Robot Quick Build Session 2009

FRC Control System & Electrical Assembly
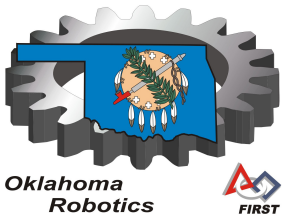
Produced by
Ken York, Team 476
Ed Latimer, Team 476
Ron Markum, Team 1750

Special Thanks to

Oklahoma State University

Overview

- During the next two and a half hours students will assemble and test the control system.
- During the first hour the layout and installation of the components and wiring on to the base plate should be completed.
- At hour two you should be joined by someone from the programming group who will install the software upgrades and set up the tethered and wireless communications.
- You should have the required components of the KOP and RQBS parts with you an ready to assemble.
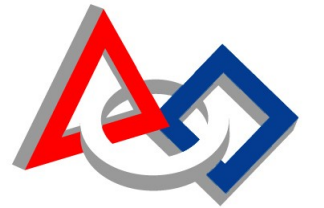- After completion, the electrical assembly will be taken to the frame area and mounted onto the robot chassis.
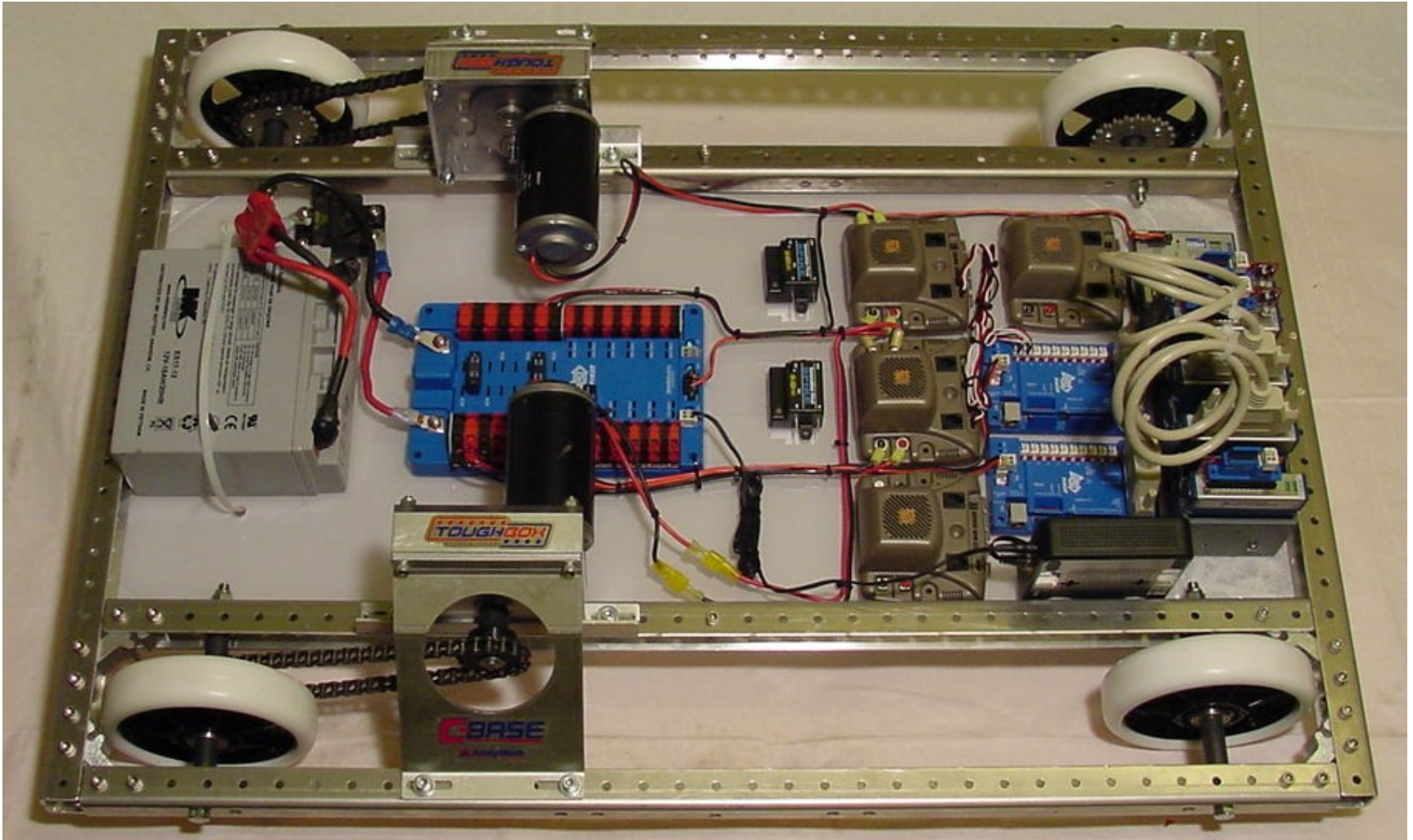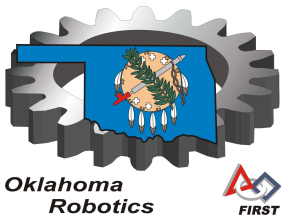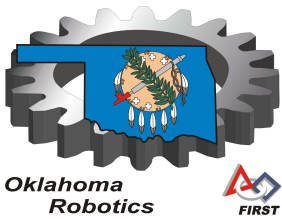
The Goal

Check the Parts

- Locate the Control System Box.
- Inventory the contents. Report any missing components.
- Locate the 120 amp circuit breaker. *
- Locate the QD battery connectors.*
- Locate the wiring terminals.*
- Locate the RQBS base plate and bag.

*Located in one of the tote boxes. Refer to KOP inventory sheets.

Required Tools

- **Safety Glasses, put them on now.**
- Wire strippers
- Wire cutters
- Wire crimpers
- Phillips screwdriver - #2
- Flat Screwdriver
- Supplied Wago flat screwdriver
- 7/16" combination wrench
- 3/8" combination wrench
- 10mm combination wrench
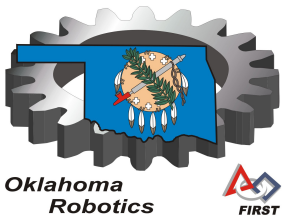- Tape measure
- ¼" and 3/8" Drills
- Cordless drill

Required Control System Items (robot)

- Place the following items on a clear workspace.

- cRIO and modules, power distribution board, Jaguar controllers, digital sidecars, 120 amp breaker, 2 PWM cables, 2 CIM motors, Ethernet cable, connector bag, 2 DB37 cables, and extra 10 and14 gauge wire.
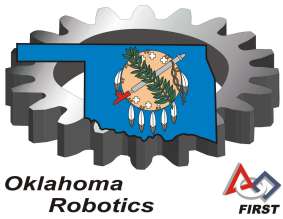
Read Instructions!

- Peruse sections 1-5 of the 2009 Control System Manual.

- Read section 2 carefully.

- Do not connect battery until instructed.

- Make all electrical connections and ensure CIM motors are secured and safe to operate before powering any part of the control system.

- Refer to the large 2009 FRC Control System layout included in the control system box.

Layout

- Use the provided drilling templates, drill ¼" and 3/8" holes as indicated. Accurately place templates on the base plate and tape in place. Verify the 32" spacing dimension between the two template holes.
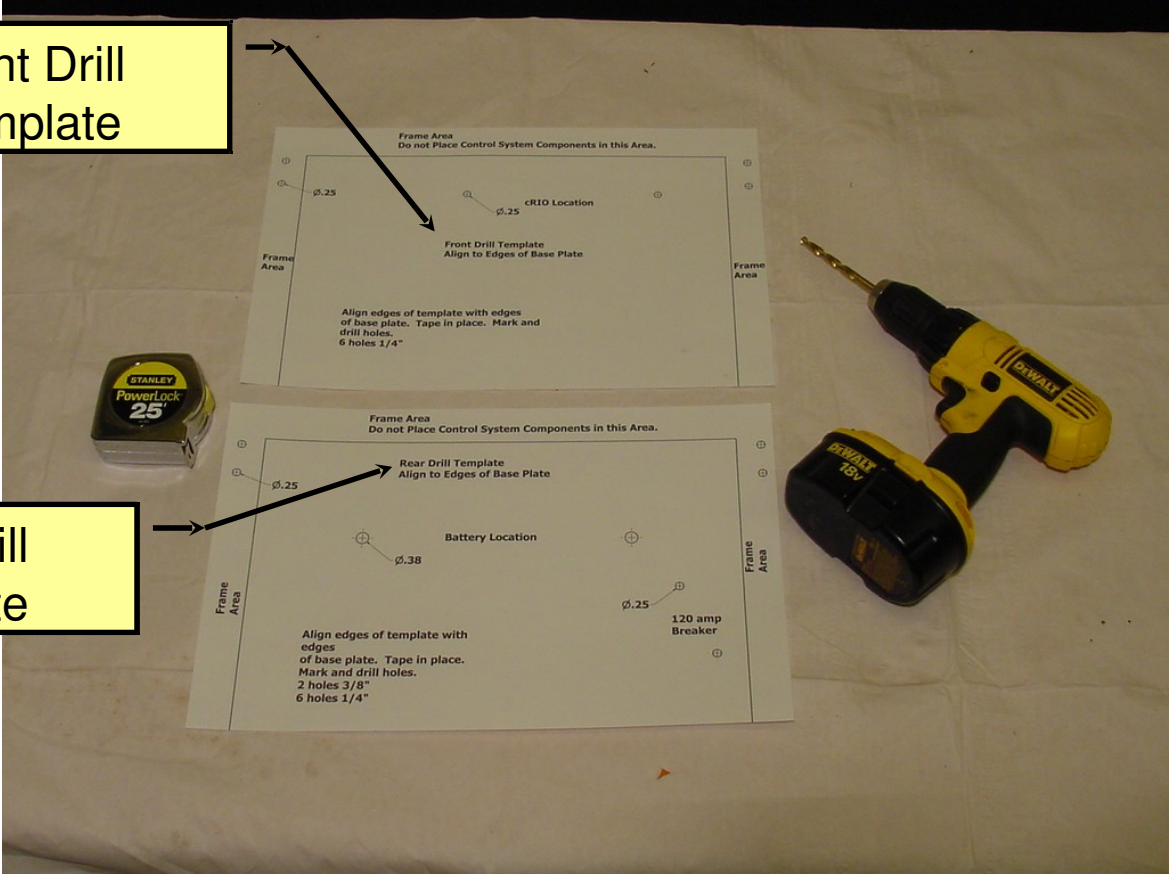
- See the pictures in the next two slides.

