

FRC Kitbot Programming prekickoff - 2026

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Phoenix
10 JANUARY 2026

Presentation Overview

- This is based on 2025 Kitbot code and 2025 WPILIB
- Expect 2026 Kitbot code and 2026 WPILIB posted by FRC soon
- We'll go over:
 - Reference Sources
 - Setting up coding environment
 - Steps to compile
 - Steps to deploy
 - Some test/troubleshoot info

Important Resources

REFERENCE DOCS:

Search "**FRC Control System**" or visit

<https://docs.wpilib.org/en/stable/docs/zero-to-robot/introduction.html>

Notice left column there has so much info..

But go through steps 2 thru 4 on that page as they also are very helpful.

Kitbot programming guide PDF along with example code in zip file:

<https://www.firstinspires.org/resources/library/frc/kitbot>

We'll refer to that PDF as the Kitbot Java PDF. There is also a Kitbot PDF related to building the actual robot hardware found on the Kitbot order page.

Development Environment

- Java is most popular Coding Language in FRC
 - Popular = examples are easier to find
 - Easier to get help with JAVA from other teams or FSA
 - some teams use Python or C++ or Labview instead of Java
- VScode is the usual editor
 - also known as an IDE (Integrated Development Environment)
- Gradle is behind the scene to do the build and deployment
- Git is used for revision control and coding sharing

Set up environment – follow suggestions

The screenshot displays the FRC Game Manual website. The sidebar on the left contains the following navigation links:

- Step 2: Installing Software
 - Offline Installation Preparation
 - Installing LabVIEW for FRC (LabVIEW only)
 - Installing the FRC Game Tools
 - WPILib Installation Guide
 - Python Installation Guide
 - Next Steps
- Step 3: Preparing Your Robot
- Step 4: Programming your Robot
- CONTROL SYSTEM OVERVIEWS
 - Hardware Component Overview
 - Software Component Overview
- PROGRAMMING BASICS
 - What is WPILib?
- 2026 Overview
- VS Code Overview
- Dashboards
- Telemetry
- FRC LabVIEW Programming
- FRC Python Programming
- Hardware APIs
- CAN Devices
- Basic Programming
 - Support Resources
 - FRC Glossary
- API DOCS
 - WPILib Java API Docs

The main content area is titled "Step 2: Installing Software". It features a warning box stating: "The documentation you are currently viewing is for upcoming changes to WPILib. Please see the [stable](#) version for the current release of WPILib." Below the warning, a list of links is provided:

- Offline Installation Preparation
- Installing LabVIEW for FRC (LabVIEW only)
- Installing the FRC Game Tools
- WPILib Installation Guide
- Python Installation Guide
- Next Steps

At the bottom right of the page, there is a version selector showing "en" and "latest". A blue arrow points to the "latest" version selector.

Search FRC Control System
or visit

<https://docs.wpilib.org/en/latest/docs/zero-to-robot/step-2/index.html>

Make sure says Latest
Here !

Install tips for Programming Environment

- Window Laptop for now (you will need drivestation, etc)
- First Install the FRC Game Tools
 - Brings along drivestation and Roborio image tool
- Second Install WPILib
 - Brings along VS Code
- Install Rev Client if using Sparks (not needed until time to deploy or setup CAN IDs)
- Install CTR Phoenix tool if using Krakens or other CTR devices
- Install Git for revision control

Install tips continued

- Decide where to keep your code on your computer
BUT DO NOT store code on Onedrive, it will not compile correctly
And will bite you at competition for sure
- example:
C:\FRC might be good folder to create and put your projects in
- Once you've downloaded one time, you will understand how to save it all off to Flash drive for multiple computer's use
- Linux PC can be used for writing code, just Drivestation won't run there this year (maybe next year?)

Install Rev Hardware client

Follow instructions and allow to update:

<https://docs.revrobotics.com/rev-hardware-client/gs/install>

This allows Spark firmware and more to get updated, and also to assign CAN IDs.

If using CTR hardware instead of REVrobotics, you would use CTR Phoenix Tuner, similar procedure



Installation



Those using REV ION products on REVLlib 2026 or newer must use [REV Hardware Client 2 ↗](#).

Before starting download the latest version of the REV Hardware Client.

[REV Hardware Client - Version 1.7.5 ↗](#)

System Requirements

- Operating System: Windows 10 (64-bit) or newer
- Processor: 64-bit



As of April 12, 2024 Windows 10 or later is required for the latest version of the REV Hardware Client. [Please use 1.6.4 if you are on an older version of Windows. ↗](#)

Installation Instructions

- Download the REV Hardware Client Installer
- Run the Installer
- Run the REV Hardware Client from the Windows Start Menu or a desktop shortcut

After setting up Development Environment, you then “Image the RoboRio”

Visit <https://docs.wpilib.org/en/stable/docs/zero-to-robot/step-3/index.html>

Walks you through Imaging your RoboRio and setting up your radio.

Programmers need to know how to do this.

Roborio Imaging Tool provides a way to update the Roborio firmware if needed,



But almost always you will need to update the Roborio Image from year to year, and **at competition it will slow you down** if you did not do this as it is required to be up to date, as is all firmwares on all robot devices capable of firmware updates.

Kitbot Programming starting point

- visit <https://www.firstinspires.org/resources/library/frc/kitbot>
- download the zip file of code for that bot (might also be on github)
- open up file explorer , find that C:\FRC folder or make one
- and again right click and create folder for Kitbot
- Drag in the content of the Zip file
- Launch VS

Refresh > This PC > Windows-SSD (C:) > FRC

Icons: Copy, Paste, Print, Share, Delete, Sort, View, More options

<input type="checkbox"/> Name	Date modified	Type	Size
-------------------------------	---------------	------	------

This folder is empty.

View >

Sort by >

Group by >

Undo Delete Ctrl+Z

New >

Properties Alt+Enter

AMD Software: Adrenalin Edition




Open in Terminal

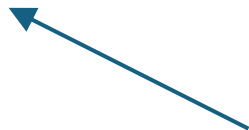
Folder

Shortcut

Microsoft Access Database

Bitmap image

X Kitbot2025 X +				
C This PC > Windows-SSD (C:) > FRC > Kitbot2025 >				
Icons Sort View ...				
<input type="checkbox"/> Name	Date modified	Type	Size	
 Inline Commands	1/4/2025 10:23 AM	File folder		
 Traditional Commands	1/4/2025 10:23 AM	File folder		
 KitBot_Java_Software_Guide.pdf	1/4/2025 10:20 AM	Adobe Acrobat D...	784 KB	



Zipfile had 2 separate Code directories, you can rename or use as is
and PDF file is Guide, good reference
Start with Traditional Commands folder, probably best to copy directory
and rename the copied directory as your TestBot for starting out

Traditional Commands				
This PC > Windows-SSD (C:) > FRC > Kitbot2025 > Traditional Commands >				
Sort View ...				
Name	Date modified	Type	Size	
.gradle	11/27/2024 11:33 AM	File folder		
.vscode	11/27/2024 11:33 AM	File folder		
.wpilib	11/27/2024 11:33 AM	File folder		
bin	11/27/2024 11:33 AM	File folder		
gradle	11/27/2024 11:33 AM	File folder		
src	11/27/2024 11:33 AM	File folder		
vendordeps	1/4/2025 10:07 AM	File folder		
.gitignore	11/27/2024 11:33 AM	txtfile	3 KB	
build.gradle	1/2/2025 9:24 AM	GRADLE File	4 KB	
gradlew	11/27/2024 11:33 AM	File	9 KB	
gradlew.bat	11/27/2024 11:33 AM	Windows Batch File	3 KB	
settings.gradle	11/27/2024 11:33 AM	GRADLE File	1 KB	
WPILib-License.md	11/27/2024 11:33 AM	MD File	2 KB	

