Wiring

How to Wire Different Components and Sensors

- The Wiring Process
- PDH and Breakers/Fuses
- Orange Pi and Arducam System

The Wiring Process

Throughout our subteam, we use a variety of wires that accomplish different things. The color and size of wires are very important and something that we need to pay attention to.

The CAN wire on our robot is the 22-gauge green and yellow wire.

It connects all of our:

- Motors
- Encoders
- RoboRio
- Pigeon
- CANivore
- CANdle
- PDH

Essentially, it connects everything that needs some sort of information.

CAN Cable - mindsensors.com

Pulse Width Modulation (PWN):

- 22 gauge
- Red - Positive
- Black- Negative
- White - Neutral/Signal

Power:

- Usually a lower gauge wire (meaning greater thickness)
  - 10
  - 12
  - 14
- Crimped with Anderson crimps
- Connects components to power suppliers (PDH, VRM, etc)

Battery Wire:

- 4 or 6-Gauge Wire
- Special Anderson and crimping system
- Connect to Batteries

Status Lights:

If you are ever unsure about the condition of a device, always reference its Status Lights and/or Phoenix Tuner.

For a quick reference on status lights for most electrical devices on an FRC Competition Robot, look at this: Status Light Quick Reference — FIRST Robotics Competition documentation

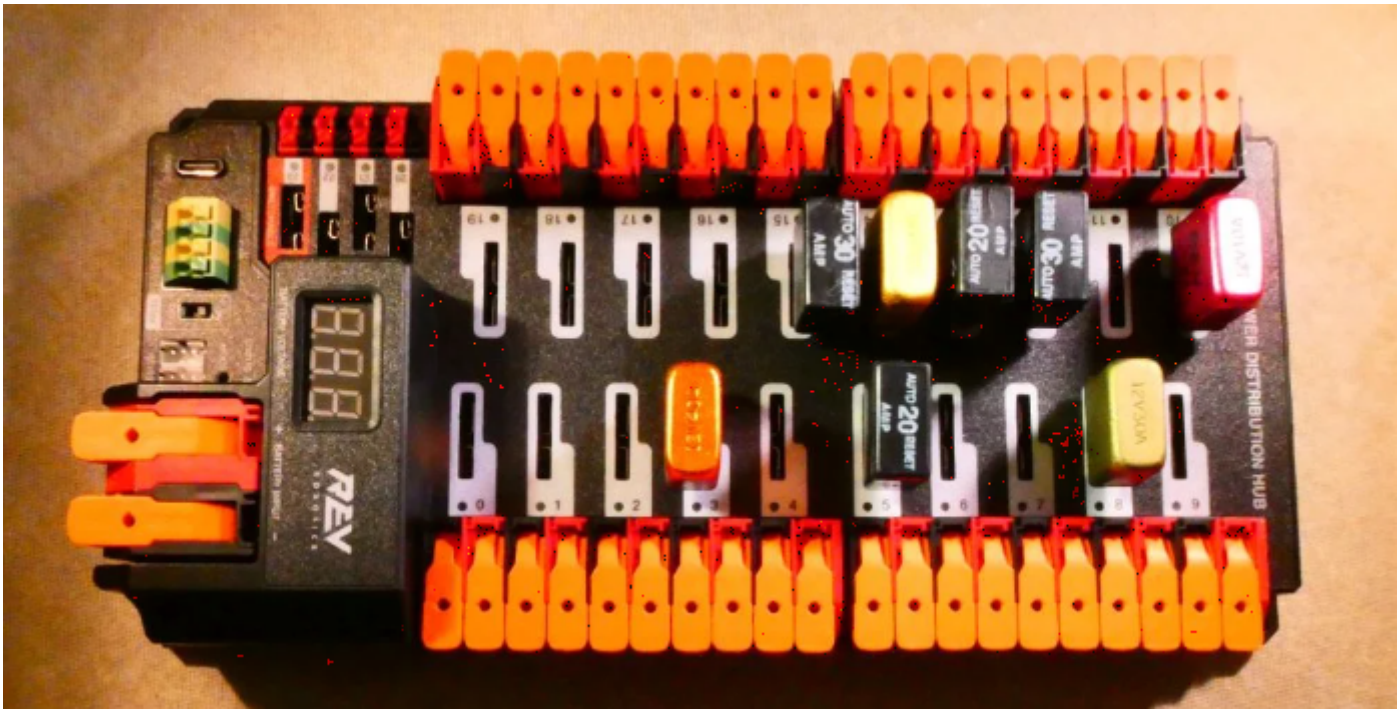
Phoenix Tuner is a way for a user to reference and control a device. From there, you can update its firmware and use it to test prototypes easily.