Drill Holes in Base Plate

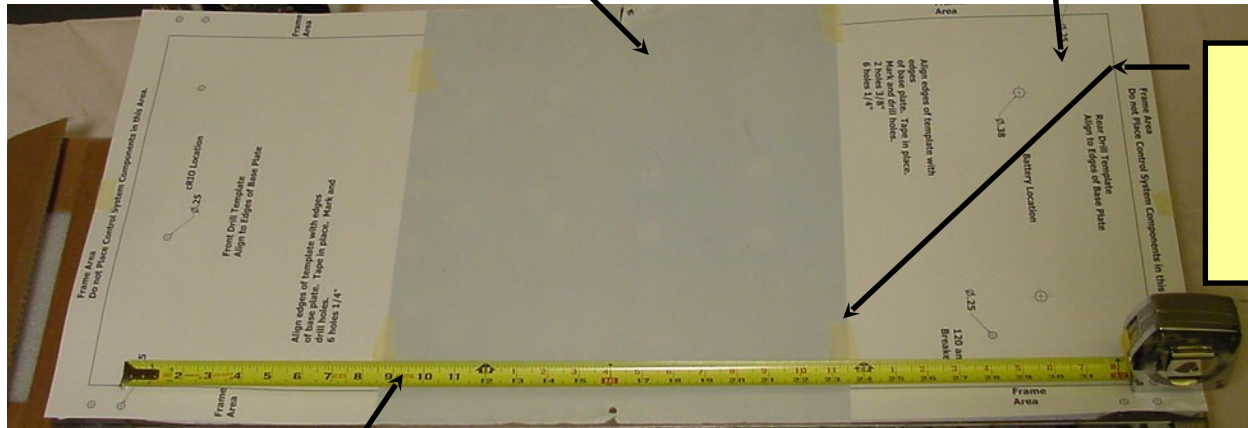Front Drill Template

Rear Drill Template

Drill Holes in Base Plate

Base Plate

Rear Drill Template
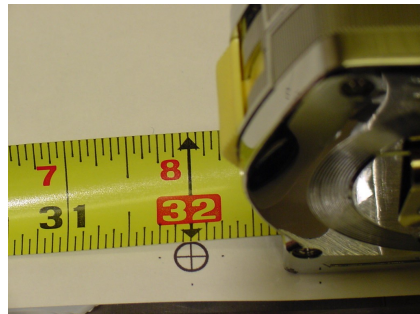
Tape Several Places to hold Template in Place

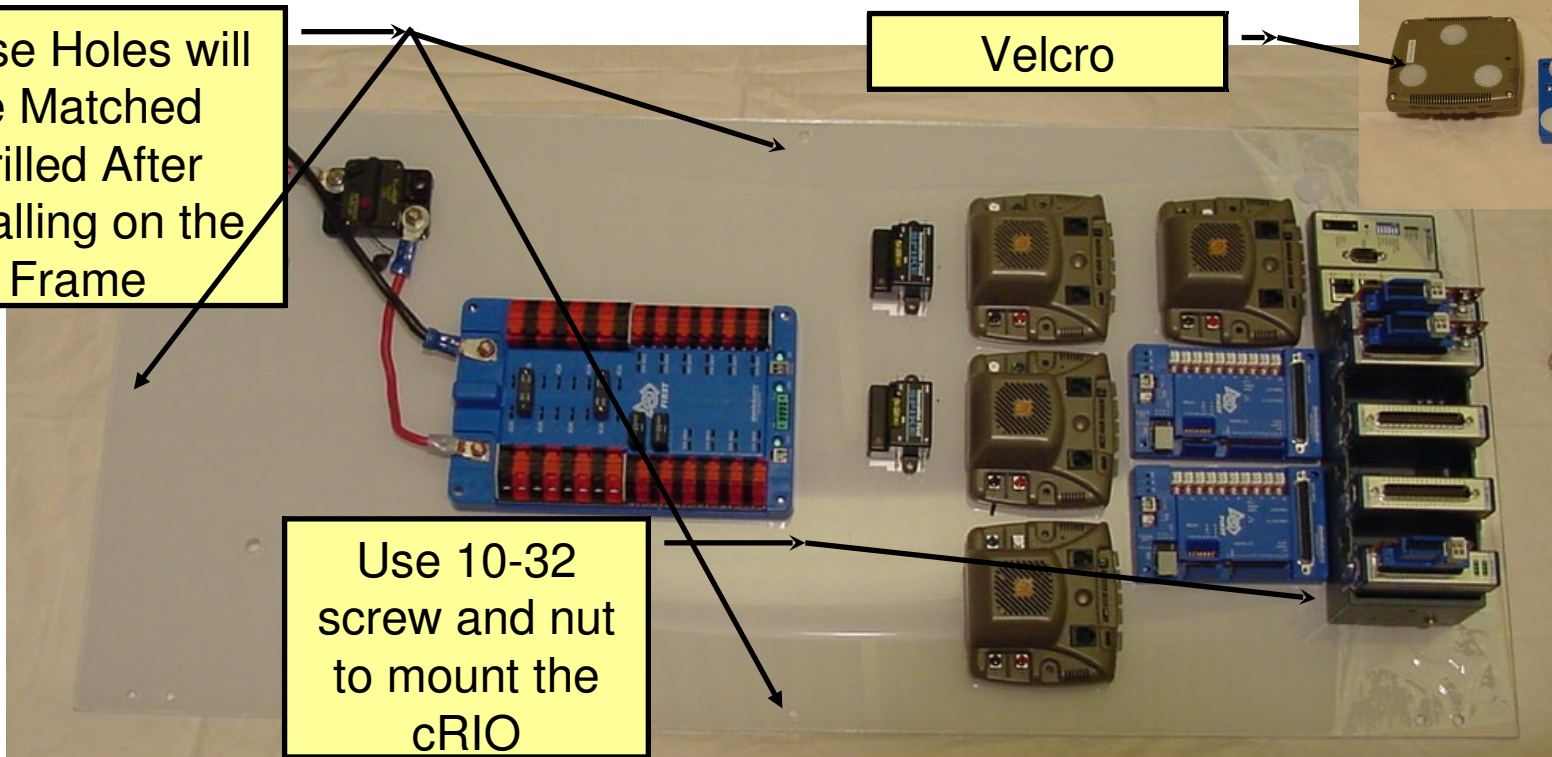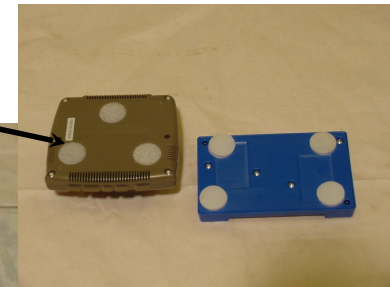Make Sure Holes on Both Edges are Spaced 32" Apart Before Taping
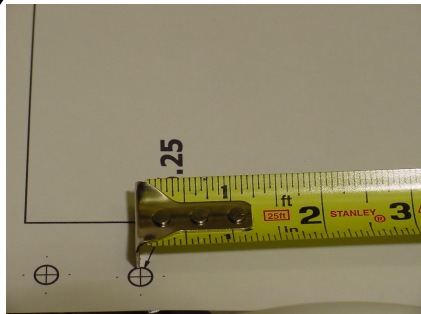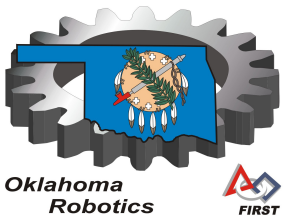
Layout

- Layout the items similar to the picture.
- Leave 1-1/4" margin around all edges. This is the frame mounting area.

