

GETTING STARTED WITH THE 2015 CONTROL SYSTEM

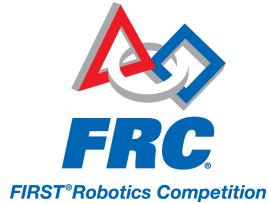


Table of Contents

| | |
|---|-----|
| Getting Started with the ScreenSteps Documentation | 3 |
| Getting Started With the Screen Steps Documentation..... | 4 |
| Getting Started with the 2015 Control System | 8 |
| 2015 FRC Control System Hardware Overview | 9 |
| Wiring the 2015 FRC Control System..... | 25 |
| 2015 FRC Software Component Overview..... | 52 |
| Imaging your Classmate (Rookie USB stick) | 68 |
| Imaging your Classmate (Veteran/Rookie Image Download) | 73 |
| Installing LabVIEW for FRC 2015 (LabVIEW only)..... | 92 |
| Installing Eclipse (C++/Java) | 116 |
| Installing the FRC 2015 Update Suite (All Languages) | 140 |
| Updating your roboRIO firmware | 164 |
| Imaging your roboRIO | 170 |
| Installing Java 8 on the roboRIO using the FRC roboRIO Java Installer (Java only) | 175 |
| RoboRIO Networking | 186 |
| FRC Driver Station Software | 189 |
| Running your Benchtop Test Program - Tethered..... | 199 |
| Programming your radio for home use | 201 |
| Running your Benchtop Test Program - Wireless | 208 |
| Updating and Configuring Pneumatics Control Module and Power Distribution Panel..... | 210 |

Getting Started with the ScreenSteps Documentation

Getting Started With the Screen Steps Documentation

ScreenStepsLive is a new tool that FRC/WPI are using to create and present documentation. This document is a brief introduction to the ScreenStepsLive site and the documentation contained here.

What's Here?

The documentation on the ScreenStepsLive site encompasses a number of potentially familiar documents from previous seasons such as the Getting Started with the 201X Control System, Getting Started with C++, Getting Started with Java, WPILib Cookbook, Vision Whitepaper and more. It also includes quite a bit of brand new documentation such as the Control System Software and Hardware Overviews, documentation on new features or tools such as Robot Builder and Live Window/Test Mode, and new documentation on existing tools such as Getting Started With the SmartDashboard.



FRC

FIRST® Robotics Competition

Navigating the Site

The screenshot shows a web-based documentation site for the FIRST Robotics Competition. At the top, there's a breadcrumb navigation path: "Robot programming with WPILib > Getting started with C++ > Configuring Wind River Workbench". Below this, there are links for "PREV INSTALLING THE C++ DEVELOPMENT TOOLS" and "NEXT CREATING A ROBOT PROJECT". On the left side, there's a sidebar with "Documentation site powered by ScreenSteps Live" and a "Learn more about ScreenSteps Live" button. It also lists "Last Updated" (Oct 31, 2012) and download links for "Download Lesson PDE" and "Download Manual PDE". Under "Other Resources", it lists sections for "BETA TESTING FOR 2013", "WPILIB PROGRAMMING DOCUMENTATION" (with links to "Getting started with C++", "Getting started with Java", "WPILib programming", and "Command based programming"), and "SOFTWARE TOOLS" (with links to "RobotBuilder", "Extending RobotBuilder (under development)", and "SmartDashboard"). The main content area shows a "Configuring Wind River Workbench" page with a sub-section titled "Creating a Target Server Connection". It features a screenshot of the Wind River Workbench interface showing the "Remote Systems" window with a context menu open over a connection entry. A note below explains how Workbench connects to a cRIO controller and how to add a new connection. Another note provides instructions for specifying the connection type, showing a screenshot of the "Select Remote System Type" dialog box.

The documentation is organized into a hierarchy with Sections at the very top, followed by Manuals, Chapters, then Lessons. At any time while you are browsing through the documentation, you can use the navigation at the top of the screen to go back to the Manual or to the home screen. You can also use the navigation on the left side of the screen when viewing a Manual or Chapter to jump to a different Manual. Each article also has a Prev and Next link at the top and bottom of the article to take you to the previous article or next article in the Manual.

Using the Search

Filter Search Results

Check the options below to only search specific manuals

BETA TESTING FOR 2013

- Beta testing WPILib for 2013

WPILIB PROGRAMMING DOCUMENTATION

- Getting started with C++
- Getting started with Java
- WPILib programming
- Command based programming

SOFTWARE TOOLS

- RobotBuilder
- Extending RobotBuilder
- SmartDashboard
- Debugging and testing robot programs

2013 CONTROL SYSTEM

- Getting Started With the 2013 Control System

Search Results

RobotBuilder

Match any search term Match all search terms

Total articles found: 21 [Reset Search](#)

Starting RobotBuilder

Locating the RobotBuilder .jar file
RobotBuilder is shipped as a .jar ... in the example above).
Starting RobotBuilder from the command line
In ... ;java -jar RobotBuilder.jar" from the directory that contains RobotBuilder
MANUAL [RobotBuilder](#)

Overview of RobotBuilder

...
Add each subsystem to the RobotBuilder project
Each subsystem will be ... ;Subsystems" folder in the RobotBuilder application

A search bar is located at the top of each page which you can use to search the site. After entering a search query you will be brought to the search results page. From this page you can refine your query by selecting whether to "match any" or "match all" terms in the search. You can also narrow your search to specific manuals by checking them in the left pane.



FRC

FIRST® Robotics Competition

Downloading PDFs

Topics

- The basic steps to create a robot program 12
- Writing C++ code for your robot 4
- Writing Java code for your robot 5
- Advanced techniques 4

Documentation site powered by [ScreenSteps Live](#)

Learn more about [ScreenSteps Live](#)

Last Updated
Oct 31, 2012

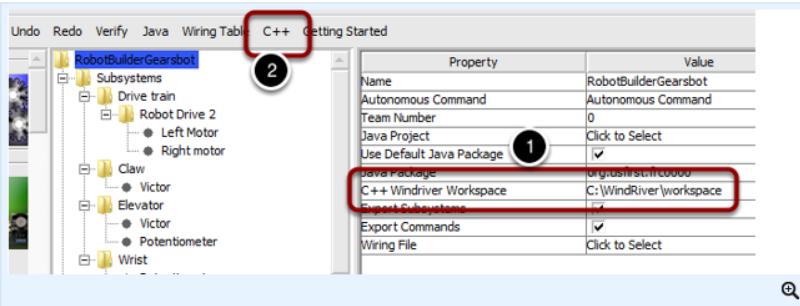
[Download Lesson PDF](#)
[Download Manual PDF](#)

PREV: [STARTING ROBOTBUILDER](#)

Generating C++ code for a project

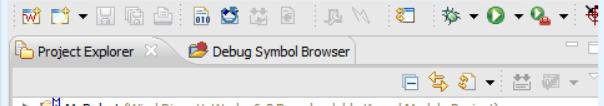
Adding code to create an actual working subsystem is very straightforward. For simple subsystems that don't use feedback it turns out to be extremely simple to open or close a claw on the robot arm.

Generate the code for the project



Verify that the C++ WindRiver workspace location is set properly (1) and generate code for the C++ robot project (2).

Import the project into WindRiver Workbench



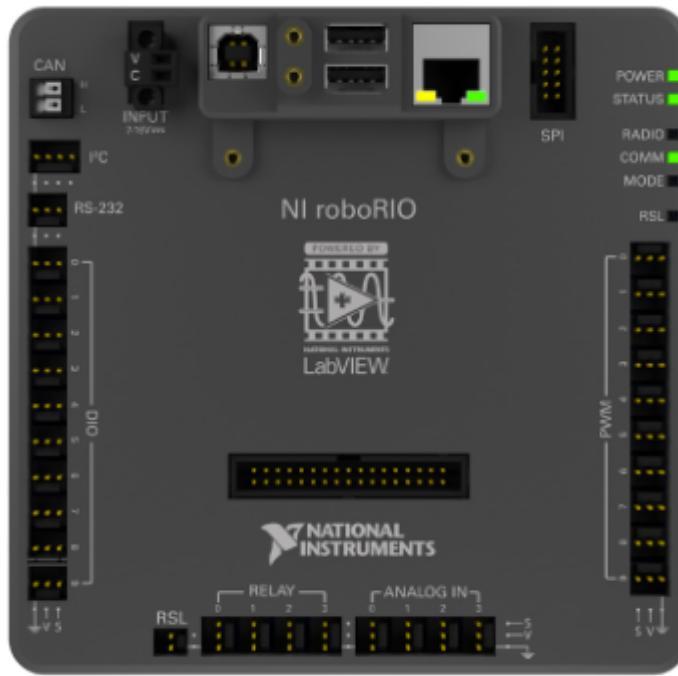
For offline viewing, every Manual in the documentation can be downloaded as a PDF. From the manual page or from any of the Lessons within the manual you can download the manual PDF by clicking the link on the left side of the window. Additionally, some individual Lesson PDFs can be downloaded from the lesson pages.

Getting Started with the 2015 Control System

2015 FRC Control System Hardware Overview

The goal of this document is to provide a brief overview of the hardware components that make up the 2015 FRC Control System. Each component will contain a brief description of the component function, a brief listing of critical connections, and a link to more documentation if available. Note that for complete wiring instructions/diagrams, please see the [Wiring the 2015 Control System](#) document.

National Instruments roboRIO



The NI-roboRIO is the main robot controller used for FRC 2015. The roboRIO includes a dual-core ARM Cortex™-A9 processor and FPGA which runs both trusted elements for control and safety as well as team-generated code. Integrated controller I/O includes a variety of communication protocols (Ethernet, USB, CAN, SPI, I2C, and serial) as well as PWM, servo, digital I/O, and analog I/O channels used to connect to robot peripherals for sensing and control. The roboRIO should connect to the dedicated 12V port on the Power Distribution Panel for power. Wired communication is available via USB or Ethernet. Detailed information on the roboRIO can be found in the [roboRIO User Manual](#).

Power Distribution Panel



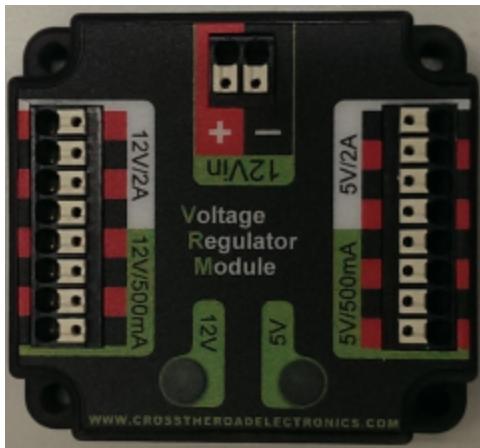
The Power Distribution Panel (PDP) is designed to distribute power from a 12VDC battery to various robot components through auto-resetting circuit breakers and a small number of special function fused connections. The PDP provides 8 output pairs rated for 40A continuous current and 8 pairs rated for 30A continuous current. The PDP provides dedicated 12V connectors for the roboRIO, as well as connectors for the Voltage Regulator Module and Pneumatics Control Module. It also includes a CAN interface for logging current, temperature, and battery voltage. For more detailed information, see the [PDP User Manual](#).

Pneumatics Control Module



The PCM is a device that contains all of the inputs and outputs required to operate 12V or 24V pneumatic solenoids and the on board compressor. The PCM is enabled/disabled by the roboRIO over the CAN interface. The PCM contains an input for the pressure sensor and will control the compressor automatically when the robot is enabled and a solenoid has been created in the code. The device also collects diagnostic information such as solenoid states, pressure switch state, and compressor state. The module includes diagnostic LED's for both CAN and the individual solenoid channels. For more information see the [PCM User Manual](#).

Voltage Regulator Module



The VRM is an independent module that is powered by 12 volts. The device is wired to a dedicated connector on the PDP. The module has multiple regulated 12V and 5V outputs. The purpose of the VRM is to provide regulated power for the D-Link 1522 RevB radio, custom circuits, and IP vision cameras. **Note: The two connector pairs associated with each label have a combined rating of what the label indicates (e.g. 5V/500mA total for both pairs not for each pair). The 12V/2A limit is a peak rating, the supply should not be loaded with more than 1.5A continuous current draw.** For more information, see the [VRM User Manual](#).

Motor Controllers

There are a variety of different motor controllers which work with the FRC Control System. These devices are used to provide variable voltage control of the brushed DC motors used in FRC.

Jaguar Motor Controller



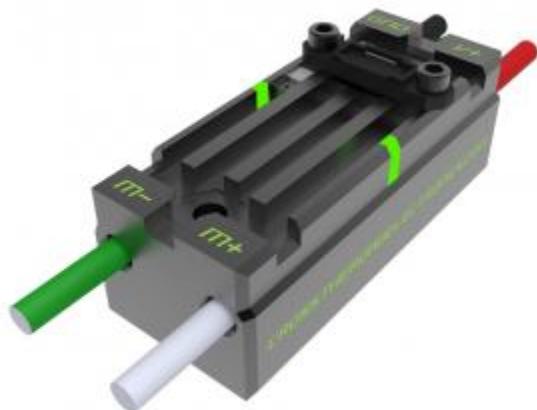
The Jaguar Motor Controller from VEX Robotics (formerly made by Luminary Micro and Texas Instruments) is a variable speed motor controller for use in FRC. The Jaguar can be controlled using either the PWM interface or over the CAN bus. The Black Jaguar can also be used to convert from RS232 (from the BDC-Comm PC program) to the CAN bus. The Jaguar should be connected using one of these control interfaces and powered from the Power Distribution Panel. For more information, see the Jaguar Getting Started Guide, Jaguar Datasheet and Jaguar FAQ on [this page](#).

Talon Motor Controller



The Talon Motor Controller from Cross the Road Electronics is a variable speed motor controller for use in FRC. The Talon is controlled over the PWM interface. The Talon should be connected to a PWM output of the roboRIO and powered from the Power Distribution Panel. For more information see the [Talon User Manual](#).

Talon SRX



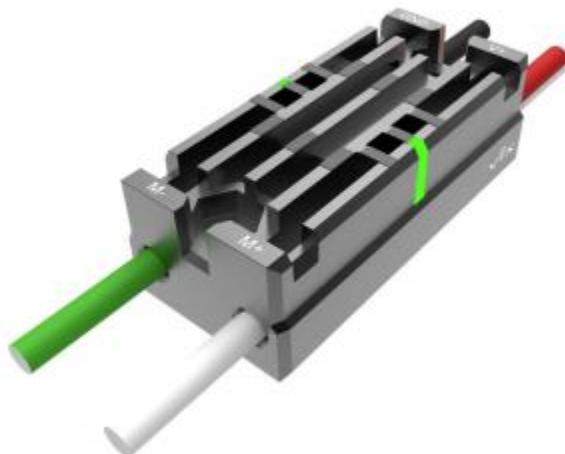
The Talon SRX motor controller is a CAN-enabled "smart motor controller" from Cross The Road Electronics/VEX Robotics. The Talon SRX has an electrically isolated metal housing for heat dissipation, making the use of a fan optional. The Talon SRX can be controlled over the CAN bus or PWM interface. When using the CAN bus control, this device can take inputs from limit switches and potentiometers, encoders, or similar sensors in order to perform advanced control such as limiting or PID(F) closed loop control on the device. For more information see the [Talon SRX User Manual](#).

Victor 888 Motor Controller / Victor 884 Motor Controller



The Victor 888 Motor Controller from VEX Robotics is a variable speed motor controller for use in FRC. The Victor 888 replaces the Victor 884, which is also usable in FRC. The Victor is controlled over the PWM interface. The Victor should be connected to a PWM output of the roboRIO and powered from the Power Distribution Panel. For more information, see the [Victor 884 User Manual](#) and [Victor 888 User Manual](#).

Victor SP



The Victor SP motor controller is a PWM motor controller from Cross The Road Electronics/VEX Robotics. The Victor SP has an electrically isolated metal housing for heat dissipation, making the use of the fan optional. The case is sealed to prevent debris from entering the controller. The controller is approximately half the size of previous models. For more information, see the [Victor SP User Manual](#).

Spike H-Bridge Relay



The Spike H-Bridge Relay from VEX Robotics is a device used for controlling power to motors or other custom robot electronics. When connected to a motor, the Spike provides On/Off control in both the forward and reverse directions. The Spike outputs are independently controlled so it can also be used to provide power to up to 2 custom electronic circuits. The Spike H-Bridge Relay should be connected to a relay output of the roboRIO and powered from the Power Distribution Panel. For more information, see the [Spike User's Guide](#).

Axis M1013/M1011/206 Ethernet Camera



The Axis M1013, M1011 and Axis 206 Ethernet cameras are used for capturing images for vision processing and/or sending video back to the Driver Station laptop. The camera should be wired to a 5V power output on the Voltage Regulator Module and either the D-Link 1522 RevB (if used on the robot) or the ethernet port of the roboRIO. For more information, see [Configuring an Axis Camera](#) and the [Axis 206](#), [Axis M1011](#), [Axis M1013](#) pages.

Microsoft Lifecam HD3000



The Microsoft Lifecam HD3000 is a USB webcam that can be plugged directly into the roboRIO. The camera is capable of capturing up to 1280x720 video at 30 FPS. For more information about the camera, see the [Microsoft product page](#). For more information about using the camera with the roboRIO, see the Vision Processing section if this documentation.

D-Link DAP-1522 Rev B



The D-Link DAP-1522 Rev B robot radio is used to provide wireless communication functionality to the robot. The device can be configured as an Access Point for direct connection of a laptop for use at home. It can also be configured as a bridge for use on the field. The robot radio should be powered by one of the 5V outputs on the VRM and connected to the roboRIO controller over Ethernet. For more information, see [Programming your radio for home use](#) and the [D-Link DAP1522 Support Page](#).

120A Circuit Breaker



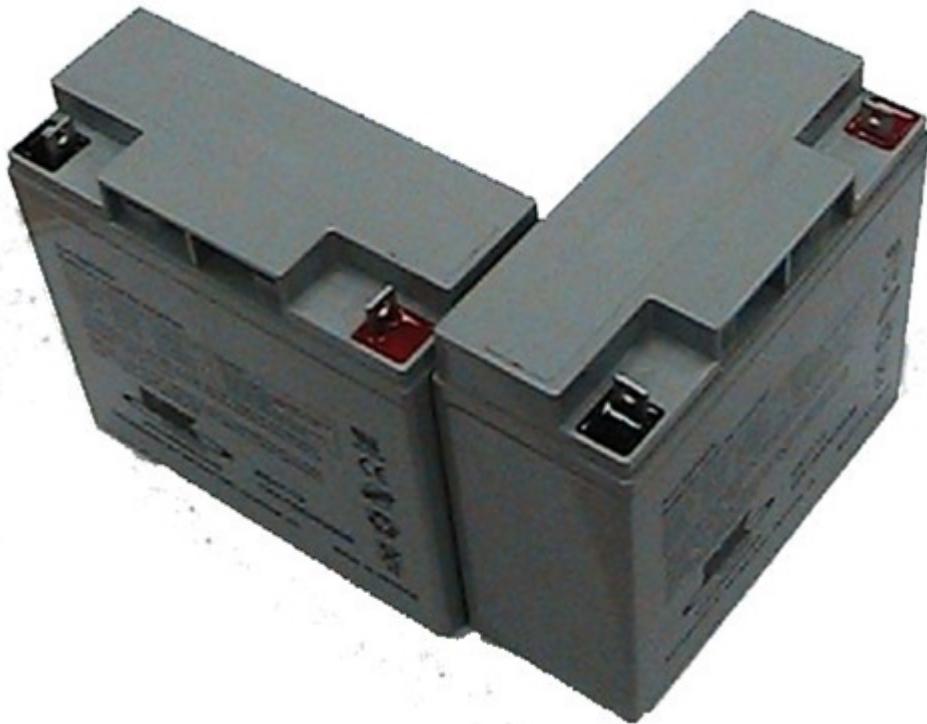
The 120A Main Circuit Breaker serves two roles on the robot: the main robot power switch and a protection device for downstream robot wiring and components. The 120A circuit breaker is wired to the positive terminals of the robot battery and Power Distribution boards. For more information, please see the [Cooper Bussmann 18X Series Datasheet](#) (PN: 185120F)

Snap Action Circuit Breakers



The Snap Action circuit breakers, MX5-A40 and VB3 series, are used with the Power Distribution Panel to limit current to branch circuits. The MX5-A40 40A MAXI style circuit breaker is used with the larger channels on the Power Distribution Panel to power loads which draw current up to 40A continuous. The VB3 series are used with the smaller channels on the PDP to power circuits drawing current of 30A or less continuous. For more information, see the Datasheets for the [MX5 series](#) and [VB3 Series](#).

Robot Battery



The power supply for an FRC robot is a single 12V 18Ah battery. The batteries used for FRC are sealed lead acid batteries capable of meeting the high current demands of an FRC robot. For more information, see the Datasheets for the [MK ES17-12](#) and [Enersys NP18-12](#). Note that other battery part numbers may be legal, consult the 2015 FRC Manual for a complete list.

Image credits

Image of roboRIO courtesy of [National Instruments](#). Images of Jaguar Motor Controller, Talon SRX, Victor 888 Motor Controller, Victor SP Motor Controller, and Spike H-Bridge Relay courtesy of [VEX Robotics, Inc.](#). Lifecam, PDP, PCM, and VRM photos courtesy of FIRST. All other photos courtesy of [AndyMark Inc.](#).



FRC

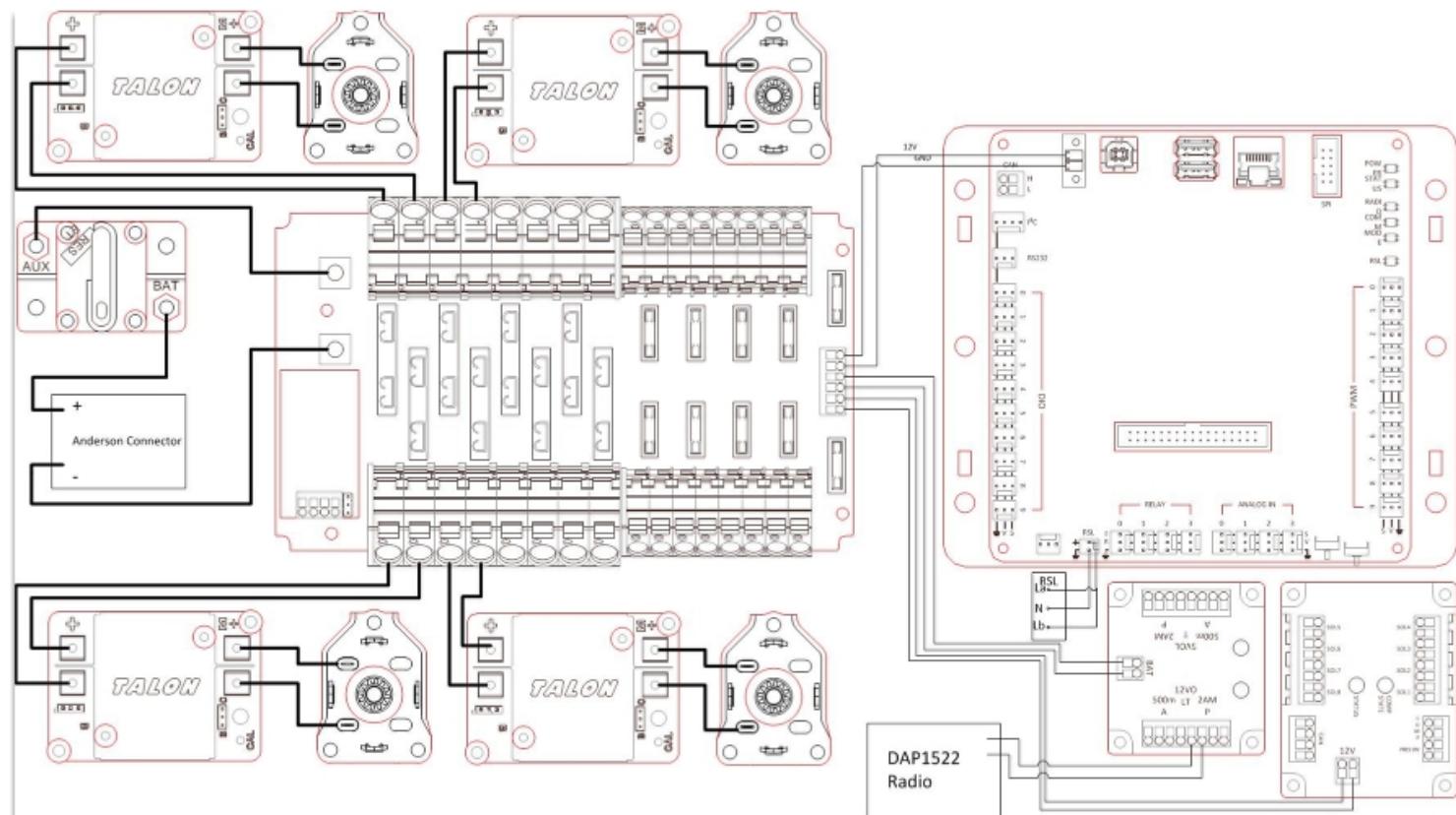
FIRST® Robotics Competition

Wiring the 2015 FRC Control System

This document details the wiring of a basic electronics board for bench-top testing.

The images shown in this section reflect the setup for a Robot Control System using a roboRIO and Talon SR motor controllers. The setup is similar for Jaguars, Talon SRXs, Victor 884/888s, or Victor SPs.

Gather Materials



Locate the following control system components and tools

- Kit Materials:
 - Power Distribution Panel (PDP)
 - roboRIO
 - Pneumatics Control Module (PCM)



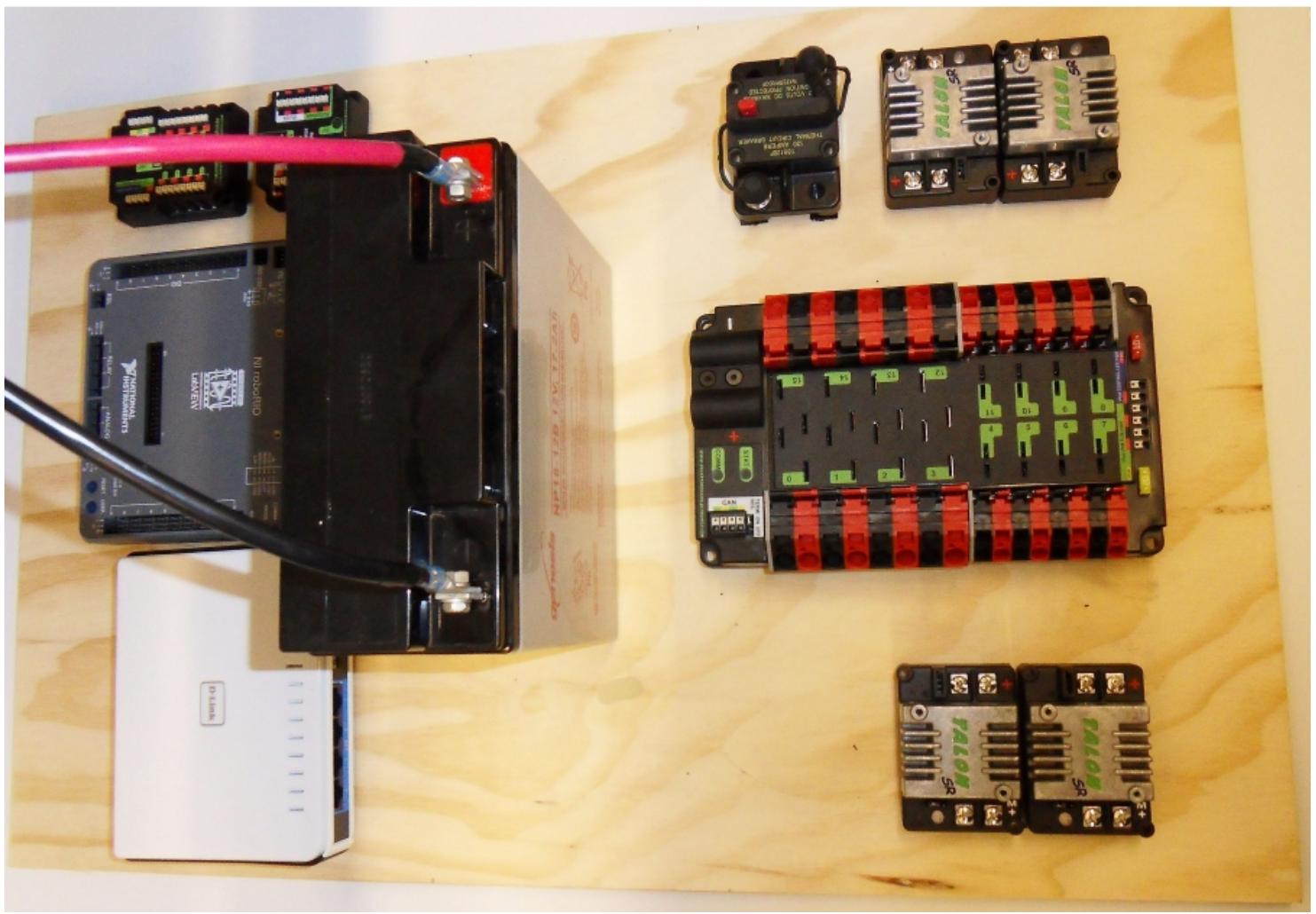
FIRST®Robotics Competition

- Voltage Regulator Module (VRM)
 - DAP1522 Radio (with power supply and Ethernet cable)
 - Robot Signal Light (RSL)
 - 2x Talon SR speed controllers
 - 2x PWM cables
 - 2x PWM y-cables
 - 120A Circuit breaker
 - 4x 40A Circuit breaker
 - 6 AWG Red wire
 - 10 AWG Red/Black wire
 - 18 AWG Red/Black wire
 - 22AWG yellow/green twisted CAN cable
 - 2x Andersen SB50 battery connectors
 - 6AWG Terminal lugs
 - 16x Yellow ring terminals (from bag of assorted crimp terminals)
 - 12V Battery
 - Red/Black Electrical tape
 - Dual Lock material or fasteners
 - Zip ties
 - 1/4" or 1/2" plywood
- Tools Required:
 - Wago Tool or small flat-head screwdriver
 - Very small flat head screwdriver (eyeglass repair size)
 - Philips head screw driver
 - 5mm Hex key (3/16" may work if metric is unavailable)
 - 1/16" Hex key
 - Wire cutters, strippers, and crimpers
 - 7/16" box end wrench or nut driver

Create the Base for the Control System

For a benchtop test board, cut piece of 1/4" or 1/2" material (wood or plastic) approximately 24" x 16". For a Robot Quick Build control board see the supporting documentation for the proper size board for the chosen chassis configuration.

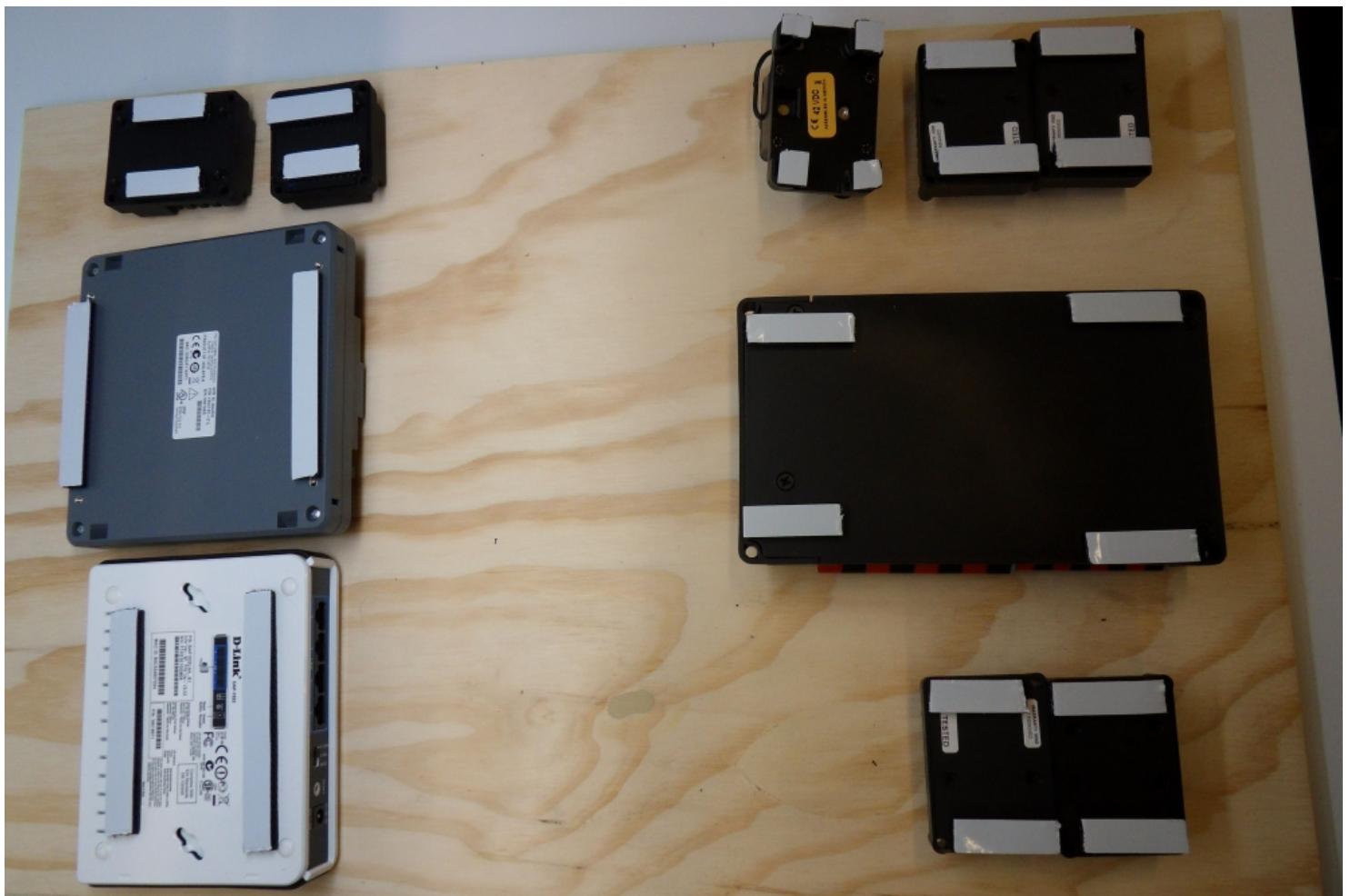
Layout the Core Control System Components



Layout the components on the board. One layout that should work is shown in the images above.

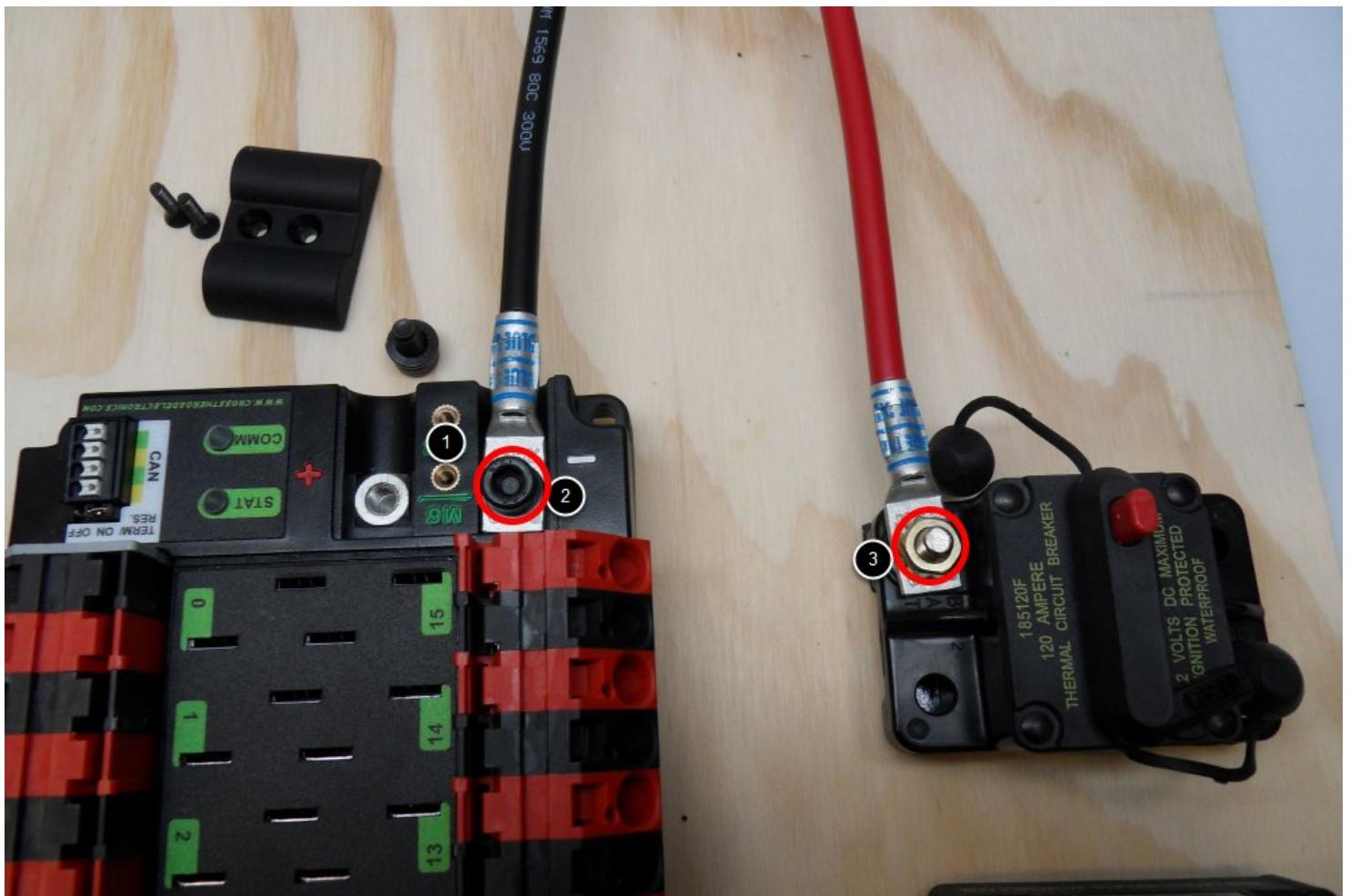
Note: If creating the board for a robot chassis, per the QuickBuild instructions for the **long orientation**, you may wish to turn the battery 90 degrees clockwise compared to the image above and spread the components on each side accordingly in order to accommodate building a box to retain the battery without hitting the CIM motors.

Fasten components



Using the Dual Lock or hardware, fasten all components to the board. The image shows an example of possible Dual Lock placement.

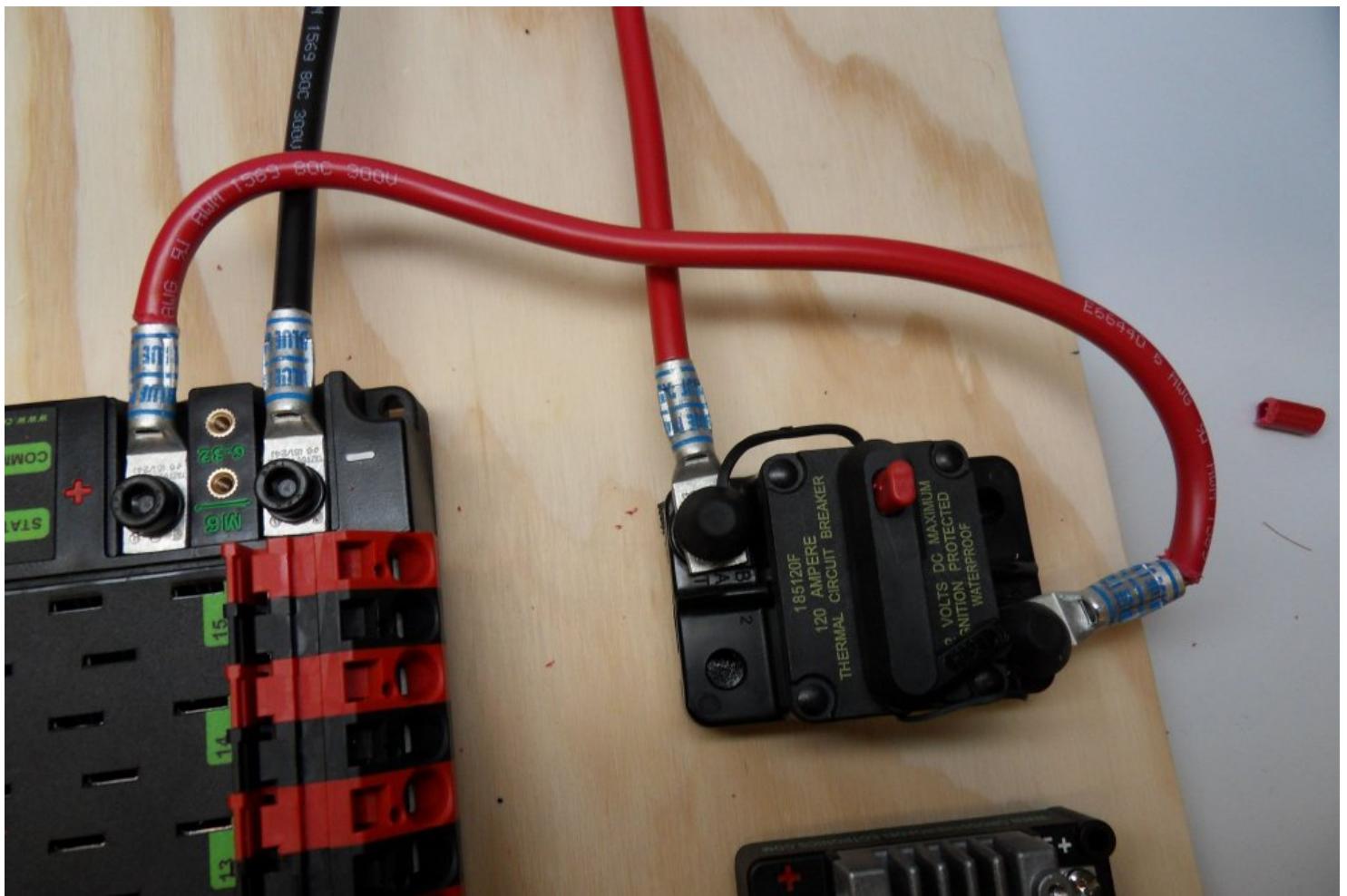
Attach Battery Connector to PDP



Requires: Battery Connector, 6AWG terminal lugs, 1/16" Allen, 5mm Allen, 7/16" Box end

1. Attach terminal lugs to battery connector.
2. Using a 1/16" Allen wrench, remove the two screws securing the PDP terminal cover.
3. Using a 5mm Allen wrench (3/16" will work if metric is not available), remove the negative (-) bolt and washer from the PDP and fasten the negative terminal of the battery connector.
4. Using a 7/16" box end wrench, remove the nut on the "Batt" side of the main breaker and secure the positive terminal of the battery connector

Wire Breaker to PDP

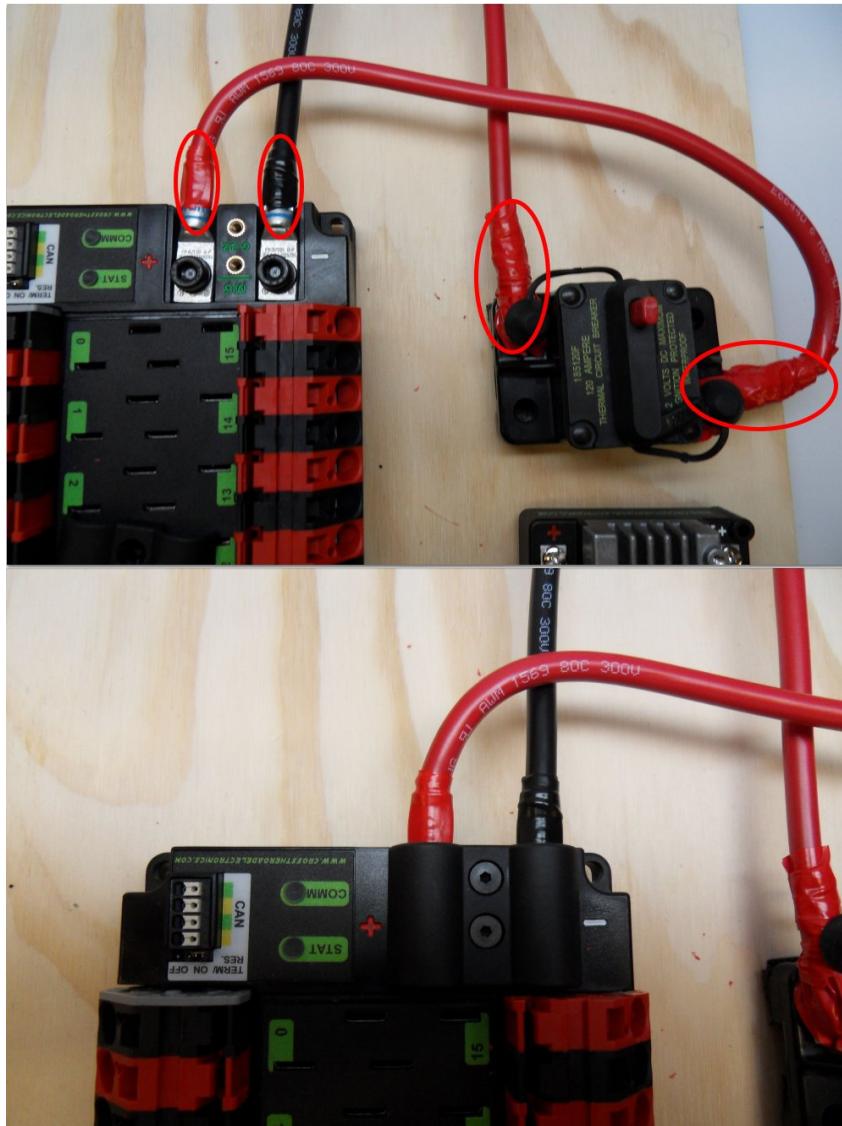


Requires: 6AWG red wire, 2x 6AWG terminal lugs, 5mm Allen, 7/16" box end

Secure one terminal lug to the end of the 6AWG red wire. Using the 7/16" box end, remove the nut from the "AUX" side of the 120A main breaker and place the terminal over the stud. Loosely secure the nut (you may wish to remove it shortly to cut, strip, and crimp the other end of the wire). Measure out the length of wire required to reach the positive terminal of the PDP.

1. Cut, strip, and crimp the terminal to the 2nd end of the red 6AWG wire.
2. Using the 7/16" box end, secure the wire to the "AUX" side of the 120A main breaker.
3. Using the 5mm, secure the other end to the PDP positive terminal.

Insulate PDP connections



Requires: 1/16" Allen, Electrical tape

1. Using electrical tape, insulate the two connections to the 120A breaker. Also insulate any part of the PDP terminals which will be exposed when the cover is replaced. One method for insulating the main breaker connections is to wrap the stud and nut first, then use the tape wrapped around the terminal and wire to secure the tape.
2. Using the 1/16" Allen wrench, replace the PDP terminal cover

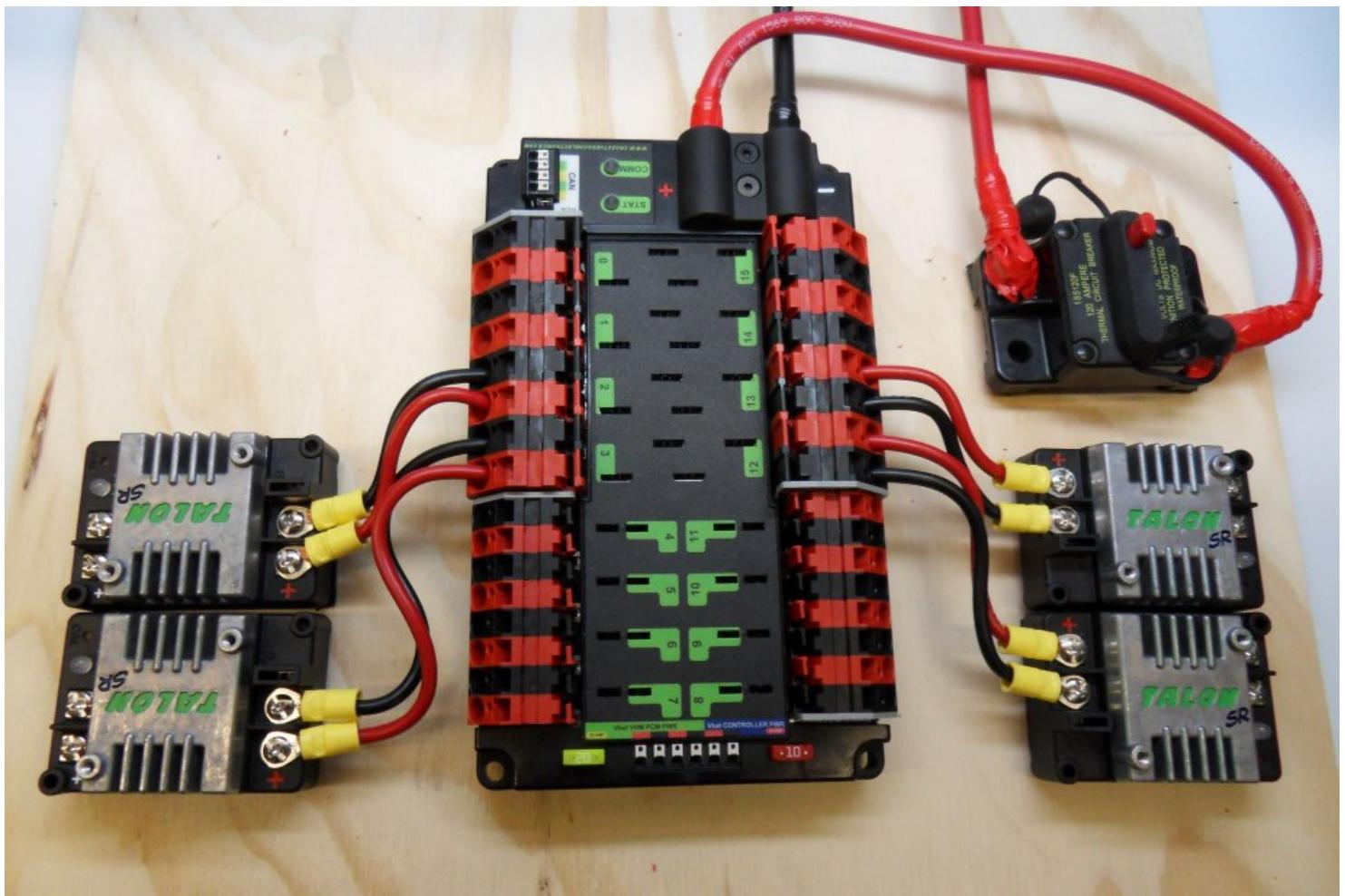
Wago connectors

The next step will involve using the Wago connectors on the PDP. To use the Wago connectors, insert a small flat blade screwdriver into the rectangular hole at a shallow angle then angle the screwdriver upwards as you continue to press in to actuate the lever, opening the terminal. Two sizes of Wago connector are found on the PDP:

- Small Wago connector: Accepts 10AWG-24AWG, strip 11-12mm (~7/16")
- Large Wago connector: Accepts 6AWG-12AWG, strip 12-13mm(~1/2")

To maximize pullout force and minimize connection resistance wires should not be tinned (and ideally not twisted) before inserting into the Wago connector.

Motor Controller Power

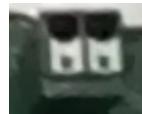


Requires: Wire Stripper, Wire Crimper, Small Flat Screwdriver, Phillips Head Screwdriver, 10AWG red and black wire, 8x yellow ring terminals

For each of the 4 Talon SR motor controllers:

1. Strip the ends of the 10AWG red and black wire and crimp a yellow ring terminal on each
2. Using the Phillips head screwdriver, remove the Talon SR power input screws (side with the red +) and secure the wires to the Talon.
3. Measure the wire needed to reach the Wago connector pair to be used (large 40A terminal pairs). Make sure to consider the wire that will be stripped and inserted into the connector.
4. Cut and strip the wire, then insert into the Wago terminals

Weidmuller Connectors

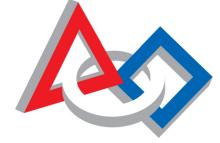


A number of the CAN and power connectors in the system use a Weidmuller LSF series wire-to-board connector. There are a few things to keep in mind when using this connector for best results:

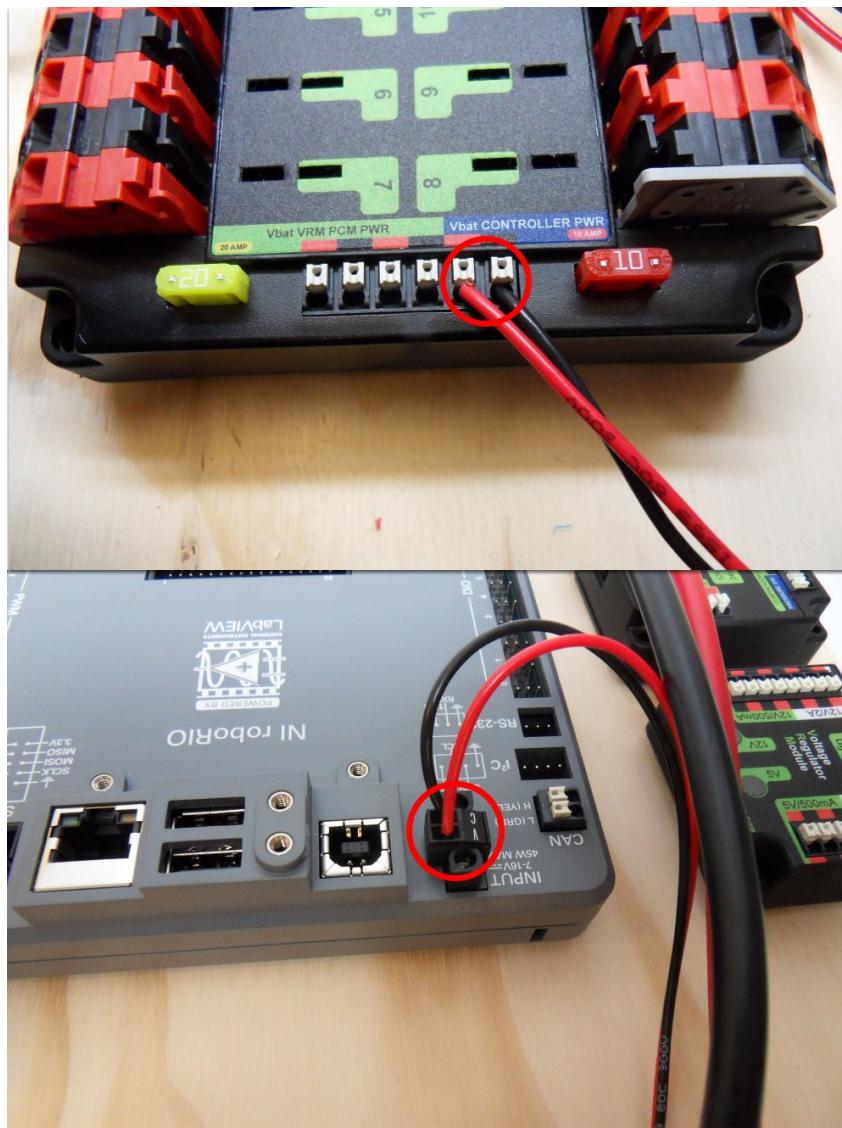
- Wire should be 16AWG to 24AWG (consult rules to verify required gauge for power wiring)
- Wire ends should be stripped approximately 5/16"
- To insert or remove the wire, press down on the corresponding "button" to open the terminal

After making the connection check to be sure that it is clean and secure:

- Verify that there are no "whiskers" outside the connector that may cause a short circuit
- Tug on the wire to verify that it is seated fully. If the wire comes out and is the correct gauge it needs to be inserted further and/or stripped back further.



roboRIO Power

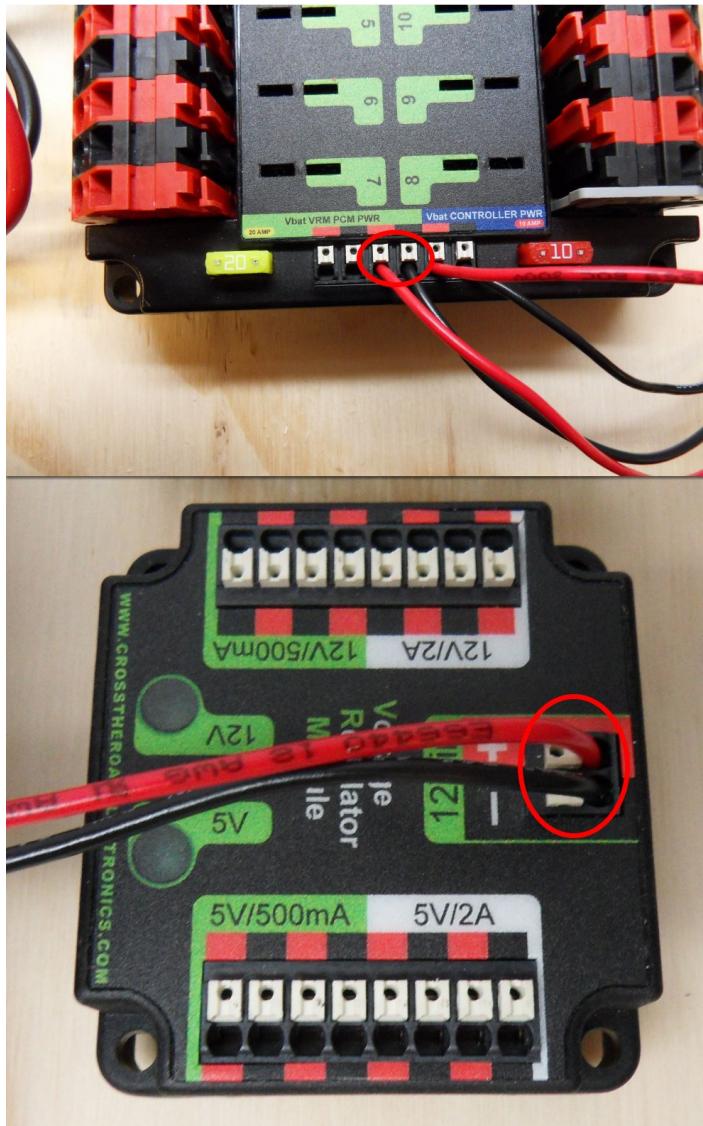


Requires: Wire stripper, very small flat screwdriver, 18AWG Red and Black

1. Strip ~5/16" on both the red and black 18AWG wire and connect to the "Vbat Controller PWR" terminals on the PDB
2. Measure the required length to reach the power input on the roboRIO. Take care to leave enough length to route the wires around any other components such as the battery and to allow for any strain relief or cable management.
3. Cut and strip the wire.

- Using a very small flat screwdriver connect the wires to the power input connector of the roboRIO (red to V, black to C)

Voltage Regulator Module Power

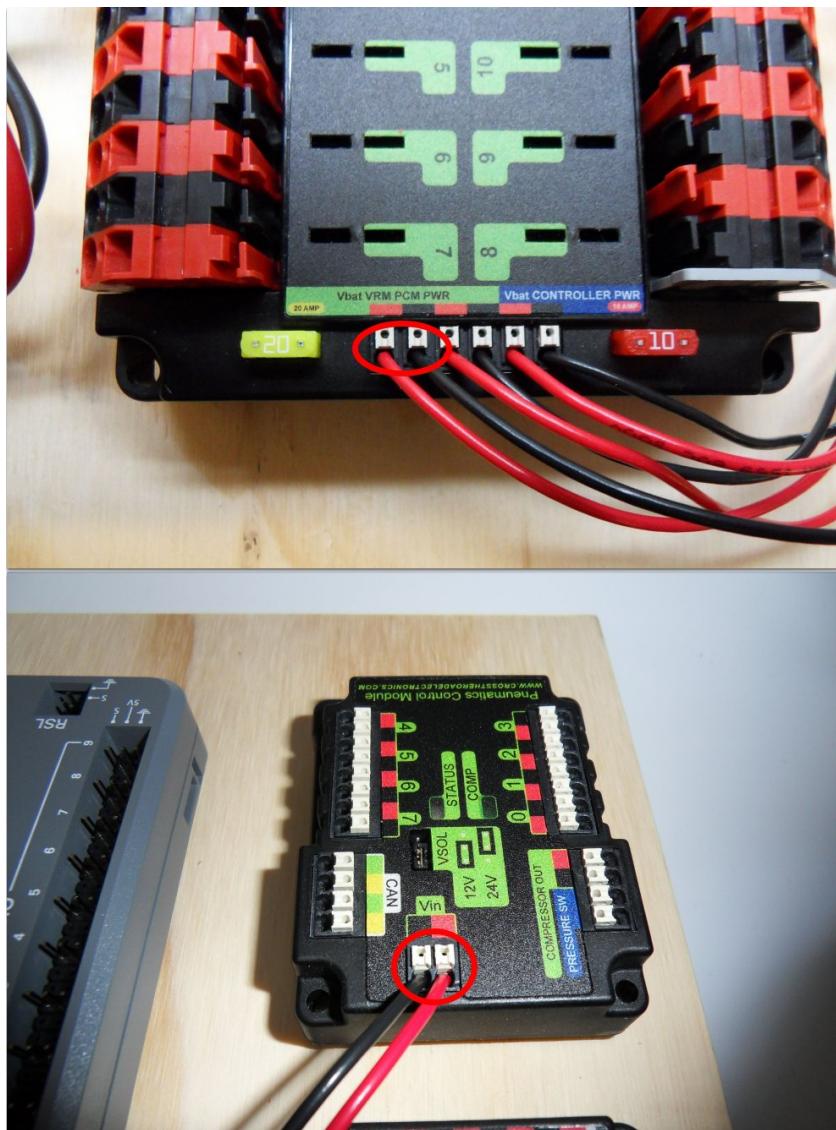


Requires: Wire stripper, small flat screwdriver (optional), 18AWG red and black wire

- Strip ~5/16" on the end of the red and black 18AWG wire.
- Connect the wire to one of the two terminal pairs labeled "Vbat VRM PCM PWR" on the PDP.

3. Measure the length required to reach the "12Vin" terminals on the VRM. Take care to leave enough length to route the wires around any other components such as the battery and to allow for any strain relief or cable management.
4. Cut and strip ~5/16" from the end of the wire.
5. Connect the wire to the VRM 12Vin terminals.

Pneumatics Control Module Power (Optional)



Requires: Wire stripper, small flat screwdriver (optional), 18AWG red and black wire

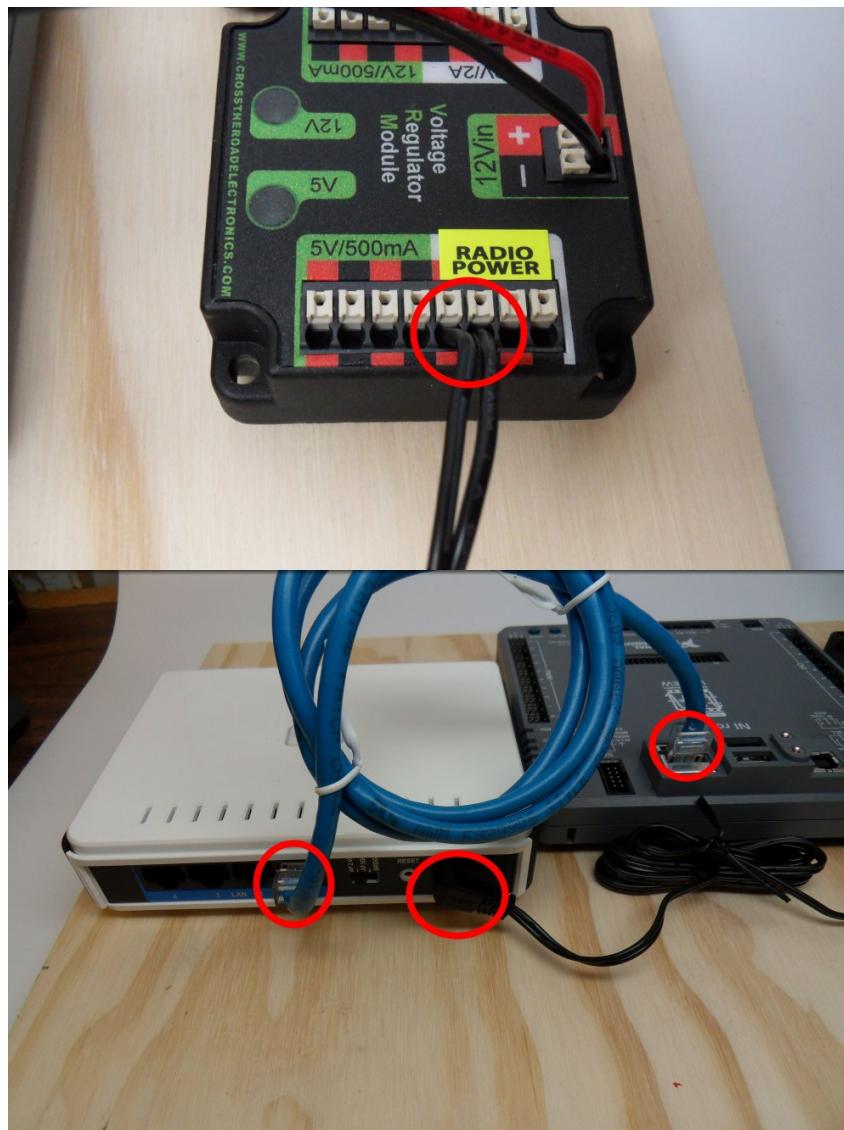
Note: The PCM is an optional component used for controlling pneumatics on the robot.



FIRST®Robotics Competition

1. Strip ~5/16" on the end of the red and black 18AWG wire.
2. Connect the wire to one of the two terminal pairs labeled "Vbat VRM PCM PWR" on the PDP.
3. Measure the length required to reach the "Vin" terminals on the VRM. Take care to leave enough length to route the wires around any other components such as the battery and to allow for any strain relief or cable management.
4. Cut and strip ~5/16" from the end of the wire.
5. Connect the wire to the VRM 12Vin terminals.

Radio Power and Ethernet



Requires: Wire stripper, small flat screwdriver (optional), DAP1522 power supply, DAP 1522 Ethernet cable

1. Cut off the "Wall wart" of the DAP1522 power supply (the end that plugs into the AC wall outlet). It is recommended to leave a small pigtail on the wall-wart if you wish to retain it for future use. Leave the radio side of the wire as long as possible in case you decide to relocate your radio later.
2. Strip ~5/16" off of each wire on the power cord.

