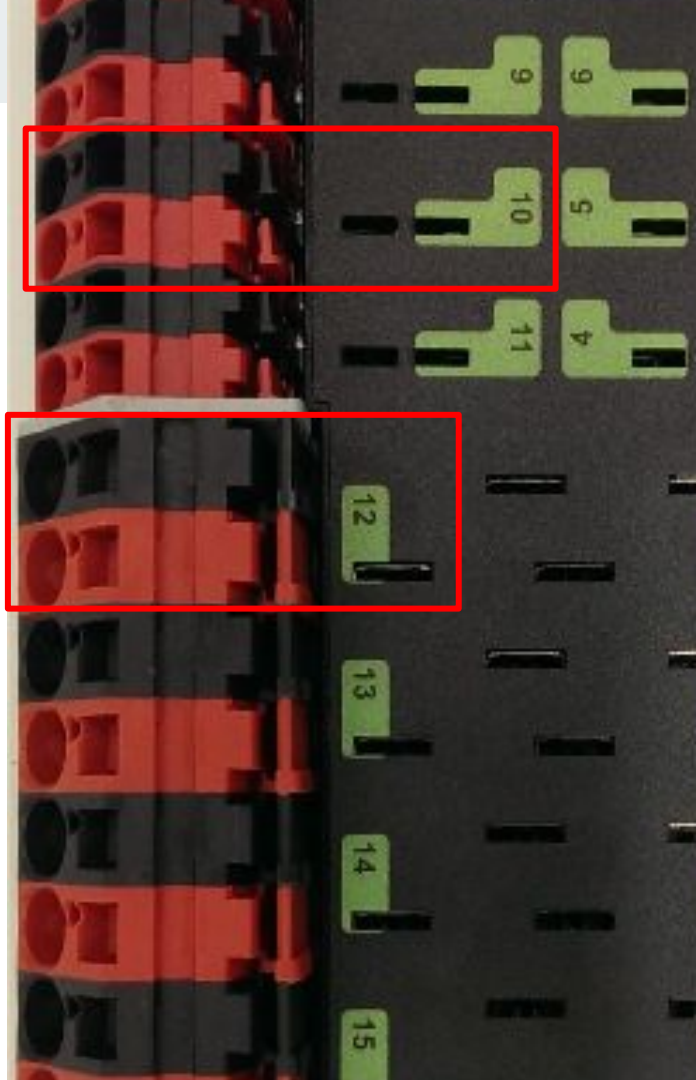
Each channel is paired with a black and red connector.

The two indicated here are connection pairs for 10 and 12

Size of the wire will be determined by the current draw of the device.

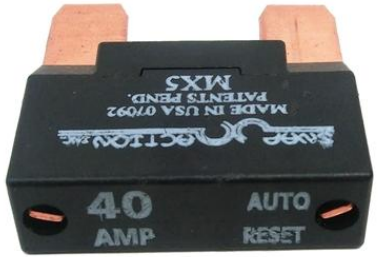
Each channel can only host ONE device/circuit.

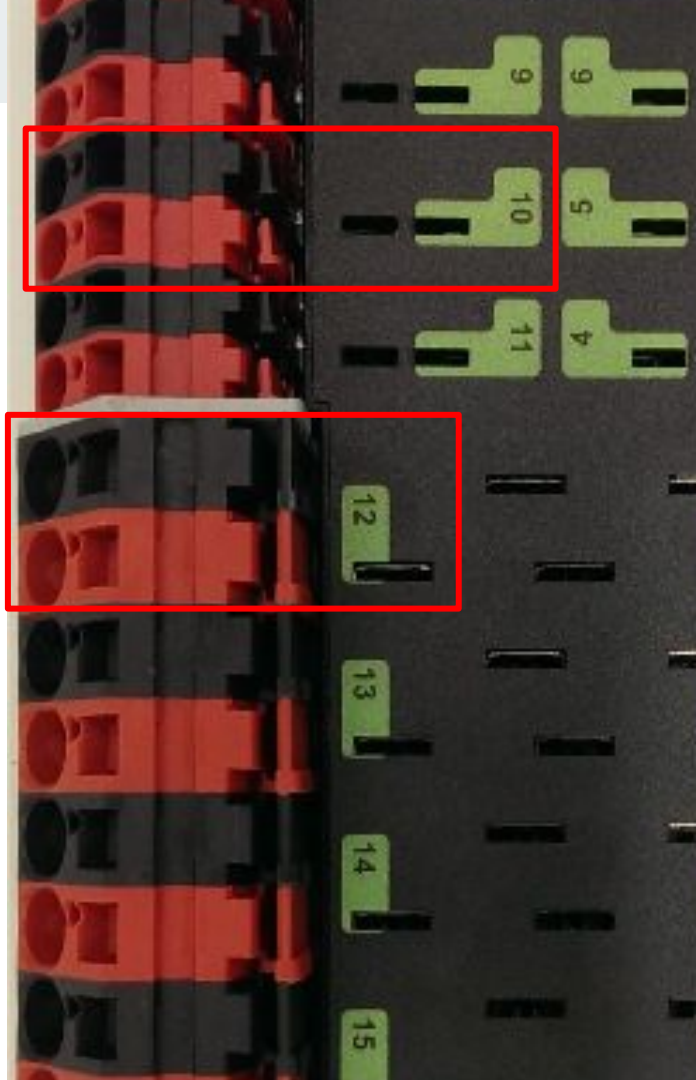




PDB- Breakers

Each Red channel has a “breaker” associated with it. The breaker is a resettable fuse that breaks or “trips” the circuit. This occurs when individual circuit pulls too much electricity (current). Only 40 amps in the larger sections. 30 amps to 5 amps in the smaller section. If a fuse “trips” it will reset once the breaker “cools down”. Fuse must be the same or less than the devices maximum current draw.