These Holes will be Matched Drilled After Installing on the Frame

Velcro

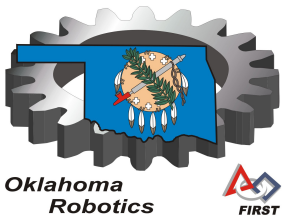Use 10-32 screw and nut to mount the cRIO

Wiring

- Wire the large battery wires. The black wire is connected directly from the half connector to the PD (power Distribution) board.

- The red wire from the half connector is attached to the 120 amp circuit breaker and then on to the PD board.

- <u>Note: the 120 amp breaker uses SAE threads while the PD board uses Metric threads. Do not swap the nuts!</u>
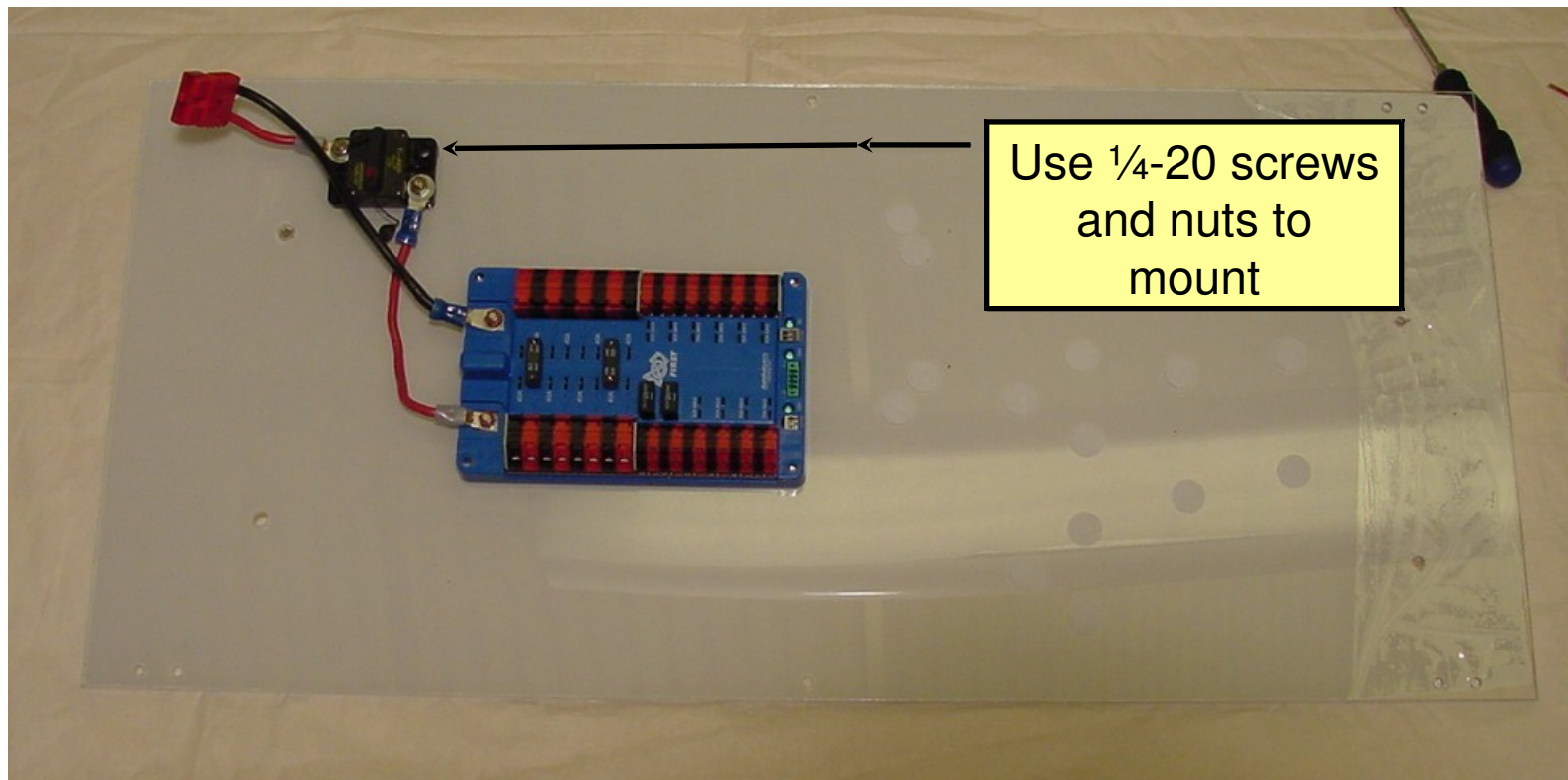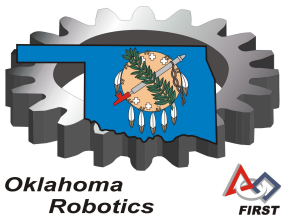
Wiring

Make the connections as shown below.
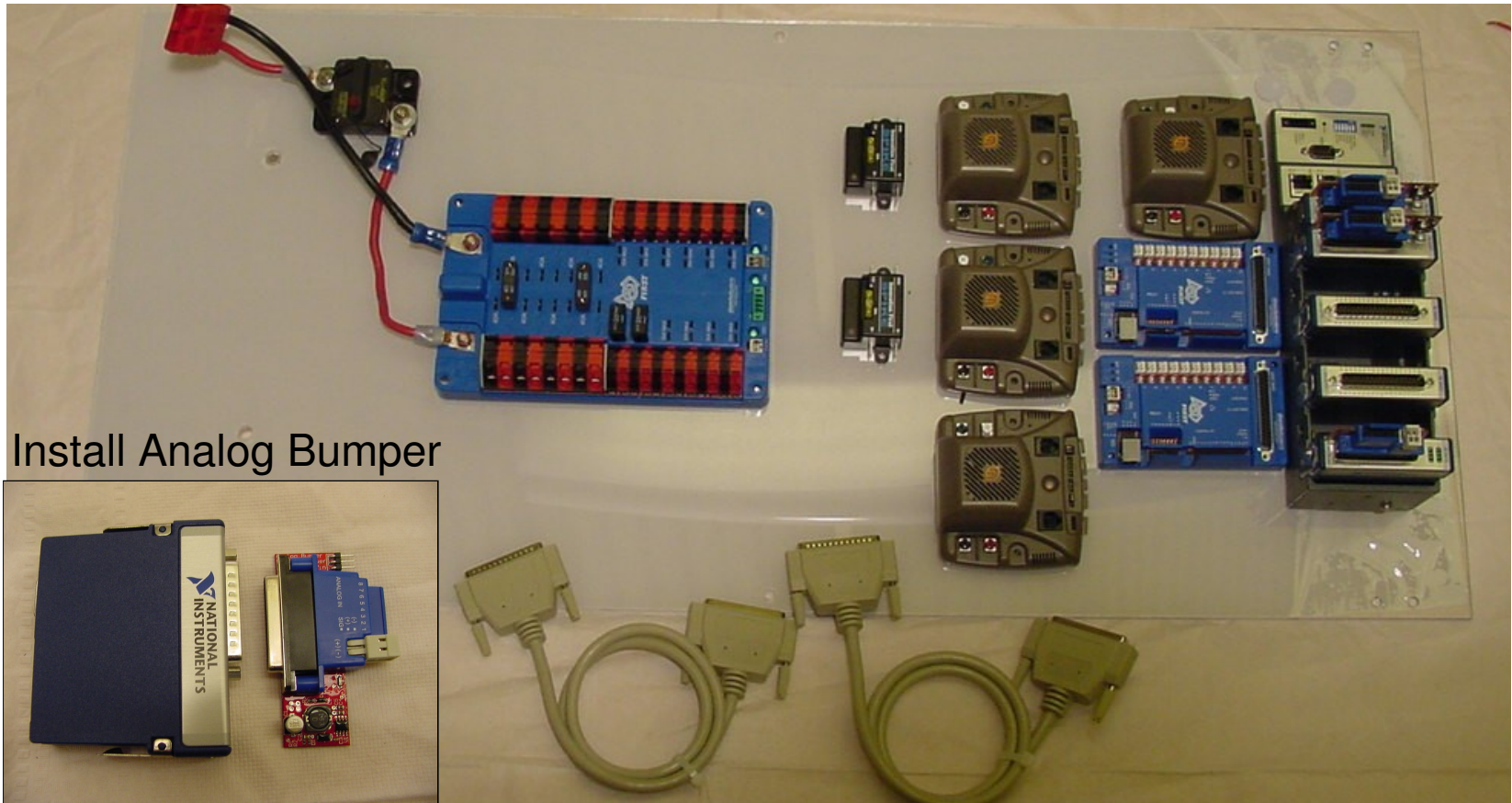
Use the large terminals. Make good crimps.