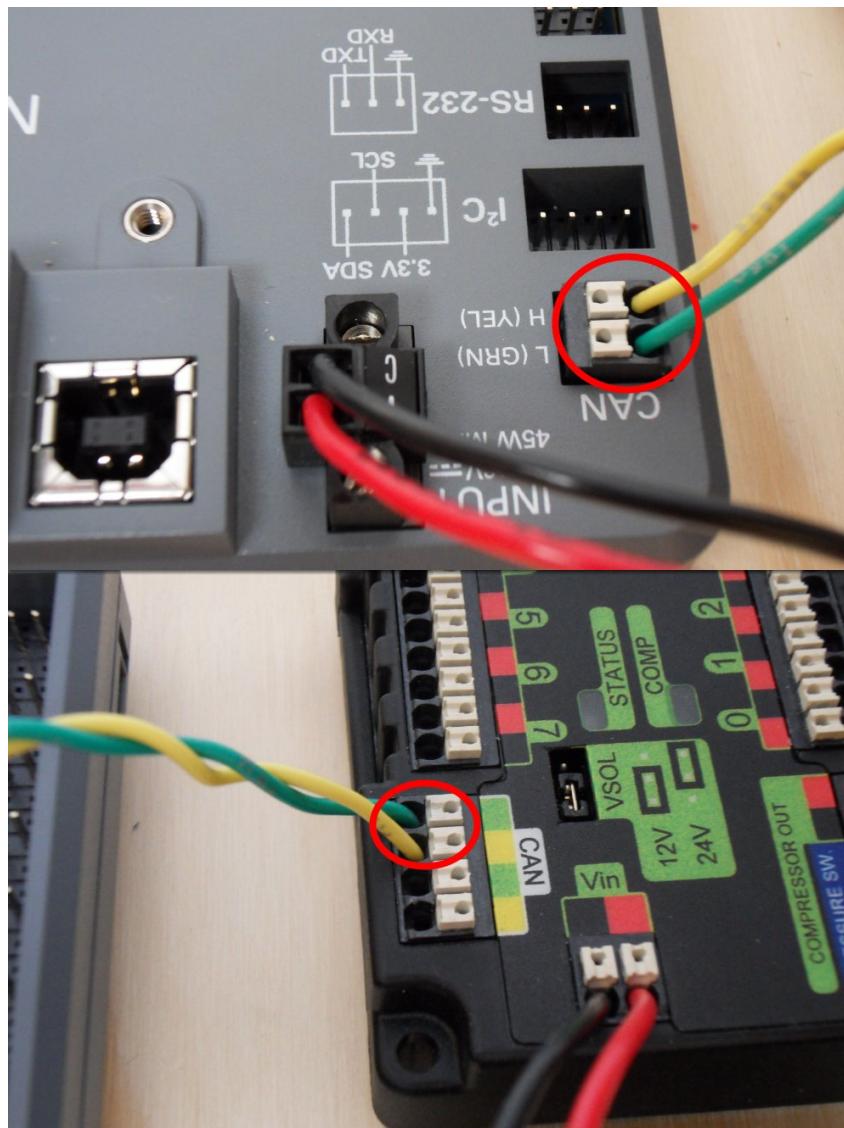


FIRST®Robotics Competition

3. Locate the wire with the white stripes on it (one wire has white stripes, the other has writing) and attach it to either of the two red terminals on the "Radio Power" supply of the VRM.
4. Connect the other wire (with writing on it) to the black terminal immediately to the right of the red terminal used above.
5. Plug the barrel connector into the back of the DAP1522
6. Plug the Ethernet cable into any of the four ports on the back of the DAP 1522 and into the roboRIO.

Note: If you wish to verify the polarity of the radio power connection using a DMM or Continuity tester, the connector is center pin positive. This means that the wire connecting to the red terminal should be connected to the center of the connector, the wire connecting to the black terminal should be connected to the outside of the connector.

RoboRIO to PCM CAN



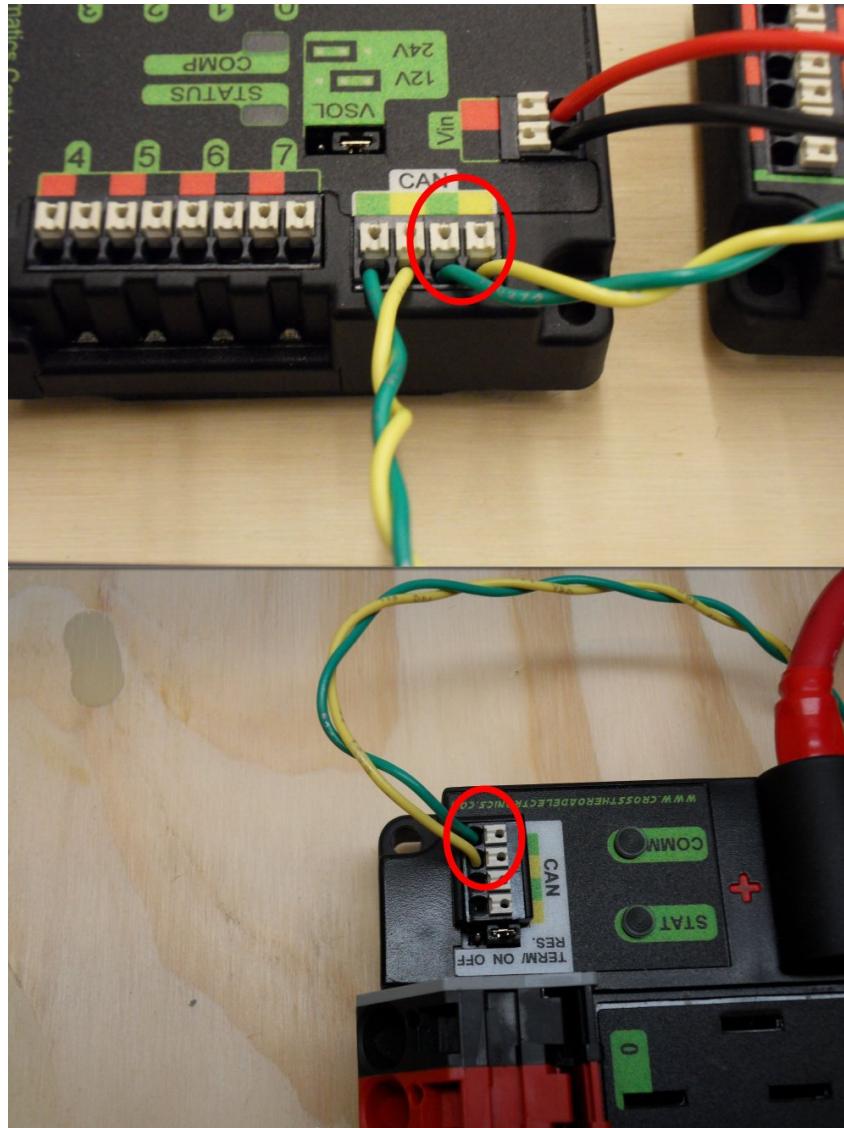
Requires: Wire stripper, small flat screwdriver (optional), yellow/green twisted CAN cable

Note: The PCM is an optional component used for controlling pneumatics on the robot. If you are not using the PCM, wire the CAN connection directly from the roboRIO (shown in this step) to the PDP (show in the next step).

1. Strip ~5/16" off of each of the CAN wires.

2. Insert the wires into the appropriate CAN terminals on the roboRIO (Yellow->YEL, Green->GRN).
3. Measure the length required to reach the CAN terminals of the PCM (either of the two available pairs). Cut and strip ~5/16" off this end of the wires.
4. Insert the wires into the appropriate color coded CAN terminals on the PCM. You may use either of the Yellow/Green terminal pairs on the PCM, there is no defined in or out.

PCM to PDP CAN



Requires: Wire stripper, small flat screwdriver (optional), yellow/green twisted CAN cable



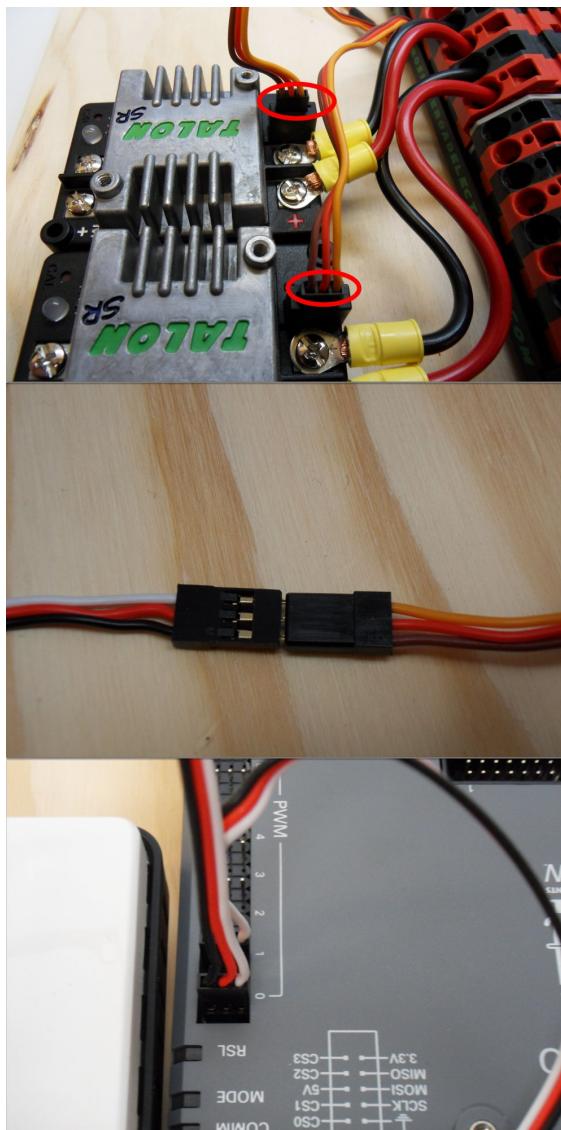
FIRST®Robotics Competition

Note: The PCM is an optional component used for controlling pneumatics on the robot. If you are not using the PCM, wire the CAN connection directly from the roboRIO (shown in the above step) to the PDP (show in this step).

1. Strip ~5/16" off of each of the CAN wires.
2. Insert the wires into the appropriate CAN terminals on the PCM.
3. Measure the length required to reach the CAN terminals of the PDP (either of the two available pairs). Cut and strip ~5/16" off this end of the wires.
4. Insert the wires into the appropriate color coded CAN terminals on the PDP. You may use either of the Yellow/Green terminal pairs on the PCM, there is no defined in or out.

Note: The PDP ships with the CAN bus terminating resistor jumper in the "ON" position. It is recommended to leave the jumper in this position and place any additional CAN nodes between the roboRIO and the PDP (leaving the PDP as the end of the bus). If you wish to place the PDP in the middle of the bus (utilizing both pairs of PDP CAN terminals) move the jumper to the "OFF" position and place your own 120 ohm terminating resistor at the end of your CAN bus chain.

PWM Cables



Requires: 2x PWM Y-cable, 2x PWM cable

For each pair of Talon SRs:

1. Connect 1 PWM Y-cable to the two Talons. The brown wire on the Y-cable should face the inside of the Talon (towards the B mark on the device)
2. Connect the PWM cable to the Y-cable. The brown wire on the Y-cable corresponds to the black wire on the regular PWM cable.

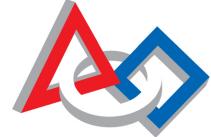
3. Connect the PWM cable to one of the PWM ports on the roboRIO. The black wire should be towards the outside of the roboRIO. It is recommended to connect the left side to PWM 0 and the right side to PWM 1 for the most straightforward programming experience, but any channel will work as long as you note which side goes to which channel and adjust the code accordingly.

Robot Signal Light



Requires: Wire stripper, 2 pin cable, Robot Signal Light, 18AWG red wire, very small flat screwdriver

1. Cut one end off of the 2 pin cable and strip both wires
2. Insert the black wire into the center, "N" terminal and tighten the terminal.



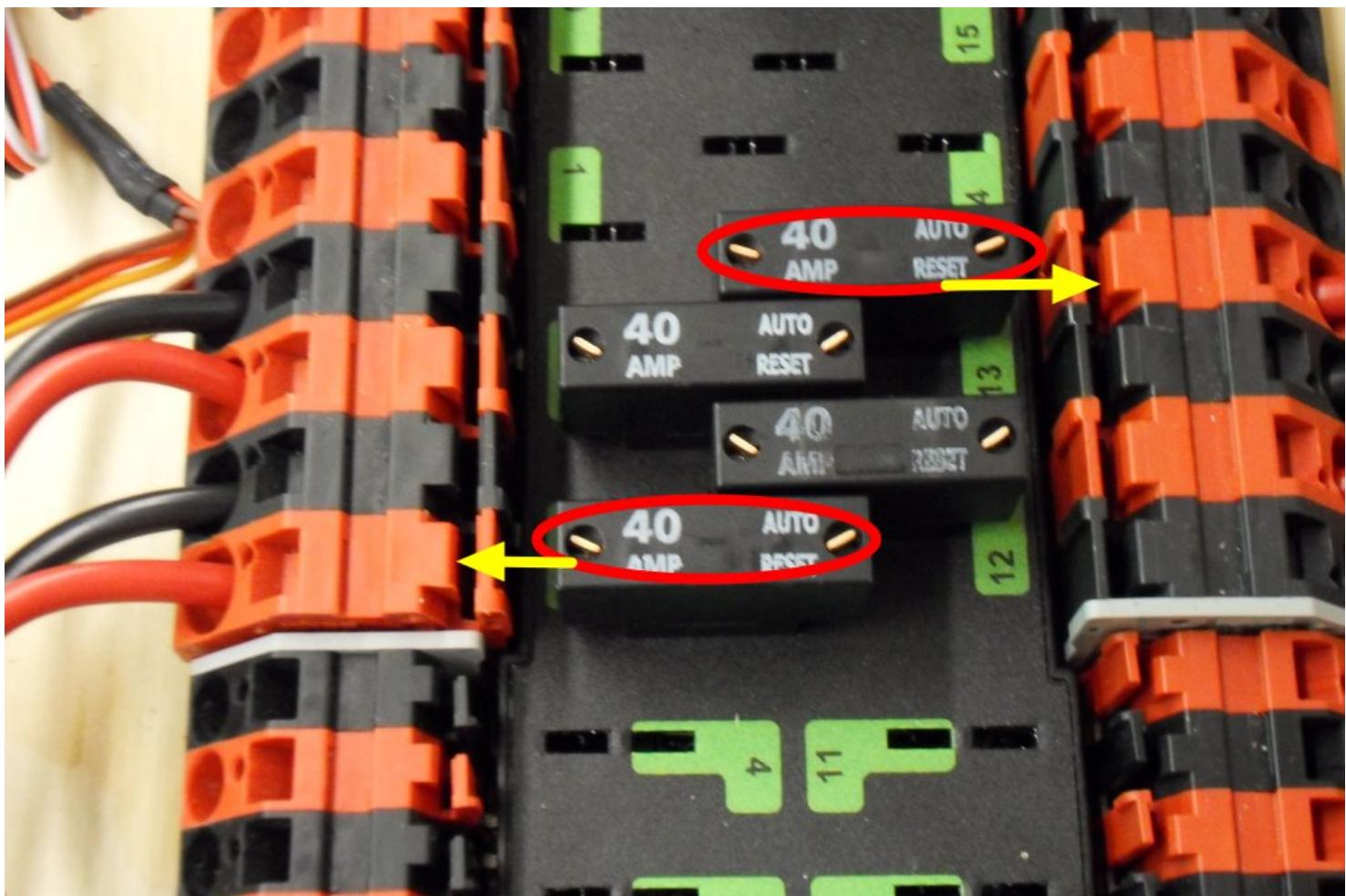
FRC

FIRST® Robotics Competition

3. Strip the 18AWG red wire and insert into the "La" terminal and tighten the terminal.
4. Cut and strip the other end of the 18AWG wire to insert into the "Lb" terminal
5. Insert the red wire from the two pin cable into the "Lb" terminal with the 18AWG red wire and tighten the terminal.
6. Connect the two-pin connector to the RSL port on the roboRIO. The black wire should be closest to the outside of the roboRIO.

You may wish to temporarily secure the RSL to the control board using zip ties or Dual Lock (it is recommended to move the RSL to a more visible location as the robot is being constructed)

Circuit Breakers

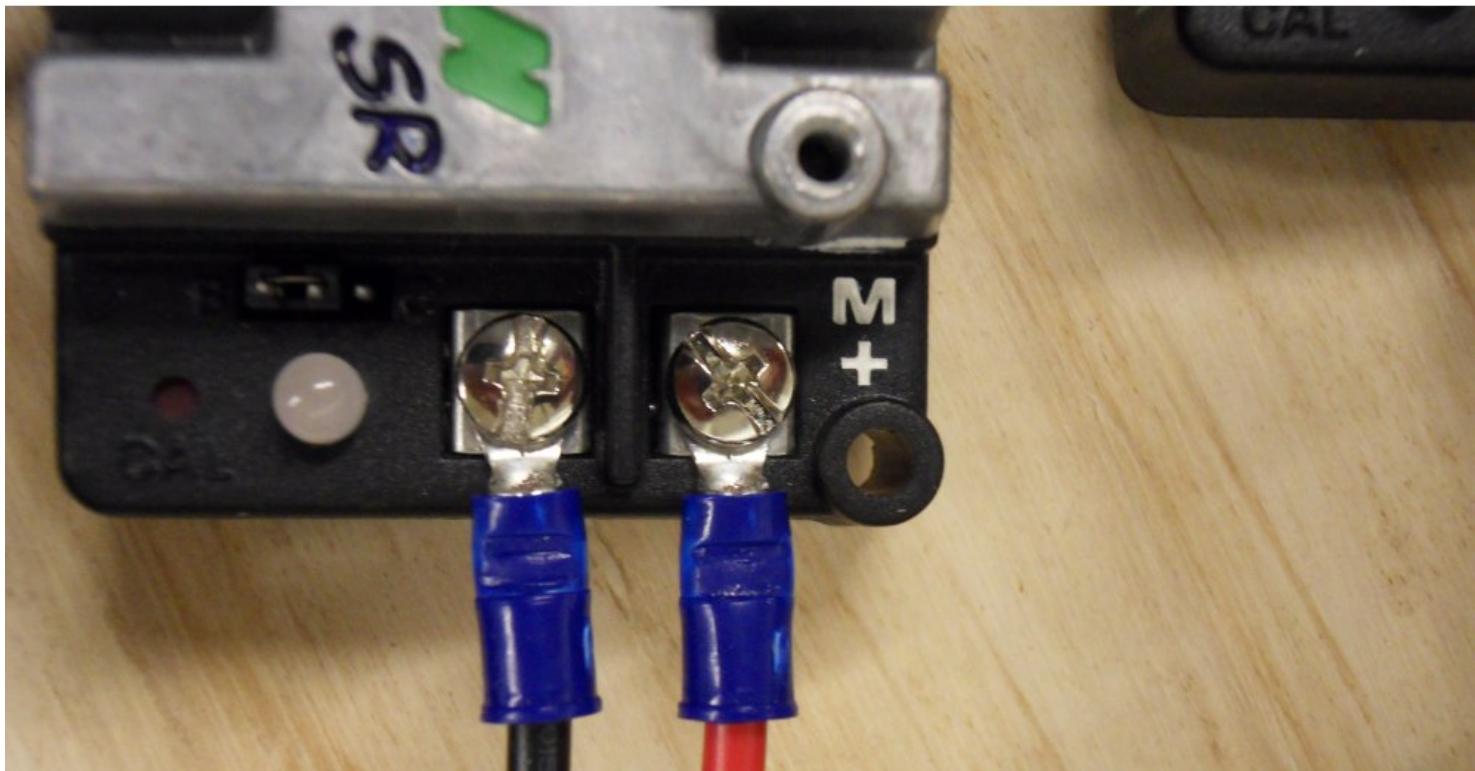


Requires: 4x 40A circuit breakers

Insert 40-amp Circuit Breakers into the positions on the PDP corresponding with the Wago connectors the Talons are connected to. Note that, for all breakers, the breaker corresponds with the nearest positive (red) terminal (see graphic above). All negative terminals on the board are directly connected internally.

If working on a Robot Quick Build, stop here and insert the board into the robot chassis before continuing.

Motor Power

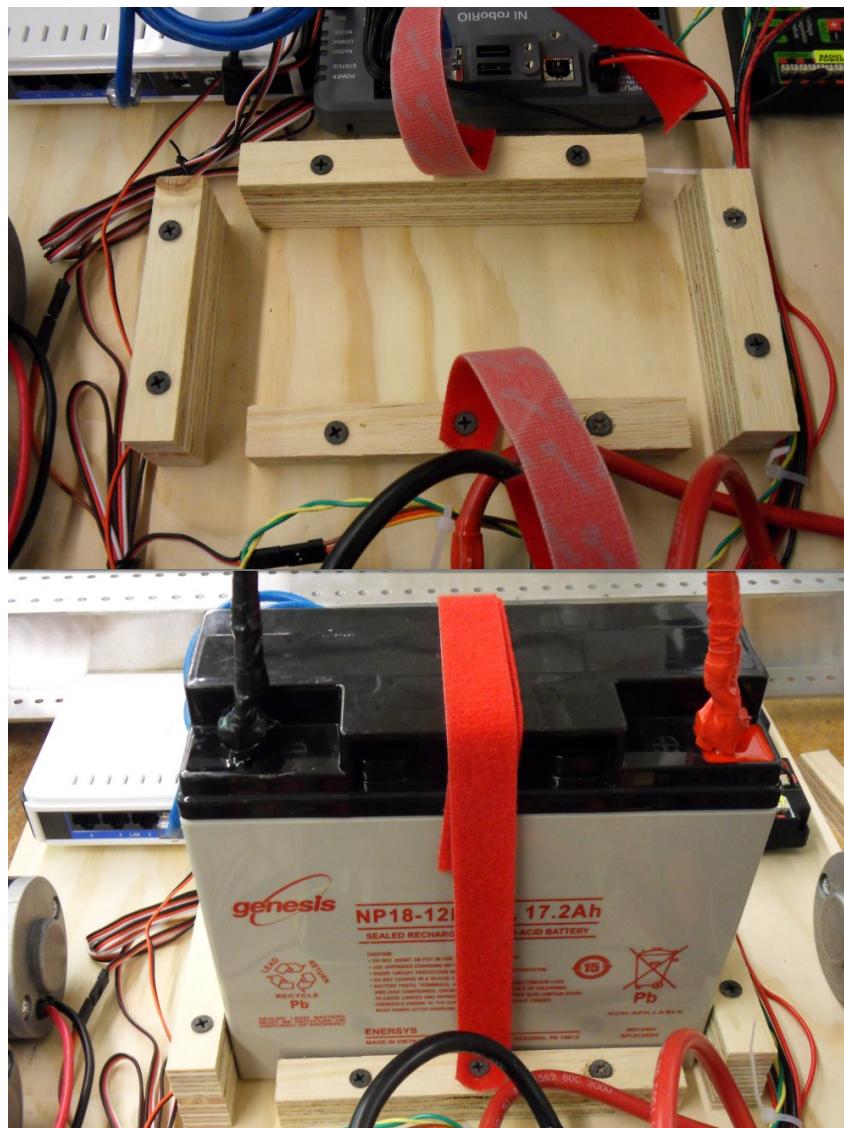


Requires: Wire stripper, wire crimper, phillips head screwdriver, 8x blue ring crimp terminals

For each CIM motor:

1. Strip the ends of the red and black wires and crimp on a blue ring crimp terminal on each
2. Select a Talon to control that motor and connect the terminals to the Talon outputs (it is recommended to put the red wire on the M+ output)

Battery Box



Requires: Plywood Scraps, plywood cutting tool (e.g. saw), 10x 2" wood screws, drill, 1/8" drill bit, Philips head driver bit or philips head screwdriver, velcro wrap

Construct a battery box. the design shown uses scraps of plywood left over from cutting out the electronics board (4 pieces 4"x1.5" for the short sides of the battery stacked 2 high, 3 pieces 6"x1.5" for the front and back stacked 2 high in the back). Use the velcro wrap to make a pair of straps which will overlap to secure the battery

STOP



STOP!!

Before plugging in the battery, make sure all connections have been made with the proper polarity. Ideally have someone that did not wire the robot check to make sure all connections are correct.

- Start with the battery and verify that the red wire is connected to the positive terminal
- Check that the red wire passes through the main breaker and to the + terminal of the PDP and that the black wire travels directly to the - terminal.
- For each motor controller, verify that the red wire goes from the red PDP terminal to the Talon input labeled with the red + (not the white M+!!!!)
- For each device on the end of the PDP, verify that the red wire connects to the red terminal on the PDP and the red terminal on the component.



- Verify that the wire with the white stripe on the radio power supply is connected to the red terminal of the Radio supply on the VRM

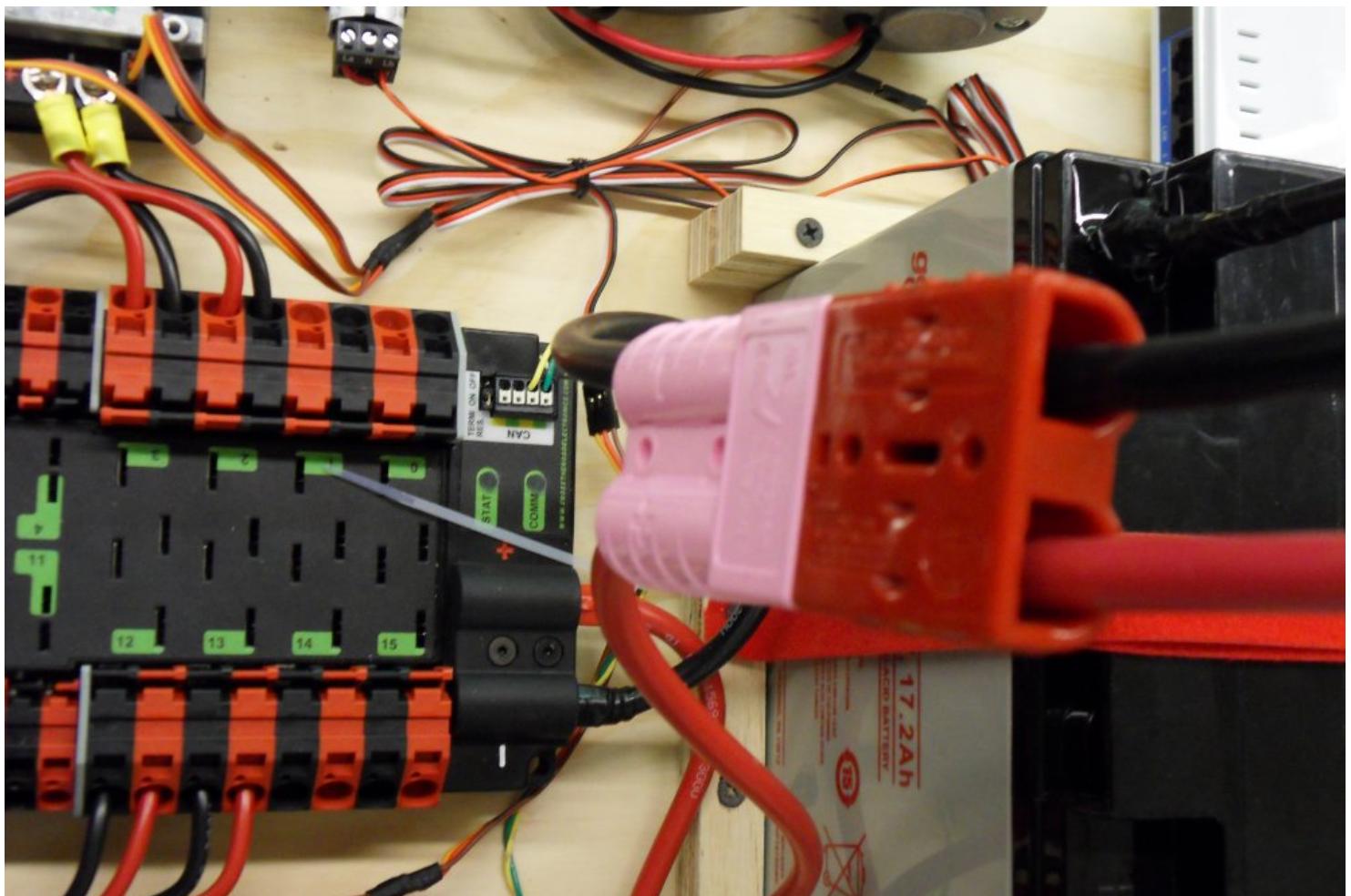
It is also recommended to put the robot on blocks so the wheels are off the ground before proceeding. This will prevent any unexpected movement from becoming dangerous.

Manage Wires

Requires: Zip ties

Now may be a good time to add a few zip ties to manage some of the wires before proceeding. This will help keep the robot wiring neat.

Connect Battery



Connect the battery to the robot side of the Andersen connector. Power on the robot by moving the lever on the top of the 120A main breaker into the ridge on the top of the housing.

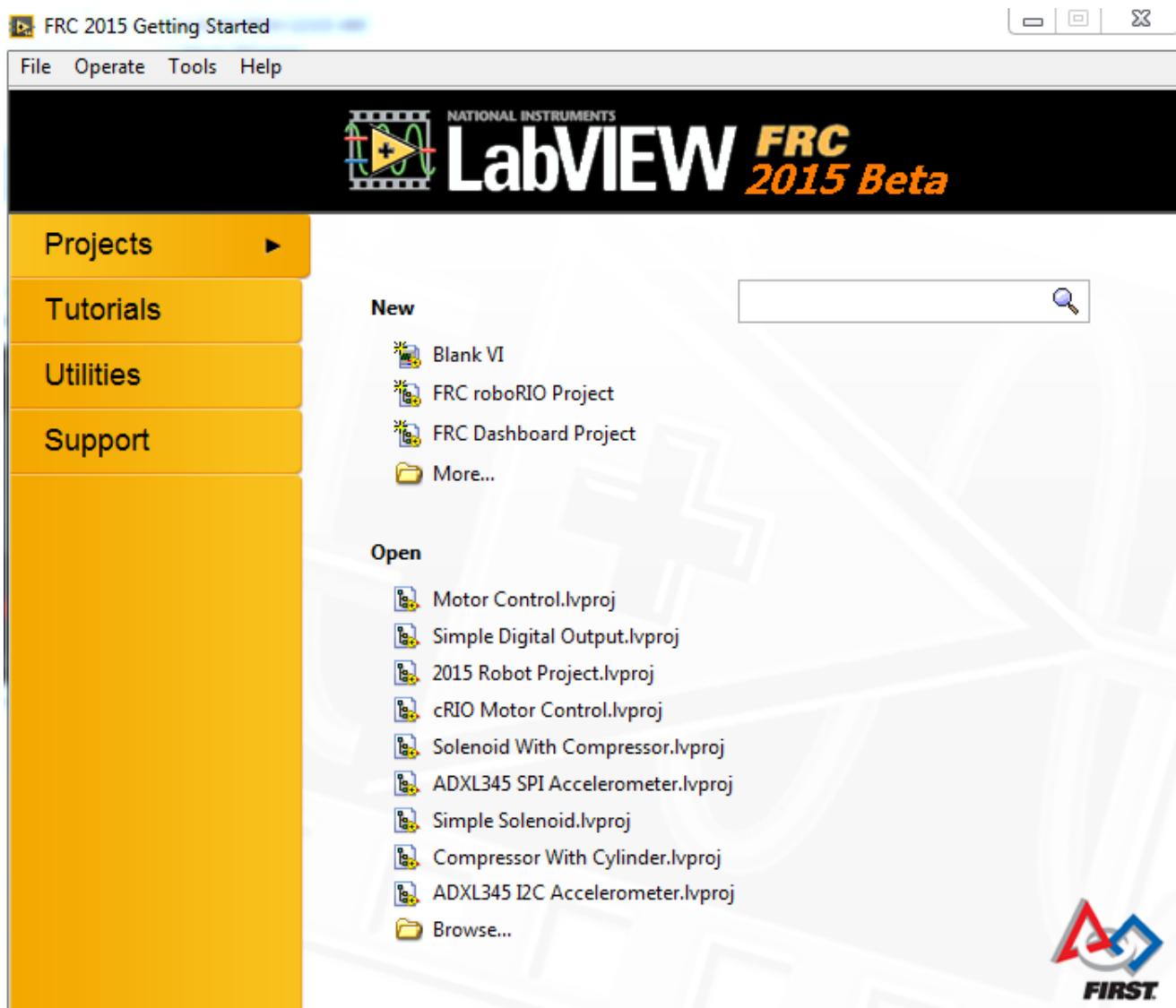
2015 FRC Software Component Overview

The 2015 FRC Control System consists of a wide variety of mandatory and optional software components designed to assist you in the design, development and debugging of your robot code, control robot operation, and provide feedback to assist with troubleshooting. For each software component this document will provide a brief overview of its purpose, a link to the package download if appropriate, and a link to further documentation where available.



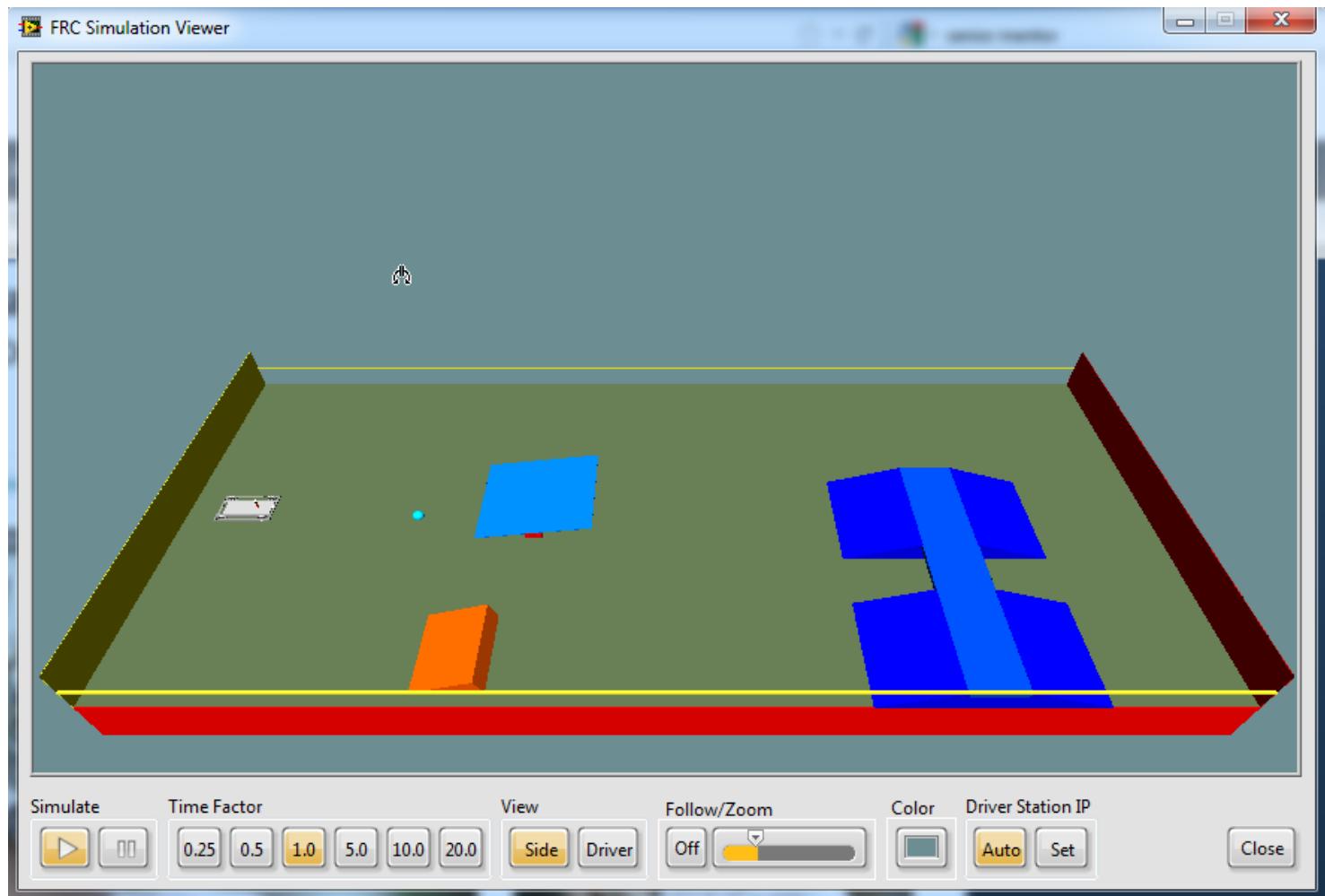
FIRST®Robotics Competition

LabVIEW FRC 2015



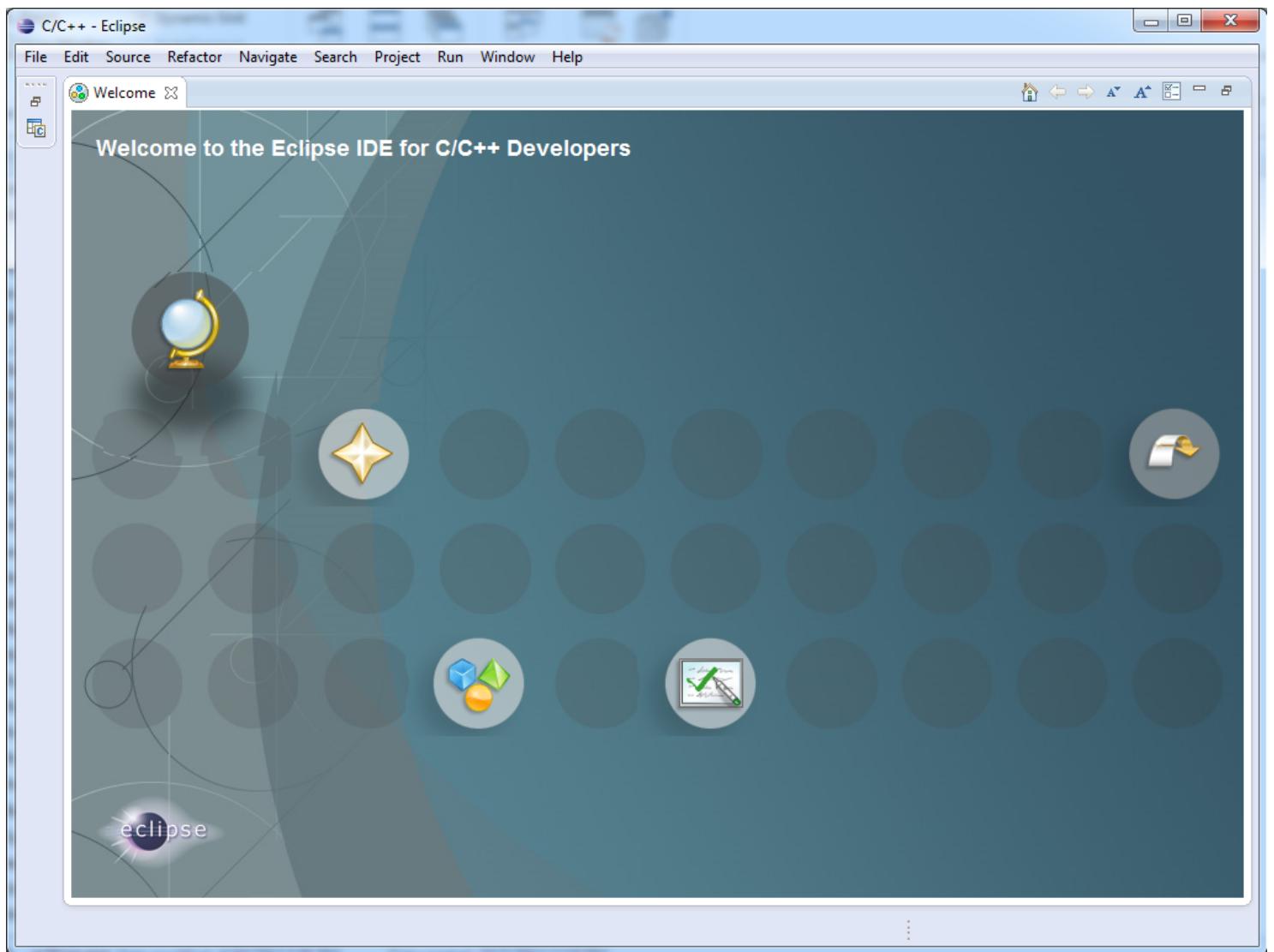
LabVIEW FRC 2015, based on National Instruments' LabVIEW 2014, is the development environment for LabVIEW, one of the three officially supported languages for programming an FRC Robot in 2015. LabVIEW is a graphical, dataflow-driven language. LabVIEW programs consist of a collection of icons, called VIs, wired together with wires which pass data between the VIs. The LabVIEW FRC 2015 installer is distributed on a DVD found in the Kickoff Kit of Parts and is also available for download [here](#). Instructions for installing the FRC libraries (package also includes Driver Station and Utilities) can be found [here](#). A guide to getting started with the LabVIEW FRC 2015 software, including installation instructions can be found [here](#).

FRC Robot Simulator



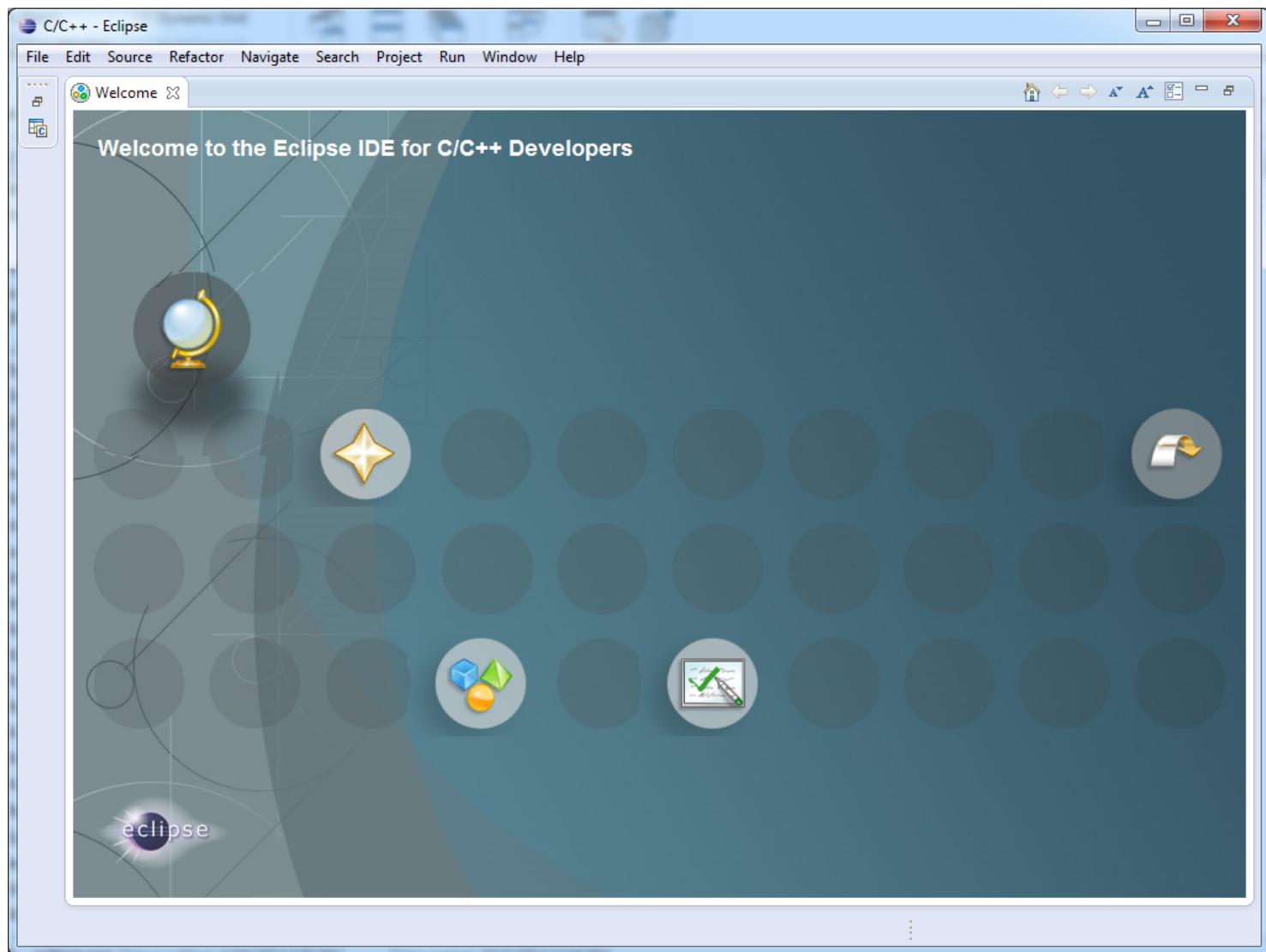
The FRC Robot Simulator is a component of the LabVIEW programming environment that allows you to operate a predefined robot in a simulated environment to test code and/or Driver Station functions. It utilizes a LabVIEW code project as the robot code and communicates with the FRC Driver Station for robot control and the FRC Default Dashboard for robot feedback. The FRC Robot Simulator is installed with LabVIEW FRC 2015. The LabVIEW FRC 2015 installer is distributed on a DVD found in the Kickoff Kit of Parts and is available for download [here](#). Instructions for installing the language specific update can be found [here](#). Information on using the FRC Robot Simulator can be found by opening the Robot Simulation Readme.html file in the LabVIEW Project Explorer.

Eclipse IDE for C/C++ Developers



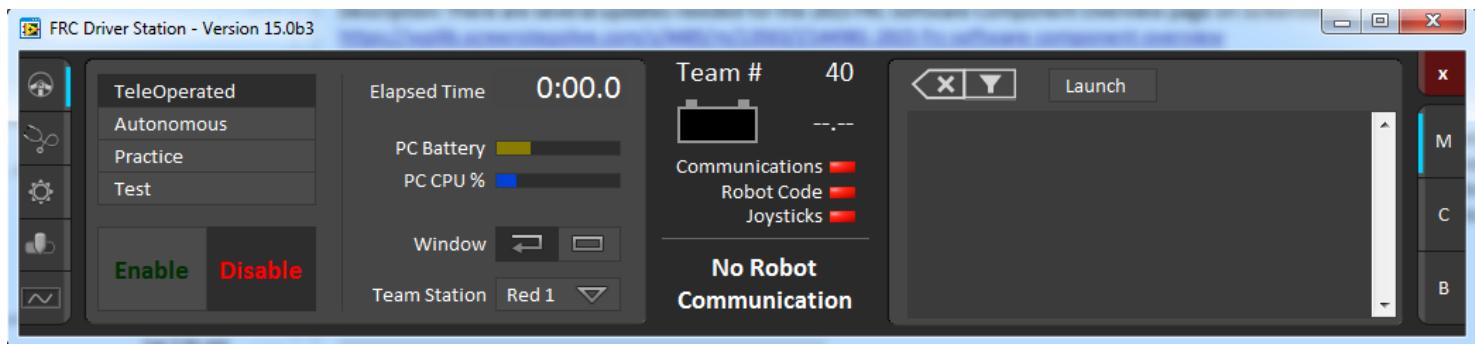
Eclipse IDE for C/C++ Developers is the supported development environment for C++, one of the three supported languages used for programming an FRC robot in 2015. C++ is an object-oriented text based programming language. A program in C++ (for FRC) consists of a number of header (.h) and implementation (.cpp) files. The Eclipse IDE for C/C++ Developers can be downloaded [here](#). It is recommended to install the language specific updates through Eclipse in order to be automatically notified of updates. A guide to getting started with C++ for FRC, including the installation and configuration of Eclipse IDE for C/C++ Developers can be found [here](#).

Eclipse IDE for Java Developers



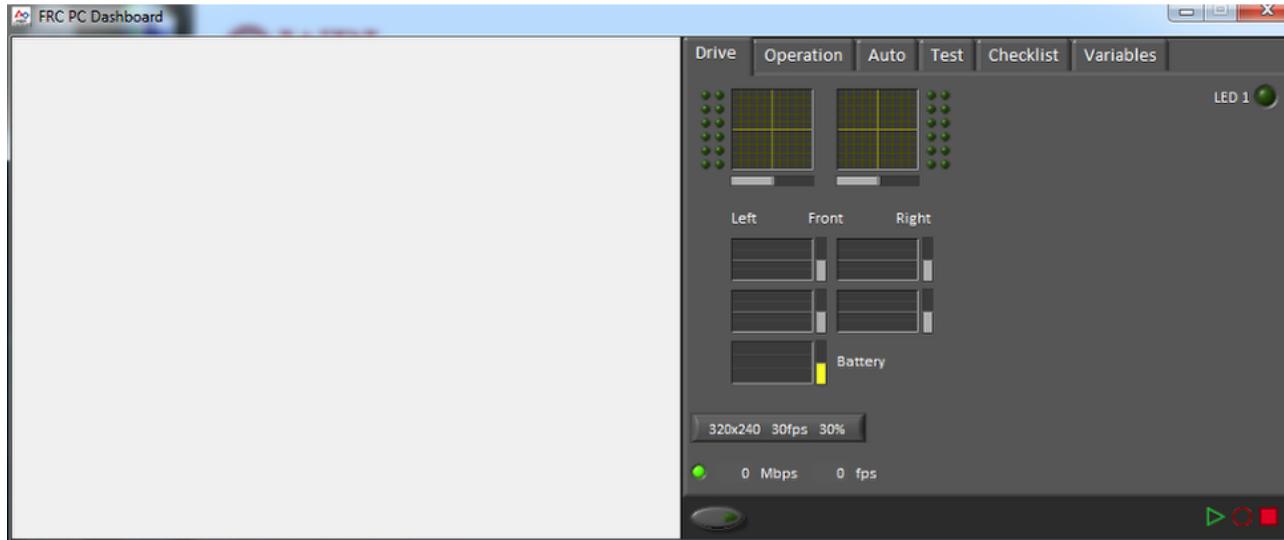
Eclipse IDE for C++ Developers (with Java development tools installed) is the primary supported development environment for Java, one of the three supported languages used for programming an FRC robot in 2015. Java is an object-oriented text base programming language. A program in Java (for FRC) consists of one or more .java files contained in one or more packages. A guide to getting started with Java for FRC, including the installation and configuration of the Eclipse IDE can be found [here](#).

FRC Driver Station



The FRC Driver Station software is the only software allowed to be used for the purpose of controlling the state of the robot during competition. This software contains the code necessary to send data to your robot from a variety of input devices such as joysticks, gamepads, and customizable IO boards. It also contains a number of tools used to help troubleshoot robot issues such as status indicators and log file creation. Instructions for installing the FRC Driver Station (included in the FRC 2015 Update Suite) can be found [here](#). More information about the FRC Driver Station software can be found [here](#).

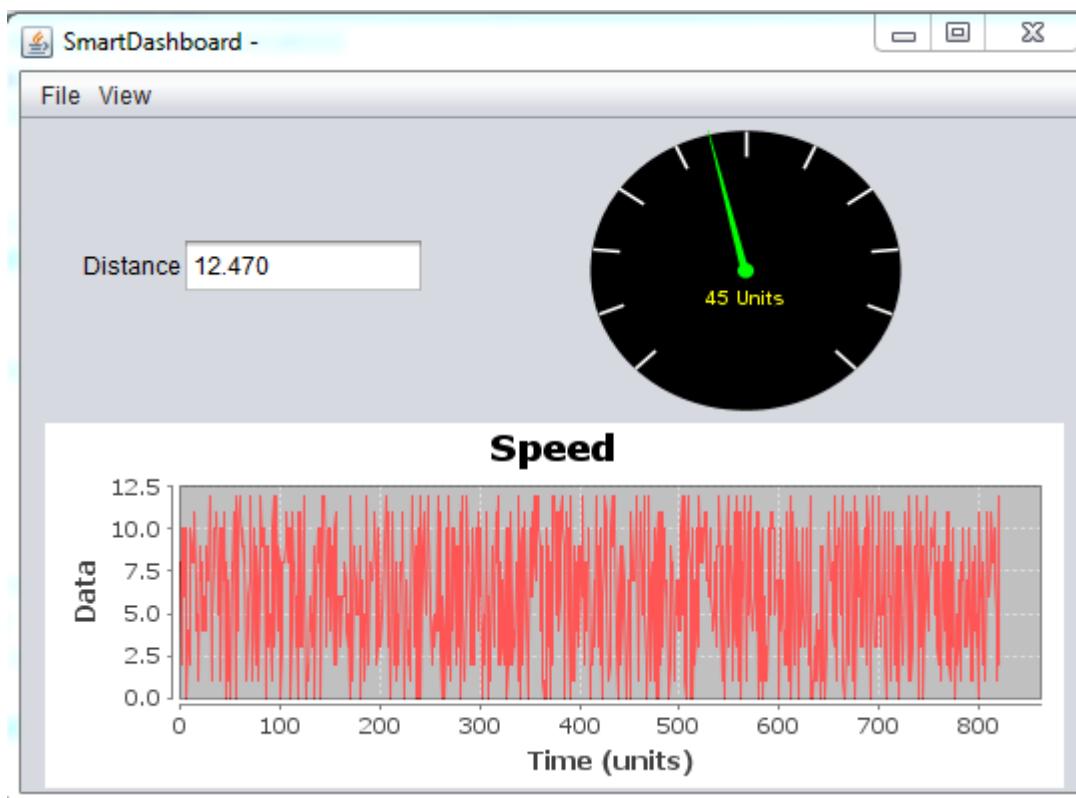
FRC LabVIEW Dashboard



The FRC LabVIEW Dashboard is the default dashboard program installed with, and automatically launched by, the FRC Driver Station. The purpose of the Dashboard is to provide feedback about the operation of the robot. The FRC Default Dashboard serves as an example of the types of feedback

teams may want from their robot. It includes a tabbed display that can switch between viewing an image from a camera on the robot or a display of NetworkTables variables, a display of information regarding the joysticks and drive motors, an indicator of the robot IP and battery voltage, and a second tabbed display that can switch between examples of custom indicators and controls, a test tab for use with the Driver Station Test Mode and a Checklist tab that teams can use to enter a custom checklist to complete before each match. The FRC Default Dashboard is included in the FRC 2015 Update Suite. Installation instructions can be found [here](#). More information about the FRC Default Dashboard software can be found [here](#).

SmartDashboard



The SmartDashboard is an alternate dashboard application written in Java. The SmartDashboard automatically creates a widget for each variable sent from the Robot sent using the SmartDashboard class or VIs. These widgets can be configured to a number of preset display types, or users can create custom extensions in Java. Vision extensions are available for the SmartDashboard which allow it to display images from the Axis camera on the robot. The SmartDashboard is included in the [C++ and Java](#) language updates (enabled by clicking the C++ or Java buttons respectively on the Setup tab of the Driver Station). The Vision extensions and a standalone installer for the SmartDashboard (for use by LabVIEW teams or installing on a DS without the C++ or Java programming environments) can be

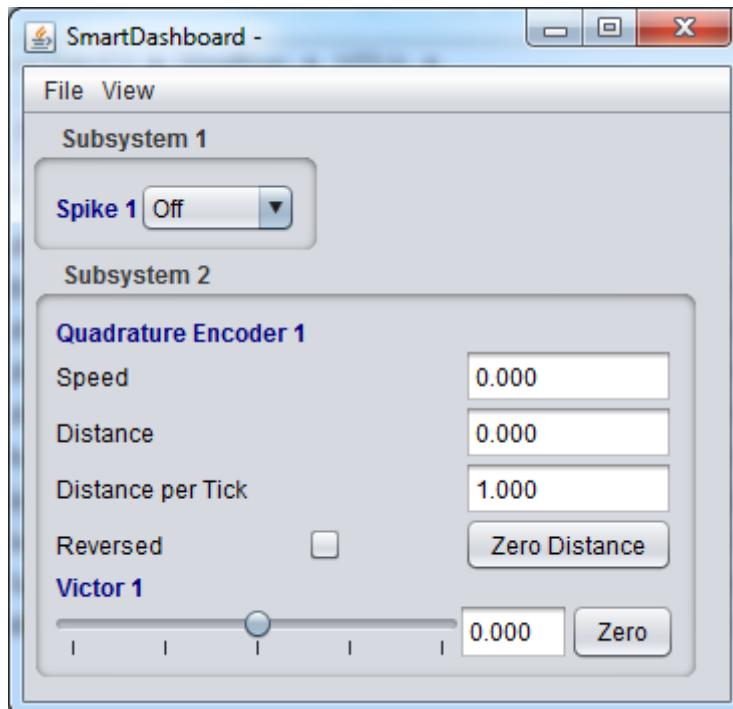


FRC

FIRST® Robotics Competition

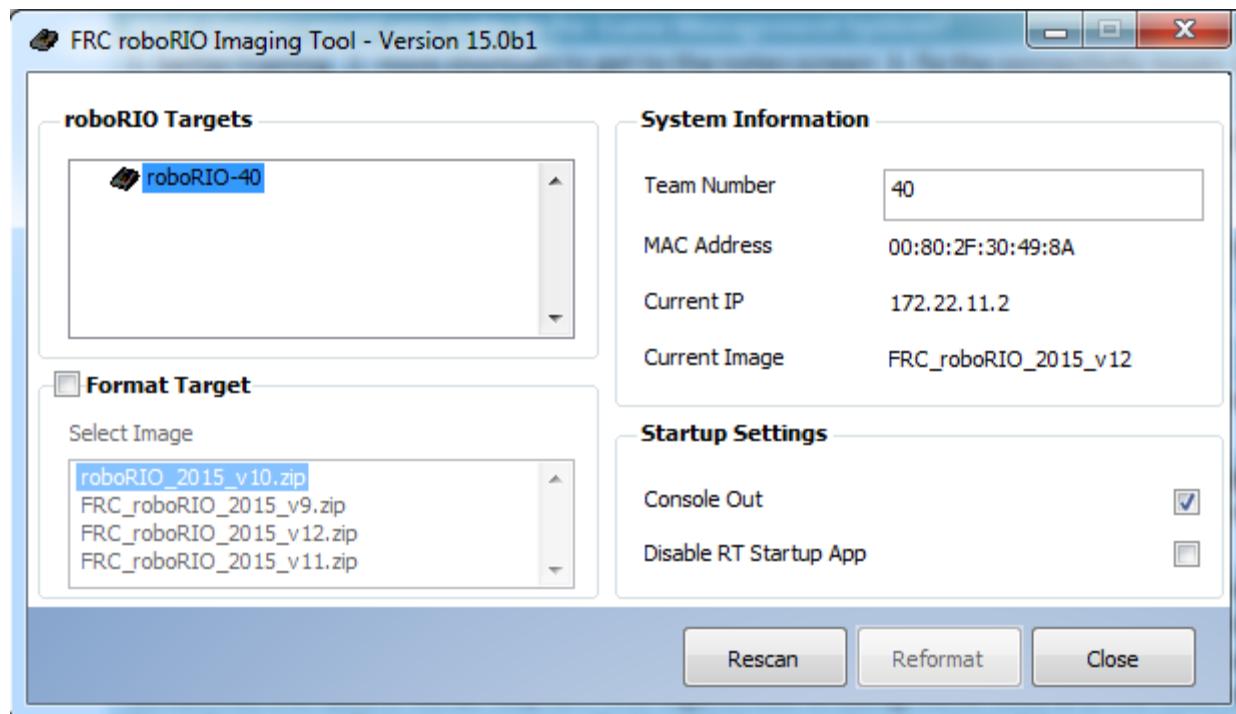
found [here](#). Note that teams may need to install the Java Runtime Environment to use the SmartDashboard on computers not set up for Java programming. Additional documentation on the SmartDashboard can be found [here](#).

LiveWindow



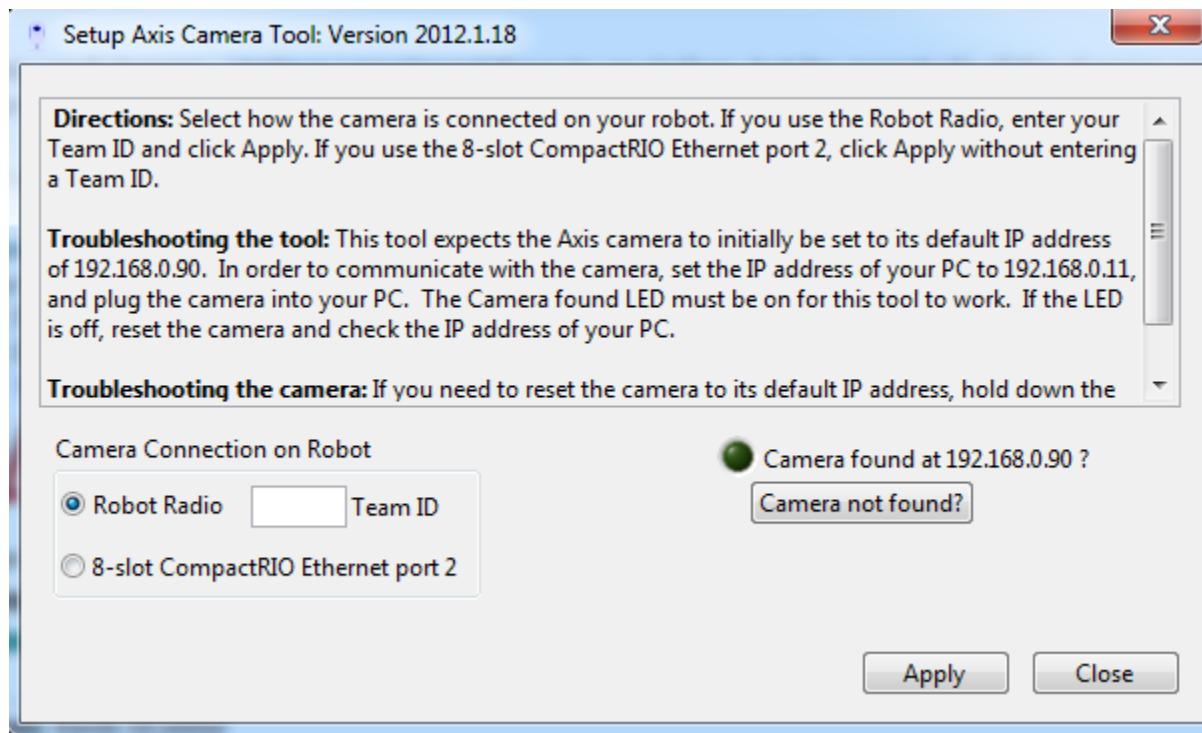
LiveWindow is a new mode of the SmartDashboard for 2013, designed for use with the new Test Mode of the Driver Station. LiveWindow allows the user to see feedback from sensors on the robot and control actuators independent of the written user code. More information about LiveWindow can be found [here](#).

FRC 2015 roboRIO Imaging Tool



The FRC 2015 roboRIO Imaging Tool is a software tool used to format and setup an roboRIO-FRC device for use in FRC. The tool detects any roboRIO device on the network, reports the current MAC, name, IP and Image version. The tool allows the user to configure the team number, set options including Console Out and whether an applications runs on Startup, and install the latest software image on the device. The FRC 2015 roboRIO Imaging Tool is installed as part of the FRC 2015 Update Suite. Installation instructions can be found [here](#). Additional instructions on imaging your roboRIO using this tool can be found [here](#).

Setup Axis Camera



The Setup Axis Camera utility is a LabVIEW program used to configure an Axis 206 or M1011 camera for use on the robot. The tool takes a factory reset camera connected directly to the computer and configures the IP, username and password, anonymous access, and default framerate and compression (for use with the SmartDashboard or other access methods). The Setup Axis Camera tool is installed as part of the FRC 2015 Update Suite. Installation instructions can be found [here](#). Instructions for using the tool to configure the camera are located [here](#).



FRC

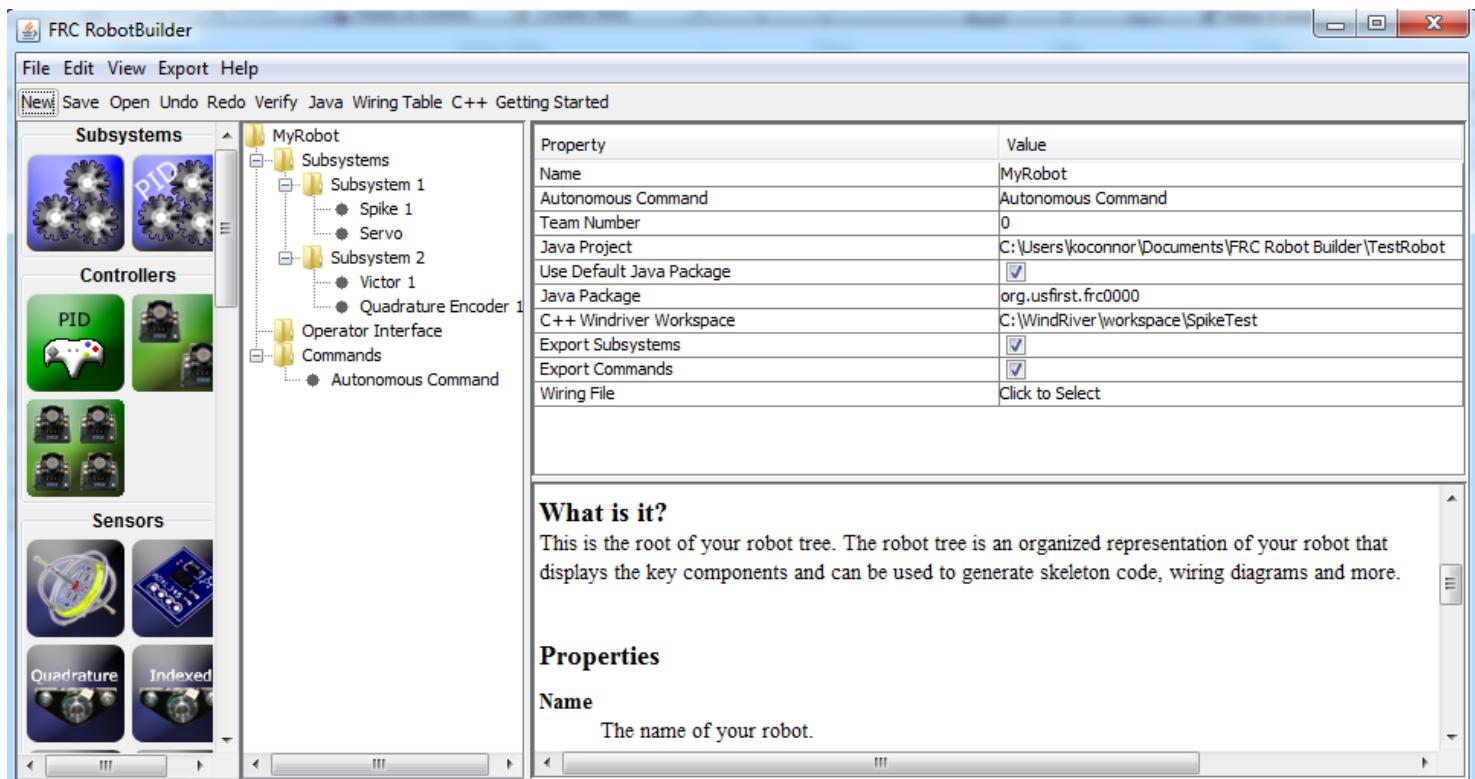
FIRST® Robotics Competition

FRC Driver Station Log Viewer



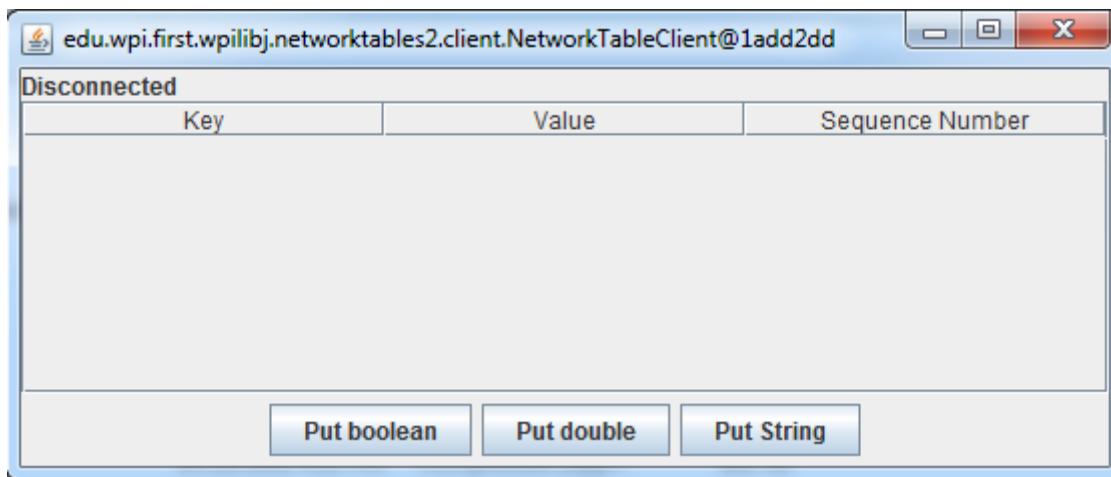
The FRC Driver Station Log Viewer is a LabVIEW program used to view logs created by the FRC Driver Station. These logs contain information such as battery voltage, trip time, CPU% and robot mode, as well as events such as joystick removal. The FRC Driver Station Log Viewer is included in the FRC 2015 Update Suite. Installation instructions can be found [here](#). More information about the FRC Driver Station Log Viewer and understanding the logs can be found [here](#).

