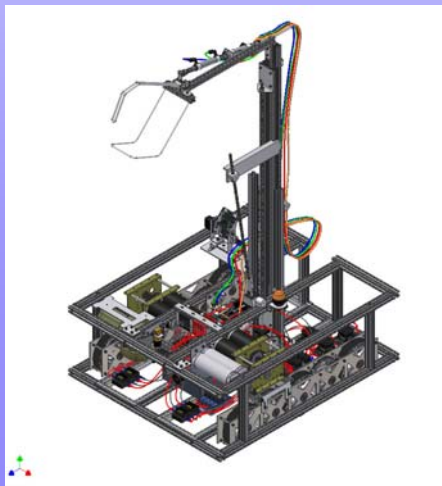
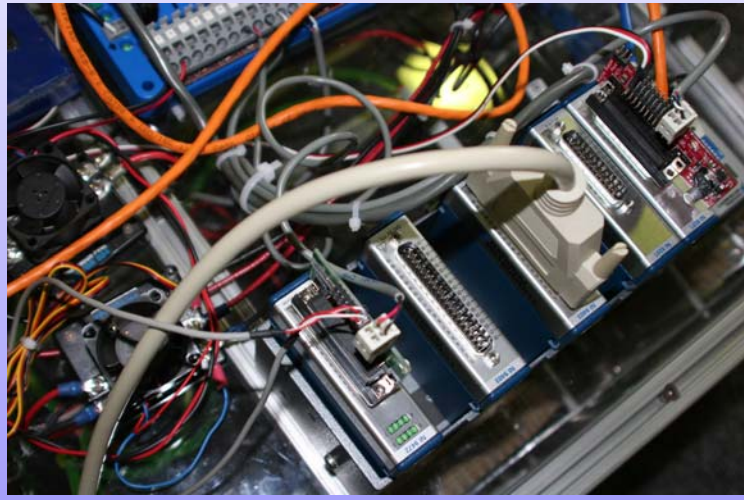
2009 FRC Control System

Published by Team 103



Section 1
Overview of Components

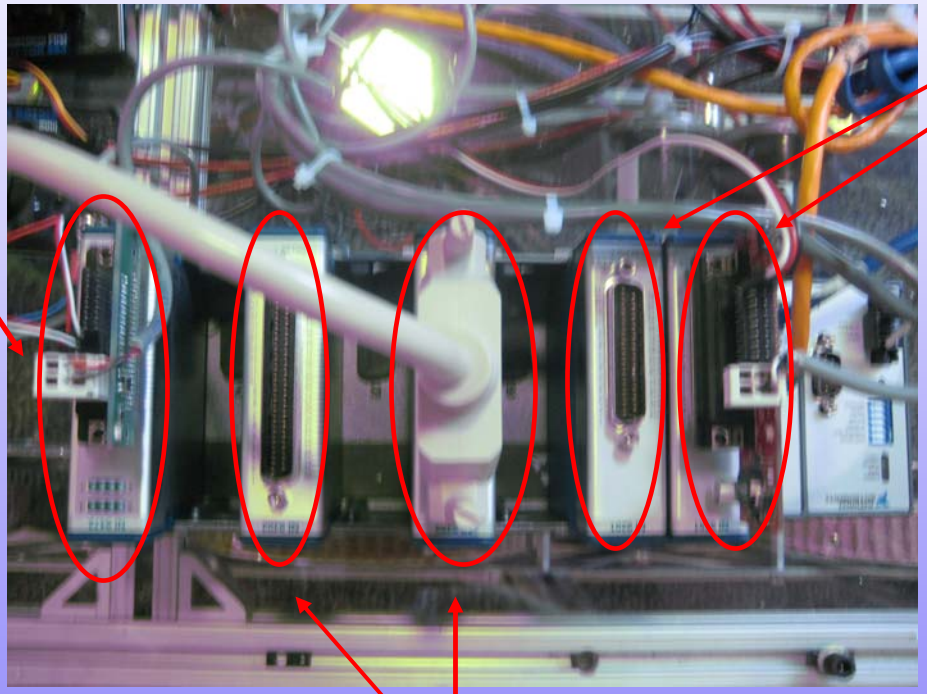
- cRIO
- DSC (Digital Side Car)
- Power Distribution Board
- Wireless Gaming Adapter
- Wireless Router
- Driver Station
- Speed Controllers (Victors, Jaguars)
- 2009 KOP Joysticks



cRIO

- National Instruments compactRIO

NI 9472 Module. Plugged in Port 8, solenoid breakout attached.



