

DevilBotz 2876 Swerve Bring-Up Checklist

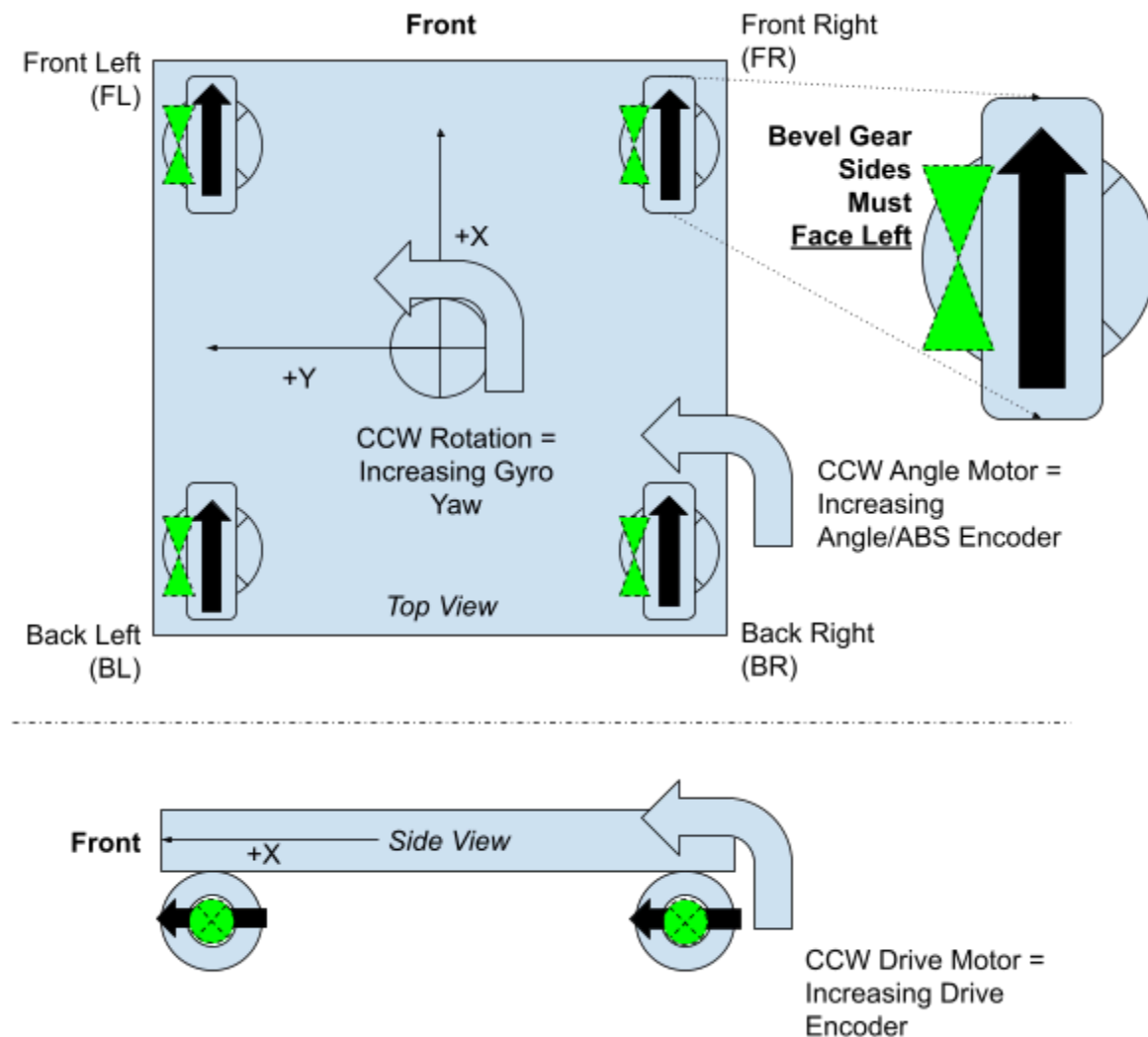
DevilBotz 2876
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Resources

- [YAGSL Wiki](https://yagsl.gitbook.io/yagsl/) - <https://yagsl.gitbook.io/yagsl/>
- [REV Robotics Hardware Client](https://docs.revrobotics.com/rev-hardware-client/) - <https://docs.revrobotics.com/rev-hardware-client/>
 - for configuring Spark Max Motor Controllers and other Rev devices
- [Phoenix Tuner X](https://v6.docs.ctr-electronics.com/en/stable/docs/tuner/index.html) - <https://v6.docs.ctr-electronics.com/en/stable/docs/tuner/index.html>
 - for configuring CanCoders and other CTR devices