Robot Builder



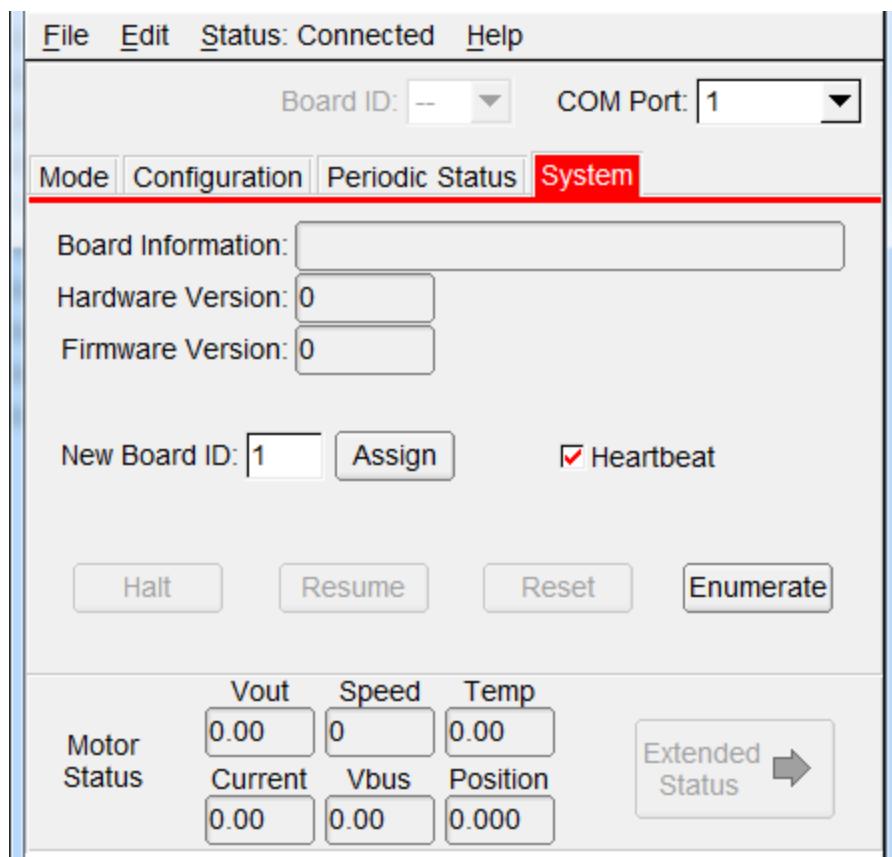
Robot Builder is a tool designed to aid in setup and structuring of a Command Based robot project for C++ or Java. Robot Builder allows you to enter in the various components of your robot subsystems and operator interface and define what your commands are in a graphical tree structure. Robot Builder will then verify that you have no port allocation conflicts and can generate a wiring table indicating what is connected to each port as well as C++ or Java code. The code created generates the appropriate files, constructs the appropriate objects and adds LiveWindow code for each sensor and actuator, but does not write any of the actual Subsystem or Command methods. The user must write the appropriate code for these methods for the robot to function. Robot Builder is installed with the [C++ or Java language specific updates](#) (in the USER\wpilib\tools directory). Note that teams may need to install the Java Runtime Environment to use the Robot Builder on computers not set up for Java programming. More information about Robot Builder can be found here ([update link](#)). More information about the Command Based programming architecture can be found in the [C++](#) and [Java](#) manuals.

Outline Viewer



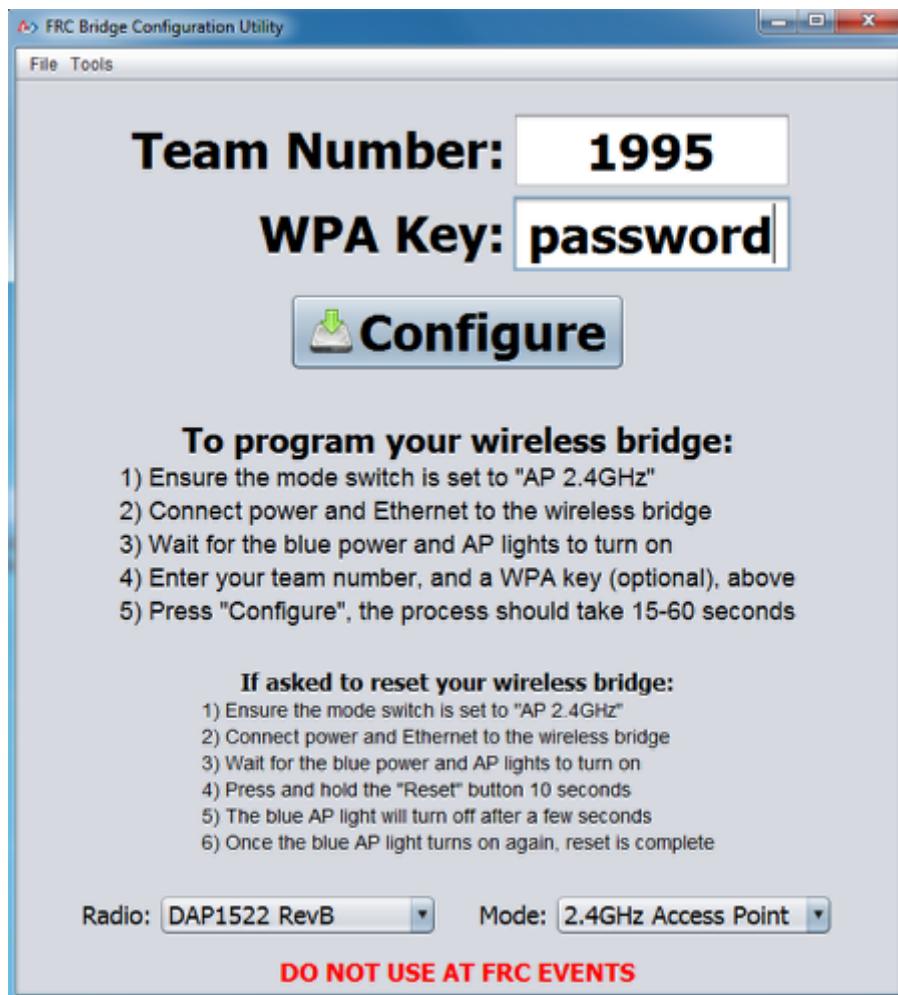
The Outline Viewer is a utility used to view, modify and add to the contents of the Network Tables for debugging purposes. It displays all keys currently in the Network Table along with the value and Sequence Number and can be used to modify the value of existing keys or add new keys to the Table. The Outline Viewer is included in the [C++ and Java](#) language updates (found in USER\tools\wpilib). LabVIEW teams can use the Variables tab of the LabVIEW Dashboard to accomplish this functionality. Note that teams may need to install the Java Runtime Environment to use the Network Tables Viewer on computers not set up for Java programming. Additional documentation on the Network Table Viewer can be found [here \(update link?\)](#).

BDC-COMM



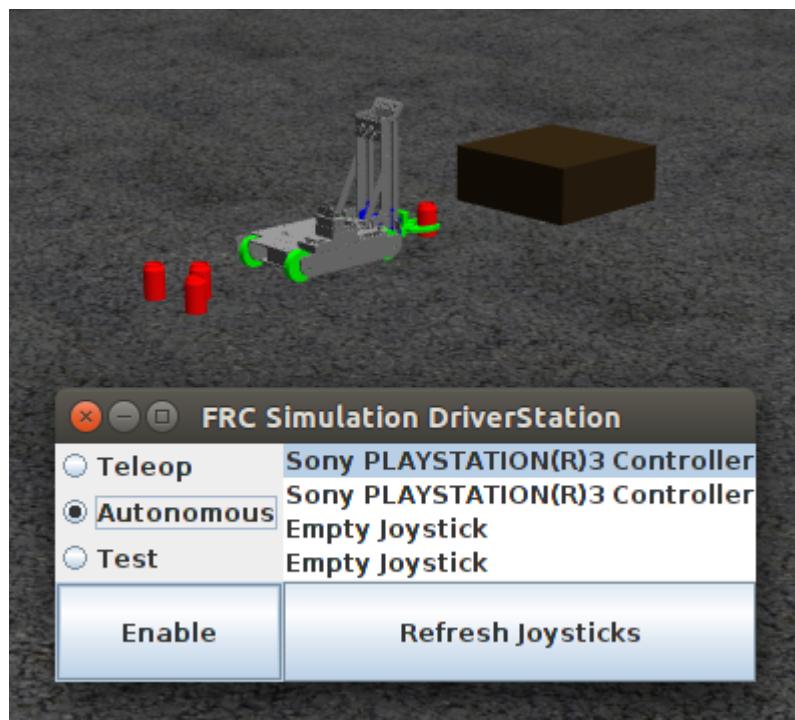
BDC-COMM is a software utility used to configure, update and test Black Jaguar motor controllers over the Serial/CAN interface. This tool can be used to update the Black Jaguar firmware, set the Board ID, and set configuration values such as the fault time and soft limits. The tool can also be used to control, and report the status of, an individual Jaguar in the various modes for testing. BDC-COMM is installed as part of the NI Update Suite (installation instructions found [here](#), installed to PUBLICDOCUMENTS\frc) or can be downloaded from [here](#).

FRC Bridge Configuration Utility



The FRC Bridge Configuration Utility is a tool used to configure the D-Link DAP-1522 radio for practice use at home. This tool sets the appropriate IP, and network settings for proper network connection, as well as the QOS settings required to mimic the bandwidth limiting and packet prioritization experience on the FRC playing field. The FRC Bridge Configuration Utility is installed as part of the NI Update Suite (installation instructions found [here](#)). Instructions on using the FRC Bridge Configuration Utility to configure your radio can be found [here](#).

FRCSim



FRCSim is a simulator for teams using C++ or Java based on the Gazebo simulation software. For the 2015 season, FRCSim requires a computer running Linux (for more specific info, see the details in the FRCSim documentation). Installation and usage instructions for the FRCSim simulator can be found in the Using FRCSim with C++ and Java manual.

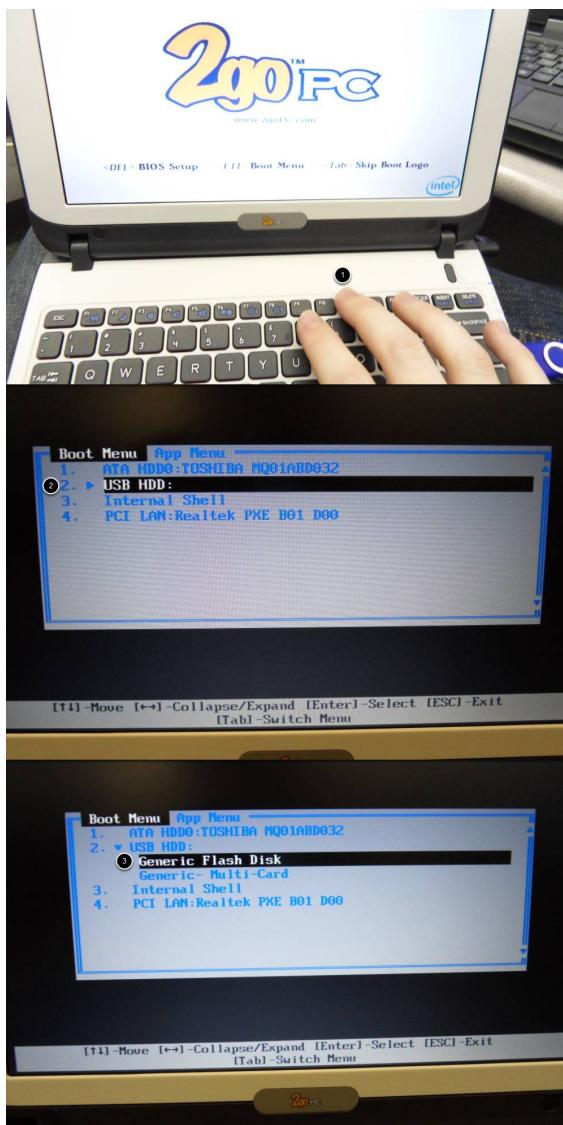
Imaging your Classmate (Rookie USB stick)

This document outlines the procedure to image an E12 Classmate PC using the USB Stick provided in the 2015 Rookie Kit of Parts. Veteran teams may not need to image their machines, but should see the section on [Image Download](#) if they wish to do so.

Hardware Setup

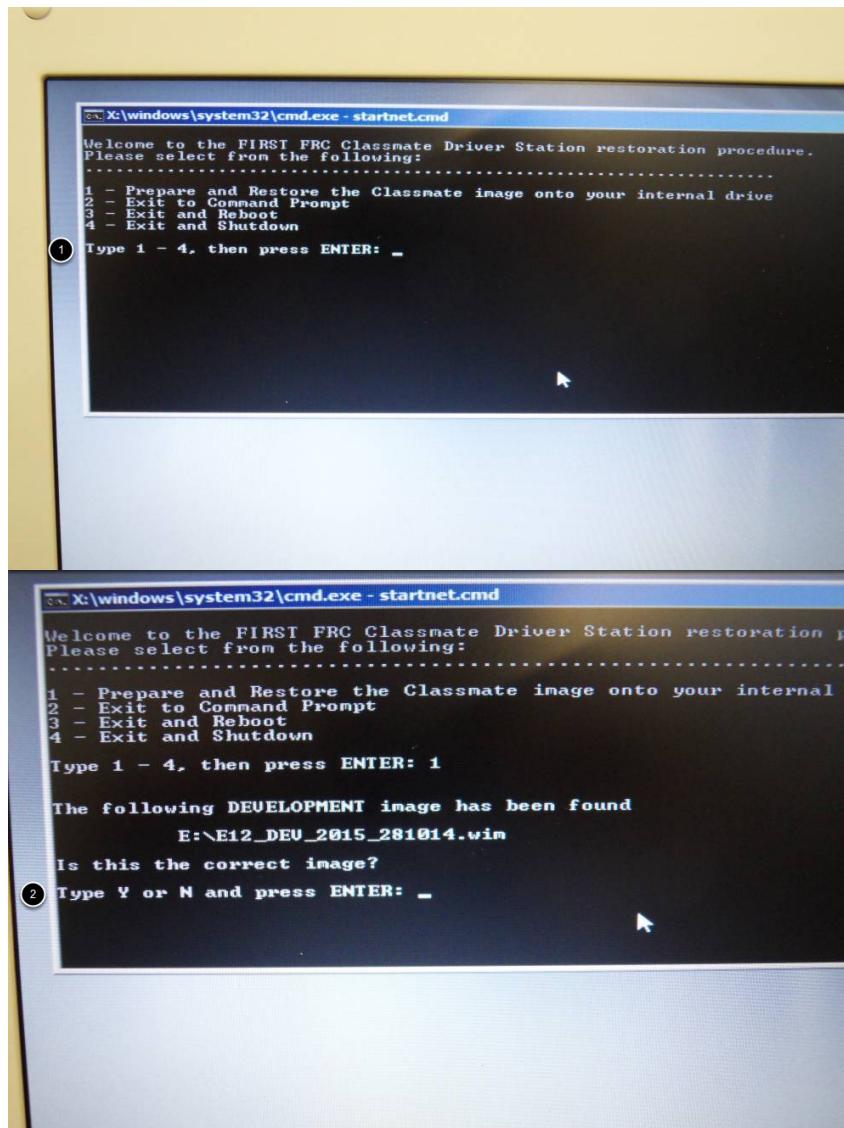
1. Make sure the Classmate is turned off, but plugged in.
2. Insert the “2015 E12 Image” USB Thumb Drive from the Kit of Parts into a USB port on the Classmate.

Boot to USB



1. Power on the Classmate and tap the F11 key on the keyboard. Tapping the F11 key during boot will bring up the boot menu.
2. Use the up/down keys to select the **USB HDD:** entry on the menu, then press the right arrow to expand the listing
3. Use the up/down arrow keys on the keyboard to select the USB device (it will be called “Generic Flash Disk”). Press the ENTER key when the USB device is highlighted.

Image the Classmate



1. To confirm that you want to reimage the Classmate, type “1” and press ENTER.
2. Then, type “Y” and press ENTER. The Classmate will begin re-imaging. The installation will take 15-30 minutes.
3. When the installation is complete, remove the USB drive.
4. Restart the Classmate. The Classmate will boot into Windows.

Initial Driver Station Boot

The first time the Classmate is turned on, there are some unique steps, listed below, that you'll need to take. The initial boot may take several minutes; make sure you do not cycle power during the process.

Please note that these steps are only required during original startup.

Enter Setup

1. Log into the Developer account.
2. Click "Ask me later".
3. Click "OK". The computer now enters a Set Up that may take a few minutes.

Activate Windows

1. Establish an Internet connection.
2. Once you have an Internet connection, click the Start menu, right click "Computer" and click "Properties".
3. Scroll to the bottom section, "Windows activation", and Click "Activate Windows now"
4. Click "Activate Windows online now". The activation may take a few minutes.
5. When the activation is complete, close all of the windows.

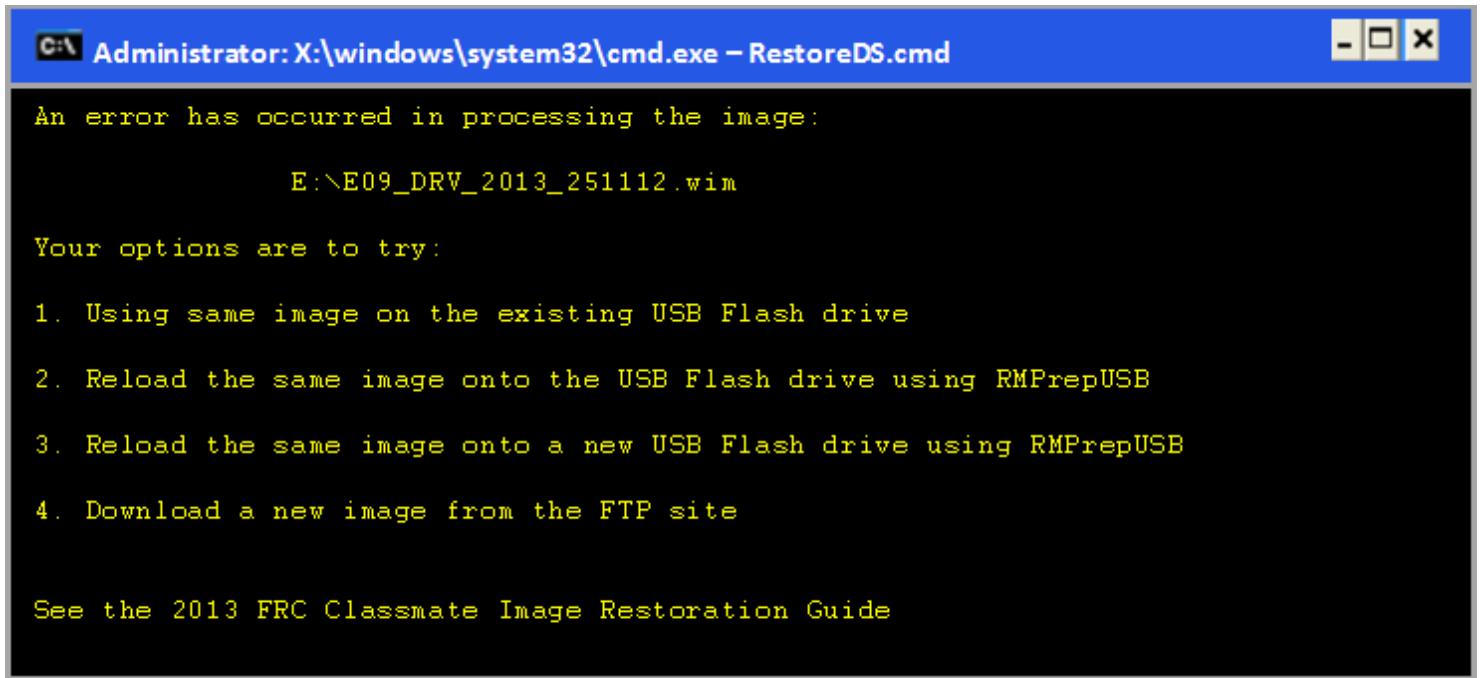
Microsoft Security Essentials

1. Navigate through the Microsoft Security Essentials Setup Wizard. Once it is complete, close all of the windows.

Update Software

In order for the Classmates to arrive at Kickoff locations in time, they were shipped before the final version of the software was ready. To use the software for FRC some additional components will need to be installed. LabVIEW teams should continue with the [Installing the FRC 2015 Update Suite \(All Languages\)](#) article. C++ or Java teams should continue with [Installing Eclipse \(C++/Java\)](#) but can skip downloading and copying the Eclipse software itself (all other components including Java should be installed according to instructions).

Errors during Imaging Process



C:\> Administrator:X:\windows\system32\cmd.exe – RestoreDS.cmd

An error has occurred in processing the image:
E:\E09_DRV_2013_251112.wim

Your options are to try:

1. Using same image on the existing USB Flash drive
2. Reload the same image onto the USB Flash drive using RMPrepUSB
3. Reload the same image onto a new USB Flash drive using RMPrepUSB
4. Download a new image from the FTP site

See the 2013 FRC Classmate Image Restoration Guide

If an error is detected during the imaging process, the following screen will appear. Note that the screenshot above shows the error screen for the 2013 Driver Station-only image for the E09. The specific image filename shown will vary depending on the image being applied.

The typical reason for the appearance of this message is due to an error with the USB device on which the image is stored. To image the Classmate you will need to borrow a working USB drive from another team, request a new drive from frcparts@usfirst.org or re-create the drive using the instructions in [Imaging your Classmate \(Veteran/Rookie Image Download\)](#).

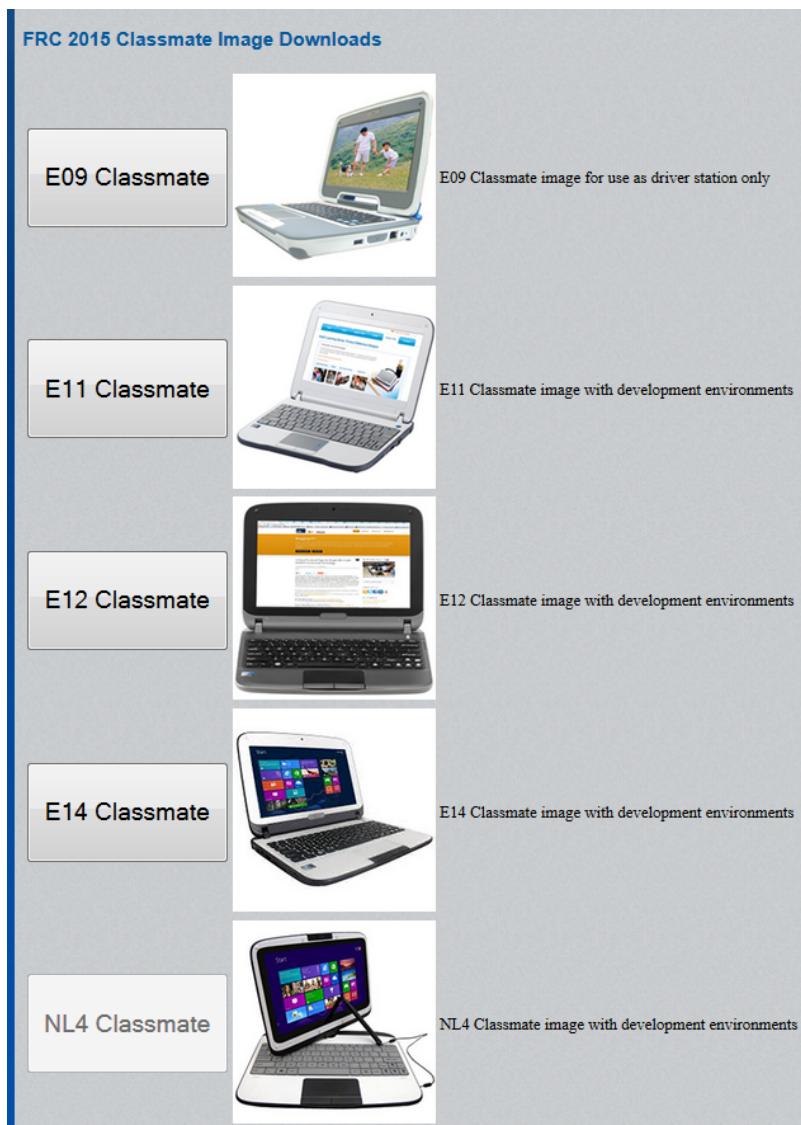
Imaging your Classmate (Veteran/Rookie Image Download)

This document describes the procedure for creating a bootable USB drive to restore the 2015 FRC image on a Classmate computer. Note that Veteran teams are not required to re-image their Classmates. If you do not wish to re-image your Classmate you will need either a USB optical drive or to copy the contents of the LabVIEW DVD to a USB Flash drive then you can start with the appropriate document for [C++\Java](#), [LabVIEW](#), or [DS only](#).

Prerequisites

1. E09, E11, E12, E14, or NL4 Classmate computer
2. 16GB or larger USB drive
3. 7-Zip software installed. [Download here \(www.7zip.org\)](http://www.7zip.org) As of the writing of this document, the current released version is 9.20 (2010-11-18)
4. RMprepUSB software installed. [Download here \(http://www.rmprepusb.com/documents/release-2-0\)](http://www.rmprepusb.com/documents/release-2-0) Scroll down the page and select the stable (Full) version's download link. As of the writing of this document, the current stable version is 2.1.725

Download the Classmate Image



Download the Classmate image from the [Classmate PC FIRST FRC System Image Portal](#). There are several Classmate images available for the 2015 season, one for each model of Classmate. On the download site, select the option that matches your Classmate PC by clicking the button to the left of the image. Due to the limited size of hard drive in the E09, it is supported with a DS/Utilities image only and does not have the IDEs for LabVIEW or C++/Java installed. All other images have the base LabVIEW installation already present and Eclipse already downloaded.



FRC

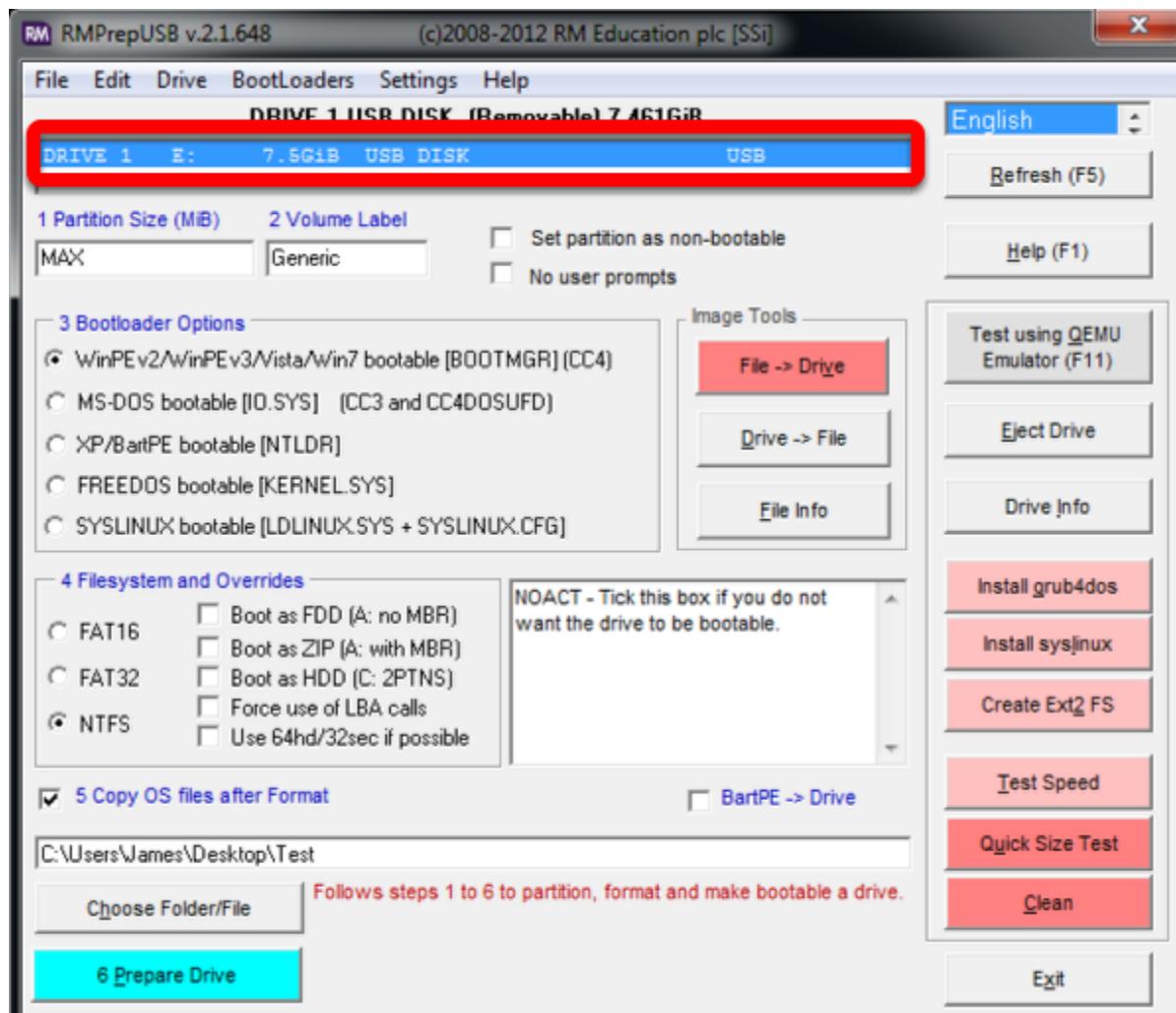
FIRST®Robotics Competition

NOTE: These images only install the prerequisite core FRC software, it is still necessary to install the FRC specific updates. See the [Update Software](#) step for more information.

Preperation

1. Place the image file downloaded from the Intel site to a folder on your root drive (e.g. C:\2013_Image)
2. Connect 8GB or larger USB Flash drive to the PC to use as the new restoration drive.

RMPrep



Start/Run RMprepUSB

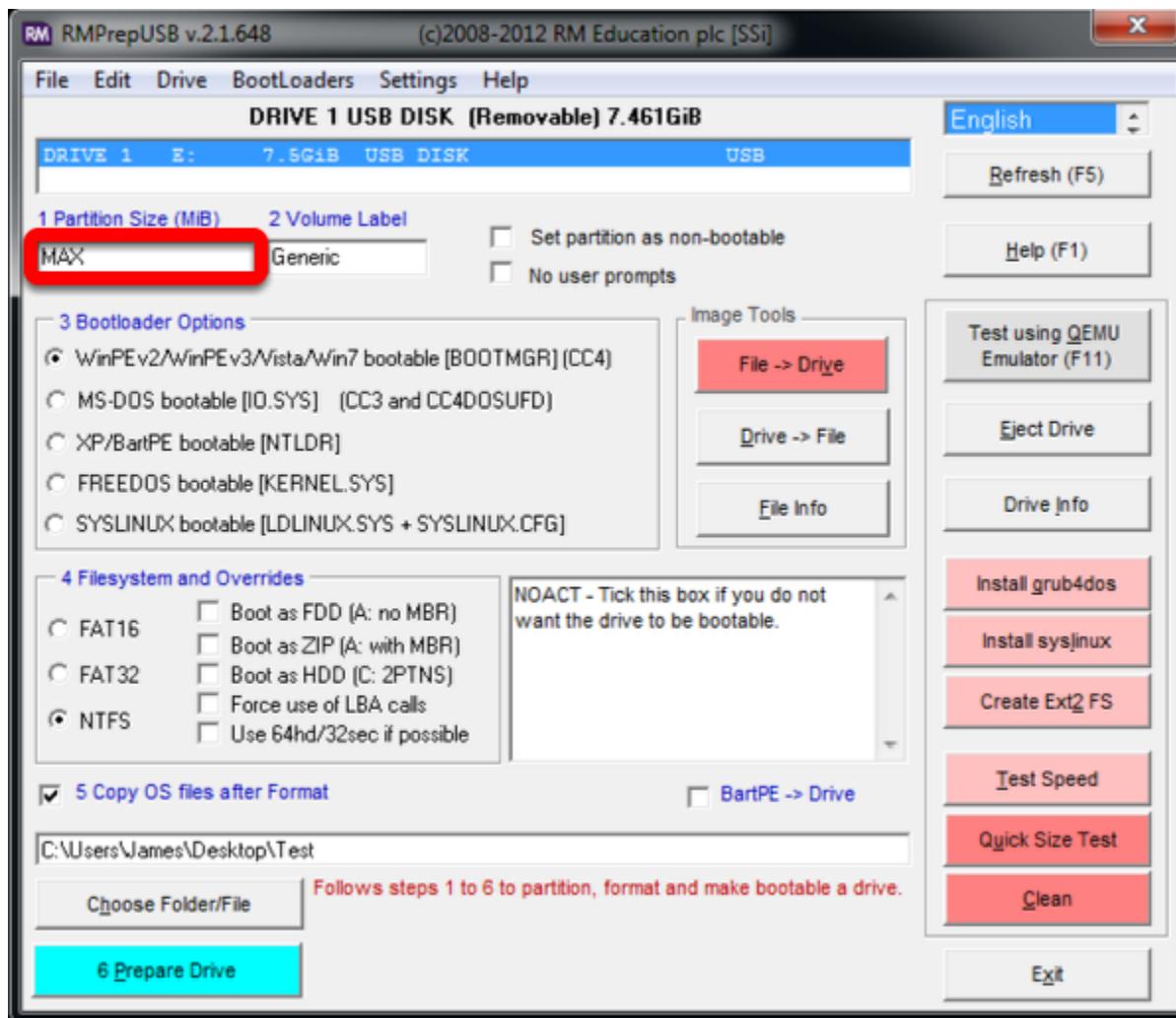


FRC

FIRST®Robotics Competition

Select USB Drive

Set Partition Size



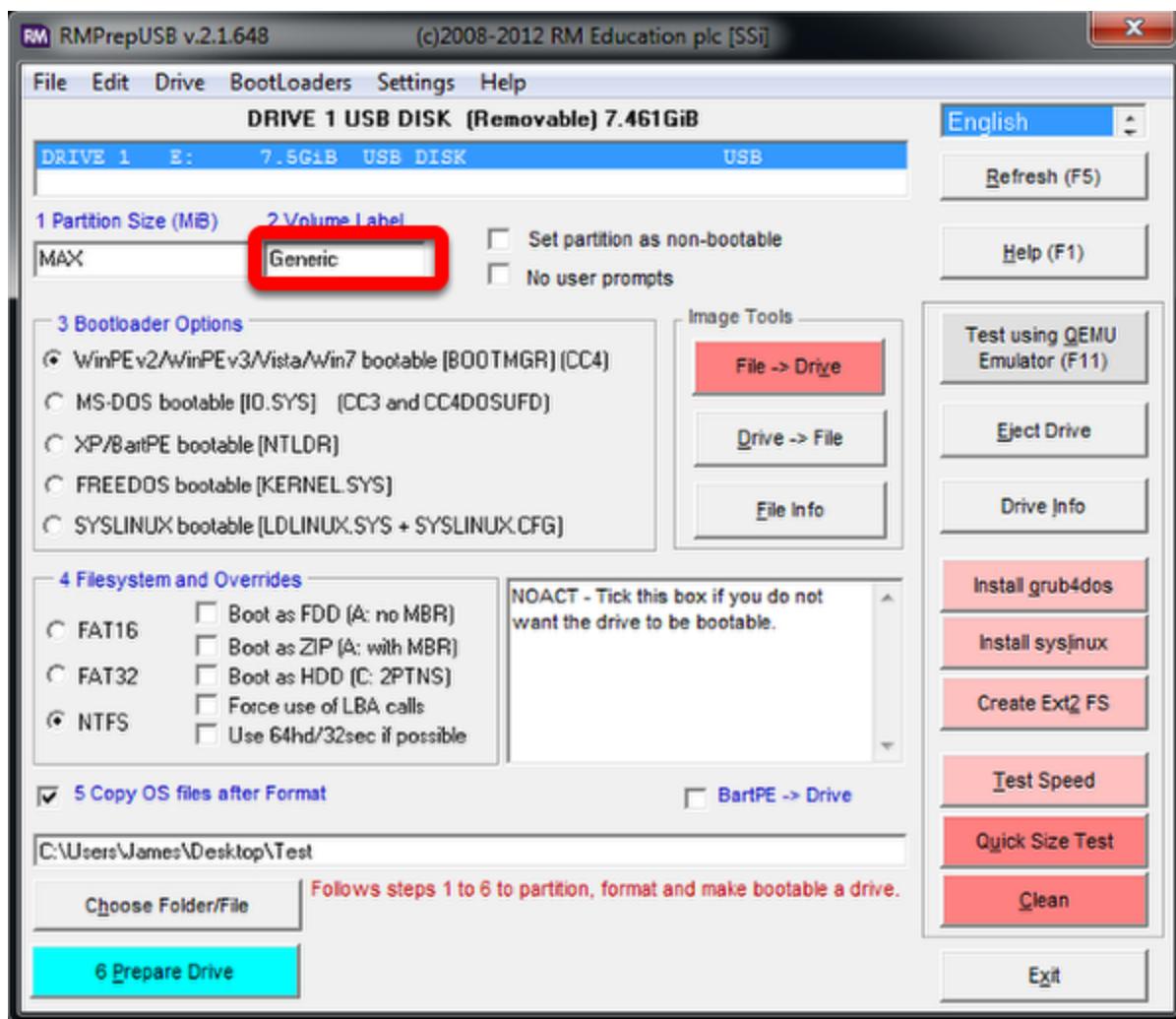
Set Partition Size to MAX



FRC

FIRST®Robotics Competition

Set Volume Label



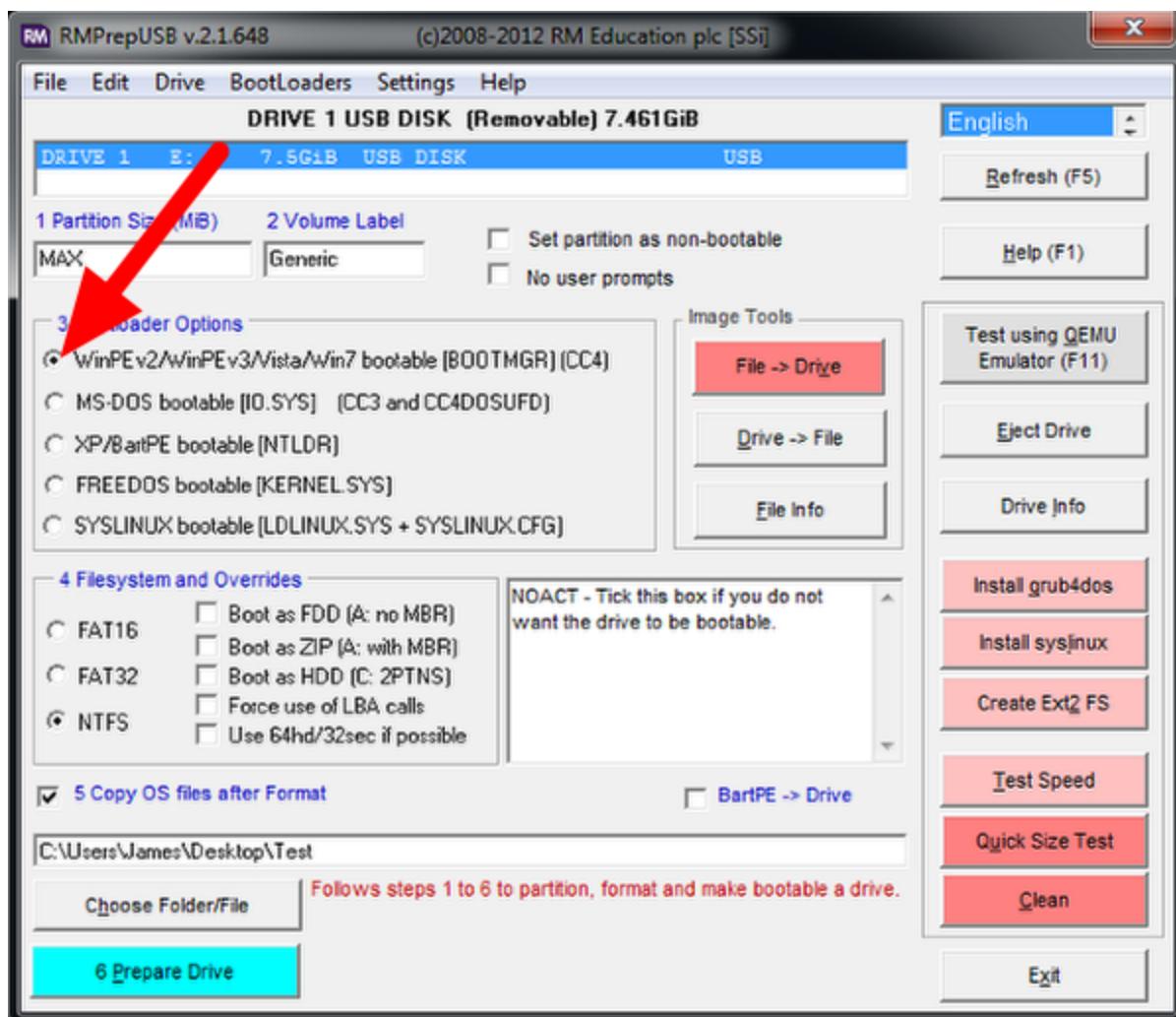
Set Volume Label to Generic



FRC

FIRST® Robotics Competition

Set Bootloader Option



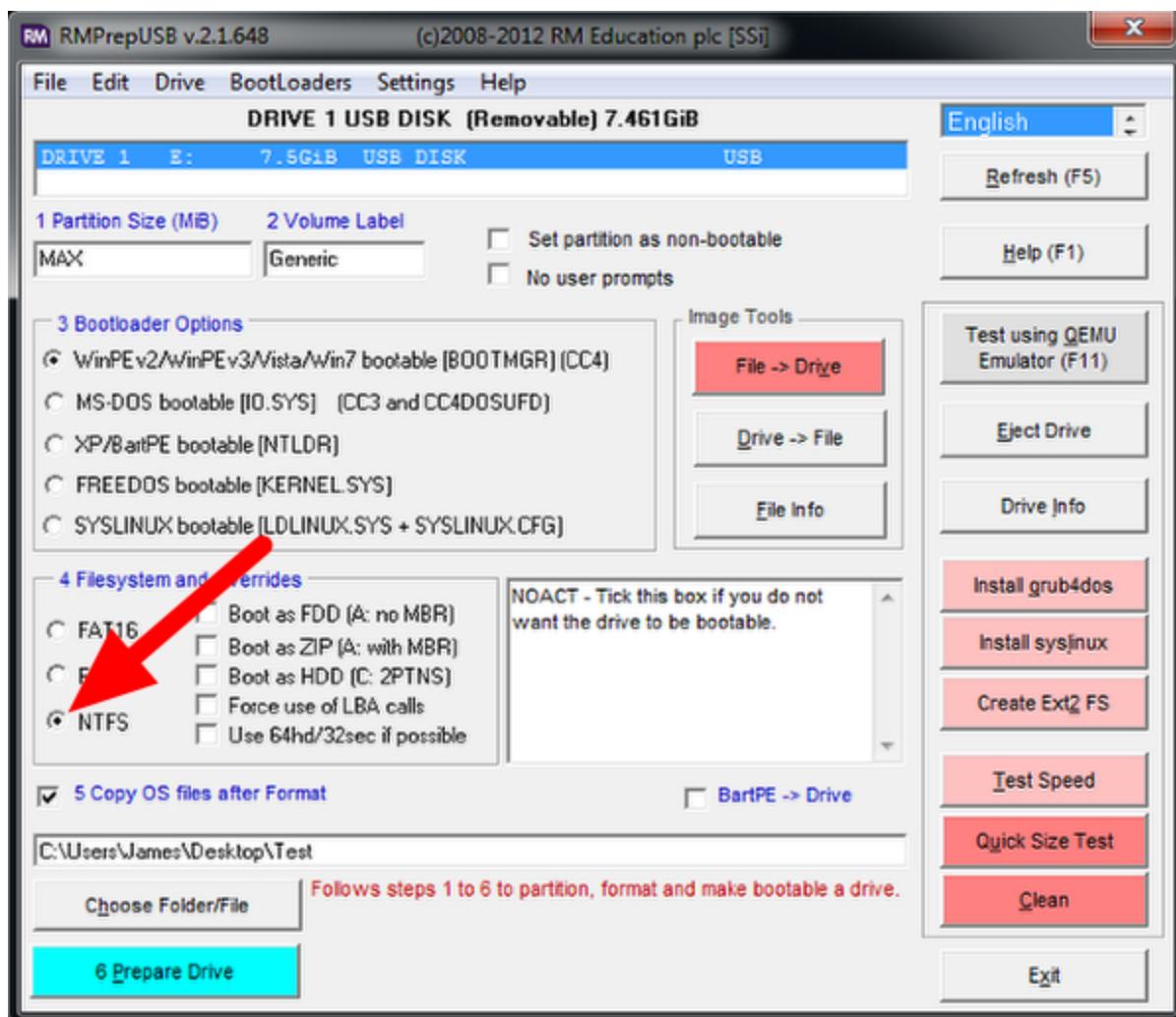
Select Bootloader Option “WinPE v2/WinPE v3/Vista/Win7 bootable”



FRC

FIRST®Robotics Competition

Select Filesystem



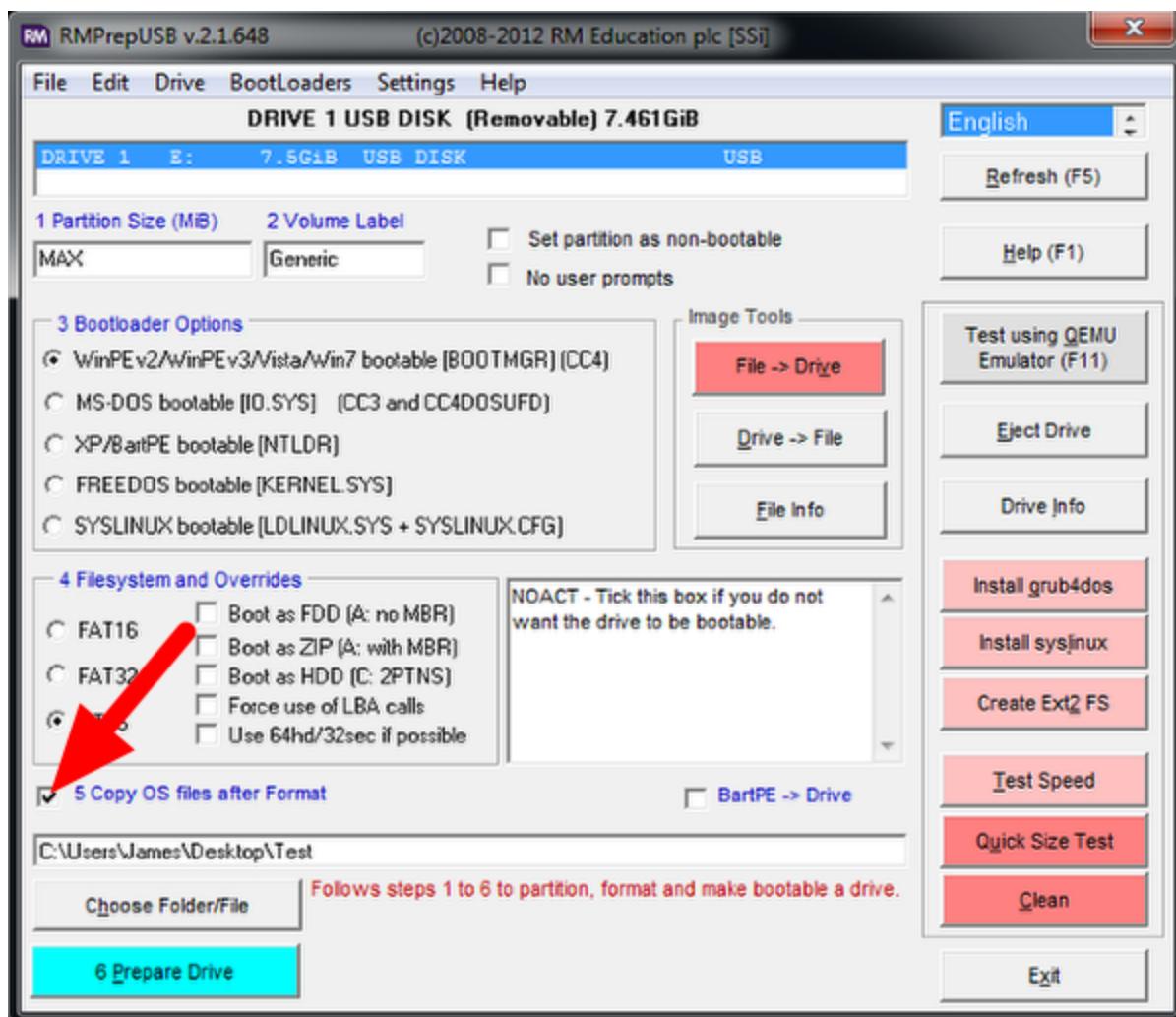
Select NTFS Filesystem



FRC

FIRST®Robotics Competition

Copy OS Files Option



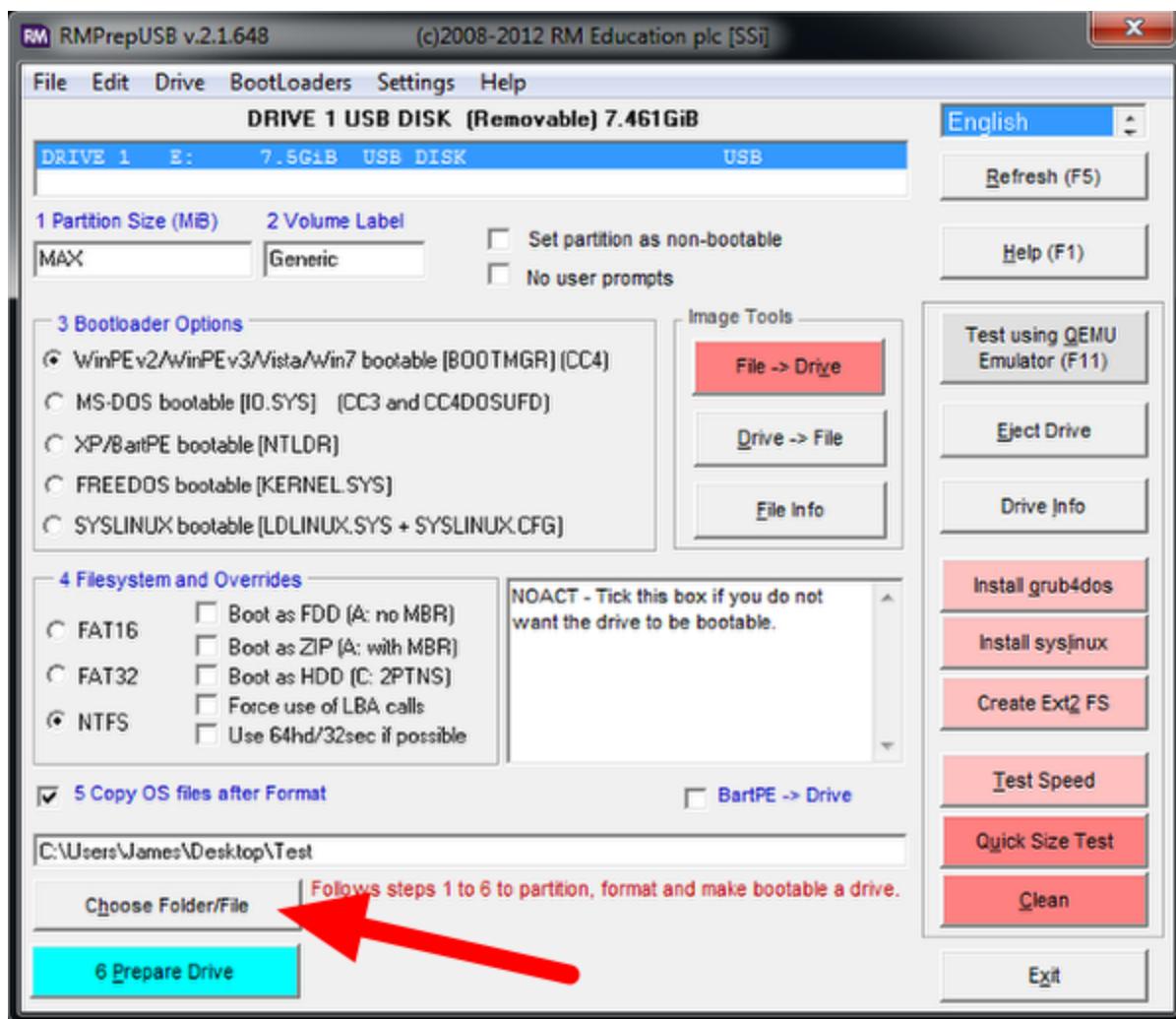
Ensure the “Copy OS files after Format” box is checked



FRC

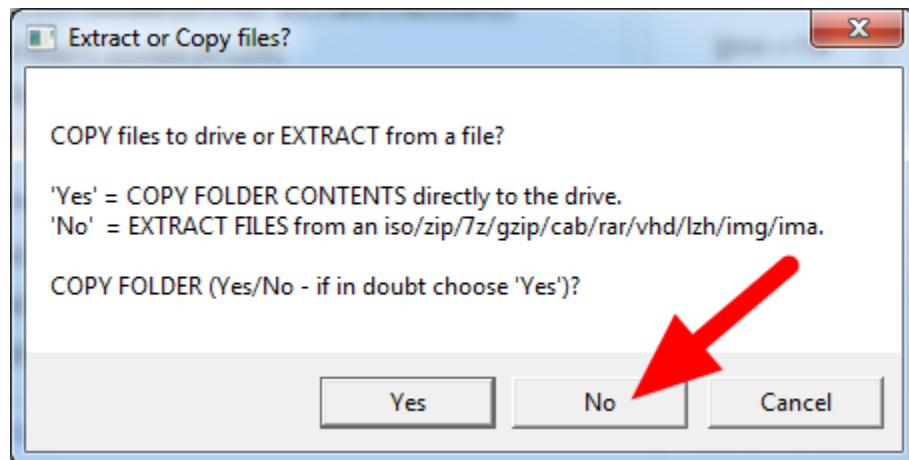
FIRST®Robotics Competition

Locate Image



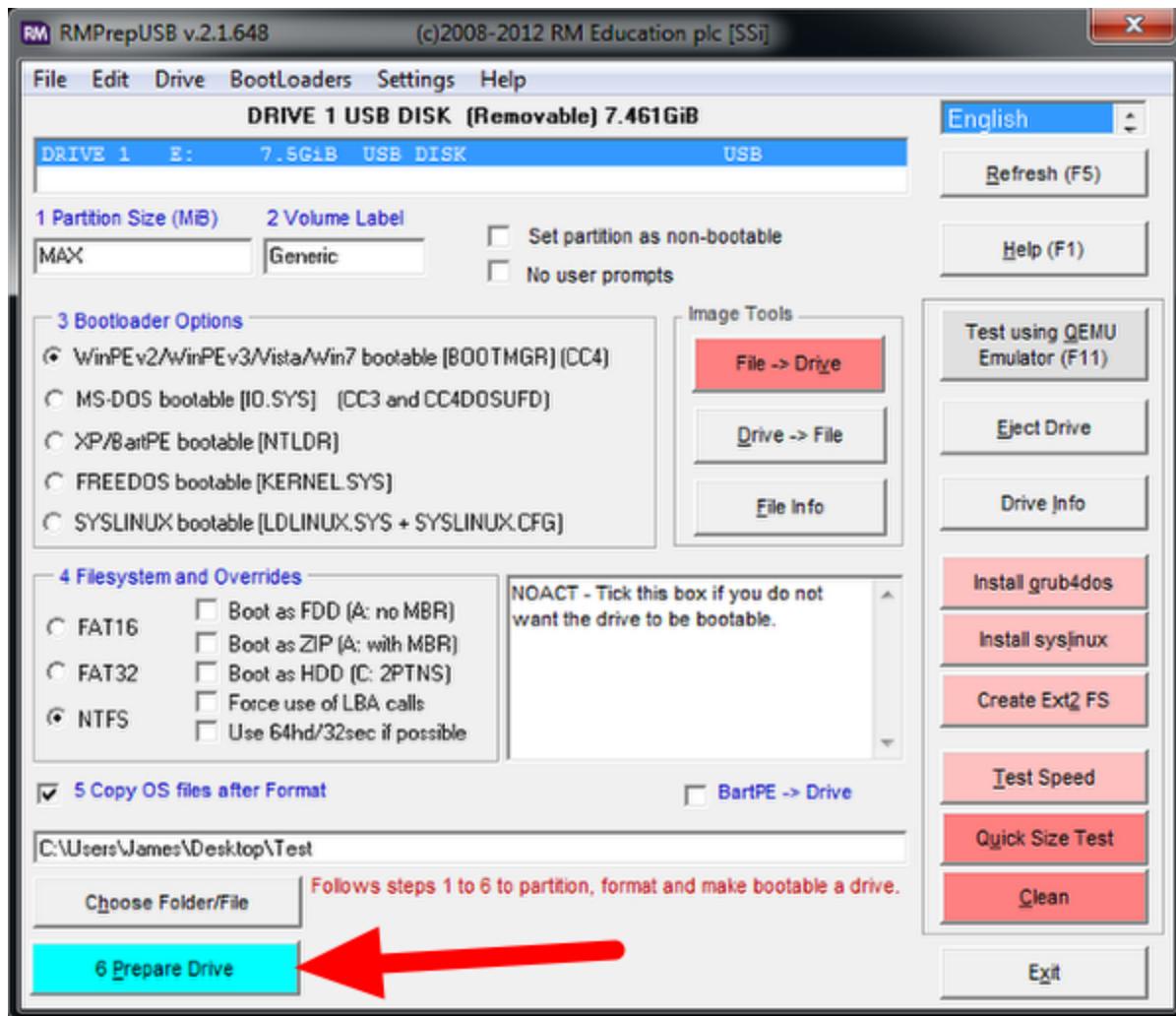
Select the “Choose Folder/File” button

Copy Files Dialog



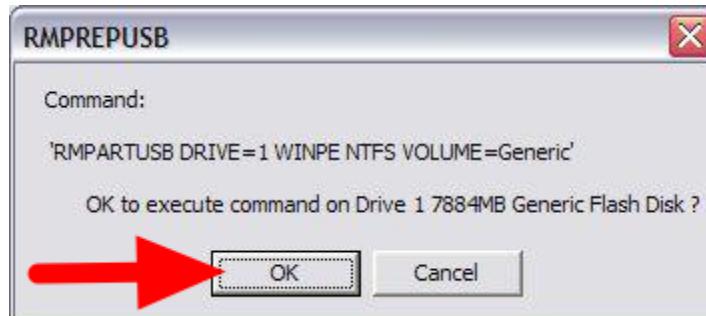
Choose "No" and select your .7z image

Prepare Drive



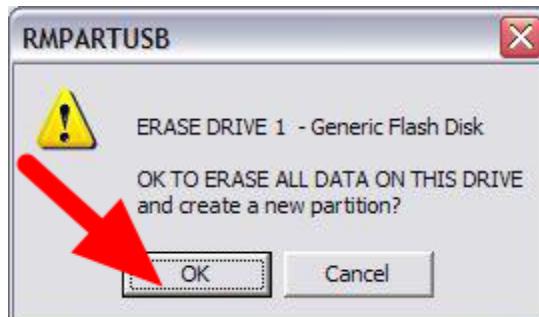
All configuration settings are now complete. Select “Prepare Drive” to begin the process

Confirmation Dialog 1



Click “OK” to execute the command on the selected USB Flash drive. A Command Prompt will open showing the progress.

Confirmation Dialog 2



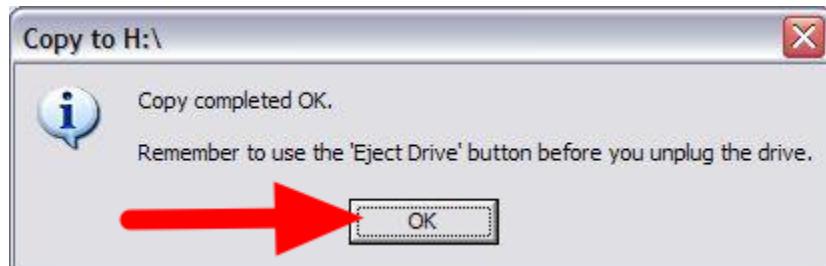
Click “OK” to format the USB drive

NOTE: ALL DATA ON THE DRIVE WILL BE ERASED!

Decryption

Note: If you are using an encrypted version of the image downloaded before kickoff you will be prompted to enter the decryption key found at the end of the Kickoff video.

Copy Complete



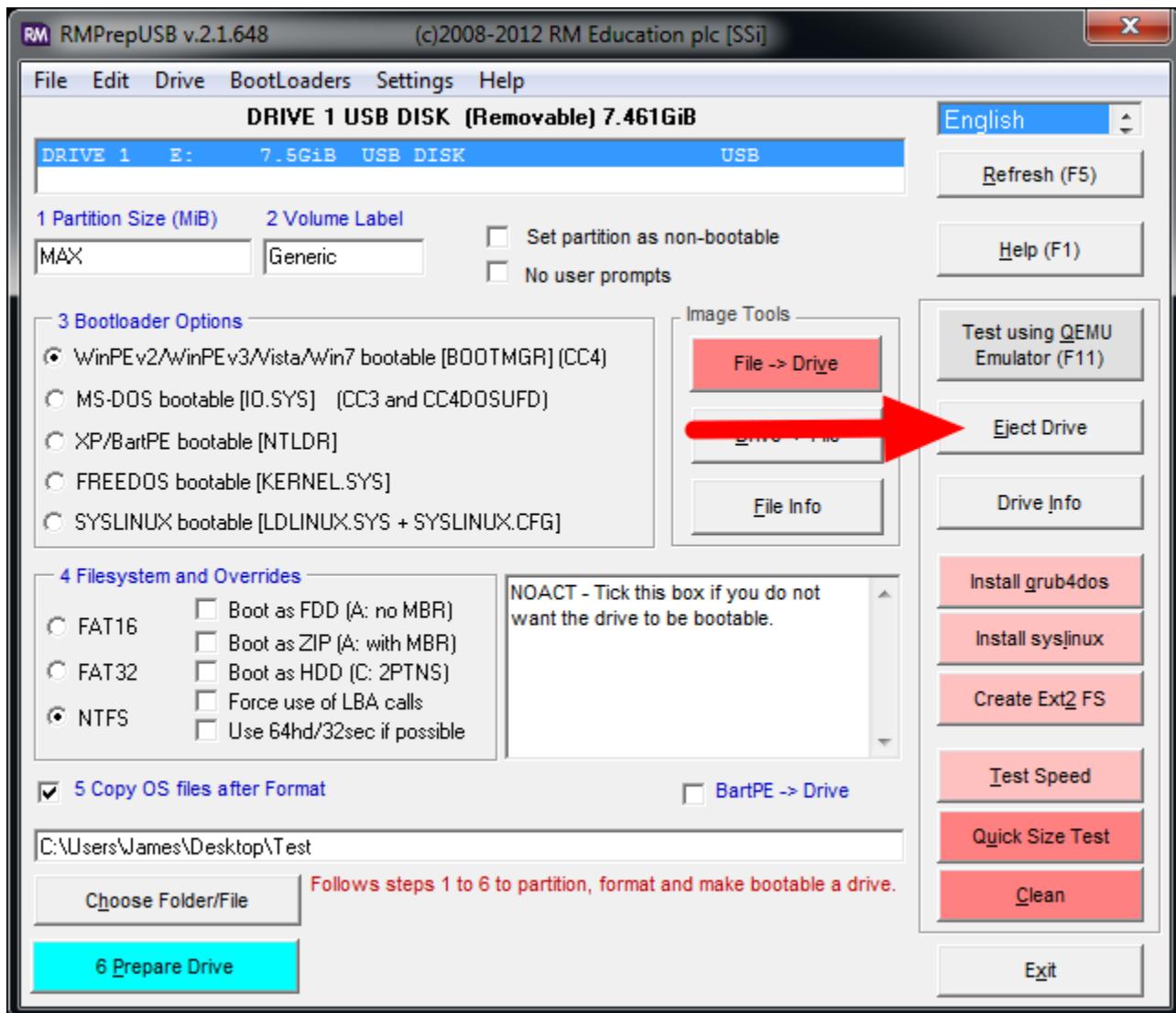
Once formatting is complete, the restoration files will be extracted and copied to the USB drive. This process should take ~15 minutes when connected to a USB 2.0 port. When all files have been copied, this message will appear, press OK to continue.



FRC

FIRST® Robotics Competition

Eject Drive

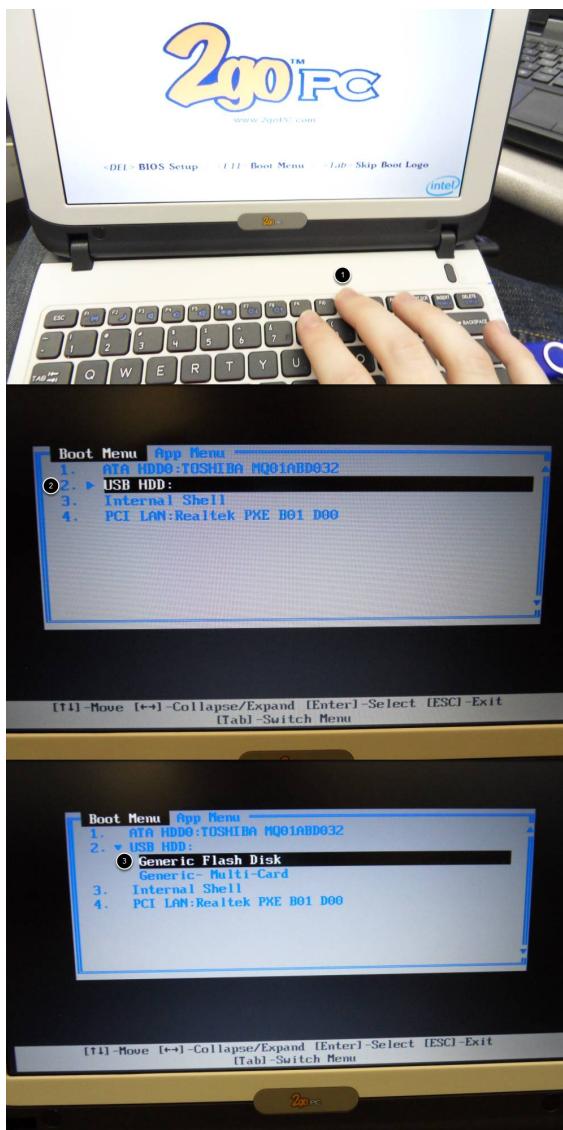


Press the “Eject Drive” button to safely remove the USB drive. The USB drive is now ready to be used to restore the image onto the Classmate PC.