Please reference this for Phoenix Tuner: Phoenix Tuner X and its installation, Installing Phoenix 6 (FRC)

PDH and Breakers/Fuses

Power Distribution Hub (PDH), Breakers, and Fuses

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Usage

The power distribution hub, or PDH for short, distributes power to the entire robot. There 24 total ports, 20 for components needing a larger power supply and 4 who need smaller supplies. There are also 2 ports to support a CAN chain (yellow and green ports).

When plugging components into the PDH it is best practice to use breakers or fuses. If there is ever a power surge breakers and fuses will be able to stop it from reaching the more expensive and important parts. There are different types of breakers and fuses based off of the amount of amps they let through. The main difference between breakers and fuses is their reusability. Breakers are reusable due to a small sheet of metal which bends breaking a circuit when heated to a certain temperature. Fuses are

not reusable as when to much electricity flows through it it heats up and pretty much melts itself.

How to Wire/ Connect

For the CAN chain and the 4 smaller ports they need a 22 gauge wire with a ferrule. In order to insert the wire into the ports use a small flat head screw driver and press down on the square button with a diagonal cut located directly above where you insert the wire. Hold it down until the metal part of the ferrule has been inserted then let go of the button to lock the wire in place.

In order to connect to the battery to get power use 6 gauge wire. On the bottom left on the image above the bigger red and black ports is where you insert the wires. First strip the wire bare by about a 3/4ths of an inch and then insert the bare wire into the 2 ports. Lift the orange lever above the 2 ports to unlock it, then insert the wire, push down on the lever to lock in the wires.

For the 20 larger ports 12 gauge wire is recommended. No crimps or ferrules are needed, instead just strip the wire until roughly 3/4 of a inch of it is bare metal. There is a large lever directly above the hole where the wire should be inserted, pull up on the lever to unlock the port and once the wire is fully inserted so no metal is visible push the lever back down to lock it into place.

Breakers are placed in the white slots behind one of the 20 port taking up majority of the PDH. Fuses are placed in the smaller slots above the CAN chain ports.

(NOTE! Breakers need to be inserted in a certain way. If you look at the bottom of the breaker where the 2 prongs are sticking out you will see that the prongs are off centered. When placing the breaker into the PDH make sure the side furthest from the 2 prongs is lined up on the right or on the same side where there is more white paint marking where to insert it)

Orange Pi and Arducam System

This section covers how to wire the Orange Pi and Arducam System, which are vision systems that we use as an alternative to the Limelight system.

