



FIRST Robotics Competition Software Setup Guide

Programming Subteam | Windows

Written & Provided by FRC 1923: The MidKnight Inventors
West Windsor-Plainsboro Regional School District
www.FIRSTrobotics1923.org | [@FRC1923](https://twitter.com/FRC1923) | facebook.com/FRC1923

Table Of Contents

- # Introduction
- # Java
- # Eclipse
- # WPILib
- # CTRE Toolsuite
- # Git
- # GRIP
- # FRC Drivers Station
- # Shuffleboard

INTRODUCTION

This guide will give you the tools you need to set up all necessary software for FRC Programming on a FRC team. The following sets of instructions will make sure you have the tools required to contribute to the robot's code.

YOU WILL NEED:

1. An internet connection for software downloads.
2. Recommended:
 - Logging in to your system as an administrator, this will save you time as you will not be required to enter a password for every install.

THINGS TO REMEMBER:

- If you need help, you can always reach out to your team leadership on Discord or via email. We are here to help you! This document just serves to cover frequently asked questions and our normal instructions.
- Wait for a step to finish before moving on, as programs may perform unexpected actions.
- The **white on black text** represents a file path.
- The **grey highlighted text** represents shell commands; run them in cmd.
- This guide focuses on windows.
 - However, we do have an Ubuntu version: [insert view-only link here]
 - We have plans to release a macOS-based document in the future. Stay tuned on our website, www.FIRSTrobotics1923.org!

Installation Guide:

Java (JRE and JDK)



INTRODUCTION

Java is one programming language option for FRC robots. Note that you can run either Java or C++ on the robot; our team uses Java. Because it is the language for the AP Computer Science exam, many schools offer a Java course. Java's syntax and structure is also more concise and easier to understand than C++, making it easier to learn.

INSTALLATION

Java Runtime Environment (JRE)

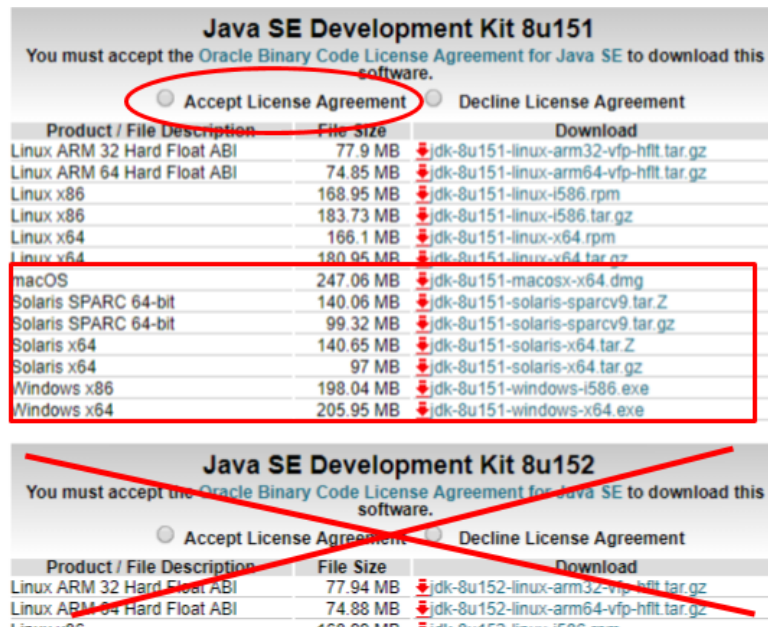
This is the program that allows Java programs to be executed. This is a fairly easy installation.

1. Visit <https://java.com/en/download/> and click the red "Free Java Download" button. Save the file.
2. Run the file you just downloaded
3. Click the install button, agree to any licence terms and follow any on screen instructions.

Java Development Kit (JDK)

Having the ability to run Java programs does not empower you to create them. That requires the Java Development Kit (JDK). This will take your code and compile it into a format your computer can understand and execute. This is an easy download.

1. Visit <http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html>
2. You should see a number of grey sections. Focus on the first one.
3. Agree to the license agreement by selecting the grey radio button.
4. Click the link next to your operating system to start the download.



5. Save the file & run it.
6. Click next and follow any on screen instructions to fully install JDK.

Validating the install:

1. On windows go to **C:\Program Files\Java**
2. If you can see folders starting with jdk and jre then the install was successful.