Hardware Setup

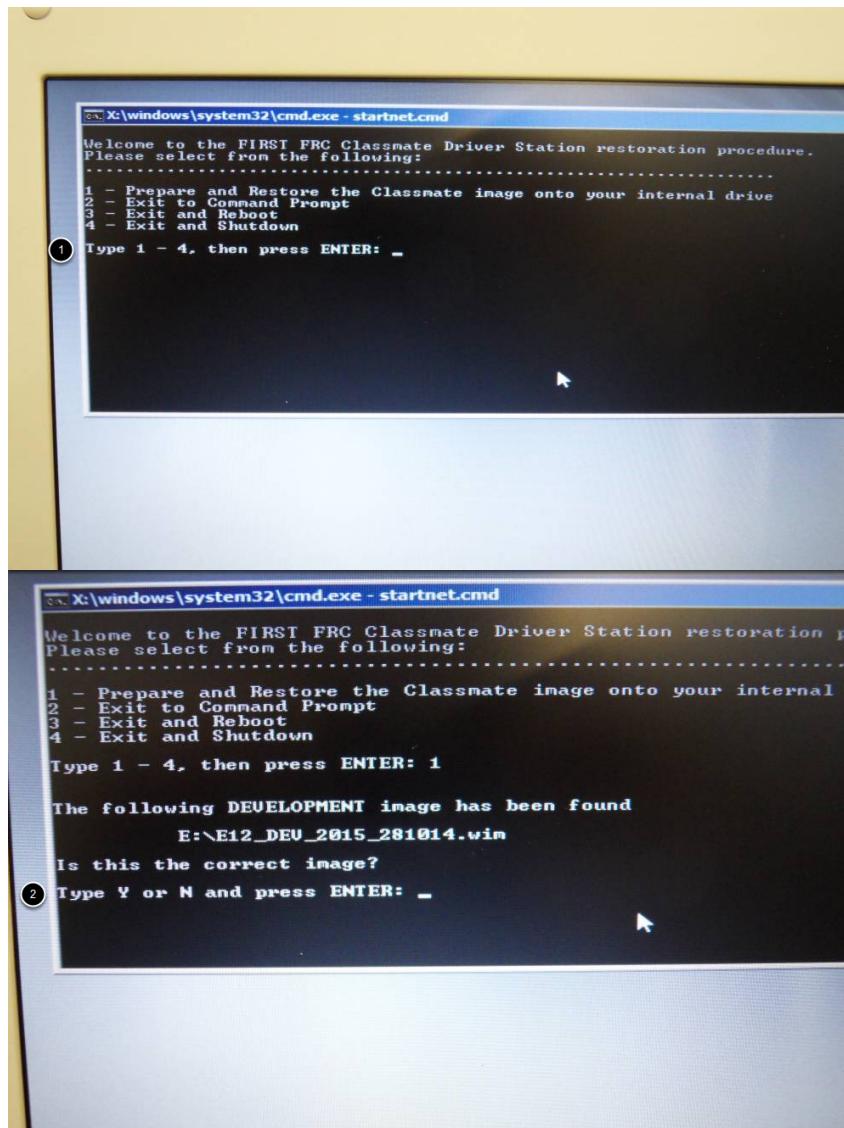
1. Make sure the Classmate is turned off, but plugged in.
2. Insert the “2015 E12 Image” USB Thumb Drive from the Kit of Parts into a USB port on the Classmate.

Boot to USB



1. Power on the Classmate and tap the F11 key on the keyboard. Tapping the F11 key during boot will bring up the boot menu.
2. Use the up/down keys to select the **USB HDD:** entry on the menu, then press the right arrow to expand the listing
3. Use the up/down arrow keys on the keyboard to select the USB device (it will be called “Generic Flash Disk”). Press the ENTER key when the USB device is highlighted.

Image the Classmate



1. To confirm that you want to reimagine the Classmate, type “1” and press ENTER.
2. Then, type “Y” and press ENTER. The Classmate will begin re-imaging. The installation will take 15-30 minutes.
3. When the installation is complete, remove the USB drive.
4. Restart the Classmate. The Classmate will boot into Windows.

Initial Driver Station Boot

The first time the Classmate is turned on, there are some unique steps, listed below, that you'll need to take. The initial boot may take several minutes; make sure you do not cycle power during the process.

Please note that these steps are only required during original startup.

Enter Setup

1. Log into the Developer account.
2. Click "Ask me later".
3. Click "OK". The computer now enters a Set Up that may take a few minutes.

Activate Windows

1. Establish an Internet connection.
2. Once you have an Internet connection, click the Start menu, right click "Computer" and click "Properties".
3. Scroll to the bottom section, "Windows activation", and Click "Activate Windows now"
4. Click "Activate Windows online now". The activation may take a few minutes.
5. When the activation is complete, close all of the windows.

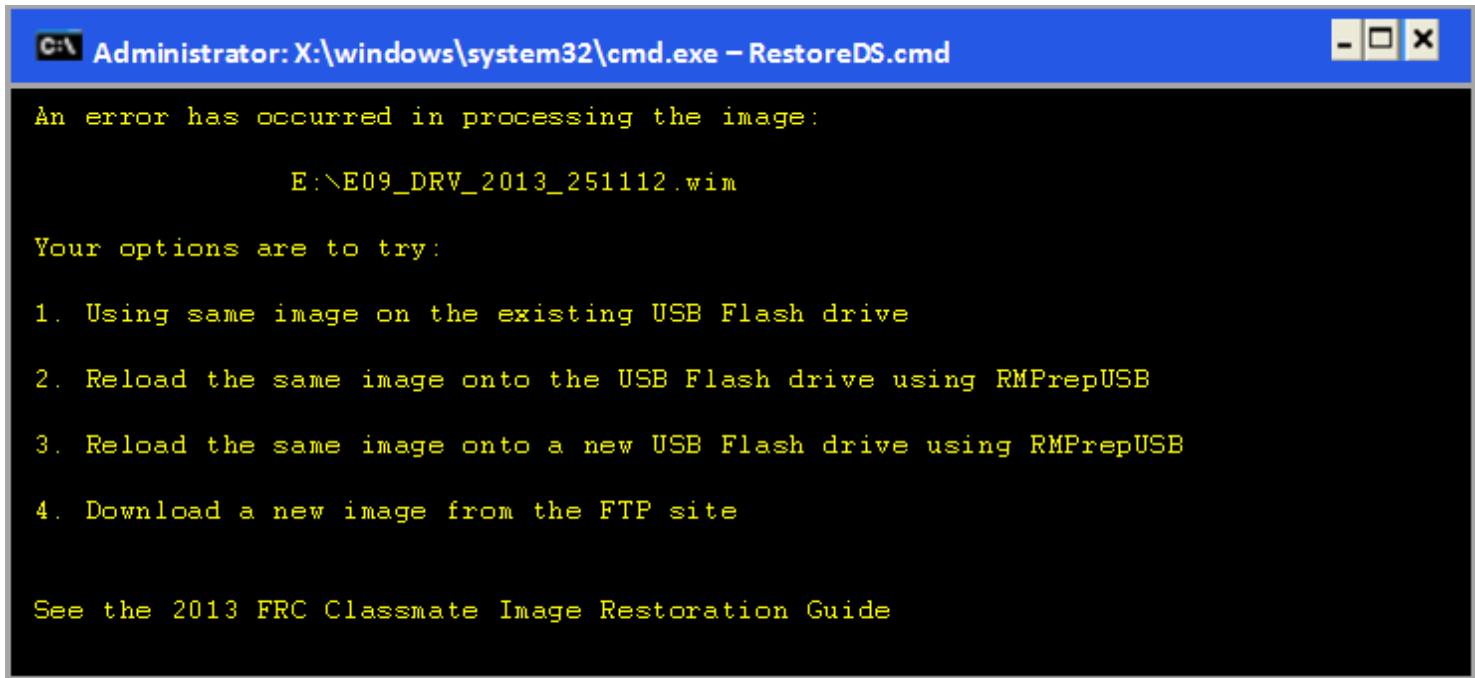
Microsoft Security Essentials

Navigate through the Microsoft Security Essentials Setup Wizard. Once it is complete, close all of the windows.

Update Software

In order for the Classmates to arrive at Kickoff locations in time, they were shipped before the final version of the software was ready. To use the software for FRC some additional components will need to be installed. LabVIEW teams should continue with the [Installing the FRC 2015 Update Suite \(All Languages\)](#) article. C++ or Java teams should continue with [Installing Eclipse \(C++/Java\)](#) but can skip downloading and copying the Eclipse software itself (all other components including Java should be installed according to instructions).

Errors during Imaging Process



C:\> Administrator: X:\windows\system32\cmd.exe – RestoreDS.cmd

An error has occurred in processing the image:
E:\E09_DRV_2013_251112.wim

Your options are to try:

1. Using same image on the existing USB Flash drive
2. Reload the same image onto the USB Flash drive using RMPrepUSB
3. Reload the same image onto a new USB Flash drive using RMPrepUSB
4. Download a new image from the FTP site

See the 2013 FRC Classmate Image Restoration Guide

If an error is detected during the imaging process, the following screen will appear. Note that the screenshot below shows the error screen for the Driver Station-only image for the E09. The specific image filename shown will vary depending on the image being applied.

The typical reason for the appearance of this message is due to an error with the USB device on which the image is stored. Each option is listed below with further details as to the actions you can take in pursuing a solution. Pressing any key once this error message is shown will return the user to the menu screen shown in [Image the Classmate](#).

Option 1

Using same image on the existing USB Flash drive: To try this option, press any key to return to the main menu and select #1. This will run the imaging process again.

Option 2

Reload the same image onto the USB Flash drive using RMPrepUSB: It's possible the error message was displayed due to an error caused during the creation of the USB Flash drive (e.g. file copy error, data corruption, etc.) Press any key to return to the main menu and select #4 to safely shutdown the



FRC

FIRST® Robotics Competition

Classmate then follow the steps starting with [RMPrep](#) to create a new USB Restoration Key using the same USB Flash drive.

Option 3

Reload the same image onto a new USB Flash drive using RMPrepUSB: The error message displayed may also be caused by an error with the USB Flash drive itself. Press any key to return to the main menu and select #4 to safely shutdown the Classmate. Select a new USB Flash drive and follow the steps starting with [RMPrep](#).

Option 4

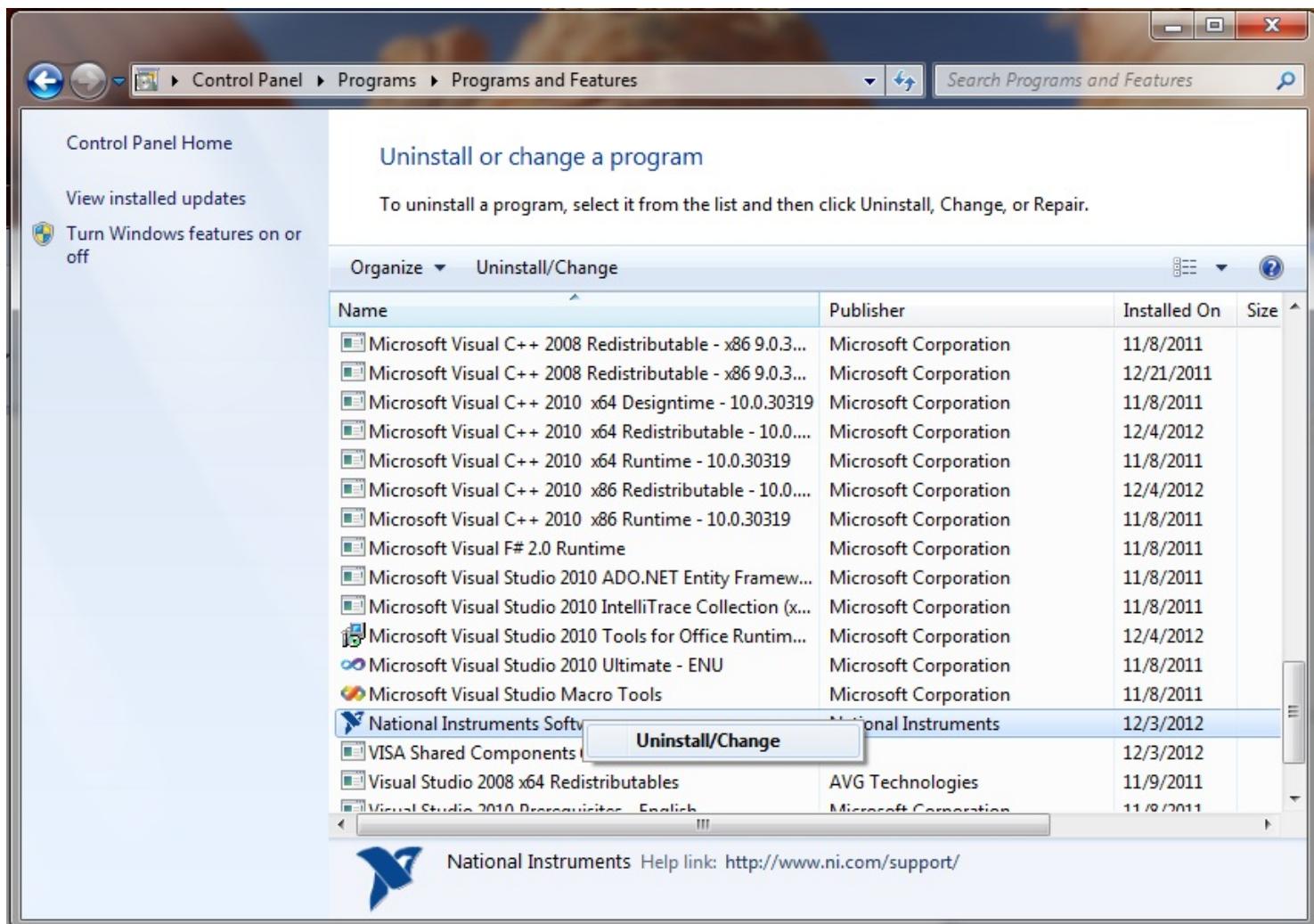
Download a new image: An issue with the downloaded image may also cause an error when imaging. Press any key to return to the main menu and select #4 to safely shutdown the Classmate. Starting with [Download the Classmate Image](#) create a new copy of the imaging stick.

Installing LabVIEW for FRC 2015 (LabVIEW only)

Note: This installation is for teams programming in LabVIEW or using NI Vision Assistant only. **C++ and Java teams not using these features do not need to install from the DVD.**

Download and installation times will vary widely with computer and internet connection specifications, however note that this process involves a large file download and installation and will likely take at least an hour to complete.

Uninstall Old Versions (Recommended)

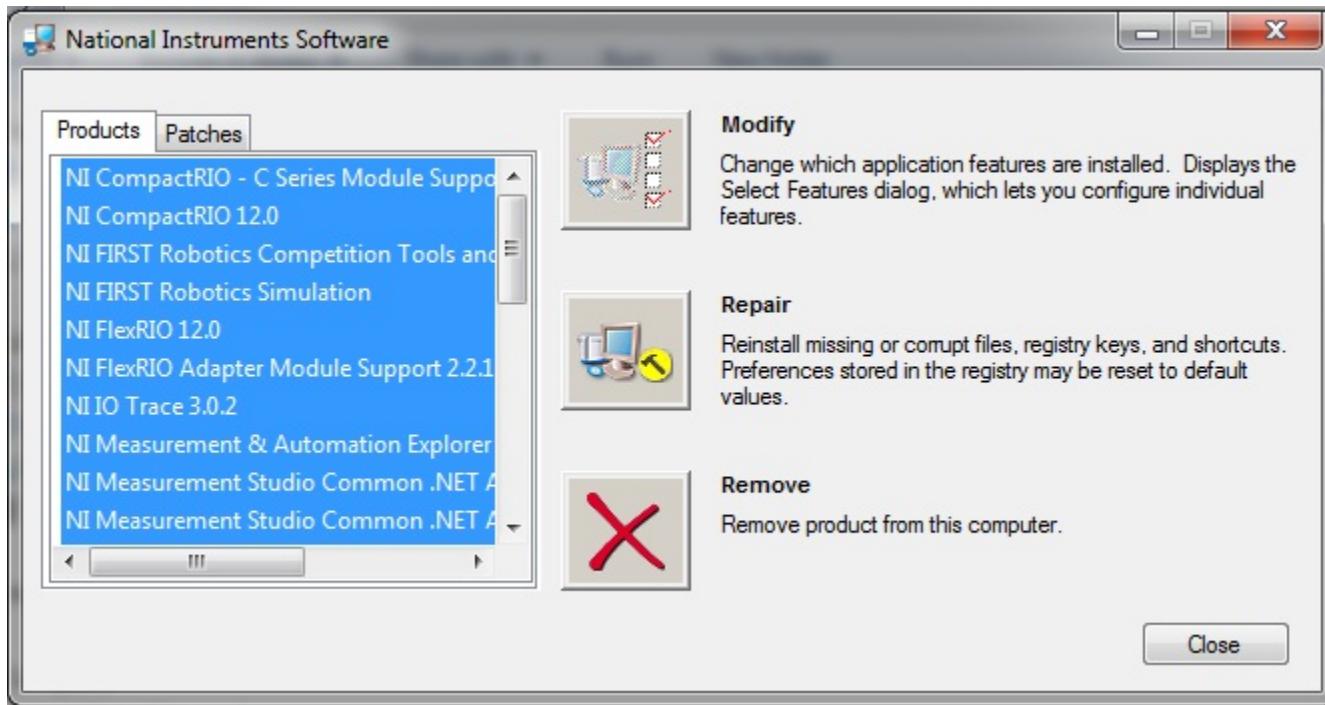


NOTE: The cRIO-FRCII (4-slot) is supported by the 2015 software, but the cRIO-FRC (8-slot) is not. The LabVIEW for FRC 2014 license has been extended. If you wish to keep programming 8-slot cRIOS you will need to maintain an install of LabVIEW for FRC 2014. While these versions should be able to co-exist on a single computer, this is not a configuration that has been extensively tested.

Before installing the new version of LabVIEW it is recommended to remove any old versions. The new version will likely co-exist with the old version, but all testing has been done with FRC 2015 only. Make sure to back up any team code located in the "User\LabVIEW Data" directory before un-installing. Then

click **Start >> Control Panel >> Uninstall a Program**. Locate the entry labeled "**National Instruments Software**", right-click on it and select **Uninstall/Change**.

Select Components to Uninstall



In the left pane of the dialog box that appears, **select all entries**. The easiest way to do this is to click the top entry to highlight it, then scroll down to the bottom entry, press and hold shift and click on the last entry then release shift. Click **Remove**. Wait for the uninstaller to complete and reboot if prompted.

Getting LabVIEW Installer

Either locate and insert the LabVIEW DVD or download the LabVIEW 2015 installer from
<http://www.ni.com/download/labview-for-frc-15.0/5088/en/>

If downloaded, right click on the downloaded file (NI_FRC2015.zip) and select Extract All.

Note: This is a large download (~4GB). It is recommended to use a fast internet connection and to use the NI Downloader to allow the download to resume if interrupted.



FIRST®Robotics Competition

Installing LabVIEW

National Instruments LabVIEW requires a license. Each season's license is active until January 31st of the following year (e.g. the license for the 2015 season expires on January 31, 2016)

Teams are permitted to install the software on as many team computers as needed, subject to the restrictions and license terms that accompany the applicable software, and provided that only team members or mentors use the software, and solely for FRC. Rights to use LabVIEW are governed solely by the terms of the license agreements that are shown during the installation of the applicable software.

Welcome



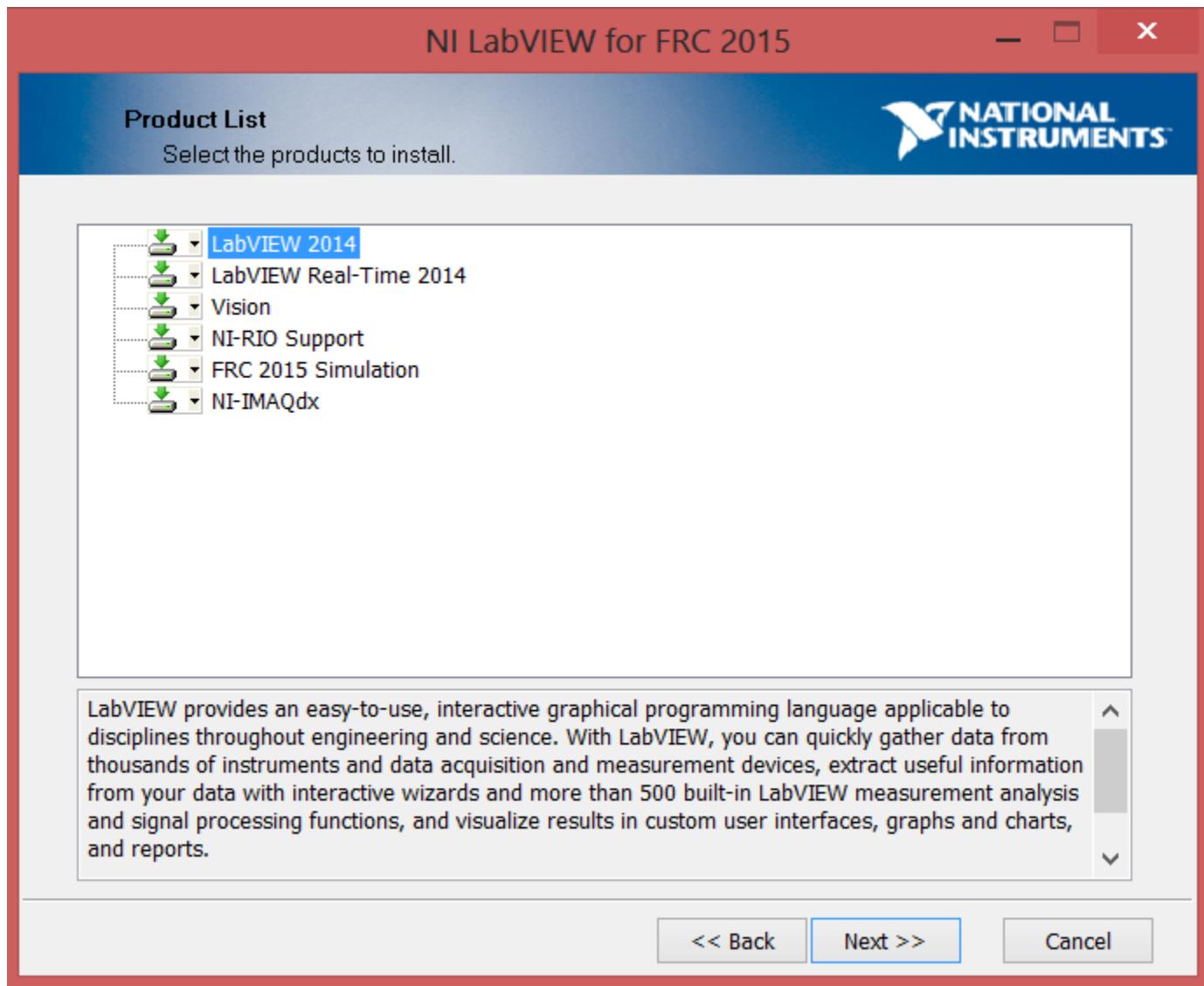
Double click on **autorun.exe** to launch the installer. If prompted to allow changes click Yes. To install LabVIEW to program your FRC robot, click the top option **Install Everything for LabVIEW Development**. To install only NI Vision Assistant for use with C++ or Java, click Install Only NI Vision Development Module.

Warnings



Click "Next"

Product List



Click "Next"



FIRST®Robotics Competition

Product Information

NI LabVIEW for FRC 2015

Product Information

Please read the following information about the products to be installed.

Search for important messages and updates on the National Instruments products you are installing. To perform this search, your IP address will be collected in accordance with the National Instruments Privacy Policy.

Note: You will be given the opportunity to select the updates you want to install.

[Privacy Policy](#)

<< Back Next >> Cancel

Un-check the box, then click "Next"



FIRST®Robotics Competition

User Information

NI LabVIEW for FRC 2015

User Information

Enter the following information.

Full Name:

Organization:

Install NI LabVIEW for FRC 2015 using the following serial number:

Serial Number:

Leave the Serial Number field blank to use the product in evaluation mode.

[<< Back](#) [Next >>](#) [Cancel](#)

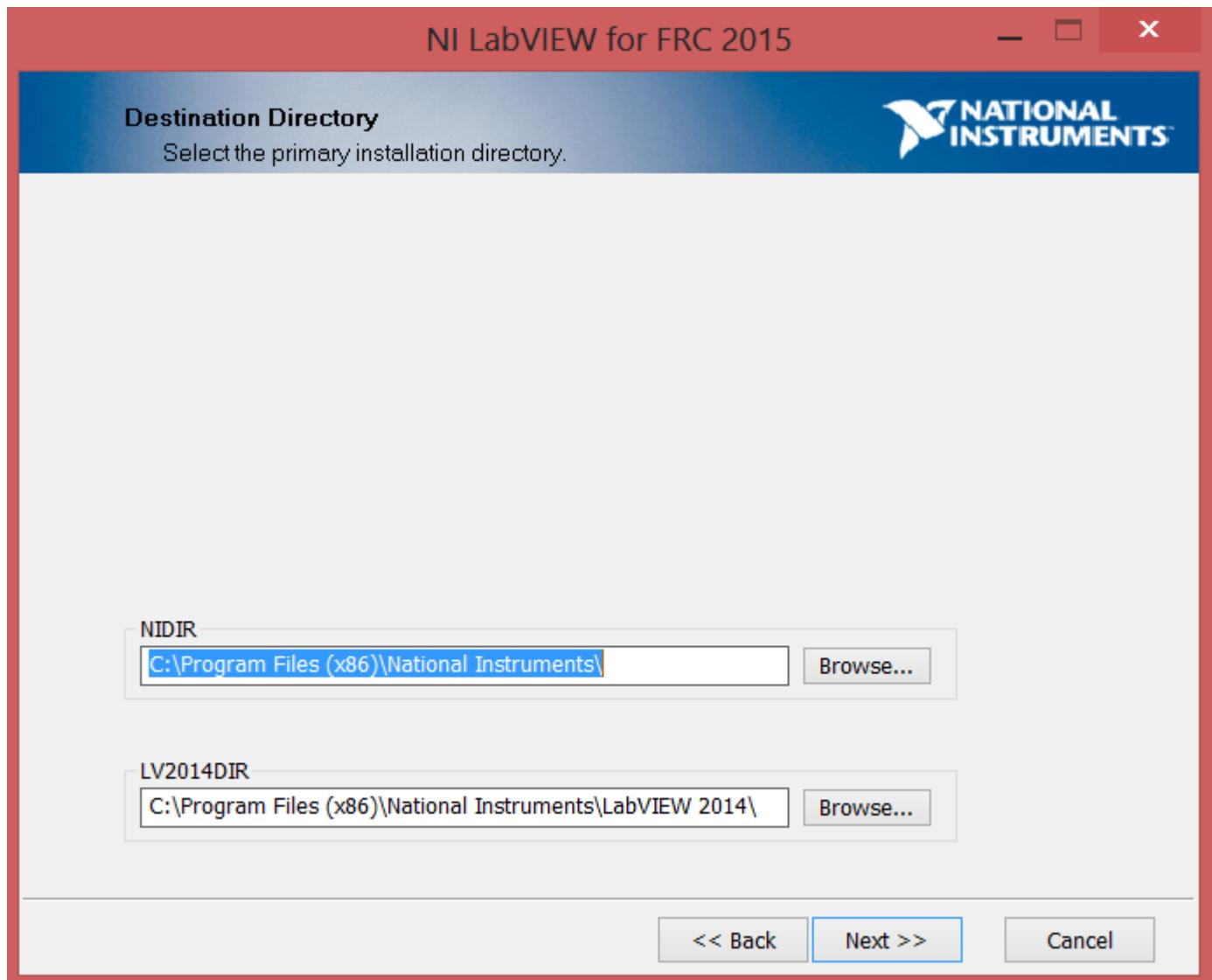
Enter name, organization, and the serial number from your KOP. Click "Next"



FRC

FIRST®Robotics Competition

Destination Directory



Click "Next"

License Agreements (1)

NI LabVIEW for FRC 2015

License Agreements
You must accept the licenses displayed below to proceed.

NI FIRST Competition IVI

NATIONAL INSTRUMENTS SOFTWARE LICENSE AGREEMENT

INSTALLATION NOTICE: THIS IS A CONTRACT. BEFORE YOU DOWNLOAD THE SOFTWARE AND/OR COMPLETE THE INSTALLATION PROCESS, CAREFULLY READ THIS AGREEMENT. BY DOWNLOADING THE SOFTWARE AND/OR CLICKING THE APPLICABLE BUTTON TO COMPLETE THE INSTALLATION PROCESS, YOU CONSENT TO THE TERMS OF THIS AGREEMENT AND YOU AGREE TO BE BOUND BY THIS AGREEMENT. IF YOU DO NOT WISH TO BECOME A PARTY TO THIS AGREEMENT AND BE BOUND BY ALL OF ITS TERMS AND CONDITIONS, CLICK THE APPROPRIATE

The software to which this National Instruments license applies is:

LabVIEW 2014
LabVIEW Real-Time 2014
Vision
NI DIO Support

I accept the above 3 License Agreement(s).
 I do not accept all these License Agreements.

<< Back Next >> Cancel

Check "I accept..." then Click "Next"



FRC

FIRST®Robotics Competition

License Agreements (2)

NI LabVIEW for FRC 2015

License Agreements

You must accept the licenses displayed below to proceed.

[Microsoft Silverlight 5 EULA](#) [Microsoft Silverlight 5 Privacy Statement](#)

MICROSOFT SOFTWARE LICENSE TERMS

MICROSOFT SILVERLIGHT 5

These license terms are an agreement between Microsoft Corporation (or based on where you live, one of its affiliates) and you. Please read them. They apply to the software named above, which includes the media on which you received it, if any. The terms also apply to any Microsoft

- updates (including but not limited to bug fixes, patches, updates, upgrades,

The software to which this third-party license applies is distributed with the following products:

LabVIEW 2014
LabVIEW Real-Time 2014
Vision
NI DIO Support

I accept the above 2 License Agreement(s).
 I do not accept all these License Agreements.

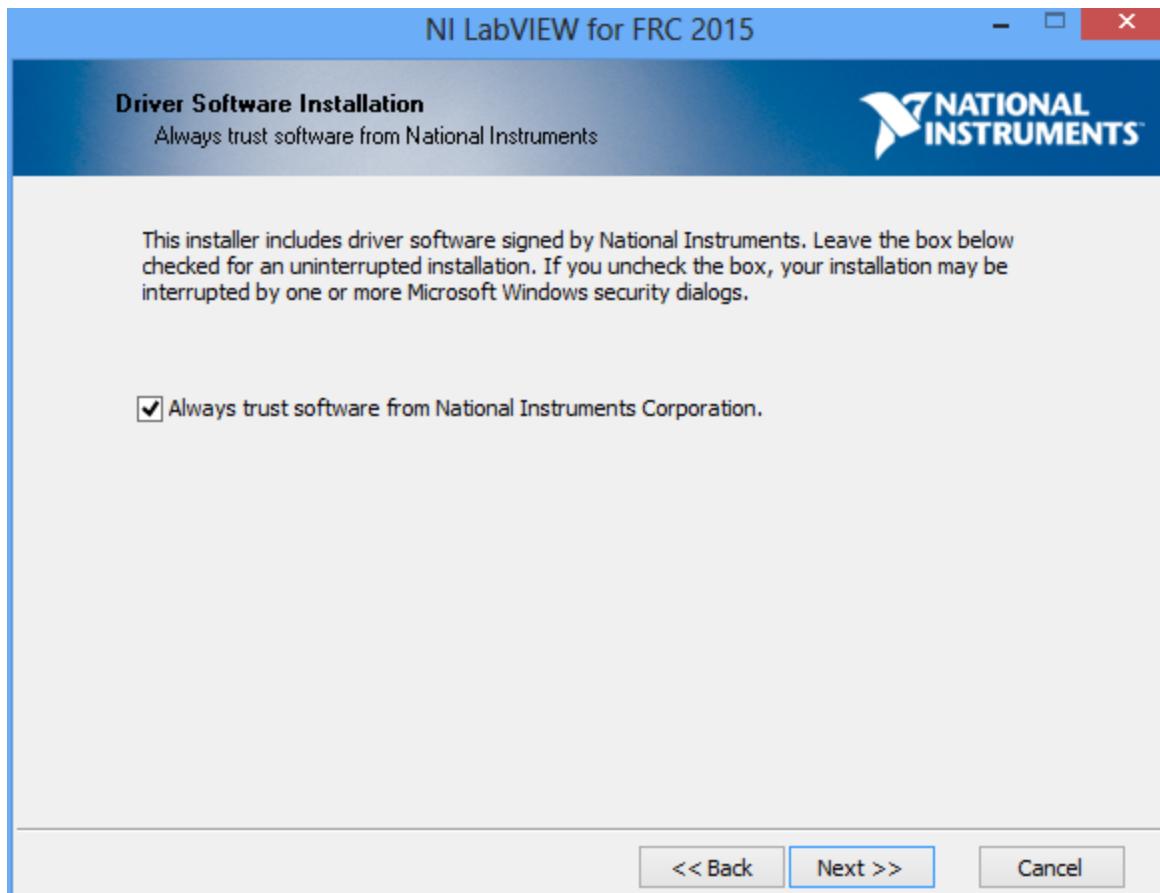
<< Back [Next >>](#) Cancel

Check "I accept..." then Click "Next"



FIRST®Robotics Competition

Driver Software Installation



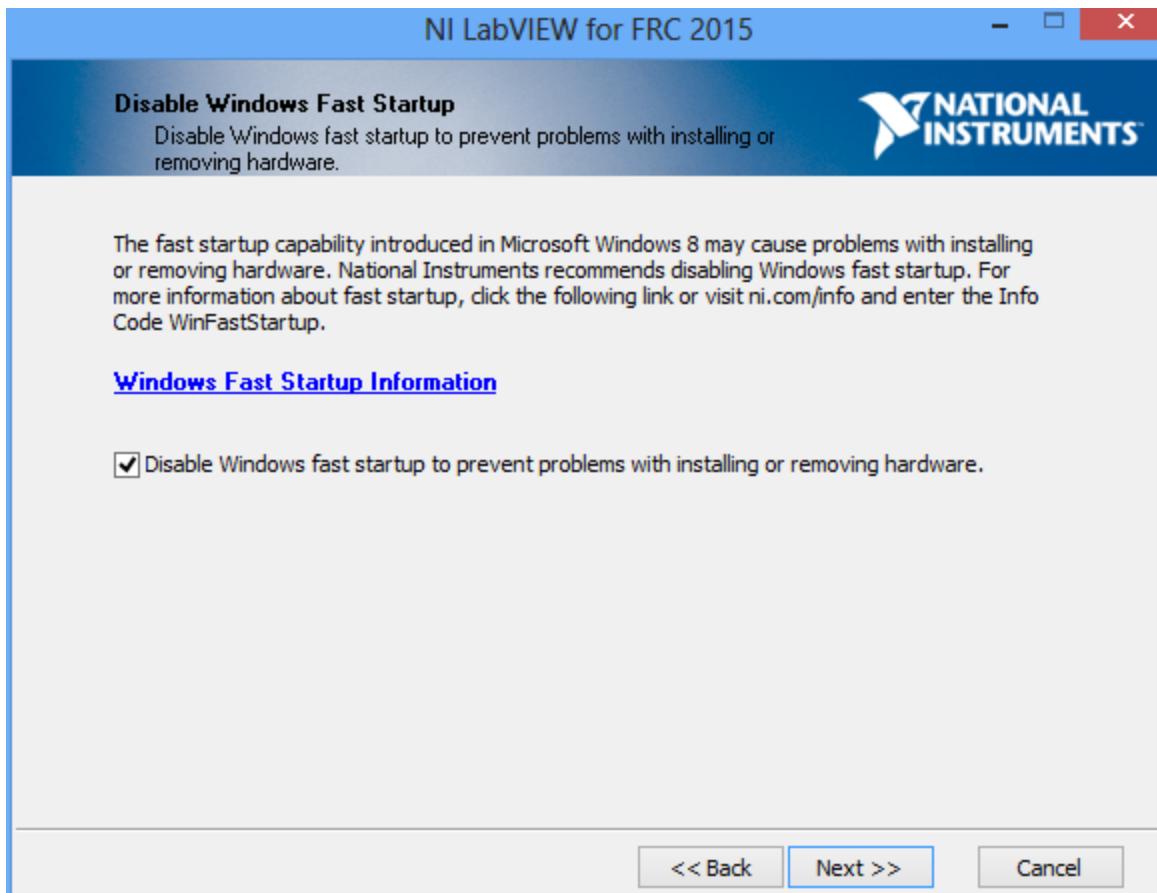
If you see this screen, Click "Next"



FRC

FIRST®Robotics Competition

Disable Windows Fast Startup



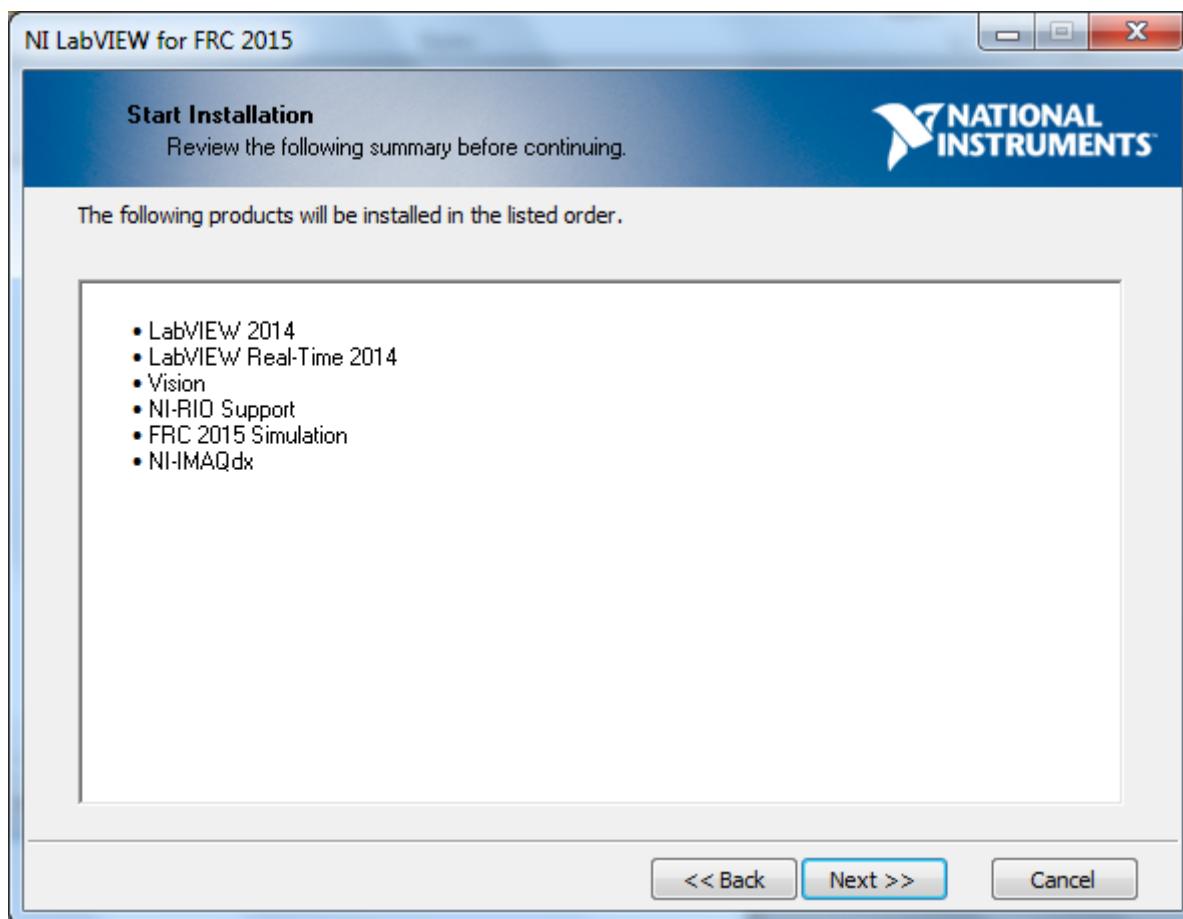
If you see this screen, click "Next"



FRC

FIRST®Robotics Competition

Start Installation



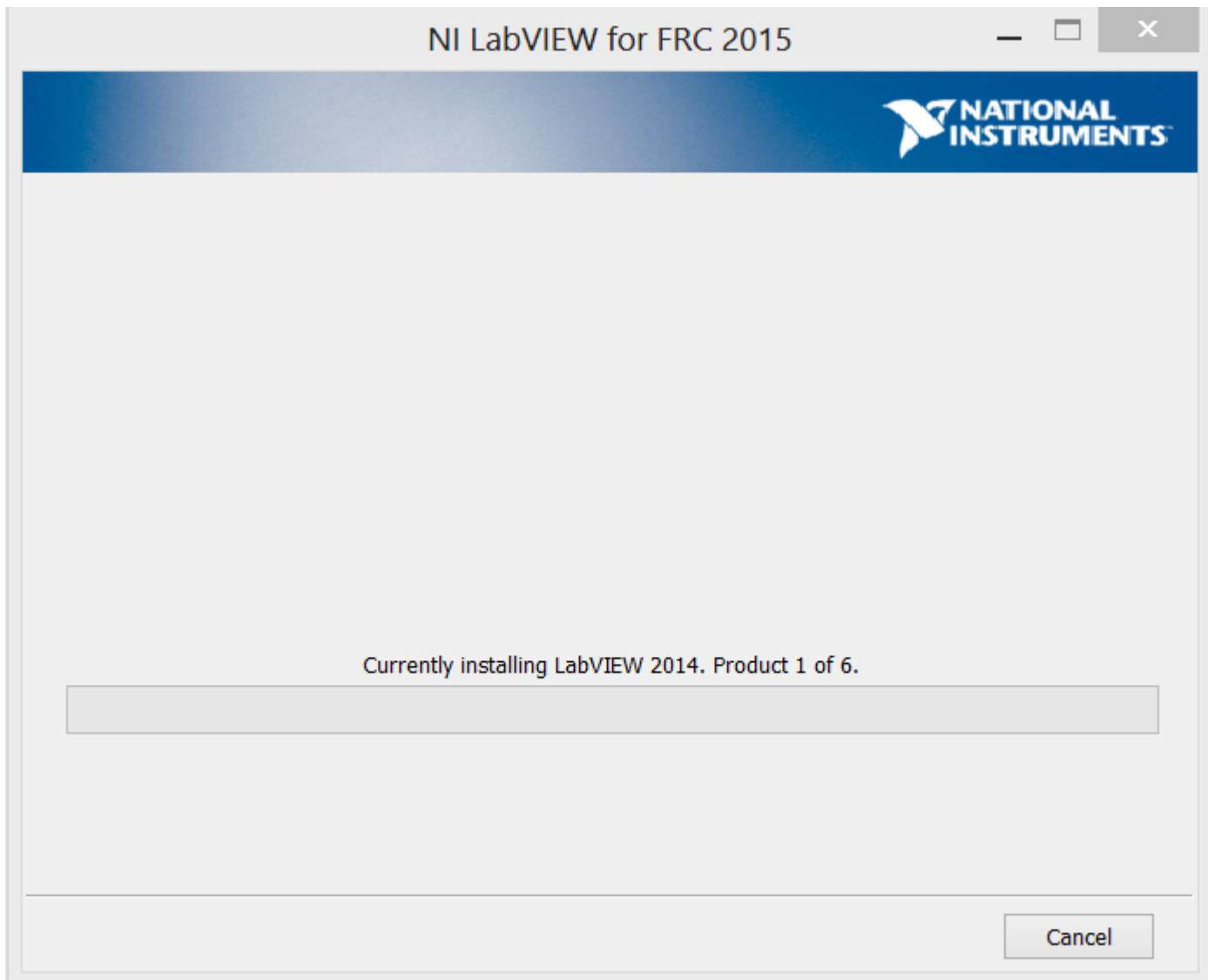
Click "Next"



FRC

FIRST®Robotics Competition

Overall Progress

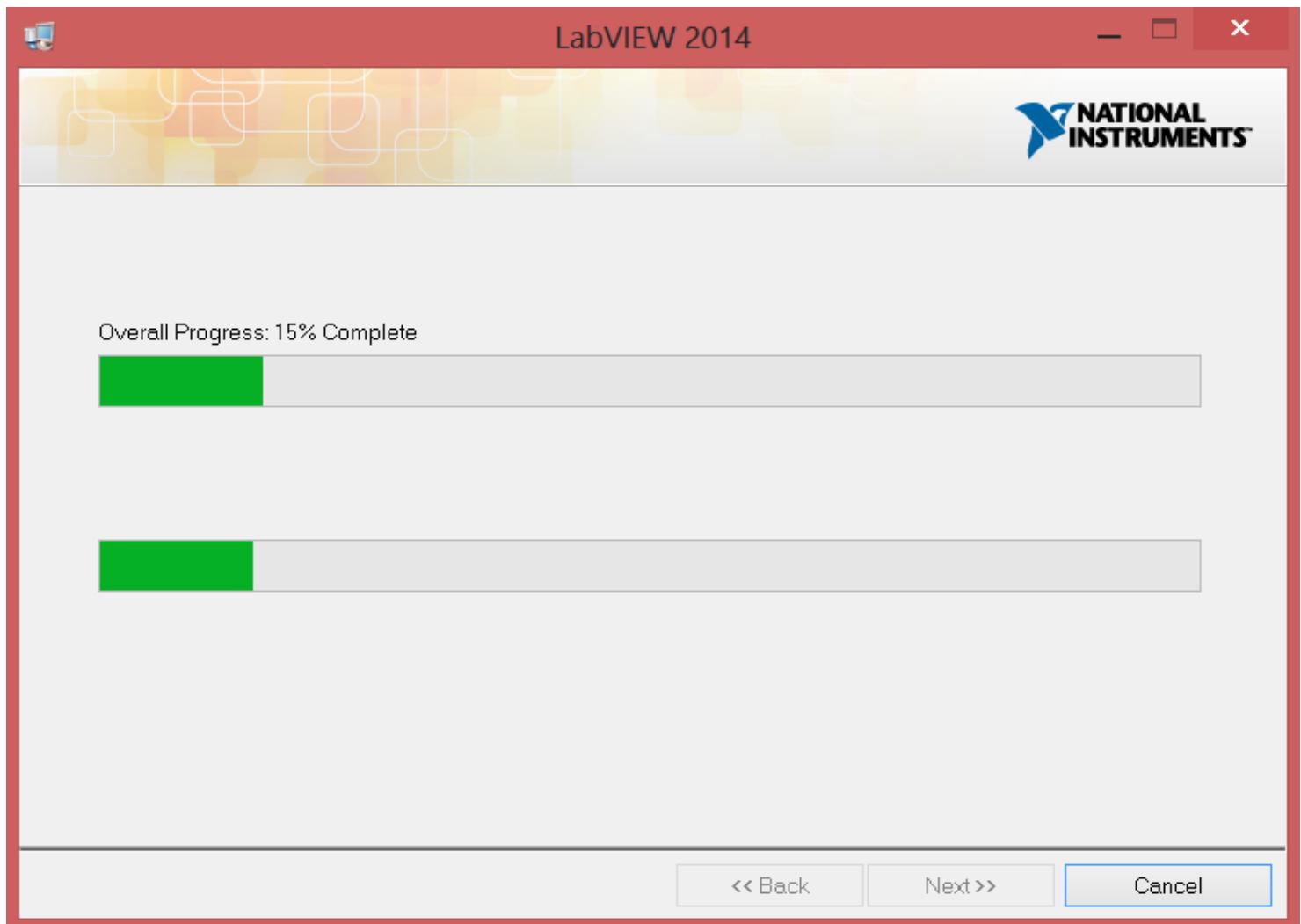


Overall installation progress will be tracked in this window



FIRST®Robotics Competition

Individual Product Progress



Each product installed will also create an individual progress window like the one shown above.

Product Information

NI LabVIEW for FRC 2015

Product Information

Please read the following information about the products you have installed.

LabVIEW 2014

WARNING: Windows Firewall Might Be Enabled

You have a version of the Windows operating system that enables the Windows Firewall by default. When you first launch LabVIEW, a dialog might appear that gives you the option to receive information over the network. National Instruments recommends you select "Unblock" so that you can use all the networking features in LabVIEW. Refer to [ni.com/info](#) and enter the info code `expm69` for more information.

Vision

WARNING: Windows Firewall Might Be Enabled

You have a version of the Windows operating system that enables the Windows Firewall by default. When you first use NI Vision, a dialog might appear that gives you the option to receive information over the network. National Instruments recommends you select "Unblock" so that you can use the networking features of NI Vision.

NI-IMAQdx

<< Back [Next >>](#) Finish

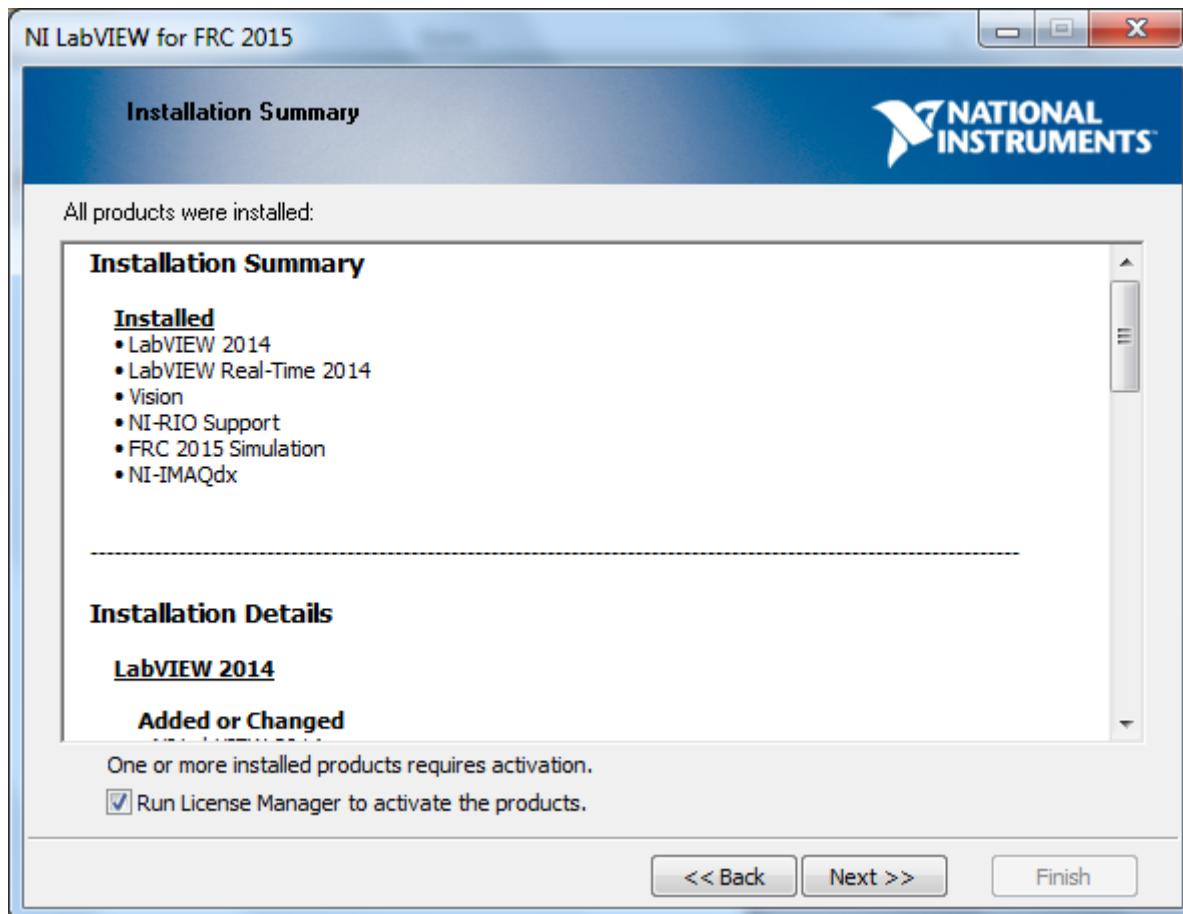
Click "Next"



FRC

FIRST®Robotics Competition

Installation Summary



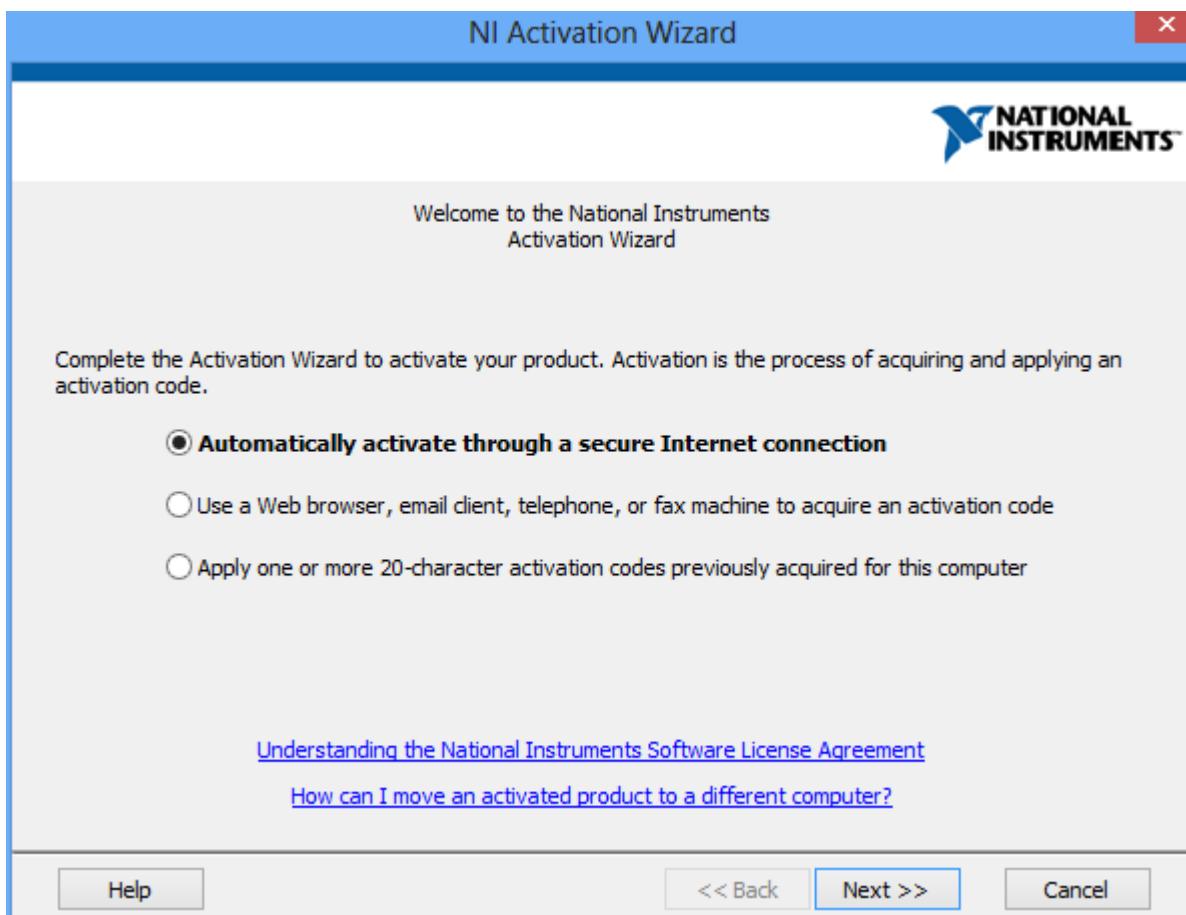
If internet access is available and you are ready to activate, click "Next"; otherwise uncheck the "Run License Manager..." and click "Next".



FRC

FIRST®Robotics Competition

NI Activation Wizard

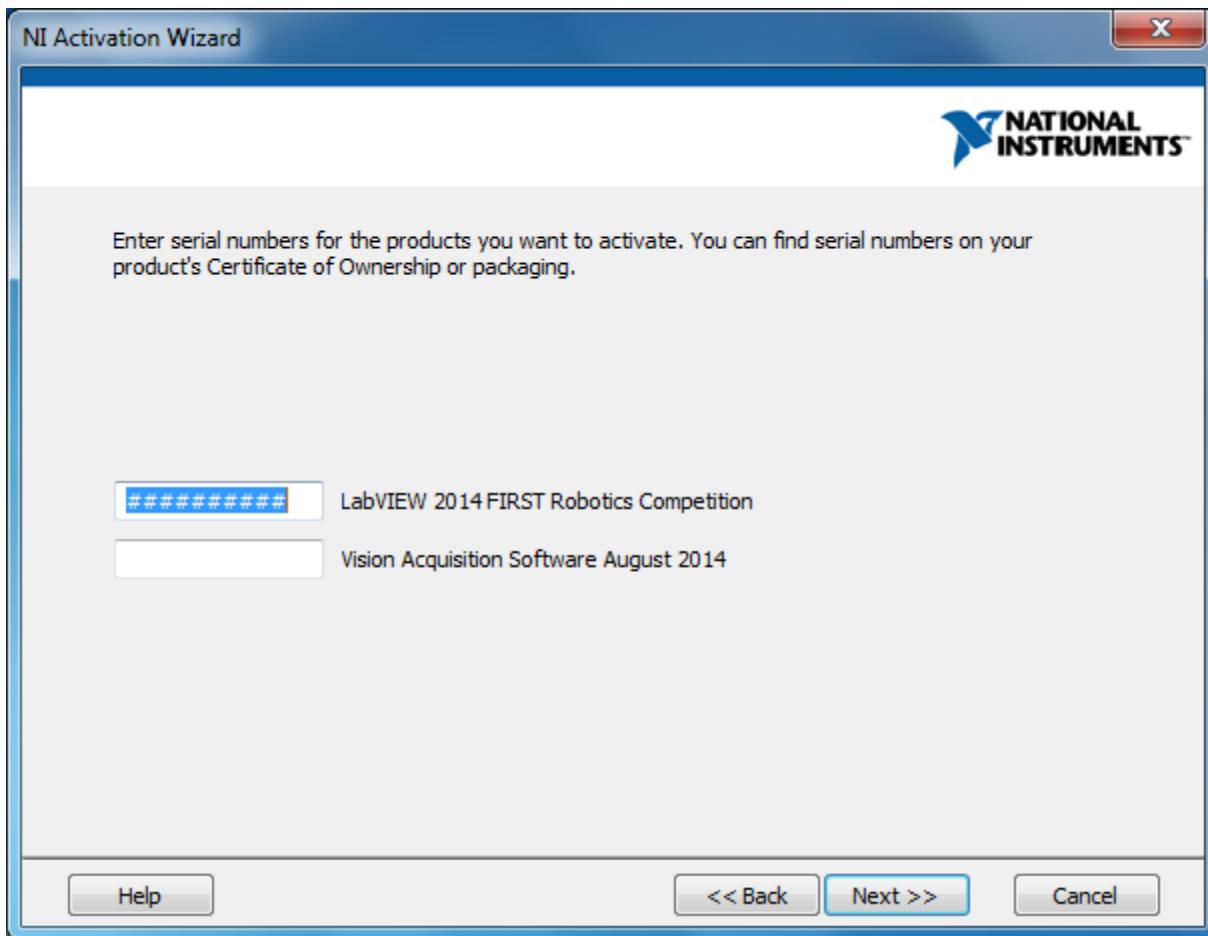


If internet connection is available, click "Next"



FIRST®Robotics Competition

NI Activation Wizard (2)



The serial number you entered at the "User Information" screen should appear in all of the text boxes. Click "Next".



FRC

FIRST®Robotics Competition

NI Activation Wizard (3)

NI Activation Wizard

NATIONAL INSTRUMENTS

A National Instruments User Profile is required to activate your product. When you activate NI software using your User Profile, NI can better deliver benefits associated with software maintenance and support programs.

Log in to your User Profile

Email

Password

[Forgot your password?](#)

Create a new User Profile

[National Instruments Software Activation Privacy Statement](#)

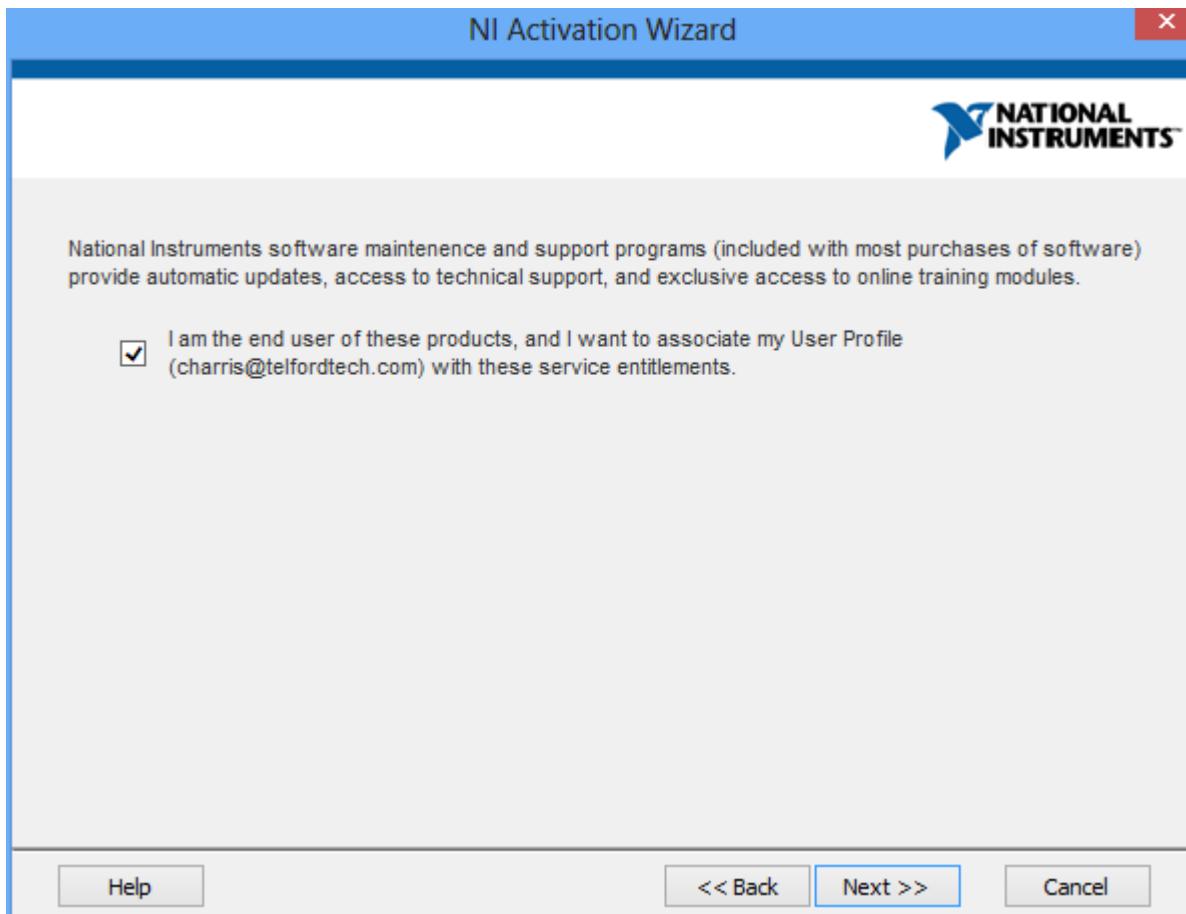
Help Next >> Cancel

Check "Log in to your User Profile" and enter your NI user profile information, or check "Create a new User Profile" then click "Next".



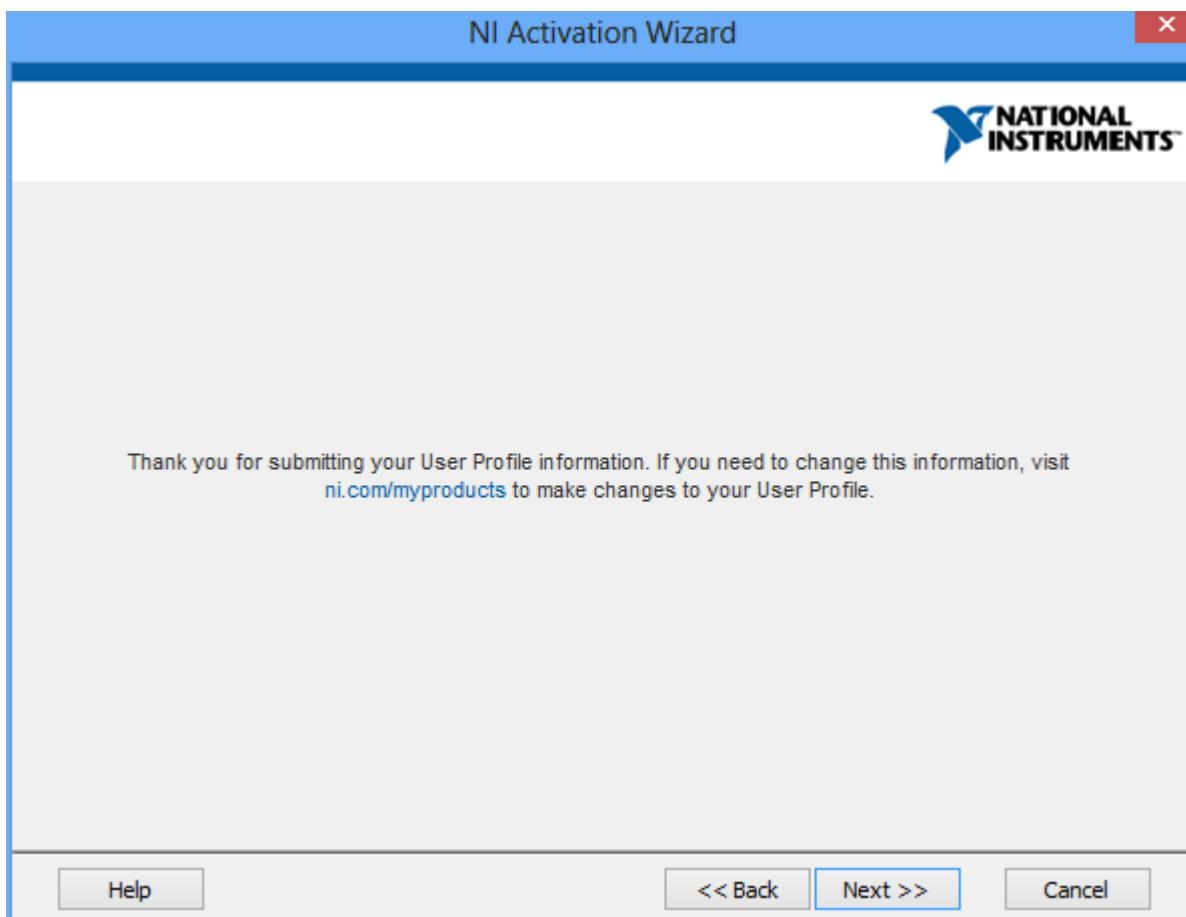
FIRST®Robotics Competition

NI Activation Wizard (4)



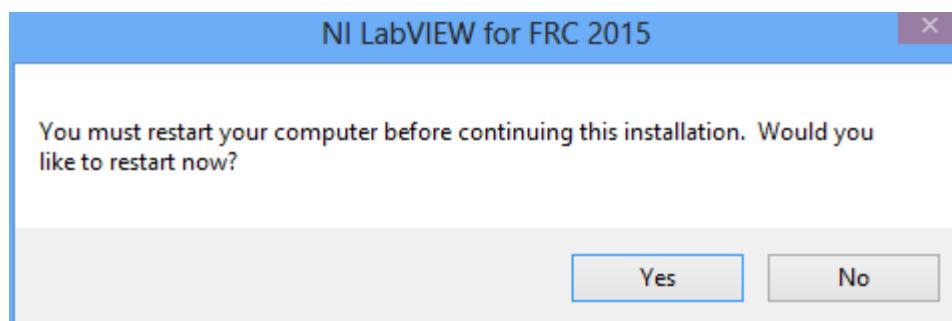
Click "Next".