Swerve Orientation Diagram

Note: When viewed from the top, make sure the sides of the wheel with the bevel gear are pointing to the **left**



Step 1: Module Types

	Model, Version, Etc
<i>Motor</i>	Neo
<i>Controller</i>	Spark Max
<i>Absolute Encoder</i>	REV Throughbore
<i>IMU</i>	Pigeon 2.0

Step 2: Build Specific Details

1. Measure the module center relative to the **robot center**

	Location (Inches)			
Module	X		Y	
<i>Front Left (FL)</i>	+	10.875"	+	9.375"
<i>Front Right (FR)</i>	+	10.875"	-	9.375"
<i>Back Left (BL)</i>	-	10.875"	+	9.375"
<i>Back Right (BR)</i>	-	10.875"	-	9.375"

2. Measure the wheel diameter *in meters*
3. Determine the *reported* internal encoder resolution
 - a. *Note: Most encoders now normalize the reported values to -1 to 1, so the Encoder Resolution when computing the conversion factors should generally be "1". One known exception is the TalonSRX.*
4. Find the drive/angle gear ratio from the swerve module manufacturer specs
5. Calculate the drive/angle conversion factors
 - a. Drive Motor Conversion Factor (meters/rotation) = $(\text{PI} * \text{WHEEL DIAMETER IN METERS}) / (\text{GEAR RATIO} * \text{ENCODER RESOLUTION})$
 - b. Angle Motor Conversion Factor (degrees/rotation) = $360 / (\text{GEAR RATIO} * \text{ENCODER RESOLUTION})$

Note: For Absolute Encoders attached **directly** to the dataport on the SparkMAX, the Conversion Factor is **360**

Motor	Wheel Diameter (meters)	Encoder Resolution (CPR)	Gear Ratio	Conversion Factor
<i>Drive</i>	4"	1	6.75 L2	0.04728678
<i>Angle</i>		1	21.4286	360

Step 3: Electrical Characteristics

- Set/Verify the CAN IDs for each module

Note: Update the FW for each module and reset any stored settings to factory defaults

	Motor/Encoder CAN IDs		
Module	Drive	Angle	Absolute Encoder
Front Left (FL)	3	2	2
Front Right (FR)	12	13	13
Back Left (BL)	1	16	16
Back Right (BR)	15	14	14

- Check Inversion
 - Rotate the *drive* wheel **CCW** (moving “forward”)
 - ☐ The built-in encoder value should **increase**. If not, invert the drive motor.
 - Rotate the *angle* wheel **CCW** (when viewed from the top)
 - ☐ The built-in encoder value should **increase**. If not, invert the angle motor.
 - ☐ The absolute encoder value should **increase**. If not, invert the absolute encoder.
 - Rotate the entire *robot* **CCW**.
 - ☐ The gyro angle (yaw) should **increase**. If not, invert the IMU

Note: If you are using the hardware utilities for accessing the motors controllers and/or absolute encoders, the RoboRio must **not** be active on the CAN bus. The most reliable way to disable the RoboRio, **without affecting the CAN BUS termination**, is to temporarily disconnect it from power by pulling the 10A fuse on the Power Distribution Panel (PDP) and **then** power cycle the robot.

	Inverted?			
Module	Drive	Angle	Absolute Encoder	IMU
Front Left (FL)	N	N	N	Inverted
Front Right (FR)	inverted	N	N??	
Back Left (BL)	inverted	N	N??	
Back Right (BR)	inverted	N	N??	

Step 4: Absolute Encoder Offsets

- Turn Robot On (Disabled so the wheels can be turned manually)
- Manually Turn All 4 wheels so that they are all pointing forward and forward rotation results in increasing drive encoder values (see the black arrows in [Orientation Diagram](#)).

10. Measure the absolute encoder value for each module

Module	Angle Absolute Offset (degrees)
<i>Front Left (FL)</i>	0??
<i>Front Right (FR)</i>	0?
<i>Back Left (BL)</i>	0?
<i>Back Right (BR)</i>	0?

Step 5: Input Data into the YAGSL Configuration Web Page

Open the following webpage and import your data into the config files:

<https://broncbotz3481.github.io/YAGSL-Example/>