Use ¼-20 screws and nuts to mount

Wiring

Locate and install the DB37 cables.

Install Analog Bumper

Wiring

Assemble the power cable for the cRIO.

(#16 AWG)

Wiring

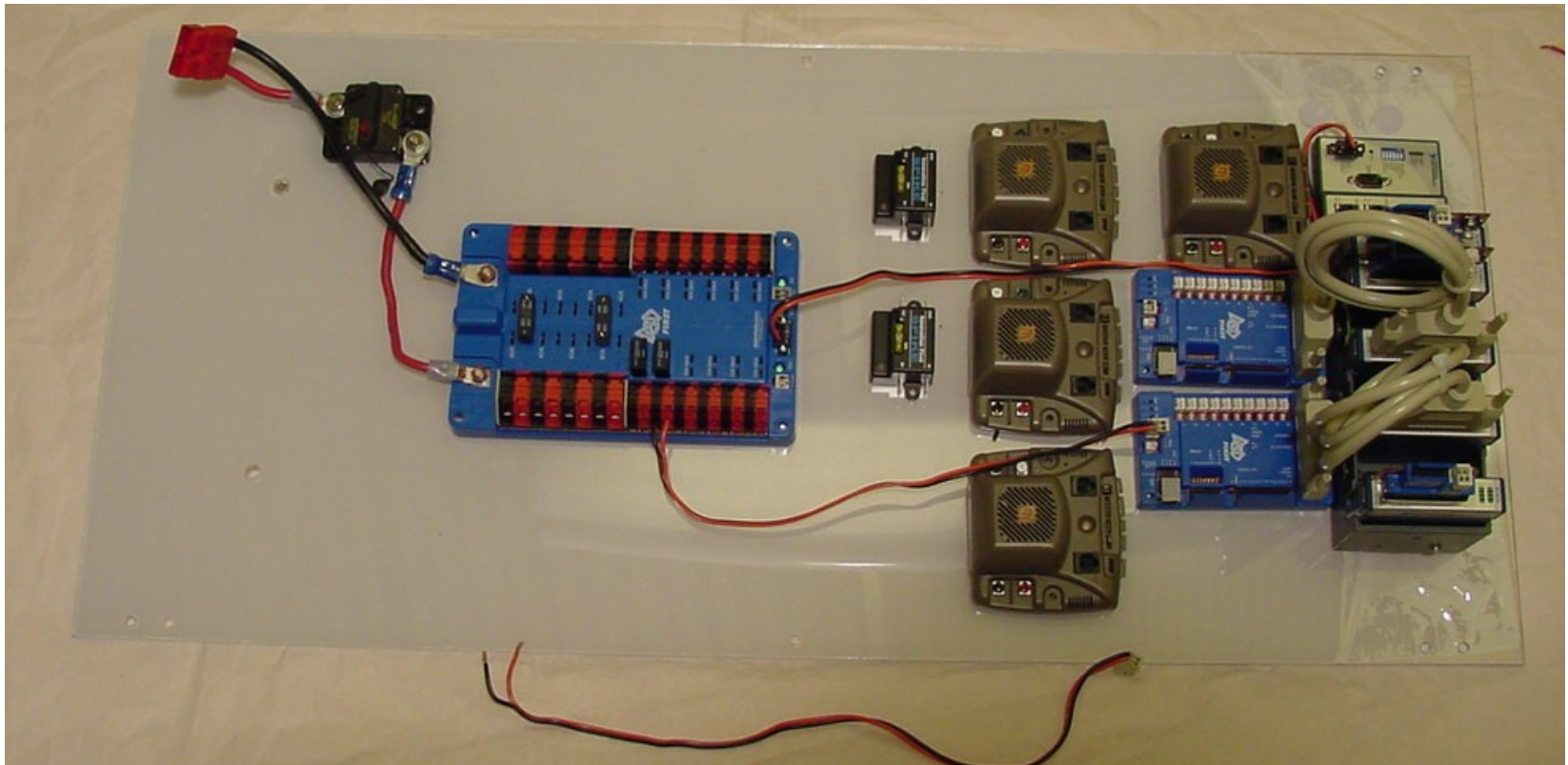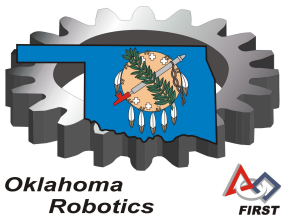Install cRIO power cable. Assemble DSC (Digital SideCar) power cables. (#14 AWG)
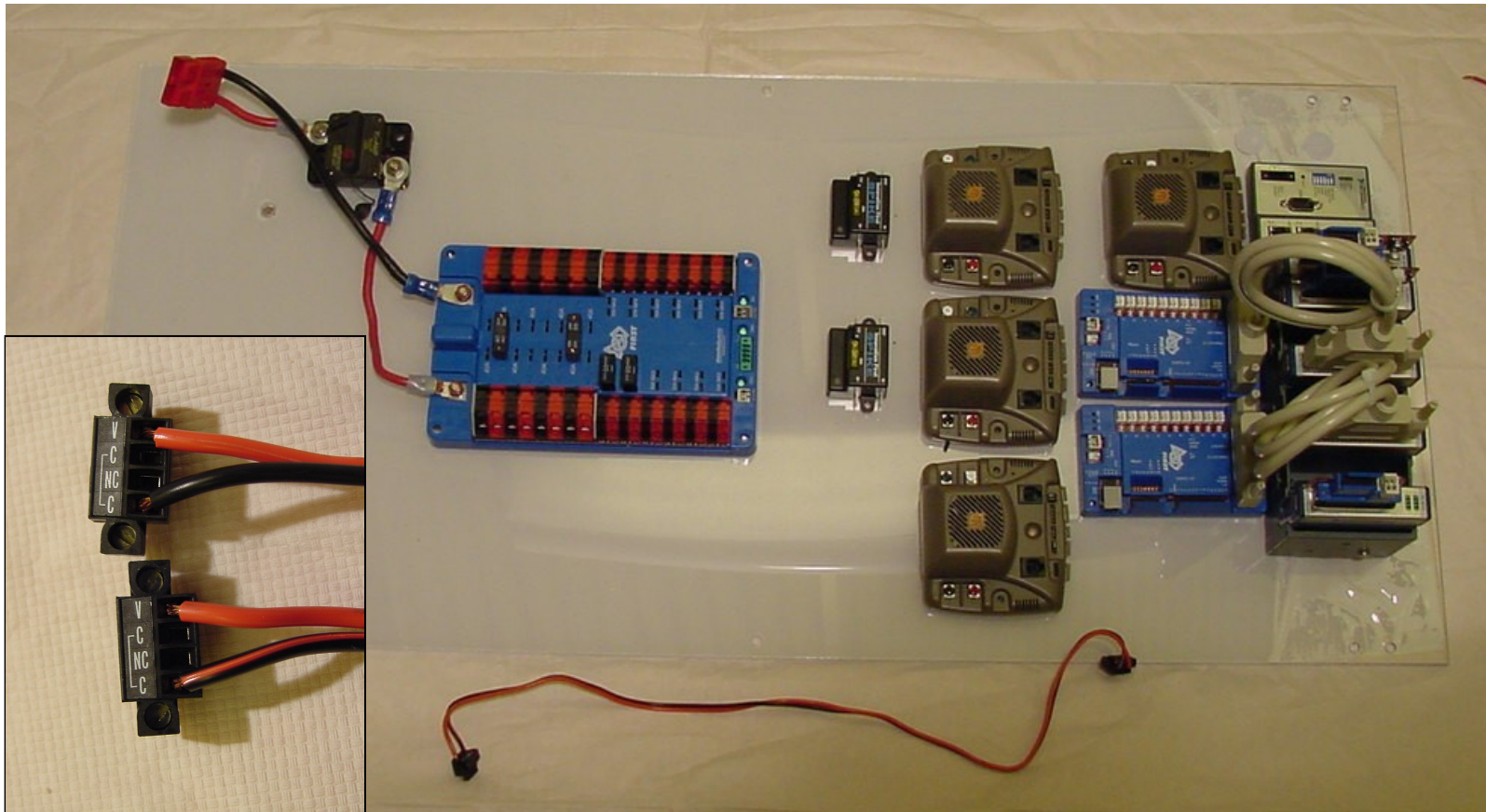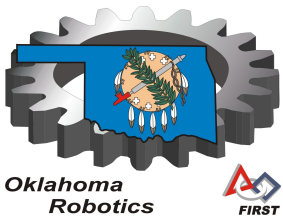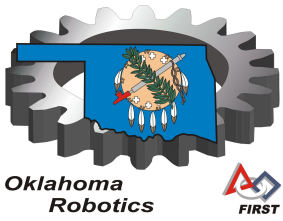
Wiring

Attach DSC cables to PD board.