NI 9201 Module. Plugged in to Port 1 and 2. Analog Breakout attached to module on Port 1. Serves all analog inputs.

NI 9403 Module. Digital I/O, DB937 plugged in to DSC on port 4, also in port 6.

cRIO Modules

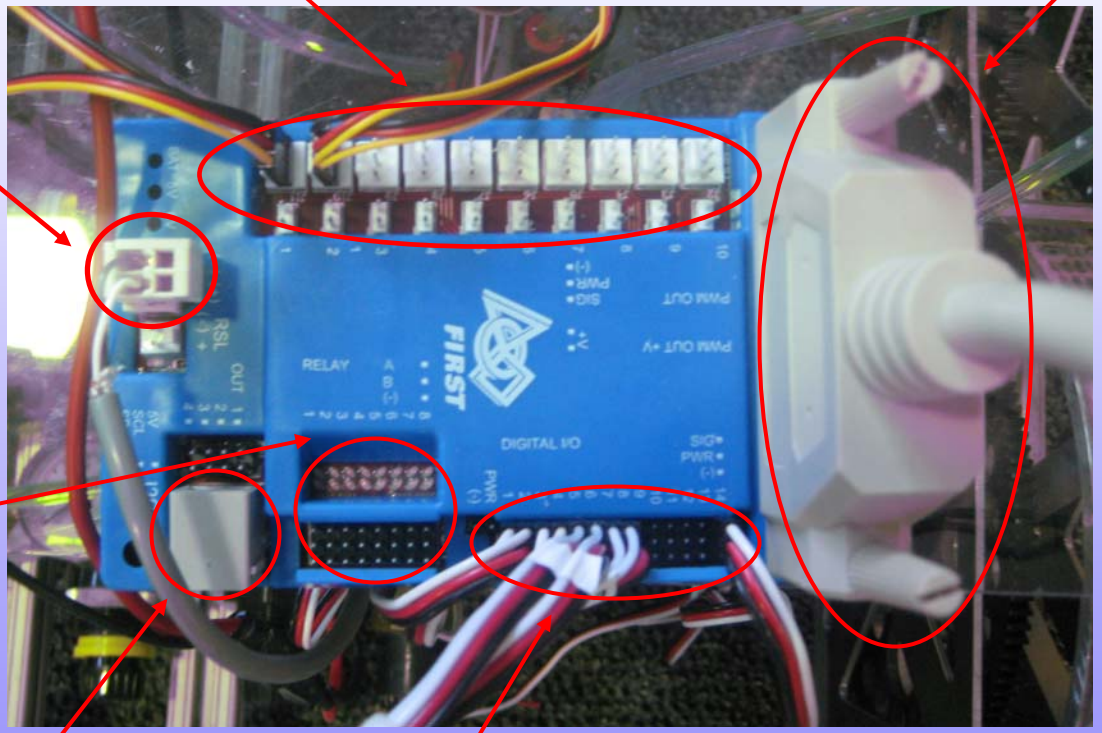
- For this year, teams cannot add more modules to the cRIO
- The only flexibility that teams have is the option of removing unused modules (i.e. only having to use one NI 9403 digital module).
- Used ports on cRIO are port 1,2,4,6,8

DSC (Digital Side Car)

PWM outputs and power jumpers

DC-37, connected to digital module on cRIO.

Connected to PD, power distribution board.