Notes

For information on how the compile and execute process works in Java check out the following:

- How compilers work: <https://youtu.be/QXjU9qTsYCc>
- Java Program Execution: <https://youtu.be/G1ubVOl9lBw?t=1m2s>
- Add Java to windows PATH: <https://www.javatpoint.com/how-to-set-path-in-java>

You should now have java installed. Now you can begin setting up your development environment.

Installation Guide:

Eclipse



INTRODUCTION

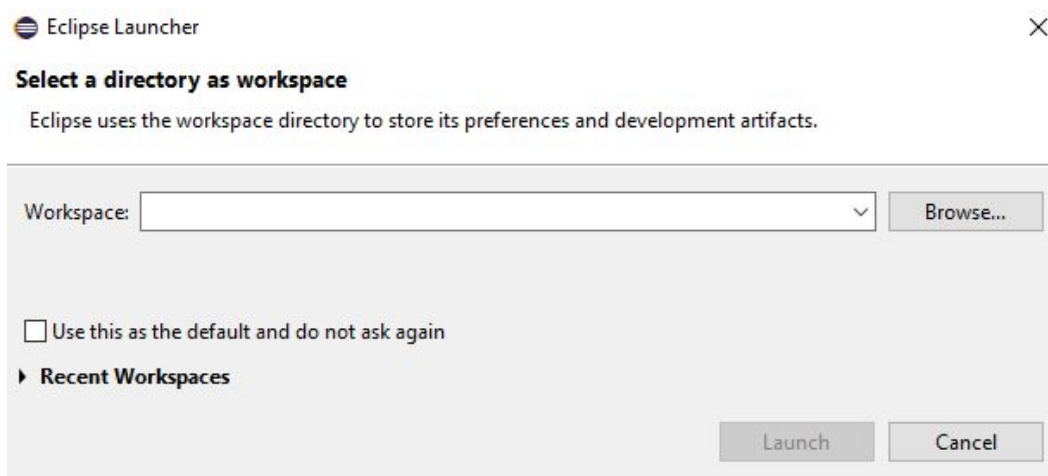
Eclipse is an Integrated Development Environment (IDE). Eclipse assists with development by providing features such as error reporting, suggestions, warnings and code autocompletion.

INSTALLATION

1. Visit <https://www.eclipse.org/downloads/> and download the latest version
2. Run the installer.
3. Select “Eclipse IDE for Java Developers”
4. Click install
5. A popup with the licence agreement should appear. Click “Accept Now”

SETUP

1. Open Eclipse:
 - The installer installs a shortcut on the desktop in the default settings
2. When eclipse opens the following screen appears:



3. You need to select a “workspace”. Click the “Browse” button and select a folder.
 - A workspace is a folder on your computer where all projects are stored.
 - If you are creating a new workspace, select an empty folder.
 - To use an existing workspace, select that folder.

Notes

Once eclipse is setup you can start writing in java.

The following resources will help you learn the Java language:

- Java Beginners: <https://www.youtube.com/playlist?list=PLFE2CE09D83EE3E28>
- Object Oriented Java: https://www.youtube.com/playlist?list=PLonJJ3BVjZW6_q8gh7XoLUIhRlyBcYJLP
- Java AP review: <https://www.youtube.com/watch?v=3Ky9MZyL8r4>
- Online Guide: <https://www.tutorialspoint.com/java/>
- Online Practice: <http://codingbat.com/java>

The following resources will help you write useful, concise and effective code that is easily understood:

- Java Documentation: <https://docs.oracle.com/javase/8/docs/api/>
- Reading javadocs: https://www.tutorialspoint.com/java/java_documentation.htm
- UML diagrams: <https://www.ibm.com/developerworks/rational/library/769.html>
- Standardized java code style: <https://google.github.io/styleguide/javaguide.html>

You should have eclipse up and running. Now you can write basic java code!

Try printing “Hello, World!” to the console to make sure that everything works!