Wiring

- Make power wires for Jaguar, 2 sets. (#10 AWG)
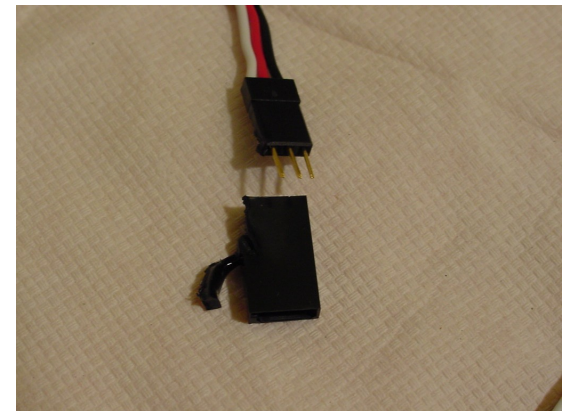
- Crimp supplied connectors to one end.
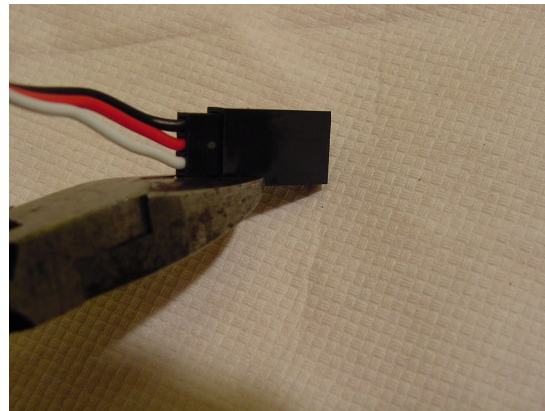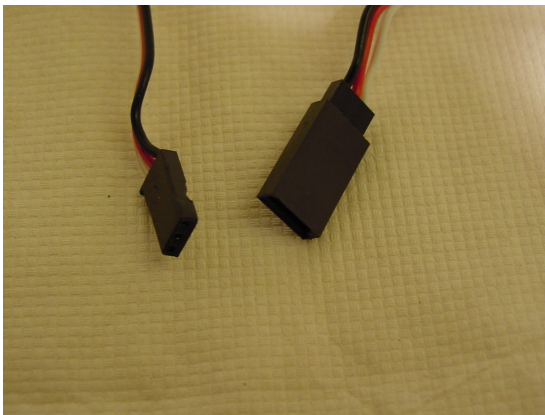

Connect Terminals Here
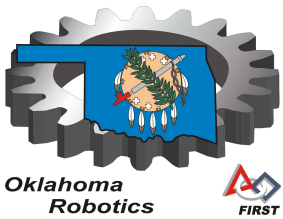
Connect Ends Here
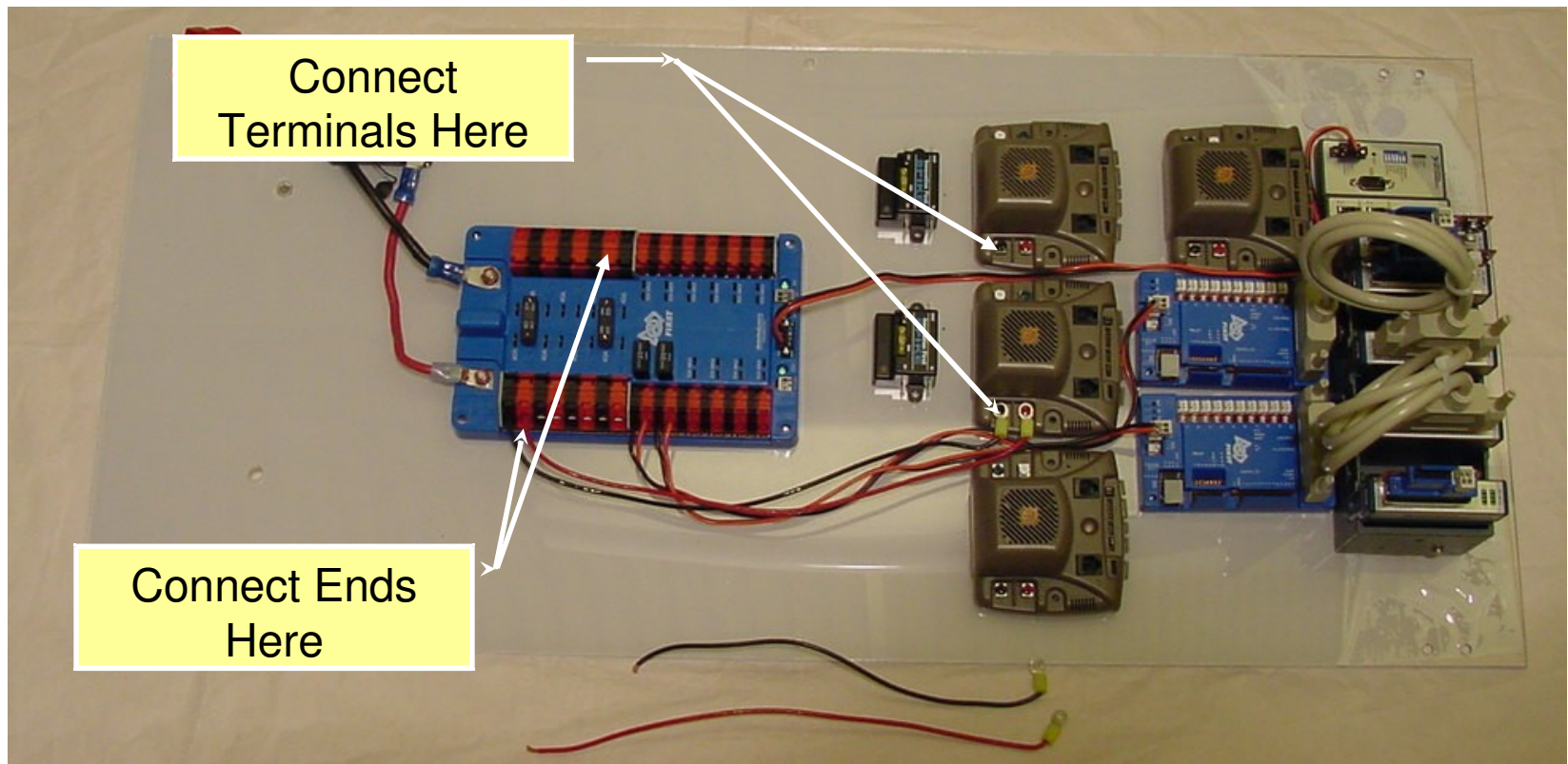
Wiring

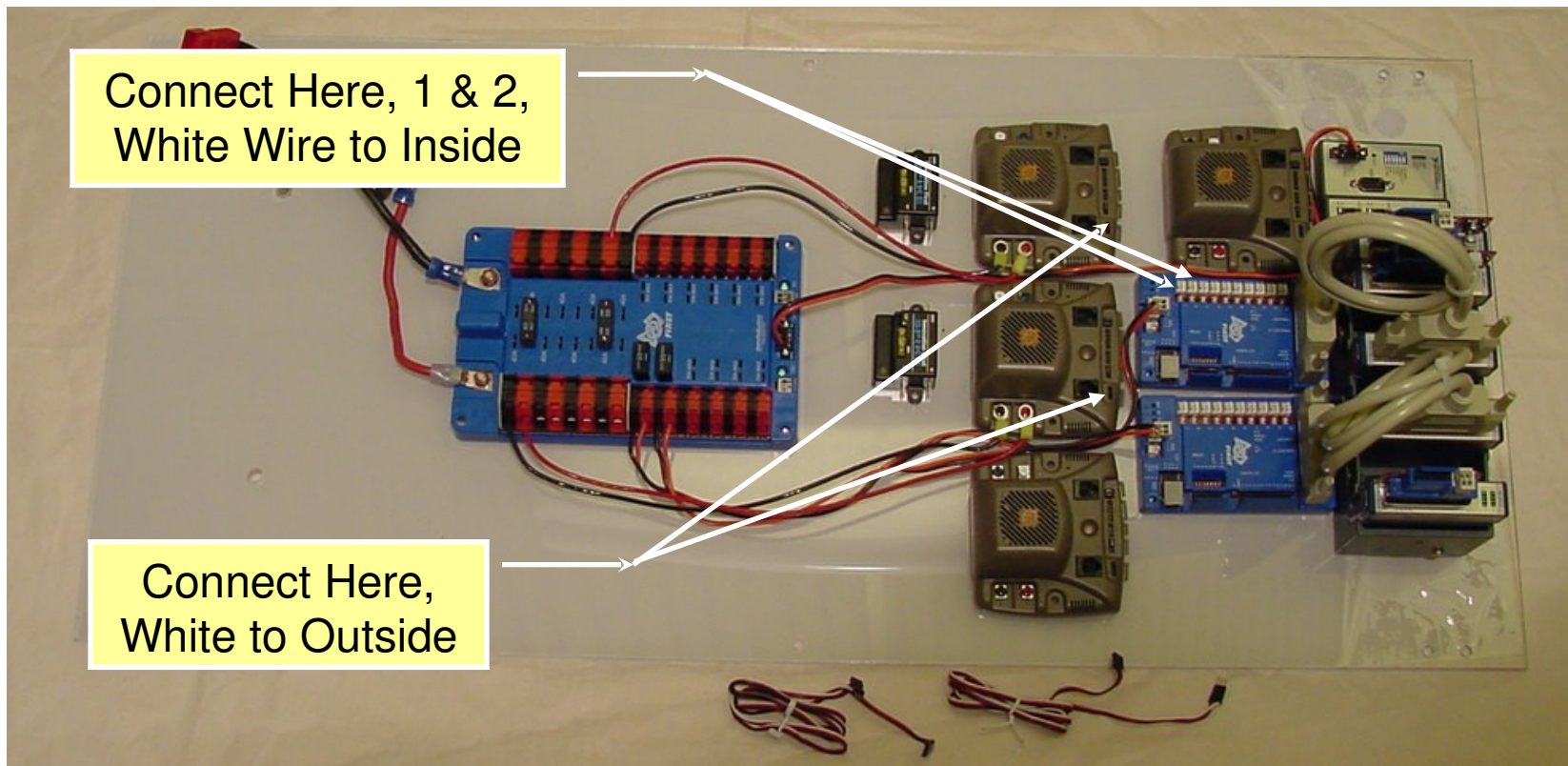- Prepare 2 PWM Wires. The protective casing must be removed from one end.
- Refer to official PWM cable modification document.