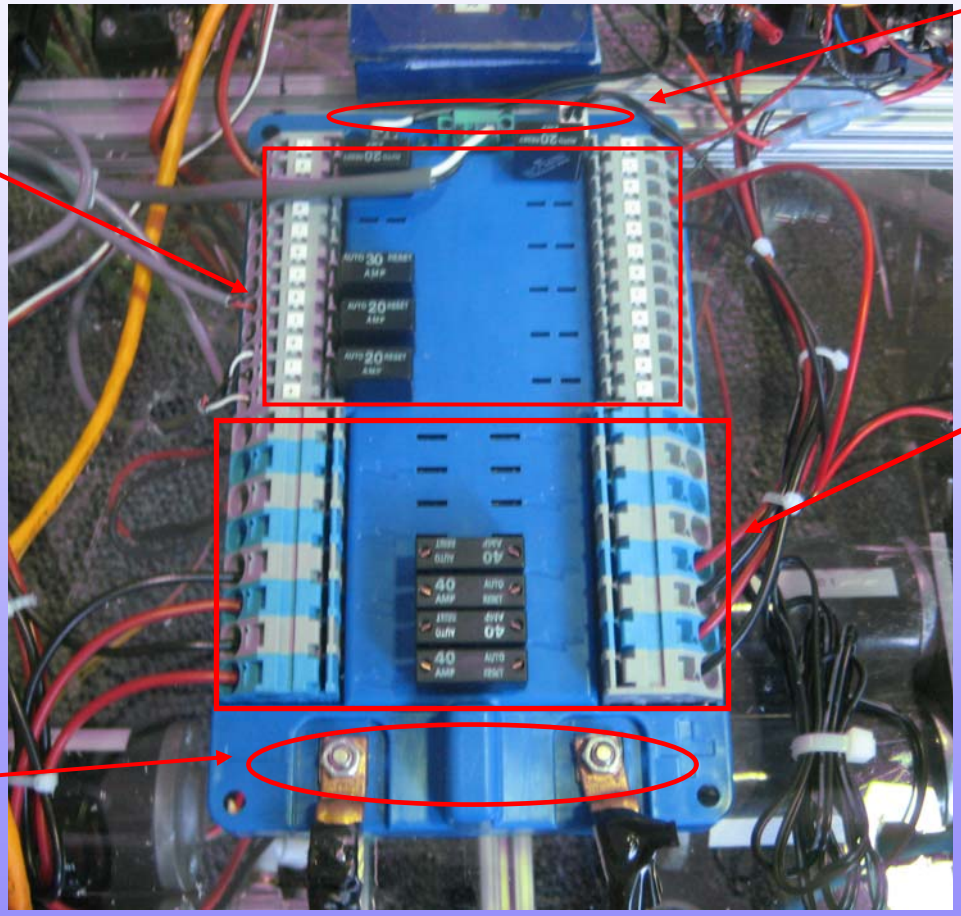


Relays with LED indicators

12C Port

Digital I/O. 14 inputs, these are bi-directional, can be used as outputs as well.

Power Distribution Board



Aux. connectors for cRIO, camera, and linksys gaming adapter

20A/30A circuit breakers

40 A circuit breakers

Connects to 120 HI-AMP circuit breaker

Note: Battery shanks are M6

Important Information about the PD Board

- Very similar in layout to the IFI Breaker Panel, has wago connectors
- Do not tin the wires when inserting them into the PD board
- All connections need to have either a 20A/30A or 40A fuse

Wireless Gaming Adapter

Power cord, connected to the PD Board.

Ethernet thru cable, connected to port #1 on cRIO.

LED status indicators

IMPORTANT: Keep the CD that comes with both the adapter and router, you will need these to configure your network.

IP Addresses

- Each team has a unique IP address that relates to their team number. Driver station follows is 10.xx.yy.5 and Wireless router is 10.xx.yy.4

IP Config	Team 27	Team 357	Team 2235
cRIO IP	10.27.0.2	10.3.57.2	10.22.35.2
PC	10.27.0.6	10.3.57.6	10.22.35.6
Camera	192.168.0.90	No Change	No Change