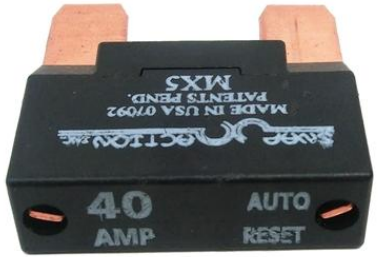


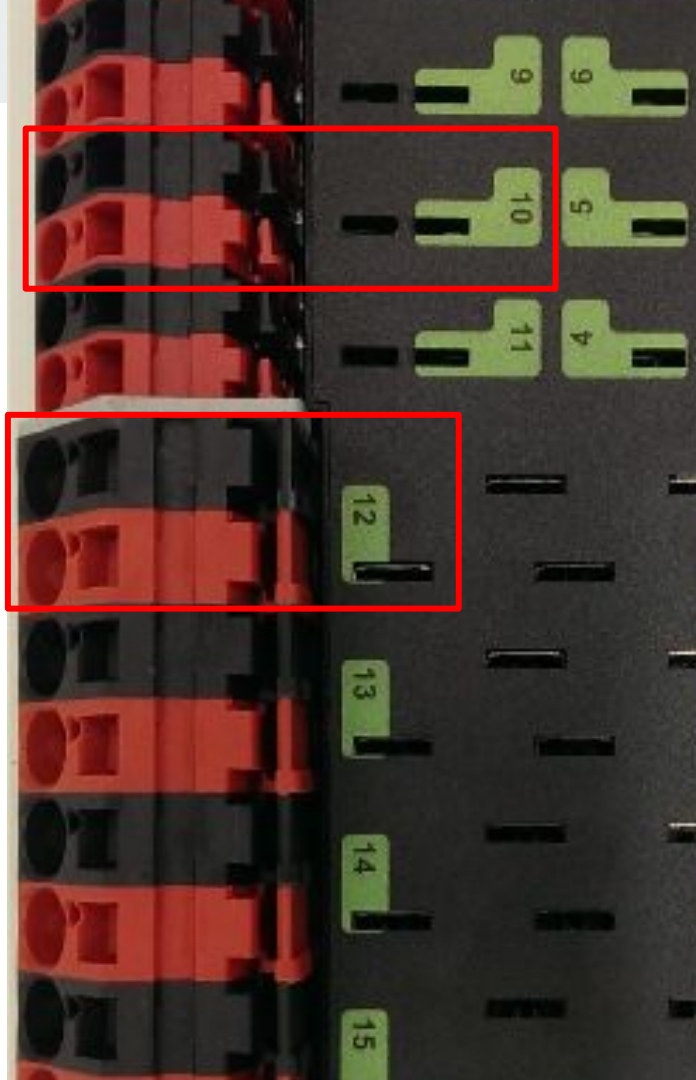
PDB- Breakers

From the CTR Electronics website for Talon SRX

Supported Communication Protocols	PWM, CAN, SPI, USART (serial)
Direct Sensor Input	Yes
Min/Max Voltage	6-28V
Continuous Current	60A
Surge Current (2 sec)	100A
PWM Input Pulse (high time)	1 - 2 ms nominal

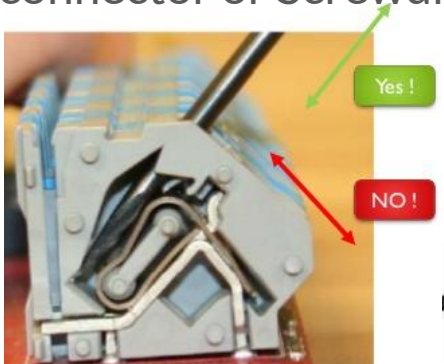
Talons = 60 amps max. We use a 40 amp breaker.



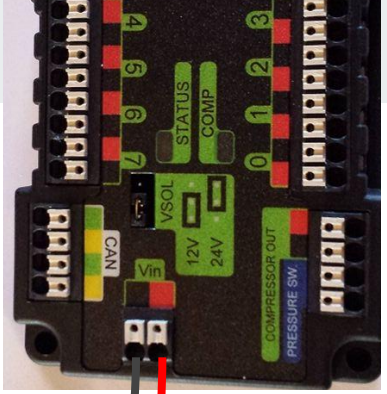


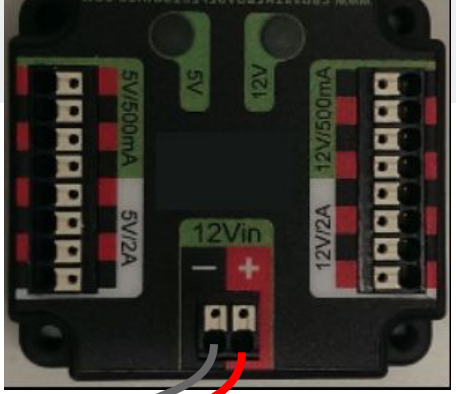
PDB- Wago

The connectors used on the PDB are called WAGO connectors. A special Type of “screwdriver” called a wago is used to open the connector and an internal spring closes it. Pushing the Wago tool all the way in the connector will open allowing the wire to inserted into the round part of the connector. Pull it out and it will close. It is NOT a lever. If a regular screwdriver is used it could damage the connector or Screwdriver.