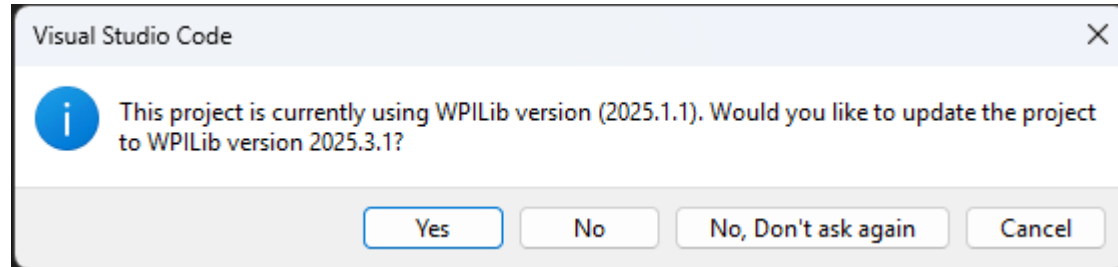
Next open up vscode

Launch VS Code

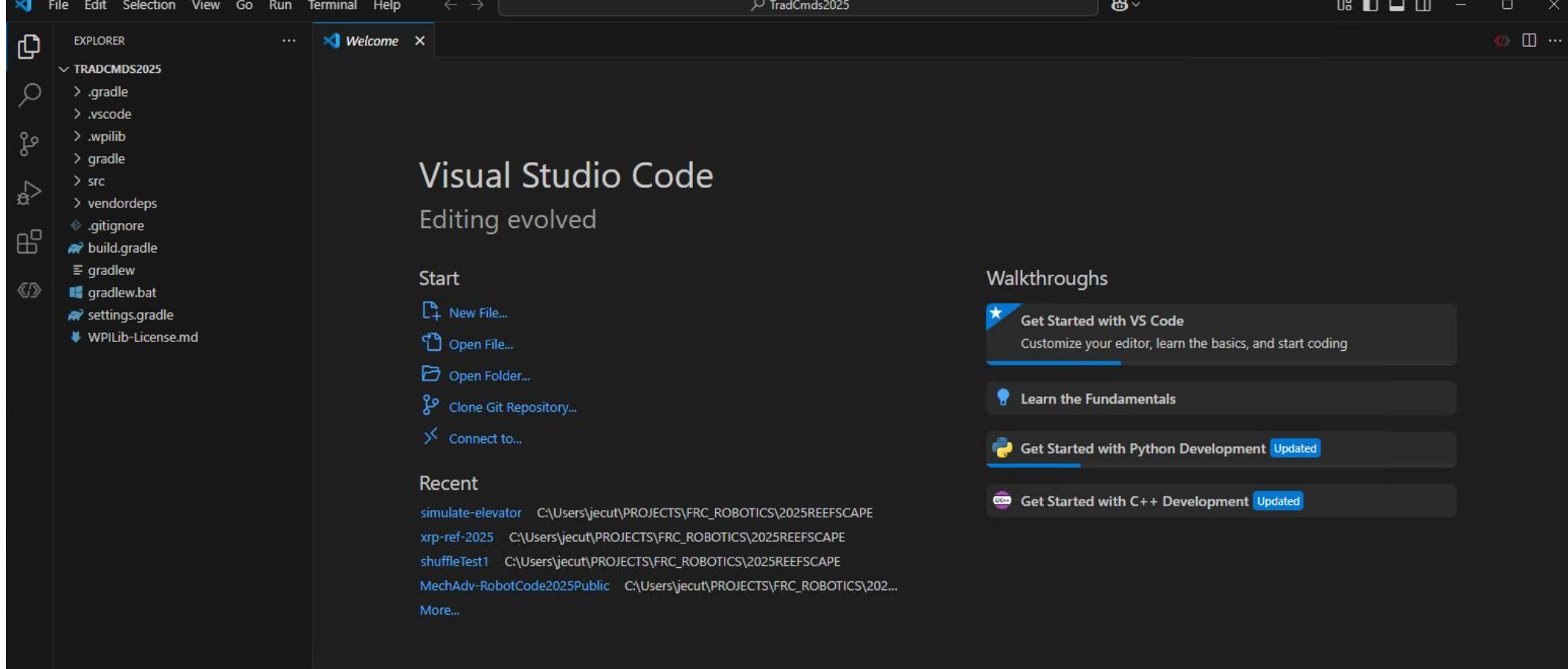
Icons from previous installs may appear along with Documentation links, use the Icon with year that makes sense



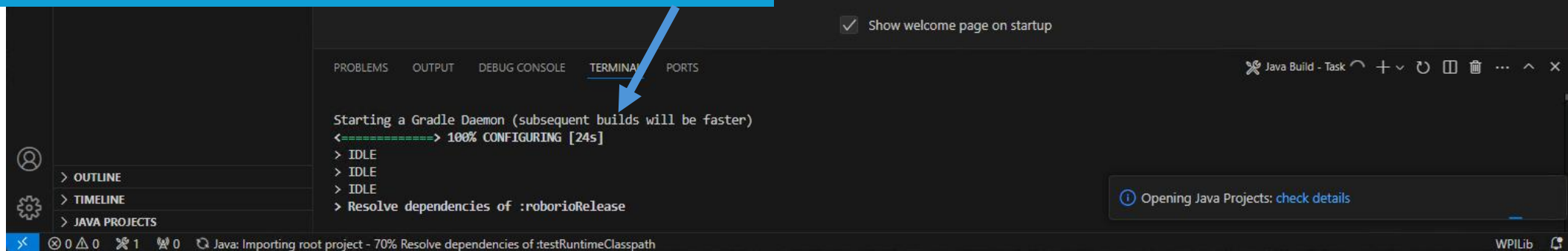
First Time you open existing or Old Project



Feel free to say no and see if it still builds.
You can always close it and it will prompt you again if you said no.