Installation Guide:

WPILIB



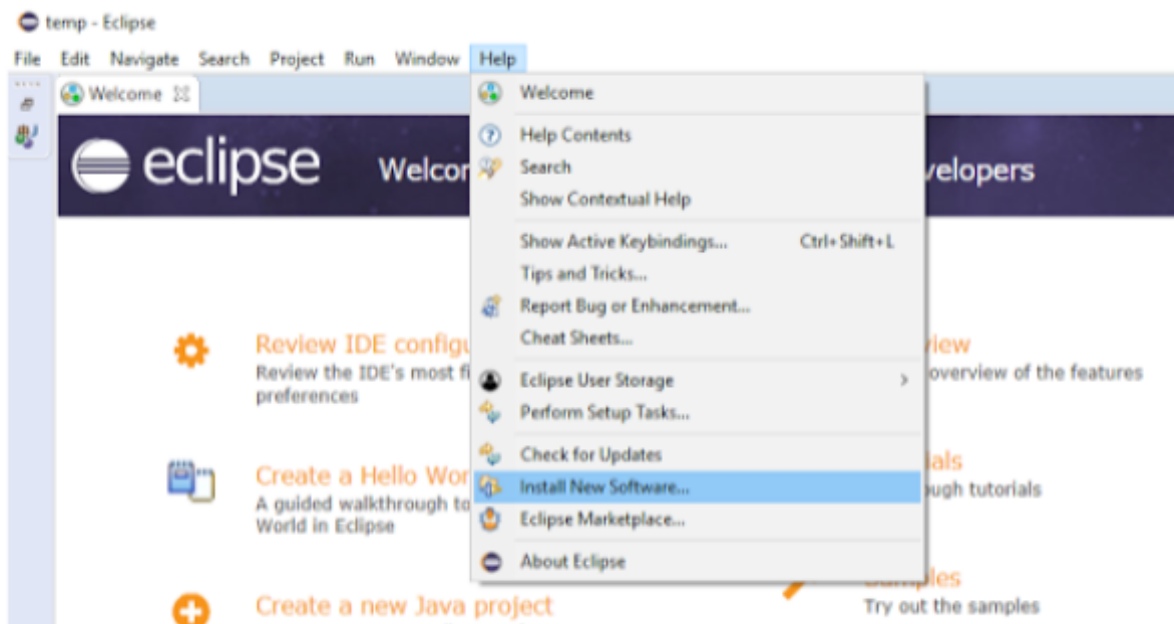
INTRODUCTION

WPILIB is the tool that enables communication with the robot hardware. This tool allows communication to the drivers station and controllers. WPILIB is a plugin for eclipse. Plugins are small add ons that enable new features. WPILIB provides code, as well as debugging tools and a way to easily deploy your code to the robot.

INSTALLATION

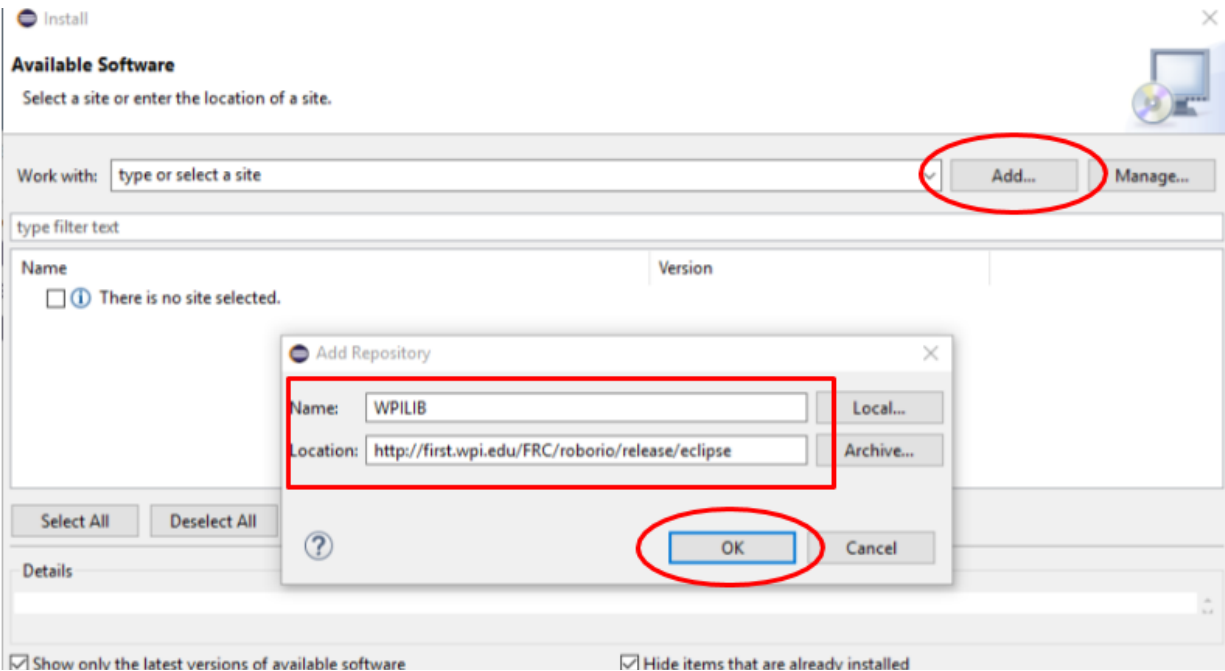
Installation is the same for all operating systems, all you need is eclipse and an internet connection.