PDB- Small power outs



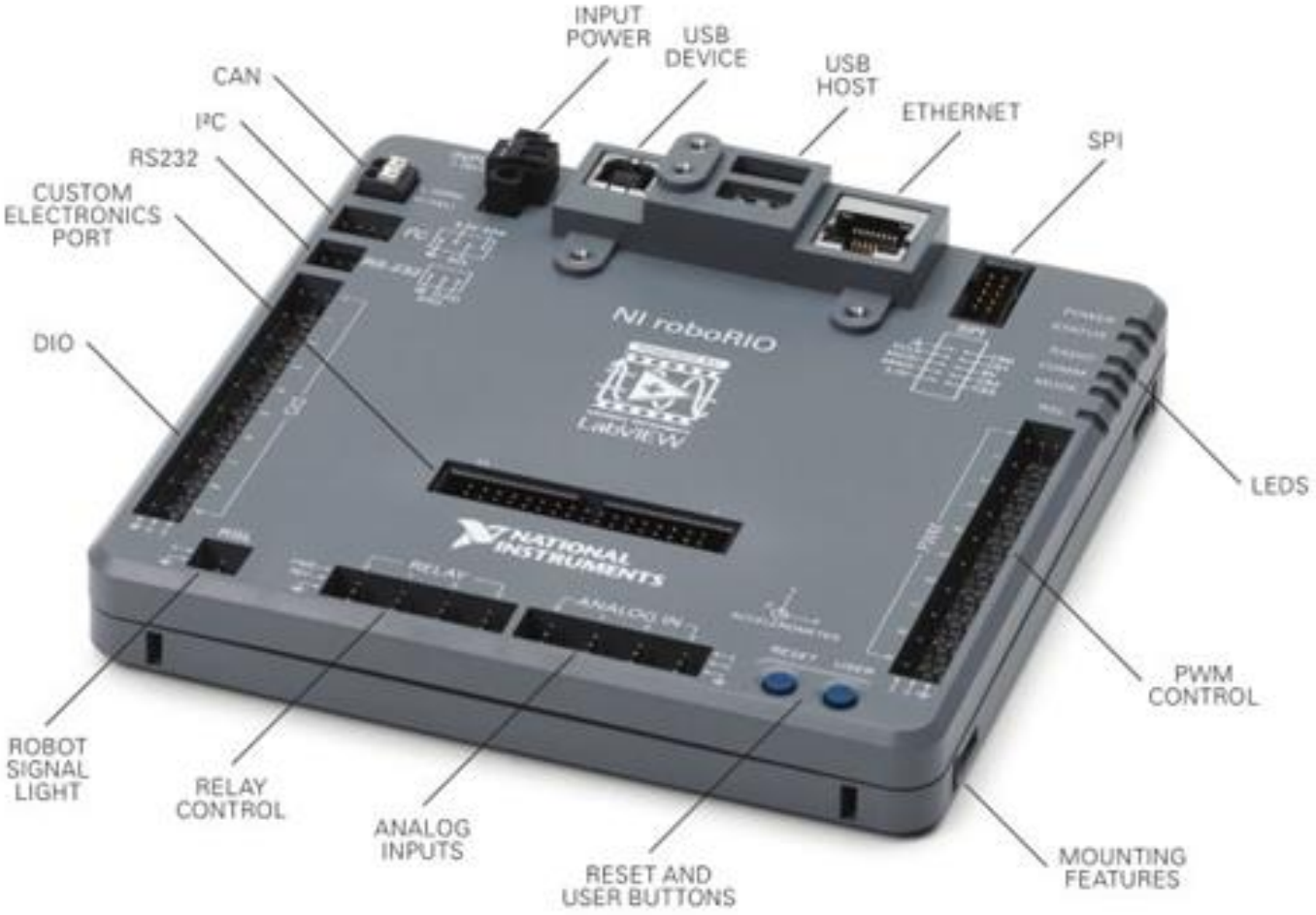


16 Gauge wire

Use 16 gauge wire to connect the Rio,PCM,and VCM

At the bottom of the PDB there are a few special outputs protected by “regular Fuses” that will fail one time and have to be replaced.

Robot Rio


INPUT POWER
USB DEVICE
USB HOST
ETHERNET
SPI
CAN
I²C
RS232
CUSTOM ELECTRONICS PORT
DIO
NI roboRIO
LABVIEW
NATIONAL INSTRUMENTS
LEDS
PWM CONTROL
ROBOT SIGNAL LIGHT
RELAY CONTROL
ANALOG INPUTS
RESET AND USER BUTTONS
MOUNTING FEATURES