First time you open, it builds, be patient

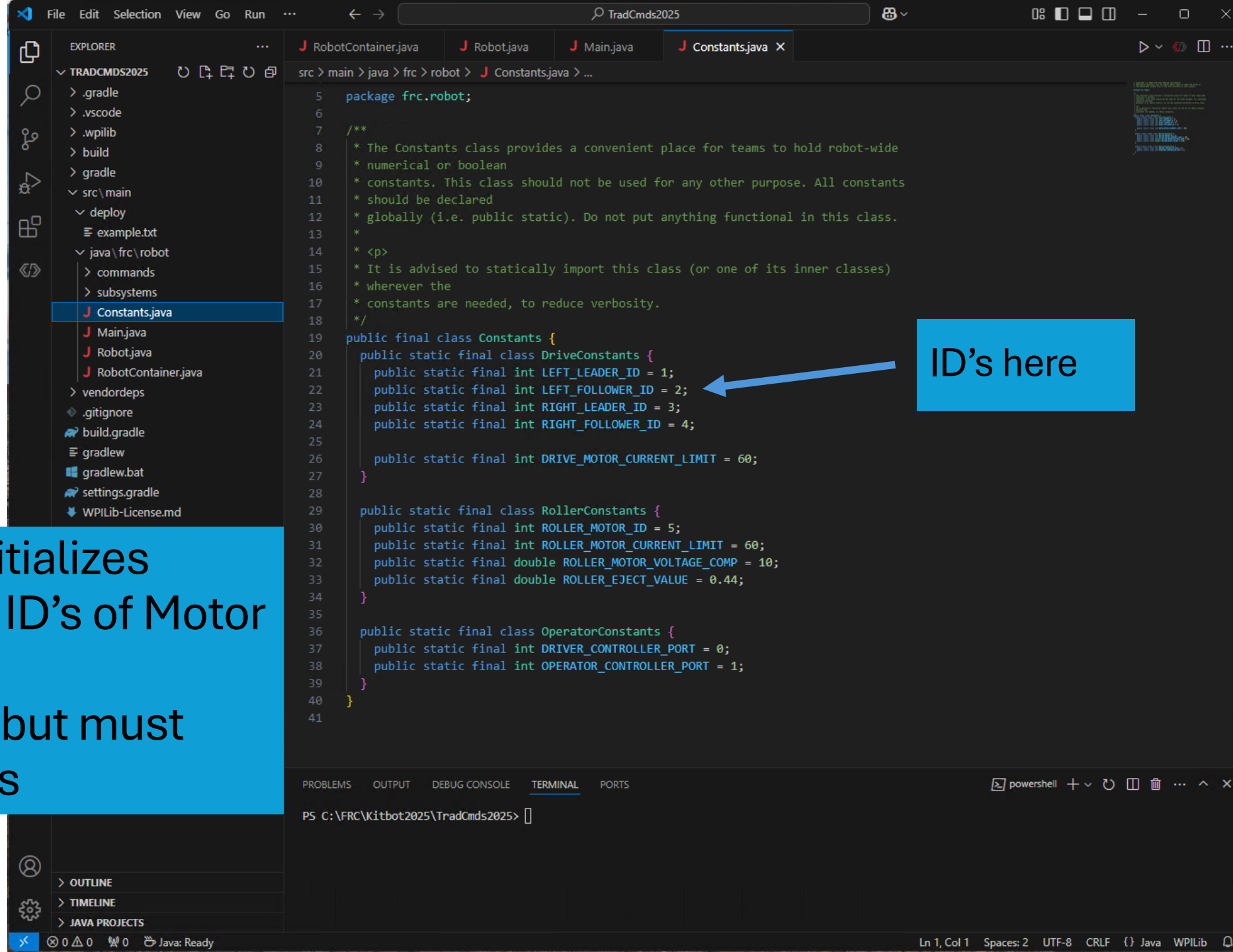


Java code found under
src\main\java\frc\robot

The screenshot shows the Visual Studio Code interface with a Java project named 'TradCmds2025'. The Explorer view on the left displays the project structure, with the file 'RobotContainer.java' selected under the path 'src\main\java\frc\robot'. The main editor area shows the code for 'RobotContainer.java', which includes imports for WPILib classes and the definition of the 'RobotContainer' class. The class contains private final instances for the drive subsystem, roller subsystem, driver controller, and operator controller. The bottom status bar indicates the current position is 'Ln 1, Col 1' and the file encoding is 'UTF-8'.

```
File Edit Selection View Go Run ... TradCmds2025
J RobotContainer.java X J Robot.java J Main.java J Constants.java
src > main > java > frc > robot > J RobotContainer.java > ...
1 // Copyright (c) FIRST and other WPILib contributors.
2 // Open Source Software; you can modify and/or share it under the terms of
3 // the WPILib BSD license file in the root directory of this project.
4
5 package frc.robot;
6
7 import edu.wpi.first.wpilibj.smartdashboard.SendableChooser;
8 import edu.wpi.first.wpilibj2.command.Command;
9 import edu.wpi.first.wpilibj2.command.button.CommandXboxController;
10 import edu.wpi.first.wpilibj2.command.button.Trigger;
11 import frc.robot.Constants.OperatorConstants;
12 import frc.robot.Constants.RollerConstants;
13 import frc.robot.commands.AutoCommand;
14 import frc.robot.commands.DriveCommand;
15 import frc.robot.commands.RollerCommand;
16 import frc.robot.subsystems.CANDriveSubsystem;
17 import frc.robot.subsystems.CANRollerSubsystem;
18
19 /**
20  * This class is where the bulk of the robot should be declared. Since
21  * Command-based is a
22  * "declarative" paradigm, very little robot logic should actually be handled in
23  * the {@link Robot}
24  * periodic methods (other than the scheduler calls). Instead, the structure of
25  * the robot (including
26  * subsystems, commands, and trigger mappings) should be declared here.
27  */
28 public class RobotContainer {
29     // The robot's subsystems
30     private final CANDriveSubsystem driveSubsystem = new CANDriveSubsystem();
31     private final CANRollerSubsystem rollerSubsystem = new CANRollerSubsystem();
32
33     // The driver's controller
34     private final CommandXboxController driverController = new CommandXboxController(
35         OperatorConstants.DRIVER_CONTROLLER_PORT);
36
37     // The operator's controller
38     private final CommandXboxController operatorController = new CommandXboxController(
39         OperatorConstants.OPERATOR_CONTROLLER_PORT);
40
41     PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
42 PS C:\FRC\Kitbot2025\TradCmds2025>
43
44 OUTLINE
45 TIMELINE
46 JAVA PROJECTS
47 0 0 0 Java: Ready
48 Ln 1, Col 1 Spaces: 2 UTF-8 CRLF {} Java WPILib
```

Constants.java file initializes
ID #'s related to CAN ID's of Motor
Controllers
Values are up to you, but must
agree with Controllers



```
5 package frc.robot;
6
7 /**
8  * The Constants class provides a convenient place for teams to hold robot-wide
9  * numerical or boolean
10 * constants. This class should not be used for any other purpose. All constants
11 * should be declared
12 * globally (i.e. public static). Do not put anything functional in this class.
13 *
14 * <p>
15 * It is advised to statically import this class (or one of its inner classes)
16 * wherever the
17 * constants are needed, to reduce verbosity.
18 */
19 public final class Constants {
20     public static final class DriveConstants {
21         public static final int LEFT_LEADER_ID = 1;
22         public static final int LEFT_FOLLOWER_ID = 2;
23         public static final int RIGHT_LEADER_ID = 3;
24         public static final int RIGHT_FOLLOWER_ID = 4;
25
26         public static final int DRIVE_MOTOR_CURRENT_LIMIT = 60;
27     }
28
29     public static final class RollerConstants {
30         public static final int ROLLER_MOTOR_ID = 5;
31         public static final int ROLLER_MOTOR_CURRENT_LIMIT = 60;
32         public static final double ROLLER_MOTOR_VOLTAGE_COMP = 10;
33         public static final double ROLLER_EJECT_VALUE = 0.44;
34     }
35
36     public static final class OperatorConstants {
37         public static final int DRIVER_CONTROLLER_PORT = 0;
38         public static final int OPERATOR_CONTROLLER_PORT = 1;
39     }
40 }
41
```

PS C:\FRC\Kitbot2025\TradCmds2025>

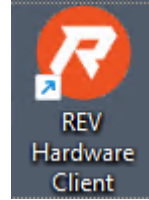
Notice those ID's get used in
subsystems
CANDriveSubsystem.java

```
4  
5 package frc.robot.subsystems;  
6  
7 import com.revrobotics.spark.SparkBase.PersistMode;  
8 import com.revrobotics.spark.SparkBase.ResetMode;  
9 import com.revrobotics.spark.SparkLowLevel.MotorType;  
10 import com.revrobotics.spark.SparkMax;  
11 import com.revrobotics.spark.config.SparkMaxConfig;  
12  
13 import edu.wpi.first.wpilibj.drive.DifferentialDrive;  
14 import edu.wpi.first.wpilibj2.command.SubsystemBase;  
15 import frc.robot.Constants.DriveConstants;  
16  
17 // Class to drive the robot over CAN  
18 public class CANDriveSubsystem extends SubsystemBase {  
19     private final SparkMax leftLeader;  
20     private final SparkMax leftFollower;  
21     private final SparkMax rightLeader;  
22     private final SparkMax rightFollower;  
23  
24     private final DifferentialDrive drive;  
25  
26     public CANDriveSubsystem() {  
27         // create brushed motors for drive  
28         leftLeader = new SparkMax(DriveConstants.LEFT_LEADER_ID, MotorType.kBrushed);  
29         leftFollower = new SparkMax(DriveConstants.LEFT_FOLLOWER_ID, MotorType.kBrushed);  
30         rightLeader = new SparkMax(DriveConstants.RIGHT_LEADER_ID, MotorType.kBrushed);  
31         rightFollower = new SparkMax(DriveConstants.RIGHT_FOLLOWER_ID, MotorType.kBrushed);  
32  
33         // set up differential drive class  
34         drive = new DifferentialDrive(leftLeader, rightLeader);  
35  
36         // Set can timeout. Because this project only sets parameters once on  
37         // construction, the timeout can be long without blocking robot operation. Code  
38         // which sets or gets parameters during operation may need a shorter timeout.  
39         leftLeader.setCANTimeout(milliseconds:250);  
40         rightLeader.setCANTimeout(milliseconds:250);  
41         leftFollower.setCANTimeout(milliseconds:250);  
42         rightFollower.setCANTimeout(milliseconds:250);  
43     }  
44 }  
45  
46
```

