

Part 10 Focus Guide

Use the built-in IMU to turn right 90 degrees

TEACHER NOTE

Use this guide beside the video. Students should leave able to connect a physical Hub orientation to signed yaw feedback and a safe stop decision.

Prep

- Two-motor StarterBot; Control Hub rigidly mounted
- Driver Station, charged battery, and StarterBotImuTurn90.java
- Tape, square or protractor, and a clear 6-foot test area
- Part 10 student workbook and POWERING ON poster

Planned pauses

TIME	ASK	LISTEN FOR
0:10	IMU vs encoders?	Heading/orientation vs wheel travel
0:31	What is robot FRONT?	A team-defined chassis direction
0:55	What describes Hub mounting?	Logo direction plus USB direction
1:15	What does resetYaw do?	Current aligned direction becomes zero
1:37	Error at target -90, current -70?	-20; continue clockwise
1:47	Why slow near target?	Reduce overshoot
1:56	Why tolerance?	A practical completion band

Hands-on sequence

1. With DISABLED shown, identify FRONT and record the Hub logo/USB directions.
2. Read the matching RevHubOrientationOnRobot values in code.
3. Place the robot level, square, and still; observe yaw before and after resetYaw().
4. Predict error and correction for sample headings.
5. Clear the full turn sweep, run POWERING ON, and complete one supervised low-power turn.
6. STOP, confirm DISABLED, then record final yaw and exit reason.

Part 10 Technical Notes

Keep the sensor model and safety model explicit

Code model

error = **normalize(targetHeading - currentHeading)**

turnPower = clip(error * TURN_GAIN, -MAX_TURN_POWER, +MAX_TURN_POWER)

If power is nonzero but too small to move the robot, apply the configured minimum while preserving the sign.

Independent stop paths

- Absolute error enters the tolerance band.
- Elapsed time reaches the timeout.
- opModeIsActive() becomes false after STOP.
- A final stopDrive() sends zero power even when a loop exits unexpectedly.

Misconceptions to catch

PROMPT	EXPECTED RESPONSE / EVIDENCE
The IMU knows field position.	No. Yaw gives orientation; it does not directly measure x/y field position.
Right is always -90.	Only after the physical orientation and sign convention are verified.
Exact -90.000 is required.	No. A small tolerance handles real sensor and drivetrain variation.
More power fixes error.	Higher power may increase overshoot; diagnose sign and orientation first.

POWERING ON SAFETY GATE
1. Confirm the Driver Station shows DISABLED . Place and square the robot before the test.
2. Remove hands, tools, cables, tape measures, and loose objects.
3. Check the full route or turn sweep, side boundaries, and stopping buffer.
4. Call POWERING ON! loudly, then pause while everyone steps behind the boundary.
5. Visually confirm that no one is holding, touching, or reaching toward the robot.
6. Only then authorize INIT and START. Keep the operator ready to press STOP.
7. After the run, press STOP and visibly confirm DISABLED before anyone approaches.