Robot Rio - Ports - CAN

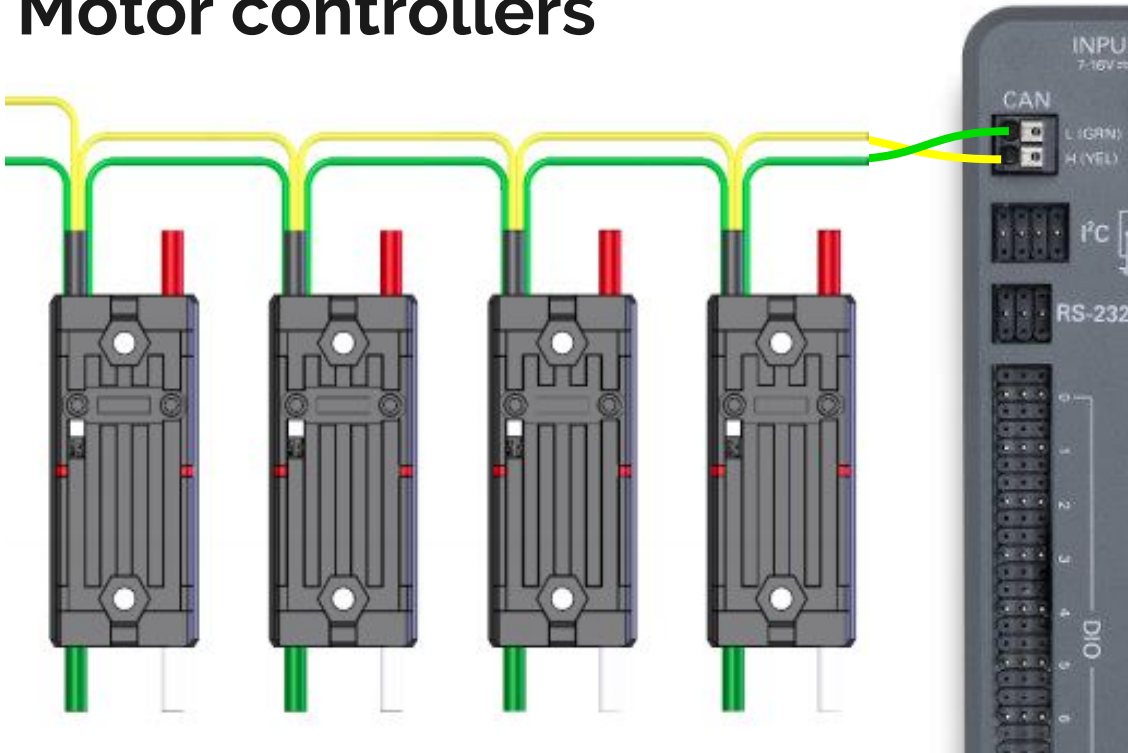
CAN connector is the communications backbone of the robot. We use CAN to communicate to the PCM, Motor controllers, and PDB. The newer versions of the Rio have the colors printed on them

Yellow = High

Green = Low

Robot Rio - Ports - Motor controllers

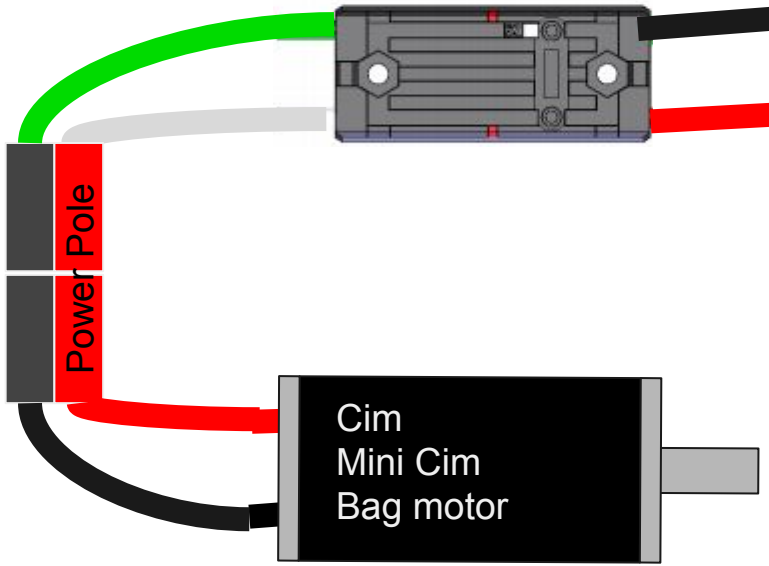
2890 typically uses Talon SRX motor controllers. These use the CAN network for their speed and direction signals (along with a whole host of other signals).



Robot Rio - Ports - Motor controllers

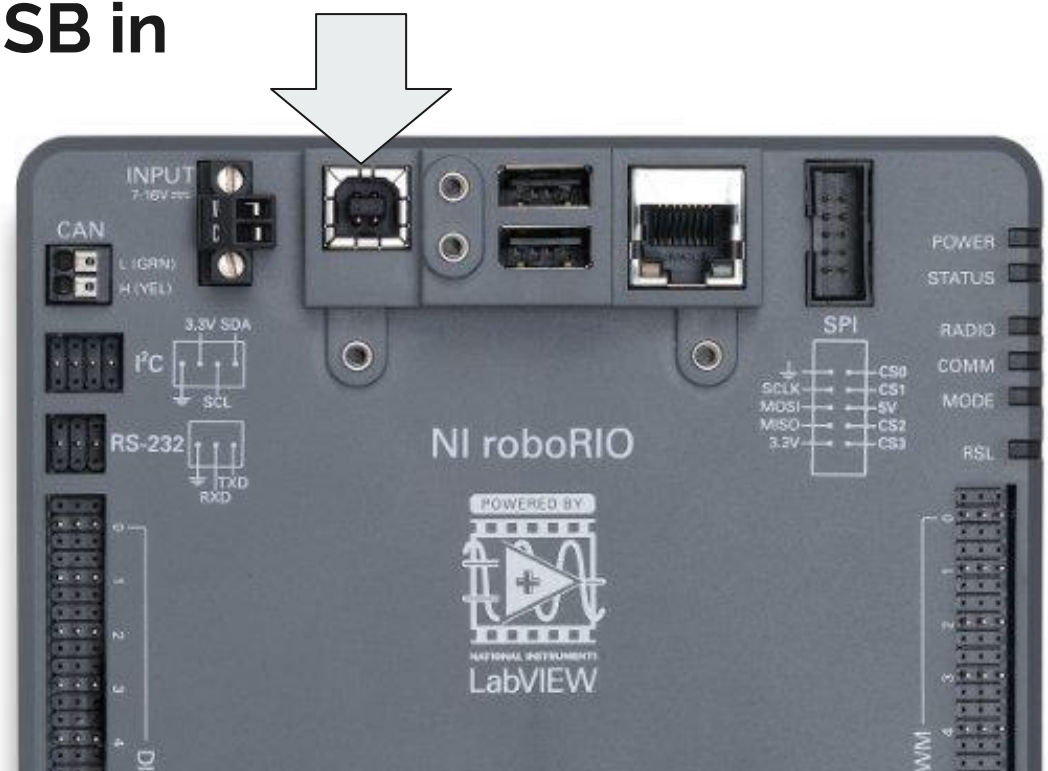
2890 prefers to connectorize as many connections as we can to make swapping parts easier. We are currently using Anderson PowerPole connectors for motors