PS C:\FRC\Kitbot2025\TradCmds2025>

Ln 1, Col 1 Spaces: 2 UTF-8 CRLF {} Java WPILib

Set hardware to agree with Software



First time you run REV Client,

You will see list of CAN Devices, And you can 'blink' an individual device to find it on the Robot.

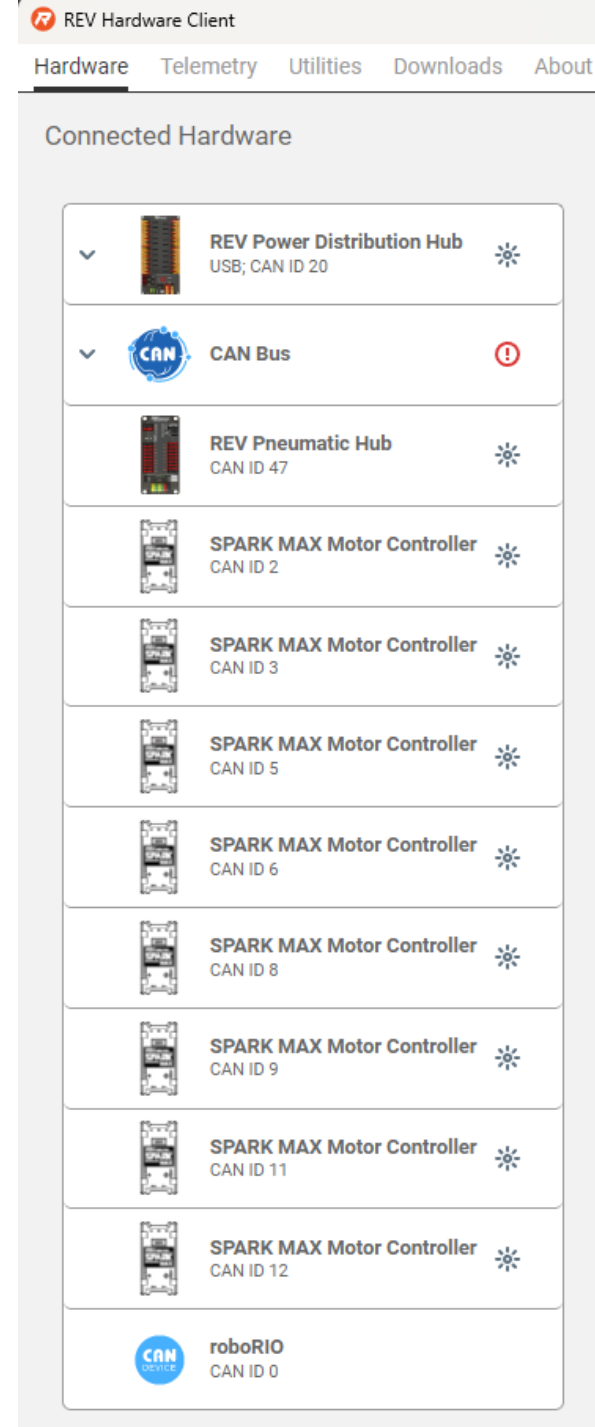
You should make sure all CAN ID's are unique.

Set the ID's inside REV client to agree with actual device's function on the robot.

If they would conflict or be duplicate, move some to higher numbers. Keep in the range 1 to 62 unless you know otherwise. Try not to use ID 0 or 1 as it may conflict with Power Distribution or Pneumatics controller.

See also section 3.4 of Kitbot Java PDF

Also recommend Max Current 30A not 60A.



Here is where you actually set the CAN ID

AND there is Update tab to update firmware

You see we set Current limit to 30A, but that can be overridden in software, set both places to 30A.

The screenshot displays the REV Hardware Client software interface. The top navigation bar includes 'Hardware', 'Telemetry', 'Utilities', 'Downloads', and 'About'. The left sidebar, titled 'Connected Hardware', lists several devices: 'REV Power Distribution Hub' (USB; CAN ID 20), 'CAN Bus' (with a red warning icon), 'REV Pneumatic Hub' (CAN ID 47), and four 'SPARK MAX Motor Controller' units with CAN IDs 2, 3, 5, and 8. The 'SPARK MAX Motor Controller' with CAN ID 3 is selected and highlighted in blue.

The main panel is titled 'SPARK MAX Motor Controller' and shows the 'CAN ID 3' in the top right corner. The 'Basic' tab is active, displaying various configuration settings. At the top, there are 'Load Configuration' and 'Save Configuration' buttons. The 'CAN ID' is set to 3, and the 'Input Voltage' is 12.24V. The 'Motor Type' is 'REV NEO Brushless', and the 'Idle Mode' is 'Coast'. The 'Smart Current Limit' is set to 30. The 'Primary Encoder Type' is 'Hall Sensor', and the 'Encoder Counts Per Rev' is 4096. The 'PWM Input Deadband' is set to 0.05. The 'Limit Switch' section shows 'Hard Forward Limit' and 'Hard Reverse Limit' both enabled. The 'Soft Limits' section shows 'Forward Limit' and 'Reverse Limit' both disabled. The 'Ramp Rate' section shows 'Rate (1/X seconds to full speed)' set to 0. The 'Update' tab is visible in the top navigation bar.

Notice Red Triangle near the Update tab, it wants Firmware update.

When you select a Spark Max you can choose Run and move the slider/click run to have motor spin. BUT keep hands clear and warn people.

Always have robot on blocks off floor in case you are spinning the wrong motor.

Also keep bumpers or poolnoodle on perimeter of robot to guard against running it into objects.

The screenshot displays the REV Hardware Client software interface. On the left, the 'Connected Hardware' panel lists two Spark MAX Motor Controllers: 'USB; CAN ID 1' and 'CAN ID 2'. The 'USB; CAN ID 1' controller is selected, and a red triangle icon indicates a firmware update is needed. The main panel shows the configuration for the selected controller. The 'Run' tab is active, and a red box labeled '1' highlights the 'Run Motor' button and the 'Setpoint' slider, which is currently set to 0.00. Below this, another red box labeled '2' highlights the 'PDIF' section, which includes a 'Profile' dropdown set to 0, an 'Increment' field set to 0.00001, and four gain fields (kP_0, kI_0, kD_0, kF_0) all set to 0. A red box labeled '3' highlights the 'View Graph on Telemetry Tab' button at the bottom right. The top navigation bar includes 'Hardware', 'Downloads', 'Telemetry', and 'About' tabs. The bottom left corner has a 'Scan For Devices' button and a 'Don't see your device?' link. The bottom right corner has a 'Report an Issue' link.