Wiring
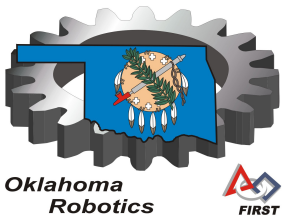
Install PWM cables as indicated.

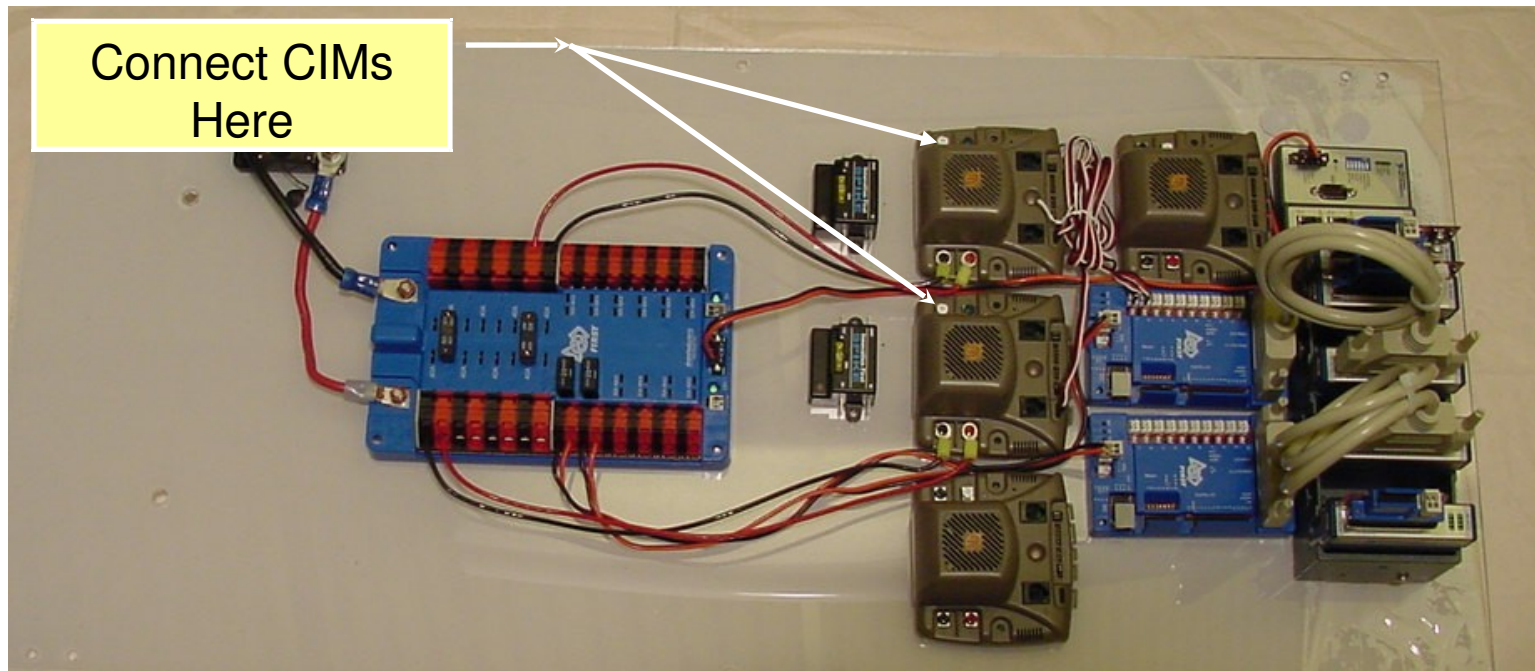Connect Here, 1 & 2, White Wire to Inside

Connect Here, White to Outside

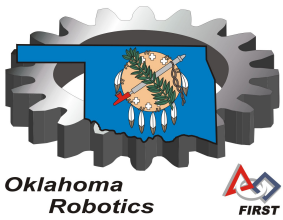# Wiring

The wiring of the control system bench test is complete. The final step is connecting 2 CIM motors to the Jaguars.
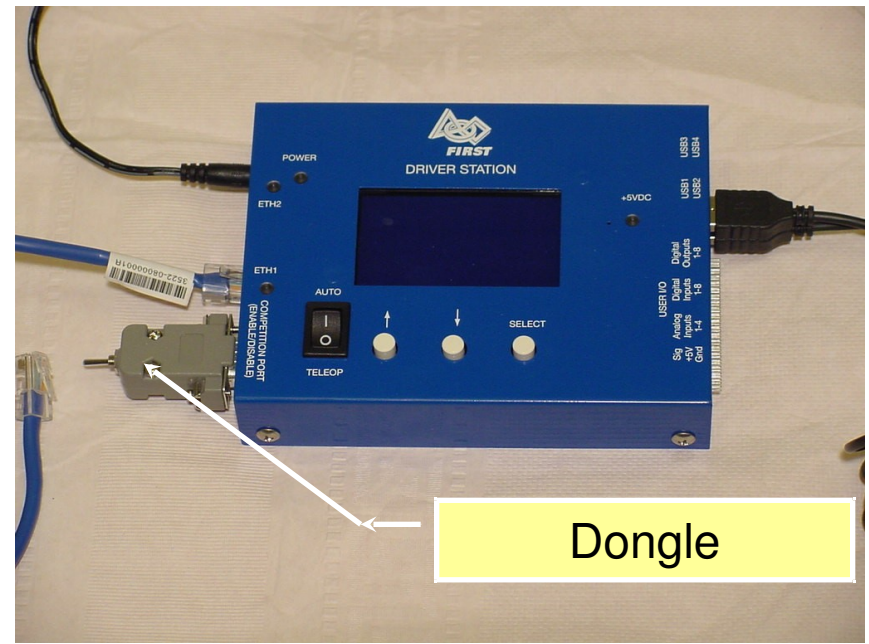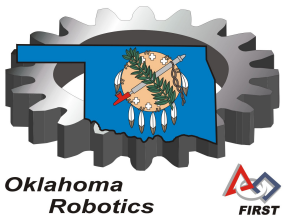

Connect CIMs Here

Wiring
Drivers Station (DS)