The green and white wires should all be wired the same way and changed in code.



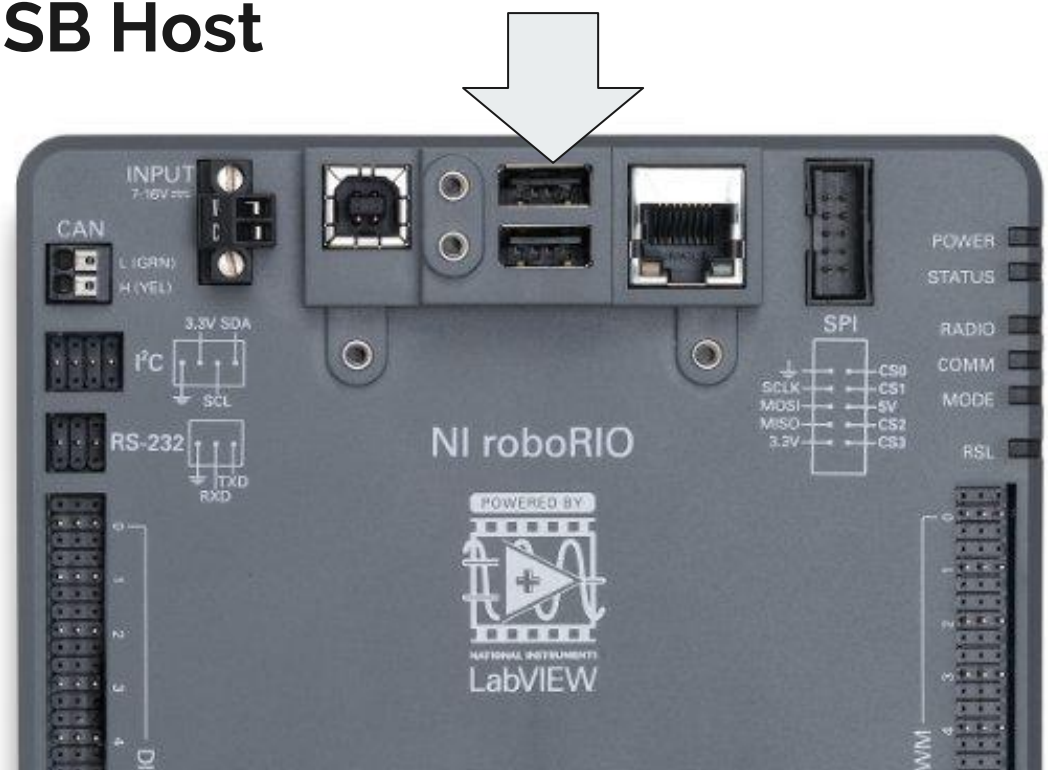
Robot Rio - Ports - USB in

Used to make the Rio look like a device on the usb network of another computer. Can be used to access the silver Silverlight diagnostic screen or to “drop code”