CAN BUS ISSUES:

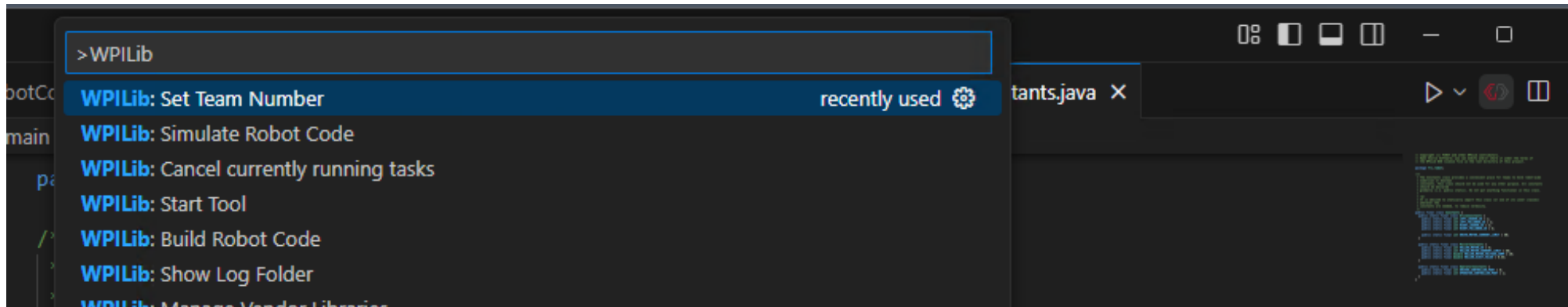
If you don't see all of the devices, you likely have one or more issues with your CAN bus wiring:

1. Verify that your CAN bus starts with the roboRIO and ends the built in terminator of a Power Distribution Hub or Power Distribution Panel (with the termination set to On using the appropriate jumper or switch).
2. Check that your CAN bus connections all match yellow-yellow and green-green.
3. Check that all CAN wire connections are secure to each other and that the connectors are securely installed in each SPARK Max.
4. If you're still having trouble, moving the USB connection around to different devices and seeing what each device can "see" on the bus can help pinpoint the location of an issue.
5. You can also disconnect a single SPARK from CAN bus and after a power cycle, use the USB cable to 'talk' to just that one SPARK by plugging into it directly.

Build the Code

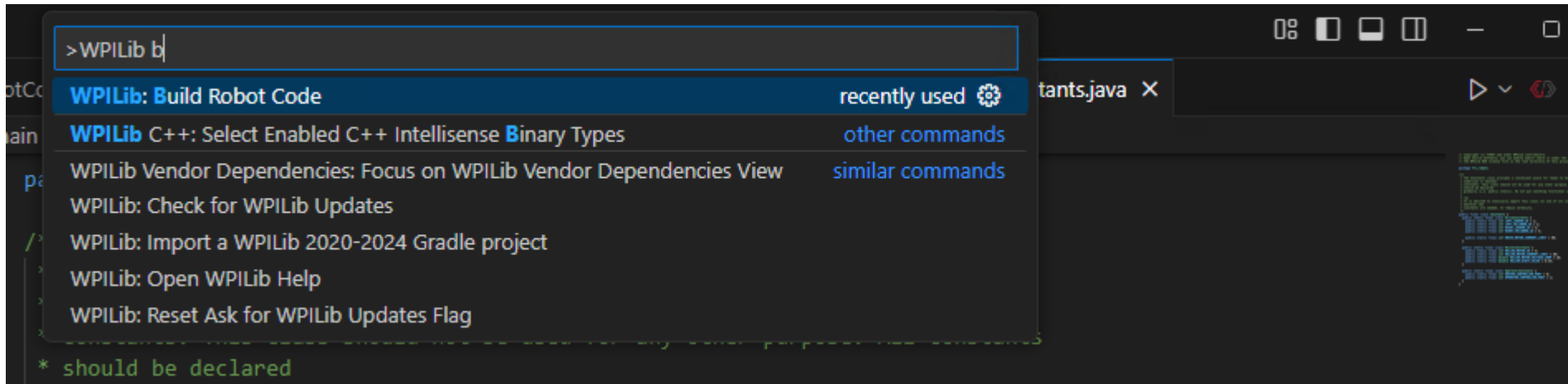
First set the team # (normally you do this when you build a new project), click the Red/Gray <<>> at top right and start typing “Set Team Number”, you should get option to set team to your team#.

Leading Zeros are not allowed



Build Continued 1

Click the Red Gray <<>> again and choose Build Robot Code



Time to Deploy

But first words of safety: **WARNING**

Make sure area safe to operate the robot.

Have bumpers or pool noodle attached to edges of robot to lessen any impacts.

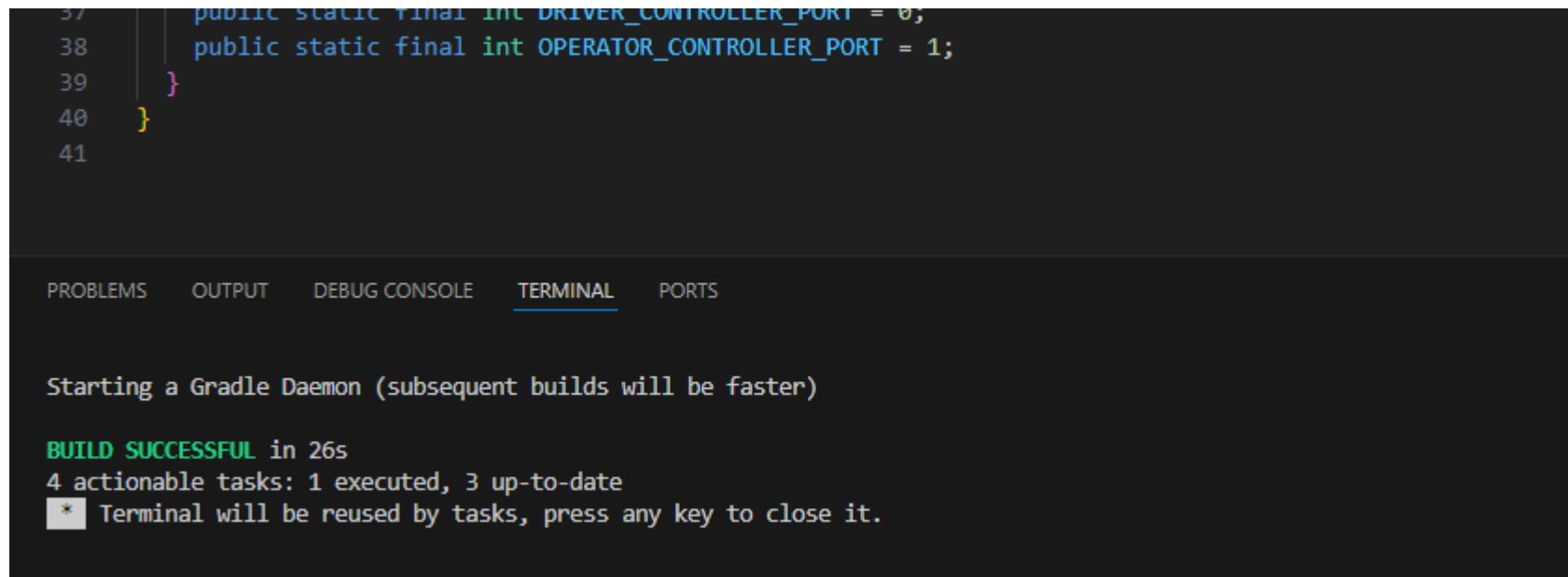
It will go the wrong way at first.

It will need to probably be slowed down, do that in code.

Remember the spacebar is E-stop (Emergency Stop) and the Enter is enable/disable. After an E-stop you may have to power cycle robot.