Connect the DS as shown below.
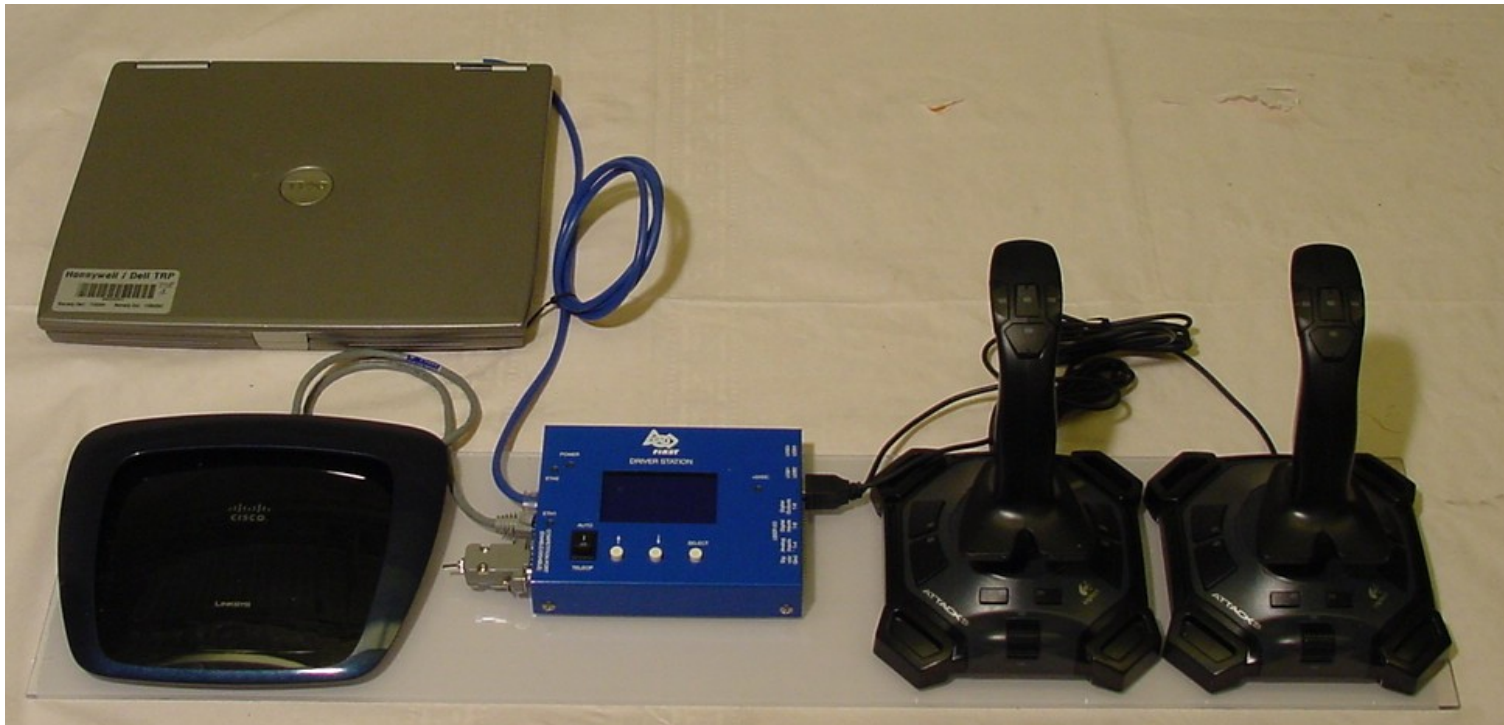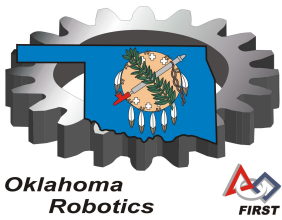Joysticks plug into USB 1 & 2.

Dongle

Wiring
Drivers Station (DS)

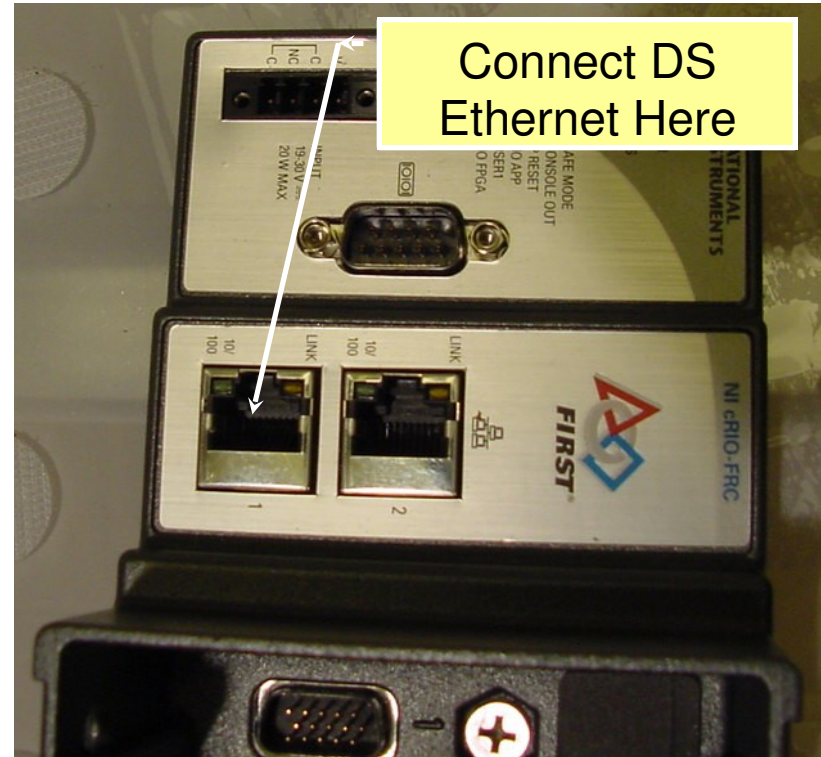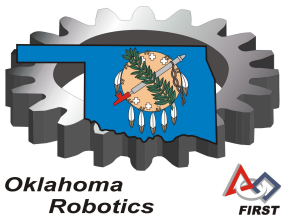Mount Drivers Station components to base using hook and loop dots.

Tethered Wiring

- Connect the blue Ethernet cable from the DS to the cRIO port.

- Put 120 amp breaker in off position.

- Connect battery. Leave main breaker off.

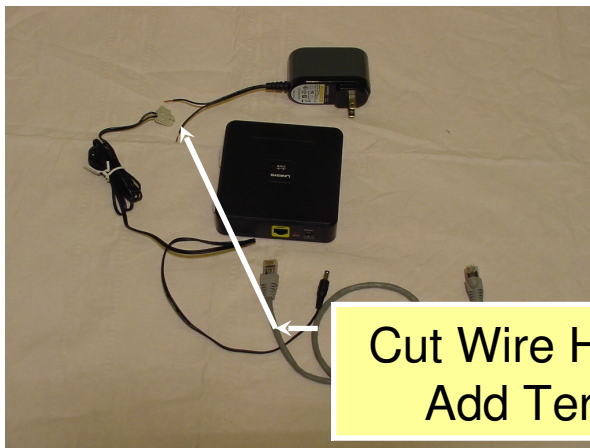- Plug in wall wart for DS and power DS.

Connect DS Ethernet Here
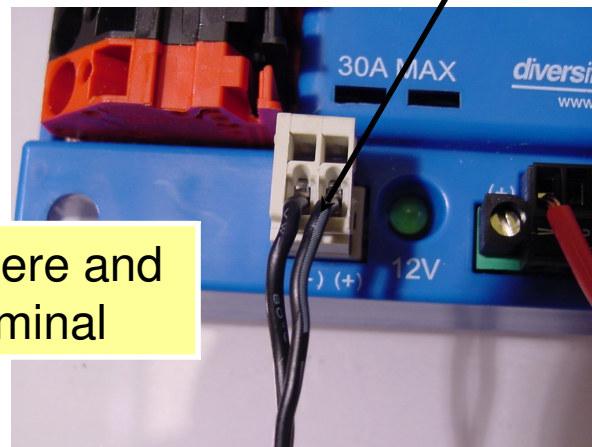
Wireless Wiring?

- Follow section 2.3.2 of the FRC Control System Manual.

- The power wires to the wireless bridge need to be modified.

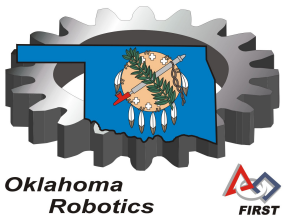Black w/ white stripe

Cut Wire Here and Add Terminal
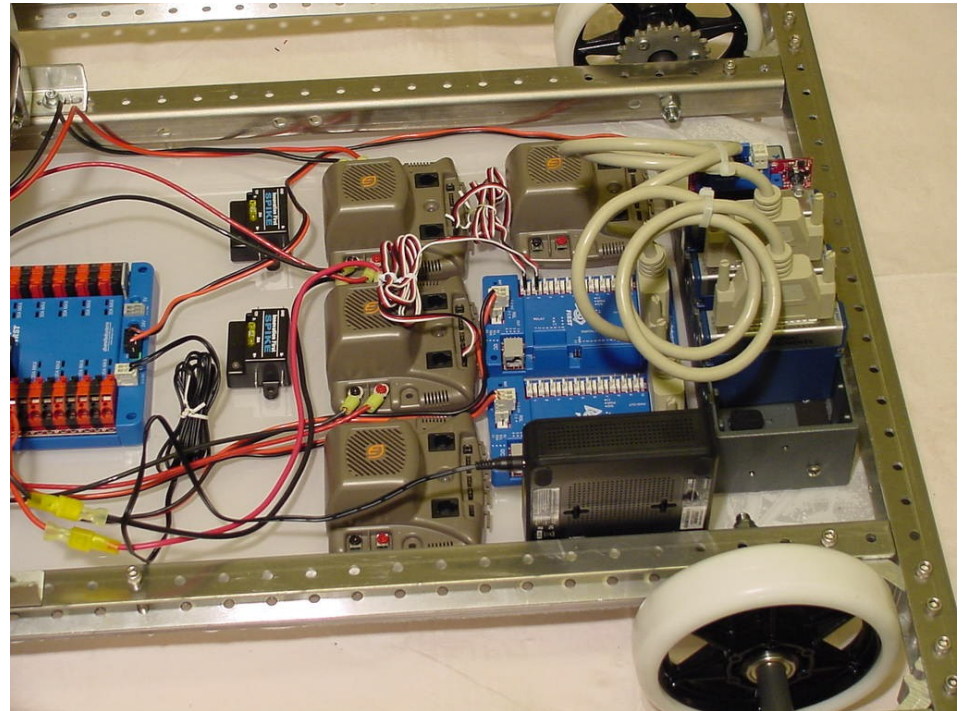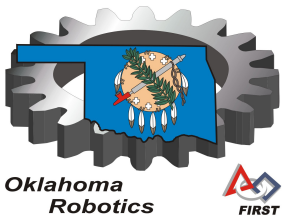
Wireless Setup

Mount wireless bridge and install modified power wire. (Frame included for reference.)