Background

Orange Pi

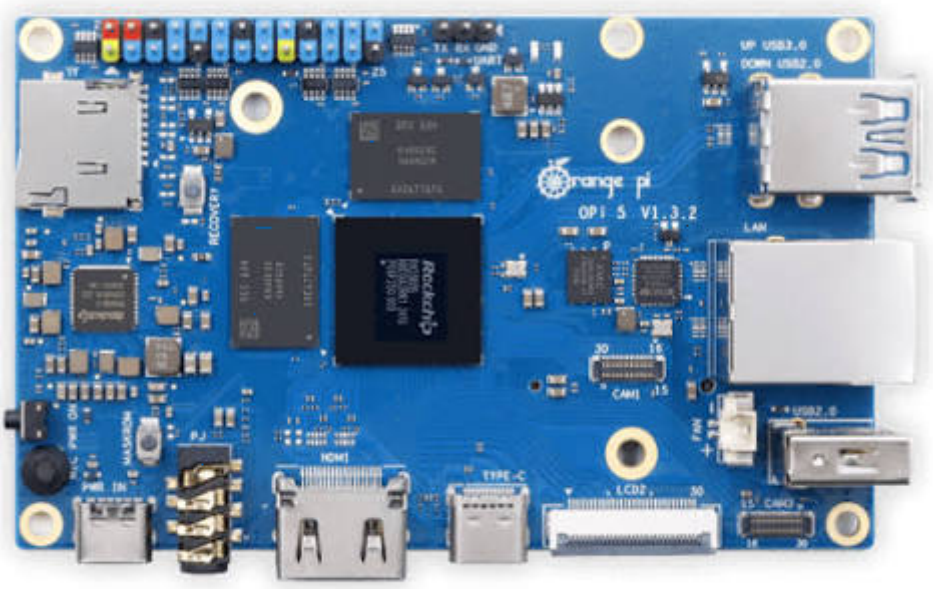


Figure 1

The Orange Pi (**Figure 1**) is a high-speed single board computer powered by a buck converter which is connected to the PDH. This requires 5 volts to power it this is where the buck converter comes in.