1. Open Eclipse.
2. Go to **Help -> Install New Software**

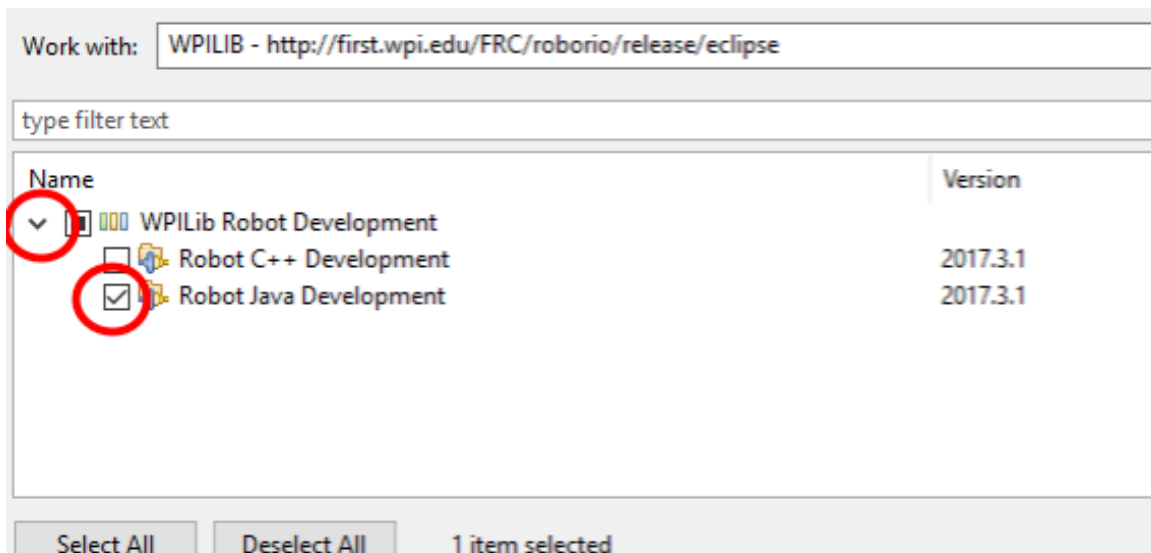


3. Click the "Add" button. A popup should appear

4. In the popup:
 - a. Type "WPILIB" in the "Name" textbox
 - b. Type <http://first.wpi.edu/FRC/roborio/release/eclipse>
 - c. Click "Ok"



5. The center area of the window should now have "WPILib Robot Development"
 - a. Click the arrow on the left to expand the selection
 - b. Select "Robot Java Development"



6. Click the "Next" button on the bottom of the window.
7. A new window will open. Click the "Next" button on the bottom.

8. Accept the license agreement and click “Finish”
9. You might see a security warning. If you see this warning click “Install Anyway”.
10. Leave eclipse alone while it installs WPILib in the background, this may take a while depending on your internet connection.
11. Click the “Restart Now” button when prompted.