Robot Rio - Ports - USB Host

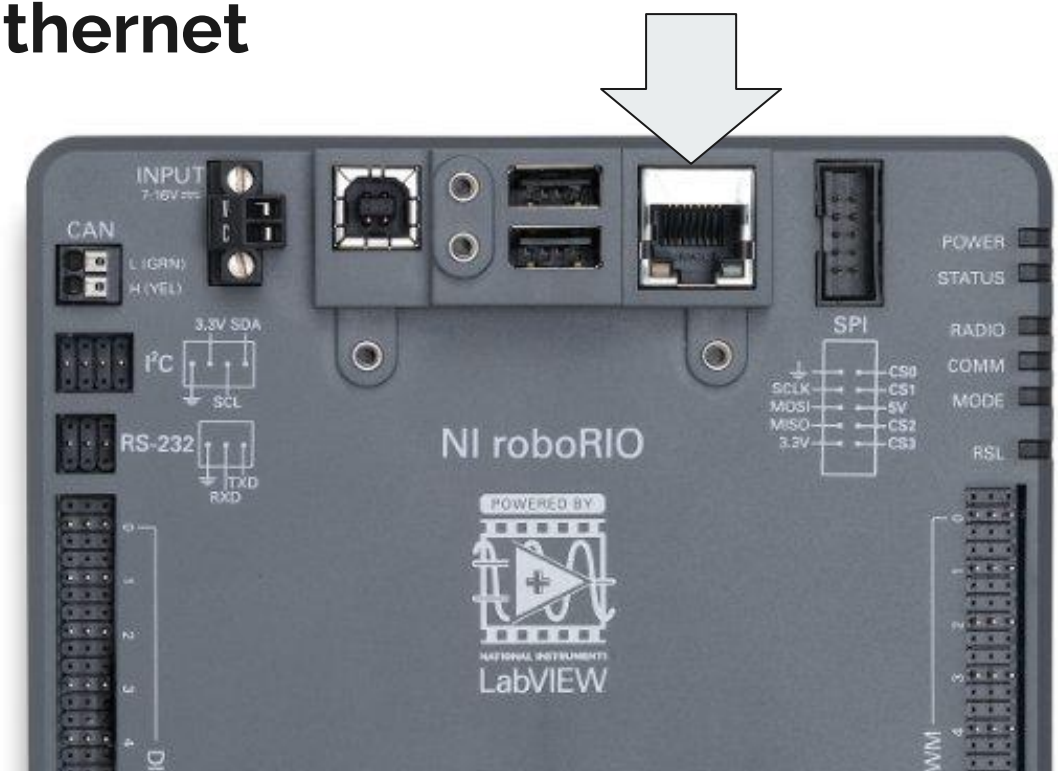
USB devices such as cameras can be plugged in here and are accessible by the Rio itself.



Robot Rio - Ports - Ethernet

Main way most teams access the Rio

Used to communicate directly with the drive station in “Tethered mode” or via WiFi with the radio in wireless mode.



Robot Rio - Ports - DIO

Digital Input / Output

Can only send a ON or OFF signal

Can only receive ON or OFF signals

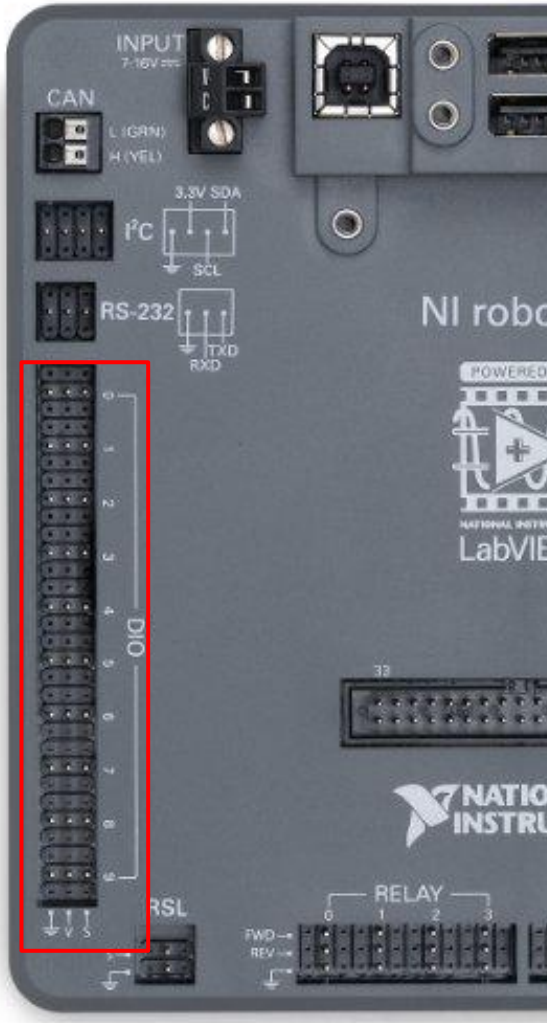
Often used to :

Fire solenoids	Ultrasonics
Limit Switches.	Indicator lights
Connect servos	Mode Switches

-Black = Ground -

-Red = 5 Volts +

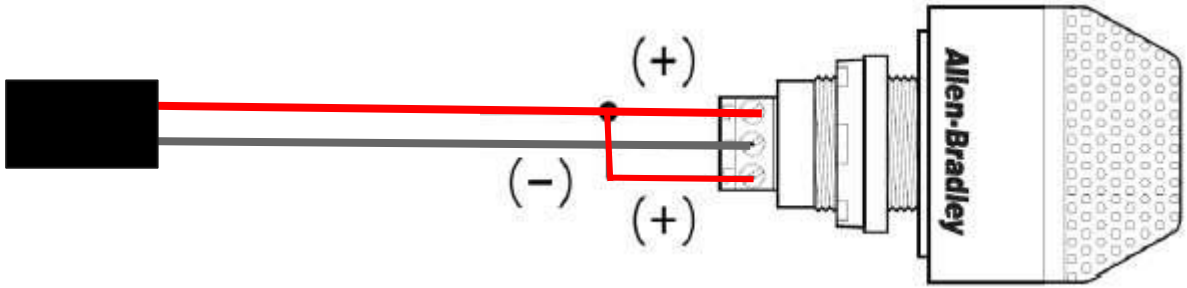
-White = Single / Data



Robot Rio - Ports - RSL

Robot Safety Light- Used as a signaling light to show communications status.

ROBOT WILL NOT ENABLE WITHOUT LIGHT INSTALLED



-Red = 5 Volts +

-Black = Ground -

Robot Rio - Ports - Relay

Controls mechanical switches called relays. Relays typically have 2 states as listed on the board Forward & Reverse.