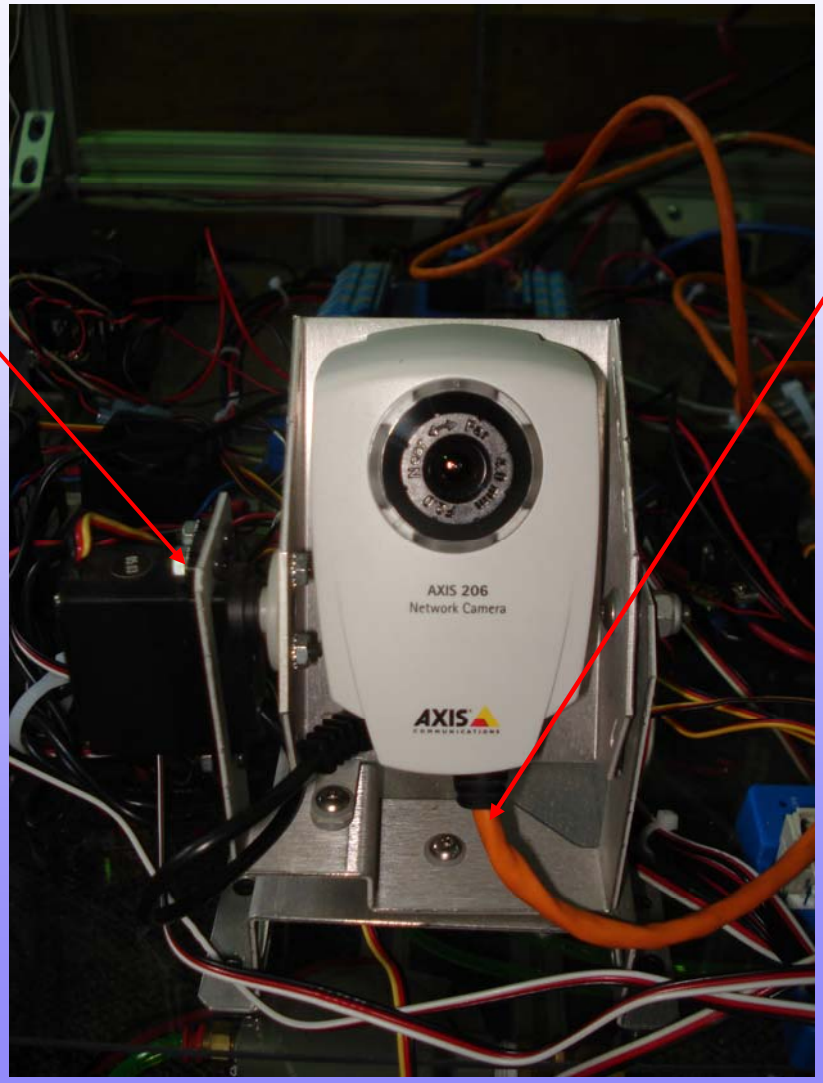
Camera

- Axis 206 Network Camera
- Capable of grabbing 15 fps with 320x240
- Implements nicely with old pan-tilt assembly from CMUcam.
- Needs a crossover ethernet cable(orange). Camera is ALWAYS plugged into port 2 on cRIO.
- Has a special jack on the PD Board

Network Camera with Pan-Tilt

Old Pan-Tilt assembly from previous year. Attached to back panel via 8-32 screw and lock nut.

Servos can be plugged directly into DSC.



Ethernet **Cross-over** cable connected to port #2 on cRIO.

Wireless Router

- Communicates with on-board gaming adapter. Also connects to port 1 on DS.

Driver Station (DS)