NI Activation Wizard (5)



Click "Next".

Restart Message



Select "Yes"



FIRST®Robotics Competition

NI Update Service

A screenshot of the NI Update Service application window. The window title is "NI Update Service". The menu bar includes "File", "Edit", and "Help". A status bar at the top right shows "1 update hidden".

- ⊖ **Critical Updates (2)**
 - ⊖ Development Environment Software
 - LabVIEW 2013 (32-bit) f2 Patch URGENT 171 MB
 - ⊖ Driver Software
 - LabVIEW Real-Time 2013 Patch for Linux RT Targets 211 MB
- ⊖ **Patches (1)**
 - ⊖ Development Environment Software
 - Patch for Building Installers with NI Products 22 MB
- ⊕ **Upgrades and Service Packs (11)**

On occasion you may see alerts from the NI Update Service about patches to LabVIEW. The majority of these updates are patches to functionality of LabVIEW not typically used in FRC (even those marked as critical or urgent). You are welcome to click the links for the patch notes and choose to install some or all of these patches, however **FRC will communicate any recommended updates through our usual channels** (Frank's Blog, Team Updates or E-mail Blasts).

Installing Eclipse (C++/Java)

The 2015 suite of text-based languages, Java and C++, utilize the current version of Eclipse as a development environment. The FRC specific tools for the chosen language are installed as Eclipse plugins. You can install both the Java and C++ development tools into the same installation of Eclipse to allow programs to be written with either language using a common set of tools and user interface.

Note: The C++ and Java tools and environment are available for Windows, Mac OSX and Linux, though the Windows version is the one that has been the most heavily tested. You should be able to use any of the three for your development platform, however you should keep in mind that you will need a Windows computer to run the Driver Station software and roboRIO Imaging tool.

Getting Java

Java SE Development Kit 8u11

You must accept the [Oracle Binary Code License Agreement](#) for Java SE to download this software.

Accept License Agreement Decline License Agreement

| Product / File Description | File Size | Download |
|----------------------------|-----------|--|
| Linux x86 | 133.58 MB |  jdk-8u11-linux-i586.rpm |
| Linux x86 | 152.55 MB |  jdk-8u11-linux-i586.tar.gz |
| Linux x64 | 133.89 MB |  jdk-8u11-linux-x64.rpm |
| Linux x64 | 151.65 MB |  jdk-8u11-linux-x64.tar.gz |
| Mac OS X x64 | | |
| Solaris SPARC 64-bit (SVR) | | |
| Solaris SPARC 64-bit | 96.14 MB |  jdk-8u11-solaris-sparcv9.tar.gz |
| Solaris x64 (SVR4 package) | 135.7 MB |  jdk-8u11-solaris-x64.tar.Z |
| Solaris x64 | 93.18 MB |  jdk-8u11-solaris-x64.tar.gz |
| Windows x86 | 151.81 MB |  jdk-8u11-windows-i586.exe |
| Windows x64 | 155.29 MB |  jdk-8u11-windows-x64.exe |

x86/64 should match Eclipse version

To use Eclipse you must have Java JDK installed on your system. You can get Java from the web site: <http://www.oracle.com/technetwork/java/javase/downloads/index.html>. Select "Java Download", then scroll down the page to "Java SE Development Kit". Accept the license agreement and download the Java SDK for your platform. The version (either x86 or x64) should match the version of Eclipse that you have installed or plan to install on your computer. This has been tested with Java SE 8u11 but will probably work with later versions as well.

Java 8 is installed on the RoboRIO and to take advantage of all the features it offers, it is suggested that you use Java 8 on your development system. You may use an earlier version.

Note: Java is required to be installed even if you are doing C++ development since Eclipse, the development environment, is a Java program. Also, the Oracle web page might change over time, so the images shown here might not exactly match what you see.

Installing the C++ Toolchains (C++ teams only)



Download the appropriate C++ Toolchains installer for your platform from <http://first.wpi.edu/FRC/roborio/toolchains/>

Note: Remaining Toolchain installation instructions describe Windows installation, instructions for the other two platforms are listed on the download pages.

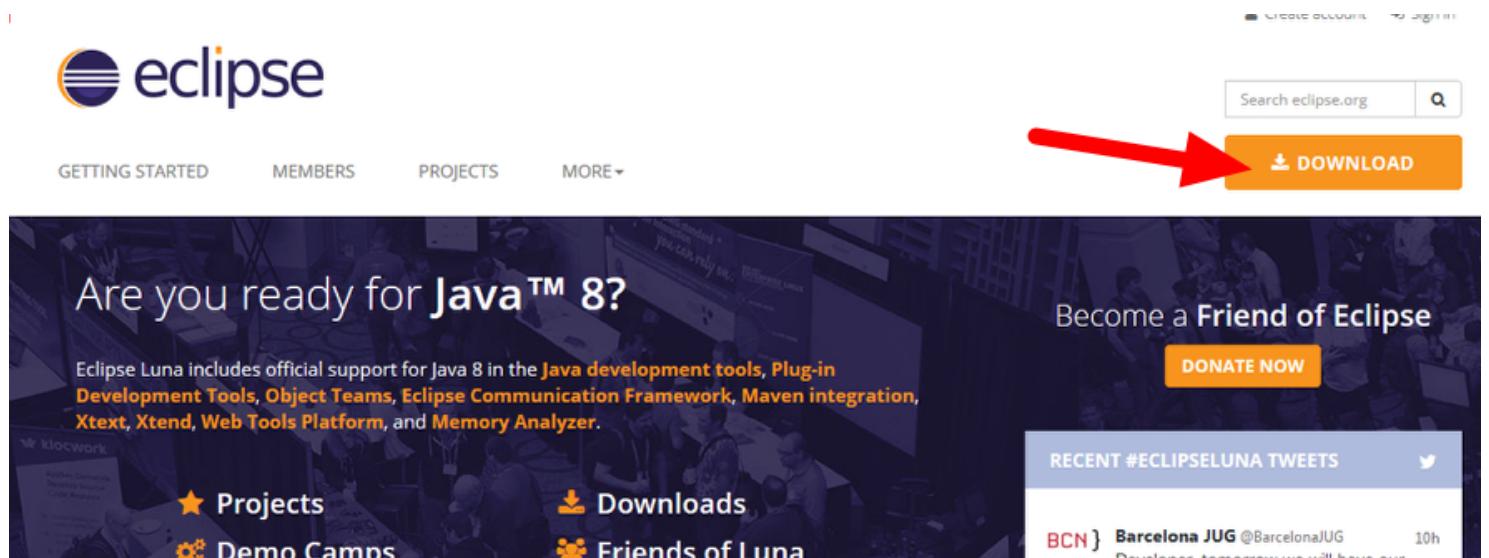
Note: The Windows toolchains will install to the drive the installer is run from. To install from a USB drive, make sure to copy the installer to a permanent drive on the computer before running it. If you accidentally install in the wrong location, run the installer again and select "Remove" to uninstall, move the installer to the desired drive and then re-install.

Windows: Double click on the downloaded file to launch it. If you receive a Security Warning, click Run. Check the box to accept the License Agreement, then click **Install**. When the install completes, click **Finish**.

Mac OSX: Double-click on the downloaded file in Finder to unzip it. In Finder, right-click on the "FRC ARM Toolchain.pkg" file, then press the option key on your keyboard, and click "Open". Follow the steps to install the package.

Linux: See the instructions in the text file on the toolchains page.

Getting Eclipse



The screenshot shows the Eclipse website homepage. At the top, there's a navigation bar with links for 'GETTING STARTED', 'MEMBERS', 'PROJECTS', and 'MORE'. On the right side of the header, there's a search bar labeled 'Search eclipse.org' and a large orange 'DOWNLOAD' button with a white icon. Below the header, a banner features the text 'Are you ready for Java™ 8?' and information about Eclipse Luna's Java 8 support. It also includes links for 'Projects', 'Downloads', and 'Friends of Luna'. To the right, there's a section for 'Friends of Eclipse' with a 'DONATE NOW' button and a 'RECENT #ECLIPSELUNA TWEETS' feed. The overall theme is dark with purple and blue accents.

You can get eclipse from the web site: <http://www.eclipse.org> then press the "Download" button to select the version to be used.

Download Eclipse



The screenshot shows the Eclipse download page. It lists several IDE options, with 'Eclipse IDE for C/C++ Developers, 140 MB' being the first one. Below the link, it says 'Downloaded 102,350 Times' and 'An IDE for C/C++'. A red callout box points to the text '32/64 should match Java version' and the 'Windows 32 Bit' and 'Windows 64 Bit' download links. Other versions listed include 'Eclipse IDE for Java and Report Developers, 225 MB' and 'Windows 32 Bit'.

Select the C/C++ version of eclipse. **The C/C++ version should be selected regardless of programming language choice (C++ or Java).** You can also select one of the other versions, but that will require adding the C Development Tools (CDT). You should choose the version of eclipse that matches your operating system and version of Java from above.

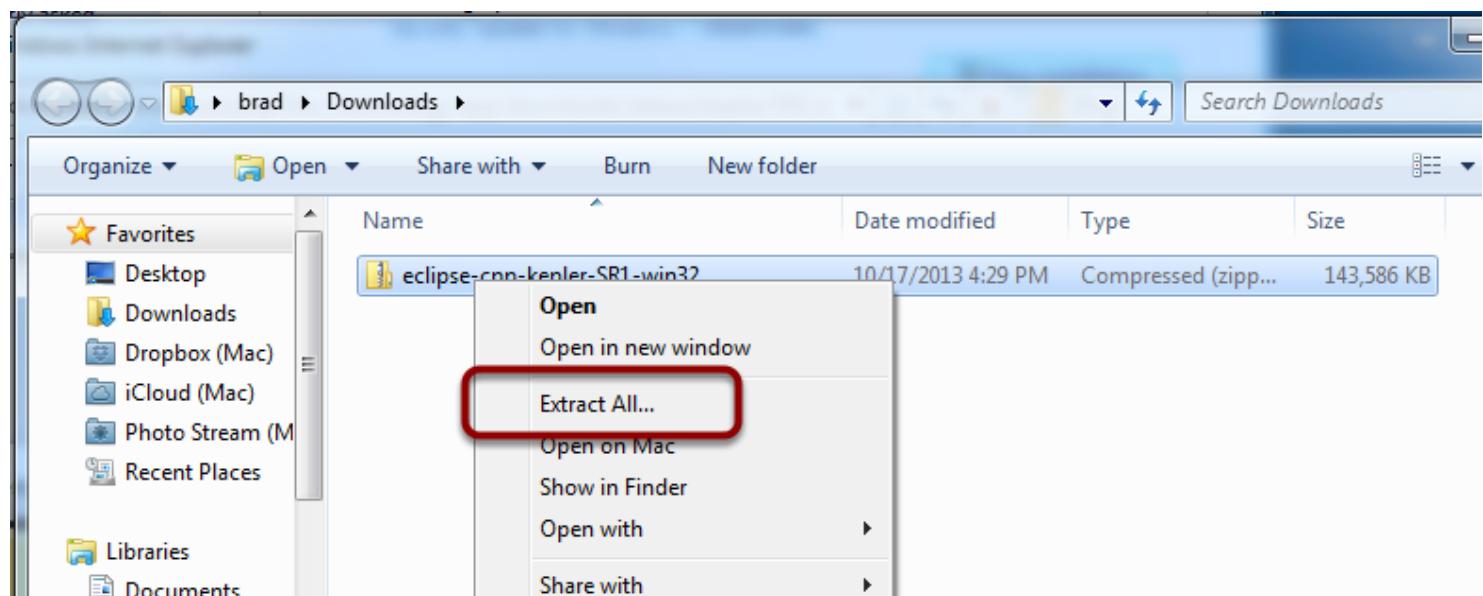
At the time of this writing the current version is Luna (4.4) and that is what we've been using for development of the tools. On the next screen choose a download site and start the download. Choose a location such as the downloads folder for the zip file.

Note: on 64 bit Linux systems it might be necessary to install 32 bit version of libc. For example, on Ubuntu Linux, the command would be:

```
sudo apt-get install libc6-i386
```

This is necessary to run the gcc binaries as part of the plugins since they are compiled for 32 bit linux.

Unpack the eclipse folder and move it to Program Files



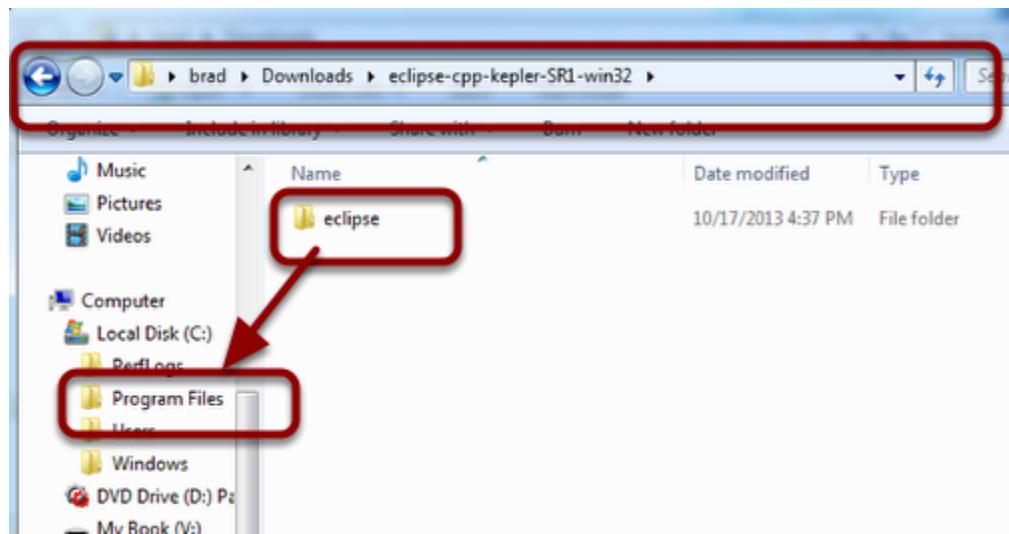
Extract the contents of the zip file by right-clicking on the .zip file in a windows explorer window and selecting "Extract All..." and taking the default for the location to extract it.



FRC

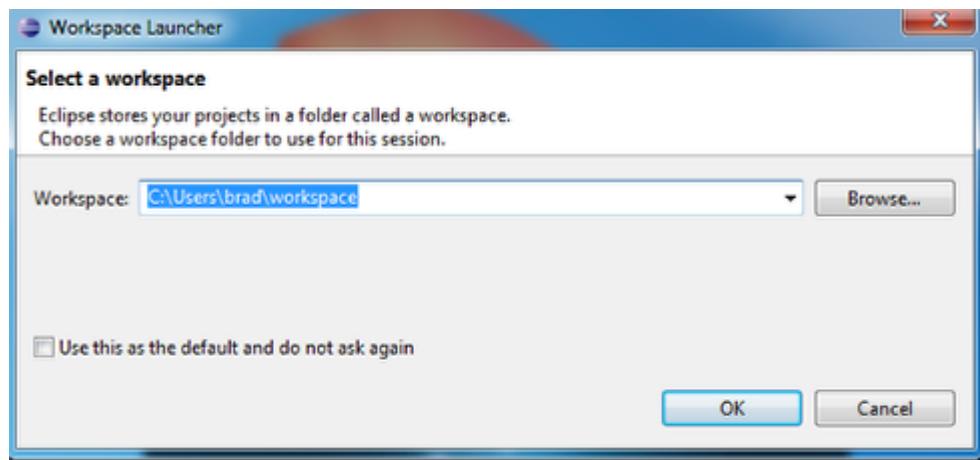
FIRST® Robotics Competition

Move the extracted eclipse folder to Program Files



Move the extracted folder to Program Files or some other convenient location from which to easily run it. Within the eclipse folder you'll see the file "eclipse.exe". You can right-click on "eclipse.exe" and select "Pin to start menu" to make it easier to run eclipse without having to find the installation location.

Starting Eclipse for the first time



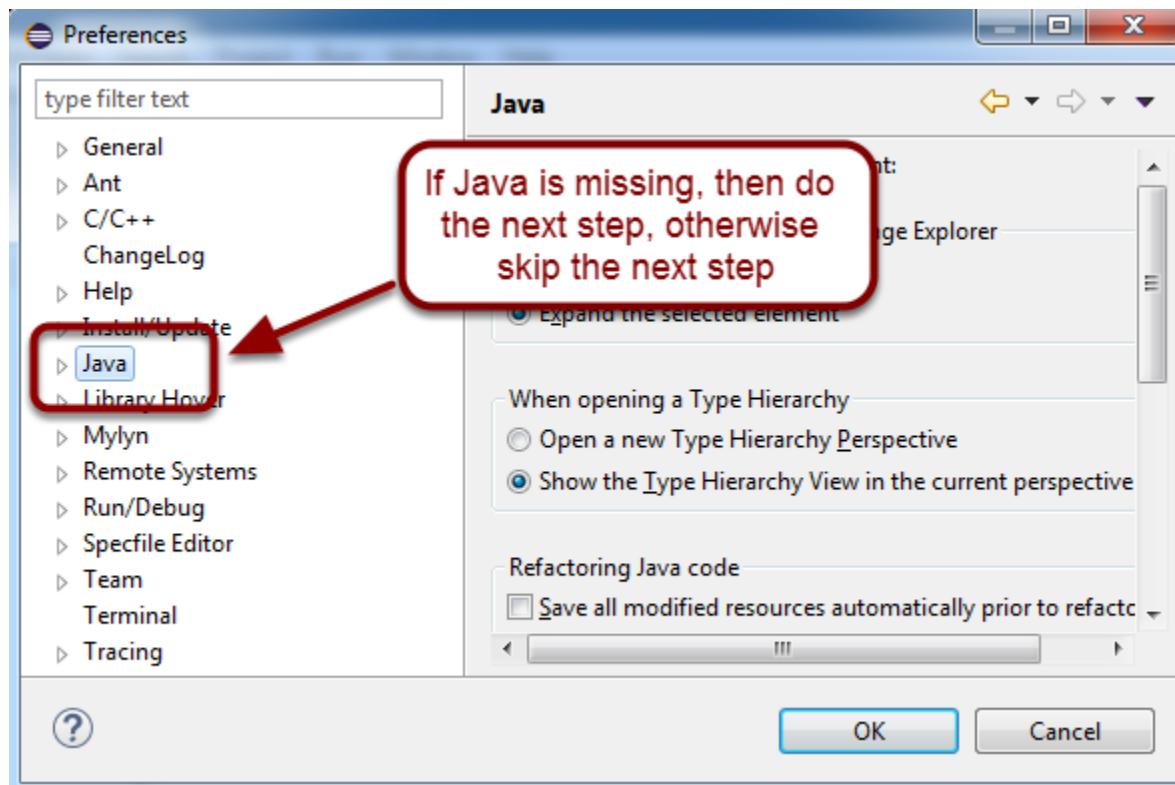
Start Eclipse (it will be on your start menu if you chose to pin it from the previous step.) The first time Eclipse starts it will ask you for the location of your workspace. A workspace is the location on disk where projects and files are stored by default. You can have more than one workspace, but it's suggested to take the default location until you have more experience with Eclipse.



FRC

FIRST®Robotics Competition

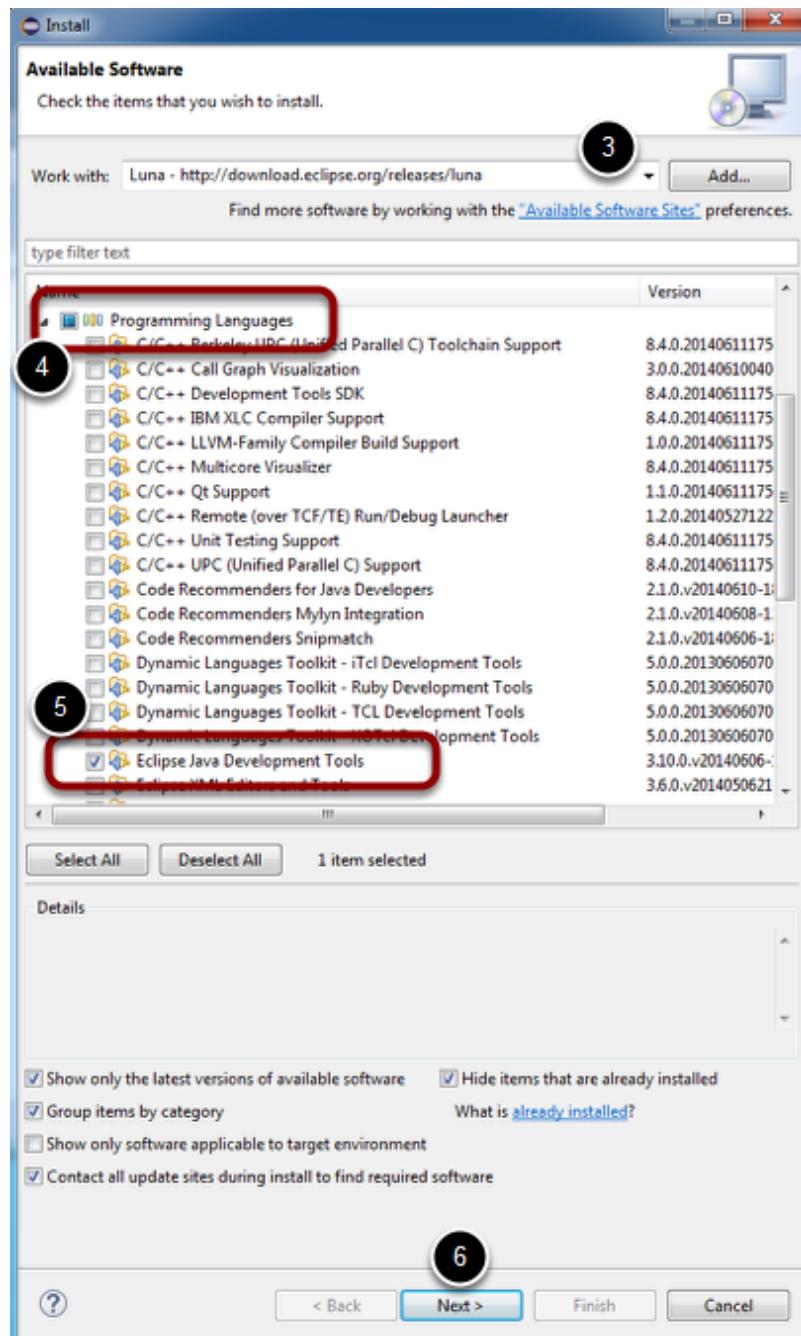
Checking for Java development tools (Java teams only)



On some installations of the C++ version of eclipse the Java development tools don't also get installed. To determine this (and to be able to do the following steps), be sure to install it. To determine if it's missing, select Window, then Preferences from the menu bar. Then look for Java on the left side of the Preferences window. If it is missing then you must install it. The installation procedure is in the next step. If you do have the Java development tools installed (Java is shown), then skip the next step and continue configuring to Setting up the JDK in Eclipse.

Note: while Java is not strictly required to be installed to use WPILib C++ we recommend setting up Eclipse to be able to handle both when you are starting so that if you decide to try writing Java programs in the future, the tools will be ready for use.

Install Eclipse Java Development Tools



If Java is missing from the preferences window (see previous step), then it must be installed

1. Close the Preferences window if it's open.



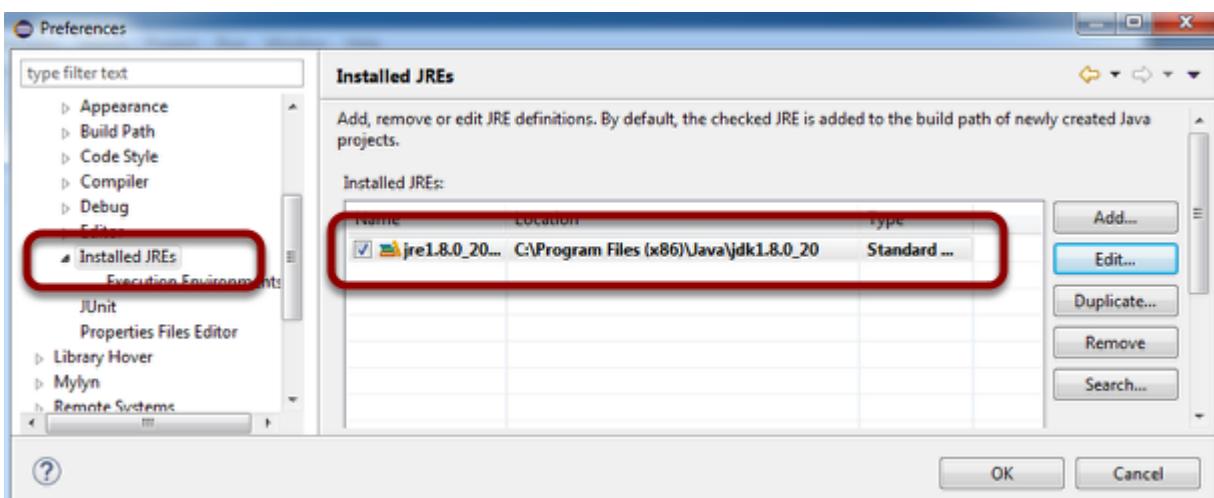
FRC

FIRST® Robotics Competition

2. Select Help, then Install New Software... from the menu bar.
3. Click the dropdown and select the "Luna" site as shown.
4. Scroll down to the Programming Languages section and click the arrow to expand.
5. Choose Eclipse Java Development Tools
6. Click Next.
7. Take the defaults for the other options and let Eclipse restart.

When these steps are finished, and Eclipse has restarted, Java should be an available option on the Preferences window, and all the Java perspectives will be available.

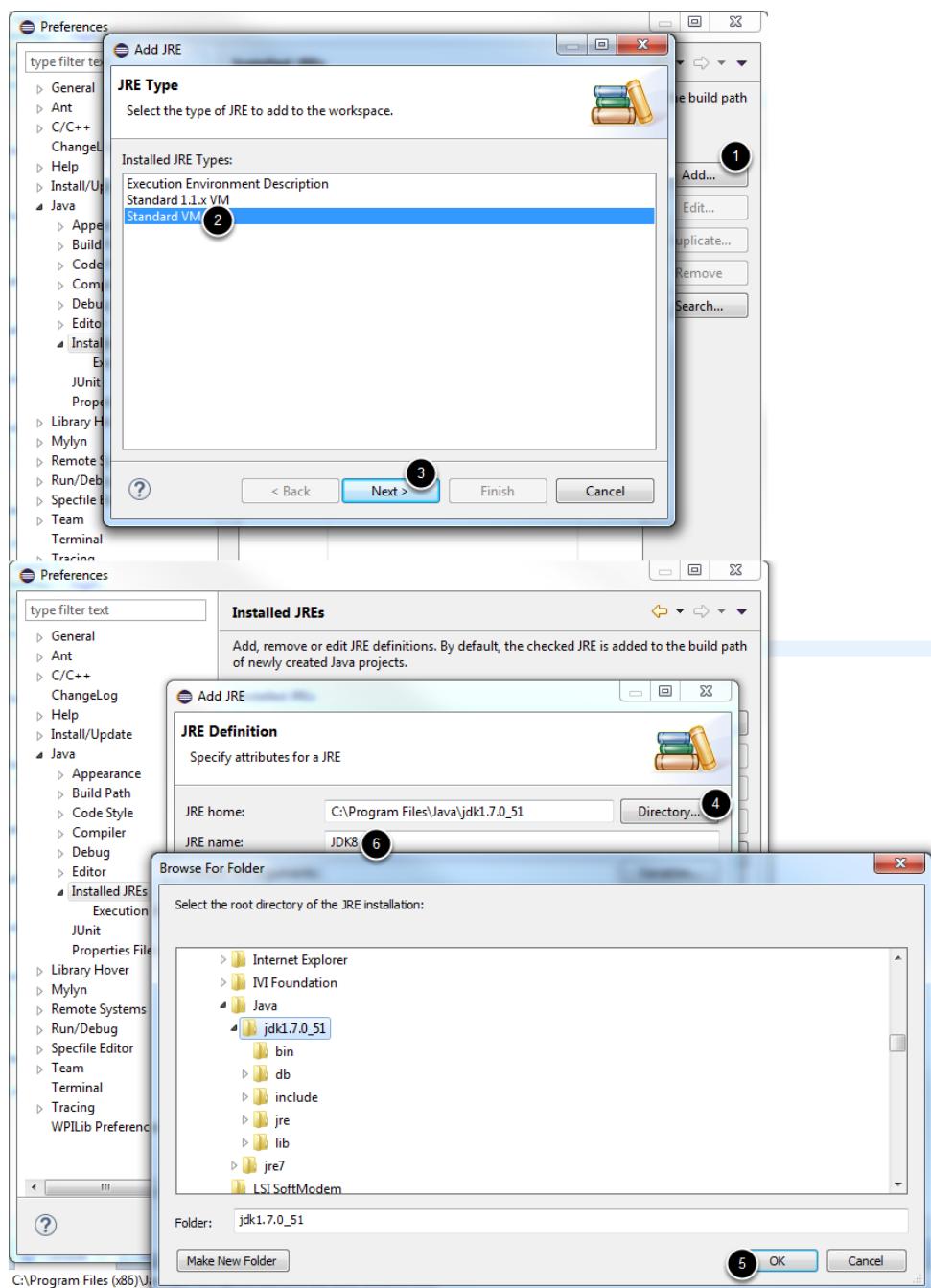
Setting up the JDK in eclipse (Java teams only)



Select Windows from the menu bar, then Preferences. Choose Java preferences in the list on the left of the Preferences window, then Installed JREs. Be sure that the installed JDK is selected as shown (make sure the "Location" field includes jdk 8 or 1.8, the name field may be the same in either location). This will enable eclipse to build Java programs for the RoboRIO. Without this setting you will see error messages about the JRE path not being set correctly.

If you do not see any option with the appropriate location, see the next step "Adding the JDK". If you do have the appropriate option, skip the next step.

Adding the JDK



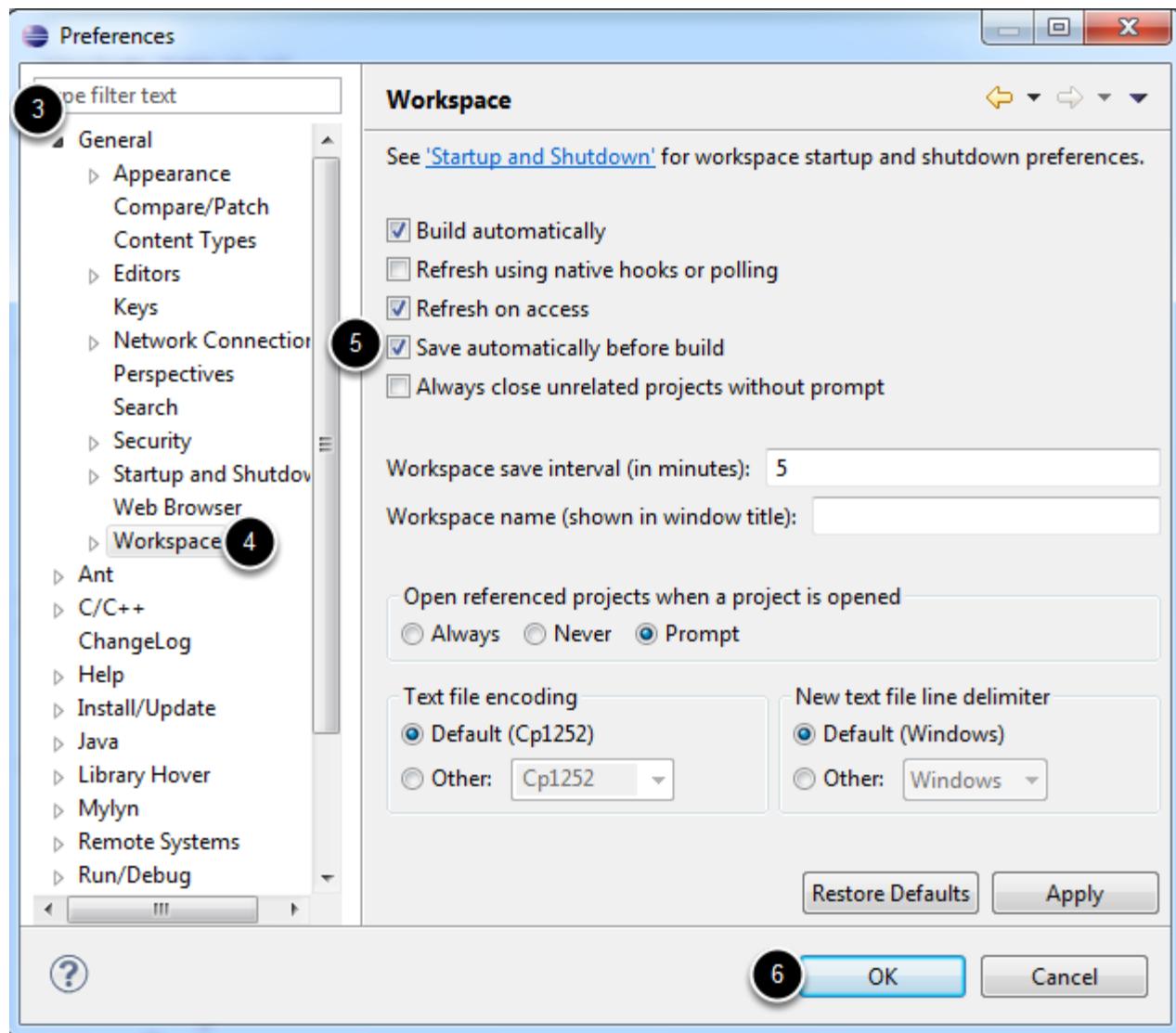
Only if the JDK is not shown in the step above:

1. Click **Add**



2. Select **Standard VM**
3. Click **Next**
4. Click **Directory** and browse to the folder for the JDK (usually C:\Program Files\Java* or C:\Program Files (x86)\Java*). The image shows jdk1.7.0_51, you will likely have a jdk1.8.* version.
5. Click **OK**. Pick a name for the JRE such as JDK8.
6. Click **Finish**
7. Make sure the box for the newly added JDK entry is checked.

Configuring eclipse



There is a huge number of configuration options for eclipse to set up the environment for your preferences. One suggested setting to note is: "Save automatically before build." This setting will cause all of your workspace changes to be saved when you build the project. If you don't set this, remember to save changes before building, otherwise the rebuilt program won't reflect your newest updates.

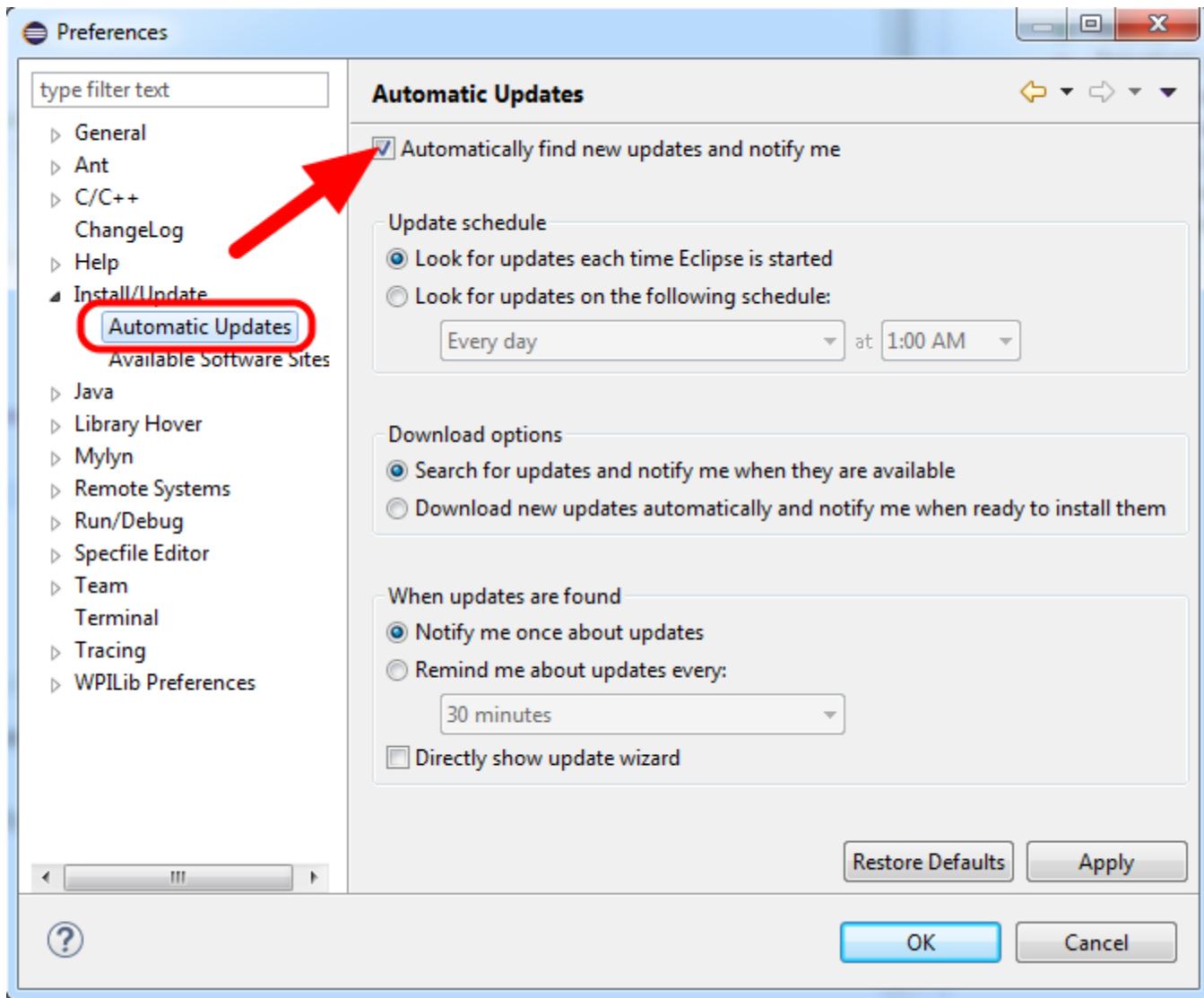
To set this, go to **Window -> Preferences -> General -> Workspace -> Check Save automatically before build -> OK**



FRC

FIRST® Robotics Competition

Automatic Updates



Another recommended setting is enabling Automatic Updates. With Automatic Updates enabled, Eclipse will check for updated versions of the plugins each time it starts and inform you if an update is available. This will help insure you are notified of new versions of the WPILib plugins.

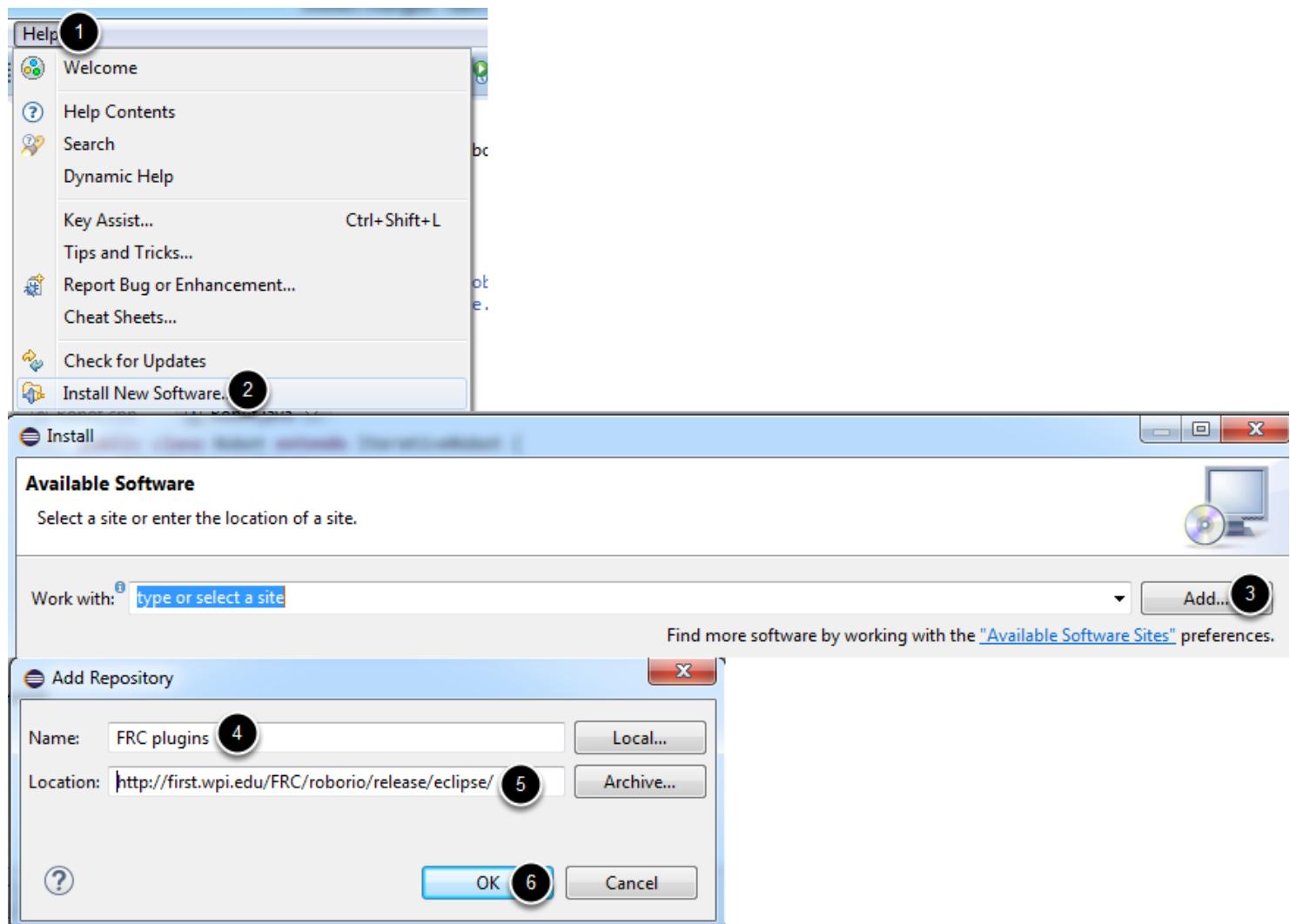
To enable Automatic Updates, select **Install/Update** then **Automatic Updates**. Check the box at the top to **Automatically find new updates and notify me**.



FRC

FIRST®Robotics Competition

Installing the development plugins - Option 1: Online Install



It is recommended to install the plugins using this method, which requires an active internet connection and fetches the plugins directly from the WPILib site. This will allow you to check for updates to the plugins using Eclipse.

Eclipse extensions are based on user-installed plugins. To get the WPILib development tools you will need to install the correct plugin for your language.

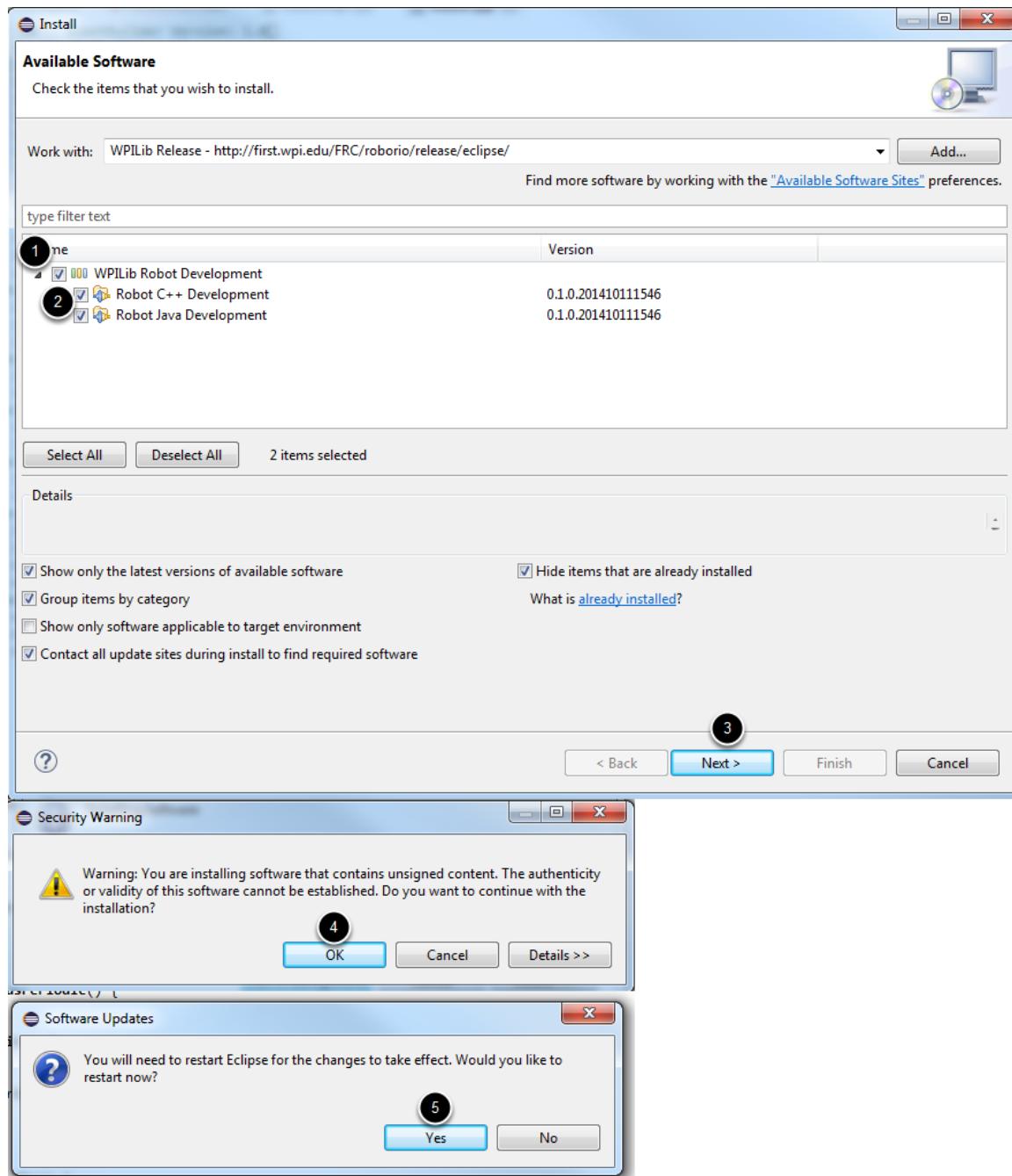
When Eclipse starts:

1. Select "Help"



2. Click "Install new software".
3. From here you need to add a software update site, the location where the plugins will be downloaded. Push the "Add..." button then fill in the "Add Repository" dialog with:
4. Name: FRC Plugins
5. Location: <http://first.wpi.edu/FRC/roborio/release/eclipse/>
6. Click "OK".

Selecting the correct plugins



1. Click the arrows if necessary to expand the WPILib Robot Development menu.
2. Select the WPILib Robot Development plugin for your desired language (you can install both if you wish to try programming in both languages)



FIRST®Robotics Competition

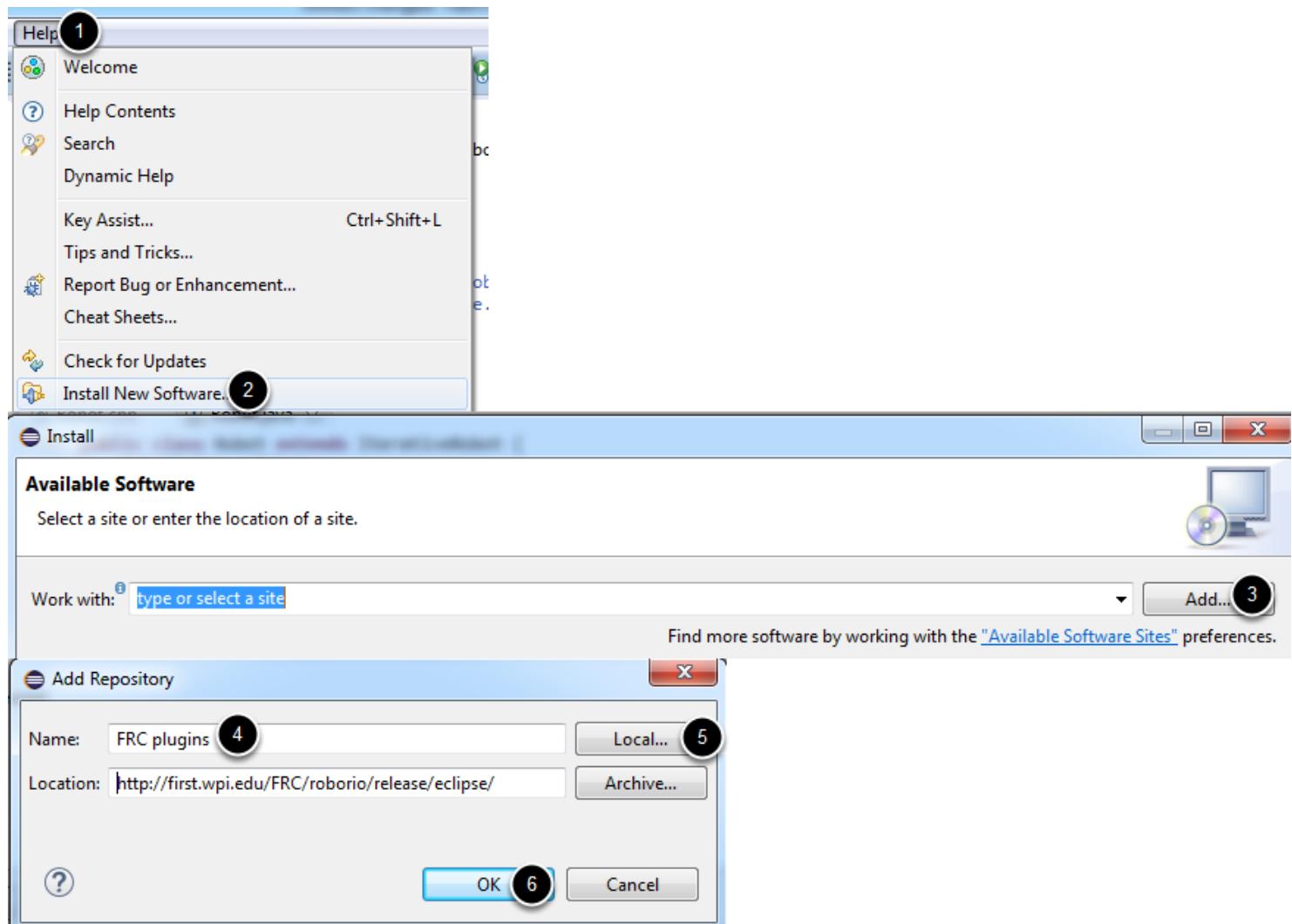
3. Click **Next, Next** on the next page, then click the radio button to accept the license agreement and click **Finish**.
4. If you receive a Security Warning prompt, click OK to continue.
5. When prompted, restart Eclipse. After Eclipse restarts and you select your Workspace (if prompted) you will see a dialog that says Installing Java. This details the installation progress of the plugins, wait for the install to complete before proceeding. This dialog should only appear when the plugins are first installed or updated.



FRC

FIRST®Robotics Competition

Installing the development plugins - Option 2: Download and install offline



If you need to download the plugins and install them on a different machine offline, you will be unable to check for updates using Eclipse. Download the zipfile containing the plugins from <http://first.wpi.edu/FRC/roborio/zipfile/>. For the kickoff release, the zip file containing the plugins is encrypted. Right click on it and select Extract All, then enter the password from the kickoff broadcast, R3C3CL3RU\$H2015.

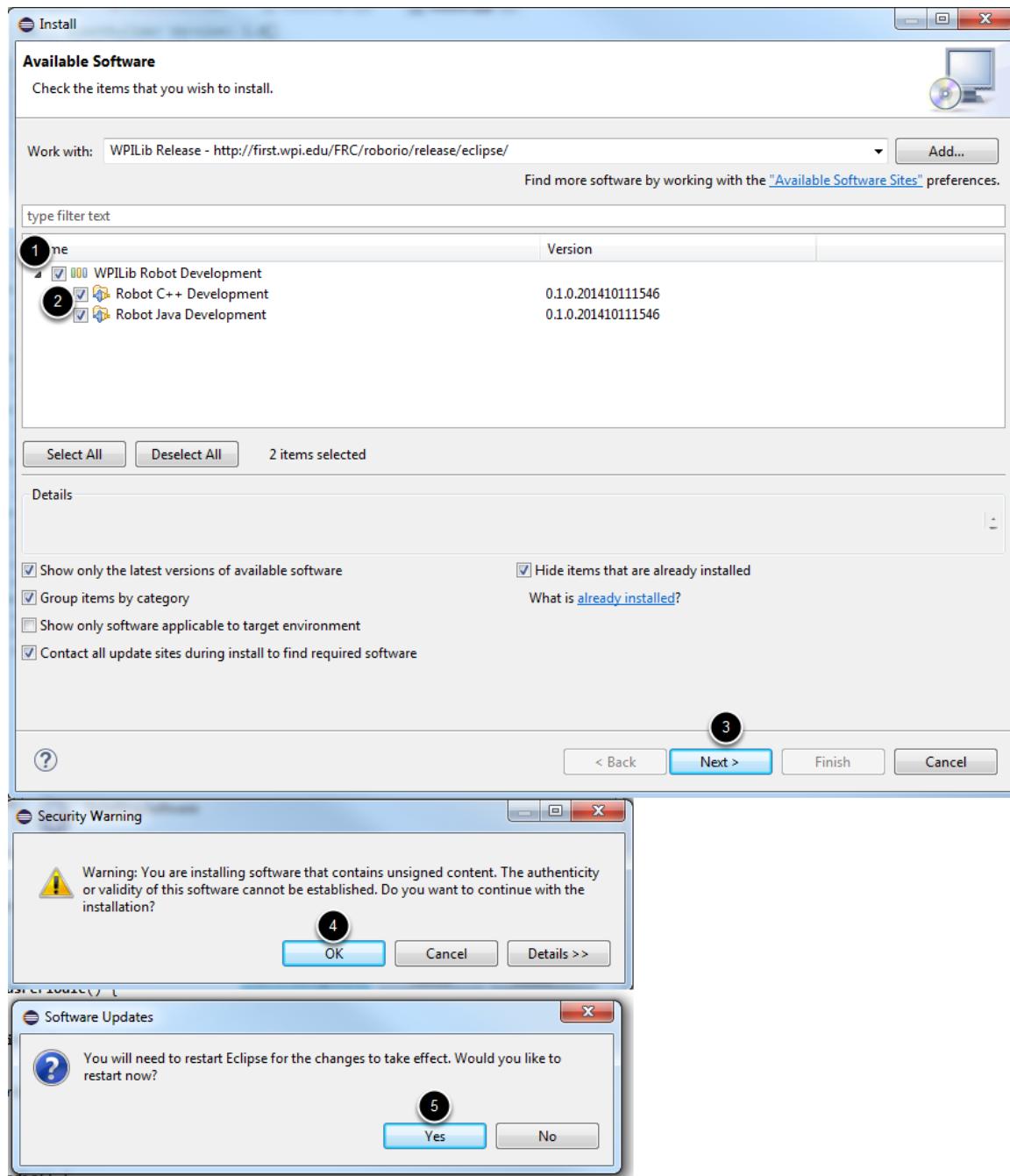
When Eclipse starts:

1. Select "Help"



2. Click "Install new software".
3. From here you need to add the downloaded plugin location. Push the "Add..." button then fill in the "Add Repository" dialog with:
4. Name: FRC Plugins Offline
5. Click Local
6. Browse to the "site" directory inside the directory you extracted the zip file to.
7. Click "OK".

Selecting the correct plugins

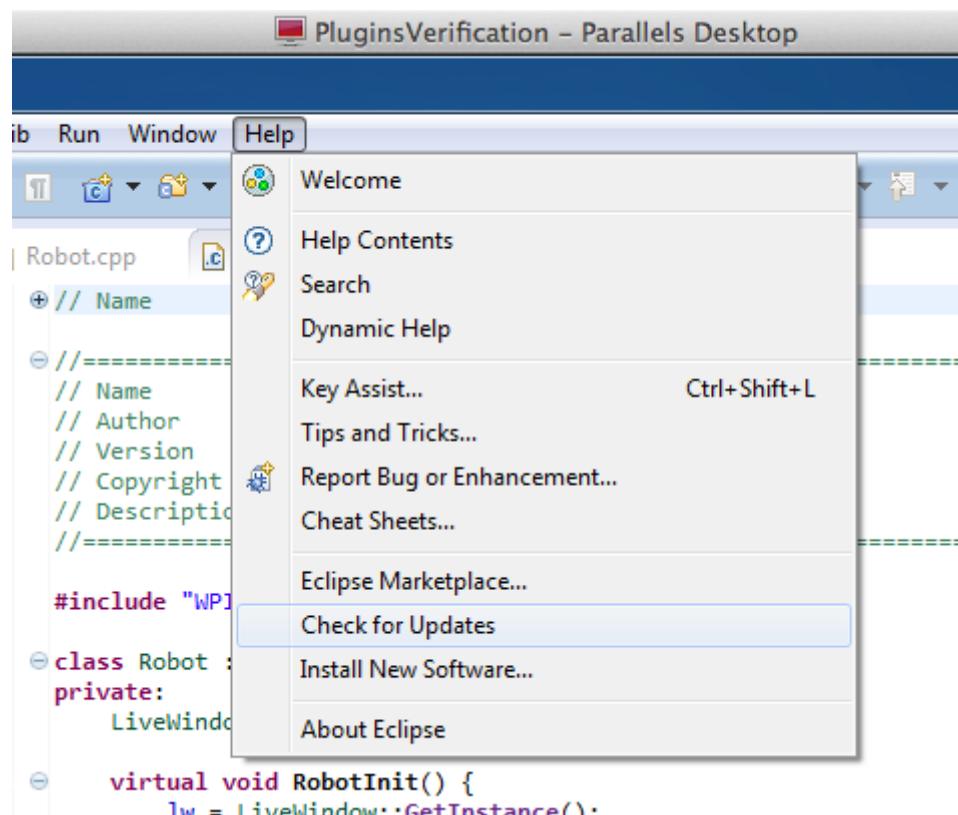


1. Click the arrows if necessary to expand the WPILib Robot Development menu.
2. Select the WPILib Robot Development plugin for your desired language (you can install both if you wish to try programming in both languages)

3. Click **Next, Next** on the next page, then click the radio button to accept the license agreement and click **Finish**
4. If you receive a Security Warning prompt, click **OK** to continue.
5. When prompted, restart Eclipse. After Eclipse restarts and you select your Workspace (if prompted) you will see a dialog that says **Installing Java**. This details the installation progress of the plugins, wait for the install to complete before proceeding. This dialog should only appear when the plugins are first installed or updated.

If updated plugins are released, you can either repeat this process (you will get one additional Eclipse window telling you that the components are already installed and an upgrade will be performed instead of an install), or if online installation is an option, you can complete the online installation steps above, then get future updates using the Eclipse Automatic Updates (or the manual update check described below)

Updating the plugins manually



Note: This only works if the plugins were installed using Option 1 - Online Install from above. For updating plugins when the offline install was used, see the note at the end of the step above.



FIRST®Robotics Competition

If you choose not to enable Automatic Updates as described above, you will need to manually have Eclipse check for updates to install new versions of the plugins.

Select **Help** from the menu bar, followed by **Check for updates**. Eclipse will check if there is a newer version available of any installed plugin and inform you if an update is found. Updating the plugins will ensure that your development system is up to date with the latest version of the development tools.

Troubleshooting

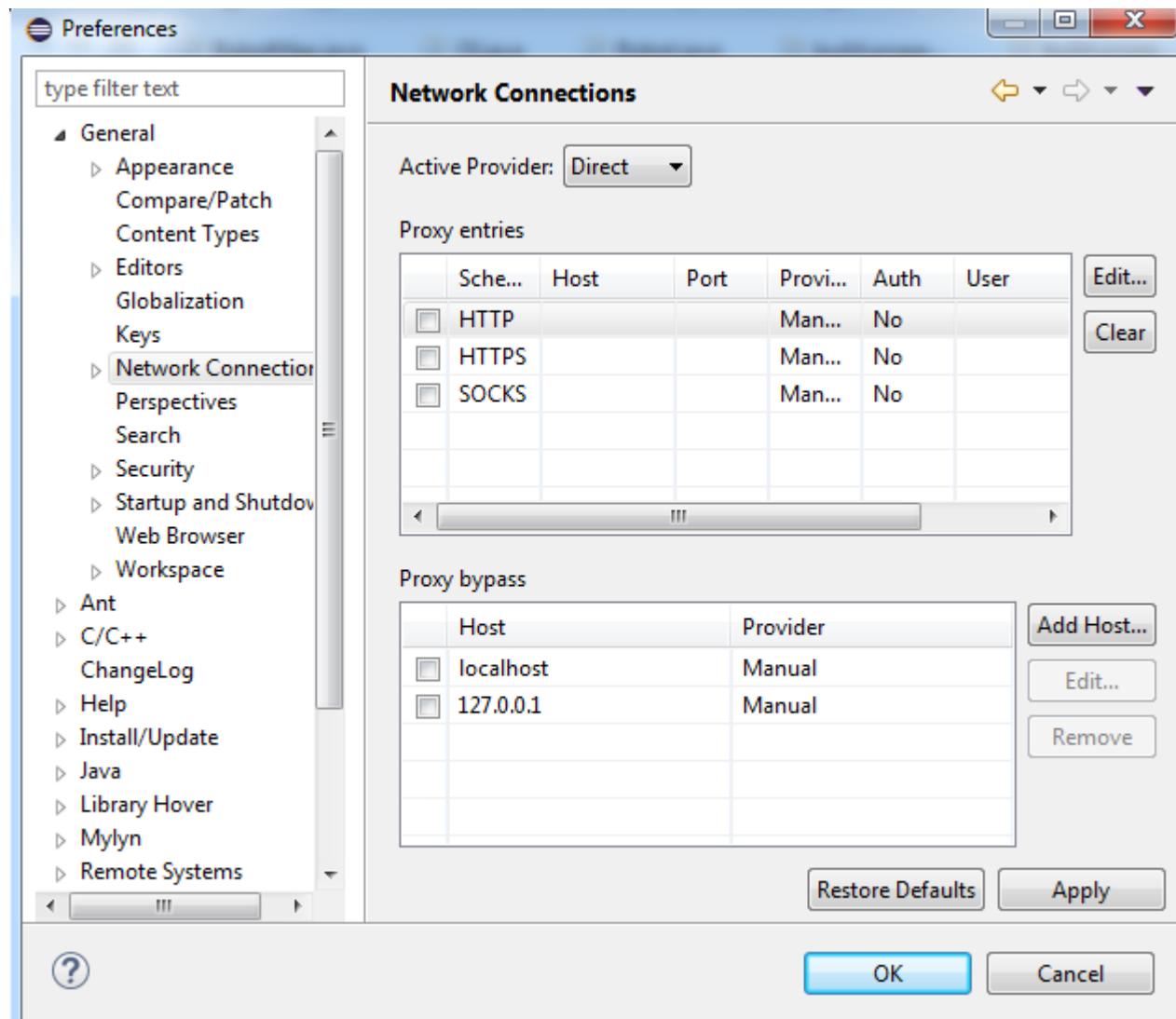
Below are some troubleshooting steps for commonly encountered issues



FRC

FIRST® Robotics Competition

Unable to read repository at <http://first.wpi.edu/FRC/roborio/release/eclipse/content.xml>!"



This error occurs if Eclipse cannot contact the server to download the plugins. There are a couple possible causes of this issue:

1. Your computer is not connected to the Internet. Verify your network connection and try again.
2. Your firewall is blocking Eclipse. Try adding an exception for Eclipse or disabling your Firewall.
3. Your proxy settings were read improperly by Eclipse. In Eclipse Select **Window->Preferences->General->Network Connections**. If you don't use a proxy or don't know, set the Active



FIRST®Robotics Competition

Provider to **Direct**. If you use a proxy set the Active Provider to Manual and configure the proxy information by selecting the protocol and clicking Edit.

Need Java 1.7 or newer

If you get an error message when attempting to run Eclipse that says you "need Java 1.7 or newer", you have mismatched versions of Java and Eclipse installed. The easiest fix is to go back and download the other version of Eclipse (32 bit if you had 64, 64 if you had 32).