Validating the install:

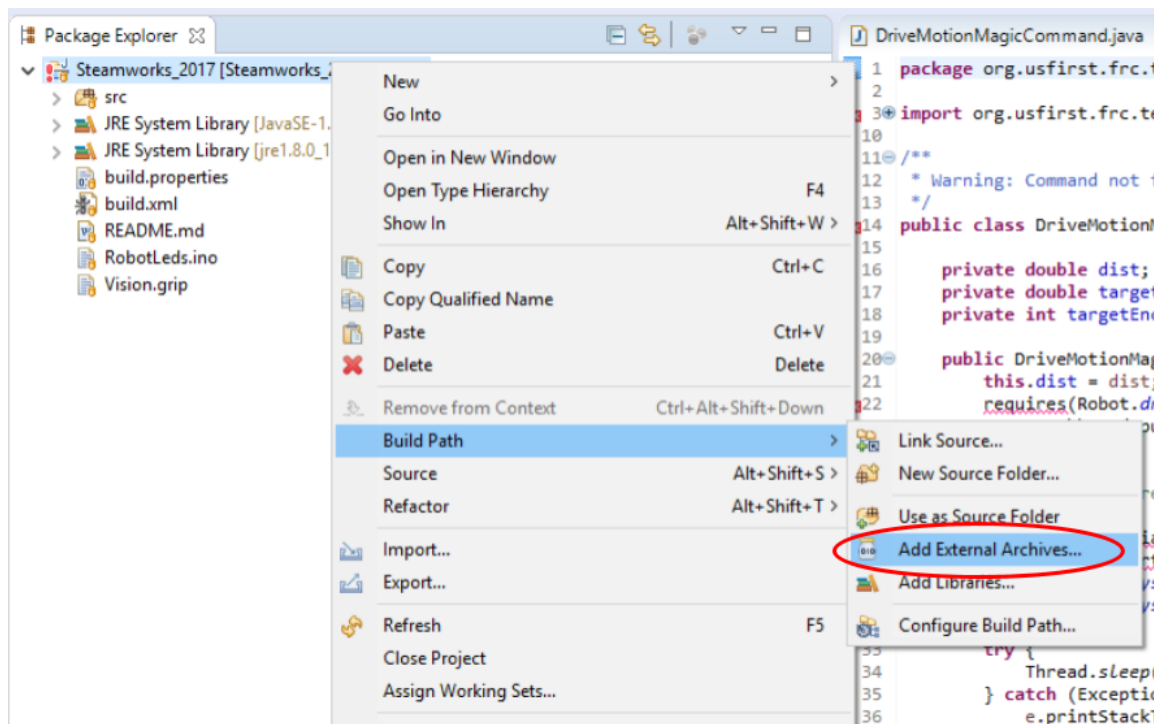
1. If you see “WPILib” on the menu bar (the one with “File”, “Edit”, etc) then you have correctly installed WPILib.

SETUP

Adding WPILib to a robot project

Even though you have the plugin installed, you may still encounter errors in your project. If you know your code should work, then the primary issue is probably that your project does not reference the correct jar files. If you have no errors, then you can skip this section.

1. Right click your robot project, go to **Build Path -> Add External Archives**



2. Navigate to **C:\Users\Your_User_name\wpilib\java\current\lib**
3. Highlight all the jar files, then click “Open”

Notes

For information on using WPILib check out the following resources:

- WPILib Documentation: <https://wpilib.screenstepslive.com/s/4485>
- WPILIB API: <http://first.wpi.edu/FRC/roborio/release/docs/java/>
- Working project, 1923 Steamworks:
https://github.com/Team1923/Steamworks_2017

You should have WPILib up and running. Now you can write and test robot code!

Try writing a basic program, like moving the robot forward, to make sure everything's running. (You may see errors if you use anything related to Talons but haven't installed CTRE Toolsuite (which is next on this list to be downloaded) or anything that is on this list that you haven't downloaded yet)

Installation Guide:

CTRE Toolsuite



INTRODUCTION

In addition to WPILib, you'll need to install the CTRE Toolsuite. As of 2016, WPILib no longer provides direct CAN Talon SRX support. This means that CTRE provides the interface for the talons as a 3rd party integration. We will be downloading the CTRE installer which places their libraries into the correct location on your system. WPILib tools will automatically detect the libraries and allow them to be used in FRC programs.

INSTALLATION

Please note that this installer is only for Windows.