Information Panel

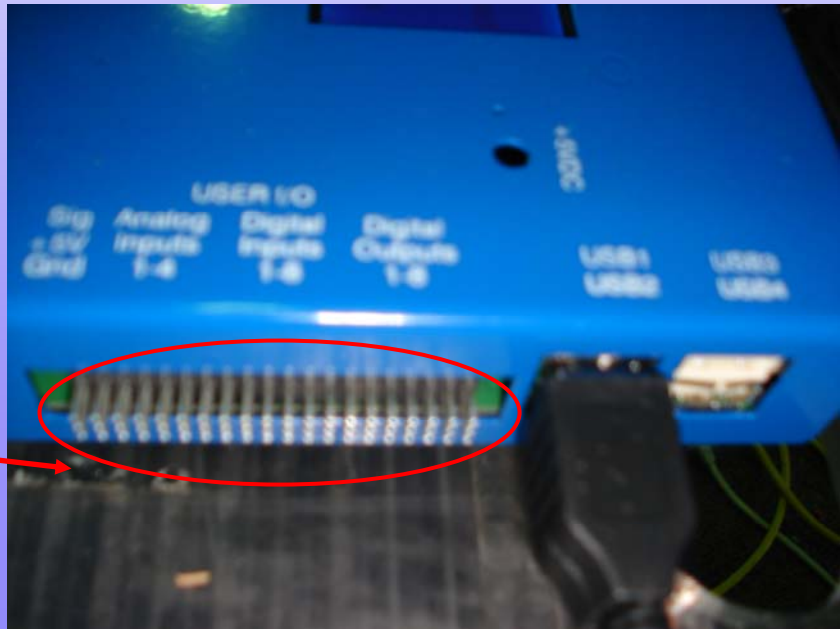
Team #

Mode: Enabled/Disabled

Battery

DS Update Version

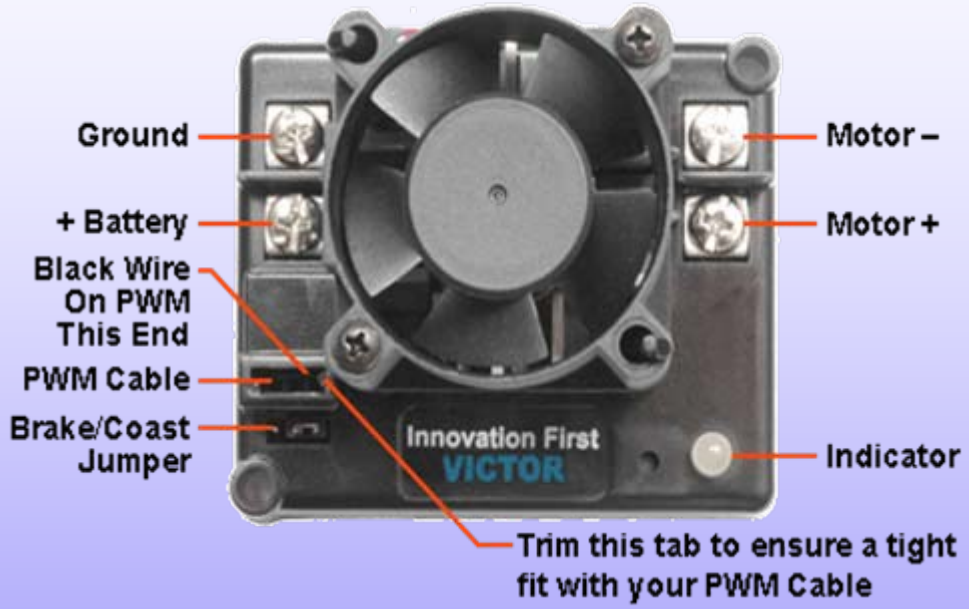
User I/O for customized control



Speed Controllers… Victors vs. Jaguars

- FIRST has announced a new speed controller, the Jaguar.
- Teams will still be able to use the Victors from previous years.
- Jaguars are almost 2x bigger then Victors, but offer much more advanced control, including CAN (Controller Area Network).

Speed Controllers…
Victors vs. Jaguars



Logitech Attack Joystick

- Implements well with Joystick.vi
- 12 different buttons, including rapid fire trigger, plus 3 analog axis controls
- 2 provided in kit

Logitech Gamepad

- True “Plug and Play”
- No need to install any drivers, works right out of the box
- Not provided in kit

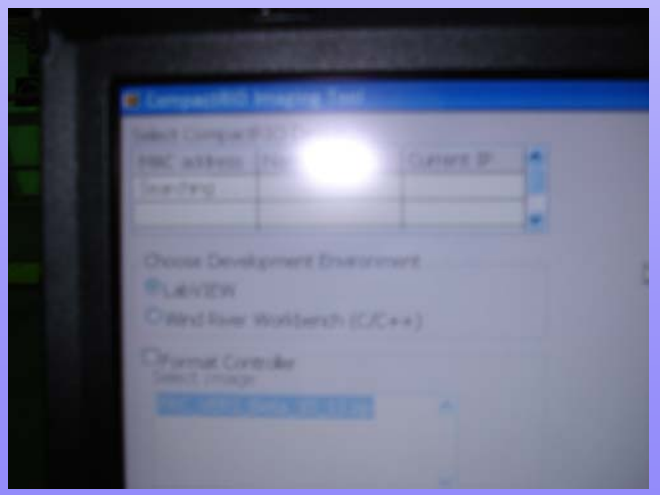
Section 2
Configuring Your cRIO and DS

- Re-imaging the cRIO
- Upgrading DS Firmware
- Installing Updates
- Configuring Your Wireless Network
- Setting Your Team Number on the DS

Re-imaging the cRIO

- What is an image?
- Bundled images for use by the cRIO Imaging Tool. Each image contains a cRIO filesystem, VxWorks kernel image, FPGA image, FIRST software, and configuration files for the cRIO-FRC controller.