Bench Test

- You are now ready to proceed with section 2.2.4 of the 2009 FRC control system manual.
- Test the DS as per section 2.2.4
- Test tethered operation as per section 2.3. You will not have motors at this point but can watch the lights on the Jaguar controllers to verify operation.
- **You should be joined at this point by members of the programming team with the laptop.**
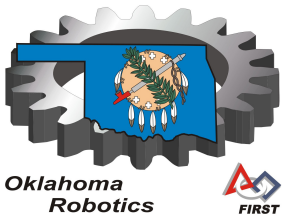- After successful tethered test, set up system for wireless operation.

Wireless Setup

- At this point you are ready to configure your wireless system. You must follow the instruction carefully.

- Refer to the FRC Checklist by Benjamin Heaivilin and the FRC 2009 Control System Manual. **(This will take about an Hour)**

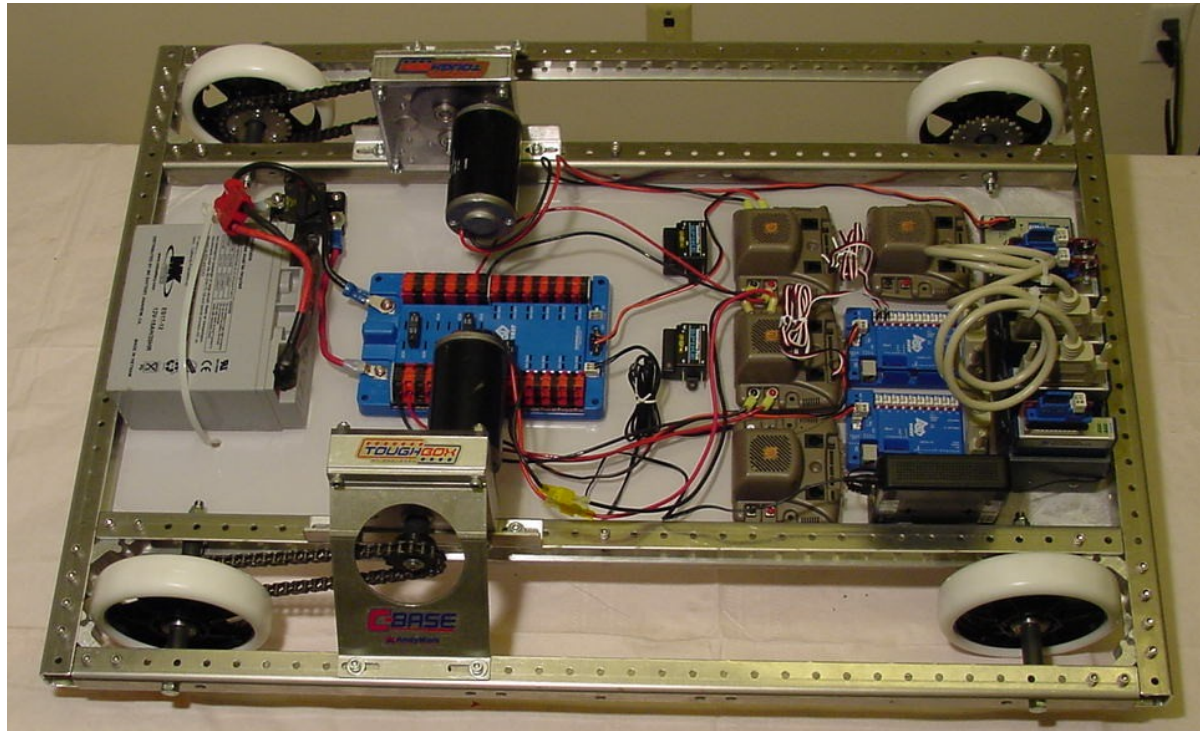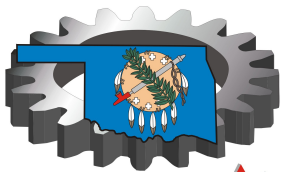- After completion your system should operate wirelessly.

Install Base Plate onto Kitbot Frame

Report back to the frame assembly area to verify they are ready for the base plate installation.

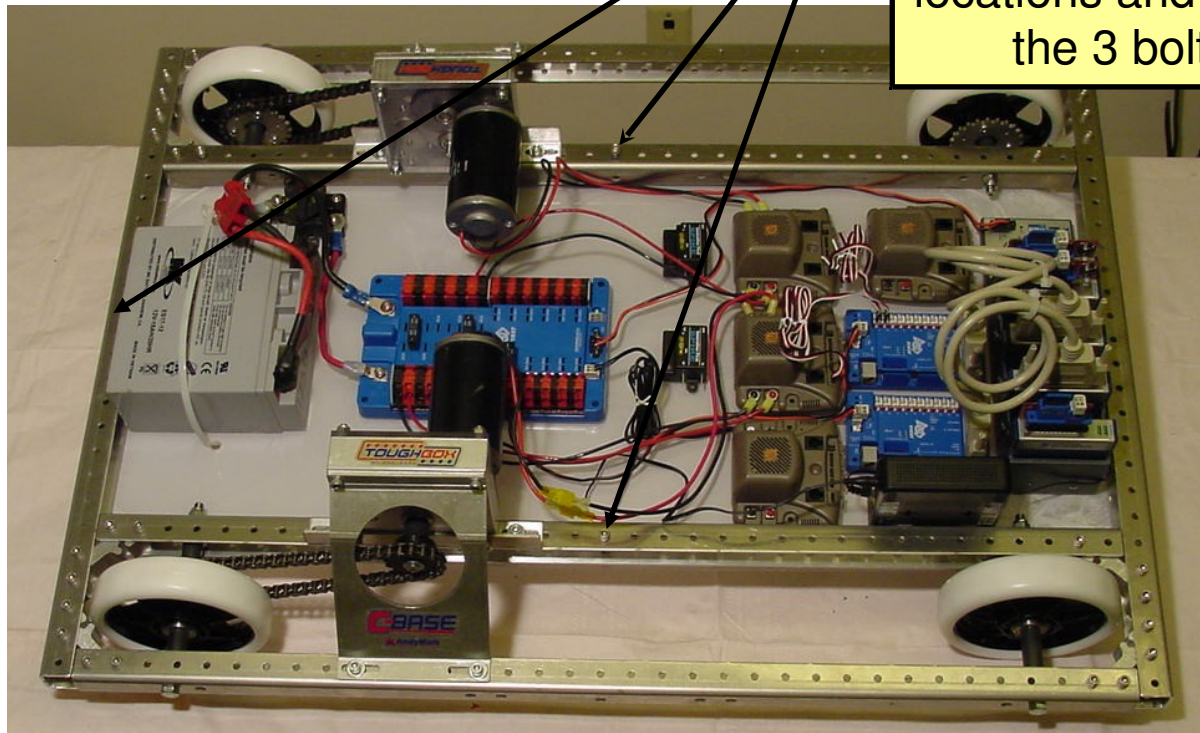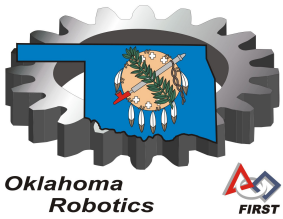# Install Base Plate onto Kitbot Frame

Match drill three ¼" holes and install 1-3/4" long bolts and nuts.

Match drill base plate at these locations and install the 3 bolts

Complete Tests

- Complete any remaining bench test not finished in the previous slides.
- **AT THIS POINT, THINGS CAN MOVE! BLOCK THE WHEELS OFF THE TABLE.**

- **MAKE SURE NOTHING IS IN THE CHAIN AREA OR CAN GET CAUGHT IN THE CHAIN.**

- **KEEP ALL PERSONNEL CLEAR OF THE CHAIN!**

Programming

- Download the supplied default program to the cRIO.
- Bench test the program.
- Go to drive area.

- CONGRATULATIONS!!!