1. Download the CTRE Toolsuite installer here:
<http://www.ctr-electronics.com/downloads/installers/CTRE%20Toolsuite%20v4.4.1.14.zip> (The download is about 80 MB)
2. Unzip the file and run the installer **as administrator**
3. Do not tick/untick any boxes in the installer. Just keep pressing "Next" or "I Agree"
4. Restart Eclipse (file -> Restart)

SETUP

1. Once installed, find where the CTRE jar is located in your filesystem, an example path is:
C:/
2. Open up eclipse, and right click on the project that uses Talons and add the CTRE.jar jar to the build path

Installation Guide:

Git



INTRODUCTION

Git is a version control system. It tracks changes and allows collaboration between large groups of people. Think Google Drive, but for code.

You might be confused between git and github. Git is a technology used for code collaboration. GitHub is a company that provides hosting services for git repositories. You can learn more about the difference here:

<https://www.codefellows.org/blog/git-and-github-what-s-the-difference/>

Before you start this installation we recommend that you create a GitHub account here:

<https://github.com/join>

For this guide we will install GitHub Desktop: a GUI git client that makes it easy to use git, so we recommend it for beginners. If you are an advanced user, you can install the command line only version here: <https://git-scm.com/downloads>. Note that eclipse contains a git client as well.

INSTALLATION

1. Visit <https://desktop.github.com/> and click "Download".
2. Run the file you just downloaded.
3. Let the installer run.
 - There should be nothing to do here, except to agree to a licence agreement if one appears. GitHub installation is very straightforward, and is already configured for your system.
4. Sign-in to your github account

Notes

- Some teams have their code on a private repository, to access the code you will need to contact your programming leadership. Make sure you include your GitHub username and email address in your request.
- For information on using Git and GitHub check out the following resources:
 - What is GitHub: <https://youtu.be/w3jLJU7DT5E>
 - Using GitHub Desktop: <https://help.github.com/desktop/guides/contributing-to-projects/>
 - Using git (basic): <https://www.git-tower.com/learn/git/ebook/en/desktop-gui/basics/what-is-version-control#start>
 - Command Line Tutorial: https://youtu.be/SWYqp7iY_Tc
 - Git documentation: <https://git-scm.com/doc>
 - Using git (advanced): <https://www.git-tower.com/learn/git/ebook/en/command-line/basics/what-is-version-control#start>

You should have Git and GitHub setup and running. Now you can send off your contributions to your team!

Try creating a simple repository and tracking changes to it via git. Then try contributing to someone else's repository!

Once you feel comfortable with the GUI, move on to the command line!

Installation Guide:

GRIP



INTRODUCTION

FIRST designed the field with elements that encourage teams to implement vision processing in their robot. GRIP is a program that enables teams to effectively use vision processing in their code.

INSTALLATION

1. Visit <https://github.com/WPIRoboticsProjects/GRIP/releases> and download the appropriate file for your system.
2. Run the file
3. Click Install
4. Let the installer run.
 - a. There should be nothing to do here, except to agree to a licence agreement if one appears. This is a straightforward install.

Notes

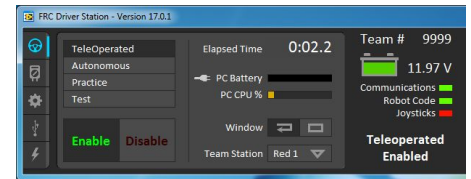
GRIP obviously requires a webcam, unless you are connecting to a live feed from the robot.

For information on using GRIP we recommend using the documentation and tutorials here: <https://github.com/WPIRoboticsProjects/GRIP/wiki>

You should have GRIP running setup. Now you can contribute to the forefront of computer vision programming! As a practice try isolating the image of a small brightly colored object.

Installation Guide:

FRC Drivers Station

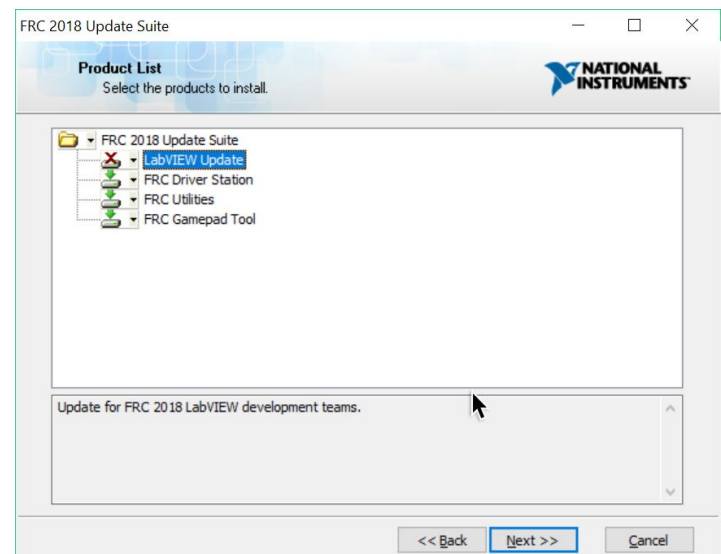


INTRODUCTION

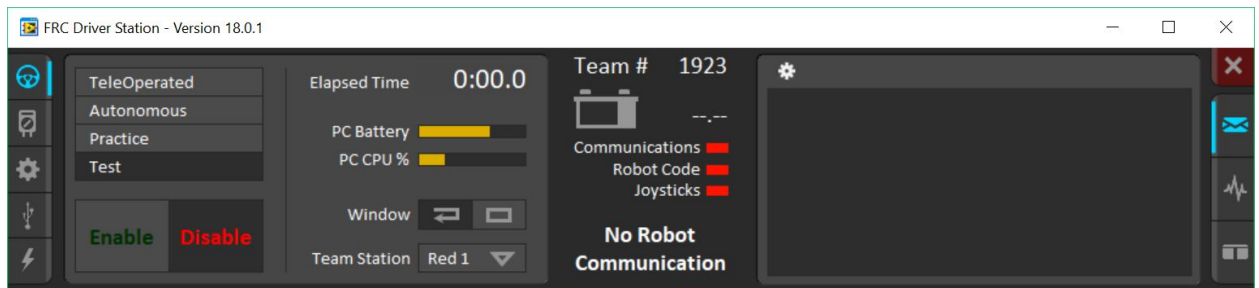
We download the official (unofficial Drivers Stations are not allowed at competition for safety reasons) FRC Drivers Station from The FRC Update Suite which includes the Drivers Station in a nice and friendly GUI installer. Note that this may require a lot of space especially if you don't currently have the .NET Framework downloaded. Keep in mind that the FRC Drivers Station is Windows only!


INSTALLATION

1. Visit:
http://download.ni.com/support/softlib/first/frc/FileAttachments/FRCUpdateSuite_2018.1.0.zip and download the zip to your Downloads folder.
2. Extract the folder by right-clicking it and selecting 'Extract All...' then click 'Extract' to confirm the extraction.
3. Once the files are done extracting (this may take while since there are 1000+ files that are compressed and need to be inflated),
4. Run the file: 'setup.exe'
5. Click 'Next > >'
6. Change LabVIEW to 'Do not install'
7. Click 'Next > >'
8. Click 'Next > >' again
9. You should see a screen that says: 'There are no notifications for your products.' If so, then click 'Next > >' again.
10. Fill out the corresponding fields then click 'Next > >'
11. Accept the license agreements from NI and FIRST
12. Accept the license agreements from Microsoft Silverlight



13. Check 'Always trust software from National Instruments Corporation.' then click 'Next > >'
14. Check 'Disable Windows fast startup to prevent problems with installing or removing hardware.' then click 'Next > >'
15. Click 'Next > >' to the Windows Firewall warning, if you see it
16. Allow your computer to be restarted when prompted to do so.
17. When your computer restarts, you should see desktop icons for 'FRC Driver Station' and the 'roboRIO Imaging Tool'
18. Try double-clicking the 'FRC Driver Station'
19. Allow 'FRC Driver Station' the permissions to make changes to your device



20. You should now see above image. Now click on Setup (the gear image): 
21. Set the team number to '1923' and dashboard type to Shuffleboard.
This will open up shuffleboard
22. Once shuffleboard is opened you will see an option to update it towards the bottom of the screen. Once shuffleboard is updated, you should be good to go!

Notes

Before installing FRC Driver Station, make sure that any prior existing versions are removed per:

https://wpilib.screenstepslive.com/s/currentCS/m/getting_started/l/599670-installing-the-frc-update-suite-all-languages#uninstall_old_versions_recommended

For information on using shuffleboard we recommend using the documentation and tutorials here: <https://github.com/wpilibsuite/shuffleboard/wiki>



FIRST Team 1923: The MidKnight Inventors

West Windsor-Plainsboro Regional School District

www.FIRSTrobotics1923.org | twitter @FRC1923 | facebook.com/FRC1923