Reimaging software screenshot



Upgrading DS Firmware

- Downloaded from the Internet (most likely from www.usfirst.org)
- Store file on a flash drive on the top directory as DSUB_PKG.BIN
- Insert flash drive into USB port #1 on the DS
- Then, pressing a series of different buttons you will proceed to the firmware update screen

Upgrading DS Firmware

Flash drive inserted in USB port 1 for DS update

Installing Updates with Labview

- Downloaded from the Internet, zip file, save on desktop
- “Extract All”
- Follow steps until reaching the .exe file, follows through all the screens until the update is complete

Setting Your Team Number on the DS

- Power on the DS, hold down the middle button for approx. 4 seconds
- “SET TEAM NUMBER” will appear on the display
- “Left button”- increases the selected digit
- Right button- sets the team number to the displayed number
- Center button- moves the cursor to the next digit
- Buttons must be pushed down for at least one second for it to respond

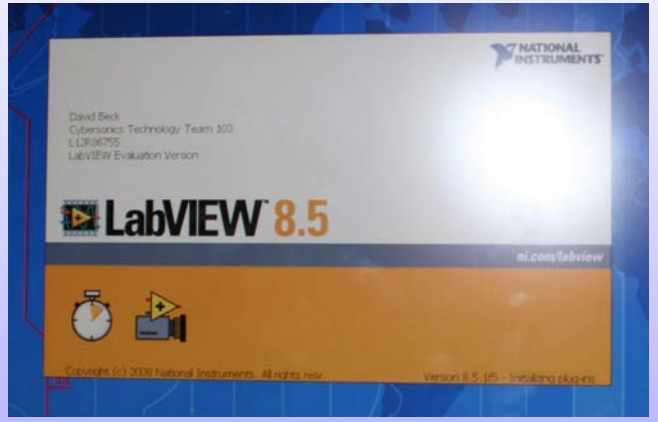
Labview vs. Wind River C++

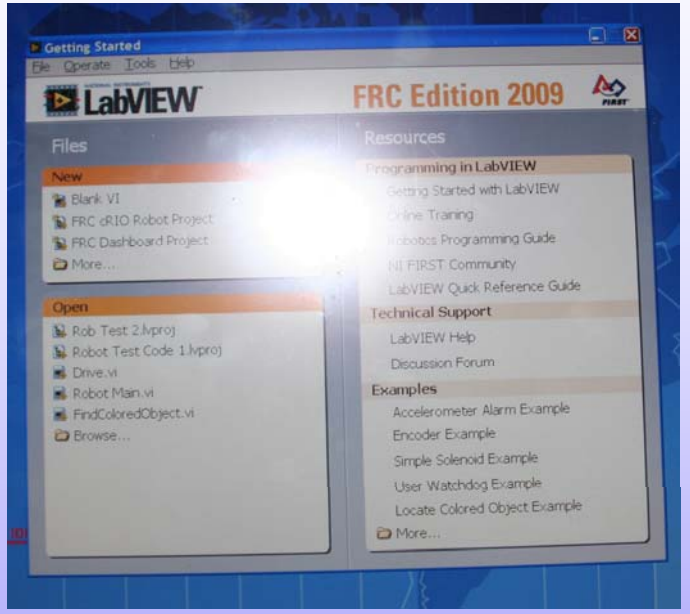
- Labview is a graphical programming interface made by National Instruments
- Wind River is a computer program that uses C++ as its coding language.
- C++ Libraries for Wind River were made by WPI and are currently available online.