Deploy Robot Code

Click the Red / Gray <<>> again and choose Deploy to Robot
You should see Build Successful as below after about 30 seconds,
Subsequent builds happen faster.



```
37 public static final int DRIVER_CONTROLLER_PORT = 0;
38 public static final int OPERATOR_CONTROLLER_PORT = 1;
39 }
40 }
41
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

Starting a Gradle Daemon (subsequent builds will be faster)

BUILD SUCCESSFUL in 26s
4 actionable tasks: 1 executed, 3 up-to-date
* Terminal will be reused by tasks, press any key to close it.

Game Controllers

Xbox Controllers are the most popular, possibly followed by Logitech F310 type controllers.

The code is set up to use the Xbox controller class.

There are 2 controllers expected, one for Driver and one for the Operator.

Driver will move the robot, and the Operator will operate the roller.

If a team wants to use the Logitech F310 game controllers, they will appear like Xbox controllers to the WPILib software if they are configured in the correct mode. To set up the Logitech controllers, check that the switch on the back of the controller is set the 'X' setting. Then when using the controller, make sure the LED next to the Mode button is off; if it is on press the Mode button to toggle it. When the Mode light is on, the controller swaps the function of the left Analog stick and the D-pad.

Those extra buttons can cause robot downtime during competition so train the drive team on them or find a way for them to not be pressed.

More details on Code Layout

Subsystems

For the 2025 KitBot we have 5 motors that make up 2 subsystems, the Drivetrain, and the Roller. The 4 motors in the drivetrain always need to be working together to move the robot around the field and the Roller motor must spin to manipulate Pipes.

Two subsystem files: Drive and Roller in subsystems folder

The general rule of thumb on how to break up subsystems is to think about what actions, or commands, you might have to control the subsystems.

Perhaps you will run the intake while moving the arm or wrist?

Err towards more smaller subsystems; you can always make commands that require multiple subsystems but if you end up wanting separate commands to control a single subsystem at the same time, you'll have to refactor the subsystem to split it up.

See the Kitbot Java PDF as some of this mentioned there.

Imports

```
import com.revrobotics.spark.SparkBase.PersistMode;
import com.revrobotics.spark.SparkBase.ResetMode;
import com.revrobotics.spark.SparkLowLevel.MotorType;
import com.revrobotics.spark.SparkMax;
import com.revrobotics.spark.config.SparkMaxConfig;

import edu.wpi.first.wpilibj.drive.DifferentialDrive;
import edu.wpi.first.wpilibj2.command.SubsystemBase;
import frc.robot.Constants.DriveConstants;
```

Import section of code declares what other classes or packages we need to reference within this code (imports). A common practice is to add imports as you go.

The first group of imports in this subsystem is from the REV Robotics library for the Spark MAXs.

The second group is WPILib classes (one for the type of drivetrain on the robot and one for subsystems) and the DriveConstants section of the Constants file from this project.

Constructors

```
/** Class to drive the robot over CAN */  
public CANDriveSubsystem() {  
    // create brushed motors for drive  
    leftLeader = new SparkMax(DriveConstants.LEFT_LEADER_ID, MotorType.kBrushed);  
    leftFollower = new SparkMax(DriveConstants.LEFT_FOLLOWER_ID, MotorType.kBrushed);  
    rightLeader = new SparkMax(DriveConstants.RIGHT_LEADER_ID, MotorType.kBrushed);  
    rightFollower = new SparkMax(DriveConstants.RIGHT_FOLLOWER_ID, MotorType.kBrushed);  
  
    // set up differential drive class  
    drive = new DifferentialDrive(leftLeader, rightLeader);  
}
```

The next section is the constructor. In the first part of the constructor we initialize any variables contained in the subsystem.

In the case of our drivetrain, we initialize the 4 motor controllers and add one controller for each side into a WPILib DifferentialDrive object which describes the whole drivetrain.

The remainder of the constructor (not pictured) sets up the SparkMAXs for the drivetrain. One motor on each side is set as a follower and directed to follow the leader, then the leader motors are configured with some additional details.

Methods

```
38     public void driveArcade(double xSpeed, double zRotation) {  
39         drive.arcadeDrive(xSpeed, zRotation);  
40     }
```

The remainder of the subsystem class is methods. Here we define any methods that commands may need to call to get status from or perform actions on the subsystem. For our simple drivetrain, the only method we need is the `driveArcade` method which simply passes the parameters through to the same method on the `DifferentialDrive` object.

Actual Drive Control

RobotContainer.java's ConfigureBindings sets up what the Xbox controller does

```
private void configureBindings() {  
    // Set the A button to run the "RollerCommand" command with a fixed  
    // value ejecting the gamepiece while the button is held  
  
    // before  
    operatorController.a()  
        .whileTrue(new RollerCommand(() -> RollerConstants.ROLLER_EJECT_VALUE, (  
  
    // Set the default command for the drive subsystem to an instance of the  
    // DriveCommand with the values provided by the joystick axes on the driver  
    // controller. The Y axis of the controller is inverted so that pushing the  
    // stick away from you (a negative value) drives the robot forwards (a posit  
    // value). Similarly for the X axis where we need to flip the value so the  
    // joystick matches the WPILib convention of counter-clockwise positive  
    driveSubsystem.setDefaultCommand(new DriveCommand(  
        () -> -driverController.getLeftY() *  
            (driverController.getHID().getRightBumperButton() ? 1 : 0.5),  
        () -> -driverController.getRightX(),  
        driveSubsystem));  
}
```

Command DriveCommand does the driving

Constructor stores
parameters into Class
variables for later.

The addRequirements
will make sure subsystem is
available

```
package frc.robot.commands;

import edu.wpi.first.wpilibj2.command.Command;
import frc.robot.subsystems.CANDriveSubsystem;
import java.util.function.DoubleSupplier;

// Command to drive the robot with joystick inputs
public class DriveCommand extends Command {
    private final DoubleSupplier xSpeed;
    private final DoubleSupplier zRotation;
    private final CANDriveSubsystem driveSubsystem;

    // Constructor. Runs only once when the command is first created.
    public DriveCommand(
        DoubleSupplier xSpeed, DoubleSupplier zRotation, CANDriveSubsystem driveSubsystem) {
        // Save parameters to local variables for use later
        this.xSpeed = xSpeed;
        this.zRotation = zRotation;
        this.driveSubsystem = driveSubsystem;

        // Declare subsystems required by this command. This should include any
        // subsystem this command sets and output of
        addRequirements(this.driveSubsystem);
    }
}
```

Command DriveCommand does the driving

In the execute() method, we call the driveArcade method from the drive subsystem which tells the motors to drive such that the robot moves according to the joystick inputs.

```
38  @Override
39  public void initialize() {}
40
41  @Override
42  public void execute() {
43      |   driveSubsystem.driveArcade(xSpeed.getAsDouble(), zRotation.getAsDouble());
44      |
45  }
46
47  @Override
48  public void end(boolean isInterrupted) {}
49
50  @Override
51  public boolean isFinished() {
52      |   return false;
53  }
```

Autonomous – drive forward 1 second

Imports and Constructor

Class sets up two variables and a method

```
package frc.robot.commands;

import edu.wpi.first.wpilibj.Timer;
import edu.wpi.first.wpilibj2.command.Command;
import frc.robot.subsystems.CANDriveSubsystem;

// Command to run the robot at 1/2 power for 1 second in autonomous
public class AutoCommand extends Command {
    CANDriveSubsystem driveSubsystem;
    private Timer timer;
    private double seconds = 1.0;

    // Constructor. Runs only once when the command is first created.
    public AutoCommand(CANDriveSubsystem driveSubsystem) {
        // Save parameter for use later and initialize timer object.
        this.driveSubsystem = driveSubsystem;
        timer = new Timer();

        // Declare subsystems required by this command. This should include any
        // subsystem this command sets and output of
        addRequirements(driveSubsystem);
    }
}
```


AutoCommand Methods

- Initialize: Start the timer.
- Execute: Sets the drive motors to drive forward.
- End: Stop the timer and stop the drive subsystem.
- IsFinished: Returns true when the timer exceeds 1 second.