Installing the FRC 2015 Update Suite (All Languages)

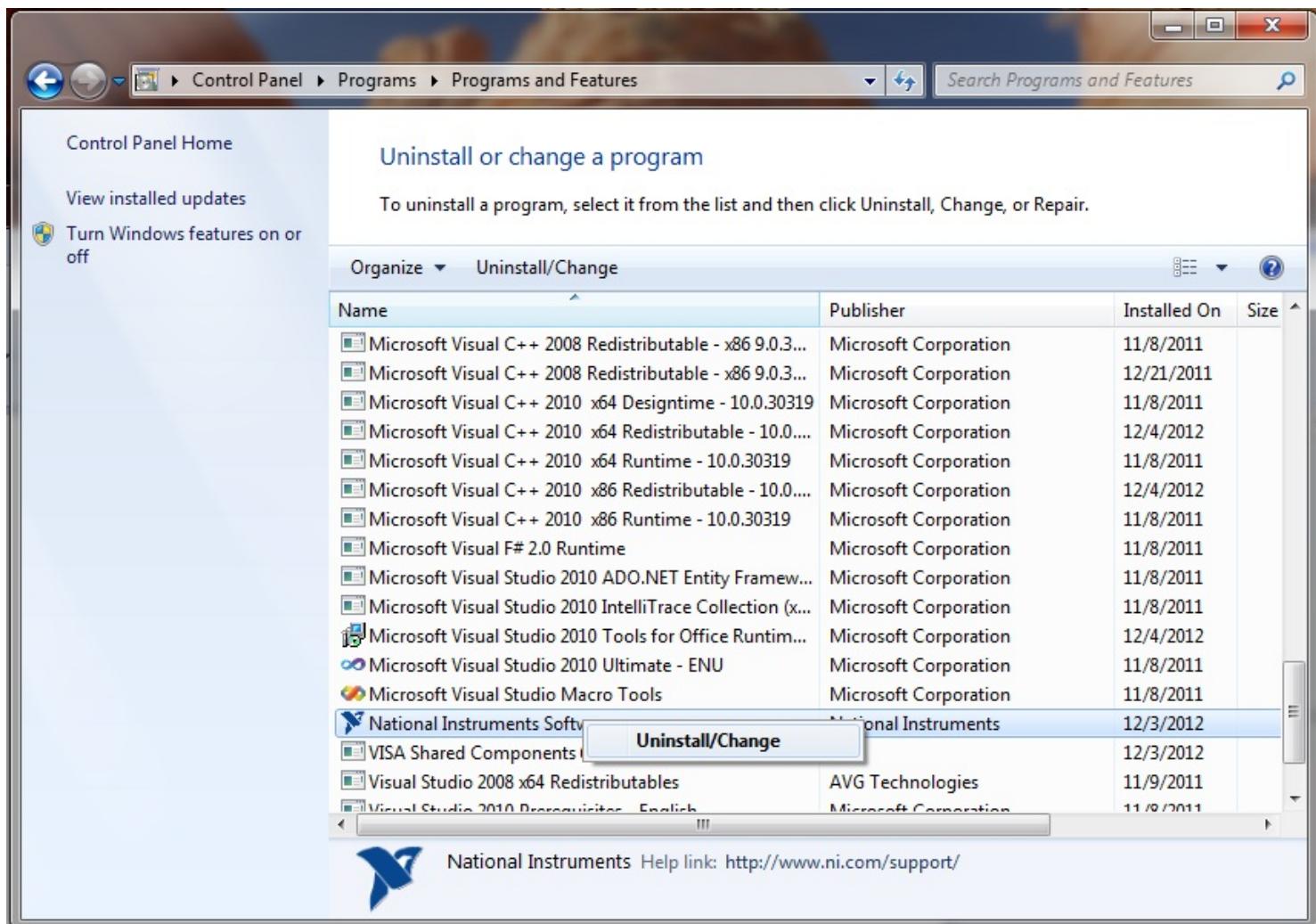
The FRC 2015 Update Suite contains the following software components: LabVIEW Update, FRC Driver Station, and FRC Utilities. If an FRC 2015 LabVIEW installation is found, the LabVIEW Update will be installed or updated, otherwise this step will be skipped. The FRC Driver Station and FRC Utilities will always be installed or updated. The LabVIEW runtime components required for the driver station and utilities is included in this package. **No components from the LabVIEW DVD are required for running either the driver station or utilities.**



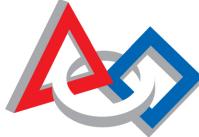
FRC

FIRST® Robotics Competition

Uninstall Old Versions (Recommended)



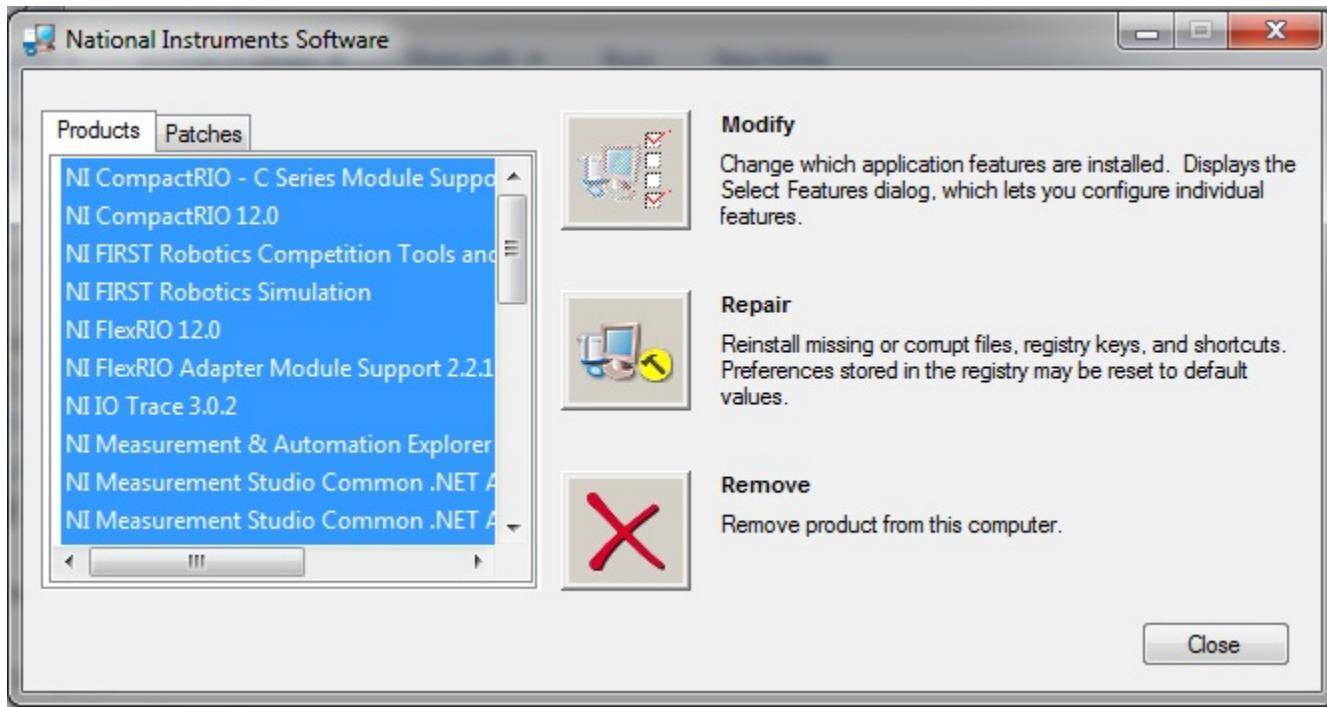
LabVIEW teams have already completed this step, do not repeat it. Before installing the new version of the NI Update it is recommended to remove any old versions. The new version will likely properly overwrite the old version, but all testing has been done with FRC 2015 only. Make sure to back up any team code located in the "User\LabVIEW Data" directory before un-installing. Then click **Start >> Control Panel >> Uninstall a Program**. Locate the entry labeled "**National Instruments Software**", right-click on it and select **Uninstall/Change**.



FRC

FIRST®Robotics Competition

Select Components to Uninstall



In the left pane of the dialog box that appears, **select all entries**. The easiest way to do this is to click the top entry to highlight it, then scroll down to the bottom entry, press and hold shift and click on the last entry then release shift. Click **Remove**. Wait for the uninstaller to complete and reboot if prompted.

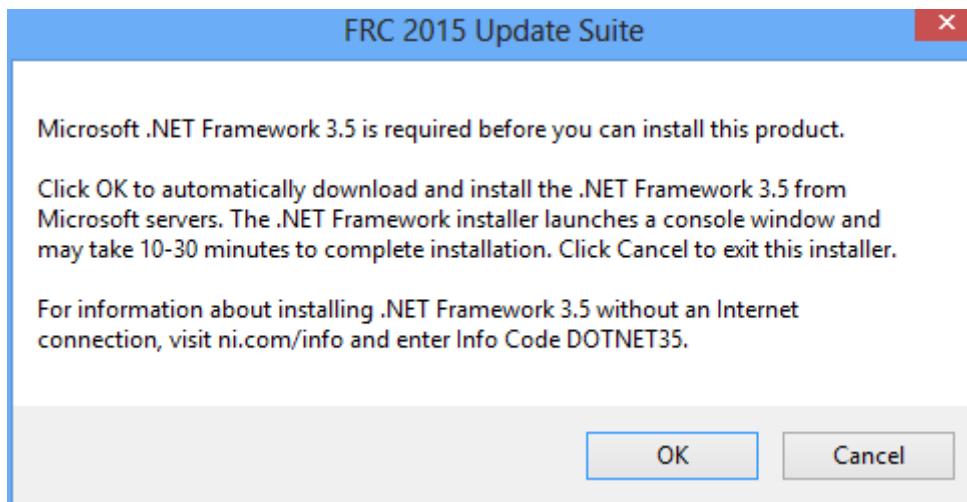
Downloading the Update

Download the update from <http://www.ni.com/download/first-robotics-software-2015/5112/en/>.



FIRST®Robotics Competition

Windows 8



If installing on Windows 8 and the above error appears, jump down to the [Addendum on Windows 8 installation](#) before returning here to re-start the installation.



FIRST®Robotics Competition

Welcome



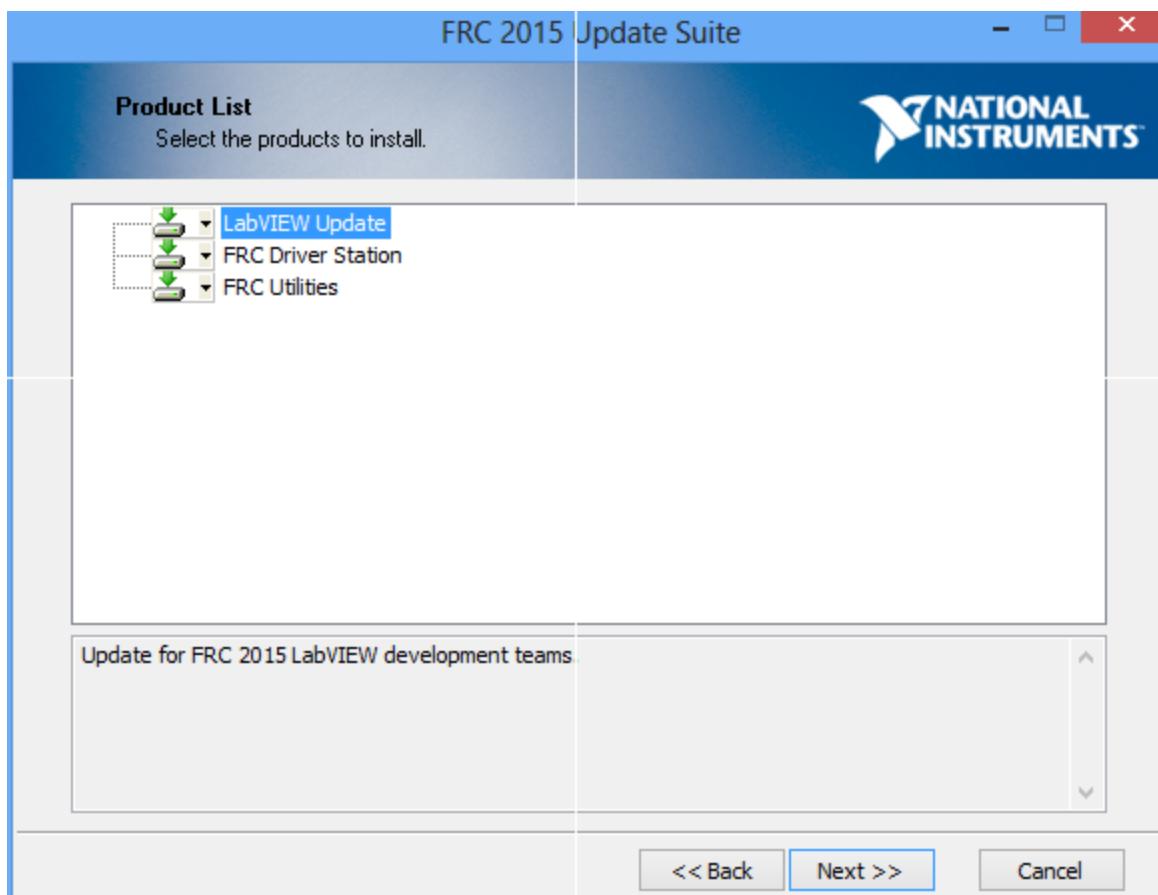
Right click on the downloaded zip file and select Extract All. If you downloaded the encrypted zip file, you will be prompted for the key which is **R3C3CL3RU\$H2015**. Open the extracted folder and any subfolders until you reach the folder containing "setup" (may say "setup.exe" on some machines). Double click on the setup icon to launch the installer. Click "Next" on the splash screen that appears.



FRC

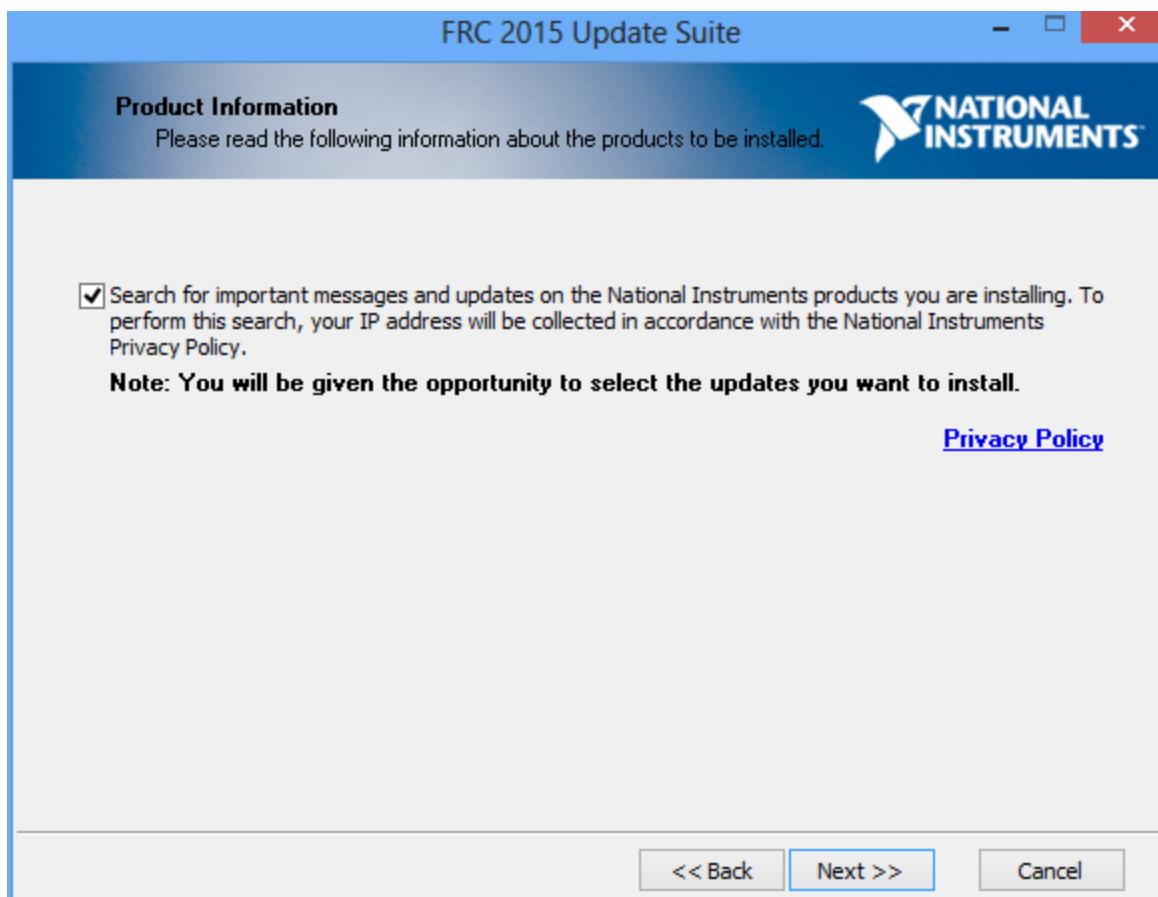
FIRST® Robotics Competition

Product List



Click "Next"

Product Information

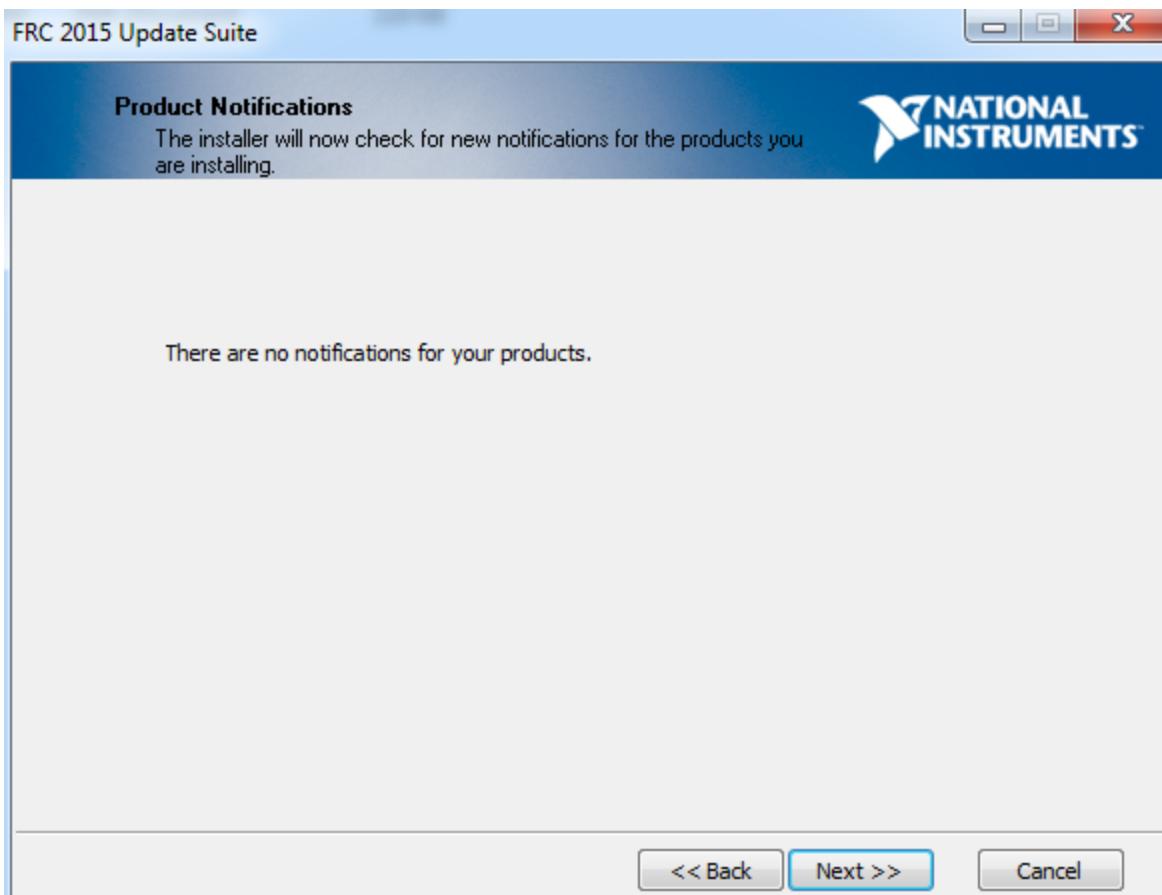


Click "Next"



FIRST®Robotics Competition

Product Notifications



Click "Next"



FRC

FIRST®Robotics Competition

User Information

FRC 2015 Update Suite

User Information
Enter the following information.

NATIONAL INSTRUMENTS

Full Name:

Organization:

Install FRC Driver Station using the following serial number:

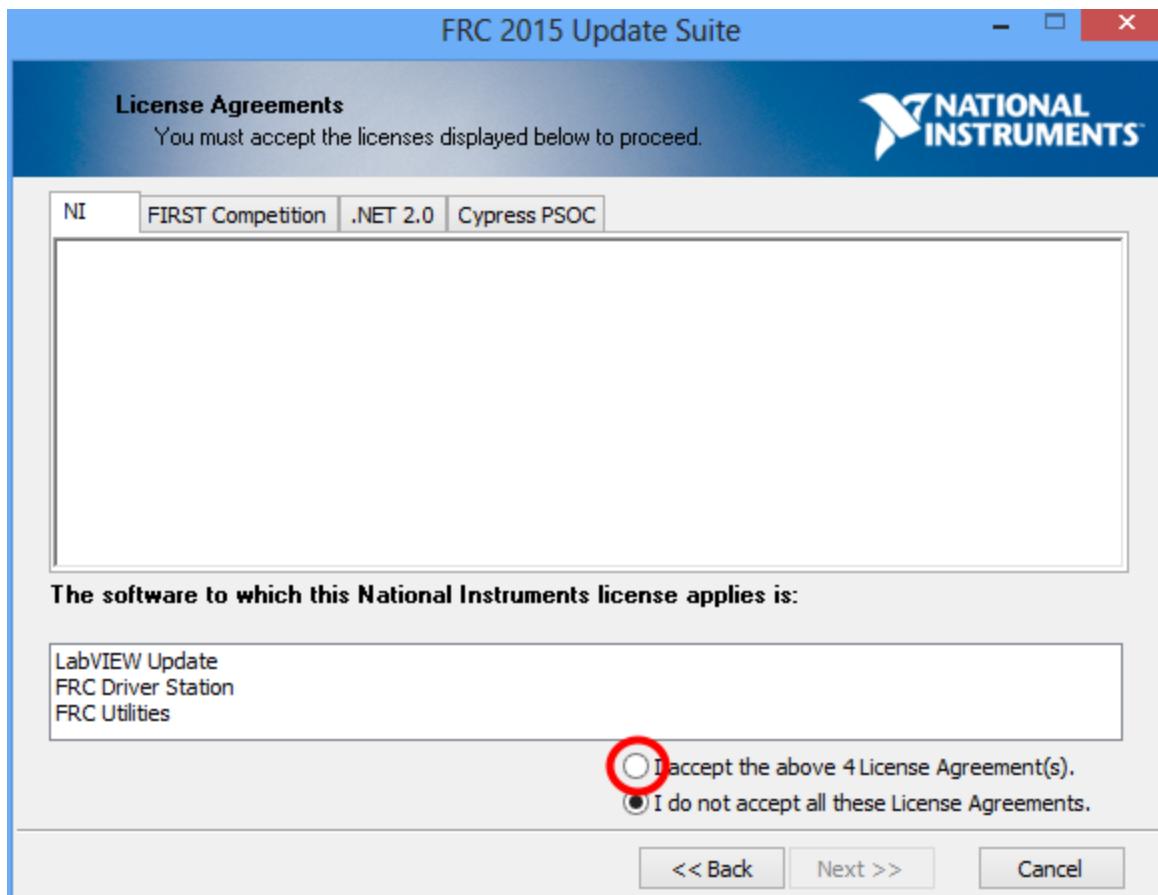
Serial Number:

Leave the Serial Number field blank to use the product in evaluation mode.

<< Back Cancel

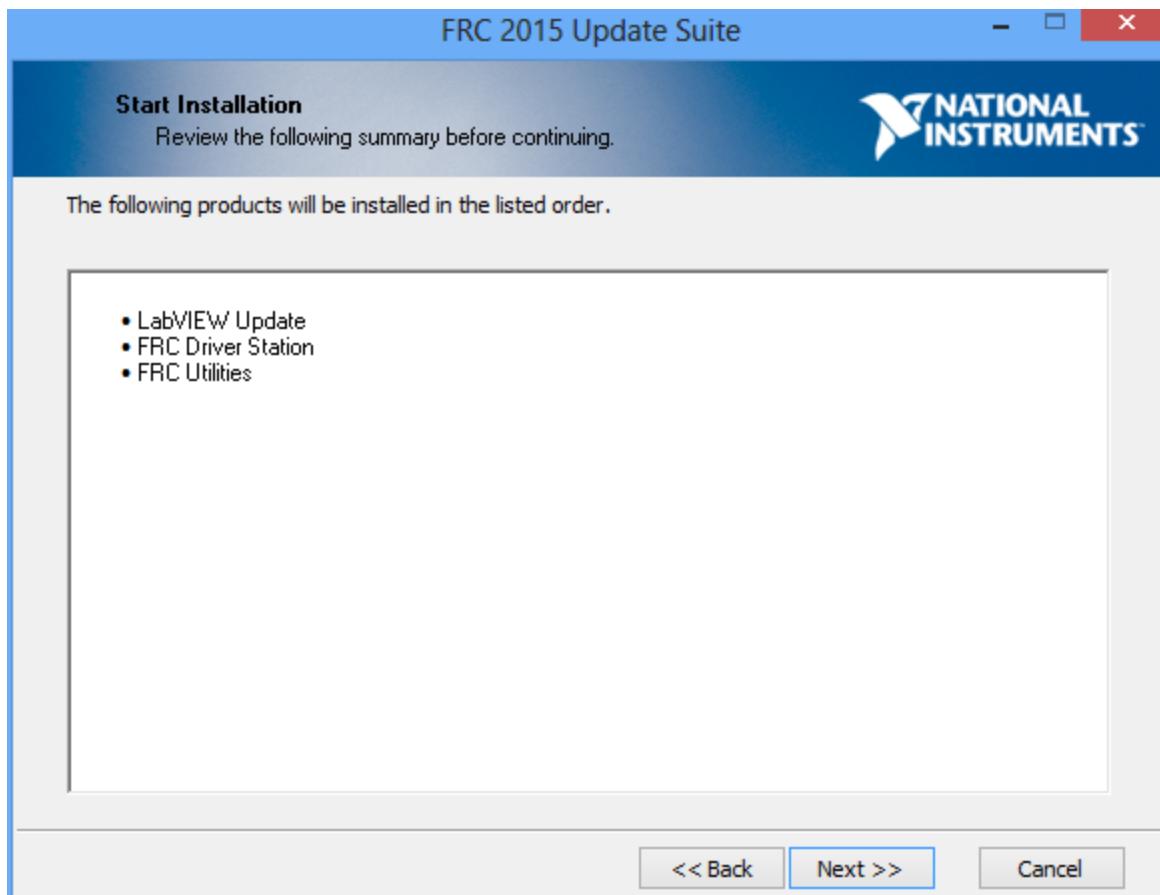
Enter full name and organization and the serial number from your kit of parts then click **Next**

License Agreements



Select "I accept..." then click "Next"

Start Installation



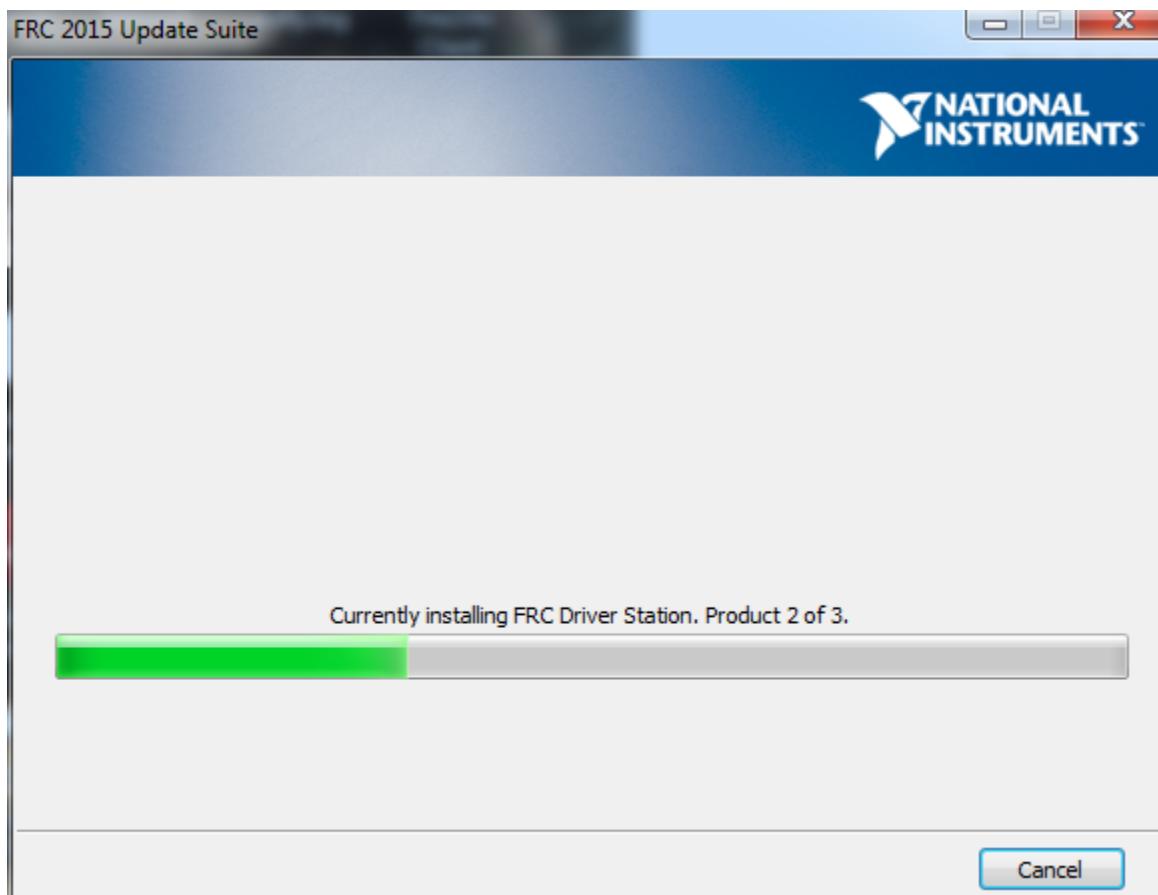
Click "Next".



FRC

FIRST®Robotics Competition

Summary Progress

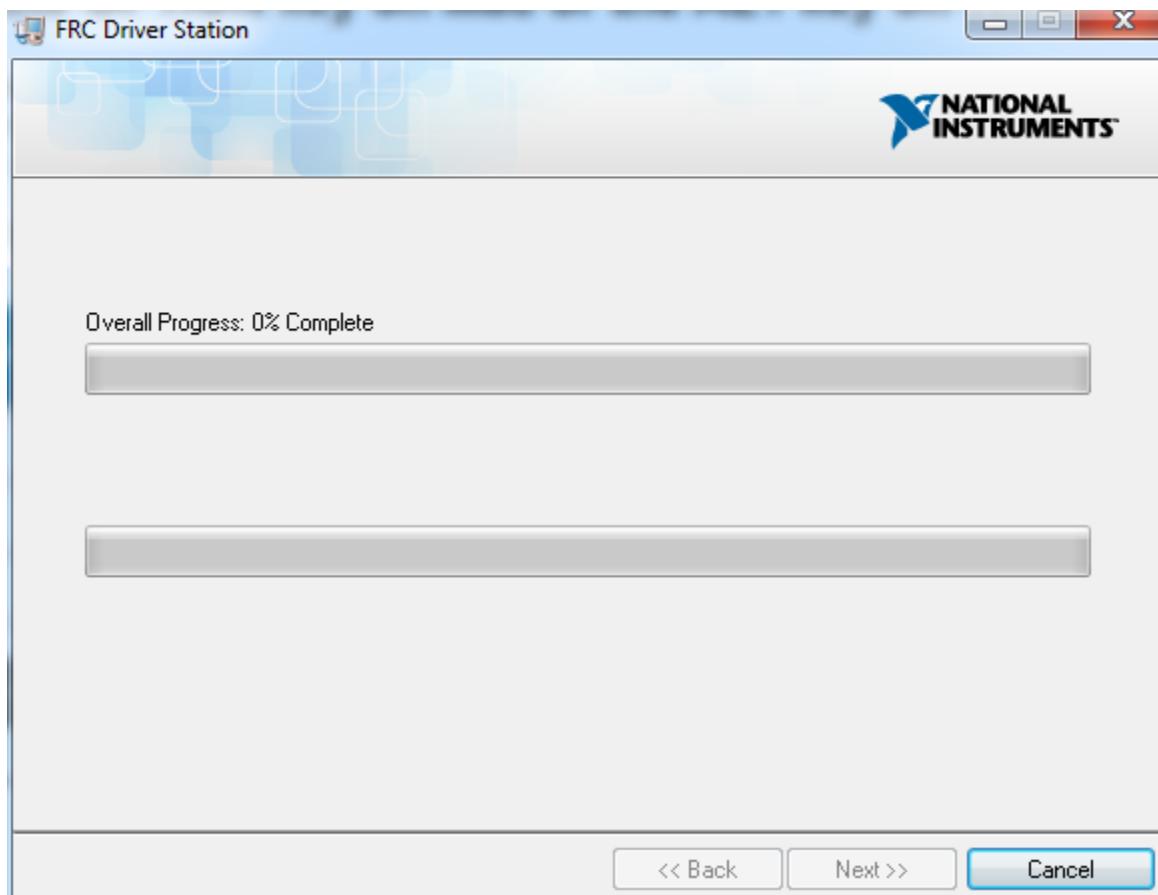


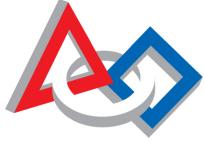


FRC

FIRST®Robotics Competition

Detail Progress





FRC

FIRST®Robotics Competition

Installation Summary

The screenshot shows the 'FRC 2015 Update Suite' window with the title 'Installation Summary'. The window displays a list of installed products: LabVIEW Update, FRC Driver Station, and FRC Utilities. It also includes sections for 'LabVIEW Update' and 'FRC Driver Station' with activation details and a checked checkbox for 'Run License Manager to activate the products.' Navigation buttons at the bottom include '<< Back', 'Next >>', and 'Finish'.

All products were installed:

Installation Summary

Installed

- LabVIEW Update
- FRC Driver Station
- FRC Utilities

Installation Details

LabVIEW Update

Installation Summary

- No software installed or removed.

FRC Driver Station

One or more installed products requires activation.

Run License Manager to activate the products.

<< Back Next >> Finish

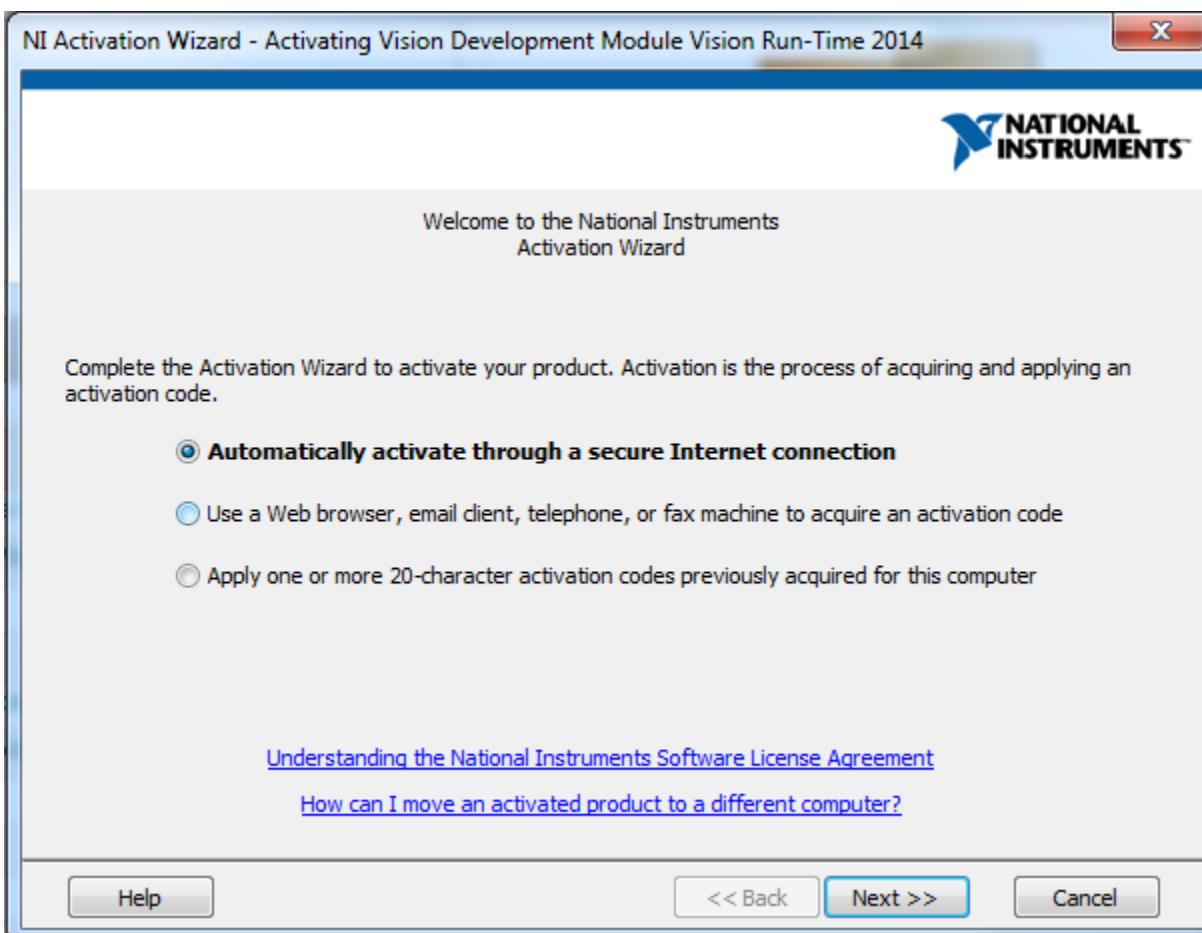
Make sure the box is checked to **Run License Manager...** then click **Next**



FRC

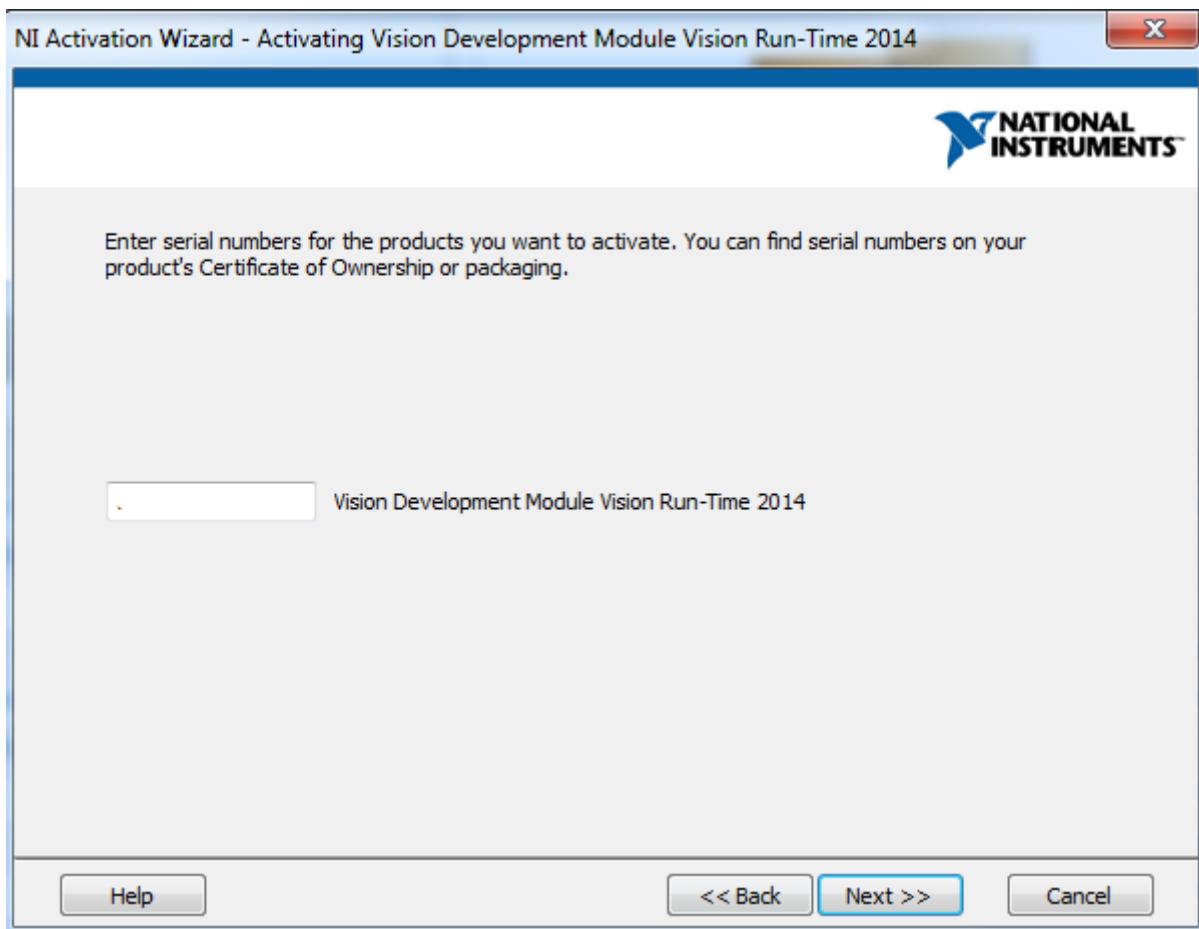
FIRST®Robotics Competition

Activate



Select your desired activation method (Internet activation recommended), then click **Next**

Serial Number Confirmation



Make sure the serial number in the box matches the one from your kit, then click **Next**



FRC

FIRST®Robotics Competition

User Profile

NI Activation Wizard - Activating Vision Development Module Vision Run-Time 2014

NATIONAL INSTRUMENTS

A National Instruments User Profile is required to activate your product. When you activate NI software using your User Profile, NI can better deliver benefits associated with software maintenance and support programs.

Log in to your User Profile

Email

Password

[Forgot your password?](#)

Create a new User Profile

[National Instruments Software Activation Privacy Statement](#)

[Help](#) [<< Back](#) [Next >>](#) [Cancel](#)

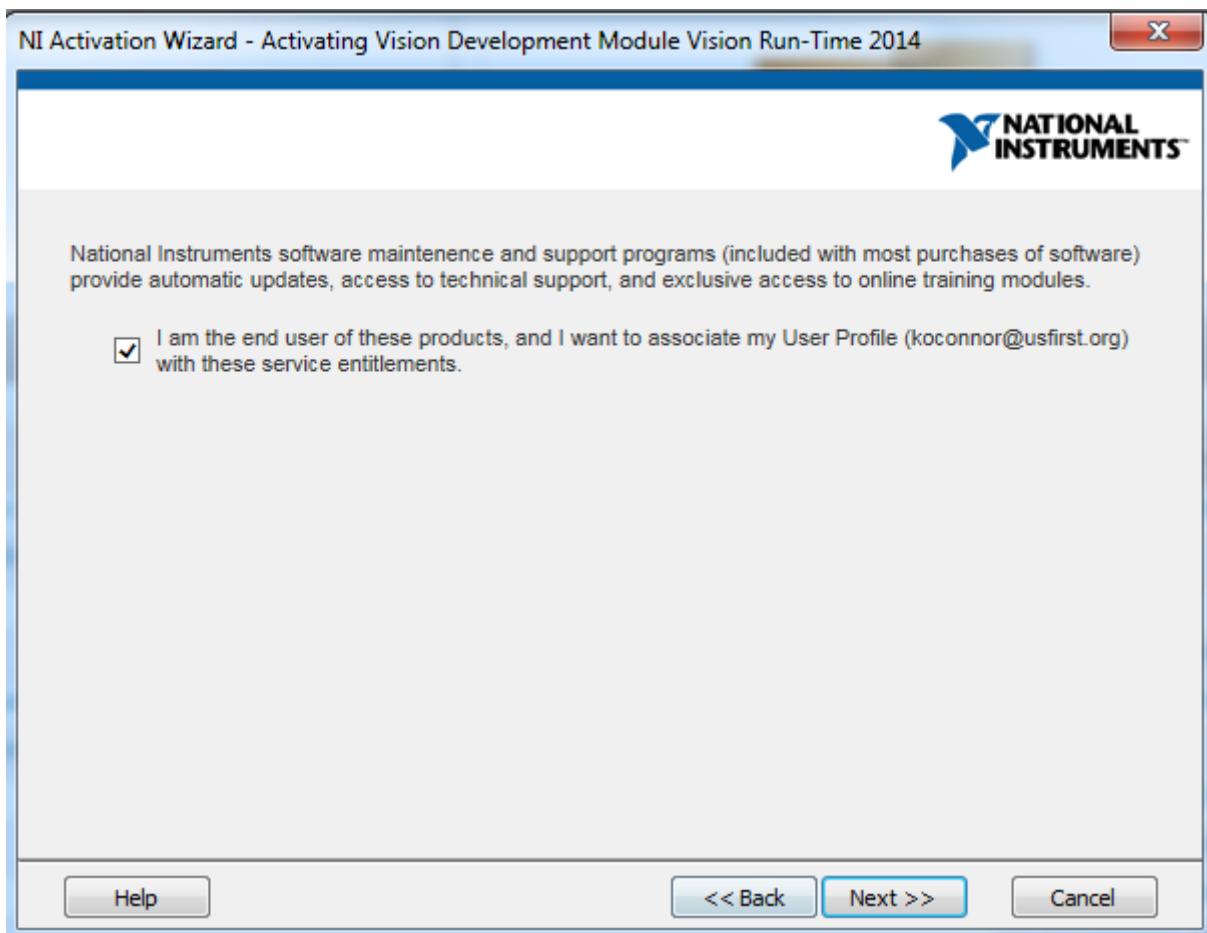
Log in or create an NI Profile. One profile may be used for multiple installations.



FRC

FIRST®Robotics Competition

User Profile 2

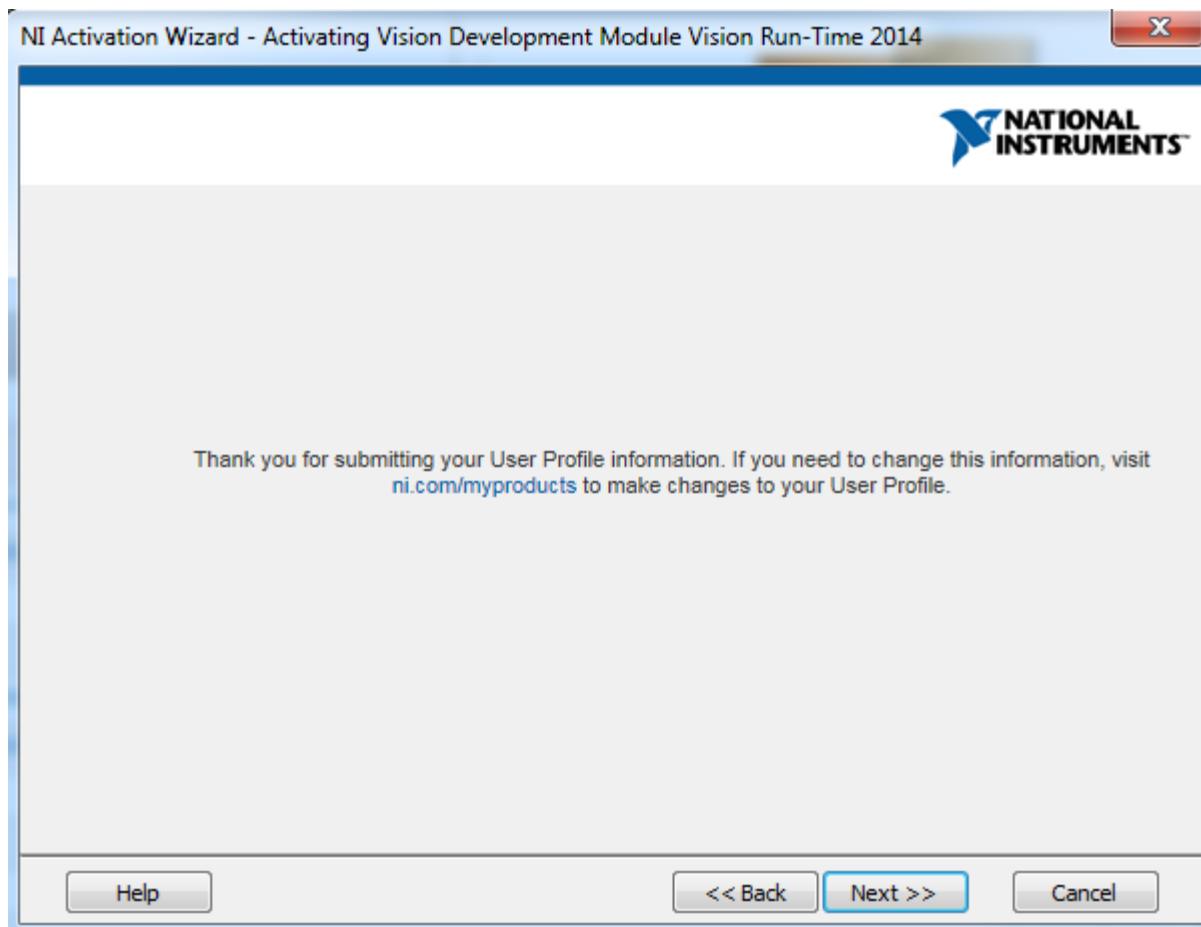


Click **Next**



FIRST®Robotics Competition

User Profile 3

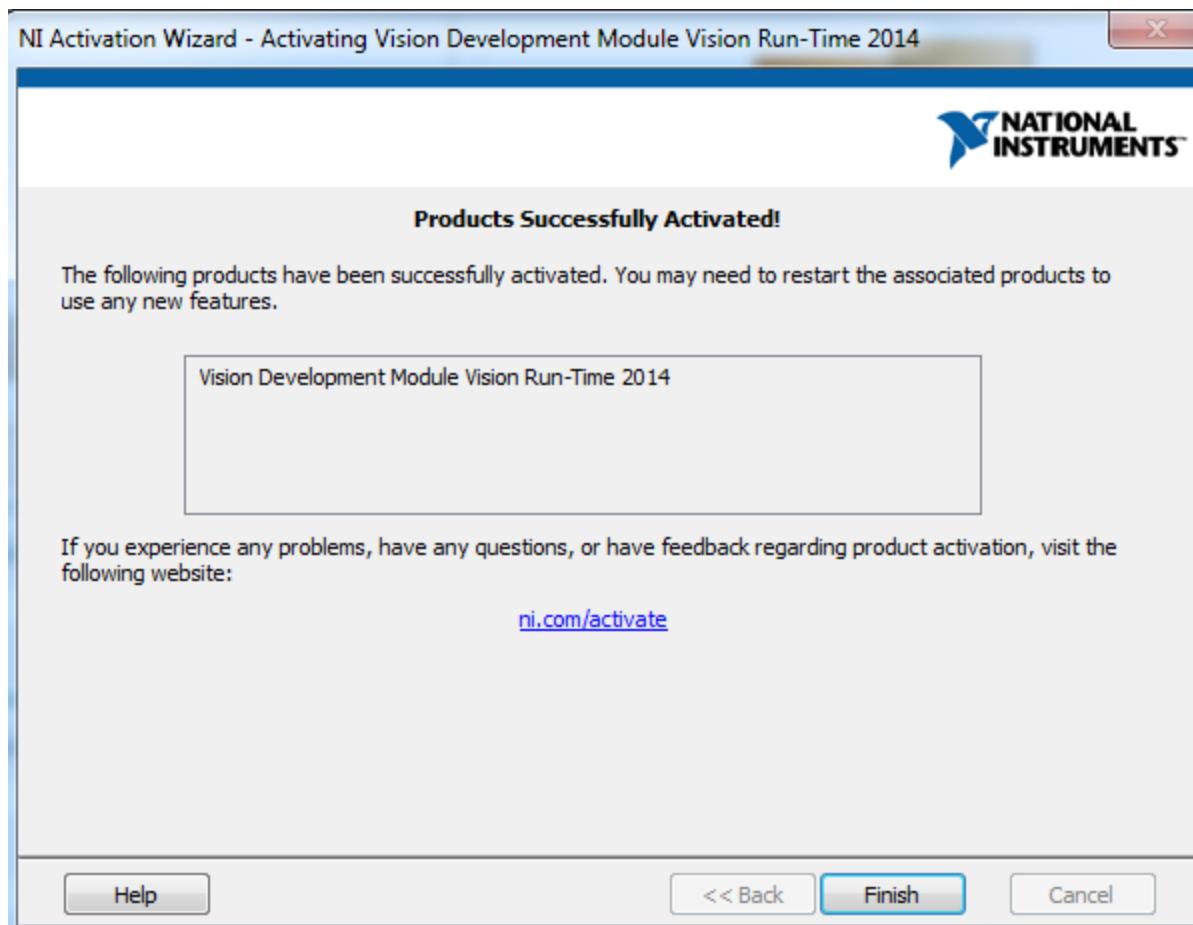


Click **Next**



FIRST®Robotics Competition

Finish



After the product is activated, Click **Finish**. If prompted to Reboot, click **Yes**



FIRST®Robotics Competition

NI Update Service

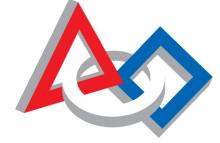
A screenshot of the NI Update Service application window. The window title is "NI Update Service". The menu bar includes "File", "Edit", and "Help". A status bar at the bottom right shows "1 update hidden". The main pane displays update categories: "Critical Updates (2)", "Patches (1)", and "Upgrades and Service Packs (11)".

| Category | Update Description | Status | Size |
|---------------------------------|---|--------|--------|
| Critical Updates (2) | Development Environment Software | | |
| | LabVIEW 2013 (32-bit) f2 Patch | URGENT | 171 MB |
| Patches (1) | Driver Software | | |
| | LabVIEW Real-Time 2013 Patch for Linux RT Targets | | 211 MB |
| Upgrades and Service Packs (11) | | | |

On occasion you may see alerts from the NI Update Service about patches to LabVIEW. The majority of these updates are patches to functionality of LabVIEW not typically used in FRC (even those marked as critical or urgent). You are welcome to click the links for the patch notes and choose to install some or all of these patches, however **FRC will communicate any recommended updates through our usual channels** (Frank's Blog, Team Updates or E-mail Blasts).

Addendum - Installing on Windows 8

If installing on Windows 8, the Microsoft .NET Framework 3.5 may need to be installed. If you see the dialog shown above, click "Cancel" and perform the steps shown below. An internet connection is required to complete these steps.



FRC

FIRST® Robotics Competition

Programs and Features

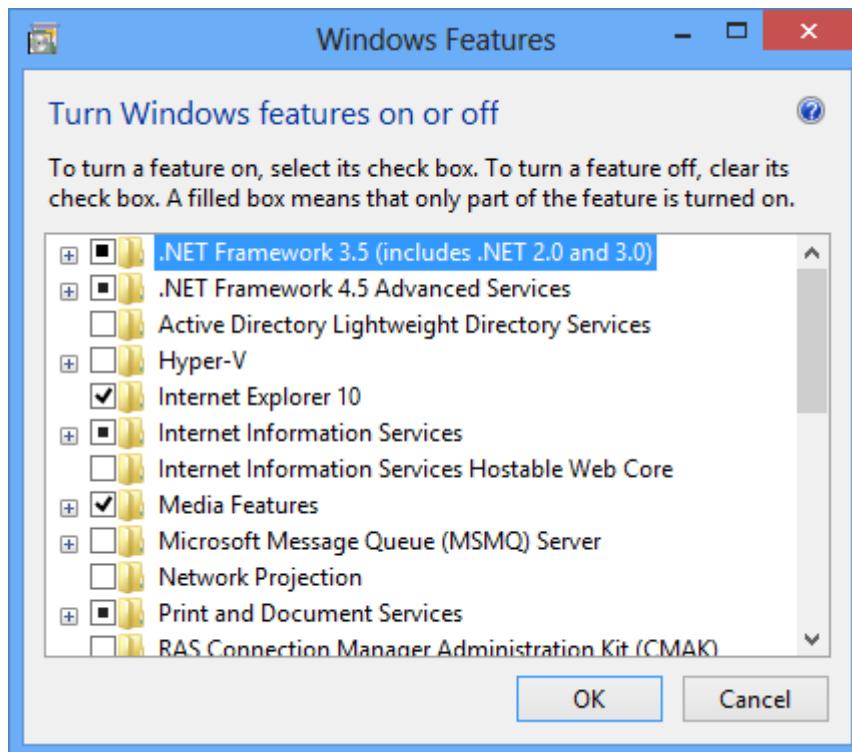
The screenshot shows the Windows Control Panel's 'Programs and Features' window. At the top, there is a breadcrumb navigation: Control Panel > All Control Panel Items > Programs and Features. A red oval highlights the link 'Turn Windows features on or off' in the left sidebar. The main area displays a table of installed programs:

| Name | Publisher | Installed On | Size | Version |
|---|-----------------------------|--------------|-------------|----------------|
| Microsoft Silverlight | Microsoft Corporation | 10/1/2013 | 50.6 MB | 5.1.20125.0 |
| Microsoft Visual C++ 2008 Redistributable - x64 9.... | Microsoft Corporation | 7/30/2013 | 13.2 MB | 9.0.30729.6161 |
| Microsoft Visual C++ 2008 Redistributable - x86 9.... | Microsoft Corporation | 7/30/2013 | 10.1 MB | 9.0.30729.4148 |
| National Instruments Software | National Instruments | 10/1/2013 | | |
| ScreenSteps 3.0 | Blue Mango Learning Systems | 9/30/2013 | 40.6 MB | 3.0 |
| VISA Shared Components 64-Bit | IVI Foundation | 10/1/2013 | Oct 1, 2013 | 1.5 |
| VMware Tools | VMware, Inc. | 7/30/2013 | 60.5 MB | 9.2.3.21136 |

At the bottom of the window, it says 'Currently installed programs Total size: 175 MB 7 programs installed'.

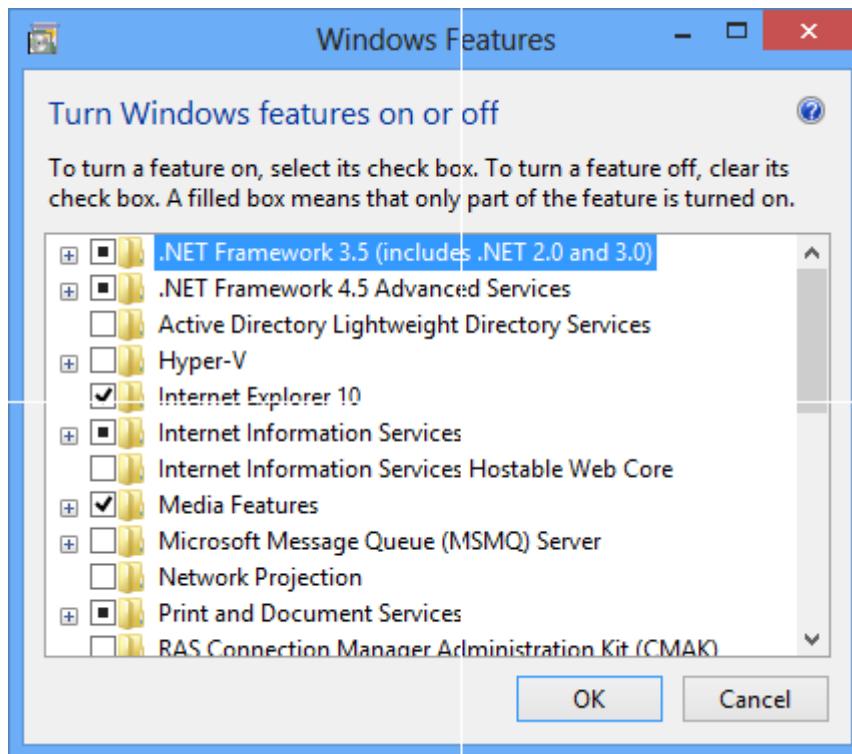
Open the "Programs and Features" window from the control panel and click on "Turn Windows features on or off"

Windows Features (.NET Framework 3.5 not on)



Select ".NET Framework 3.5 (includes .NET 2.0 and 3.0)" to enable it (a black dot, not a check box will appear) and then click "OK". When installation finishes [restart installation of FRC 2015 Update Suite](#).

Windows Features (.NET Framework 3.5 already on)



If a black dot is shown next to ".NET Framework 3.5" the feature is already on. Click "Cancel" and [restart installation of FRC 2015 Update Suite](#).

Updating your roboRIO firmware

Before updating firmware on your roboRIO, you must have completed installation of the [FRC Update Suite](#). You also must have the roboRIO power properly wired to the Power Distribution Panel as described [here](#).

Note that the firmware is separate from the roboRIO image. You will need to update your roboRIO firmware once after receiving the roboRIO and should only need to do so again if instructed specifically by an update.

Configuring the roboRIO

The roboRIO must be wired for power and connected to the computer via USB in order to update the firmware.



FRC

FIRST®Robotics Competition

USB Connection



Connect a USB cable from the roboRIO USB Device port to the PC. This requires a USB Type A male (standard PC end) to Type B male cable (square with 2 cut corners), most commonly found as a printer USB cable.

Note: The roboRIO should only be imaged via the USB connection. It is not recommended to attempt imaging using the Ethernet connection.

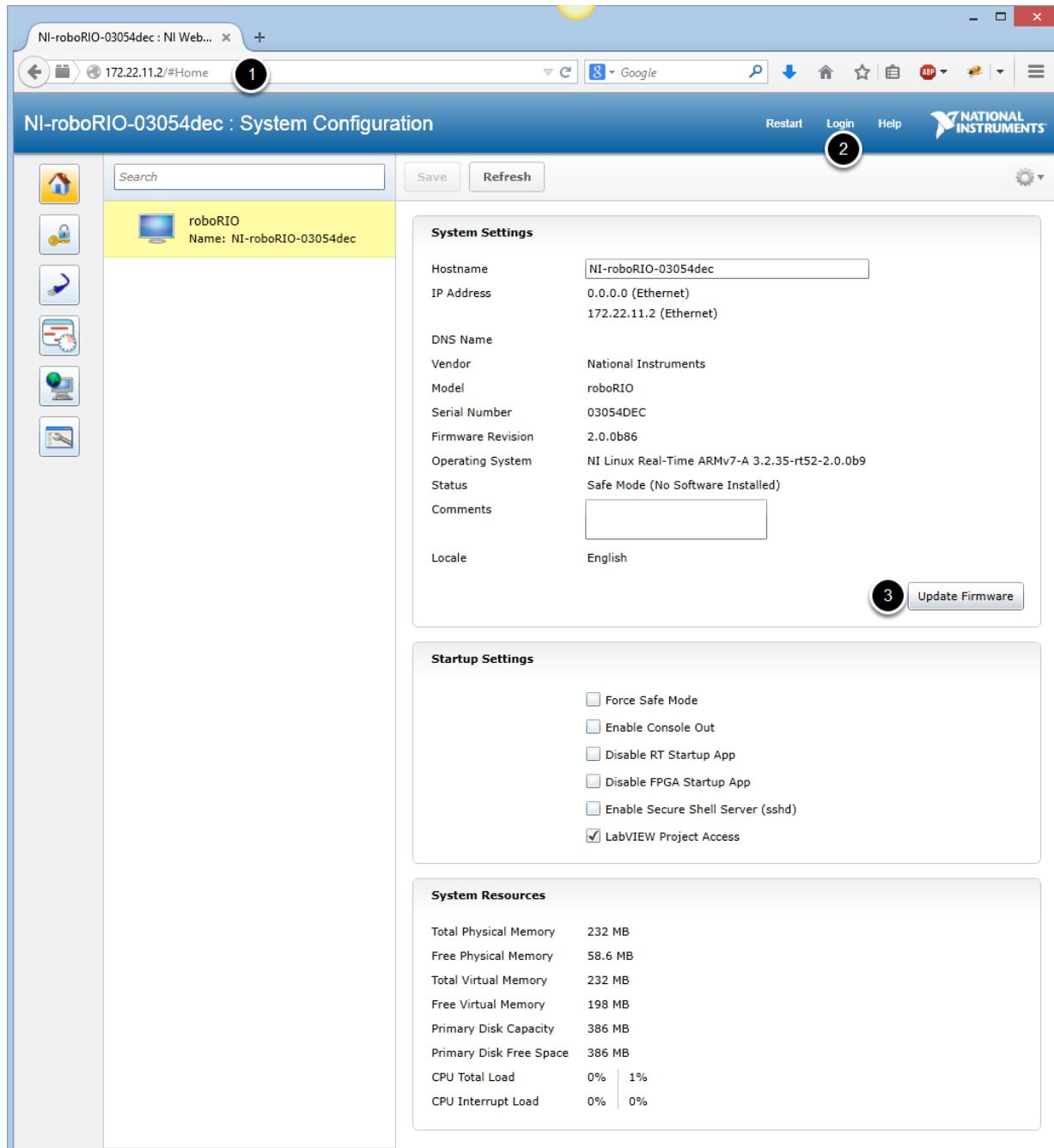
Driver Installation

The device driver should install automatically. If you see a "New Device" pop-up in the bottom right of the screen, wait for the driver install to complete before continuing.

Firmware Update Using Web Browser

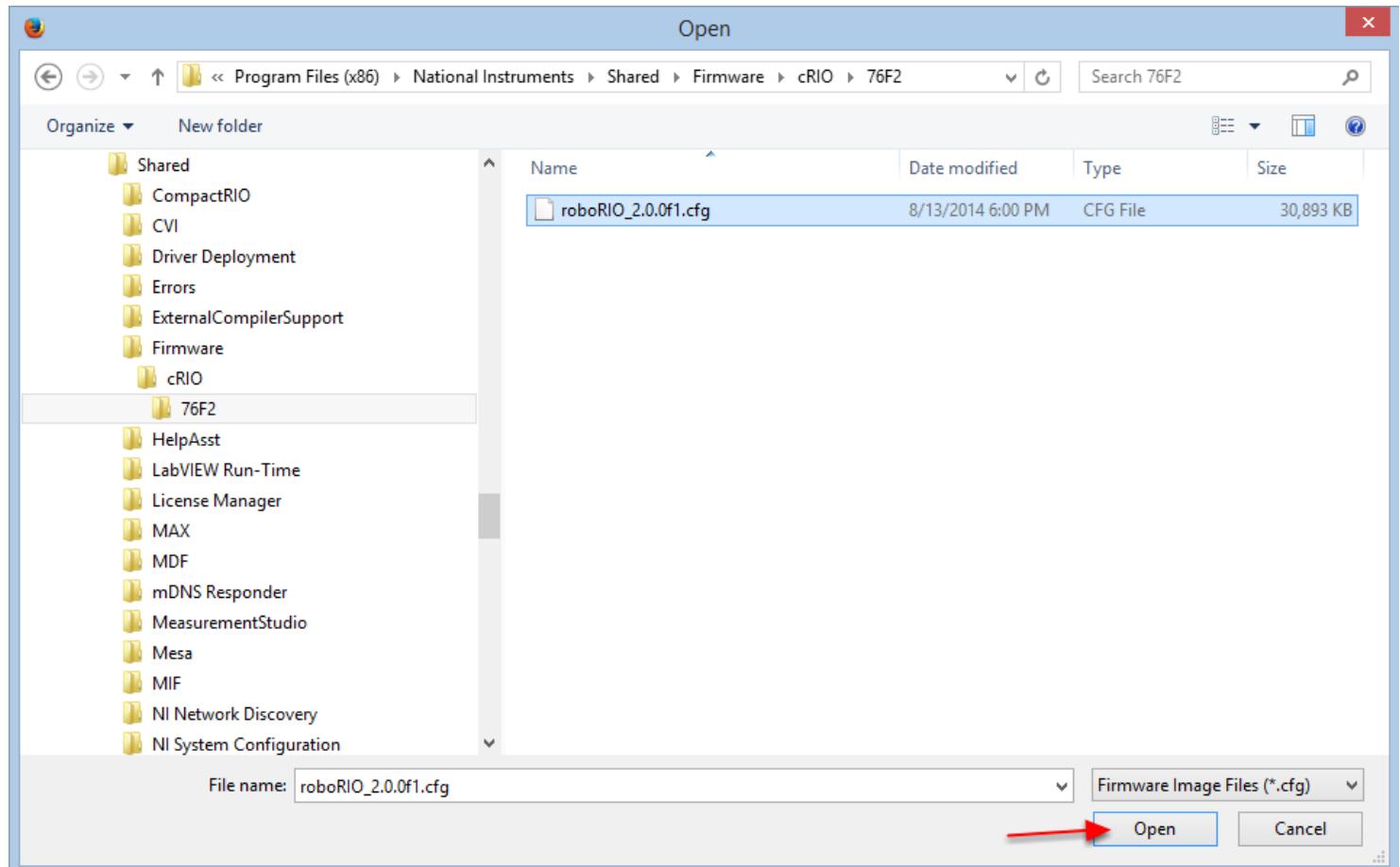
The embedded web server on the roboRIO requires using a browser which supports [Silverlight](#).