WIND RIVER

Section 3
Labview

- Creating A Project



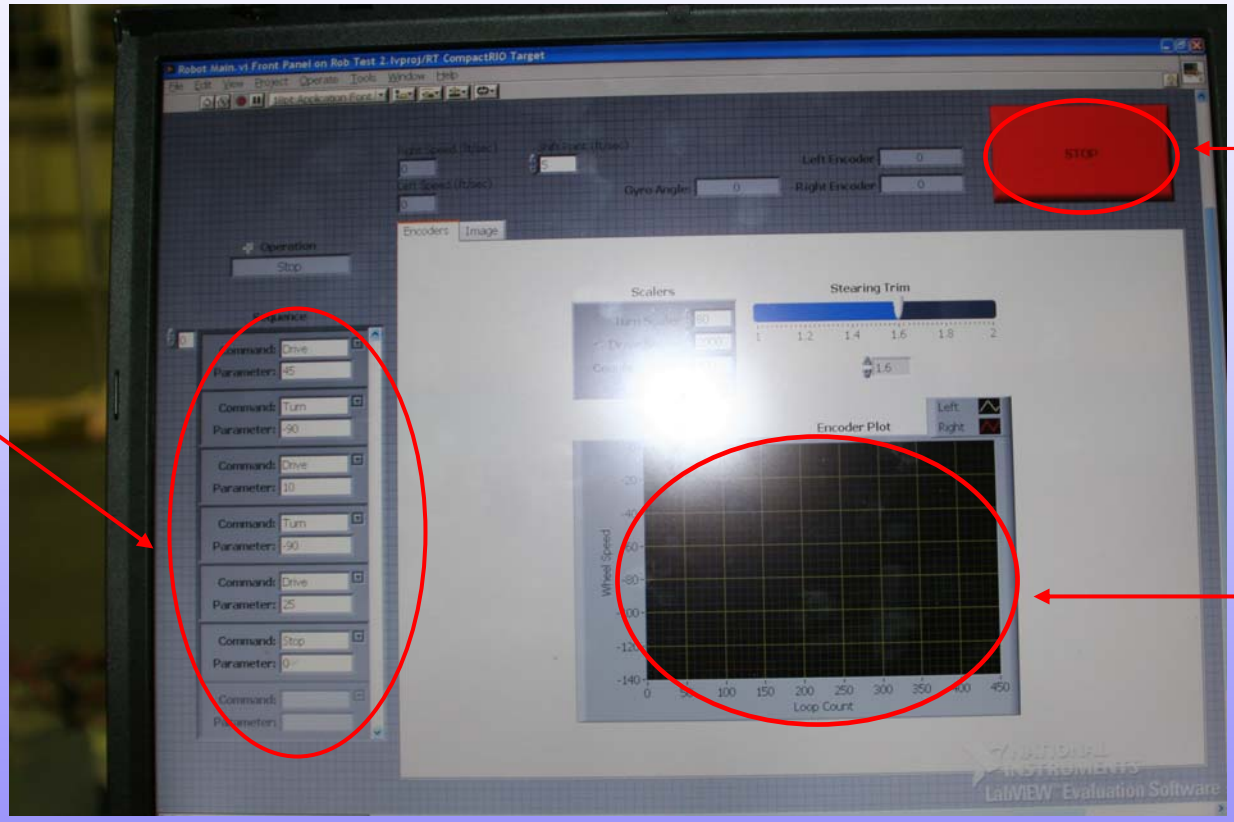


- FRC 2009 Edition vs. Labview 8.5
- Labview VI Libraries
- Deployed vs. Debug Modes

Creating A Project

- Once Labview is opened, click on “new project”
- You will then be prompted to a screen that will ask you to input your cRIO IP address and project name
- Once this is done you can begin to create your project