Buck Converter

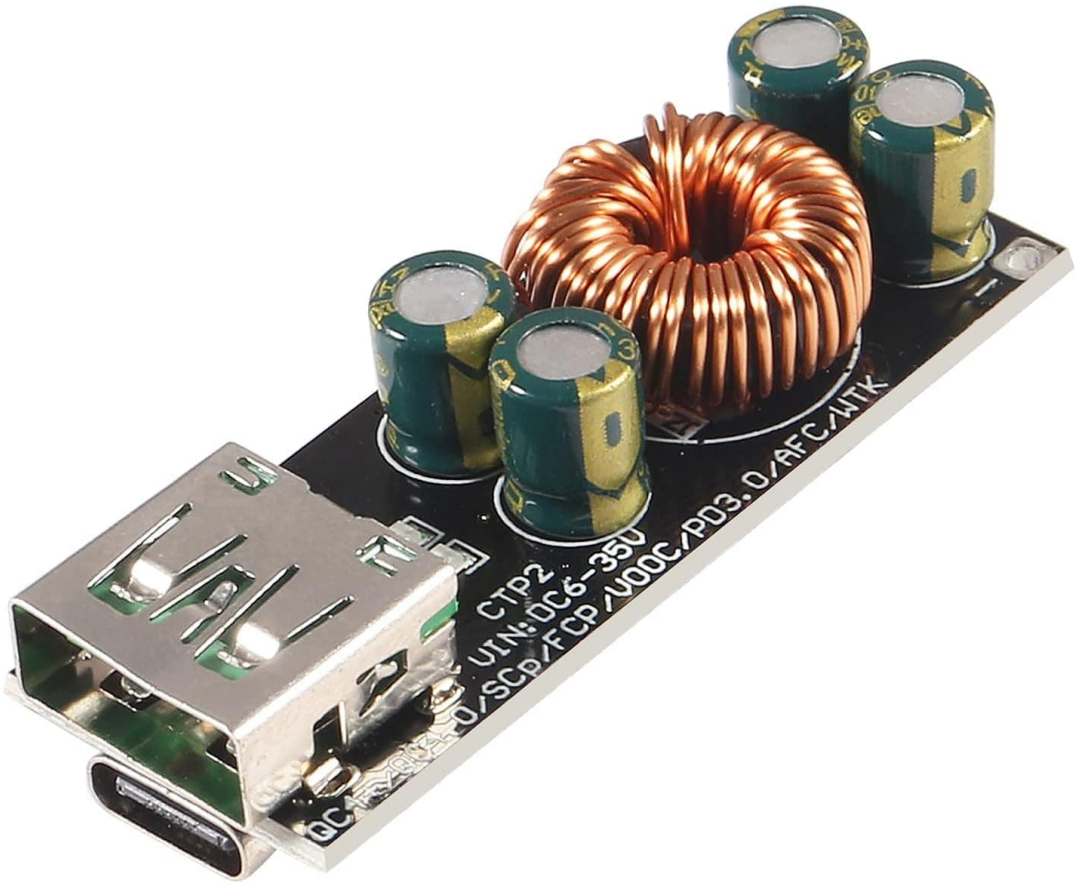


Figure 2

The buck converter is shown above in **Figure 2**. Our particular converter is a DC to DC converter which means it transfers the same type of current. The buck converter turns the 12 volts from the PDH to 5 volts.

Arducam



Figure 3

The arducam (**Figure 3**) is a robust high quality camera module specifically created for processors like the Orange Pi and Raspberry Pi. In our system, we connect the arducam to the Orange Pi via USB.

How to Wire

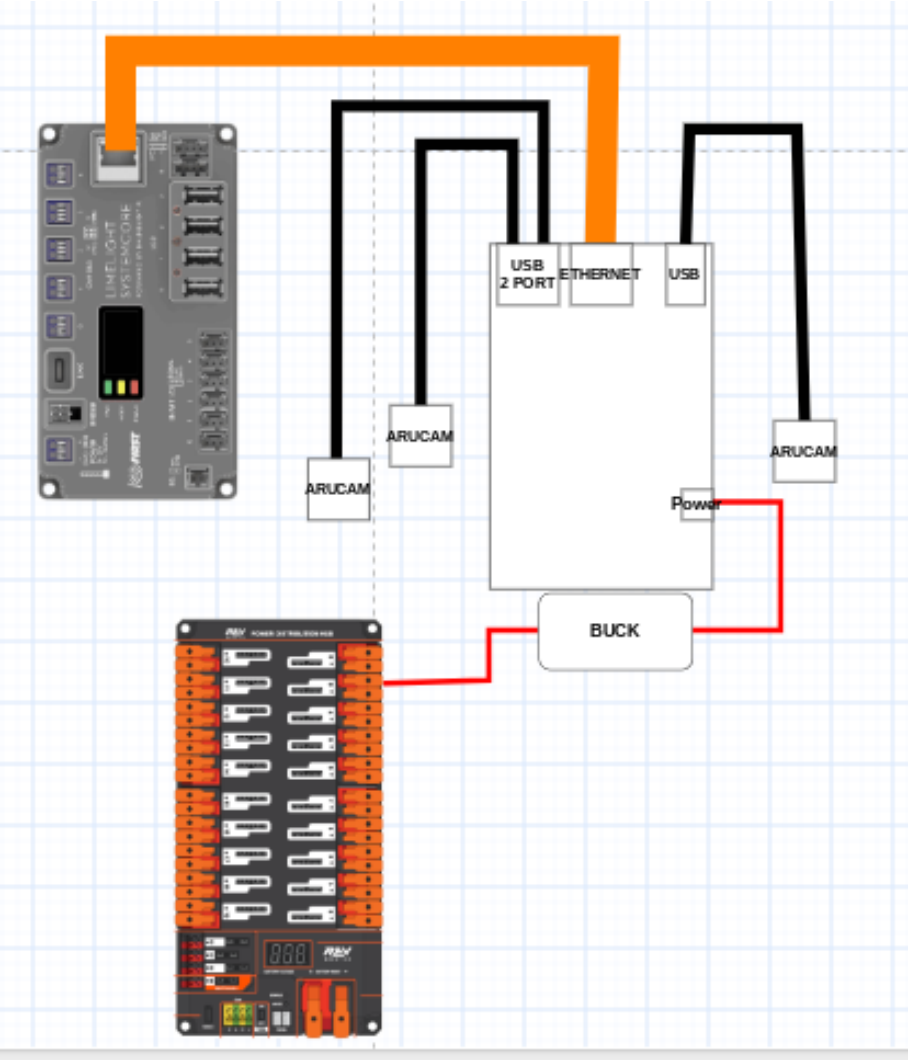


Figure 4