Launch Compatible Browser and Navigate to roboRIO



1. Enter the address 172.22.11.2 in your browser's address bar and press enter.
2. Click Login. Enter "admin" in the Username field and leave the Password field blank.
3. Click Update Firmware

Locate Firmware

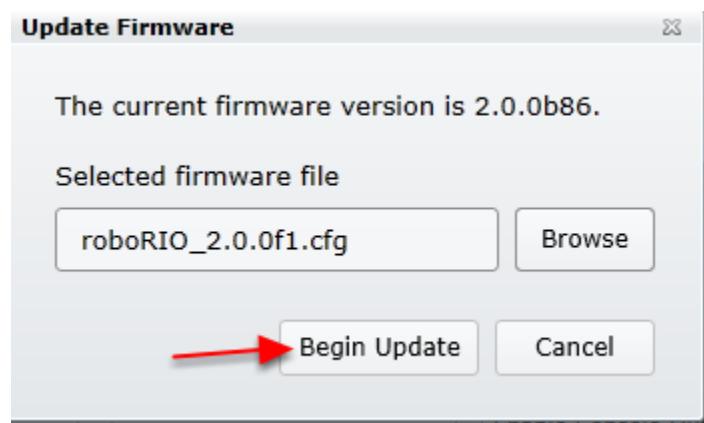


Browse to **Program Files\National Instruments\Shared\Firmware\cRIO\76F2\ Program Files(x86)** on 64 bit and select the latest firmware, then click **Open** (this image shows version 2.0.0f1).



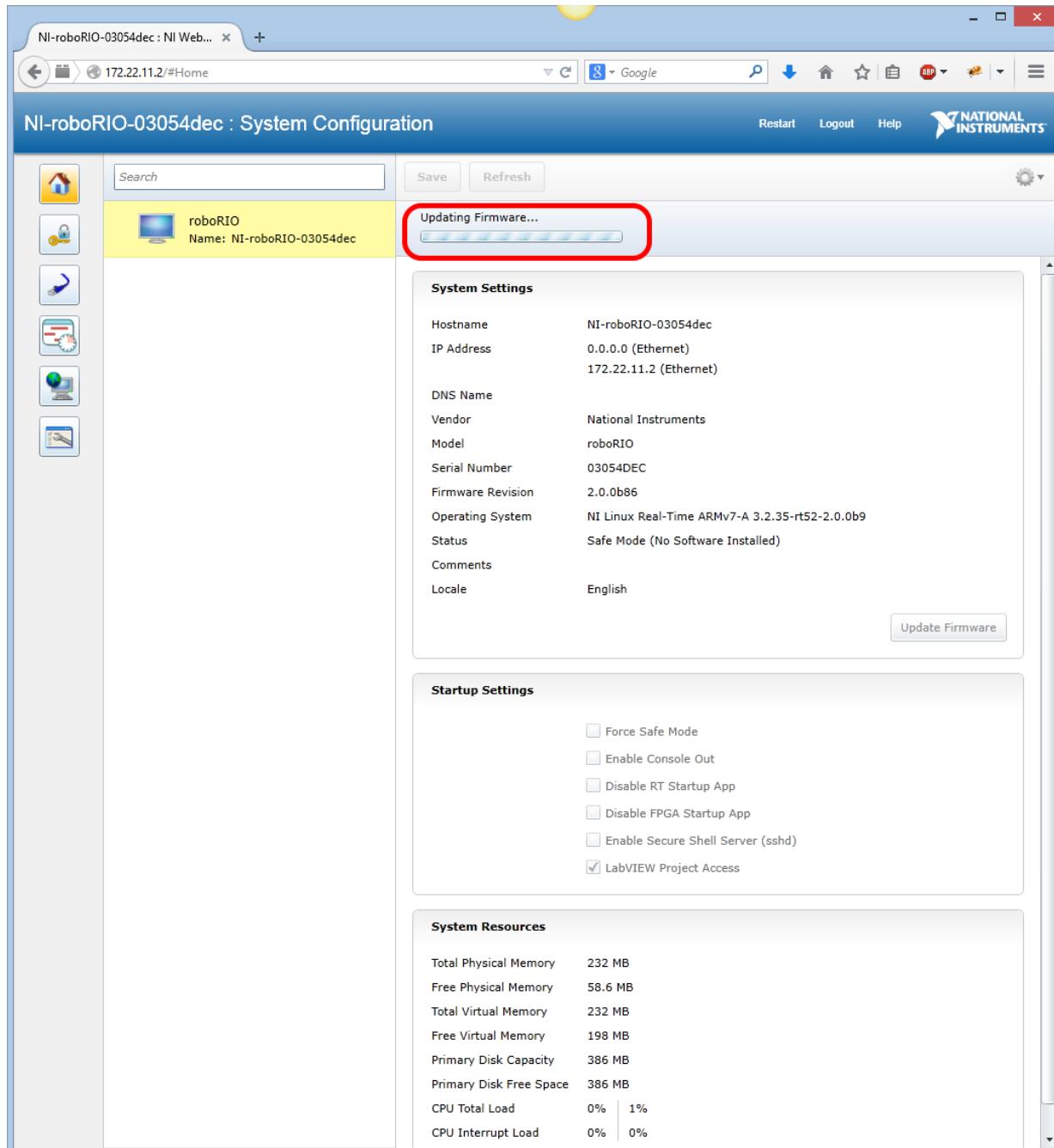
FIRST®Robotics Competition

Begin Update



Verify that the firmware selected is correct, then click **Begin Update**

Updating



A progress indicator will appear below the toolbar. Do not close the browser or power off the roboRIO until the process completes and the message appears "The firmware update completed successfully".

Imaging your roboRIO

Before imaging your roboRIO, you must have completed installation of the development environment and language updates for the appropriate programming language ([C++\Java](#), [LabVIEW](#)) and the [FRC Update Suite](#). You also must have the roboRIO power properly wired to the Power Distribution Panel as described [here](#) and have updated the firmware as described in the [previous article](#).

Configuring the roboRIO

The roboRIO Imaging Tool will be used to image your roboRIO with the latest software.

USB Connection



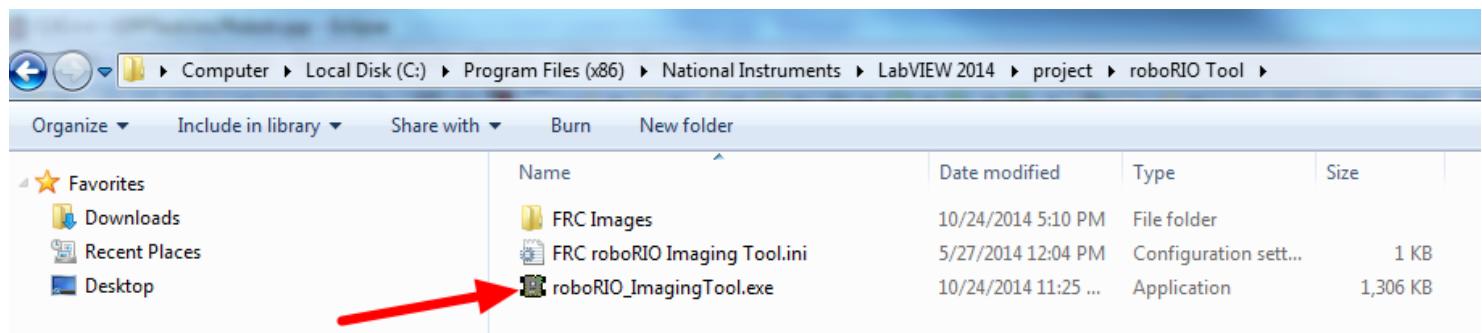
Connect a USB cable from the roboRIO USB Device port to the PC. This requires a USB Type A male (standard PC end) to Type B male cable (square with 2 cut corners), most commonly found as a printer USB cable.

Note: The roboRIO should only be imaged via the USB connection. It is not recommended to attempt imaging using the Ethernet connection.

Driver Installation

The device driver should install automatically. If you see a "New Device" pop-up in the bottom right of the screen, wait for the driver install to complete before continuing.

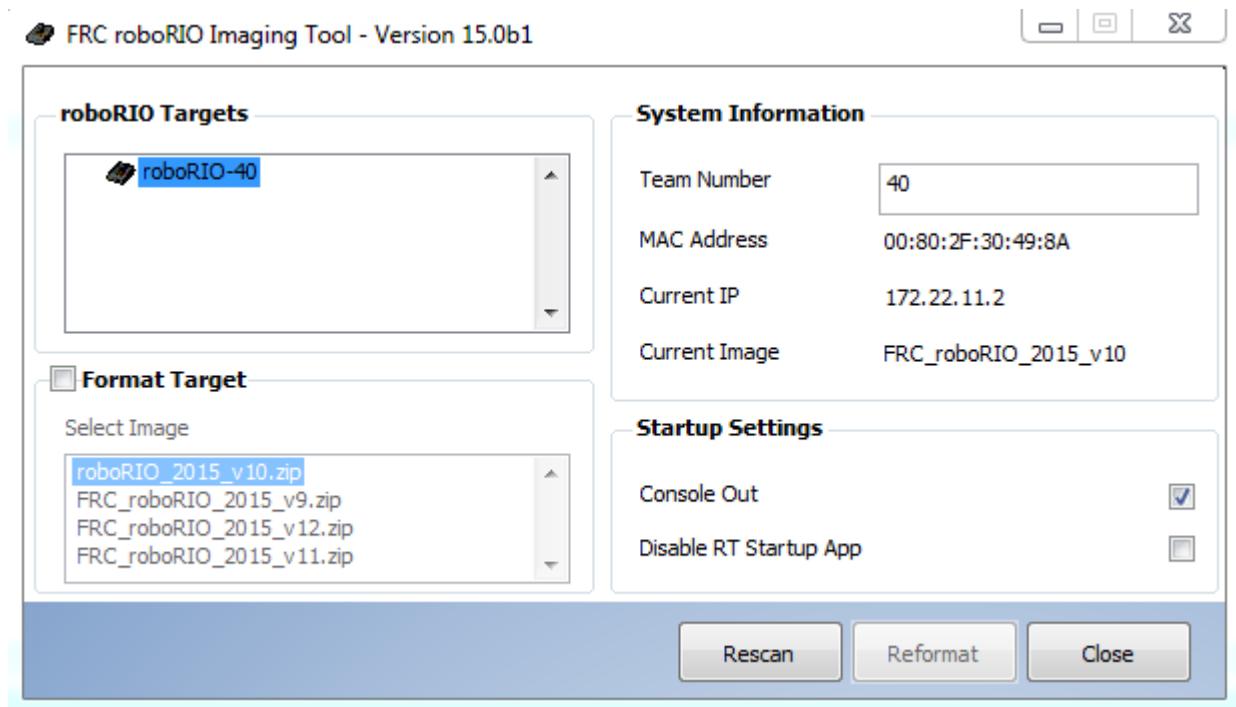
Launching the Imaging Tool



The roboRIO imaging tool and latest image are installed with the NI Update Suite. Browse to **C:\Program Files (x86)\National Instruments\LabVIEW 2014\project\roboRIO Tool** and double click on **roboRIO_ImagingTool.exe**

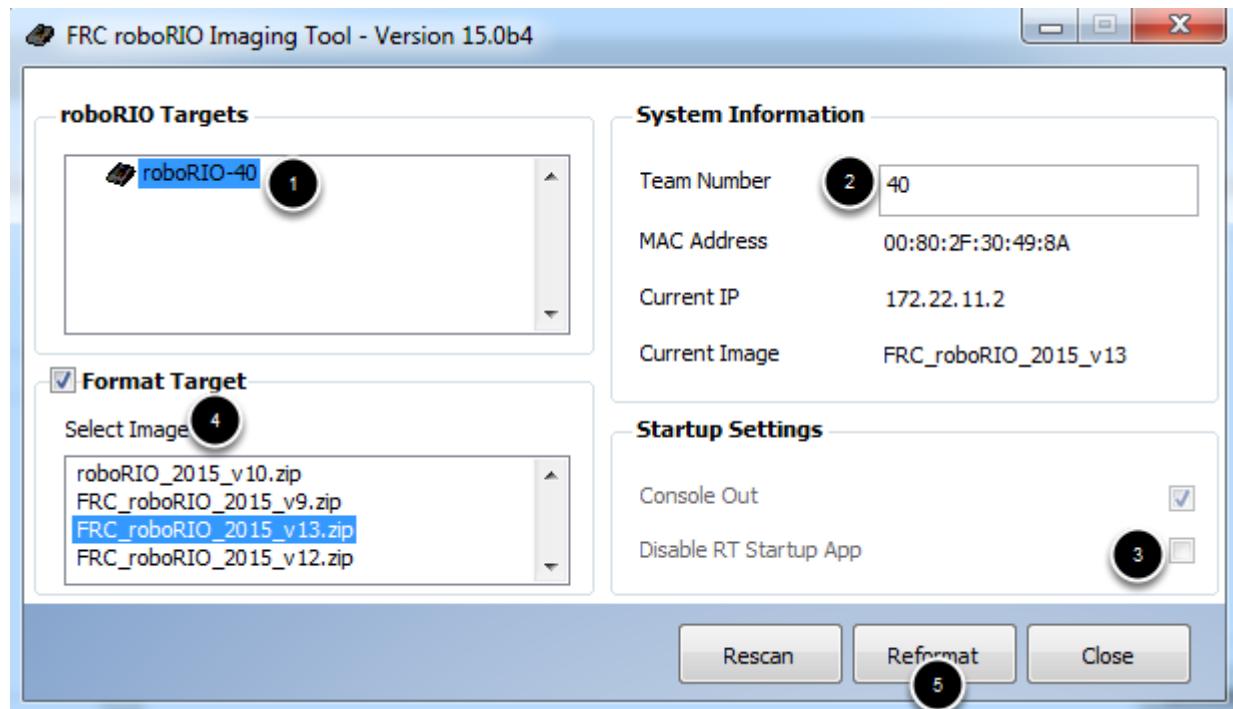
Note: For 32-bit machines the path is C:\Program Files\National Instruments\LabVIEW 2014\project\roboRIO Tool

roboRIO Imaging Tool



After launching, the roboRIO Imaging Tool will scan for available roboRIOs and indicate any found in the top left box. The bottom left box will show the available image versions that may be loaded onto the roboRIO. The right hand column contains information and settings for the roboRIO selected in the top left pane.

Imaging the roboRIO



1. Make sure the roboRIO is selected in the top left pane
2. Enter your team number in the box in the top right
3. Make sure the Disable RT Startup App box is unchecked in the bottom right
4. Check the box to Format Target and select the latest image version in the box.
5. Click Reformat to begin the imaging process.

Imaging Complete



When the imaging completes you should see the dialog above. Click Ok, then click the Close button at the bottom right to close the imaging tool. **Reboot the roboRIO using the Reset button to have the new team number take effect.**

Installing Java 8 on the roboRIO using the FRC roboRIO Java Installer (Java only)

Running robot Java programs requires the Java runtime to be installed on the roboRIO. This can be done easily using the FRC Java Installer application. The application itself uses java, so Java 8 must be installed on the development system to use the installer. In addition a connection to the roboRIO and the internet are required to download the roboRIO Java runtime and then transfer it to the roboRIO. The installer also has provisions to download Java from the internet once, then install on multiple roboRIOs, or reinstall it after re-imaging a roboRIO.

The computer used to run the installer can be running Microsoft Windows, Mac OS X, or Linux.

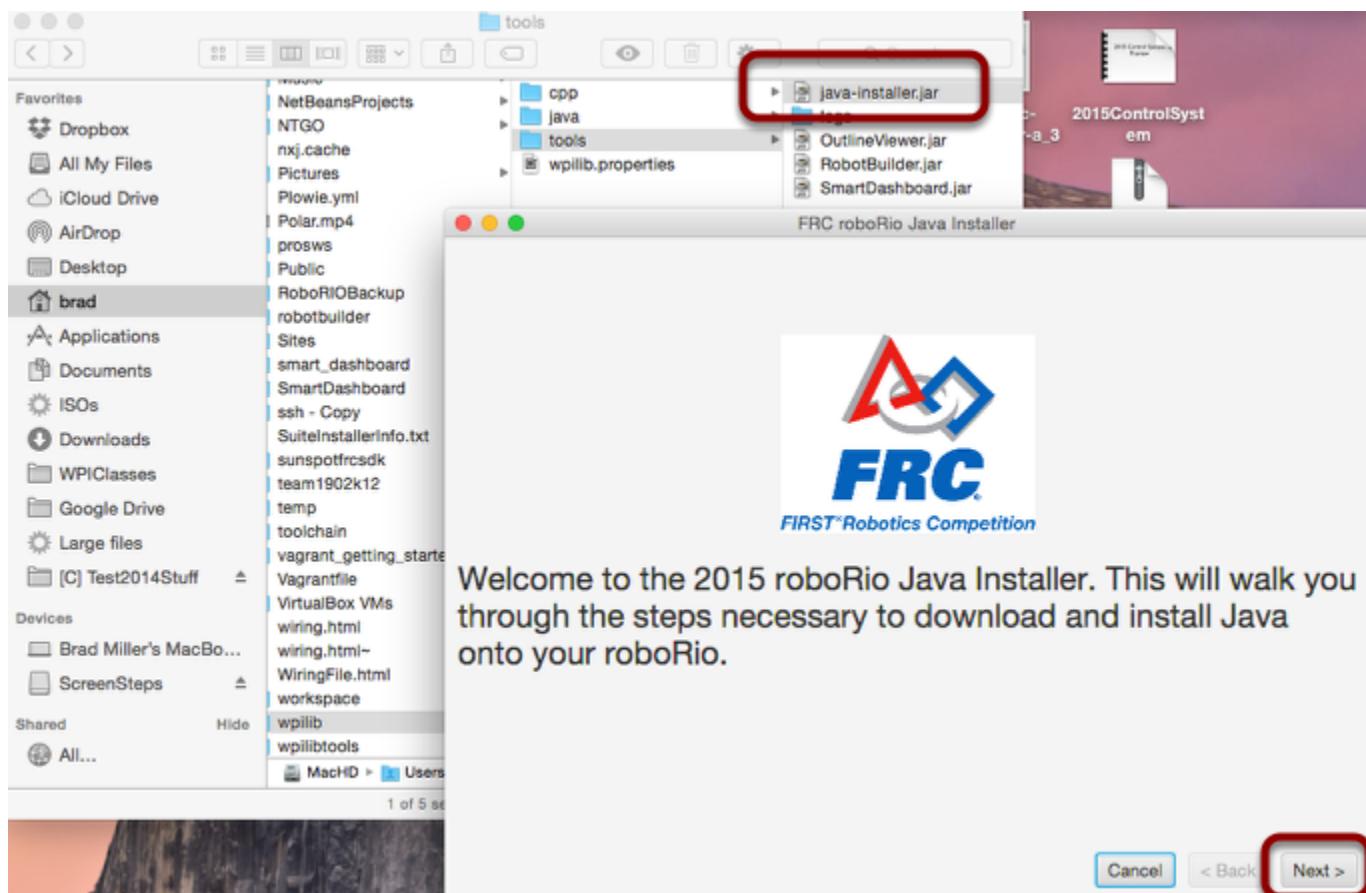
Note: Whenever a new image is installed on the roboRIO (either when initially setting it up or later if the image is updated or reinstalled) the Java runtime must be replaced. This is an easy to overlook step so be sure to keep this in mind.



FRC

FIRST®Robotics Competition

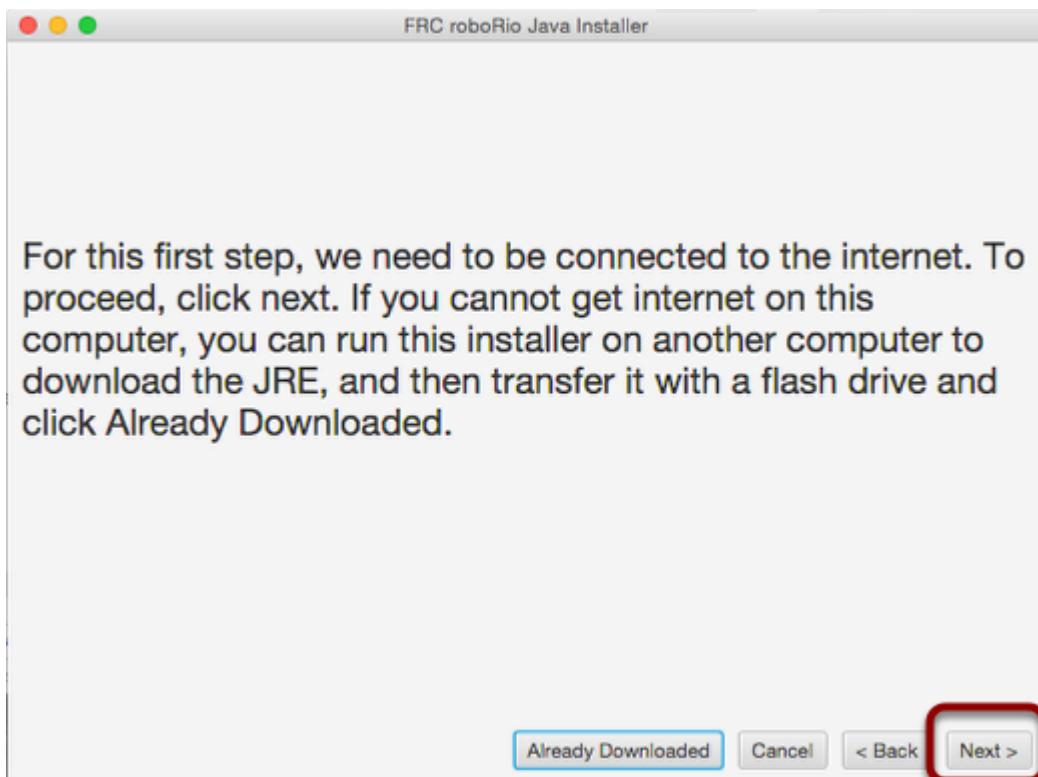
Start the FRC Java Installer



The FRC Java Installer application is written in Java. You can usually run it (depending on your computer operating system) by double-clicking on the file in <home-directory>/wpilib/tools/java-installer.jar. So if your home directory is c:\Users\george then the installer is c:\Users\george\wpilib\tools\java-installer.jar. When it starts you'll see the start screen.

The installation takes several steps and the Next button is usually used to navigate between steps. To get started click "Next".

Getting ready to download Java from the internet



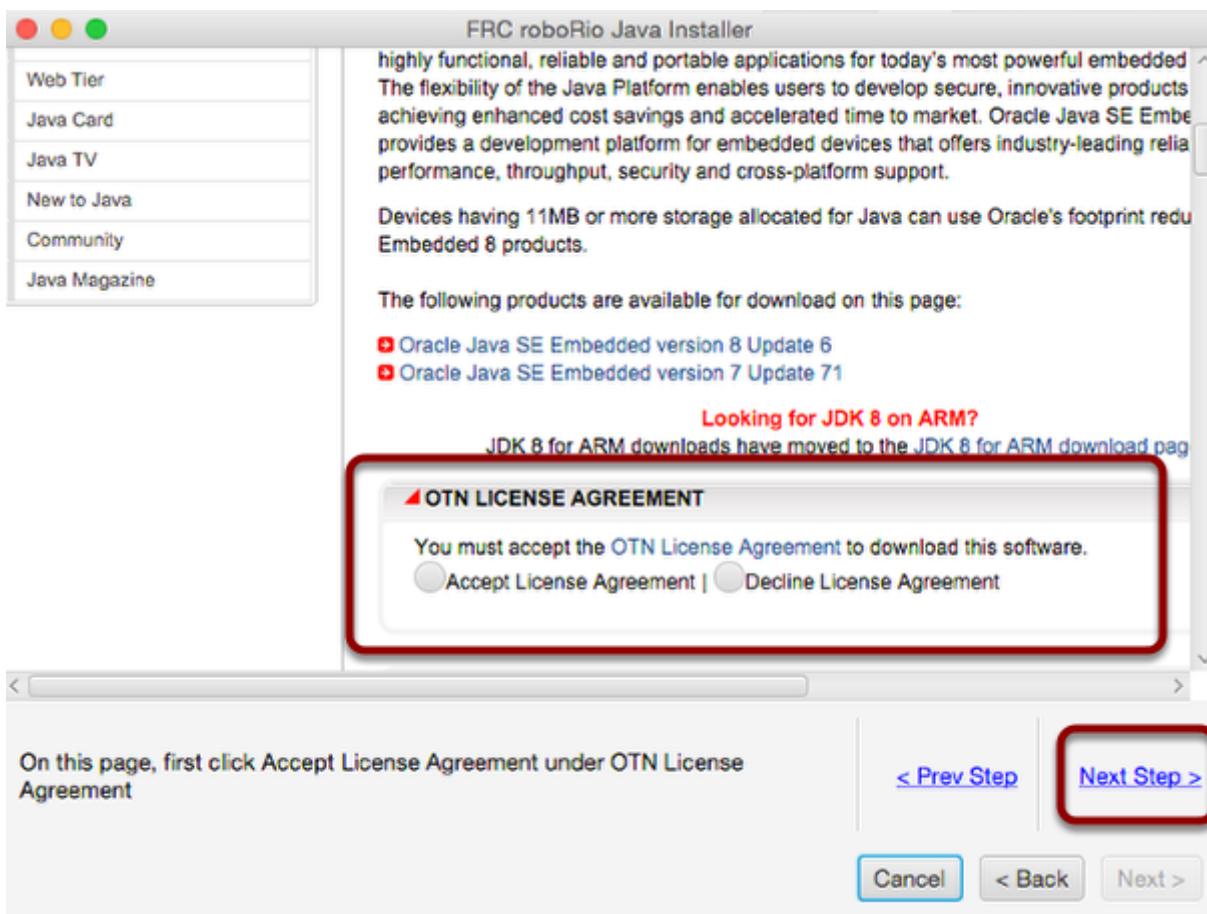
In this step you have the option of using an already downloaded JRE (Java Runtime Edition) or getting it now. Letting the installer help you download Java is the most common option and you get to it by clicking "Next".



FRC

FIRST®Robotics Competition

Accepting the Oracle Java license agreement



In this step you must accept the License Agreement by clicking on the "Accept License Agreement" radio button. You might have to scroll down the page to see the button. Once you've done that, click "Next Step".



FRC

FIRST® Robotics Competition

Select the version of Java to download

FRC roboRio Java Installer

| Description | Size | |
|--|--------|--|
| ARM, Linux | | |
| ARMv7 Linux - VFP, HardFP ABI, Little Endian1 | 117 MB | ejdk-8u6-fcs-b23-linux-arm-vfp-hflt-12_jun_2014.tar.gz |
| ARMv7 Linux - VFP, SoftFP ABI, Little Endian2 | 116 MB | ejdk-8u6-fcs-b23-linux-arm-vfp-sflt-12_jun_2014.tar.gz |
| ARMv5 Linux - SoftFP ABI, Little Endian3 | 101 MB | ejdk-8u6-fcs-b23-linux-arm-sflt-12_jun_2014.tar.gz |
| Power Architecture, Linux | | |
| Power Architecture Linux - Headless - e600 CPU variant with a Classic Floating Point | 102 MB | ejdk-8u6-fcs-b23-linux-ppc-12_jun_2014.tar.gz |

A red arrow points from the text "Next, download the ARMv7 Linux - VFP, SoftFP ABI, Little Endian JRE." to the second row of the table, specifically highlighting the "ARMv7 Linux - VFP, SoftFP ABI, Little Endian2" entry.

Next, download the ARMv7 Linux - VFP, SoftFP ABI, Little Endian JRE. This is the second link in the first download box

[< Prev Step](#) [Next Step >](#)

[Cancel](#) [< Back](#) [Next >](#)

You now select the correct version of Java to download. For the roboRIO, that is the "ARMv7 Linux - VFP, SoftFP ABI, Little Endian JRE". This is shown in the installer instruction window.

Log into the Oracle web site



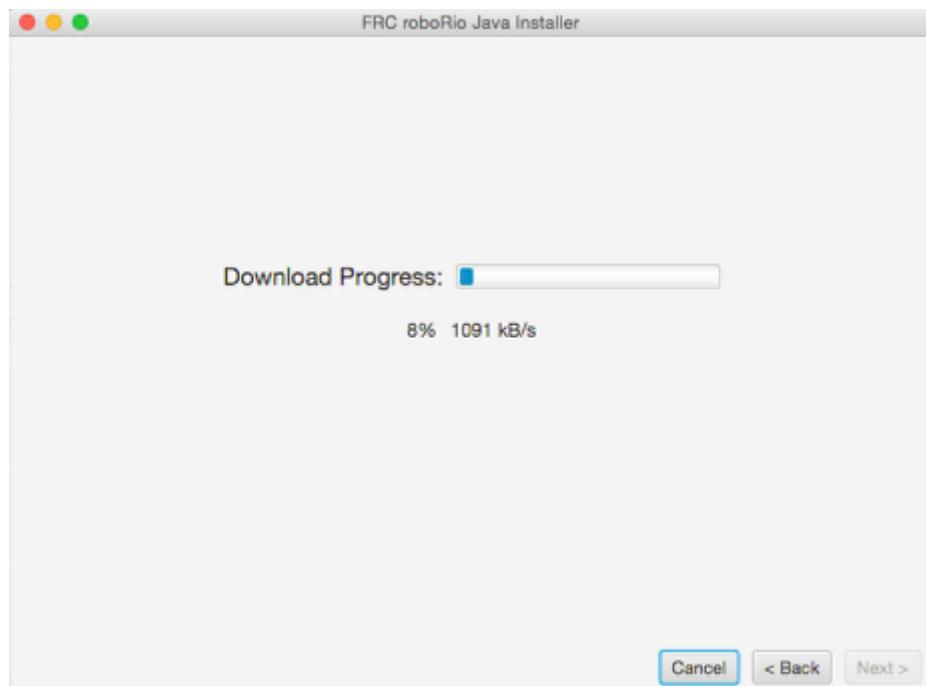
To download Java, Oracle requires you to create a free account. If you already have an account you can just log in. If you don't yet have an account, click the "Sign Up" link and follow the steps to create an account. When you sign in, the download will begin.



FRC

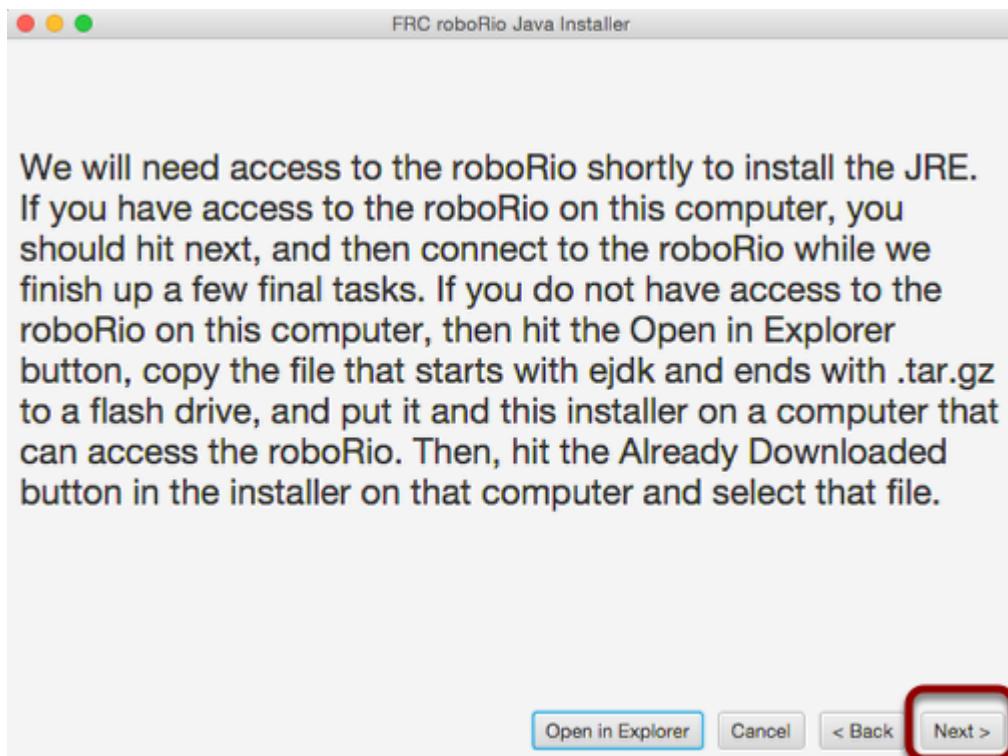
FIRST®Robotics Competition

Java downloads to your computer



The download will start once logged into your Oracle account. Let it finish and you will be redirected to the next step.

Getting ready to install the JRE onto the roboRIO

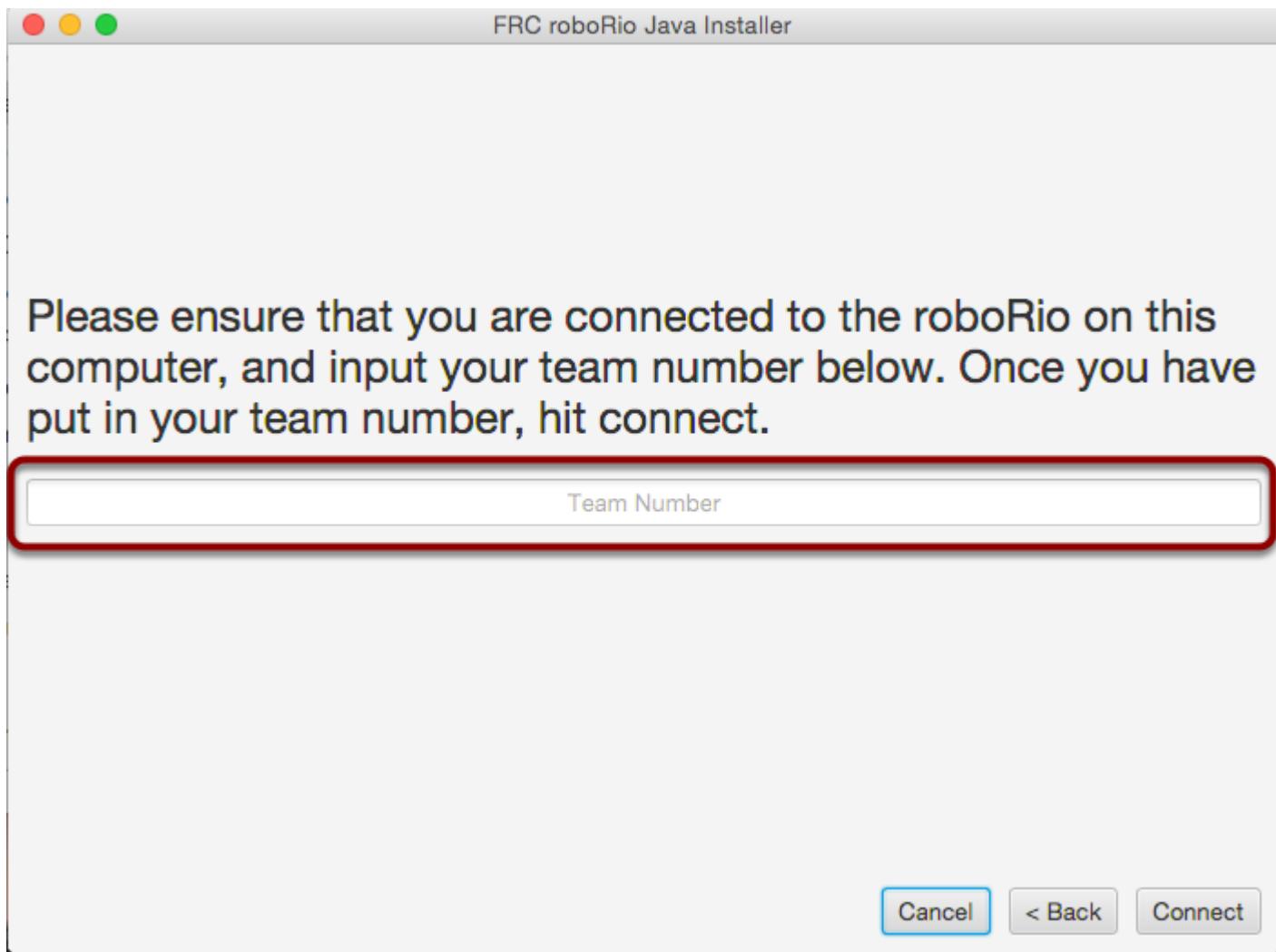


Make sure your computer is connected to the roboRIO. If this computer can not be connected to the roboRIO, then you can take the downloaded Java file and the installer and continue on a computer that is connected to the roboRIO. Click "Next" when you're ready to proceed.



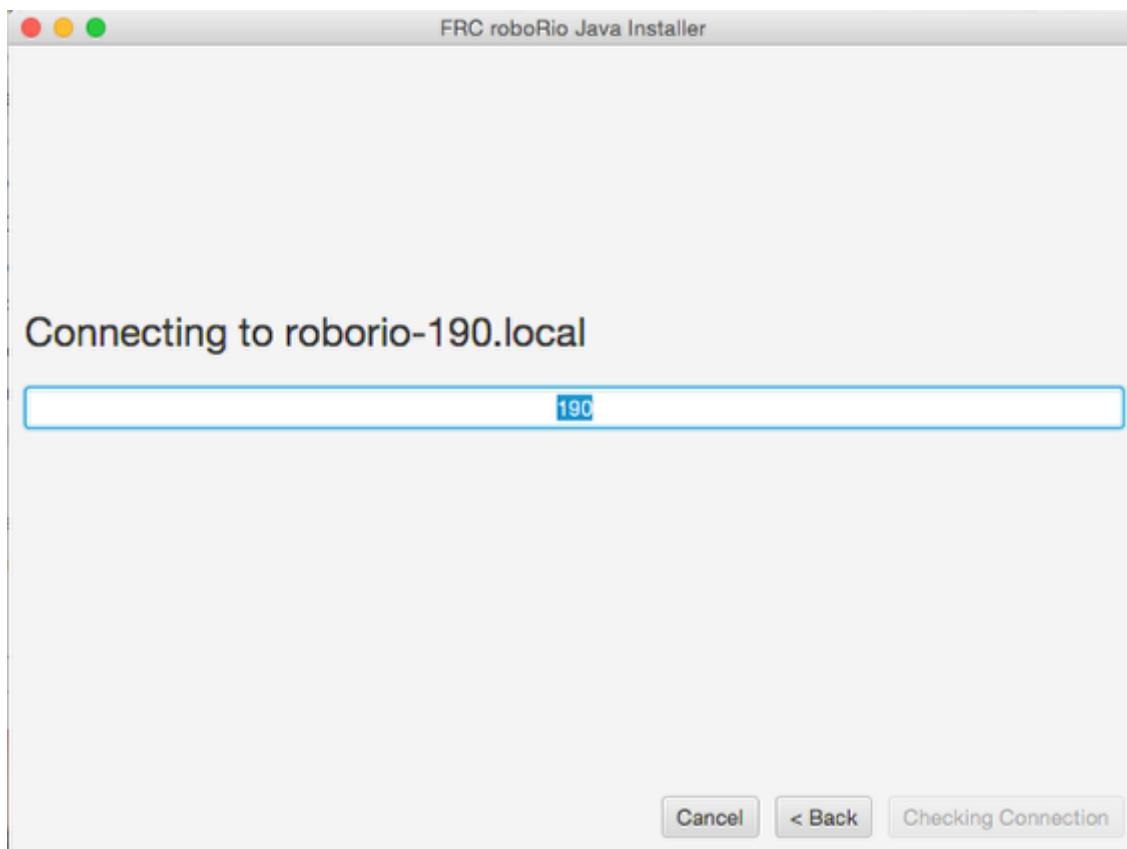
FIRST®Robotics Competition

Uncompressing and getting Java ready to install



In this next step, the installer will automatically complete a number of steps to get Java ready to install on your roboRIO. Then you must enter your team number so the roboRIO can be located on the network. When you have entered the team number and the roboRIO is connected, click "Connect".

Downloading Java to the roboRIO

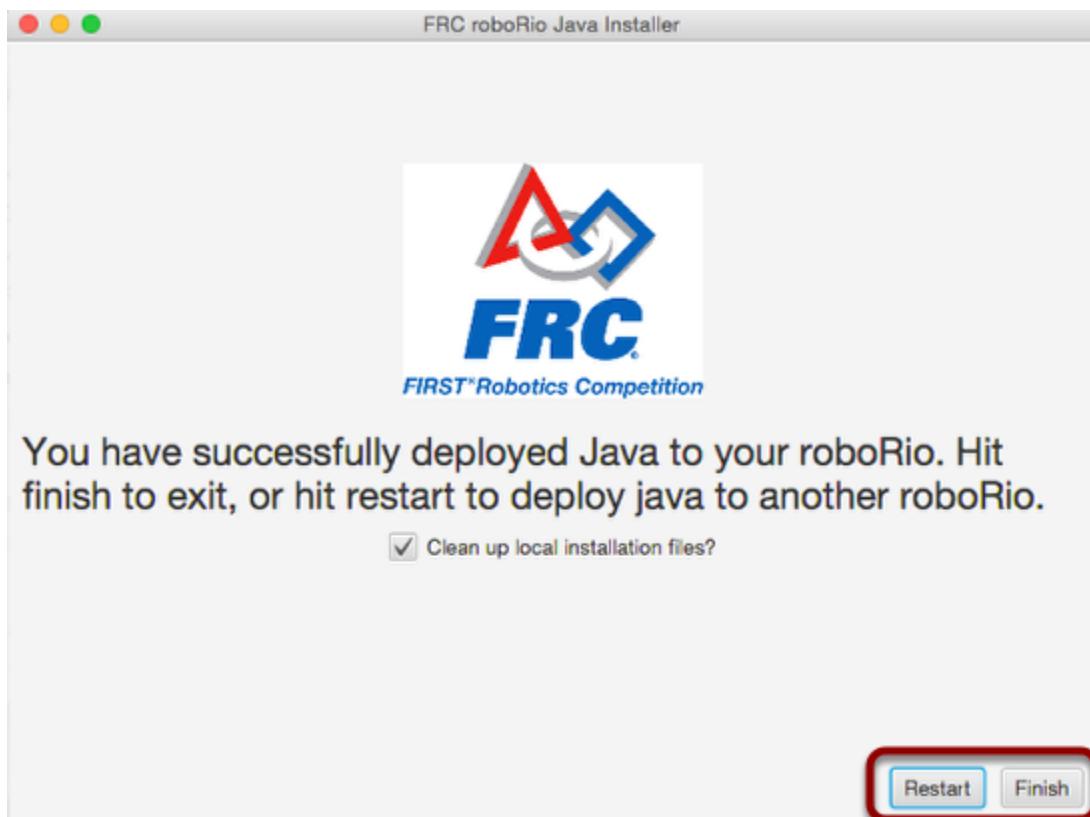


The installer will now connect and then install Java to your roboRIO. If the installer has trouble connecting, make sure the computer is on the same network as the roboRIO. You may also try turning off other network interfaces temporarily to make sure the installer finds your roboRIO.



FIRST®Robotics Competition

Succesful installation



A successful installation is indicated and you may exit the installer by clicking "Finish". If you want to install Java on another roboRIO, click "Restart".

RoboRIO Networking

The network setup used on the 2015 system is a little bit different than the previous Control System. The new scheme utilizes mDNS to allow for the use of DHCP addressing and seamless transition from ethernet to USB and back.

mDNS

The FRC Driver Station, LabVIEW, and the Eclipse plugins for C++ and Java are all programmed to discover your roboRIO using the mDNS protocol. This means that the roboRIO can be detected regardless of the interface or IP being used.

mDNS - Principles

Multicast Domain Name System (mDNS) is a system which allows for resolution of host names to IP addresses on small networks with no dedicated name server. To resolve a host name a device sends out a multicast message to the network querying for the device. The device then responds with a multicast message containing it's IP. Devices on the network can store this information in a cache so subsequent requests for this address can be resolved from the cache without repeating the network query.

mDNS - Providers

To use mDNS, an mDNS implementation is required to be installed on your PC. Here are some common mDNS implementations for each major platform:

Windows:

- NI mDNS Responder - **Installed with the NI FRC Update Suite**
- Apple Bonjour - Installed with iTunes

OSX:

- Apple Bonjour - **Installed by default**

Linux:



FIRST® Robotics Competition

- nss-mDNS/Avahi/Zeroconf - Installed and enabled by default on some Linux variants (such as Ubuntu or Mint). May need to be installed or enabled on others (such as Arch)

mDNS - Firewalls

To work properly mDNS must be allowed to pass through your firewall. **Depending on your PC configuration, no changes may be required, this section is provided to assist with troubleshooting.** Because the network traffic comes from the mDNS implementation and not directly from the Driver Station or IDE, allowing those applications through may not be sufficient. There are two main ways to resolve mDNS firewall issues:

- Add an application/service exception for the mDNS implementation (NI mDNS Responder is C:\Program Files\National Instruments\Shared\mDNS Responder\nimdnsResponder.exe)
- Add a port exception for traffic to/from UDP 5353 (IP ranges 10.0.0.0-10.255.255.255
172.16.0.0-172.31.255.255 192.168.0.0-192.168.255.255 169.254.0.0-169.254.255.255
224.0.0.251)

mDNS - Browser support

Most web-browsers should be able to utilize the mDNS address to access the roboRIO webserver as long as an mDNS provider is installed. Please note the following exceptions:

Chrome - In Google Chrome, a trailing '/' must be appended to access mDNS addresses (eg. **roboRIO-190.local/**)

USB

If using the USB interface, no setup is required. The roboRIO driver will automatically configure the IP address of the host (your computer) and roboRIO and the software listed above should be able to locate and utilize your roboRIO

Ethernet/Wireless

The 2015 Bridge Configuration Utility has been modified to enable the DHCP server on the DAP1522 radio in the home use case (AP mode), if you are putting the DAP1522 in bridge mode and using a router you can enable DHCP addressing on the router. The bridge is set to the same team based IP address as before (10.TE.AM.1) and will hand out DHCP address from 10.TE.AM.20 to 10.TE.AM.199. When connected to the field, FMS will also hand out addresses in the same IP range.



FIRST® Robotics Competition

roboRIO Ethernet Configuration

The roboRIO Ethernet interface should be set to DHCP. When connected to the DAP1522 bridge, the roboRIO will receive an IP from the bridge. When tethered directly to a PC, both devices will self-assign IPs.

PC Adapter Configuration

When connecting via Ethernet (to either the radio or directly to the roboRIO) or Wireless (to the DLink radio), your computer adapter should be set to DHCP. When connecting through the DAP1522, your PC will receive an IP address from the radio. If tethered directly to the roboRIO both devices will self-assign IPs.

IP Lists

IPs for system components:

roboRIO USB: 172.22.11.2

roboRIO mDNS: roboRIO-####.local (where ##### is your team number with no leading zeroes) You should be able to use this address to communicate with the roboRIO over either interface through ping, browser, etc.

Robot Radio: 10.TE.AM.1 (where TE.AM is your 4 digit team number with leading zeroes if required)

roboRIO Ethernet: DHCP, assigned by the Robot Radio

Driver Station PC: DHCP, assigned by the Robot Radio

Additional Programming computers: DHCP, assigned by the Robot Radio

DHCP range: 10.TE.AM.20 to 10.TE.AM.199

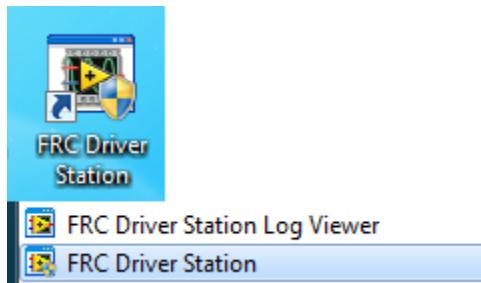
Troubleshooting

See [RoboRIO Network Troubleshooting](#)

FRC Driver Station Software

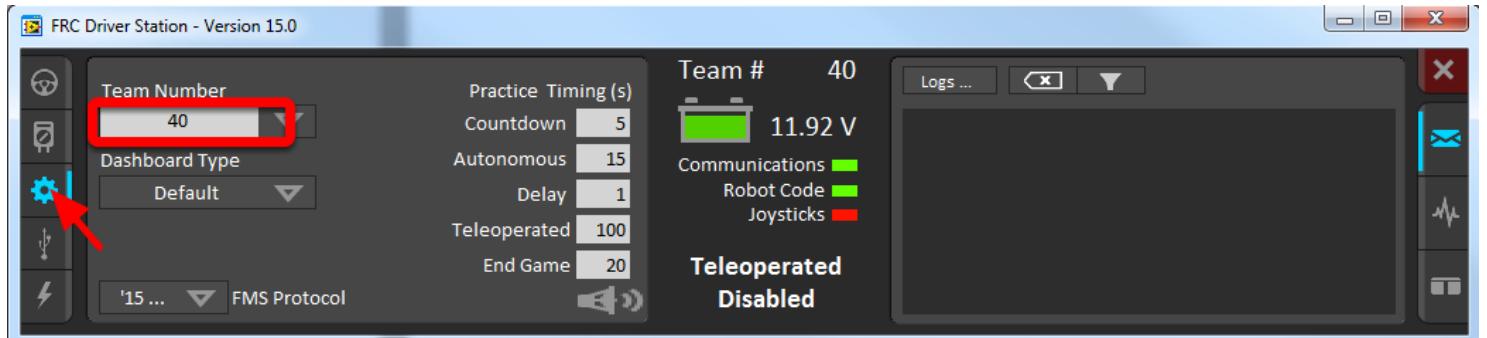
The Driver Station software has been re-worked for 2015

Starting the FRC Driver Station



The FRC Driver Station can be launched by double-clicking the icon on the Desktop or by selecting Start->All Programs->FRC Driver Station.

Setting Up the Driver Station

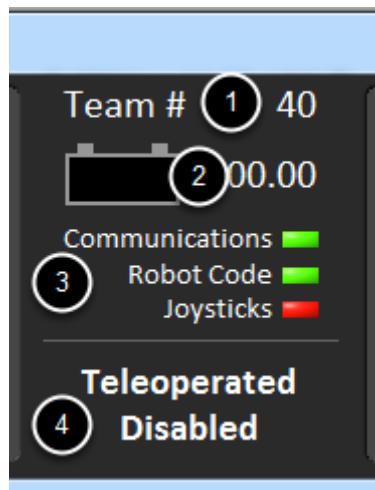


For information on installing the Driver Station software see [this document](#). Typically the Driver Station will set the appropriate settings automatically, but if you do have to set the network settings manually, the DS should use the following settings:

- IP: DHCP

The DS must be set to your team number in order to connect to your robot. In order to do this click the **Setup** tab then enter your team number in the team number box. Press return or click outside the box for the setting to take effect.

Status Pane



The Status Pane of the Driver Station is located in the center of the display and is always visible regardless of the tab selected. It displays a selection of critical information about the state of the DS and robot:

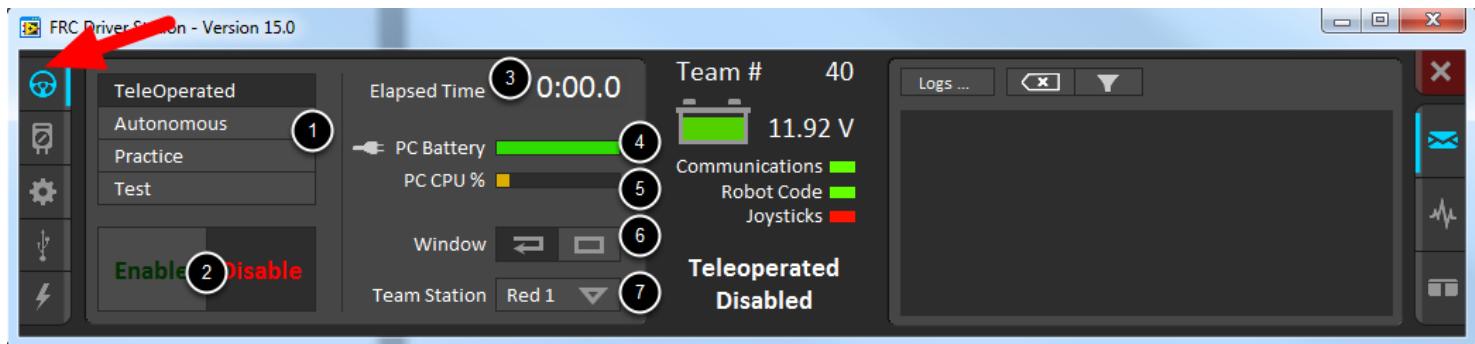
1. Team # - The Team number the DS is currently configured for. This should match your FRC team number, to change the number see the Setup Tab.
2. Battery Voltage - If the DS is connected and communicating with the roboRIO this displays current battery voltage as a number and with a small chart of voltage over time in the battery icon. The background of the numeric indicator will turn red when the roboRIO brownout is triggered. See [RoboRIO Brownout and Understanding Current Draw](#) for more information.
3. Major Status Indicators - These three indicators display major status items for the DS. The "Communications" indicates whether the DS is currently communicating with the FRC Network Communications Task on the roboRIO. The "Robot Code" indicator shows whether the team Robot Code is currently running (determined by whether or not the Driver Station Task in the robot code is updating the battery voltage), The "Joysticks" indicator shows if at least one joystick is plugged in and recognized by the DS.
4. Status String - The Status String provides an overall status message indicating the state of the robot, some examples are "No Robot Communication", "No Robot Code", "Emergency Stopped", and "Teleoperated Enabled". When the roboRIO brownout is triggered this will display "Voltage Brownout".



FRC

FIRST® Robotics Competition

Operation Tab

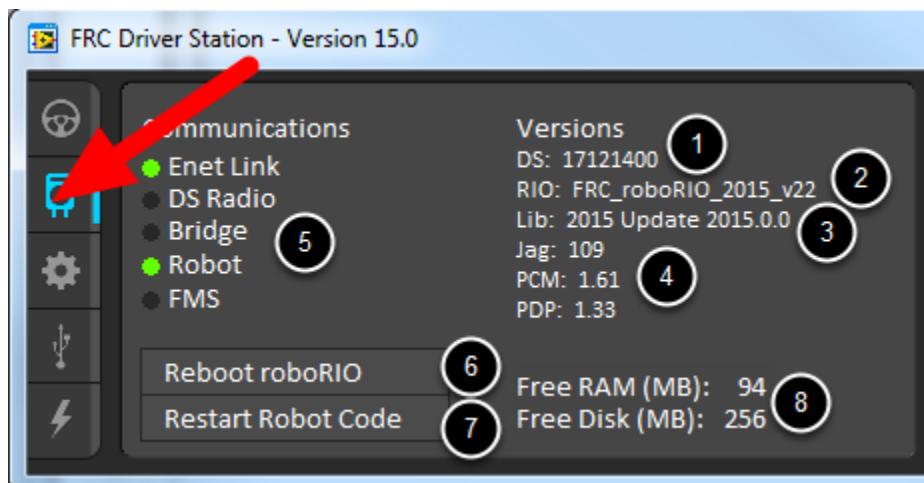


The Operations Tab is used to control the mode of the robot and provide additional key status indicators while the robot is running.

1. Robot Mode - This section controls the Robot Mode. Practice Mode causes the robot to cycle through the same transitions as an FRC match after the Enable button is pressed (timing for practice mode can be found on the setup tab).
2. Enable/Disable - These controls enable and disable the robot. You can also use the key combination []\ (the 3 keys above the enter key on most keyboards) to enable the robot and the Enter key to Disable the robot. **The Spacebar will Emergency Stop the Robot**
3. Elapsed Time - Indicates the amount of time the robot has been enabled
4. PC Battery - Indicates current state of DS PC battery and whether the PC is plugged in
5. PC CPU% - Indicates the CPU Utilization of the DS PC
6. Window Mode - When not on the Driver account on the Classmate allows the user to toggle between floating (arrow) and docked (rectangle)
7. Team Station - When not connected to FMS, sets the team station to transmit to the robot.

Note: When connected to the Field Management System the controls in sections 1, and 2 will be replaced by the words FMS Connected and the control in Section 7 will be greyed out.

Diagnostics Tab



The Diagnostics Tab contains additional status indicators that teams can use to diagnose issues with their robot:

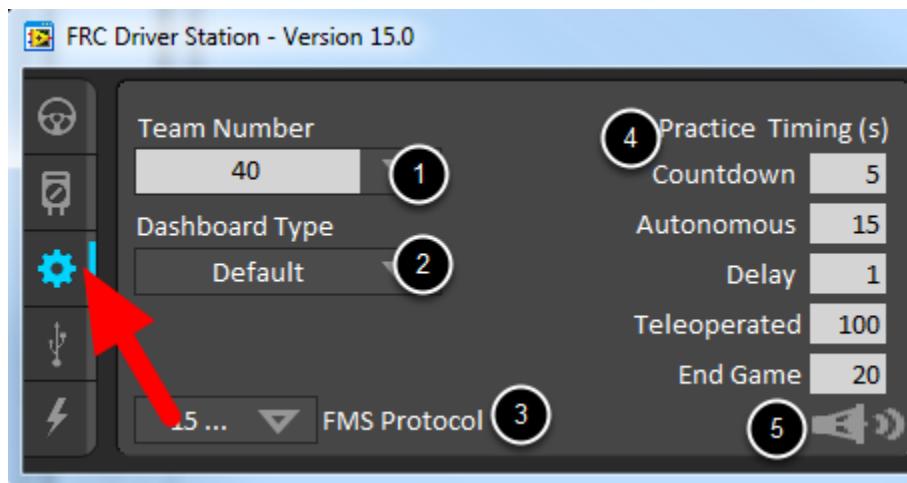
1. DS Version - Indicates the Driver Station Version number
2. roboRIO Image Version - String indicating the version of the roboRIO Image
3. WPILib Version - String indicating the version of WPILib in use
4. CAN Device Versions - String indicating the firmware version of devices connected to the CAN bus
5. Connection Indicators - Indicate connection status to various components. "Enet Link" indicates the computer has something connected to the ethernet port. "DS Radio" is a legacy indicator used to indicate the ping status to an external radio on the DS side at 10.XX.YY.4. "Bridge" indicates the ping status to the robot wireless bridge at 10.XX.YY.1. "Robot" indicates the ping status to the roboRIO using mDNS (with a fallback of a static 10.TE.AM.2 address). "FMS" indicates if the DS is receiving packets from FMS (this is NOT a ping indicator).
6. Reboot roboRIO - This button attempts to perform a remote reboot of the roboRIO (after clicking through a confirmation dialog)
7. Restart Robot Code - This button attempts to restart the code running on the robot (but not restart the OS)
8. Memory Stats - This section shows stats about the roboRIO memory



FRC

FIRST® Robotics Competition

Setup Tab



The Setup Tab contains a number of buttons teams can use to control the operation of the Driver Station:

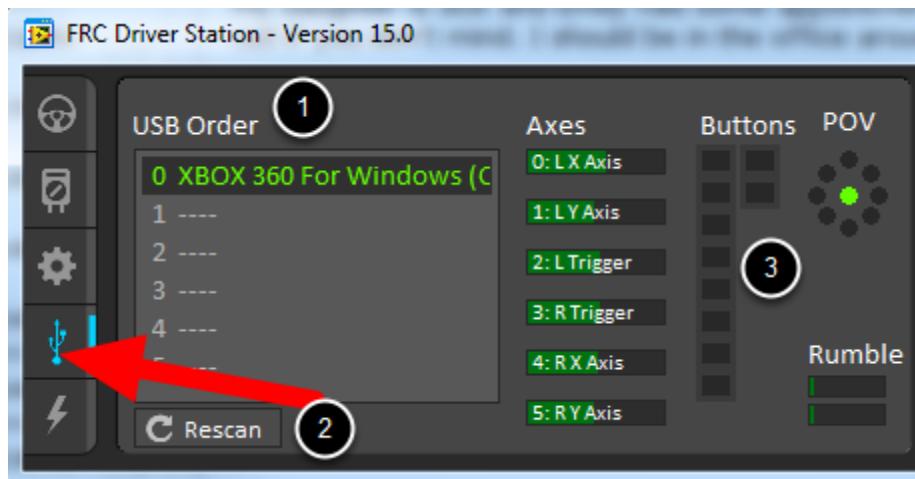
1. Team Number - Should contain your FRC Team Number. This controls the mDNS name that the DS expects the robot to be at.
2. Dashboard Type - Controls what Dashboard is launched by the Driver Station. **Default** launches the file pointed to by the "FRC DS Data Storage.ini" file, by default this is Dashboard.exe in the Program Files\FRC Dashboard folder. **LabVIEW** attempts to launch a dashboard at the default location for a custom built LabVIEW dashboard, but will fall back to the default if no dashboard is found. **Java** and **C++** launch the SmartDashboard included with the language update for that language. To use the SmartDashboard with camera extension leave the option set to Default and see the SmartDashboard section of the documentation. **Note: There is a known issue with this control resetting when the DS is restarted while set to C++ or Java. If you wish to have the DS start the Smartdashboard when it starts up, set the type to Default and see the article [Setting the Driver Station to Start SmartDashboard](#).**
3. FMS Protocol - This controls which version of the DS to FMS communication protocol to use. This control is only needed when connecting to a 2014 FMS such as at a Week Zero event, where it should be set to '14. This control will reset to '15 (the setting required for 2015 Competition Events) each time the DS is started.
4. Practice Mode Timing - These boxes control the timing of each portion of the practice mode sequence. When the robot is enabled in practice mode the DS automatically proceeds through the modes indicated from top left down to bottom left then up to top right and down.
5. Audio Control - This button controls whether audio tones are sounded when the Practice Mode is used.



FRC

FIRST® Robotics Competition

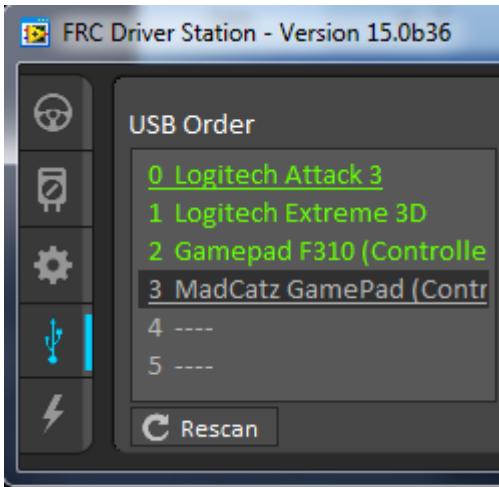
USB Devices Tab



The USB Devices tab includes the information about the USB Devices connected to the DS

1. USB Setup List - This contains a list of all compatible USB devices connected to the DS. Pressing a button on a device will highlight the name in green and put 2 *'s before the device name
2. Rescan - This button will force a Rescan of the USB devices. While the robot is disabled, the DS will automatically scan for new devices and add them to the list. To force a complete re-scan or to re-scan while the robot is Enabled (such as when connected to FMS during a match) press F1 or use this button.
3. Device indicators - These indicators show the current status of the Axes, buttons and POV of the joystick.
4. Rumble - For XInput devices (such as X-Box controllers) the Rumble control will appear. This can be used to test the rumble functionality of the device. The top bar is "Right Rumble" and the bottom bar is "Left Rumble". Clicking and holding anywhere along the bar will activate the rumble proportionally (left is no rumble = 0, right is full rumble = 1). This is a control only and will not indicate the Rumble value set in robot code.

Re-Arranging and Locking Devices



The 2015 Driver Station has the capability of "locking" a USB device into a specific slot. This is done automatically if the device is dragged to a new position and can also be triggered by double clicking on the device. "Locked" devices will show up with an underline under the device. A locked device will reserve it's slot even when the device is not connected to the computer (shown as grayed out and underlined). Devices can be unlocked (and unconnected devices removed) by double clicking on the entry.

Note: If you have two or more of the same device, they should maintain their position as long as all devices remain plugged into the computer in the same ports they were locked in. If you switch the ports of two identical devices the lock should follow the port, not the device. If you re-arrange the ports (take one device and plug it into a new port instead of swapping) the behavior is not determinate (the devices may swap slots). If you unplug one or more of the set of devices, the positions of the others may move, they should return to the proper locked slots when all devices are reconnected.

Example: The image above shows 4 devices:

- A Locked "Logitech Attack 3" joystick. This device will stay in this position unless dragged somewhere else or unlocked
- An unlocked "Logitech Extreme 3D" joystick
- An unlocked "Gamepad F310 (Controller)" which is a Logitech F310 gamepad
- A Locked, but disconnected "MadCatz GamePad (Controller)" which is a MadCatz Xbox 360 Controller

In this example, unplugging the Logitech Extreme 3D joystick will result in the F310 Gamepad moving up to slot 1. Plugging in the MadCatz Gamepad (even if the devices in Slots 1 and 2 are removed and those slots are empty) will result in it occupying Slot 3.



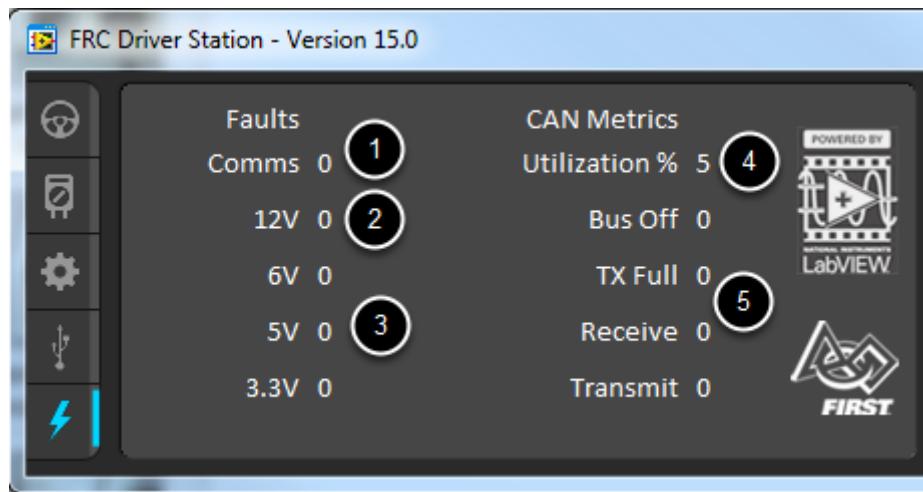
FRC

FIRST®Robotics Competition

Joystick Setup Best Practice

Note: When using the Re-Arranging and Locking feature described above, teams should take care to make sure devices behave as they expect when the DS is restarted, and when the DS computer is rebooted with the devices connected, after initial setup. XInput devices such as Xbox controller may enumerate differently when they are connected 1-at-a-time versus all at once.