If forward is HIGH reverse is LOW

If reverse is HIGH froward is LOW

-forward = 5 Volts +

-reverse = 5 Volts +

-Black = Ground -

Robot Rio - Ports - Analog IN

Used to “Read” a signal that varies from 0-5v

-White = Single / Data

-Red = 5 Volts +

-Black = Ground -

Often used to :

Potentiometers

Optical (light) sensors

Some types of gyros / accelerometers

Robot Rio - buttons

Reset =reboots the FPGA and Processor in the Rio when the button is held down for 5 seconds.

User = Button that can be accessed in the code.

- Not debounced

Robot Rio - Ports - PWM

Sends out a signal that switches on and off very quickly. This signal is primarily used for motor controllers and servos. Positive Voltage here is 6V.

When connected to a motor controller its wires are:

White, Red, Black

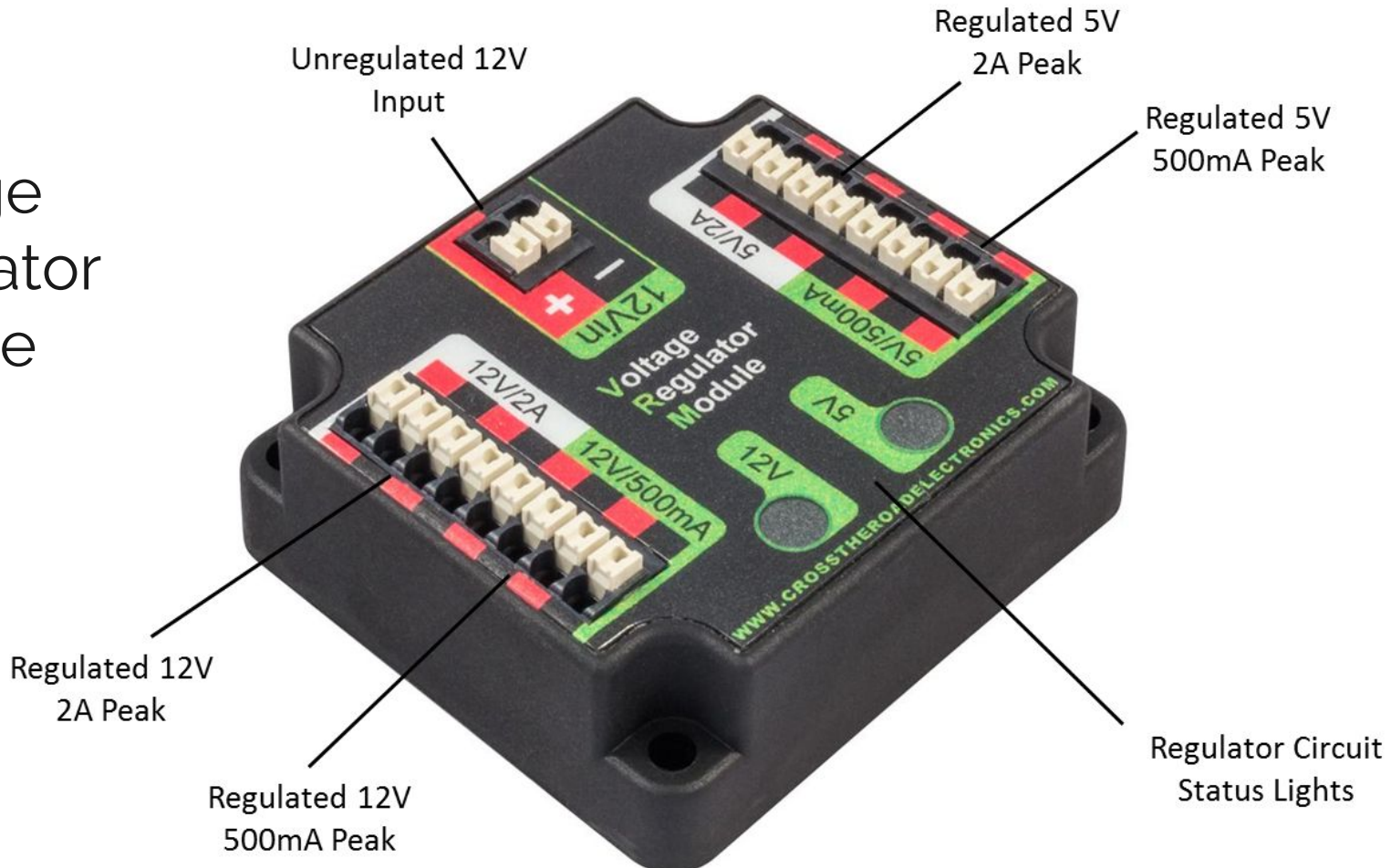
When connected to a servo it is

Red, White, Black

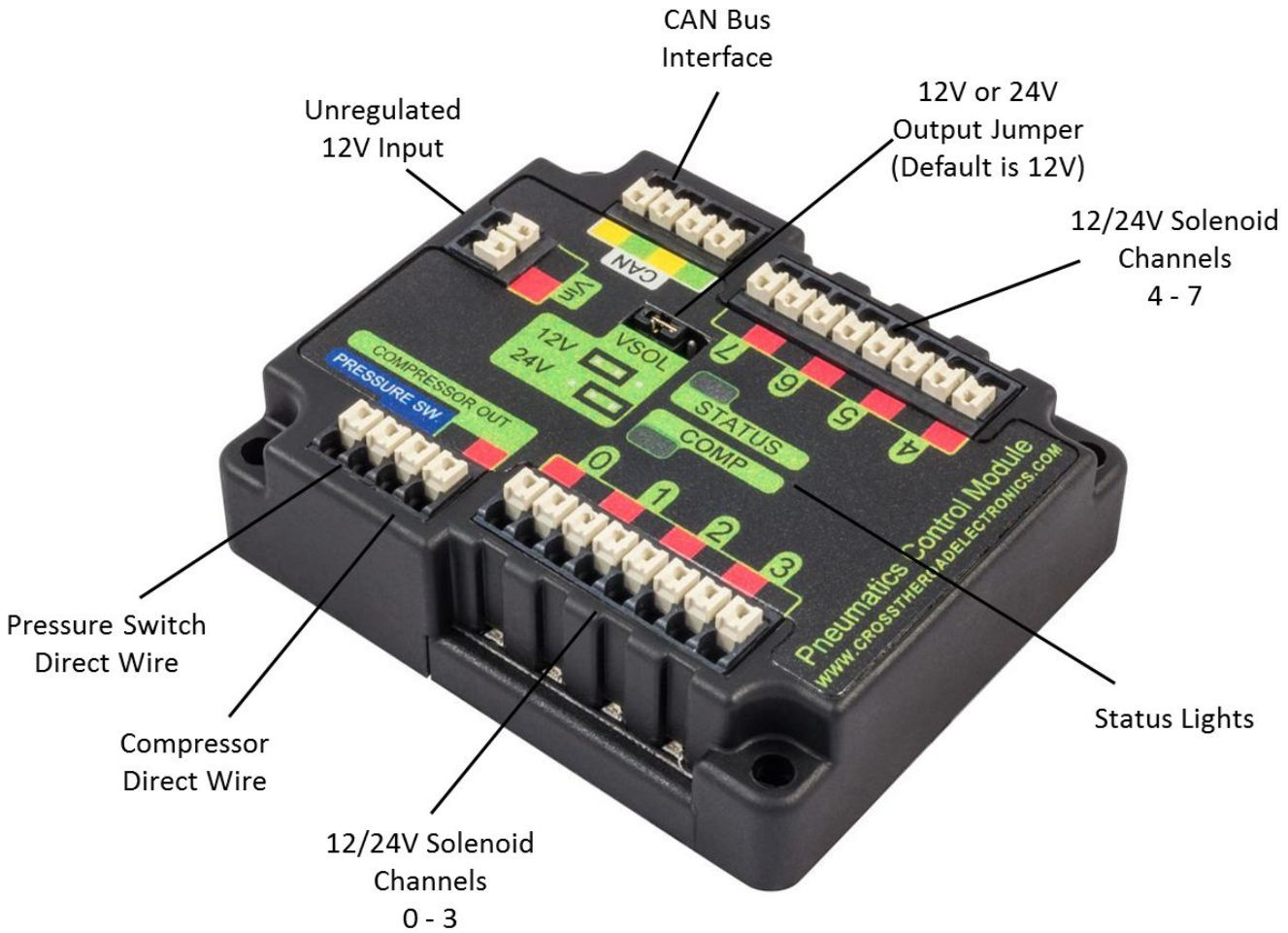
Robot Rio -Lights - RSL