```
// Runs each time the command is scheduled. For this command, we handle starting
// the timer.
@Override
public void initialize() {
    // start timer, uses restart to clear the timer as well in case this command has
    // already been run before
    timer.restart();
}

// Runs every cycle while the command is scheduled (~50 times per second)
@Override
public void execute() {
    // drive at 1/2 speed
    driveSubsystem.driveArcade(xSpeed:0.5, zRotation:0.0);
}

// Runs each time the command ends via isFinished or being interrupted.
@Override
public void end(boolean isInterrupted) {
    // stop drive motors
    driveSubsystem.driveArcade(xSpeed:0.0, zRotation:0.0);
}

// Runs every cycle while the command is scheduled to check if the command is
// finished
@Override
public boolean isFinished() {
    // check if timer exceeds seconds, when it has this will return true indicating
    // this command is finished
    return timer.get() >= seconds;
}
```

Enable/Disable AutoCommand

RobotContainer.java

autoChooser is a pulldown that can appear on your drivestation's dashboard such as Shuffleboard.

Read about Dashboards

```
/**
 * The container for the robot. Contains subsystems, OI devices, and commands.
 */
public RobotContainer() {
    // Set up command bindings
    configureBindings();

    // Set the options to show up in the Dashboard for selecting auto modes. If you
    // add additional auto modes you can add additional lines here with
    // autoChooser.addOption
    autoChooser.setDefaultOption(name:"Autonomous", new AutoCommand(driveSubsystem));
}
```



More on Autonomy

Refer to the Kitbot JAVA PDF to learn more about Autocommands
And also the Command Based Programming section of Wpilib docs.

Why Git ?

For Revision Control

- Once you add and commit, code is on github forever
- Allows you to revert back before that accidental wrong edit
- Allows 'branching' for adding a feature while main baseline still available
- Allows other team to look at your code to assist
- Allows you to share your code to assist other teams

Install GIT for version Control

<https://docs.wpilib.org/en/stable/docs/software/basic-programming/git-getting-started.html>

Lots of info on the FRC page, follow those instructions

Hardware Component Overview

Software Component Overview

PROGRAMMING BASICS

What is WPILib?

2026 Overview

VS Code Overview

Dashboards

Telemetry

FRC LabVIEW Programming

FRC Python Programming

Hardware APIs

CAN Devices

Basic Programming

Git Version Control Introduction

The C++ Units Library

The Java Units Library

Joysticks

Coordinate System

Setting Robot Preferences

Robot Project Deploy Directory

Using Test Mode

Reading Stacktraces

Treating Functions as Data

Get Alliance Color

Java Garbage Collection

Git Version Control Introduction

Important

A more in-depth guide on Git is available on the [Git website](#).

Git is a Distributed Version Control System (VCS) created by Linus Torvalds, also known for creating and maintaining the Linux kernel. Version Control is a system for tracking changes of code for developers. The advantages of Git Version Control are:

- Separation of testing environments into *branches*
- Ability to navigate to a particular *commit* without removing history
- Ability to manage *commits* in various ways, including combining them
- Various other features, see [here](#)

Prerequisites

Important

This tutorial uses the Windows operating system

You have to download and install Git from the following links:

- [Windows](#)
- [macOS](#)
- [Linux](#)

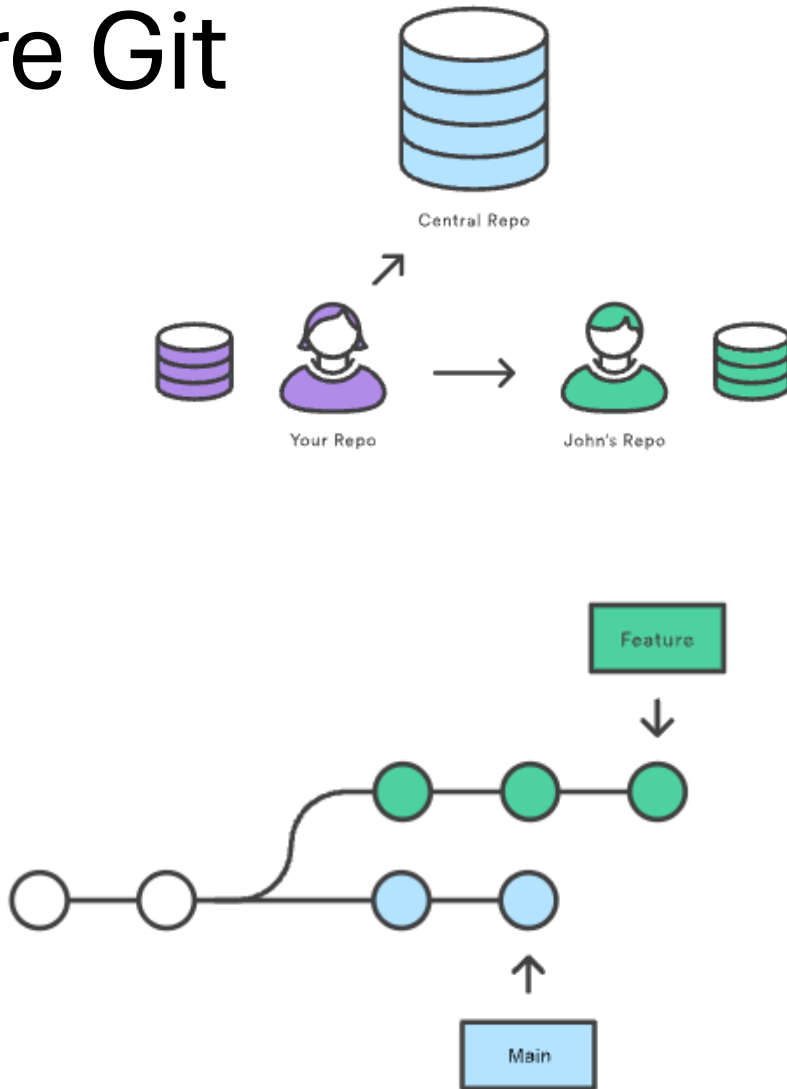
Note

You may need to add Git to your [path](#)

Git Vocabulary

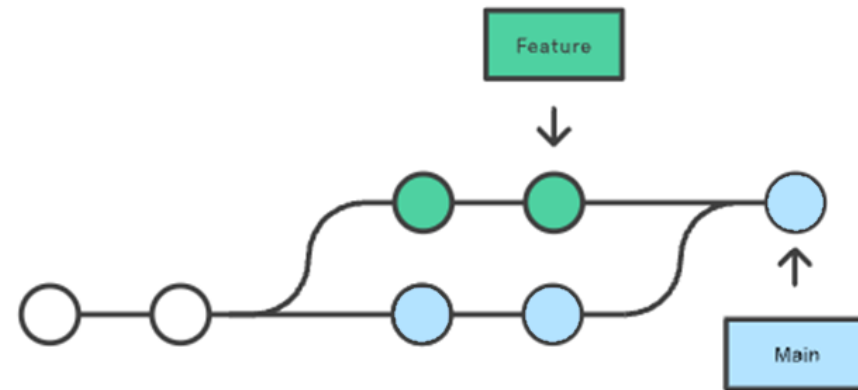
- Git concepts and commands:
- **Repository:** the data structure of your code, including a .git folder in the root directory
- **Clone:** retrieve a local copy of a repository to modify
- **Fork:** duplicate a pre-existing repository to modify, and to compare against the original
- **Branch:** a means of grouping a set of commits. Each branch has a unique history. This is primarily used for separating development and stable branches
- **Add:** Queues up some changes
- **Commit:** a particular saved state of the repository, which includes all files and additions
- **Push:** update the remote repository with your local changes
- **Pull:** update your local repository with the remote changes
- **Merge:** combine various changes from different branches/commits/forks into a single history
- VS Code extension so it's built into VS code

More Git



Tutorials on Git

- <https://git-scm.com/learn>
- <https://www.atlassian.com/git/tutorials>
- <https://docs.github.com/en/get-started/start-your-journey/hello-world>



Vision – very helpful for autonomous period

- Photonvision runs on Raspberry Pi with webcam to help locate your robot on field
<https://photonvision.org/>
- Limelight is all in one solution for locating robot on field.
- <https://docs.wpilib.org/en/stable/docs/software/vision-processing/apriltag/index.html>
- Once your robot knows where it is, autonomy becomes easier
- <https://www.youtube.com/@0ToAuto>



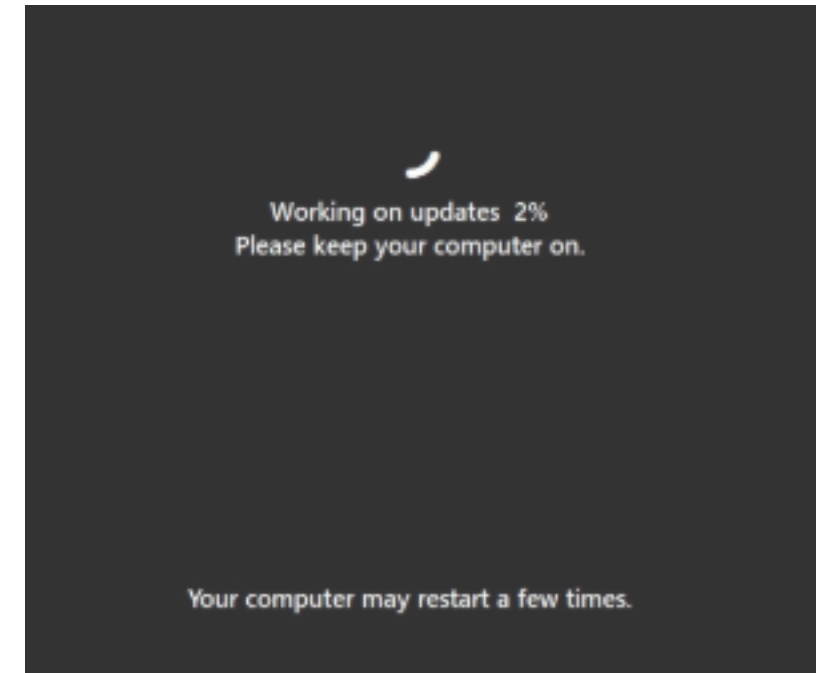
Learn Java and more

- <https://learn.microsoft.com/en-us/shows/java-for-beginners/>
- Codecademy
- Coders need to know the hardware they control:
<https://docs.wpilib.org/en/stable/docs/controls-overviews/control-system-hardware.html>

Competition gotchas

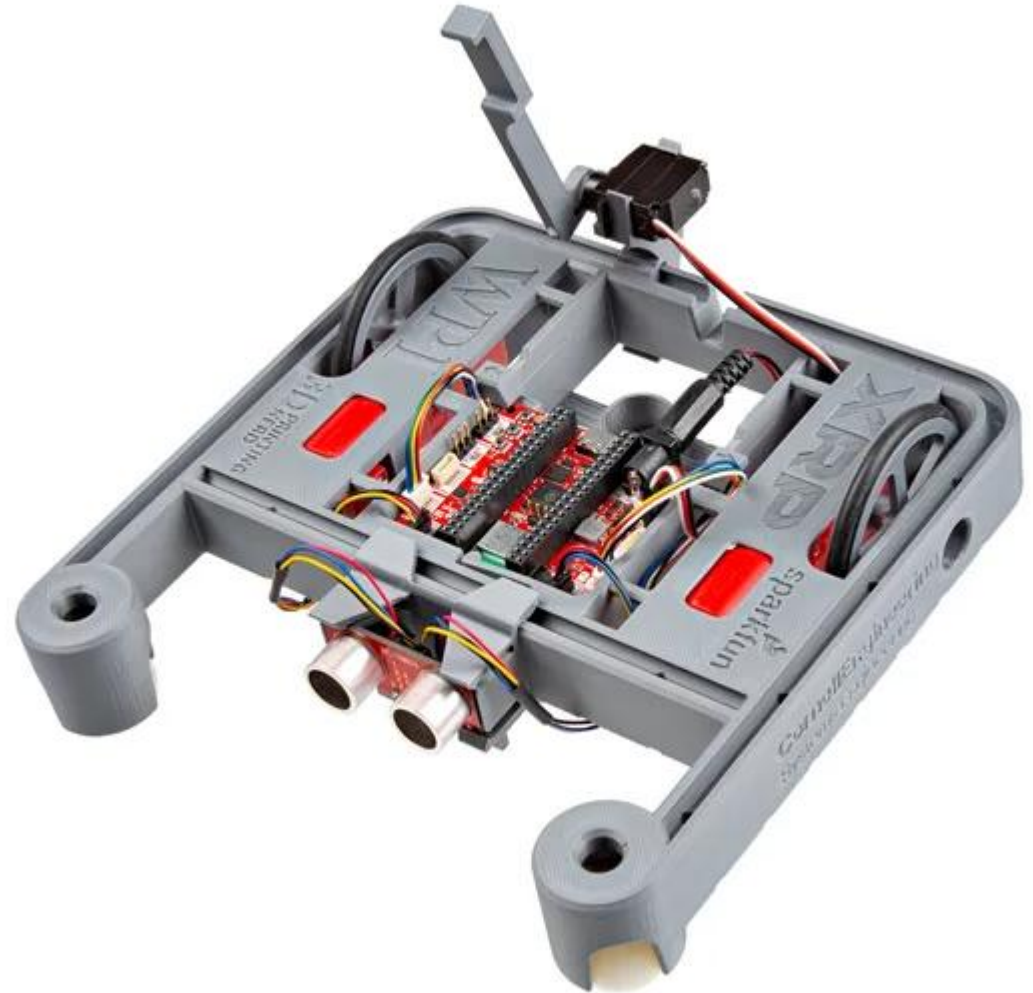
BEFORE Leaving for competition:

- Make sure firmware updated for all motor controllers (use REV client or CTR phoenix tuner)
- Make sure your code compiled with latest WPILib
- Make sure Roborio has latest firmware and Image
- Visit here <https://github.com/wpilibsuite/allwpilib/releases>
- **Update Laptop software, but once updated, turn off updates for duration of competition**, as that 'blank screen updating' during your scheduled competition does happen.



XRP robot is tiny robot using same code

- Uses same WPILib code
- Great intro to code for new coders
- Helps understand game controller and motors
- <https://docs.wpilib.org/en/stable/docs/xrp-robot/index.html>



Other References

- Team 254 Slides <https://drive.google.com/drive/folders/1tZ6xdn-xzFpcAzW3VB5ttzQwuhUmvPJB?usp=sharing>
- Kitbot 2025
<https://firstfrc.blob.core.windows.net/frc2025/KitBot/KitBotBuildInstructions.pdf>
- And the Kitbot Java PDF from the kitbot java code zipfile
- <https://frcteam3255.github.io/FRC-Java-Tutorial/>
- FirstSC slack for updates on any South Carolina specific coding collaborations

More

ADVANCED PROGRAMMING

- ⊞ Vision Processing
- ⊞ Command-Based Programming
- ⊞ Kinematics and Odometry
- ⊞ NetworkTables
- ⊞ Path Planning
- ⊞ roboRIO
- ⊞ Advanced GradleRIO
- ⊞ Advanced Controls
- ⊞ Convenience Features

EXAMPLES AND TUTORIALS

- WPILib Example Projects
- Third Party Example Projects

ROMI AND XRP SUPPORT

- ⊞ Getting Started with Romi
- ⊞ Getting Started with XRP

There is so much at the
docs.wpilib.org site