CAN\Power Tab



The last tab on the left side of the DS is the CAN\Robot Power Tab. This tab contains information about the power status of the roboRIO and the status of the CAN bus:

1. Comms Faults - This indicates the number of Comms faults that have occurred since the DS has been connected
2. 12V Faults - This indicates the number of input power faults (Brownouts) that have occurred since the DS has been connected
3. 6V/5V/3.3V Faults - This indicates the number of faults (typically cause by short circuits) that have occurred on the User Voltage Rails since the DS has been connected
4. CAN Bus Utilization - This indicates the percentage utilization of the CAN bus
5. CAN faults - These indicate the counts of each of the 4 types of CAN faults since the DS has been connected

Charts Tab



The Charts tab plots and displays advanced indicators of robot status to help teams diagnose robot issues:

1. The top graph charts trip time in milliseconds in green (against the axis on the right) and lost packets per second in blue (against the axis on the left)
2. The bottom graph plots battery voltage in yellow (against the axis on the left), roboRIO CPU in red (against the axis on the right), DS Requested mode as a continuous line on the bottom of the chart and robot mode as a discontinuous line above it.
3. This key shows the colors used for the DS Requested and Robot Reported modes in the bottom chart.
4. Chart scale - These controls change the time scale of the DS Charts
5. This button launches the DS Log File Viewer

Messages Tab



The Messages tab displays diagnostic messages from the DS, WPILib and/or the roboRIO:

1. Logs - This button launches the DS Log File Viewer
2. Clear - This button clears all messages from the display window
3. Filter - This button toggles between filtering out warnings (filled in icon like the image above) and showing all messages (icon outline only)

Both Tab

The last tab on the right side is the Both tab which displays Messages and Charts side by side

Driver Station Keys

The following keys can be used to control Driver Station operation:

- F1 - Force a Joystick refresh.
- ⌥ - Enable the robot
- Enter - Disable the Robot
- Space - Emergency Stop the robot. After an emergency stop is triggered the roboRIO will need to be rebooted before the robot can be enabled again.

Running your Benchtop Test Program - Tethered

Running your benchtop testing program while tethered to the Driver Station via ethernet or USB cable will confirm the the program was successfully deployed and that the driver station and roboRIO are properly configured.

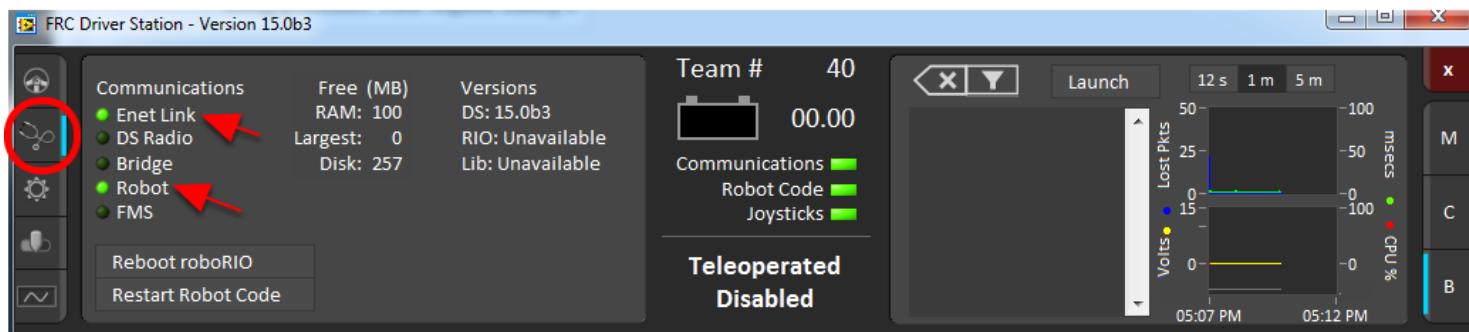
Overview

You should create and download a Benchtop Test Program as described for your programming language:

- [C++](#)
- [Java](#)
- [LabVIEW](#)

The roboRIO should be powered on and connected to the PC over Ethernet or USB. The Driver Station software should be configured with your team number as described in the [previous article](#).

Confirm Connectivity



Using the Driver Station software

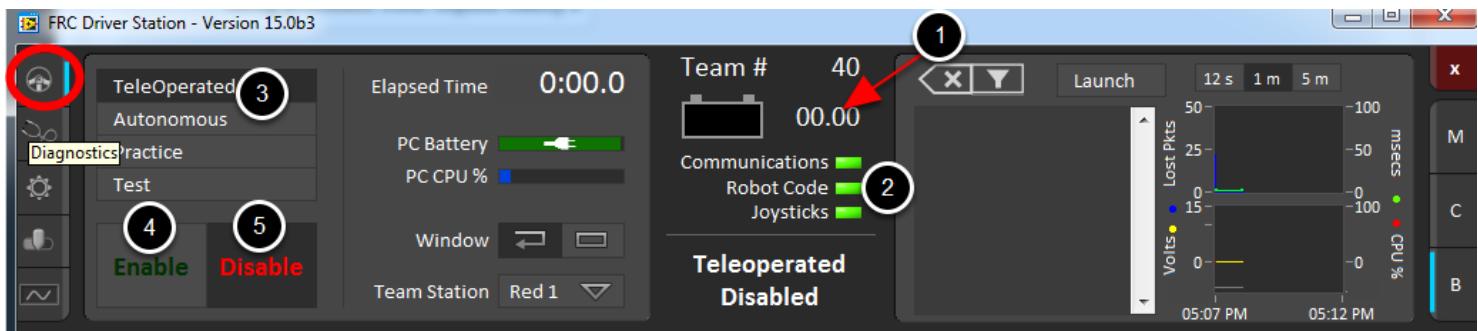
Click Diagnostics and confirm that the Enet Link and Robot leds are green.



FRC

FIRST® Robotics Competition

Tethered Operation



Click the Operation Tab

1. Confirm that battery voltage is displayed
2. Communications, Robot Code, and Joysticks indicators are green.
3. Put the robot in Teleop Mode
4. Click **Enable**.- Move the joysticks and observe how the robot responds.
5. Click **Disable**

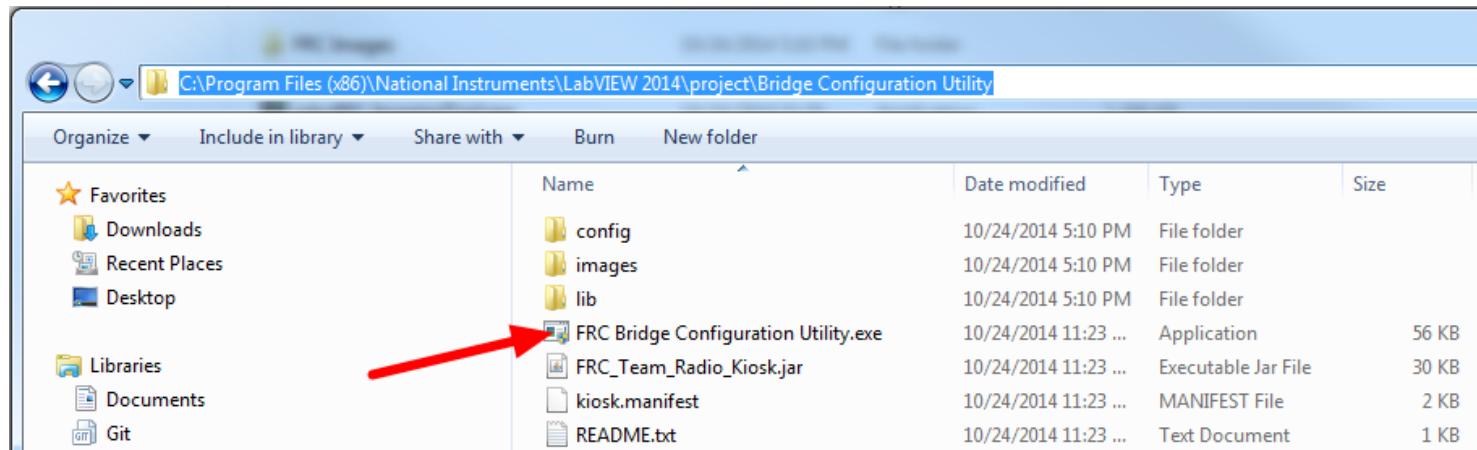
Programming your radio for home use

This guide will show you how to use the 2015 FRC Bridge Configuration Tool software to configure your robot's wireless bridge for use outside of FRC events.

Before you begin using the software:

1. Disable WiFi connections on your computer, as it may prevent the configuration utility from properly communicating with the bridge
2. Make sure no devices are connected to your computer via ethernet, other than the wireless bridge.

Launch the software



Browse to **C:\Program Files (x86)\National Instruments\LabVIEW 2014\project\Bridge Configuration Utility** and double-click on **FRC Bridge Configuration Utility.exe** to launch the program.

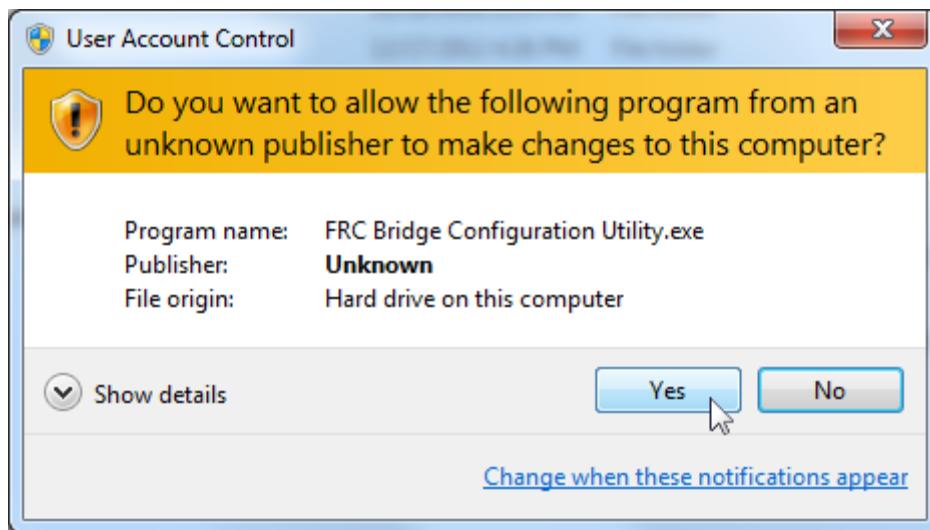
Note: For 32-bit machines the path is **C:\Program Files\National Instruments\LabVIEW 2014\project\Bridge Configuration Utility**



FRC

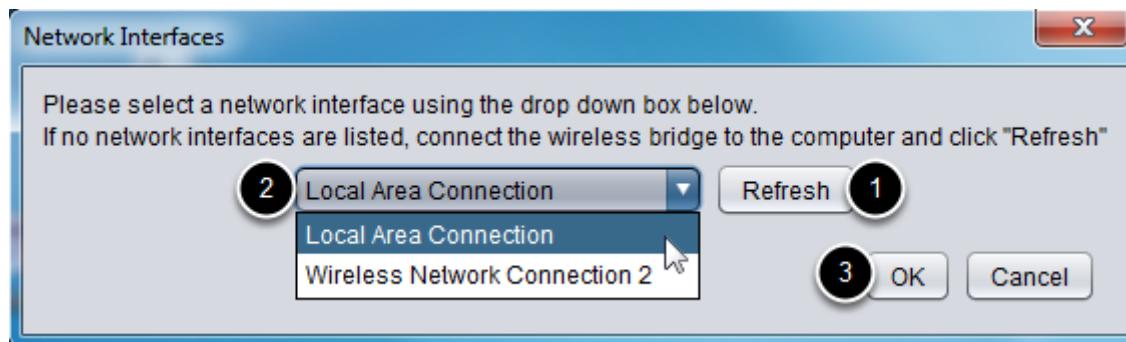
FIRST® Robotics Competition

Allow the program to make changes, if prompted



If your computer is running Windows Vista or Windows 7, a prompt may appear about allowing the configuration utility to make changes to the computer. Click "Yes" if the prompt appears.

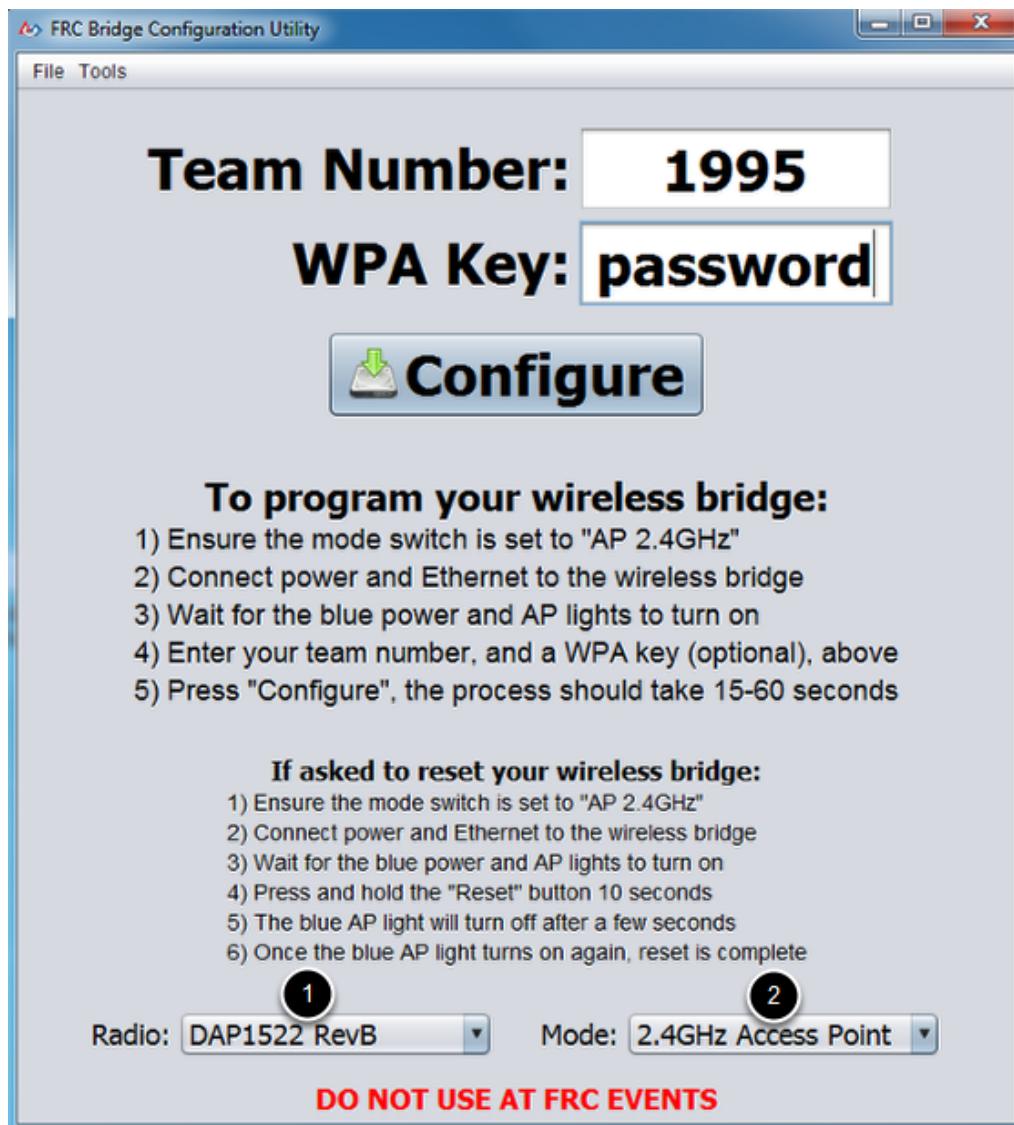
Select the network interface



Use the pop-up window to select the which ethernet interface the configuration utility will use to communicate with the wireless bridge. On Windows machines, ethernet interfaces are typically named "Local Area Connection". The configuration utility can not program a bridge over a wireless connection.

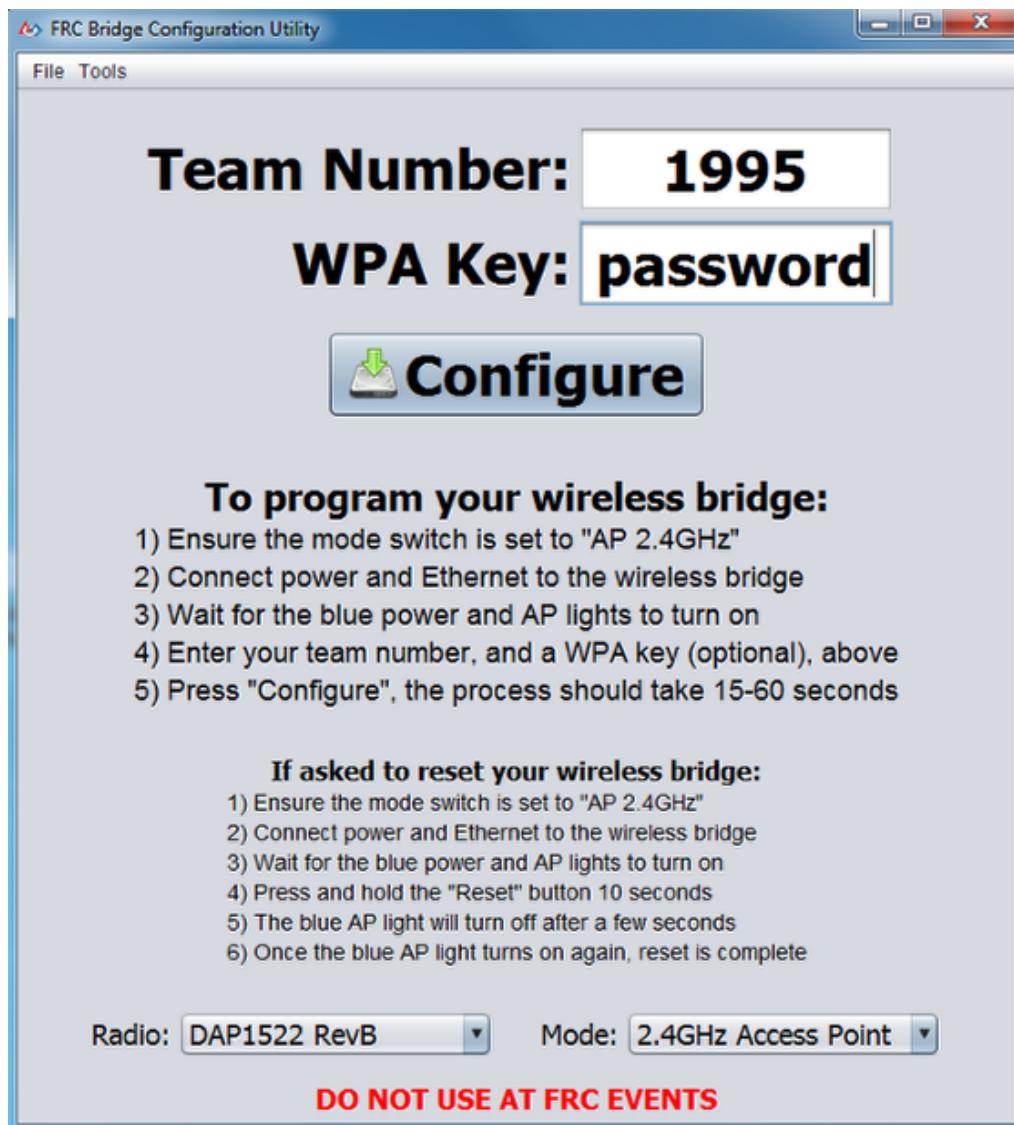
1. If no ethernet interfaces are listed, click "Refresh" to re-scan for available interfaces
2. Select the interface you want to use from the drop-down list
3. Click "OK"

Select a bridge model and operating mode



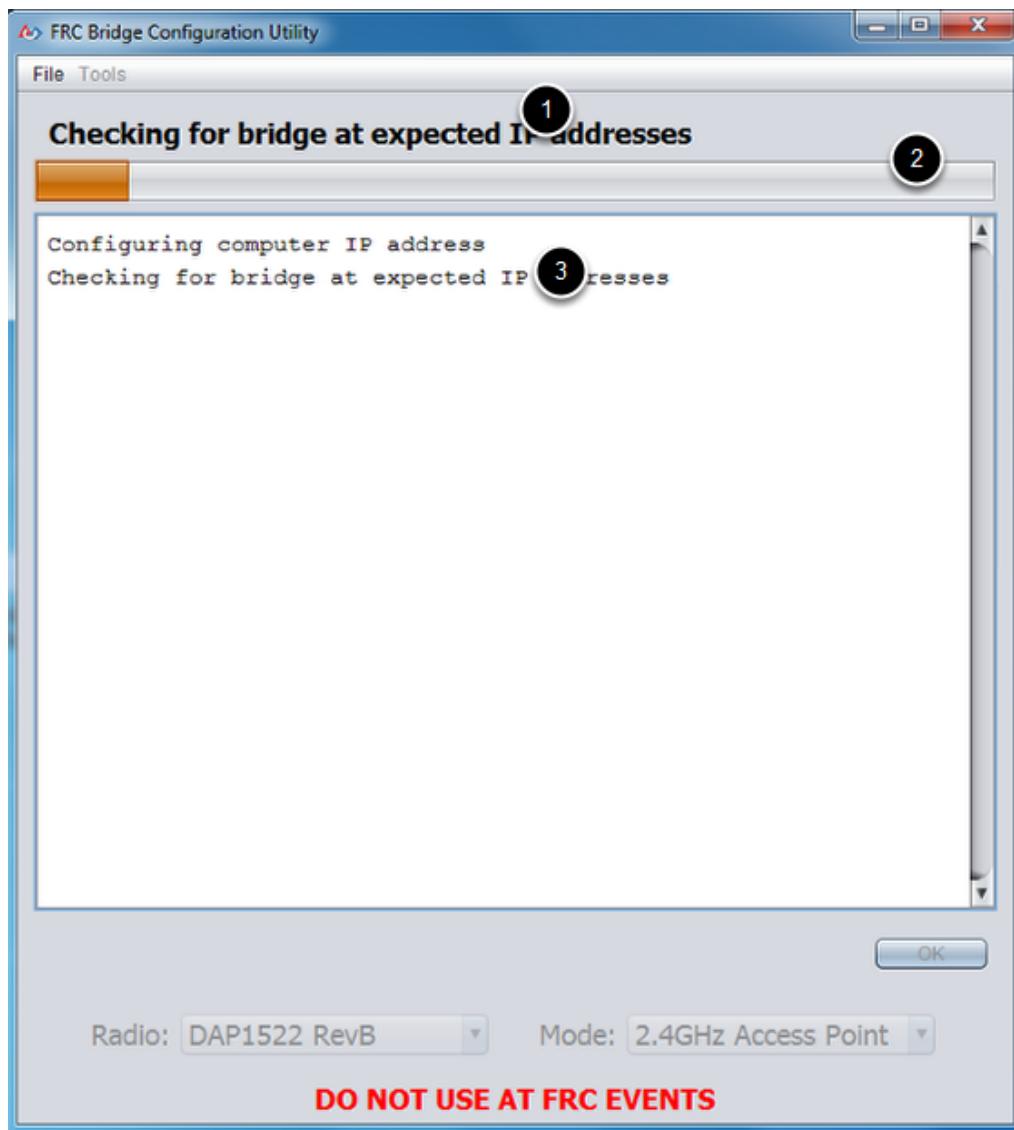
1. Select which DAP1522 revision you are configuring using the drop-down list
2. Select which operating mode you want to configure. For most cases, the default selection of 2.4GHz Access Point will be sufficient.

Prepare and start the configuration process



Follow the on-screen instructions for preparing your wireless bridge, entering the settings the bridge will be configured with, and starting the configuration process. These on-screen instructions update to match the bridge model and operating mode chosen at the bottom of the window.

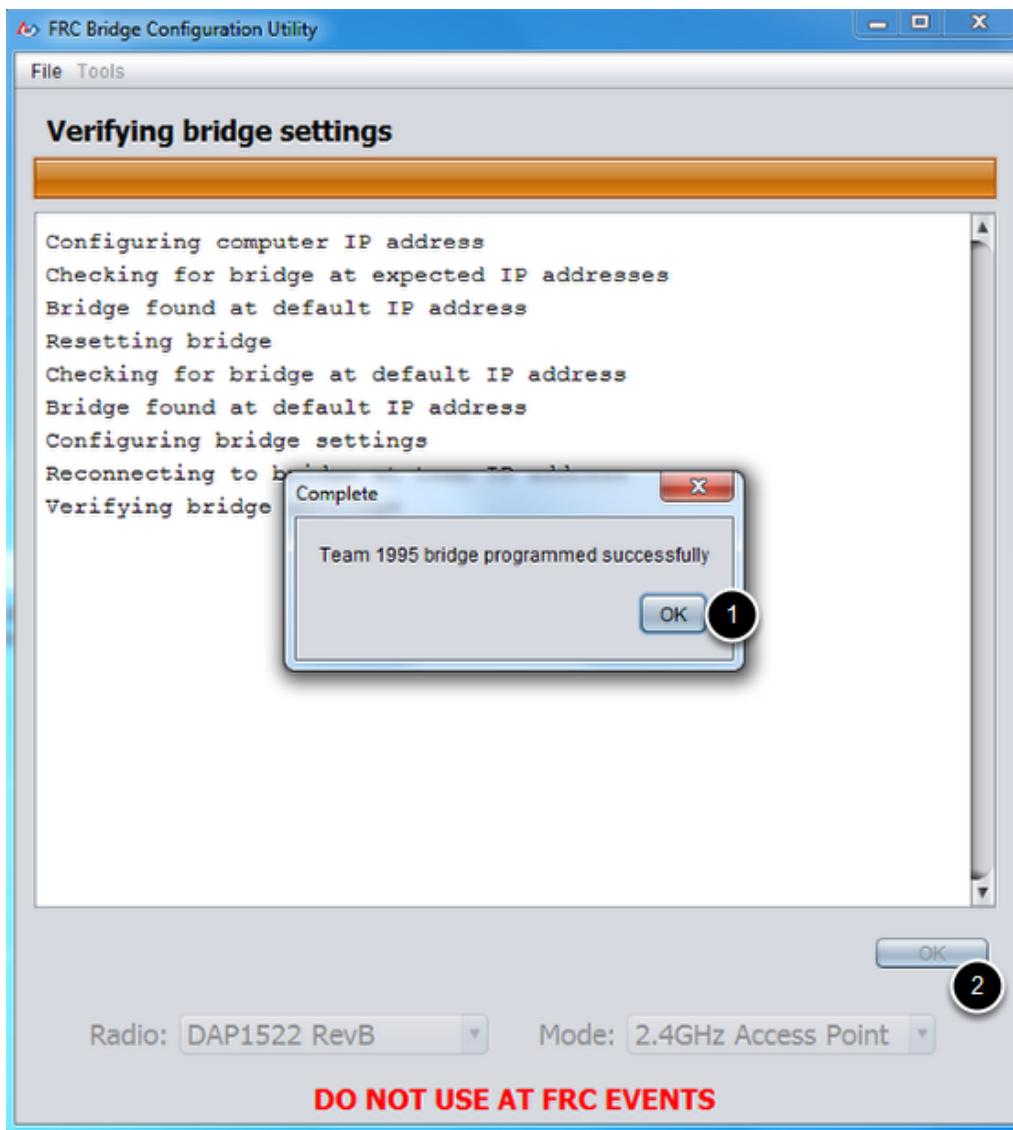
Configuration Progress



Throughout the configuration process, the window will indicate:

1. The step currently being executed
2. The overall progress of the configuration process
3. All steps executed so far

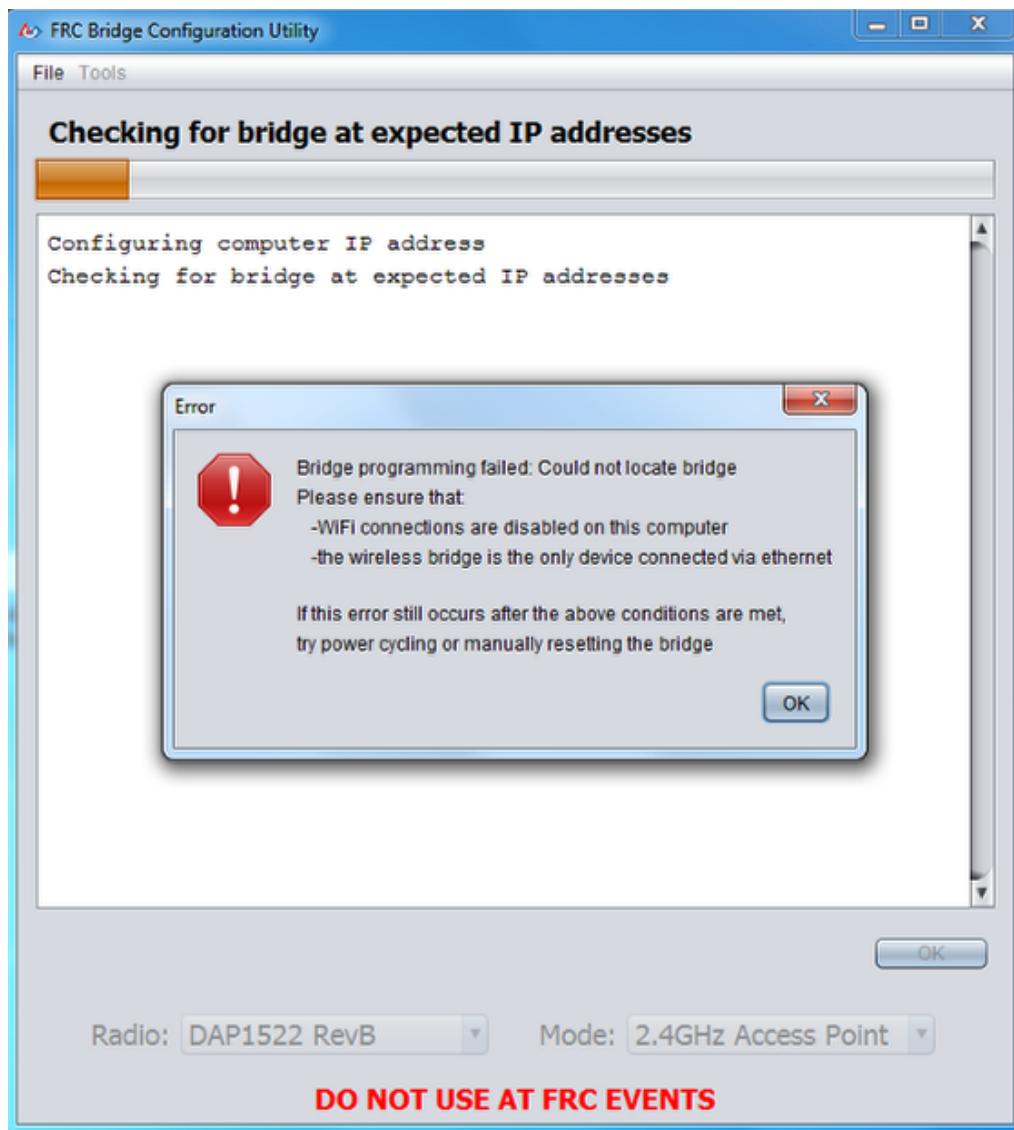
Configuration completed



Once the configuration is complete:

1. Press "OK" on the dialog window
2. Press "OK" on the main window to return to the settings screen

Configuration errors



If an error occurs during the configuration process, follow the instructions in the error message to correct the problem.



FRC

FIRST® Robotics Competition

Running your Benchtop Test Program - Wireless

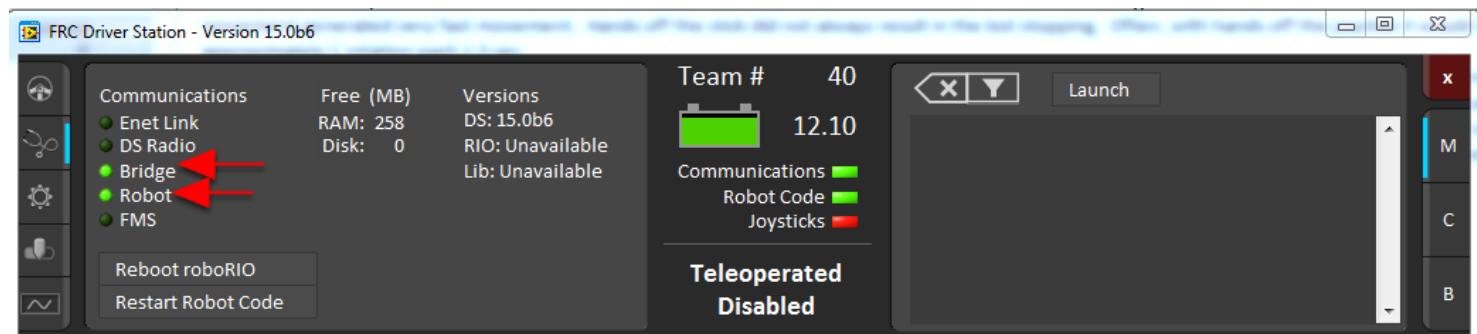
Before attempting wireless operation, tethered operation should have been confirmed as described in the [previous article](#). Running your benchtop testing program while connected to the Driver Station via WiFi will confirm that the access point is properly configured

Configuring the access point

See the article [Programming your radio for home use](#) for details on configuring the DAP1522 for use as an access point.

After configuring the access point, connect the driver station wirelessly to the robot. The SSID will be your team number (as entered in the Bridge Configuration Utility). If you set a key when using the Bridge Configuration Utility you will need to enter it to connect to the network. Make sure the computer network adapter is set to DHCP ("Obtain an IP address automatically").

Confirm Connectivity



Using the Driver Station software

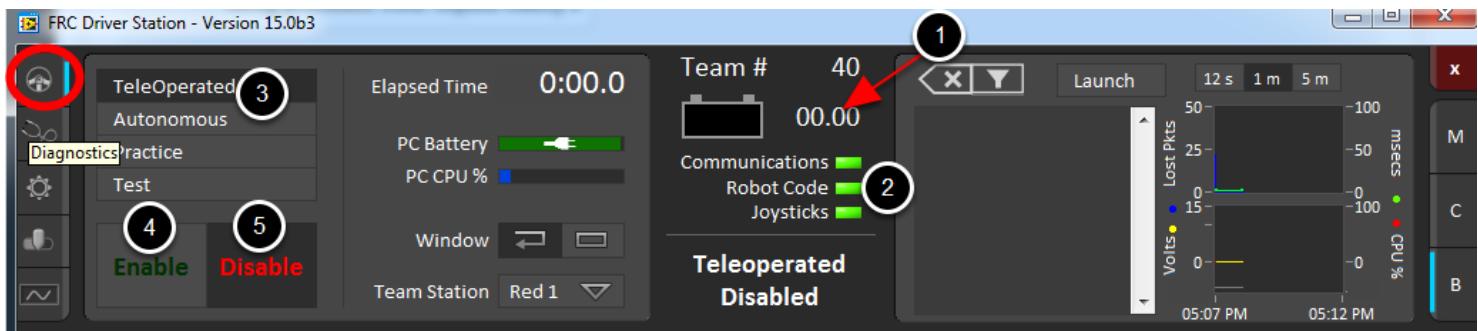
Click Diagnostics and confirm that the Bridge, and Robot LEDs are green.



FRC

FIRST® Robotics Competition

Wireless Operation



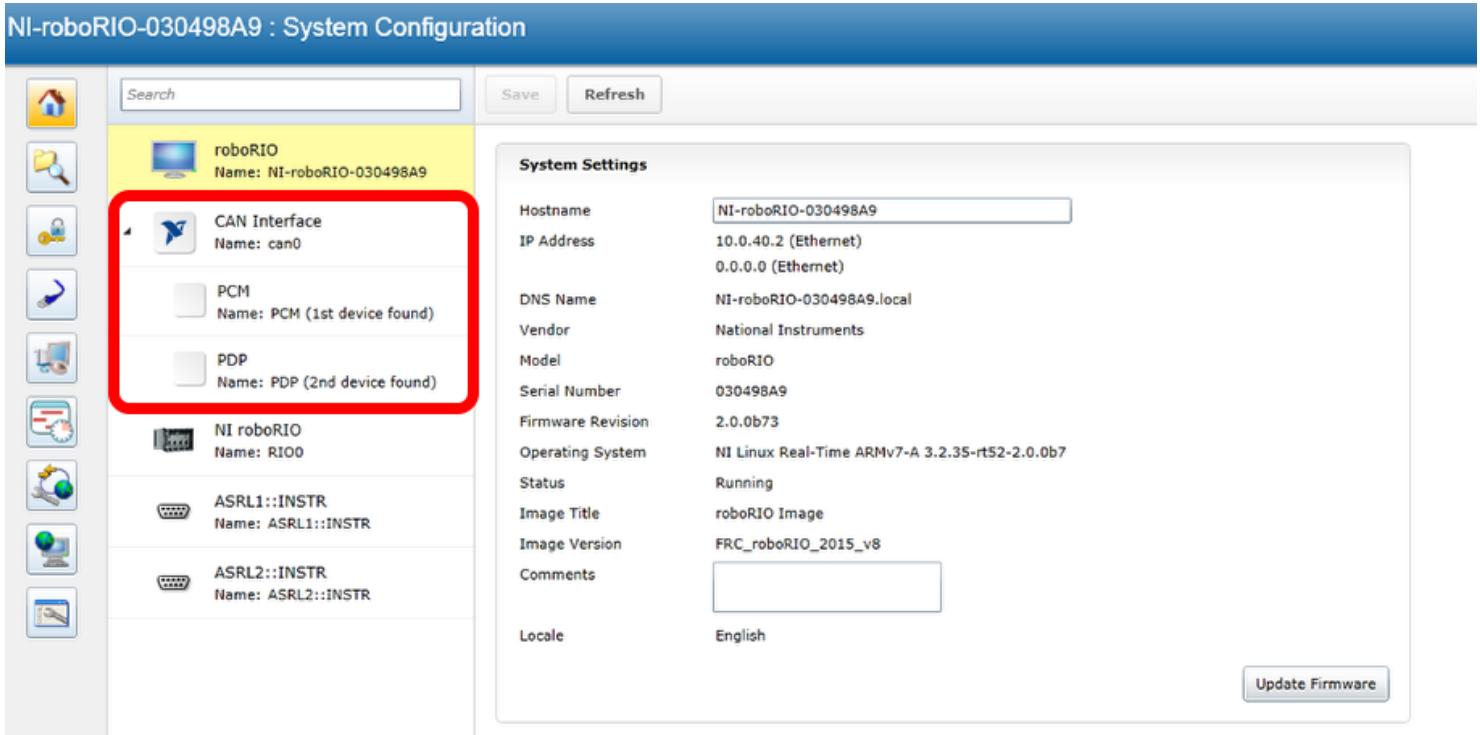
Click the Operation Tab

1. Confirm that battery voltage is displayed
2. Communications, Robot Code, and Joysticks indicators are green.
3. Put the robot in Teleop Mode
4. Click **Enable**.- Move the joysticks and observe how the robot responds.
5. Click **Disable**

Updating and Configuring Pneumatics Control Module and Power Distribution Panel

This document describes the process of updating the firmware on the Cross the Road Electronics CAN devices as of roboRIO Rev C with image v8. Some of these steps will be removed as the software continues to mature.

Accessing CAN Node Settings



The screenshot shows the NI WebDash interface for system configuration. On the left, a sidebar lists various hardware components: CAN Interface (Name: can0), PCM (Name: PCM (1st device found)), PDP (Name: PDP (2nd device found)), NI roboRIO (Name: RIO0), ASRL1::INSTR (Name: ASRL1::INSTR), and ASRL2::INSTR (Name: ASRL2::INSTR). The CAN Interface, PCM, and PDP entries are highlighted with a red box. On the right, the 'System Settings' panel displays the following information:

| | |
|-------------------|---|
| Hostname | NI-roboRIO-030498A9 |
| IP Address | 10.0.40.2 (Ethernet) 0.0.0.0 (Ethernet) |
| DNS Name | NI-roboRIO-030498A9.local |
| Vendor | National Instruments |
| Model | roboRIO |
| Serial Number | 030498A9 |
| Firmware Revision | 2.0.0b73 |
| Operating System | NI Linux Real-Time ARMv7-A 3.2.35-rt52-2.0.0b73 |
| Status | Running |
| Image Title | roboRIO Image |
| Image Version | FRC_roboRIO_2015_v8 |
| Comments | (empty) |
| Locale | English |

Note: The CAN Interface, PCM, and PDP entries in the sidebar are highlighted with a red box.

Open the WebDash by using a browser to navigate to the roboRIO's address (172.22.11.2 for USB, or "roboRIO-####.local where #### is your team number, with no leading zeroes, for either interface). You should see a page that looks like the image above, with the CAN devices listed out below the CAN Interface.

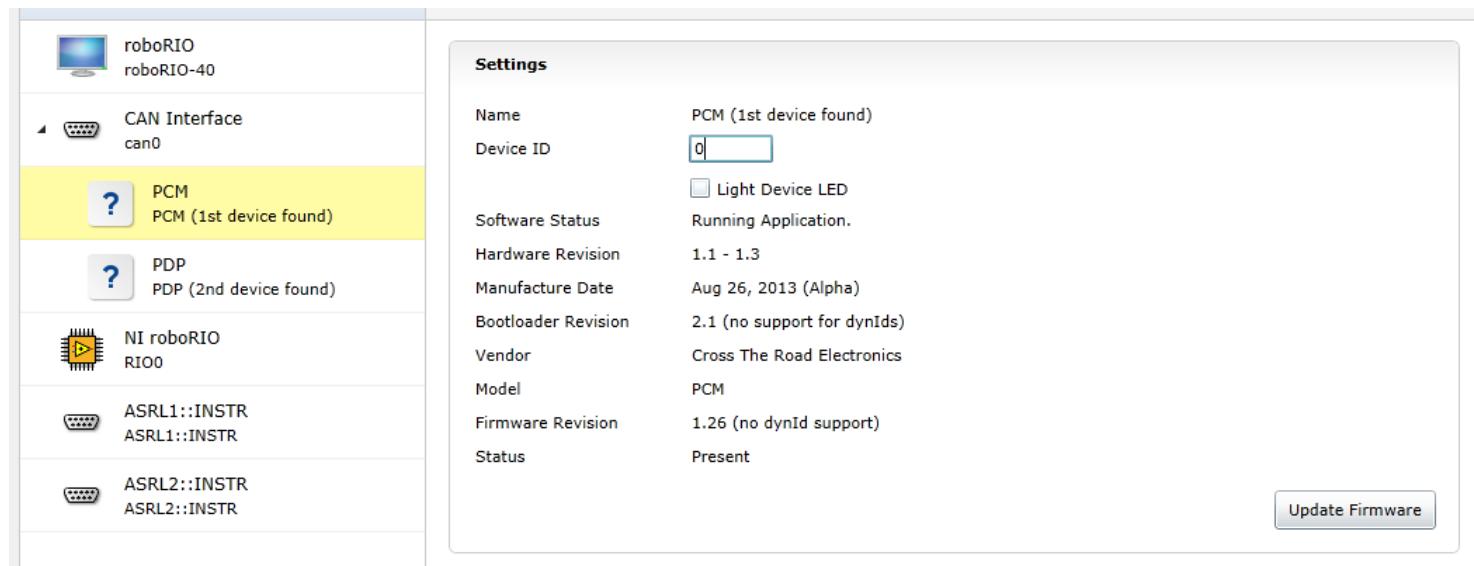
Note: The discovery order (e.g. "1st device found") is needed to separate devices of the same type but has no actual significance. You may see the PDP or a Jaguar or Talon SRX discovered first on your CAN network, even if the PCM is the first node in your CAN chain.

Troubleshooting

If you do not see any nodes below the CAN Interface entry try the following:

- Check the CAN cabling. If the LEDs on the PCM and PDP are red then they are not seeing CAN. Note that just because the LEDs on the devices are green does not mean the CAN cabling to the roboRIO are correct, they will turn green if the two other devices can see each other on the CAN network.
- Try refreshing the page. The device polling is done once every five seconds and the webpage itself doesn't always react to the Refresh button so if in doubt force a refresh by using the browser's refresh button or closing and re-opening the page.
- Make sure the CAN Interface is expanded. Double clicking the CAN Interface entry (or clicking the triangle to the left of the entry if present) will collapse the tree, repeating will expand it.
- Try restarting the browser. Occasionally the Silverlight plugin may crash or lock up resulting in the CAN devices silently not refreshing.

Settings



The screenshot shows the Control System Settings page. On the left, a tree view lists the following nodes:

- roboRIO (roboRIO-40)
- CAN Interface (can0)
 - PCM (PCM (1st device found))
 - PDP (PDP (2nd device found))
- NI roboRIO RIO0
- ASRL1::INSTR ASRL1::INSTR
- ASRL2::INSTR ASRL2::INSTR

The PCM node is highlighted with a yellow background. On the right, a detailed settings panel is displayed for the selected PCM node:

| Settings | |
|---------------------|-----------------------------|
| Name | PCM (1st device found) |
| Device ID | 0 |
| Software Status | Running Application. |
| Hardware Revision | 1.1 - 1.3 |
| Manufacture Date | Aug 26, 2013 (Alpha) |
| Bootloader Revision | 2.1 (no support for dynIds) |
| Vendor | Cross The Road Electronics |
| Model | PCM |
| Firmware Revision | 1.26 (no dynId support) |
| Status | Present |

A "Update Firmware" button is located at the bottom right of the panel.

To access the Settings page of one of the CAN nodes, select the node by clicking on its entry in the list. The settings for that node will then be displayed in the right pane.



FIRST® Robotics Competition

Setting CAN IDs

| | | |
|------------------------|--------------------------------|--|
| Save | Revert | Self-Test |
| Settings | | |
| Name | PCM (1st device found) | |
| Device ID | <input type="text" value="0"/> | <input checked="" type="checkbox"/> Light Device LED |
| Software Status | Running Application. | |
| Hardware Revision | 1.1 - 1.3 | |
| Manufacture Date | Aug 26, 2013 (Alpha) | |
| Bootloader Revision | 2.1 (no support for dynIds) | |
| Vendor | Cross The Road Electronics | |
| Model | PCM | |
| Firmware Revision | 1.26 (no dynId support) | |
| Status | Present | |
| Update Firmware | | |

Each device comes with the CAN ID set to a default value of 0. If using only a single device of that type it is recommended to leave the ID at the default value to allow for the use of default Opens/Constructors. If using multiples of a particular device type (I.E. 2 PCMs or 4 Talon SRXs) you will need to change the node ID of all but one device. To change the node ID:

- Highlight>Select the Device ID and replace it with your desired ID.
- Press "Save". The "Save" button will depress and the "Refresh" button will appear.
- The PDP, PCM and Talon SRX require no additional action to save the new ID. For CAN Jaguars, a notice will appear instructing you to push the user button within 5 seconds. After doing so, click Refresh and verify that the new Device ID has been set.



FIRST® Robotics Competition

ID Ranges

⚠ There was a problem saving the settings for this device.
Device ID must be in the range 0 - 63

Settings

| | |
|---|---------------------------------|
| Name | PCM (1st device found) |
| Device ID | <input type="text" value="94"/> |
| <input type="checkbox"/> Light Device LED | |

The valid ID ranges for each type of device are:

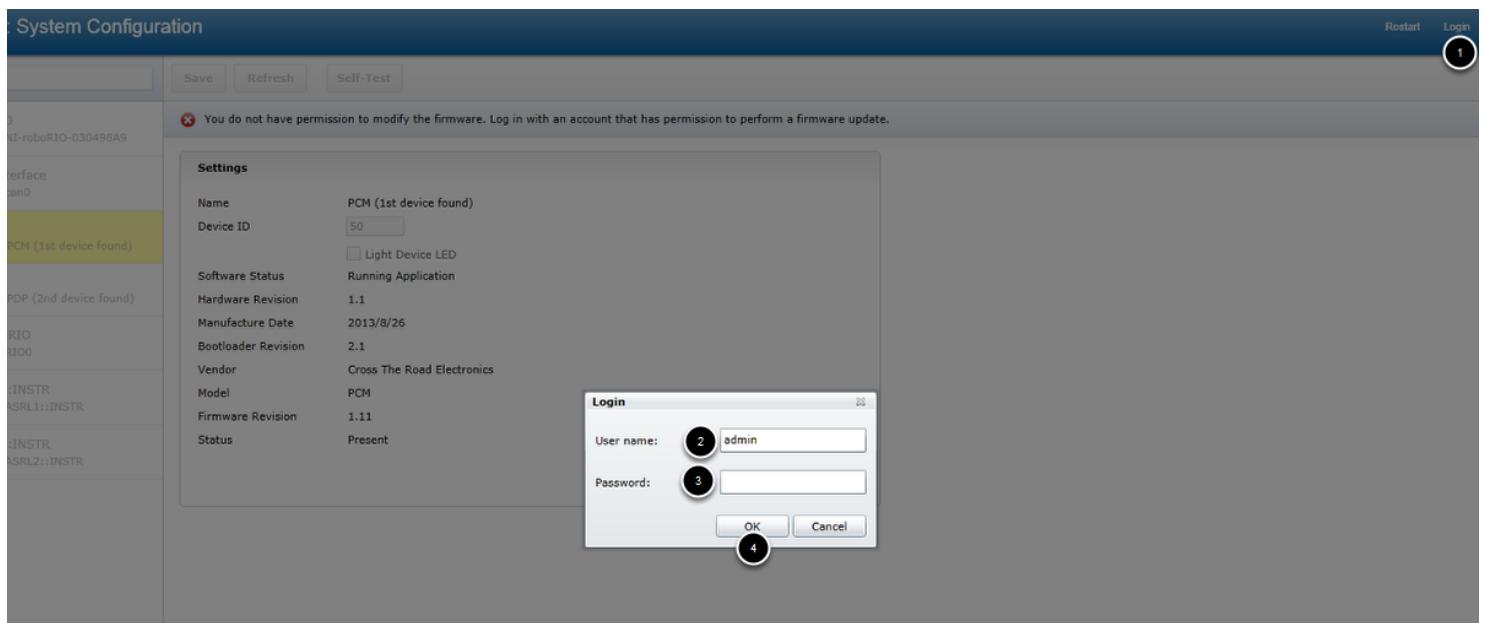
- Pneumatics Control Module (PCM) ID - 0 to 62 (inclusive)
- Power Distribution Panel (PDP) ID - 0 to 62 (inclusive)
- Jaguar ID- 1 to 63 (inclusive)
- Talon SRX ID- 0 to 62 (inclusive)

Since the ID ranges for different products don't overlap there is no issue with two or more CAN nodes of different types having the same Device ID (e.g. a PDP with ID=0, a PCM with ID=0, and a Talon SRX with ID=0 on the same bus). Using multiple devices of the same type, such as multiple PCMs or multiple Jaguars with the same node ID will result in a conflict. The web plugin supports a strategy that will allow for recovery of this condition for all devices other than Jaguars, but the devices are not properly usable from within a robot program while in this state. To recover Jaguars which have been set to the same ID you will have to remove all but one of the devices from the bus, then set the devices to non-conflicting IDs.

If you select an invalid ID you will get an immediate prompt like the one shown above.

Changing the PDP ID while using C++\Java WPILib is not recommended as there is no way to change the desired node ID in the library. PCM node IDs may be set as desired and addressed using the appropriate Open or Constructor of the Solenoid or Double Solenoid class.

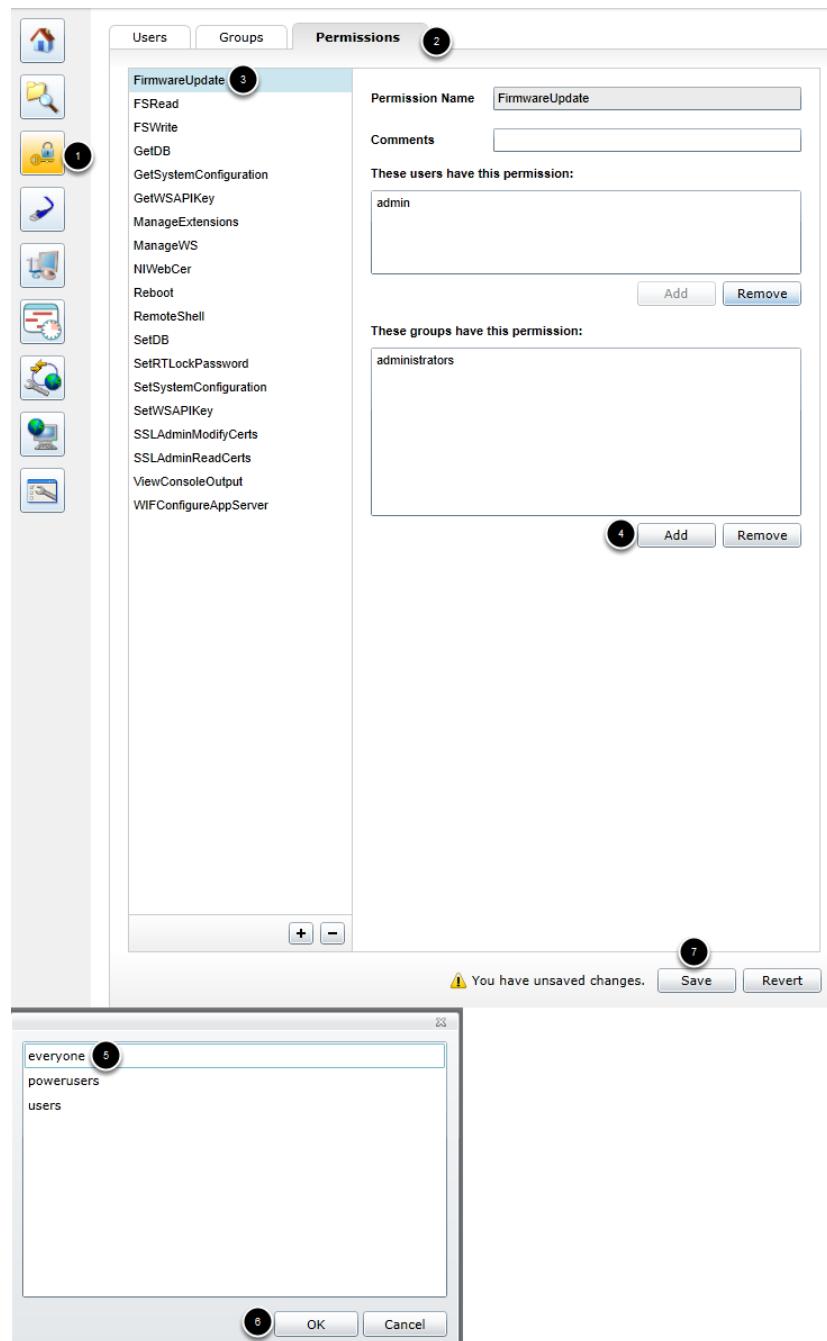
Updating CAN Node Firmware



This page can also be used to update the device firmware. To load new firmware you must be logged in:

1. Click "Login" at the top right of the page.
2. Enter the User Name "admin"
3. Leave the Password field blank.
4. Click Ok.

Updating Permissions



If you would like to skip the Login step in the future you can set up Permissions to allow firmware updates:



1. Click the Lock Icon in the far left pane.
2. Click the Permissions tab.
3. Select Firmware Update from the list.
4. Click Add below the second large box.
5. Select "everyone"
6. Click Ok.
7. Click Save.

Update Firmware

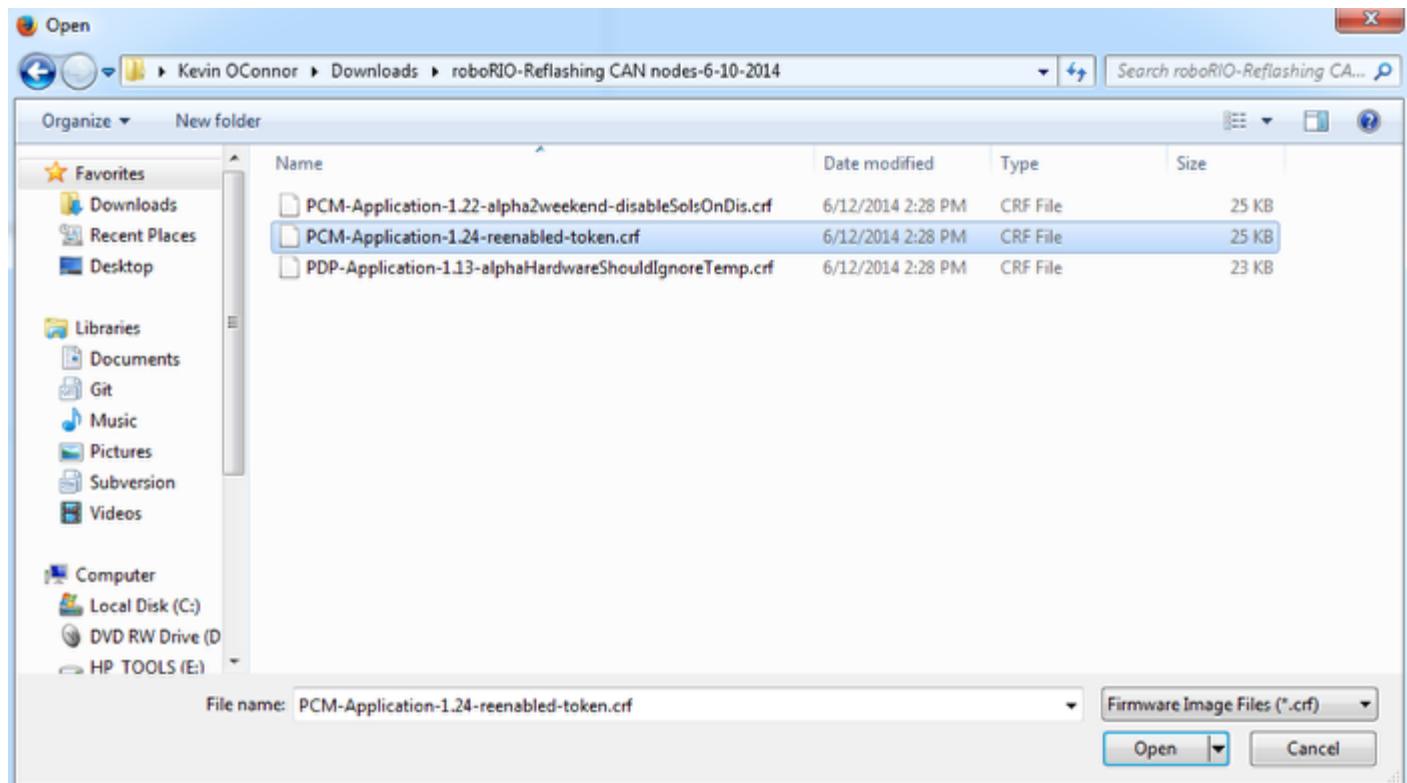
Settings

| | |
|---|--------------------------------|
| Name | PCM (1st device found) |
| Device ID | <input type="text" value="0"/> |
| <input type="checkbox"/> Light Device LED | |
| Software Status | Running Application. |
| Hardware Revision | 1.1 - 1.3 |
| Manufacture Date | Aug 26, 2013 (Alpha) |
| Bootloader Revision | 2.1 (no support for dynIds) |
| Vendor | Cross The Road Electronics |
| Model | PCM |
| Firmware Revision | 1.26 (no dynId support) |
| Status | Present |



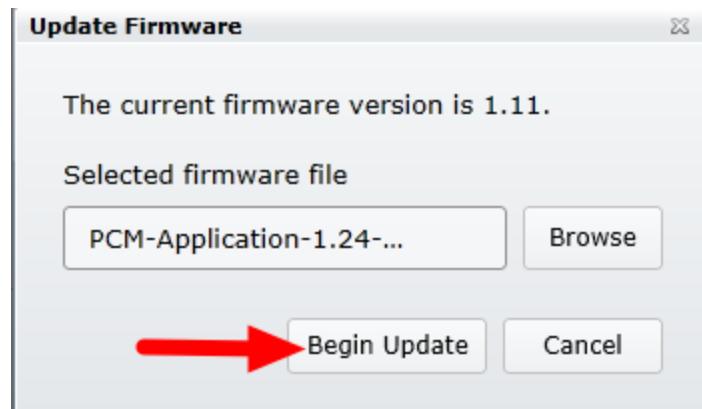
The firmware on a CAN Node is updated from the Setting's page for that node. To update the firmware of a CAN Node, press the Update Firmware button.

Select New Firmware



CTRE Devices use a file format call CRF (Cross The Road Firmware). Using the dialog, browse to the correct location on your computer and select the new firmware file, then click Open. Firmware for CTRE devices can be found in the **C:\Users\Public\Documents\FRC** folder.

Confirmation



On the dialog that appears, click Begin Update.



FRC

FIRST®Robotics Competition

Update Complete

Save **Refresh** **Self-Test**

The firmware update completed successfully.

| Settings | |
|---------------------|---|
| Name | PCM (1st device found) |
| Device ID | 0 |
| | <input type="checkbox"/> Light Device LED |
| Software Status | Running Application |
| Hardware Revision | 1.1 |
| Manufacture Date | 2013/8/26 |
| Bootloader Revision | 2.1 |
| Vendor | Cross The Road Electronics |
| Model | PCM |
| Firmware Revision | 1.24 |
| Status | Present |

If the update completes successfully, you should see a confirmation message near the top of the page and the Firmware Revision should update to match the new file.



FRC

FIRST® Robotics Competition

Troubleshooting

There was a problem updating the firmware for this device.
PCM (1st device found) : CTRE_DI_CouldNotErase

| Settings | |
|---|---|
| Name | PCM (1st device found) |
| Device ID | 0 |
| <input type="checkbox"/> Light Device LED | |
| Software Status | Bootloader, LED is blinking green/orange. |
| Hardware Revision | 1.1 |
| Manufacture Date | 2013/8/26 |
| Bootloader Revision | 2.1 |
| Vendor | Cross The Road Electronics |
| Model | PCM |
| Firmware Revision | 255.255 |
| Status | Present |

Update Firmware

Since ten seconds is plenty of time for power/CAN to be disconnected, an error code will be reported if a reflash is interrupted or fails. Additionally the Software Status will report “Bootloader” and Firmware Revision will be 255.255 (blank). If a CAN Device has no firmware, it’s bootloader will take over and blink green/yellow on the device’s corresponding LED. It will also keep it’s device ID, so the RIO can still be used to set device ID and reflash the application firmware (crf). This means you can reflash again using the same web interface (there is no need for a recovery button).

Self-Test

 The self test completed successfully.

PCM IS NOT ENABLED! If robot is enabled maybe the ID is wrong?
 Close-Looping is ON, but PCM is DISABLED.
 Compressor Is Off
 Pressure is full.

| (Fault) | (Now) | (Sticky) |
|--------------------|-------|----------|
| Compressor Current | 0 | 0 |
| Comp Short Circuit | 0 | 0 |
| Solenoid Fuse | 0 | 0 |
| Solen 1 | 0 | |
| Solen 2 | 0 | |
| Solen 3 | 0 | |
| Solen 4 | 0 | |
| Solen 5 | 0 | |
| Solen 6 | 0 | |
| Solen 7 | 0 | |
| Solen 8 | 0 | |

Solen 1 is OFF
 Solen 2 is OFF
 Solen 3 is OFF
 Solen 4 is OFF
 Solen 5 is OFF
 Solen 6 is OFF
 Solen 7 is OFF
 Solen 8 is OFF

Battery (V): 12.39
 Solenoid (V): 12.23
 Compressor (A): 0.00

Double click "Self-Test" to clear sticky faults (this will disable compressor momentarily).

BuildTime: Jun 3 2014 20:46:03
 Press "Refresh" to close this window.

Pressing Self Test will display data captured from CAN Bus at time of press. This can include fault states, sensor inputs, output states, measured battery voltage,etc...

At the bottom of the section, the build time is displayed for checking what firmware revision is installed. The image above is an example of pressing “SelfTest” with PCM. Be sure to check if PCM is ENABLED or DISABLED. If PCM is DISABLED then either the robot is disabled or team code is talking to the wrong PCM device ID (or not talking to the PCM at all).



FIRST®Robotics Competition

Sticky Faults

The self test completed successfully.

PCM is enabled.
Compressor is close-looped on sensor
Compressor Is Off
Pressure is full.

| (Fault) | (Now) | (Sticky) |
|--------------------|-------|--|
| Compressor Current | 0 | 0 |
| Comp Short Circuit | 0 | 1 Most likely the compressor output was shorted |
| Solenoid Fuse | 0 | 0 |
| Solen 1 | 0 | |
| Solen 2 | 0 | |
| Solen 3 | 0 | |
| Solen 4 | 0 | |
| Solen 5 | 0 | |
| Solen 6 | 0 | |
| Solen 7 | 0 | |
| Solen 8 | 0 | |

Solen 1 is OFF
Solen 2 is OFF
Solen 3 is OFF
Solen 4 is OFF
Solen 5 is OFF
Solen 6 is OFF
Solen 7 is OFF
Solen 8 is OFF

Battery (V): 12.39
Solenoid (V): 12.22
Compressor (A): 0.00

Double click "Self-Test" to clear sticky faults (this will disable compressor momentarily).

BuildTime: Jun 3 2014 20:46:03
Press "Refresh" to close this window.

After enabling the robot and repressing “SelfTest” we see the PCM is enabled but an intermittent short on the compressor output reveals itself in a sticky fault.

Sticky faults persist across power cycles. They also cause orange blinks on the device LED. The PCM will orange blink to signal a sticky fault only when the robot is disabled. The PDP will orange blink



FRC

FIRST®Robotics Competition

anytime it sees a sticky fault (since PDPs are not output devices they don't care if robot is enabled or not).

Clearing Sticky Faults

The self test completed successfully.

PCM IS NOT ENABLED! If robot is enabled maybe the ID is wrong?
Close-Looping is ON, but PCM is DISABLED.
Compressor Is Off
Pressure is full.

| (Fault) | (Now) | (Sticky) |
|--------------------|-------|----------|
| Compressor Current | 0 | 0 |
| Comp Short Circuit | 0 | 0 |
| Solenoid Fuse | 0 | 0 |
| Solen 1 | 0 | |
| Solen 2 | 0 | |
| Solen 3 | 0 | |
| Solen 4 | 0 | |
| Solen 5 | 0 | |
| Solen 6 | 0 | |
| Solen 7 | 0 | |
| Solen 8 | 0 | |

Solen 1 is OFF
Solen 2 is OFF
Solen 3 is OFF
Solen 4 is OFF
Solen 5 is OFF
Solen 6 is OFF
Solen 7 is OFF
Solen 8 is OFF

Battery (V): 12.39
Solenoid (V): 12.22
Compressor (A): 0.00

Faults cleared!

Double click "Self-Test" to clear sticky faults (this will disable compressor)

To clear Sticky Faults, double click Self Test in a rapid fashion. If the faults don't clear you may need to triple click, or rapidly click until you see the "Faults cleared!" text appear.



FIRST®Robotics Competition

PDP Self-Test

The self test completed successfully.

- Channel 1 (A): < 1.73
- Channel 2 (A): < 1.73
- Channel 3 (A): < 1.73
- Channel 4 (A): < 1.73
- Channel 5 (A): < 1.73
- Channel 6 (A): < 1.73
- Channel 7 (A): < 1.73
- Channel 8 (A): < 1.73
- Channel 9 (A): < 1.73
- Channel 10 (A): < 1.73
- Channel 11 (A): < 1.73
- Channel 12 (A): < 1.73
- Channel 13 (A): < 1.73
- Channel 14 (A): < 1.73
- Channel 15 (A): < 1.73
- Channel 16 (A): < 1.73

Battery(V) : 13.52
Temp(C) : 98.09
FaultHardwareStatus : 0
Current FAULTS : 00000000000000000000
FaultTemp : 0
FaultVbat : 0
Current FAULTS : 0000000000000000 (sticky)
StickyFaultTemp : 0
StickyFaultVbat : 0

Double click "Self-Test" to clear sticky faults.

BuildTime: Jun 3 2014 20:46:03
Press "Refresh" to close this window.

Here's an example for PDP. Notice here this PDP sees a temperature of 98.09C (don't worry this board does not have the temp sensor populated). With this firmware, no temp fault is recorded because this hardware revision does not have the temp sensor populated.