Mimics the RSL light showing connection status.

Voltage **R**egulator **M**odule

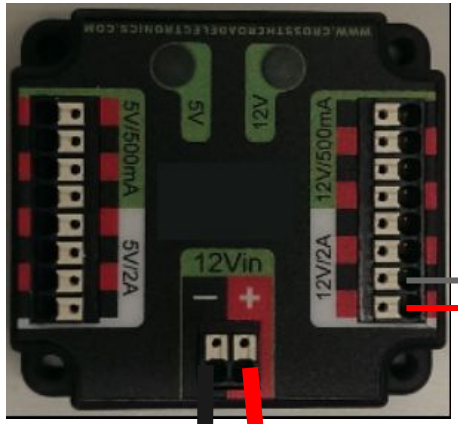


Pneumatic **C**ontrol **M**odule



Radio

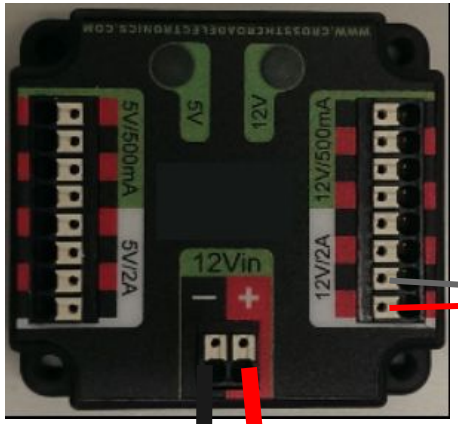
The standard connection for the radio is a ¼” barrel jack. Look at the label on the bottom of the radio to determine the Voltage and current. Voltage must be the same. Current should be HIGHER.



¼ inch jack
Center +

Radio

2890 has been experimenting with Power Over Ethernet into the POE Port on the radio



Poe Injector

Ethernet

To Achieve Electronic Technician Level 2

1. Memorize the details of this presentation
2. Take the Pretest for Electronics Technician Level 2
3. Schedule an in person test with a Electronics Trainer to construct a board
4. Pass the Electronics Technician Level 2 Test with 95% proficiency or better.

Next-Electronic Technician Level 3

1. Memorize all LED error codes for RIo and Talons.
2. Troubleshoot a electronics board with introduced errors.