Robot Main VI Front Panel

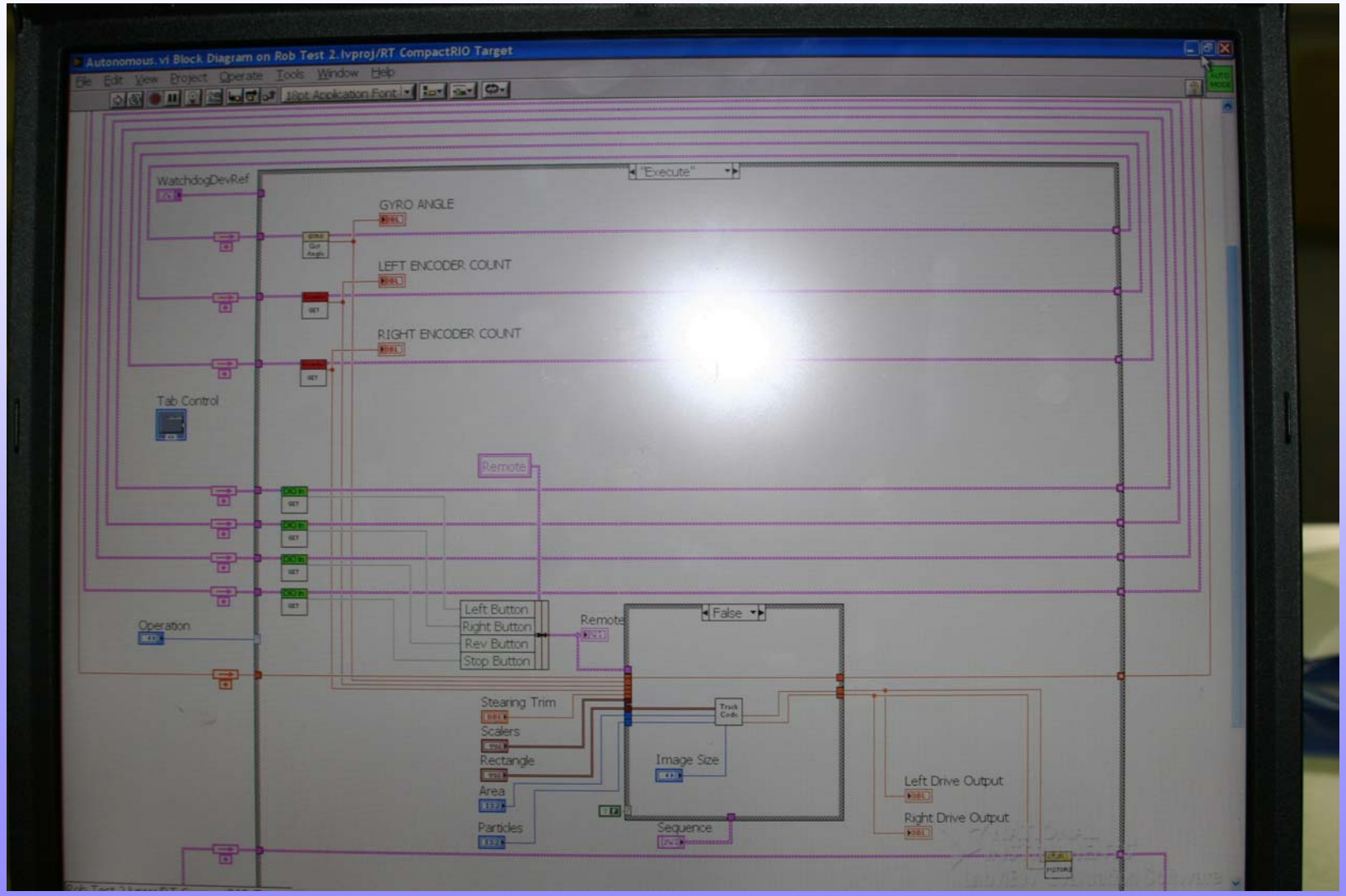


Command Sequence

Stop

Encoder Plot

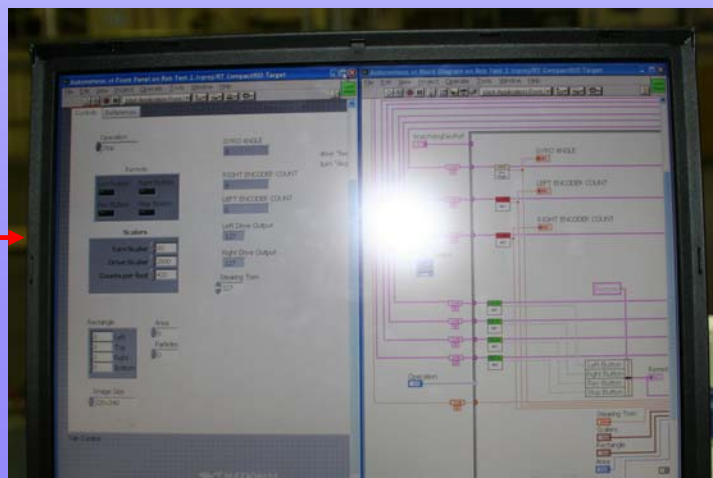
Autonomous VI Block Diagram



Labview VI Libraries

- Pre-made VI's in the FRC 2009 Edition that make coding much easier
- Example VI's include joystick.vi, encoder.vi, gyro.vi
- There are sub VI's within these VI's (i.e. start encoder.vi, get count encoder.vi)

Control panel along with corresponding block diagram



Deployed Mode vs. Flashing Code

- Deployed mode means running the code off a laptop or desktop computer
- After working out all the kinks, you can then “flash” your code onto the cRIO
- “Flashing” your code on the cRIO means that the desktop or laptop is no longer required to run your robot

Questions ????